



PROCEEDING INTERNATIONAL CONFERENCE 6th SAADC 2017

Conference on Sustainable Animal Agriculture for Developing Countries

**"WISDOM OF USING LOCAL RESOURCES FOR DEVELOPMENT OF
SUSTAINABLE ANIMAL PRODUCTION IN DEVELOPING COUNTRIES"**



The Singhasari Resort, Batu City, Indonesia, October 16-19, 2017

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PREFACE

It is my privilege to thanks to all of authors for your enthusiasm in participating and contributing papers at this 6th International Conference on Sustainable Animal Agriculture for Developing Countries (The 6th SAADC-2017) that had been successfully held on 16-19 October 2017 in The Singhasari Resort, Batu City, Indonesia with the theme of *“Wisdom of Using Local Resources for Development of Sustainable Animal Production in Developing Countries”*

The primary objective of the 6th SAADC-2017 was to provide a scientific forum for animal scientists and producers, and administrators of livestock related agencies, particularly from the developing countries, to share their experiences, discuss issues and suggest recommendations to develop further a more sustainable livestock production.

This proceeding contains selected papers that were presented in the conference based on the quality and relevancy to the confencence. The papers are reflecting responsiveness of animal scientist from various countries in promoting sustainability of animal agriculture for the prosperity of the never ending generations. These proceeding hopefully will certainly enrich the body of knowledge and understanding about various aspects related to sustainable animal agriculture.

Our special thanks are also for the SAADC President for his confidence to our Universitas Brawijaya to organize this prestigious conference. Also, congratulation that SAADC is now listed in the International Congress and Conference Association (ICCA) based on its quality and consistent activities.

We also wish to thank all partners and sponsors for their support to the success of the conference. To colleague members of the organizing committee, please accept my deep appreciation for your hard working in ensuring the success of the conference.

Yours Sincerely,

Prof. Ifar Subagiyo
Chief Editor

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**KEYNOTE ADDRESS AND
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Making money from milk on small-holder dairy farms in the tropics: an international perspective

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Abstract

The profitability of milk production in the developing world varies widely between farming systems. This results from poor animal productivity and an inefficient marketing chain structure where a high proportion of the profit margin passes to intermediary milk collectors and distributors rather than to the farmer. Hygiene standards are often compromised through the lack of chilling facilities for milk storage and the need to adulterate the raw product to enhance profit margins. Co-operative selling of milk along with the acquisition of feed and veterinary medicines has boosted the financial resilience of small-holder farming communities world-wide, although in some regions a lack of trust between families even within the same village has prevented this activity. Despite this, commercial reality dictates that farming communities work together to achieve financial sustainability. Although milk has traditionally provided many consumers with their only source of animal protein, vitamins and minerals, we are now discovering its many other virtues particularly in relation to cognitive development and memory retention and the provision of antioxidants. The impact of milk processing technology on some of these remarkable properties requires further investigation to ensure milk consumers world-wide benefit from their positive attributes.

Keywords: dairy, developing countries, co-operatives, marketing chains, milk attributes

Introduction

More than 6 billion people worldwide consume milk and milk products with the majority of these people live in developing countries (FAO, 2016). Milk serves as the major source of protein, calcium, phosphorus, iron, vitamin A and riboflavin for the predominance of populations across the globe. In addition this complex biological fluid has positive health attributes including the provision of protection against coronary heart disease, stroke, diabetes, some cancers and dementia (Kliem and Givens, 2011).

Milk production in the developing world

In spite of the fact that small-holder farmers supply 80% of the food in developing countries, often they receive below market prices for their produce. This is part due to the fact that they receive little information on market prices, and if they did have the information, the cost of transport of their products to these markets is most often prohibitive. To add to this inefficiency, a third of the world's food is spoiled or discarded, while this loss extends to 50% in Africa (Agriledger, 2017).

Our economic analysis of 212 small-holder farm household in irrigated Okara and arid Bhakkar districts of Pakistan showed a positive gross margin of \$US84 and \$US129 per farm per annum respectively from their milk operations. These farmers owned 11 animal (4 milking) and 3.6 ha of land. The milk enterprise became loss bearing, however, after taking finance and labour costs into account with negative balances of \$US278 and \$US100 respectively (Godfrey, 2016).

However this is not always the case. Comparable dairy farmers in the Serajgon district of Bangladesh owning 0.6ha and 1 to 3 cattle, were able to generate a gross margin of up to \$US1545 per cow. The supply of high quality concentrate feeds were important for generating profits along with the development of efficient marketing chains related to co-operatives like the Bangladesh Milk Producer's Cooperative Union Ltd (Milk Vita), the BRAC Dairy and Food Project among others (Mandal et al., 2009).

The poor lactational performance of animals has been one important contributory element to low profitability, with animals averaging 3.15L/day across the country (Anon, 2015). However interventions in nutrition and animal health have enabled these farmers to double these yields. Of course the relative ineffectiveness of industry-wide genetic selection programs to improve productivity of native tropical dairy breeds of cattle is also a contributory factor.

The utility of co-operatives

Co-operatives have worked in different ways across the global dairy spectrum. The BRAC co-operative in Bangladesh, for example, have undertaken to provide a fair price and a steady income for the farmer largely because they have developed an efficient cold chain to deliver directly a high quality product to the consumer. The very strength of this co-operative lies in its ability to support the farmer through breed development, quality veterinary health care, fodder cultivation, vaccination with quality effective vaccines, provision of anthelmintics, feed supplies and financial support services. This co-operative has diversified to spread risk across a range of products including yoghurt, flavoured milks, mango and tamarind fruit juices, butter a ghee (Mandal et al., 2009). In effect it exhibits all the hallmarks of a mature dairy co-operative found across the developed world.

The ownership of co-operatives by producers ensures that profit margins on farm are sustained, however it is the goodwill of the co-operative companies as exemplified in Bangladesh that facilitate a healthy relationship between the producers and the marketers of their product.

The Indian experience

Similarly in India major advances in the productivity of the dairy industry have been achieved through the implementation of strategic government and commercial operations. Milk availability has increased from 110 grams per day per person in the early 1970's to 307 grams in 2013-4, even allowing for the increase in the nation's population (India, 2015). The success of the dairy program "Operation Flood" created an enormous yet manageable network of small-holder farmers functionally connected to processors and in turn consumers. The initial flush of success was based on a system of highly regulated domestic markets, with licensing systems favouring co-operatives and the public sector. The liberalisation of these controls since the 1990's has assisted in the establishment of modern supply chains providing price and market stability for farmers along with heavy incentives to meet contemporary food standards (Sharma, 2015). The number of private sector processing plants increased to 765 and co-operative processing plants to 263 across the country by 2011. The linkage of 15.1million small-holder producers to markets through a tri-levelled co-operative structure at the village,

district and state level in the so-called “Anand Pattern” has delivered an effective marketing structure with profits shared equitably along the chain (GCCMF, 2012; NDDDB, 2013).

However co-operatives are not always effective vehicles for the profitability of small-holder dairy farming. Increasingly we are recognising that the structure of marketing chains serving these poor farming communities are often biased to serve the financial needs of middlemen responsible for transferring the product from its source on farm to the consumer (Rota, 2010): the producer is clearly being exploited.

The dairy and beef production sectors in Nicaragua provides one case in point, where rate limiting feed resources are divided to produce either milk or meat. The major limitations to productivity are typical of that found in any developing country including poor forage availability and quality, lack of disease management and prevention strategies, livestock of low genetic merit, poor infrastructure for milking and animal management, and weak market access for products with market chains dominated by too many profit taking market actors. No incentives are in place to encourage farmers to produce a high quality product. In 2000 the dairy farmer was receiving 63% of the price paid by the consumer for the product, whereas by 2012 this had dropped to 42%. Clearly the processors, distributors and retailers across the chain were profiteering at the expense of the farmer while failing to deliver additional services to the farmer to improve their resilience and confidence in the market (Holmann et al., 2014). It is important to note that this is no different to the situation in the Australian dairy industry (Graham, 2017).

However because the meat sector was more highly regulated the productivity of beef increased by 66.4%, while that of the dairy cow decreased by 15.5% between 2001 and 2011. Here beef production was seen as the more profitable enterprise (Holmann et al., 2014).

Similar scenarios appear in Africa, where in both Uganda and Sudan, for example, the milk sector is controlled largely by the milk intermediaries, who collect milk from large areas and are unpoliced by either the government or private sector milk processors. Thus both farmers and consumers are exploited by adulteration of the raw product enroute from the farm gate to the milk shop. Furthermore inadequate capital in the form of commercial rate loans has ensured that farm infrastructure remains at the same primitive level (Rota, 2010).

So where does the concept of co-operative commercial activity fall down in the developing world?

Joining forces with other farmers to take advantage of contemporary agricultural technology and agribusiness concepts has worked well in many countries, but has failed in others as evidenced above. The key challenges that need to be confronted when forming co-operatives are (Agriledger, 2017)

- Equality for women and minorities;
- Empowerment of small-holder farmers;
- Increases in small-holder farmer income;
- A reduction in food/feed waste;
- Provision of digital identity;
- Provision of basic mobile finance in the form of loans;
- Facilitation of access to insurance needs;
- Access to new products and services;
- A better life for families and the communities they live with.

While increasing marketing power through the formation of co-operatives, there are other ways in which small-holder dairy farmers can improve their financial viability. Diversification of their enterprise to produce other commodities provides one alternative. The novel concept of village based seed enterprises developed by Tufail in Punjab has provided a lucrative opportunity for farmers to raise high quality forage seed which has the potential to increase whole farm income significantly (Tufail, 2017). The endless capabilities of female

members of the farming community to value add to raw milk by selling yoghurt and dairy sweets also improves the family income (Batool et al., 2014).

In heavily populated countries the pressure of animal production on the environment is a pressing issue. In addressing the “The future of food” the progressive Gates Foundation is now investing in meat substitutes given that livestock may exert an unacceptable environmental footprint on our planet (Gates, 2013).

Is this really likely given the importance of cattle to the wellbeing of communities in the developing world? For example cattle provide 45% of the GDP of Ethiopia, while only 20g of animal protein per person per day either as meat or milk are required to prevent malnutrition. This is reassuring given that cattle assume importance in many societies that extends well beyond the mere provision of animal protein.

Empowerment of farming communities, however requires a multi-disciplinary approach. In supporting small-holder farmers involved with horticulture in the Philippines expertise in agribusiness, technology and community capacity building has been combined to achieve transformative changes in the way their products are produced and sold to increase profits. Thus in theory more resilient farming communities are generated (Braidotti, 2017). However the benefits are not always shared equally in a community and so the sociologist is just as important as the technologist in dealing with any inequalities associated with wealth creation within the community: effective teamwork is critical. So where can we make more from milk?

Consumer handling of milk

Traditionally in many countries consumers need to boil milk due to adulteration and poor health standards practiced along marketing chains. The use of pesticides for example, is unregulated in many developing countries and so they find their way into the milk supply chain (Ismael and Elkassas, 2016) Heat treatments are however effective in decreasing this risk for the consumer (Singh and Nelapati, 2017).

In contrast the transfer of mycotoxins from fungus contaminated feedstuffs into milk and then the consumer (Aslam et al., 2016) provides a serious health risk which cannot be alleviated through treatment of milk. The simple removal of contaminated feed from the feed-base resolves this issue.

Heat treatments of milk are required to minimise the impact of zoonoses passing to consumers in many countries where raw milk consumption is commonly practiced: the transfer of *brucella* spp in raw milk has been reported in Nigeria (Ior and Chukwu, 2015) and Uganda (Rock et al., 2016) while *mycobacterium bovis* is prevalent in raw milk in Tanzania to provide just two of many examples (Roug et al., 2014). Raw milk is by and large not consumed in advanced economies because of the possible public health risks.

The impact of heating protocols on milk quality factors remains controversial. Of great importance is the impact of heat treatment on the functional properties of milk proteins which provide bioactive peptides critical to neonatal development. The losses of minerals, lactose and fat as a result of this process appear to be minimal, while the content of some vitamins are decreased (Bahman et al., 2012; Claes et al., 2013).

Evidence is accumulating now to show that unprocessed cow's milk does in fact have some virtues in protecting infants from common respiratory infections. Given the co-evolution of humans and cattle, it is not surprising that many immuno-modulatory molecules are shared between their milks including immunoglobulins, cytokines, growth factors, lactoferrin, oligosaccharides and milk fat globule membranes (Loss et al., 2015).

By way of example the need for conservation of just one milk protein, lactoferrin as a sialic acid-rich, iron-binding milk glycoprotein in milk has been recognised. We now know

that lactoferrin also modulates immune function, has antibacterial and anti-inflammatory actions as well as affecting neurodevelopment and cognition (Chen et al., 2015; Wang, 2016). In investigations of its role in pig production, the supplementation of sows with just 1g of lactoferrin in feed from conception to the end of lactation significantly increased milk output and piglet growth to weaning at 21 days of age (Jahan, 2017). Conservation of lactoferrin in milk is therefore important for the consumer and yet heat treatment causes it to coalesce with casein components thereby decreasing its biological availability (Brisson et al., 2007).

The importance of milk for learning behaviour

Increased consumption of human milk is known to improve cognitive ability in human babies (Anderson et al., 1999). We are now recognising that the major sialylated glycoconjugate molecules, sialylated glycoproteins, sialylated milk oligosaccharides, and gangliosides found in milk play a major role in this process. This has been most simply demonstrated by supplementing milk provided to piglets from birth with a rich source of sialic acid residues in casein glycomacropeptide, which stimulated learning behaviour by increasing the ability to recognise easy and difficult visual cues in an 8-arm radial maze free choice paradigm (Wang et al., 2007). Our recent studies have identified that 96% of sialic acid is in the form of *N*-acetylneuraminic acid, 3-6% as *N*-glycolylneuraminic acid and 1-2% as ketodeoxynonulosonic acid. These are distributed in sialylated glycoproteins (41-46%), sialylated milk oligosaccharide (31-42%), and gangliosides (12-28%). However we have identified a further 55 porcine milk oligosaccharides structures by using liquid chromatography-electrospray ionization-tandem mass spectrometry, the functions for which are yet to be identified. (Wei et al., 2017) Clearly the milk glycome is complex with a wide possible array of biological functions which may vary as lactation proceeds.

So what are the implications for human mental health? A number of studies have now shown that consumption of dairy products is associated with improved cognition in humans from 29 to over 60 years of age. (Park and Fulgoni, 2013) However intriguingly in a study of matched twins in which the confounding influences of genetic and family-environmental factors are accounted for, better short term memory was associated with dairy product consumption in men only and not in women. (Ogata et al., 2016) This difference may provide important leads in investigating sex differences in susceptibility to Alzheimers disease as well as the aetiology of type 2 diabetes and hypertension, both of which are associated with cognitive decline (Rabin et al., 2009; Soedamah-Muthu et al., 2012; Monette et al., 2014).

It is likely that the complex carbohydrate component of milk will be involved in these disease states. The impact of milk processing on their biological activity remains to be investigated.

The main glycoproteins found in bovine milk, lactoferrin, the immunoglobulins, glycomacropeptide derived from κ -casein, and the glycoproteins of the milk fat globule membrane are all likely to be affected with the various heat treatments used in industry and in the home.

Milk and wound repair

A recent detailed proteomic analysis of bovine colostrum has identified over 1700 specific proteins, with 93 of these being associated with the process of wound repair including inflammation, tissue remodelling, collagen synthesis and blood vessel formation (Altomare et al., 2016).

Given the complexity of these proteins it is highly likely that their healing capacity will be altered through milk processing. In particular the orchestration of the inflammatory response by a subset of cytokines which is opposed by those with anti-inflammatory effects may be

compromised. Clearly we wish to preserve the ability of cow's milk as an adjuvant fluid for wound healing.

Milk and antioxidants

The reaction of oxygen with certain molecules to steal an electron, forming chains of free radicals results in oxidative stress which is associated with neurodegenerative diseases, diabetes and cancer. Milk contains a variety of both lipophilic (conjugated linoleic acid, α -tocopherol, β -carotene, vitamins A and D3, coenzyme Q10, phospholipids) and hydrophilic antioxidants (proteins, peptides, vitamins, minerals and trace elements). These are critical in neutralising the destructive reactive oxygen species that are a part of homeostasis (Grazyma et al., 2017) The lipophilic molecules are heat stable and therefore most likely not affected by milk processing, while on the other hand the hydrophilic moieties are more susceptible to degradation. Clearly the presence of these anti-oxidants contributes to the health giving properties of milk and its products.

Conclusion

In this paper we reviewed some of the challenges that limit the supply of what has been termed the "ultimate superfood". It is important to rural communities across the developing world because it provides a reliable source of basic nutrients to support families on a daily basis for up to 250 days from a single animal. While feeding the family on a daily basis the farmer is able to sell his surplus product through a number of channels, although, as identified above, this practice is not always profitable. A world without milk would see countless millions dying of starvation and for good reason. The preservation of all its wonderful biological properties for the consumer should be a high priority for dairy industries world-wide. We advocate that further research into milk processing is conducted to maximise the utility of this important biological fluid to feed our ever growing populace.

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Robust study design for animal production in developing countries

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Abstract

The application of sound principles of study design is central to the scientific method, and complying with these principles is essential for evaluating improvements in animal production in developing countries. This paper considers some fundamental issues of study design, and challenges that may occur in applying these in a developing country context. It also considers aspects of the overall goal and conduct of a study to increase the likelihood that it will deliver improved outcomes to smallholder farmers. Some future prospects for the ‘digital age’ are also considered.

Keywords: developing country, study design, quantitative research, qualitative research, digital future

Introduction

The application of sound principles of study design is central to the scientific method. These principles apply everywhere, i.e. in both developed and developing countries, and should be applied whenever possible. By adhering to these principles, we can largely trust the results of our study findings, and be confident that conclusions drawn and action taken are the best, for the available resources. Nonetheless there may be certain limitations to some aspects of studies undertaken in developing countries which may not be there in developed countries. The following text will outline some key concepts of study design, and discusses where challenges may occur in applying these concepts in developing country agriculture. Some general recommendations and guidelines are provided. It should be noted that this is a personal perspective based on the author’s career, mostly working as an applied statistician in agricultural, animal and veterinary science, both in developing and developed countries.

Experimental studies vs observational studies

Studies may be classified as experimental vs observational. An experimental study is where a specific intervention is applied and compared to a non-intervention group, or alternative intervention groups, and the effect on the outcome of interest is evaluated. In contrast, an observational study usually involves no specific intervention but evaluates the system in its ‘natural’ state. In terms of principles of study design, there are some common issues to both, and some specific to the type.

Experimental studies typically investigate one or possibly a small number of factors simultaneously, for example, effects of three different diets on poultry growth (single factor design), or effects of vaccination type and vaccination frequency on disease prevalence (two factor design). The choice of the study factors together with the number of chosen levels for each factor is known as the *treatment design*. Fundamental to good study design is the *random*

allocation of experimental treatments to the study animals. This ensures that on average, any systematic difference observed between the treatments is actually due to the treatment and not some other confounder or unknown influence. This random allocation can be undertaken by computer-based methods, or simply shuffling paper lists of animals. Another issue to consider is the *sample size* or the *number of replicates* per treatment, or treatment combination (if a factorial treatment design is used). Sufficient replicates are required to have the necessary *power* to detect a treatment effect, however substantially more than needed is wasteful of resources, and potentially causing unnecessary harm to animals. There are many web-based programs to evaluate sample size, as well as included in many statistical packages. In addition to the treatment design, a key feature is the choice of a particular experimental design to control for extraneous sources of variation. These may be from simple designs such as a completely randomised design (equivalent to a randomised control trial in the epidemiological and medical literature), ranging to more specialised designs taking into account one or more levels of blocking. Finally, a critical issue is the concept of the experimental unit, i.e. the unit at which the treatment is allocated at, and the sampling unit, the unit on which a measurement is made. These may be different, but is an issue often overlooked in experimental studies. All of these experimental study issues are dealt with in standard applied statistics texts such as that by Mead et al., (2003) and Welham et al., (2014).

Observational studies require many of the same considerations as required for the design of experimental studies. Firstly, *random selection* of units (as opposed to random allocation to treatments) needs to be considered. This may be as simple as compiling a list of animals on a farm, then randomly selecting a sample to undertake the study. However, in observational studies, the sampling is often more hierarchical or multi-level, e.g. selecting, ideally randomly, at each of the following levels: District > Village > Farm > Animal. There will be random variation associated with each of these levels, and observational studies must consider sample sizes for each of these levels, i.e. how many districts are sampled, right down to how many animals per farm. While there are some resources available for these issues (e.g. Epitools, <http://epitools.ausvet.com.au>), they usually only cover simpler designs, and a formal sample size evaluation may not be possible. In these situations, considerations of what is feasible will be arrived at by a combination of practical considerations, consideration of previous similar studies, perhaps in conjunction with sample size tools. However, it should be noted that there are situations where *purposive sampling* as opposed to random sampling may be appropriate: such as when exploring associations between factors in a cross-sectional study, and also in application of qualitative research methods (see below).

Unlike experimental studies, (non-randomised) observational studies involve disentangling complex relationships between the outcome variable(s) of interest and potential explanatory factors. Careful consideration needs to be given to decide what potential explanatory variables should be recorded, as adjusting for *confounding variables* is critical in observational studies. Unlike randomised experiments, it is easy to attribute an association to an explanatory variable, when in reality it is an association with another perhaps unrecorded variable that is driving the process. Epidemiologists have a well-structured approach to dealing with these issues, particularly with statistical model building (Dohoo et al., 2009).

Statistical analysis

It goes without saying that studies usually require much input, in term of prior planning, execution, and field or laboratory data collection. Consequently, appropriate allocation of time and resources should be made to analyse the data in the most appropriate way to match this effort. It is beyond the scope of this paper to outline the range of statistical methods that may be appropriate for different study designs, so this will not be attempted here. However, it is

worthwhile pointing out the rise in use of *mixed model* methodology in the analysis of both experimental and observational studies (Welham et al., 2014) such as required when analysing multi-level data as mentioned above.

While many researchers enter and store their data into Microsoft Excel spreadsheets, Excel cannot be considered the ideal platform to undertake analyses. While it does have statistical capabilities (including the Data Analysis Tools add-in), it does not support a truly interactive and highly visual approach to data analysis. There are of course many commercially-available statistical packages, but these may not be available especially for a research group on a restricted budget, particularly if they are in a regional office for example. However, the statistical and computing package R (R Core Team 2017) is freely available and there is much support globally for using this package. R is a command-driven program, i.e. requires coding, and while this makes for an extremely powerful tool, some researchers do not feel comfortable with coding and prefer a menu-based interface. However, such a platform has been developed for R, known as R Commander, and this is also freely available (Fox 2016).

Design issues in developing countries

Firstly, it should be said that first-rate science does and can be done in developing countries: this should always be the objective. Secondly, first rate science does not need to cost “mega-dollars”. However, there are in some situations limitations that need to be acknowledged, but this does not need to detract from the quality of the science.

Data collection in the field, or even biological sample collection, may have additional challenges in developing countries. For example, in larger enterprises, there may be an established protocol to routinely record production data or health event data, and these may be used for research purposes. However for smallholder farmers, such records will not usually be available and a system needs to be put in place for the acquisition of these data for the study. It may require prioritisation as to what measures can be easily and robustly recorded in field conditions, to ensure data collection continues in a timely and accurate manner. Particularly when the study involves surveys, a decision needs to be made as to who will undertake this, either community-based enumerators, or research staff based at a central agency or project office. Both approaches have their advantages and disadvantages, i.e. local community knowledge vs understanding of research protocols.

While the need for randomisation / random selection is important, there may be constraints for undertaking this as fully as might be hoped. For example, in the situation of sampling from “District > Village > Farm > Animal” mentioned previously, it may not be possible to sample farms randomly from a village, due to refusal of the farmer, or the need to obtain recommendations of suitable farmers from the ‘head person’ of the village. In other situations, there may be government restrictions of conducting studies in certain districts of a country.

Maximising the benefit of the study to the rural community

It is of utmost importance that when a study is designed, it considers how it will benefit the rural community, particularly when this involves smallholder farmers. Some features to help towards this goal are as follows:

1. Inclusive: Ideally the study will involve participation or involvement of the whole community, men, women, and children, recognising the role all members have in agricultural production and enterprises.
2. Giving back: While there will be a long-term goal of benefiting the rural community on completion of the research project, there will be benefits if assistance can be made

during the study with providing advice on animal production and health issues. Perceived benefit to smallholders is important for the ongoing input and cooperation from them in a research study.

3. Understanding farmers: If the end result of a research study is to recommend some change in farmers' practices, we need to understand items such as where they obtain their advice from, under what conditions would they change their current farming practices, etc. This is best undertaken by means of *participatory rural appraisal (PRA)* and *participatory epidemiology (PE)* methods, often conducted using focus groups, within the broader framework of qualitative research methods. Exploring and understanding the narrative of the farmer is critical here, and this can be assisted using qualitative research methods software such as NVivo. Application of such a *mixed methods* approach (combination of quantitative and qualitative research methods) will assist with ensuring the research is tuned to the needs of the local rural community. To facilitate this, a multi-disciplinary approach should be considered, involving social scientists as well as life scientists.
4. Capacity building: As well as benefiting the rural community, there should also be benefits to the research staff involved in the study, particularly early career researchers, in terms of them acquiring additional skills, experience with interactions with the rural community, and recognition of the contribution they can make. It is also important that a gender-sensitive approach be adopted in involvement of research staff.

The digital future

In August 2017, the Crawford Fund in Australia, an NGO concerned with agricultural development in developing countries, hosted a conference on "Transforming Lives and Livelihoods: The Digital Revolution in Agriculture". This outlined how digital technologies, including "big data", could be applied in developing countries, particularly smallholder farmers. The following themes were particularly relevant:

Digital data collection: Traditionally, data collected in the field, especially when involving surveys, have been paper-based, with subsequent data entry. However, this is time consuming and in some situations error-prone. In recent years a range of *mobile acquired data (MAD)* device applications has been developed allowing data to be recorded on site, with automatic storing of latitude, longitude, altitude and time. One particular MAD application, CommCare, has been adopted by the Australian Centre for International Agricultural Research (ACIAR) for in-country fieldwork that they fund.

Satellite and other geospatial data: Previously, if weather or climatic data were to be used in any modelling, this had to rely on government metrological office reports, which may not be available on the temporal or spatial scales required. However, satellite data are now widely available, as well as long-term global climatic data on a fine $0.5^\circ \times 0.5^\circ$ scale (e.g. <https://www.esrl.noaa.gov/psd/data/>). These can now be used as input into modelling, e.g. using climate data to predict disease prevalence, in the absence of on-the-ground evaluation.

Meta-analysis: Standardised data collection, achievable by having a common data collection and dissemination system, could be used for undertaking a meta-analysis of data collected by different agencies across a county, or even on a multi-country scale. Such large-scale data analyses may be required to model the effects of climate change, and develop and evaluate response strategies.

Conclusion

The application of sound principles of study design is a fundamental part of the scientific method, and should be applied as far as possible. While there are some challenges in application of these principles in developing-country animal agriculture, most problems are surmountable. However, in order to ensure the outcomes will be of benefit to rural communities, a more holistic approach to research should be undertaken. However, with recent developments in climate and other data availability, there are exciting prospects to incorporate these data to make local area predictions, and hence management recommendations to benefit rural communities.

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Implementation of breeding programme for sustainable livestock production in tropical countries

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Abstract

The livestock sector globally is highly dynamic. In developing countries, it is evolving in response to rapidly increasing demand for livestock products. In developed countries, demand for livestock products is stagnating, while many production systems are increasing their efficiency and environmental sustainability. Historical changes in the demand for livestock products have been largely driven by human population growth, income growth and urbanization. The livestock breeding programmes may be seen as important parts of national agricultural policies, aiming at improving the food and income of a country, region or locality and of livestock keepers. To realize the benefits of a breeding programme, the breeding objectives must be appropriately defined for the species or breeds, communities and environments concerned, and the strategies laid out can be followed in practice. The challenge to increase food production in developing countries lies in efficient exploitation of genetic diversity among and within breeds of different species. Realistic ways of improving these breeds must be chosen and applied in the context of environmental constraints and socio-economic demands and within the resources available. The most productive and adapted animals for each environment must be identified for breeding purposes. Only then will it be viable to increase food production without further increasing the number of animals with the subsequent effects of land degradation. A basic principle to follow should be based on the assumption that there is no better way to conserve a breed for future generations than to consistently keep the breed or population viable by using an efficient, demand-driven long-term breeding programme suitable to commercial or cultural needs of livestock owners. Dairy development tends to be more strongly supported by the public sector in the countries that aim to use dairying to alleviate poverty, hunger and provide livelihood support in terms of income and employment generation to the millions of landless and smallholder dairy farmers. The absence of coordinated systems for data collection and record-keeping and the maintenance of databases for the livestock sector, including a mechanism for feedback and exchange among the stakeholders for development of livestock-related policies have been identified as a major constraint for many tropical countries. Such data recording, even on a limited scale, is critical for genetic improvement of livestock. Small ruminants (sheep and goats) have a unique niche in smallholder agriculture from the fact that they require small investments; have shorter production cycles, faster growth rates and greater environmental adaptability as compared to large ruminants. They are important protein sources in the diets of the poor and help to provide extra income and support survival for many farmers in the tropics and sub-tropics. Small ruminants' improvement programmes in developing countries, however, have several constraints. One major shortfall has been weak planning, particularly poor involvement of livestock owners and stakeholders in the design and implementation of the programmes. In addition, low productivity, high density of animals in relation to grazing capacity, unreliable and erratic rainfall, increasing human population, small landholding, and declining land productivity are all major concerns. The best alternative for sheep and goat production in developing countries is doubling the output per sheep or goat with 15 per cent less number of

sheep through environmental and genetic means that reduce mortality and increase fertility, growth and yearling weight allowing lambs to be marketed at yearling age. The breeding programmes based on open nucleus flocks utilizing government ranches at the top of a three tier system of flocks will be used for conservation and improvement of indigenous breeds as well as for crossbreeding. In conclusion, improving the productivity of livestock in tropical countries require a multifaceted set of interventions that will involve not only proper management of local animal genetic resources, but also strengthening of local institutions for support of farming activities, including not only breeding-related services, but also services related to nutrition, health care, milk marketing and social services.

Keywords: tropics, breeding programme, sustainable production

Introduction

Livestock are a significant global asset and keeping livestock is an important risk reduction strategy for vulnerable communities. Currently, livestock is one of the fastest growing agricultural subsectors in developing countries. Its share of agricultural GDP is quickly increasing. This growth is driven by the rapidly increasing demand for livestock products, this demand being driven by population growth, urbanization and increasing incomes in developing countries. The global livestock sector is characterized by a dichotomy between developing and developed countries. In developing countries much of the growth was concentrated in countries that experienced rapid economic growth, particularly in East Asia and revolved around poultry and pigs. In developed countries, on the other hand, production and consumption of livestock products are now growing only slowly or stagnating, although at high levels. This combination of growing demand in the developing world and stagnant demand in industrialized countries represents a major opportunity for livestock keepers in developing countries, where most demand is met by local production, and this is likely to continue well into the foreseeable future. At the same time, the expansion of agricultural production needs to take place in a way that allows the less well-off to benefit from increased demand and that moderates its impact on the environment. Historically, domestication and the use of conventional livestock breeding techniques have been largely responsible for the increases in yield of livestock products that have been observed over recent decades. If past changes in demand for livestock products have been met by a combination of conventional techniques, such as breed substitution, cross-breeding and within-breed selection, future changes are likely to be met increasingly from new techniques. Currently many developed countries focuses on other attributes in addition to production and productivity, such as product quality, increasing animal welfare, disease resistance and reducing environmental impact (Thornton et al., 2010).

Modifiers of future livestock production and consumption trends

The future livestock production and consumption trends will depend mainly on land, climate change and welfare measures to be followed for the livestock industry.

Land

Recent assessments expect little increase in pasture land in near future. Some intensification in production is likely to occur in the humid as well as sub-humid zones, where this is feasible, through the use of improved pastures and effective management. In the more arid and semi-arid areas, livestock are a key mechanism for managing risk, but population increases are fragmenting rangelands in many places, making it increasingly difficult for

pastoralists to gain access to the feed and water resources that they have traditionally been able to access. In the future, grazing systems will increasingly provide ecosystem goods and services that are traded, but how future livestock production from these systems may be affected is not clear.

Climate change

Recently, scientists predict climate change scenarios that will have dramatic effects on livestock production. Livestock production systems will be affected in various ways and changes in productivity are inevitable. As a result of climate change, the heat stress caused by rising temperatures will impair reproduction. Water, feed and fodder availability will be affected by climate change as well as by increased demand for fuel crops, which will reduce the amount of land and water available for feed crops. Vectors that carry animal diseases will be able to expand their ranges to higher elevations as temperatures rise, threatening many traditional breeds and leading to further genetic erosion (Thiruvankadan et al., 2016).

Climate change will have severely deleterious impacts in many parts of the tropics and subtropics, even for small increases in the average temperature. Many factors determine whether specific adaptation options are viable in particular locations. More extensive adaptation than is currently occurring is needed to reduce vulnerability to future climate change, and adaptation has barriers, limits and costs. Several mitigation options have adaptive benefits, such as growing agro forestry species that can sequester carbon, which can also provide high-quality dietary supplements for cattle. Such carbon payments could represent a relatively large amount of potential income for resource-poor livestock keepers in the tropics (Steinfeld et al., 2006; IPCC, 2007; Smith et al., 2008; Thronton, 2010).

Socio-cultural modifiers

Social and cultural drivers of change are having profound effects on livestock systems and livestock have multiple roles in human society. They contribute substantially and directly to food security and to human health. Livestock's contribution to livelihoods, particularly those of the poor in developing countries, is well recognized. Livestock generate income by providing both food and non-food products that the household can sell in formal or informal markets. In addition to their food security, human health, economic and environmental roles, livestock have important social and cultural roles. Inevitably, the cultural and social roles of livestock will continue to change, and many of the resultant impacts on livelihoods and food security may not be positive (Thronton, 2010).

Ethical concerns as a driver of change

Ethical concerns may play an increasing role in affecting the production and consumption of livestock products. While there are differences between different countries in relation to animal welfare legislation, animal welfare is an increasingly global concern. Part of this probably arises as a result of the forces of globalization and international trade. Improving animal welfare need not penalize business returns and indeed may increase profits. For instance, measurements of functional traits indicate that focusing on breeding dairy cows for milk yield alone is unfavourably correlated with reductions in fertility and health traits. The most profitable bulls are those that produce daughters that yield rather less milk but are healthier and longer lived: the costs of producing less milk can be more than matched by the benefits of decreased health costs and a lower herd replacement rate. Identifying situations where animal welfare can be increased along with profits, and quantifying these trade-offs, requires integrated assessment frameworks that can handle the various and often complex inter-relationships between animal welfare, management and performance (Lawrence et al., 2004; Kitalyi et al., 2005; Lawrence and Stott, 2009; Thronton, 2010).

Current status and proposed breeding programme

There is a need to improve current practices in Asia with regard to selection of cattle for breeding purposes, for both dairy and beef production. For many years, most of the countries in the region have been importing cows, bulls, and semen, largely from the temperate regions of the world, and using them to 'upgrade' the genetics of their existing herds of indigenous cattle for improving producing ability. However, and based on current evaluation of production levels and the productivity of cattle and buffalo, some doubts exist regarding the need and wisdom to continue this practice. Because the importation has been ongoing for up to 50 years, in some cases, and because the exotic breeds are not naturally adapted to the climatic and management conditions that prevail in the region, the current local populations may already contain a sufficient proportion of exotic genetic material to support efficient productivity and yet withstand the local environments. Most Asian countries are implementing crossbreeding programmes to upgrade the local cattle population to 75% or more of exotic genotype, but they are often not successful due to incompatibility of the genotypes with farmers' breeding objectives and the production systems. Choice of the exotic breeds usually depends on milk production, early maturity, and compatibility with local breeds, especially related to body size. Exotic animals used in crossbreeding are not naturally adapted to local conditions, so large scale crossbreeding in Asian countries should be carried out with caution; also, crossbreeding tends to decrease the population of local breeds, and therefore, there is an urgent need to conserve the uniquely adaptable, heat tolerant, draught and disease resistant local breeds.

The primary current need is to properly manage the genetic resources within each country, by developing selection programmes to improve the productivity of the existing stock while maintaining the unique and beneficial genetic characteristics of the indigenous breeds. Breeding programmes have to consider important phenotypic traits that have an economic value (those that affect either the income obtained or the costs of production), although traits that provide a less tangible utility for cultural or other reasons may also be considered important. Among them and depending of the purpose of the animals, production traits like milk and fat yield, and body weight, reproduction traits like age at first calving and calving interval, and others like disease resistance, milk let-down, temperament, udder characteristics, skin colour and body size and shape may also be considered. In general, the breeding and improvement of farm animal genetic resources for different traits have to be made based on the following principles:

- Breeding will be based on a sound scientific basis for the genetic improvement of livestock breeds, for superior productivity, optimal resource utilization and environmental sustainability.
- Farm animal genetic resources are biological capital which can continue to be utilized for wealth generation, improvement of the socio-economic status of citizens and economic growth of the nation.
- Indigenous farm animal genetic resources are recognized as a national heritage and they must be conserved and sustainably utilized for the present and future generations.
- Formulation and implementation of the policy framework for the breeding, improvement, conservation and sustainable utilization of livestock breeds should be in close cooperation with all stakeholders, including policymakers, scientists, farmers, entrepreneurs, consumers and the public.
- Farmers must be intrinsically involved in livestock breeding and improvement programs and the formation of breed societies should be encouraged.
- Networking and collaboration with established international partners should be pursued for mutual benefit. The government shall provide long-term support and incentives for breeding

programs and establishment of well documented breeding data which has to be easily assessable and user friendly.

- An open nucleus breeding programme, where animals from the general population can be part of the nucleus, has been proposed for faster genetic improvement. Because this scheme is not restricted to animals already in the nucleus (as is the case with a closed nucleus), it allows for greater selection intensity and is often quoted as the preferred method of operation for quick genetic gain. This scheme can be recommended as an alternative to the progeny testing scheme, and can be achieved either by grouping high production animals at the farmer level (Group Nucleus Breeding Structure), or by assembling all animals at a highly organized location (Central Nucleus Breeding System).
- Genomic selection should be able to double the rate of genetic gain in the dairy industry as it enables selection decisions to be based on genomic breeding values, which can ultimately be calculated from genetic marker information alone, rather than from pedigree and phenotypic information. Genomic selection is not without its challenges, but it is likely to revolutionize animal breeding.

In general, the general strategic approach needed for beef and dairy cattle breeding of indigenous and crossbred cattle are as follows:

- Dairy breeding is for the primary goal of producing quality milk economically and for the secondary goal of producing beef. Selective breeding of the recognised breeds and upgrading of non-descript dairy animals using temperate dairy breeds (eg. Jersey and Holstein-Friesian) and limiting the exotic inheritance to 50 per cent as an option for high input farms.
- Pureline breeding of cattle for beef production has to be continued with selected farmers who are involved in the multiplier programme and crossbreeding with *Bos taurus* or *Bos indicus* breeds for production of terminal crosses at the commercial level. Enhancing local beef cattle breeding so as to decrease dependence on imports of beef and live cattle for slaughter by providing special incentive.
- Establishment of computerized data recording system and data management for efficient genetic selection in lean growth rate, feed efficiency, fertility and tropical adaptability traits for beef cattle. For milk production, genetic selection in milk yield, milk protein, milk fat, lean growth rate, feed efficiency, fertility and tropical adaptability traits is needed.
- Aggressive bio-prospecting with proper pre- and post- evaluation to determine suitability of imported breeds which are adaptable to and highly productive under tropical climatic conditions (Herath and Mohammad, 2009; Jain and Muladno, 2009; Blair, 2009; Anon., 2013; Thiruvankadan et al., 2016).

Small ruminants (sheep and goats) have a unique niche in smallholder agriculture from the fact that they require small investments; have shorter production cycles, faster growth rates and greater environmental adaptability as compared to large ruminants. They are important protein sources in the diets of the poor and help to provide extra income and support survival for many farmers in the tropics and sub-tropics. Small ruminants' improvement programmes in developing countries, however, have several constraints. One major shortfall has been weak planning, particularly poor involvement of livestock owners and stakeholders in the design and implementation of the programmes. In addition, low productivity, high density of animals in relation to grazing capacity, unreliable and erratic rainfall, increasing human population, small landholding, and declining land productivity are all major concerns. The best alternative for sheep and goat production in developing countries is doubling the output per sheep or goat with 15 per cent less number of sheep through environmental and genetic means that reduce mortality and increase fertility, growth and yearling weight allowing lambs to be marketed at yearling age. The breeding programmes based on open nucleus flocks, utilizing government

ranches (and research centres) at the top of a three tier system of flocks will be used for conservation and improvement of indigenous breeds as well as for crossbreeding.

Conclusions

Several assessments agree that increases in the demand for livestock products, driven largely by human population growth, income growth and urbanization, will continue forever. Globally, the increasing demand for livestock products continues to be a key opportunity for poverty reduction and economic growth. Smallholders currently are critical to food security for the vast majority of the poor, and this role is not likely to change significantly in the future. Improvement programmes for small ruminants in the tropics face several constraints that have hampered the establishment and sustainability of such programmes. In general, participatory programme is believed to ensure not only long-term genetic improvement and livelihood improvement, but also conservation of the indigenous genetic diversity as well as eco-system health. In general, improving the productivity of livestock in tropical countries require a multifaceted set of interventions that will involve not only proper management of local animal genetic resources, but also strengthening of local institutions for support of farming activities, including not only breeding-related services, but also services related to nutrition, health care, milk marketing and social services. These services are to be provided by a combination of governmental, non-governmental, and private institutions.

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Symbiotic relationship and sustainable agriculture

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Abstract

Symbiosis means living together in an intimate association of two or more dissimilar organisms. Mutualistic symbiosis results in the benefit of all organisms, those remain in intimate association. These associations may be natural or man made. Association of nitrogen fixing bacteria and legume plants or rumen micro-organisms and ruminants are natural due to their role in ecosystem. Human due to their intellectual advantage over other living beings on earth and with the concept of civilization have developed relationship with plants and animals which can be described as *permassociation* i.e. Permanent Association which emerged in Plant agriculture and Animal agriculture. This relationship developed by human beings intensified, biodiversity of plant and animal species on earth sustaining living ecological systems, cycles. It also enhances the health of soil, plants and animals managed under precautionary and responsible manner to protect the health as well as current, future generations and environment. This is achieved by the appropriate design of management of biological processes based on ecological systems using natural resources. In India tribal people, their sheep and goat, farmers in an example of emerging associations. Symbiotic relationship and environment synchronization developed much closure association. Feed efficiency is a measure to know how the farm animals convert the nutrients that they eat in to the product. Considerations of Temperature humidity Index, Feed efficiency of animals and the efforts of human for environment synchronization results in better sustainability in animal agriculture.

Keywords: permassociation, symbiotic relationship, environment synchronization, feed efficiency

Introduction

Symbiosis means living together in an intimate association of two or more dissimilar organisms. Parasitism, commensalism and mutualism are the three types of symbiotic relationship. Out of these three, in mutualistic symbiosis both the organism in association get benefited, both of them are in permassociation (Permanent Association) and interdependent. A site specific application in an integrated system of plant and animal product practices is sustainable Agriculture that enhances environmental quality and natural resource base which promotes stable, prosperous farm families and communities. The term symbiosis was used by Anten de Bary (1879), a German mycologist at the University of Strasbourg to refer to the living together or close association of two different species. Mutualistic symbiotic relationships and sustainable plant and animal agriculture may be naturally controlled or man-made.

Naturally controlled symbiosis and base for Sustainable Agriculture

Symbiotic relationship may be between soil, plant and animals associated together where all organisms get benefited and are interdependent. Nature has evolved all symbiotic relationships between the organisms of permassociations, which became the natural resource base for sustainable plant or animal agriculture.

Evolution and Symbiosis

Nature's first symbiotic permassociation is evolutionary origin of chloroplast (Schimper 1983) and then the mitochondria of all eukaryotic cells. It was believed that both were free living bacteria that became incorporated in primitive host cell. (Gray 1992, Margulis 1992)

Microbial symbiosis, perform many chemical reactions which are not possible for their host and create the basis for sustainable plant or animal agriculture collectively. They can photosynthesize, fix nitrogen, synthesize amino acids, provide vitamins and growth factors and remain in permassociation. (Permanent Association)

Plants cannot metabolize the molecular nitrogen in the form of nitrate converted to NH_4^+ . Legumes overcome this problem by their semiotic union with a group of nitrogen fixing bacteria, rhizobia. It is the nature's gift that each legume plant species has permassociation with a specific nitrogen fixing bacteria. These bacteria live in a specialized root nodules.

Microbes and Animals Permassociation

Evidence is accumulating that, interactions of animals with environmental microbes have resulted in the coordinate evolution of a complex symbiosis. Co-evolved partnership between micro-organisms and animals represent a common fundamental theme in the biology of animals, most environmentally transmitted symbiosis in the animals such as establishment of rumen micro-organisms.

The ruminants like cattle, buffalo, sheep, Goat cannot digest their feed. The various types of microbes get established in a permassociation in the ruminants stomach. These microbes digest the feeds ingested by ruminants which will result in the production of food necessary for human. Microbes get nutrients and a place to live in the alimentary canal, whereas the host ruminant get benefited because of the digestion of feed.

Table 1. Establishment of bacteria

Sr. No.	Organisms	At age
1	Lactic acid bacteria	1 to 6 weeks
2	Cellulolytic Bacteria	After 3 weeks
3	Facultative anaerobes	3 to 6 weeks
4	Other types of bacteria found in mature animal	After 6 weeks
5	All types of microbes predominantly as that of mature animal	After 13 weeks

Table 2. Microbial count in rumen liquor (per ml)

Types of Organism	Buffalo	Cow	Sheep/Goat
Total Bacterial Count (Direct microscopic)* 10^{10}	6.9 to 32.7	5.4 to 31.4	18.0 to 88.0
Protozoa * 10^4	1.8 to 13.8	0.3 to 19.7	1.4 to 7.8
Yeasts * 10^3	6.9 to 18	00 to 10	6.8 to 13

Manmade Symbiotic Permassociation and Sustainable Plant and Animal Agriculture

Mutualyctic symbiotic permassociation may be between soil, plant, animals and human associated together where all the organisms get benefited and an interdependent.

Our genus Homo has been on earth from about two million years ago. Out of this time span, almost 99.5% lived in a history of subsistence on hunting the animals and gathering food. It was totally dependant on nature for life support. About 10,000 years ago, the transition from hunting to foraging for food to the cultivation of plants and domestication of animals took place.

Humans have used their intellectual advantage and developed permassociation (Permanent Association) with plants as well as animals. However their relationship has elements of symbiosis can be seen in the world as plant husbandry and animal husbandry. Number of plant and animal species were get spread throughout the world from their original habitat.

The diversity of plants, animals and microbes on earth abounds due to evolution, climate competition and also symbiotic relationship developed by human. At each new kingdom of life came out, the ecosystem on earth, became more complex and the bionic components became more interactive.

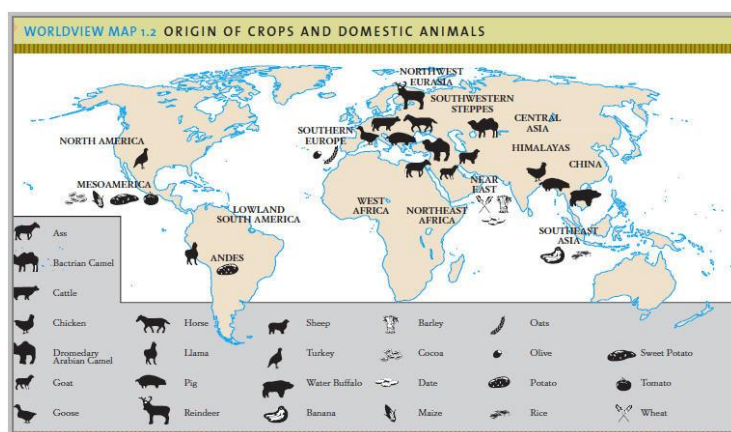


Figure 1.

The droppings of sheep, and goat contains higher nutrients than FYM and compost. As a traditional method in Maharashtra State of India, the Sheep and goat are kept in the open cultivated land. Their droppings and urine get mixed in the soil which facilitates to increase the soil N P & K Proportions, also helps the soil microbes for enrichment of soil fertility.

Field trials conducted at IISS, Bhopal (Ramesh, et al. and Bhat *et al* 2009) indicated that continuous application of organic manures (Amount varies from 3 to 6 tons/hectare according to source) resulted, not only sustainable crop productivity but also increased the soil nutrient level than chemical fertilizer.

Table 3. Effect of organic manure vs chemical fertilizer

Treatment	Soil Available		
	Nitrogen (N) (kg/ha)	Phosphorous (P ₂ O ₅) (kg/ha)	Potash (K) (kg/ha)
Initial	132	12.4	560
Poultry excreta	161	25.1	658
Cattle dung	151	19.1	621
Chemical Fertilizer	143	15.0	579

Feed efficiency is a measure to know, how the farm animals convert the nutrients they eat into products. On the most basic level, it gives an idea, how closely a ration meets an animal nutrient requirement and of the relative demands of maintenance and production.

Symbiotic permassoication and environment synchronization developed much closure association between plants, animals and human which benefit all those associated.

Calculation for feed efficiency (FE)

FE = Average milk (kg)/Average DMI (kg)

FE = Average weight gain (kg)/Average DMI (kg)

Where,

FE = Feed Efficiency

DMI = Dry Matter Intake

Experiment 1

Twelve non descript cows of first lactation were kept under three digestion trials each with pre-experimental period of 21 days and experimental period of 7 days cows fed with concentrate mixture and roughages along with 1.0% of the concentrate mixture, poultry excreta is added to the ration at Gorakshan Sanstha (NGO) in Latur city (MS, INDIA). Poultry excreta is kept in autoclave to kill the microbes if any and then fed before milking in the morning and evening hours mixed with small quantity of dry roughage and studied the feed efficiency under different season along with the practices necessary for environment synchronization under different housing conditions as shown in Table 4.

Table 4. Effect of feeding and environment synchronization on feed efficiency of cow

Parameters	Type of housing	Control tree shed	Summer season thatched material animal given with cold water	Winter season thatched material animal given with warm water	Overall
Daily weight gain(kg)	S	0.115	0.384	0.365	0.375
	S+O	0.128	0.392	0.569	0.481
	LH	0.130	0.524	0.372	0.448
Dry matter intake/kg/day/head	S	2.891	6.432	7.485	6.940
	S+O	2.102	5.869	7.290	6.565
	LH	2.098	5.110	7.190	6.145
Feed efficiency weight gain/DMI (kg)	S	0.039	0.059	0.049	0.054
	S+O	0.060	0.067	0.078	0.073
	LH	0.061	0.102	0.051	0.073
Milk yield kg/day	S	2.15	6.40	6.50	6.45
	S+O	2.20	7.13	7.48	7.31
	LH	3.15	8.15	8.85	8.50
Feed efficiency milk yield/DMI kg.	S	0.74	0.995	0.868	0.929
	S+O	1.04	1.214	1.026	1.113
	LH	1.50	1.594	1.230	1.383

S= Inside shed

S+O = Inside shed during day and in open at night in summer and vice versa in winter

LH = Inside loose house

The results indicates that environment synchronization and poultry excreta increases feed efficiency for weight gain as well as milk production under loose housing conditions. Misra, et al. (1963, 1965) described microclimate in some other types of houses for buffaloes provide animal comfort by providing cooler atmosphere conditions which improves productivity.

Experiment 2

Twelve lactating cross bred Holdeo cows (62.5% cross) of third and fourth lactation were selected and maintained under different housing conditions for 21 days each as shown in Table, 5. The cows were fed with concentrate mixture and roughages in the proportion of 60:40 respectively. In addition to that they were fed with 250gms of butter milk mixed with 250gms dry roughage and fed before morning and evening milking. The studies were carried out to know the feed efficiency along with certain physiological parameters as shown in Table 5 during summer months.

Table 5. Effect of feeding and environment synchronization in crossbred cows in summer season

Parameters	Tree shed (No butter milk)	Loose house Showering cold water alone + butter milk	Loose house drinking cold water alone + butter	Loose house showering drinking cold water sprinkling cold water + butter milk
Ambient Temp. (°C)	40.0	39.0	39.4	38.0
Respiration rate per min.	40.0	32.0	34.0	34.0
Heart rate per min	60.0	52.0	48.0	44.0
Body temp. (°C)	39.1	38.9	38.7	38.4
Daily dry mater intake kg/head/day	11.88	10.90	10.14	9.24
Milk yield kg/day/head	8.66	10.24	10.50	11.30
Feed efficiency	0.728	0.94	1.03	1.22

Result indicate that animal responses like rectal temperature, respiration rate, heart rate under different housing conditions were well with norms in lactating cows (Benpong, 1963). The feed efficiency increased with low dry matter intake.

Considerations of temperature humidity index (heat stress), feed efficiency of animals and efforts of human for environment synchronization results in butter sustainability in plant and animal agriculture.

Appropriate, well planned design and management of biological processes based on ecological systems using natural resources, which are the internal to the systems also referred agro-ecological methods caused to develop permassociation among the symbionts. Biodiversity is good for plant and animal agriculture and plant and animal agriculture is good for biodiversity.

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Herd characteristic, feed resource and socioeconomic aspect of smallholder dairy farm in Lampang province, northern Thailand

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Abstract

The objective of this study was to examine dairy herd characteristic, feed resource and socioeconomic aspect of smallholder dairy farm in Lampang province, northern Thailand. Smallholder dairy farms were selected by purposive sampling for three consecutive years in 2014, 2015 and 2016. Data indicated that the number of smallholder milking farms was 43, 41.57 and 40.91 households with herd size averaged 44.82, 55.94 and 57.65 animal/farm, respectively. The number of milking cows was 19.09, 23.46 and 23.83 head/farm and the average values for milk production were 197.39, 238.97 and 276.03 kg/farm or 10.34, 10.18 and 11.57 kg/head/day, respectively. Sweet corn husk was mainly fed as roughage source with additional hybrid Napier grass whereas rice straw was supplemented only in dry season. Concentrates were also fed as protein and mineral supplements and available throughout the entire years. All feed resources required to purchase into farms except the hybrid Napier grass which was grown for cut and carry inside farms. The socioeconomic characteristics of farmers were similar to those in other regions.

Keywords: smallholder, dairy, Lampang, Thailand

Introduction

Dairy production has been one of among the food production systems of animal origin which produces milk to support the demand of milk consumption in Thailand. Milk production remained relatively constant in the past three years from 2014 to 2016, producing annually from 1,111,481 to 1,161,102 tons of fresh milk with the number of dairy cows ranged 591,642 to 622,892 heads (OAE, 2016). Milk production is dominant in central, northeast, north and south regions, respectively. The Thai dairy industry has consisted of large scale and smallholder dairy farms with 16,248 households involved (DLD, 2015). In 2015, the northern region produced 134,082 tons of fresh milk or 11.55% of gross milk production (OAE, 2016). Lampang is located at latitude: 18°16'N, longitude: 99°30'E or 18.3°, 99.5° in decimal degrees (about 500 km north of Bangkok or 90 km south of Chiang Mai). Like other parts of the country, milk production system here is mostly operated by smallholder dairy farms which are quite sustainable and mature. Data of smallholder dairy herds in the north has been observed in different perspectives especially in Chiang Mai, Chiang Rai and Lamphun provinces (Singhla et al., 2017; Konig et al., 2005). However, data of smallholder dairy farms in this area is quite limited. Therefore, this study was aimed to examine herd characteristics, feed supply and socioeconomics aspects of Lampang smallholder dairy farms.

Methodology

This study was conducted and obtained data from all productive smallholder dairy farms which have been registered to the Lampang Dairy Coop, Ltd. in 2014 to 2016. The questionnaire and interview were used as tools to obtain primary data. Feeds were sampling to analyzed for DM, CP (AOAC, 1984), NDF and ADF (Goering and Van Soest, 1970). Secondary data was be accessed from individual farm records at Lampang Dairy Coop, Ltd and online data proposed by Department of Livestock Development (DLD) and Office of Agricultural Economics (OAE), Ministry of Agriculture and Cooperatives. The data was analyzed using descriptive statistics and Chi-square (SPSS, 2006).

Results and Discussions

The dairy herd characteristics are shown in Table 1. Comparing to 2014, the number of small holder dairy farms declined 3.32 and 4.86 % in year 2015 and 2016, respectively. The herd consisted of 42.59, 41.93 and 41.35 % of milking cows with average milk production 197.39, 238.97 and 276.03 kg/farm or 10.34, 10.18 and 11.57 kg/head/day in 2014 to 2016, respectively. Milk production was slightly lower than data of Boonkum et al., (2011) who reported that Thai Holstein cows generally produced 12.6 to 14.4 kg of milk per cow per day.

Table 1. Characteristics of herd size of Lampang smallholder dairy farms

Items	2014	2015	2016	SE	Overall mean
No. milking farms	43	41.57	40.91	1.06	41.82
Herd size, head/farm					
Total	44.82	55.94	57.65	6.96	52.80
Milking cow	19.09	23.46	23.84	2.63	22.13
Dry cow	3.66	5.98	5.68	1.26	5.10
Herd size, %					
Milking cow	42.59	41.93	41.35	0.62	41.95
Milking herd size, %					
Dry cow	19.17	14.26	23.82	4.78	19.08
Milk production					
Kg/farm/day	197.39	238.97	276.03	39.34	237.46
Kg/head/day	10.34	10.18	11.57	0.76	10.69

Sweet corn husk was fed as the main roughage (Table 2) due to its availability as purchase feed from a nearby whole kernel sweet corn canning factory. In addition, hybrid Napier grass and rice straw were also supplemented especially by the end of each year due to low amount of sweet corn husk. Concentrate feeds were also purchased as protein and mineral supplements throughout the entire year. Napier grass was mostly grown as fodder in farms.

Table 2. Feed resources for Lampang smallholder dairy farms

Item	2014	2015	2016
Feed resources			
Scaled sweet corn husk with cobs	Purchase	Purchase	Purchase
Hybrid Napier grass	Cut & carry	Cut & carry	Cut & carry
Rice straw	Purchase	Purchase	Purchase
Commercial concentrates	Purchase	Purchase	Purchase
Nutrient composition, %DM	DM	CP	NDF
Sweet corn husk	28.28	6.39	75.08
Hybrid Napier grass	24.40	9.84	68.33
Rice straw	93.73	4.31	76.65
Commercial concentrates	96.21	18.50	35.24
			27.18

Most smallholder dairy farmers were dominated by educated male with dairy expertise (Table 3). The socioeconomic aspects of farmers were similar to those in the northeast, south and central regions of the Thai Kingdom (Sarakul et al., 2009; Sarakul et al., 2011).

Table 3. Some characteristics of Lampang smallholder dairy farmers in 2014.

Items	Frequency	Percentage	Chi-square	P-value
Gender				
Male	33	84.61	18.692	0.001
Female	6	15.38		
Age of farmers, year				
20-29	2	5.13	28.821	0.001
30-39	12	30.77		
40-49	4	10.26		
50-59	19	48.72		
60-69	2	5.13		
Educational background				
Not educated	1	2.56	11.615	0.040
Primary school	13	33.33		
Junior high school	6	15.38		
Senior high school	5	12.82		
Higher certificate diploma	7	17.95		
Bachelor degree	7	17.95		
Dairy raising experience, year				
1-5	16	41.02	4.154	0.125
6-10	16	41.02		
11-15	7	17.95		

Conclusion

Lampang smallholder dairy farm consisted of 41.95 % of milking cows in the herd. Diets relied heavily on sweet corn husk and concentrates as purchase feeds except hybrid Napier grass. Socioeconomic aspects were similar to those in other regions. Further research should be conducted to monitor aspects to maximize profit margin and maintain farm sustainability.

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Towards a cost-effective feeding of broiler chickens

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Abstract

As feed constitutes more than 70% of the total cost of production, thus any attempt to reduce feed cost may lead to improved production efficiency and profitability. There is an opportunity to utilize locally available agriculture by-products as a source of energy or protein for broiler chickens. Palm kernel cake (PKC) can be a valuable source of energy for broilers but because of its high fibre content and low level of energy the use of PKC in poultry rations is limited. The availability of energy of PKC can be improved through physical and biochemical treatments. The availability of commercial synthetic amino acids has allowed a reduction of crude protein in poultry diets. Supplementing low-crude protein diets with synthetic amino acids has been shown to save cost. Exogenous emulsifiers may improve fat digestibility, reduce the inclusion level of crude palm oil in the diet of broilers and decrease feed cost substantially because oil is expensive. Vitamin and trace mineral premixes can be withdrawn from corn-soy based finisher diets without any adverse effects on growth performance and well-being of broilers. Such practice could substantially reduce production costs. Practical and innovative strategies to reduce feed costs are critical to ensure the sustainability of the poultry industry,

Keywords: feed, cost-effective, production efficiency, broiler chickens

Introduction

Feed is the single greatest cost of broiler chicken production. The soaring prices of feed ingredients over the past decades have reduced profit margins of broiler production. The price of corn which constitute more than 60% of a poultry ration, has been escalating steeply and the future challenges to the grain industry included productivity and demand for natural resources, technology, food safety issues, climate change and workforce turnover (Donley, 2012). The price of soy bean meal, the most widely fed protein source has also soared due to increased acreage used to grow corn at the expense of soy bean acreage. The poultry sector in countries like Malaysia is not sustainable in the long term because of its dependence on imported feed grains and feed supplements. It was estimated that 87% of the ingredients used in compound feeds are imported. Thus, any attempt to reduce feed cost may lead to improved production efficiency and profitability. Many strategies have been proposed for reducing feed costs such as manipulation of feed ingredients, supplementation of enzymes and antimicrobials, and use of non-conventional feed ingredients. This paper will focus on reducing feed cost for optimum production of broiler chickens through utilisation of palm kernel cake (PKC) as a source of energy, provision of low-protein amino acid-supplemented diets, supplementation of exogenous emulsifier, and removal of vitamin and trace mineral supplements.

Utilisation of palm kernel meal as a source of energy

For the last few decades, local researchers have researched on availability, nutritive value, optimal inclusion levels and treatment methods to enhance the feeding values of various locally available feed ingredients in poultry rations to partially replace corn. Palm kernel cake

is an important by-product of the oil palm industry and is obtained after the extraction of palm kernel oil from the kernels of the oil palm fruits. However, owing to its high fibre content and shell content, low level of energy and key essential amino acids, and grittiness the use of PKC in poultry rations is very limited (Zulkifli et al., 2003). Although the subject of using PKC in poultry diets has been studied considerably the recommended levels of inclusion seem to vary from one study to another. These inconsistencies could be due to variations in the content of protein, fibre and energy which depends on the sources, the methodology of oil removal and the efficiency of oil extraction from the kernel. Problems associated with the use of PKC may not be related to the physical properties of PKC but to its contribution to the overall nutrients in the diet, particularly energy. Another potential problem with PKC as poultry feed is the ration requires high inclusion level of fat due to the low energy content of PKC. High dietary fat may result in fatter chickens and feed rancidity problem. Because of these limitations, currently, the use of PKC in poultry diet by local feed millers is usually less than 5%. Earlier studies have shown that the availability of energy of PKC can be improved through physical and biochemical treatments (Hanafiah et al., 2017). The high level of fibre content in PKC contributes to the low digestibility. Fermentation with cellulolytic bacteria (Alshelmani et al., 2016) and enzymatic treatments have been shown to improve digestibility for poultry. Research at UPM showed that incorporating broiler chicken diets with fermented PKC (FPKC) at 20% can reduce the use of grain corn in ration by 23% and had no detrimental effect on growth performance in broiler chickens (Zulkifli et al., unpublished data). The level of oil included in the basal and FPKC based diets were 3.2 and 3.7%, respectively. This will reduce the cost of producing broiler chickens and importation of grain corn for poultry feed. Feeding FPKC based diet did not affect intestinal villi height and crypt depth but improved the population of lactic acid bacteria in the gut (Alshelmani et al., 2016). Rezaei et al. (2015) demonstrated that extract of PKC, contained a mixture of monosaccharides (including mannose) and oligosaccharides (mainly mannobiose) that acted as prebiotics which could modulate the immune function in poultry.

Low-protein amino acid-supplemented diets

Protein source is the most expensive component in broiler diets. The price of common protein sources like soybean meal is on the rise worldwide. Therefore, it is economically valuable to move to exact feeding of amino acids (AA) under different conditions. Poultry requires a specific quantity and balance of essential AA and nitrogen (for synthesis of non-essential amino acids) rather than crude protein *per se* (Awad et al., 2014a; b; 2016). The availability of commercial AA in synthetic form has allowed reduction of crude protein (CP) in poultry diets. Supplementing low-CP diets with synthetic AA has been shown to save cost (Dozier et al., 2008) and decrease nitrogen excretion (Bregendahl et al., 2002). However, the level of dietary CP may affect the response of broilers to hot environment. Cheng et al. (1997) reported that high protein diets were detrimental to weight gain, feed efficiency, and carcass composition in heat-stressed broilers. Thus, reduced dietary protein in heat-stressed chickens with adequate fortification of several essential amino acids may improve overall performance (Rahman et al., 2002; Zaman et al., 2008). On the contrary, other studies did not support the recommendation that low-CP diets were beneficial to poultry raised in a hot environment (Alleman and Leclercq, 1997; Temim et al., 2000). Work in our laboratory (Zulkifli et al., unpublished data) showed that irrespective of temperature ($23\pm1^{\circ}\text{C}$ throughout versus $33\pm1^{\circ}\text{C}$ for 6 hours per day from 22 to 35 days of age), feeding broilers with starter and finisher diets with 19.5% and 17.5% CP, respectively had no adverse effect on growth performance when compared to the control group (21% and 19% CP in starter and finisher diets, respectively). Low-CP diets, however, were beneficial in improving survivability rate but not the performance of heat-stressed broiler chickens. We also demonstrated that the stress of

overcrowding had negligible effect on the growth performance of broilers fed low-CP amino acid-supplemented diets. It appears that the response of broiler chickens to stressful environment was not dependent on dietary CP level.

Exogenous emulsifier supplementation

Fats and oils are commonly included in poultry feeds to increase energy concentration, improve feed palatability, growth performance and heat tolerance in poultry (Daghir, 2008). However, the digestion and absorption of dietary fats in young birds are limited because of incomplete development of the digestive tract (Baião and Lara, 2005; Wang et al., 2016), and insufficient secretion of lipase and bile salt (Jackson et al., 1971; Polin, 1980). This limitation affects the ability to form micelles in the intestinal lumen which reduces fat digestion and absorption of nutrients (Leeson and Atteh, 1995). Emulsifiers favour micelle formation, an essential step for lipid absorption, as it creates a diffusion gradient that promotes absorption (Guerreiro Neto et al., 2011). This has led to an increasing interest in exogenous emulsifiers to improve the utilization of fats in young birds (Zaefarian et al., 2015; Upadhaya et al., 2016; Boontiam et al., 2017). Working with a commercial synthetic hydrophilic emulsifier (Volamel), based on glycerol polyethylene glycol ricinoleate (Nukamel N.V., Hoogbuul, Olen, Belgium), we noted improvement in apparent metabolisable energy of diet and fat digestibility in broilers (Tan et al., 2016; Zulkifli et al. unpublished data). In another study, supplementation of exogenous emulsifier at the expense of crude palm oil (CPO) in the diet of broilers resulted in a similar growth performance with those provided control diet. Reduction in CPO inclusion reduced feed cost substantially because the oil is expensive.

Removal of vitamin and trace mineral supplements from diets

The diet of commercial broiler chickens is routinely fortified with vitamin (VIT) and trace mineral (TRM) premixes. However, a portion of the required VIT and TRM may come from major feedstuffs such as maize and soybean meal. Although VIT and TRM supplements make up only a small part of the total feed cost, their withdrawal from the diet fed during the finisher period could substantially reduce production costs. Skinner et al. (1992), and Christmas et al. (1995) reported that the withdrawal of both premixes from 28 to 49, and 35 to 42 days of age had negligible effect on growth performance. It has also been reported that, humoral immunity was not affected by withdrawal of both VIT and TRM premixes during the finisher period (Deyhim and Teeter, 1993; Khajali et al., 2006). However, the question remains, whether such practices may have an adverse effect on broilers under hot and humid tropical conditions. Heat stress is detrimental to the absorption of VIT (Klasing, 1998) and may reduce plasma and tissue concentrations of TRM on poultry. Working under the hot and humid tropical environment, Mochamat et al. (2017) reported that VIT and TRM premixes can be withdrawn from corn-soy based diets at 21 to 42 days of age without any adverse effects on growth performance, mortality rate, immune response and incidence of foot pad dermatitis in male and female broilers. There is the question, whether VIT and TRM premixes can be removed from diets based on alternative feed ingredients such as PKC.

Conclusion

The poultry industry will continue to make a significant contribution to global food security. However, the soaring prices of feed ingredients is a major challenge and must be addressed to ensure the industry remains viable and sustainable. Feed millers and poultry producers should focus on practical and innovative strategies to reduce feed costs. There is considerable scientific evidence indicating replacing feed ingredients with locally available alternatives such as PKC, formulating low-protein amino acid-supplemented diets,

supplementation with emulsifier, and withdrawal of vitamin and trace mineral premix from the finisher diet can reduce feed cost substantially.

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ORAL PRESENTATION

Plasma leptin ghrelin and their expression of receptors in different tissues and on production performance during post summer period in PD 3 chicken line

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Abstract

During summer high ambient temperature prevailing in the environment or in the shed, has a significant negative effect on the physiological functions of the chicken. PD 3 chicken layer line was developed at this institute from Dehlam breed. Despite good management practices, the temperature in the shed was higher (36.9-29°C) than the temperature which should be present in the thermoneutral zone (20-26°C) during eight weeks of summer period. The following experiment was conducted, to observe the effect of supplementation of fermented yeast culture (*Saccharomyces cerevisiae*) 1.5×10^7 cfu/g, (FYC, commercial product) on certain physiological blood parameters and mRNA expression of genes for receptors.

Keywords: summer, PD3 chicken line, hormone, receptors, fermented yeast culture

Introduction

During growth phase, chickens have higher metabolic activity (Freitas et al., 2014), and stress experienced during summer will be more. The stress experienced during growth phase may have an impact on egg production and feed efficiency in the later part of the season coinciding with the laying period. These are the two important parameters which govern the economics of the producer. Heat stress also leads to cellular oxidative stress, which causes damage to cell membranes. Leptin, probably because of its sensitivity to heat stress, it is suggested that Leptin plays a key role in regulation of energy metabolism under heat stress conditions (Morera et al., 2012). Fermented yeast culture used in the present study, is a commercial product composed of yeast and the media on which it is grown and is a source of vitamin, amino acids etc.

Methodology

The duration of the summer period was for eight weeks / 56 d (Age of the birds- 17-24 weeks). The study during post summer period extended from 25th week to 32 weeks of the age of the birds. A total number of 150 birds were divided equally in to three groups. Supplementation of FYC was given along with the basal diet, @ of 0.5g/kg (T1) and 1.25g/kg (T2) respectively to the two experimental groups and the control group was offered feed devoid of FYC. Feed intake and body weight were recorded at 15d interval, whereas Leptin and Ghrelin hormones were estimated by enzyme immunoassay using commercial EIA kits. in the blood samples collected at 15d interval. For assay of hormone receptors, total RNA was extracted, converted to cDNA and was amplified with respective primers. Estimation of plasma

total proteins, cholesterol, AMP kinase and protein carbonyls was done using commercially available kits.

Results and Discussion

The treatment group (T2) to which 1.25g of FYC was offered, the level of plasma Leptin and Ghrelin was reduced to physiological levels{(P<0.01), Table 1&2}, the expression fold of mRNA of the leptin and ghrelin receptors in liver, hypothalamus and magnum portion of the reproductive tract was also less when compared with their control counterparts (Fig 1a,b). The concentration of plasma AMP kinase was higher in the control group (Table 3). Similarly, the concentration of cholesterol and MDA was higher in the control group at 49d interval (Table 3). Higher plasma Leptin and MDA levels have been reported under the effect of heat stress (Al-Azraqi,2008) The change in the concentration of plasma protein carbonyls and protein as estimated for the two groups was not significantly different from each other. The results of different parameters of T1 group were not significantly different from control (Table 3). During post summer period , it was observed that supplementation of FYC(T2), had positive effect in increasing egg production performance (66%,62% (T1,T2)vs.60%(C)), fertility and hatchability parameters. Increase in egg production performance has been reported by (Yalcin et al., 2008). Studies on histopathology of the jejunum revealed that , supplementation of FYC, reduced enteritic necrosis from medium to mild state in the post summer period only (Fig 2a, b). It is concluded and hypothesized that supplementation of FYC @ 1.25 mg/kg had positive effect on production performance and got the hens acclimatised to higher temperatures at an earlier time when compared with the controls. Supplementation during post summer period improved feed efficiency(P<0.05), without any negative effect on body and egg weight. Acclimatisation to heat stress was advanced in the case of (T2) group with respect to T1 and Control group. This also led to increase in egg production parameters at later stage. FYC is a source of different constituents, which might have had important role in reducing stress effects and increasing productivity and decreased energy consumption.

Table 1. Effect of supplementation of FYC on levels of plasma Leptin (ng/ml) in PD 3 chicken line during summer season

Days	Control	T1	T2
7	1.657 ^a ±0.09	1.608±0.15	1.252 ^b ±0.05
21	1.824 ^a ±0.06	1.788±0.08	1.345 ^b ±0.15
35	1.683±0.08	1.665±0.06	1.319±0.06
49	1.524±0.10	1.536±0.12	1.397±0.10

Values with different superscripts in a row are significantly different (P<0.01), C-control, T1-0.5mg/kg, T2-1.25mg/kg

Table 2. Effect of supplementation of FYC on levels of plasma Ghrelin (pg/ml) in PD 3 chicken line during summer season

Days	Control	T1	T2
7	62.01±3.20	60.23±1.25	54.78±2.11
21	77.57 ^a ±2.10	74.23±2.19	67.56 ^b ±2.01
35	68.70 ^a ±2.20	67.43±2.53	54.62 ^b ±2.38
49	58.29 ^a ±2.39	59.45±2.34	49.75 ^b ±2.93

Values with different superscripts in a row are significantly different (P<0.01), C-control, T1-0.5mg/kg, T2-1.25mg/kg

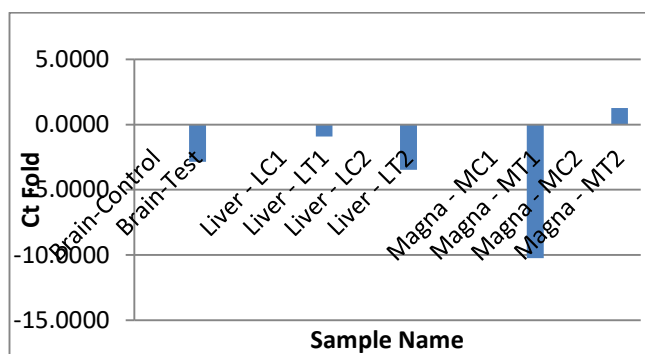
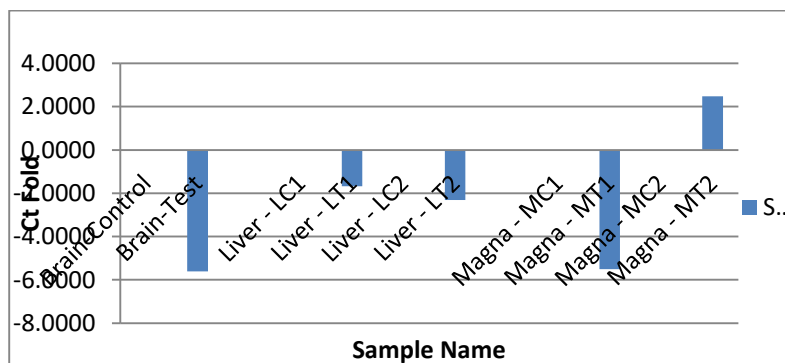
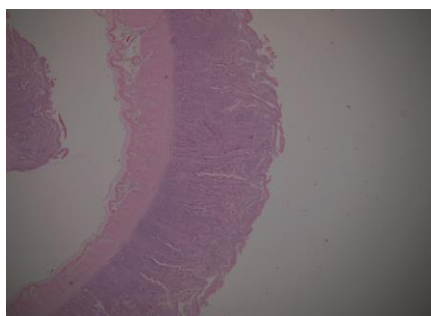
Table 3. Effect of supplementation of FYC on levels of different plasma parameters in PD 3 chicken line during summer season

Parameters	C	T1	T2	C	T1	T2
Cholesterol(mg/dl)	211.9±7.18	197.32±2.13	193.8±5.20	234 ^a ±9.23	222±7.28	163 ^b ±5.36
MDA(uMol/ml)	140.09±10.0	135.21±2.32	80.54 ^b ±2.69	100.2 ^a ±5.2	108±4.5	58 ^b ±1.58
Protein(mg/ml)	3.60±0.05	3.59±0.05	3.54±0.04	3.19 ^a ±0.04	3.32±0.04	3.96 ^b ±0.04
Protein carbonyl (nmol/mg)	321.19±10.05	315.65±4.32	320.62±9.45	328.6±2.3	320.1±2.10	315.2±3.10
AMPK inase (ng/ml)	0.99±0.03	0.85±0.02	0.88±0.02	1.58 ^a ±0.03	1.32±0.05	1.22 ^b ±0.03

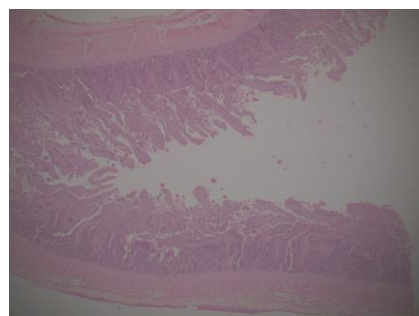
7 days

49 days

Values with different superscripts in a row are significantly different ($P < 0.01$), C-control, T1-0.5mg/kg, T2-1.25mg/kg

**Figure 1a.** Relative down regulated gene expression of Ghrelin receptor in treatment groups T1 and T2 with respect to control and normalized with respect to actin gene. The test values are significantly different from control at least at $P < 0.05$. C1&C2- Control, T1 and T2-Treatment**Figure 1b.** Relative down regulated gene expression of Leptin receptor in treatment groups T1 and T2 with respect to control and normalized with respect to actin gene. The test values are significantly different at least at $P < 0.05$. C1&C2- Control, T1 and T2-Treatment

a



b

Figure 2. Mild and medium necrosis of villi in the jejunum as observed at 200x magnification

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Egg yolk cholesterol and serum metabolites of laying hens fed dried tomato (*Solanum lycopersicum L*) meal in diet

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Abstract

In an experiment with one hundred MB 402 laying hens (36 weeks of age), the effect of dried tomato meal in diet on egg yolk cholesterol and serum metabolites was determined. The birds were allocated into five experimental diets and each was divided into four replicate groups of five birds per replicate. Tomato meal was included in four experimental diets at levels of 2, 4, 6, 8 % to substitute based diet. The treatments were: R0 = 100 % based diet (BD) + 0 % tomato meal (TM); R1 = 98 % BD + 2% TM; R2 = 96% BD + 4% TM; R3 = 94% BD + 6% TM; and R4 = 92% BD + 8% TM. Feed and water were provided for *ad libitum*. The study was conducted over a period of 8 weeks. Data were collected on : egg yolk cholesterol, triglyceride, total cholesterol, LDL-cholesterol, HDL-cholesterol. Data were analyzed by one-way analysis of variance. The treatment means were compared using Duncan's multiple range test. The results showed that no differences in hen triglycerida, HDL, LDL cholesterol between treatments R1, R2, R3, and R4 compared to treatment R0 (control), but high significant egg yolk cholesterol and total cholesterol. It can be concluded that tomato meal can be used as an alternative feedstuff in laying hen diets at inclusion levels up to 8% without negative effects on egg yolk cholesterol and serum metabolites.

Keywords: dried tomato meal, egg yolk cholesterol, serum metabolites

Introduction

Tomato are excellent sources of potassium, folate, and vitamins A, C, and E, but are superior sources of α -tocopherol and vitamin C. Fiber is another dietary component and appreciable amounts are found in tomato. Tomatoes also contains a variety of phytochemicals, including carotenoids and polyphenols (Campbell et al., 2004). The nutritional value of tomato can provide the poultry industry with an alternative feedstuff.

Squires et al.(1992) reported that tomato pomace could be used in broiler chicken diets up to level of 20 %. That using of dried tomato pomace (only separated tomato seeds) in broiler chicken diets were caused an extended shelf life for broiler meats, because of alpha-, beta-, gamma- and delta-tocopherols in tomato pomace cause an antioxidant effect. Dried tomato pomace was fed to laying hens at an inclusion rate of 12%, which resulted in similar egg production, feed efficiency, egg weight and shell. The limiting factors of dried tomato pomace in poultry diets are low energy and high fiber contents. The objective of this research was to evaluate the use of dried tomato meal in diet to egg yolk cholesterol and serum metabolites of laying hens.

Methodology

The tomatoes were washed, cut, and sun-dried to constant weight for 3-5 days. Part of tomato then was ground to fine powder using mortar and pestle. After that, mixed with other

ingredients to compound the feed. One hundred MB 402 laying hens (36 weeks of age) were used for the study. The birds were divided into five experimental diets and each was divided into four replicate groups of five birds per replicate using completely randomized design. The control diet (based diet) was formulated to contain 51% corn, 14% rice bran, 7% fish meal, 6% CaCO₃, and 22% commercial diet. Tomato meal was included in four experimental diets at levels of 2, 4, 6, 8% to substitute based diet. The treatments were: R0 = 100% based diet (BD) + 0% tomato meal (TM); R1 = 98% BD + 2% TM; R2 = 96% BD + 4% TM; R3 = 94% BD + 6% TM; and R4 = 92% BD + 8% TM. Chemical composition of tomato meal were: 20.73% crude protein, 1.53% fat, 30.94% crude fiber, 0.98% Ca, 1.20% P, and 2416 Kcal/kg ME, and chemical composition of the diets are shown in Table 1.

Table 1. Chemical composition of the diets

Nutrients	Diets				
	R0	R1	R2	R3	R4
Crude protein (%)	17.49	17.47	17.45	17.44	17.42
Fat (%)	6.63	6.61	6.59	6.57	6.56
Crude fiber (%)	4.31	5.41	6.50	7.24	8.69
Ca (%)	2.76	2.75	2.69	2.66	2.56
P (%)	1.42	1.16	1.42	1.41	1.40
ME (Kcal/kg)	2766	2759	2752	2745	2738

R0 = 100% based diet (BD) + 0% tomato meal (TM); R1 = 98% BD + 2% TM; R2 = 96% BD + 4% TM; R3 = 94% BD + 6% TM; and R4 = 92% BD + 8% TM.

The egg yolks from each treatment were pooled and analyzed cholesterol content by the colorimetric assay of Bair and Marion (1978) on the fat extract obtained by a modification of the procedure of Folch et al., (1957) from 2 eggs of each replicate. 1.5 ml blood was collected at last keeping period through brachial vein with 3 ml syringes (content 0.1 ml heparin). The chickens were fasted for 12 hours prior to blood sampling. Data collected were subjected to analysis of variance (ANOVA). Where significant variance ratios were detected, differences between treatment means were tested using Duncan's multiple range test procedures (Snedecor and Cochran, 1967)

Results and Discussions

The effects of dietary dried tomato meal on the egg yolk cholesterol and serum metabolites of laying hens during the entire trial period are shown in Table 2. Results showed that no differences in hen triglycerida, HDL, LDL between treatments R1, R2, R3, and R4 compared to treatment R0 (control). Egg yolk cholesterol and total cholesterol highly significant different. Salajegheh (2012)^[6] reported that serum protein, cholesterol, LDL, HDL, albumin, glucose, triglyceride levels were not significantly affected by dried tomato pomace (DTP) addition.

Table 2. Effect of dried tomato meal in diet on egg yolk cholesterol and serum metabolites

Treatment	Egg yolk cholesterol (mg/g yolk)	Triglycerida (mg/dl)	Total cholesterol (mg/dl)	HDL-cholesterol (mg/dl)	LDL- cholesterol (mg/dl)
R0	121.76 ± 0.8 ^a	75.26 ± 9.81	135.8 ± 3.96 ^a	97.80 ± 0.83	54.80 ± 3.34
R1	121.12 ± 1.05 ^a	75.20 ± 5.70	126 ± 6.51 ^b	97.80 ± 0.83	53.6 ± 2.30
R2	119.48 ± 0.8 ^b	75.50 ± 11.72	122 ± 2.73 ^b	97.80 ± 0.83	55.20 ± 5.71
R3	118.22 ± 0.67 ^c	75.66 ± 18.82	122.86 ± 3.89 ^b	97.60 ± 0.54	54.40 ± 1.14
R4	118.24 ± 0.58 ^c	73.22 ± 20.25	118.2 ± 5.58 ^c	97.40 ± 0.54	54.4 ± 0.55
Sign	***	Ns	***	ns	Ns

HDL = High – Density Lipoprotein, LDL = Low – Density Lipoprotein, ns : not significant different, **: significant different, ***: highly significant different

Frieman et al.,(2000) indicated that feeding of tomatoes reduced serum Low-Density Lipoprotein (LDL) cholesterol and triglyceride concentration in hamsters. Kavitha et al., (2004) reported that the (DTP) inclusion up to 15 % without enzyme the supplementation in broiler diets reduce the serum and muscle cholesterol contents.

Conclusion

These finding indicated that dried tomato meal could be used as an alternative feedstuff in laying hen diets to substitute based diet, at inclusion levels up to 8% without negative effects on egg yolk cholesterol and serum metabolites.

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Carcass quality as well as composition and oxidative stability of the meat of crossbreds of Thai indigenous chickens and a layer breed as compared with purebred Thai indigenous, layer and broiler chickens

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Abstract

It was investigated whether crossbreeding of Thai Native chickens with a layer chicken type improves carcass and meat quality in comparison to the respective purebred types and a commercial broiler type. Two-hundred 1-day old birds, 50 each of Pradu Hang Dam)Thai indigenous; PA(, Rhode Island Red)RR(, crossbred)CB = PA×RR(, and broiler)Ross; BR(were kept in 20 pens per ten chickens. Birds were slaughtered either after 120 days (PA, CB and RR) or 45 days (BR). Body and carcass weight and breast proportion were highest for BR and lowest for PA and RR) $P > 0.05$), and intermediate with CB. The PA, CB and RR chickens had a higher leg proportion than BR) $P > 0.05$ (. The RR had most abdominal fat) $P > 0.05$ (. The breast meat of BR had the highest) $P > 0.05$ (intramuscular fat content, whereas the protein content of PA, CB and RR was higher than in BR) $P > 0.05$ (. The content of malondialdehyde was higher) $P > 0.05$ (in breast meat of BR when compared with RR, CB and PA from day 3 of storage onwards. In conclusion, crossbreeding was beneficial with respect to carcass traits, even though the advantage over the pure lines was small compared with the difference to the commercial broilers. In the meat quality traits, inclusive of oxidative stability, crossbreds did not differ from the pure lines, but all extensive types were superior to broilers in this trait.

Keywords: meat quality, lipid oxidation, pradu hang dam, rhode island red

Introduction

Among the factors influencing growth, carcass and meat quality of growing chickens, such as genetics, nutrition, and husbandry, genetics is the most important factor. Chicken meat is a very popularly commodity in Thailand and it originates from fast-growing broilers, crossbreds or native chickens)Jaturasitha et al., 2016(Commonly, the crossbreds also have Thai native chicken as one parent in order to preserve its preferred black color, which is a dominant trait. Recently, Thai native chickens were becoming more popular among Thai consumers due to their chewy and tasty meat)Jaturasitha et al., 2008(. However, comparisons between crossbreds and pure lines are limited. Therefore, the objective of this study is to compare crossbreds in growth, carcass and meat quality with pure lines of Thai indigenous chickens and a layer type as well as with fast-growing broilers.

Methodology

An experiment was carried out with a total of 200 chickens kept in pens of ten each. Treatments with 50 birds each were Pradu Hang Dam)a representative of Thai indigenous

chickens; PA(, Rhode Island Red)RR(, crossbreds)PA × RR; CB(and a commercial broiler line)Ross; BR). The 1-day old chickens were fattened until being either 120 (PA, CB and RR) or 45 days old (BR). Except for the broilers, which received a broiler-type diet, all other types were fed with another diet which is also used for egg production from extensive poultry husbandry. Water and feed were provided at *ad libitum* access as recommended by NRC (1994) for slow growing chicken types. Chicken slaughtering and carcass cutting followed Henrickson (1985). The breast muscle was deboned after removing the skin, weighed and then the meat was minced by using a domestic meat chopper. Subsequently, the meat samples were frozen at -20 °C until the analysis took place. The chemical composition (moisture, protein and fat) of the breast meat was analyzed by methods of proximate analysis. The thiobarbituric acid method with malondialdehyde as a key compound, which was analyzed according to Rossell (1994)^[5], was used to determine the status and progress of lipid oxidation in the breast muscle. For this purpose, the breast meat was stored for 0, 3, 6 and 9 days at 4°C. Data were subjected to ANOVA by the GLM procedure considering type as effect and animal within type (replicate) as random effect using SAS version 6.12. Differences among mean were assessed by Duncan's New Multiple Range Test.

Results and Discussion

The effects of chicken type on body and carcass weight were highly significant (Table 1). Even though BR had been fattened for a much shorter time, body weight, carcass weight and breast proportion were by far highest for BR, intermediate for CB chickens, and lowest for PA and RR chickens ($P < 0.05$, except between PA and RR). The PA, CB and RR chickens had a higher ($P < 0.05$) leg proportion than BR. The highest abdominal fat proportion was found with the RR. The RR, being a layer type, had higher abdominal fat maybe because reached puberty at an earlier age (Haitook, 2006).

Table 1. Body weight, carcass weight and composition (means ± standard deviation)

Criteria	Chicken type				P-value
	PA	CB (PA×RR)	RR	BR	
Body weight)g(1,827±39 ^c	1,894±36 ^b	1,825±33 ^c	2,136±25 ^a	<0.001
Carcass weight)g(1,268±30 ^c	1,376±31 ^b	1,254±23 ^c	1,567±21 ^a	<0.001
Carcass composition					
Breast (%)	15.1±0.1 ^c	16.2±0.1 ^b	15.0±0.1 ^c	27.1±0.8 ^a	<0.001
Leg (%)	29.7±0.2 ^a	30.3±0.1 ^a	30.4±0.2 ^a	27.1±0.4 ^b	<0.001
Abdominal fat (%)	1.76±0.24 ^c	2.64±0.19 ^b	3.25±0.18 ^a	2.57±0.15 ^b	<0.001

PA, Pradu Hang Dam; CB, crossbreds; RR, Rhode Island Red; BR, broilers

^{a-c}Means within a row with no common superscript differ significantly) $P < 0.05$ (

The results on the chemical composition and malondialdehyde content of the breast meat are presented in Table 2. There was no difference between chicken types in moisture content of the breast meat. The BR had the highest ($P > 0.05$) intramuscular fat contents and the lowest ($P > 0.05$) protein contents of all chicken types, whereas there were only minor differences among the other types. The level of protein was similar to the level of 24.6% reported by Sirri et al. (2010)^[7] for a slow-growing chicken type. In addition, Young and Choi (2003)^[8] described that the intramuscular fat content of traditional Korean chickens was lower than that of common broilers. In the present study the malondialdehyde concentration was higher ($P > 0.05$) in the breast muscle of the BR when compared with RR, CB and PA after storage for 3, 6 and 9 days. Pikul and Kummerow (1990) also described that broiler meat is more susceptible to oxidation. Min et al. (2008) argued that the complex interplay of the

prevalence of endogenous catalysts such as myoglobin and free ionic iron, reducing compounds, antioxidants (e.g., carnosine and related dipeptides), and catalase influences the development of lipid peroxidation in meat. The predominant reasons for the higher susceptibility of the broiler meat to oxidation still need to be determined.

Table 2. Composition and TBARS of the breast muscle (means \pm standard deviation)

Criteria	Chicken type				P-value
	PA	CB (PA×RR)	RR	BR	
Chemical composition, %					
Moisture	74.7±0.0	74.8±0.0	74.8±0.1	74.8±0.0	0.760
Protein	23.8±0.1 ^a	23.7±0.1 ^a	23.5±0.1 ^a	23.1±0.2 ^b	<0.001
Fat	1.47±0.17 ^b	1.39±0.11 ^b	1.53±0.15 ^b	2.09±0.15 ^a	<0.001
TBARS, µg of malondialdehyde/ kg meat					
Day 0	25±0	29±2	54±17	63±17	0.113
Day 3	155±0 ^b	183±12 ^b	181±13 ^b	298±10 ^a	0.001
Day 6	247±20 ^b	262±31 ^b	262±1 ^b	448±30 ^a	0.025
Day 9	403±21 ^b	427±15 ^b	475±15 ^b	644±0 ^a	0.001

PA, Pradu Hang Dam; CB, crossbred; RR, Rhode Island Red; BR, broiler

^{a-c}Means within a row with no common superscript differ significantly)P < 0.05(

Conclusion

At the slaughter age of 120 days, typical for Thai conditions, crossbred chickens were superior to the purebred lines in growth and carcass traits, whereas there was no difference in meat composition and oxidative stability of the breast meat to the purebred lines, although all extensive types were superior to broilers in oxidative stability. Although crossbreds are not competitive to broilers, they may be the choice when extensively producing special Thai chicken meat. It still has to be shown that chewiness and taste which are characteristic for the Thai indigenous chickens are still present after crossbreeding.

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Effect of genotype on productive and reproductive traits of desert and taggari goats managed under natural grazing during rainy season

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Abstract

The productive and reproductive performance of Sudanese Desert and Taggari goats has been studied during rainy season of South Kordofan state, Sudan. About Thirty five male and female Sudan Desert and Taggari goat kids were used in this experiment. The result inducted that birth weight, growth rate at different ages, pre-weaning average daily weight gain of kids, weaning weight, body weight and age at puberty and body weight at first kidding was significantly ($p < 0.01$) affected by breed. Desert kids showed better birth weight (2.45 ± 0.07 vs 1.95 ± 0.04 kg) and weaning weight (10.84 ± 0.34 vs 8.44 ± 0.19 kg) than Taggari kids. The result revealed that Desert kids have heavier ($p < 0.01$) body weight at puberty (23.09 ± 0.44 kg) but exhibit longer time to show first estrus (242.57 ± 4.97 day) compared with Taggari kids with 18.59 ± 0.34 kg for body weight and 211.34 ± 5.48 day for days to puberty. Body weight at first kidding was significantly ($p < 0.05$) larger for Desert kids (377.70 ± 12.12 kg) than Taggari kids (384.33 ± 6.51 kg), but age at first kidding was not affected by breed. In conclusion the investigated breed showed different body weight changes at different ages which affect reproductive and productive traits of the Taggari and desert goats under rangeland system during rainy season.

Keywords: desert, Taggari kids, breed, genotype, Sudan, performance

Introduction

Goats are widely distributed around the world with high demand for their meat in many developing and subtropical countries and arid regions (Casey et al., 2003). In most of these countries, the productivity of goats is below their potential (Matossian de Pardos, 2000). Goats are neglected animals in Sudan despite the fact that they play a very important role in the rural economy and provide many poor urban and rural families with milk and meat. Sudan have two breeds of meat goat, they were the Sudanese Desert and Taggari goats. Indigenous goat breeds are well adapted to semi arid tropical conditions, with a high degree of heat tolerance and are partly resistant to many of the diseases prevailing in the semi arid areas, not to mention their ability to survive long periods of feed and water shortage (Bushara et al. 2011).

Birth weight and the growth of kids until weaning, together with reproduction birth characteristics, dressing percentage, meat quality are reliable indicators of the breed efficiency in the production of meat (Sundaram et al. 2012). Comparative evaluations of meat goat breeds for pre-weaning kid performance had received inadequate research attention in the Sudan. A high rate of reproductive efficiency is generally thought to be the most important prerequisite for the production of meat (Herold et al. 2007), therefore an assessment of the general reproductive characteristics of native breeds is necessary prior to developing strategies aimed at improving meat supplies. Studies conducted by various authors reflected the facts that grazing alone may not be sufficient for optimum live weight gain and reproductive performance

of goats. Keeping this view in mind, the present study was therefore undertaken to investigate and compare some productive and reproductive performances of Sudanese Desert and Taggari goats under traditional management system depended on natural grazing to exploit the potentialities of goats for the welfare of the rural poor and village community.

Methodology

The present study was conducted in South Kordofan state at Al Debat locality (100 km south of ELObeid) which lies within the medium rain (500 mm) woodland savannah (longitudes 12.39° N, Latitudes 29.48°E). Thirty five male and female Sudanese goat kids (18 Sudanese Desert kids and 17 Taggari kids) were used in this experiment. The kids were born during the rainy season of year 2012. All animals were treated with the necessary medication. The animals were ear tagged, weighed and divided into two groups as group A of Taggari kids and group B of Desert kids. The grazing zone of these animals was in the around the study area. All their kids were allowed day grazing from 0800 to 1800 hr and in the evening they were kept indoor in enclosures. Kids born were allowed to freely suckle colostrum for the first three days after parturition, thereafter they were separated from their dams during the day. In the evening half of their dam milk was milked before kids were released to spend the night with their dams. Kids were weaned at three months of age. All kids were weighed at weekly intervals up to age at first kidding. All the data obtained from the experiment were analyzed using T-test as means and standard errors using SPSS.

Results and Discussion

Effect of breed on birth weight, body gain and weaning weight

The results show that the live body weight at birth, growth rate, body gain and weaning weight were significantly ($P < 0.05$) affected by breed (Table 1). The two breeds exert significant ($P < 0.05$) effect on growth in different age with higher ($P < 0.05$) daily body weight gain for Desert goats compared to Taggari goats. The Desert goats showed significant higher ($P < 0.05$) body weight at weaning time. In this experiment, Desert goats tended to have a better reproductive performance compared to the other genotype of Taggari goats as shown by an excellent fertility, heavier birth weight of kids, fastest growth rate and heaviest litter at weaning. This result with same of Bushara and Abu Nikhaila (2011) and lowered than the results of Zeinelabdeen et al. (2011) for Nilotic kids. Birth weight of Desert it seemed very high same results were obtained by Bushara et al. (2017) for Peri-urban Desert goats and agrees with Banerjee and Jana (2010) whom reported that the differences in birth weight in livestock may be attributed to the effect of breed besides of the non genetic factors. Generally the significant difference in birth weight of kids resulting from the random effects of the dams can be attributed to the natural variation occurring in the prenatal and post birth nutrient supplied by mothers. The pre weaning gain of kids of the two breeds showed significant affect. Nieto et al. (2006) reported that, in early life of the kid, weight gain depends on milk consumed as the only source of feed, so the dam producing capacity will influence the growth rate of kids. The variation in daily body weight gain may be due the variation in time of measurement of body weight and different breed's size. Different weaning were reported in this study showed that the body weight at weaning in affected by breed which agreed with Dereje et al. (2015) who stated that weaning weight of kids is influenced by breed, birth weight and lactation performances of dam, weaning age, pre-weaning nutrition and litter size. Also the differences in the pre-weaning weight gains are closely associated with the differences in level of milk intake during milk feeding period and the nutritional status of the doe.

Table 1. Effect of breed on birth weight, litter size, body weight at different ages and growth rate and weaning weight of Sudanese goats

Variables	Type of breed			
	No.	Taggari	No.	Desert
Birth weight	17	1.95±0.04 ^b	18	2.15±0.07 ^a
Body weight gain/g/day	16	72.14±1.65 ^b	15	95.91±3.64 ^a
Weaning weight (kg)	16	8.41±0.19 ^b	15	10.84±0.34 ^a

^{ab} Values in the same rows followed with different letters are significant at P<0.05 and P<0.001

Effect of breed on some reproductive traits of Sudanese goats

Effect of breed on body weight at puberty and at 1st kidding, age at puberty and 1st kidding were shown at (Table 2). The Desert goats showed significant higher (P<0.05) pubertal body weight and at puberty time compared with Taggari goats, but Taggari goats had significant (P<0.05) advance to Desert goats on time of puberty. The breed on the other hand seemed to exert a non significant effect on age at first kidding. The large body weight of Desert goats showed its gene make up which tended to increase this result is in line with Malau-Aduli et al. (2005) and Zeinelabdeen et al. (2011). Taggari goats showed lowered body weight at first estrus may be due to some environmental factors, the result here is higher than that obtained by Bushara et al. (2011) and Zeinelabdeen et al. (2011). Many authors showed that some breed exhibit earlier estrus and reached puberty at an earlier age compared as in this study. These results were consistent with Hassan et al. (2007) and Thiruvankadan et al. (2000). Generally, the sexual maturity is mostly dependent on weight rather than age, so good management and care of female kids allow them early attainment of puberty. The Desert goats kids showed significantly higher body weight at first kidding compared with Taggari goat kids here the phenomenon of genetic is clearly appearance and this results agree with Banerjee and Jana (2010) and Assan (2013). Higher body weight at kidding was reported by Zeshmarani et al. (2007) for Black Bengal. The present review shows that the indigenous goat breeds of Sudan tend to have their first kids before they are two years old. Age at first kidding varies considerably in the literature from lowest age at first kidding noticed by Dereje et al. (2015) 516.9 days or 17 months and Hassan et al. (2007) 360.5±10 days for Black Bengal goats. Does living in harsh environments are expected to have a higher age at first kidding than does living in optimal environments (Dereje et al., 2015). The small sample size was responsible for non-significant for the effect of breed on age at first kidding. Generally the results of this study it seemed very good that there is a hope for future ability for improvement of the goats flock in Sudan, since those goats managed under natural grazing where quality and quantity of pasture available to the weaned kids which promote the good growth rate.

Table 2. Effect of breed on puberty weight, age of puberty, body weight and age at 1st kidding of Sudanese goats

Variables	Type of breed			
	No.	Taggari	No.	Desert
Body weight at Puberty (kg)	8	18.59±0.34 ^b	7	23.09±0.44 ^a
Age at puberty(days)	8	211.33±5.48 ^b	7	242.57±4.97 ^a
Body weight at 1 st kidding (kg)	8	22.84±0.29 ^b	7	25.91±0.24 ^a
Age at 1 st kidding(days)	8	384.33±6.51	7	397.71±12.12

^{ab} Values in the same rows followed with different letters are significant at P<0.001

Conclusion

The results showed that the Desert goats had superior reproductive and productive traits than Taggari goats under grazing condition. However, Taggari goat had lighter body weight at first kidding. Further studies may be conducted using large number of animals for a longer period to get more detailed information related to reproductive performance.

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Dairy cattle biogas unit sludge on the nutrient of rice straw compost

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Abstract

The purpose of this research was to find out the following: 1). The mixing effect of BGUS of dairy cattle manure with dry rice straw; 2). The effect of composting time; and 3). The effect of interaction to compost nutrient content. The significance of this research were to: 1). determine the effect of treatment, 2). determine treatment in producing compost nutrient content. The method used in this research was T experiment tested on dry rice straw which were called T₁₋₅. Later on, it was observed on W₃₋₅, and repeated 5 times. The variables measured in the compost nutrient content were: 1). pH, 2). organic C, 3). N total, 4). C/N ratio, 5). P, 6). K, 7). Ca, 8). Mg and 9). CEC. The result of analysis variance of T treatment to P, CEC was significantly different ($P < 0.05$). Next, on a case W versus C/N, K and CEC were also significantly different ($P < 0.05$). The interaction of treatment on the compost nutrient content in organic C, N total, C/N, P, K, Ca, Mg and CEC were very significant ($P < 0.01$). Therefore, it could be concluded that 1). The compost nutrient content of rice straw was affected by the addition of BGUS. and 2). The BGUS addition and composting time of rice straw affected compost nutrient content. Suggestion: Compost production made of rice straw with BGUS addition and composting time are greatly determining the nutrient content of the compost.

Keywords: biogas, sludge, straw, nutrient, compost

Introduction

The population of dairy cattle reaching 525,000 heads (28.9%). The dairy cattle slurry of 21.000 ton/per day can be accommodated by biogas unit (BGU) volume 5 m³ as much as 584,000 units. Similarly, cattle dung that have been processed in BGU and become biogas unit sludge (BGUS) will form rice straw compost as much as 827,090 tons or 0.0004% of Indonesia rice straw products. The purpose of this research was to know 1). The effect of mixing BGUS with rice straw (T) and 2). The influence of composting time (W) and 3). The effect of TW interaction to nutrient content of compost. Moreover, the significance of this research were to 1). Establish the effect of T, W and TW, 2). Determine T, W and TW in producing the compost nutrient content.

Methodology

The research location was in Wonokerto Village, Malang Regency, East Java Province. The BGUS added to the stacks of chopped and dried rice straw were 1, 2, 3, 4, and 5 (based on weight), here, it referred to as T₁, T₂, T₃, T₄ and T₅. Then it was observed from week 3 to week 5 or W₃, W₄ and W₅ and repeated for 5 times. The measured variable was the nutrient content of the compost which included: a). pH, b). C organic, total N, C/N ratio, P, K, Ca, Mg and CEC (Cation exchange capacity). The study was designed with a completely randomized design (CRD) with random factorial model (Steel and Torrie, 1980).

Results and Discussion

The analyzed results that TW on nutrient of compost was significantly different ($P < 0.01$), except for T to pH and W to P. It shows that T and W have a role in determining the nutrient of the compost produced. TW compound interaction to pH showed no significant effect ($P > 0.05$), W had significant effect ($P < 0.05$). According to Junus, Widodo, Wahyono and Zamrud. (2015), the BGUS has pH above 7. It shows contrast to the Pratiwi, Atmaja, and Soniari (2013) observation result, which explains that the quality of waste compost of rice does not give a real effect. Pan and Sen (2013), explain that the composting process using microbes will produce pH between 6.5 - 8. More details are explained on Table 1.

Table 1. The effect of T, W and TW on the nutrient content of compost

No.	Variable	Treatment		
		T	W	T x W
1	pH	ns	**	ns
2	C organik	**	**	**
3	N total	**	**	**
4	C/N	**	*	**
5	P	*	ns	**
6	K	**	*	**
7	Ca	**	**	**
8	Mg	**	**	**
9	CEC	*	*	**

ns = not significant ($P > 0.05$) ** = highly significant ($P < 0.01$) * = significant ($P < 0.05$)

The TW interaction of compost organic C element gave significant effect ($P < 0.01$). More details are explained on Table 1. Goyal, Singh, Suneja and Kapoor (2009) state that compost can increase C soil organic. The longer the composting time, the bigger number of N will be (Pan and Sen, 2013), but in this experiment the optimal N was formed on W3 (Table 1). The greater the number of organic N content then C/N will be decreased (Table 1). The lowest TW interaction to P nutrient content was at T4W4 = 0.12% and the highest was at T1W4 = 0.34%. The more BGUS in rice straw composting process, the higher content of P will be. Details are on Table 1. That was due to the large number of microbes from the BGUS.

The lowest K nutrient interaction to TW was at T4W3 = 1.24% and the highest was at T1W3 = 3%, because BGUS utilization was bigger in number than the amount of composted straw. Hence for treatment of P4W3 straw received more BGUS that consequently fastened the race process and many K nutrients were utilized for microorganism development. Details of nutrient K fluctuations chart are on Table 1. The lowest Ca nutrients was at T3W4 = 1.35% and the highest was at T2W5 = 2.01%. According to Faridullah, Nisar, Alam, Irshad and Sabir (2014), the decomposition of organic matter will increase Ca nutrient. Therefore, T2W5 produces more Ca nutrients on Table 1.

The lowest Mg nutrients was at T1W3 = 0.42% and the highest was at T4W3 = 1.9%, because BGUS usage would accelerate the composting process. According Ogundare, Lajide (2013), during composting process the availability of macro nutrients such as Mg will increase. Further descriptions are on Table 1. The lowest interaction of TW to CEC was at T1W3 = 39.57 me/100 g and the highest was at T2W4 = 70.36 me/100 g. According to Jiménez and Garcia (1991), the mature compost will increase CEC number. Therefore, T2W4 interaction is the best CEC product. A whole description is provided on Table 1.

Conclusion

Concluded that 1). The compost nutrient of rice straw was affected by the addition of BGUS and 2). The BGUS addition and composting time of rice straw affected compost nutrient.

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Effect of rice hull inclusion with and without enzymes on growth performance and digestive traits of broilers

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Abstract

In a twenty-one day feeding trial, the effects of rice hulls inclusion with and without enzymes supplementation were determined on growth performance, and digestive traits of broilers. Total of 200 one-day-old male broiler chicks (Lohmann) were divided into 40 groups of five (5) birds each and randomly assigned to the four treatment diets in a completely randomized designed (CRD). The treatment diets were: 1) corn-soybean based diet as a control diet (C), 2) inclusion of 4% rice hulls in the diets (RH), 3) RH diet + phytase 1750 FTU/kg (RHP), 4) RH diet + phytase 1750 FTU/kg + cellulase 500 unit/kg (RHPC). Inclusion of 4% rice hulls in the diets increased body weight gain (BWG) ($p < 0.001$) and gave better feed conversion efficiency (FCE) ($p < 0.05$) on broiler chickens at 21 d of age compared to those fed the control diets. Supplementation of phytase or phytase and cellulase did not enhance BWG or FCE. Feed intake was not affected by diets ($p > 0.05$). In addition, inclusion of rice hulls in the diet increased jejunum weight ($p < 0.05$), and supplementation of phytase decreased the weight of jejunum same as that in the control diet. The inclusion of 40 g/kg rice hulls in corn-soybean based diets induces a better growth performance of young broiler chickens. Addition of phytase or phytase and cellulase in a balanced diet did not improve growth performance but it affected jejunum weight. The mechanism in which the addition of enzymes reduced the jejunum weight was unknown.

Keywords : rice hulls, growth performance, jejunum weight, phytase, cellulase

Introduction

The inclusion of insoluble NSP (iNSP) in broiler diets has been reported to enhance healthy gut environment (Bao and Choct, 2010) and nutrients digestibility (González-Alvarado *et al.*, 2010). González-Alvarado *et al.* (2010) suggested that a minimal amount of fibers in the diets might require for young broiler chickens. However, it was reported that interaction of one iNSP with other iNSPs, or with other cell-wall components can change the physical properties of an iNSP source (Hartini *et al.*, 2003), so the benefit of one iNSP might not apply to the other iNSPs. Beside iNSP, phytase is commonly used in poultry diets to improve broilers performance. The utilization of cocktail enzymes such as phytase+carbohydrase has been reported to increase the phytase efficacy in increasing broiler performance (Avila *et al.*, 2012). Inclusion of hulls in the broilers diet affected the weight of gastrointestinal organs and length of small intestine (González-Alvarado *et al.*, 2010). In this study the effects of rice hulls inclusion with and without enzymes supplementation in diets was investigated on growth performance and digestive traits of broiler chickens from 1 to 21 d of age.

Methodology

Diets used in the experiment were: 1) corn-soybean based diet as a control diet (C), 2) inclusion of 4% rice hulls in a diet (RH), 3) RH diet + phytase 1750 FTU/kg (RHP), 4) RH diet + phytase 1750 FTU/kg + cellulase 500 unit/kg (RHPC). All diets were formulated to be isocaloric and isonitrogen and meet all nutrient recommendations of the NRC (1994) for broilers starter diets. All diets were provided as mash feed. A total of 200 one-day-old male broiler chicks (Lohmann) (initial BW of 54.56 ± 2.3 g) were randomly allocated to 40 cages with 5 birds per cage and 10 cages per treatment. Chick were given free access to both water and feed until 3 weeks of age. Cages were illuminated 24 h per day. Body weight and FI (g/b/d) were determined at 0 and 21 d of age. Body weight gain and FI were used to calculate FCE (FCE = BWG/FI) during the entire experimental period. Mortality was recorded daily. At 21 d of age, one bird from each of five replicates per treatment that had weights closed to the mean weight for the cage was selected for dissection. The digestive tract, including gizzard, were weighed prior to and after removal of content. The pancreas was also removed and weighed. Relative weight of empty gizzard, duodenum, jejunum, ileum, and pancreas was expressed as g/100 g BW, whereas length of duodenum, jejunum, and ileum was expressed as cm/100 g BW.

The data obtained were analyzed statistically using one-way Analysis of Variance (SPSS 16.0, 2007). After a significant F test, Duncan's multiple range test was used to inspect differences among group means. Statistical significance was accepted at $p < 0.05$.

Results and Discussion

The effects of diets on growth performance and relative weight and length of digestive organs of broiler chickens are presented in Table 1.

Table 1. Growth performance and relative weight and length of digestive organs of broiler chickens during the experiment (mean \pm SEM)

	Control diet	RH	RH+phytase ¹	RH+phytase+ cellulase ²	p-value
BWG (g/b/d)	28,60 \pm 0,396 ^a	32,43 \pm 0,686 ^c	29,26 \pm 1,00 ^{ab}	31,48 \pm 0,983 ^{bc}	**
FI (g/b/d)	39,57 \pm 0,671	40,24 \pm 0,999	37,56 \pm 0,897	38,70 \pm 1,309	ns
FCE (g/g)	0,728 \pm 0,014 ^a	0,807 \pm 0,007 ^b	0,781 \pm 0,023 ^{ab}	0,819 \pm 0,031 ^b	*
<u>Weight of digestive organs (g/100 g BW)</u>					
Gizzard	3,07 \pm 0,23	3,25 \pm 0,18	2,80 \pm 0,15	3,36 \pm 0,18	ns
Duodenum	1,08 \pm 0,08	1,23 \pm 0,07	1,15 \pm 0,07	1,15 \pm 0,09	ns
Jejunum	2,02 \pm 0,11 ^a	2,48 \pm 0,16 ^b	1,95 \pm 0,14 ^a	2,18 \pm 0,13 ^{ab}	*
Ileum	1,48 \pm 0,13	2,04 \pm 0,18	1,65 \pm 0,17	1,84 \pm 0,19	ns
Pancreas	0,05 \pm 0,003	0,05 \pm 0,004	0,05 \pm 0,005	0,06 \pm 0,004	ns
<u>Length of digestive organs (cm/100 g BW)</u>					
Duodenum	3,18 \pm 0,11	3,49 \pm 0,16	3,38 \pm 0,13	3,50 \pm 0,09	ns
Jejunum	8,20 \pm 0,41	8,54 \pm 0,35	8,06 \pm 0,32	8,51 \pm 0,31	ns
Ileum	8,60 \pm 0,46	8,78 \pm 0,43	8,52 \pm 0,27	8,68 \pm 0,30	ns

¹1750 FTU/kg, ²500 unit/kg, ns= not significantly different, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

The inclusion of 4% rice hulls in the diets markedly increased BWG ($p < 0.01$), improved FCE ($p < 0.05$) but had no effect on FI. No additional improvement in BWG and FCE were found by supplementation of enzymes. Our data agreed with those of González-Alvarado et al. (2007), who found that a minimal amount of fiber in the diet increased chick performance. However, Hetland and Svihus (2001) included 4% oat hulls in the diets found an increased in FI but not BWG. Differences in diet composition would exert different physical properties of the fiber (Hartini et al., 2003) which eventually influenced the utilization of nutrients in posthatch chicks (Noy and Sklan, 2002). The lack effect of phytase addition on growth performance supported the previous finding that the higher or the sufficient the dietary P level, the poorer the response to phytase (Bedford et al., 2016). The inclusion of 4% rice hulls increased the relative weight of jejunum ($p < 0.05$), and addition of enzymes reduced the jejunum weight similar to the control diet. The increased in small intestinal weight in diets rich in cellulose was reported due to the thickening of the muscular wall of small intestine (Jamroz et al., 1992). The mechanism where enzymes reduced the weight of jejunum was unknown.

Conclusion

The inclusion of 40 g/kg rice hulls in broiler starter diets based on corn-soybean diets increased growth performance. The mechanism was suggested through improving nutrient utilization. Supplementation of phytase or phytase and cellulase in the RH diets did not affect growth performance but decreased relative weight of jejunum. The mechanism where enzymes supplementation reduced the jejunum weight was unknown. Cellulase supplementation did not increase efficacy of phytase on growth performance.

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The effect of restricted feeding to reproductive performance on sexual maturity of quail (*Coturnix coturnix japonica*)

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Abstract

Reproductive performance of quail hens (*Coturnix coturnix japonica*) at sexual maturity was evaluated following two feeding restriction programs (100, 90 and 80% of ad libitum; and metabolizable energy (ME): 2800 kcal/kg and 2700 kcal/kg) between 2 to 5 weeks of age with five replicates of 10 chicks per replicate. Body weight and feed conversion were measured during feed restriction. After experimental feeding treatment, age at first egg, BW, egg weight, reproductive organ and morphology ovary on sexual maturity were evaluated of one hens quail per treatment. The results of experiment indicate that the restricted feeding was consequently significant ($P < 0.01$) to delay sexual maturity and influence the development of reproductive organ of sexual maturity. However, it did not show significant influence ($P > 0.05$) on the weight of first-laid egg.

Keywords : restricted feeding, reproductive performance, sexual maturity, quail

Introduction

Japanese quail is bred for eggs and meat production. However it is well known that both protein and energy in poultry ration are considered the most expensive items in the cost of a complete feed, where energy alone contributes to about 70% of the total cost of poultry diets (Skinner *et al.*, 1992). Furthermore, both dietary energy and protein represent approximately 85% of total feed cost (Gunawardana *et al.*, 2008). Hence, it is to be expected that many programs will be made to reduce their use in the rations without lowering performance. Many of these restriction programs involve quantitative feed and energy feeding regimes.

Only a little or limited information was reported to deal with the use of qualitative restricted feeding as a nutritional approach to reduce cost of feeds or problems associated with egg production in Japanese quail hens. Although, some studies have determined the effects of qualitative and quantitative feed restriction on growth performance of broilers reproductive performance, ovary morphology and laying traits (Anderson, 2010; Jang *et al.*, 2009). Ovarian sensitivity to overfeeding is primarily on sexual maturity. During reproductive development, the amount of LYF (Large yellow follicle) is very sensitive to sexual maturity time and body weight. Therefore, the experiment was aimed to study the effect of feed restriction on reproductive performance in sexual maturity of Japanese quail.

Methodology

The experiment was conducted on 300 of Japanese quail hens at 2 weeks of age. Birds were housed with natural ventilation of 5x 3m² with laying cages of (40x20x15cm²) at a density of 10 quail per cage. Hens were equally allotted to 2 dietary regimes, basic on Metabolize energy (ME) R1= 2800 kcal/kg; R2 = 2700 kcal/kg and quantitative restricted

feeding; P0 = 100% of adlibitum; P1 = 90% of adlibitum and P2 = 80% of adlibitum (N= 300). Each group (n= 50) has five replicates containing 10 birds each.

All birds were reared under similar managerial and hygienic conditions. They obtained standar protein of quail breeder ration (24%) and water adlibitum during the experiment. Water was provided via automatic nipple drinkers. All birds were fed according to treatment diets from 14 d to 42 d of age and maintained until the first laid egg seen. Body weight and total feed intake data were determined on 14, 28, 35 and 42 d of age. Quails were individually weighed and mortality was recorded as occurred. Body weight at the sexual maturity, age at the first egg, first-egg weight, morphology ovary were studied by analysis of variance, including the effects of restricted feeding and EM content of feed. When the *F*-test was significant, least squares mean being compared.

Results and Discussion

The effect of restricted feeding and EM of ration on reproductive performance of quail are presented in Table 1. Restricted feeding and nesting on EM ration shows significant to delay of sexual maturity age ($p < 0.01$). Sexual maturity of quail can be postponed up to 3.62 days at feeding rate of 90%, and 4.62 days at feeding rate of 80%. Restricted feeding shows a significant effect on the first quail egg weight ($p < 0.01$). The highest mean egg weight was produced by quail group with 90% adlibitum followed by quail group which got 80% and lowest egg weight was produced by quail group with feeding ad-libitum. The length and weight of ovaries and ovaries during treatment generally increases with increasing animal life. The data of morphology ovary at sexual maturity indicates that the highest LYF amount is at the feeding level of adlibitum and significantly different ($P < 0.01$). The results of restricted feeding shows that feeding on a limited basis decreases the amount of LYF as Robinson (1995) indicated that the excess of feed consumption during the growth of reproductive organs will result in the formation of LYF, in large quantities it increases the number of fail-to-form eggs. At quail of optimum amount of LYF based on the research result is four to five. Restricted feeding also had a significant effect on the small number of follicles (SYF), but with no noticeable effect on the number of medium follicles (MYF). The amount of SYF is the most prevalent at the feeding rate of 90% ad-libitum and the lowest in the ad-libitum treatment.

Table 1. The average of age, body weight, fisrt egg weight, and the developmental of reproductive organs on sexual maturity with restricted feeding

EM ration (kcal/kg)	Restricted Feeding (% <i>Ad-libitum</i>)	Age of Sexual maturity (day)	Body Weight at SM (gram)	Egg Weight first (gram)	Ovary weight (g)	Oviduct weight (g)	Oviduct Length (cm)
2800	100	44.00±1.79 ^a	181.67±8.85	9.94±1.18 ^b	5.65±3.00 ^a	5.66±0.93 ^a	22.50±4.01 ^a
	90	46.67±1.00 ^b	174.33±8.62	8.29±1.17 ^a	7.10±0.99 ^b	7.51±1.03 ^c	28.10±1.15 ^b
	80	53.00±4.98 ^c	167.00±14.57	9.37±0.67 ^b	5.22±1.88 ^a	5.62±1.61 ^a	26.00±6.76 ^b
2700	100	42.67±2.30 ^a	187.67±15.13	8.96±1.64 ^a	5.14±1.92 ^a	6.62±1.06 ^b	27.40±3.87 ^b
	90	50.67±1.92 ^c	180.67±12.32	8.28±1.41 ^a	7.16±0.76 ^b	6.78±0.31 ^b	28.80±2.62 ^b
	80	55.33±3.03 ^d	171.00±10.60	9.00±0.60 ^b	4.89±1.60 ^a	4.25±3.18 ^a	28.20±5.81 ^b

a,b,c,d,e : means within same column with different superscripts ($P < 0.05$) are significantly different

Table 2. Average Number of Follicles in onset of sexual maturity with Restricted Feeding

Number of follicle		Treatment					
		2800 Kcal/kg			2700 Kcal/kg		
		100%	90%	80%	100%	90%	80%
Large Yellow Follicle (LYF)		3.00±1.0a	3.00±1.0a	2.67±0.4 b	3.33±0.7a	3.00±0.0a	2.33±0.5b
Medium Yellow Follicle (MYF)		3.33±0.84a	3.33±1.30a	2.67±0.4 5b	2.00±0.55b	2.00±0.89b	2.33±0.89b
Small Yellow Follicle (SYF)		16.33±7.73a	21.67±11.46b	16.00±6. 4a	23.67±12.30b	31.33±8.85c	20.00±3.65 b

a,b,c,d,e : means within same column with different superscripts ($P < 0.05$) are significantly different

LFY = yolk diameter > 10 mm, MYF = yolk diam

Conclusion

Restricted feeding has a significant effect to delay sex maturity. Restricted feeding at the 90% of ad-libitum and EM ration 2800 kcal/kg provide the best results for quail feed management during growth.

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Behaviour of imported brahman cross cows maintained by smallholder farmers

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Abstract

To increase cattle population in Indonesia, government import Brahman Cross (BX) cows from Australia to be kept by smallholder farmers. The failure of similar previous programs related to management done by farmers which was not match with characteristics of Brahman Cross. This study was done to explore the behaviour of BX cows ex-import in the smallholder farming system. Six BX cows who with age ranged from 2 to 4 years, kept in a colony housing with cut and carry feeding system were observed during 24 hours for 7 days for their behaviours (frequency of urination, defecation, drinking, eating and rumination and duration of eating, sitting and rumination). We compared the results with the results from locally adaptive cattle in similar production systems. The results showed that Brahman Cross cows had frequency of eating, drinking, rumination, urination, defecation and sitting were 6.6 ± 1.18 ; 1.07 ± 0.41 ; 16.9 ± 1.15 ; 6.14 ± 0.51 and 8.02 ± 1.73 times respectively. While duration of eating, sitting and rumination were 32.0 ± 0.28 ; 79.0 ± 0.1 and 31.0 ± 0.03 minutes / day, respectively. Brahman Cross cows eat, drink and ruminate less compared to Bali and Ongole cattle in colony housing with cut and carry feeding system. The feed consumption of the BX cow was 4.76 kg dry matter (DM) / head/day and the body condition score of the cows were 2.5 ± 0.55 .

Keywords: behaviour, Brahman cross cows, smallholder farming system

Introduction

Indonesia is an emerging economy, where high population growth and economic progress are major driving forces for the rising demand for animal source foods. The average meat consumption is 2.36 kg/capita per year or 593.516.62 ton (BPS, 2014) and is expected to increase to 4.0 kg/capita per year or 1.045.097.84 ton by 2024. The human population is expected to increase from the current 241 million to 289 million by 2024 (Agus *et al.*, 2014). The national production of beef cattle can not fulfil the demand. As a result, there is always a gap between the supply and demand. To satisfy the demand for meat, the government has been importing meat as well as live feeder and slaughter stock, a few breeding animals and semen.

This condition also drives the government to import productive female Brahman Cross (BX) cattle from Australia to be placed on smallholder farming systems. The objective of the program is to increase cattle population. However, the former similar programs have been failed in smallholder farming systems, due to circumstances in terms of poor management practices and behaviour expression of Brahman Cross which might be different in the new conditions. This study was done to explore the behaviour of BX cows ex-import in the smallholder farming system.

Methodology

Six BX cows with age ranged 2 – 4 years, kept in a colony house were used in this study. Digital watch was used to determine the time and thermo hygrometer to measure the temperature and humidity. We observed the behaviour (frequency of eating, drinking, rumination, urination, defecation and sitting) of BX cows in 24 hours for seven days continuously. The *body condition score* (BCS) of the cows and feed consumption were also measured.

Results and Discussion

Management practice by smallholder farmers

The BX cows were imported from the Northern Territory in Australia and being kept in a colony housing with space of 50 m² / head. The cows had been kept for 6 month when the study was done. The feeding system was cut and carry with the frequency of feeding was 4 times per day. The type of offered feed was native forages which contained 12.99% dry matter (DM), 85.16% organic matter (OM), 25.58% crude fibre (CF), 6.84% crude fat and 19.83% crude protein (CP). The total DM intake per day for a cow was 4.76 kg. The average of BCS of the cows was 2.5 ± 0.55 . The BX were originally kept in natural free range grass system in Australia with the space for one cattle is about 150 m² (Gleeson et.al., 2012). The system allows cattle to graze freely in open ranged grassland and the type of the grasses are different with ones in Indonesia. The average body weight and BCS of imported cows from Northern Territory of Australia are 338 kg and 3, respectively (Gleeson et.al., 2012). The change of management practices can result in signs of stress of the cattle that include the decrease of their performance (Broucek et.al., 2017).

The behaviour activities of BX cows

Movements and behaviour measurements of animals are difficult record accurately. Some alternative methods had been applied, for instance using mechanical devices or video camera, but this even may not warrant high precision (Vega et.al., 2010). Moreover, in a remote place as in this study area, the use of high tech methods might be costly and demanding high efforts. In this study two people were assigned to record the time and frequency of behaviour activities of BX cows in 24 hours. Table 1. presents the behaviour activities of cows from this study and other studies.

When compared to other study on Bali and Ongole cattle under similar production system, BX cows eat, sit and ruminate much less than Bali and Ongole cattle. The frequency and duration of eating and ruminating are influenced by type and amount of feed offered to the animals. Brahman cross cows were imported from a place with different environment, resources and management practices. Behaviour of animals is an adaptation process to the environment (Yamin et.al., 2013).

Table 1. Behavioural activities of cows in 24 hours

Behavioural activity	BX	Bali ¹	Ongole ²
Frequency of eating (times)	6.6 ± 1.18	10.82 ± 1.08	5.89 ± 0.2
Frequency of drinking (times)	1.07 ± 0.41	4.36 ± 0.71	1.23 ± 0.16
Frequency of rumination (times)	16.9 ± 1.15	n.a*	14.03 ± 0.33
Frequency of urination (times)	6.69 ± 0.86	5.39 ± 2.70	n.a*
Frequency of defecation (times)	6.14 ± 0.51	5.25 ± 0.85	6.00 ± 0.39
Duration of eating (minutes)	32.0 ± 0.28	483.6 ± 54.6	262.8 ± 26.4
Duration of sitting (minutes)	79.0 ± 0.10	621.6 ± 86.4	621.6 ± 86.4
Duration of rumination (minutes)	31.0 ± 0.03	400.8 ± 52.2	145.8 ± 33.6

¹The study on Bali cattle in a colony housing with cut and carry system (Sasongko, 2017)

²The study on Ongole cattle in a colony housing with cut and carry system (Sefrianingtyas, 2015)

*n.a non available

Conclusions

The observed Brahman Cross cows eat, drink and ruminate less compared to Bali and Ongole cows in colony housing with cut and carry feeding system. The further study should be conducted to investigate the cause this less ruminate activity related on DM intake and digestibility.

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Comparison of performance, incidence of foot pad dermatitis, and gut microflora of broiler chickens raised on floor pens and in cages in a tropical environment

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Abstract

This study was conducted to determine the effects of cage and floor pen rearing systems on growth performance, incidence of footpad dermatitis (FPD), and cecal *E. coli* population in broiler chickens in a tropical environment. A total of 200 day-old male broiler chicks (Cobb 500) were equally allocated to either battery cages with wire floors (CG) or floor pens with wood shavings as litter (FP) from day 1 to 42. The body weight and feed intake of CG broilers were significantly lower than those on floor pens. However, the CG broilers had significantly better feed conversion ratios than their FP counterparts. The incidence of FPD and cecal *E.coli* population were higher in FP birds than those of the CG group which suggest poorer welfare in the former.

Keywords: rearing system, broiler chickens, growth performance, foot pad dermatitis and gut microflora

Introduction

Floor pens and battery cages are common rearing systems for commercial broiler chicken production worldwide. Each system is associated with some drawbacks which may influence productivity, health, or welfare of broilers (Wang et al., 2015). Questions have frequently been raised about the welfare of cage-reared chickens (Duncan, 2001). Overcrowding, movement of restriction and the lack of exercise are welfare concerns that are associated with cage rearing system. However, separating broilers from their feces reduced the occurrence of diseases (Al-Bahouh et al., 2012) and stands as a welfare benefit (Duncan, 2001). Earlier work comparing broilers raised in cages and floor pens were conducted under temperate conditions. In a hot tropical environment, chickens tend to drink more to alleviate heat stress. Consequently, more water will be excreted through droppings, which in turn will result in wet litter problem. Wet litter may increase obnoxious odor coming from ammonia and bacterial action in the droppings and this may increase susceptibility to respiratory diseases, contact dermatitis, and leg weakness (de Jong et al., 2014). Thus, this study was conducted to compare the growth performance, cecal *E. coli* population, and incidence of footpad dermatitis in broiler chickens reared in cages and floor pens in a tropical environment.

Methodology

A total of 200 day-old male broiler chicks (Cobb 500) were obtained from a commercial hatchery. Upon arrival (day 1), the chicks were equally assigned to either cages (CG) (10 replicates) with wire floors or floor pens (FP) (10 replicates) in a conventional, open-sided house. The floor space allowed for both CG and FP birds was 0.1 m² per bird. Birds were fed

commercial broiler chicken diets. Birds were raised in naturally ventilated houses and the minimum and maximum temperatures during the experimental period were 24°C and 35°C, respectively. The relative humidity ranged from 75 to 90%. On day 42, growth performance, incidence of FPD (Nagaraj et al., 2007), and cecal *E. coli* population were determined. Mortality rate was recorded daily. The population of cecal *E. coli* was determined according to a quantitative real-time PCR method as previously described (Rezaei et al., 2015). Data were analyzed using ANOVA of SAS software (SAS Institute, Inc.). No statistical analyses can be applied successfully to assess the effect of rearing system on the incidence of FPD because none of the CG birds showed FPD lesions.

Results and Discussion

The FP chickens consumed more feed and had greater body weights than the CG group on day 42 (Table 1). Improvements in feed intake and weight gain of caged birds in comparison to those on floor pens have also been reported by Fouad et al. (2008). Venäläinen et al. (2006) suggested that the lower feed intake in caged broilers could be associated with increased incidence of leg weakness which may restrict feeding activity (Venäläinen et al., 2006). In the present study, although we did not quantify, there was no apparent differences in the incidence of leg weakness between FP and CG birds. We showed better feed conversion ratios (FCR) on day 42 in CG birds than those of FP. The superior FCR among the CG birds could be attributed to the noted lower total number of cecal *E. coli* when compared to their FP counterparts. The close relationship between gut microbiota and feed efficiency in chickens has been well documented (Stanley et al., 2012). *E. coli* is a major pathogen that is detrimental to the gut health of chickens. Schulze Kersting (1996) suggested that the higher cecal *E. coli* counts of broilers on floor pens could be associated with the higher prevalence of FPD which may serve as a gateway to the bacteria. FPD is a serious economic and welfare problem in broiler production (Berg, 2004). In the present study, the mean FPD lesion scores of the broilers reared in floor pens was 1.00 while none of the CG broilers were affected. The FPD lesions in broilers may be caused by a close contact with wet, sticky and compact litter, and high ammonia concentration (Nagaraj et al., 2007). Rearing system had negligible effect on mortality rate.

Table 1. Mean (\pm SEM) body weights (BW), feed intake (F), feed conversion ratios (FCR), mortality rates, footpad dermatitis (FPD) scores, and cecal *E. coli* populations in broiler chickens as affected by rearing system at 42 days of age

Item	Variable					
	BW (g/bird)	FI (g/bird)	FCR (feed/gain)	Mortality (%)	FPD	<i>E. coli</i> (log ₁₀ cfu/g)
Floor pens	2476 \pm 38	4649 \pm 59	1.88 \pm 0.02	4.50 \pm 0.14	1.00 \pm 0.18	4.81 \pm 0.12
Cages	2349 \pm 23	4277 \pm 53	1.82 \pm 0.02	5.00 \pm 0.17	0.00 \pm 0.00	3.94 \pm 0.06
<i>P</i> -value	0.0094	0.0032	0.0352	>0.05	*NA	<0.0001

*NA = not applicable

Conclusion

The results of this study provide evidence that under the hot and humid tropical environment, broilers in cages had lower feed intake and body weights but better FCR than those on floor pens. The rearing of broilers in cages reduced incidence of FPD and cecal *E. coli* population which can be considered as an improvement in the welfare of the broilers.

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The effect of daylight transportation through body weight loss and physiology response between sheep and lambs

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Abstract

The study was conducted to examine the effect of daylight transportation through body weight (BW) loss and sheep physiology thin tailed sheep (S) 10 – 11 months and lambs (L) 3 – 4 months. Twelve male sheep raised in Boja that were divided into 2-groups that were 6 S with average BW 23.66 ± 2.07 kg and 6 L with average BW 14.69 ± 1.45 kg. They were transported ± 8 hours from 11.00 AM – 19.00 PM on the road around ± 169 Km. Before and after daylight transportation BW-urine-feces were measured to find out BW loss. Heart-respiratory-rectal temperature were measured every 2h to examine the physiology response of sheep and lambs during transportation. Collected data was analysed by using pair T test and nested design.. Urine-feces-BW loss result showed L were higher (9.49 / 2.04, 1.91, 5.54%) than S (5.97 / 1.18, 1.23, 3.57%). During transportation, heart rate of S decreased 10 times/minute and L decreased 12 times/minute. Respiratory rate of S increased 38 times/minute and L increased 25 times/minute. Temperature rectal of S decreased 0.40°C and L decreased 0.10°C . This study demonstrated that lambs got daylight transportation effect higher than sheep and it was expressed by BW loss and sheep physiology response.

Keywords : body weight loss, sheep, daylight transportation, lambs, sheep physiology

Introduction

Transportation is usually use to mobilize animal from farm to the market and slaughtered house. The purpose of transportation is to keep effectivity, time efficiency, energy and cost also to keep sheep in the good condition. Transportation activity has a low awareness to the environmental and the animals, in the other hand transportation circumstances give an effect to the physiology response of animals. Bad transportation circumstances could give negative towards animals such as stress and body weight loss (Haryati et al., 2015).

The high demand of animals requires farmers to have stocks of animals to be transported neither daylight nor night. The most transportation occurs in daylight time because its easy to load the animals into the car. In Indonesia, transported animals is thin tailed sheep and adjusted by the market demand. Usually, sheep were transported to the slaughtered house however the lambs transported to another farm for feedlot. However, the daylight circumstances condition tend to be hot and cause a disruption of animal physiology response. Previous research showed that increasing of sheep heart rate (HR) 60 beats/minute (bpm) (Grandin, 2014), 22 breaths/minute (bpm) of respiratory rate (RR) (Darussalam et al., 2015) and 0.74°C of rectal temperature (RT) (Knowles et al., 1995) were the effects of transportation.

Stress condition of sheep during transportation can be indicated by the failure of homeostatic process (Moberg dan Mench, 2000) and identified by body physiology response (Grandin, 2014) and also give an effect on the body weight loss (Zhong et al., 2014). Homeostatic process in animal is to keep the body balance that expressed with heat loss through perspiration, respiration, urination and defecation (Haryati et al., 2014).. Zhong et al., (2014)

reported that was easier for lambs to encounter oxidation stress than sheep during transportation and 8h transportation gave different effect to the body weight loss of sheep and lambs in which sheep higher 9.04% than lambs 7.18%. Therefore, it is necessary to examine the daylight transportation effects through body weight loss and sheep physiology between sheep and lambs.

The aim of this study is to examine the effect of daylight transportation through body weight loss and physiology response thin tailed sheep and lambs. The benefit of this study is to examine the effect of daylight transportation through body weight loss and physiology response thin tailed sheep as a consideration during daylight transportation

Methodology

A total of 12 thin tailed sheep (6 S with 10 – 11 months and 6 L with 3 – 4 months; 23.66 ± 2.07 and 14.69 ± 1.45 kg of average BW) were used in this experiment. The first 11 d S and L physiology were collected as a normal standard of body physiology that consist of HR, RR, RT, Rh and environmental temperature were measured and recorded every 7, 12, 18 and 22h. (Table 1). On d 12 of experiment, S and L were transported for ± 8 hours from 11.00 AM – 19.00 PM. They were picked up by a car on the road around ± 169 Km. Before transportation, S and L had in similar treatment and they were fitted with harness equipped with containers to collect urine and feces. S and L were individually housed in wood cages with head to head position above the car and using tarpaulin as a roof. The S and L position in the car were randomized according to the ages. Drinking patterns during transportation were given equally ± 400 ml. Sheep and environmental physiology were collected every 2h. The BW were measured before and after transportation occurred. Analyses data were performed using pair T test and nested design. The statistic model was as follows : $Y_{ijk} = \mu + \alpha_i + \beta_{j(i)} + \varepsilon_{(ij)k}$.

Results and Discussion

The result showed that comparison between before and after transportation data was significantly different, except the HR of S (Table 1). The daylight transportation gave some effects on S and L BW loss. Based on the data, BW was significantly different by daylight transportation. In the other hand, HR, RR and RT were not influenced. The effect of age in daylight transportation showed that BW and HR were not significantly different. However RR and RT were significantly different by the effect of age. The average BW S after transportation decreased from 23.66 ± 2.07 kg to 22.24 ± 1.68 kg and those of L also decreased from 14.69 ± 1.45 kg to 13.30 ± 1.42 kg. L BW loss was 9.49% that consist of 2.04% urine, 1.91% feces and 5.54% BW loss. However, the S BW loss was lower than L. S BW loss was 5.97% that consist of 1.18% urine, 1.23% feces and 3.57% BW loss. During transportation, HR of S decreased 10 times/minute and L decreased 12 times/minute. RR of S increased 38 times/minute and L increased 25 times/minute. TR of S decreased 0.40°C and L decreased 0.10°C .

Table 1. Weight and Body Physiology Comparison Between Sheep and Lambs Before and After Transportation

Parameter	S (n=6)		Lamb (n=6)		p-value		Level of Sig.	
	Before	After	Before	After	S	L	S	L
BW (kg)	23.66±2.07	22.24±1.68	14.69±1.45	13.30±1.42	0.001	0.000	*	*
HR	95±6.77	85±14.44	103±11.77	91±5.87	0.232	0.043	NS	*
RR	42±6.13	80±18.57	43±8.05	68±10.04	0.008	0.001	*	*
RT	39.2±0.15	38.8±0.25	39.1±0.19	39.0±0.24	0.001	0.043	*	*

BW, body weight. HR, heart rate. RR, respiratory rate. RT, rectal temperature. NS, non-significant. *, Significant. Before, data before transportation. After, data during (HR, RR, and RT) and after (BW) transportation. S, Sheep. L, Lambs.

Table 2. Weight and body physiology comparison between before and after transportation in sheep and lambs

Parameters	Age	T1 Before	T2 After	Mean
Body weight (kg)	Sheep	23.66±2.07 ^a	22.24±1.68 ^b	22.95 ± 1.00 ^x
	Lamb	14.69±1.45 ^a	13.30±1.42 ^b	14.00 ± 0.98 ^x
Heart rate (beats/minute)	Sheep	95±6.77 ^a	85±14.44 ^a	90 ± 7.07 ^x
	Lamb	103±11.77 ^a	91±5.87 ^a	97 ± 8.49 ^x
Respiratory rate (breaths/minute)	Sheep	42±6.13 ^a	80±18.57 ^a	61 ± 26.87 ^x
	Lamb	43±8.05 ^a	68±10.04 ^a	56 ± 17.68 ^y
Rectal Temperature (°C)	Sheep	39.2±0.15 ^a	38.8±0.25 ^a	39.1 ± 0.14 ^x
	Lamb	39.1±0.19 ^a	39.0±0.24 ^a	39.1 ± 0.07 ^y

^{ab}, different superscript in the columns mean significant different (P<0.05). ^{xy}, different superscript in the cells mean significant different (P<0.05)

Daylight transportation circumstances tend to have high temperature and humidity that cause a stress effect to the sheep. Aberle et al. (2001) reported that high temperature and relative humidity make sheep uncomfortable with the circumstances and make sheep stress. Beside environment circumstances, the age of sheep also affected different level of sheep stress. It was easier for lambs got stress during transportation than sheep (Zhong et al., 2014). Sheep were regulated stress by increasing of respiratory rate, while lambs could not be able to maximize the respiratory rate due to the immature respiratory organs. Lambs were more susceptible to the stress condition because of the imperfect lung and organ function (Grant et al., 2001). In spite of imperfect organ, lambs overcome stress daylight transportation effect by excreted gut contents. The decreasing of body weight during transportation could be attributed to the loss of gut contents and would be excreted through the defecation and urination (Kumar et al., 2003).

Conclusion

Based on the results, it can be inferred that daylight transportation gave higher effect stress on lambs than sheep and it was expressed body weight loss percentage and body physiology.

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The productivity of Kejobong and Bligon Goats, local Indonesian goats developed by farmers

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Abstract

This paper discusses the productivity of Kejobong and Bligon goats, two Local Indonesian goats breed kept by farmers at traditional management. On farm research was conducted for 12 months at Ngudidadi village, Purbalingga district, (45 farmers) and Purwo Manunggal farmer group, Gunungkidul (30 farmers). Sixty six does, 87 pre-weaning kids at Ngudidadi and 75 does, 95 kids in Purwumanunggal, aged 2.0-2.5 years, were regularly monitored, including services per conception (S/C), gestation period (GP), litter size (LS), birth weight (BW), postpartum mating (PPM), mortality, weaning weight (WW), average daily gain (ADG), kidding intervals, kid crop, doe reproduction index and doe productivity. On laboratory research was done using 9 male Kejobong and 9 male Bligon goats kept for 5 months were investigated their DM, CP and TDN intakes, and ADG. S/C, GP and PPM of Kejobong goats was higher ($P<0.01$) than Bligon goats, while LS did not significantly differ. BW and pre-weaning mortality was the same, while WW and ADG were significantly higher ($P<0.05$) in Kejobong kids rather than Bligon kids. The result from on-laboratory research showed that FI, DMI, CPI, and intake of TDN did not significantly differs between male Kejobong and Bligon goats. ADG, feed conversion and feed cost per-gain was also the same between the two types of local goats. Kejobong goats had a potentially better performances in terms of growth, feed intake and feed efficiency, however, poor management in terms of feed quality offered by the farmers make those potential was un-emerged, low reproductive performance of Kejobong does.

Keywords: Kejobong goat, bligon goats, productivity, reproduction, traditional management,

Introduction

One of the basic properties needed for the development of livestock farming in Indonesia is the variety in animal genetic resources. This variety is formed through domestication and natural and artificial selection within species. One of the species most adapted to local conditions and increasing in numbers worldwide is goats. Also in Indonesia, goats are an important asset owned by small farmers. Goats are well accepted by many people, but goat farming is still done in a traditional way (Budisatria et al., 2008). Its has not changed over the last decades (Budisatria, 2006).

In different areas in Indonesia farmers have developed different types of goats. Two local breeds of goats are Kejobong and Bligon goats. The Kejobong are widely found in Kejobong district of Purbalingga regency, the area were they originated from. They underwent farmers' selection from generation to generation until up to the existence of their homogenous black colour (Astuti et al., 2007). Bligon goat is a name being used by people in Gunungkidul area, an uplands limestones areas in Yogyakarta province. Actually these goats resulted from mating local Kacang does with Etawah Cross males. Their body shape is similar as of Kacang

goats, and their body size is smaller than Etawah Cross (Hardjosubroto, 1994). This paper presents the production performances of Kejobong and Bligon goats, two local goats developed by Indonesian farmers. It is expected that this paper can give the illustration of the potency of goat germ plasm in Indonesia, as initial data for the purpose of protecting, conserving, and making use of goat germ plasm for scientific as well as economics advantages.

Methodology

On farm research

This research was conducted for 12 months at the two farmers groups; Ngudidadi village, Kejobong sub district, Purbalingga district, Central Java and Purwo Manunggal farmer group, Panggang, Gunungkidul. In total all farmers group members (45 farmers in Ngudidadi and 30 farmers at Puromanunggal) were selected and their goats were monitored over a period of 12 months. In total, 56 does; 87 pre-weaning kids at Ngudidadi and 75 does; 95 kids in Purwo Manunggal, aged 2.0-2.5 years, were regularly monitored. The monitoring included services per conception (S/C), gestation period, litter size (LS), birth weight BW), postpartum mating (PPM), mortality, weaning weight (WW), average daily gain (ADG), kidding intervals, kid crop, doe reproduction index and doe productivity. Goats productivity in terms of kid crop, doe reproduction index, and doe productivity over a period of one year were calculated using an equation described by Amir and Knipscheer (1989).

Experimental station research

In total 9 male Kejobong and 9 male Bligon goats of 6-8 months were used, kept for 5 months. Feed used consisted of ground nut leaves and rice bran (70% and 30%). Feed was given 3.5% of body weight on dry matter basis. Feed was offered twice a day, in the morning and afternoon. Feed analyses were done to calculate dry matter (DMI), crude protein and total digestible nutrients (TDN) intakes. For productivity the goat was calculate the ADG, feed conversion, and feed cost per kg gain. The data was analysed using Independent T-test to compare information between Kejobong and Bligon goats.

Results and Discussion

Doe productivity

Services per conception, postpartum mating period, and kidding intervals were higher in Kejobong goats than Bligon goats ($P < 0.01$), whereas litter size did not significantly differ (Table 1). The reproduction parameters resulted in 22% higher kid crop percentage and 21% higher doe reproduction index in Bligon goats ($P < 0.01$) compared to Kejobong goats. Doe productivity did not differ significantly between the two goat breeds. This was due to the higher weaning weights of Kejobong goats. Reproduction efficiency is determined by many different processes and these processes include age at first kidding, kidding interval, birth type and the litter sizes at birth and the weaning rate (Greyling, 2000), they have economic significance since they determine reproductive performance and the productivity of a goat enterprise (Urdaneta et al., 2000). Less litter size and high pre-weaning mortality of Kejobong goats might affect the growth of pre-weaning kids. Waldron et al. (1999) and Marai et al. (2002) found that the productivity of goats born as singles was higher than those of twin and multiple births.

Tabel 1. Productivity of Kejobong and Bligon does kept by farmers

Parameter	Kejobong	Bligon	Sig.
Numbers of does	56	59	
Service per conception (time)	1.7 ± 0.7	1.2 ± 0.4	0.01
Gestation period (month)	5.1 ± 0.1	5.0 ± 0.1	0.01
Litter size (head)	1.6 ± 0.6	1.7 ± 0.5	0.28
Post partum mating (month)	3.8 ± 0.7	3.2 ± 0.4	0.01
Kidding intervals (month)	9.4 ± 0.9	8.4 ± 0.5	0.01
Kid crop (%)	185.0 ± 67.5	226.1 ± 70.6	0.01
Doe reproduction index (head/year)	1.9 ± 0.7	2.3 ± 0.7	0.01
Doe productivity (kg/head/year)	21.4 ± 7.6	20.1 ± 5.9	0.30

Pre-weaning growth

There were no significant differences in BW and pre-weaning mortality between Kejobong and Bligon goats, however, WW and ADG were significantly higher ($P < 0.05$) in Kejobong kids than in Bligon kids. Sex did not have a significant effect on the BB, WW and ADG both in Kejobong and Bligon goats Table 2. Male Kejobong goats had 31% higher in ADG compared to male Bligon kids, while ADG of female Kejobong kids was 1.6 times higher than those of female Bligon kids.

Tabel 2. Average of birth weight, weaning weight and gain of Kejobong and Bligon kids

Parameter	Kejobong		Bligon	
	Male	Female	Male	Female
Birth weight (kg) ^{ns}	2.2±0.06	2.1±0.06	2.2 ± 0.23	2.1 ± 0.19
Weaning weight (kg)	11.4±0.31 ^a	12.0±0.98 ^a	8.3 ± 1.32 ^b	7.8 ± 1.23 ^b
ADG (g/head/day)	99.5±3.17 ^a	107.0±9.78 ^a	75.7 ± 20.92 ^b	64.5±18.13 ^b

^{a,b}Different superscript at the same rows denote significant differences ($P < 0.05$).

Experimental station research

There was no significant difference between male Kejobong and Bligon goats in FI, DMI, CPI, and intake of TDN. Average daily gain, feed conversion and feed cost per-gain was also the same between the two types of local goats. Average daily gain of male Kejobong tended to be higher than those of male Bligon goats, also the same result was found on the feed conversion and feed cost per gain.

Table 3. Nutrient intakes and growth of male Kejobong and Bligon goats

Parameter	Kejobong	Bligon	Sig.
Feed intakes (g/head/day) ns	2.2±0.05	2.1±0.13	0.39
% DMI ns	3.3±0.46	2.9±0.21	0.34
Nutrient intakes : (g/kg MBW/day)			
Dry matters	70.6±7.24	60.2±4.26	0.64
Crude proteinns	6.7±0.69	5.7±0.41	0.64
Total digestible nutrients ns	34.4±3.53	29.3±2.07	0.64
ADG (g/head/day)ns	41.4±8.10	21.1±9.53	0.20
Feed conversion ratios	14.8±3.27	21.7±1.41	0.28
Feed cost per gain (Rp/kg)ns	31,820±7,032	78,150±4.191	0.28

1 € = Rp 12,300 in 2011.

The feed conversion and feed cost per gain of male Bligon goats almost two times higher than male Kejobong goat, indicating that in Bligon goats, more feed and cost were needed to produce one kg of gain compared to Kejobong goats. Overall, Bligon goats' farmers seem to manage their small ruminants better than Kejobong goats' farmers. Kejobong goats farmers offered cassava leaves as main feed for their goats combined with native grass, while

Bligon goats farmers offered various types of local forages which can be easily found in their surroundings, since most of them are living close to the forest side. This was supported by the experimental station results which showed that Kejobong goats had potentially good performances in terms of growth, feed intake and feed efficiency. With better feed, Kejobong goats had almost two times higher growth than Bligon goats.

Conclusion

Kejobong goats had potentially good performances in terms of growth, feed intake, feed efficiency, and body sizes, however, poor management i.e. poor ability on detecting the heat, less variation and poor quality of feed resulted in the fact that their potential could not be exploited.

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Carcass characteristic of Bali bull on different ages

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Abstract

The purpose of this research was to know the carcass characteristic. The materials used in this research were 115 heads of Bali bull. Bali bulls were divided based on ages PI₂ (1.5-2 years) and PI₄ (2.5-3 years). Bali bulls were taken from farmers on Bali Island and slaughtered at commercial slaughter house. The methods used in study were case studies. Data were taken randomly and location choosen by purposive sampling. The variable observed were body weight, carcass weight, dressing percentage, percentage of meat, bone, fat, meat bone ratio and saleable meat yield. Data was analyzed by *unpaired t-test*. The result of this study shown that the ages give a highly significant difference effect ($P < 0.01$) on dressing percentage, fat percentage and saleable meat yield. The dressing percentage were PI₂ 53.39% and PI₄ 56.12 %, while the fat percentage were PI₂ 4.04% and PI₄ 4.43%. The percentage of bone were 17.54% and PI₄ 17.59%, while the percentage of meat PI₂ 70.82% and PI₄ 71.31%, the percentage of meat bone ratio were PI₂ 4.05: 1 and PI₄ 4.06 were not significant. The percentage of fat were PI₂ 4.04% and PI₄ 4.23% and saleable meat yield $76,91 \pm 0,85$ and 76.66 ± 0.47 were significant ($P < 0.05$). the conclusion from the study were the production of carcass based on carcass age charicteristic give an effect on dressing percentage, fat percentage and saleable meat yield, but does not affected the bone and meat percentage or MBR.

Keywords : carcass characteristic, age, bali bull

Introduction

The Bali cattle is one of the indogenous local cattle were potential for carcass production. The weight and proportion of different tissue (fat, muscle and bone) in the carcass distribution have significant economic value (Lambe et al, 2010). The value of carcass is determined by 3 factors: 1) weight, 2) evaluation of intramuscular fat and 3) physiological maturity (Lawrence et at, 2008). Carcass percentage is very important trait in the feedlot and is influenced by age, sex, castration, carcass weight, meat yield, meat and carcass quality (McKlerrnan, 2007). The carcass quality is influenced by balance of the composition of bone, meat and fat. It was reported that decreasing the percentage of bone and muscle resulted in increased in fat percentage (Aberle et al., 2001). Changes in the proportions of bone, muscle and fat are parallel with the order of growth: first bone, then muscle and last fat. It was reported that decreasing the percentage of bone and muscle resulted in increased in fat percentage (Aberle et al., 2001).

Methodology

The methods that used in study were case studies. Data were taken randomly and the location choosen by purposive sampling. One hundred fifteen of Bali bull were divided based on ages PI₂ (18-24 months) and PI₄ (24-36 months). Carcass was obtained by cutting the head, the front legs, and the hind legs at a site between *os occipitale* and *os atlas*, between between

carpus and *metacarpus*, and between *tarsus* and *metatarsus*, respectively, two oxtails were joined together into carcass (INS, 2008). The carcass was evaluated for its hot carcass weight (HCW), dressing percentage, carcass composition (bone, meat and fat percentage), meat: bone ratio (MBR) and saleable meat yield (SMY). The three components were separately weighed as the carcass components. The data were subjected to analysis of average and unpaired t-test Unequal Variances.

Saleable meat yield (SMY) (Purchas, 2006)

$$SMY = \frac{(100 - \% \text{ fat})MBR}{MBR + 1}.$$

Results and Discussion

Hot carcass weight and dressing percentage are important indicators in evaluating beef cattle fattening. Those indicators for Bali bull as affected by different of age in this study presented in Table 1. Carcass is basically composed of edible part (meat) and non-edible one (bone and fat). Hence, proportion of meat, bone, fat, especially meat: bone ratio and Saleable meat yield (SMY) are as important measures for carcass. Good carcass must have higher meat/bone ratio. In terms of carcass composition, meat: bone ratio is an indicator of muscularity (McIntyre, 2004). Dressing percentage of Bali bull in this study was 53.39% and 56.12%, respectively. These values are in the range of dressing percentage of cattle reported by McIntyre (2004), which was 45% and 60%, 56.9% for Braford cattle (Orellana et al., 2009) and 52.6% for *Bos indicus* (Nellore cattle) (Maggioni et al., 2010). Variation may occur as a result of the varying degree of thoroughness in the cleaning process of carcass (Maggioni et al., 2010). Carcass meat percentage, bone percentage and meat bone ratio was not significantly different and tended to be relatively constant in age. However, PI₄ showed the highest meat percentage (71.31%). Saleable meat yield (SMY) in age PI₂ dan PI₄ significantly different (P<0.05). This is due to the fat percentage, the value of MBR and the influence of age.

Tabel 1. Data of proportion of meat, bone, fat, meat : bone ratio and saleable meat yield (SMY) of carcass of Bali bull as affected by different age

Weight Parameters	Age		Average
	PI ₂ (N=54)	PI ₄ (N=61)	
Slaughter weight (kg)	342,07±30,96	448,82±32,88	395,45±31,92
Hot carcass weight (kg)	182,62±17,25	251,73±17,86	217,18±17,55
Dressing percentage (%)	53,39 ^a ±1,69	56,12 ^b ±1,66	54,75±1,67
Bone percentage (%)	17,54±0,75	17,59±0,44	17,56±0,03
Meat percentage (%)	70,82±1,60	71,31±1,26	71,06±0,35
Fat percentage (%)	4,04 ^a ±0,24	4,35 ^b ±0,31	4,23±0,28
MBR	4,05±0,23	4,06±0,11	4,05±0,01
SMY (%)	76,91 ^a ±0,85	76,66 ^b ±0,47	76,79±0,18

a.b : value on the same row with different superscript are highly significant (P<0,01) and (P<0.05)

Beef production can be evaluated based on carcass component, the proportions of muscle, fat and bone. Phillip (2010) percentage of bone in carcass ranged from 13-16%, muscle 54-68%, and fat 13-31%. Those values were much influenced by several factors, including genetics. In addition, bone percentage of carcass of *Bos indicus* breeds was reported by Orellana et al. (2009) in Criolo breed 23.9%, Braford breed 20.4 %, Nellore breed 16.6%, Nellore and European crossbreeds 15.2%. Maggioni et al. (2010) found that crossbreeding reduced the percentage of bone and increased the percentage of muscle and fat. McIntyre (2004) reported that meat carcass percentage ranged from 40-70%. As compared to the above reports, data in Table 1 showed that carcass meat percentage of Bali bull as affected by different of age was on high rank PI₂ 70.82 %and PI₄ 71,31%, while bone and fat percentage was on

lower rank for PI₂ 17.54 % dan PI₄ 17,59. Fat percentage PI₂ 4.04 % and PI₄ 4,35% respectively. MBR is influenced by meat weight and bone weight, this indicates the higher the MBR the higher the meat weight. MBR of Bali bull aged PI₂ is 4.05: 1 and the age of PI₄ is 4.06: 1. Saleable meat yield Bali bulls aged PI₂ higher than PI₄ ($P < 0.05$) because increased fat will decrease saleable meat yield and increasing meat bone ratio will increase the saleable meat yield.

Conclusion

The conclusion from the study were the production of carcass based on carcass age characteristic is give an effect on dressing percentage, fat percentage and saleable meat yield, but does not affected the bone and meat percentage or MBR.

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Effect of time of first colostrums feeding on serum immunoglobulin concentration and body weight gain in Friesian Holstein calves

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Abstract

Calves receive a level of passively-acquired immunity through colostrums. This passive immunity provides protection for the new born calf up to 6 months of age which helps them remain healthy and productive through life. The effect of method and time of first colostrums feeding on the concentration of serum immunoglobulin (Ig) and body weight gain was evaluated in Frisian Holstein (FH) calves. Serum samples from 30 newborn Holstein Friesian then cared until weaning (60 days). Serum immunoglobulin (Ig) levels were measured by refraktometry. Method was used in this experiment was Complete Randomized Design (CRD) with 3 treatment and 10 replication, if there were significant influence would tested by Duncan's Multiple Range Test Method (DMRT). The result of this research showed that timing until 60 minute colostrums feeding at calf has no effect ($P>0,05$) on Immunoglobulin G serum concentration and average daily gain (ADG) at weaning (60 days). The timing of colostrums feeding on 41-60 minute give the best result on Immunoglobulin G serum and average daily gain at weaning of calves.

Keywords: calves, IgG, passive immunity, average daily gain

Introduction

Colostrums is essential for calves because they are born without any appreciable immunity. Unlike us, calves can only obtain immunity from colostrums. At birth the calf's small intestine is referred to as "open." This means that nutrients and possibly pathogens can be transferred from the gut to the bloodstream. Therefore, it is essential that calves be born in a clean environment and be fed colostrums as soon as possible after birth. Newborn calves have a very low concentration of serum immunoglobulin at birth and colostrums provides the immunoglobulin (antibodies) necessary for health and growth. With a passive transfer of immunity being the ultimate goal for reducing mortality and morbidity in calves, colostrums conception is crucial. High quality maternal colostrum should be used because it contains specific antibodies and offers the calf the most complete form of nutrition (Mendonsa, 2011)

Merrik's Inc. (2005) reported The National Animal Health Monitoring System (NAHMS) evaluated the degree to which calves in the United States were protected by colostrum immunity and these researchers found that 90% of all immunoglobulin transferred to calves by colostrums, and those calves with serum IgG levels $<10\text{mg/ml}$ experienced mortality rates over twice that of calves with serum IgG levels of $\geq 10\text{ mg/ml}$. The highest levels of antibody are found in the first milk after calving. The efficiency of antibody absorption decreases gradually from birth and it is most important that calves receive colostrums within the first 6 hours of life. Various amounts are available, from 60 g of IgG/dose to 100 g/dose. Erickson (2010) indicates that a minimum of 100 g at birth will provide enough IgG for most calves to attain passive transfer. However, up to 200 g and provides better insurance to protect the calf and the

amount of colostrums provided to calves at birth significantly influence pre pubertal growth rate. An effective colostrums management program has three essential parts. They are (1) quality, (2) quantity, and (3) timing (Moraes et al. 2000). However, colostrums feeding of dairy calves is often insufficient. Amounts and time point of colostrums intake greatly affect metabolic and endocrine traits in neonatal calves raised in conventional farm systems with two daily feedings (Roauprich et al., 2000), and weight gain has also been associated with passive immunity in calves. Nocek et al.(1984) showed that inadequate amounts of colostrums administered to calves resulted in higher mortality rates, more severe diarrhea, and lower weight gain in affected calves. Trotz-Williams et al. (2008) observed higher mortality rates and lower weight gain in calves with low serum IgG concentrations. The objectives of this study were to evaluate the serum immunoglobulin levels by the time first feeding colostrums in newborn calves to relate these weight gain in the weaning

Methodology

Thirty newborn FH female calves with born weight up to 30 kg from The Greenfield Indonesia were used in the study. The calves were removed from their dams right after parturition and housed in individual pens. Calves were divided into three treatment groups each consisting of ten calves. The treatment were : T1: time interval colostrum feeding at 0-20 minute after birth. T2: time interval colostrum feeding at 21-40 minute after birth. T3: time interval colostrum feeding at 41-60 minute after birth. The colostrum were distributed for calves at the same quantity (4L) and protein quality >22% . Weaning was carried out at approximately 2 months of age. Body weight were evaluated at two month of age to determine the average daily gain (ADG).

Results and Discussion

Concentration of IgG at calves is to know the success of passive transfer of immunity. Quigley and Mills (2005) report the success of passive transfer of immunity determine by testing concentration of immunoglobulin G serum at 24 until 48 hours of age, if concentration of immunoglobulin G <10 g/L its mean passive transfer of immunity is fail. At the table 1 showing that the result of immunoglobulin concentration is success. Because it was more than 10 g/L. The result of this study is interval of colostrum feeding not affected ($P>0,05$) with concentration of IgG at serum. Because of colostrum feeding at every treatment is <1 hour. Quigley (2001) reported, colostrum feeding as soon as possible is more efficient to absorb IgG at the colostrum than >2-4 hours after birth.

Table 1. Average of concentration of immunoglobulin g at 48 hours after birth

Interval of colostrum feeding	Average of concentration of IgG (g/L)	Average daily gain (kg/day)
T1 (0-20 minute)	14,366 ± 2,3142	0,628 ± 0,05
T2 (21-40 minute)	14,472± 3,3070	0,618 ± 0,101
T3(41-60 minute)	14,949± 3,8304	0,663 ± 0,13

Table 1 showed that average daily gain of weaning at 30 calves are above the average at weaning of age (2 months). Heinrichs and Jones (2003) reports that the success of feeding can be seen from average daily gain of 0,5-0,7 kg/days for 8 weeks. Interval of colostrum feeding is not affected ($P>0,05$) to average daily gain at weaning. The reason is same. It's caused the colostrum feeding is <1 hour. Georgive (2008) reported that colostrum feeding at first hour is important, not only for transfer maternal antibody and supply of nutrient, but also

for support normal calf growth and maturation of gastrointestinal cell function. Because colostrum contains growth factors. Treatment 3 (41-60 minutes) has the high result of average daily gain than the others ($0,663 \pm 0,13$ kg/day).

Conclusion

In conclusion, timing of first feeding colostrum on calves no significant effect on IgG concentrations at blood serum and average daily gain in Holstein Friesian calves. Feed colostrum as soon as possible, at least within the first 3 hr after birth.

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Characteristics of goat farm based on farmer's profile and goat population in Senduro Village, Lumajang Regency, East Java, Indonesia

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Abstract

Senduro is a village known as the centre of good quality goat, such as dairy goat. Moreover, the area is more famous after the government declared that Senduro Goat as the original race of Indonesia. Nevertheless, the development of the race is still constrained by many factors, for example the lack of information about the characteristics of farms in the village of Senduro. This study was aimed to identify information about the characteristics of Goat Farm based on Farmer Profile and Goat population in Senduro. Materials used for the study were 30 farmers who have goat farms. Methods used were interview and observation. The collected data then analyzed descriptively. Results shows that Farmers has the average age 44.3 ± 9.37 years old. The education level farmer are as follows: (1) Elementary School was 36.67%; (2) Junior High School was 6.67%; (3) Senior High School was 50%; and Vocational Highschool was 6.67%. The farmers had quite much experience with average 13.03 ± 8.98 years. The goat population itself vary with average 12.33 ± 11.87 heads in every farm. In conclusion, the characteristic of the farmer were middle age with intermediate education and quite long experience while the population is vary on middle population each farm.

Keyword: farmer's profile, goat population, senduro

Introduction

There are urgently needed for domestic self sufficiency nowadays, especially on livestock product demand. Indonesian government has been supporting the growth of local livestock production with several regulations such as strategic planning for 2015-2019 clause 14, Number 18 Year 2009 which said that area of origin source of livestock will be based on agroclimate, carrying capacity, social economy, culture, and technology (Anonymous, 2009). Focus on farmer characteristic, it will be very based on their background. The most important background comes on ages, education background, and experience. The other focus is the goat population, which become the indicator of the prosperity of livestock farming in one area.

Based on Dirhamsyah *et al.* (2016) education background become the ultimate factor on family life quality which measured in how long of the person takes formal education. Hartono (2011) said that formal education become fondation of new value of better understanding which lead into prosperous life. From the investigation of Hartono (2011) the education background of dairy farmer are mostly elementary school because of economic reason. Hendrarso (2011) said that the working is the activity which to gain profit or salary at least one hour every week contuniously. Hendrarso (2011) also said that unemployment is the resident which more than 10 years old without occupation or looking for occupation vacancy. based on Sayogyo (1982), villagers are acting based on tradition and customs but it was not logic reasons, which mean their business are based on experience and local customs.

Methodology

Study was performed in Senduro Village from 1 August 2017 to 31 September 2017. Materials used for the study were 30 farmers who have goat farms. Methods used were interview and observation. The collected data then analyzed descriptively. Variables observed are ages, education background, livestock farming experience, and goat population.

Results and Discussion

Based on study, there were several findings based on age, livestock farming experience, and education background. The result can be seen on table 1 and figure 1.

Table 1. Farmers background based on age and livestock experience

Description	Average
Age (year)	44.30±9.38
Experience (year)	13.03±8.99
Goat Ownership (head/farm)	12.33±11.87

Based on table 1, the age average of farmer is 44.30±9.38 which means that mostly farmer are middle age. The middle age become the optimum time in business since the farmer has sufficient money and power to manage goat farm. The skill acquired by acquiring experience, which is commonly 13.03±8.99 years in farming. Goat ownership is moderate 12.33±11.87 head/farm. the condition is relevant with Naamwintome *et al.* (2013) that there is limited youth participation on agriculture business in Sissala-Ghana which suggest there is need of some transfer skill and business in order to improve those sector. More specifically, there are educational background and goat ownership can be analyzed thoroughly. The statistic can be seen in figure 1 and 2.

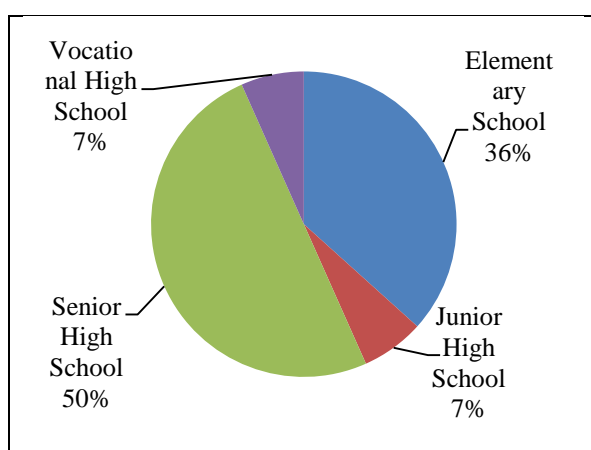


Figure 1. Farmer educational background

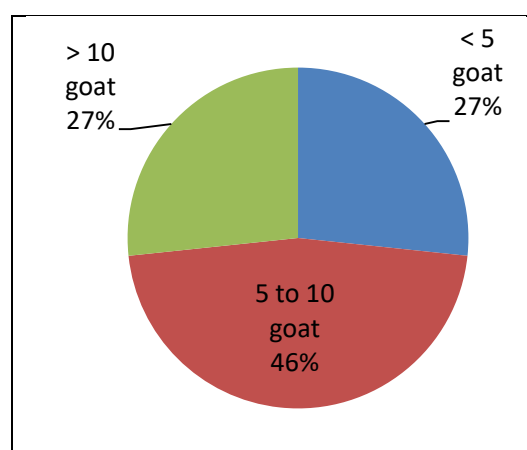


Figure 2. Goat ownership

Based on figure 1, it can be seen that the education level farmer are as follows: (1) Elementary School was 36.67%; (2) Junior High School was 6.67%; (3) Senior High School was 50%; and Vocational High school was 6.67%. The result is different with Hartono [3], which said that the education background of dairy farmer were mostly elementary school. This information provides for the technology transfer need to be simple or intermediate because the ability of the farmer can absorb mostly in basic or middle level.

Based on figure 2, it can be seen that the majority of goat ownership is 5 to 10 goat per head (46%). The ownership of less than 5 or more than 10 goats is the same 27%. It can mean the ownership of goat is in middle scale. Based on Aziz (2010), goat in Asia Region is the largest population with 59.7% of the world population and Indonesia is in 10th rank among them because it can be reared by poor and rural society on that area for profitable reason. The middle scale of goat ownership indicated the growth of small income family to have better status because of goat farming.

Conclusion

In conclusion, the characteristic of the farmer are middle age with intermediate education and quite long experience while the population are varies.

Acknowledgement

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Poultry industry and strategy for sustainable development to 2020

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Abstract

Vietnamese Prime Minister on January 16, 2008 signed Decision No. 10/2008/QĐ-TTg on “Approving the strategy on animal breeding development up to 2020”. This is an extremely important and necessary legal framework, guiding the development of the livestock industry in general and in particular for Poultry farming. Accordingly, "to accelerate the innovation and development of Poultry towards Farming, industrialization and controlled grazing", so that in 2020, the Poultry industry become the sustainable and effectively manufacturing industry. The total flock of chicken will grow at over 5%/year on average, reaching over 300 million chicken, of which chicken raised on an industrial scale will account for around 33%; chicken meat reach 1.760 tons, accounted for 32% total meat industry; the number for egg is 14 billion, the waterfowl output is: 293.000 tons, each person/year is 3,0kg. These are huge targets, requires more than a decade from now through 2020, the livestock sector must implement synchronized and effectively series of important methods in planning and disposing land, organization of production, science and technology, finance and credit, production and quality control of poultry feed, disease prevention, slaughtering, processing, marketing, human resources, especially environmental protection in the Poultry Development process from now to 2020 and subsequent years. Scientific and technological solutions especially “Poultry Breeding”, the primary factor of all in the Poultry farming development of the Animal Breeding development to 2020.

Keyword: poultry, development to 2020, VietNam Livestock Association.

Status of poultry livestock industry in Vietnam and development direction by 2020

Traditional chicken raising method

Since the traditional chicken raising manner is dispersed, outdated, and has low productivity and high disease potential, product quality is not high. Products has not met the need of society: meat yield 4,5-5,4 kg/person/year, egg yield 35 eggs/person/year, the number of products supplied in every year is 350-450 thousand tones of meat and 2.5-3.5 billion eggs. Vietnam has many kinds of domestic chicken which are selected and domesticated such as chickens: Ri, Mia, Ho, H'Mong, Tre and Ac etc; however, self-sufficient breed production and new variety creation with unknown origin have lead to yield reduction, and are likely to eliminate rare breeds.

Industry of slaughter and food processing

Currently, over 95% of products are consumed in form of uncooked, the trading and manual slaughter have been polluting the environment; disease spreading has caused value decrease of chicken raising industry, unsustainable market development, and damages to the poultry industry, especially chicken raising has left serious consequences in both economy and society. Overall, chicken husbandry in the form of an industry in Vietnam is still less development than that of other countries in the region and the world.

Poultry diseases

The cause of epidemic outbreak and relapse is primarily by small and unbridled raising methods; extended purchase, transportation and manual slaughter have lead to serious environmental pollution and the spread of epidemics. With the support of the community and the World Bank, Vietnamese has improved their competitive capacity in husbandry sector and build chicken farming renewal proposal from 2007-2020.

*Shortcomings and achievements of chicken husbandry**Shortcomings*

Chicken farming is mainly implemented in form of spontaneity, dispersed and concentrated raising method, and also utilizes available food. Nearly 70% of rural households rear chickens in which 65% of households apply small scale and breeding dispersed. Household has only 28-30 chickens, farmers mainly to traditional methods, and they have not been trained. This form is likely to be the risk of transmission and spreading pathogens. Industrial and semi-industrial farming methods are goods production form, and become the trend of development. In recent years, this method has many difficulties because it requires large investments, highly technology, land and stable market. Productivity and efficiency are quite low, and could not compete with international products. Native breeds produced by the method of self-production, self-consumption with low yields could not compete with other products on the international market.

Poultry breeds which have been not selected and improved produce; especially 100% of high productivity breeds industry are imported, and its productivity only reaches 85-90%. Due to low productivity and high price of domestic meat and eggs, the competitive capacity of these products on international market is low. These products are only consumed in domestic market, and could not been exported. Status of fresh chicken products sold in the market which have not been controlled in terms of food safety is a major concern of consumers.

Achievements of chicken raising sector

The success of the poultry is chicken breeding research Egg, meat such as Luong Phuong LV1, LV2 and LV3, Sasso and Kahir, Ri and Egypt. Has many model of industrial chicken and backyard colored chicken with the scale from 8,000 to 15,000. Concentrated husbandry has brought economically efficiency and contributed to the development of livestock sector and agricultural economy, GDP growth increase, poverty eradication, job creation, and met the needs of food in the market. Breeding farms, concentrated has condition to implement bio-security, control diseases, and reduce environmental pollution. Since 2005, several provinces have interested in the automatically and semi-automatically concentrated slaughter systems (Poultry Association, 2007).

Challenges of the integration process

Feed price is still high since raw materials have been imported from other countries (corn, soybean, fish meal, premix and oil). The original breed manufacturers are still too small; the high-yield breeds are still depended on foreign markets. For the process of integration into WTO and the impact of the Trans-Pacific Partnership (TPP) on Vietnamese in the coming years (NIEC, 2015), chicken breeding industry have to competition of foreign companies and corporations which have strong finance, high technological, advantages of breeds, cheap raw materials, etc. It really is challenges for the livestock industry in the upcoming integration process in Vietnam.

Development direction and objectives of chicken livestock industry by 2020

Direction

Transfer chicken raising method from traditional, scattered and small scale manner to goods manufacturing, concentrated, industrial and semi-industrial manner on the basis of planning local breeding zones and areas to increase commodities and easily control diseases. Take the breed steps as the breakthrough on local poultry breed selection and multiplication, import purebred chicken species and grandparents generation with high adaptation ability, select and crossbreed chicken matching with Vietnamese climate for activeness in breeding, recover and enhance seed quality management, focus on the disease prevention, rapidly apply technical advances on breed, feed, veterinary, technical improvement, high product quality and reduce product price. Prioritize to the development of industrial and semi-industrial chicken raising manner in the mountainous midland provinces and others with large land bank ensuring bio-security condition. Slaughter and concentrated processing facilities, ensure food safety and meet the demand of domestic market and export.

Objectives

Transfer to concentrated, industrial chicken raising method developed mainly in the Midlands, the region with more land and not yet environmental pollution. Reduce small livestock, specially densely populated. Disease controlled, reduce the damage caused by the disease to a minimum level: ensure environmental hygiene condition and food safety for chicken products. Develop the industry of chicken processing and slaughter in order to increase the product value, provide products with food safety for consumers, and sustainable market. (Association Vietnam Poultry, 2007)

Global trends and forecasting in poultry farming

Production of poultry worldwide is forecasted to increase 1.6 percent in 2014, according to Terry Evans, an analyst at the industry in the first part of the series in 2014 on the global trends of poultry, and expected to pass pork in 2020. Asia accounted for over a third of the world's chicken meat. In both the short and long term, the prospects for the poultry, especially chicken manufacturer, will stabilize. After two difficult years due to high feed costs and disease through 2013, now chicken meat has been growing. After gaining 2.7% increase in 2012, the growth of poultry meat production fell to 1.5% in 2013. The latest estimate shows contrition in 2014 may increase by 1.6%.

In the long term, according to an outlook report by the Organization for Economic Cooperation and Development (OECD) and the Food and Agriculture of the United Nations (FAO), production of poultry meat in 10 years to 2023 will grow by 2.3% per year to about 134.5 million tons that this sector will become the largest sector from 2020 onwards (chart 1). Chicken meat represents about 88 percent of poultry meat production worldwide. FAO estimates that poultry production worldwide will amount to approximately 108.7 million tons in 2014, 95.5 and chicken from 96 million tonnes. From 2000 to 2012, the number of chicken slaughtered worldwide has increased from 40.635 million to 59 861 million, while the average slaughter weight per chick increased from 1,44kg to 1,55kg.

The number of slaughtered poultry in Asia has increased from 14.687 million to 24.723 million in this period. Carcass weight increased from about 1.3 kg operating in this region, but in America it rose from 1,67kg to 1,93kg. The regional analysis of indigenous chicken production globally (chart 2) show that, in 2012 - the latest data of FAO, the US accounted for 43% of the nearly 93 million tons, Asia accounted for 34%, Europe nearly 17%, Africa 5% and Oceania <1%. (Animal Husbandry Association of Viet Nam: AHAV, 2015). The total flock of chicken will grow at over 5%/year on average, reaching over 300 million chicken, of which chicken raised on an industrial scale will account for around 33%; chicken

meat to 1.760 tons, accounted for 32% total meat industry; the number for egg is 14 billion, the waterfowl output is: 293.000 tons, each person/year is 3,0kg.

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The nutritive value of feed for raising sheep in the southern border of Thailand

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Abstract

The purpose of this research was to study the nutritive value of native plant and by-product from household for feeding sheep in Southern Border (Pattani, Yala and Narathiwat) of Thailand. There are 3 located for raising sheep such as plain land, wetlands and Coastal plains. The sample of 60 farmers was randomly selected from Pattani, Yala and Narathiwat provinces. The research tool was a structural questionnaire and collected by interview. The statistic employ were frequency, distribution and percentage. The results revealed that they also used *Leucaena leucocephala* (*Leucaena leucocephala*) (DM=26.51, CP=30.12, NDF=34.12, ADF=24.12%), Chinese violet (*Asystasia gangetica* (L.) T. Anders.) (DM=13.16, CP=19.44, NDF=36.43, ADF=17.06%), Purple guinea (*Megathyrus maximus* (Jacq.) Simon & Jacobs cv. Purple) (DM=22.91, CP=8.82, NDF=66.22, ADF=39.31%) and Napier grass (*Pennisetum purpureum*) (DM=23.00, CP=8.50, NDF=60.01, ADF=33.22%), Furthermore, farmer used peel from fruit and by-product from gain to feed sheep such as banana peel (DM=15.47, CP=4.33, NDF=38.25, ADF=25.71), soybean hull (DM=88.65, CP=13.75, EE= 2.15, CF= 28.59%) and by product from fried starch (DM=53.62, CP=13.00, ash= 3.38%) for raising sheep.

Keywords: nutritive value, feed, sheep

Introduction

In several developing countries, ruminant animals are the major contributors to draught power and are increasingly important as a source of meat, milk, and other livestock products. Livestock contribute 10 to 45% to the gross domestic product (GDP) in the developing world. Indonesia, Myanmar and Thailand have the largest ruminant populations in Southeast Asia. The livestock numbers continue to increase throughout Southeast Asia despite the increasing human population density in these regions. Thailand, which lies between 5°30' and 20°30'N and 98° and 105°E, has approximately 0.6 million dairy cattle, 6.5 million beef cattle and 1.2 million buffalo; about 3.4 million families raise these animals on 184,400 ha of forage (Department of Livestock Development, 2011). In the past decade, sheep production in Thailand did not play an important role in sustaining agricultural production. Live lambs in meat, wool and dual purpose types were imported from US, Africa, and other parts of the world as an alternative agricultural enterprise by the Department of Livestock Development, Thailand. However, sheep was not a popular animal in comparison to other livestock animals, such as cattle, swine and poultry (Supakorn et al., 2013). The number of sheep population in Thailand in 2015 was 49,448 heads. In southern border of Thailand like Pattani, Yala and Narathiwat, There are 19,470 heads or 39.37% of total population sheep in Thailand (Department of Livestock Development, 2015). The Thai Muslims living in the 3 southern border provinces that demand sheep for ritualistic (Pralomkarn, 1999). The common problem

of the farmers is the scarcity of good quality forage and the sometimes very high prices during the dry season. Grass and legume pastures are generally sources of green forage for beef cattle during wet or rainy seasons. During the dry season, grasses and legumes stop growing so the farmers need to find alternative roughages for their animals. Agricultural crop-residues and by-products from agro-industry can be used to feed the ruminant (Wanapat, 1999). Thai farmers owned on average area for such farming is only 0.40-4.80 ha per farm. This amount of area cannot support sufficient feed for ruminant (Tudsri and Swasdiphanich, 1993). Thus, this study was aimed to survey the type and nutritive value of plant and by-products that farmer use to raising sheep in the 3 southern border provinces of Thailand.

Methodology

A total of 60 samples were collected from farm sheep in Pattani, Yala and Narathiwat Province of Thailand. The research tool was a structural questionnaire and collected by interview. The statistic employ were frequency, distribution and percentage. In addition, collecting and sampling of forage and by-products that farmer most raised sheep. The 5 samples of each forages were evaluated the dry matter (DM), crude protein and ash (AOAC, 1990). Neutral detergent fiber (NDF) and acid detergent fiber (ADF) were evaluated using the methods of Goering and Van Soest (1970).

Results and Discussion

The most of farmers raised sheep in 3 southern border provinces of Thailand. They also used *Leucaena leucocephala* (*Leucaena leucocephala*), Chinese violet (*Asystasia gangetica* (L.) T. Anders.), Purple guinea (*Megathyrsus maximus* (Jacq.) Simon & Jacobs cv. Purple and Napier grass (*Pennisetum purpureum*). Moreover, many farmer used peel from fruit and gain to feed sheep such as banana peel, soybean hull and by product from fried starch for raising sheep (Table 1). The studied similar to Supanee *et al.* (2013) who found that goat farming in the Northern Central Region of Thailand. Most commonly used feedstuffs for dairy goat farming were fresh pangola and paragrass, corn stover and husk either fresh or silage as roughage. In addition, other feedstuffs such as dry pangola, rice straw, pressed pineapple cake, and fresh *Leucaena leucocephala* may be fed or allowed free grazing on fresh forages depending on their availability.

Table 1. The chemical composition of forage source for most farmer raising goat

Chemical composition (%)	Dry Matter	Crude Protein	Neutral Detergent Fiber	Acid Detergent Fiber
Plant				
Leucaena leucocephala	26.51	30.12	34.12	24.12
Chinese violet	13.16	19.44	36.43	17.06
Purple guinea	22.91	8.82	66.22	39.31
Napier grass	23.00	8.50	60.01	33.22
Fruit Peel				
Banana peel	15.47	4.33	38.25	25.71

Conclusion

It was concluded in this study that in the 3 southern border provinces of Thailand. Farmer also used *Leucaena leucocephala*, Chinese violet Purple guinea, Simon & Jacobs cv. Purple and Napier grass and supplement with banana peel, soybean hull for raising sheep.

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Feeding microparticle protein-composed diet on protease activity and protein utilization in broiler chickens

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Abstract

Local protein sources, fish meal and soybean meal, were firstly processed to obtain reduced particle size for the improvement of protein utilization and productive efficiency of poultry. Intact protein of the ingredients was changed to be microparticle by ultrasonic bath treatment. However, to minimize the remaining fine portion due to the birds may encounter difficulties consuming fine particles diet, pelleting would be a precise solution when feeding microparticle protein. Experimental animals were 180 birds of one week old broiler, and were given dietary treatments until 5 weeks of age. Dietary treatments were D1: mash diet with intact protein (usually used by the farmers), D2: mash diet with microparticle protein, and D3: pelleted diet with microparticle protein, with completely the same nutrients content. A completely randomized design with 3 treatments and 6 replications (10 birds each) was assigned in the present study. Feed consumption, intestinal protease activity, protein and selected amino acid digestibilities (PAAD), fecal N^T -methylhistidine (N^T -MH) excretion, body weight gain (BWG), and feed conversion ratio (FCR) were the parameters observed. Data were subjected to analysis of variance and continued to Duncan test at 5% probability. Results indicated that protease activity, PAAD, BWG, and FCR significantly increased ($P < 0.05$) due to feeding D3 diet. Arginine and methionine digestibilities were significantly lowest ($P < 0.05$) in birds fed D2, but feed consumption and fecal N^T -MH were the same in all dietary treatments. In conclusion, protease activity increases, and protein utilization and growth improve in broiler fed pelleted microparticle diet.

Keywords: broiler, microparticle protein, pelleted diet, protein utilization, protease activity

Introduction

Poultry production nowadays is mostly focused on feed technology and management especially those related to feed ingredients utilization. Fish meal and soybean meal are the predominant protein sources for poultry. Increasing protein utilization efficiency can be manipulated by producing microparticle protein with ultrasonic bath method (Suthama and Wibawa, 2016). Feeding microparticle protein derived from either fish meal or soybean meal improved protein digestibility and nitrogen retention. The smaller particle size of feed ingredients in general as well as protein in particular (Jambrak et al., 2014, Huang and Stein, 2016) ensuring the possibility of the greater access to digestive enzyme. However, there would be an apprehensive about the particles uniformity and the balance of nutrients consumed when mash form of complete feed is fed. When the birds were provided very fine or very coarse particle they may encounter the difficulties to consume the feed (Pacheco et al., 2013). Therefore, pelleting is considered to be a promising way when feeding complete diet composed of microparticle protein derived from both fish meal and soybean meal.

Methodology

A total of 180 birds of one week-old broiler were divided into 3 groups of treatment, and provided diets of protein intact (D1), mash (D2) and pelleted (D3) forms of microparticle protein until 5 weeks of age. Protein microparticle derived from both fish meal and soybean meal was prepared by ultrasonic bath method (Suthama and Wibawa, 2016). Dietary treatments (Table 1) were formulated with completely the same nutrients content, namely protein, ether extract, Ca, and P was 21.2, 2.8, 4.3, and 1.0%, respectively, and metabolizable energy was 2927 kcal/kg. A completely randomized design was arranged, with 3 treatments and 6 replications of 10 birds each. Data of intestinal protease activity, protein and amino acid digestibilities (PAAD), faecal N^T -methylhistidine (N^T -MH) excretion, feed consumption, body weight gain (BWG), and feed conversion ratio (FCR) were tested using analysis of variance and continued to Duncan test.

Table 1. Composition of experimental diet

Ingredient	Intact protein diet	Microprotein diet	
		Mash	Pellet
	-----	(%)	-----
Yellow corn	48	48	48
Rice bran	14	14	14
Intact soybean meal	27	—	—
Microparticle soybean meal	—	27	27
Fish meal	10	—	—
Microparticle fish meal	—	10	10
CaCO ₃	0.5	0.5	0.5
Premix	0.5	0.5	0.5
Total	100	100	100

Results and Discussion

Intestinal protease activity, PAAD, BWG, and FCR indicated significantly ($P < 0.05$) highest values when pelleted diet composed of microparticle protein was fed (D3) (Table 2). However, all above parameters in D2, except FCR, were the same as those in D3. Arginine and methionine digestibilities in D2 were significantly lowest ($P < 0.05$), but feed consumption and faecal N^T -MH were not affected by the treatment. The result suggested that more advantages can be found in determining nutrient digestibility when pelleted fine particle (microparticle protein) was fed. The increased protease activity which is closely related to the improved PAAD have a positive impact on BWG improvement.

This finding was disagreed with that of Suthama et al. (2014) that no change in protease activity was found in indigenous Kedu chicken given low protein diet. However, when 20% protein diet was fed with added additive had a beneficial effect on intestinal digestive enzyme activity in broiler (Wu et al., 2013). It can be assumed that there was an improved enzyme kinetic and no waste metabolism because the intestinal protease was effectively attached the protein when pelleted diet was fed (D3). The unchanged faecal N^T -MH, an index of body protein degradation, also supported the evidence of precise balance between dietary status and protease activity, and thus, better protein utilization and higher BWG can be achieved. Many previous studies (Dozier et al., 2010, Chewning et al., 2012, Mingbin et al., 2015) have shown that chickens could metabolise a pelleted diet more efficient due to higher dietary density and quicker digestion that ensure the better energy conversion from the feed to facilitate protein

metabolism for growth. Finally, improved feed and nutrients efficiency indicated by similar feed consumption, better growth rate and feed conversion ratio.

Tabel 2. Protein utilization and performance of broiler fed different form of diet

Parameter	Intact protein diet (D1)	Microparticle protein diet	
		Mash (D2)	Pellet (D3)
Protease activity (U/g)	11.86 ^b	12.63 ^{ab}	14.01 ^a
Protein digestibility (%)	82.90 ^b	86.70 ^a	88.10 ^a
Amino acid digestibility (%)			
Arginine	80.00 ^b	76.00 ^c	84.40 ^a
Lysine	82.90 ^b	86.30 ^a	88.60 ^a
Methionine	77.20 ^a	72.50 ^c	78.80 ^a
Fecal N ^t -MH (μmol/d)	11.09	11.42	10.97
Feed consumption (g/bird/d)	109.23	107.17	112.11
Body weight gain (g/bird/d)	54.91 ^b	55.81 ^b	62.57 ^a
Feed conversion ratio	1.99 ^a	1.92 ^a	1.79 ^b

^{a-c}Mean values within collum bearing different superscript differ significantly (P<0.05)

Conclusion

Protease activity, protein and amino acids digestibilities increase, and growth rate improves but no change in feed consumption and faecal N^t-methylhistidine (N^t-MH) in broiler fed pelleted microparticle diet.

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The biological quality of adding fermented cabbage waste as probiotic to pellet calf starter diet on calf performance

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Abstract

Newborn calf has an undeveloped rumen which tends to easily diarrhea caused by *E. coli* infection from the environment resulting in death. Feeding calf starter (CS) diet after birth can promote rumen development. Although giving antibiotic can suppress *E. coli* infection but it has negative effect. *Lactobacillus* sp is a probiotic bacterium (lactic acid bacteria) that can replace antibiotics. Waste cabbage naturally content *Lactobacillus* sp. but fermentation process can further increase the number of *Lactobacillus* sp in the waste cabbage. The aim of this research was to examine the effect of addition fermented waste cabbage (FWC) in calf starter diet on calf performance. Completely randomized design with 3 treatments (CS-L1: CS + 2% FWC, CS-L2: CS +4% FWC, CS-L3: CS +6% FWC) and 5 replications was employed for this study. The materials of CS were corn, soybean meal, rice bran, molasses, mineral mix and materials in FWC were cabbage waste, sugar and salt, 15 FH calf (2-6 weeks old). Feeding calf starter + FWC twice per day after giving milk. Water was given ad libitum. The parameters measured were calf starter intake and daily gain. The data were analyzed with ANOVA and Duncan's test. The result indicated that feeding of FWC had no effect on calf starter intake, but significantly improved ($P < 0.05$) average daily gain with addition of 6% fermented waste cabbage been the best.

Keywords: calf starter, fermented waste cabbage, calf starter intake, body weight gain

Introduction

Optimal physical and metabolic development of reticulo-rumen can be achieved at 2-6 weeks after birth depending on feeding practices (Cunningham, 1992). Feeding calf starter combined with corn fodder and 5% molasses to one week old Friesian Holstein (FH) calves can promote rumen development (Mukodiningsih et al., 2010; 2016). However, proper management of calves after birth until weaning is critical as newly born calves are subjected to diarrhea related diseases resulting in high mortalit of up to 39% (Wudu et al., 2008). Diarrhea is generally caused by *Escherichia coli* from the environment and feeding feed containing antibiotic has been reported to reduce the population *E. coli*, but the above practice can resulted in drug residues in milk or meet product. Probiotic bacteria are beneficial bacteria that can suppress harmful bacteria in the digestive tract. It can be used as alternatively to antibiotics because probiotics are capable of maintaining the balance of intestinal micro flora in the digestive tract (Shitandi et al., 2007), and an increase serum and antibody IgA, IgM and IgG (Panda et al., 2008). The use of probiotic in large quantities does not have a negative effect, because probiotics are friendly and safe materials. *Lactobacillus* sp is a probiotic bacterium (lactic acid bacteria) that can suppress populations of *E. coli*. Cabbage waste is by product of cabbage's outer shells that naturally contains lactic acid bacteria and fermentation process can further increase its number. Inclusion of fermented

cabbage waste in pelleted calf starter as much as 6% produced the best quality of chemical, physical, microbiological pellet compared with 2 and 4% (Mukodiningsih et al, 2017). The aim of this study was to examine the effect of addition of fermented cabbage waste (FCW) in calf starter on calf performance.

Methodology

The treatments of this study were (i) calf starter (CS) pellet plus 2% fermented cabbage waste (FCW), CS-L1; (ii) calf starter pellet plus 4% FCW, CS-L2 and (iii) calf starter pellet plus 6% FCW, CS-L3. The CS was formulated with yellow corn ground, rice bran, soybean meal, mineral mix and molasses (Mukodiningsih et al., 2010) to meet the nutrient requirement of calves with 18% protein and 75% TDN (NRC, 2001). Proximate and starch content were analyzed (AOAC, 1990), and NDF according to Van Soest (1994). The fermented cabbage waste consisted of cabbage leave blended and mixed with 6% salt and 6.4% sucrose (w/w) and fermented for 6 days. The above treatment diets were pelleted with steam conditioned at 75-80°C for about 15 seconds. The diameter of pellet was ~ 6mm, and then dried until final moisture content ~ 13%. The biology quality of the different diet-pellet was parameters observed, it used Frisian Holstein calves with aged 7-14 days and \pm 35 kg-initial body weight. The experiment was done 6 weeks consist preliminary (1 week) and observation (5 weeks) using completely randomize design with 3 treatments and 5 replication. Calves feeding were 40% CS-L and 60% milk (NRC. 2001) given twice a day at 7:00 AM and 3:00 PM. The starter feed (CS-L) was given 30 min after giving milk (Morisse et al., 2000). Clean drinking water was provided ad libitum. Dry matter calf starter intake and body weight gain were determined. All data were analysed using the analysis of variant, and differences were compared using Duncan test (Still and Torrie, 1981).

Results and discussion

Adding FWC in pellet of calf starter gave no significant effect on dry matter intake (DMI), but significant effect on average daily gain (ADG) (Table 1).

Table 1. Feed intake and average daily gain (ADG) of FH Calves

Treatments	Parameters	
	Dry matter intake (g/day)	ADG (kg/day)
CS-L1	103.82	0.71 ^a
CS-L2	117.79	0.60 ^a
CS-L3	109.21	1.03 ^b

*superscript on the same column indicate significant different (P<0.05)

Although not significantly different, the dry matter intakes of calves in the CS-L1, CS-L2 and CS-L3 were within the range daily intake of solid feed for calves from 50 g at 3 weeks to 300 g at 17 weeks (Morisse et al., 2000; NRC, 2001). There was significant difference (P<0.05) in ADG with T3 treatment recorded the highest ADG. It was assumed that, increasingly FWC (6%) in calf starter also increases intake of lactic acid bacteria resulting in healthier calves in T3 compared to those in T1 and T2. The above suggestion was also reflected by the low population of E coli in feces from T3 calves (6.3×10^6 cfu / g) which is below the suggested value of 10^9 cfu / g standard by Boyd and Marr (1980).

Conclusion

The formula calf starter added fermented waste cabbage 6% is the best.

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Dietary inclusion of carrot (*Daucus carota* L) waste meal on performance and egg quality of laying hens after peak egg production

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Abstract

This study was aimed to evaluate the performance and egg quality of laying hens given diet composed of carrot waste meal. Experimental animals were 200 birds of 80 week-old laying hen, with an average body weight was $1.940,56 \pm 16,62$ g. Feed was composed of protein concentrate, yellow corn, rice bran, and carrot waste meal. Research was arranged in a completely randomized design (CRD) with 4 treatments and 5 replications of 10 birds each. Dietary treatments were dietary inclusion levels of carrot waste meal as follows: T0 = none, T1 = 2%, T2 = 3%, and T3 = 4%. Parameters measured were feed consumption, egg production, feed conversion (FCR) and egg characteristics (eggshell thickness, egg yolk color, egg yolk index, and egg yolk weight). Data were analyzed according to analysis of variance and continued to Duncan test at 5% probability level when the treatment effect was significant. The results showed that feed consumption, egg production, and FCR were not affected by feeding carrot waste, although the range was between 1,096 to 1,140 g, 76.67 to 77.88%, and between 2.37 to 2.45, respectively. However, among egg characteristics, only egg yolk color was improved by the treatment (7,35 in T0 vs. 9,40 in T3). Conclusion is that carrot waste meal can be used as diet componen to improve egg yolk color without negative impact on productive performance of laying hens after peak egg production.

Keywords: carrot waste meal, egg quality, laying hen, productive performance

Introduction

Modern laying chickens were able to lay more than 300 eggs per year with effectively productive age was 22 to 72 weeks. However, when the age exceeded 72 weeks (ie.80 weeks old), the growth of ovum slowed down and egg production would be lower than previous period. The increasing age of laying hens can be associated with the decreasing minerals metabolism fate and may lowered bone minerals deposition, especially calcium (Ca) and phophorus (P). Thus, it is greatly possible to exert a negative effect on egg production, and quality either exterior (shell) or interior (yolk and white). Wistedt (2013) reported that shell quality and weight, and bone strength decreased with increasing age in laying hens after peak production. In regard with yolk color, Pelicia et al. (2009) stated that the orange intensity of yolk increased with increasing dietary Ca level, and was also found that diet with 4.5% Ca improved feed conversion and eggshell quality. Dietary inclusion of unconventional feedstuff such as carrot (*Daucus carota* L.) waste seems to provide some advantages due to its rich in vitamin A and β -carotene. Carrots contains large amounts of carotenoid compounds, ranging from 6000 to 54800 pg /100 g (Kotecha et al., 1998), but low Ca content of about 33 mg/100g (Anonymous, 2016). Therefore, feeding carrot waste will beneficial for performance and egg quality in second production cycle of laying hens.

Methodology

Experimental animals were 200 birds of 80-week-old laying hen with average body weight was $2,281 \pm 111,45$ g. Feed was composed of corn, rice bran, protein concentrate, premix and carrot waste with the composition and nutrient content as shown in Table 1. A completely randomized design (CRD) with 4 treatments and 5 replications (10 birds each), was assigned in the present study. Treatments applied were as follows: T0: feed without carrot waste, T1: feed with 2% carrot waste, T2: feed with 3% carrot waste, and T3: feed with 4% carrot waste. Parameters observed were feed consumption, egg production, feed conversion ratio (FCR), eggshell thickness, and yellow egg characteristics (color, index and weight). Data were statistically tested using analysis of variance, and continued to Duncan test ($P < 0.05$).

Table 1. Composition and nutrient content of experimental feed

Ingredient	Dietary treatment			
	T0	T1	T2	T3
	----- (%) -----			
Yellow corn	45.00	45.00	45.00	45.00
Rice bran	22.00	19.00	18.00	17.00
Protein concentrate	32.00	33.00	33.00	33.00
Carrot waste	—	2.00	3.00	4.00
Avimix	1.00	1.00	1.00	1.00
Total	100.00	100.00	100.00	100.00
Nutrient content (%)				
Metabolizable energy(kkal/kg)	3,008.30	3,000.95	2,988.23	2,975.50
Crude protein	17.17	17.22	17.11	17.13
Crude fiber	4.05	4.15	4.14	4.14
Ether extract	5.44	4.53	4.56	4.59
Calcium	4.35	5.38	5.27	5.15
Phosphorus	0.83	0.90	0.92	0.94

Results and Discussion

Dietary inclusion of carrot waste improved significantly ($P < 0.05$) egg yolk color, and level at 4% (T3) indicated the highest value, but there was no effect on other parameters (Tables 2). Performances including feed consumption, egg production and feed conversion ratio were still within the normal range. The results suggested that carrot waste didn't exert a negative impact on the performance of 80-week old laying hens. This agreed with Sikder et al. (1998) that feed consumption and egg production were not affected by feeding dried carrot meal up to 8% during 63-day feeding trial.

Table 2. Feeding effect of carrot waste on performance and egg quality characteristics of laying hen after peak production

Parameter	Treatment			
	T0	T1	T2	T3
Feed consumption (g)	1,140.00	1,096.00	1,120.00	1,126.00
Egg production (%)	77.38	76.68	76.67	77.88
Feed conversion ratio (FCR)	1.77	1.71	1.73	1.70
Eggshell thickness (mm)	0.67	0.69	0.66	0.71
Egg yolk color	7.35 ^c	8.60 ^b	8.95 ^b	9.40 ^a
Egg yolk index	0.42	0.43	0.42	0.41
Egg yolk weight (mg)	19.12	19.08	19.07	18.71

^{a-c} The same letter in the same row indicate significantly difference ($P < 0.05$)

Feeding carrot waste could improved egg yolk color due to the contribution of xanthophyl and/or carotenoid content. The evidence of this phenomenone was supported by the increase in egg yolk color becoming deep-yellow (almost orange) in T3 diet (Figure 1). The previous findings indicated that carotenoid-containing plant sources such as carrot (Hammershøj et al., 2010), paprika (Lokaewmanee et al., 2011), and yellow maize with high β -cryptoxanthin (Tanumihardjo, 2012) increased yolk color and carotenoid content. However, physical egg quality based on eggshell thickness was unchanged because Ca content among diets wasn't far different, ranging from 4.35 to 5.38%, although with carrot waste inclusion (Table 1). It has been reported previously by Pelicia et al. (2009) that diet containing 4.5% Ca in average improved feed conversion and maintained eggshell quality.

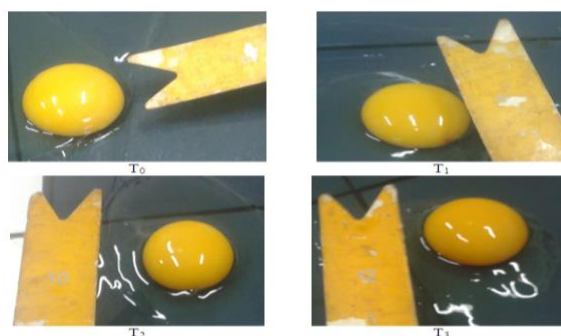


Figure 1. Effect of feeding carrot waste on egg yolk color of 80-week-old laying hen

Conclusion

Dietary unclusion of carrot waste meal untill 4% improves egg yolk color without interference on the productive performance of laying hens after peak egg production.

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Early feed restriction and *ad libitum* methods on broiler performance

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Abstract

The study was conducted to determine if there is a difference in performance broilers of two different strain fed one of three different levels protein with either *ad libitum* or restricted methods. The experiment used a factorial design with 2 strain, 2 feeding methods, 3 diets in different protein levels. 180 broiler chicks were allocated to 12 treatments with 3 replicates of 5 chicks/replicate. The experimental diets were diet with crude protein 20% as control, crude protein 19% and crude protein 18%. The feed consumption, body weight gain, and feed conversion ratio (FCR) were measured weekly. The results show that in both strains weight gain and feed conversion ratio of broiler fed restricted diet and *ad libitum* did not have any significant difference. Feed intake of broilers of both strains fed restricted diet formulated on low level protein diet was significantly higher than feed intake of those fed *ad libitum* formulated on standard protein level diets.

Keywords: *ad libitum*, broiler, restricted, low, protein

Introduction

Genetic improvements of modern broiler chicken now have led to a very fast growth rate. However, this growth rate is accompanied by increased body fat deposition, high mortality and high incidence of metabolic disorder. These situations most commonly occur with broilers that consume feed *ad libitum*. Thus feed restriction has been proposed to reduce these problems. Early feed restriction programs used to reduce abdominal fat and carcass fat in broiler chickens rely on the phenomenon called compensatory growth to produce market body weight similar to control groups. Skip a day deprivation of feed is a technique for restricting early growth and has not been extensively studied in broiler chickens. An oversupply of protein diet may lead to inefficient and uneconomical meat production. Therefore, this study was conducted to investigate the effect of early feed restriction and levels of diet protein on the performance of two commercial broiler strains.

Methodology

The experiment method was used 3 x 2 x 2 factorial arrangement. 180 broiler chicks were allocated to 12 treatments with 3 replicates of 5 chicks/replicate. The research was terminated at 42 days of age. The treatment were 3 protein levels for grower period (20%, 19% and 18%), 2 strain of broiler, and 2 feeding methods (*ad libitum* and restricted). Chicks were exposed to feed restriction from 8-14 day of age, each chick was allowed a daily intake 12 g. Following the restriction period, the chickens were fed *ad libitum*. Experimental diets were mixed one day before experiment. All diets were optimized to the same ME level (12.96 MJ/kg feed), and 23% crude protein in the starter period, 3 protein levels for grower period. The selection and allocation procedure was such that the mean group weights were the same and contained a similar range of body weights; birds with extreme low or high body weight were

discarded as were sick birds. Pen body weight and feed consumption were recorded on weekly basis.

Statistical analysis

Data were subjected to One-Way ANOVA procedures of SAS software for analysis of variance. The significant level was set at $P < 0.05$ by Duncan's multiple range test.

Results and Discussion

The effect of early feed restriction and ad libitum on performance of two different strain of broiler fed different level of protein diet is given in Table 1. Weight gain of broilers of both strains fed restricted or *ad libitum* formulated on low protein diet (diet 3) was significantly lower than weight gain of those fed control diet (diet 1). Numerically, strain B was lower in weight gain than strain A, but statistically, both strain of chickens were exposed to feed restriction were not significantly different in body weight gain from those fed ad libitum. The chickens were able to totally compensate for the weights lost during the restriction program even after extended feeding. Feed intake of strain B birds fed restricted diet was significantly ($P < 0.05$) higher than those given ad libitum diet. Feed intakes of present study agree with Zhan et al., (2007) that the feed restriction increases feed intake. The higher feed intake can be related to the hypertrophy of the gastrointestinal tract that occurs after the restriction period, when the chickens are fed *ad libitum*. Strain A birds were significantly heavier ($P < 0.05$), ate more food and had lower FCR ($P < 0.05$) than strain B. This difference is most likely due to the development characteristics of these two genotype. In both strains feed conversion ratio of chickens fed restricted diet and/or ad libitum diet formulated on low protein diet were not significantly different with those given standard protein level diet. Lee and Leeson (2001) observed that reduction of protein diet by 2% had no negative effect feed conversion ratio compared to chickens fed the control diet, since this level of protein reduction results in amino acid levels being relatively close to current recommendation. However, in this study show that using a low protein diet depressed body weight gain compared with results from the high protein level diet, whereas feed intake was unaffected.

Table 1. Effects of early feed restriction and ad libitum on weight gain, feed intake, and feed conversion ratio of two different strain of broilers during 0 to 42 days of age

	Weight gain				Feed intake				FCR			
	Strain A		Strain B		Strain A		Strain B		Strain A		Strain B	
	Ad lib	Restrict.	Ad lib	Restrict.	Ad lib	Restrict.	Ad lib	Restrict.	Ad lib	Restrict.	Ad lib	Restrict.
Diet 1	1,909 ^a	1,931 ^a	1,790 ^a	1,687 ^a	3,086 ^a	3,262 ^b	3,079 ^a	3,250 ^b	1.62 ^a	1.69 ^b	1.72 ^b	1.92 ^b
Diet 2	1,906 ^a	1,919 ^a	1,701 ^a	1,796 ^a	3,099 ^a	3,308 ^b	3,070 ^a	3,224 ^b	1.63 ^a	1.72 ^b	1.81 ^b	1.80 ^b
Diet 3	1,878 ^b	1,875 ^b	1,578 ^b	1,564 ^b	3,021 ^a	3,100 ^b	2,992 ^a	2,990 ^a	1.60 ^a	1.65 ^b	1.91 ^b	1.91 ^a

Values are means \pm SEM

Means \pm SEM followed by the same superscripts in each parameter are not significantly different at the 5% level

Conclusion

Early feed restriction for short period and subsequent refeeding in broiler chickens is marked by catch up growth which is accompanied by increase in feed intake. Body weight gain was not affected by restricted feeding and refeeding

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Evaluation of *in vitro* digestibility complete feed based on corncob as main feed formulation with different fermentation time

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Abstract

The utilization of micro-organism to improve feed quality has been widely known. The purpose of this study was to evaluate *in vitro* digestibility of complete feed based on corncob as main feed formulation with different fermentation time. This study was designed by using completely randomized design (CRD) consisting of 4 treatments and 4 replications (P0; control, P7; a 7d fermentation, P14 ; a 14d and P21; a 21d fermentation) Parameters measured in this study were *in vitro* dry matter digestibility (IVDMD) and *in vitro* organic matter digestibility (IVOMD). The results of this study indicated that fermentation for 21 days significantly improved ($P < 0,01$) IVDMD and IVOMD about 33,90% and 33,74% respectively compared to control.

Keywords: corncorb, fermentation, complete feed, in vitro digestibility, SBP

Introduction

Corn cob is one of agriculture by products that has a big potency to be used as ruminant feed, but it contained high level of lignin in the form of complex cellulose and hemicellulose resulting in low its digestibility and palatability. Efforts to improve corn cob quality as ruminant feed can be used in different methods such as physics, biology and chemistry or combined methods. One of the methods to improve animal feed is fermentation (Samadi et al., 2015 ; 2016). According to Wina (2005) administration of micro-organism to improve animal feed has been widely studied such as by using probiotics (bacteria, fungi, yeast or combined microorganisms products to produce enzymes. Saus Burger Pakan (SBP) is one of the inoculants in the microorganism cultures containing multi microbes cellulolytic, lactic acids, amylolytic, essential amino acids, vitamin and mineral (Kartolo, 2014). Study conducted by Wulandari et al. (2014^a) cacao pod fermented with SBP reduced *neutral detergent fiber* (NDF) content during a-6 day fermentation with the level of inoculant 0,05%. Even though feeding complete feed based on fermented cacao pod was not significantly influence on sheep performance, DMD, and OMD, but it significantly improved crude fiber digestibility (Wulandari et al., 2014^b).

Fermentation by using substrate from agriculture by products was often not successful in improving feed quality due to low nutrition content for microorganisms. Fermentation of agriculture by products is more effective in the form of complete feed containing based on animal requirement on different stages of physiology. According to Ginting (2009) formulation of feed raw materials to be complete feed effected on improving of nutrition density in feed, and also can be used to improve palatability. Based on aforementioned, this

study needs to be conducted to evaluate *in vitro* digestibility complete feed based on corncob fermented by using SBP with different fermentation time.

Methodology

This experiments was conducted at Nutrition and Feed Technology Laboratory, Animal Husbandry Department, Agricultural Faculty, Syiah Kuala University, Banda Aceh. In vitro analysis was carried out at Nutrition and Dairy Science Laboratory, Nutrition and Feed Technology Department, IPB Bogor.. This study was designed by using completely randomized design (CRD) consisting of 4 treatments and 4 replications (P0; control, P7; a 7d fermentation, P14 ; a 14d fermentation and P21; a 21d fermentation). After fermentation process, each samples were analyzed for a-two stages fermentation according to Tilley dan Terry (1963). First step of fermentation, samples were incubated for 48 h in a buffer solution containing rumen fluid, continued by digestion with pepsin in the solution of for 48 h. Residues were filtered by using Whatman no 41 and dried with the temperature of 60°C for 48 hours. Dried samples were used to determine IVDMD and IVOMD. All data were analyzed by using ANOVA. If there was different between treatments tested by Duncan Multiple Range Test-DMRT (Steel dan Torrie, 1995).

Results and Discussion

The results of study indicated that fermentation time of complete feed based on corncob by using SBP significantly ($P < 0,01$) effected on IVDMD. Figure 1 shows that the value of IVDMD consistently increased by the length of fermentation time with 8,81%, 25,6% and 33,9% at the fermentation time 7, 14, and 21 days respectively.

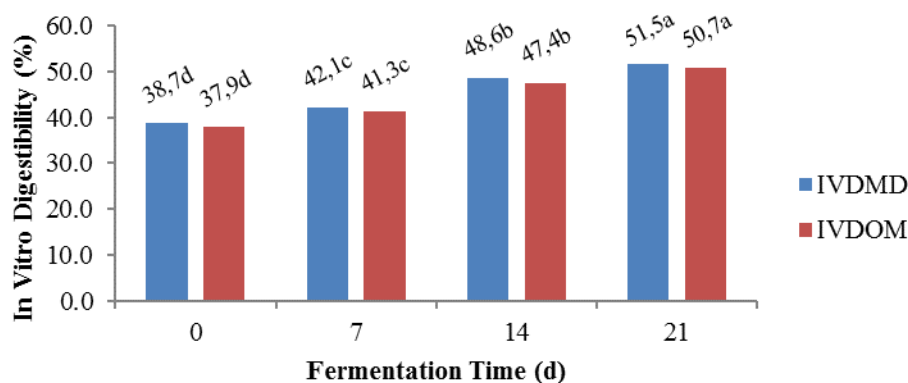


Figure 1. *In vitro* digestibility coefficient of complete feed based on corncob as raw materials formulation at difference time of fermentation

Our results are in accordance with study conducted by Prastyawan et al. (2012) in which at incubation time of 0 or 1 week, there was not significant increase of IVDMD amoniation-fermented corncob, but after 2 and 4 weeks of incubation, there was a significant effect of IVDMD coefficient. It was probably that at the beginning of incubation, the growth of microbes was not optimal and still in adaptation period. Therefore, degradation of crude fiber is still not optimal resulting in low digestion. Prolong incubation time caused increase of microbe activities to grow and ferment the corncobs. Digestibility of dry matter at ruminant animals indicated that high digested nutrition mainly digested by rumen microbes. The higher of IVDMD was the better of feed quality (Osuji et al., 1993).

The duration of complete feed fermentation based on corncob also significantly effected ($P<0,01$) on IVOMD of feed. Coefficient of IVOMD consistently increased with fermentation time. It was the same as IVDMD coefficient with the percentage of 9,03%, 26,0% and 33,74% at the period of fermentation 7, 14, and 21 days respectively. Parakkasi (1999) stated that organic matter digestibility is high correlation with organic matter digestibility. It is caused that part of dry matter is organic matter. Dry matter was able to influence organic matter. Decrease of dry matter digestibility reduced organic matter and on the others.

Conclusion

Fermentation up to 21 days significantly improved ($P<0,01$) IVDMD and IVOMD coefficients of complete feed with corncob as main raw materials.

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The effect of *lempuyang* (*Zingiber zerumbet*) in the organic feed towards nutritive contents of kampong chicken meat

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Abstract

The purpose of this research was to analyze the effect of *lempuyang* (*Zingiber zerumbet*) in the organic feed towards dry matter, ash, protein, crude fiber and fat contents of kampong chicken meat. This research conducted in January – May, 2017. This study used 100 chickens. This chickens was reared for 63 days. This research used experimental methods. The design was used in this study was completely randomized design (CRD) with 4 treatments and 5 replications. The treatment in this study consisted of P0: Organic feed with ginger (0.25%), garlic (0,25%) without *lempuyang* (as control), P1: Organic feed with ginger (0.25%), garlic (0,25%) and *lempuyang* 0.15%, P2: Organic feed with ginger (0.25%), garlic (0,25%) and *lempuyang* 0.30% and P3: Organic feed ginger (0.25%), garlic (0,25%) and *lempuyang* 45%. The variables measured were dry matter, ash, protein, crude fiber and fat contents of chicken meat. The data was analyzed by analysis of variance (ANOVA), when there was a significant effect, further tested by Least Significant Difference (LSD). Based on the research, it can be concluded the effect of of *lempuyang* as a mixture of herbs in the organic feed as much as 0.15-0.45 percent have no significant effect ($p > 0.05$) on the content of dry matter, ash, protein and crude fiber of chicken meat but have significantly affect ($p < 0.05$) on the fat content of chicken meat with the best treatment that can reduce fat content is the addition of *lempuyang* 0.30% and 0.45%.

Keywords: organic food ingredients, chicken, herbs, lempuyang

Introduction

Special feed for kampong chicken is not yet available in the market, so farmers are forced to use factory feed that is not specific to kampong chicken. Factory feed generally contain chemical substances can increase the chemical residue in chickens and harmful to humans. One alternative for the replacement of factory feed is organic feed that do not contain harmful chemicals. Organic feed support the optimal growth of kampong chicken, healthy, safe and not at risk for humans who consume.

However, we need to support the growth of kampong chicken maximally. One of them is by giving organic herbs to improve the productivity and health of chicken. Herbal medicine can increase chicken resistance in the face of disease so as to optimize growth, including improving the quality of chicken meat. Herbs are a local potential that is easily obtainable because many people plant and grow wild in the forest and can be obtained at a cheap price. This will ensure the availability of natural medicine with improving the welfare of the people who are trying to procure herbal medicine. If herbs can be used as an alternative to manufactured medicines, then the level of dependence on drugs derived from foreign investment will be lost. Some of the herbs are ginger, garlic and especially *lempuyang*.

One type of *lempuyang* that is often used is elephant *lempuyang* (*Zingiber zerumbet*). *Lempuyang* elephant (*Zingiber zerumbet*) contains approximately 0.82% volatile oil with supporting components, among others zerumbon, α -pinene, α -cariofilen, camphor, cineol 1.8, α humulen, cariofilen oxides, epoxides and cinamaldehyde humulen (Suhirman et al., 2006). Essential oils stimulates the production of digestive juices that produce pH suitable for digestive enzymes. At the same time, there is an increase in the activity of digestive enzymes and the regulation of microbial activity. (Bintang and Nataamijaya, 2006, Lee et al., 2004, Horosova et al., 2006, Nursal, 2006). It is necessary to conduct research on organic feed with the addition of herbs especially *lempuyang* with the title of “ The Effect of *Lempuyang* (*Zingiber zerumbet*) in the Organic Feed Towards Nutritive Contents of Kampong Chicken Meat”.

The problem statement: is there any effect of *lempuyang* (*Zingiber zerumbet*) in the organic feed towards nutritive contents of kampong chicken meat? and the research purpose: to analyze the effect of *lempuyang* (*Zingiber zerumbet*) in the organic feed towards nutritive contents of kampong chicken meat

Methodology

This research was conducted in Gondang, Tegalgondo Village, Karangploso District, Malang Regency. This research conducted in January – May, 2017. This study used 100 chickens. This chickens was reared for 63 days. In this study, the litter system enclosure cages were utilized. This research used experimental methods. The design was used in this study was completely randomized design (CRD) with 4 treatments and 5 replications. The treatment in this study consisted of P0: Organic feed with ginger (0.25%), garlic (0,25%) without *lempuyang* (as control), P1: Organic feed with ginger (0.25%), garlic (0,25%) and *lempuyang* 0.15%, P2: Organic feed with ginger (0.25%), garlic (0,25%) and *lempuyang* 0.30% and P3: Organic feed ginger (0.25%), garlic (0,25%) and *lempuyang* 45%. The variables measured were dry matter, ash, protein, crude fiber and fat contents of chicken meat. The nutritive contents analyzed by proximate analysis in the Nutrition Laboratory of University of Muhammadiyah Malang. The data was analyzed by analysis of variance (ANOVA), when there was a significant effect, further tested by Least Significant Difference (LSD).

Results and Discussion

The results of the effect of *lempuyang* to the mixture of herbs in the organic feed toward the nutrient contents consisting of the content of dry matter, ash, protein, crude fiber and fat of kampong chicken meat showed varying results as contained in Table 1.

Table 1. Average nutritive contents of chicken meat in each treatment

Treatment	Average Nutrient Contents (%)				
	Dry Matter	Ash	Protein	Crude Fiber	Fat
P0	94.66	5.65	70.99	0.63	15.59 ^a
P1	94.43	5.80	72.44	0.80	14.69 ^{ab}
P2	94.67	5.94	69.91	0.81	13.59 ^c
P3	94.18	5.99	70.63	0.60	14.03 ^{bc}

The calculation showed the addition of *lempuyang* to the mixture of herbs in the organic feed had no significant effect ($p > 0.05$) on the dry matter of kampong chicken meat. This is due to the nutrient content in the feed for each treatment is the same. While the content

of flavonoids and essential oils in *lempuyang* still not effective to give a real effect on the content of dry matter of chicken meat. The rations used in the study have the same dry matter, namely: P0 (87.49%), P1 (87.68%), P2 (87.42%), P3 (87.66%) so produce dry matter digestibility almost the same and deposited in meat with almost the same amount.

The calculation showed the addition of *lempuyang* on the mixture of herbs in the organic feed had no significant effect ($P > 0,05$) to the ash content of kampung chicken meat. This is due to the amount of nutrient content during maintenance is relatively similar, like calcium is about 0.90 percent and phosphorus is about 0.72 percent. However, the average ash content of chicken ranges from 5.65 percent to 5.99 percent which indicates ash content is higher than the other kind chicken. This is in accordance with the opinion of Abubakar et al. (2008) states the ash content of chicken meat in the chest 1.04 percent and thigh 0.98 percent. Based on the calculations, there is an average difference in ash content of 82 percent in chicken that given herbs in the feed compared to ash content in chicken without herbs. This indicates herbs in the feed is able to increase the level of ash.

The calculation showed the addition of *lempuyang* in the mixture of herbs in the organic feed had no significant effect ($P > 0,05$) to the protein content of kampung chicken meat. This is due to the protein levels contained in the diet at each treatment is relatively the same during maintenance as much as 20 percent. The average protein of meat ranged from 69.91 percent to 72.44 percent. The value was higher than the protein content of chicken meat generally. This is in accordance with the opinion of Riyanto (2006) states the protein content of chicken meat for dry weight was 47.21 percent. In addition there was an average difference in protein content levels of 34.8 percent between the protein of chicken meat which contained herbs in feed with crude protein of chicken meat without herbs.

The calculation showed the addition of *lempuyang* in the mixture of herbs in the organic feed had no significant effect ($P > 0,05$) to the crude fiber content of kampung chicken meat. Feed ration has a similarly crude fiber content, resulting in a equal crude fiber digestibility, which is deposited in nearly equal amounts of meat. The essential oil content in *lempuyang* is able to degrade the amount of Salmonella Sp. in the gastrointestinal tract, but is not yet optimal to improve the digestibility of crude fiber so can not able to reduce the deposit of crude fiber in chicken meat. Although *lempuyang* has not been able to give a real effect, the use of herbs (garlic, ginger, and *lempuyang*) can improve the quality of meat. Crude fiber content of chicken obtained an average herbal treatment of 0.70 percent, while the crude fiber content of chicken meat without herbal treatment of 1.30 percent.

The calculation showed the addition of *lempuyang* in the mixture of herbs in the organic feed had significant effect ($p < 0.05$) on the fat content of kampung chicken meat. The results of the least significant difference (LSD) showed the best treatments on P2 and P3 with the addition of *lempuyang* as much as 0.30 percent and 0.45 percent indicating the fat content of kampung chicken was average of 5.53 and 5.91 percent. This may be due to *lempuyang* is functioning in improving the performance of poultry digestive organs in stimulating the bile wall to release bile and stimulate the release of pancreatic sap containing amylase, lipase and protease enzymes. That was useful for improving the digestion of feed ingredients such as carbohydrates, fats and proteins.

The average difference in the fat content of chicken meat with broiler chicken by 4.3 percent. That feed with extra herbs can decrease the fat content in the meat. The average fat content of meat in this study is 5.53 percent to 5.91 percent. The number of fat content in meat is normal. According Purwati (2007), the fat content of chicken meat is average of 10.21 percent, while fat levels lower of broilers. Fat content of kampung chicken meat is normal, because Aberle et al., (2001) states chicken fat content is in the variation ranges from 1.2 to 12 percent.

Conclusion

Based on the results of research, the addition of *lempuyang* as a mixture of herbs in the organic feed as much as 0.15-0.45 percent have no significant effect on the content of dry matter, ash, protein and crude fiber of kampung chicken meat but have significantly affect for the fat content of kampung chicken meat with the best treatment that can reduce fat content is the addition of *lempuyang* 0.30% and 0.45%

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Potential of bioactive compounds *Archidendron jiringa* by product to be natural feed additive for sustainable animal production

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Abstract

This experiment was designed to evaluate of nutritional and bioactive compounds (tannin and saponin) of *Archidendron jiringa* by product. The treatments used two materials (skin and leaves of *A. jiringa*) with 4 replicates. Variables observed were nutritional component (ash, CP, EE, CF, and NFE) and content of bioactive compounds (tannin and saponin). Data were analyzed descriptively by calculated the average of data obtained. *A. jiringa* leaves has high crude protein (18.04%) and crude fiber (27.11%), while the skin only has high crude fiber (27.50%). Tannin content of *A. jiringa* leaves (14.74%) was higher than the skin (7.82%), however the saponin content of skin (56.92%) was higher than the leaves (29.66%). It is concluded that tannin and saponin contained in the *A. jiringa* by product has potential to be an alternative of natural feed additive.

Keywords: *Archidendron jiringa* by product, feed additive, saponin, and tannin

Introduction

Chemical feed additive for animal nutrition has been stop for used, so natural feed additive to be potential solution. Chemical feed additive leaved residue that can be dangerous for animal and human health. Indonesia has big natural source potentially to produce and provide natural feed additive for sustainable animal production. *Archidendron jiringa* is a tropical plant Southeast Asian typical. The Seeds of *A. jiringa* was in Indonesia, Malaysia and Thailand as a food ingredient. In Indonesia *A. jiringa* plant widely grown in the western part, particularly in Bengkulu Province, Sumatra island. According statistic data of horticulture production 2014, Bengkulu Province has the 4th rank *A. jiringa* trees (37.434 trees) with the 2nd rank production (107.99 kg/trees) after East Java Province (Direktorat Jenderal Holtikultura, 2015). During this time the fruit was used as food and medicine *A. Jiringa* contained bioactive compounds (tannin, saponin, flavonoid, alkaloid, glikosida, and steroid). Tannin and saponin in low level can improved quality of rumen microbes and animal productivity. But until now, not to much information about bioactive compounds of *A. Jiringa* by product, especially the skin and leaves. Therefore, objective of this research to evaluate of nutritional component (ash, CP, EE, CF, and NFE) and bioactive compounds (tannin and saponin) of *A. jiringa* by product according quantitative analysis. The main target of this research is to use *A. jiringa* by product for an alternative of natural feed additive for sustainable animal productivity.

Methodology

Preparing materials

Archidendron Jiringa by product was dried for 5-6 hours under the sun until got stable weigh. After that, the materials were milled with grinding mechine to got materials into a fine powder form.

Nutritional component analysis

Nutritional component (ash, CP, EE, CF, and NFE) of *A. Jiringa* by product was analyzed according (AOAC, 2005).

Dry matter content: The dry matter content was estimated by drying triplicates 10g weight of the sample at 105°C for 24 hours and then reweighing after cooling in a desiccator.

Ash Content/Mineral Content: Two grams of the dried sample was weighed in to a dry porcelain dish and then heated in a muffle furnace at 600 °C for 6 hours. It was cooled in desiccators and weighed.

Crude protein content: One gram of each sample was weighed into a digestion flask. Ten grammes of potassium sulphate, 0.7g mercuric oxide and 20 cm³ concentrated sulphuric acid were added to the sample in the digestion flask. The flask was heated gently at an inclined angle until frothing subsides and boiled until the solution becomes clear. This was continued for half an hour. When the frothing is in excess, a small amount of paraffin wax was added. On cooling, 90 ml of distilled water was added and mixed. A small piece of pumice was added to prevent bumping. 80 ml of 2M sodium hydroxide solution was added while tilting the flask so that two layers are formed. The condenser unit was rapidly connected, heated and the distilled ammonia collected in 50 ml boric acid / methyl red indicator. Fifty milliliters of the distillate was collected and titrated against 0.1 M hydrochloric acid solution.

Ether extract content: The ether extract content was determined using Soxhlet extraction method. Two grams of the sample was weighed into the Soxhlet extraction thimble. Cotton wool was used as plug to avoid loss of sample. The thimble was transferred into the Soxhlet extractor and sufficient petroleum ether was added until the latter is siphoned into the receiving flask which has been weighed. More ether was poured to cover the thimble completely and flask placed with the extractor on the electric heating mantle. The reflux condenser was heated gently for 3 hours, switched off and allowed to cool for 10 minutes. Recovered solvent was transferred into an air oven (100 °C) for 1 hour and then cooled in desiccators and weighed. The amount of oil produced was calculated and expressed as percentage of original sample.

Crude fiber content: Crude fiber content were analysed by using Ankom Fiber Analyzer (A200). 1 g dry sample was put into filter bag (Ankom F-57) and seal 0.5 cm distance from the opening. Bags placed in to the analyzer. Firstly 1900-2000 mL of 1.25 % sulfuric acid solution added and then heated 45 min. After heated 45 min samples cleaned out from the acid then 5 min twice washed with distilled water. After this step NaOH solution added and heated 45 min cleaned out, twice washed with distilled water. After the cleaning step filter bags remove from the machine, wringed out and filter bags placed in to the beaker and filled with acetone. 3-5 min later wringed out and after a while samples left in the oven for about 2-4 h at 105 °C. The material was transferred into crucible and muffle oven at 550°C for 2 h. After it, crucibles were placed in muffle oven for 12 h at 550°C, cooled in the desiccator and recorded the crucible weight.

Nitrogen free extract content: Nitrogen free extract was calculated by subtracting the total protein, lipid, moisture and ash content from 100 thus: % carbohydrate (100% – (% ash+ % CP+ % EE+ % CF)

Bioactive Compounds Analysis

The bioactive compounds of *A. Jiringa* by product were determined tannin and saponin content.

Tannin (Van-Burden et al., 1981): Determination of total tannins 500 mg of the sample was weighed into a 50 ml plastic bottle. 50 ml of distilled water was added and shaken for 1 h in a mechanical shaker. This was filtered into a 50 ml volumetric flask and made up to the mark. Then 5 ml of the filtered was pipetted out into a test tube and mixed with 2 ml of 0.1 M FeCl₃ in 0.1 N HCl and 0.008 M. The absorbance was measured at 120 nm within 10 min.

Saponin (Obdoni and Ochuko, 2001): Determination of total saponins The samples were ground and 20 g of each were put into a conical flask and 100 cm³ of 20% aqueous ethanol were added. The samples were heated over a hot water bath for 4 h with continuous stirring at about 55°C. The mixture was filtered and the residue re-extracted with another 200 ml 20% ethanol. The combined extracts were reduced to 40 ml over water bath at about 90°C. The concentrate was transferred into a 250 ml separatory funnel and 20 ml of diethyl ether was added and shaken vigorously. The aqueous layer was recovered while the ether layer was discarded. The purification process was repeated. 60 ml of n-butanol was added. The combined n-butanol extracts were washed twice with 10 ml of 5% aqueous sodium chloride. The remaining solution was heated in a water bath. After evaporation the samples were dried in the oven to a constant weight; the saponin content was calculated.

Data analysis

The treatments used two materials (skin and leaves of *A. jiringa*) with 4 replicates. Variables observed were nutritional component (ash, CP, EE, CF, and NFE) and content of bioactive compounds (tannin and saponin). Data were analyzed descriptively by calculated the average of data obtained.

Results and discussion

The nutritional component of *A. jiringa* by product (leaves and skin) is as shown in Table 1. The percentage of *A. jiringa* leaves has high crude protein content (18.04%) and crude fiber content (27.11%), while the skin only has high crude fiber (27.50%). The crude protein presentage of *A. jiringa* leaves (18.04%) approximate with *Gliricidia sepium* (20.40%) and *Leucaena leucocephala* (24.60%) that were as protein sources for feed animal (Foroughbakch et al., 2012). The crude fiber presentage of *A. jiringa* leaves (27.11%) and skin (27.50%) approximate with alfalfa hay (28.60%) (Vafeiadakis, 2013) and Shorgum-sundangrass Timothy leaves on late vegetative (27.00%) (Schroeder, 2004) that were fiber soures for ruminant. This result showed that *A. jiringa* by Product can be use crude protein and crude fiber sources

Table 1. Average nutritional component of *A. jiringa* by Product (100% DM)

No	Materials	DM (%)	Ash (%)	EE (%)	CP (%)	CF (%)	NFE (%)
1	Leaves of <i>A. jiringa</i>	93.88	2.98	2.91	18.04	27.11	49.97
2	Skin of <i>A. jiringa</i>	92.36	3.39	0.65	8.83	27.50	59.62

Proksimat Analysis PAU, IPB, Bogor (2016)

Based on the analyzed result of bioactive compounds (Table 2) reported that tannin content of *A. jiringa* leaves (14.74%) was higher than the skin (7.82%), however the saponin content of skin (56.92%) was higher than the leaves (29.66%). Tannin was bioactive compound that has pottential to modified rumen microbe population. Tannin in optimal level can reduced

methane production and increased VFA production. Tan et al., (2011) reported that added condensed tannin (*in vitro*) from *Leucaena leucocephala* extract at level 0, 10, 15, 20, 25 and 30 mg in 500 mg basal diet showed that the higher treatments decreased methane production, VFA total, population of protozoa and methanogenic bacteria. The methane production was significantly decreased ($P<0.01$) from 5.5-10.0 mg/g BK compared with the control (14.9 mg/g BK). The total VFA production was significantly decreased ($P<0.01$) from 47.6-46.7 mmol/L compared with control (57.3 mmol/L). Total protozoa significantly decreased ($P<0.01$) from $4.11-4.73 \times 10^7$ compared with a control of 5.83×10^7 . The total methanogen bacteria significantly decreased ($P<0.01$) from $3.24-1.65 \times 10^7$ compared with the control (3.25×10^7). Puchala et al., 2005 reported that addition of condensed tannins to goats (*in vivo*) can decreased methane production. This research have compared feeds with different presentage of condensed tannins. The addition of tannin from plant of *Sericea lespedeza* (17.7% condensed tannin) significantly reduced ($P<0.001$) methane production (10.7 g/kg digestibility of DM) and increased ($P<0.01$) dry matter digestibility (0.71 kg/day) compared with the addition of mixtures of *Digitaria ischaemum* and *Festuca arundinacea* plants (0.5% condensed tannins), where methane production (21.5 g/kg digestibility DM) and dry matter digestibility (0.51 kg/day). Jayanegara (2008), reported that hydrolysable tannin decreased ruminant methane production on *in vitro* and reduced methane linearly with tannin activity ($r^2=0.99$ and $P<0.001$). There were two mechanism tannin reduced methane (1) directly, tannin can blocked growing and activiting of methanogens and (2) indirectly to blocked fiber digestibility that can reduced H production (Tavendale et al., 2005). Hess et al. (2003) reported tannin can reduced protozoa populations and methane emissions (research used PCR).

Table 2. Average of tannin and saponin content *A. jiringa*

No	Materials	Tanin (%)	Saponin (%)
1	Leaves of <i>A. jiringa</i>	14.74	29.66
2	Skin of <i>A. jiringa</i>	7.82	56.92

BPPT, Ciawi Bogor (2016)

Saponin seems to be particularly related to their antiprotozoal effects. Saponin made complex form with sterols in protozoa cell membrane, so that can inhibited protozoa activity and lysis their cell (Cheeke, 1999). Pen et al. (2006) reported that added *Yucca schidigera* extract (80-100 g/kg saponin) with level 2, 4 and 6 ml/l rumen fluid reduced ($P<0,001$) methane emission until 32-42%, protozoa population until 56%, and increased 54% propionate concentration. The same reported by Hu et al. (2005) that added saponin extract from tea seed (60% saponin) with 0,2 and 0,4 mg/ml rumen fluid reduced ($P<0,01$) protozoa population and methane production. Suharti et al. (2011) reported that the addition of *Sapindus rarak* extract (81.5% saponin) at levels 0.6 and 0.8 mg/ml of rumen fluid significantly decreased ($P<0.05$) protozoa populations. Level of 0.8 mg/ml significantly increased ($P<0.05$) population *P. ruminicola* (amylolytic bacteria) and propionate percentage and decreased acetate and propionate ratio. According to Hart et al. (2008) reported that addition of saponin more effective when the feed composition in high percentage of grain compared with high fiber, because high of grain can increased propionate production. Saponin able to lysed protozoa cell by formed complex bonds with the sterols present on the surface of the protozoa membrane thus disrupted the development of protozoa which causes rupture membrane, lysed cells and dead the protozoa. Protozoa were more susceptible with saponins than bacteria because wall of protozoa cell membrane contained cholesterol whereas bacteria form peptide bonds with glycerol (peptidoglycan). Bacteria don't have sterols that can bind the saponin, so bacteria have the ability to metabolize these antiprotozoa factors from saponin with eliminated the carbohydrate chain of saponins (Cheeke, 2000). According to Patra and Saxena

(2010), the effectiveness of saponins can be reduced, because saponins capable to degraded by rumen microbes. For effectiveness saponin function in rumen, there were need protective against to protected saponin from rumen microbial degradation.

Conclusion

Archidendron jiringa by Product has potential to be sources of crude protein, crude fiber and tanin-saponin to be an alternative of natural feed additive for sustainable animal production

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Using durian seed (*Durio zibethimus*) to support living kampung chicken/KC in Indonesia villages

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Abstract

Indonesia need a lot of protein source such as chicken. While like now most of people consume broiler, local chicken/KC can be used to cover. Different from broiler, KC can use low quality feed ingredient such as durian seed (*Durio zibethimus*). This research objective was to investigate corn substituted by durian seed for KC feed and was conducted at the Laboratory of Animal Biology, Faculty of Agriculture, University of Sumatra Utara from May to July 2015. Experimental design was completely randomized design (CRD) with 4 treatments and 5 replications, where the treatments were level durian seed on feed, i.e. P1 (5%), P2 (15%), P3 (25%). Parameters were feed consumption, body weight gain, feed conversion ratio (FCR), meat quality, i.e. protein content, cooking loss and tenderness. The results showed that Durian seed (*Durio zibethimus*) could substituted corn up to 25% and Durian seed (*Durio zibethimus*) influenced protein content, cooking loss and tenderness of KC meat.

Keywords: durian seed, KC, corn, body weight gain, tenderness

Introduction

One of the ingredients that is always used in chicken feed formula is corn so the need for corn is enormous. Local chicken in Indonesia which also is called Kampung Chicken/KC use less of corn. Only the maintenance of KC is took longer as for non-intensively about 6 months while intensively about 3 months to achieve a weight of about 1.2 kg. 60% of Indonesia people live in villages and they could rise KC intensively and use waste which enormous in villages for chicken feed. According to Ginting (2017) unused enormous agriculture waste for example durian seed is just triggered green house gases (GHG) and harm the environment. Utilization of durian seed is still limited. Only a third of the durian fruit are edible, referring to Indonesia Central Bureau of Statistic (2015), there were up to 12,000 tonnes of durian seeds that were generally dumped. In terms of nutritional content, durian seeds contain such as crude protein, coarse fat, coarse fiber, energy and minerals that were almost close to the nutrient content in corn flour. The purpose of this study was to examine the utilization of durian seed as a corn substitute on performances of KC.

Methodology

This study was conducted with parameters were consisted of feed consumption, body weight gain, feed conversion ratio (FCR), meat quality, i.e. protein content, cooking loss and tenderness. KC DOC as much as 80 head of age 2 weeks, concentrated feed consisting of durian seed, corn flour, rice bran, fish meal, soybean meal, coconut cake, palm kernel cake (BIS), oil and mineral flour.

Results and Discussion

Table 1. Consumption, Body Weight Gain, FCR, Protein Meat Content, Cooking Loss of 12 week old Kampung Chicken/KC

Treatments	Consumption g/head/week	Body weight gain g/head/week	FCR	Protein meat content	Cooking loss	Tender ness
P1	316.22	89.16	3.72	35.19	1.149	1.92
P2	305.02	96.56	3.24	35.12	1.072	2.28
P3	301.81	90.70	3.46	35.11	0.972	2.45

Consumption

The average consumption of KC during the study was not significantly different between treatments. Consumption on P1, P2 and P3 was influenced by the content of gelatin in durian seeds that bind large amounts of water to give a sense of satiety. Voigt (1984) stated that gelatin contains free fat (low), so it can reduced the energy consumed by the body without any negative effects. Gelatin was a material capable of expanding in water and forming a water-binding gel Cornelia et al. (2015).

Body weight gain

The average rate of chicken body weight during the study was not significantly different between treatments (P1, P2, P3). This showed that by giving of corn flour and durian grain flour did not give different effect to the increase of chicken body weight. The nutrient content of corn flour and durian seed meal could be digested and used by animal well, both for basic living and for production. Average growth of chicken body weight of all treatments was equal to 13.16 grams/head/day. This figure was higher than the standard of KC increased body weight gain on maintenance which was 9.8 grams/head/day.

FCR

The conversion of chicken ration during the study was not significantly different between treatments (P1, P2, P3). The highest ration conversion was in P1 of 3.72 whereas the lowest ration conversion was in P3 of 3.46. The lower the conversion value of the ration indicated the more effective the use of the ration as animal feed.

Protein meat content

Protein was one of meat nutrition component. Protein was contained complete and balanced essential amino acids. Table 1 show that there were no differences in meat protein content. As the nutritional levels in the rations were almost the same, hence no difference in protein content of meat in each treatment meant that the effect of durian seeds was as good as corn flour for protein source.

Cooking loss

The highest rate of cooking loss in KC meat was in P1 treatment, which was 1.149 while the lowest cooking loss of KC meat in P3 treatment which was 0.972. Cooking loss average in this study was 1.064%. According to Lawrie (1995), the normal cooking loss value was 1.5 to 54.5%. The result of the diversity analysis showed that the use of durian seed meal as the substitution of corn flour in the ration gave no significant effect ($P > 0.05$) on the cooking loss of KC meat. This study have also done organoleptic test but not yet published which found that chicken meat feels tender and juicy.

KC meat tenderness

The highest score of KC tenderness was in P3 treatment which was 2.45 kg/cm² while the lowest score of KC meat tenderness was in P1 which was 1.92 kg / cm². The tenderness and texture of the meat was the most important determinant of meat quality. The tenderness might vary among species and between muscles, as well as on the same muscle Warriss (2000). More over, Warriss (2000) mentioned that the factors affecting meat tenderness were meat pH (high pH will lead to increased tenderness) and fat in the product, energy levels in rations and shrinkage. In addition, meat tenderness decreased with the increase of KC age. KC which were tested in this study were 12 weeks old with meat pH 5.82. According to Glamoclija et al. (2015) normal meat pH was in the range of 5.2-7 and the best quality pH was in the range of 5.7-6. Meaning that the pH of meat in this study indicated the quality of the meat produced from the treatments were in very good quality. In this study, the yield of meat tenderness was about 1.96-2.49 kg/cm² which was in the range of soft meat. This was in accordance with Pearson and Young (1971) who stated that the value of meat tenderness was divided into three parts, ie a soft range with a scale of 0-3 kg/g, moderately 3-6 kg/g and hard with a scale of > 6 -11 kg/g.

Conclusion

Utilization of durian seed (*Durio zibethimus*) up to 25% could substituted corn on KC feed. In addition, utilization of durian seed (*Durio zibethimus*) caused a good effect on protein content, cooking loss and tenderness of KC meat.

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Effect of inclusion of condensed tannin with differing molecular weight in diet rich in sunflower oil on ruminal pH and kinetics of gas production *in vitro*

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Abstract

Condensed tannins (CTs) play a very important role in ruminant feeding. However, their chemical structure and molecular weight have effect on their biology property and efficacy to rumen manipulation. This study was aimed to investigate the effect of CTs with differing molecular weight on *in vitro* gas production. Inclusion of high molecular weight CTs (HMW-CT) at 2 and 4 mg/100 mg DM substrate had significantly decreased *in vitro* gas production rate constant (*c*) ($P < 0.05$) and total gas production ($P < 0.001$).

Keywords: secondary compound, ruminant, ruminal pH, ruminal fermentation

Introduction

Plant secondary compounds including condensed tannins (CTs) plays a very important role in ruminant feeding especially in tropical areas. Although condensed tannins that distributed widely in feed stuff have been identified as a major factor in limiting the nutritive value and feeding quality (Osborne and McNeill, 2001), in ruminant nutrition, CTs have been recognized to be beneficial use such as increase rumen-undegradable protein, bloat prevention (Waghorn, 2008), anthelmintic property (Athanasiadou et al., 2001), mitigating methane emission (Patra and Saxena, 2011) and manipulation of rumen fermentations.

Effects of CTs on rumen fermentation have been reported differently among studies primarily depending on their sources and concentrations used (Frutos et al., 2004). However, recent studies by Huang et al. (2010) and Naumann et al. (2013) seem to suggest that chemical structure and molecular weight of CTs have effect on their efficacy to manipulate rumen fermentation. Therefore, this study was aimed to investigate the effects of CTs extracted from tropical plant materials which has potential use as feed for ruminant with differing molecular weight on rumen fermentation characteristics using *in vitro* gas production procedure.

Methodology

Condensed tannin extracts preparation

Condensed tannins extracted from two tropical plant materials; Siamese neem (*Azadirachta indica* A. Juss. var. *Siamensis* Valetton) leaf and manosteen (*Garcinia mangostana*) peel were used as representatives of high molecular weight CTs (HMW-CT, 3612 Da) and low molecular weight CTs (LMW-CT, 2914 Da), respectively, based on their molecular weight determined by Petlum et al. (unpublished data) using Gel Permeation Chromatography (RID-10A, Shimadzu, Columbia, MD, USA) with procedures as described by Huang et al. (2010). The CTs from each plant materials used in this study were extracted using the method described by Huang et al. (2010).

Determination of in vitro fermentation parameters

The following five treatments were used: control (CONT, with no CTs supplementation), supplemented with LMW-CT extracted at 2 and 4 mg/100 mg DM of substrate (LMW-CT2 and LMW-CT4, respectively), and supplemented with HMW-CT extracted at 2 and 4 mg/100 mg DM of substrate (HMW-CT2 and HMW-CT4, respectively).

Three matured rumen fistulated Saanen male goats fed 2.5 % dry matter of body weight containing 60% Pangola (*Digitaria eriantha*) hay and 40% commercial concentrate (14% of crude protein) were used as donors of the rumen fluid. Rumenal fluid collected were pooled and strained through 4 layers of cheesecloth and then used immediately. Artificial saliva was prepared under anaerobic conditions in a water bath at 39°C according to Menke and Steingass (1988), the strained rumen fluid was mixed in a 2:1 ratio (artificial saliva: rumen fluid). Thirty mL of buffered rumen fluid solution was dispensed into 100 mL calibrated glass syringes (Toitu, TOP Surgical Manufacturing Co. Ltd., Japan) containing 200 mg DM of substrate rich in sunflower oil (comprises of 117.6, 78.4 and 4.0 mg DM of pangolar hay, 14%CP concentrate and sunflower oil, respectively). Syringes were incubated in water bath at 39°C for 24 h. For above procedures, a total of 9 and 3 replicates for each treatment (from three separated run) were used for measurements of total gas production and ruminal pH, respectively. The total gas produced were recorded at 1, 2, 3, 4, 6, 8, 10, 12, 16, 20 and 24 h of incubation, and net gas production values were corrected by subtracting blank values from the samples (Menke and Steingass, 1988). Cumulative gas production data were fitted to the model of Ørskov and McDonald (1979) described as $Y = a + b(1 - e^{-ct})$; where Y represents the cumulative gas production at time t , a is the gas production from the immediately soluble fraction, b is the gas production from the insoluble fraction, c is the rate of gas production (/h) and $(a+b)$ is the potential gas production. The contents of three syringes from each treatments were collected at 0, 1, 2, 4 and 24 h of incubation and immediately measured for pH using pH meter (METTLER TOLEDO, Model S220-Kit).

Statistical analysis

Data of *in vitro* gas production and ruminal pH were analyzed in a Completely Randomized Design (CRD) using the PROC GLM of SAS (1998). Multiple comparisons among treatment means were identified using Duncan's New Multiple Range Test (DMRT) (Steel and Torrie, 1980). Mean differences were considered significant at $P < 0.05$.

Results and discussion

In vitro gas production and ruminal pH

Ruminal pH and the kinetics of gas production and total gas production of each treatment are presented in Table 1. Ruminal pH of all treatments were ranged in the normal

value (6.70 to 6.95) for all time of incubation and were not significantly affected by CTs inclusion. The intercept value (*a*), the insoluble fraction (*b*) and potential gas production (*a+b*) were not significantly affected ($P > 0.05$) by CT extracted inclusion for all treatments. In contrast, in comparison with control, only HMW-CT, at all the two inclusion levels, significantly decreased the gas production rate constant (*c*) ($P < 0.05$). Similarly, cumulative gas production at 24 h were significantly decreased with supplementation of all levels of HMW-CTs. The results of this study demonstrated that CTs with higher molecular weight had stronger inhibiting effect than that of lower molecular weight on total gas production even at low level of supplementation (2 mg/100 mg DM). Similar to the study by Huang et al. (2010) which reported that inclusion of condensed tannins from leucaena-hybrid Bahru (LLB) at levels of 2 to 5 mg/100 mg DM significantly decreased *in vitro* total gas production compared to control ($P < 0.001$). The stronger inhibitory effect of higher molecular weight of CT on gas production probably due to its biological property such as protein-binding ability, which have been demonstrated that the stronger protein binding ability and suppression of methane production of LLB was due to the higher proportion of the larger molecular weight fractions of the condensed tannins of LLB (Huang et al., 2011a; Huang et al., 2011b).

Table 1. Effects of inclusion of condensed tannins with differing molecular weights on ruminal pH and gas production *in vitro*

Items	Treatments					SEM	P-values
	Control	LMW-CT2	LMW-CT4	HMW-CT2	HMW-CT4		
<i>Gas kinetics</i> ^A							
a	-1.85	-2.17	-1.12	-2.46	-2.00	0.660	0.4039
b	62.46	57.34	66.56	61.21	65.60	4.406	0.3061
c	0.08 ^a	0.07 ^{ab}	0.07 ^{abc}	0.05 ^c	0.06 ^{bc}	0.008	0.0163
a+b	60.61	55.17	65.44	58.75	63.60	4.513	0.2429
Total gas production ^B	40.17 ^a	40.11 ^a	41.83 ^a	31.61 ^c	36.28 ^b	1.698	0.0001
<i>pH at time (h) of incubation</i>							
0-h	6.87	6.86	6.85	6.89	6.86	0.029	0.9679
1-h	6.93	6.87	6.91	6.92	6.89	0.023	0.8102
2-h	6.90	6.84	6.84	6.89	6.95	0.027	0.2316
4-h	6.89 ^a	6.81 ^b	6.86 ^{ab}	6.89 ^a	6.92 ^a	0.017	0.0671
24-h	6.71	6.70	6.72	6.74	6.79	0.023	0.3198

^Aa: the gas production from the immediately soluble fraction. b: the gas production from the insoluble fraction.

c: the gas production rate constant. a+b: the potential extent of gas production.

^BGas production of 24 h of incubation (mL/200 mg DM of substrate).

^{abc}Means with different superscript letters within a same row differ significantly ($P < 0.05$)

Conclusion

Inclusion of higher molecular weight of condensed tannins extract have been demonstrated the stronger inhibitory effect on *in vitro* ruminal gas production. However, further study on effect of CTs with differing molecular weight on rumen manipulation and fermentation parameters would be further investigate.

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The effect of substitution of groundnut cake by dried rumen content in ration for lamb fattening in Sudan

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Abstract

The present study was conducted to evaluate inclusion of dried rumen content in growing lamb diets. Graded levels of dried rumen content (0, 10 and 20%) were incorporated in three diets iso-energetic, iso-nitrogenous diet for lambs. Diet A contained 0% dried rumen content while diets B and C contained 10 and 20% dried rumen content respectively. Thirty yearling male lambs of Sudan desert sheep ecotype Butana Ashgar with average body weight of 20 kg were used for the feeding trial. The lambs were randomly divided into three experimental groups having equal number and live weight. Each group was offered one of the experimental diets for a feeding period of 49 days. Dietary treatments did not affect any carcass parameter but it significantly affect the proportion of the Breast in the whole sale cuts. Carcass composition parameters did not differ significantly among the treatment groups. Muscle percentage was slightly higher in the control group, but fat percentage was higher in group C which was fed a diet containing 20% dried rumen content. The slaughter by products showed no significant differences among dietary treatments. Chemical composition of meat revealed that the protein content in the muscles of group A was slightly higher than that of the other groups, but group C has the highest fat and lowest moisture content. Meat quality of group C was of superior water-holding capacity and lower cooking losses, and was more tender than that of group A and B. The meat colour of group A and B was darker than that of group C. Dietary treatments showed no significant effect among the tested groups for taste panel scores of tenderness, juiciness, flavour, colour and overall acceptability. However, meat from animals in group C was more desired than that from the other groups. It is thus concluded that dried rumen content when incorporated in lamb diets up to 20% produced carcasses which were significantly not different from that produced by the control diet. Though not significantly different between the different dietary treatments, but 20% inclusion level of dried rumen content increased depot and carcass fat and overall acceptability of the meat

Key words: dried rumen content in lamb fattening

Introduction

Feed constitutes the largest single factor in the costs of production of animal of all kinds. Feeding practices and feeds in use today range from excessively costly to nutritionally inadequate and from highly efficient to wasteful materials. In order to achieve successful feeding program one should be able to provide proper nutrients at the least costs. The cost of feed, as percentage of total production costs, accounts for about 50-60% of nutrient feeding systems and 56-80% in an industrial system (Khattak et al., 2009). Conventional animal feed in the Sudan include

groundnut Cake, groundnuts hulls, and sorghum grain and wheat bran. The relative abundance of these products and by-products offers a unique opportunity of fast improvement of animal production in the country. Unfortunately, there are constraints facing their efficient utilization. These include export of these products, human nutrition, food industries and poultry nutrition. These crippling realities that are characteristics of third world countries has led to the use of locally available, and cheap industrial by-products and animal wastes as feed ingredient. The products of livestock industry are meat, wool ,hair and hides and skin. The by-products are blood ,rumen digesta ,hooves ,bones etc, .recycling these by-products will reduce disposal and environmental pollution problems.

Rumen contents are abundantly available as slaughterhouse by-products and mainly considered as waste materials, creating environmental pollution. With appropriate processing and proper use. Rumen content could provide a valuable source of nutrients when included in diets for various classes of livestock. Previous studies have generally indicated that dry rumen contents contained substantial amount of CP and utilizable energy for nutrients (Reddy and Reddy, 1980; Gosh and Dey, 1993).

Previous studies have generally indicated that dry rumen contents contained substantial amounts of crude protein and utilizable energy for ruminants (Messersmith et al., 1974; Prokop et al., 1974; Reddy and Reddy, 1980; El-yassin et al., 1991; Ghosh and Dey, 1993 and Salinas-chavira et al., 2007). In practice, the high moisture of the total rumen contents as collected at the slaughter house is still regarded as one of the obstacles that require an appropriate solution. Goodrich and Meiske (1969) used a forced air oven to dry rumen contents and found that beside its high economical costs, drying temperature had adversely affected the feeding value of the crude protein component. Sun drying is an excellent approach for tackling this problem (Abdelmawla, 1990 and Khattab et al., 1996). The objective of this study is to Evaluate the effect of feeding dried rumen content on carcass characteristics and meat quality.

Methodology

Study area

The experiment was conducted at the Animal production department farm, Faculty of Agriculture and Natural Resources, University of Kassala,.

Rumen content collection and treatment

Rumen content of cattle were collected immediately after slaughtering in plastic bags from a local slaughter house at New Halfa and transported to Animal Production Department Farm then stored for a night at a low ambient temperature and dried by sun which during drying were turned daily for a week to accelerate complete drying then ground to allows easy mix with other ration ingredients. Representative samples of dried rumen content and experimental rations were taken for chemical analysis according to (AOAC 1975).

Experimental animals

Thirty lambs of Sudanese desert sheep (Al-Butana Ashgar) were purchased from New Halfa livestock market. Animals were selected according to age (6-8 months) and weight which was approximately 26 kg transported Animal Production Department Farm rested, ear tagged and given an adaptation period for two weeks.

Adaptation period

During this period animals were fed groundnut halum and a mixture containing equal percentage of the assigned experimental rations *ad libitum*. The groundnut halum was gradually substituted by rations mixture during the first 7 days. The rations mixture feeding continued till the end of the adaptation period.

Spraying with an acaricide solution against ecto parasites with Gematoxcine solution and deworming with Thiabendazole as a drench solution was performed and the Thiabendazole treatment was repeated after 15 days. Animals were also injected by antibiotic (oxy-Tetracycline 20%) as preventive dose.

Experimental procedure

After the adaptation period the animals were individually weighed and then randomly divided into three groups (A, B and C) of similar number and weight. The three groups were separately penned. Each pen was provided with watering and feeding facilities.

Feeds and feeding

Three iso-caloric and iso- nitrogenous diets containing graded levels of dried rumen content (A 0%, B 10% and C 20%) were used. The other ingredients were sorghum grain, groundnut cake, wheat bran, groundnut hulls, molasses, salt and calcium carbonate. The chemical analysis, ingredient proportion and chemical analysis of dried rumen content and the experimental diets are given in tables (1) and (2).

During the feeding period, animals were fed daily the assigned diets *ad libitum*. The diets were offered in one meal at 7:00 am. throughout the study period which extended for 49 days. Green fodder (*Medicago sativa* and *Sorghum biocolor* (L) Moench) offered once a week at a rate of one kg/head/week to avoid vitamin A deficiency. Clean water was available throughout the experiment period.

Slaughter procedure and slaughter data

At the end of the experimental period, five lambs were randomly taken from each group and transported to the department of meat production, Faculty of animal production, University of Khartoum for slaughter. Slaughter weights were taken after an overnight fast except for water. The animals were slaughtered following the Local Muslim Practices i.e. by severing both the jugular veins, carotid arteries and esophagus by a sharp knife without stunning. When complete bleeding was attained, the head was removed at the atlantooccipital joint, the body was practically skinned on its back and the feet were cut at knee and hock joints, the body was then hanged using hooks and skinning was completed. The skin, feet as well as the thoracic and visceral organs were individually weighed. Gut fill was determined as the difference in weight between the full and empty alimentary tract. The kidneys and kidneys knob channel fat were left intact in the carcass. The carcasses were weighed warm and then chilled at 4°C for 24 hours; thereafter the cold carcasses were reweighed. The tail was removed at its base and weighed. The kidneys and kidneys knob channel fat were removed and weighed. The carcass was then split along the vertebral column into left and right sides, the left side was weighed and broken into whole sale cuts according to M.L.C procedure (1976), these included: Neck: which was removed by cutting through the junction of sixth and seventh cervical vertebrae at right angle to the axis of the vertebrae. Leg and chump: was removed by cutting

between both sixth and seventh lumbar vertebrae. Single short forequarter: this joint was removed by cutting along the posterior edge of the sixth rib, sawing through the sternum and vertebral bodies. The loin: was separated from the best end of neck joint by cutting along the posterior edge of the 13th rib. Best end of neck and Breast: were removed by cutting and sawing along a straight line from a point on the posterior surface of 13th rib (2.5 inch from the ventral tip of the eye muscle) to a point on the posterior surface of the 7th rib (3 inch from the ventral tip of the eye muscle). The dorsal cut comprised the best end of neck and the ventral one was the breast. Each cut was weighed and dissected into muscle, bone, fat and trim. The weight of each tissue was determined and recorded. The meat was covered by wet towels throughout the dissection to prevent loss of weight by evaporation.

Samples for chemical analysis and quality determination

Longissimus dorsi muscle samples were taken from loin joint. Samples were kept in polythene bags and frozen stored awaiting chemical analysis. *Semi membranous* muscle was also removed from both sides of the carcass. Each muscle was freed from external visible fat and connective tissues and utilized for meat colour determination. Chemical analysis of protein, fat, ash and moisture was done according to (AOAC 1975).

Moisture content determination: Determination of moisture content was based on weight loss from a definite quantity of 5gm sample from *longissimus dorsi* muscle, dried overnight in drying oven at 100-105 °C for 18 hours. The dried sample was cooled in desiccators for half hours and weighed. The moisture content was calculated as a percentage of fresh sample weight as follows:

$$\text{Moisture \%} = \frac{(\text{weight of fresh sample} - \text{weight of dried sample})}{\text{Weight of fresh sample}} \times 100$$

Protein content determination: Crude protein content was determined by using kjeldahl method and calculated by multiplying the amount of nitrogen by 6.25. One gram of dried sample was weighed in kjeldahl flasks. Two tablets of catalyst mixture (10 parts K₂SO₄ to 1 part of CuSO₄) and 10 ml of concentrated H₂SO₄ were added. The content of the flask was digested under boiling at maximum heat for 3 hours, and then the flask was cooled and transferred to distillation unit. The sample was distilled by using NaOH solution. The content was titrated against HCl acid 0.1N and crude protein percentage calculated as follows:

$$N = \frac{TX \ 0.1 \times 0.014 \times 20 \times 100}{\text{Weight of sample}}$$

T = peapate reading

$$C.P = N \times 6.25$$

Ether extracts determination: Fat content was determined by ether extract method. Three grams of dried samples was placed in soxhlet tubes. The samples were subjected to continuous extraction with 150-200 ml petroleum ether for 5-6 hours. The flasks were then removed from the extractor and allowed to dry for 2 hours in a drying oven until no traces of ether remained. The flasks were weighed after cooling in desiccators. The difference between the flasks containing the fat and weight of the empty flasks was the fat weight in the samples. The calculation was performed using the formula:

$$\text{Fat \% of sample} = \frac{\text{fat weight}}{\text{Weight of sample}} \times 100$$

Ash content determination: Ash content was determined by weighing 5grams of dried fat free sample into dried crucibles of known weight. The crucibles

were placed inside a muffle furnace at 550 – 600°C for 18 hours, cooled in desiccators and weighed to determine the ash percentage as follows:

$$\text{Ash \%} = \frac{\text{weight of Ash}}{\text{Weight of sample}} \times 100$$

Quality attributes

Water -holding capacity (W.H.C): Samples weighing about 0.5gm from the minced *L.dorsi* muscles were used. Each sample was placed on a humidified filter paper (whatman No.1) kept in a desiccator over saturated KCl solution and pressed between two plexiglass plates for 3 minutes at 25 kg load. The meat film area was traced with a ball pen and the filter paper was allowed to dry. Meat and moisture areas were measured with a compensating planometer.

The resulting area covered by the moisture was divided by the meat film area to give a ratio expressed as water holding capacity of meat. A larger ratio indicates an increase in the watery condition of the muscle or a decrease in water holding capacity (Babiker and Lawrie, 1983).

$$\text{W.H.C} = \frac{\text{Loose water area} - \text{meat film area}}{\text{Meat film area}}$$

Colour determination: Colour was determined on the semi-membranous muscles. Each muscle was allowed to oxygenate for half an hour at 4°C before colour determination. Hunter colour components L (lightness), a (redness) and b (yellowness) were recorded using Hunter Lab Tristimulus colour meter (D25.2). Subsequently these samples were frozen for cooking loss.

Cooking loss determination: Semi-membranous samples were thawed at 4°C for 24 hours, placed in plastic bags in a water bath at 80°C for 90 minutes. Muscle samples were then cooled in running water, dried from fluids and reweighed. Cooking loss was determined as loss in weight during cooking and expressed as percent of pre-cooking weight.

$$\text{Cooking loss} = \frac{W_1 - W_2}{W_1} \times 100$$

Where:

W_1 = weight before cooking

W_2 = weight after cooking

Taste panel: Sensory panel sessions were conducted to compare some selected sensory properties of the five treatments. The frozen meat samples (*L.dorsi* muscle) from each treatment were thawed for 24 hours in a refrigerator (4°C). The samples were then cut into equal pieces and wrapped individually in aluminum foil and roasted in an oven at 180°C for 60 minutes. The cooked samples were then cut into pieces and served warm.

Fifteen samples from the five treatments were evaluated at each session by semi-trained panelists (Stone, *et al.*, 1974 and Cross, *et al.*, 1978). Panelists were instructed to record their responses for each attribute (tenderness, juiciness, flavour, colour and overall acceptability) according to a 5-point scale (Appendix 2).

Statistical analysis

Data collected were subjected to analysis of variance (Steel and Torrie, 1990) of complete Randomized Design model while significant treatment means were separated by Duncan (Duncan, 1955) multiple range test.

Results

Carcass yield and characteristics

The data of carcass yield and characteristics of experimental lambs are shown in Table 4. No significant differences among the treatment groups were observed for slaughter weight, hot carcass weight, cold carcass weight, empty body weight, half carcass weight, dressing-out percentage (on slaughter weight or empty body bases) and chiller shrinkage. Gut fill percentage was not significantly different among the treatment groups. Maximum gut fill (12.05%) was found in group A and minimum gut fill (9.85%) was found in group C.

Table 4. Slaughter weight and carcass characteristics

Item	Treatment groups			L.S	S.E
	A (0%)	B (10%)	C (20%)		
Slaughter weight (kg)	36.60	37.40	36.38	N.S	0.62
Empty body weight (kg)	32.19	33.37	32.79	N.S	0.56
Gut fill (as % of slaughter weight)	12.05	10.77	9.85	N.S	0.44
Hot carcass weight (kg)	18.80	19.30	19.06	N.S	0.34
Cold carcass weight (kg)	18.30	18.85	18.38	N.S	0.37
Half carcass weight (kg)	8.75	9.10	8.88	N.S	0.19
Hot dressing (%) live body wt.base	51.31	51.62	52.09	N.S	0.30
Empty body wt. base	58.94	57.87	57.82	N.S	0.39
Cold dressing (%) live body wt.base	49.87	50.42	50.31	N.S	0.40
Empty body wt. base	56.69	56.51	55.84	N.S	0.42
Chiller shrinkage (%)	1.81	1.49	1.78	N.S	0.19
Total muscle (as % of cold side wt.)	56.67	56.02	56.27	N.S	0.59
Total bone (as % of cold side wt.)	19.82	20.92	19.39	N.S	0.76
Total fat (as % of cold side wt.)	16.09	19.73	21.21	N.S	1.07
Total trim (as % of cold side wt.)	6.59	6.95	5.47	N.S	0.58

No significant differences among treatment groups were observed for carcass muscle, bone and fat percentages (Table 4). However, lambs fed ration A tended to have a greater value of carcass muscle (56.65%) while those fed ration B have the lowest value (56.02%). Lambs fed ration C were intermediate (56.27%). On the other hand, lambs fed ration B tended to have a higher value of carcass bone percentage than those fed rations A and C. Lambs fed ration C appeared to have more developed carcass fat than those fed rations B and A.

Non-carcass components expressed as percentage of empty body weight are represented in Table 5. No significant difference among the treatment groups was observed for head, skin, four feet, heart, lung and trachea, intestine (empty), stomach (empty and full), liver, spleen, kidney, kidneys knob and channel fat, reproductive organs, omental fat and mesenteric fat, but these values tended to be slightly higher in group A than the other groups.

Average intestine weight (full) was significantly different ($P < 0.05$) among the treatment groups. Group A (5.87%), followed by group C (5.42%) and group B which had the least intestine weight (full) (5.24%).

Table 5. Non carcass components (as percentage of empty body weight)

Item	Treatment groups			L.S	S.E
	A (0%)	B (10%)	C (20%)		
Head	5.23	5.13	5.16	N.S	0.05
Skin	5.96	6.04	6.03	N.S	0.08
Four feet	3.39	3.30	3.21	N.S	0.04
Heart	1.58	1.56	1.67	N.S	0.03
Lung and trachea	3.03	2.98	2.93	N.S	0.04
Intestine (Full)	5.87a	5.24b	5.42ab	*	0.11
Intestine (empty)	4.08	3.84	3.83	N.S	0.09
Rumen (Full)	6.77	6.61	6.16	N.S	0.15
Rumen (empty)	3.62	3.48	3.51	N.S	0.06
Liver	3.01	2.80	3.01	N.S	0.05
Spleen	1.62	1.64	1.82	N.S	0.06
Kidneys	1.51	1.49	1.51	N.S	0.01
Kidney knob and channel fat	2.54	2.58	2.60	N.S	0.06
Reproductive organs	2.41	2.11	2.43	N.S	0.09
Omentum fat	2.73	2.89	2.78	N.S	0.11
Mesenteric fat	2.46	2.35	2.33	N.S	0.05

The whole sale cuts of the experimental lambs from cold carcass (left side) are shown in Table 6. The proportion of the various whole sale cuts obtained from the carcass sides of the experimental lambs as leg and chump, single short fore quarter, loin, best end of neck and neck were not significantly different among the treatment groups. However, a significant differences among the treatment groups was observed for breast ($P < 0.05$). The tail and loin weights though not significantly different among the treatment groups, but their values were slightly heavier for group C than for the other groups.

Joint composition of the experimental lambs expressed as percentage of joint weight are presented in Table 7. No significant differences among the treatment groups were observed for all joint composition.

Meat chemical composition

Meat chemical composition data of the experimental lambs are shown in Table 8. There were significant differences among treatment groups in percentages of protein. Group C had the highest muscle fat and lowest moisture percentage than the other groups. No significant differences among the treatment groups were observed for moisture, fat and ash percentage.

Table 6. Yield of whole sale cuts (as percentage of cold side weight)

Item	Treatment groups			L.S	S.E
	A (0%)	B (10%)	C (20%)		
Leg and chump	32.98	32.08	32.71	N.S	0.24
Single short fore quarter	29.61	30.21	29.68	N.S	0.45
Loin	9.73	10.44	10.82	N.S	0.24
Breast	6.10b	6.86a	6.82a	*	0.14
Best end of neck	6.79	7.51	7.05	N.S	0.22
Neck	8.61	8.49	8.38	N.S	0.21
Tail	5.91	6.34	7.14	N.S	0.51

Table 7. Joint composition (as percentage of joint weight)

Item	Treatment groups			L.S	S.E
	A (0%)	B (10%)	C (20%)		
Leg and chump :					
Muscle	63.20	60.99	62.22	N.S	0.47
Bone	18.89	18.10	17.55	N.S	0.50
Fat	13.18	15.48	16.47	N.S	0.68
Trim	4.12	3.61	3.41	N.S	0.27
Single short fore quarter :					
Muscle	59.65	57.04	58.14	N.S	0.56
Bone	22.78	22.67	21.75	N.S	0.62
Fat	12.15	15.11	14.06	N.S	0.69
Trim	5.08	4.87	5.07	N.S	0.29
Loin :					
Muscle	53.89	57.53	57.60	N.S	2.09
Bone	13.34	10.72	13.16	N.S	0.71
Fat	15.44	20.49	15.84	N.S	1.21
Trim	8.81	8.40	10.34	N.S	0.38
Breast :					
Muscle	59.06	54.23	54.32	N.S	1.07
Bone	20.12	18.56	18.48	N.S	0.40
Fat	13.65	18.21	16.12	N.S	1.17
Trim	7.91	9.45	9.35	N.S	1.10
Best end of neck :					
Muscle	57.42	53.57	52.22	N.S	1.33
Bone	23.06	23.04	24.76	N.S	1.02
Fat	13.20	15.08	16.59	N.S	1.09
Trim	8.33	6.79	5.02	N.S	1.00
Neck :					
Muscle	58.69	55.89	58.48	N.S	1.10
Bone	19.94	20.01	17.44	N.S	0.93
Fat	9.33	10.70	13.21	N.S	0.98
Trim	10.35	9.99	8.80	N.S	0.85
Tail :					
Muscle	12.24	12.02	11.26	N.S	0.97
Bone	18.10	14.43	14.26	N.S	1.45
Fat	66.56	74.03	70.04	N.S	2.17

Meat quality attributes

Data of meat quality attribute of the experimental lambs are also shown in Table 8. No significant differences among the treatment groups were observed for Hunter lightness (L), redness (a) and yellowness (b). Group C had the highest values for lightness and redness and lowest values for yellowness, while group A had the highest values for yellowness.

Table 8. Meat chemical composition and quality attribute (as percentage of fresh meat weight)

Item	Treatment groups			L.S	S.E
	A (0%)	B (10%)	C (20%)		
Moisture %	75.39	74.60	74.28	N.S	0.40
protein %	22.39 ^a	20.72 ^b	20.99 ^b	**	0.20
Fat %	1.90	1.58	2.07	N.S	0.14
Ash %	0.90	0.94	0.86	N.S	0.08
Lightness(L)	28.14	27.58	29.16	N.S	0.33
Redness (a)	7.80	7.30	8.12	N.S	0.27
Yellowness (b)	3.90	3.80	3.52	N.S	0.24
Water holding capacity (ratio)	1.57	1.66	1.53	N.S	0.09
Cooking loss (%)	36.91	37.72	36.52	N.S	0.57

Water-holding capacity values of muscle studied were not significantly different among the treatment groups. Group C showed superior WHC values than the other groups table (8). Although cooking loss values were not significantly different among treatment groups, meat from group B had higher cooking loss while meat from group C had the least cooking loss.

Subjective evaluation of meat quality is presented in Table 9. There were no significant differences among the treatment groups for all evaluated eating quality attributes. Colour scores were higher for group B, followed by group C, but group A had received lower colour scores. Flavour scores were higher in group C than for the other groups. Higher scores for tenderness were given for lambs in group B. Juiciness scores were highest in group C and least in group B. Generally meat from group C tended to have the highest scores for flavour, juiciness and overall acceptability while group A tended to have the least scores for colour, flavour and overall acceptability.

Table 9. Subjective evaluation of meat quality

Item	Treatment groups			L.S	S.E
	A (0%)	B (10%)	C (20%)		
Colour	3.78	3.88	3.84	N.S	0.07
Flavour	2.72	2.94	3.02	N.S	0.07
Tenderness	3.26	3.34	3.24	N.S	0.06
Juiciness	2.84	2.76	2.98	N.S	0.13
Overall acceptability	3.28	3.34	3.42	N.S	0.06

Discussion

Carcass yield and characteristics

There were no significant differences among the treatment groups observed for slaughter weight and carcass weight (cold or warm). Also no significant differences among treatment groups were found for dressing percentage either on empty weight or live weight basis.

The values for the dressing percentage agreed with that reported by Beshir (1996), Abouhief (1999) and Mohammed (2005). El-Karium and Owen (1987) reported a respective dressing percentages of 45.06 and 43.35 for Sudan desert sheep ecotype (Watish and Shugor) which were lower than the values reported in

this study. Here, sheep ecotype differences and ration composition might be responsible.

The gut fill percentage in this study was 12.05%, 10.77% and 9.85% for group A, B and C respectively. Group C however gut fill percentage could be due to increased digestibility of the diet offered which contained higher proportion of fermented dietary material. This result agreed with the findings reported by Mansour et al. (1988), El-khidir et al., (1989), Babiker and Mohammed (1990) and EL-Hassan (1994). El-khidir et al. (1989) reported gut fill of Sudan desert sheep in the range of 20.8 to 24.9, also Beshir (1996) reported gut fill of 14.54, 13.14 and 13.00 for Sudan desert sheep. These variations in gut fill could be due to type of feed, ration chemical and Physical composition, age, species and pre-slaughter conditions of the animals.

No significant differences were observed among the three dietary treatments in carcass shrinkage. Carcass shrinkage or moisture loss is the proportion of the carcass moisture lost by evaporation during the cold storage period. Generally, carcasses with good subcutaneous fat cover suffer less loss. In addition, refrigeration conditions and duration affect this parameter. The carcass shrinkage values in the present study were lower than that obtained by Beshir (1996) and Beshir (2002). These differences might possibly be due the duration, temperature and humidity of refrigeration used as well as amount of carcass fat.

Non- carcass components were not significantly different among the treatment groups. These findings agreed with the findings reported by Beshir (1996) and Beshir (2002). Omental and mesenteric fat depots were greater in group A and B than group C.

The major whole -sale cuts as leg and chump, single short fore quarter, loin, best end of neck, breast, neck and tail were expressed as percentage of cold carcass weight. The cut weights with the exception of breast were not significantly different among the treatment groups. The whole - sale cuts values reported by Beshir (1996) and Beshir (2002) for Sudan desert lambs were in line with the values reported in this study.

In this study the carcass muscle percentage was 56.67, 56.02 and 56.27 for group A, Band C respectively. Although group A had more percentage carcass muscle, the total carcass muscle was not significantly different among the treatment groups. This result was in agreement with the result reported by Beshir (1996) of Sudan desert sheep.

Fat percentage in this study was 16.09, 19.73 and 21.21 for group A, B and C respectively, and was not significantly different among the treatment groups, but groups Band C which were fed dried rumen content, had the highest total fat percentage than the control. These results were higher than that reported by Beshir (2002), but lower than that reported by Beshir (1996).

Bone percentage recorded here was 19.82, 20.92 and 19.39 for group A, B and C respectively, which had no significant effect among the treatment groups. Group B recorded the highest total carcass bone percentage, while groups C recorded the least value. Total bone percentage reported in this study was greater than that reported by Beshir (1996) and Beshir (2002). This variation in bone percentages might be due to differences in diets and age which affected carcass composition.

Joint composition expressed as percentage of joint weight is shown in table (7). No significant differences among the treatment groups were observed for leg and chump, single short for quarter, loin, best end of neck, breast, neck and tail

muscle, fat and bone. Generally group A in most joints tended to have greater muscle and lesser fat than the other groups. On the other hand fat in all joints was greater in group B and C. The increased muscle in group A might be due to its carcass weight. These findings were in line with that reported by Beshir (1996) for sheep fed graded levels of Karkadeh seeds and Beshir (2002) for sheep fed graded levels of Water Melon seed cake.

Meat chemical composition

Meat protein percentage in this study was significantly different among the treatment groups. Group A recorded the highest protein, while group B recorded the least protein percentage. The values for meat protein percentage in this study were lower than that reported by Beshir (2002) who found (22.75, 22.75, 22.75, 22.75, and 22.58) for lambs fed graded levels of Water Melon seed cake. Fat percentage in this study was not significantly different among the treatment groups. Group C recorded the highest fat percent and group A recorded the lowest fat percentage. The values for fat percentage in this study were lower than that reported by Beshir (1996) and Beshir (2002).

Moisture percentage was not significantly different among the treatment groups. Group C had the lowest moisture percentage which coincided with its highest fat percentage. The values for moisture percentage reported in the present study were in close line with the results reported by Beshir (1996) and Beshir (2002). Ash percentage was not significantly different among the treatment groups. Group C had the lowest values for ash percentage which coincided with its highest fat percentages. These findings agreed with that reported by Beshir (1996), but in contrast with that reported by Beshir (2002).

Meat quality attributes

The superior water- holding capacity found in the meat from group C could be explained by the high carcass fat of this treatment. Increased water- holding capacity is found to associate with increased fatness (Lawrie, 1979). Lower cooking loss was found in meat from group C, while highest cooking losses were found in group B. These differences in cooking loss could be attributed to differences in water-holding capacity already mentioned. The values of cooking loss in this study were highest than that reported by Beshir (2002). Hunter colour components indicated that group A and B were darker in colour than group C. This finding accorded with myoglobin concentration in meat which decreases as the percentage of intramuscular fat increases (Janicki et al., 1963).

The results of all the tasted attributes i.e. colour, flavour, tenderness, juiciness and overall acceptability were not significantly different among the treatment groups. On the other hand, all attributes tended to have higher scores in group C. This might be associated with increased fatness in this group over the others.

Conclusion

The protein and energy values of dried rumen content are high enough to allow its inclusion in diets as protein and energy sources for ruminants. Dried rumen content up to a level of 20% in lamb diets increased but not significantly carcass and meat fat and improved make quality outfalls. Dried rumen content had no deleterious effect on ruminant livability.

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Correlation between chewing time (eating and ruminating) and rumen pH change on lambs

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Abstract

This study aims to examine the relationship between length of eating and ruminating time to changes of rumen pH, and length of ruminating time with the intake of crude fiber. The materials were used 30 lambs aged 3-4 months old with body weight 13.75 ± 2.46 (CV 17.90%). Fed with a complete feed form of pellet contained 14-18% of crude protein and 70-75% of total digestible nutrients. The length of eating and ruminating time was observed through direct observation of lambs every 5 minutes for 2 x 24 hours. Intake of rumen fluid was done at 0 hours (before eating) then 3 hours (after eating). The data were analyzed using correlation and regression analysis. The correlation of rumen pH change 3 h after feeding has strongly negative correlation ($r = 0.81$) with ruminating at moderate negative ($r = 0.59$) eating time, and has strongly negative correlation ($r = 0.60$) with total chewing (eat and rumination). The relationship between the intake of crude fiber with ruminating time was strongly positive ($r = 0.80$). The ruminating time was very influential on the change of rumen pH. In order to maintain the rumen pH to be neutral pH then the time range required was 405-460 minutes. It can be achieved if the lambs consume crude fiber feed as much as 280-300 g.

Keywords: eating and ruminating behaviour, chewing time, lambs

Introduction

The normal conditions of physiological rumen such as pH is essential for the sustainability of the fermentation process of feed in the rumen. If the rumen pH is low (acid), it will adversely affect the rumen microbe, in turn will interfere the fermentation process of feed by rumen microbes. Therefore, the digestion and absorption of nutrient feed is not optimal. The pH conditions of the rumen to remain normal can be maintained by the buffer. Saliva produced from the mastication process is one of the good buffers to maintain rumen pH (Jiang et al., 2017). Saliva can be produced from the process of mastication. The length of chewing time (eating and ruminating) is influenced by the form of feed and the nutrient content of feed (Suzuki et al., 2014). Chewing during eating aims to minimize feed particles to be easy to swallow and the chewing during ruminations aims to minimize the size of feed particles that are returned to the mouth for easily passing through the rumen. Suspected rumination activity gives a greater influence on salivary secretion and will affect the change of rumen pH. The content of crude fiber is one of the factors that affect the chewing time. The higher the crude fiber of feeds, the higher time the rumination to optimize feed to digest (Maktabi et al., 2016). The longer the rumination time, the more saliva will be generated and the availability of buffers to keep the rumen pH is sufficient. In the other hand, high crude fiber in the feed causes the proportion of other important nutrients to be low and decrease the digestibility of the feed.

Based on that discussion, it is important to compare the length of eating time with the length of ruminating time in the rumen pH changes and to know the optimal amount of crude

fiber intake in the length of ruminating time. The benefit of this research is to know the relationship between length of eating and ruminating time in rumen pH changes.

Methodology

The materials used in this study were 30 lambs aged 3-4 months with body weight 13.75 ± 2.46 (CV 17.90%), raised in individual cages equipped with drinking and feeding bunk. The feed was a complete feed form of pellet. Crude protein content ranges from 14-18% and total digestible nutrient ranges from 70-75%. The crude fiber intake was calculated from the percentage of crude fiber feed multiplied with dry matter intake. The length of eating and ruminating time was observed through direct observation of lambs every 5 minutes for 2 x 24 hours. The time of rumination was calculated during the lambs chewing but not in the feed bunk. Intake of rumen fluid was done at 0 hours (before eating) then 3 hours (after eating). The rumen fluid was taken using a plastic tube inserted slowly into the mouth and then vacuumed with a vacuum pump. The rumen fluid sample was filtered and pH was measured using Eutech® pH meters. The data were analyzed using correlation and regression. The relationship between two observed variables was known correlation coefficient. According to the method of Santoso (2005), the coefficient value were 0.00 - 0.19 (very low), 0.20 - 0.39 (low), 0.40 - 0.59 (moderate), 0.60 - 0.79 (strong), and 0.80 - 1.00 (very strong).

Results and Discussion

Based on Table 1. the relationship of rumen pH change 3 hours after eating has strongly negative with the ruminating time ($r = 0.81$), moderate negative ($r = 0.59$) with eating time, and strongly negative ($r = 0.60$) with total chewing (rumination and feeding). The graph illustrates that the time of rumination gave a stronger influence in the change of the pH rumen than that of the eating time. This is in line with Yang and Bauchemin (2006) that chewing time increases especially when chewing ruminations increase saliva secretion and will provide enough buffer to maintain rumen pH. Overall, the total time of eating and ruminating illustrates that the less the time intake of the feed, the greater the decrease in rumen pH. This is due to the influence of chewing activity affect the number of saliva secretion (Krause et al., 2002). Based on the equation (Table 2), the rumen pH decreased greatly when the duration of ruminating time was less than 457 minutes, the eating time less than 485 minutes and the total length of chewing (eating and ruminating) was less than 683 minutes.

Table 1. Body weight, dry matter intake, crude fiber intake, ruminating time and change of rumen pH

Parameter	Ranges	Average	Standart Deviasi
DM intake (g/day)	313.34 to 2034.46	1058.57	455.92
CF intake (g/day)	25.63 to 277.30	127.33	74.71
Eating time (minute)	110 to 545	267	101.21
Ruminating time (minute)	35 to 510	262	132.71
Rumen pH at 0 time	5.70 to 7.50	6.93	0.49
Rumen pH at 3 rd time	5.10 to 7.20	6.37	0.74
Change of rumen pH	-2.20 to 0.30	-0.56	0.67

Based on Table 2, the relationship of the crude fiber intake has strongly positive correlation ($r = 0.80$) with ruminating time. It means that the higher the intake of crude fiber, the higher the ruminating time, but at the some points, the length of rumination began to

decline. Based on the equation (Table 2), the optimal intake of crude fiber was 281.72 g that resulted 409 minutes of rumination length. The strong relationship between ruminating time and the intake of crude fiber was caused by rumination aimed in breaking feed particles into smaller and easier to be digested. The higher the crude fiber content in feed, the higher the particles should be broken down into smaller, thus causing the increase of ruminating time (Jalali et al., 2012).

Table 2. The result of equation graph relation of eating and ruminating time, and total chewing time with change of rumen pH and graph relation of crude fiber intake with ruminating time

Parameter	Equation	R ²	r
Correlation of crude fiber intake and ruminating time	$y = -0,005x^2 + 2,8172x + 12.527$	0.63	0.81
Correlation of ruminating time with change of rumen pH	$y = -7E-06x^2 + 0.0064x - 1.6769$	0.64	0.80
Correlation of eating time and change of rumen pH	$y = -1E-05x^2 + 0.0097x - 1.9551$	0.35	0.59
Correlation of total chewing time and change of rumen pH	$y = -3E-06x^2 + 0.0041x - 1.5594$	0.36	0.60

Conclusion

Based on the results of this study, it can be concluded that the ruminating time is very influential in rumen pH changes. To maintain the neutral rumen pH, it requires 280-300 g of crude fiber and It can be achieved if the lambs consume crude fiber feed as much as 280-300 g, at least.

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Fecal forensic tests as an indicator digestibility on young and mature sheep

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Abstract

This study was aimed to determine the digestibility of feed on young and mature sheep through the fecal forensic by means of fecal particle distribution. The study was conducted in November 2016 to April 2017 at the Faculty of Animal and Agricultural Sciences, Diponegoro University, Semarang. Six young male thin-tailed sheep 4-5 months old and 6 thin-tailed mature sheep 12-14 months old were used and reared in individual pens. The parameters observed were the proportion in percentage of fecal coarse particles proportion diameter > 0.5 mm, medium particles > 0.01 - < 0.5 mm and fine particles < 0.01 mm, and feed digestibility. The dry matter DMD and organic matter OMD digestibility values were determined by digestion trial total collection method. The data of feed digestibility were then correlated with the proportion of fecal particles. The results showed that correlation between DMD and the proportion of coarse particle and medium particles was weak, being 0.24 and 0.07, respectively, while the fine particles was found strong $r=0.90$. Similarly, the correlation value between OMD and the fecal particles proportion were found medium $r=0.64$, weak $r=0.39$ and strong $r=0.94$ for coarse, medium and fine particles, respectively. It can be concluded that proportion of fine fecal particles could be used to determine DMD and OMD for young and mature sheep.

Keywords: young sheep, mature sheep, forensic, fecal particle

Introduction

Nowadays, the demand of lean meat increased for health reason. Lean meat can be obtained from lambs meat. Liu et al. (2015) reported that the quality of the lambs meat physically is more tender and chemically has lower fat than that of mutton. Moreover, fattening lambs also can speed up the production and the economic turnover. Fattening lambs is an effort that can be performed by lambs to increase productivity (Martawidjaja et al., 1997). However, the digestive organs of lambs and their function at this phase are still developing, so the ability to digest solid and fibrous feed still in growing and change fast. Therefore, to provide an appropriate feeding to fulfill the lamb requirement, the knowledge on feed absorbed by animal must be considered. To determine the feed compounds or nutrients which absorbed by animal, it is required the feed evaluation, and one of the conventional methods and commonly used is digestion trials. The value of this feed digestibility is trusted to describe the feed utilization (Zinn et al. 2007) but the digestion trials are expensive, laborious and time consuming, and may not fit with the fast change of digestive organs function or for periodically evaluation in animal operations.

Santosa et al. (2015) introduced the fast and practical method to determine feed digestibility by using fecal characteristics - called forensic test - by means of the fecal particles proportion and reported that proportion of fecal particles has correlation to the feed digestibility and could be used to scan the feed utilization in mature goats. The proportion of smaller particles indicated the proportion of feed digested properly, so the higher proportion of small

particles indicated the more feed absorbed. Ramond et al. (2005) reported that the feed digestibility declined when the large particle sizes in feces increase. Currently, forensic tests have not been tested yet in the digestive organ of young sheep, considering the digestive organ of young and mature sheep was different. Therefore, it is necessary to evaluate whether the fecal forensic test that can be applied for digestibility evaluation on young sheep.

This study aimed to determine correlation between fecal particles proportion and feed digestibility on lambs. The benefit of this study was to provide a simple and accurate method to determine feed digestibility to allow proper feeding management at fattening young sheep.

Methodology

The experiment used six 6 young male thin tailed lambs 3 months old with the average body weight of 17.44 kg CV 2.70% and 6 mature thin tailed rams 12-14 months old with an average body weight of 26.60 kg CV 4.04%. The animals were purchased from animal farmer in Boja, Kendal, Central Java.

During the study, the young and mature sheep were raised in the individual pen with free access to water. The pellet feed was given adlibitum composed of Napier grass, soybean meal, rice bran, mineral mix, dried cassava, wheat bran and molasses to give crude protein CP 12% and total digestible nutrients TDN 55%. A digital scale 10 kg capacity with 1 g precision to weigh the feces, a sieve with opening size of 0.01 mm and 0.5 mm diameter was used to separated feces in medium and coarse size, while the loss part from 0.01 mm was determined as the fine particles. The method is figured in Figure 1.

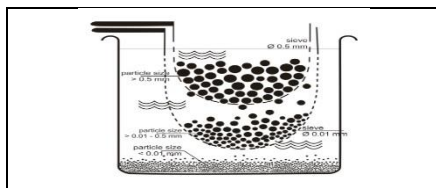


Figure 1. Sieving feces to separate particle size of feces

The particle weight was oven-dried at 135 C for 2 hours to obtain dry matter of the particles. An analytical scale with the precision of 0.001 g was used to weigh the fecal particles sieved. Meanwhile, the feed digestibility dry matter and organic matter was determined by using a total collection method for 7 days. Feces were taken to get the dry matter DM and the fecal particles. In the fecal particle's test, feces collected was weighed in 10 g and 3 replications, then soaked them in 50 ml water for 24 hours and then the feces was sieved with opening size diameter 0.5 mm and 0.01 mm to find out the distribution of fecal particles size which was measured to the initial feces weight. The proportion percentage of fecal particle size was correlated to the digestibility.

Results and Discussion

Correlation between each fecal particle size proportion and dry matter and organic matter digestibility are presented in Table 1. The results showed that the correlation between dry matter digestibility and the proportion of coarse and medium particles was weak, 0.24 and 0.07, respectively, while the fine particles was strong $r=0.90$. Similarly, the correlation value between organic matter digestibility and the fecal particles proportion were found medium $r=0.64$, weak $r=0.39$ and strong $r=0.94$ for coarse, medium and fine particles, respectively.

Table 1. Correlation among each fecal particle size proportion coarse, medium, fine particle and the dry matter and organic matter digestibility

Particles size diameter, mm	Correlation value r			
	Dry matter digestibility	Strength correlation	Organic matter digestibility	Strength correlation
Coarse; >0.5	0.24	weak	0.64	moderate
Medium; 0.01 - 0.5	0.07	weak	0.39	weak
Fine; < 0.01 mm	0.90	strong	0.94	strong

Proportion of fine fecal particles diameter <0.01 mm showed a strong relationship to the digestibility and it indicated that this fine particle size proportion can be used to predict the digestibility. This condition can be explained by the fact that smaller particles give a broader surface per unit weight of feed and allow to rumen microbes, digestive enzymes to digest the feed. Degradation of fecal particle size is resulted from all processes that occur in every site of digestive organ from mouth, rumen, and intestine either mechanically or enzymatically. The smaller the particles of degradation give higher digestibility values, and therefore the feed can be absorbed and utilized in animal body. Syahrir et al. (2008) stated that the higher the degradation of dry matter and organic matter give the higher nutrients of feed that can be utilized to meet the nutritional requirement of animals.

Conclusion

This study showed that distribution of fecal particles size, especially the fine particle size <0.01 mm has a strong relationship to dry matter and organic matter digestibility. Therefore, the fine fecal particle size could be used to determine feed DM and OM digestibility, or in another words the proportion of fecal particle size could also be used to monitor the performance of digestive organ to digest the feed.

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Effect of vitamin A restriction on carcass traits and blood metabolites in Korean native steers

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Abstract

Many studies have shown that the restriction of vitamin A in ruminants is positively correlated to high marbling score during the fattening time. This study aims to determine the effects of vitamin A restriction on serum metabolic parameters, carcass performance in Korean native steers during fattening period. In study 1, 60 Korean native steers were divided into two groups supplied following diets containing 890 IU/kg, with 8,000 IU (control), 3,000 IU (T1) and 0 IU (T2) of supplemental premix vitamin A/kg of DM. Body weight was measured monthly. Serum vitamin A levels and metabolic parameters were detected by using HPLC and automatic analyzer, respectively. We found that vitamin A restriction did not affect the body weight as well as average daily gain. Serum vitamin A was clearly reduced in T2 group ($P < 0.05$) paralleled with the elevation of blood urea nitrogen, albumin and NEFA compared to control ($P < 0.05$). In study 2, another 20 Korean native steers were divided into two groups with the diets containing 890 IU/kg, with 8,000 IU (control) and 0 IU (T) of supplemental premix vitamin A/kg of DM. As a result, marbling score in T group is numerically higher than control ($P > 0.05$), T group had higher proportion of grade ≥ 1 and $\geq 1+$, however PPAR γ , aP2, SCD genes in subcutaneous fat showed no difference ($P > 0.05$). In conclusion, restriction of vitamin A during fattening has potential to improve the meat quality, and its regulation of blood parameters would become the metabolic markers in Korean native steers during the fattening period.

Keywords: vitamin A, blood metabolites, carcass traits, Korean native steers

Introduction

Marbling score is an essential factor for high quality beef production which both meet the satisfaction of consumers and producers in many parts of the world (Arnett et al., 2009). Vitamin A is a fat soluble vitamin, which is required for the maintenance of normal vision. The negative correlation between serum vitamin A level and marbling scores was first revealed by the vitamin A restricted study of Japanese black cattle (Oka et al., 1998). Currently, many studies on vitamin A restriction showed the enhancement of marbling score (Gibb et al., 2011, Pickworth et al., 2012), however others showed that there was no effect on marbling in

finishing beef cattle (Gorocica-Buenfil et al., 2007, Bryant et al., 2010), also the effect of restricted vitamin A on carcass traits of Korean natives is not clear yet. Moreover, although the previous data showed some relationships between different serum vitamin A level and blood metabolic parameters within a narrow range of vitamin A restriction during the fattening period of beef cattle (Wang et al., 2014), it is still not clear between serum vitamin A level and blood metabolic parameters under the restriction of vitamin A from vitamin premix during the fattening period of Korean native steers.

Therefore, we aimed to find the relationship between vitamin A restriction and carcass traits as well as some metabolic responses in the blood to the vitamin A restriction in Korean native steers.

Methodology

Animals and management

All procedures involving animals were approved by the Animal Care and use Committee of Konkuk University prior to the experiments (Certificate No: KU16134). In study 1, 60 Korean native steers (15 to 24 months old) were divided into two groups supplied following diets containing 890 IU/kg, with 8,000 IU (control), 3,000 IU (T1) and 0 IU (T2) of supplemental premix vitamin A/kg of DM. Body weight was measured monthly. In study 2, another 20 Korean native steers (16 to 24 months old) were divided into two groups with the diets containing 890 IU/kg, with 8,000 IU (control) and 0 IU (T) of supplemental premix vitamin A/kg of DM.

Serum vitamin A and metabolite analysis

Blood samples collected from jugular vein of each beef steer were used for the determination of vitamin A levels and metabolic parameters by using HPLC and automatic analyzer, respectively.

Carcass traits and gene expression

Carcass traits were obtained at 30 months old from the slaughter house. The measuring method is based on the Korean beef carcass-grading system included quality and yield (Moon et al. 2003). The expression of PPAR γ , aP2, SCD genes were detected by real time-PCR.

Statistical analysis

The result values were shown as the means with standard errors. The data of serum vitamin A, growth performance and blood metabolic were analyzed by Duncan's multiple range test using one-way analysis of variance (one-way ANOVA). The data of carcass traits were analyzed through the Student's *t*-test. In all cases, significance was set at $P < 0.05$.

Results and discussion

As a result, the body weight of Korean native steers from 15 months age to 24 months age did not show the significant between the treatment and control. The total average daily gain also showed no significant differences in groups.

In the initial four months, the concentration of serum vitamin A in control, T1 and T2 maintained the similar ($P > 0.05$), followed by the concentration of serum vitamin A in T2 was significantly decreased by feeding feedstuff contain 0.89/g vitamin A ($P < 0.05$) between the 20 and 24 months age, while there were no change on control and T1 group. It implied that although intake of vitamin A was reduced by the restriction, the concentration of serum vitamin A was maintained by released vitamin A from liver which was similar to previous findings

(Pickworth et al., 2012). With process of vitamin A restriction, the storage of vitamin A in liver was reduced; it was not enough to maintain the balance of serum vitamin A. Therefore it caused the decrease in T2 serum vitamin A (0.89 IU/g), in which vitamin A was absolutely removed from vitamin premix. No change of serum vitamin A level in T1 (3 IU/g) provide an evidence that the liver is still be able to maintain the serum vitamin A with 3 IU/g premix vitamin A in the feedstuff by its regulation on vitamin A.

In the previous studies, the metabolic profile test (MPT) was established as a tool for early monitoring the health status in dairy herds (Kida 2002). Vitamin A deficiency promotes the exfoliation of epithelial cells so as to facilitate the formation of urinary calculus. Considering of vitamin A restriction, MPT parameters should be inspected to monitor of metabolic status in ruminants. Blood urea nitrogen in treatment group showed the higher value than control group ($P < 0.05$). In the previous research reported that lower level of vitamin A was compared with the higher level of urea nitrogen (Adachi et al., 1999). Blood urea nitrogen is an indicator of protein intake, blood urea nitrogen increases with the increase of protein intake (Broderick and Clayton). Meanwhile, the albumin, creatinine and NEFA were significantly higher in T2 group than in control group. Albumin is a type of protein produced from liver which maintains fluid balance in the body (Rall et al., 1995). Creatinine is a molecule that generated from the metabolism of muscle, which is important for energy production in muscles. Creatinine is transported to the kidney by the way of bloodstream as an indicator of kidney function (Rule et al., 2004). The creatinine level in the blood will increase by the poor clearance in kidney. NEFA is used as an indicator for energy metabolism, the transportation of NEFA into blood provides energy to tissue throughout the body, however too much serum NEFA can lead to toxic (Adewuyi et al., 2005).

As for the result of carcass traits, although there was no difference in marbling score between the two groups ($P > 0.05$), T group had higher proportion of grade ≥ 1 and $\geq 1+$ (based on beef carcass grading system in Korea). In addition, fat color in T group was higher than that in control ($P < 0.05$). Meanwhile, PPAR γ , aP2, SCD genes in subcutaneous fat showed no difference between the two groups.

Conclusion

All things taken together, these results suggest that vitamin A restriction from vitamin premix can be contributed to the higher proportion of high quality beef, and serum urea nitrogen, creatinine, albumin and NEFA may be used as the metabolic markers in Korean native steers during the fattening period.

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Stimulation of chewing activity of ewes by feeding spent mushroom substrates containing long-cut sweetcorn stover

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Abstract

In order to promote the use of spent mushroom substrates (SMS) as cattle feed, we evaluated the quality of the silage made of enokitake (*Flammulina velutipes*) SMS containing a long-cut sweetcorn stover (L-SMS), and effect of this silage on chewing activity in ruminants. Three kinds of silage were used: 1) conventional corn silage (control), 2) conventional enokitake SMS silage (C-SMS) and 3) L-SMS. These silages were measured to evaluate the quality, and then given to Friesland ewes for 11 days, with the first 7 days and second 4 days used for adaptation and measurement, respectively. The behaviour of ewes was recorded by video cameras during 4-day measurement period. Both SMS silages were rich in crude fibre and poor in NFE, suggesting that these may suitable for roughage. The results based on sensory evaluation showed that qualities of both SMS silages were not inferior to control silage, although both SMS silages showed lower lactic acid levels and higher pH values than control silage. There was no significant difference in dry matter intake of ewes among groups, suggesting that SMS silages have no adverse effect on palatability. Comparing with control group, total chewing time was significantly shorter in C-SMS group, but such tendency was not found in L-SMS group. Similar trend was found in the numbers of chews. In conclusion, it is suggested that L-SMS is much superior to C-SMS when it was used as roughage for ruminants.

Keywords: spent mushroom substrate, silage, roughage, chewing activity, ruminants.

Introduction

Enokitake (*Flammulina velutipes*) is one of the most eaten mushrooms in Japan and produced primarily in Nagano prefecture. Unfortunately, the spent mushroom substrate is recognized to be a waste agricultural biomass, although the substrate of enokitake is mainly composed of feed materials, such as corncob and rice bran. Consequently, many studies have been performed to use SMS as cattle feed (Oh *et al.*, 2010; Xu *et al.*, 2010; Kim *et al.*, 2015), but practical use of SMS for that purpose seems to be difficult, because of its low nutritional value for cattle feed. However, it may be impossible to use more nutrient-rich materials for mushroom substrates, because of overnutrition. Kim *et al.* (2015) reported that SMS silage could be used as a roughage source for beef cattle, but this depressed rumination activity, because of its small particle size.

Against this background, we have planned to establish a successive production system of mushroom and roughage: more specifically, producing mushrooms with substrates containing long-fibre materials and using the resultant SMS as roughage. We selected long-cut sweetcorn stover as a long-fibre material, because this is one of the main crops in Nagano prefecture and has been used as cattle feed previously. Recently, we have established the method to produce enokitake with a substrate containing long-cut sweetcorn stover. In the present study, we evaluated the quality of silage of enokitake SMS produced according to the

above method and effect of this silage on chewing activity in ruminants.

Methodology

Diets

Three kinds of silage were used: 1) conventional corn silage (control), 2) conventional SMS silage (C-SMS) produced by lactic fermentation of conventional enokitake SMS, 3) long fibre SMS silage (L-SMS) which was produced by lactic fermentation of enokitake SMS containing long-cut (30 mm) sweet corn stover.

Animals, feeding and measurement

A total of four Friesland ewes (1-5 years old, average body weight of 55.7 ± 3.0 kg) were used according to a randomized block design with four replicates. Each animal was housed in an individual pen and allocated to one of the 3 dietary groups (control, C-SMS and L-SMS) and given free access to feed and water for 11 days, with the first 7 days and second 4 days used for adaptation and measurement, respectively. A commercial concentrate diet (CP 16%, TDN 72%) was also given at a rate of 1.2% of body weight. The behaviour of ewes was recorded by video cameras during 4-day measurement period.

Analysis

The quality of these silages was evaluated by measuring proximate composition, NDF, pH, lactic acid concentration and sensory analysis. Data on behaviour were analysed by Tukey-Kramer test.

Results and discussion

Quality of silages

CP level of control silage was 3.5%, and those of both SMS silages were about 3.5 times greater than that, which is due to high CP content of substrates for enokitake. Crude fibre level was 19% in control silage and 25% in C-SMS silage and 23% in L-SMS silage. NFE level was 70% in control silage and about 46% in both SMS silages. Judging from these values, SMS may be suitable for roughage. The results based on sensory evaluation showed that qualities of both SMS silages were not inferior to control silage, although, comparing with control silage, both SMS silages showed lower lactic acid levels and higher pH values, which may be due to low NFE level in both SMS silages. To improve their fermentation quality, it may be necessary to provide cheap carbon sources which can be utilised easily by lactic acid bacteria.

Feeding trial

Dry matter intake tended to increase in C-SMS group, which may be due to the fact that this silage was less bulky than other silages. Little difference was found in DM intake between control and L-SMS groups. Therefore, it seems that SMS silages have no adverse effect on palatability in ewes. In this connection, previous studies showed that sheep and cattle did not refuse SMS although it has the unique smell (Xu *et al.*, 2010; Kim *et al.*, 2015). Comparing with control group, chewing time during eating and ruminating was numerically shorter in C-SMS group, and total chewing time significantly shorter in C-SMS group (Figure). However, such tendency was not found in L-SMS group: this group always showed similar values to those found in control group. The number of chews during eating and ruminating showed similar pattern to the results of chewing time.

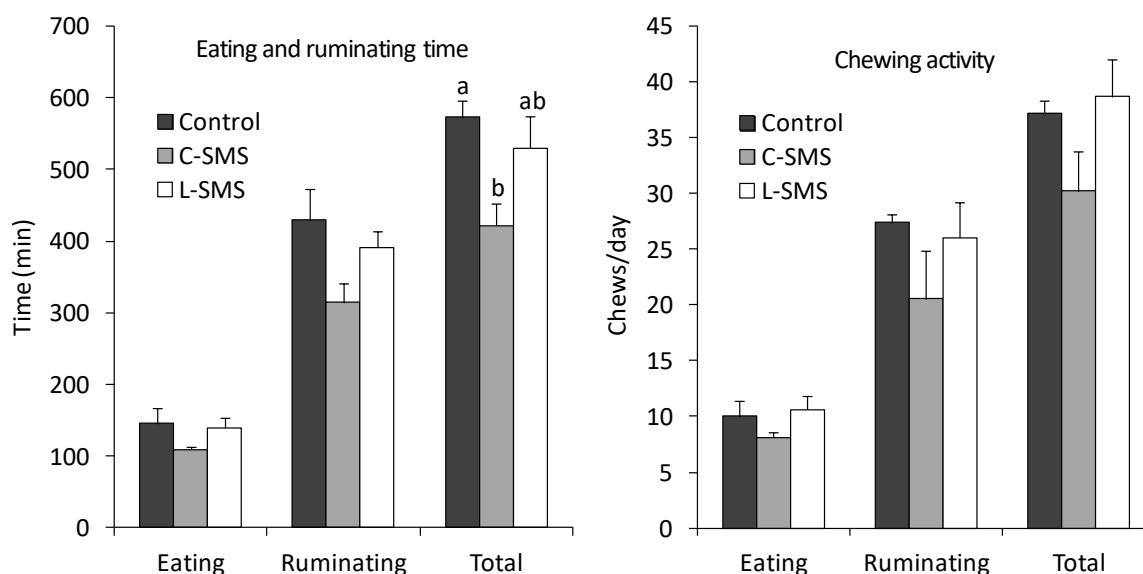


Figure. Chewing activity of ewes given SMS containing long-cut sweetcorn stover.

Conclusion

It is clarified that L-SMS had no adverse effect on palatability in ewes and stimulated their chewing activity, and suggested that carbon sources utilised easily by lactic acid bacteria should be used in silage preparation to improve fermentation quality.

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Response to tropical leaves for potential trend of total gas production *in vitro* in Saanen goats

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Abstract

This experiment was conducted to investigate *Cymbopogon citratus* and *Psidium guajava* effects on rumen fermentation involving total gas production and response of nutrient degradability for 96 h using *in vitro* gas production method. Rumen fluid were collected from four ruminally cannulated Saanen goats, which accepted a Total Mixed Ration (TMR) feed based on Pangola hay and concentrate (50:50) followed by treatments (T1=TMR; T2= TMR+ 5% *Cymbopogon citratus* of total feed in DM; T3= TMR + 5% *Psidium guajava* of total feed in DM). A statistical analysis used computer package analysis SPSS (version 18). Differences between means were determined by Tukey's Honest Significant Difference Test $P < 0.05$. All effects of treatments were significantly different ($P < 0.001$) with control treatment. However, comparison of *Cymbopogon citratus* and *Psidium guajava* was expressed in similarly mode. Essential oils as major compound of these plants played as antimicrobial interrupting bacteria microorganism diversity. Based on this study, it could be concluded that *Cymbopogon citratus* and *Psidium guajava* were recommended to carry out investigations.

Keywords: goat, *in vitro*, gas production, *Cymbopogon citratus*, *Psidium guajava*

Introduction

A continuing strategy to modulate secondary ruminal fermentation using supplementary leave including herb is still a hot issue discussed. *Cymbopogon citratus* and *Psidium guajava*, a group of potentially tropical plants were reported to treat human health since long times ago as antiseptic and antimicrobial. Prasad et al. (2010) described that *Cymbopogon citratus* played the volatile sign as essential oils expressing antifungal mode in *in vitro* and *in vivo* to possess dermatophytes. Also, Pal et al. (2015) supplemented 46.6g/Kg *Psidium guajava* influencing biomass production *in vitro* of microorganism in ruminal sheep. Moreover, a common technique for evaluation of feeds or new feeds for ruminants is *in vitro* gas production technique. This way is cheap, convenient, and fast allowing immense number of samples to be handled in a short time. Therefore, this study was undertaken to study the polyphenol compound of *Cymbopogon citratus* and *Psidium guajava* and their effect on total gas production and degradability response in Saanen goats.

Methodology

Animals and analysis of sample collection

In vitro incubations were conducted at Animal Nutrition laboratory Suranaree University of Technology as outlined previously (Menke and Steingass, 1998) with rumen fluid collected from four ruminally cannulated (40 mm internal diameter) Saanen goats (body weight= 52 ± 6.42) Kg before morning feeding. All the animals were offered a total mixed ration (TMR, forage: concentrate ratio 50:50), based on Pangola hay (particle size >4cm) and concentrates, in two meals (60% at 9:00h and 40% at 17:00 h) at approximately 0.8 times the

voluntary feed intake previously determined *ad libitum* (37 g DM/kg metabolic weight and day) with differential treatments (T1=TMR; T2= TMR + 5% drying *Cymbopogon citratus* of total feed in DM; T3= TMR + 5% drying *Psidium guajava* of total feed in DM). Initial level at 5% of total feed were chosen as higher supplementation of phytochemical plant following previously studies (Wanapat et al., 2008). Animals had continuous access to clean drinking water. Formulation and chemical composition of the diet is exhibited in Table 1. Moreover, feed samples analysis (see table 1) had been prepared (ISO 6498:2012) and analysed for DM (ISO 6496:1999), ash (ISO 5984:2002), and crude protein (ISO 5983-2:2009). Neutral and acid detergent fibers (α NDF and ADF) had been determined using a fibre analyser (Ankom Technology Methods 13 and 12), respectively. Cumulative gas production data and their fractions were fitted to the model of Orskov and McDonald (1970) by NEWAY computer package program.

Table 1. Formulation and chemical composition of the experimental diet^a

	T1	T2	T3
Ingredients (g/kg DM)			
Pangola hay	500	500	500
Cassava seed	30	30	30
Cassava pulp	190	190	190
Rice bran	50	50	50
Molasses	40	40	40
Palm meal	130	130	130
Soybean meal	40	40	40
Urea	10	10	10
Mineral ^b	8	8	8
Premix	2	2	2
<i>Cymbopogon citratus</i> mash	-	10	-
<i>Psidium guajava</i> mash	-	-	10
Chemical composition, g/kg DM			
Organic matter	699.2	838.9	819.1
Crude protein	122.4	125.3	124.0
Ether extract	63.1	37.3	38.3
Neutral detergent fibre	822.4	641.2	630.2
Acid detergent fibre	667.0	343.5	321.5
Acid detergent lignin	78.8	63.7	74.7

^a n=10; ^b Contained (g/kg): NaCl (988.7), Mg (5), P (1.5), Zn (0.32), Ca (2.5), Fe (1.6), Co (0.045), I (0.125), and Mn (0.21)

Statistical method

Data were analysed as a compare means into one-way ANOVA with a treatment and measurement as factor and dependent list, respectively using computer package analysis SPSS (version 18). Differences between treatment means were determined by Tukey's HSD (Honest Significant Difference) Test that be declared the significant differences at $P < 0.05$.

Results and Discussion

The effects of plant supplementation are presented in Table 2. *In vitro* gas production was carried out completely at 96 h. The trend *in vitro* gas production of *Cymbopogon citratus* (T2) and *Psidium guajava* (T3) toward control (T1) are depicted in Figure 1. An inclusion of T2 and T3 containing polyphenol fraction could intrude the bacteria community to ferment and digest soluble and/or insoluble fractions on feed particle. Apart of lower effect from other studies, this study applied higher level with 5% of total feedstuff tending to directly possess bacteria at 4 h onwards. As result, T2 and T3 were appeared at similar point before they walked away against to T1 by lower level of gas production.

The number of potential degradability, non-degradability, and effective degradability were significantly different with control ($P < 0.001$) affected by *Cymbopogon citratus* and *Psidium guajava* supplementation. These results were close to Wanapat et al. (2008) observation in beef cattle which were supplemented by *Cymbopogon citratus*. The presence of outer membrane in bacteria gram negative has been investigated behaving the strong defence

due to own hydrophilic surface, which played as impermeable obstacle. However, the absent of impermeable membrane in bacteria gram positive provided greater effects of polyphenol compound from these leaves to remove chemiosmotic control in bacteria through influencing electron transport, ion gradients, protein translocation, phosphorylation steps, and other enzyme-dependent reactions (Dorman et al. 2000). In our study, lower degradability and slower colonization time were significant appear because of dropping bacteria gram positive population by 5% *Cymbopogon citratus* and *Psidium guajava* supplementation.

Table 2. Total gas production (A), colonization time (L), fermentation rate (μ), non-degradable fraction (FI), potential degradability (PD), and effective degradability (ED) of dry matter in 96 incubation hours

Parameter	T1	T2	T3	SEM	P-value
A (mL)	97.51 ^a	90.63 ^b	91.42 ^b	0.267	***
L (Hours)	0.112 ^b	1.003 ^a	1.036 ^a	0.012	***
μ (mL/h)	66.35 ^b	58.34 ^a	59.24 ^a	0.299	***
FI (mL)	2.49 ^a	9.37 ^b	8.53 ^b	0.267	***
PD (mL)	97.52 ^b	90.76 ^a	91.67 ^a	0.286	***
ED (gr/Kg)	4.88 ^b	4.54 ^a	4.58 ^a	0.014	***

: significant different (<0.05), *: highly significant different (<0.001), ^a n=10; ^{a,b} Means within a row with a different superscript differ (P,0.05)

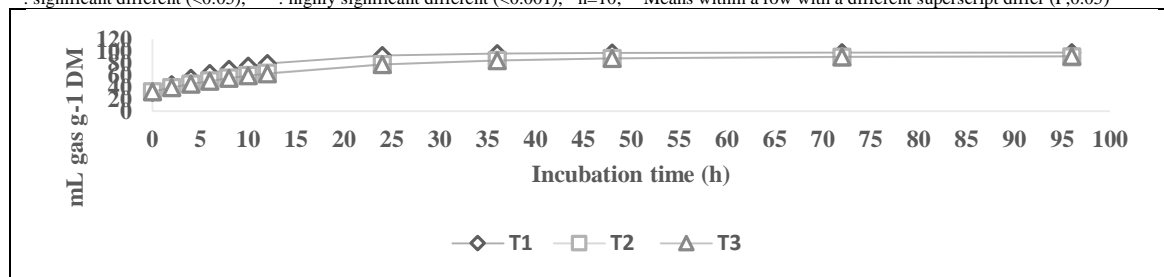


Figure 1. Cumulative gas production profiles (mL gas g⁻¹ DM) from *in vitro* fermentation of *Cymbopogon citratus* and *Psidium guajava*

Conclusion

In summary, all effects of 5% *Cymbopogon citratus* and *Psidium guajava* supplementation were significantly different with control (P<0.001). Comprehend understanding may imply new decision to choose the best secondary supplementation whether *Cymbopogon citratus* or *Psidium guajava* for next sustainable investigations.

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Buckwheat phytase activity: *In vivo* prediction of production performance and phytate phosphorus utilization in laying hens

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Abstract

Our previous *in vitro* study showed that, buckwheat, especially Shinano-1-go variety, contained high phytase activity which was further induced by germination. The present study was conducted to evaluate whether partial replacement of maize by non-germinated (BU) and germinated (GBU) Shinano-1-go can improve phytate phosphorus (P) utilization in laying hens. Forty White Leghorn laying hens were divided into 8 groups and then allocated to one of the 8 experimental diets: positive control (PC), negative control (NC), and NC diet containing 10, 15 and 20% of BU and GBU at the expense of maize. Feed intake and hen-day egg production were recorded daily for 5 wks trial period (47 to 51 wks of age). Comparing with PC group, NC group was lower in feed intake, hen-day egg production, egg weight and egg mass, but these parameters were restored when BU and GBU was added to NC diets, and the extent of restoration was dose-dependent and more prominent in GBU groups than BU groups. Retention of total P was improved in diets containing BU or GBU. In conclusion, Shinano-1-go can be used an energy source improving phytate P utilization in laying hens.

Keywords: available phosphorus, buckwheat, egg production, germination, phytase activity

Introduction

Nowadays, exogenous phytase enzyme is routinely added to the poultry diet to enhance phytate phosphorus (P) utilization. However, this enzyme is expensive and using of ingredients rich in phytase activity may become an alternative of low cost. Buckwheat (*Fagopyrum esculentum*) is a pseudocereal having high energy and phytase activity (NRC, 1994; Egli et al., 2002), can be cultivated even on low-fertility soils and sometimes used as a green manure or a plant for erosion control. Therefore, it may be interest to use buckwheat seeds as a poultry feed source rich in energy and phytase. In our previous *in vitro* study, it was clarified that Shinano-1-go variety of buckwheat showed higher phytase activity, and this activity increased further by germination. Unfortunately, no *in vivo* study has been performed so far, and therefore it is obscure whether buckwheat phytase can degrade phytate-P successfully even in the chicken digestive tract. The purpose of the present study was to measure egg production performance in laying hens given P-deficient diets containing non-germinated (BU) and germinated (GBU) Shinano-1-go buckwheat, and to discuss whether BU and GBU can be used as an energy source improving phytate-P utilization in laying hens.

Methodology

Shinano-1-go BU was purchased commercially and part of this variety was germinated for 36 h at room temperature ($23 \pm 2^\circ \text{C}$) in a dark condition. Non-germinated and germinated

seeds were ground to pass through 1.0 mm aperture, and then used as BU and GBU. Analyzed phytase activity in BU and GBU was 2.21 U/g and 2.87 U/g.

A total of 40 White Leghorn laying hens (46 wks of age) were divided into 8 groups and randomly assigned into one of the 8 experimental diets: positive control (PC), negative control (NC), and NC diet containing 10, 15 and 20% of Shinano-1-go BU and GBU at the expense of maize. Diets were provided for 6 wk: first 1 wk was employed for adaptation and the subsequent 5 wks experiment during which egg production, feed intake and egg weight were recorded. Egg mass and feed conversion ratio were calculated at the end of experiment. Excreta was collected during the last 4 days of experimental period, dried and stored until analysis. Diets and excreta were analysed for proximate composition and total P according to AOAC (1990) and ISO (1998), respectively.

The obtained data were analyzed by one-way ANOVA. The Tukey's multiple comparison tests was performed at a significance level of 5% among the dietary groups.

Table 1. Ingredients and chemical composition of experimental diets

	PC	NC	NC+BU			NC+GBU		
			10%	15%	20%	10%	15%	20%
Ingredients, %								
Commercial diet ¹	33.5	33.7	34.0	34.2	34.7	34.0	34.2	34.7
Soybean meal	19.3	19.3	17.7	17.2	16.4	17.7	17.2	16.4
Maize	38.8	38.8	28.5	22.8	17.2	28.5	22.8	17.2
BU	-	-	10	15	20	-	-	-
GBU	-	-	-	-	-	10	15	20
Maize oil	0.45	0.45	2.05	3.05	3.95	2.05	3.05	3.95
CaCO ₃	5.7	6.4	6.4	6.4	6.4	6.4	6.4	6.4
Ca ₃ (PO ₄) ₂	0.9	-	-	-	-	-	-	-
Vit- min premix ²	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05
Analyzed composition, %								
Crude protein	17.92	17.89	17.94	17.74	17.83	17.93	17.86	17.79
Available-P	0.36	0.20	0.21	0.20	0.21	0.20	0.21	0.20
Calcium ³	3.60	3.60	3.61	3.62	3.64	3.62	3.62	3.64
ME (kcal/kg) ³	2984	2990	2985	2990	2990	2985	2990	2990

¹Layer diet (CP≥17.0%, ME≥2850 kcal/kg, Feedone Co., Ltd. Kanagawa, Japan); ²NRC (1994); ³Calculated

Results and Discussion

Efficiency of microbial phytase to improve utilization of phytate P in laying hens is well proved (Gordon and Roland, 1997; Wu et al., 2006). Unfortunately, there are limited findings in case of plant phytase, although some researchers have exhibited improved P utilization in laying hens and broilers given triticale and wheat having high phytase activity (Francesch et al., 2005; Barrier-Guillot et al., 1996). In the present study, hen-day egg production and feed intake showed similar pattern of response towards different dietary treatments (Figure). Comparing with the data in PC group, egg production performance decreased ($P<0.05$) when P-deficient diet (NC) was given, but restored when P-deficient diet containing BU and GBU was given. Deteriorated feed conversion ratio, decreased egg weight and egg mass in P-deficient NC group were restored with increasing level of BU and GBU in diets. In this connection, there was no detrimental effect of BU and GBU on their performance. Total P excretion decreased and retention increased dose-dependently with the addition of BU and GBU.

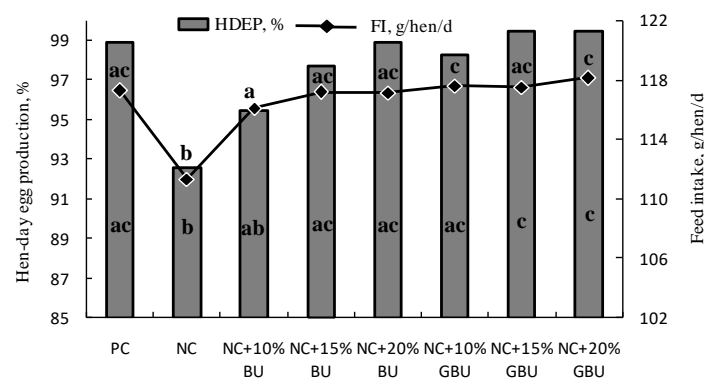


Figure: Hen-day egg production (HDEP) and feed intake (FI) of laying hens given non-germinated (BU) and germinated (GBU) buckwheat added diets

Conclusion

In conclusion, we clarified that dietary Shinano-1-go effectively (and germinated one further effectively) restored egg productivity in laying hens given P-deficient diet, suggesting that Shinano-1-go can be used as an energy source improving phytate phosphorus utilization in laying hens.

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Effects of dietary β -1,4-mannobiose on the growth performance and productivity of Hinai-jidori chicken slow-growing Japanese meat-type chicken

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Abstract

We previously demonstrated that β -1,4-mannobiose MNB, a main component of mannose sugar included in mannanase hydrolyzed copra meal, could be a feed additive to improve the meat yield of broiler chicks. We investigated the effects of dietary MNB on the growth performance and productivity in Hinai-jidori chickens, which is one of the most popular slow-growing meat-type chickens Jidori in Japan. A total of 120 day-old female Hinai-jidori chicks were allocated to four groups 29 birds / group, and were raised in an open-sided poultry shed with access to a grass paddock until they were 23 wk old. The control group was fed only the mixed diet during the experiment period. The other three groups were fed 0.02% MNB supplemented diets for either 9 weeks 0-9 wk; MNB 0-9W, 14 weeks 9-23 wk; MNB 9-23W or 23 weeks 0-23 wk; MNB 0-23W. Body weight and feed intake were measured, and proportions of dressed carcass were calculated. Twenty three weeks body weight and average daily weight gain of MNB 0-23W were significantly heavier than those of the control. The feed conversion rate of MNB 0-23W was lowest between the groups. The production score was superior in order of MNB 0-23W 334, MNB 9-23W 304, MNB 0-9W 298, and control 297. There was no significant difference in the proportions of dressing carcass between groups. These results suggest that MNB could be a promising candidate feed additive to improve the growth performance and productivity in slow-growing meat-type chickens.

Keywords: β -1,4-mannobiose, growth performance, Hinai-jidori chicken, productivity, production score

Introduction

β -1,4-mannobiose MNB is a main component of mannose sugar included in mannanase- hydrolyzed copra meal MCM. MNB has been reported to improve *Salmonella enterica* clearance, to reduce the degree of intestinal pathology in caecal tonsils and increase IgA production and the number of intraepithelial mononuclear cells in chicks (Agunos et al., 2007). Moreover, MNB was suggested to act as a potent immune modulator and exert a combination effects on the intestinal immune system (Ibuki et al., 2010), and the *in vitro* immunomodulating activities and antibacterial effects of MNB were also confirmed in chicken macrophages (Ibuki et al., 2011). In addition to immunomodulatory, MNB was suggested to improve the meat yield (Ibuki et al., 2013). Morphological findings revealed that MNB might be effective for activating intestinal absorptive function and that the functional activation promotes the growth of broiler chickens (Ibuki et al., 2014). However, the effects of MNB on

growth in slow-growing Japanese meat-type chickens Jidori, hybrid cross between Japanese native and imported breeds, have not been examined.

The objective of the present study was to investigate the effects of dietary MNB on the growth performance and productivity of Hinai-jidori chicken, which is one of the most popular Jidori in Japan.

Methodology

A total of 120 day-old female Hinai-jidori chicks were allocated to four groups 29 birds / group, and were raised in an open-sided poultry shed with access to a grass paddock until they were 23 wk old. Feed and water were provided *ad libitum*. The control group was fed only the mixed diet during the experiment period. The other three groups were fed 0.02% MNB supplemented diets for either 9 weeks 0-9 wk; MNB 0-9W, 14 weeks 9-23 wk; MNB 9-23W or 23 weeks 0-23 wk; MNB 0-23W. Body weight and feed intake were measured at day old and 23 wk old. Production score was calculated from the body weight, mortality, raising days and feed conversion. At 23 wk old, six birds from each group were randomly selected, and proportions of dressed carcass leg meat, breast meat, tender meat, liver, heart, and gizzard were calculated. Data were analyzed using Excel-Toukei 2006. Significant differences $P < 0.05$ were analyzed using ANOVA and Dunnett's test.

Results and Discussion

Table 1 shows the effects of dietary MNB on the growth performance, productivity and carcass traits of Hinai-jidori chickens. The body weight of MNB 0-23W 2744.3g was significantly heavier than that of the control 2614.6g, though there were no significant differences between control and other two groups MNB 0-9W and MNB 9-23W. The average daily weight gain of MNB 0-23W 16.9g was also significantly heavier than that of the control 16.1g as with the body weight. The feed conversion rate of MNB 0-23W was the lowest among groups. The mortalities were 0 % in all groups. The production score was superior in order of MNB 0-23W 334.3, MNB 9-23W 304.4, MNB 0-9W 298.1, and control 297.2.

Table 1. Effects of dietary β -1,4-mannobiose on the growth performance, productivity, and carcass traits of Hinai-jidori chickens

Item	Control	MNB0-9W	MNB9-23W	MNB0-23W
Growth performance				
Body weight g	2,614.6±38.3 ^b	2,604.3±39.4 ^{ab}	2,697.5±30.1 ^{ab}	2,744.3±36.1 ^a
Average daily weight gain g, g/bird/day	16.1±0.2 ^b	16.0±0.2 ^{ab}	16.6±0.2 ^{ab}	16.9±0.2 ^a
Feed intake g, g/bird/day	85.1	84.0	85.3	83.5
Feed conversion rate	5.3	5.3	5.3	4.9
Mortality %	0	0	0	0
Productivity				
Production score	297.2	298.1	304.4	334.3
Carcass traits %				
Leg meat	20.8±0.3	20.8±0.3	20.7±0.1	21.0±0.2
Breast meat	13.9±0.3	13.2±0.4	13.8±0.4	12.8±0.4
Tender meat	3.7±0.1	3.5±0.2	3.4±0.1	3.6±0.1
Liver	1.5±0.03	1.4±0.07	1.3±0.03	1.5±0.10
Heart	0.5±0.05	0.4±0.02	0.4±0.02	0.4±0.03
Gizzard	2.6±0.2	2.5±0.1	2.5±0.1	2.4±0.1

^{a,b} Means within the same row with different superscripts are significantly different $P < 0.05$. Mean \pm SE

These results suggest that MNB increases the body weight and improves the productivity in Hinai-jidori chickens. There were no significant differences in the proportions of dressed carcass traits between the groups. This result was not in agreement with previous our report Ibuki et al. (2011), which showed that dietary MNB significantly increased the relative weight of breast muscle in broiler chicks. The discrepancy of these results may be due to the differences between the breeds, age or sexes.

Conclusion

MNB could be a promising candidate feed additive to improve the growth performance and productivity in slow-growing meat-type chickens.

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Effects of different molecular weight tannin in roughage on *in vitro* gas production technique

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Abstract

The objectives of this was to study the effect of different molecular weight tannin on *in vitro* gas production technique. It was found there was supplementation with high molecular weight tannin from neem with purple napier. There was reduced gas production when with reduced methane, ammonia nitrogen production which shows that the supplementation can reduce fermentation waste of microorganisms in ruminants and increased volatile fatty acid.

Keywords: low molecular weight tannin from mangosteen, high molecular weight tannin from neem rice straw napier pak chong1 purple napier

Introduction

Utilization of roughage and by-productions from agriculture for ruminant feeding leads to reduced production costs. Using by-production in large quantities can substitute concentrate sources. It has been found that the price of animal feed has increased steadily (Wanapat, 2010). In addition, it was found plants with tannin compounds can be used as by-pass protein (Wanapat 2533). Plants with tannin compounds can be beneficial on microbial fermentation in the rumen of animals (Makkar, Bluemmel, and Becker, 1995). This is a way to reduced production costs and local resources can be used to provide the highest benefit. Therefore the objective of this study about the effects of different molecular weight tannin in roughage on *in vitro* gas production technique.

Methodology

Roughage 3 species of rice straw (RS), napier pak chong 1(NP1) and pruple napier (PNP) which supplement tannin from Low molecular weight Magosteen and High molecular weight Neem supplement at 4% of DM .Samples of each tannin plant leaves with Low molecular weight Magosteen , High molecular weight Neem were used in the study.

Rumen fluid was collected from the drilling SAC of Thailand native goats before feeding in the morning, then taken to the laboratory immediately and squeezed through four layers of gauze and mixed (1:2 v/v) with an artificial saliva. The total gas produced were measured at 12, 24 h of incubation, and net gas production values were corrected by subtracting blank values from the samples (Menke&Steingass, 1988). Cumulative gas production data were fitted to the model of Orskov& McDonald (1979) described as $Y = a + b(1 - e^{-ct})$; where Y represents the cumulative gas production at time t , a is the gas production from the immediately soluble fraction, b is the gas production from the insoluble fraction, c is the rate of gas production (/h) and $(a+b)$ is the potential gas production. At 12 and 24 h of incubation, the methane (CH₄) volume was measured by absorbed produced CO₂ into the content by adding 4.0 mL of 10 M NaOH. Therefore, the gas volume remaining in the syringe considered to be

CH₄ (Fievez et al, 2005). Values of pH of acetate(C₂), propionate(C₃), butyrate(C₄) were determined by gas chromatography(GC) and total volatile fatty acid(TVFA) was calculated from C₂, C₃ and C₄ (Fievez et al., 2005). The NH₃-N was determined by use of crude protein analysis. (AOAC,1990; Cheng, 2007). The data of *in vitro* gas production were analyzed using the PROC GLM of SAS (1998). Multiple comparisons among treatment means were identified using Duncan's New Multiple Range Test (Steel &Torrie, 1980). Mean differences were considered significant at P<0.05.

Results and Discussion

Data of *In vitro* gas productions: Supplementation with high molecular weight tannin from neem and low molecular weight tannin from mangosteen have effect on gas production. However supplementation with different molecular weight tannin in roughage found that when supplementation with high molecular weight tannin from Neem in purple Napier grasses have tendency to makes decreased production of gas.

Table 1. Effects of different molecular weight tannin on *in vitro* gas production technique

R	RS			PK1			PN			SEM	P-Value		
T	0	L	H	0	L	H	0	L	H		R	T	R*T
Gas kinetics													
a	44.00 ^d	43.00 ^d	43.20 ^d	49.00 ^{ab}	49.20 ^{ab}	50.00 ^a	48.00 ^{ab}	47.00 ^{bc}	45.00 ^{cd}	0.43	0.0001	0.3092	0.1141
b	142.00 ^e	146.00 ^d	130.00 ^f	149.00 ^{bc}	151.00 ^{ab}	152.00 ^a	148.00 ^{cd}	151.00 ^{ab}	151.00 ^{ab}	0.42	0.0001	0.0001	0.0001
c	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	2.45			
a+b	186.00 ^e	189.00 ^e	173.20 ^d	198.00 ^{ab}	200.20 ^{ab}	202.00 ^a	196.00 ^b	198.00 ^{ab}	196.20 ^b	0.85	0.0001	0.0004	0.0001
Total gas production (mL/g DM of substrate)													
12-h	28.36 ^d	29.05 ^d	22.15 ^e	36.52 ^{abc}	37.62 ^{ab}	38.88 ^a	35.07 ^{bc}	35.42 ^{bc}	33.51 ^c	0.61	0.0001	0.0186	0.0021
24-h	41.74 ^d	43.53 ^d	32.55 ^e	51.63 ^{abc}	53.22 ^{ab}	54.72 ^a	49.93 ^{bc}	51.02 ^{abc}	49.16 ^c	0.72	0.0001	0.0027	0.0001

a,b,c,d,e Within rows, values followed by different letters are significantly different (P<0.05)

RS: rice straw, PK1: napier pak chong1, PN: purple napier, L: low molecular weight from mangosteen, H: high molecular weight from neem, R:roughage, T:tannin

a:the gas production from the immediately soluble fraction, b:the gas production from the insoluble fraction, c:the gas production rate constant, a+b: the potential extent of gas production.

Table 2. Effects of different molecular weight tannin on PH Methane and NH₃-N production

R	RS			PK1			PN			SEM	P-Value		
T	0	L	H	0	L	H	0	L	H		R	T	R*T
PH													
12-h	6.78 ^a	6.73 ^b	6.62 ^{de}	6.62 ^d	6.63 ^{cd}	6.60 ^e	6.73 ^b	6.65 ^c	6.61 ^{de}	0.004	0.0001	0.0001	0.0001
24-h	6.81 ^b	6.75 ^c	6.88 ^a	6.72 ^d	6.61 ^e	6.63 ^{fg}	6.68 ^e	6.66 ^f	6.72 ^d	0.006	0.0001	0.0001	0.0001
Methane (CH ₄) production (mL/g DM of substrate)													
12-h	3.40 ^d	3.00 ^d	8.20 ^b	9.20 ^{ab}	11.20 ^a	9.20 ^{ab}	9.40 ^{ab}	5.20 ^{cd}	7.20 ^{bc}	1.00	0.0001	0.0696	0.0002
24-h	2.20 ^c	3.20 ^c	3.40 ^c	3.20 ^c	7.20 ^b	14.20 ^a	8.80 ^b	4.20 ^c	8.20 ^b	1.30	0.0001	0.0001	0.0001
Ammonia nitrogen (NH ₃ -N) production (mg)													
12-h	22.41 ^a	10.75 ^c	7.83 ^d	16.58 ^b	10.75 ^c	7.83 ^d	22.41 ^a	7.83 ^d	4.91 ^e	2.18	0.0018	0.0001	0.0001
24-h	10.75 ^c	7.84 ^d	2.00 ^f	4.92 ^e	1.97 ^f	0.91 ^g	19.50 ^a	13.67 ^b	7.84 ^d	2.14	0.0001	0.0001	0.0036

a,b,c,d,e,f,g Within rows, values followed by different letters are significantly different (P<0.05) NH₃-N: ammonia nitrogen

Data of pH, Methane and NH₃-N production: Supplementation with high molecular weight tannin from neem with purple napier have the tendency to have reduced pH and ammonia nitrogen. However supplementation with low molecular weight tannin from Mangosteen in Napier Pak Chong1 have the tendency for reduced methane production. This

show that supplementation tannin can reduced greenhouse gas from the fermentation of microorganisms in the rumen.

Data of volatile fatty acid: Supplementation with high molecular weight tannin from neem and purple napier have the tendency to increase volatile fatty because roughage will have large quantities of acetic acid and low quantities of propionic acid, when compared with food like flour and sugar.

Table 3. Effects of different molecular weight tannin on volatile fatty acid

R	Time	RS				PK1			PN		SEM	P-Value		
T		0	L	H	0	L	H	0	L	H		R	T	R*T
C2 mmol/L	12-h	4.53 ^c	5.64 ^c	11.60 ^c	11.91 ^c	15.65 ^b	21.18 ^a	11.91 ^c	9.56 ^d	13.42 ^c	0.41	0.0001	0.0001	0.0001
C3 mmol/L	12-h	5.80 ^{bc}	6.09 ^{bc}	5.41 ^c	5.25 ^c	9.77 ^a	7.97 ^{ab}	5.25 ^c	6.31 ^{bc}	6.82 ^{bc}	0.42	0.0074	0.0082	0.0434
C4 mmol/l	12-h	11.01 ^b	7.58 ^{cd}	6.31 ^{cd}	5.71 ^d	14.39 ^a	8.20 ^c	5.71 ^d	7.93 ^{cd}	7.15 ^{cd}	0.41	0.0005	0.0001	0.0001
C2 mmol/L	24-h	16.22 ^{bcd}	14.72 ^d	18.42 ^b	16.51 ^{bcd}	15.54 ^{cd}	17.46 ^{bc}	17.24 ^{bc}	17.33 ^{bc}	28.55 ^a	0.42	0.0001	0.0001	0.0001
C3 mmol/L	24-h	6.39	5.47	6.70	6.00	6.22	5.67	7.27	7.07	7.03	0.41	0.118	0.8685	0.7871
C4 mmol/l	24-h	7.71	6.43	6.48	7.10	6.28	6.16	7.04	6.85	5.88	0.41	0.4348	0.324	0.7282

a,b,c,d Within rows, values followed by different letters are significantly different (P<0.05)

C2: Acetic acid, C3: Propionic acid, C4:Butyric acid

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Effect of *Pleurotus* species pretreatment of lignocellulose on a reduction in lignin and the biodegradation of rice stubble

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Abstract

The aim of this study was to examine the bioconversion of rice stubble fermentation with *Pleurotus ostreatus* (POT), *Pleutus sajor-caju* (PSC) and *Pleurotus eous* (PE). The rice stubbles was inoculated with the fungi and incubated in the dark cupboard in the laboratory at 30°C and 75% relative humidity (RH). The chemical composition and *in vitro* degradability of untreated rice stubble and treated rice stubble with *Pleurotus* species were analyzed at day 20, 25, 30, 35 and 40th inoculation. Results shown that all of fermentation by *Pleurotus* fungi treatments were apparently increased ($p < 0.001$) in crud protein (CP) content when compared with the control. Whereas significant decreased in neutral detergent fiber (NDF), acid detergent fiber (ADF), acid detergent lignin (ADL), hemicellulose, and cellulose contents of rice stubbles by fungal fermentation.

Keywords: white-rot fungi, rice stubble

Introduction

Many crop residues from the human food industry have in common a high biomass, low crude protein content of approximately 3 to 4% and high content of crude fiber of approximately 35 to 48% (Devendra, 2009). The problems of farmers who raise ruminants in summer are using rice straw replace grass. In currently rice straw was employed as ruminant feed over 87% of the roughage feed (Malik et al., 2015; Peripolli et al., 2017) as well as rice is harvested with a mechanical harvester affected to the rice straw product consists of rice stubble (rice stubble is a part of rice production system and we are not using it), which high of lignin compound. Rice stubble compound high of lignin binds cellulose and hemicellulose consistency than rice straw. Therefore, using white-rot fungi to break lignin with cellulose or hemicellulose bonds is an alternative method. This is likely to increase nutrients digestibility and may be a combination of several methods to achieve maximum utilization of nutrients.

Fungi in white-rot fungi group produce enzymes which contain lignin peroxidase (LiP), manganese peroxidase (MnP) and laccase these microbes are well known (Bugg et al., 2011). Usual in plants, lignin, cellulose and hemicellulose are compound together as lignocellulose. In general plants consist cellulose 30-45%, lignin 13%, but in hardwood cellulose 45-56%, lignin 18-30% (Chen, 2014). The gold of this experiment was studied species of *Pleurotus* fungi to degrade lignocellulosic materials, to improve the utilization of rice stubble as feed.

Methodology

Fungal species and spawn preparation

Three white-rot fungi, *P. sajor-caju*, *P. eous* and *P. ostreatus* were used in this experiment. The jam bottles (120mls) used for this study were thoroughly washed, dried for 24 hrs, at 100°C and 25.0 g of rice stubble were put in jam bottle and added 70 ml of distilled water. The bottle was covered with aluminum foil and sterilized in the autoclave at 121°C for 15 min (Kinfemi et al; 2009). The substrate was inoculate with 2% mycelia disc and covered immediately. They were kept in the dark cupboard in the laboratory at 30°C and 75% relative humidity (RH) for 20, 25, 30, 35 and 40 days of inoculation.

Chemical analysis

Proximate analysis by AOAC. (1995) and Neutral Detergent Fiber (NDF), Acid Detergent Fiber (ADF) and Acid Detergent Lignin (ADL) were assessed using the methods of Van Soest et al. (1991).

Results and discussion

Chemical composition

Chemical composition of untreated and treated rice stubble with *Pleurotus Ostreatus* (POT) found that the Crude Protein (CP) and ash contents of the fungal treated substrates increased from day 20th incubation when compared with control. POT Fungal treatment reduced DM, OM, EE, ADF, NDF, and cellulose ($p < 0.05$) at day 20th incubation, but DM and EE were increased after day 25th fermentation were not affected by fungi treated. ADL and hemicellulose were significantly decreased ($p < 0.01$) at day 25th by POT fungi incubation. These results similar with Jafari et al. (2007) studied *P. Ostreatus* treated rice straw found the constituents of OM, hemicellulose, ADF, NDF, and ADL were apparently decreased ($p < 0.05$) when compared with untreated fungi. The CP increase may have been an effect of increased fungal biomass (Chen et al, 1995). The increase in CP contents may be due to secretion of certain extracellular proteineous enzymes into the waste during their breakdown and its subsequent metabolism (Akinfemi et al., 2010).

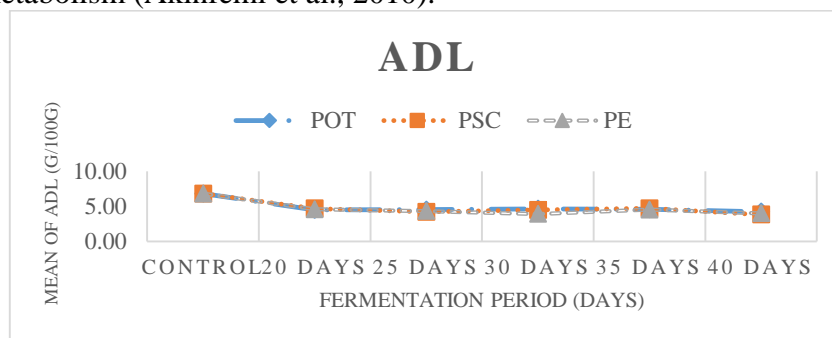


Figure 1. Changes in levels of acid detergent lignin (ADL) in rice stubble fermented by *Pleurotus sp.*

Chemical composition of untreated and PSC treated rice stubble found fungi treatment decreased OM content was significantly reduced ($p < 0.01$) at day 30th incubation and proceed decreased value as long as fermented fungi, while ash content was increased ($p < 0.01$) at day 30th incubation. DM, CP, and EE contents were increased number by fungi fermentation but not significant difference. ADF, NDF, hemicellulose, and cellulose were significantly reduced by PSC fungi fermentation ($p < 0.01$) at day 20th incubation. ADL content was decreased ($p < 0.05$) by fungi activity at day 35th fermentation. When cultivated rice residue was inoculated with the PE fungi a decrease ($p < 0.05$) in OM concentration. This effect was related a greater

mineralization of the organic matter, indicated by the increase ($p < 0.05$) in ash concentration and greater biomass value, implied by the increase ($p < 0.01$) in CP content. DM and EE contents were not affected by PE fungi fermentation ($p > 0.05$). These results supported earlier studies (Mahesh and Mohini, 2013; Yilkal, 2015). The fraction of NDF, ADF and cellulose were significantly decreased upon fungal treatment ($p < 0.01$) at day 20th of incubation and constant concentration until the end of testing except NDF fraction precede reduced amount by fungi fermentation. The quantity of ADL content was apparently reduced ($p < 0.01$) on fungi treatment at day 25th incubation; continue decreased number along with the time fungi fermentation. Hemicellulose component was significantly decreased by fungi inoculate ($p < 0.01$) at day 30th incubation and proceed reduced until the testing last.

Conclusion

Utilization of agricultural residues treated with white rot fungi as ruminants feed has been demonstrated in numerous studies. This study shown that all of fungal species resulted in a reduction of the cell wall components, whereas increased CP and ash contents in experimental rice stubbles. The properly fermented period as high nutritive values of fermented rice stubble depend on fungus species.

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Early evaluation of 65th days after sowing *bmr* sorghum productivity grown on swamp soil applied with different levels of *Biochar*

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Abstract

Marginal soils utilization for plant growing has limiting factor, *i.e.* low soil acidity, high of Al^{3+} , which could inhibiting plant surviving and productivity. *Biochar* was good soil amendment that can utilize as one of substance to transform soil biological and chemical status. The research was conducted by growing G.20 line brown midrib (*bmr*) sorghum in *green house* system. Sorghums were grown in 45 kg capacity polybag which applied by four levels of *biochar* (0, 5, 10, and 15 ton ha⁻¹). Sorghum was harvested at 65 days after sowing and the observation parameters in this research were: 1) leaf percentage, 2) individual weight, 3) dry matter (DM) content, and 4) stem °brix value. The application of *biochar* until 15 ton ha⁻¹ on swamp soil didn't give significant effect to *bmr* sorghum's leaf percentage, individual weight, and brix level, nevertheless it's have significant effect on DM content, which 10 and 15 ton ha⁻¹ level was have highest DM percentage.

Keywords: brown midrib, *biochar*, swamp, productivity

Introduction

Nowadays, forage source production was started to utilizing the potency of marginal soils, such as swamp area. The marginal soils utilization for plant growing has limiting factor, *i.e.* low soil acidity, high of Al^{3+} , which could inhibiting plant surviving and productivity. In other hand, soil fertility increasing program with adding organic or chemical fertilizer independently on marginal soil will encountered by the problem of soil nutrients leaching. Sorghum has ability to grow well, and have good biomass production on marginal soil. This potency makes sorghum as promising forage source in the future.

Biochar was good soil amendment that can utilize as one of substance to transform soil biological and chemical status. They provide soil microbes' habitat without degraded and applied *biochar* generally indwell on soil for long time (hundred or thousand years). In long term, *biochar* didn't disturb soil carbon-nitrogen balance, but they can hold up, make water and soil nutrition available for plant. *Biochar* will increase soil nutrient availability and retention, so they can increase plant productivity (Gani, 2009). *Biochar* application on marginal swamp soil, be expected can change soil characters, and soil organic matter would relatively well preserved to optimized marginal soil, specially swampy area for sorghum based forage producing.

Methodology

This research was conducted by growing G.20 line brown midrib (*bmr*) sorghum from SEAMEO Biotrop Bogor in *green house* system. Sorghums were grown in 45 kg capacity polybag (as research unit) which applied by four levels of *biochar* (0, 5, 10, and 15 ton ha⁻¹).

Research was designed using Randomized Complete Design (RCD) with four treatments, and four replications.

Sorghum sowing was conducted by create five holes in each research unit within ± 3 cm deep, filled by three sorghum G.20 line seeds, and insecticide-nemaside were applied to prevent germination disturbances. During sorghum cultivation, there was twice (15 and 30 days after sowing (DAS)) NPK fertilizer application for 270 kg ha^{-1} . Insect and fungi disturbances were anticipated using pesticide/ insecticide as well as fungicide.

Sorghum was harvested at 65 DAS with consideration the plant was reach best phase as forage source. The observation parameters in this research were: 1) leaf percentage, 2) individual weight, 3) dry matter (DM) content, and 4) stem °brix value. Significances different of research results of Analysis of Variance (ANOVA) were tested using Duncan Mean Range Test (DMRT).

Results and discussion

Initially, brown midrib (*bmr*) was result of genetic mutation from some grasses species, which has lower total lignin content on the plant parts. In the recent years, *bmr* types were applied on green fodder (forage) *i.e.* sorghum, sudangrass, and corn (Miller and Stroup 2003). *bmr* sorghum was one of sorghum breeding that focused to the forage source purpose. The average lignin content of *bmr* line was lower compare with sweet sorghum varieties (Kurniawan *et al.* 2016). Research results were describes on the table below.

Table 1. Leaf percentage, individual weight, dry matter content, and stem °brix of sorghum

Parameters	Biochar Applied Levels			
	0 ton ha ⁻¹	5 ton ha ⁻¹	10 ton ha ⁻¹	15 ton ha ⁻¹
Leaf Percentage (%)	57.71± 4.47 ^{ns}	56.85± 2.65 ^{ns}	54.81± 2.31 ^{ns}	53.41± 2.67 ^{ns}
Individual Weight (gram)	168.84±42.84 ^{ns}	181.83±32.58 ^{ns}	182.83±14.69 ^{ns}	198.92±29.59 ^{ns}
Dry Matter Content (%)	13.28± 0.74 ^b	13.38± 1.16 ^b	15.30± 1.03 ^a	14.58± 1.14 ^{ab}
Stem Brix (°brix)	6.36± 0.72 ^{ns}	5.99± 0.60 ^{ns}	6.95± 1.03 ^{ns}	6.53± 1.14 ^{ns}

ns: not significant

different superscript in the same row/ parameters have significant different ($p < 0.05$)

Leaf percentage

There was no significant difference ($p > 0.05$) on leaf percentage due to the treatments of this research. The leaf percentages were started from 53.41 to 57.71%. Kurniawan *et al.* (2014) on their research using *bmr* sorghum which harvested on 80 DAS reported leaf percentage around of 30%. The leaf: stem ratio decreasing and the increasing of stem percentage probably could decrease the forage quality due to leaf's crude protein content was higher compare to the stems. Leaf was edible part which easier to degrade than stems part (Silungwe 2011).

Individual weight

Individual weights reflect the sorghum productivity on every single hectare sowing unit. They assumed that higher individual biomass weight would produce higher fresh yield on the field. The research result showed that all levels *biochar* application didn't give significant effect ($p > 0.05$) on sorghum individual weight (168 to 198 gram). That yields were lower if compared with other *bmr* sorghum research (Kurniawan *et al.* (2014)) which harvested on 80 DAS with the average yield 530 gram. Weather factor become crucial that influence the yield. As long research conducted, the location was dominated by rain and lack of sun light. It's allegedly causing the low of individual weight.

DM content

DM content in this research was significantly affected ($p < 0.05$) by *biochar* adding level. The 10 to 15 ton ha⁻¹ applications were obtaining the highest DM percentage (14.58 – 15.30%) compared to the others. These results were lower if compared to Kurniawan *et al.* which reported 19.24 – 19.82% while *bmr* PATIR lines were harvested at 80 DAS. Overall, general characters of *bmr* lines were the reduction of DM production, re-growth ability, total biomass, tillering, and longer time to get blooming phase (Pedersen 2005).

Brix stem

Sorghum stem's sugar content was expressed in °brix. The ° brix level became important parameters to sorghum genotype selection which have high sucrose accumulation (Kawahigashi *et al.* 2013). Research results showed that brix level (5.99 to 6.95) didn't have significant difference ($p > 0.05$) as a result of *biochar* adding levels. This level was lower about half point of the result of Kurniawan (2014). The sorghum sweetness was one of important objectives of sorghum as forage source development beside its tenderness and leaf proportion (Bian, 2006). Sucrose content which reflected from brix level of *bmr* would be useful for its utilization as high quality forage preservation, due to sucrose was good substrate on fermentation process (silage) (Kurniawan, 2014).

Conclusion

The application of *biochar* until 15 ton ha⁻¹ on swamp soil didn't give significant effect to *bmr* sorghum's leaf percentage, individual weight, and brix level, nevertheless it's have significant effect on DM content, which 10 and 15 ton ha⁻¹ level was have highest DM percentage. For the comprehension result, it might need to evaluate *biochar* affectivity on sorghum re-growth plant, which has longer time for *biochar* performance on soil.

Acknowledgement

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Use of live yeast culture microbial as a co-active in the rumen on gas kinetic by using *in vitro* gas production technique

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Abstract

The objective of this study was determined the effect of autochthonous live yeast culture with doses on gas production by using *in vitro* the gas production technique. The experimental design was 4x2 factorial in completely randomized design (CRD) with three replication per treatment. The effect of factors A was consisted to YCO, yeast culture (Control, no inoculated of live yeast), YC1, live yeast strain 1 culture, YC2, live yeast strain 2 culture and YC3, live yeast strain 3. The factor B consisted to two dose, which 10 and 20 % of fermented fluid. The total gas produced in the head of syringes were recorded at 2, 4, 6, 8, 10, 12, 24, 36, 48 and 72 h of incubation. As a results, addition live yeast culture, YC3 with 20 % of fermented fluid could be improved gas kinetic, cumulative gas production at 36, 48 and 72 h of incubated ($p < 0.05$).

Keywords: yeast, live yeast culture, gas production

Introduction

In recently, after antibiotics were banned by the European Union the animal nutritionists were sought a substitute for antibiotics due to prevented of product residues-antibiotics. Otherwise, the addition of yeast is not only increased productivity in animal, but also to decreases the risk of animal digestive transfer of potential human pathogen (Chaucheyras-Durand et al., 2012). Whereas, The researchers, for instance, Armato et al. (2016), showed that yeast cell wall had good potential to be a rich source of vitamins, and live yeast as dietary allow feed additive a better utilization of feed for dairy cows. In spite of the supplementation of yeast products were results varied of each studies, the rumen autochthonous yeast could be positive effected nutrient digestibility and improved ruminal microbial communities. Therefore, the aim of the experiment was determined the supplementation of different ruminal yeast strain culture and concentrate level on gas kinetics cumulative volume of gas production

Methodology

This experiment was conducted *in vitro* gas production technique at various incubation time intervals. The study used a design was 4x2 factorial in completely randomized design (CRD) with three replication per treatment. A factors were consisted 3 rumen yeast strain (YC1, YC2, YC3 and YC0) and B factors were composed by two levels, which are 10 and 20 % of artificial fermented fluid. The rumen yeast culture isolated from the ruminant animals in previous study, briefly yeasts were isolated from ruminants partial part of Thailand, steer beef

cattle, goats (SUT goat and sheep research), dairy cows (SUT Farm) and buffalos (local farm), that follow the isolation method by Paserakung et al. (2015) and the K.M.P. company. Then, 12 yeasts isolated were tested to performance by the pH (3-7.5), tolerance to VFA in medium, and propagation on anaerobic condition. Thereafter, the 3 yeasts isolated candidate going to the next step.

The single colony of each yeasts candidate were incubated in broth medium 100 ml according to Agarwal et al. (2000) and also incubate for 30°C at 24 h. Afterward, live yeast culture were inoculated in the strain rumen fluid with according to Menke and Steingass (1988). Thirty-ml of buffered rumen fluid solution were dispensed into 100 ml calibrated glass syringes containing 200 mg substrate, which a total mixed ration (TMR) were substrate by concentrate (commercial feed 14 % of CP) and roughage (rice straw) ratio follow as 60 : 40 ratio. During the incubation, the total gas production was measured at 2, 4, 6, 8, 10, 12, 24, 36, 48 and 72 h. Net gas production values were corrected by subtracting blank values from the samples. The cumulative gas production data was fitted to the model of Ørskov and McDonald (1979) as follows : $p = a + b(1 - e^{-ct})$; where p represents the cumulative gas production at time t , c is the rate of gas production (/h) and $(a+b)$ is the potential gas production.

Statistics analysis

All data were analyzed as factorial completely randomized design by using the PROC ANOVA of SAS (1998). The statistics significant differences between treatments were determined using Duncan's News Multiple Range Test (DMRT) (Steel and Torrie, 1980).

Results and discussion

Gas kinetics were not interaction ($P < 0.05$) among main effect, but the main factor B founded that a , b and c values were highly significant different ($P < 0.01$) (Table 1). Whereas, the cumulative gas production profiles were showed by the Figure 1. The volume of gas production at 24 h incubation were highly significant different ($P < 0.01$) between live yeast strain and gas volume increased when added high dose follow as the Table 1.

Table 1. Effect of live yeast culture and concentrated level supplementation on gas kinetics were used by an *in vitro* gas production.

Items	Gas kinetic ¹				GP, ml at 24 h
	a, ml.	b, ml.	c, ml/h	a+b, ml.	
² Strain					
YC0	-18.54	124.87	0.14 ^a	106.33	99.37 ^a
YC1	-11.58	120.37	0.09 ^b	108.80	93.93 ^b
YC2	-13.77	120.69	0.09 ^b	106.92	90.23 ^c
YC3	-14.48	121.46	0.09 ^b	106.98	91.20 ^b
³ Doses, % of fermented fluid					
10	-8.38 ^b	114.67 ^b	0.08 ^b	106.08	87.04 ^b
20	-20.80 ^a	129.03 ^a	0.12 ^a	108.22	100.33 ^a
⁴ P-Value					
YC vs Dose	ns	ns	ns	ns	ns
YC	0.05	0.06	**	ns	**
Dose	**	**	**	ns	**

¹ a , the readily dietary soluble fraction; b , the insoluble fraction, c , the rate constant for the insoluble fraction; $a+b$, the potential extent of gas production; GP, gas production ²Strain; YC0 = Yeast culture no inoculum, YC1 = yeast culture inoculum strain Y1 (5.1×10^7 cfu/ml), YC2 = yeast culture inoculated yeast strain Y2 (4.3×10^7 cfu/ml), YC3 = yeast culture inoculated yeast strain Y3 (4.1×10^7 cfu/ml)

It could be owing to in present study was differenced of concentrate to roughage ratio and also the medium of yeast culture, which high readily soluble nutrients could be supported growth microorganisms in the rumen. These probably possibility supported inform by Chaucheyras-Durand et al. (2012), who indicated that the yeast or culture may have stimulate bacterial growth through removal of oxygen. However, the yeast's action may differ according to the nature and function of the micro-organism. Likewise, Newbold et al. (1998) suggested that yeast culture provides of many nutrients were importance for microorganism in the rumen. Marrero et al. (2015) demonstrated that the yeast strain (*Candida spp.*) enhances the ruminal fermentation process and the action of microorganisms on gas production, as the same result with this experiment although addition live yeast strain lower than positive control. Moreover, the effect of dose was highly significant different ($P < 0.01$) on gas production and the volatile fatty acid.

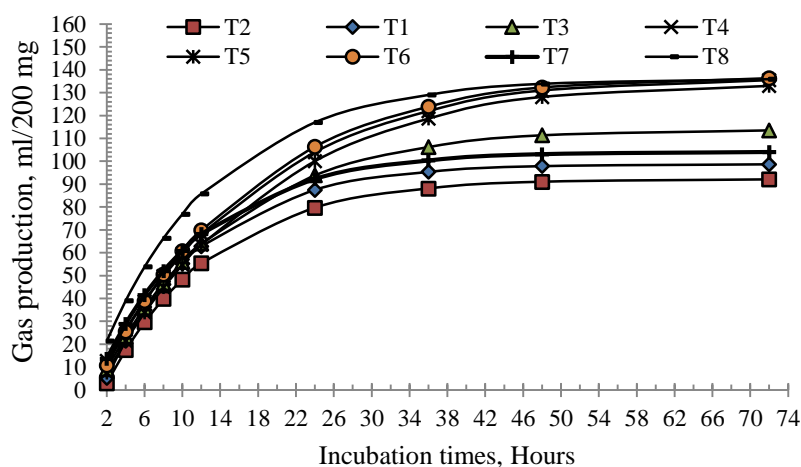


Figure 1. Gas cumulative profile of treatments

T1=YC1 with 10 % of fermented fluid, T2 = YC2 with 10 % of fermented fluid, T3 = YC3 with 10 % of fermented fluid, T4 = YC1 with 20 % of fermented fluid, T5= YC2 YC1 with 20 % of fermented fluid, T6 = YC3 with 20 % of fermented fluid, T7 = YC0 with 10 % of fermented fluid, T8= YC0 with 20 % of fermented fluid.

Conclusion

Based on this experiment, it could be concluded that to addition live yeast culture, YC3 with 20 % of fermented fluid could be improved gas kinetic, gas cumulative.

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Forage yield and nutrients quality of sticky and purple corn stover

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Abstract

The objective of this study was to compare forage yield and nutrients quality of sticky and purple corn stover. Sticky corn of control and anthocyanin rich purple corn using completely randomized design (CRD) with 3 duplicates per treatment. The results showed that, sticky corn stover (SS) and anthocyanin rich purple corn stover (PS) fresh weight data indicated that there was not showed significant different ($p>0.05$), but dry matter (DM) yield of PS significant higher than SS ($p<0.05$). Similarly, PS contained significant higher chemical composition yield ($p<0.05$), which consist of organic matter (OM), gross energy (GE), crude protein (CP), neutral detergent fiber (NDF) and acid detergent fiber (ADF) compared to SS by all the observations. In addition, PS did not have negative effect on the animal dry matter intake (DMI), digestible dry matter (DDM), relative feed value (RFV) and net energy for lactation ($p>0.05$) by our predicted. The present study showed that PS had a significant higher forage and chemical composition yield and did not have negative effect on the animal DMI, DDM, RFV and NEL values. Therefore, PS can be used as a potential ideal feedstuff for the animals in tropical countries due to antioxidant activities of the anthocyanin.

Keywords: sticky corn stover (SS), purple corn stover (PS), forage yield, nutrients quality

Introduction

Anthocyanin, as a group of phenolic compounds widely existing in the plant kingdom. Natural anthocyanin as healthy pigments and have been reported to various biological activities, such as antioxidant, anti-inflammatory, anti-mutagenic, antimicrobial and anticancer activities (He and Giusti, 2010). Purple corn is a rich and economic source of anthocyanin colorants and functional ingredients, which has been cultivated in South America, mainly in Peru and Bolivia and Asia (Jing and Giusti, 2007).

Thailand is a tropical country with different climates from others countries and areas, and ruminant roughage must be supported which are not available in the dry season. Corn stover as a kind of by-product feedstuff and an available energy source for ruminants, which has been popular in Southeast Asia countries (Wattanaklang *et al.*, 2016). Therefore, the objective of this study was to compare forage yield and nutrients quality of sticky and purple corn stover.

Methodology

Sticky corn of control (T1) and anthocyanin rich purple corn (T2) using completely randomized design (CRD) with 3 duplicates per treatment were planted in Suranaree University of Technology (SUT) farm, Nakhon Ratchasima, Thailand from June 16 to September 1, 2016.

The diameter was set to 0.5 meter (m) per line of seed, and all the field management to be consistent. Harvested corn at the same time using cutting machine set for 0.93 centimeter (cm) theoretical length of cut until the corn is ripe. After that, weighed and calculated the yield. On the other hand, collected and mixed samples were dried in the oven at 65°C for 72 h and grinded, and through 1 mm sieve and analyzed chemical analysis. Dry matter (DM), crude protein (CP), ash were determined according to feed proximate analysis of AOAC (1990); organic matter (OM) was estimated from the difference between ash and dry matter; neutral detergent fiber (NDF) and acid detergent fiber (ADF) were measured following by Van Soest *et al.* (1991). Gross energy was measured using a Parr 6200 calorimeter (Moline, Illinois, USA). Dry matter intake (DMI), digestible dry matter (DDM), relative feed value (RFV) and net energy for lactation (NEL) were estimated according to the following equations adapted from Lithourgidis *et al.* (2006): $DMI = 120 / \%NDF$ dry matter basis, $DDM = 88.9 - (0.779 \times \%ADF)$; dry matter basis), $RFV = \%DM \times 0.775$ and $NEL = (1.044 - (0.0119 \times \%ADF)) \times 2.205$.

Statistical analysis

The data was subjected the General Linear Models (GLM) by Statistical Analysis System 9.1 (SAS 9.1). Using the Duncan's New Multiple Range Test compare the treatment means and significant difference was decided to $P < 0.05$.

Results and discussion

Control of sticky corn stover (SS) and treatment of anthocyanin rich purple corn stover (PS) fresh weight data indicated that there was not showed significant different ($p > 0.05$), but DM yield of PS significant higher than SS ($p < 0.05$). In addition, PS contained significant higher chemical composition yield ($p < 0.05$), which consist of OM, GE, CP, NDF and ADF, compared to SS. Anthocyanins have the potential to mitigate photooxidative injury in leaves, both by shielding chloroplasts from excess high-energy quanta, and by scavenging reactive oxygen species. In addition, the presence of epidermal coumaroyl anthocyanins conferred protective benefits under high light. On the other hand, PS had the colour because the anthocyanin so that produced variation in the background, which resulted in a larger number of insect species being camouflaged on the plant (Schaefer and Rolshausen, 2006). Consequently, PS had higher forage and chemical composition yield since the protective effect of anthocyanins for corn.

Table 1. Forage yield and nutrients quality of sticky and purple corn stover

Items	SS	PS	SEM	<i>p</i> values
Forage (kg/ha)	11790.48	12000.00	278.317	0.6227
DM (kg/ha)	2747.12 ^b	3167.99 ^a	71.01857	0.0138
OM (kg/ha)	2572.10 ^b	2949.10 ^a	66.2066	0.0158
GE (Mcal/ha)	10805.13 ^b	12443.89 ^a	279.0541	0.0142
CP (kg/ha)	180.61 ^b	229.35 ^a	5.0284	0.0024
NDF (kg/ha)	1586.23 ^b	1781.77 ^a	40.2094	0.0263
ADF (kg/ha)	676.27 ^b	796.08 ^a	17.7567	0.0088
DMI (g kg ⁻¹ of body weight)	20.79	21.35	0.4503	0.4711
DDM (g kg ⁻¹ DM)	697.23	693.25	7.7910	0.7524
RFV (%)	112.35	114.67	2.4819	0.5764
NEL (Mcal kg ⁻¹)	1.27	1.25	0.0419	0.7524

In the same row, values with different letter superscripts mean significant difference ($p < 0.05$).

Various researches refer negative impact of anthocyanin on intake and production, which had low palatability owing to their bitterness taste (Jöbstl *et al.*, 2004). Also, some negative effects of polyphenols were associated to their interaction with digestive enzyme and epithelium lining digestive trace. For this study, we found that PS did not have negative effect on the DMI, DDM, RFV and NEI ($p>0.05$) by our predicted. Therefore, PS had a potential ideal feedstuff for the ruminants.

Conclusions

The present study showed that PS had a significant higher forage and chemical composition yield and did not have negative effect on the animal DMI, DDM, RFV and NEI values. Therefore, PS can be used as a potential ideal feedstuff for the animals may due to antioxidant function of the anthocyanin. Further study is encourage to understand if feeding PS impact on ruminal fluid microorganism, plasma antioxidant activities and related gene expression in ruminants.

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Effects of aflatoxin levels in the diet on aflatoxins residues in the liver, meat, and egg of laying duck

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Abstract

Research was conducted to study dose-dependent effects of aflatoxin B1 AFB1 on laying duck. AFB1 contaminated-corn AFC was added into diet to achieve levels of AFB1 of 0; 25; 37.5; and 50 ppb. Sixty four of 6 months Alabio laying ducks were randomly assigned into 4 groups of AFB1 levels in the diet. Treatment was conducted for 60 days and at the end of treatment final body weight were recorded and the birds were sacrificed. Meat and liver samples were collected for AFB1 and Aflatoxin M1 AFM1 determination. Meanwhile, egg weight and egg production were recorded since last 15 days of treatment, and egg samples laid at last day were analyzed for AFM1 concentration. AFB1 and AFM1 were analyzed using ELISA tests. Results showed levels of AFB1 contamination significantly $P < 0.05$ reduce body weight gain and egg production. AFB1 levels from 25 until 50 ppb resulted on aflatoxins residue in egg, meat and liver of laying duck. These levels of residues were significantly $P < 0.05$ affected by level of AFB1 contamination in the diet. In conclusion, AFB1 exposure on laying duck through AFC inclusion reduced body weight and egg production, and resulted aflatoxins residues in egg, meat, and liver of laying duck.

Keywords: aflatoxin, aflatoxin residue, laying duck, duck performance

Introduction

Aflatoxin is a secondary metabolite produced mainly by fungus *Aspergillus flavus*, *A. nomius* and *A. parasiticus*. Among of aflatoxins, aflatoxin B1 AFB1 is the most prevalent and toxic compound. International Agency for Research on Cancer IARC since 2002 has listed AFB1 and its metabolite, Aflatoxins M1 AFM1, as carcinogenic substances for human (El-Tras et al., 2011). Recent studies found carry-over of aflatoxin B1 from feed into animal tissues and products (Voelkel et al., 2011). Duck is one of sensitive animal to aflatoxins exposure that related to its liver biotransformation capacity (Diaz and Murcia, 2011). Therefore, consumption of AFB1 contaminated diet may have consequences on duck performance and aflatoxin transfer into duck's products. However, there are only few reports of aflatoxins residues in ducks compared to broiler chickens (Bintvihok et al., 2002).

Previous survey in a duck farming centre area in Indonesia, showed high prevalence of AFB1 contamination in feed and feedstuff for duck ration. Furthermore, AFB1 residue were detected in liver and meat, and AFM1 were detected in the liver and egg collected from that area (Sumantri et al., 2017). This present research was aimed to study the effects of AFB1 levels on laying duck performance, and aflatoxins residues in meat, liver, and egg.

Methodology

AFB1-contaminated corn containing 200 ppb of AFB1 AFC was produced based on Agus et al. (2010). AFC was mixed into commercial feed by replacing uncontaminated corn with AFC to create increasing dietary AFB1 contents of 0 ppb; 25 ppb; 37.5 ppb, and 50 ppb. A total of 64 Alabio laying ducks *Anas platyrinchos borneo* were used in the experiment. Ducks were weighed and randomly allotted to 4 dietary treatments with 4 replicates of 4 birds in each unit. Experimental diet and water were provided ad libitum. The experiment was started when the birds were aged 6 months and lasted for 60 days. Laid eggs recorded and weighted daily starting at last 15 days. Body weight was recorded at the beginning and the end of experiment. At the end of experiment, birds were sacrificed, then livers were collected and weighted. Livers samples were analyzed for AFB1 and AFM1 contents, meanwhile breast meat sample were analyzed for AFM1 content. From each replication, eggs laid at day 60th were pooled for AFM1 analysis. AFB1 and AFM1 contents were analyzed using ELISA kits produced by Romer Lab. Data was analyzed using analysis of variance according to a completely randomized design. All statistical analysis were performed using software package SPSS version 18.0.

Results and discussion

Laying duck performance

Body weight gain, egg production, and egg weight of laying duck were significantly affected by AFB1 levels in the diet. Data on Table 1 shows live weight gains were reduced by higher AFB1 levels in the diet. Diet containing 50 ppb AFB1 or more significantly reduced weight gain in duck compared to chicken (Ostrowski-Meissner, 1983). AFB1 exposure reduced the efficiency of feed utilization in duck (Verma et al., 2002), and detrimental effects of AFB1 on the performance was dose-dependent response (Wan et al., 2013).

Table 1. Performance of laying duck received different level of AFB1 content in the diet.

AFB1 levels ppb	Average Daily Gain g	Egg weight g	Hen Day Average %
00.0	144.06 ^b	59.95 ^b	37.50 ^a
25.0	76.88 ^{ab}	56.78 ^a	45.31 ^a
37.5	56.67 ^{ab}	57.63 ^a	56.25 ^b
50.0	34.06 ^a	60.00 ^b	43.75 ^a

^{a,b} Means in each column with different superscripts are significantly different $P < 0.05$

Table 2. AFB1 residues in liver and egg of duck received different levels of AFB1 in the diet

AFB1 levels ppb	AFB1 residue ppb		AFM1 residue ppt		
	Liver ^{NS}	Egg	Liver	Meat	Egg
00.0	0.15	0.50 ^a	0.29 ^a	31.67 ^a	0.14 ^a
25.0	1.07	2.41 ^b	0.32 ^b	99.72 ^a	0.23 ^a
37.5	1.42	1.68 ^a	0.35 ^c	123.32 ^a	0.36 ^b
50.0	0.93	1.22 ^a	0.29 ^a	402.25 ^b	0.37 ^b

^{a,b,c} Means in each column with different superscripts are significantly different $P < 0.05$; ^{NS} Not significantly different $P > 0.05$

Aflatoxins residues

This study indicated consumption of AFB1 contaminated diet results in aflatoxins residues in meat, liver and egg of laying duck. As shown in Table 2, AFB1 contents were found in very low concentration in the liver and egg < 2 ppb. Similarly, AFM1 contents were also

detected in very low concentration in liver and egg < 2 ppt, but surprisingly, AFM1 content in meat was detected on significant level > 50 ppt. High level of AFM1 found in meat in this study was inconsistent with other's studies.

Experiment by Bintvihok et al. (2002) on chicken, duck, and quail showed aflatoxins residues were found higher in liver than in the muscle, and aflatoxins in the egg were lower or similar to in the liver. Report on AFM1 residue in the products of duck is still limited; especially in the egg. Zaghini et al. (2005) reported no residues of AFM1 detected < 0.01 ppb in egg of laying hens fed with diet containing 2,500 ppb AFB1 for four weeks. Similarly, negative detection of AFM1 in the liver also resulted in that experiment, confirmed that only small quantities of aflatoxins are likely to be stored in the hen tissues.

Conclusion

This study showed diets containing AFB1 below threshold limit for duck 50 ppb may transfer its residues into meat, liver, and egg of laying duck. In contrast to previous studies, this present study reported noticeable levels of AFM1 in meat of laying received diet containing AFB1 between 25 to 50 ppb.

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Enrichment of feedstuff with fermented soybean peel to increase rabbit body weight

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Abstract

This study aimed at finding out the best feed supplement formula to increase Rabbit Body Weight. A randomized block design with one factor namely the percentage of fermented peel added (0%; 5%; 10% and 15% w/w) on to the plan feedstuff and replicated six times was carried out to run this study. The addition of 10% (w/w) of fermented soybean peel providing the highest dry feed material consumption (41.86 g/head/ day), but the increase of body weight was only (16.83 g/head/day) which is lower than that of the addition of 15% fermented peel (17.45 g/head/day). A significant difference among treatment found on the feed conversion. The lowest feed conversion was obtained in treatment of 15% fermented feed (2.36 g/head/day). After 24 hours of fermentation the slurry became very moist due to the absorption of water from the environment. To extend the storage stability of the fermented feed the addition of 5% maltodextrin and 0.5% tween 80 shown the best result of granulated fermented feed which is stable at room temperature (25°C) and could withstand until 1 month of storage. The moisture content of granulated feed supplement is about 11.2%. The proximate analysis of granulated feed shown that after being processed contain the isoflavone of the granulated animal feed supplement is 10,100 ppm.

Keywords: feedstuff, granulated flour, bodyweight, fermented and soybean peel

Introduction

Fermented soybean (tempeh) is one of the most important vegetable protein source which has gained consumer acceptance by most of Indonesian people. Prior to processing the bean was cooked and steamed and the peel of the bean is removed. Kumalaningsih and Surya (2012) and Ardiansyah *et al.* (2014) stated that about 50.92 – 67.898 kg per year of solid waste is discarded and sold as animal feed of low prices. Furthermore Nasahi (2010) reported that solid waste contain high valuable bioactive compound as glycoside and should be degraded into three biotic namely dietary fibre, microbes and also isoflavone through fermentation process.

The nutritional benefit of solid waste (peel) should be therefore being socialized to the farmers to enrich the ordinary feedstuff to increase the quality of animal feed. However the preparation practices starting from the show chart, and formulation as well as the storage stability of the healthy feed supplement which could be carried out by the farmers should be clearly explained.

de Blas and Wiseman (2010) stated that rabbit is one of the most potential animal having a distinct digestive system which could metabolize dietary fibre and converted to volatile fatty acid which is main factor as source of energy to support the growth of the animal. Socialization of this method to the farmers is urgently required. However the low level

of handling and technology of the farmers at rural region become the main hindrance the extension service for making feed supplement.

Under such circumstances, second stages should be therefore being carried out for the product of feed supplement which is easy to perform and mainly at the rural region. The use of soybean waste (peel) as raw material for making probiotic feed supplement containing microbes is expected to provide beneficial effect.

Effective microbe (EM4) has been commercialized and most of farmers known the use of this organism for the degradation of solid or liquid waste (Saleh, 2008). The inoculation of EM4 on to the solid soybean or peel waste is expected could hydrolyzed the glycoside found in the peel to be several biotic.

However the main important factor is how to stabilize the storage stability of this fermented peel. Previous study carry out by Zulfikar (2015) stated that the use 5% dextrin and 0.5% tween 80 could protect the biotic during storage. The objective of this study is to find out the best processing method for making granulated fermented peel containing bioactive. The enrichment of the ordinary feedstuff with the granulated fermented soybean waste is thought beneficial not only reducing the environmental problem but also increasing body weight of the animal.

Methodology

Material

Soybean peel was purchased from the small scale traditional fermented soybean (tempeh) located at Malang region, East Java Province, Indonesia. Feedstuff was prepared in the following composition: yellow corn, cake of coconut extraction, rice bran, fish protein concentrate, salt and mineral. The standard feed (BRI) is a from tofu waste

Processing of fermented solid waste for Rabbit feed

The solid waste or peel of soybean was weighed 100 g and process blended and pressed again until the moisture content reached 40%, the pasteurized for 15 minutes. Commercial effective microbe (EM4) was prepared by diluted 10 ml of concentrated liquid EM4 on to 900 ml aquades and added with 2 g of sucrose than incubated at 24 hours to experiment. Solid waste (peel) 100 g of was grinded and pressed to reached a moisture content of 40% (w/w) then pasteurized for 15 minutes, cooled and inoculated with prepared culture of EM4 (1%) then added with 2.5% skin milk, and 2 g of sucrose. Prepared cultures of EM4 (1%) was the inoculated on to the solid soybean waste incubated for 24 hours, and used to enrich the feedstuff based on the treatment.

Feeding Trial

The Rabbit New Zealand variety with weight variete from 200-900 g were used for the feeding trial the selected Rabbit were divided into three groups. Including to the body weight, i.s small, medium, and large size. Group I consisting of small Rabbit, Group II consisting of medium Rabbit, and Goup III consisting of large Rabbit. All the cages were given the code of treatment the feed will be given twice per day based on the body weight. All the Rabbit received dry feedstuff 6% based on the body weight. Observation concerning the feed consumption was carried out everyday.

Statistical Analysis

A randomized block design with one factor (0; 5; 10; and 15%) of fermented feed and replicated 6 (six times).

Chemical Analysis

The chemical composition analysis was determined by AOAC series method (Horwitz *et al.*, 2010). Mineral content (AOAC, 2005), dietary fibre (AOAC, 2005), isoflavone (Zhang and Schwartz, 2005), protein (AOAC, 2005). The New Zealand white rabbit age of one month were used and grouped into 4 groups containing one rabbit. Placed in battery cages or individual pan. Each pan containing one rabbit replicated 6 (six) to that is 24 pans.

Results and Discussion

Experiment 1. Effect of enrichment of fermented peels as the rabbit productivity

Dry feed material consumption

Statistical analysis showed that a significant difference between treatment of control and the addition of fermented peel. The results were depicted in Table 1 below.

Table 1. Dry feed material consumption

Treatment	Dry Material Consumption (g/head/day)	Notation
P0 (Control)	39.28	a
P1 (+5% fermented peel)	40.70	b
P2(+10% fermented peel)	41.86	b
P3(+15% fermented peel)	41.23	b

The enrichment of feedstuff with fermented peel from 5% to 15% showed no significant difference on the dry material consumption. However the addition of fermented peel by 10% showed the highest feed consumption (41.86 g/head/day). Apparently the presence of fermented peel containing isoflavone has a significant effect on the palatability of feed as reported by (Kumalaningsih and Surya, 2012).

The increase body weight

The enrichment of fermented peel also increase the rabbit body weight as shown in Table 2 below.

Table 2. The increase body weight

Treatment	The Increase Body Weight (g/head/day)	Notation
P0 (Control)	14.35	a
P1 (+5% fermented peel)	15.67	b
P2(+10% fermented peel)	16.83	c
P3(+15% fermented peel)	17.45	d

The higher increase weight is obtained in treatment of P3 or the addition of 15% fermented peel (17.45 g/head/day). Apparently the more fermented peel added the more increase the body weight. According to Kumalaningsih and Surya (2012) the mixture of the feed supplement not only increase the presence of isoflavone but also enhancement the palatability of feed, consequently this condition improve the feed intake and could increase the body weight.

Feed conversion

The feed conversion is given in Table 3 below. The feed conversion ratio (FCR) is calculated as the following.

$$\text{FCR} = \frac{\text{Feed Intake}}{\text{Average Daily Gain}}$$

Table 3. Feed conversion ratio (FCR)

Treatment	Feed Conversion Ratio (FCR)	Notation
P0 (Control)	2.74	bc
P1 (+5% fermentated peel)	2.60	b
P2(+10% fermentated peel)	2.49	ab
P3(+15% fermentated peel)	2.36	a

Analisis statistic showed that the more concentration of feed supplement the more decrease the feed conversion. The addition up to 15% of feed supplement the feed conversion is 2.36. This is due to the body weight also increase.

Characteristic of the feed supplement

The characteristic of the feed supplement after fermentation is depicted in this Table 4 below.

Table 4. Chemical characteristic of feed supplement

Composition	Before Fermentation	After Fermentation
Crude Protein (%)	17.29	23.92
Crude Fat (%)	6.61	9.78
Ash (%)	3.94	4.05
Fiber (%)	40.18	29.36
M. Content (%)	10.03	15.48
Isoflavone (ppm)	5213.44	7121.42

From the Table above it could be seen that the crude protein content before fermentation was 17.29% (w/w) and after 24 hours increase up to 23.92%. Apparently this is due to the fact that EM4 consisting mixture of microbes that although only being fermented for 24 hours the protein content has increased by 23.92 – 17.29%. According to Ardiansyah *et al.* (2014) EM4 microbes could utilized the energy to form crude protein compound. It is surprising that the crude fiber decreased from 40.18% to 29.36% due to the decomposition of crude fibre by mold or bacteria. This evidence indicated that the cell wall which contain lignin, cellulose and hemicellulose has been converted to be soluble crude fibre. Chao *et al* (2007) stated that achimycetes microbes is one of the potential organism producing cellulose enzym.

The precence of low molecule weight of cellulose is very important for the feedstuff, to improve the digestion system, and also increased the availability of dietary fiber which is shortage during the dry season.

Characteristics of blend feed supplement

Table 5. Chemical composition of fermented soybean peel

Hours	Ingredients					
	Protein	Fat	Ash	Moisture	Fibre	Isoflavone
24	23.90	9.79	4.10	15.48	29.48	7121.42
36	25.17	10.38	5.32	15.89	28.31	7011.30
48	26.98	11.03	6.21	16.17	28.01	6987.41

Experiment 2. Effect of filler and emulsifier on the chemical composition and storage stability on granulated flour

Storage stability of granulated feed supplement

The moisture content in Table 6 increased substantially during storage after 48 hours the peel very moist and the moisture content is about 37.8%. The granulated flour has the moisture content in the range 10.5 – 11.2% and not increase during storage at room temperature (27°C). This avoidance indicated that the method for the granulated flour production has been established. According to Narsih (2013), the use of maltodextrin and tween 80 shown a promising result. Kumalaningsih *et al* (2011), reported that maltodextrin has very soft and gentle carbohydrate and could be absorbed by the organism during storage. The proximate composition of granulated flour is showed in the Table 7.

Table 6. The moisture content of fermented and granulated feed supplement show

Hours	Fermented (%)	Granulated (%)
24	30.6	11.2
36	31.3	11
48	37.8	10.5

Table 7. Chemical Composition of Granulated Flour

Composition	Before Fermentation (%)	After Fermentation (24 hours) (%)
Crude Protein	14.92	16.26
Crude Fat	7.89	12.51
Ash	11.76	4.77
Fiber	20.83	37.89
M. Content	13.44	6.55
Isoflavone	0.000127	0.0078

The isoflavone of the granulated flour is above 10,100 ppm. Hernawati (2010) stated that the existent of isoflavone in the animal feed is important to support the growth and increase the rabbit body weight.

Conclusion

Enrichment of plain feed supplement with fermented peel improve the body weight of rabbit. The use of 5% maltodextrin and 0.5% tween 80 could stabilize the granulated flour during storage. The feeding trial with granulated flour should be further investigated to confirm the prospect of the granulated flour as feed supplement to substitute the existing imported feed supplement used.

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Influence of feed particle size on performance and gastrointestinal tract measurement of broilers from one to twenty-eight days of age

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Abstract

The influence of feed particle size on performance and gastrointestinal tract of broilers fed corn-soya based diets was investigated. The experiment consisted of 4 treatment with 6 replication (106 birds per replication) i.e. T1: prestarter, starter and finisher using fine corn (FC); T2: prestarter, starter, and finisher using medium-fine corn (MFC); T3: T1 + replace FC with 7.5% medium corn (MC) in starter phase and 15% in finisher phase from total formula; T4: T1 + replace FC with 5% coarse corn (CC) in starter phase and 10% in finisher phase from total formula. Each diet, in crumble (prestarter and starter phase) and pellet form (finisher phase), and water was offered ad libitum from 1 to 28 day post hatch. Body weight (BW) increased ($P<0.05$) with increasing of feed particle size (T4) without negative effect on feed intake (FI) and feed conversion ratio (FCR) ($P>0.05$). All treatments were no difference in relative weight of proventriculus, gizzard and liver at 28 day of age ($P>0.05$). Relative weight of small intestine increased ($P<0.05$) with decreasing feed particle size. The results of this study indicated that increasing feed particle size in each phase of broiler could improve broilers performance but enable to stimulate development the upper part of gastrointestinal tract.

Keywords: feed particle size, performance, gastrointestinal tract, broiler

Introduction

Feed particle size is an important non-nutrient factor for gastrointestinal tract development and meat production for broiler. Smaller particle sizes increases surface area and improve nutrient digestibility, on the other hand, coarse particle size can stimulate development of upper part of digestive tract (proventriculus and gizzard) and longer retention time which plays an important in intestinal health and nutrient utilization (Zaefarian et al., 2016). Xu et al. (2015) reported increasing feed particle size with increasing inclusion corn coarse show the highest body weight compare with control (fine corn). Relative gizzard weight increased with increasing feed particle size (Singh et al., 2014). The aim of the study was to observe the effect of feed particle size on performance and digestive tract measurement of broilers from 1 to 28 days of age.

Methodology

A broiler experiment was carried out from 1-28 days of age. Total 2544 ROSS 308 broiler chicks unsexing weighed and randomly distributed among 24 pens with 106 chicks each pen. Each pen was 3 m in width, 3.5 m in length and 30 cm in height with rice hull as bedding. Corn-soya based diets were formulated to meet the ROSS 308 Nutrient Requirement (ROSS

2014). FC, MFC and MC+CC was prepared by grinding whole corn through a hammer mill using with 3 different screen size, screen 2.5 x 2.5 mm; 2.5 x 3 mm and 2.5 x 5.5 mm, respectively. After grind in screen 2.5 x 5.5 mm, MC and CC were divided using vibro shifter, corn pass the screen 2.5 x 5 mm as MC and retained corn as CC. The other raw material were grinding using screen 2.5 x 2.5 mm. Particle size distribution of corn and diets determined by dry sieving method described by Baker and Herrman (2002). The diets and water were available ad libitum. Performance was measured from 1-7 (prestarter), 7-21 (starter) and 21-28 days of age (finisher). 3 birds per treatment at 28 day of age of average body weight were weighed individually and killed by cervical dislocation. Organ contents were removed, rinse and weighed. The experiments were design using completely randomized design with 4 treatments and 6 replication, the treatments are T1: prestarter, starter and finisher using FC; T2: prestarter, starter, and finisher using MFC; T3: T1 + replace FC with 7.5% MC in starter phase and 15% in finisher phase from total formula; T4: T1 + replace FC with 5% CC in starter phase and 10% in finisher phase from total formula. Data obtained from the experiment were analyzed by using analysis of variance (ANOVA) and continued with Duncan's multiple range tests. Significance of an effect was stated at the probability level of $P \leq 0.05$. All data were analyzed using GLM procedure of SAS software version 9.1 (SAS Institute Inc., Cary, NC, USA).

Results and Discussion

The particle size of FC, MFC, MC and CC were 791, 839, 1,322 and 2,395 μm , respectively. The feed particle sizes for each phase are given in Figure 1. Particle size for prestarter, starter and finisher was 547-600 μm , 790-841 μm and 782-924 μm . In this study, the broilers were relatively less productive. Compared to ROSS 308 Performance Objective (ROSS 2014), average final BW at 28 days of age was 6% lower than standard. Adding CC (T4) improves body weight ($P < 0.05$) but FI and FCR was similar among all treatment ($P > 0.05$). Increasing feed particle size can stimulate development of upper part of gastrointestinal tract (proventriculus and gizzard) and longer retention time; this combination can improve broiler performance by increasing nutrient digestibility (Svihus 2011). In this study, feed particle sizes until 924 μm was enable to stimulated upper part of gastrointestinal tract development (proventriculus and gizzard) ($P > 0.05$). This result contradicts with Svihus (2011), they was reported that gizzard responds rapidly to changes in the coarseness of the diet. Feed particle size up to 600, 841 and 924 μm in each phase not enough to stimulate gizzard development. Relative liver weight of all treatments are not significant different ($P > 0.05$), its data indicated that increasing feed particle size were not depress the metabolisms process. Relative weights of total small intestine were significant in T1 and T2 ($P < 0.05$). Singh et al. (2014) reported that increasing inclusion coarse corn was no effect on the relative weight of total small intestine. The mechanism of feed particle size in small intestine development was unclear, but it may relate with the particle size of digesta when entering the small intestine.

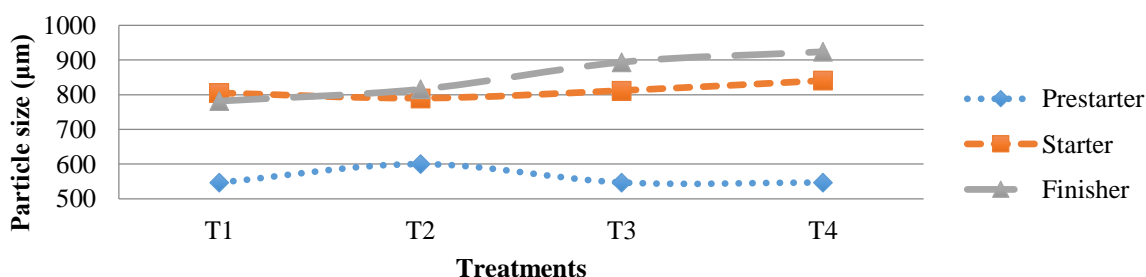


Figure 1. Feed particle size of each phase

Table 1. Effect of particle size on body weight (BW), feed intake (FI), feed conversion ratio (FCR) and relative weight gastrointestinal tract of broilers at 28 day of age

	T1	T2	T3	T4	SEM	P-Value
BW (g)	1407 ± 21.86bc	1423 ± 9.01ab	1405 ± 9.00c	1430 ± 9.99a	3.42	0.01
FI (g)	2183 ± 22.33	2182 ± 15.79	2183 ± 28.77	2182 ± 22.61	4.35	0.99
FCR	1.55 ± 0.03	1.53 ± 0.02	1.55 ± 0.02	1.53 ± 0.02	0.005	0.09
Proventriculus (g/kg BW)	5.77 ± 0.83	6.82 ± 1.45	5.31 ± 1.26	5.85 ± 1.00	0.33	0.48
Gizzard (g/kg BW)	22.36 ± 1.94	22.25 ± 4.39	18.13 ± 4.79	21.35 ± 2.44	1.03	0.48
Liver (g/kg BW)	27.06 ± 1.08	27.27 ± 2.32	31.84 ± 6.90	30.51 ± 5.33	1.28	0.52
Small intestine (g/kg BW)	56.49 ± 2.77a	60.82 ± 10.12a	43.99 ± 3.74b	37.48 ± 2.19b	3.15	0.003

Conclusion

The current study demonstrated that increased feed particle size does not seem to depress the broilers growth performance. Increasing inclusion of CC more than 5% in starter phase and 10% in finisher phase, for increasing feed particle size, may be able to influence the gastrointestinal tract development.

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Hydroponic corn fodder, a potentially sustainable feed alternative to maintain feed intake of *Bos sondaicus* bulls during long transportation

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Abstract

Long transportation of life cattle might result in many stressors on cattle which lead most commonly to appetite and body weight loss. A previous study has been reported that the average amount of body weight loss from cattle transported from West Timor to Jakarta has been reported about 12.60% of initial body weight. Some strategies including feed interventions has been looking to reduce the loss. It is well known that hydroponic corn fodder is palatable, digestible and nutritious feed for animals including cattle. A simple experiment has been conducted to test the potential feed of the hydroponic corn fodder prior to used as an alternative feed for cattle during long transportation. Hydroponic corn fodder were grown in a housing facility. The hydroponic corn fodder were watered without nutrient rich solution. The production and quality of the fodder were measured such as growth, fresh weight, dry matter, ash, crude protein and crude fiber content. Palatability test was also conducted for two *Bos sondaicus* bulls. The height of the corn fodder at day 7 was 20±4cm. The fresh weight of the corn fodder was much heavier about 263,36% of initial seed weight. The crude protein content increased. The crude fiber content was very low, about 6.30±0.70% which means very digestible. The offered hydroponic corn fodder, 6 kg/h/day, was always consumed by the bull cattle without left any fodder refusal. These results indicate that the hydroponic corn fodder could be used a potentially sustainable feed alternative for *Bos sondaicus* bull during long duration transportation. It is suggested to test the hydroponic corn fodder as an alternative feed to cattle during ship transportation from West Timor to Jakarta to maintain the feed intake of the cattle, therefore it could lower the body weight loss.

Keywords: cattle, sprout, stressors, long transportation, body weight loss

Introduction

Long transportation of life cattle might result in many stressors on cattle which lead most commonly to appetite and body weight loss (McVeigh et al., 1982). A previous study has been reported that the average amount of body weight loss from cattle transported from West Timor to Jakarta has been reported about 12.60% of initial body weight (Leo-Penu, 2010). Some strategies including feed interventions has been looking to reduce the loss. Green fodder would be a great option as feed to maintain the intake of the cattle during the long transportation. However, the availability of the green fodder is faced some serious constraints such as land unavailability, long drought season, fertilizer, longer growth period, fencing, etc. All of the constraints limited the sustainability of green fodder production and supply.

It is well known that hydroponic corn fodder is palatable, digestible and nutritious feed for animals including cattle (Naik et al., 2015). The technology may overcome most of the constraints to continuously produce and supply green fodder. This experiment aimed to investigate the potential production and quality of hydroponic corn fodder prior to be used as feed alternative for cattle during long transportation, especially from West Timor to Jakarta, Indonesia.

Methodology

Hydroponic Corn Fodder Production

Hydroponic corn fodder were grown in a housing facility (10 m x 5 m). Selected and weighted corn seed were washed with detergent until clean and then were rinsed with tap water three times. The corn seed were soaked in tap water for 3 hours. The seed were then distributed to the trays (1000 g DM per tray). The hydroponic corn fodder were watered with tap water using sprayer regularly every four hours. The corn seed were grown for twelve days. On day seven, however, the fodder were started to be harvested for analysing the changes in the quality.

Sample collections

Samples from two trays were collected every day started from day 7 to day 12 to be analysed further. The production of the hydroponic corn fodder were measured. The fodder were also analysed further to determine the dry matter, ash, crude protein, Extract Ether and crude fiber content.

Palatability test

Two *Bos sondaicus* bulls (BW 230 ± 15 kg) were used to test the palatability of the fodder. The bulls were allocated in the individually shaded pen. Both cattle were offered *Sorghum plumosum* var. *Timorensis* hay *ad libitum* and addition of 3 kg concentrate mixture containing rice meal, urea and minerals per head per day. At the data collection day, the cattle were also offered additional 6 kg of wet hydroponic corn fodder. The offered and the refusal fodder were measured.

Results and Discussion

The production of hydroponic corn fodder during the production period is presented in Table 1. Wet (as fed) weight of the fodder increased 2.5 to 3 folds of the original seed weight during 7 to 12 days of the sprouting period. The increase of the fodder production however did not followed by the dry weight. The DM weight of the fodder decreased as the fodder used their own energy reserves for growth. During the sprouting period, starch as energy reserves is derived by partial degradation for cell respiration and cell wall synthesis (Chavan and Kadam, 1989; Naik et al., 2015).

Table 1. Production of the hydroponic corn fodder

Nutrient	Corn Seed (day 0)	Harvest Days					
		7	8	9	10	11	12
Wet weight, gram	1000	2581,9	2607,5	2703,55	3019,05	3100,4	3441,85
Dry weight, gram	1000	708,4	679,75	618,20	581,00	475,1	430,85
Dry weight loss,%	-	-29,16	-32,05	-38,23	-41,90	-52,49	-56,92

Note: corn seed (day 0) on DM basis and wet weight (day 7 to 12) on 'as fed' basis

The changes in chemical composition of hydroponic corn fodder during the harvest days is presented in Table 2. Most of the nutrients changed during the growth period. The decrease in DM content is followed by the increase in crude protein (CP). The CP content of the fodder increased from 09.21% to 10.37% on day 7 and kept increasing up to the end of the harvest day (day 12), about 17.29%. The increase in CP content may be the result of the chemical reserves break down by enzymes due to hydration and subsequent sprouting in various parts of the corn seed. Ash and crude fiber content of the fodder has the same trend as CP content. The use of tap water may also contributed to the increase in ash content.

Table 2. Changes in chemical composition (% DM basis) and consumption of the hydroponic corn fodder

Components	Corn Seed (day 0)	Harvest Days					
		7	8	9	10	11	12
Dry matter, %	89.08	25,35	22,91	20,47	19,36	16,84	13,13
Ash, %	01.54	01,89	01,95	02,00	02,10	02,76	03,05
Crude protein, %	09.21	10,37	10,78	11,58	12,47	16,44	17,29
Extract Ether, %	04.37	04,89	05,34	05,87	06,43	06,49	06,16
Crude fiber, %	03.10	05,65	06,70	06,80	07,74	10,17	10,63
Corn fodder							
Consumption, kg	-	6	6	6	6	6	6

Note: DM corn fodder and consumption on 'as fed' basis

The offered hydroponic corn fodder (about 6 kg wet weight/head/day) was consumed without wasting any refusal by the experimental bulls. The cattle preferred to consume the corn fodder for the first preference then other offered feed. Also the hydroponic fodder was reported to have high digestibility, about 61.15 to 92.2 % DM. This potential feed would be an alternative feed to maintain the feed intake of *Bos sondaicus* bulls during long transportation as most of the cattle would lose their appetite and lose body weight. It is expected that offered hydroponic corn fodder to cattle could decrease the body weight loss due to long transportation activities. On the other hand, the production of hydroponic corn fodder could overcome some constraints regarding conventional green fodder production, for example land unavailability, long drought season, fertilizer, longer growth period, fencing, etc.

Conclusion

Hydroponic corn fodder could be used as a potentially sustainable feed alternative to maintain the feed intake of *Bos sondaicus* bulls during long transportation as most of the cattle would lose their appetite and lose body weight.

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Forage yield and nutrients quality of sticky and purple corn stover

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Abstract

The objective of this study was to compare forage yield and nutrients quality of sticky and purple corn stover. Sticky corn of control and anthocyanin rich purple corn using completely randomized design (CRD) with 3 duplicates per treatment. The results showed that, sticky corn stover (SS) and anthocyanin rich purple corn stover (PS) fresh weight data indicated that there was not showed significant different ($p>0.05$), but dry matter (DM) yield of PS significant higher than SS ($p<0.05$). Similarly, PS contained significant higher chemical composition yield ($p<0.05$), which consist of organic matter (OM), gross energy (GE), crude protein (CP), neutral detergent fiber (NDF) and acid detergent fiber (ADF), and anthocyanin yield, compared to SS by all the observations. In addition, PS did not have negative effect on the animal dry matter intake (DMI), digestible dry matter (DDM), relative feed value (RFV) and net energy for lactation ($p>0.05$) by our predicted. Similarly, we did not find significantly different ($p>0.05$) for rumen fermentation in both of treatments except gas volume at 3 h and instantaneous fermentation fraction of a parameters ($p<0.05$) through *in vitro* experiment. Finally, purple corn stover presented significantly higher ($p<0.05$) antioxidant activity in terms of scavenging DPPH free radical. The present study showed that PS contained rich anthocyanin as well as had a significant higher nutrients yield and antioxidant activity, and did not negative effect on the animal DMI, DDM, RFV and NEI values and rumen fermentation parameters. Therefore, PS can be used as a potential ideal feedstuff for the ruminants in tropical countries due to antioxidant activities of the anthocyanin.

Keywords: sticky corn stover (SS), purple corn stover (PS), nutrients yield, antioxidant activity, rumen fermentation

Introduction

Anthocyanin, as a group of phenolic compounds widely existing in the plant kingdom (Zhao et al., 2009). Natural anthocyanin as healthy pigments and have been reported to various biological activities, such as antioxidant, anti-inflammatory, anti-mutagenic, antimicrobial and anticancer activities (He and Giusti, 2010). Purple corn is a rich and economic source of anthocyanin colorants and functional ingredients, which has been cultivated in South America, mainly in Peru and Bolivia and Asia (Jing and Giusti, 2007). Hosoda et al. (2012a) demonstrated that lactating dairy cows had higher plasma enzyme activities when feeding anthocyanin rich corn silage, compared to control corn silage. Similarly, anthocyanin purple pigment from anthocyanin-rich corn can be significantly improve blood antioxidant activity, especially superoxide dismutase (SOD) value in sheep (Hosoda et al., 2012b).

Thailand is a tropical country with different climates from others countries and areas, ruminant roughage must be supported which are not available in the dry season (Hare et al.,

2009). Corn stover as a kind of by-product feedstuff and an available energy source for ruminants and has been also popular in Southeast Asia countries (Wattanaklang et al., 2016; Dakaew et al., 2016). On the other hand, there are a large number of corns were planted in Thailand, such as, sweet corn, sticky corn and purple corn, especially purple corn contained abundant in anthocyanin. Hence, it is considered that purple corn may be protected the corn to sunshine, pest control and osmotic adjustment, also could be a domestic source of anthocyanin for animal due to its antioxidant activity.

To our understand, we have not found related knowledge for purple corn yield and nutrients quality of ruminants in tropical countries so far. Therefore, the objective of this study was to compare forage yield and nutrients quality of sticky and purple corn stover.

Methodology

Sticky corn of control (T1) and anthocyanin rich purple corn (T2) using completely randomized design (CRD) with 3 duplicates per treatment were planted in Suranaree University of Technology (SUT) farm, Nakhon Ratchasima, Thailand from June 16 to September 1, 2016. The diameter was set to 0.5 meter (m) per line of seed, and all the field management to be consistent. Harvested corn at the same time using cutting machine set for 0.93 centimeter (cm) theoretical length of cut until the corn is ripe (Cox et al., 2006). After that, weighed and calculated the yield. On the other hand, collected and mixed samples were dried in the oven at 65°C for 72 h and grinded, and through 1 mm sieve and analyzed chemical analysis. Dry matter (DM), crude protein (CP), ash were determined according to feed proximate analysis of AOAC (1990); organic matter (OM) was estimated from the difference between ash and dry matter; neutral detergent fiber (NDF) and acid detergent fiber (ADF) were measured following by Van Soest et al. (1991). Gross energy (GE) was measured using a Parr 6200 calorimeter (Moline, Illinois, USA). Dry matter intake (DMI), digestible dry matter (DDM), relative feed value (RFV) and net energy for lactation (NEL) were estimated according to the following equations adapted from Lithourgidis et al. (2006): $DMI = 120 / \%NDF$ dry matter basis, $DDM = 88.9 - (0.779 \times \%ADF)$ dry matter basis, $RFV = \%DM \times 0.775$ and $NEL = (1.044 - (0.0119 \times \%ADF)) \times 2.205$.

Anthocyanin content in corn stover was extracted using 1% HCL in methanol solution at 50 °C for 24 h, then kept -20 °C after filtering and transferring into 50 mL plastic containers. Centrifuged at 10000 min/r for 15 min at 4 °C, the supernatant was filtered 0.45 µm and for the determination of anthocyanin content by and high performance liquid chromatography (HPLC) according to Hosoda et al. (2009) and Yang et al. (2009).

The DPPH free radical scavenging activity of the corn stover extract was determined spectrophotometrically by the method of Yang and Zhai (2010), using a stable free radical *a,a*-diphenyl-b-picrylhydrazyl (DPPH; German) with slight modifications. Briefly, an aliquot of 1.00 mL of the appropriate diluted (5, 4, 3, 2 and 1) of each corn stover extract (three replications) was added to 2.00 ml of 0.1mmol/L DPPH solution, and shaken vigorously. OD values were determined at 517 nm, using spectrophotometer after incubation for 30 min at 30 °C water bath, and all of processes were carried out in the dark. The percentage of DPPH· (%DPPH·sc) was calculated by the following formula: $\% DPPH \cdot sc = (Ac - As) \times 100 / Ac$. Where Ac and As are the absorbance of the control and the sample, respectively.

The process of in vitro followed by Menke and Steingass (1988). Briefly, rumen fluid was collected from the mouth of Saanen dairy goats using a vacuum pump before feeding in the morning, then taken to the laboratory immediately and squeezed through four layers of gauze and mixed (1:2 v/v) with an artificial saliva. And transferred to the water bath preheated to 39°C and purged with CO₂. The 100 mL glass gas-tight syringes used as fermentation vessels and given 30 mL buffer with 0.50 g substrate of each syringe. Read and recorded the volume

of at 3, 6, 9, 12, 24, 48, 72 and 96 h.

Additionally, gas production was calculated according to the following equation by Ørskov and McDonald (1979). $y = a + b(1 - e^{-ct})$. Where “y” stands for gas production at time t, “a” describes the gas produced (ml) by instantaneous fermentation of the soluble and readily available fraction of feed, “b” is the gas produced (ml) by the fermentation of insoluble, but slowly fermentable fraction, “c” is the fractional rate at which gas is produced per hour (%/h) and t describes gas production time point.

Organic matter digestibility(OMD), metabolisable energy(ME) and effective degradability(ED) were referenced to the following formulas by Menke et al. (1979), Menke and Steingass (1988) and Elimam et al. (1984), respectively. (1) $OMD(\%) = 0.986 \times GP(24h) + 0.0606 \times CP + 11.03$; (2) $ME(MJ/kg) = -0.20 + 0.1410 \times DOM$; (3) $ED(\%) = a + b \times c / (k + c)$. Where GP and CP were gas production and crude protein of substrate, respectively; and where k means ruminal outflow rates and the value sets as 0.031/h in the above of model.

Statistical analysis

The data was subjected the General Linear Models (GLM) by Statistical Analysis System 9.1 (SAS 9.1). Using the Duncan's New Multiple Range Test compare the treatment means and significant difference was decided to $P < 0.05$.

Results and discussion

Control of sticky corn stover (SS) and treatment of anthocyanin rich purple corn stover (PS) fresh weight data indicated that there was not showed significant different ($p > 0.05$), but DM yield of PS significant higher than SS ($p < 0.05$). In addition, PS contained significant higher chemical composition (OM, GE, CP, NDF and ADF) yield and anthocyanin yield ($p < 0.05$), compared to SS. Neill and Gould (2003) who reported that anthocyanins have the potential to mitigate photooxidative injury in leaves, both by shielding chloroplasts from excess high-energy quanta, and by scavenging reactive oxygen species. In addition, the presence of epidermal coumaroyl anthocyanins conferred protective benefits under high light (Tattini et al., 2014). On the other hand, PS had the colour because the anthocyanin so that produced variation in the background, which resulted in a larger number of insect species being camouflaged on the plant (Schaefer and Rolshausen, 2006). Consequently, PS had higher forage and chemical composition yield since the protective effect of anthocyanins for corn. On the other hand, various researches refer negative impact of anthocyanin on intake and production, which had low palatability owing to their bitterness taste (Jöbstl et al., 2004). Also, some negative effects of polyphenols were associated to their interaction with digestive enzyme and epithelium lining digestive trace (Correddu, 2015). For this study, we found that PS did not have negative effect on the DMI, DDM, RFV and NEI ($p > 0.05$) by our predicted. Therefore, PS did not impact on ruminants palatability can be as a potential ideal feedstuff for the ruminants.

Table 1. Forage yield and nutrients quality of sticky and purple corn stover

Items	SS	PS	SEM	p values
Forage (kg/ha)	11790.48	12000.00	278.317	0.6227
DM (kg/ha)	2747.12 ^b	3167.99 ^a	71.01857	0.0138
OM (kg/ha)	2572.10 ^b	2949.10 ^a	66.2066	0.0158
GE (Mcal/ha)	10805.13 ^b	12443.89 ^a	279.0541	0.0142
CP (kg/ha)	180.61 ^b	229.35 ^a	5.0284	0.0024
NDF (kg/ha)	1586.23 ^b	1781.77 ^a	40.2094	0.0263
ADF (kg/ha)	676.27 ^b	796.08 ^a	17.7567	0.0088
Anthocyanin (kg/ha)	1.04 ^b	7.44 ^a	0.1454	<0.0001
DMI (g kg ⁻¹ of body weight)	20.79	21.35	0.4503	0.4711
DDM (g kg ⁻¹ DM)	697.23	693.25	7.7910	0.7524
RFV (%)	112.35	114.67	2.4819	0.5764
NEL (Mcal kg ⁻¹)	1.27	1.25	0.0419	0.7524

SS: sticky corn stover, PS: purple corn stover; DM: dry matter, OM: organic matter, GE: gross energy, CP: crude protein, NDF: neutral detergent fiber, ADF: acid detergent fiber; DMI: dry matter intake, DDM: digestible dry matter, RFV: relative feed value, NEL: net energy for lactation.

In the same row, values with different letter superscripts mean significant difference ($p < 0.05$). The same as below table.

Ruminal fluid did not cause degradation of the anthocyanin (Hosoda et al., 2009; Song et al., 2012), which mean that anthocyanin may be stability in the rumen and bypass to small intestine. Accordingly, anthocyanin contents possible impact rumen fermentation parameters. For this study, we did not find significantly different ($p > 0.05$) for rumen fermentation in both of treatments except gas volume at 3 h and instantaneous fermentation fraction of a parameters ($p < 0.05$) through *in vitro* experiment (table 2). Therefore, anthocyanin rich purple corn stover may be an appropriate feedstuff for ruminants. As for the gas volume at 3 h and “a” of sticky corn stover significantly higher than purple corn stover, which may be owing to rich anthocyanin can be bypass to small intestine so that remain short time in the rumen to impact on the ruminal fluid fermentation. However, it is necessary that deep understand the prospective effects by feeding trial for ruminants.

Table 2. Rumen fermentation of sticky and purple corn stover

Items	SS	PS	SEM	p values
3 h (ml)	18.70 ^a	15.37 ^b	0.8333	0.0474
6 h (ml)	24.33	20.67	1.2693	0.1106
9 h (ml)	31.33	29.00	4.0417	0.2282
12 h (ml)	39.33	35.67	1.3017	0.1172
24 h (ml)	61.33	57.33	1.7038	0.1722
48 h (ml)	80.00	79.00	1.3333	0.6240
72 h (ml)	88.67	85.83	1.7989	0.3278
96 h (ml)	90.67	88.50	1.1961	0.2694
a (ml)	7.26 ^a	3.71 ^b	0.0190	<.0001
b (ml)	85.17	86.91	0.5298	0.1452
c (% h)	0.04	0.04	0.0002	0.6838
a+b	92.43	90.63	0.5338	0.1393
OMD (%)	71.90	68.00	1.6799	0.1757
ME (MJ/kg)	9.94	9.39	0.2369	0.1757
ED (%)	54.90	52.27	1.0712	0.3800

SS: sticky corn stover, PS: purple corn stover; a is the fraction of immediately degraded, b is the fraction of slowly degraded, c is the rate of degradation of b (%/h); OMD, ME and ED mean organic matter digestibility, metabolisable energy and effective degradability.

In previous observations showed that free radicals may damage biological components such as proteins, lipids, nucleic acids (RNA and DNA), thus trigger many degenerative and chronic diseases (Wang et al., 2010). Reactive oxygen species (ROS), such as superoxide and nitric oxide, and the natural byproducts of the normal metabolism of oxygen, play important roles in cell signaling (Zhang and Gutterman, 2007). Accordingly, the presence of antioxidants can quench these free radicals and alleviate the oxidative stress. In addition, DPPH is a well-known radical and a trap for other radicals, and rate reduction of a chemical reaction upon addition of DPPH is used as an indicator of the radical nature of that reaction (Sharma and Bhat, 2009). Anthocyanin, as a bioactive secondary metabolite of plant and had high antioxidant activity. The DPPH scavenging effects of two treatments increased with concentration (Figure 1), at 1/3 to 1 dilution did not show significant different for both of extracts. However, purple corn stover extract presented strong antioxidant activity due to it was significantly higher than sticky corn stover extract all the time, which meant that anthocyanin rich purple corn stover had higher antioxidant, compared to sticky corn stover.

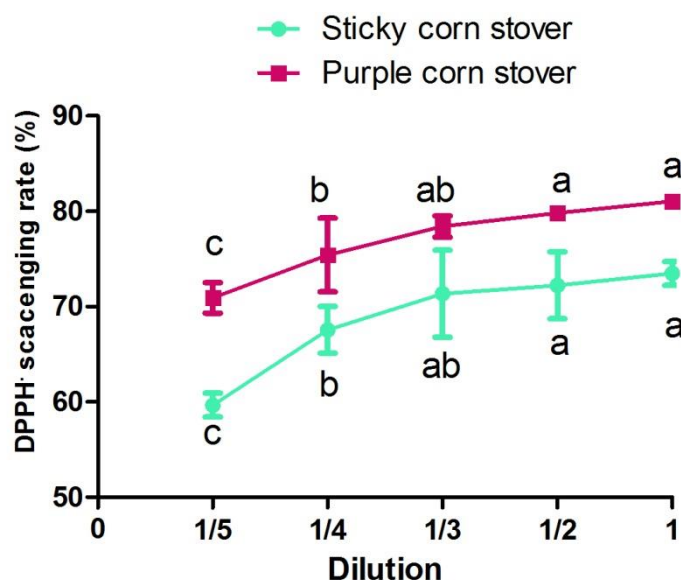


Figure 1 DPPH free radical scavenging activity of sticky corn and purple corn stover
Values with different letter superscripts mean significant difference ($p < 0.05$)

Conclusion

The present study showed that PS had a significant higher forage, chemical composition, anthocyanin yield and antioxidant activity, did not negative effect on the animal DMI, DDM, RFV, NEI values and rumen fermentation parameters. Therefore, PS can be used as a potential ideal roughage for the ruminants may due to antioxidant function of the anthocyanin. Further study is encourage to understand if feeding PS impact on ruminal fluid microorganism, plasma antioxidant activities and related gene expression in ruminants.

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Effect of molasses and iron (II) sulfate on fermentation and anthocyanin stability of anthocyanin-rich Napier Grass silage in *in vitro*

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Abstract

A study of anthocyanin rich – Napier grass silage added with different levels of molasses and FeSO₄ total was nine treatments were conducted in *in vitro* to evaluate fermentation quality, nutrient composition and anthocyanin stable. The results showed that molasses enhanced anthocyanin level and effected on all of parameters except butyrate. Addition of FeSO₄ effected on lactate, butyrate, ammonia-N, dry matter, Ash, organic matter, acid detergent fiber and crude fiber. A significant interaction between two factors on pH, lactate, butyrate, ammonia-N, Ash, Organic matter, crude protein, acid detergent fiber and crude fiber. Addition of molasses at 4% and FeSO₄ at 0.03 % improve anthocyanin level, silage quality and nutrient composition.

Keywords: anthocyanin rich-Napier grass, molasses, FeSO₄, anthocyanin, silage quality

Introduction

Anthocyanin rich Napier grass is a cultivate of Napier grass with leaves and stems in purple color which pigment was made from anthocyanin to protect plant cell from UV radiation, oxidative stress from environmental pathogen and herbivores (Lev-Yadun et al., 2009). Napier grass is a good feed for ruminant but low soluble carbohydrate (Okaraonye et al., 2009). Besides, Napier grass grows in tropical and sub-tropical regions with a wide range of annual moisture from 750 to 2,500 mm rainfall (Skerman and Riveros, 1990) and has high production and short cutting cycle (Nyambati et al., 2010).

Silage is the best method to keep forage in long time as a feed for small ruminant. Molasses was used as additive in silage to made fermentation quickly by decrease pH and provide energy for lactic bacteria (Pipat et al., 2011). Anthocyanin rich feedstuffs were easy to lost anthocyanin in ensiling progress (Song et al., 2012, Hosada et al., 2009) and stable when pH lower than 4. In addition, Iron (Fe) is an essential component of several cytochromes and iron-sulfur proteins involved in the electron transport chain and several important biological processes (Parish and Rhinehart, 2008; Ganz and Nemeth, 2006). Level of FeSO₄ at 0.03%/DM was reported not effect on lamp performance and meat characteristics (Abdelrahim et al., 2012). When adding FeSO₄ in silage under fermentation, Fe²⁺ will be received electron become Fe³⁺ by lactic bacteria (Scheers et al., 2016), then Fe³⁺ will combine with anthocynindin become Metallo-anthocyanin compound (Yoshida et al., 2009, Scheers et al., 2016). Using molasses and FeSO₄ like additive in silage will help anthocyanin stable better. This study was conducted to evaluate effect of additive on fermentation quality, nutrient composition and stable of anthocyanin in silage after 21 day ensiling.

Methodology

Anthocyanin rich Napier grass (*Pennisetum Purpureum*) was used in this study. They were planted at Suranaree University of Technology Farm and harvested at 90 days, then cut into 2~3 cm long for making silage. The materials were prepared in a 1 kg silage nylon bag, taken out air by vacuum pumps, closed and then stored in a dark place at a room temperature (25°C) to sampling at 21 day ensiling. Three levels of molasses and FeSO₄ were added in silage, total is nine treatments were shown in table below.

Treatment	Molasses (%)	FeSO ₄ (%)
Control	0	0
1	0	0.015
2	0	0.03
3	4	0
4	4	0.015
5	4	0.03
6	8	0
7	8	0.015
8	8	0.03

The dry matter (DM), crude protein (CP), crude fiber (CF), neutral detergent fiber (NDF), acid detergent lignin (ADL) and acid detergent fiber (ADF) will be measured by the methods of AOAC (1995) and Van Soest et al. (1991). For the pH and organic acid analysis, the 100 g samples of silage were mixed with 600 ml pure water, kept overnight at 4°C, grinding and filter. The extract which passed through a syringe filter paper will be used for pH and organic acid analyses. The pH and organic acid will be determined by pH meter and high-performance liquid chromatography (HPLC), respectively. The anthocyanin content extracted using 0.01N HCl- 80% Methanol solution and determined by HPLC.

The data of this experiment subjected to SAS Ver. 9.1 program using the general linear model procedure and statistically significant differences among means will be determined using Duncan's multiple range test at 5% probability (SAS, 2002).

Results and discussion

The pH, lactic acid, acetic acid, propionic acid, butyric acid and ammonia-nitrogen of Anthocyanin rich Napier Grass silage at 21 day ensiling are shown in table 1. Molasses addition showed a decrease effect on pH but a slightly effect was found in FeSO₄ addition on pH (P=0.058). A significant interaction between molasses and FeSO₄ levels in pH implied that the increasing effect on pH by FeSO₄ and molasses level increased.

At all FeSO₄ levels, lactic acid increased significantly with increasing molasses addition. Similarly, the same results were on acetic acid, propionic acid. In contrast, molasses addition was no effect on butyric acid but FeSO₄ addition effect on butyric and a significant between molasses and FeSO₄ on butyric acid. Ammonia nitrogen was effected by addition of molasses and FeSO₄, increasing level of FeSO₄ decreased ammonia nitrogen but combination of FeSO₄ and molasses increased this parameter.

Table 1. Effect of molasses and iron (II) sulfate on fermentation of anthocyanin-rich Napier grass silage *in vitro*

Parameters		pH	LA %	AA %	PA %	BA %	NH ₃ /N (%)
MOL 0	Fe 0	4.76	5.51	0.22	-	0.39	33.05
	Fe 15	4.68	6.33	0.36	-	0.36	22.38
	Fe 30	4.51	8.13	0.27	-	0.29	21.951
MOL 4	Fe 0	3.79	15.9	0.37	0.44	0.29	12.16
	Fe 15	3.8	22.36	0.5	0.47	0.31	11.87
	Fe 30	3.83	35.04	0.48	0.55	0.59	12.26
MOL 8	Fe 0	3.65	29.84	0.48	0.52	0.65	8.49
	Fe 15	3.7	37.22	0.62	0.59	-	11.77
	Fe 30	3.69	39.32	0.69	0.66	-	10.3
SEM		0.05	2.97	0.13	0.08	0.08	2.11
Molasses		**	**	**	**	NS	**
P value	FeSO ₄	0.058	**	0.066	NS	**	*
	MOL x Fe	**	**	NS	NS	**	**

MOL: molasses; Fe: FeSO₄; LA: lactic acid; AA: acetic acid; PA: propionic acid; BA: butyric acid; - : cannot detect

*, **, NS: significantly at $P < 0.05$, $P < 0.01$ and not significant, respectively.

Addition of molasses increased significantly dry matter, crude protein, anthocyanin and organic matter but decreased on Ash (table 2). In contrast, there was no effect of FeSO₄ on anthocyanin and crude protein but significant different was found in other parameter from table 2. A significantly interaction between molasses and FeSO₄ on crude protein, Ash and organic matter but not on anthocyanin and dry matter.

Table 2. Effect of molasses and iron (II) sulfate on DM, Ash, OM, CP and anthocyanin stability of anthocyanin-rich Napier grass silage *in vitro*

Parameters		DM	%Ash	%OM	%CP	Anthocyanin (mg/g)
MOL 0	Fe 0	15.45	13.51	82.84	3.9	0.29
	Fe 15	16.26	13.48	83.6	3.65	0.25
	Fe 30	15.38	15.86	79.98	3.65	0.32
MOL 4	Fe 0	17	13.08	82.28	4.34	0.59
	Fe 15	17.34	12.61	82.89	4.35	0.57
	Fe 30	17.61	12.52	82.83	4.84	0.51
MOL 8	Fe 0	18.07	12.22	82.4	4.45	0.48
	Fe 15	19.46	13.81	81.35	5.46	0.51
	Fe 30	18.59	13.29	82.03	4.68	0.59
SEM		0.52	0.43	0.38	0.22	0.09
Molasses		**	**	**	**	**
P value	FeSO ₄	*	**	**	NS	NS
	MOL x Fe	NS	**	**	**	NS

MOL: molasses; Fe: FeSO₄; DCM: dry matter; OM: organic matter; CP: crude protein

*, **, NS: significantly at $P < 0.05$, $P < 0.01$ and not significant, respectively.

From table 3, molasses decreased neutral detergent fiber, acid detergent fiber, hemicellulose, acid detergent lignin, cellulose and crude fiber. In contrast, FeSO₄ addition only effect on acid detergent fiber and crude fiber. Similarly, interaction between molasses and FeSO₄ effect significantly on acid detergent fiber and crude fiber and there are a trend to effect on cellulose ($p=0.06$).

Table 3. Effect of molasses and iron (II) sulfate on NDF, ADF, Hemicellulose, ADL, Cellulose and CF of anthocyanin-rich Napier grass silage *in vitro*

Parameters		% NDF	% ADF	% HEM	% ADL	% CEL	% CF
MOL 0	Fe 0	75.64	45.32	30.32	12.27	33.05	45.24
	Fe 15	75.59	42.78	32.81	11.97	30.81	44.59
	Fe 30	74.7	44.86	29.84	11.56	33.3	43.8
MOL 4	Fe 0	67.76	38.03	29.73	10.82	27.21	34.42
	Fe 15	71.28	39.09	32.19	10.1	28.99	36.68
	Fe 30	67.26	36.84	30.42	9.79	27.05	36.92
MOL 8	Fe 0	64.06	35.09	28.97	12.16	22.93	35.5
	Fe 15	59.83	33.23	26.6	10.09	23.14	31.12
	Fe 30	60.35	34.7	25.65	12.16	22.54	33.35
SEM		2.38	0.7	2.32	1.02	1.3	0.57
Molasses		**	**	**	**	**	**
P value	FeSO ₄	NS	*	NS	NS	NS	*
	MOL x Fe	NS	**	NS	NS	0.06	**

MOL: molasses; Fe: FeSO₄; NDF: neutral detergent fiber; ADF: acid detergent fiber; HEM: hemicellulose; ADL: acid detergent lignin; CEL: cellulose; CF: crude fiber.

*, **, NS: significantly at $P<0.05$, $P<0.01$ and not significant, respectively.

According to Catchpoole et al. (1971) quality silage has a pH at 4.2 or below, lactic acid between 3-13 % a butyric acid concentration less than 0.5 %, acetic acid from 1-3 %, propionic less than 1% and ammonia nitrogen less than 12%. According to their standard, the result presented in table 1 show that the silage pH of treatments no added molasses were higher 4.2, the butyric less than 0.5% and lactic acid were from 5 to 8 %. Addition of molasses and FeSO₄ increased the number of lactic acid higher than 13% and decreased pH lower than 4.2. However, acetic acid, propionic acid and butyric acid were followed the standard. In contrast, ammonia nitrogen in treatments no molasses were higher standard. We can explain Anthocyanin rich Napier grass is a cultivar of Napier so they were high in fiber and low in soluble carbohydrate, when ensiling, pH was still high and appearance of water in grass made protein breakdown to increase the number of ammonia nitrogen. In addition, high level of butyric showed an association with protein degradation. Yunus et al. (2000) indicated that Napier grass was known to have a high moisture content, an effective procedure in silage making.

Water soluble carbohydrate concentration in fresh grass give a high probability of lactate type silage and preservation of silage being better (Wilkinson, 1983). Molasses is used in silage making was found to produce more lactate and less acetate and ammonia nitrogen than untreated treatment (McDonald et al., 1991).

Addition of molasses increase dry matter, organic matter (Yunus et al., 2000) and decrease ash. Besides, molasses help reduce ammonia nitrogen and help maintain crude protein

than untreated treatments. When combination of molasses and FeSO₄ helped pH decrease quickly and maintain anthocyanin in silage. Sugar in molasses blocked activity of water and enhanced activity of lactic bacteria by provide an energy source. High level of molasses made pH drop less than 4 but silage was found much wet but kept anthocyanin stable better. FeSO₄ addition in silage played a role like salt to absorbed water from cell membrane and inhibit activity of negative bacteria with lactic bacteria. In addition, under fermentation, Fe²⁺ from FeSO₄ received electron become Fe³⁺ by lactic bacteria (Scheers et al., 2016), then Fe³⁺ combined with anthocynindin become Metallo-anthocyanin compound (Yoshida et al., 2009, Scheers et al., 2016) but FeSO₄ level at 0.03% was not effect on anthocyanin.

Molasses and FeSO₄ decreased all type of fiber, special on acid detergent fiber and crude fiber by made an acidic condition in silage to degraded fiber better than no additive by increasing activity of lactic bacteria (McDonald et al., 1991).

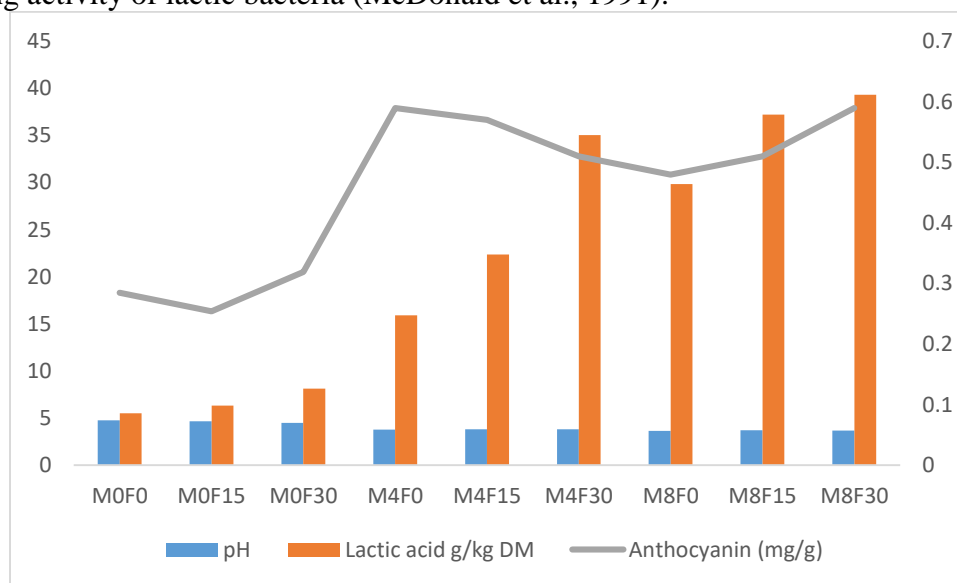


Figure 1. Relationship of pH, lactic acid and anthocyanin in different levels of molasses and FeSO₄ were added in silage

Conclusion

Addition of molasses and FeSO₄ at 4% and 0.03%, respectively, help to enhance anthocyanin, silage fermentation quality and nutrient composition.

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Effect of probiotic containing *Enterobacter sp.*, *Bacillus sp.*, *Cellulomonas spp.*, *Actinomyces spp.* supplementation on the laying performance and egg cholesterol of quail (*Coturnix coturnix japonica*)

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Abstract

The purpose of this study was to know the effect of probiotic supplementation to feed consumption, egg production, egg mass, feed conversion, feed efficiency and egg cholesterol. 80 quails of *Coturnix coturnix japonica* at 14 weeks of age were completely randomized into five treatments, each treatment consisted of four replication and each replication consisted by five heads. T0 with organic quail feed as a control group without probiotic supplementation, T1 with the addition of 1 ml probiotic/gram of feed, T2 with the addition of 2 ml probiotic/gram of feed, T3 with the addition 1 ml probiotic/liter water drinking and T4 with the addition of 2 ml probiotic/liter water drinking. The results showed that the probiotic supplementation give a significant effect ($p < 0,05$) to feed consumption, feed conversion, feed efficiency and egg cholesterol, but can't effect egg mass and Quail Day Production. T4 showed the highest significantly different in feed conversion, feed efficiency and egg cholesterol. It can be concluded that we can give 2 ml probiotic containing *Enterobacteria*, *Bacillus spp.*, *Cellulomonas spp.* and *Actinomyces spp.* in drinking water for the best result.

Keywords: probiotic, production performance, egg cholesterol, quail

Introduction

Japanese quail, the smallest farmed avian species is getting more importance for commercial egg and meat production with high rate of egg production (Ahmed, et al., 2017). Recently the ban on the use of antibiotic as a growth promoters (AGP) in animal feeds, due to their residual effect in animal products as well as development of bacterial resistance in animals and human body, have make a way to look for alternatives of antibiotics (Yang et al., 2009). It is generally accepted that direct-fed microbials (DFMs), defined as a source of viable, naturally occurring microorganisms, as an alternative to antibiotics (Lee and Lillehoj, 2017). Probiotics or direct-fed microbials (DFM) are live microorganisms that, when administered in adequate amounts, give a health benefit on the host (Hill et al., 2014). Most probiotic strains that are used in livestock are members of the bacterial genera *Bacillus* and *Enterococcus* (Gaggia et al., 2010). Feeding Probiotic resulted in a lower feed conversion (Gao, et al., 2017). In addition to increasing the quantity of eggs produced, the fact that this probiotic can reduce egg cholesterol level may encourage people especially in developing countries to consume more eggs and enjoy good health as well as other benefits derived from chicken egg (Ezema and Eze, 2015). Probiotic treatment may be given through feed and water, then expect that the consumption of probiotics can improve the efficiency of feed, then increase egg production. The purpose of this study was to know the effect of probiotic containing *Enterobacteria*, *Bacillus spp.*,

Cellulomonas spp. and *Actinomyces spp.* supplementation to feed consumption, egg production, egg mass, feed conversion, feed efficiency and egg cholesterol.

Methodology

Study area and farm management

The research was conducted in May - June 2017 in the Faculty of Veterinary Medicine, University of Airlangga, Surabaya, Indonesia. Probiotics used in this study contains cellulolytic and proteolytic bacteria consisting of *Enterobacteria*, *Bacillus spp.*, *Cellulomonas spp.* and *Actinomyces spp.* 80 quails of *Coturnix coturnix japonica* at 14 weeks of age were completely randomized into five treatments, each treatment consisted of four replication and each replication consisted by five heads, the treatments are T0 for the control with 100% organic quail feed, T1 group for organic quail feed with 1 ml probiotic/gram of feed, T2 group for organic quail feed with 2 ml probiotic/gram of feed, T3 group for organic quail feed with 1 ml probiotic/liter water drinking and T4 group for organic quail feed with 2 ml probiotic/liter water drinking.

Organic quail feed was made from organic grain and other crop without any antibiotic, chemical composition and other prohibited materials. The probiotic liquid, dissolved in water (free chlorine and other antiseptics), and then allowed to stand for 24 hours without aeration. The probiotic solution (T1 and T2) sprayed evenly into 100 kg of feed and then left the feed dry and the other probiotic solution (T3 and T4) then stir evenly into drinking water and ready to be given.

Data collection and statistical analysis

Feed consumption was calculated every week during four weeks of treatment. Number of eggs laying per bird in each replicate was recorded daily. The egg cholesterol measured after four week of treatment, with 5 randomize egg each treatment, using enzymatic colorimetric method. Data analysis was performed using Analysis of Variant (ANOVA). If the result show different or significantly different then continued with Duncan Multiple Range Test (Kusniningrum, 2008). Statistical analysis using SPSS for Windows 21.0.

Results and discussion

The results showed that the probiotic supplementation give a significant effect ($p < 0.05$) to feed consumption, feed conversion and feed efficiency, where T4 showed the highest significantly different. Balanced gastrointestinal microflora are major functional effects attributed to the consumption of probiotics (Tellez, et al., 2015), then the utilization of selected probiotics may improve the metabolism of the host animals in various ways, including absorptive capacity, protein metabolism and energy metabolism (Salminen, 2006), so can improve the digestion of food and can minimize feed consumption (Astuti, et al., 2015). This result in line with Talebi et al. (2008) reported that addition of probiotic to broiler chicken diets decreased feed conversion ratio significantly.

The results showed that the probiotic supplementation can't effect Quail day production and egg mass. Egg production is costly in terms of energy and protein. The required energy for egg formation may be derived from daily feed intake. Daily feed intake is more important source of nutrient for small birds like quail than body reserve. If energy or protein is limiting, birds can compensate by reducing egg size or the number of eggs laid (Brand et al., 2004). The effectiveness of probiotic application may depend on factors such as microbial species composition (e.g., single or multistrain), liveability, supplemental administration dose, method and frequency of application and diet composition (Milkulski, et al., 2012). Although egg

weight is a highly heritable trait, the beneficial effect of probiotic feeding on egg weight may be attributable to a favorable environment in the intestinal tract, which may help to assimilate more nutrients (Panda, et al., 2008).

Table 1. The result of feed consumption, egg mass, QDP, feed conversion, feed efficiency and egg cholesterol in 4 week of treatment

Treatment	Feed consumption (g) \pm SD	Egg mass (g) \pm SD	Quail day production (%) \pm SD	Feed conversion \pm SD	Feed efficiency \pm SD	Egg cholesterol (mg/g) \pm SD
T0	23.02 ^e \pm 0.02	10.91 ^d \pm 0.01	55.77 ^e \pm 0.02	2.12 ^c \pm 0.01	47.52 ^a \pm 0.01	19.02 ^e \pm 0.01
T1	21.40 ^b \pm 0.02	10.83 ^c \pm 0.15	52.73 ^c \pm 0.02	1.96 ^a \pm 0.01	48.65 ^e \pm 0.01	6.76 ^a \pm 0.02
T2	22.05 ^c \pm 0.02	10.72 ^a \pm 0.02	41.82 ^a \pm 0.01	2.06 ^b \pm 0.01	50.60 ^c \pm 0.02	6.93 ^b \pm 0.02
T3	22.43 ^d \pm 0.02	10.85 ^c \pm 0.02	55.03 ^d \pm 0.02	2.06 ^b \pm 0.01	48.36 ^b \pm 0.02	13.57 ^d \pm 0.02
T4	21.36 ^a \pm 0.01	10.76 ^b \pm 0.01	50.03 ^b \pm 0.02	1.96 ^a \pm 0.03	50.39 ^d \pm 0.03	12.45 ^c \pm 0.02

Note: different superscript in the same column show a different effect ($p < 0.05$)

The results showed that the probiotic supplementation give a significant effect ($p < 0.05$) to egg cholesterol. Probiotics are reported to have hypocholesterolemic (Chiang and Pan, 2012). Feeding probiotics may also play good role in altering the lipid metabolism as various studies have shown that probiotics could reduce total cholesterol and triglyceride contents of egg yolk (Mohan et al. 1995). Mahdavi et al., (2005) reported that Probiotics reduce cholesterol concentrations in egg yolk.

Conclusion

It can be concluded that the probiotic can't increase quail production and egg mass, but can decrease the feed consumption, feed conversion, egg cholesterol so increase feed efficiency. We can give the addition of 2 ml probiotic/liter drinking water for the best result.

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***In vitro* cultures of inulin from chicory on the abundance of calve fecal microbial populations by real – time PCR**

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Abstract

This study was to the effect of inulin from chicory on the abundance of bacteria and fermentation using *in vitro* of calve fecal. Factors consisted of starch 2 levels (0% and 1% starch respectively) and inulin from chicory 4 levels (0%, 1%, 2% and 4% respectively). In this study was increased the total gas production of fecal fermentation with inulin at the end of the 24 h was increased linearly when increasing percent of inulin. In contrast, the pH values at 24 h was decreased linearly ($P < 0.001$) with increasing percent of inulin. The VFA concentrations at the end of the 24 and 48 h of incubation were influence the levels of inulin. The proportion of acetate to propionate ratio (A/P) was significantly at 24 and 48 h of incubation. Nevertheless, in this study compare with control group significant reduced acetic acid and increased propionic and butyric acid proportions. The abundance of Total bacteria, Bifidobacterium and Lactobacillus abundance were increased linearly with increasing levels of inulin but abundance of *E. coli*, *C. difficile* were decreased linearly with increasing levels of inulin. In general, the reduction of intestinal pH is a positive outcome, as a more acidic environment might protect against undesirable and pathogenic bacteria. *In vitro* fermentation and animal studies have demonstrated that supplementing the diet with inulin decreased the pH. Inulin can suppress *E. coli* and *C. difficile* which are harmful microbes cause of diarrhea in the ruminant animals. But supported bifidobacterial and lactobacillus abundance comparable with high levels of inulin.

Keywords: *in vitro*, inulin, fecal, real – time PCR, ruminant

Introduction

Diarrhea is a commonly reported disease in young animals, and still a major cause of productivity and economic loss to cattle producers worldwide. (Yong-il Cho and Kyoung-Jin Yoon, 2014). Most young ruminant diarrhea are caused by more than one factor. Immunity, it is well known that intestinal microbiota has an important influence on the health of mammals, as it modulates the immune system and provides resistance against pathogens (Hooper et al., 2001; Suchodolski 2011). The current has banned all in-fed use of antibiotic. Therefore, alternative to reduce the use of antibiotic in the animal feed. This perspective has stimulated nutritionists and feed manufacturers to search for new, safer alternatives. Recently, prebiotics has been introduced as a new concept under functional food science owing to concern over residues of antibiotic. (Samanta et al., 2013). Inulin is carbohydrate form of fructan; it is fiber source which is not digested in digestive system (stomach and intestine) in single stomach animal or human. Therefore, inulin will fall into colon and is benefit to body growth due to an

increase in number of health benefit microorganisms, such as *Lactobacillus* and *Bifidobacteria* (Younes et al, 1995; Kaur and Gupta, 2002). Inulin reduce in *E. coli* and *Clostridium* which are dangerous to health, for example, diarrhea, will be determined. Ruminant animals (cattle, buffalo, goat, sheep and deer).

A lot of studies have been conducted to investigate the effects of prebiotics on intestinal microbial populations, digestive and systemic health, immune function and growth performance in non-ruminant. Although several studies have presented the inulin effects of animal feed and using in vitro fermentation of rumen fluid samples, no study has been reported that fermentation used in vitro culture of calve fecal samples. The objective of this study was to analysis the effect of inulin on the abundance of bacteria and their fermentation using in vitro of calve fecal samples.

Methodology

Two levels of starch and 4 levels of inulin from chicory were a completely randomized design with a 2 x 4 factorial arrangement of treatments. Factors consisted of starch levels (0% starch and 1% starch respectively) and inulin from chicory levels (0%, 1%, 2% and 4% respectively). Fresh fecal samples were collected from 3 Jersey calves after feeding the milk. (approximately 32 days after birth). In the culture, sterile medium + fecal slurry + treatment these culture tubes were carried out in triplicate and incubated 37 °C for 24, 48 h in a shaking incubator. Total bacteria, *Bifidobacterium*, *Clostridium difficile*, *Escherichia coli*, *Lactobacillus* and *Salmonella* were quantified using respective specific real-time PCR assays. Volatile fatty acid (VFA) concentrations were analysis using gas chromatography. The pH values were recorded using a pH meter. Gas pressure was measured using a manometer.

Results and Discussions

Inulin extracted from chicory used in this study was increased the total gas production of fecal fermentation with inulin at the end of the 24 h was increased linearly when increasing percent of inulin which is simultaneously reflected by the large increase in gas production at high percent of inulin and gas production when the time of incubation increase (from 0 to 24 h). In contrast, the pH values of the fecal fermentation at 24 h was decreased linearly ($P < 0.001$) with increasing percent of inulin. The VFA concentrations at the end of the 24 and 48 h of incubation were influence the levels of inulin. The proportion of acetate to propionate ratio (A/P) was significantly at 24 and 48 h of incubation. The addition of starch (0% starch and 1% starch) have influence acetate, butyrate and acetate to propionate ratio (A/P) ($P < 0.001$) at the end of the 24 h but at the 48 h did not influence butyrate, valerate and iso- butyrate. Nevertheless, in this study compare with control (0% inulin) significant reduced acetic acid and increased propionic and butyric acid proportions. The addition of 0% or 1% starch did not differ the abundance of *E. coli*, *Clostridium* at 24 h and *E. coli* at 48 h incubation. The abundance of Total bacteria, *Bifidobacterium* and *Lactobacillus* abundance were increased linearly with increasing levels of inulin but abundance of *E. coli*, *Clostridium* were decreased linearly with increasing levels of inulin.

Table 1. Effects of inulin from Chicory powder on VFA concentrations in the fecal cultures at 48 hr.

Treatment A	Treatment B	Total VFA (mM)	Acetate (mM)	Propionate (mM)	Butyrate (mM)	Valerate (mM)	Isobutyrate (mM)	Isovalerate (mM)	Acetate/Propionate
0% starch	0%inulin	35.19	19.59	6.61	3.35	2.88	1.05	1.70	2.96
	1%inulin	83.06	31.75	35.11	8.69	8.05	0.40	0.70	0.90
	2%inulin	90.47	10.97	15.04	33.64	29.42	0.90	0.50	0.73
	4%inulin	105.80	19.41	13.61	40.35	27.74	4.27	0.42	1.43
Contrast									
	Linear	<.0001	<.0001	0.6686	<.0001	<.0001	<.0001	<.0001	<.0001
	Quadratic	<.0001	0.0039	<.0001	0.6481	0.0051	<.0001	<.0001	<.0001
	Cubic	0.0024	<.0001	<.0001	<.0001	<.0001	0.0593	<.0001	<.0001
1% starch	0%inulin	59.52	36.45	6.06	12.57	2.76	0.56	1.11	6.01
	1%inulin	93.56	38.82	31.41	12.38	9.80	0.46	0.69	1.24
	2%inulin	95.82	11.56	15.26	37.18	30.55	0.80	0.48	0.76
	4%inulin	110.32	18.53	14.95	43.07	29.57	3.79	0.41	1.24
Contrast									
	Linear	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001
	Quadratic	0.0019	0.0005	<.0001	0.0474	0.0011	<.0001	<.0001	<.0001
	Cubic	0.0025	<.0001	<.0001	<.0001	<.0001	0.0196	0.2695	<.0001
MSE		16.3232	0.6734	0.5300	5.1452	2.4854	0.0840	0.0007	0.0040
Effect									
	Starch*Inulin	0.0052	<.0001	0.0008	0.1112	0.7178	0.3574	<.0001	<.0001
	Starch	<.0001	<.0001	0.0578	0.0004	0.1256	0.0741	<.0001	<.0001
	Inulin	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001

Table 2. Effect of inulin of fecal fermentation at 48 hr on abundance of Total bacteria, *E. coli*, *Clostridium*, *Bifidobacterium* and *Lactobacillus* quantified by real-time PCR.

Treatment A	Treatment B	Abundance (log ₁₀ no. of copies of rrs gene/ml)				
		Total bacteria	<i>E. coli</i>	<i>Clostridium</i>	<i>Bifidobacterium</i>	<i>Lactobacillus</i>
0% starch	0%inulin	9.69	8.52	6.23	7.20	7.74
	1%inulin	10.60	8.44	5.67	8.79	8.82
	2%inulin	10.71	8.34	5.73	9.14	9.11
	4%inulin	10.75	8.42	5.90	9.33	9.40
Contrast						
	linear	<.0001	0.1048	0.0022	<.0001	<.0001
	Quadratic	<.0001	0.1664	<.0001	<.0001	<.0001
	Cubic	0.0016	0.3691	0.0689	0.0003	0.0041
1% starch	0%inulin	10.38	8.52	6.53	9.87	8.20
	1%inulin	10.65	8.43	6.00	9.08	8.98
	2%inulin	10.73	8.48	5.84	9.27	9.04
	4%inulin	10.76	8.46	5.89	9.26	9.37
Contrast						
	linear	<.0001	0.5617	<.0001	<.0001	<.0001
	Quadratic	0.0093	0.5236	<.0001	<.0001	0.0002
	Cubic	0.4518	0.3450	0.4656	<.0001	0.0002
MSE		0.0047	0.0065	0.0077	0.0061	0.0063
Effect						
	Starch*Inulin	<.0001	0.4317	0.0271	<.0001	0.0003
	Starch	<.0001	0.2119	0.0003	<.0001	0.0024
	Inulin	<.0001	0.1898	<.0001	<.0001	<.0001

Conclusion

The cumulative gas production technique can be used to study the effect of inocula (as source of microflora) and substrates on in vitro fermentation characteristics between inocula and substrate (Williams et al., 2001). The cumulative gas production measured fermentation

kinetics and end products, such as total gas production, and VFA were also determined. (Shim et al., 2007). Bauer et al. (2004) reported that fecal inocula can be used for *in vitro* assessment of large intestinal fermentation. The quantification of the species bacteria that are important to animal health and the analysis for the major fermentation products and pH allow for evaluation of these inulin with respect to bacteria and fermentation. However, the result *in vitro* studies cannot be directly extrapolated to *in vivo* studies. However, this *in vitro* study allowed us to evaluate four levels inulin and such *in vitro* studies using fresh fecal samples of animal may be used to test other promising prebiotic ingredients and their combinations simultaneously. The findings of this study may help in designing further evaluate these prebiotics. Overall, the level inulin in these studies had various effects on the species of bacteria and. Future improvement of creep feed for ruminants should be directed to reduce the abundance of potentially harmful bacteria including *E coli* and *C difficile* and increase the abundance of potentially useful bacteria including *Bifidobacterium* and *Lactobacillus*. Therefore, in ruminant animals (cattle, buffalo, goat, sheep, deer), some of microorganisms in the rumen can digest inulin, thereafter the efficiency of inulin in digestive system decreases.

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Effect of a mixture of jackfruit peel (*Artocarpus heterophyllus*) and manure fermented by using *Aspergillus oryzae* on NH₃, VFA concentration and estimated ME, NE, OMD and MP values *in vitro*

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Abstract

This research was conducted to investigate the effect of a mixture of jackfruit peel and manure fermented by using *Aspergillus oryzae* on NH₃ and VFA concentration as well as estimated ME, NE, OMD and MP values *in vitro*. The method used in this study was an Experiment by using Randomized Block Design (RBD) with 4 treatments and 3 replications. The feed treatment consisted of T0: 50% Jackfruit Peel + 50% Manure, T1: 60% Jackfruit Peel + 40% Manure + 0.4% *Aspergillus oryzae*, T2: 70% Jackfruit Peel + 30% Manure + 0.4% *Aspergillus oryzae*, T3: 80% Jackfruit Peel + 20% Manure + 0.4% *Aspergillus oryzae*. Parameters observed were concentration of NH₃, VFA and estimated ME, NE, OMD and MP values. Data were analyzed by using Analysis of Variance from RBD. The significant different among treatments then was analyzed by Least Significant Difference Test (LSDT). The results showed that NH₃ concentration was highly significant different $P < 0.01$ while VFA was significant different $P < 0.05$. The estimated ME, NE, OMD and MP values were highly significant different $P < 0.01$. It is concluded that the effect of a mixture of jackfruit peel and manure fermented by using *Aspergillus oryzae* could increase NH₃, VFA concentration and ME, OMD, MP values, but tends to decrease NE value. The best treatment of this research was T3 treatment. It is suggested taking further research such as *in vivo* trial.

Keywords: jackfruit peel, manure, *aspergillus oryzae*, NH₃, VFA

Introduction

Jackfruit peel is an alternative feed that can be used as animal feed because it contains high carbohydrate 71.53 %, but low protein (Novandrini, 2003). Manure contains 94.3 % DM, 85.8 % OM, and 15.4 % CP (Lanyasunya et al., 2006). Manure utilization as animal feed had problems because it contains microorganism that can be harmful to cattle. Fermentation with *Aspergillus oryzae* could be good treatment to solve the problem and increase the nutritive value of jackfruit peel and manure. Widodo (2011) explained that *Aspergillus oryzae* was able to ferment carbohydrate to form glucose, and then convert to alcohol. This yeast also produces phytase which can increase availability of mineral.

This research was conducted to investigate the effect of a mixture of jackfruit peel and manure fermented by using *Aspergillus oryzae* on NH₃ and VFA concentration and estimated ME, NE, OMD and MP values *in vitro*.

Methodology

The method used in this study was an Experiment by using Randomized Block Design RBD with 4 treatments and 3 replications. The feed treatment consisted of T0: 50% Jackfruit Peel + 50% Manure, T1: 60% Jackfruit Peel + 40% Manure + 0.4% *Aspergillus oryzae*, T2: 70% Jackfruit Peel + 30% Manure + 0.4% *Aspergillus oryzae*, T3: 80% Jackfruit Peel + 20% Manure + 0.4% *Aspergillus oryzae*. Parameters observed were concentrations of NH₃, VFA and estimated ME, NE, OMD, and MP values. Data were analyzed by using Analysis of Variance from RBD. The significant different among treatments was then analyzed by Least Significant Difference Test LSDT.

Results and discussion

The results of this experiment were shown in Table 1, 2, 3 and 4. Table 1 describes the nutritive value of raw material i.e dry jackfruit peel and manure. Dry jackfruit peel had low CP 10.01 % and high CF 33.01 %. Meanwhile manure had higher CP than jackfruit peel and less than half of CF content than jackfruit peel. Furthermore, the nutritive value of mixture of jackfruit peel and manure fermented by using *Aspergillus oryzae* could be seen in Table 2.

Table 1. Nutritive value of jackfruit peel and manure

No	Feeds	Nutritive Value % DM			
		DM*	OM**	CP**	CF**
1	Dry jackfruit peel	25.54	92.32	10.01	33.01
2	Dry manure	35.57	50.21	15.05	14.06

DM = Dry Matter, OM = Organic Matter, CP = Crude Protein, CF = Crude Fibre

values in the same column showed a significantly different $p < 0.05$ * or highly significant different $P < 0.01$ **

Table 2. Nutritive value mixture of jackfruit peel and manure fermented by using *Aspergillus oryzae*

Treatments	Nutritive Value % DM			
	DM*	OM**	CP**	CF**
T0 not fermented	93.71	83.86	9.83	31.35
T1 fermented	94.11	83.64	10.06	29.12
T2 fermented	94.52	83.22	10.40	25.33
T3 fermented	94.72	80.71	11.41	23.59

DM = Dry Matter, OM = Organic Matter, CP = Crude Protein, CF = Crude Fibre

values in the same column showed a significantly different $p < 0.05$ * or highly significant different $P < 0.01$ **

The nutritive value of mixture of jackfruit peel and manure fermented by using *Aspergillus oryzae* tended to increase DM, OM, CP and CF. Ammonia, total VFA concentration, estimated ME, NE, OMD, MP values were shown in Table 3 and 4.

Table 3. Ammonia NH₃ and total VFA concentration mixture of jackfruit peel and manure fermented by using *Aspergillus oryzae*

Treatments	NH ₃ *mM/ml rumen liquid	VFA** µl
T0	7.73±1.22 ^a	60.00±10.00 ^a
T1	11.55±1.26 ^a	73.33±11.55 ^a
T2	12.38±1.96 ^b	83.33±15.28 ^a
T3	16.45±0.71 ^b	96.67±11.55 ^b

NH₃ = Ammonia, VFA = Volatile Fatty Acids

values in the same column showed a significantly different $p < 0.05$ * or highly significant different $P < 0.01$ **

Table 4. Estimation of ME, NE, OMD, dan MP value mixture of jackfruit peel and manure fermented by using *Aspergillus oryzae*

Treatments	ME* MJ/Kg DM	NE** MJ/Kg DM	OMD** %	MP** g/kg OMD
T0	11.44±0.19 ^a	5.14±0.02 ^b	43.77±1.11 ^a	52.80±1.34 ^a
T1	12.35±0.54 ^b	5.09±0.06 ^b	51.32±2.87 ^a	62.30± 3.68 ^b
T2	11,98±0.15 ^a	4.80±0.02 ^a	54.23±0.83 ^b	65.41±1.00 ^b
T3	13.09±0.21 ^c	4.85±0.03 ^a	63.68±1.18 ^c	77.18±1.89 ^c

ME = Metabolizable Energy, NE = Net Energy, OMD = Organic Matter Digestibility, MP = Microbial Protein.

values in the same column showed a significantly different $p < 0.05$ * or highly significant different $P < 0.01$ **

The results showed that the NH_3 concentration was highly significant different $P < 0.01$ while VFA concentration was significant different $P < 0.05$. The estimated ME, NE, OMD and MP value were highly significant different $P < 0.01$.

Conclusion

It is concluded that the effect of mixture of jackfruit peel and *manure* fermented by using *Aspergillus oryzae* could increase NH_3 , VFA concentration and ME, OMD, and MP values, but tends to decrease NE value. The best treatment of this research is T3. It is suggested taking further research such as *in vivo* trial.

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Optimization of enzymatic hydrolysis of palm kernel expeller and its effect on broiler's growth performance

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Abstract

The effectiveness of enzymatic hydrolysis is dependent on various factors such as temperature and moisture content which influence the stability and functionality of enzymes. In this study, parameters influencing the enzymatic fermentation of palm kernel expeller (PKE) were optimized employing response surface methodology (RSM). In addition, the effectiveness of enzymatic treatment of PKE in improving its inclusion level in broiler diets was evaluated. The results showed that temperature, enzyme concentration and hydrolysis time had significant ($P < 0.01$) effect on the enzymatic hydrolysis of PKE. Using the crude enzyme produced by *Aspergillus terreus* K1, maximum reduction of crude fiber (40%) were achieved by fermenting the PKE at 60% initial moisture with 9.0 U/g PKE mannanase at 51 °C for 18 h. Results of the growth performance study showed an increase in FCR with increase in PKE inclusion level. However, increasing the inclusion rate of enzyme-treated PKE to 30% did not affect FCR of broilers as compared to those fed 20% PKE. Overall result of this study indicates that birds can be fed with 5% of PKE during the starter period and the PKE inclusion level can increase to 20% PKE in the finisher diet.

Keywords: palm kernel expeller, response surface methodology, enzymatic fermentation

Introduction

Palm kernel expeller (PKE) is a by-product obtains through the mechanical extraction of palm (*Elaeis guineensis*) oil. The fiber of PKE is mainly in the form of insoluble mannan hemicelluloses (58%) and degrading the fiber to release the available nutrients has been the greatest challenge in the use of PKE in poultry diet (Sundu and Dingle, 2003). Attempts have been made to improve the inclusion rate with biological pretreatment being the ideal one. Mirnawati et al. (2011) reported that 17% of *Aspergillus niger* fermented PKE can be included in broiler's diet, while the use of commercial enzyme cocktail can increase PKE inclusion up to 20% (Soltan, 2009). Nevertheless, the efficacy of enzymatic hydrolysis depends on several factors influencing the stability and functionality of enzymes used such as temperature and moisture content. Thus, the objectives of this study was to optimize the enzymatic hydrolysis of PKE using a crude enzyme produce by *Aspergillus terreus* K1 and to evaluate whether enzymatic treatment of PKE can improve its utilization in broiler chickens.

Methodology

Response surface methodology was used to optimize the enzymatic degradation of PKE by a crude enzyme produces using *Aspergillus terreus*. Design-Expert® software (version 8.0) was used for the statistical design of experiments and data analysis. A CCD with four factors

and five levels using six replicated center points was employed and crude fiber reduction was measured. Data from the CCD were analyzed by the least squares method to fit the second-order polynomial model.

For growth performance study, 180 male day-old broiler chicks (Cobb 500) were randomly assigned into five treatment groups. Each treatment consisted of six replications and six birds per replicate (6 birds/cages) making up a total of 36 birds per treatment. The dietary treatment combinations were T1 (corn-soybean meal based diet without PKE as control), T2 (5% UPKE in starter + 20% UPKE in grower), T3 (5% UPKE in starter + 30% UPKE in grower), T4 (5% EPKE in starter + 20% EPKE in grower), T5 (5% EPKE in starter + 30% EPKE in grower). Feed intake (FI) and body weights (BW) were recorded weekly for estimations of feed conversion ratio (FCR) during the various growth periods.

Results and Discussion

Results shows that all of the first order main effects (X_2 , X_3 and X_4) with exception of moisture content (X_1) are highly significant ($P < 0.01$) for the enzymatic hydrolysis of PKE (Table 1). Fermenting the PKE at 60% initial moisture with 9.0 U/g PKE mannanase at 51 °C for 18 h, results in the reduction of crude fiber of untreated PKE from 22% to approximately 13.5% in enzyme-treated PKE.

Table 1. Analysis of variance (ANOVA) table for crude fiber reduction

Source	Sum of squares	Df	Mean Square	F-value	Prob > F
Model	3042.29	14	217.31	50.81	< 0.01
X_1	16.32	1	16.32	3.82	0.07
X_2	1139.47	1	1139.47	266.42	< 0.01
X_3	324.94	1	324.94	75.98	< 0.01
X_4	1332.81	1	1332.81	311.63	< 0.01
X_1X_2	35.19	1	35.19	8.23	0.01
X_1X_3	0.16	1	0.16	0.04	0.85
X_1X_4	22.92	1	22.92	5.36	0.04
X_2X_3	3.43	1	3.43	0.80	0.39
X_2X_4	91.35	1	91.35	21.36	< 0.01
X_3X_4	39.91	1	39.91	9.33	0.01
Residual	64.15	15	4.28		
Lack of fit	42.47	10	4.28	1.00	0.54
Pure error	21.39	5	4.28		
Cor. Total	3106.45	29			
SD	2.07		R^2	0.9793	
CV (%)	10.09		Adjusted R^2	0.9601	
			Predicted R^2	0.9108	

The effect of enzymatic reduction of crude fiber was further evaluated in a growth performance to determine the maximum level of untreated PKE and enzyme-treated PKE in broiler's diets (Table 2). In the starter period, inclusion of 5% untreated and enzyme-treated did not affect growth performance (ADG, feed intake and FCR) of chickens as compared to those fed the control (corn-soybean meal without PKE). Results of the growth performance study indicate that the higher inclusion of untreated PKE (30%) in broilers diets lead to significant increase in FCR as compared to control and those fed with lower percentage of untreated PKE (20%). In contrast, enzymatic treatment of PKE leads to a non-significant

increase in FCR of broilers fed with 30% enzyme-treated PKE as compared to 20% enzyme-treated PKE.

Table 2. Growth performance of chicken fed with different dietary combination treatments

Parameters	Control	20% UPKE	30% UPKE	20% EPKE	30% EPKE	SEM
Starter						
ADG (g/bird)	39.16	39.48	37.91	39.55	39.29	0.38
Feed intake (g/bird/day)	48.13	49.52	47.40	50.17	46.92	0.73
FCR	1.23	1.26	1.25	1.27	1.20	0.01
Finisher						
ADG (g/bird)	61.50 ^{ab}	68.71 ^a	59.13 ^b	67.38 ^{ab}	59.89 ^b	1.38
Feed intake (g/bird/day)	114.51 ^a	135.54 ^b	127.01 ^{ab}	126.79 ^{ab}	124.33 ^{ab}	2.61
FCR	1.87 ^a	1.97 ^b	2.15 ^c	1.88 ^{ab}	2.08 ^c	0.03

¹UPKE = Raw- PKE; EPKE = Enzyme-treated PKE

^{2a,b,c} Values on the same row with different superscripts differ significantly ($P < 0.05$).

Conclusion

Optimization results indicated that 40% crude fiber reduction can be achieved through enzymatic fermentation. However, the effect of enzyme treatment was not reflected in the growth performance of broiler chickens. Overall result of this study indicates that birds can be fed with 5% of PKE during the starter period and the PKE inclusion level can increased to 20% PKE in the finisher diet

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The correlation between protein and fat in meat with protein intake of local lambs

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Abstract

This research was conducted to examine the correlation between protein and fat of meat with protein intake of local lambs. This research used 12 local male lambs \pm 3 months with average body weight \pm 25.82 kg CV=13,71%. They were fed with complete feed contained crude protein CP about 14% - 18% and 70% of total digestible nutrients (TDN). Protein and fat of meat were measured by taking sample of *Longissimus dorsi* (LD) muscles and *Biceps femoris* (BF) muscles. The analyses of protein and fat of meat were done by using Macro Kjeldhal and Sochlet methods, respectively. Correlation analysis was used to know the relationship of the data. The result showed that the level of CP intake has a low correlation $r_1 = 0.19$ with the protein in meat, while the fat in meat has a strong correlation $r_2 = 0.73$ with the level of CP intake. This study concludes that the protein of meat has a low correlation with the protein level intake, but it has a strong correlation with the fat content.

Keywords: lambs, meat protein, meat fat

Introduction

Lamb's meat is one of the source of animal protein that usually consumed by people. Nowadays, the increase of animal protein needs caused people start to realize and understand the important of animal protein for their health and intelligence. However, the consumers are being selective in choosing meat with low fat. Low fat meats might be obtained from the lambs (Soeparno, 2000).

The lambs need nutrient in feed to maintain body condition and optimize growth. In general, the main limitation of nutrients in feed are energy and protein (Mathius et al., 1996). The deficiency of nutrient has negative effect on animal. Deficient of protein may lead break down of the reserve protein inside the blood, heart and changes the development of rumen microorganism that are useful to digest cellulose. The microbes also play as an important source of microbial protein which helps to fulfill the needs of body protein (McDonald et al., 1988). However, feed given with high level of protein could not necessarily increase the meat protein level significantly, because meat protein will increase according to the age and body weight (Lawrie, 2003). Feed with different protein energy ratio could produce designated chemical meat content and different meat products (Soeparno, 2000).

The quantity of feed consumption regulates the growth rate of fat cells and fat composition that could affect the meat chemical quality. The meat chemical composition is depend on the animal species, age, sex, feed, location and the function of the part in the body (Romans et al., 1994).

Methodology

Twelve male local lambs with average age ± 3 months and body weight ± 25.82 kg were used in this research. The lambs were individually housed in the iron cage model. The equipments used in this research were *Fortune* hanging scale to measure animal body weight with 50 kg of maximum capacity and 0.1 kg of accuracy, *Camry* hanging balance to measure feed with 5 kg of maximum capacity and 0.05 accuracy, aluminum foil and cutter. Feed ingredients were rice bran, cassava meal, sugar cane top, cassava peel, soybean meal, fish meal, molasses and mineral. Feed contained 14%-18% of crude protein CP about and 70% of total digestible nutrients TDN. The feed was formed in pellet. Feed and water was given in *ad libitum*.

The research was conducted over 12 weeks. All of the lamb were fasting for 6 h, measured the body weight and slaughtered. The process took 6 days due to 2 lambs slaughtered in each day. The slaughtered were done by cutting the neck circulations consisting of digestion, respiration and blood circulation. The carcass was obtained by separating the head, foot, skin, tail and viscera. All carcasses were put into the cooling room with 17°C temperatures for 10 h. Then, each carcass was cut into 2 parts, right and left parts. Only the right part was used, then *Longissimus dorsi* (LD) muscles and *Biceps femoris* (BF) muscles were separated from bones and fat. The protein and fat of both muscles were analyzed by using Macro Kjeldhal and Sochlet methods, respectively.

The data were performed by correlating between CP intake with meat protein and fat. The obtained coefficient correlation were then descriptively analyzed based on Santosa (2005) method who classified coefficient correlation into 3, namely between 0.00 – 0.19 lowest, 0.20 – 0.39 low, 0.40 -0.59 medium, 0.60 – 0.79 strong, and 0.80 – 1.00 strongest.

Results and discussion

The correlation between protein and fat in meat of lambs with protein intake can be seen in figure 1.

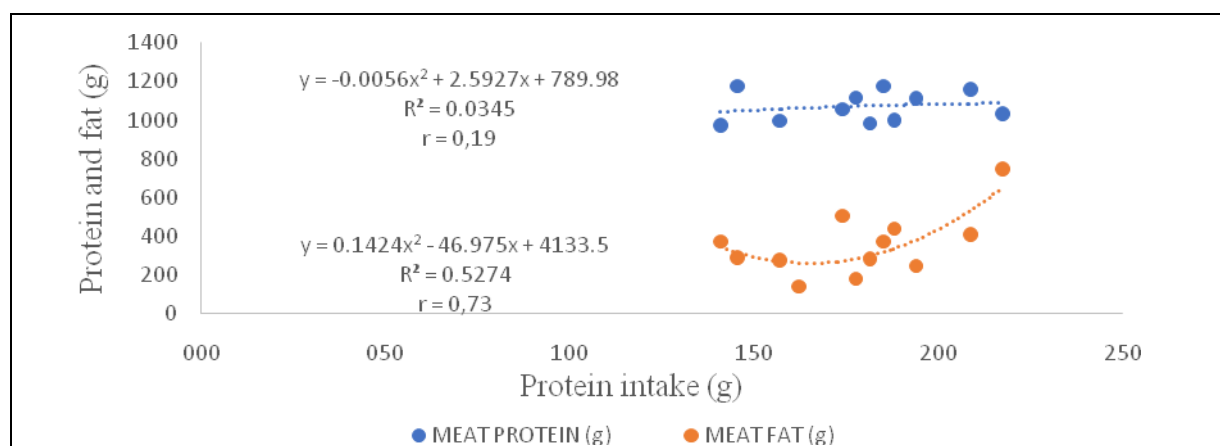


Figure 1. Correlation between the consumption of protein feed with the protein and meat fat

The result showed that correlation between CP intake and meat protein content was positive but the coefficient correlation was categorized as lowest ($r = 0.19$). While correlation of CP intake with meat fat resulted a positive result with strong coefficient correlation category ($r = 0.73$). It was due to the constant and relative growth body protein until the point when the growth rate decreases. Different thing occurred to the body fat, the deposition always increases.

Fox and Black (1984) reported that when the animals are growing, the growth of fat and protein increase. Meat protein in the animals was relatively constant (Searle and Griffiths, 1983), but age affected meat protein content (Lawrie, 2003). Tillman et al. (1983) reported that animals with protein above the level of consumption will be deaminated within the body and changed into energy, and also being stored as body fat form.

Based on the graph and the equation in figure 1, a peak point of meat protein growth occurred when protein consumption was around 231.49 g. The lowest point of meat fat occurred when protein consumption was around 198.22 g. Owens et al. (1993) reported that total deposition of protein could be limited by the supply of nutrient, but with the higher supply from balanced feed also makes maximum of protein deposition. Protein synthesis rate during growing period could be limited by the amino acid supply.

A low correlation was influenced by the age of lambs. It is because increasing meat protein was due to increasing age and body weight. On the other hand, higher protein feed given to the lambs tended to increase meat fat. The results also supported the fact that the cells growth in the body of animals should be supported with sufficient protein in feed. McDonald et al. (1988) reported that lambs need enough nutrition to support the growth process with protein.

Conclusion

Based on the research, it can be inferred that feed given with 14-18% protein level in the male local lambs has a low correlation with meat protein and has strong correlation with meat fat.

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Effects of oil palm leaflets in total mixed ration on nitrogen utilization, rumen fermentation and growth in goats

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Abstract

Effects of oil palm leaflets (OPL) in TMR on productive performance of goats were investigated in two experiments. Experiment 1: sixteen male Anglo-Nubian crossbred goats weighing 21.8 ± 3.4 kg, of between 11 to 12 months old were used in a 4x4 Latin Square experiment consisted of the following four treatments; 50% grass hay in TMR (T1); 50% OPL in TMR (T2); 60% OPL in TMR (T3) and 70% OPL in TMR (T4). Results showed that DMI had no differences among treatment groups. No differences were observed in DM digestibility among treatments. Treatments have no effect on faecal N excretion, N absorption and retention. No effect on rumen pH, concentrations of NH_3N and blood urea nitrogen (BUN) among treatment groups. Experiment 2: Eighteen male goats comprised of Thai native goats (TN, 14.2 ± 1.8 kg BW), Anglo-Nubian x TN crossbred (ATN, 16.5 ± 2.1 kg BW) and Boer x TN crossbred (BTN, 17.2 ± 1.9 kg BW) of average 8 to 9 months old were allocated in a 122-day CRD feeding trial. Animal received TMR containing 70% OPL fed ad libitum. The order for ADG was BTN (86.1 g/d) > ATN (72.5 g/d) > TN (63.3 g/d), respectively).

Keywords: oil palm leaflets, total mixed ration, meat goats, N utilization

Introduction

Feed cost makes up the main cost component in goat production, accounting to 60-70% of the production costs (Strauch and Stockton 2013). Utilization of oil palm fronds (OPF) in ruminant production is well documented (Eng et al., 2005; Wan Zahari et al., 2005). However, their low N and high fibre contents of OPF are the generally main factors limiting their digestibility and intake by ruminant. Oil palm leaflets (OPL) which contain up to 10.0% CP (Mohd Sukri 2003) may offer a solution use to substitute OPF for ruminants. Little is known on the efficacy of using OPL as feed ingredient for feeding of ruminants. Therefore, the objectives of this study were first to determine the optimal inclusion rate of OPL as roughage source in TMR followed by a feeding trial to test the production responses of three local goat breed-types using the selected TMR.

Methodology

Oil palm fronds (OPF) was harvested from oil palm plantation and was later separated the oil palm leaflets (OPL) from petiole. OPL was then chopped to the fine particle of ~2-4 mm size for the preparation of TMR treatment. Chemical composition of the dietary treatment are presented in Table 1.

Experiment 1

Sixteen male Anglo-Nubian crossbred (Anglo-Nubian × Thai native) goats weighing 21.8 ± 3.4 kg and aged between 11 to 12 months old were used in a 21-day per period 4x4 Latin Square experiment. Goats were randomly allocated to four dietary treatments: 50% grass hay in the TMR (T1, as control); 50% OPL in TMR (T2); 60% OPL in TMR (T3) and 70% OPL in TMR (T4). Animals were housed in individual pens and have free access to fresh clean water. Feed were offered ad libitum. Body weights (BW) of the goats were recorded. Digestibility was determined using 7 days total collection method. Daily total faecal output was used for determination of faecal DM, and faecal-N contents. Total urine produced was analyzed of total urine-N. Rumen fluid were used for determination of ruminal pH, ammonia-N and short chain volatile fatty acids (SCFA) contents.

Experiment 2

Eighteen male goats comprised of six Thai native goats (TN, 14.2 ± 1.8 kg BW), six Anglo-Nubian x TN crossbred (ATN, 16.5 ± 2.1 kg BW) and six Boer x TN crossbred (BTN, 17.2 ± 1.9 kg BW) of average 8 to 9 months old were randomly allocated in a 122-day CRD feeding trial to compare the performance of the three breed-types fed on TMR containing 70% OPL diet. BW of goat were determined every 14 days.

Chemical analysis

Diets and faeces samples were analyzed for DM. NDF and ADF were determined according to Van Soest et al. (1991). Ether extract was determined according to AOAC (2006). CP was determined using the Kjeldahl procedure (AOAC 2000). NH_3N was determined using direct stream distillation of Kjeldahl method. SCFA was determined due to Cottyn and Bouque (1968).

Statistical analysis

Feed intake, N utilization, SCFA and NH_3N data were analysed using the GLM procedure of SAS. Repeated measurements of ruminal pH and NH_3N were applied. The means were compared using Duncan's multiple range test after analyses of variance (ANOVA) using SAS program (SAS, 2009) and the values are expressed as mean.

Table 1. Chemical composition of the total mixed ration (TMR) used for the experiment

Parameters	Treatment			
	T1	T2	T3	T4
Crude protein (CP)	14.0	14.0	14.0	14.0
Energy (kJ ME/kg)	31.42	31.17	31.63	31.04
Neutral detergent fiber (NDF)	35.4	33.7	35.9	38.1
Acid detergent fiber (ADF)	26.8	27.7	26.6	29.5

T1, 50% grass hay in TMR; T2, 50% oil palm leaflet (OPL) in TMR; T3, 60% OPL in TMR; T4, 70% OPL in TMR

Results and discussion

Experiment 1: Daily DMI was affected by diets, with goats in T2 and T3 had higher than those in T1 and T4. DM digestibility was not different among treatments. Ruminal pH was not significantly different among the treatments, average ruminal pH of goats fed the four diets was 6.8. Ruminal NH_3N concentration did not significantly different among treatments. Daily faecal and urinary N losses (g/day) were not significant affected by the various level of OPL substitution. There were no differences ($P>0.05$) in N absorbed (g/day) and N retention

(g/day) among treatment groups. Results in the present study demonstrated that OPL can be used up to 70% without adverse effect on goat production.

Table 2. Feed intake and percent digestibility ruminal pH, ruminal NH₃N, blood urea nitrogen (BUN), short chain fatty acids (SCFA) and nitrogen utilization of meat goats fed different dietary TMR treatments throughout 84 days

Parameter	Treatment				s.e.m.
	T1	T2	T3	T4	
Total DM intake (g/d)	544.5 x	564.6 z	560.1 z	558.8 y	1.12
DM Digestibility (%)	58.2	57.2	56.2	55.1	0.67
pH	6.8	6.8	6.8	6.8	0.91
NH ₃ -N (mg/L)	138.5	139.5	142.3	145.0	1.23
SCFA (mmol/L)	93.9 x	112.1 z	116.6 z	106.5 y	1.20
N excretion					
Faecal N (g/d)	7.46	7.72	7.56	7.17	0.46
Urinary N (g/d)	4.32	5.48	4.91	3.79	1.01
N absorbed g/d	4.7	4.9	5.0	5.3	0.78
N retention g/d	0.4	-0.6	0.1	1.5	0.56

T1, 50% grass hay in TMR; T2, 50% oil palm leaflet (OPL) in TMR; T3, 60% OPL in TMR; T4, 70% OPL in TMR; x y z, different letters in the row are significantly differed (p<0.05); s.e.m., standard error of the mean

Experiment 2: ADG, FCR, and feed cost per kg gain of three treatment groups are presented in Table 3. The order for feed intake was BTN (Boer cross) > ATN (Anglo-Nubian cross) > TN (Thai native) which as expected resulted in higher ADG for BTN (86.1 g) than ATN (72.5 g) with the lowest for TN (63.6 g).

Table 3. Average daily gain, feed conversion ratio, daily gram N intake and production cost of goats received fermented TMR throughout 112 days

Parameter	Treatment			s.e.m.
	TN	ATN	BTN	
Average daily gain (g/day)	63.6 x	72.5 y	86.1 z	1.30
Total BW gain (kg in 114 days)	7.20 x	8.26 y	9.81 z	1.32
Total feed intake (kg)	46.9 x	58.7 y	62.7 z	0.55
Feed conversion ratio (FCR)	6.51	7.11	6.39	
Feed cost per kg gain*	26.6	29.1	26.1	

TN, Thai native; ANT, crossbred Anglo Nubian with NT; BNT, crossbred Boer with NT; x y z, different letters in the row are significantly differed (p<0.05); * feed cost (THB 4.09 /kg DM); s.e.m., Standard error of the mean.

Conclusion

In conclusion, OPL can be included up to 70% in a well-formulated TMR without causing any adverse effect to goats. Boer x Thai native goats performed better than Thai native and Anglo-Nubian x Thai native goats

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The proximate analysis and *in vitro* gas production of some types of waste paper

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Abstract

Two experiments were conducted to determine the proximate analysis and *invitro* gas production and to predict the metabolizable energy of some types of waste paper in the Gezira State, Sudan. There were variations in proximate analysis, *invitro* gas production and metabolizable energy among types of waste paper. Crude protein was very low (0.3 – 0.9%) and crude fibre was high (45.95 – 58.7) in waste paper. Ash, EE and NFE varied greatly among types of waste paper. Gas production was highest in Roneo printed A4 paper and least in new newsprint. Metabolizable energy was highest in printed A4 paper (5.47- 5.56Mj) and least in newsprint (1.74- 2.77Mj). The results suggested that supplemented waste paper could be utilized as a basal diet for ruminants, especially in droughts.

Keywords: waste paper, proximate analysis, in vitro gas production, metabolizable energy

Introduction

Nutrition is a main constraint for animal production in the Sudan due to rangeland deterioration (Abusuwar and Darrag, 2002) and seasonal variations in feeds quality and quantity associated with seasonal rainfall with serious shortages and effects on animal health and performance in the dry season (Elhag, 1992). Crop residues are important in filling the nutritional gap, but generally have low nutritive value limiting dry matter intake and animals performance (Hamed, 2007). Large amounts of different types of waste paper are available in the Sudan and are not properly recycled and their elimination has serious impacts on the environment. Exploiting waste paper is a mode of recycling and sustaining natural resources. Waste paper is used in paper manufacturing (Amin, 1987), fibre sludge cement board (Isou et al., 1998), weeds control (Smith et al., 1998) and animal feed (Van Soest, 1982). Different raw materials are used in paper manufacturing including wood with physical and / or chemical treatments which are likely to affect their nutritive value (Amin, 1987). There are variations in the composition of different types of waste paper with generally high crude fibre and very low crude protein (> 1%). Up to 24% waste paper in rations did not affect palatability and depressed intake (Dinius and Oltjen, 1971). Waste paper digestibility varies greatly with raw materials and processing. Mechanical pulp forms about 70% of newsprint and is less affected by chemical treatments and has a digestibility similar to wood (Dinus and Oltjen, 1971). The chemical pulp is highly delignified and almost completely digestible and up to 98%. Ground newsprint absorbed about three times its weight molasses, palatable and can be used as molasses carrier. Ink, which may contain lead, has no serious effects on cattle since it is not accumulated to noticeable levels in animals (Anonymous, 2002). Information on the nutritive value of different types of waste paper in the Sudan and abroad is scarce. Consequently, two experiments were conducted to determine the proximate analysis and *in vitro* gas production and predict metabolizable energy in some types of waste paper.

Methodology

Ten different types of waste paper were collected and properly sampled including: Office paper (original and computer or Roneo printed), newsprint (new, shaded or sun exposed), glossy magazines, cement brown packing paper and ordinary and glossy cardboard.

Experiment I: The proximate analysis of some types of waste paper

Different types of waste paper were shredded and analyzed in triplicates as described by AOAC (1990). Nitrogen free extract was calculated by difference (Van Soest, 1982).

Experiment II: In vitro gas production and metabolizable energy in some types of waste paper

In vitro gas production was determined in different types of waste paper as described by (Menke et al., 1979). The rumen fluid was collected from two rumen fistulated cows about 5 years old. They were fed sorghum straw *ad lib.* and Berseem (*Medicago sativa*) in two equal meals at 8.00 am and 4.00 pm. The rumen fluid was collected an hour before the morning meal. The metabolizable energy was calculated from *invitro* gas production (Menke et al., 1979).

Statistical analysis

Data were statistically analyzed using analysis of variance, Duncan's test and correlations test (Gomez and Gomez, 1979).

Results and discussion

The proximate analysis of types of waste paper is shown in Table 1. There were significant differences in the proximate analysis of waste paper. Dry matter was high in all types of wastepaper. Crude protein was very low (<1%) with significant differences among types of wastepaper. There were great and significant variations in EE among types of waste paper and was highest in the cardboard. Crude fibre was generally high with great and significant differences among types of waste paper and was highest in cement brown packing paper and least in glossy newsprint. There were great and significant differences in ash among types of waste paper and was highest in the Roneo typed A4 and glossy newsprint and least in newsprint, except the glossy. Nitrogen free extract varied greatly and was highest in newsprints and least in cement brown packing paper.

Table 1. The proximate analysis (%) of different types of waste paper.

Types	DM	CP	EE	CF	Ash	NFE
A4	96.38 ^{ab}	0.80 ^a	3.50 ^b	58.70 ^b	17.99 ^b	19.01 ^e
Computer printed A4	98.20 ^a	0.80 ^a	3.50 ^b	58.70 ^b	17.99 ^b	19.01 ^e
Roneo printed A4	97.36 ^{ab}	0.89 ^a	2.05 ^c	58.64 ^b	32.10 ^a	19.01 ^e
New newsprint	95.56 ^b	0.69 ^b	3.30 ^b	58.25 ^b	1.86 ^d	35.87 ^c
Shaded old newsprint	96.41 ^b	0.90 ^a	2.45 ^c	57.30 ^c	0.73 ^e	38.62 ^b
Sun exposed newsprint	96.11 ^b	0.03 ^d	2.43 ^c	50.45 ^e	1.07 ^e	46.02 ^a
Glossy newsprint	96.72 ^b	0.89 ^a	2.05 ^c	45.95 ^f	32.10 ^a	19.01 ^e
Cement packing	96.33 ^b	0.33 ^c	3.42 ^b	77.40 ^a	2.22 ^d	16.63 ^f
Ordinary cardboard	94.97 ^b	0.89 ^a	4.45 ^a	54.90 ^d	6.91 ^c	32.85 ^d
Glossy cardboard	96.01 ^b	0.89 ^a	4.45 ^a	54.90 ^d	6.91 ^c	32.85 ^d

Means with different letters in a column were significantly different at $P \leq 0.05$. Means with similar letters in a column were not significantly different at $P > 0.05$.

Table 2 shows actual and corrected means of *in vitro* gas production and predicted ME in types of waste paper. Corrected gas production was generally lower than the actual with

significant differences among types of waste paper. Corrected values were highest in computer and Roneo printed A4 paper and least in the new newsprint.

Predicted ME varied significantly among types of wastepaper and the ranking order was generally similar to the corrected gas production. The computer and Roneo typed A4 had the highest mean gas production, ME and CF and newsprint had the least gas production, ME and ash and high CF.

Table 2. *In vitro* gas production and predicted metabolizable energy in some types of waste paper.

Types	Actual gas volume (ml)	Corrected gas volume (ml)	ME (MJ/Kg DM)
A4 Paper	20.00±3.8	16.57	3.92±0.4
Computer printed A4 paper	34.00±3.8	27.67	5.47±0.4
Roneo printed A4 paper	34.25±3.8	28.33	5.56±0.4
New newsprint paper	1.00±3.8	0.87	1.74±0.4
Shaded old newsprint paper	5.00±3.8	4.19	2.18±0.4
Sun exposed newsprint paper	3.50±3.8	2.92	2.01±0.4
Glossy newsprint paper	10.35±3.8	8.49	2.77±0.4
Cement packing paper	19.00±3.8	15.83	3.81±0.4
Ordinary cardboard	19.50±3.8	16.27	3.86±0.4
Glossy cardboard	25.50±3.8	21.37	4.61±0.4

The variations in proximate analysis among types of waste paper were similar to that reported for office paper and newsprint (Anonymous, 2002) and were mainly due to variations in raw materials and processing. The high DM in waste paper was because processing involves drying. The variations in DM among types of waste paper were mainly due to differences in raw materials, processing and affinity to absorb moisture. The low CP in types of waste paper was similar to that reported for office paper and newsprint (0.7%) (Anonymous, 2002). The great variations in EE among types of waste paper were similar to that in office paper (1.9%) and newsprint (3.7%) (Anonymous, 2002). Office paper had relatively high EE than that reported in the literature (1.9%) (Anonymous, 2002) and could be due to variations in raw materials and processing. However, EE in new newsprint was close to that in the literature (3.7%). The results demonstrated that CF is the main component in different types of waste paper because wood was the main raw material. The great variations among types of waste paper in CF were due to variations in raw materials and processing. Fibres were treated physically by grinding and drying and may be chemically which are likely to improve the nutritive value. Crude fibre in newsprint and A4 was generally lower than the reported 68.9% and 83.8%, respectively (Anonymous, 2002) and could be due to different raw materials and processing. The results showed that glossy newspaper had lower CF than other newsprint and are likely to have better nutritive value. The relatively higher ash in Roneo printed and glossy newsprint and least in newsprint, except the glossy, could be due to types of ink. Ash in office paper (5.5%) (Anonymous, 2002) was about 30% of that in A4 paper. The reported ash in newsprint (0.9%) was relatively higher than that for the shaded and less than other newsprint in this study. The results suggested that ash level was not serious, except in the Roneo typed and glossy print and is not likely to affect animals health. Variations in NFE among types of waste paper were mainly due to raw materials and processing and were not very high since they were mainly fibres. The relatively higher NFE in newsprint suggested it as an alternative feed for ruminants and nitrogen should be added. Nitrogen free extract in this study was higher than that for office paper (8.1%) and newsprint (25.8%) reported by Anonymous (2002) and may be due to variations in raw materials and processing.

The variations in gas production and ME among types of waste paper were mainly due to raw materials and processing which are known to influence the nutritive value of waste paper (Nishimuta et al., 1968) and *in vitro* digestion (Coombe and Briggs, 1974). Dry matter digestibility in newsprint was about 30% and it was 40 – 60% for brown raping paper and cardboard and up to 98% for high quality chemical pulp paper (Anonymous, 2002). The ME on different types of waste paper was very low indicating low nutritive value and should be properly supplemented.

The results showed that waste paper had high CF and very low CP and should be supplemented for ruminants and more precise research is required to study intake, rumen fermentation, metabolism and effects on animal physiology, health and performance.

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Physical and chemical qualities of dwarf elephant grass *Pennisetum purpureum* cv Mott silage

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Abstract

This research aimed to examine the effect of different cutting age and molasses addition on dwarf elephant grass silage based on physical quality, pH, nutritive value dry matter DM, organic matter OM, crude protein CP, fleigh point and *in vitro* digestibility of IVDMD and IVOMD. This research also aimed to find out the ideal cutting age and molasses addition on dwarf elephant grass silage. A Completely Randomized Factorial Design was used in this experiment, with two factors ie. cutting age of dwarf elephant grass (40 days, 50 days, 60 days) and additional of molasses (0 %, 2 %, 4 %, 6 %). Each treatment was replicated three times. Twenty-one days were employed in making silage. Parameters of this experiment were physical and chemical qualities including pH, nutritive value dry matter DM, organic matter OM, crude protein CP, fleigh point and *in vitro* digestibilities of IVDMD and IVOMD. The result indicated that cutting age and molasses addition has no effect on the physical quality of silage. In addition, interaction significantly affected pH, DM and highly significant affected IVDMD. Cutting age factor highly significant influenced on DM, CP and IVOMD. Molasses addition significantly affected OM, Fleigh point, and highly significant on DM, CP, OMD. It can be concluded that different factors have the different influence on the physical and chemical qualities of dwarf elephant grass silage, especially with the addition of molasses. The best treatment was of 60 days of cutting age and 6% of molasses addition.

Keywords: dwarf elephant grass, cutting age, molasses addition, nutritive value, digestibility

Introduction

Availability of forage becomes a common problem for ruminant farmer especially in dry season. Silage production could be a viable option to obtain forage during dry season due to a decline in forage growth, production and quality. Dwarf elephant grass *Pennisetum purpureum* cv Mott may be used as an alternative grass for silage production because of its high productivity and palatability. However, it has high moisture content, low soluble carbohydrates and high buffering capacity. As a result fermentation process is difficult, and may lead to production of poor quality of silage (Rodrigues et al., 2005). Thus, ensiling practices such as wilting and the use of additives to increase dry matter concentration may improve the fermentation process and silage quality (Teixeira et al., 2008). This research aimed to examine the effect of different cutting age and molasses addition on dwarf elephant grass silage based on physical and chemical qualities namely pH, nutritive value dry matter DM, organic matter OM, crude protein CP, fleigh point and *in vitro* digestibilities of IVDMD and IVOMD. This research also wanted to find out the ideal cutting age and molasses addition on dwarf elephant grass silage.

Methodology

A Completely Randomized Factorial Design was used in this experiment, with two factors ie. cutting age of dwarf elephant grass namely at 40 days, 50 days, 60 days and additional of molasses consisted of 0 %, 2 %, 4 %, 6 %. Each treatment was replicated three times. Twenty-one days were employed to process the complete feed into silage in all of the treatments. Parameters of this experiment were physical qualities including pH, nutritive value dry matter DM, organic matter OM, crude protein CP, fleigh point and in vitro digestibility IVDMD and IVOMD.

Results and discussion

The result indicated that cutting age and molasses addition has no effect on the physical qualities of silage in all treatments, namely almost having the similar brown green colour, slightly smooth texture, sour odour and no fungi detected in the silage. The results on chemical qualities of dwarf elephant grass silage is shown in Table 1.

Table 1. Average chemical quality of dwarf elephant grass silage

Parameter	Cutting Age	Molasses addition				Average
		0 %	2 %	4 %	6 %	
pH**	40 days	6.43 ^d	3.83 ^a	3.70 ^a	3.68 ^a	4.42 ^{ab} ±4.05
	50 days	5.73 ^c	4.17 ^a	3.93 ^a	3.90 ^a	4.44 ^b ±2.62
	60 days	4.68 ^b	4.02 ^a	3.93 ^a	3.80 ^a	4.11 ^a ±1.17
	Average	5.62 ^c ±2.65	4.01 ^b ±0.50	3.86 ^a ±0.4	3.80 ^a ±0.32	
DM % *	40 days	9.10 ^a	10.83 ^{abcd}	9.95 ^{abc}	11.41 ^{bcd}	10.32 ^a ±1.01
	50 days	9.65 ^{ab}	10.96 ^{abcd}	12.75 ^d	14.40 ^e	11.94 ^a ±2.07
	60 days	12.28 ^d	11.69 ^{cd}	12.44 ^d	12.78 ^d	12.30 ^b ±0.46
	Average	10.34 ^a ±5.10	11.16 ^a ±1.39	11.71 ^a ±4.61	12.86 ^b ±4.48	
OM % *	40 days	78.35	79.81	79.94	80.25	79.58±2.53
	50 days	78.73	79.50	81.36	81.67	80.31±4.28
	60 days	80.48	80.49	79.01	80.75	80.18±2.37
	Average	79.18 ^a ±3.41	79.93 ^a ±1.53	80.10 ^a ±3.35	80.89 ^b ±2.17	
CP % **	40 days	13.29	12.82	13.11	14.51	13.43 ^b ±2.23
	50 days	10.64	12.68	12.04	13.68	12.26 ^{ab} ±3.82
	60 days	8.23	11.73	12.17	12.17	11.07 ^a ±5.71
	Average	10.72 ^a ±7.78	12.41 ^a ±1.77	12.44 ^{ab} ±1.74	13.45 ^c ±3.56	
Fleigh point*	40 days	-34.39	73.17	76.84	80.58	49.05±55.71
	50 days	-5.18	59.97	73.16	77.78	51.43±38.48
	60 days	42.19	67.55	72.68	78.27	63.17±15.93
	Average	0.87 ^a ±38.65	66.89 ^b ±6.62	74.22 ^b ±2.27	78.87 ^b ±1.59	
IVDMD % **	40 days	46.17 ^{ab}	57.93 ^{cd}	59.72 ^{cd}	62.22 ^{de}	56.51 ^{ab} ±7.11
	50 days	43.86 ^a	63.39 ^e	62.74 ^{de}	63.86 ^e	58.46 ^a ±9.75
	60 days	48.96 ^b	56.93 ^{bc}	56.74 ^{cd}	58.53 ^{cd}	55.29 ^b ±4.30
	Average	46.33 ^a ±2.55	59.41 ^b ±3.47	59.73 ^{bc} ±3.00	61.53 ^c ±2.73	
IVOMD % **	40 days	43.12	53.11	52.60	54.89	50.93 ^b ±5.30
	50 days	39.67	53.12	59.09	57.02	52.22 ^b ±8.73
	60 days	38.16	44.49	43.85	50.40	44.22 ^a ±5.00
	Average	40.31 ^a ±2.54	50.24 ^b ±4.98	51.84 ^b ±7.65	54.10 ^b ±3.38	

^{a-e} values in the same row or coloumn for each parameter with different superscripts were significantly different $p < 0.05$ * and highly significant different $P < 0.01$ **

The result showed that the two factors and their interaction significantly affected pH, and highly significantly affected IVDMD. It means that cutting age and additional of molasses

influenced pH, DM and IVDMD of silage. The results agreed with Cherney et al. (2004) that there were a positive relationship between Readily Available Carbohydrate (RAC) with pH. RAC was needed by BAL to decrease pH of silage to become about 3.5 (Muck and Kung, 1997). Cutting age factor highly significantly influenced DM, CP and IVOMD of silage. This results were in agreement with those reported by Tan and Tumer (1996) and Toruk et al. (2009) indicated that the ensiling and nutritional quality of silage depend upon the stage of maturity at the harvest time. Additional of molasses significantly affected OM, Fleigh point, and highly significantly affected DM, CP, IVOMD. McDonald et al. (1991) stated that silage additives is used to ensilage and ensure the fermentation process enable to produce a well preserved silages, reduce ensiling losses and improve aerobic stability of silages during the feed-out period.

Conclusion

It could be concluded that different factors have different influence on the physical and chemical qualities of dwarf elephant grass silage, especially with the addition of molasses. The best treatment for making dwarf elephant grass silage was of 60 days of cutting age and 6% of molasses addition.

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Tannin content of tea leaf (*Camellia sinensis*, L.) added with molasses and fermentative additive as *Attacus atlas* (L.) larval feed

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Abstract

An experiment was carried out to study nutrient composition, tannin concentration and fibre component of tea leaf (*Camellia sinensis*, L.) in comparison with guava leaf (*Psidium guajava*, L.) and soursop leaf (*Annona muricata*, L.) as *Attacus atlas* (L.) larval feeds.. Young and mature leaves were used as samples. Tea leaves were harvested from Purwakarta and Cipanas - Bogor districts, guava and soursop leaves were obtained from Pandeglang district, West Java Province. Nutrient composition and fibre component, respectively, were analysed with proximate analysis and fibre detergent analysis, and total tannin concentration was determined by titrimetric and spectrophotometric methods. Data were analysed descriptively. Results demonstrate that concentrations of nutrient, total tannin and fibre components vary among tea, guava and soursop leaves. Age of leaves mostly affect moisture, DM and silica concentrations, but young leaves do not always contain more moisture than the mature leaves; greater silica concentrations are found in young tea leaves, and in mature guava and soursop leaves. Tannin concentrations of tea leaves are influenced by method used for tannin analysis, plant age and locations for harvesting tea leaves with young tea leaf from Purwakarta measured with titrimetric method has the highest tannin concentration. Locations for obtaining tea leaves only cause small differences in crude protein, crude fibre and GE concentrations, but do not produce any differences in fibre component concentrations. It is concluded that tea leaves from Purwakarta are rich in crude protein concentration with reasonable concentrations of other nutrient and fibre component, but high tannin concentration; these can be the basis for its used by *A. atlas* larvae as its feed.

Keywords : *Attacus atlas* (L.), feeds, fibre component, nutrient composition, total tannin concentration

Introduction

Attacus atlas (L.) is a wild silkworm that is capable of producing very fine silkyarn. The wild silkworm (Saturniidae family) can be found in China, Japan, India and Indonesia (Peigler 1994). The wild silkworms are polyphagous and phytophagous herbivores capable of eating wide variety plants (80 plants from 48 families) (Peigler 1989 in Solihin *et al.* 2010). Consequently, the wild silkworms are able to digest/degrade and ferment fibre components and secondary metabolites, such as tannin, from the feeds. These abilities are due to the presence of microbes in its digestive tracts that have adapted to feed eaten (Waterman 2000; Broderick

et al. 2004; Anand *et al.* 2010). The wild silkworms can be found in tea plantation (natural habitat) in Purwakarta, Kabupaten Bandung Barat, and eat tea leaves (*Camellia sinensis*, L.) that contain fibre and tannin (Barus 2010). To study ability to tolerate tannin in tea leaf, it is a necessitate to determine amount of tannin consumed by the wild silkworms. For that purpose, the wild silkworms are reared under a controlled management by keeping in a farmer house near the plantation. In the beginning, for practical reason, tea leaves are provided by ensilaging tea leaves using molasses and fermentative additive in a plastic bag. However, the fermented products are refused by the silkworms as changes in tea leaf freshness and performance. It is then decided to spray the mixture of molasses and fermentative additive to tea leaf, but it is not known whether the addition can alter tannin, nutrient and fibre component contents. Therefore, this study is done to determine effects of molasses and fermentative additive addition on tannin, nutrient and fibre component contents in tea leaves..

Methodology

Young and mature tea leaves were harvested from tea plantation (Nusantara VIII) in Kecamatan Cikalong Wetan, Kabupaten Bandung Barat, West Java Province. Young leaves were the 3rd - 6th leaves from the top plant (eaten by young larvae, the 1st - 3rd instars); mature leaves were the 7th - 10th leaves from the top plant (consumed by older larvae, the 4th - 6th instars) (Desianda 2011). Molasses and fermentative additive (mineral salts) were obtained from Centras, Centre for Research and Community Service, Bogor Agricultural University.

Tea leaves were prepared according to treatment applied in a farmer house (Kecamatan Cikalong Wetan, Kabupaten Bandung Barat). Young and mature tea leaves were divided into control and treated tea leaves. Treated tea leaves were tea leaves sprayed with a mixture of diluted molasses (5 - 10 %) in water (1 : 1 ratio) and fermentative additive (2 %) solution. Treated tea leaves were kept at room temperature for 10 minutes. Both control and treated tea leaves were processed for laboratory analysis (Close and Menke 1986). Ground dried samples were used for measuring contents of tannin using titrimetric (Association of Analytical Chemistry, AOAC 1980) and spectrophotometric (AOAC 1984) methods, nutrients with proximate analysis (AOAC 2000) and fibre with fibre detergent analysis (Goering and Van Soest 1970). Those were the variables; data were analysed descriptively.

Results and Discussion

Tannin contents among samples and its trend measured with titrimetric method differ from those detected with spectrophotometric method (Table 1). Using titrimetric method, young leaves contain more tannin than mature leaves; addition of molasses and fermentative additive reduce tannin content in young leaf with a reverse result in mature leaf. Analysing with spectrophotometric method, young leaves contain lesser tannin than mature leaves; adding molasses and fermentative additive does not affect tannin content of young leaves, but increases slightly tannin content in mature leaves. The present results agreed with those obtained by Tabasum *et al.* (2011) with titrimetric method, and with those found by Ramdani *et al.* (2013) with spectrophotometric method.

Table 1. Tannin, nutrient and fibre contents of young and mature tea leaves (*Camellia sinensis*, L.) added with molasses and fermentative additive

Variables	Control tea leaf		Tea leaf + molasses + fermentative additive	
	Young	Mature	Young	Mature
Tannin content :				
Titrimetric method (% DM)	0.961	0.507	0.854	0.625
Spectrophotometric method (% DM)	11.60	15.18	11.51	16.02
Proximate analysis :				
Moisture (% fresh matter, FM)	89.61	83.59	89.25	83.22
Dry matter (% FM)	10.39	16.41	10.75	16.78
Ash (% dry matter, DM)	6.85	7.99	6.72	9.64
Organic matter (% DM)	93.15	92.01	93.28	90.36
Crude protein (% DM)	21.11	20.03	19.32	19.84
Ether extract (% DM)	3.03	3.81	2.74	4.44
Crude fibre (% DM)	12.14	14.81	9.92	14.09
Nitrogen free extract, NFE (% DM)	56.88	53.36	61.30	51.99
Gross energy, GE (kal/g DM)	4713	4757	4682	4688
Fibre component analysis :				
NDF (% DM)	38.55	40.96	39.50	40.08
Hemicellulose (% DM)	1.58	4.00	3.00	3.03
ADF (% DM)	36.97	36.96	36.51	37.04
Cellulose (% DM)	20.76	20.52	19.70	18.03
Lignin (% DM)	16.07	15.36	15.83	16.77
Silica (% DM)	0.14	0.14	0.97	0.91

Proximate analysis on control tea leaf (Table 1) show that young leaf contains more moisture, but less DM content than mature leaf. Comparisons with mature leaf, young leaf has less contents of ash and crude fibre (CF) with similar contents in crude protein (CP), ether extract (EE) and GE; but with slightly higher of OM and NFE contents. These are the same for young and mature treated tea leaves. No effect of adding molasses and fermentative additive on moisture and DM contents, but it affects differently on other nutrients in young and mature leaves. In control treatment, fibre component contents of young leaf differ from those of mature leaf; young leaf are low in NDF and hemicellulose with a slightly high lignin and with no differences in ADF, cellulose and silica contents (Table 1). Adding molasses and fermentative additive only increases hemicellulose and silica contents in young leaf; but reduces cellulose, and increases lignin (slightly) and silica contents in mature leaf.

The present results also show differences in tannin, nutrient and fibre component contents of young and mature leaves. These could be affected by factors : plant ages, plant samples, tannin types and its distribution in plant parts, sample preparation/processing, etc. (Forrest and Bendall 1969; Akande *et al.* 2011; Tjakradidjaja 2012; Adnani 2013), plant stage growth, *i.e.* development of plant cell structure and lignification (Jung 1997; McDonald *et al.* 2002). Addition effects on tannin, nutrient and fibre component contents could be more due to increases in easily available carbohydrate (molasses) and mineral salts (fermentative additive), rather than changing in tannin, nutrients and fibre structures.

Conclusion

It is concluded that addition of molasses and fermentative additive changes tannin, nutrient and fibre component contents by providing more easily available carbohydrate and mineral salts.

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***Mitsuokella jalaludinii* supplementation improved nutrient utilization of broilers fed low available phosphorous diet**

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Abstract

Phytase is frequently used as a feed supplement to improve availability of P in poultry. *Mitsuokella jalaludinii*, isolated from the rumen of cattle showed high phytase activity capable of hydrolysing phytate compounds. In this study, the efficacy of freeze-dried *M. jalaludinii* phytase was evaluated as a feed supplement for broilers fed low-available P (aP) diet. The results showed that freeze-dried *M. jalaludinii* cells with functional phytase activity significantly enhanced ($p < 0.05$) growth performance and feed conversion ratio of broilers fed low-aP diet and the apparent digestibility of dry matter and crude protein of the feed. Phytase supplementation also enhanced retention of P, Ca, Mn, Cu, and Zn as well as the Ca and Mn content in tibia of broilers. The Ca, Mn and Zn concentrations in plasma of broilers fed low-aP diet were not significantly different than those fed normal diet, but the levels of P and Cu were significantly lower ($p < 0.05$) than the control.

Keywords: broiler, *Mitsuokella jalaludinii*, mineral retention, nutrient utilization, phytase

Introduction

The poultry diets are mainly made up of ingredients of plants origin such as cereal grains and seeds which contain phytates, the principal storage form of phosphorous (P). A major problem associated with phytate molecules is their anti-nutritive properties which reduce the bioavailability of nutrients present in the feed. The supplementation of exogenous phytase has become a regular practice to enhance the utilization of nutrients in the feed as the enzyme would release P, Ca and other minerals as well as proteins bound to the phytic acid.

A bacterial species, locally isolated from the rumen of cattle, known as *Mitsuokella jalaludinii*, was able to produce phytase with activity comparable to the commercial phytase enzyme Natuphos[®] (Lan et al., 2012). The phytase enzyme had a wider pH range and uninhibited by metal chelating agents.

Tang et al. (2017a) showed that *M. jalaludinii* phytase could be preserved by freeze drying the bacteria, although the cells were non-viable. Consequently, in the present study, freeze-dried *M. jalaludinii* cells with functional phytase activity were evaluated as a feed supplement to enhance nutrient utilization of broilers fed low-available P diet.

Methodology

Dietary treatments and sampling

This study was carried out in accordance with the guidelines and approval by the Institutional Animal Care and Use Committee (IACUC) of University Putra Malaysia with the reference number: UPM/IACUC/AUP-R14/2015. A 3-week feeding experiment with completely randomized design was conducted. A total of 120 day-old male Cobb, purchased

from a local hatchery was assigned to three different dietary treatments with four replicates per treatment.

Phytase from *M. jalaludinii* was produced through semi-solid fermentation under anaerobic condition using rice bran and fish meal as substrates (Tang et al., 2017b). The cells were either freeze-dried or oven-dried (65°C, 72h) for the preparation of active (MJ) or deactivated (DMJ) phytase. The corn-soybean meal basal diet was either supplemented with dicalcium phosphate (DCP) as normal-available P diet or without DCP as low-available P (aP) diet. The three diets were normal-aP+DMJ (control), low-aP+MJ, and low-aP+DMJ. All diets were iso-nitrogenous and iso-caloric by adding equal amount of MJ or DMJ. Live weight was monitored weekly, while feed intake was recorded daily.

Samples collection and analyses

Total excreta was collected at day 18-20 for the determination of dry matter (DM) and crude protein (CP) digestibility. At the end of 21 days, 12 broilers from each treatment group were randomly selected and sacrificed for the collection of blood samples for plasma preparation. The left tibia was removed from each sacrificed chicken. The feed, excreta, plasma and tibia samples were analyzed for DM and CP by standard procedures (AOAC, 2002) and minerals by Inductively Coupled Plasma Optical Emission Spectroscopy.

Statistical analyses

All data collected were analyzed by using statistical software, IBM® SPSS for Microsoft Windows® version 22.0. Data were subjected to analysis of variance (ANOVA), and the means were tested by Duncan multiple range test for significant difference at $p < 0.05$. The results were reported as means \pm standard error (SE).

Results and discussion

The results showed that the live weight and feed conversion ratio of broilers were significantly ($p < 0.05$) improved in broilers fed low-aP+MJ diet compared to the control and those fed low-aP+DMJ (Table 1). This indicated that phytase in freeze-dried *M. jalaludinii* cells was able to hydrolyze phytates in the feedstuffs, hence enhancing the bioavailability of nutrients. As such, significantly higher ($p < 0.05$) apparent digestibility of DM and CP for broilers fed with low-aP+MJ diet compared to the control was observed.

The mineral retentions were significantly higher ($p < 0.05$) for broilers fed with low-aP+MJ diet except Ca (Table 1). The results on P retention are in accordance with the meta-analysis conducted by Bougouin et al. (2014), on the positive effects of phytase supplementation on P retention for both layers and broilers. Enhanced retention of Mn, Cu, and Zn also indicated the ability of *M. jalaludinii* phytase to release these minerals from the phytate complex.

Ca and Mn were more concentrated ($p < 0.05$) in tibia bone of broilers fed low-aP+MJ diet compared to broilers fed control diet. The amount of tibia P in broilers fed low-aP+MJ was similar to the control broilers, but was significantly higher ($p < 0.05$) than broilers fed low-aP+DMJ. Phytase supplementation affected P retention as well as P deposition in broilers fed low-aP diets. Ca, Mn and Zn concentrations in plasma of broilers fed low-aP+MJ diet were not significantly different, but the levels of P and Cu were significantly lower ($p < 0.05$) than the control. Bilal et al. (2015) observed that microbial phytase supplementation in broilers fed low P diet showed no effect on serum Ca, but significantly increased ($p < 0.05$) P concentration. In the present study, the amount of plasma P was not influenced by phytase supplementation compared to broilers fed low-aP+DMJ, similar to the findings reported by Kliment and Aneglovičová (2011), that microbial phytase supplementation did not influence P content in the blood of broilers fed low P feed.

Table 1. Live weight, feed conversion ratio (FCR), apparent digestibility of dry matter (DM) and crude protein (CP) and mineral retention of broilers fed normal-available P and low-available P diets

Parameter	Dietary treatments		
	Normal-aP (control)	Low-aP+MJ	Low-aP+DMJ
Live weight (g/bird)	673.81±4.19 ^b	719.28±10.66 ^a	677.22±6.38 ^b
FCR	1.580±0.012 ^b	1.458±0.017 ^c	1.663±0.013 ^a
Digestibility (%)			
-DM	89.1±1.22 ^b	93.0±0.80 ^a	91.3±0.18 ^{ab}
-CP	88.0±0.81 ^b	94.1±1.26 ^a	90.3±1.10 ^b
Mineral retention (%)			
- P	81.9±1.11 ^b	88.1±0.80 ^a	81.4±0.58 ^b
- Ca	90.8±0.26 ^b	93.9±0.76 ^a	92.8±0.79 ^{ab}
-Mn	76.4±0.77 ^b	81.5±0.54 ^a	78.2±0.78 ^b
-Cu	75.9±1.51 ^b	87.5±3.63 ^a	75.5±3.99 ^b
-Zn	80.8±0.90 ^c	85.5±0.13 ^a	83.3±0.31 ^b

Data represent means ± SE of 4 replicate cages with 10 broilers for each cage.

^{a-c} Means in the same row with different superscripts differ significantly (p<0.05).

aP: Available phosphorus

MJ: Freeze-dried active *M. jalaludinii* phytase

DMJ: Oven-dried deactivated *M. jalaludinii* phytase

Conclusion

The results showed the efficacy of freeze-dried *M. jalaludinii* in enhancing live weight, feed conversion ratio and the digestibility of crude protein and dry matter in broilers. Broilers supplemented with freeze-dried *M. jalaludinii* showed significantly (p<0.05) higher retention of P and Ca, Mn, Cu and Zn than broilers fed the control diet.

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The effects of feeding flavonoids compounds from Iranian propolis extracts to Holstein milk production and quality

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Abstract

In this study 18 dairy postpartum Holstein cows (120 DIM and body weight of 577 ± 37.54 Kg) were used. The experiment was carried out in a period of 29 d (10 d adaptation and 19 d sample collection). The data was analyzed considering a completely randomized design by the GLM procedure of SAS 9.1. Means among treatment were compared by Tukey test ($P < 0.05$). In this experiment 3 treatments [A: control, B: control+ Iranian propolis extract (IPE) 50% (4.37 v/w) and C: control+ IPE 75% (5.39 v/w)] were used. The cows were fed with 3.27g/Kg IPE (50% and 75%) per kg dry matter intake. The results of this study showed that adding different concentrations of IPE to Holstein dairy cow ratio did not statistically ($P > 0.05$) change milk production, milk protein and milk urea nitrogen, but milk fat and lactose significantly ($P < 0.05$) changed. The flavonoids compounds in propolis increased fat and lactose's milk.

Key words: flavonoids compounds, propolis extract, Holstein milk

Introduction

In recent year consumers, producers and researchers have been concerned with diets that help people improve their health care (Nagai and Inoue, 2004). The relation between diet and health care is considered a key factor to prevent diseases. In some countries antibiotics are added to the dairy cows diet while in others it is prohibited (Mills et al., 2009). The prohibition of antibiotics in 2006 caused the researchers to spend a lot of time on studying and researching the secondary metabolites and extracts of herbal plants (Mills et al., 2011). The Compounds like phenylpropanoids and flavonoids have an effect on rumen microbial metabolism by changing the fermentation process (Balcells et al., 2012). Propolis is made by bees by collecting some substances from buds and flowers and mixing them with their saliva, wax and pollen. The function of propolis is to seal and protect the hives against intruders and microbes (Ghisalberti, 1979). The chemical composition of the propolis is different and depends on the characteristics of the regional flora (Bankova, 2000). The purpose of this study was to investigate the effects of feeding phenolic compounds from Iranian propolis extracts on milk production milk quality of Holstein dairy cows.

Methodology

IPE was obtained from Ehtesham Apiary, Hezar Masjed Mountains, Khorasan Razavi province ($37^{\circ} 37' 31.07''$ N, $58^{\circ} 43' 49.74''$ E) which has a relatively warm weather in October 2014 from 180 hives. According to a previous studies, two extracts of IPE [50% and 75% [(it means 50 and 75 grams of propolis in 100ml ethanol 70%)] were used. Small pieces of propolis

(about 4-5 mm) were mixed with ethanol 70% and distilled water in a shaker (GFL model 3005, Germany) with 300 rpm at room temperature for 72 h. Then, the ethanol extract was filtered with a Whatman No.41 filter paper. To eliminate the ethanol, a rotary evaporator (Heidolph laborota 4000, Germany) at 42 °C for 30 min was used. Total flavonoids compounds of IPE were measured by Change et al, (1959). In this study 18 dairy postpartum Holstein cows (120 DIM, body weight of 577 ± 37.54 Kg) were used. In this experiment 3 treatments [A: control, B: control+ Iranian propolis extract (IPE) 50% (4.37 v/w) and C: control+ IPE 75% (5.39 v/w)] were used. The cows were milked individually 3 times a day at 06:00, 14:00 and 20:00 h. The experiment was carried out in a period of 29 d (10 d adaptation and 19 d sample collection). The cows were fed ad libitum (total mixed ratio) individually at 08:00 and 16:00. Milk yield were measured from d 19 to 29 and the average of the data was calculated. An aliquot was collected in a sealed tube with preservative (potassium dichromate) and stored at 4 °C for milk component analysis. To determine fat, protein, milk urea nitrogen and lactose concentrations of individual milk samples, Milko-Scan 605 analyzer (Foss Electric, Hillerød, Denmark) was used. The trial was analyzed considering a completely randomized design by the GLM procedure of SAS 9.1. Means among treatment were compared by Tukey test.

Results and Discussions

The total flavonoids compounds of IPE are in table 2. As the results indicate, there were significant differences ($p < 0.05$) between total phenolic compounds in control, IPE 50% and IPE 75% treatments.

Table 1. Total flavonoids compounds of Iranian Propolis Extracts

Item	Treatments			SEM	P value
	Control	IPE 50%	IPE 75%		
Total flavonoids compounds	0.00 ^a	4.37 ^b	5.39 ^c	0.0.05	<0.001

IPE: Iranian propolis extracts

SEM: Standard Error of the Mean.

^{a-c} means in the same row followed by different superscripts differ ($P < 0.05$)

Feeding the cows with different concentrations of IPE did not statistically ($P > 0.05$) change milk production, milk protein and milk urea nitrogen, but milk fat and lactose significantly ($P < 0.05$) changed (table 2).

Table 2. Milk production and milk composition of experimental treatments.

	Treatments			SEM	P-value
	Control	IPE 50%	IPE 75%		
Milk production (Kg/d)	37.16 \pm 2.10	38.26 \pm 2.56	36.85 \pm 2.23	7.50	0.6509
Fat (%)	3.70 \pm 0.26 ^a	3.76 \pm 0.21 ^b	3.81 \pm 0.24 ^c	0.05	0.0251
Protein (%)	3.10 \pm 0.02	3.11 \pm 0.03	3.11 \pm 0.03	0.20	0.3300
Lactose (%)	4.67 \pm 0.02 ^a	4.75 \pm 0.02 ^b	4.87 \pm 0.02 ^c	0.07	0.0025
Milk Urea Nitrogen (mg/dl)	12.77 \pm 3.51	12.31 \pm 2.94	12.80 \pm 3.23	1.72	0.0643

SEM: Standard Error of the Mean

IPE: Iranian propolis extracts

a-b: means in the same row followed by different superscripts differ ($P < 0.05$)

Values are means \pm SD

The results of our study are consistent with Lana et al. (2005) findings in terms of milk production and protein percentage, but contradict in terms of fat and lactose percentages. This difference may be related to the kind of livestock, the different concentrations of propolis used and their plant origins. Finally, our results are quite similar with the results of study done by Aguiar et al. (2014) in terms of milk production, fat, protein and lactose percentages.

Conclusion

The flavonoids compounds in propolis increased fat and lactose's milk.

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Effect of synbiotic meal on *Salmonella* sp., *Escherichia coli*, and lactic acid bacteria population of broiler

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Abstract

Over the past few decades, antibiotics have been used as treatment for salmonellosis in the broiler, the aim of this research was to evaluate the effect of a synbiotic meal on total *Salmonella* sp., lactic acid bacteria (LAB), and *Escherichia coli* (E.COLI) of broiler. Feed used in this study was composed of corn, soybean meal, corn gluten meal, copra meal, rice bran, DL-methionine, lysine, and mineral premix. This research was conducted at the Teaching Farm of University of Brawijaya, Dau Subdistrict, Malang. Included 125-day old chicken (DOC), that were reared for 35 days. The method used in this research was Completely Randomized Design (CRD) with 2 control 3 treatments and 5 replications (each replication consist of 5 birds); the control were K⁻ : basal diet + 0% synbiotic meal, K⁺ : basal diet + tetracycline antibiotics and the treatments were P₁: basal diet + 0.2% synbiotic meal, P₂: basal diet + 0,4% synbiotic meal, and P₃: basal diet + 0,6% synbiotic meal. The Variables observed were *Salmonella* sp., lactic acid bacteria (LAB), and E. COLI. Data were analyzed by Analysis of Variance (ANOVA) and significant difference treatments were then analyzed by Least Significant Differences Test (LSD). The results showed that the synbiotic meal had significantly effect (P<0.01) on *Salmonella* sp. population, total LAB and had a significant effect (P<0.05) on E.COLI. It was concluded that 0.6% synbiotic (P₃) could decrease *Salmonella* sp. and increase total LAB; therefore, a synbiotic meal could be used as an alternative replacement for antibiotic treatment.

Keywords: antibiotic, broiler, probiotic, salmonellosis, synbiotic,

Introduction

The broiler chicken increased from 1,529,329.18 in 2015 to 1,592,669.40 in 2016 at Indonesia (Directorate General of Animal Husbandry, 2016). In the broiler, maintenance is used as an antibiotic growth promoter (AGP) or growth promoter. AGP as feed additives could lead to antibiotic residues on livestock products that are harmful to consumers. These effects encourage research to find alternatives to antibiotics. Synbiotic is a feed additive consisting of probiotics and prebiotics. The objective of this study was to investigate the effects of synbiotic from combination of *Lactobacillus* sp and extract *Saccharomyces cerevisiae* cell wall as additive feed on population *Salmonella* sp., LAB and *E. coli*.

Methodology

This research was conducted at Teaching Farm Animal Husbandry Faculty, Brawijaya University, Dau, Malang. Feed formulation and analysis was conducted at Feed and Nutrition

Laboratory, and analysis of intestinal microbiology was conducted at the Microbiology Laboratory of Animal Husbandry Faculty, Brawijaya University.

The test animal used was day old chick (DOC): Broiler was mixed sex, production of PT Charoen Pokphand was maintained in 25 plot cages, and each plot was filled with 5 (five) broilers. The feed used was composed of corn, rice bran, soybean meal, corn gluten meal, copra meal, rice bran, DL-methionine, lysine, and mineral premix based calculations by Leeson and Summer (2005).

The method used in this research was Completely Randomized Design (CRD) with 2 controls, 3 treatments and 5 replications (each replication consisted of 5 birds). The dietary controls were K⁻: basal diet + 0% synbiotic meal, and K⁺: basal diet + tetracycline antibiotics. The treatments were P₁: basal diet + 0.2% synbiotic meal, P₂: basal diet + 0.4% synbiotic meal, and P₃: basal diet + 0.6% synbiotic meal. The variables observed were *Salmonella* sp., lactic acid bacteria (LAB), and *Escherichia coli* (E. COLI). Data were analyzed by Analysis of Variance (ANOVA) and significantly different treatments were then analyzed by Least Significant Differences Test (LSD).

Results and discussion

The results of this study indicated synbiotics had high significant effects ($P < 0.01$) on the population growth of lactic acid bacteria and *Salmonella* sp, in additionally, there was significant ($P < 0.05$) on the population growth of *E.coli* bacteria. The results of the research is summarized in Table 1.

Table 1. Effect of synbiotics seplementation in feed on LAB, Salmonella, and *E.coli* of 35 days broiler

Total Bacteria (log CFU)	Treatments				
	K ⁻	K ⁺	P1	P2	P3
Lactic Acid Bacteria	7.95±0.4712 ^{ab}	7.58±0.9174 ^a	8.76±0.5238 ^{bc}	9.22±0.2561 ^c	9.58±0.2135 ^c
Salmonella sp	4.54±0.1356 ^c	2.20±0.1414 ^a	3.10±0.6000 ^b	4.28±0.1470 ^c	2.44±0.1356 ^a
Eschericia coli	3.10±0.3037 ^{bc}	2.60±0.0892 ^a	3.61±0.6391 ^d	2.81±0.4977 ^{ab}	3.45±0.2349 ^{cd}

^{a-d} Means in same column with different superscripts are significantly different

In our study the population of LAB (cfu / g) in the broiler colon increased significantly ($P < 0.01$). The use of synbiotics in the treatment of P₃ gave the best results in the increase of lactic acid bacteria population when compared with P₂ and P₁ also control. The results proved that synbiotic supplementation in broiler diets had beneficial effect LAB population. Samli, Senkoylu, Koc, Kanter, and Agma, (2007) who observed generally LAB population in broilers is 4.24 log cfu / g, however we obtain increasing LAB population by synbiotics supplementation. The presence of Synbiotic contains *Lactobacillus* sp. can adapt well and can develop in the broiler intestine. The early colonization of the epithelial wall of the intestine by a dense mat of lactobacilli could competitively exclude attachment of pathogenic bacteria. Earlier studies of the multi-strain *Lactobacillus* by Jin et al (1996) showed that all 11 *Lactobacillus* strains exhibited moderate to strong ability to attach on intestinal epithelial cells of broiler chickens.

As Table 2 shows, the population of *Salmonella* sp. (Cfu / g) in broiler colon had significantly decrease compared with negative control ($P < 0.01$). The use of Synbiotics on P₃ (2.44 ± 0.1356) showed the best results compared to P₁ and P₂. The result of synbiotic

synthesis in the third treatment (P3) was similar to the control K⁺ (2.20 ± 0.1414) with use of tetracycline antibiotics. We agreed that the decrease in salmonella bacteria population, due to the antimicrobial content present in probiotics. Higgins et al., (2007) confirmed that probiotics strains had antimicrobial activities in broilers. In additional, Mead (2000) explain 4 methods of antimicrobial activity, that is competition for receptor sites, production of volatile fatty acids that are inhibitory of certain enteric pathogens, competition With pathogens limiting nutrients, and production of bacteriocins. The LAB culture could reduce Salmonella recovery through a number of these inhibitory mechanisms.

The population of *E.coli* bacteria (cfu / g) in the broiler intestine significantly decreased ($P < 0.05$). P2 (2.81 ± 0.4977) showed the best results where population *E.coli* was lower than control K⁻, P1, and P3. *E.coli* population in broiler chicken is generally 5.6 log cfu / g. Bruggencate, Bovee-oudenhoven, Lettink-Wissink, Katan, and Meer, (2006) confirmed the low population of *E.coli* bacteria in broilers that synbiotic treatment caused by the role of the prebiotic component oligosaccharides, that is raffinose and stachyose. This prebiotic component can be fermented by lactic acid bacteria causing acidic conditions. In this experiment, we found that acidic condition causes *E.coli* growth to be inhibited, so the host is protected from pathogenic bacteria. The decrease the number of *E.coli* bacteria in the gastrointestinal tract of broilers in this study indicates that *E.coli* bacteria are unable to use oligosaccharide prebiotics as a source of nutrients for their growth.

Conclusion

Use of 0.6% Synbiotic could decrease Salmonella sp. and increase total LAB. Ecoli had decrease when using 0.4% synbiotics in feed. Therefore synbiotic can be used as an alternative replacement for antibiotic

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Response to differential native asian leaves for trend of total gas production *in vitro* in Saanen goats

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Abstract

Tropical countries have various native plants containing polyphenol compounds that promise beneficial effect for human and animal itself. *Cymbogon citratus* and *Psidium guajava* as its promotor have health benefit as antiseptic and antimicrobial. Their present is used for feed additive supplementation on Total Mixed Ration (TMR). Four ruminally cannulated Saanen goats were prepared for collecting rumen fluid. The goats accepted feeds based on pangola hay and concentrate (TMR; ratio 65:35%) (T1=TMR; T2= TMR+ 5% *Cymbogon citratus* of total feed in DM; T3= TMR + 5% *Psidium guajava* of total feed in DM). Approximately 200 mg of sample of diet ground to 1 mm were placed in six replicates (n=6) in 100 ml calibrated glass syringes. Syringes were shaken gently at each reading and the gas volume was recorded at 0, 2, 4, 6, 8, 10, 12, 24, 36, 48, 72 and 96 h of incubation. Data were analyzed as a compare means into one-way ANOVA with a treatment and measurement as factor and dependent list, respectively using computer package analysis SPSS (version 18). Differences between treatment means were determined by Tukey's HSD (Honest Significant Difference) Test that be declared the significant differences at $P < 0.05$. Polyphenol-containing plants of *Cymbogon citratus* and *Psidium guajava* may influence on feed fermentation on the rumen. Whether advantageous or disadvantageous depend on objective on study. T2 and T3 which are containing polyphenol compounds had decreased on gas production, ME, NE_L, and OMD and it relates to decrease of methane per unit OMD.

Keywords: goat, in vitro, gas production, methane, and native Asian leaves

Introduction

Tropical area has various herb plants which have a beneficial health for human and/or small ruminant. Native Asian leaves including *Cymbogon citratus* and *Psidium guajava* are known in advance from long times ago to use antiseptic and antimicrobial for human health (Mailoa et al., 2013; Manosroi et al., 2006) and their existence easy to collect near ranch area. In fact, ordinary farmer even feeds the ruminants with all of leaves deriving from rural area in brief time. In this side, obtaining diets randomly accepted by animal supports their metabolism on maintenance, reproduction, and animal production. Unfortunately, nutrient ingredient in roughage involving herb plant is not adequately, sometimes, additional concentrate in mix together with basal feed creates a complete feed. It represents as total mix ration (TMR) and/or more additional vitamin and/or mineral. Since there is no evidence found addresses critically disadvantage regarding animal poisoning and unclear how fluctuating organic compound mode influences on rumen metabolism, the golden way is open to modulate rumen fermentation. However, ability requirement for adapting is slightly stable depending on characteristic type of basal feed, feeding system, and environment. This assumption is bringing awareness to be

careful on applying feeding method and their supplementation, sometimes, there is inconsistency data about this regard either.

The well-documented observations in earlier year expressed that small ruminant especially goats that have symbiosis with their microorganism involving bacteria, protozoa, fungi, and yeast for anaerobic fermentation (Bodas et al., 2008; Carreño et al., 2015). Major constituent of feed nutrient including carbohydrate, protein, fibre, and fat are metabolically broken down by them. Gas production is one of parameters to detect an existence of microorganism on their metabolism (Carreño et al., 2015; Paengkoum et al., 2015). However, microorganisms on rumen are quite sensitive for fluctuating condition because of environmentally change in treatment. Therefore, it gives challenge for nutritionist to discover up-to-date method to feed for building performance up. Thus, the objective of this observation is to know and clarify effect of differential herb plants in TMR their constituent on total gas production response in goats.

Methodology

Animals and analysis sample collection

In vitro incubations were conducted as outlined previously (Frutos et al., 2004) with rumen fluid collected from four ruminally cannulated (40mm internal diameter) Saanen goats (body weight= 52±6.42) Kg. All the animals were offered a total mixed ration (TMR, forage: concentrate ratio 65:35), based on pangola hay (particle size >4cm) and concentrates, in two meals (60% at 9:00h and 40% at 17:00 h) at approximately 0.8 times the voluntary feed intake previously determined ad libitum (37 g DM/kg metabolic weight and day) with differential TMR (T1=TMR; T2= TMR+ 5% drying *Cymbogon citratus* of total feed in DM; T3= TMR + 5% drying *Psidium guajava* of total feed in DM). Formulation and chemical composition of the diet is shown in Table 1. Animals had continuous access to clean drinking water.

Table 1. Chemical composition of the diet consumed (n=18)

Parameter	T0 (g/Kg DM)	T1 (g/Kg DM)	T2 (g/Kg DM)
Dry matter	92.15 ± 0.12	93.39 ± 0.06	91.39 ± 0.16
Crude protein	21.24 ± 0.10	12.53 ± 0.30	12.40 ± 0.20
Crude fat	6.31 ± 1.02	3.73 ± 0.08	3.83 ± 0.18
Ash	22.23 ± 0.06	9.50 ± 0.10	9.48 ± 0.20
Crude fiber	17.31 ± 1.25	2.73 ± 0.18	2.83 ± 0.28
Crude NFC	66.82 ± 6.41	15.50 ± 0.40	14.48 ± 0.50
NDF	82.24 ± 6.51	64.12 ± 1.32	63.02 ± 1.22
ADF	66.70 ± 0.59	34.35 ± 1.26	32.15 ± 0.26
ADL	7.88 ± 0.35	6.37 ± 0.67	7.47 ± 0.57
NDIN	0.154 ± 0.003	1.26 ± 0.01	1.86 ± 0.21
NDINCP	1 ± 0.02	7.86 ± 0.04	7.96 ± 0.34
ADIN	0.158 ± 0.003	4.60 ± 0.09	4.80 ± 0.89
ADINCP	0.99 ± 0.03	0.74 ± 0.01	0.74 ± 0.01

NFC = Non-Fibrous Carbohydrates, NDF = Neutral Detergent Fiber, ADF = Acid Detergent Fiber, ADL = Acid Detergent Lignin, NDIN = neutral detergent insoluble nitrogen, NDICP = neutral detergent insoluble crude protein, ADIN = acid detergent insoluble nitrogen, ADICP = acid detergent insoluble crude protein.

After of an initial 15 d adaptation period of animals under study, four sampling periods collected in mixture then directly moved to laboratory for continue batch culture analysis in anaerobic condition. The *in vitro* gas production was carried out using the method proposed by Menke and Steingass (1998). Approximately 200 mg of sample of diet (T1, T2, and T3) ground to 1 mm were placed in six replicates (n=6) in 100 ml calibrated glass syringes. Buffer and mineral solutions were added in a 2:1 ratio to rumen liquid collected. Thirty-five milliliters of this mixture were introduced in each syringe for incubation. Syringes were shaken gently at each reading and the gas volume was recorded at 0, 2, 4, 6, 8, 10, 12, 24, 36, 48, 72 and 96 h of incubation. Moreover, feed samples analysis (see table 1) had been prepared (ISO 6498:2012) and analyzed for DM (ISO 6496:1999), ash (ISO 5984:2002), and crude protein (ISO 5983-2:2009). Neutral and acid detergent fibers (α NDF and ADF) had been determined using a fiber analyzer (Ankom Technology Methods 13 and 12), respectively. Cumulative gas production data were fitted to the model of (Orskov and McDonald, 1970) by NEWAY computer package program, $y = a + b(1 - e^{-ct})$ where, a, the gas production from the immediately soluble fraction (mL); b, the gas production from the insoluble fraction (mL); c, the gas production rate constant for the insoluble fraction (mL/h); a+b, potential gas production (mL); t, incubation time (h); y, gas produced at time “t”. Organic matter digestibility (OMD), metabolizable energy (ME) (Menke et al., 1979) and net energy lactation (NE_L) (Menke and Steingass, 1998) contents of forages were estimated using equations given below:

$$\text{OMD (\%)} = 14.88 + 0.889 \text{ GP} + 0.45 \text{ CP} + 0.651 \text{ A}$$

$$\text{ME (MJ/kg DM)} = 2.20 + 0.136 \text{ GP} + 0.0574 \text{ CP}$$

$$\text{NEL (MJ/kg DM)} = 0.101 \text{ GP} + 0.051 \text{ CP} + 0.112 \text{ EE}$$

where; GP, 24 h net gas production (mL/200 mg DM); CP, crude protein (%); A, Ash content (%); EE, Ether extracts (%).

Statistical method

Data were analyzed as a compare means into one-way ANOVA with a treatment and measurement as factor and dependent list, respectively using computer package analysis SPSS (version 18). Differences between treatment means were determined by Tukey's HSD (Honest Significant Difference) Test that be declared the significant differences at $P < 0.05$.

Results and discussion

All effects of *Cymbogon citratus* and *Psidium guajava* leave (vectors) on supplementation of TMR were expressed in table 2 and 3. Clearly, there are significantly results between T1, T2, and T3 on increase of gas production, ME, NE_L, and OMD. T1 is opposite to T2 and T3, but T2 is similar act with T3. Gradually rise of T1 gas fermentation is caused by absent of vector supplementations whereas T2 and T3 have vectors containing the strange substances of organic compounds in leaves. Mailoa et al. (2013) explained that *Cymbogon citratus* and *Psidium guajava* leave have polyphenol compounds involving tannins, saponins, alkaloid, and flavonoid. These compounds promised to antimicrobial agent (Scalbert, 1991) that diminished commonly bacteria relating to fiber fermenters. Thus, other microorganisms on the rumen impacted and needed time for adapting period such a preliminary metabolism to usual condition e.g. pH and temperature (see table 2). Since organic compounds of vectors were bringing microorganism to force their feed fermentation and creating long time of lag/colonization period (see table 3) leading to lower of number of gas measurement. On other words, gas measurement could reflex how feed fermentation work by microorganism on the rumen. T1 was more effective on degradability than T2 and T3.

Table 2. *In vitro* gas production (mL) parameters and ME, NE_L and OMD values of different treatment

Parameter	Treatment			SEM	P-value
	T1 (n=6)	T2 (n=6)	T3 (n=6)		
Time 0	31.17 ^a	32.24 ^{ab}	32.43 ^a	0.182	**
Time 2	44.18 ^a	39.21 ^b	39.07 ^b	0.145	***
Time 4	54.62 ^a	45.35 ^b	44.95 ^b	0.235	***
Time 6	63.00 ^a	50.75 ^b	50.17 ^b	0.308	***
Time 8	69.74 ^a	55.51 ^b	54.79 ^b	0.352	***
Time 10	75.15 ^a	59.71 ^b	58.89 ^b	0.374	***
Time 12	79.50 ^a	63.40 ^b	62.53 ^b	0.380	***
Time 24	92.56 ^a	77.96 ^b	77.92 ^b	0.280	***
Time 36	96.13 ^a	84.76 ^b	84.44 ^b	0.177	***
Time 48	97.13 ^a	87.95 ^b	88.03 ^b	0.163	***
Time 72	97.48 ^a	90.14 ^b	90.73 ^b	0.231	***
Time 96	97.51 ^a	90.63 ^b	91.42 ^b	0.267	***
a	31.17 ^b	32.24 ^{ab}	32.43 ^a	0.182	**
b	66.34 ^b	58.53 ^a	59.24 ^a	0.299	***
c	0.11 ^b	0.06 ^a	0.06 ^a	0.002	***
OMD	98.26 ^b	85.28 ^a	84.63 ^a	0.249	***
ME	14.82 ^b	12.84 ^a	12.74 ^a	0.038	***
NEL	9.41 ^b	7.94 ^a	7.86 ^a	0.028	***

ME = metabolizable energy (MJ/Kg DM), NEL = net energy lactation (MJ/Kg DM), OMD = organic matter digestibility (%), a = the gas production from the immediately soluble fraction (mL), b = the gas production from the insoluble fraction (mL), c = the gas production rate constant for the insoluble fraction (mL/h), SEM = standard error of means,

: significant different (<0.05), *: highly significant different (<0.001)

^{a,b} Means within a row with a different superscript differ (P,0.05)

Table 3. Total gas production (A), colonization time (L), fermentation rate (μ), non-degradable fraction (FI), potential degradability (PD), and effective degradability (ED) of dry matter in 96 incubation hours

Parameter	Treatment			SEM	P-value
	T1 (n=6)	T2 (n=6)	T3 (n=6)		
A (mL)	97.51 ^a	90.63 ^b	91.42 ^b	0.267	***
L (Hours)	0.112 ^b	1.003 ^a	1.036 ^a	0.012	***
μ (mL/h)	66.35 ^b	58.34 ^a	59.24 ^a	0.299	***
FI (mL)	2.49 ^a	9.37 ^b	8.53 ^b	0.267	***
PD (mL)	97.52 ^b	90.76 ^a	91.67 ^a	0.286	***
ED (gr/Kg)	4.88 ^b	4.54 ^a	4.58 ^a	0.014	***

: significant different (<0.05), *: highly significant different (<0.001)

^{a,b} Means within a row with a different superscript differ (P,0.05)

On other hands, exacerbating rumen fermentation by antimicrobial agent on feed ration has a potentially owning antiprotozoal role to collapse methane producer by disrupting protozoa (Kamra et al., 2006; Santra et al., 2012). It is known in advance that protozoa have symbiosis with methanogenic archaea which produce methane on feed fermentation. T2 and T3 have contrast situation on percentage of OMD than T1. Jayanegara et al. (2012) described that reduce of OMD relates to abate methane, especially methane per unit OMD. This suggests that organic compounds of vectors may have a direct inhibitory effect on the methanogens.

Conclusion

Polyphenol-containing plants of *Cymbogon citratus* and *Psidium guajava* may influence on feed fermentation on the rumen. Whether advantageous or disadvantageous depend on objective on study. T2 and T3 which are containing polyphenol compounds had decreased on gas production, ME, NE_L, and OMD and it relates to decrease of methane per unit OMD. Further observation corresponding to other parameter such as Volatile Fatty Acids (VFA), Fatty Acids (FA), and methane measurement in advance level is convenient conducted for completely treatment in this scope.

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Organoleptic characteristics of eggs produced by local hens fed diets containing cakalang (*Katsuwonus pelamis* L) fish oil waste

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Abstract

The objective of this study was to determine organoleptic characteristics of eggs produced by local hens fed diet containing cakalang fish oil waste as oil source in diets. Two hundred native chicken of 36 weeks of age were used in this experiment. The birds were allocated into five experimental diets and each was divided into five replicate groups of eight birds per replicate. The treatments were R0 = 100% BD + 0% COFW, R1 = 98.5% BD + 1.5% COFW, R2 = 98% BD + 2% COFW, R3 = 97.5% BD + 2.5% COFW, R4 = 96% BD + 3% COFW. The study was conducted over a period of 8 weeks. There were 36 fairly trained panelists involved for organoleptic test that rated the egg for color, aroma, texture and flavor, and overall acceptability on sevetic test results were analyzed by point hedonic scale from 1 = dislike extremely to 7= like extremely. The organoleptic test results showed that the highest rating of the eggs There was no significant $P > 0.05$ difference in egg attributes when birds were fed 0 or 3% CFOW in egg yolk color, flavor and texture, but significant $P < 0.01$ in egg aroma. Based on results obtained in study into effects of layer diet with fish oil cakalang and organoleptic traits of eggs, the following can be concluded: usage of feedstuffs rich in cakalang fish oil waste in diet can have negative effects on sensory traits of eggs.

Keywords: cakalang fish oil waste, organoleptic, eggs

Introduction

Egg contains long chain unsaturated fatty acids which is a functional food, because it is highly nutritious and could prevent coronary heart disease. Essential fatty acids needed by animal body for growth and normal function of tissues and organs. It can not be synthesized by the animal. Some of those fatty acids are alpha linoleic acid omega-6 and alpha linolenic acid omega-3. In addition, synthesis of omega-3 and omega-6 are depended on fatty acid profile in feed (Raes et al., 2002). Norata et al. (2003) stated that HDL cholesterol has a role in coagulation, fibrinolysis, platelet and molecules nearby attachment and protease expression that affect the antioxidant activities. That is also in accordance with Lee and Lip (2003) who stated that fish oil supplementation can increase the HDL level and decrease triglyceride level. Therefore, the aim of this study was to evaluate organoleptic characteristics of egg laid by local hen fed diet containing cakalang (*Katsuwonus pelamis* L) fish oil waste.

Methodology

Two hundred 36-week old local hens were housed in individual cages within a room with environmental control. The treatments in this study was processing industrial of fish oil. The treatments were R0=Basal Diet (BD); R1=98.5% BD + 1.5% Cakalang Fish Oil Waste (CFOW); R2= 98.5 BD + 2% CFOW; R3=97.5% BD + 2.5% CFOW and R4= 97% BD + 3%

CFOW. Basal diet contained 40% corn, 9% rice bran, 30% commercial diet, 12% fish meal and 9% soybean meal. The nutrient content of the basal diet is shown in table 1.

Table 1. Nutrients of the diets

Nutrients	Diets				
	R0	R1	R2	R3	R4
Crude Protein %	18.15	18.03	17.99	17.95	17.91
Fat %	6.9	7.20	7.57	7.95	8.32
Crude Fiber %	6.15	6.15	6.02	5.99	5.96
Ca %	0.73	0.73	0.73	0.73	0.73
P%	0.77	0.77	0.77	0.77	0.77
ME Kcal/kg	2658.16	2690.73	2701.04	2712.15	2723.46

During feeding trials, feed and water were given to hens two times daily at 07.00 and 16.00, in which the diets were given about 3% above the average daily consumption, and the water was given *ad libitum*. Each diet was fed to five replicates of eight birds each. Thirty six untrained panelists were asked evaluate hard-boiled eggs aroma, yolk flavor, texture, and color. The study was conducted in one 8-h period and only those participants who indicated that they did eat hard-boiled eggs were chosen. Each participant received four warm internal yolk temperature of 73 °C unpeeled eggs. Individuals were asked to cut into the boiled eggs themselves and to clear the palate with water and unsalted crackers between each sample. The test was carried out between 09.00 to 11.00 am, with the consideration within that time the panelists are not too hungry and not to full.

Egg samples were coded with three digit randomized numbers. The samples were served to the panelists individually on paper plates in a random order to evaluate. At the time of testing each panelist was given a form sheet to use for testing. Organoleptic characteristics of the eggs were recorded on a seven point hedonic scale, namely: 1 extremely dislike, 2 dislike, 3 somewhat dislike, 4 neutral, 5 somewhat like, 6 like, and 7 extremely like, with similar ascending ratings for the desired attributes of color, aroma, texture, and flavor of the egg.

Calculations of the egg organoleptic test results were analyzed descriptively, while the data of the organoleptic test was then analyzed Completely Randomized Design, *Wilcoxon* test (Steel and Torrie, 1994).

Results and discussion

The panelists mean acceptability ratings for the samples of eggs in organoleptic test is shown in Table.2. There was no significant ($P > 0.05$) difference in egg attribute when birds were fed 0 or 3 % CFOW in egg yolk color, flavor and texture, but highly significant ($P > 0.01$) in egg aroma. Color is an import attribute of foods because it can influence acceptability by panelists (Goldberg et al., 2013).

Table 2. Effect of CFOW in diets on organoleptic properties of local hen eggs.

Treatment	Color	Aroma	Flavor	Texture
R0	4.77±1.03	5.45±0.85 ^a	5.62±0.68	4.97±0.66
R1	5.14±1.35	5.31±1.4 ^a	5.65±1.05	5.31±0.75
R2	5.02±1.72	5.65±0.87 ^b	5.51±0.98	5.28±0.92
R3	5.45±1.22	5.20±1.32 ^c	4.65±1.66	5.48±0.88
R4	5.74±1.09	5.20±1.02 ^c	3.94±1.71	5.40±1.21
Sign	Ns	**	Ns	Ns

ns: not significant, *** significant different.

It was reported that organoleptic quality of the n-3 eggs tends to be similar to regular table eggs, although in some cases panelists were able to detect off-flavors (Milinsk et al., 2003). Poorer overall impression and lower grades for aroma and taste of eggs might be effect of the different CFOW level on organoleptic traits of egg can be due to higher content of n-3 PUFA in eggs. Gonzales-Esquerria and Leeson (2000) reported on statistically significantly better ($P < 0,05$) grades of eggs originating from hens in the control 2% and 4% of animal and plant fat than of eggs laid by hens fed 2 – 4% of cod –liver oil.

Conclusion

Based on results it can be concluded that the use of feedstuffs rich in CFOW in diet can have negative effects on sensory traits of eggs.

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Effect of prebiotic and Immunowall® as feed additive in enzyme activity, intestinal characteristic, and broiler performance

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Abstract

The research purpose was to determine the prebiotic and immunowall® effect as the feed additive on enzyme activity, intestinal characteristic, and broiler performance. The research method was used completely randomized design with 3 treatments and 8 replicates. The materials used for this research were 720 unsex day old chicks with Ross 308 strain with average body weight 43.34 ± 1.20 g/head. The treatments used for research were dietary with T₀ (basal feed), T₁ (basal feed + 0.05% prebiotic at 1-13 days) and (basal feed + 0.05% immunowall® at 15-32 days), T₂ (basal feed + 0.1% prebiotic at 1-13 days) and (basal feed + 0.05% immunowall® at 15-32 days) The parameters observed were enzyme activities (protease and amylase), intestinal characteristic (villus total and villus height), and performance (feed intake, body weight, feed conversion ratio, mortality, and production index broiler). The data analysis was the analysis of variance (ANOVA) and continued by Duncan Multiple Range Test. The results showed that using the prebiotic and immunowall® effect as feed additive has significant difference ($P < 0.05$) on enzyme activities (protease and amylase), intestinal characteristic (villus total and villus height), performance (final body weight and mortality) and significantly different ($P < 0.01$) (feed conversion, index production, and IOFC). The addition of 0.05% prebiotic and 0.05% immunowall® gave the best effect on enzyme activity, intestinal characteristic, and broiler performance.

Keywords: prebiotic, enzyme activity, intestinal characteristic, performance, broiler

Introduction

The quality of broiler carcass mostly from several factors. The feed is the effect to the quality of broiler. The using feed additive is one method to improve the quality of feed. The antibiotics are given as growth promoter but antibiotics cause bacterial resistance and residue in the carcass (Sjojfan, 2003). Nowadays, prebiotics use as the substitute from antibiotics because it's safer. The uses *Saccharomyces cerevisiae* is the most in the prebiotics. The *Saccharomyces cerevisiae* is the most lactic acid bacteria in the intestinal. The *Saccharomyces cerevisiae* produce an essential enzyme that increased quality in the digestive tract of broiler (Sjojfan et al., 2015). The prebiotics can increase the absorption nutrient in the broiler that will affect the internal organs. The indicator performance (feed intake, body weight, feed conversion ratio, mortality, and production index broiler) and enzyme activities (protease and amylase), intestinal characteristic (villus total and villus height).

According to Sjojfan et al. (2015) stated the *Saccharomyces cerevisiae* are an organism that produce amylase enzyme. The *Saccharomyces cerevisiae* are source vitamin, carbohydrate, and protein that increased total protein absorb in intestinal. Sjojfan et al. (2012) stated used of prebiotics increased immunity of the broiler starter periods. The prebiotics consist of enzyme that has bio-catalisator for metabolism in intestinal of the broiler. The small intestinal of broiler consist villus that has a function to absorb nutrient content. The villi

are indicator the nutrient can absorb in the intestinal of broiler. The use prebiotics as feed additive are help the villus absorb nutrient. In otherwise the research used prebiotics as feed additive need to be developed in addition of intestinal characteristic (villus total and villus height). The performance indicator use prebiotics are help from MOS. Mannan oligosaccharides are yeast that produce endogenous enzyme that will hydrolysis in the intestinal wall of broiler (Sjofjan et al., 2012).

Methodology

Materials are used 720 unsex day old chicks with average body weight 43.34 ± 1.20 g/head. The prebiotic given 1-13 days and immunowall® has given 15-32 days. The research method was used completely randomized design with 3 treatments and 8 replicates. The replicates consist 30 heads of broiler with total (720 heads). The level of dietary and prebiotics were T0= (basal feed + 0% probiotic) T1= (basal feed + 0.05% prebiotic at 1-13 days) and (basal feed + 0.05% immunowall® at 15-32 days) T2= (basal feed + 0.1% prebiotic at 1-13 days) and (basal feed + 0.1% immunowall® at 15-32 days) The variables observed were enzyme activities (protease and amylase), intestinal characteristic (villus total and villus height), and performance (feed intake, body weight, feed conversion ratio, mortality, and production index broiler). The data analysis using analysis of variance (ANOVA) and continued by Duncan's Multiple Range Test (Steel and Torrie, 1992).

Results and discussion

The treatment effect of prebiotic and immunowall® as feed additive in enzyme activity, intestinal characteristic, and broiler performance presented on Table 1.

Table 1. Enzyme activities and intestinal characteristic

Treatment	Variables			
	Protease*	Amylase*	Villus total*	Villus Height**
	(μmol tyrosine/ g enzyme minute)	(μmol glucose/ g enzyme minute)	(unit/transversal cut)	(μm)
T ₀	6.59 ± 0.99^a	62.42 ± 4.46^b	211.16 ± 16.33^a	887.25 ± 62.54^a
T ₁	7.70 ± 1.24^b	63.89 ± 3.38^a	230.33 ± 16.50^b	1191.50 ± 119.44^b
T ₂	8.22 ± 0.91^b	69.65 ± 6.91^b	234.33 ± 10.76^b	1246.33 ± 96.90^b

*Superscript showed significant different (0.05), **: Superscript showed significantly different (0.01)

Based on table 1 result from the research on the average protease enzyme activities are significant different ($P < 0.05$). The used prebiotics are impacted to the protease enzyme. The enzyme reacts because of MOS, while the protolithic bacteria produce protease enzyme to react the absorption. According to Haryati (2011) stated the used of prebiotics using Lactobacillus and Bifid bacteria in intestinal can support micro faunas and the pathogen microorganism reduce can't react and the absorption of nutrient will react in the binding site using blocking factors. Lactobacillus is bacterial that produce protease enzyme. The Lactobacillus is using MOS to optimizing the synthesis the protease enzyme. Microorganism in the intestinal using MOS from the feed while the Lactobacillus produce protease enzyme and transform into potential energy for growth and increased the production. The using prebiotic that produce enzyme more efficiency than basal feed. According to Sjofjan et al.

(2015) stated the function of the protease enzyme are for catalysator to hydrolyzed protein. Protease enzymes are needs to break down the peptide in protein feed and breakdown the amino acid in the broiler body. The prebiotics in the T₁ and T₁ showed that protease enzyme activity is increased because the composition was given. The nucleotide in the feed are affected to broiler body that produces the enzyme. Nucleotide is the semi essential nutrient substance that produces from broiler body. The nucleotide in the broiler body is substance from growth and given in the brooding period will increase optimum absorb nutrient. The activities of the protease enzyme are increased due to the acid condition in the intestinal of broiler. The several factors affect are genetic, feed composition, and feed intake. Protease enzymes will breakdown the protein into amino acids that will absorb by broiler into body weight (Wahyu, 2004).

The enzyme reacts because of MOS, while the amyl lithic bacteria produce amylase enzyme. According to Oyeleke and Oduwele (2009) stated MOS consist high amylin that breakdown the starch into molecule e.g. glucose, maltose, dextrose as the carbon source to produce amylase enzyme that has a potential than basal feed. The differences enzyme activities in the each level prebiotics provide feed additive to bacteria growth for produce amylase enzyme to optimum phase. Amylase enzyme cycle IS breakdown the glycoside in the amylin. The enzyme activity is increased due to pH that changes enzyme intermolecular structure and enzyme become denaturation (Sjofjan et al., 2012). The used prebiotics in the T₂ are increased T₀ and T₁. The content of nucleotide in the each treatments are affect to produce enzyme from the broiler body. Nucleotide is essential substance that needed to be growth for broiler and cell replicates. The used nucleotide in the brooding periods give growth and cell replicate for broiler performance especially in the intestinal (Sjofjan et al., 2015).

Based on Table 1 result from the research on the average villus total are significant different ($P < 0.05$). The used prebiotics are impact to the metabolism in the broiler that has positive physiology intestinal condition. The average of villus total (ileum) is 211.16-233.33. The average are higher to Sjofjan et al. (2015) that the average of the villus total are 180.50-216.00 that used probiotic in the drinking water laying hens. According to Ningrum et al. (2016) stated that the used prebiotics in the Broiler strain Ross 308 (35 aged) are 218.33 – 251.75. The optimum level is T₂ that used by the microorganism for optimum nutrient absorption. The decreasing absorption affects to the amount total and length of villus broiler. The several factors affect the absorption are the feed, disease, and total pathogen and non-pathogen bacteria in the broiler intestinal. According to Hamsah (2013) stated increased total villus activities due to microbial and enzyme work to absorb the nutrient from feed. The villus total decreased due to age factors. Ermalia et al. (2016) stated the villus total decrease started at 14 days and 21 days. The several factors impact the decreased of villus total are feed, disease, and balancing between the total pathogen and non-pathogen bacteria in the broiler intestinal.

Based on Table 1 result from the research on the average villus length is significantly different ($P < 0.01$). The used prebiotics are increased the villus length due to beta-glycan and Mannan oligosaccharides (MOS) that use by microbial that increased intestinal absorption. Beta-glycan has functioned as anti-septic, anti-oxidant, anti-aging, immune activator, radiation factors, anti-inflammation, anti-cholesterol, and anti-diabetes. Beta-glycan are extracted from yeast has positive impact to the absorption nutrient (Sjofjan et al., 2015). The villus length average is 887.25 μm to 1246.33 μm . the result showed the used prebiotics are better than the basal feed to villus length the result better Beski and Saldary (2015) that 558.3 – 883.3 μm and Ningrum et al. (2016) that the used prebiotics in the Broiler strain Ross 308 (35 aged) are 700.50 – 1072.76 μm . According Rofiq (2003) villus are the important part to absorb the nutrient from the feed. MOS function is help endo β -mannose enzyme and

galactosidase. The high nutrient content in the MOS are affected to the palatability while feed intake increase digestibility enzyme.

Table 2. Probiotic effect in performance

Treatment	Variables					
	Feed intake	Final BW*	Feed Conversion**	Mortality*	Production Index (IP)**	Income Over Feed Cost**
	(g/chick)	(g/chick)		(%)		(IDR/head)
T ₀	3186.9±83.3	2040.7±63.6 ^a	1.56±0.05 ^b	5.00±1.8 ^b	354.94±21.2 ^a	12383.9±1059.4 ^a
T ₁	3083.9±106.4	2124.3±70.1 ^b	1.45±0.06 ^a	2.08±2.5 ^a	409.86±27.5 ^b	14334.3±1291.2 ^b
T ₂	3086.3±82.1	2128.3±57.0 ^b	1.45±0.06 ^a	1.67±2.5 ^a	412.96±27.3 ^b	14448.3±1153.9 ^b

*: Superscript showed significant different (0.05), **: Superscript showed significantly different (0.01)

Based on Table 2 result from the research the average feed intake is not significant different ($P>0.05$). The used prebiotics are not significant different due to feed and the nutrient content of feed each other are same. The protein and energy are given different to the amount feed consumption, due to energy is inhibit factor. Warisah (2015) stated that the used prebiotics as feed additive is not significant different to the feed intake. According to Daud (2005) are the feed and the nutrient content of feed each other is same. The feed intake level does not depend on absorption in the intestinal. The several factors affected are body weight, strain, production levels, temperature levels, broiler activities, and humidity. The capacities of the gizzard effect to the feed intake. The other factors affect to the feed intake are palatability (color, taste, odor, and texture).

Based on Table 2 result from the research on the average feed intake is significant different ($P<0.05$). The used prebiotics are not significant different due to feed and the nutrient content of feed each other are same. The protein and energy are given different to the amount feed consumption, due to energy is inhibit factor. The final body weight has correlation positive after given prebiotics. The final body weight is increased due to the nucleotide content in the prebiotics. The used of prebiotics as feed additive because the nucleotide can absorb by enterocyte in the intestinal and proliferation cycle was at the optimum point. The absorption of the nutrient content affects the final body weight are optimum in the broiler. According to Daud (2005) stated that increased the broiler body weight due to metabolism from the microbial in the prebiotic, the enzyme that absorbs nutrient content combine with metabolism to produce and grow the organs in the broiler. The prebiotic increase microbial population and immunity. The final body weight has the correlation with the number of MOS that provide the substrate for lactic acid bacteria.

Based on Table 2 result from the research on the protease enzyme activities showing the T₀ higher are (1.56±0.05) with basal feed + 0.1% prebiotic at 1-13 days) and (basal feed + 0.1% immunowall® at 15-32 days) and lower T₁ are (1.45±0.06) (basal feed + 0.05% prebiotic). The treatment from lower to higher is T₀, T₂, and T₁. The average feed intake is significantly different ($P<0.01$). The low feed intake and the final body weight are increased converted into high feed conversion in the broiler. The feed conversion lowers the feed efficiency are increased.

Based on Table 2 result from the research on the average mortality is significant different ($P<0.05$). The mortality is determined by the number of mortality divide the amount of the early population times 100%. According to Bell and Weaver (2002) mortality is the indicator that calculated used percentage. The higher mortality is in the 3 weeks and 5 weeks. The causes of mortality are *Escherichia coli* (Colibacillosis). The indicate *Escherichia coli* are in the broiler are broiler is weakness, the feather number are not widely, feed intake is low, and look pale. The used prebiotics in the mortality variable is significant different due to

MOS content and β -glycan has ability to decreasing pathogen bacterial in the broiler. The prebiotics in the MOS produces mannose that reduces Salmonella, Campylobacter, Clostridium perfringens, and Escherichia coli.

Based on Table 2 result from the research on the average production index are significantly different ($P < 0.01$). The production index is the amount of the successful in the end period of broiler. The indicator successful of broiler management is the production index. The production determine by comparison between average body weight times live percentage of broiler divided feed conversion and times the age of broiler. The used prebiotics in the production index are given positive correlation to the final body weight of broiler, decrease the mortality, and increased the feed conversion (T_1 and T_2). The factors affected to both treatments are the performance index e.g. body weight, feed conversion, and mortality. Bahari et al. (2012) stated the important component in the performance index is the amount of mortality, body weight, feed conversion ratio, and aged. The production index is depending on the final body weight, live broiler, time management, and feed conversion (Daud, 2005).

Based on Table 2 result from the research on the average income over feed cost are significantly different ($P < 0.01$). The income over feed cost the number showed the between income that gained from one period in the broiler. The income over feed cost is gained from the number selling chicken with income among the one periods broiler rearing (Sjofjan, 2008). The used prebiotics in the broiler are significantly different due to the value of IOFC are consist the value of feed intake and final body weight of broiler. The significantly different of IOFC impact to the value of income and price of selling broiler. The lower feed consumption given the number of expenditure lower. Tantalo (2009) stated the IOFC value depend on the final body weight broiler. The IOFC value depends on the income and the expenditure during rearing of broiler (Sjofjan, 2008).

Conclusion

The prebiotic and immunowall[®] effect as feed additive has significant difference ($P < 0.05$) on enzyme activities (protease and amylase), intestinal characteristic (villus total and villus height), performance (final body weight and mortality) and significantly different ($P < 0.01$) (feed conversion, index production, and IOFC). The addition of 0.05% prebiotic and 0.05% immunowall[®] gave the best effect on enzyme activity, intestinal characteristic, and broiler performance.

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Enrichment of omega-3 long chain fatty acids into the egg yolk of Mojosari ducks through dietary fish oil and tomato powder supplementation

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Abstract

This study investigated the effect of diet supplemented with fish oil and tomato powder on enrichment of omega-3 long chain polyunsaturated fatty acids (n-3 LC PUFA) into the egg yolk of Mojosari ducks. A total of 120 female and 20 male Mojosari ducks, aged at 40-weeks-old, were randomly distributed into 20 flocks (each flock consisted of 6 female and 1 male ducks). The ducks were then fed 1 of 5 diets, either T0: basal diet (control), T1: basal diet supplemented with 1% fish oil, T2: basal diet supplemented with 2% fish oil, T3: basal diet supplemented with 1% fish oil + 1% tomato powder or T4: basal diet supplemented with 2% fish oil + 1 % tomato powder. All data were subjected to one-way Analysis of Variance and LSD Duncan's Test. Result showed that dietary treatment had significant effect ($p < 0.05$) on intake of n-3 PUFA. Egg yolk n-3 LC PUFA (particularly EPA) significantly increased ($p < 0.05$) by the supplementation of dietary fish oil, either as single or in combination with tomato powder. Diet T3 had higher enrichment efficiency of n-3 LC PUFA into the egg yolk compared to other treatments. This study suggest that diet supplemented with 1% fish oil + 1% tomato powder could optimize enrichment efficiency of n-3 LC PUFA into the egg yolk of Mojosari ducks.

Keywords: antioxidant, DHA, EPA, fatty acids, poultry

Introduction

Recent evidence showed that dietary omega-3 polyunsaturated fatty acid (n-3 PUFA) had an important role in human nutrition. Gogus and Smith (2010) reported that supplementation of n-3 PUFA in mothers diet could improve psychomotor development, cognitive development and birth weight of infant. Moreover, supplementation of n-3 PUFA is currently also being applied in poultry breeder diet. Baéza et al. (2017) noted that maternal intake of n-3 PUFA could increase n-3 PUFA in the egg yolk and then could improve growth performance and welfare of duckling. Those findings suggest that enrichment of n-3 PUFA in the egg yolk had a potency to improve performance of the hatched birds.

The use of dietary fish oil as n-3 PUFA source in poultry diet gain much attention in recent decade. Major n-3 PUFA component in fish oil are EPA and DHA, which is categorized as omega-3 long chain polyunsaturated fatty acid (n-3 LC PUFA). EPA and DHA will give direct biological role in the body, while another n-3 PUFA compound such as α -linolenic acid should be first converted into EPA and then DHA before being utilized in the body. However, due to its high content of n-3 LC PUFA, fish oil is being highly susceptible to oxidation, which then may cause detrimental effect on laying performance (Andri et al., 2016). Thus, dietary antioxidant source should be added to prevent the oxidation. Tomato is one of the potential antioxidant sources due to its lycopene content (Guil-Guerrero and Rebollosa-Fuentes, 2009). Therefore, the purpose of this study was to investigate the effect of diet supplemented with fish oil and tomato powder on enrichment of n-3 LC PUFA into the egg yolk of Mojosari ducks.

Methodology

A total of 120 female and 20 male Mojosari ducks, aged at 40-weeks-old, were randomly distributed into 20 flocks (each flock consisted of 6 female and 1 male ducks). The ducks were then fed 1 of 5 diets, either T0: basal diet (control), T1: basal diet supplemented with 1% fish oil, T2: basal diet supplemented with 2% fish oil, T3: basal diet supplemented with 1% fish oil + 1% tomato powder or T4: basal diet supplemented with 2% fish oil + 1% tomato powder. Fish oil was supplemented into the diet by replacing soybean oil, while tomato powder replaced tapioca flour. The treatments were lasted for 6 weeks. Feedstuff composition and nutrient content of basal diet was shown in Table 1. Total n-3 PUFA content of dietary treatments was shown in Table 2.

Table 1. Feedstuff composition and nutrient content of basal diet

Feedstuff composition		Nutrient content	
Corn (g/kg)	480	Energy (kcal ME/kg) ¹	2.845
Soybean meal (g/kg)	200	Crude protein (g/kg) ¹	196.00
Rice bran (g/kg)	132	Crude fat (g/kg) ¹	48.80
Meat bone meal (g/kg)	80	Calcium (g/kg) ²	32.50
Soybean oil (g/kg)	20	Phosphorus (g/kg) ²	5.00
Tapioca flour (g/kg)	10	Lysine (g/kg) ²	10.60
Premix (g/kg)	78	Methionine (g/kg) ²	5.40

¹Calculated using data of proximate analysis of feedstuff, ²Calculated using data of Leeson and Summers (2005)

Table 2. Total n-3 PUFA content of dietary treatments

Variable	Control	1% FO	2% FO	1% FO + 1% TP	2% FO + 1% TP
Total n-3 PUFA (mg/kg) ¹	2.07	4.40	6.37	4.34	6.75

¹ α -linolenic acid + EPA + DHA

Intake of n-3 PUFA was calculated by feed intake multiplied by total n-3 PUFA in the diet. Enrichment efficiency of n-3 LC FA in the egg yolk was calculated by formula = (total n-3 LC PUFA in the egg yolk / intake of n-3 PUFA) x 100%. All data were subjected to one-way Analysis of Variance and LSD Duncan's Test.

Results and discussion

Result showed that dietary treatment had significant effect ($p < 0.05$) on intake of n-3 PUFA (Table 3). The use of diet T4 had the higher intake of n-3 PUFA compared to other treatments. This finding related with the total n-3 PUFA in the diet (Table 2) which was also higher in diet T4. Egg yolk n-3 LC PUFA significantly increased ($p < 0.05$) by the supplementation of dietary fish oil and tomato powder, particularly in the form of EPA. The use of 2% fish oil in diet T2 and T4 could significantly increased ($p < 0.05$) DHA content, but the use of fish oil at 1% in diet T1 and T3 did not significantly ($p > 0.05$) providing higher DHA content compared to control (T0). Previously, Chen and Hsu (2003) also reported that diet containing refined cod liver oil could increase EPA and DHA content in the egg yolk of Tsaiya duck.

Table 3 showed that diet T3 provide the most optimum enrichment efficiency of n-3 LC PUFA. This finding indicated that tomato powder may support fish oil to improve enrichment efficiency of n-3 LC PUFA. It could be explained that antioxidant substances in tomato powder may improve availability of n-3 LC PUFA by protecting fish oil from oxidation. Beside that, the presence of antioxidant substances maybe also could improve the desaturase

and elongase enzymes which were involved in the conversion of α -linolenic acid to EPA and then DHA (Hayat et al., 2010). For that reason, tomato powder addition in fish oil-containing diet could optimize the enrichment efficiency of n-3 LC PUFA into the egg yolk.

Table 3. Effect of dietary fish oil and tomato powder supplementation on intake of n-3 PUFA, egg yolk n-3 LC PUFA and enrichment efficiency

Treatments	Intake of n-3 PUFA (mg)	Egg yolk n-3 LC PUFA (mg)			Enrichment Efficiency (%)
		EPA	DHA	Total ³	
T0 (Control)	295.61 ^a	25.01 ^a	64.00 ^a	89.01 ^a	30.05 ^a
T1 (1% FO ¹)	618.23 ^b	233.77 ^b	94.54 ^{ab}	328.31 ^b	53.13 ^{bc}
T2 (2% FO ¹)	921.21 ^c	238.99 ^b	133.26 ^b	372.25 ^b	40.38 ^{ab}
T3 (1% FO ¹ + 1% TP ²)	615.19 ^b	275.52 ^b	100.14 ^{ab}	375.66 ^b	61.01 ^c
T4 (2% FO ¹ + 1% TP ²)	964.00 ^d	259.57 ^b	136.86 ^b	396.43 ^b	40.99 ^{ab}
SEM	55.76	24.35	8.20	30.05	3.18
<i>p</i> -value	<0.001	<0.001	0.01	<0.001	0.005

^{a-d} means in the same column with different superscripts are significantly different ($p < 0.05$)

¹FO: Fish Oil, ²TP: Tomato Powder, ³EPA + DHA

Conclusion

The use fish oil, either as single or in combination with tomato powder could increase intake of n-3 PUFA and egg yolk n-3 LC PUFA (particularly in the form of EPA). It is recommended to use diet supplemented with 1% fish oil + 1% tomato powder to achieve optimum enrichment efficiency of n-3 LC PUFA in the egg yolk of Mojosari ducks.

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Corn straw based on complete feed silage quality with adding various legumes

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Abstract

The research aim was to find out quality of corn straw based on complete feed silage with adding various legumes. The method research was experiment, using a Completely Randomized Design with four treatments ie : T1 (40 % concentrate + 39.5 % corn straw + 20.5 % *Calliandra calothyrsus*), T2 (40 % concentrate + 45 % corn straw + 15 % *Leucaena leucocephala*), T3(40 % concentrate + 42 % corn straw + 18 % *Gliricidia sepium*) and T4 (40 % concentrate + 44.5 % corn straw + 15.5 % *Indigofera zolingeriana*) and replicated three times. The percentages was in total dry matter basic with crude protein (CP) 13 %. Measured variables were physical characteristic, pH, nutrient contents, nutrient content loss, fleigh point and digestibility. Collected data were analyzed by analysis of Variance and continued with Duncan's Multiple Range Test (DMRT). The result showed that inclusion of various legumes in corn straw based on complete feed silage highly significant influence ($P < 0.01$) on the texture, flavor, dry matter (DM), organic matter (OM), CP, Extract Eter (EE), and Nitrogen Free Extract (NFE), CP Loss, EE Loss, DM digestibility and OM digestibility. It has significantly effect ($P < 0.05$) on Crude Fiber (CF), DM Loss, OM Loss, NFE Loss and did not influence ($P > 0.05$) on pH and Fleigh point. It can be concluded that T2 (the addition with *Leucaena leucocephala*) is the best treatment with pH 4.67 ± 0.13 , DM 41.94 ± 1.42 %, OM 88.59 ± 0.16 %, CP 13.67 ± 0.18 %, CF 25.19 ± 0.99 %, EE 2.85 ± 0.09 %, NFE 46.88 ± 0.72 %, Fleigh point 101.98 ± 7.62 , DM digestibility 57.51 ± 2.94 % and OM digestibility 58.80 ± 0.79 %.

Keywords: silage, complete feed, corn straw, legumes, digestibility

Introduction

Corn straw is an agricultural by product which is consists of the leaves, stalks and cobs of dry maize plants that left in a field after harvest (Umiyasih and Wina, 2008). According to Dewi, Mukodiningsih and Sutrisno (2012) Corn straw as animal feed has low dry matter digestibility (28.35 -35.51%) and organic material digestibility (49.44 – 56.99%). It is means that corn straw need to mix with other feedstuff to increase the quality such in making complete feed silage. Corn straw will mix with concentrate and add with various legumes and then processed as a silage to increase the digestibility of corn straw. The research aim was to find out quality of corn straw based on complete feed silage with adding various legumes.

Methodology

The method research was experiment, using a Completely Randomized Design with four treatments ie : T1 (40 % concentrate + 39.5 % corn straw + 20.5 % *Calliandra calothyrsus*), T2 (40 % concentrate + 45 % corn straw + 15 % *Leucaena leucocephala*), T3(40

% concentrate + 42 % corn straw + 18 % *Gliricidia sepium*) and T4 (40 % concentrate + 44.5 % corn straw + 15.5 % *Indigofera zolingeriana*) and replicated three times. The percentages was in total dry matter basic with crude protein (CP) 13 %. Measured variables were physical characteristic, pH, nutrient contents, nutrient contents loss, fleigh point and digestibility. Collected data were analyzed by analysis of Variance and continued with Duncan's Multiple Range Test (DMRT).

Results and discussion

Result of this experiment are shown in Table 1 below. The result showed that inclusion of various legumes in corn straw based on complete feed silage highly significant influence ($P < 0.01$) on the texture, flavor, dry matter (DM), organic matter (OM), CP, Extract Eter (EE), and Nitrogen Free Extract (NFE), CP Loss, EE Loss, DM digestibility and OM digestibility. It has significantly effects ($P < 0.05$) on Crude Fiber (CF), DM Loss, OM Loss, NFE Loss and did not influence ($P > 0.05$) on pH and Fleigh point. Physical quality of corn straw based on complete feed silage shown color green to brown, and still solid. According to Chahine, Tiana and Glenn (2015) solid texture of silage is caused by decreasing of pH silage as soon as possible so it can inhibit decaying microbial growth. Nutrient contents of complete feed silage based on DM already categorized as good quality of silage because it had DM around 35 – 40 % (Kaizer, Pilts, Burn and Griffiths, 2004). For it DM loss also agree with Rowghani and Zahmiri (2009) which stated that anaerobic condition in ensilage will cause DM loss around 10 % and Mc Donald et al. (1981) added that in good silage DM loss will be around 7 – 20 %. DM loss signed that lactic acid bacteria use some of nutrient to produce acid.

Table 1. Silage complete feed quality based on corn straw with adding various legumes

Variables	Treatment 1 (T1)	Treatment 2 (T2)	Treatment 3 (T3)	Treatment 4 (T4)
pH	5.08 ± 0.20	4.67 ± 0.13	4.92 ± 0.30	4.95 ± 0.05
Color **	2.05 ^a ± 0.87	2.37 ^b ± 1.06	2.30 ^{ab} ± 0.81	2.13 ^a ± 0.95
Texture **	3.45 ^b ± 0.57	3.45 ^b ± 0.67	3.40 ^b ± 0.59	3.05 ^a ± 0.59
Flavor	4.33 ± 0.51	4.35 ± 0.48	4.17 ± 0.59	4.30 ± 0.56
Fungi	4.08 ± 0.81	4.15 ± 0.73	4.02 ± 0.91	4.13 ± 0.75
DM (%) **	42.70 ^b ± 0.77	41.94 ^b ± 1.42	38.75 ^a ± 1.11	40.49 ^{ab} ± 0.64
OM (%) **	89.39 ^b ± 0.25	88.59 ^a ± 0.16	89.11 ^b ± 0.07	88.31 ^a ± 0.13
CP (%) **	13.44 ^b ± 0.21	13.67 ^b ± 0.18	13.45 ^b ± 0.14	12.43 ^a ± 0.27
CF (%) *	24.88 ^a ± 0.63	25.19 ^{ab} ± 0.99	26.72 ^c ± 0.26	26.28 ^{bc} ± 0.45
EE (%) **	1.89 ^a ± 0.05	2.85 ^c ± 0.09	2.21 ^b ± 0.06	2.35 ^b ± 0.05
NFE (%) **	49.18 ^b ± 0.17	46.88 ^a ± 0.72	46.74 ^a ± 0.27	47.25 ^a ± 0.32
DM Loss (%) *	12.12 ^{ab} ± 1.61	10.50 ^a ± 0.85	9.26 ^a ± 2.28	14.44 ^b ± 1.37
OM Loss (%) *	12.85 ^{ab} ± 1.35	12.04 ^a ± 1.65	9.57 ^a ± 2.26	14.82 ^b ± 1.31
CP Loss (%) **	11.49 ^a ± 2.90	6.90 ^a ± 0.54	8.38 ^a ± 3.23	19.78 ^b ± 0.53
CF Loss (%)	1.20 ± 0.90	5.86 ± 5.31	2.78 ± 2.46	7.99 ± 3.04
EE Loss (%) **	25.84 ^{ab} ± 2.92	19.32 ^a ± 3.60	23.25 ^a ± 3.87	33.34 ^b ± 0.73
NFE Loss (%) *	17.54 ^b ± 1.77	15.91 ^b ± 0.16	12.64 ^a ± 1.95	15.76 ^b ± 1.09
Fleigh Point	87.29 ± 6.59	101.98 ± 7.62	85.68 ± 13.07	87.92 ± 1.19
DM Digestibility (%)	52.52 ^a ± 2.13	57.51 ^{ab} ± 2.94	62.30 ^b ± 4.06	62.53 ^b ± 2.03
OM Digestibility (%)	53.03 ^a ± 2.10	58.80 ^{ab} ± 0.79	64.18 ^b ± 4.85	63.33 ^b ± 1.55

^{a-c} values in the same row for each variables with different superscripts were significantly different ($p < 0.05$) (*) and highly significant different ($P < 0.01$) (**)

Conclusion

It can be concluded that T2 (the addition with *Leucaena leucocephala*) is the best treatment with pH 4.67 ± 0.13 , DM 41.94 ± 1.42 %, OM 88.59 ± 0.16 % , CP 13.67 ± 0.18 %, CF 25.19 ± 0.99 %, EE 2.85 ± 0.09 %, NFE 46.88 ± 0.72 %, Fleigh point 101.98 ± 7.62 , DM digestibility 57.51 ± 2.94 % and OM digestibility 58.80 ± 0.79 %.

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***In vitro* digestibility and NH₃ concentration rice straw based on complete feed silage with inclusion of various legumes**

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Abstract

The objective of this research was to evaluate *in vitro* digestibility dry matter /DM and organic matter/OM and NH₃ concentration rice straw based on complete feed silage with inclusion various legumes. This research was carried out at Animal Feed and Nutrition Laboratory and Sumbersekar Field Laboratory, Faculty of Animal Husbandry, University of Brawijaya. The method research was experiment, using a Completely Randomized Design with four treatments ie : CFS1 40 % concentrate + 40.5 % rice straw + 19.5 % *Calliandra calothyrsus*, CFS2 40 % concentrate + 46 % rice straw + 14 % *Leucaena leucocephala*, CFS3 40 % concentrate + 43 % rice straw + 17 % *Gliricidia sepium* and CFS4 40 % concentrate + 45 % corn straw + 15% *Indigofera zolingeriana* and replicated 3 times. The percentages was in total dry matter basic with crude protein CP 13 %. Measured variables were nutrient contents, digestibility and NH₃ concentration. Collected data were analyzed by analysis of Variance and continued with Duncan's Multiple Range Test DMRT. The result showed that addition of various legumes in rice straw based on complete feed silage was highly significant influence $P < 0.01$ on DM digestibility and OM digestibility with the highest value on SCF4, followed with SCF3, SCF2 and SCF1. The treatments also showed significantly different $P < 0.05$ on NH₃ concentration, which is CFS 3 has the highest value. It can be concluded that SCF 3 the addition with *Leucaena leucocephala* was resulted the best quality of rice straw complete feed silage.

Keywords: silage, complete feed, rice straw, legumes, digestibility

Introduction

Rice straw is an agricultural by product that is commonly found in the field and used as animal feed. The main problem of the utilization of rice straw was high crude fiber content of 33.91 % (Sutardi, 2001), contained lignin that decrease intensity and degradation rate in digestion system (Sutama et al., 2006) and had a low crude protein content of 3 – 5% (Antonius, 2009; Trisnadewi et al., 2014). Because of these limitations, to increase the utilization of rice straw as animal feed, it should be conducted a processing technology such as fermentation to increase the quality of rice straw such as incorporating rice straw in the complete feed silage. Munawaroh et al. (2015) stated that complete feed silage will have lower crude fiber because of its fermentation process. Irsyammawati et al. (2011) also noted that a material which has high readily available carbohydrate is needed to enhance lactic acid bacterial growth, such as concentrate. Mixing rice straw with concentrate as energy source and added with legume as protein source and then processed to silage would increase the quality and digestibility of rice straw. A complete feed is a feed for animal made to fulfil the needs of animal production. The objective of this research was to evaluate *in vitro* digestibility dry matter /DM and organic matter/OM and NH₃ concentration rice straw based on complete feed silage with inclusion various legumes

Methodology

This research was carried out at Animal Feed and Nutrition Laboratory and Sumbersekar Field Laboratory, Faculty of Animal Husbandry, University of Brawijaya. The method of research was experiment, by using a Completely Randomized Design with four treatments ie : CFS1 40 % concentrate + 40.5 % rice straw + 19.5 % *Calliandra calothyrsus*, CFS2 40 % concentrate + 46 % rice straw + 14 % *Leucaena leucocephala*, CFS3 40 % concentrate + 43 % rice straw + 17 % *Gliricidia sepium* and CFS4 40 % concentrate + 45 % corn straw + 15% *Indigofera zolingeriana* and replicated 3 times. Twenty-one days were employed to process the complete feed into silage in all of the treatments. Measured variables were nutrient contents, digestibility and NH₃ concentration. Collected data were analyzed by analysis of Variance and continued with Duncan's Multiple Range Test DMRT.

Results and discussion

Results of this experiment are shown in Table 1 below. The result showed that addition of various legumes in rice straw based complete feed silage showed highly significant effect $P < 0.01$ on DM and OM digestibilities with the highest value on SCF4 followed with SCF3, SCF2 and SCF1. The difference of digestibility was assumed because of adding different legumes. Legume has anti nutritive factors that can influence the digestibility of complete feed silage. Among all the legumes, *Calliandra calothyrsus* on SCF1 had the highest tannin and as a result digestibility of *Calliandra* containing silage was the lowest among the other treatments. If compared with Yanuario et al. (2008) who found lower DM and OM digestibilities. Tilman et al. (1991) added that crude protein and crude fiber contents of feedstuff also influenced digestibility.

Table 1. Rice straw based on silage complete feed quality by adding various legumes

Variables	Treatment 1 CFS1	Treatment 2 CFS2	Treatment 3 CFS3	Treatment 4 CFS4
DM %	47.50	44.77	40.29	41.00
OM %	86.30	84.90	85.10	83.77
CP %	14.57	15.02	15.16	15.40
CF %	23.12	24.92	24.05	24.18
EE %	2.03	2.54	2.93	4.14
DM Loss %	31.71	32.83	32.16	
CP Loss %	20.19	21.10	21.67	19.63
CF Loss %	33.24	34.33	35.76	36.61
DM Digestibility % **	54.32 ^a ±1.32	57.04 ^{ab} ±0.82	59.29 ^b ±1.92	59.89 ^b ±2.96
OM Digestibility % **	56.14 ^a ±6.56	57.99 ^{ab} ±7.18	62.54 ^b ±7.40	62.61 ^b ±9.66
NH ₃ concentration mM *	7.74 ^a ±0.86	8.78 ^{ab} ±2.18	11.80 ^c ±2.35	10.74 ^{bc} ±3.59

^{a-e} values in the same row with different superscripts were significantly different $p < 0.05$ * or highly significant different $P < 0.01$ **

The treatments also showed significantly different ($P < 0.05$) on NH₃ concentration, which was found that CFS 3 had the highest value. All CFS have NH₃ concentration between 7.74±0.86 mM until 11.80^c±2.35 mM, it means that all the treatments had crude protein that is easily degraded by rumen microbes. Tanuwiria et al. (2005) stated that protein feed that is easily degraded by rumen microbes produced more nitrogen ammonia (N-NH₃) for synthesis of microbial protein. It was indicated by highly NH₃ production > 12 mM in rumen. If protein feed is not easily degraded by rumen microbes, it produces NH₃ less than 3 mM.

Conclusion

It can be concluded that SCF 3 (the addition with *Leucaena leucocephala*) resulted the best quality in rice straw complete feed silage.

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Effect of addition either probiotic or encapsulated in feed on intestinal microflora population of local duck

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Abstract

The aim of this research was to investigate the effect of either probiotic or encapsulated on lactic acid bacteria (LAB), *Salmonella sp* and *Eschericia coli* as feed additive to population in small intestine of local duck. This research was conducted in Animal Husbandry Faculty Field Laboratory, Malang. One hundred and twenty day old duck (DOD) were reared for 42 days (6 weeks) in treatment cage. The method which used was Completely Randomized Design (CRD) with 6 treatments with 5 replication (each replication consist of 4 birds). The treatments were K- = control diet; K+ = control diet + 0.2% tetracycline; P1= control diet + 0.2% probiotic; P2= control diet + 0.4% probiotic; P3= control diet + 0.2% probiotic encapsulated and; P4= control diet + 0.4% probiotic encapsulated. Variables observed were total LAB, *Salmonella sp* and *Eschericia coli*. Data were analyzed by Analysis of Variance (ANOVA) and significant difference treatments then analyzed by Least Significant Differences Test (LSD). The result showed that addition 0.4% either probiotic or encapsulated had significant effect ($P < 0.05$) of total LAB 9.23 ± 0.14^c log cfu compared negative and positive control diet, addition of 0.4% either probiotic or encapsulated had significant effect ($P < 0.05$) in *Salmonella sp* 2.88 ± 0.30^c and *Eschericia coli* 3.94 ± 0.45^d population compared negative control diet. This research conclude that either probiotic or encapsulated had significant effect in negative control diet on total LAB, *Eschericia coli* and *Salmonella sp*, and no significant effect of positive control diet on *Eschericia coli* and *Salmonella sp*.

Keyword: local duck, probiotic, encapsulated, microflora

Introduction

Probiotics are potentially non-pathogenic living microorganisms that prove beneficial to their host (FAO, 2001). Curenly, probiotics are not only focused on improving human health, but have been widely developed in the poultry industry as a growth promoter, subtheaurepic agent and improve poultry performance. Previous studies have reported that probiotic *Lactobacillus sp.* capable to increase body weight and decreasing mortality, feed conversion ratio and pathogenic microflora in some poultry commodities (Bitterncourt et al., 2011). Currently, probiotics need to increase its survival rate, one of them using encapsulation method.

The encapsulation or coating matrix within the microcapsule wall is current expected to protect the probiotic substance. Commonly, method which used were spray drying, cross

link, extrusion, freeze drying, extrusion and rotational suspension separation (Hermana et al, 2015).

Mojosari local duck is a one native duck that currently needs to be developed. Based on data from the Ministry of Agriculture (2016) it is reported that the production of duck meat continues to increase, until 2015 meat production reached 34,845 tons (was increased of 5.02% from 2014). Some of the constraints faced in the local duck business are slow growth production, inefficient in feed used, too expensive feed costs (Purba and Ketaren, 2011). Therefore, this study was conducted to determine the effect of either probiotic or encapsulated on the performance of local mojosari duck in terms of microflora population.

Methodology

This research was conducted in Animal Husbandry Faculty Field Laboratory, Malang. Feed which used were corn, ricebrand, meat bone meal, soybean meal, mineral premix, DL-methionine and lysine. The method which used was Completely Randomized Design (CRD) with 6 treatments with 5 replication (each replication consist of 4 birds). The treatments were K- = control diet; K+ = control diet + 0.2% tetracycline; P1= control diet + 0.2% probiotic; P2= control diet + 0.4% probiotic; P3= control diet + 0.2% probiotic encapsulated and; P4= control diet + 0.4% probiotic encapsulated. Variables observed were total LAB, *Salmonella sp* and *Eschericia coli*. Data were analyzed by Analysis of Variance (ANOVA) and significant difference treatments then analyzed by Least Significant Differences Test (LSD).

Results and discussion

The result of this research was showed in Table 1. This research showed that any significant effect ($P < 0.05$) between treatments on total LAB, *Eschericia coli* and *salmonella sp*. Addition of 0.2% either probiotic or encapsulated was increased total LAB, the best result showed in P4 which increase 9.23 ± 0.14 log cfu/ ml compared negative control diet or positive control diet. Secondly, effect of either probiotic or encapsulated had significant effect ($P < 0.05$) in total of *Eshecricia coli* compared negative control diet, but no significant effect ($P < 0.05$) compared positive control diet. The best result showed in P2 and P4 which were decreased 3.62 ± 0.27^c log cfu/ml or 2.88 ± 0.30^c log cfu/ml. Thirdly, there is significant effect ($P < 0.05$) in population of *Salmonella sp* compared negative control diet, but no significant effect ($P < 0.05$) compared positive control diet. The best result, showed in P3 and P4 which were increased 3.69 ± 0.57 log cfu/ml or 3.94 ± 0.45 log cfu/ml. This is supposed that encapsulation process could protect probiotic from external environment, pH, humidity and heat tolerant in small intestine, so that increase optimum survival rate toward small intestine (Kailasapathy, 2002; Carlos et al., 2015 dan Chang, 2005). Activity of probiotic produce inhibitory effect such as antimicrobes that capable to holding population of phatogenic bacteria.

Table 1. Effect of either probiotic or encapsulated in microflora population on small intestine of local duck

Treatment	Variables		
	BAL (log CFU)	E.coli (log CFU)	Salmonella sp
K-	8.25 ± 0.09^b	4.61 ± 0.93^a	6.11 ± 0.17^a
K+	7.19 ± 0.75^a	2.73 ± 0.10^c	3.58 ± 0.42^d
P1	8.19 ± 0.11^b	4.23 ± 0.92^b	4.66 ± 0.73^b
P2	9.05 ± 0.24^c	3.62 ± 0.27^c	4.35 ± 0.11^c
P3	8.63 ± 0.49^b	4.21 ± 0.71^b	3.69 ± 0.57^d
P4	9.23 ± 0.14^c	2.88 ± 0.30^c	3.94 ± 0.45^d

Conclusion

This research conclude that either probiotic or encapsulated had significant effect in negative control diet on total LAB, *Eschericia coli* and *Salmonella sp*, and no significant effect of positive control diet on *Eschericia coli* and *Salmonella sp*.

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Fatty acid profile, omega 3, 6, 9 content and ratio PUFA, MUFA dan SFA Trevally (*Selaroides sp*) fish oil with the addition of basil leaf powder (*Ocimum bacilicum*) as an antioxidant

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Abstract

The aim of this study was to determine the profile fatty acid, omega3, 6, 9, and ratio PUFA, MUFA, SFA of Travelly (*Selaroides sp*) fish oil with the addition of basil leaf powder powder (*Ocimum bacilicum*) as an antioxidant. This study used 4 treatments and 3 replications, M0 = 10 ml FO + 0% BP, M1 = 10 ml FO + 2% BP, M2 = 10 ml FO + 4% BP, M3 = 10 ml FO + 6% BP. This study used trevally fish obtained from sea water of Tomini Gulf and basil leaves as research material. Basil leaves separated from the stem and then dried oven at 50°C, then milled and sieved with size 60 MESH. Fish oils were obtained using the wet rendering method, followed by fatty acid analysis by gas chromatography mass spectrofotometry. The spectrum all treatments showed 18 types of fatty acids as PUFA, MUFA and SFA. It can be concluded that the addition of 6% powder of basil could be decreased SFA and increased MUFA and PUFA. The ratio PUFA:MUFA:SFA of all treatments exceeded suggested by WHO (2003) and FAO (2010). However, the proportion of M3 treatment (18.11%: 36.25%: 45.64%) was better than other treatments.

Introduction

Travelly Fish (*Selaroides spp*) is abundantly found in the waters of Central Sulawesi. The previous study showed that Travelly (*Selaroides spp*) fish oils contained 24.45% omega3, 10.53% omega6, while the PUFA, MUFA, and SFA is 35.4%: 26.08%: 47.87% (Minarny et al., 2014). Omega 3 and omega 6 (PUFA) easily oxidized so it needs treatment by adding natural materials that contain phytochemicals as antioxidants.

Wichi (1988) reported showed that the synthetic antioxidant compounds butylated hydroxyl anisole (BHA) and butylated hydroxyl toluene (BHT) are potentially carcinogenic. Therefore required a natural antioxidant compounds that are safe for consumption. One of the natural ingredients that contain many antioxidants is basil leaves (*Ocimum basilicum*).

Basil leaves contain phytochemical components such as flavonoid compounds and eugenol, arigin, anetol, boron, and essential oils. Flavonoids and eugenol act as antioxidants that can be used as antibacterial in health products. Rani Ayu et al., (2006) reported that basil leaves can be used as natural antioxidant compounds in oil palm kinking process. Based on this, then has been conducted research on the addition of basil powder as an antioxidant in Trevally fish oil (*Selaroides sp*).

Methodology

Sample preparation

Trevally fish (*Selaroides spp*) were obtained from sea water of Makassar or Tomini Gulf (Parimo Regency), Central Sulawesi Province and will be used as raw material. These fish oils were extracted by wet rendering method (AOAC, 2005). Basil leaves separated from the stem and then dried oven at 50°C, then milled and sieved with size 60 Mesh. The oil samples were then analyzed by altering the fatty acids into fatty acid methyl esters (FAME) and subsequently injected into columns GCMS (SHIMADZU-FID).

Laboratory Analysis

Samples (0.3 ml) were methylated using 1.5 ml of Na-Metanolic and heated at 65°C for 15 minutes in waterbath. 1.5 ml of BF₃-Methanol were added to the mixture, then heated at the same condition and the solution was allowed to cool down. The solution was extracted with 0.5 ml of N-Heptane and 1 ml of saturated NaCl, and the top-layer of solution (1 µl) was injected to the Gas Chromatography Mass Spectrofotometry (at the same condition with standard) as described AOAC (2005).

Results and discussion

Fatty acids profile, omega-3, 6, 9 contents and ratio PUFA, MUFA, SFA of Trevally (*Selaroides spp*) fish oil with the addition of basil leaf powder (*Ocimum bacilicum*) as an antioxidant were presented in Table 1.

Table 1. Fatty acids profile, omega-3, 6, 9 contents and ratio PUFA, MUFA, SFA

Fatty Acids	M0		M1		M2		M3	
	Average	Std	Average	Std	Average	Std	Average	Std
C16:3	1,14 ±	0,37	3,63 ±	0,73	3,15 ±	0,3	2,8 ±	0,06
C16:2	-	-	1,11 ±	0,11	0,95 ±	0,12	0,76 ±	0,03
C18:2	8,12 ±	0,23	3,83 ±	0,46	5,00 ±	0,28	8,12 ±	0,13
C20:4	-	-	-	-	-	-	0,85 ±	0,05
C20:2	-	-	1,54 ±	0,35	1,42 ±	0,03	1,9 ±	0,1
C20:5	-	-	3,3 ±	0,87	3,25 ±	0,36	3,68 ±	0,22
PUFA	9,26		13,41		13,77		18,11	
C15:1	-	-	-	-	-	-	-	-
C16:1	-	-	0,96 ±	-	-	-	-	-
C17:1	-	-	-	-	-	-	1,12 ±	0,24
C18:1	48,09 ±	0,41	32,93 ±	3,97	30,26 ±	0,82	35,13 ±	0,46
MUFA	48,09		33,89		30,26		36,25	
C12:0	1,58 ±	0,21	2,2 ±	0,33	6,47 ±	0,17	2,41 ±	0,28
C12:0	-	-	-	-	1,86 ±	0,16	-	-
C10:0	-	-	0,85 ±	-	-	-	-	-
C13:0	-	-	0,89 ±	0,04	0,86 ±	0,07	1,09 ±	0,15
C14:0	2 ±	0,17	3,72 ±	0,33	3,5 ±	0,13	3,43 ±	0,53
C16:0	33,63 ±	1,11	36,71 ±	1,16	36,95 ±	0,75	30,87 ±	0,71
C18:0	5,81 ±	0,64	8,25 ±	1,15	7,01 ±	0,32	7,03 ±	0,12
C20:0	-	-	0,9 ±	0,06	-	-	0,81 ±	0,04
SFA	43,02		53,52		56,65		45,64	

Conclusion

Increased levels of basil powder in fish oil can increase PUFA such as arachidonic acid (C20: 4) , eicosanoic acid (C20 :2), eicosapentanoic acid (C20: 5) and in general increase MUFA and decrease SFA.

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Crop by-product preservation for cattle production in Central Vietnam

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Abstract

The experiments were done to evaluate the chemical characteristics and estimate nutritive values of the feeds after preservation for ruminants as Rice straw RS, Cassava leaves CSL, Groundnut vine GV and Sweet potatoes vine SPV. The investigation was done by studying treatment methods, ME evaluation by gas test and a feeding trial with cattle was conducted. The results show that the crop by-products after preservation treatment are good for cattle production.

Keywords: crop by-product preservation for cattle

Introduction

In Central Vietnam, the weather is unfortunate to an efficient agriculture as flooding and drought, and both affecting forage production available to the animal. In contrast, natural feed resources and agricultural by-products are bounteous in the countryside, but wasted or misused, because the lack of farmer knowledge on their nutritive values and chemical characteristics. For improving the use of local feed resource and for enhancing the number of cattle and buffaloes in the area, scientist contribution toward the new information and applying new techniques is needed to find out the best solutions for the constraints in the area.

Methodology

Experiment 1. Treatment of fresh by-products to preservation

Fresh CSL, GV and SPV were added 5.0 % molasses and 0.5 % salt NaCl; after mixed were stored in sealed plastic bags (Thanh and Ogle, 2003). The silages DM, OM, CP, NDF and PH were determined 3 weeks after ensiling. The chopped rice straw (RS) was mixed with 5% urea, 0.5% salt and 70% water, and saved in plastic bags to prevent loss of NH₃ (Trach et al., 2001). After 3 weeks, the samples were analyzed for DM, OM, CP, NDF, pH and *in vitro* gas production. Excel, Minitab and Neway Excel program by Chen (1995) were used for the statistical analysis.

Experiment 2. Feeding trials on farm

Sixteen growing yellow cattle of about 120 kg body weight in *site 1*, and 20 growing yellow cattle of 87 kg body weight in *site 2*. were used. Two cattle were raised in each farm. Depend to available experiment condition, the cattle were weighed every week in *site 1* for 5 times and every ten days in *site 2* for 4 times. The cattle were divided in to two groups in each experiment site. *Site 1*: Group 1: 75% grass and 25% rice bran control; Group 2: 50% grass, 50% urea treated RS. *Site 2*: Group 1: 100% grass control; Group 2: 100% ensiled GV The daily feed intake was 60g DM/kgW^{0.75}; all animals were fed at 8:00, 12:00 and 17:00.

Results and discussion

Experiment 1

As shown in table 1, urea treated RS due to water addition, was wetter the untreated form; DM variation of SPV, CSL and GV were small. Due to the addition of NaCl or molasses the ash content in silages was increased 2.6 %. The losses of OM during the fermentation were minor. Evident losses of CP occurred in SPV, CSL and GV silages. The addition of a water solution of urea evidently affected the CP content treated RS, but did not OM changes. NDF clearly decreased in urea treated RS, which proved that the effect of urea treatment on the linkages of lignin and other cell wall components hemicelluloses. In CSL and GV and SPL silages, there was a comparable result obtained; NDF loss of about 10%. The pH in urea treated RS was alkaline due to NH_3 produced from urea hydrolyzation. The $\text{pH} < 4$ in other by-products, so that the silages were guaranteed for long and safe preservation, but not the case of SPV.

Table 1. Comparison of nutritive values of untreated and treated form of feed

Feed	DM	OM	Ash	NDF	CP	pH
Rice straw	90.3	77.8	12.5	67.9	6.6	
Urea treated rice straw	58.2	43.9	14.3	61.4	8.8	7.5
Cassava leaves	26.4	18.2	8.2	21.3	29.4	
Ensiled cassava leaves	26.8	15.8	11	19.7	27.3	3.7
Groundnut vine	29.2	19.5	9.7	30.6	14.4	
Ensiled groundnut vine	28.5	16.2	12.3	28.9	14.3	3.8
Sweet potatoes vine	20.2	9.1	11.1	39.4	23	
Ensiled sweet potatoes vine	19.9	6.4	13.5	36.3	17.1	5.2

The table 2 showed that the difference of potential gas production in untreated and treated RS were minor, even if statistically significant $P > 0.05$. The treatment was affected more by the gas production rate constant $P < 0.001$ and lag time $P < 0.01$.

Table 2. Gas production of untreated and treated feeds

	Mean		SD	P
	Untreated	Treated		
Rice straws				
Gas production a+b ml	56	55.4	3.39	0.906
Gas production rate constant fraction/hc	0.01	0.03	0.001	0.001
Lag time h	5.43	4.77	0.1	0.008
Cassava leaves				
Gas production a+b ml	44.8	38.2	0.75	0.003
Gas production rate constant fraction/hc	0.061	0.054	0.004	0.245
Lag time h	3.27	2.17	0.19	0.014
Groundnut vines				
Gas production a+b ml	51.3	48.9	1.07	0.192
Gas production rate constant fraction/hc	0.049	0.057	0.002	0.036
Lag time h	2.97	2.57	0.15	0.134
Sweet potatoes vines				
Gas production a+b ml	47.7	47.8	0.69	0.923
Gas production rate constant fraction/hc	0.052	0.054	0	0.288
Lag time h	4.03	2.5	0.28	0.018

The CSL significantly reduced gas production potential $P < 0.01$, probably because $pH < 4$ of the ensiled product and the coupled diminution of organic fermentable matter following fermentation. The ensiled GV was not different from the fresh one in gas production potential and lag time, but gas production rate constant was slightly but significantly different $P < 0.05$. The ensiled did not improve the digestibility, but allowed a safer preservation because of low pH. The ensiling process did not modify the fermentative characteristics of SPV with the exception of the lag time which significantly reduced $P < 0.02$. With SPV the ensiling could help in conservation but needs more caution as the pH could not support integrity for long period. From the gas production at the time of 48 h of incubation, the ME of the feed after processing was calculated by equation of: $Y = 0.117x + 5.07$ (Orskov and van Ryle, 1990), where Y is ME and x is gas production ml at 48 h of incubation. The gas test showed that the feeds after processing have either an increase or no change in the ME values (MJ/kgDM) compared between untreated-treated: GV: 11-10; CSL: 10-9; RS: 8-10. RS showed the best response of improvement by 29%.

Experiment 2

Diet composition was in order of DM; OM; CP %: *Site 1*: Grass 21.6; 90.4; 16.5; Ensiled GV 30.8; 88.9; 16.2. *Site 2*: Rice bran 88.2, 92.7, 12.8; Grass 29.6; 89.7; 10.9; Urea treated RS 51.8, 87.3, 10.1. During feeding experiments lasted for one month, the l.w. of heifers was weekly checked. In Figure 1, the initial l.w. of the two groups of heifers fed in site 1 were evidently different 126kg vs. 117kg, the calculated l.w. gains were compared by regression analysis. The weight gain of cattle eating grass $Y = 2.047x + 123.44$; $R = 0.94$ was higher than those receiving EGV $Y = 1.0082x + 115.19$; $R = 0.79$. Before experiment all the heifers were fed grass and one group was progressively adapted to GV for ten days. But it is evident from Figure 1 that they needed longer time to adjust to the new feed, so body weight continued to decrease. After that, the l.w. started to increase, therefore the correlation coefficient of weight gain in cattle fed ensiled GV was lower than those fed grass, and the trend was linear.

When grass was used as a main feed, urea treated RS or RB could be either employed to represent 30% total DM intake, as the results shows in Figure 2. The regressions of l. w. gain of heifers fed urea treated RS or rice bran were not different: $Y_{URS} = 3.4325x + 83.838$; $R^2 = 0.98$ and $Y_{RB} = 3.6299x + 83$; $R^2 = 0.99$.

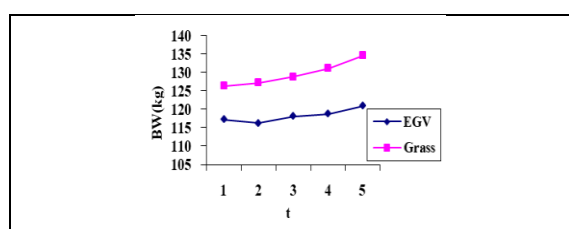


Figure 1. Bodyweight gain of cattle from experiment in site 1. BW: bodyweight; t: weeks; EGV: ensiled GV

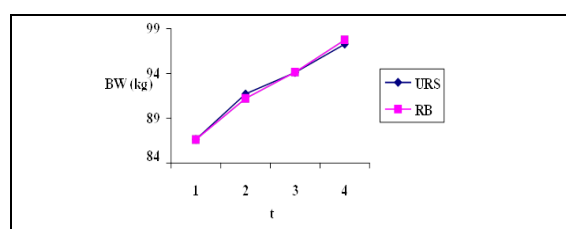


Figure 2. Bodyweight gain of cattle from experiment in site 2. BW: bodyweight; t: weeks. URS: Urea treated RS; RB: Rice bran

Conclusion

The study shows that preservation techniques to the crop by-product resource locally increases nutritive values of urea treated or be well preserved. This is confirmed by the experiment on farm.

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The Effect of addition combination of black cincau leaves (*Mesona Palustris* Bl) and probiotic encapsulated as feed additive on laying hens performance

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Abstract

The purpose of this research was to determine the effect of addition combination black cincau powder and probiotic in the form of encapsulation as feed additive on laying hens performance. The materials used were 80 laying hens 28 weeks old and each unit consist 5 laying hens. The average egg mass used before the study were $64,63 \pm 2,97$ g/day and variation coefficients were 4,59%. The method used was in vivo experiment with Completely Randomized Design (CDR) with 4 levels of inclusion 0, 0.5, 1.0, and 1.5 %, if there were significant differences it would be tested with Duncan's Multiple Range Test. Variables measured were feed consumption, Hen Day Production (HDP), egg mass, Feed Conversion Ratio (FCR), and Income Over Feed Cost (IOFC). The results showed that the combination of black cincau leaves and probiotics in the form of encapsulation did not give significant effect ($P < 0.05$) on feed consumption, hen day production, egg mass, feed conversion and income over feed cost The conclusion of this research was optimal level of combination of black cincau and probiotic encapsulated inclusion was 1,5 % on laying hens feed.

Keywords: black cincau, probiotics, laying hens

Introduction

Feed efficiency can be improved by adding feed additive. Commonly used feed additive was antibiotics. An antibiotic is synthetical feed additive used by farmer to improve production and quality of eggs. Adding antibiotics in animal feed would produce chemical residue in hen body and its eggs thus carrying bad risk for human health if consuming its products. Solution for this problem was by using natural feed additive. Natural feed additive might use probiotics and phytobiotics from herbal plants. Black cincau leaves contain active compound i.e. flavonoid, saponin, polyphenol, and alkaloid that may had functioned as antioxidant, antibacterial, improve immune system, and decrease blood cholesterol. Mountzouris et al. (2010) reported that probiotics inclusion as feed additive may increase colony non-pathogenic bacteria on cecal and can be increase feed nutrient digestibility. Combination of black cincau leaves and probiotic has given positive effect. This combination could improve the ability of digestive system. Natsir et al. (2017) reported that the use of an encapsulated acidifier-herb combination performs better than in powder forms as feed additives of broiler

Methodology

Egg layer hen used in this study were 80 hens of 28-weeks-old *Lohmann brown* strain with egg mass average before study $64,63 \pm 2,97$ g and variation coefficient 4,59%. Encapsulan used were whey, arabic gum and 0.06 gram BHT as antioxidant to prevent

oxidation. Probiotics used in this study were *Lactobacillus* sp 5.4×10^7 CFU/gram and *Bacillus* sp 2.4×10^8 CFU/gram. Probiotic encapsulant was using skim. Ratio of black cincau leaves and probiotic was 1:1. Composition and nutritional of basal feed presented in Table 1.

Table 1. Composition and nutritional content of the basal diet

Feedstuf	Starter Period (%)
Corn Yellow	48.56
Soy Bean Meal	19.42
Corn Gluten Meal	0.97
Rice Bran	14.57
Meat and bone meal	7.96
Grid	6.31
Premix	1.75
Salt	0.20
DL – methionine	0,26
Total	100
Nutritional contents ^{*)}	
ME (Kcal/Kg)**	2773.06
Crude protein (%)	19.90
Crude fiber (%)	4.17
Crude Fat (%)	4.59
Ash (%)	13.87

^{*)} Based on proximate analysis in Feed and Animal Nutrition Laboratory, Brawijaya University.

^{**)} ME = 0,7 GE (Fisher, 1982)

The research method use was feeding trial on completely randomized design with level of inclusion 0 % (P0), 0.5 % (P1), 1.0 % (P2), and 1.5 % (P3). Each treatment replicates 4 times with 5 laying hens each. The variables measured were live performance include feed consumption, Hen Day Production (HDP), egg mass, feed conversion, and Income Over Feed Cost (IOFC). The collected data were tabulated on SPSS and analyzed by ANOVA. If there were significant differences it would be tested by Duncan's Multiple Range Test.

Results and discussion

The effect of addition combination black cincau powder and probiotic as feed additive on laying hens performance was shown in Table 2.

Table 2. The effect of addition combination black cincau powder and probiotic as feed additive on laying hens performance.

Variables	Treatment			
	P0	P1	P2	P3
Feed Consumption (g/hen/day)	117.62±0.67	118.34±0.95	116.68±1.94	118.05±0.22
HDP (%)	84.57±6.17	84.64±6.50	83.00±3.54	89.80±2.78
Egg Mass (g/hen/day)	53.24±4.17	52.79±4.56	53.72±3.29	57.27±4.30
Feed Conversion	2.26±0.21	2.28±0.19	2.21±0.10	2.11±0.17
IOFC (Rp/hen/day)	652.20±30.83	546.75±116.24	559.28±85.15	600.85±106.00

Combination of encapsulated black cincau leaves and probiotics did not give significant effect ($P>0,05$) to feed consumption, hen day production, egg mass, feed

conversion and income over feed cost. This in significant difference in feed consumption might be due to *restricted* feeding and equal amount of feed with 120 g/hen/day with only once a day in the morning, also with the same basal feed thus contain similar nutritional content. Similar energy and protein as its nutritional content would produce similar consumption. Based on Table 2, the result was statistically shows no significant effect ($P>0,05$) but numerically, adding combination of encapsulated black cincau leaves and probiotic would improve HDP, egg mass and feed conversion. The optimal level of combination of black cincau and probiotic encapsulated was 1,5 %.. This might that encapsulated black cincau leaves and probiotics has contributed to digestive system so that feed nutrition would be highly absorbed by the body and thus increase the egg production. Encapsulation in feed additive was aimed to protect the sensitive feed ingredients, to reduce nutritional loss. Matusevicius et al. (2011) reported that combination of phytobiotics and probiotics was able to improve the digestion system in digesting the food. Phytobiotics in digestion system would improve due to support from probiotics and achieve optimum digestion. Lukashchuk and Slivinska (2016) reported that combination of phytobiotics and probiotics would balance the positive bacteria population in digestive system particularly those from genus *Bafidobacterium* and *Lactobacillus*. Widyaningsih and Adilaras (2013) reported that the ethanol extracts of black cincau at a dose level of 500 and 1000 mg/kg BW produce significant ($p<0.05$) hepatoprotection by decreasing the activity of SGOT, SGPT and ALP. It can be said that adding combination of encapsulated black cincau leaves and probiotics could lower feed conversion and improving efficiency of feed use. So flavonoid as bioactive compound in black cincau leaves can be used to maintain the balance of microflora in the small intestine.

Conclusion

The conclusion of this research was optimal level of combination of black cincau and probiotic encapsulated inclusion was 1.5 % on feed consumption, HDP, *egg mass*, and feed conversion, *Income Over Feed Cost* of laying hens.

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Estimation of birth weight repeatability and producing ability in Friesian Holstein crossbred cow

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Abstract

Research was done to estimate the repeatability value of birth weight in Friesian Holstein Crossbred cow. Repeatability value is important to predict the future performance in dairy cow. Repeatability is also called as genetic parameter and important in animal selection. 162 birth weight records from 54 cows from 1st, 2nd and 3rd parities were analysed to estimate repeatability value. Data were analysed using *intraclass correlation* method and model *One Way layout*. Result showed that the repeatability value of birth weight in dairy cow was categorized as medium ($0,42 \pm 0,08$). The ERPA of the cows were varied from -1.48 to 2.84. Cows with positive ERPA was about 65 % from total population, and cows with negative ERPA was about 35 % from total population. It was concluded that repeatability value of birth weight in the population was good indicator that selection in that population can be done based on the birth weight of cattle

Keywords : repeatability, genetic parameter, ERPA, producing ability

Introduction

Human needs animal protein for the essentials of life and for growth and all its activities. The number of needs is increasing in line with the increasing number of people in Indonesia and the increasing of awareness of the importance of these sources of nutrition for health. This increase should be balanced with the development of the livestock sector, especially dairy cattle business. Factors that support the livestock sector in production is by doing selection, one based on birth weight, because birth weight associated with the performance of livestock in the future. By knowing the birth weight it will be able to calculate more carefully the increase in body weight from birth to weaning.

Some characters have an advantage when used as a selected character. Selection for favorable characteristics tends to choose birth weight as a selection criterion for the purpose of achieving optimal weaning weight. Selection there are two kinds of natural selection and artificial selection. Natural selection is natural selection which is an important agent in the manufacture of today's livestock species and livestock. While the artificial selection is the selection made man to meet his needs. Human selection can be through several selection systems, depending on the nature of the selection (Maylinda, 2010). In carrying out the selection it should be noted whether the selection exercise for a trait affects the appearance of other traits. Cultivated in the selection exercise of a trait does not decrease the appearance of other traits, but rather increases.

According to Olawumi and Salako (2010) birth weight is a phenotypic expression of genotype that can be used as one of the indicators to choose a productive livestock that can produce superior livestock. The calf birth weight will then affect the weight of cows and body weight of adults. By knowing birth weight, we can estimate weaning weight to be achieved so

that it can help optimize the process of maintenance to calf. High cattle weight will accelerate the achievement of adult body weight (Williamson and Payne, 1993). The average milk production and live weight of livestock are higher in livestock born with heavy birth weight than those born with mild birth weight. Birth weight can be used as one of the selection criteria as an effort to improve the productivity of genetic quality of dairy cattle. Estimates of calf birth weight at the next parity can be known if the birth weight ripitability value is known. The value of birth weight ripitability is used to predict ERPA (Estimated Real Producing Ability) value, so it can simplify the selection process to the parent based on cattle ranking. The objective of the study was to estimate the value of ripitability of birth weight of dairy calf and to determine cattle ranking based on ERPA value (Estimated Real Producing Ability).

Methodology

The material used in this study was the birth weight recording of 54 PFH calves in the first, second and third parity, or 162 birth records from female cows. The measured variables were the birth weight records of the Friesian Holstein crossbred cows from the first, second and third parity. Data analysis was done by the analyses of variance, model One Way Layout. The statistical model as below (Hardjosubroto, 1994)

$$Y_{km} = \mu + \alpha_k + e_{km}$$

Whereas :

- Y_{km} = observation in the-m calves and in the-k cows.
- μ = population mean
- α_k = effect of the-k individuals
- e_{km} = effect of the error in the-m calves and in the=k individuals

The estimation of production ability is done by ERPA (Estimated Real Producing Ability). In ERPA the average female cow's production is compared with its herdmate production. Herdmate are all mothers in a common farm, who have children in relatively the same time, but not the half-brother (Hardjosubroto, 1994). ERPA formula is as follows :

$$ERPA = \frac{nr}{1+(n-1)r} (\bar{P} - \bar{P}_h)$$

Whereas :

- n = the number of measurement
- r = repeatability
- \bar{P} = birth weight average of the calves
- \bar{P}_h = birth weight average of the calves of the herdmate average

Data correction is done with the aim to eliminate data from non-genetic factors ie environment that can cause data variability. Correction factor in the form of multiplication is in the form of birth weight of male and female (Hardjosubroto, 1996). In this research, 1.06 correction factor of male and female mean distribution was $112,488 / 106,207 = 1,06$.

Result and Discussion

Birth weight of the calves

Birth weight includes quantitative properties that can be measured, and these properties are controlled by multiple gene pairs (Polygenes Heredity) and are influenced by many environmental factors. The data obtained are correlated data by sex. Pedet that has a high birth weight so that weaning weight is also high. The high birth weight pedet will achieve maximum growth and development so as to achieve weaning weight faster. High weaning weight will

accelerate the achievement of adult body weight (Williamson and Payne, 1993). In this study we expect high birth weight, because in accordance with the above literature if the calf that birth weight will achieve maximum growth and development to achieve weaning weight faster, and will accelerate the puberty of these animals. This study will elicit a female cow that produces a child with high birth weight, in which the birth weight data obtained from the recording is corrected based on the genital jelly of the child (Hardjosubroto, 1994). In this study the number of measurements of more than two measurements per individual then the results of the analysis of variance as a correlation in the class (interclass correlation) shows the size of the overall correlation between all possible pairs. Table 1 shows the results of Anova calculations.

Table 1. Analyses of Variance Results

Source of variance	df	SS	EMS	R ± SB*
Between Individuals	53	339,42	6,40415	0,4 ± 0,08
Between Pengukuran within individuals	108	212,14	1,96425	
Total	161			

SE* = standart error of means

The repeatability of birth weight in this study was quite good because it was obtained by a small standard error. This indicates that the temporary environment is not too high, as shown by good maintenance management. Several indicators indicate that there are already recording of reproduction. This conclusion is obtained by comparing the fact that there is a company with farm others in East Java, not many farms have recording. *Estimated Real Producing Ability (ERPA)* is an estimate of the maximum livestock production ability. This study produces the average birth weight of calves in farms Karunia amounted to 36.85 kg. Cattle that have an ERPA value above the average population with an average value of individuals ranging from 37 to 41 kg, amounting to 35 head of cattle or about 65%, and below the average population with an average value of individuals ranging from 34.68 to 36.75 kg is 19 head of cattle or about 35%. Breeders may decide on selection or culling of the dam based on the low ERPA.

Conclusion

Based on the result of the research, it can be concluded that the value of ripitability of birth weight in the location was categorized as moderate that is 0.42 ± 0.08 and is a good indicator for the selection of dairy cattle at the research location. Cattle that have an ERPA value above the average population amounted to 35 head of cattle or about 65%, and below the average 19 head of cattle or about 35%.

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Comparison of morphological characteristics male Saburai Goat on two breeding location in the Tanggamus Regency Lampung Province

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Abstract

The study was conducted with the objective to compare morphological characteristics male Saburai goat on district source Gisting District and Sumberejo District. Observations conducted on 30 goats Saburai contained in each study location. Observations of sample determined based on *purposive sampling*. The survey method used in this study were conducted from October until December 2015. The observed variable include body measurements (body length, shoulder height, chest circumference) and body weight of goats aged 6--9 months. The observed in two locations were analyzed by *t* test. The result of research shows that the average body length ($55,52 \pm 6,59$ cm), shoulder height ($58,72 \pm 5,89$ cm), circumference ($63,98 \pm 6,26$ cm), and body weight ($21,14 \pm 5,07$ kg) male Saburai goat on Gisting District each had no significant ($P > 0,05$) with an average body length ($55,48 \pm 6,20$ cm), shoulder height ($57,45 \pm 6,23$ cm), chest circumference ($61,77 \pm 5,82$ cm), and body weight ($20,72 \pm 4,51$ kg) male Saburai goat on Sumberejo District.

Keywords: male saburai goat, body length, shoulder height, chest circumference, and body weight.

Introduction

Saburai goat is a goat which be appointed by Agriculture Minister of Indonesia Republic Number 359/Kpts/PK.040/6/2015 as locally genetic source in Lampung Province. It makes from grading up between until F2 between Boer Male Goat and Ettawa Crossbed Goat. The First crossing is a mating between Male boer goat and Ettawa Crossbred goat as result called Boerawa Goat filial 1 or Boerawa Goat grade 1. The second Crossing is a mating between Boer Male Goat and Boerawa grade 1 (Boerawa G1) as result called Saburai Goat. Saburai Goat Process started in 2002 in Campang III Village, Gisting District, and dadapan village, Sumberejo District, Tanggamus Regency Lampung Province. This Location called Village Breeding Centre (VBC), Now that place calling Breeding location of Saburai goat. (The Council of Animal Husbandry and Animal Health in Lampung Province, 2015) Performance characteristic can be identification by morphological body of goat and measurement of body (body length, shoulder height, chest circumference) and body weight Identification morphological body of goat is a method Performance test to selection goat. Saburai Goat in Gisting and Sumberejo as result the different parents of goat, it have different management but the respon from the fact between genetic factor, environment, and interaction both of them, can be seen in morphological saburai goat. This is very important to get information about Comparison of Morphological characteristics male Saburai Goat on Two Breeding Location In The Tanggamus Regency Lampung Province

Methodology

This Object Research is 60 goat tail of Saburai male with age less than 1 year (6--9 months). Determination of goat age of Saburai male in field /conducted by checking of milk incisor which have grewed all (Frandsen. 1993) and interview with breeder of goat of male Saburai in District of Gisting and of Sumberejo. The equipment which is used in this research is livestock record, ribbon measure merk of Butterfly long Brand 150 cm with correctness 0,1 cm, stationery, string, digital camera, and merk weighing-machine of Oxon capacities 120 kg with correctness 0,1 kg. The Method of Research used by survey. Data was collected by purposive sampling. 30 goat tail of Saburai male District of Gisting and 30 goat tail of Saburai male in District of the Sumberejo.. Sampel taken to be to be obtained from 4 livestock group in District of Gisting and 4 livestock group in District of Sumberejo.. The observed variable include body measurements (body length, shoulder height , chest circumference) and body weight of goats of Saburai male in District of Gisting and District of Sumberejo. Data was analyzed by test of t-student use procedure of SPSS version 16.0.

Results and Discussion

Body length, shoulder height, chest circumference and body weight result of t-student test (Tables 1) indicating that goat each of variable of Saburai male. The both/ of source different area is not significant ($P>0,05$). The system caused conservancy of livestock not far differ, so that goat body length of Saburai male result both district not different. Conservancy system at the both district of goat seed source of Saburai use intensive system. Conservancy system intensively enable livestock protected from disease, economical of energy and livestock motion limited to economize yielded energy.

Table 1. Comparison of morfologi Saburai Goat male in District Gisting and Sumberejo

Variable	Average	
	Gisting	Sumberejo
Body Length (cm)	55,52±6,69	55,48±6,2
Shoulder Height (cm)	58,72±5,89	57,45±6,23
Chest Circumference (cm)	63,98±6,26	61,77±5,82
Body Weight (kg)	21,14±5,07	20,72±4,51
Sign	ns	ns

ns = not significant

Energy of feed consumed can be altered effectively become result of optimal production in the form of growth and growth of body morphology. The other factor which influence of all a livestock is cage used cage on District of Gisting and of Sumberejo is traditional cage. Bradford (1993) expressing that functioning cage to protect livestock of negative impact the predator animal and environment, well of him is continuity of birth of child and to enlarge kid before weaning age (3--4 months) According Adhianto, *et.al* (2013)⁽³⁾, long mean goat body of Saburai a period of post weaning is 45,45±3,78 cm. Result of obtained by research is long mean of goat body of Saburai male in District of Gisting and District of Sumberejo is 55,52±6,59 cm and 55,48±6,20 cm. High mean of goat shoulder of Saburai a period of/post weaning is 52,45±4,32 cm. High mean of goat shoulder of Saburai male in District of Gisting and District of Sumberejo which is each 58,72±5,89 cm and 57,45±6,23. Circular of goat chest of Saburai male in District of Gisting is 63,98±6,26 circular size measure and cm of goat chest of Saburai male in District of Sumberejo is 61,77±5,82 cm.

Result of obtained by research is goat body weight mean of Saburai male in District of Gisting and District of Sumberejo is $21,14 \pm 5,07$ kg and $20,72 \pm 4,51$ kg bigger than compared to result of research of Sulastris, (2010), that is $19,67 \pm 6,88$ kg. This matter indicate that result of which is got bigger because goat in both the source of seed have passed program of grading up with step which is same, so can yield bigger and good livestock and because of difference of accurate goat age. At research of Dakhlan and Sulastris (2006) using age goat wean with gyration 3--5 months while this research use goat of post weaning with gyration old age 6--9 months. The Goat of Saburai male in both the source of seed have passed result of cross an repair of quality of genetic through up grading with is same step and also the existence of difference of used livestock age at the (time) of research gyrating 6--9 months. Age represent factor which is very influence an livestock morphology. According to Nugiatiningsih et.al (2006) difference of goat body morphology at the same age and the same nation but differ location influenced by some factor among others genetic, size litter, gender, feed age, birth type conservancy management and environment.

Conclusion

The Characteristic of morphological (Body length, shoulder height, chest circumference and body weight) male Saburai Goat in Sumberejo and Gisting area is not different.

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Phylogenetic analysis of Gayo Horse breed through mitochondrial D-loop region

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Abstract

The objective of this research was to identify the partial D-Loop of Gayo horse. Eighty five blood samples of Gayo horse origin from Aceh Tengah, Bener Meriah and Gayo Lues region were isolated to isolate the deoxyribonucleic acid (DNA). The DNA isolation product was amplified on partial mitochondria D-Loop area by means of polymerase chain reaction (PCR) method, using Forward primer: 5'-AGCTCCACCATCAACACCCAAA-3' and Reverse primer 5'CCATGGACTGAATAACACCT TATGGTTG-3', pre-denaturation condition at 95 °C for 5 minutes, denaturation at 95 °C for 30 seconds, annealing at 60 °C for 45 seconds, elongation at 72 °C for 1 minute, and post-elongation at 72 °C for 5 minutes as much as 35 circles. PCR reaction use GeneAmp® PCR System 9700 Thermal Cycler machine. The PCR reaction produced product of 668 bp which later was sequenced. D-Loop sequenced result was compared to other local Indonesian horse and some species from Gen bank then analyzed by using MEGA version 6. Analysis result showed that eighteen different nucleotide sites and six haplotype were obtained. Genetic distance between Gayo horse and Batak horse was 0.00. It was explained that Gayo horse have close maternal genetic with Batak horse.

Keywords: DNA, D-Loop, mitochondria, Gayo horse, phylogenetic

Introduction

Gayo horse is one of eight national local horses and belongs to Indonesian biodiversity (FAO, 2007). Its distribution covers Aceh Tengah, Gayo Lues and Bener Meriah district in central region of Aceh Province, the northern part of Sumatera Island. Gayo horse has been domesticated and played significant role socio economically in Gayo highland.

Instead of its long history and culture track in community, yet the knowledge on genetic aspect referring to the origin of Gayo horse is not well studied. The current effort to find out the origin of Gayo horse was done mainly based on morphological appearance, while similar study based on molecular genetic in this area has not been reported. Morphology based analysis was not adequate to be a reference for that purpose. On the other region however, several report successfully indicates the genetic relationship between Italian horse (Cozzi et al., 2004), Argentinian horse (Minol et al., 2002), Lithuanian horse (Cothran et al., 2005), Priangan horse in west java (Yuriadi et al., 2009) and Tengger horse in east java province (Yuriadi et al., 2010), Aceh cattle (Sari et al., 2016).

Cytoplasmic genome analysis through DNA sequencing of mitochondria has been conducted in Thoroughbred horse in Korea (Lee and Cho, 2006). Yuriadi et al. (2011) reported DNA sequencing in Dieng horse (Kedu horse), and he found out 385 nucleotide, of which has 13 cytes of varying nucleotide after being compared with the sequencing of *Equus cabalis*. The sequencing potential of DNA D-Loop horse mitochondria has been proved through genetic

diversity analysis between the breed of horse using MEGA program version 4.1 (Kumar *et al.*, 2001). This research is aimed at exploring genetic relationship through genetic maternal analysis between Gayo horse and other local resource horse, and also to understand marker figure of Gayo horse using sequence control region D-Loop mitochondria. It is hoped that the study of molecular aspects would be a model to identification on *Equus caballus* in Indonesia, especially for Indonesia local breed.

Methodology

Blood samples of eighty five Gayo horses originated from Central Aceh, Bener Meriah, and Gayo Lues District were analyzed. Total DNA extracted was used as DNA template for amplification. In fifty microliters of PCR mixture contained the following components: 2 µl extracted DNA, 1 µl dNTPs 10 mM, 2 µl MgCl₂ 25 mM, 0.21 µl Taq polymerase 5 unit/µl, 5 µl PCR buffer (10x), and 37.8 µl H₂O. Primers used in this experiment was D-Loop with forward primers consisted of 5'-AGCTCCACCATCAACACCCAAA-3', and reverse primers consisted of 5'-CCATGGACTGAATAACACCTTATGGTTG-3' (Khansour and Cothran, 2013).

Polymerase Chain Reaction (PCR) for DNA amplification using GeneAmp® PCR System 9700 Thermal Cycler. Amplification of D-Loop partial was conducted as follows; pre denaturations 95 °C for 5 minutes, denaturation 95 °C for 30 seconds, annealing 60 °C for 45 seconds, elongation 72 °C for 1 minute, and post elongation 72°C for 5 minutes (denaturation-elongation conducted as many as 35 cycles). The PCR product was loaded on 2% agarose gel and run using Mupid®-2electrophoresis with 100 volt for 30 minutes. The bands of PCR product was visualized using AlphaImager® Gel Documentation. The bands were compared with Indonesian local horse and horse Genebank. Data was analyzed using MEGA v.6 software. Comparison was carried on using visual and clustal W. (Kumar et al.2011).

Results and Discussion

Amplification of D-Loop mitochondrial DNA of Gayo horse had DNA fragment around 668 bp as provided in figure 1. The attachment position of D-Loop primers on mitochondrial DNA is provided in figure 2. Genetic matrix distance of Gayo, Batak, Padang horse and genebank is provided in Figure 1.

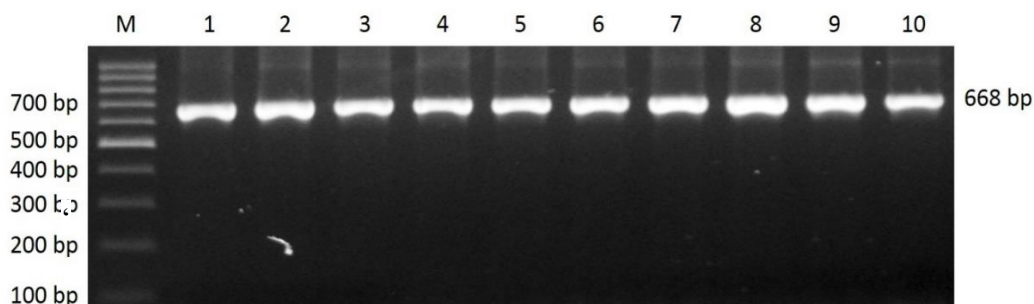


Figure 1. DNA profile based on Gayo Horse Amplification using DNA marker 100 bp.

The adhesion position of primer D-Loop at mitochondria sequencing of Gayo horse presented in Figure 2.

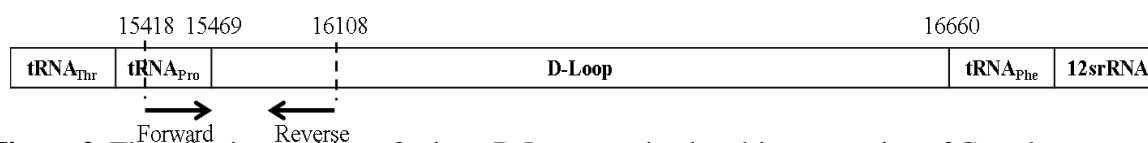


Figure 2. The adhesion position of primer D-Loop at mitochondria sequencing of Gayo horse.

The matrix showing genetic distance between Gayo, Batak as well as Padang horse compared with horse gen bank is showed in Table 1.

Table 1. Matrix showing genetic distance among horse population.

	X79547	KA	KAP	KB	KGAT	KGBM	KGGL	KGP	KP	PTB	TBA
X79547											
KA	0.022										
KAP	0.003	0.022									
KB	0.015	0.017	0.015								
KGAT	0.015	0.017	0.015	0.000							
KGBM	0.015	0.017	0.015	0.000	0.001						
KGGL	0.015	0.017	0.015	0.000	0.000	0.000					
KGP	0.015	0.017	0.015	0.000	0.000	0.000	0.000				
KP	0.015	0.017	0.015	0.000	0.000	0.000	0.000	0.000			
PTB	0.015	0.017	0.015	0.000	0.000	0.000	0.000	0.000	0.000		
TBA	0.015	0.017	0.015	0.000	0.000	0.000	0.000	0.000	0.000	0.000	

The table shows that there is no genetic distance among Gayo horse population. Gayo horse has very close relationship with Batak horse (0.000) but has long distance relationship with Arab horse (0.022). According to Nei and Kumar (2000), two individuals or more are considered to have close genetic relation in one species if the genetic distance is not above 10%. The result of this experiment showed that Gayo horse has close relationship with Batak horse, and this is in accordance with Kim et al. (2002) who stated that the smaller number of genetic distance, the closer relationship they have.

Table 2. Genetic distance of Gayo, Arabic and Batak Horse based on Haplotype.

	Haplotype 1	Haplotype 2	Haplotype 3	Haplotype 4	Haplotype 5	Haplotype 6	Haplotype 7
Haplotype 1							
Haplotype 2	0.022						
Haplotype 3	0.003	0.022					
Haplotype 4	0.015	0.017	0.015				
Haplotype 5	0.017	0.018	0.017	0.002			
Haplotype 6	0.013	0.015	0.013	0.002	0.003		
Haplotype 7	0.013	0.018	0.013	0.002	0.003	0.003	

Haplotype_1 : X79547
 Haplotype_2: KA_1
 Haplotype_3: KAP_1
 Haplotype_4: KB_1, KGAT_10, KGAT_18, KGAT_2, KGAT_3, KGAT_4, KGAT_5, KGAT_7, KGAT_8, KGAT_9, KGBM_1, KGBM_10, KGBM_14, KGBM_15, KGBM_17, KGBM_21, KGBM_4, KGBM_5, KGBM_6, KGBM_7, KGBM_9, KGGL_1, KGGL_16, KGGL_2, KGGL_21, KGGL_26, KGGL_3, KGGL_31, KGGL_4, KGGL_5, KGGL_6, KGGL_7, KGGL_8, KGGL_9, KGP_1, KGP_2, KP_1, PTB_1, TBA_1
 Haplotype_5: KGAT_1, KGBM_2, KGBM_3
 Haplotype_6: KGAT_6
 Haplotype_7: KGGL_10

Based on analysis, Gayo horse population has six haplotype which is provided in Table 2. Most of the population has haplotype 4, and it has the closest relationship with the population of haplotype 3 (Fig.3).

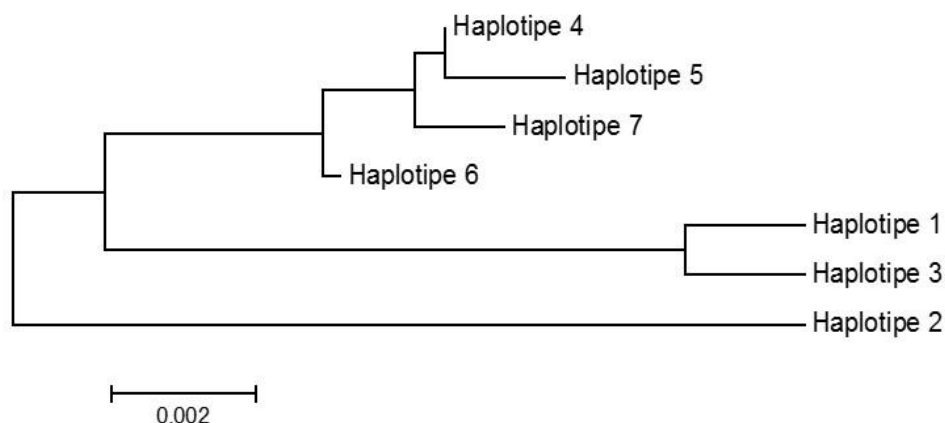


Figure 3. Phylogenetic tree based on haplotype.

Local horse population is clustered into three different groups: group 1 consisted of haplotype 4, 5, 7, and 6; group 2 consisted of haplotype 3; and group 3 consisted of haplotype 2. The phylogenetic of Gayo horse and gene bank horse is shown in figure 4.

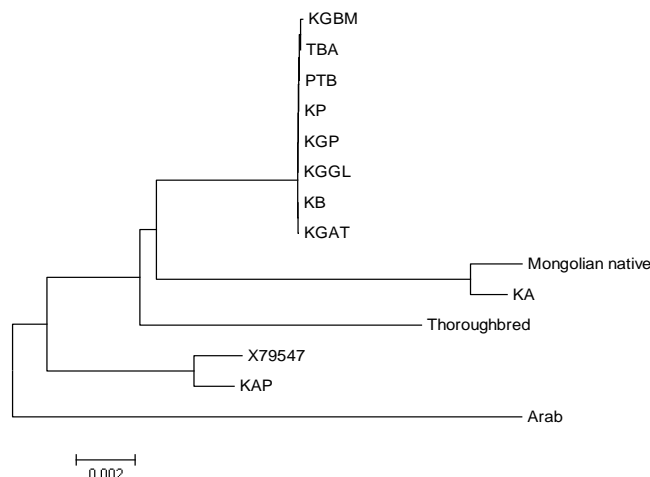


Figure 4. Total Filogeny

Gayo horse is a specific population since it is separated from Mongolian, Ausie, and Thoroughbred, and it has distance relationship with Arab horse. From D-Loop mtDNA analysis, it shows that Gayo horse is a specific population due to its specific haplotype which is distinct from other horse population. This is evidence that Gayo horse originated from Gayo highland has a genuine genetic material and need to be preserved.

Conclusion

The sequence of D-Loop region is able to distinct the maternal genetic relationship among the *Equus caballus* species, in however no able to distinct among Gayo horse. Gayo horse has close genetic relationship to each other, and this research indicates close genetic relationship between Gayo horse and Batak horse.

Acknowledgement

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Improvement of egg production performance due to selection on 3 months cumulative egg production for 4 generations on Mojosari duck

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Abstract

The objective of this research was to know the performance of improvement which consist on the mean and coefficient of variation of monthly egg production and 3 months cumulative production due to the selection of the first 3 months cumulative egg production for 4 generations in several Mojosari duck lines. Based on individual egg production records on 10 lines, consisting of 872 female Mojosari ducks, were used as research materials to obtain mean values and coefficient of variation of egg production. The results showed: 1) Selection for 4 generations significantly increased monthly egg production by 2.41 eggs or 8.6% and 3 month cumulative egg production of 22.75 eggs or 27%; 2) Decreased coefficient of variation of monthly and 3 months cumulative egg production; 3) The highest monthly eggs production and the highest production increase achieved by Line B of 24.78 and 3.56 eggs. Line J produced the highest 3 month cumulative egg production and the highest production increase of 79.8 and 27.66 eggs.

Keywords: average of production, coefficient of variation, line

Introduction

The common problem of Mojosari duck is that the productivity is still varied, so it has not been well utilized for commercial farms. Genetic quality improvement in addition to feed quality and management is needed to improve productivity. Genetic quality improvement can be through a selection supported by adapted local livestock variance data that effectively increases productivity and economic value (Shad et al., 2013). The problem is that there is a little reference to the variance of local poultry (Cheng et al., 1995; Norris and Ngambi, 2006). Phenotype variance becomes important, because without it, trait can not be selected (Kurnianto, 2009). The coefficient of variation of cumulative the duck egg production ranged from 10,79-21,82% (Tai et al., 1989; Cheng et al., 1995) and chicken ranged from 6.25 to 87.09% for monthly egg production (Nurgiartiningsih et al., 2005 ; Farzin et al., 2010; Dana et al., 2011). The records from selection program for the first 3 months of egg production for 4 generations in several Mojosari duck lines were used to estimate the egg production performance. This study aims to determine the improvement of performance that includes the mean and coefficient of variation in monthly and 3 month cumulative egg production due to the selection of the first 3 months cumulative egg production for 4 generations.

Methodology

The data were taken from the records of Mojosari duck selection program at BPTU-HPT Pelaihari, including poultry number, production date, and daily egg production. Mojosari duck comes from 10 lines (980 females), divided into 4 generations, consisting of Selected and Non-Selected / Control Ducks. Selected Duck Criteria is accordance with SNI 7559_2009

on Bibit Induk Itik Mojosari Muda and the highest ability in egg production for the first 3 months of each group.

The study observed the primary data by statistical analysis according to Kurnianto (2009):

1 Mean or average value:

$$\bar{x} = \frac{1}{n} \sum_{i=1}^n x_i$$

Monthly = egg production 28 days

3 Months Cumulative = egg production 84 days

2 Variance (σ^2):

$$\sigma^2 = \frac{\sum x_i^2 - [(\sum x_i)^2 / n]}{n-1}$$

3 Standard deviation (σ):

$$\sigma = \sqrt{\sigma^2}$$

4 Coefficient of variation (C):

$$C = \frac{\sigma}{\bar{x}} \times 100 \%$$

Data were analyzed with *Statistical Product and Service Solutions* (SPSS) 16.

Results and Discussion

Monthly egg production of selected ducks group

Selection increased the average monthly egg production of all lines of 2.41 eggs or 8.6%. Line B achieved the highest production of 24.78 eggs and the highest increase of 3.56 eggs, be in accordance with the opinion of Dana et al. (2011) that monthly egg production is positively correlated with cumulative egg production. Selection decreases the coefficient of variation from 9.1% to 7.1%. Intensive selection will reduce genetic variance and phenotype (Thiruvankadan et al., 2010) (Table 1). Monthly egg production at white Mojosari duck at 19.73 eggs (Suparyanto and Prasetyo, 2004), white Bali duck 17.8 eggs and Bali chocolate duck 15.6 eggs (Setioko et al., 2002). The coefficient of monthly chickens egg production variation 39,97% (Farzin et al., 2010) and white Mojosari duck 43,03% (Suparyanto and Prasetyo, 2004).

Table 1. Development of Monthly Egg Production on Selected Duck Group

Lines	Generation 1					Generation 2					Generation 3					Generation 4				
	N	x	sig	SD	C	N	x	sig	SD	C	N	x	sig	SD	C	N	x	sig	SD	C
Line F	66	21.50	a	1.8	8.4	29	21.13	a	2.1	9.8	14	23.34	b	2.2	9.4					
Line H	70	21.37	a	1.8	8.2	27	21.94	ab	1.8	8.3	18	23.12	bc	1.7	7.5	10	23.95	c	1.6	6.8
Line B	69	21.22	a	2.1	9.8	26	21.15	a	2.1	9.8	12	23.23	b	2.8	12.2	10	24.78	b	1.05	4.2
Line D	64	21.17	a	1.9	9.1	23	21.96	a	1.7	7.8	19	22.61	ab	1.5	6.7	9	23.55	b	1.3	5.7
Line J	69	21.17	a	2.0	9.3	29	21.04	a	1.9	8.8	19	24.04	b	1.5	6.2	10	24.23	b	1.3	5.5
Line L	67	21.14	a	2.1	10.0	18	21.45	a	1.7	8.0	19	22.39	a	1.4	6.2	7	21.99	a	1.4	6.5
Line T	74	21.05	a	1.9	9.3	22	21.62	ab	1.8	8.2	19	22.84	b	1.5	6.5	10	22.61	b	1.7	7.6
Line N	66	20.87	a	2.1	10.0	27	20.76	a	2.2	10.7	7	21.06	a	2.8	13.2	10	22.84	a	1.7	7.4
Line P	70	20.87	a	1.8	8.5	21	22.35	b	1.8	8.1	18	23.25	bc	1.7	7.1	10	24.36	c	1.1	4.5
Line R	73	20.83	a	1.8	8.7	25	20.81	a	2.4	11.4	20	24.10	b	1.4	5.6	10	23.01	b	2.0	8.7
TOTAL	688	21.12		1.9	9.1	247	21.38		2.0	9.3	165	23.12		1.86	8.0	86	23.53		1.67	7.1

Fig.1 Information: Different letters (a, b, c) on the same line show significant differences ($P < 0.05$) between generations of each line; Line F 4th Generation no duck; N = number of ducks; X = mean of egg production for 28 days (eggs), SD = standard deviation; C = Coefficient of variation (%); Sig = Significance

3 months cumulative egg production of selected ducks group

Selection effectively increased egg production by 22.75 eggs or 27%. Line J achieved the highest production of 79.80 eggs and the highest increase of 27.66 eggs. Selection decreases the coefficient of variation from 14.5% to 7.5% (Table 2)

The research on eggs production 3 months duck Alabio and Mojosari ducks 66.14 eggs and 66.76 eggs (Prasetyo and Susanti, 2000); Balinese white duck 54,7 eggs and Balinese chocolate duck 45,6 eggs (Setioko et al., 2002); Alabio ducks 65.8 eggs and Mojosari ducks 62.4 eggs (Susanti, 2003); Mojosari white duck 69.4 eggs (Suparyanto and Prasetyo, 2004). The differences is influenced by genetic and environmental variances on ducks.

Table 2. Development of 3 months cumulative egg production at Selected Duck Group

Lines	Generation 1					Generation 2					Generation 3					Generation 4				
	N	x	sig	SD	C	N	x	sig	SD	C	N	x	sig	SD	C	N	x	sig	SD	C
Line F	66	54.26	a	7.0	13.0	29	54.62	a	7.8	14.3	14	68.43	b	10.1	14.7					
Line H	70	53.64	a	7.6	14.2	27	55.07	a	8.4	15.3	18	63.17	b	12.7	20.2	10	76.90	c	4.4	0.0
Line D	65	53.52	a	7.3	13.6	23	53.70	a	8.2	15.3	19	68.63	b	9.2	13.5	9	75.44	c	5.6	0.0
Line P	71	53.13	a	8.5	16.1	21	54.43	a	9.9	18.1	18	68.33	b	12.9	18.9	10	77.80	c	1.5	0.0
Line B	69	52.51	a	7.7	14.7	27	52.93	a	8.0	15.1	12	67.58	b	11.5	17.1	10	76.10	c	4.8	0.0
Line L	67	52.43	a	8.4	16.0	18	52.67	a	8.5	16.0	19	63.37	b	11.7	18.5	7	66.86	b	9.8	0.0
Line R	73	52.32	a	7.9	15.1	25	52.72	a	8.6	16.3	20	70.75	b	7.7	10.9	10	76.70	b	4.3	0.0
Line N	66	52.26	a	7.8	15.0	27	52.89	a	7.6	14.4	7	59.57	a	12.2	20.5	10	72.50	b	5.3	0.0
Line J	69	52.14	a	7.6	14.6	29	52.83	a	8.1	15.4	19	72.16	b	7.2	10.0	10	79.80	c	1.3	0.0
Line T	75	51.97	a	7.4	14.3	22	52.45	a	11.1	21.1	19	66.47	b	10.3	15.5	10	75.20	c	4.3	0.0
TOTAL	691	52.80		7.7	14.5	248	53.46		8.5	15.9	165	67.33		10.8	16.0	86	75.55		5.7	7.5

Fig.2 Information: Different letters (a, b, c) on the same line show significant differences ($P < 0.05$) between generations of each line; X = mean of egg production for 84 days (eggs)

Conclusion

Selection increased significantly to mean monthly egg production by 2.41 eggs or 8.6% and the 3 months cumulative mean was 22.75 eggs or 27%. Decreased coefficient of monthly and 3 month cumulative egg production variation. The highest monthly egg production and the highest increase was obtained by Line B of 24.78 and 3.56 eggs. Line J produced the highest 3 months cumulative egg production and the highest increase of 79.8 and 27.66 eggs.

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Dendogram of Indonesian local Ettawah Goats in three villages of Sumenep Madura East Java

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Abstract

The highest small ruminant population in Indonesia was goats, many East Java breeders keep goats which breed of Indonesian Local Ettawah Goats (ILEG). The purpose of this research was to know the population diversity through phenotype similarity in Sumenep Madura East Java. The subject of this research was 54 heads of ILEG which fulfill the criteria of sampling in Kalianget, Saronggi and Poteran villages. The research method was a case study with primary data taking through direct observation of ILEG does in the field. Observed variables were included variations of qualitative traits included the shape of the head, face, forehead, horns, ears, back, udder, nipple, and the color of head, face, legs and tail. Data analysis was performed with the NTSYSpc version 2.0 software program before analyzing the data was converted into binary form (1, 0). The results showed that the phenotype similarity in the three villages was range between 0.58-1. The conclusion was that the diversity of phenotypes between populations in the villages of Kalianget, Saronggi, and Porteran was 42% with a dendogram of 58%.

Keywords: phenotype diversity, goat, qualitative traits

Introduction

ILEG is one of the most well-kept livestock in the Indonesian territory crossed between Ettawah goat from India and local goat Indonesia. The type of ILEG as a dual purpose type that produces meat and milk is very suitable with the characteristics of Indonesian farmers so that it can increase the income of farmers. The breeder's characteristic is to keep the goat as a saving and not the main income (Sugiarto and Ahmad, 2015) so that the livestock is sold only when there are a family needs but not by slaughtering age. Therefore, by raising dual purpose goat the farmers can get additional daily income from milk production and goat as a saving.

The island of Madura is the territory of Indonesia northeast of East Java with an area of 5,168 km² (smaller than the island of Bali) which is famous since ancient times has a tradition as a local cattle farmer (Madura cattle). But recent developments, people in the area have also bred ILEG goats and are reinforced by local government support through a goat contest. Sumenep regency is one of the areas of ILEG goat with good population growth.

ILEG goat breeding program in Madura was still unclear and unclear and the goats became a second priority after Madura cattle. So it was necessary to research about variation of qualitative character of ILEG goat in Madura island based on BSN (2015) standardization PE goat breeds with qualitative traits such as white, black, brown or combination of colour body; short tail; convex face; small horns; long, hanging and drooping down ears. Therefore, the purpose of this research was to know the population diversity through phenotype (qualitative trait) similarity in Sumenep Madura East Java.

Methodology

The method of this study was a case study with sampling in a purposive sampling. Research material was 54 does of ILEG which fulfill the criteria of sampling in Kalianget, Saronggi and Poteran villages. The does samples were does that have given the kid at least once and were used for breeding. The research location was in Sumenep area consisting of three villages namely Kalianget (KA), Porteran (PO), Saronggi (SE).

Variations of phenotypes observed were qualitative traits including hair color (body, tail, face, and legs), face form, forehead profile, horn shape, head profile, horn shape, fold ears, back form, udder form and number of nipples. Data were tabulated in the form of binary data (Yakubu et al., 2010 and Machado et al., 2000), the emerging phenotype was scored 1 and the non-appearing phenotype was scored 0. The tabulated data were analyzed by NTsys version 2.0 software to obtain a dendrogram of qualitative traits so as to obtain similarity phenotypes.

Results and Discussion

The results of field identification for qualitative traits of ILEG maintained in Sumenep were still in accordance with standard goats PE (BSN, 2015) seen from the main characteristics of long ears down, the color of the body, face, legs, and tail were a combination of white, black, chocolate. The black or brown color of the goats because it was related to eumelanin content in goat coat which coated by melanocortin 1 receptor and inherited in offspring (Le Pape et al., 2008 and Machado et al., 2000). From binary data analysis with NTsys version 2.0 between the group of does in Kalianget Village (KA), Porteran (PO), Saronggi (SA) of Sumenep Regency could be seen in Figure 1.

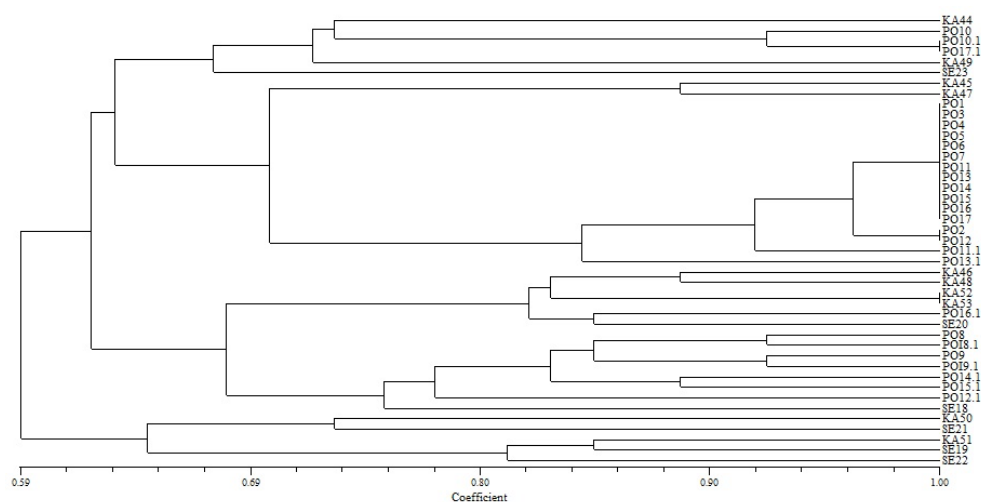


Figure 1. Dendrogram of Qualitative Traits in Three Villages Sumenep Madura Island

Figure 1, based on the similarity of more than two individuals, there are two clusters, the first cluster was the ILEG in the village of Porteran with the largest number of does, and the subcluster was ILEG from Saronggi and Kalinget villages. The second cluster was the ILEG in Kalianget and Saronggi villages only, in accordance with the opinion of Zaitoun et al. (2004) Jordan's local goat group is divided into two main clusters based on morphology characteristics.

In the village of Porteran, there was a similarity value of more than two individuals with the highest score (100%), this meant that the does in the village of Porteran tended to be the lowest of its phenotype diversity compared to the Kalianget and Saronggi groups. While the dendrogram based on similarity of qualitative traits in three villages of Sumenep district was

0.58, it meant that the phenotype diversity between Kalianget, Porteran and Saronggi villages was 42%. The phenotype diversity of this study was lower than that of Mudawamah et al. (2014) values of diversity based on the primary OPA RAPD between the natural goats of PE and 52% for artificial insemination.

Conclusion

The diversity of phenotypes based on qualitative traits between populations in the villages of Kalianget, Saronggi, and Porteran (Sumenep, Madura Island) was 42% with a dendrogram of 58%.

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The phenotypic analysis and population structure of male Senduro Goat breed at Lumajang Regency East Java Indonesia

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Abstract

The phenotypic character of the qualitative and qualitative traits of this new breed of Senduro goat has been established. However, phenotypic, genetic aspects and specific characters of this goat have not been fully described. The aim of the research is to determine the phenotypic characters based on the qualitative traits of Senduro male goats, population structure and to determine the level of similarity of goats Senduro compared with PE goat and Etawah goat. The material used in the study are male goat Senduro age of about 1 year - 4 years. The variables measured were the character of qualitative which includes the color of feathers, shape of the ears, horns, face shape, the back line, great feathers, and tail. The result showed that 211 goats Senduro that Senduro goat considered with the standard breed (SNI, 2014) include characters of white coat color, not polled, ears folded, and face down into the ears with a total percentage of 62.08%; 64%; 91.5%; and 81% respectively. The similarity rate between the goat Senduro with Etawah goat is 0,5. meanwhile, Senduro goats with PE goat have a higher similarity that is 75%. Senduro goat male phenotype in Senduro district still varied, goats Senduro in accordance with SNI estimated at 37% and 63% were still varied. It was concluded that Senduro is an important genetic resource of goat as a dual type both for milk and meat production

Keywords: chromosomes, goats, Senduro, genetic quality

Introduction

The Senduro goat has been launched as a new breed in accordance with the decision of Minister of Agriculture Republic of Indonesia by SK /1055 /Kpts / SR.120 /10 /2014. This breed goat is considered as an important new genetic resource of local livestock of Indonesia that must be protected, improved and preserved. phenotypic, genetic aspects and specific characters of this goat have not been fully described. Senduro goat has been selected by a group of the smallholder farmer in the district of Lumajang East Java. In general, this new breed is actually descendants of cross-breeding result between local goat existing and imported Etawah Goat from India. (Siswanto, 2016). A part of this goat in this area also This breed has been well adapted in this area and it mainly for both milk and meat production. In this region of Senduro, a high rate variation of phenotypes was observed. The aim of the research is to determine the phenotypic characters based on the qualitative traits of Senduro male goats, population structure and to determine the level of similarity of goats Senduro compared with PE goat and Etawah goat.

Methodology

The research was conducted in 6 villages in Senduro Sub-district of Lumajang Regency namely Purworejo, Argosari, Senduro, Burno, Kandangtepus, and Kandangan villages. The material used in this research is 211 male Senduro goats with the age range of 1 to - 4 years ages from permanent tooth change. The method used in this study is a case study. Data taken in the study include primary data and secondary data using questionnaires and recording obtained from Lumajang District Livestock Service Office. The technique of location and animals selected by purposive. The data is obtained by incidental sampling. The variables observed are phenotypic characteristics based on qualitative properties which include: feather color, face shape, convex, semi-convex and flat, ear shape and face profile, polled, tail, fur size, and spesific back line. Qualitative data was analyzed descriptively. Similarity analysis using phenogram method (Radford, 1986) [4] and reconstruction of phenogram was performed with Multi Variate Statistical Package Program (MVSP 3.1., briefly, as briefly, are as follows: (a) Determination of the characteristics of the phenotype of qualitative properties (b) Calculation of the value of similarity. (c) The creation of a similarity matrix, and (d) Preparation of fenogram diagrams.

Result and Discussion

Phenotypic character and population structure

The result showed that qualitative properties that include the color of fur, face shape, ears, polled, backline, fur, and tail have some differences especially on the color of fur, horns and ears. Senduro goats wich describe adequate with the criteria of the goats of the Senduro goat observation is in accordance with the Decision ee of the Minister of Agriculture of the Republic of Indonesia No. 1055 of 2014, among male Senduro observed were obtained as much as 79 % of the total animals (SNI, 2008).[2]. But, the character of polled-non polled (horn) showed that the horned goat the sample was obtained with a percentage of 36%., because a number costumer also tent do select polled male than non polled. Population structure of Senduro goat showed that sex ratio male: female in all age catagories are relatively unbalance naturally (Table 1)

Table 1. The population structure of Senduro Goat in district of Senduro, Lumajang East Java.

No	Sex	Adult goat (> 18 bulan)	Young (12-18 bulan)	Kid (< 12 bulan) (4.39%)	Total number (%)
1	Male (heads, %)	37 (4.64%)	35 (4.39%)	177 (22.23)	249 (31.28%)
2	Female (heads)	291	61	195	547 (68.72%)
3	Total (heads)				796

Number of Male in this region is relatively lower than a female goat in all of the categories of ages. The adult goat which may be used for natural service or reproduction and breeding is relatively very limited about 4.6 % (Table 1.). The selection intensity of male goat is very high, because of a very selected male using natural services. In case of Male Senduro, Male used for natural service is very selected base on their phenotypic or performance. It means that the genetic progress may possible to be accelerated. Goats in the sub-district Senduro obtained from the total sample 211 Senduro male goat that in the form of the ear is divided into 4 kinds of forms, and dominate the shape of the ear that covers 91.5%. Pamungkas, Aron, Meruwald, and Erwin (2009) [3] that on PE goats have ear characteristics that are long, hanging, and slightly folded at the ends. The Senduro goat that has the inner ear shape into it

is obtained with a percentage of 81% (Rokhman, Ciptadi, and Ihsan, 2016) . Similarities analysis of Senduro goat compares to others local breed exist. ie Etawah and Etawah Grade (PE) (Rokhman, Ciptadi, and Ihsan, 2016) (Table2.).

Tabel 2. The similarity of male Senduro goat compare to other local breed of Etawah (E) and descendance of Etawah Grade (PE) Matrik Similaritas Kambing Senduro, PE, and Etawah

Breed	Senduro	Etawah	PE
Senduro Goat	1	0,5	0,56
Etawah (E)	0,5	1	0,69
Etawah Grade (PE)	0,56	0,69	1

Senduro goat compare to Etawah have a similarity of 50%., meanwhile with PE have a similarity of 56%. Ritz, Mullis, Hugh, and Gaillard (2000), the value of similarity is divided into 3 categories including high (67-100%), medium (34-66%), and low degree (0-33%). The similarity level is closer that is the crossing of three goats that produce the goat Senduro is found in the blood goat PE. The resemblance between Goat goats and Etawah goat is medium (Ritz et.all, 2000) .

Conclusion

The male Senduro goat phenotype in Senduro district is still large variation, the Senduro goat which as with adequate qualification as SNI is 37%. Senduro compare to goats have a similarity meanwhile, Senduro goats with goat PE have a similarity level of 56%.

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Thyroglobulin and μ -calpain genes effect on marbling and meat tenderness in experimental crossbred beef cattle

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Abstract

The objective of present study was to determine frequency and genotypic effect of a C/T SNP in 5' flanking region of Thyroglobulin (*TG5*) gene at position 422 of accession X05380 and a C/T SNP in the intron between the 17th and 18th exon of μ -calpain gene (*CAPN1*-4751) at base 6545 of accession AF248054 on marbling and meat tenderness in experimental crossbred beef cattle. Twenty-one DNA samples from 6 of Kampaeng Saen beef cattle breed, KPS (25% Thai native x 25% Brahman x 50% Charolais), 8 of KPSxW (50% KPS x 50% Wagyu) and 7 of BNxW (25% Brahman x 25% Thai native x 50% Wagyu) crossbred cattle were analyzed two single nucleotide polymorphisms (SNPs) of *TG5* and *CAPN1*-4751 markers using *TaqMan* probe real-time PCR. The frequencies of CC, CT and TT genotype in *TG5* were 0.67, 0.33 and 0.00, respectively. The frequencies of CC, CT and TT genotype in *CAPN1*-4751 were 0.14, 0.67 and 0.19, respectively. Beef marbling score (BMS) of ribeye steak muscle were significantly different (2.85 ± 0.94 , 1.00 ± 0.00) in cattle having CC and CT genotype of *TG5* ($p < 0.01$). Meat tenderness of ribeye steak muscles was measured by Warner-Bratzler Shear Force (WBSF) after 14 days postmortem. The WBSF values were significantly different (3.16 ± 0.24 , 4.18 ± 0.38 and 5.05 ± 0.31 kg) in cattle having CC, CT and TT genotype of *CAPN1*-4751, respectively ($p < 0.01$). The result suggested that *TG5* and *CAPN1*-4751 markers may be useful to predict variation in marbling and meat tenderness in crossbred cattle.

Keywords : *thyroglobulin, μ -calpain, marbling, meat tenderness, crossbred cattle*

Introduction

The 5' flanking region of Thyroglobulin gene (*TG5*) is a consensus sequence for the RNA polymerase III binding site. Therefore, variation in this segment had been proposed to account for some of the genetic variation in producing the precursor for thyroid hormones. Two SNPs located at the position 422 of the *TG5* gene (GenBank accession X05380) were investigated and had been associated with marbling (Barendse et al., 2004). The bovine calcium-activated neutral protease (*CAPN1*) gene, encoding the protease-calpain. This protease seems to be the primary enzyme in postmortem tenderization (Koohmaraie, 1996), suggesting from both positional and functional standpoints that variation in the gene sequence might be associated with meat tenderness in cattle. A SNP (C/T) in the intron at base 6545 of accession AF248054 between the 17th and 18th exon of μ -calpain gene, namely *CAPN1*-4751 marker had been associated with meat tenderness in pure and crossbred cattle (White et al., 2005). The objective of present study was to determine the genotypic frequencies and genotypic effect of

two SNPs of the TG5 and CAPN1-4751 markers on marbling and meat tenderness in experimental crossbred cattle.

Methodology

Kamphaeng Saen (KPS) beef cattle breed is the first registered beef breed in Thailand. The establishment of the KPS since 1969 by group of animal scientists from Kasetsart University in accordance with the long-term research and development effort. The breed is a composite of 25% Thai native, 25% Brahman and 50% Charolais beef cattle. Twenty-one crossbred cattle, including from 6 of KamphaengSaen beef cattle breed. KPS (25%Thai native x 25%Brahman x 50%Charolais), 8 of KPSxW (50%KPS x 50%Wagyu) and 7 of BNxW (25%Brahman x25%Thai native x 50%Wagyu) crossbred cattle were used in this study. All of the animals were started fattening at 4 months of age (body weight range from 85.17 to 104.50 kg). The animals were fed with concentrate (15% CP) and ad libitum rice straw as roughage source. The final body weight before slaughtering ranged from 536.00 to 578.00 kg (30 months of age). A SNP of *Thyroglobulin* gene, namely TG5 marker, at the nucleotide position 422 according to GenBank accession X05380 (g422 C>T) was amplified by primers and specific probes according to Barendse (2002). The forward primer: 5'-cgggagacctgggttgatc-3', the reverse primer: 5'-gtgggtagccattcccttc-3' and two ABI TaqMan fluorogenic probes: Probe 1, 5'-ttgggaagatCccttg-3' tagged with VIC as a reporter dye, Probe 2: 5'-ttgggaagatTccttg-3' tagged with FAM as a reporter dye. A SNP of μ -*Calpain* gene, namely CAPN1-4751 marker, at the nucleotide 6545 according to GenBank accession AF248054 (g6545 C>T) was amplified by primers and specific probes according to White et al. (2005). The forward primer: 5'-tggcatcctcccccttgact-3', the reverse primer: 5'-cccccgctcacttgacaca-3' and two ABI TaqMan fluorogenic probes: Probe 1, 5'-cgcctcGgttttc-3' tagged with VIC as a reporter dye and Probe 2, 5'-cgcctcAgttttc-3' tagged with FAM as a reporter dye. Real-time polymerase chain reaction (PCR) mixture contained 20 ng (1 μ l) of DNA template, 5 μ l of TaqMan Genotyping Master Mix (2x), 0.5 μ l of TaqMan genotyping assay mix (20x) and 3.5 μ l of DNase-free, RNase free water. Real-time PCR was performed in the thermal cycler machine (StepOnePlus, ABI, USA). PCR reaction was activated AmpliTaq Gold enzyme at 95 °C for 10 min, then thermal cycle of 40 cycles included denaturation at 95 °C for 15 sec. and annealing at 60 °C for 1 min. The probe 1 and 2 were tagged with VIC and FAM fluorescent dyes which showed green and blue color of amplification curve in a result of analysis by StepOnePlus software (StepOnePlus, ABI, USA). A specific match of the probe sequence to the target sequence will result in amplification, during which cleavage and release of the reporter dye occurs. Fluorescent signal for one or two dyes indicated homozygous or heterozygous SNPs for a particular genotype of the SNPs.

In each carcass, ribeye area (REA) muscle between the 11th to 12th rib were cut and submitted to our laboratory for 14 d of aging. One half of the REA muscle samples were cut into 250-300 g of rib eye steak for REA, back fat thickness and beef marbling score (BMS) measurement (1-5; 1 = devoid, 2 = traces, 3 = slight, 4 = moderate, 5 = abundant) according to Thai Agricultural Commodity and Food Standard TACFS 6001-2004. The other half of the carcasses were deboned and cut into 3 x 2 x 5 cm of longitudinal *Longissimus dorsi* muscle for submitting to measure Warner-Bratzler Shear Force (WBSF) using the machine of Instron Universal Testing Machine (Instron Corporation, USA) at the KU meat laboratory. Statistical analysis performed in this study was one-way Analysis of Variance (ANOVA) from summary data (number of observations, means, and standard deviation for each group of genotype) via <http://statpages.info/anova1sm.html>.

Results and Discussion

In Table 1, genotypic frequencies of TG5 and CAPN1-4751 markers in 21 experimental crossbred cattle showed the frequencies of CC, CT and TT genotype in TG5 marker were 0.67, 0.33 and 0.00, respectively, whereas the frequencies of TG5 marker in Wagyu (Japanese Black cattle) were 0.12, 0.50 and 0.38 (Nicole et al., 2001). It seems that the SNP C/T in *TG5* gene of Wagyu cattle had most mutation from C to T base, in comparison with Brahman cattle having 0.95, 0.04 and 0.01 of CC, CT and TT genotype (Casas et al., 2006) and Maxican cattle having 0.73, 0.26 and 0.01 of CC, CT and TT genotype (Bonilla et al., 2010). Genotypic frequencies of CC, CT and TT genotype in CAPN1-4751 marker were 0.14, 0.67 and 0.19, respectively. Whereas Maxican cattle having 0.26, 0.46 and 0.28 of CC, CT and TT genotype (Bonilla et al., 2010). In the present study, CAPN1-4751 marker was more informative than in Brahman cattle, because in Brahman cattle the CC genotype was not observed by Casas et al. (2006).

In Table 2, genotypic effect of *TG5* on beef marbling score (BMS) in ribeye steak of 21 crossbred cattle showed beef marbling score (BMS) of ribeye steak muscle were significantly different (2.85 ± 0.94 , 1.00 ± 0.00) in cattle having CC and CT genotype of TG5 marker ($p < 0.01$). The present result was similar to the intramuscular fat (IMF%) of the Maxican cattle were statistical different ($P < 0.05$) (3.93 ± 0.30 and 3.66 ± 0.38) in CC and CT genotype of TG5 marker (Bonilla et al., 2010). Genotypic effect of CAPN1-4751 marker on shear force value in ribeye steak of 21 crossbred cattle showed the WBSF values were significantly different (3.16 ± 0.24 , 4.18 ± 0.38 and 5.05 ± 0.31 kg) in cattle having CC, CT and TT genotype, respectively ($p < 0.01$). In contrast, The WBSF values of Maxican cattle were not significantly different (4.04 ± 0.61 , 3.83 ± 0.55 and 3.86 ± 0.55 kg) in cattle having CC, CT and TT genotype (Bonilla et al., 2010).

Table 1. Genotypic frequencies of TG5 and CAPN1-4751 markers in 21 experimental

Crossbred cattle marker	Genotyping frequency		
	CC	CT	TT
TG5	0.67	0.33	0.00
CAPN1-4751	0.14	0.67	0.19

Table 2. Genotypic effect of TG5 marker on beef marbling score (BMS) in ribeye steak of 21 crossbred cattle

Genotype	n	TG5 beef marbling score	n	CAPN1 Shear force (kg)
CC	14	2.85 ± 0.94^a	3	3.16 ± 0.24^a
CT	7	1.00 ± 0.00^a	14	4.18 ± 0.38^b
TT	0	nd	4	5.05 ± 0.31^c
Sign		***		***

Conclusion

Two single nucleotide polymorphisms (SNPs) of *TG5* and *CAPN1* gene, namely TG5 and CAPN1-4751 markers were analyzed genotypic frequencies in experimental crossbred beef cattle. In this study, TG5 and CAPN1 markers showed significantly effect on beef marbling score and meat tenderness. Thus, TG5 and CAPN1-4751 markers may be useful to predict variation in marbling and meat tenderness in crossbred cattle.

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Two maternal lineages revealed by mitochondrial D-loop DNA in Thai dwarf swamp buffaloes (*Bubalus b. carabanensis*)

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Abstract

The objective of present study was to demonstrate phylogeny and evolution of dwarf swamp buffalo in Thailand. The 347 bp of D-loop mitochondrial DNA (mtDNA) of 36 samples from 21 normal swamp buffaloes and 14 dwarf swamp buffaloes were investigated together with available D-loop mtDNA sequences of other swamp and river buffaloes in GenBank. The results revealed 24 haplotypes with 91 polymorphic sites in term of 63 transitions and 28 transversions. The mean nucleotide diversity within subpopulation was 0.0618, showing rather high mitochondrial diversity. The genetic differentiation (F_{st}) was 0.0920, indicating moderated mitochondrial D-loop differentiation. The UPGMA tree of normal and Thai dwarf swamp buffaloes according to the 24 haplotypes was constructed together with river buffaloes. The UPGMA tree revealed two nodes being designated 1 and 2 in which node 1 was consist of swamp and river buffaloes. The node 2 was 4 Thai dwarf buffaloes. The swamp buffaloes were divided into lineage A and lineage B, in which lineage A was more predominant than lineage B. Most of lineage A1 contains normal swamp buffaloes, only 3 dwarf swamp buffaloes. Whereas 2 dwarf swamp buffaloes were in lineage A2 and two dwarf buffalo were located in lineage B1. The network constructed from 91 polymorphic bases and nucleotide substitution of D-loop mtDNA suggested that evolution of dwarf swamp buffalo lineage B1, A1, A2 and node 2 were occurred from ancestral node, respectively. It indicated that the dwarf swamp buffalo in lineage B1 evolved more earlier than and domesticated swamp buffaloes in lineage A1.

Keywords : maternal lineages, mitochondrial DNA, D-loop, dwarf, swamp buffaloes

Introduction

The domestic water buffalo in Asia is generally divided in two major subspecies, the river buffalo and the swamp buffalo, which differ in morphology, behavior and number of chromosomes. The river buffalo is found in the Indian subcontinent, South Asia and the Mediterranean area (Italy, Egypt and the Balkans), and sporadically in Australia and South America, whereas the swamp buffalo is in Northeast India, China (southern regions and Yangtze valley) and Southeast Asia. Both types of water buffalo descend from the wild Asian buffalo (*Bubalus arnee*), which had a widely distribution range in eastern Indian, Sri Lanka and Southeast Asia. Lau *et al.*(1998) hypothesized that the wild Asian buffalo originated in

mainland of Southeast Asia and spread north toward China and west toward the Indian subcontinent, where the river type was probably domesticated.

Dwarf buffalo or Tamaraw (*Bubalus mindorensis*) has the appearance of a typical member of its family. It has a compact, heavyset, bovine body, four legs that end in cloven hooves and a small, horned head at the end of a short neck. It is smaller and stockier compared to the water buffalo (*Bubalus bubalis*). The tamaraw has an average shoulder height of 100–105 cm. The length of the body is 2.2 m while the tail adds a further 60 cm. Body weights have ranged from 180 to 300 kg. Dwarf buffalo in Thailand, the height at shoulder of adult is not more than 110 cm. The body coat color is black or red.

The mitochondrial DNA (mtDNA) restriction fragment length polymorphism (RFLP) and mtDNA D-loop sequence polymorphism have been studied in a variety of domestic animals. Previous studies of mtDNA D-loop sequence variations have shown genetic differentiation between the swamp and river buffalo types in Southeast Asia (Lau et al., 1998), Brazil and Italy (Kierstein et al., 2004). However, mtDNA D-loop sequence of dwarf buffalo in Thailand. So we examined hypervariable region of mtDNA D-loop sequences of 21 normal swamp buffaloes and 14 dwarf swamp buffaloes from 5 provinces to investigate phylogeny and evolution of dwarf swamp buffalo in Thailand.

Methodology

Hair follicle samples of from 21 normal swamp buffaloes and 14 dwarf swamp buffaloes were extracted genomic DNA by Chelex-100 (Walsh et al., 2013) and submitted to analyze D-loop mtDNA. The D-loop region was amplified by the polymerase chain reaction (PCR) using two primers designed from a published water buffalo sequence (GeneBank DQ364160): forward 5'-CTTGCAACTTAACACTGACTTTAC-3' and reverse 5'-CCATAGCTGAGTCCAGCATC-3'. The PCR mixture contains 1x PCR buffer (50 mM of KCl, 10 mM of Tris-HCl, pH 8.3), 1.5 mM of MgCl₂, 200 µM of dNTPs, 0.4 pmole of each primer, 1 U *Taq* polymerase (Ampli Taq Gold™, Applied Biosystem, USA) and 100 ng of DNA template. The PCR reaction profiles included the following: denaturation at 94 °C for 10 min, followed by 30 cycles of denaturation at 94 °C for 30 sec, annealing at 56 °C for 1 min and extension at 72 °C for 1 min; a final extension at 72 °C for 10 min. The PCR products were initially electrophoresed at 150 Volts for 30 min. in 2% agarose gels, and viewed under UV light after staining with Ethidium bromide. The expected sizes of PCR products were determined in relation to a 100 bp DNA size standard. The PCR products were purified and sequenced using BigDye Terminator Kit (Applied Biosystems, USA) on an ABI PRISM 3010 DNA Sequencer equipped with Sequencing Analysis and Sequence Navigator (Applied Biosystems, USA).

Mitochondrial DNA D-loop sequences were compared with the following mtDNA D-loop sequences selected in GenBank database (Table 1) using ClustalW via www.genome.jp/tools/clustalw. All 24 sequences (347 bp) of mtDNA D-loop in this study, 24 sequences of river and swamp buffaloes (Table 1) were aligned by using MEGA6.06 software (Tamura et al. 2013). The identical sequences were considered as the same haplotype. The unweighted pair-group method with the arithmetic mean (UPGMA) and Maximum likelihood (ML) tree, the nucleotide diversity (π) and genetic differentiation (F_{st}) for the buffalo type were estimated by using MEGA6.06 software (Tamura et al. 2013). Median-joining network (MJ) and nucleotide substitution were generated using the NETWORK 4.6 program (Bandelt et al. 1999).

Table 1. Lineage/ haplotypes of swamp buffaloes and river buffaloes available in GenBank were used in this study.

Buffalo type	Breed/Isolates	Lineage	Haplotype	GenBank Accession
Swamp	Anhui	A1		EF053535
	Fuling	A1		EF053547
	Philippines	A1		FJ873678
	Yunnan	A1		EF053552
	SaenCP	A1	H4	KC817492
	SRS145/47	A1	H7	KC817495
	PhetdumCP	A1	H8	KC817496
	DaoCP	A1	H5	KC817493
	YodrachanUT	A1	H5	KC817494
	PhetCP	A1	H3	KC817491
	SRS48/49	A1	H2	KC817490
	KhunthongCP	A1	H9	KC817497
	Wild buffalo	A1	H10	KU687004
	DaorungCP	B1	H1	KC817489
	Dechang	B1		EF053642
	Jiangnan	B1		EF053550
River	Murrah			AF197216
	Murrah			AF197213
	Murrah			AF197215
	Mediterranean			AF197208
	Mediterranean			AF197202
	Mediterranean			AF197203
	Jafarabadi			AF197198
	Kundi			GQ166748

Results and Discussions

In this study, D-loop mtDNA sequences (374 bp) of normal and dwarf swamp buffaloes showed 91 polymorphic sites in term of 63 transitions and 28 transversions (data not shown) and classified into 24 haplotypes (23 new haplotype) as shown in Table 2.

Table 2. Node, clad, lineage, haplotype (province) of normal and dwarf swamp buffaloes were classified in this study. New haplotype H11-H33 were deposited in GenBank accession MF806037- MF806059, respectively. 48-24=24

Node	Clade	Lineage	Haplotype, H (Province)
1	River buffalo		
	Swamp buffalo		
	Normal	A1	H11(LP7), H12(LP5), H13(NA1), H14(NA2), H30(PK14), H32(PK22)
	Dwarf	A1	H20(MK8), H23(MK15), H24(MK16), H27(MK23)
	Dwarf	A2	H18(MK3), H21(MK9)
	Normal	B1	H1(PK4, PK5, MK12), H15(NA4), H31(PK18)
	Dwarf	B1	H19(MK7, MK14)
2	Normal	B2	H16(PY10), H28(PK18), H29(PK9-12), H33(PK20)
	Dwarf buffalo		H17(MK1), H22(MK10), H25(MK17), H26(MK19, MK20)

LP: Lumpang province; NA: Nan province; PK: Phuket province; MK: Maharakam province; PY: Payao province

The mean nucleotide diversity within subpopulation was 0.0618, showing rather high mitochondrial diversity. The genetic differentiation (F_{st}) was 0.0920, indicating moderated mitochondrial D-loop differentiation among normal and dwarf swamp buffaloes (Data not shown). The UPGMA and ML tree revealed two nodes being designated 1 and 2 in which node 1 was consist of swamp and river buffaloes. The node 2 was 4 Thai dwarf buffaloes. The swamp buffaloes were divided into lineage A and lineage B, in which lineage A was more

predominant than lineage B. Most of lineage A1 contains normal swamp buffaloes, only 3 dwarf swamp buffaloes. Whereas two dwarf swamp buffaloes were in lineage A2 and two dwarf buffalo were located in lineage B1. We also found seven normal swamp buffaloes H16(PY10), H28(PK18), H29(PK9-12), H33(PK20) in new lineage B2 as shown in Figure 1.

There were 7 nucleotides substitution in D-loop mtDNA from ancestral node in two dwarf swamp buffaloes of H19 (MK7, MK14) in lineage B1, whereas 10 nucleotides substitution of Dao Rung CP (H1, KC817489), 11 nucleotides substitution of Chinese Jiangnan (EF053550) swamp buffalo in lineage B1. In addition, 9 nucleotides substitution of domesticated swamp buffalo (PhetDumCP, KC817496) in lineage A1. The result indicated that the dwarf swamp buffalo in lineage B1 evolved more earlier than and domesticated swamp buffaloes in lineage A1 as shown in Figure 2.

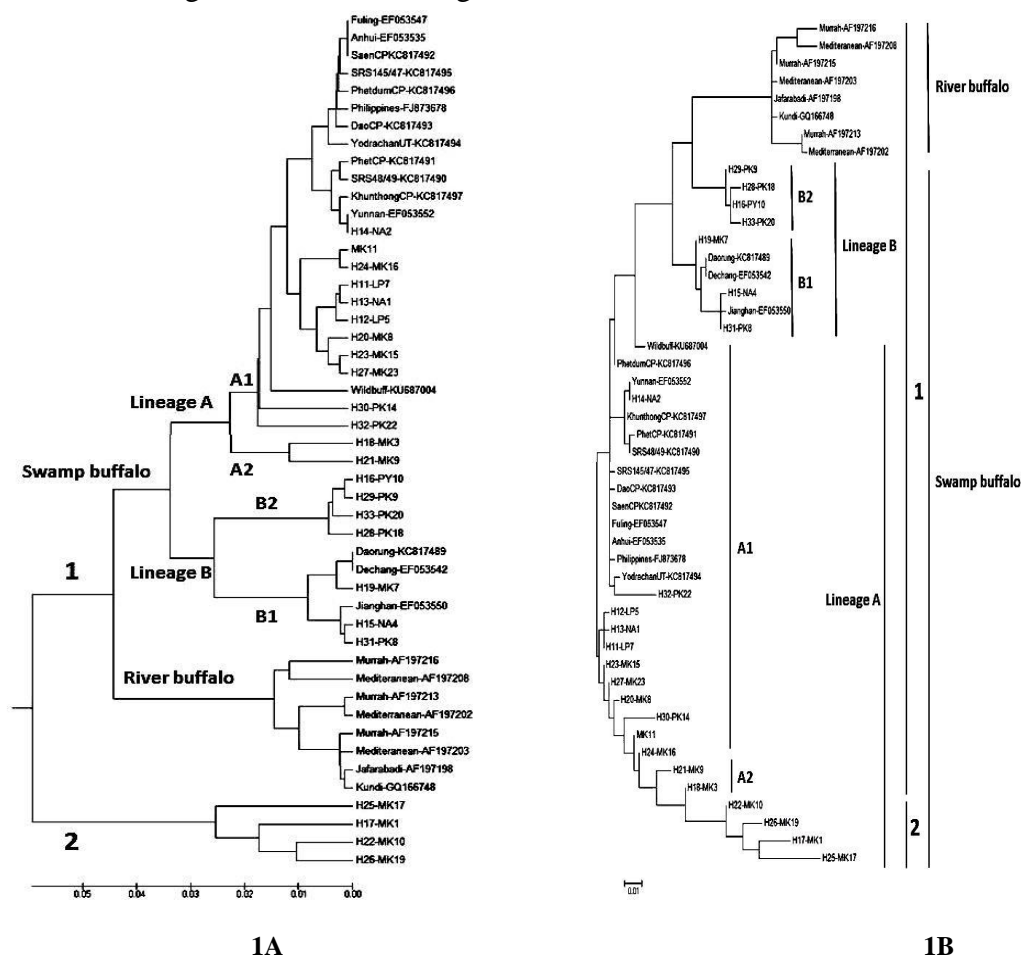


Figure 1. Phylogenetic tree construction using UPGMA (1A) and ML (1B) methods of normal swamp buffaloes and dwarf swamp buffaloes

The network constructed from 91 polymorphic bases and nucleotide substitution of D-loop mtDNA suggested that evolution of dwarf swamp buffalo lineage B1, A1, A2 and node 2 were occurred from ancestral node, respectively. It indicated that the dwarf swamp buffalo in lineage B1 evolved more earlier than and domesticated swamp buffaloes in lineage A1.

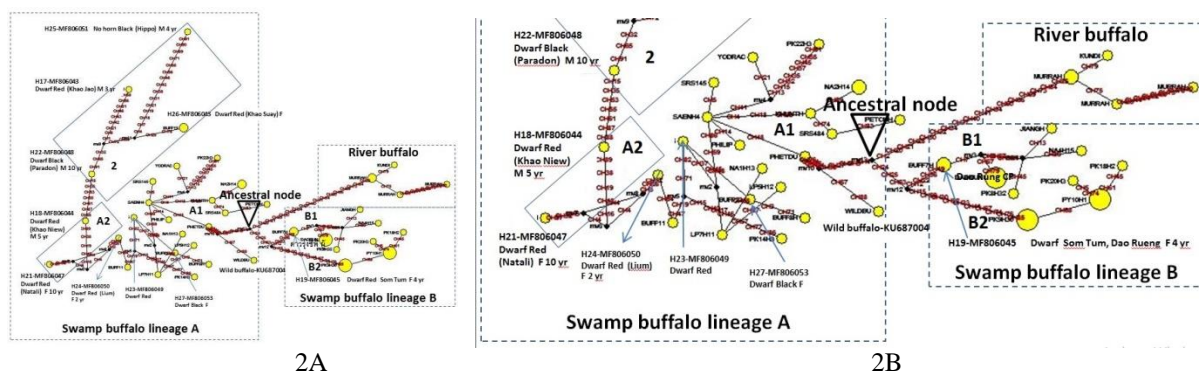


Figure 2. Evolution route network of normal swamp buffaloes and dwarf swamp buffaloes from ancestral node (2A), number of nucleotide substitution (CHx) from ancestral node to lineage B, A, node 2 of swamp buffalo clade and river buffalo clade.

Conclusion

Thai dwarf buffaloes are belong to swamp buffalo clade, B1, A1, A2 lineages and node 2. The dwarf swamp buffalo in lineage B1 evolved more earlier than and domesticated swamp buffaloes in lineage A.

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The quality of Garut's fighting-ram's frozen semen in a tris –extender supplemented with various concentrations of raffinose

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Abstract

Fighting-rams from Garut (West-Java, Indonesia) have a high potentiality to developed for the meat industry and also for ram fighting-contests. The main objective of this research was to acquire the best quality of Garut's fighting-rams' frozen semen in Tris extender supplemented with several different dosages of raffinose-concentration. After freeze-thawing, the result of this research showed that : the percentage of sperm motility in the raffinose treatment of 0.6g/100 ml diluent was significantly ($P < 0.05$) higher than Control; but, there was no significant difference ($P > 0.05$) with the raffinose treatment of 0.4 g/100 ml diluent. Evaluation of the life spermatozoa showed that the raffinose treatment of 0.6 g / 100 ml diluent ($65,75 \pm 4,65\%$) was significantly higher than ($P < 0.05$) Control ($52,80 \pm 1,64\%$); The percentage of intact acrosome in the raffinose treatment of 0.4 g/100 ml diluent ($61,80 \pm 4,32\%$) was considerably higher ($P < 0.05$) than Control ($64,60 \pm 3,29\%$). In conclusion, the Raffinosa concentration at 0.4 g/100 ml diluent is the optimal dosage for attaining the best quality of of the Garut fighting ram's frozen semen.

Keywords: Garut rams, raffinose, frozen semen.

Introduction

The Garut-fighting-rams is a distinctive local cross-breed found in West-Java, Indonesia. They grow faster and have a decent economic value (the champion-winner of a ram fighting competition, could cost up to approx. US\$ 7,500./ram). The solution to increase the population of these rams is by artificial insemination (A.I). The problem in semen freezing process is the cold shock effect. To minimize the negative effect which injures the spermatozoa during the freezing process, a cryoprotectan is added into diluted semen (Herdis,2012).

Raffinose, a potential type of sugar, could be used as a cryoprotectan. The use of raffinose, in frozen semen extenders, has been reported to support the processing of frozen cattle semen (Garde et al., 2008; Pursel et al. 2009), merino sheep semen (Bucak et al., 2013) and buffalo semen (Yulnawati et al., 2008). The main objective of this research was to acquire the best quality frozen semen in Tris extender supplemented with several different dosages of raffinose-concentration.

Methodology

On a weekly basis, using artificial vaginas, semen was collected from six mature Garut-rams. The fresh semen was evaluated macroscopically and microscopically. Qualified fresh semen was then diluted with the treatment of: 1. Tris egg yolks diluent with no addition of

raffinose (Control), 2. Tris egg yolks diluent plus raffinose 0.2 g / 100 ml diluent, 3. Tris egg yolks diluent plus raffinose 0.4 g / 100 ml diluent, 4. Tris egg yolks diluent plus raffinose 0.6 g / 100 ml diluent. Thawing was done by inserting the straws in water at 37°C for 30 seconds (Rizal et al. 2015). Evaluation of the semen at these stages: fresh semen, post dilution, post equilibration, and post thawing. The variables measured for each stage of the evaluation consisted of: motility percentage, life sperm percentage, plasma membrane percentage, and intact acrosome percentage.

Results and Discussion

The results of this research showed that sperm motility, is lower than the one which was reported by Hartanti and Karja (2014) of (81.25%); nevertheless, it is higher than the one of Nalley & Arifiantini (2013) of 72.92%. Characteristics of the Garut-ram's fresh semen are presented in Table 1.

Tabel 1. Characteristics of the Garut Ram's fresh semen.

Semen Characteristics	Average & appearance
• Volume per ejaculation (ml)	0,89 ± 0,10
• Colour	Cream
• Consistency	Viscous
• pH	7,03 ± 0,05
• Mass Motion	3,00 ± 0,00
• Concentrate (10 ⁶ sperm/ml)	4.487 ± 165
• Motility Percentage (%)	75,00 ± 0,00
• Life Sperm Percentage (%)	87,50 ± 1,29
• Abnormality Percentage (%)	2,67 ± 1,15
• Intact Acrosome Percentage (%)	85,50 ± 1,91
• Plasm Membrane Percentage (%)	85,25 ± 0,96

After the examination, the results of the study were eligible for semen freezing process. According to Matahine et al. (2014), in order to obtain good frozen semen results, fresh semen should have motility spermatozoa percentage of at least 70% and having spermatozoa with abnormality less than 20%. Characteristic of the Garut-rams' semen's during the freezing process, are presented in Table 2.

These results indicated that raffinose, as an oligosaccharide-sugar, has a role in maintaining the motility, viability, plasma membrane, and intact acrosome of the Garut-rams' spermatozoa during the freezing & thawing process. Raffinose can be metabolized by the spermatozoa through glycolysis or the Krebs cycle to produce energy, adenosine triphosphate (ATP). In addition, the ability of carbohydrates as a source of nutrients, as well as, a compound that functions as an extracellular cryoprotectant, enables it to protect the plasma membrane cell from damages (Riyadhi et al. 2017).

According to Bucak et al. (2013), raffinosa is able to maintain high activity influences in the mitochondria. Raffinosa plays a role in cryopreservation of cells by maintaining the unity of acrosomes & DNA, so as to counteract the damages caused by the freezing processes. Sugar, as an extracellular cryoprotectant, protects the spermatozoa plasma membrane from mechanical damages that occur during the cryopreservation of semen processing. This is indicated by the higher percentage value of the frozen-semen's quality in the raffinose added treatment, compared to the control treatment. According to Salamon and Maxwell (2000), sugar in a frozen state is shaped like a glass-crystal, but it is not sharp and will not damage the spermatozoa cells mechanically.

Tabel 2. The average percentage of the Garut-rams' sperm's : motility, life sperm percentage, intact plasm membrane, and intact acrosome at post dilution, post equilibration, and post thawing.

Variable	Treatment	Stages of semen processing		
		Post dilution	Post Equilibration	Post thawing
Sperm Motility Percentage (%)	Control	75,00 ± 0,00	67,00 ± 4,47	41,00 ± 4,18 ^a
	Raffinose 0,2g/100 ml	75,00 ± 0,00	68,00 ± 4,47	42,50 ± 5,00 ^{ab}
	Raffinose 0,4g/100 ml	75,00 ± 0,00	69,00 ± 4,18	49,00 ± 4,18 ^{bc}
	Raffinose 0,6g/100 ml	75,00 ± 0,00	69,00 ± 4,18	51,67 ± 5,77 ^c
Life Percentage (%)	Control	8,20 ± 1,92	76,80 ± 3,11	52,80 ± 1,64 ^a
	Raffinose 0,2g/100 ml	81,60 ± 1,82	77,00 ± 2,55	62,20 ± 5,54 ^b
	Raffinose 0,4g/100 ml	82,00 ± 2,45	77,80 ± 2,39	64,60 ± 5,77 ^b
	Raffinose 0,6g/100 ml	81,00 ± 1,58	76,20 ± 2,95	65,75 ± 4,65 ^b
Plasma Membrane Percentage (%)	Control	81,67 ± 2,16	76,67 ± 2,42	49,40 ± 2,19 ^a
	Raffinose 0,2g/100 ml	82,33 ± 1,37	78,00 ± 1,67	54,40 ± 3,05 ^b
	Raffinose 0,4g/100 ml	81,83 ± 1,60	78,17 ± 1,47	61,75 ± 5,32 ^c
	Raffinose 0,6g/100 ml	82,00 ± 1,67	76,50 ± 1,87	62,25 ± 3,30 ^c
Intact Acrosome Percentage (%)	Control	80,50 ± 1,76	76,67 ± 4,08	54,60 ± 3,29 ^a
	Raffinose 0,2g/100 ml	80,67 ± 2,50	78,17 ± 2,48	59,60 ± 3,85 ^{ab}
	Raffinose 0,4g/100 ml	81,00 ± 1,55	78,50 ± 2,66	61,80 ± 4,32 ^b
	Raffinose 0,6g/100 ml	80,33 ± 1,03	75,67 ± 1,75	61,00 ± 3,54 ^b

The ^{a,b,c}-subscripts for each variable (which are placed here in one column) shows that there are significant differences ($P < 0,05$).

Conclusion

In conclusion, The Raffinosa concentration at 0.4 g/100 ml diluent is the optimal dosage for attaining the best quality of of the Garut fighting ram's frozen semen.

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The differences time between estrous with implementation of artificial insemination on Brahman Cross cow conception rate

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Abstract

The lack of knowledge about reproduction especially on cows breeding, either using natural mating or Artificial Insemination (AI) is one of the factors that cause the failure of business livestock. The success of AI is highly dependent on the time of insemination. The timing of the Cow needs to be handled appropriately. The purpose of this research is to know the effect of time difference of IB on the success of Brahman Cross. This research was conducted in unit breeding PT. Pasir Tengah Cianjur, West Java, the research used field experimental method which obtained primary and secondary data by observation method and the data will be examined by chi square test and analyzed by analytic descriptive. The results showed that the Brahman Cross cattle in the AI at 0-4 h intervals had a higher CR, believed to be 70% while the Brahman Cross cattle in the AI at the 8-12 hour interval had a lower CR, believed to be 37.14%.

Keywords: Brahman cross, estrous, artificial insemination time, heat detector, conception rate

Introduction

Brahman Cross cattle can adapt to the tropics condition because they can resistant to heat, parasites disorder, Mosquitoes and warts. Besides that, they are also showing the good tolerance to feed containing a high crude fiber (Smith et al, 2007). In addition, the Brahman Cross is preferred by the farmer because it has a high price relatively. Body Weight addition per day and percentage of carcasses are higher with the lower bone components compared to local cattle.

Breeding systems for Brahman cross cattle can be applied with natural mating or Artificial Insemination (AI). AI is a technology to improve the efficiency of reproduction increases the genetic quality and prevents the sexually transmitted diseases. AI is a program known to farmers as an effective livestock reproduction technology. The success of AI programs is affected by several things including female cattle conditions, the skill of inseminators, time of AI, estrous detection, handling of frozen and the quality of semen (Susilawati, 2011). (Jainudeen and Hafez, 2008) has been revealed that the success of AI is depended to insemination time, unfortunately, it is difficult to predict exactly. This study will focus on the success rate of AI at different time intervals of AI which is starting from the onset of estrous until AI applied. The results of this study are expected to be guidelines for the implementation of AI in Brahman cattle.

Methodology

The research was conducted at PT. Central Sand village of Citampele, Mentengsari, Cikalongkulon, Cianjur regency, West Java. Materials used were Brahman Cross cattle 75 tail. The samples were selected purposively Sampling with the criteria of an adult female cow with body weight > 250, age 1.5 - 2 years, Normal productive organs, a clear sign of estrous condition which can be seen when the female cows are not moving when climbed by bulls (Jainudeen And Hafez, 2008). Heat detector was used to see the pressure on the vagina related to signs of estrous. The frozen semen used was Brahman cattle semen produced by Artificial Insemination Center (BIB) Lembang with the motility 35-40%.

The method used was field experimental method. Brahman cross cows as much as 35 tails were inseminated at intervals of 8-12 hours and 40 tails at intervals of 0-4 hours. The non return rate was counted to determine the pregnancy which was done on day 19-21 after inseminated, the non-estrous cows after inseminated was considered as pregnant. The conception rate was calculated with the percentage of pregnant cows on the first AI (Susilawati, 2013)

Results and Discussion

When the cows showed the sign of estrous, then according to the treatment, the cows were inseminated on 0-4 hours and 8-12 hours after onset of estrous. Before the AI performed on cows, the vaginal pressure was also evaluated and the results showed not significantly different ($P > 0.05$) as shown in Table 1.

Table 1. Observation of Vaginal Conditions during Estrus (Ω ,) by using heat detector

Interval time between estrous and AI	Total number (tails)	Average HD \pm SD (Ω ,)
0-4 hours	40	33,68 \pm 2,13
8- 12 hours	35	32,86 \pm 3,07

Based on Table 1 it can be seen that the average of HD values used in the treatment of AI at 0-4 hours has a higher value compared to the HD value in the treatment of AI at 8-12 hours, but both treatments showed a range of HD between 30- 40. It is supported by Ismaya (2014) which explains that HD is the electrical device used to determine the livestock by entering into the vagina slowly and carefully until it reaches 20-30 cm, then pressed the two buttons and the needle will show to the numbers 30-40 if there are signs of estrous, if less or more then the cows has not already or not being estrous. Determine the time of AI is an important thing to support the high success of AI. In this study, we evaluated the AI in Brahman Cross cows by using interval 0-4 hours and 8-19 after showing the signs of estrous as shown in Table 2.

Table 2. Conception Rate value with the different time interval signs of estrous and AI

Interval time between estrous and AI	Not estrus after AI (pregnant) (Tails)	Total (head)	Conception Rate (%)
0-4 hours	28	40	70
8- 12 hours	13	35	37,1
Total	41	75	54,7

Based on Table 2 showed that the AI at 0-4 hours after signs of estrous was given the significantly higher success conception rate ($P < 0.05$) compared to after 8-12 hours after

showing the signs of estrous. This is not suitable with the AI guidelines used in Indonesia where the AI performed after 8 hours showed the signs of estrous. Furthermore, according to the study of (Susilawati et al. 2011b) the factors affecting the success of AI besides the time of AI also semen deposition, the semen deposition at 4+ positions (on cornua uteri) will result in the high success of AI compared to cervical position or corpus uteri.

Conclusion

Artificial Insemination on Brahman Cross cows with AI at time interval of 0-4 hours has a better percentage of pregnancy, which is 70% compared to AI performed at 8-12 hours interval which is only 37.14%. Further research can be performed with the study of difference time of AI with the onset of estrous sign until the examination of pregnancy and the study of the length estrous time on Brahman Cross cows.

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Effect of addition of fish oil to the extender on the semen quality before freezing on Bali bull Spermatozoa

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Abstract

The objective of the present study was to investigate the effects of supplementation of honey solution to the extender on the viability, motility and abnormality of before freezing in bali bull spermatozoa. Fish oil was added at the doses of 0 (control), 50, 100, 150 and 200 mg/100 mL to the skim milk-egg yolk extender. Supplementation of fish oil at the dose of 100 mg/mL (P2) was significantly ($P<0.05$) increased on the live sperm rate, but its dose of 200 mg/mL (P4) caused a significant ($P<0.05$) decrease in the live sperm rate when compared with the control group. The motility and abnormality before freezing was no significant ($P<0.05$) compared with the control group on all doses of fish oil. In conclusion, addition of 100 mg fish oil to 100 mL of skim milk-egg yolk extender could be beneficial for the improvement of the quality of Bali bull spermatozoa before freezing.

Keywords: spermatozoa, fish oil, live sperm, motility, abnormality

Introduction

The bali cattle (*Bos sondaicus*), tamed from *Bos banteng* in Java, have been stated to have greater reproductive performance than other original cattle of Indonesian. To increase the population of bali cattle breeds, artificial insemination (AI) has developed a regular to increase the useful reproductive life of beef. One of the factor to succes of IA is semen quality including a extender. Fish oil contains omega 3 fatty acid and is a major source of eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA) (Stoeckel et al., 2011). However, Nichols et al. (2014) has been reported that fish oil contains 1970 mg saturated fatty acid (SFA), 35.5% polyunsaturated fatty acid (PUFA), 180 mg eicosapentaenoic acid (EPA) and 120 mg docosahexaenoic acid (DHA). Several researchers have assessed the effect of fish oil addition on semen quality parameters in domestic animals. They have reported that fish oil caused increments in sperm motility and reductions in abnormal sperm in boars (Rooke, 2001), improved fertility in turkeys (Blesbois, 2004) as well as increased total of sperm count in rams (Samadian et al., 2017). The objective of this study was to evaluate the effect of fish oil addition to the extender on live sperm rate, motility and abnormality before freezing in bali bull spermatozoa.

Methodology

Semen was collected by artificial vagina from four Bali bulls raised in Center Insemination Banjarbaru, province of south Kalimantan-Indonesia. Two ejaculates were obtained from each bulls every week for one month. Immediately after semen collection, the ejaculates were immersed in the warm water bath at 37°C until their assessments in the laboratory. Then, semen parameters were assessed based on the macroscopic and microscopic

characteristics. Macroscopic evaluations included volume, pH and color. Microscopic evaluations included live sperm rate, motility and abnormality. The main extender consisted of 10% skim milk, 5% egg-yolk, 1% glucose, 8% glycerol, Streptomycin (1 mg/mL) and Penicillin (1000 IU/mL). This study was designed to compare the effect different concentrations of fish oil (*liquid*) with doses 0 (control), 50 mg, 100 mg, 150 mg and 200 mg in the 100 mL skim milk-egg yolk extender. The cryoprotective extender for the control group was the same as that for the treatment groups except that it was not supplemented with fish oil (natural, 1000 mg) containing Omega-3 Marine; Triglycerides (300 mg) as EPA (180 mg) and DHA (120 mg) from Nature's Care (Manufacture Pty, Ltd. Minna Close Belrose, Australia).

For assessment of live sperm percentage, a modification of the eosin-nigrosin procedure described by Evans and Maxwell (1987) was used. The data are expressed as mean \pm SEM. A one-way analysis of variance (ANOVA) with tukey's multiple comparison test was applied to determine differences among the treatments using SPSS statistical software (version 16.0).

Results and Discussion

The effect of addition of different doses of fish oil before freezing on live sperm rate, motility and abnormality is shown in Table 1.

Table 1. effect of addition of different doses of fish oil before freezing sperm parameters.

Treatments	Sperm Parameters		
	Live Sperm Rate (%)	Motility (%)	Abnormality (%)
Contrl (P0)	84.33 \pm 21.02 ^{ab}	59.17 \pm 03.51	19.67 \pm 21.04
50 mg/100 mL (P1)	87.01 \pm 30.13 ^{bc}	61.67 \pm 19.18	19.16 \pm 17.24
100 mg/100 mL (P2)	88.17 \pm 15.09 ^c	63.38 \pm 31.60	20.10 \pm 05.18
150 mg/100 mL (P3)	83.51 \pm 31.16 ^a	57.52 \pm 27.17	20.03 \pm 18.51
200 mg/100 mL (P4)	81.15 \pm 19.08 ^a	55.83 \pm 07.15	18.85 \pm 26.03

Live sperm rate, motility and abnormality of semen are important factors because spermatozoa must travel from the vagina and uterus if semen is deposited by natural mating and AI, respectively. Before freezing processes may induce spermatozoa damages especially to the plasma membrane and organelles (Esteso et al., 2003; Munoz et al., 2009). The purpose of semen quality is important for the evaluation of before freezing of semen. In the present study, it was observed that addition of 100 mg fish oil to the 100 mL extender significantly increased on live sperm rate, but treatment with 200 mg fish oil caused significant reduction in live sperm rate in comparison with the control and other treatments. This situation is shown that the dose of 100 mg fish oil provides an ideal concentration in diluent so as to provide comfort to the spermatozoa, thus preventing damage to the process freezing. On the other hand, DHA can be presented as a cryoprotectant that will be able to penetrate the plasma membrane of the sperm and thus act intracellularly. Therefore, modifications in fatty acid composition of surrounding diluents with fish oil supplement can cause changes in the fluidity and elasticity of the sperm plasma membrane by incorporation its fatty acids in the lipids of sperm (Conquer et al., 2000). In the present study, 150 and 200 mg fish oil supplementations were observed to decrease the percentages of live sperm rate. This result are supported by the data previously reported by Kandelousi et al. (2013) who stated that higher levels of omega-6 fatty acids result in decreased sperm concentration, motility, and altered morphology.

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Changes in follicular dynamics and hormonal concentrations following administration of pregnant mare's serum gonadotropin in addition to 7-day progesterone-based synchronisation protocol in Thai native beef cows (*Bos indicus*)

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Abstract

To determine the effect of addition of pregnant mare's serum gonadotropin (PMSG) to the 7-day + controlled internal drug release (CIDR)-based protocol on the growth dynamics of the dominant follicle (DF), the characteristics of the ovulatory follicle (OF) and the corpus luteum (CL), and the concentrations of progesterone (P₄) of Thai native cows, CIDR was inserted into 20 White Lamphun cows for 7 days concurrent with injection of gonadotropin-releasing hormone (GnRH). The cows were exposed to administration of either PMSG (the PMSG-treated group) or saline (the PMSG-untreated group) concurrent with injections of prostaglandin F_{2α} (PGF_{2α}) on Day 7, and were given a second dose of GnRH on Day 10. An ovarian evaluation was carried out by scanning using transrectal ultrasonography. Blood samples were collected to measure the P₄ levels. The total growth rate of the DF and diameter of the OF were the greatest in the PMSG-treated cows. The diameter and the area of the CL and P₄ were the highest in the PMSG-treated group. The results of this study conclude that triggering of the growth rate of the DF and enhanced OF size and CL function are manipulated with administration of PMSG at the end of CIDR treatment in Thai native cows in the tropics.

Keywords: asian origin, cattle, large follicle, luteal function, white lamphun cows.

Introduction

In beef cattle, the 7-day CO-Synch protocol that is commonly adapted to synchronise oestrus and ovulation in *Bos indicus* and *Bos taurus* cattle combines an exogenous source of P₄ such as CIDR devices with GnRH as well as PGF_{2α}. This short-term protocol delivers reasonable pregnancy outcome in beef cows, but because synchronised ovulation of the small DF from the CO-Synch protocol in beef cows developed the formation of the small CL that displayed a delayed rise in P₄ concentration, the potential existed to further enhance the capability of this short-term protocol to induce ovulation (Bridges et al. 2014). The PMSG is widely used to induce ovulation and to improve the effectiveness of AI protocol in terms of ovulatory and pregnancy rates in beef cattle (Nascimento et al. 2012). However, the administration of PMSG in addition to the 7-day CO-Synch P₄-based protocol is still not evaluable to further improve the DF size in the *Bos indicus* cattle. Moreover, although the CO-Synch protocol has been mostly used in beef cattle of the *Bos taurus* breed, little information is available regarding the *Bos indicus* cattle of Asian origin concerning the dynamics of follicular growth and hormonal concentrations following this protocol. For this reason, the present experiment was conducted to determine the changes in the dynamics of DF growth, hormonal concentration and CL function after PMSG treatment on the day of CIDR withdrawal of the 7-day CO-Synch + CIDR-based protocol in Thai native cows.

Methodology

At a random stage of the oestrous cycle, a total of 20 White Lamphun cows were randomly assigned to undergo one of the two treatments, as follows: the PMSG-untreated group ($n = 10$) and the PMSG-treated group ($n = 10$). On Day 0, CIDR was inserted for 7 days concurrent with the first dose of GnRH. On Day 7, the cows in the PMSG-untreated group were given an intramuscular administration of normal saline, while the cows in the PMSG-treated group received an intramuscular injection of 500 IU of PMSG. The cows in both the groups were injected with two doses of PGF_{2α}. On Day 10, all the cows were given the second dose of GnRH. Transrectal ultrasonography was performed with a 7.5 MHz linear-array transducer (HS-1600V, Honda Electronics, Japan) to assess the position and dimension of all the follicles ≥ 2.0 mm in diameter and the CL. After the second dose of the GnRH injection, transrectal ultrasonography was managed in all the cows on Day 18 to determine the formation of the CL from this ovulation. Blood samples were collected from the coccygeal vein to measure the P₄ concentrations. The serum P₄ concentrations were measured in duplicate using the competitive enzyme-linked immunosorbent assay. The differences between the means were evaluated by Student's *t*-test. Differences with $P < 0.05$ were considered significant, and those with $0.05 < P < 0.10$ were considered a tendency.

Results and Discussion

The average diameter of the DF was the greatest in the PMSG-treated cows on the day of the second injection of GnRH (Day 10) (Table 1). Overall, cows receiving PMSG in addition to the 7-day + CIDR-based synchronisation protocol had a greater growth rate of the DF than cows that did not receive the PMSG treatment (Table 1). The beef cows that were treated with PMSG injection had greater size of the OF on day before ovulation compared to the animals that were not treated with PMSG at the time of CIDR removal (Table 1). Besides, the diameter and area of induced CL for the PMSG-treated cows was greater than that for the PMSG-untreated cows on Day 18 (Table 1). One possible reason for the differences in the DF growth and CL characteristics after ovulation between the PMSG-treated beef cows and the control beef cows in the present study could be that the DF in the PMSG-treated cows had higher growth of follicular cells containing a greater number of proliferating ovarian cells and/or retained more of the granulosa cells after induced ovulation (Fátima et al. 2013).

Table 1. Average diameter and growth rate of DF, OF size, and characteristics of CL of Thai native cows in the PMSG-treated group ($n = 10$) and the PMSG-untreated group ($n = 10$)

	PMSG-untreated	PMSG-treated	<i>P</i> -value
DF diameter at second GnRH injection (mm)	9.65 ± 0.28	11.72 ± 0.61	0.037
Total growth rate of DF from Day 0 to ovulation	0.73 ± 0.02	0.92 ± 0.04	0.015
OF diameter on day before ovulation (mm)	10.25 ± 0.28	12.00 ± 0.40	0.024
CL diameter on Day 18 (mm)	12.93 ± 0.22	16.75 ± 1.10	0.028
CL area on Day 18 (mm ²)	204.45 ± 4.29	285.37 ± 18.23	0.023

Interestingly, the cows that received PMSG treatment had higher P₄ concentration on Day 18 than the cows that were not treated with PMSG (Fig. 1). Thai native cows that were not treated with PMSG had lower growth rate of the DF and smaller OF as well as formed smaller CL which subsequently secreted less endogenous P₄ than larger OF, and this influenced the ovulation in the PMSG-treated cows. Similar to the data provided by previous study, the fixed-timed AI protocol with GnRH induced a surge of luteinising hormone (LH) and the

ovulation of the physiologically immature DF resulted in the formation of a small CL that released inadequate endogenous P₄ (Perry et al. 2005), whereas adequately circulating P₄ is important for maintenance of bovine pregnancy (Nascimento et al. 2012).

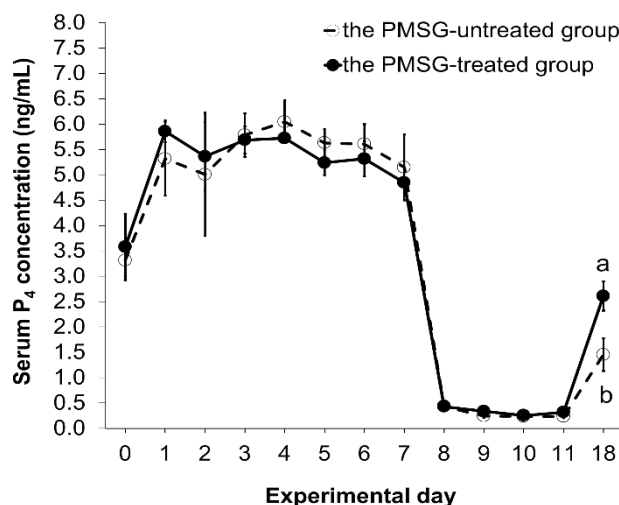


Figure 1. Serum profiles of P₄ in Thai native cows that received and that did not receive PMSG treatment in addition to the 7-day + CIDR-based synchronisation protocol. Means with different superscripts (^{a,b}) are significantly different between the synchronisation protocols.

Conclusion

It can be highlighted that triggering of the growth rate of the DF, increased size of the OF on the day before ovulation and enhanced CL function are manipulated with administration of 500 IU PMSG at the end of the exogenous P₄ treatment in Thai native beef cows in the tropics.

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Efficiency of lyophilized tris egg yolk extender on bull semen cryopreservation

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Abstract

The study was to compare fresh with lyophilized Tris egg yolk-based extender for bull semen cryopreservation regarding the percentages of sperm motility, progressive sperm motility and rapid sperm motility at three critical time points of freezing semen procedure following; after dilution, equilibration and thawing time points. Semen from eight Holstein bulls was collected and each batch of collected semen was divided equally into two groups. Control group (n=8) and Treatment group (n=8) were diluted with fresh and lyophilized Tris egg yolk extender, respectively. Final sperm concentration was about $80 \times 10^6/\text{ml}$. The diluted semen was further processed for freezing, then storage at -196°C for 24 hours. The sperm quality of both groups was evaluated by using computer assisted semen analysis (CASA). The results showed that all percentages of sperm motility, progressive sperm motility and rapid sperm motility of three time points (after dilution, equilibration and thawing) were not significantly differences between control and treatment groups. Moreover, the percentages of sperm motility, progressive sperm motility and rapid sperm motility after thawing of the control group were 41.21 ± 8.87 , 20.63 ± 4.33 and 31.04 ± 8.28 , respectively, and treatment group were 44.04 ± 7.18 , 20.67 ± 3.55 and 32.91 ± 6.90 , respectively. These values from both groups were the acceptable value of approved frozen semen quality. In conclusion, the lyophilized Tris egg yolk extender could provide semen quality after freezing-thawing similar to fresh Tris egg yolk extender. Finally, lyophilized extender had efficacy for cryoprotective effect and could be used regularly for bull semen cryopreservation.

Keywords: bull semen, CASA, cryopreservation, lyophilization, Tris egg extender

Introduction

It widely knows that the bovine semen cryopreservation is used for artificial insemination (AI) in dairy and beef industries for many years. Egg yolk is the most common ingredient which has been used in semen extender to protect sperm from the harmful effects of cooling and freezing. The effective constituent of egg yolk is low density proteins (LDL) that enhance motility, phospholipid membrane integrity, and the fertilization ability of sperm during freezing-thawing procedure (Hu et al., 2010). In addition, the egg yolk based combination with Tris and cryoprotective glycerol, is accepted to develop of freezing extender for cryopreservation of bull semen. This combination yields Tris egg yolk-glycerol extender for freezing bull sperm, which has now come to be a standard method (Wall and Foote, 1999). However, the fresh egg yolk based extender is unable to store longer. It should be freshly prepared before used which is inconvenient in some areas. Then, in recent years, demand of available instant extenders has arisen for alternative conventional protocol. The lyophilized process is a both freezing and dehydration of biological products for preservation as well as

blood plasma, tissue, drug and vaccine. This technique is able to sustain stability and viability for longer storage intervals (Moustacas et al., 2011). Moreover, the benefits of lyophilized Tris egg yolk extender may be able to preserve longer. It is available and convenient using and has the ability for bull sperm cryopreservation. This study was assigned to compare the fresh Tris egg yolk extender with lyophilized Tris egg yolk extender on bull semen cryopreservation considering the quality of sperm motility, progressive sperm motility and rapid sperm motility after semen dilution, equilibration and thawing.

Methodology

The extender was prepared as two groups, for fresh (control group) and lyophilized (treatment group) extenders. The fresh extender was prepared daily. In 1 liter fresh extender contained 24.22 g Tris (Sigma, USA), 13.6 g citric acid, 10 g fructose, 720 ml distilled water, 1,000,000 IU penicillin G, 1 g dihydrostreptomycin, 20% (v/v) egg yolk and 8% (v/v) glycerol. The extender in treatment group consisted similarly component to fresh extender excluding glycerol. The extender without glycerol in the treatment group was lyophilized (ilShin Bio Base Freeze-Dryer) and after that the lyophilized extender was stored at 4 °C until used. Prior use, the dried extender was rehydrated with 720 ml distilled water and added 8% (v/v) glycerol. Eight healthy Holstein-Friesian bulls age 3-8 years old were randomized for semen collection by artificial vagina (AV). Shortly after semen collection, the collected semen were put in a water bath (33 °C) and immediately evaluated for color, consistency, wave motion, sperm concentration and percentage of sperm motility. The semen samples with normal color, thick consistency, rapid wave motion (2-4 of 0-4 scales), $\geq 800 \times 10^6/\text{ml}$ of sperm concentration and $\geq 70\%$ of sperm motility were accepted to use in this study (Barszcz et al., 2012). After that, the semen from each bull would be divided equally into two groups. Group 1 (control group, $n=8$) was diluted with fresh extender and Group 2 (treatment group, $n=8$) was diluted with lyophilized extender. In addition, each semen sample was diluted with the extender to get final sperm concentration about $80 \times 10^6/\text{ml}$. Therefore, all diluted semen samples of both groups were evaluated with Computer Assisted Semen Analysis (CASA; IVOS program, motility analyzer version 12.3; Hamilton-Thorne, Biosciences, USA) for three parameters as percentages of sperm motility, progressive sperm motility and rapid sperm motility. Further, the diluted semen samples were equilibrated at 4 °C for 4 hours and also evaluated in CASA system with the same parameters. The equilibrated diluted semen samples were put into 0.25 ml straws for cooling process and freezing at -196 °C in liquid nitrogen where the straws were kept for 24 hours. Three straws of each bull were thawed in water bath at 37 °C for 30 seconds and evaluated again with CASA in the three parameters. In addition, the semen cooling, freezing and thawing were following the standard methods of Lumphayaklang Livestock Semen Production Center, Department of Livestock Development, Lopburi, Thailand. All parameters were analyzed using SPSS statistical package (SPSS V.10, Chicago, USA).

Results and Discussion

All sperm parameters were evaluated at the critical three time points as after dilution, equilibration and thawing by using CASA with three parameters. The average (Mean \pm SD) value of each parameter in each critical point from both groups was showed in Table 1. The percentages of sperm motility, progressive sperm motility and rapid sperm motility after dilution, equilibration and thawing of control group were not significantly different from those parameters of treatment group. From these finding results that mean the lyophilized extender was able to maintain the sperm quality similar to fresh extender on bull semen according to the previous report in ram semen (Alcay et al., 2015). In addition, this study was not assessed the

other parameters of sperm characteristics. However, the using of three parameters for semen evaluation at those three time points were suitable and practical to interpret the diluted semen quality with different extenders after processing (diluting, equilibration, freezing-thawing). According to the previous study (Sundararaman et al., 2012) that the motion of spermatozoa is an important characteristic for sperm transportation throughout female reproductive tract and successful for fertilization with the oocyte. This characteristic of spermatozoa is reduced with the processing semen cryopreservation. Then the most critical point of cryopreserved semen quality evaluation is the post-thawing. The recent study found that the percentages of sperm motility, progressive sperm motility and rapid sperm motility after thawing provided acceptable values for frozen semen quality which these values similar to the standard values of the CASA instruction belonging the Lumphayaklang Livestock Semen Production Center. Then it can be concluded that the lyophilized extender had efficacy similar to the fresh extender for cryopreserved bull semen quality.

Table 1. Average values of parameters for semen evaluation in three critical points of fresh and lyophilized extenders

Parameters	Diluted semen with fresh extender (control group, n=8)	Diluted semen with lyophilized extender (treatment group, n=8)
% sperm motility after dilution	82.62±6.79	77.54±4.08
% progressive sperm motility after dilution	60.17±5.69	55.33±4.80
% rapid sperm motility after dilution	75.50±7.93	62.50±8.39
% sperm motility after equilibration	70.21±9.46	70.42±7.12
% progressive sperm motility after equilibration	30.33±8.75	31.04±5.50
% rapid sperm motility after equilibration	61.54±8.58	61.20±13.89
% sperm motility after thawing	41.21±8.87	44.04±7.18
% progressive sperm motility after thawing	20.63±4.33	20.67±3.55
% rapid sperm motility after thawing	31.04±8.28	32.91±6.90

No significant difference in the same parameter between control and treatment groups ($P>0.05$)

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The effect of egg plant (*Solanum melongena*) peel extracts level in skim milk on sperm quality of Bali bull culled semen at room temperature

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Abstract

During dilution and stored, sperm motility reduce corresponding to appropriate processing technique and diluter used. The objective of this study was to evaluate the effect of eggplant peel extracts (EPE) in skim milk on Bali bull culled semen motility at room temperature. The method used was laboratory experiments. Semen was collected from 3 Bali bulls by artificial vagina method. Fresh semen evaluated for colour, pH, volume, concentration, mass motility, individual motility, viability, and sperm abnormality. Semen was diluted with skim milk supplemented with different levels of EPE (0, 2, 4 and 6 %) v/v with the ratio of 1 semen : 9 diluter. Semen used culled Bali bull semen (mass motility of + and motility of 50 - 55%). Immediately after dilution semen was stored for 28-29°C and sperm motility percentage was observed at 0, 2 and 4 hours after stored at room temperature. The obtained data were analyze with Analysis of Variant and Least Significant Difference was determined. The experiment was designed using randomized block design. The results showed that the level of EPE had significant effect ($P < 0.05$) on sperm motility percentage on 0, 2 and 4 hours of storage. It concluded that the level of 2 % EPE is best to maintain the sperm motility at room temperature.

Keywords: Bali bull, dilution, eggplant peel, sperm motility and room temperature

Introduction

Sperm motility is the most important indicator for characterization of sperm quality after processing. During dilution and storage, sperm motility reduce corresponding to appropriate processing technique and diluter used. Eggplant peel (EP) is part of the fruit of eggplant (*Solanum melongena*) are categorized as waste. Studies phytochemicals shows that the antioxidant compounds in the eggplant peel, especially nasunin, anthocyanin and groups of phenolic compounds other have functional properties and benefits to health such as antidiabetic, anticancer, anti-inflammatory, boost immunity, antibacterial, antifungal, antiplasmodial, and so forth (Noda et.al. 2000). This study was conducted to evaluate the effect of eggplant (*Solanum melongena*) peel extracts in skim milk based diluent on Bali cattle culled semen motility at room temperature.

Methodology

Semen was collected from three bulls (5.0 -6.0 y) with about 400 kg in weight, using artificial vagina. After collection, fresh semen was evaluated macroscopically (colour, pH, volume) and microscopically (concentration, mass motility, individual motility, life sperm, and abnormal sperm). Sampling was conducted as purposive sampling. Only semen with mass motility minimal + and individual motility of sperm more than 50% was used for research material. The selected semen was diluted with skim milk supplemented with different level of

EPE (0, 2, 4 and 6 %), the ratio of 1 semen : 9 diluter. Immediately after dilution semen was stored at room temperature (28-29°C) and sperm individual motility was observed at 0, 2 and 4 h after storage. The obtained data were analyzed with Analysis of Variance and continued by Least Significant Different if there were significant or very significant different between groups. The experiment was designed using Random group design.

Results and Discussion

Characteristics of fresh culled Bali bull semen

Table 1. Characteristics of fresh semen of Bali bulls semen used in the experiment (n=10)

Parameter	Value
Color	Creamy
pH	6.00 ± 0.0
Volume (ml)	4.75 ± 0.35
Concentration (10 ⁶ /ml)	1895 ± 1068
Mass motility	+ - ++
Sperm Individual motility (%)	52.20 ± 3.54
Sperm viability (%)	75.32 ± 6.89
Abnormal sperm (%)	12.34 ± 2.95

Table 1. shows that the color, volume, sperm concentration, sperm viability and sperm abnormality percentage research results were normal, but sperm mass and individual motility were low, so that the semen was culled and not used as raw material for frozen semen.

Sperm motility after room temperature storage

Table 2. Sperm motility following treatment with different levels of eggplant peel extracts (EPE) at room temperature storage (Mean ± SD)

Time of cooling (h)	MPF levels (%)	Mean ± SD
0	0	45.00 ± 7.07 ^a
	2	47.50 ± 3.54 ^b
	4	45.00 ± 7.07 ^a
	6	40.00 ± 4.14 ^a
2	0	43.00 ± 4.08 ^a
	2	45.00 ± 5.17 ^b
	4	40.00 ± 3.09 ^a
	6	40.00 ± 7.07 ^a
4	0	20.00 ± 0.00 ^a
	2	27.50 ± 9.61 ^b
	4	22.50 ± 3.54 ^a
	6	17.50 ± 3.54 ^b

a, b within column significant different (P<0.05)

Table 2. shows that all treatments, the longer the storage the lower sperm motility. Results of analysis of variance showed that the level of EPE in the skim milk were significant different (P<0.05) to sperm motility of Bali bull after room temperature storage. At room temperature storage 0 and 2 hours on all treatments showed individual motility of spermatozoa above the standard that is used for artificial insemination (> 40 %), while in storage 4 hours on all diluters cannot maintain the percentage of sperm with good motility. In general, it was shown that 2 % eggplant peel extracts in skim milk diluent showed an optimal level for

maintaining sperm motility after storage at room temperature compared to the level of 0, 4 and 6 % EPE contains polyphenolic compounds such as caffeic acid and flavonoids nasunin chlorogeni (Gallo et al. 2014). Both eggplant peel extracts 4 and 6% maybe too high level for maintaining sperm motility. High supplementation EPE (4 and 6%) were not able to protect spermatozoa during storage at room temperature, it was suspected because EPE contain ingredients that degrade the quality of spermatozoa, so the higher the level of supplementation the higher nicotine and solanidin content. Nicotine contained in the purple eggplant (*Solanum melongena*) have the highest levels compared with other vegetable crops (Meyer. 2010) . Solanidin is a byproduct of the metabolism of eggplant (*Solanum melongena*). These substances are toxic to bacteria, fungi, viruses, protozoa, animals, and humans, and in this study resulted in the poor quality of spermatozoa.

Conclusion

Based on the study, it was concluded that the addition 2% eggplant peel extracts in skim milk diluent resulting optimal sperm quality of Bali bull culled semen after room temperature storage.

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Differences in locational relationship between corpus luteum and ovulatory follicle changes on follicular dynamics and progesterone concentrations of Thai indigenous cows (*Bos indicus*) exhibiting 2 follicular waves

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Abstract

This study aimed to determine the impact of differences in locational relationship between the previous corpus luteum (CL) and the further ovulatory follicle (OF) on follicular dynamics and progesterone (P₄) concentrations in Thai indigenous cows exhibiting 2 follicular waves. Twenty-one cows exhibiting 2-wave pattern were studied through the interovulatory interval (IOI) and classified according to relationship between the previous CL and further OF on ovaries as follows: ipsilateral (same ovary) relationship ($n = 12$) or contralateral (opposite ovaries) relationship ($n = 9$). Ultrasound monitoring to evaluate the follicular diameter and collection of blood to determine the P₄ levels were obtained each day throughout the IOI. The IOI was longer in the contralateral cows than the ipsilateral cows. Cows with the contralateral relationship were found to have the further OF with smaller than the cows with the ipsilateral relationship. The mean growth rate of the further OF tended to be slower in the contralateral cows than in the ipsilateral cows. The levels of P₄ tended to be lower for ipsilateral cows than in the contralateral cows on Day 18 of the IOI. On Day 19 of the IOI, the concentration of P₄ was lowest in the ipsilateral cows. Day after first ovulation to P₄ <1 ng/mL (end of luteolysis) was longer in the contralateral group than in the ipsilateral group. Thus, these data highlight that the growth rate and diameter of the further OF during luteolysis increase in ipsilateral relationship than in contralateral relationship of Thai indigenous cows in the tropics.

Keywords: Asian origin, cattle, luteolysis, preovulatory follicle, White Lamphun cows.

Introduction

Ovarian follicular growth and regression have been occurred as a natural phenomenon during the oestrous cycle in cattle. In cattle, only the dominant follicle (DF) of the ovulatory wave (last wave) has regularly the possibility for ovulation, whereas the other follicles undergo the process of atresia (Bó et al. 2003). Recently, the locational relationship between the corpus luteum (CL) and preovulatory follicle (PF) (CL-PF relationship) on ovaries has been explained as contralateral (opposite ovaries) or ipsilateral (same ovary) that affected follicular dynamics during the interovulatory interval (IOI) in Holstein dairy heifers (*Bos taurus* breed) (Ginther et al. 2014); however, the impacts of locational CL-PF relationship on follicular development and hormonal concentrations have not been evaluated in *Bos indicus* cattle of Asian origin. For this reason, the present experiment was undertaken to evaluate impact of differences in locational relationship between the previous CL and the further ovulatory follicle (OF) on follicular dynamics and progesterone concentrations in Thai indigenous cows (*Bos indicus* beef cattle) with 2-wave IOI.

Methodology

Follicular growth and atresia were performed with ultrasound equipment (HS-1600V, Honda Electronics, Japan) and a 7.5 MHz linear-array probe to assess the ovarian structures. The IOI was defined as the interval between the day of first ovulation and the day of second ovulation. Twenty-one White Lamphun cows exhibiting 2-wave pattern per the IOI were used in this study. The locational relationship between the CL from pervious ovulation and the OF in cows were classified according to Ginther et al. (2013a). For 21 beef cows the ipsilateral relationship ($n = 12$) was defined as the location of the CL from pervious ovulation (from first ovulation) and the OF during the last follicular wave in the same ovary. On the other hand, the contralateral relationship ($n = 9$) was defined as the location of the CL and the OF in the opposite ovaries. Blood samples were collected from the coccygeal vein to measure the progesterone (P_4) concentrations. The serum concentrations of P_4 were measured in duplicate using the competitive enzyme-linked immunosorbent assay. For individual cows the end of luteolysis was defined as the interval from the day of first ovulation to the day of $P_4 < 1$ ng/mL (Ginther et al. 2013b). The differences between the means were evaluated by Student's *t*-test. Differences with $P < 0.05$ were considered significant, and those with $0.05 < P < 0.10$ were considered a tendency.

Results and Discussion

The IOI was longer in the contralateral cows than the ipsilateral cows (Table 1). The maximum diameter of the further OF was largest in ipsilateral cows (Table 1). During the ovulatory wave, the mean growth rate of the further OF tended to be slower in the contralateral cows than in the ipsilateral cows (Table 1). On Day 17 of the IOI, the concentrations of P_4 were lower in the ipsilateral cows compared with the contralateral cows. The levels of P_4 tended to be lower ($P = 0.087$) for the ipsilateral relationship than in the contralateral relationship on Day 18 of the IOI (Fig. 1). Additionally, day after first ovulation to $P_4 < 1$ ng/mL was longer in the contralateral group than in the ipsilateral group (18.5 ± 0.50 days vs 16.7 ± 0.33 days). The further OF was observed to have greater diameters in ipsilateral cows, probably due to the early time in $P_4 < 1$ ng/mL (the end of luteolysis). It is possible that the continuations in growth rate of the future OF begin well before the end of luteolysis in 2 follicular waves of the ipsilateral relationship (Ginther et al. 2016). Level of luteinising hormone (LH) averaged over all the IOIs for the final wave initiates to enhance gradually on Day 15 and Day 16 near the initiating of luteolysis (Hannan et al. 2010).

Table 1. Comparison of dominant follicle (DF) and ovulatory follicle (OF) characteristics between Thai indigenous cows with the ipsilateral or the contralateral relationships

	Ipsilateral relationship	Contralateral relationship	<i>P</i> -value
IOI (days)	18.50 ± 0.29	19.67 ± 0.33	0.045
Maximum diameter (mm)			
first DF	13.50 ± 0.83	11.56 ± 0.83	0.135
second DF (further OF)	13.87 ± 0.31	12.08 ± 0.21	0.006
Growth rate (mm/day)			
first DF	0.98 ± 0.10	0.86 ± 0.83	0.349
second DF (further OF)	1.12 ± 0.11	0.81 ± 0.04	0.053

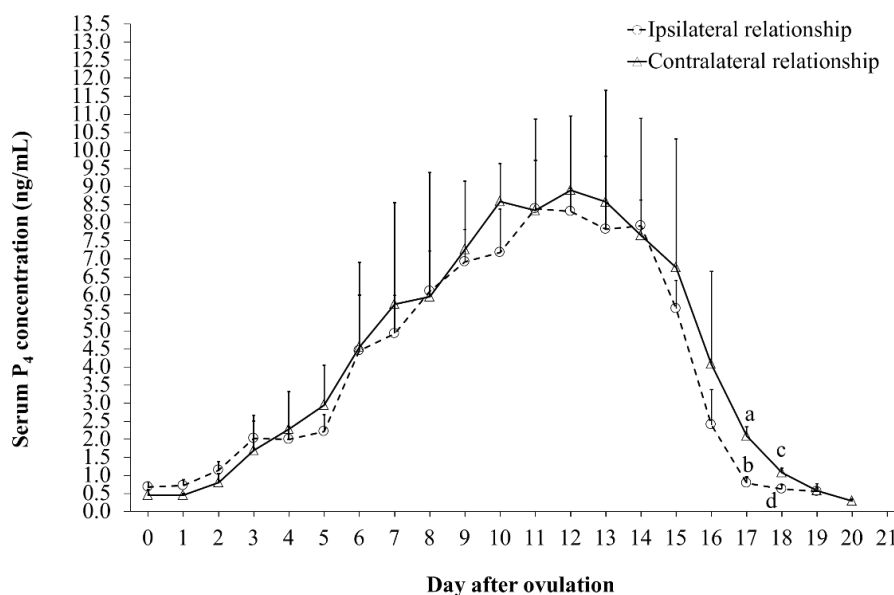


Figure 1. Changes in the circulating serum of P₄ concentrations of the ipsilateral cows and the contralateral cows. Means with different superscripts (^{a,b}) denote significant difference between groups and means with different superscripts (^{c,d}) tended to differ between group.

Conclusion

Based on the maximum diameter and growth rate of the further DF as well as serum concentrations of P₄ in White Lamphun cows exhibiting 2-IOI pattern, ovarian follicular dynamics and serum P₄ concentration in the ipsilateral cows are different to those in contralateral cows. Consequently, it can be highlighted that the growth rate and diameter of the further OF during luteolysis increase in ipsilateral cows than in contralateral cows

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Estrous profile of Etawah crossbreed goats after estrous synchronization with different method

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Abstract

Reproductive efficiency can be improved by reproductive technology such as estrous synchronization methods. This method was used to manipulate the normal estrous cycle in a group of animal population, therefore their estrus will come synchronize in the same time. The aim of this study was to determine estrous profile of Etawah Crossbreed Animal goats after estrous synchronization (ES) with different methods. The research used Completely Randomized Design with three methods of ES (T1 = 14 days intravaginal implant of 60 mg progesterone (MPA), T2 = 2 times injection of 5 mg PGF_{2α} (lutalyse) in 11 days interval, T3 = 10 days intravaginal implant of 60 mg progesterone (MPA) + injection of 5 mg PGF_{2α} (lutalyse) 48 hours before implantation removal) with six replications. Parameters consist of estrous behavior, changes of size and vulva colour and duration of estrus based on the time superficial and keratin cells were dominating in vaginal mucus cell. Results showed that estrus behaviour, change of vulva color and size of vulva were not significantly different, but estrus duration showed significant ($p < 0.05$) differences. Estrus duration that shown by T1 and T2 were significantly longer than T3. In conclusion, different methods of estrus synchronization gave the same effect on the estrous quality but different effect on the estrus duration based on vaginal mucus cell.

Keywords : Etawah Crossbreed, estrous synchronization method,

Introduction

Etawah Crossbreed goats were dairy animals that have high selling value. In order to improve reproductive efficiency, the reproductive management was a major concern to be well managed. There are many factors included in reproductive management, one of these is the method of estrous detection for the interest of Artificial Insemination (AI). The accuracy of estrous detection and time of AI is the key for the success of fertilization. In a great population of animals, estrous detection is not easy to do, therefore needed a synchronization method to facilitate the implementation of estrous detection.

Methods of estrous synchronization based on two principles, one is prolong the luteal phase and second is shorter the luteal phase. Related to the method of estrous detection, in our research before we used vaginal sponges with progesterone hormone as the content of sponges to synchronize in sheep. This method was very simple and economic. The research of dose and type of sponges content progesterone in the Etawah Crossbreed goats had been done, thus we going on to research about the effectiveness of this method compared with other methods. The aim of this research was to analyze profile of estrous in Etawah Crossbreed goats after synchronization with different methods.

In the research we used three treatments consist of implant of vaginal sponges content 60 mg progesterone MPA for 14 days, double injection of 5 mg PGF_{2α} interval 11 days, and implant of vaginal sponges content 60 mg progesterone MPA for 10 days + injection of 5 mg PGF_{2α} at 48 hours before end of implant. The differences of these treatments is on the effect of hormone,

whereas implan progesteron in spons could inhibit folliculogenesis in 14 days and estrus will came after the spons was released from the goats, while injection of $\text{PGF}_{2\alpha}$ could degraded the corpus luteum thus the animal become going on proestrus phase and then became estrus. In the combination treatment, progesteron inhibit folliculogenesis in follicular phase goats and $\text{PGF}_{2\alpha}$ would degraded the corpus luteum. These differences of mecanism of hormone would influence the level of estrogen that showed on estrous behaviour, and the changes of vulva and duration of estrus.

Methodology

The object of the research was 18 Etawah Crossbreed goat, virgin 1-2 years old in age. These goats divided in tree grup of treatment. The reasearch used Completely Random Design with three treatment and six replication. The treatment consist of : 1) T1 (implan of vaginal spons content 60 mg progesteron MPA for 14 days), 2) T2 (doble injection of 5 mg $\text{PGF}_{2\alpha}$ interval 11 days), and 3) implan of vaginal spons content 60 mg progesteron MPA for 10 days + injection of 5 mg $\text{PGF}_{2\alpha}$ at 48 hours before end of implant). Observation hadbeen done for seven days after the end of treatment. Parameters consist of estrous behaviour (scoring 1-3), colour of vulva (use indicator Salmofan), length and width the slit of vulva (measure by calipers) and duration of estrous (base on the existence of superficial and keratin cell). Data from estrous behaviour and score of vulva colour was analized by Kruskal Wallis, while size of vulva slit and estrous duration was analized by ANOVA and Duncan.

Results and Discussion

Onset of estrous

Result of this reasearch showed that the onset of estrus firstly appearance from T2 (69.03 ± 14.19 hours), followed by T3 (76.93 ± 9.90 hours) and T1 (85.30 ± 26.01 hours). Reult of ANOVA showed that there is no significant different in onset of estrus after treatment of T1, T2 and T3.

Estrous behaviour

Estrous behaviour appearance in day 3 was evaluated by scoring. Result showed that the modus from all treatment was 3. Result of Kruskal Wallis test showed that there is no significant different in estrous behaviour after treatment of estrous synchronization methode. The ended of estrous synchronization resulting decrease of progesteron then caused FSH secretion in high concenration. Thus FSH lead to development of granulosa cell and produce estrogen (Wumbu, 2003). High concentration of estrogen would trigger the goats showed the estrous behaviour.

The changes of vulva colour

The traits was shown by estrous goats are the color change of the vulva from initially pale to reddish. The results of the vulvar color assessment for seven days of observation in treated goats using the Salmofan color indicator. Result of Kruskal Wallis test showed that there was no significant difference about colour of vulva after treatment different synchronization methode. All of animal treated showed red colour at their vulva. According to Widiyono et al. (2011), the colour changes was influence by estrogen that increasing at estrus. Frandson et al. (2003) explained that after progesteron treatment ended and $\text{PGF}_{2\alpha}$ was injected, FSH increased thus folliculogenesis occure and granulosa cell in follicle developed to produce estrogen untill follicle de Graaf where estrogen in maximal level. This will stimulate the

thickening of the vaginal wall, increased vascularization causing the outer genitals to change color from pale to reddish accompanied by swelling and more mucus secretion.

Changes of vulva size

The goats being estrus will experience the color of the vulva to a reddish color accompanied by an enlarged size. The swelling of the vulva is seen from the widening of the vulvar lips and the increased length of the vulval cleft when the goats is in the estrous phase. The measurements of the width and length of the vulval cleft for seven days of observation after the termination. The result of ANOVA from data of 3rd day measurement showed that there is no significant difference of lip width size and length of vulva of goat being estrus after treated with different estrus synchronization methode. This showed that all three treatments have the same effect on the widening of vulvar lips and the length of the vulvar cleft where all of them have maximum size when the goats is in estrus phase ie on the 3rd day. The increase in length and width of the vulva from day 1 to 3 indicates that there is an increase in estrogen that caused vascularization of the vulvar wall periodically. Increased estrogen is due to FSH released after progesterone decline due to the discharge of synchronization methode, actively stimulating folliculogenesis. The granulosa cells that grow as follicle grows will begin to produce estrogen that will reach its peak when the follicle matures. The vulvar swelling of all treated goats is considered normal because it corresponds to the longer-acting size of the longitudinal bligon estrus vulva (3.06 cm) than when the anestrus condition (2.58 cm) (Widiyono et al., 2011) and the size of the Dwarf goat vulva gap African estrus (1.88 cm) longer than when anestrus conditions (1.85 cm) (Leigh et al., 2010).

Estrous duration

The dominance of vaginal mucus cells showed the estrous cyclical phase of the animal. Seen from the nucleus of the cell and its cytoplasm, vaginal mucus cells can be distinguished into parabasal, intermediates, superficial, and keratin (Major et al., 2005). In this study it was believed that at the 3rd day of observation the goats going on the estrus phase, in addition to the behavior and features of the red, swollen, and slimy vulva, the vaginal mucus cytology also indicates that the dominating cells move from intermediate cells to superficial cells on T2 and T3 and keratin cells on T1. According to Johnson (2006), estrus vaginal swabs will showed the dominance of superficial cells, but keratin cells can be used as a reference that the livestock is in the estrous phase because keratin cells are superficial cells that ceratinization resulting from high estrogen hormone in the body of livestock.

The dominance of superficial and keratin cells indicates that the livestock is in the estrus phase so that by looking at its dominance over time, the length of estrus can be determined by calculating the duration the occurrence of the two cells. The duration of estrus based on vaginal mucus cells of Etawah Crossbrees goats treated with T1, T2 and T3 were 31.30 hours, 31.10 hours and 11.36 horus resfectively. The results of ANOVA showed that duration of estrus was significantly ($p < 0.05$) affected by the treatment of estrus synchronization methode. Result of Duncan test, showed that the duration of estrus caused by goats treated with T1 and T2 longer than T3 while between T1 and T2 not significant.

Normally goats being estrus for 24-36 hours (Gimenez and Rodning, 2007). The duration of estrus shown by goats treated with T1 and T2 still in the normal range (T1 = 31.3 hours and T2 = 31.1 hours). According to Tagama (1995), estrogen levels in the body affect the duration of estrus, where high estrogen levels will lead to a longer estrus. Treatment of progesterone in vaginal sponge implanted for 14 days and treatment of double injection PGF_{2α} interval of 11 days can drastically reduce the progesterone level so that the release of FSH becomes optimal and estrogen secretion is optimal so capable to make the goats showed the normal duration estrus.

Result of T3, estrus duration shorter than normal range (T3 = 11.36 hours) and shorter than T1 dan T2. According to Fernandez-Moro et al. (2008) treatment of intravaginal implant of progesterone with injection of PGF_{2α} at 48 hours before end of treatment would trigger appearance more follicle than treatment implant of intravaginal progesterone or double injection, so the estrogen concentration in blood increased. Based on this research it was predicted that combination of progesterone intravaginal implant and injection of PGF_{2α} effectively decrease progesterone level, thus FSH released from anterior hypophysis capable to increase folliculogenesis in ovary. Increase of estrogen level linear with increasing of follicle. Estrogen then gave positive feedback to hypothalamus and then hypophysis to release LH faster than naturally, so increasing LH came faster and thus ovulation and luteinisation occur. This caused estrous duration going on faster.

Conclusion

Etawah Crossbreed goats treated by different estrous synchronization methods showed the same estrous quality but different in estrous duration. Treatment of T1 (implant vaginal sponges containing progesterone for 14 days) and T2 (double injection of PGF_{2α} interval 11 days) gave the longest estrous duration.

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Impact of management on calving interval and progesterone level in she-camels' milk in central Sudan

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Abstract

Thirty six of lactating she-camels and three mature male were selected, the animals were divided into three equal groups, the first group was managed in intensive system, all animals were kept in experimental farm and fed individually with concentrate and roughages. The second group was managed in a semi-intensive system; she-camels were grazed and supplemented with concentrate. The third group was served as a control under traditional system in this system animals graze grasses, agriculture's residues and browse the shrubs. Milk samples were collected at monthly intervals beginning at 4th month until the animal was confirmed pregnant. Milk samples were assayed for progesterone concentrations. Progesterone level in milk was also used to monitor ovarian activity during the service period and early pregnancy diagnosis. The result showed that progesterone concentration attained a higher value in intensive and semi-intensive systems as compared with the traditional system. In intensive system the lowest value of progesterone. The progesterone level within traditional system was recorded the lowest value in the 5th month postpartum and the highest value in 18th month postpartum, the lowest value under semi-intensive was recorded in the fifth month and the highest value was in 13th month postpartum. The farming system has a clear effect on the progesterone hormone concentration in she-camels under extensive and semi-extensive system that means the supplementation stimulated the ovarian activities, she-camels in traditional were pregnant later, calving interval days in extensive and semi-extensive was a shorter interval than under traditional system.

Keywords: camel milk, progesterone, management systems.

Introduction

Camels are an important livestock species in the arid and semi-arid zones in Asia and Africa. Camels contribute significantly to the livelihood of the pastoralists and agro-pastoralists living in the fragile environments of the deserts and semi deserts of Asia and Africa. The camel population in Sudan was estimated to be 4.623 million heads (Ministry of Animal Resources and Fisheries 2011) ranking the country worldwide second only to Somalia (FAO 1998). Most camels are raised within pastoral systems in the western Kordofan and Darfur and eastern regions of the country, they are well adapted to the local environmental conditions and can survive in zones which are prohibitive for other livestock species. The camels in Sudan are owned and raised by nomadic different tribes. Camel herders migrate north in the wet season and south during the dry season searching for the good pastures. Camel production in Sudan reared under four management systems include traditional nomadic system, transhumance or semi-nomadic system, sedentary or semi-sedentary system and the

intensive system (Shuiep et al., 2008; Ishag and Ahmed, 2011; Eisa and Mustafa, 2011). Traditional nomadic systems found in Sennar State and the type of camel is Nefidi camel, the herd owners kept the animals in these areas for milk and meat. Under traditional management the camel productive and reproductive traits are low. This may be due to herd dynamics and lack of sufficient feed and water (Bakheit, 2006).

The main constraints facing camel production under traditional system are that camels lose their base environments and desire of the herders to settle around towns and many old cultural values, the traditional role of the camel is disappearing so new and improved methods of camel raising must be initiated that will enable man to utilize the natural ability of the camel to produce milk, meat, fibre, hides and energy in areas where other animals cannot produce, or produce only with difficulty. The main Objective of this study was to investigate the impact of improved management system on camel reproductive potentials, to assess progesterone hormone level in camel milk as pregnancy indicator and to calculate the calving interval days in different husbandry systems.

Methodology

Animal and managements

This study was carried out in three different areas in central Sudan (Sennar State). Thirty six of lactating she-camels and three mature male for mating were selected, the animals were divided into three equal groups, the first group was managed in intensive system, all animals were kept during the study in experimental farm and fed individually daily with 5Kg of concentrate and 25 Kg of roughages. The second group was managed in a semi-intensive system with in near site of the first group, she-camels were grazed and browsed during the day they selected the available plants and shrubs, all animals were herded during the night in pens and supplemented individually daily with 5Kg of concentrate. The third group was served as a control under traditional system (as nomadic practice) in this system animals graze grasses, agriculture's residues and browse the shrubs.

Determination of progesterone level

From all experimental animals, milk samples (10 mL) were collected into tubes containing sodium-azide at monthly intervals beginning at 4th month from parturition and every month until the animal was confirmed pregnant by non-return to oestrus. Milk samples were centrifuged to remove fat and then stored until assayed for progesterone. Concentrations of progesterone in the defatted milk were measured using the solid-phase RIA system supplied by the Joint FAO/IAEA. Also a set of detailed structured questionnaires were used to collect information from camel owners about herd structure and constraints of camel production in the areas.

Statistical analysis

Data of monthly progesterone concentrations were analyzed using a least square model with husbandry amendment fixed effects and the random error using Statistical Analytical System (SAS, 2001). Least significant difference (LSD) was used to detect statistical significance between means.

Results and Discussion

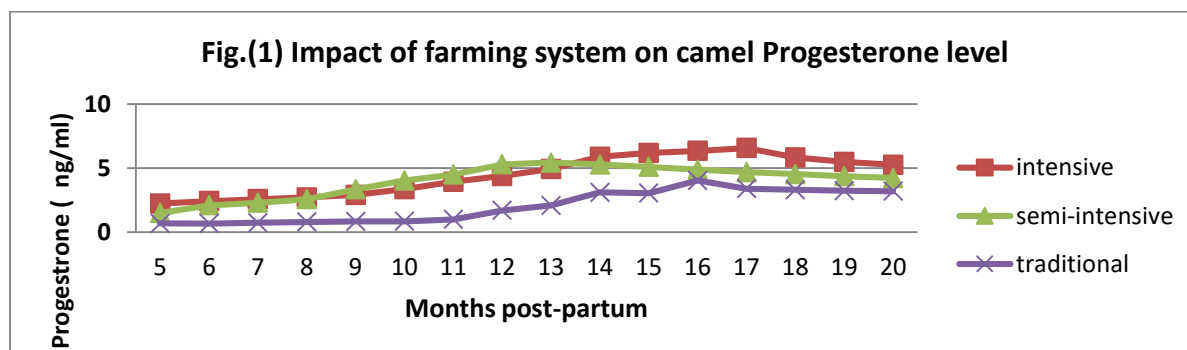
The result showed that the progesterone concentration attained a higher value in intensive and semi-intensive systems (4.73 ± 0.06 and 3.9 ± 0.07 ng/ml) as compared with the traditional system (1.46 ± 0.82 ng/ml). In intensive system the lowest value of the progesterone

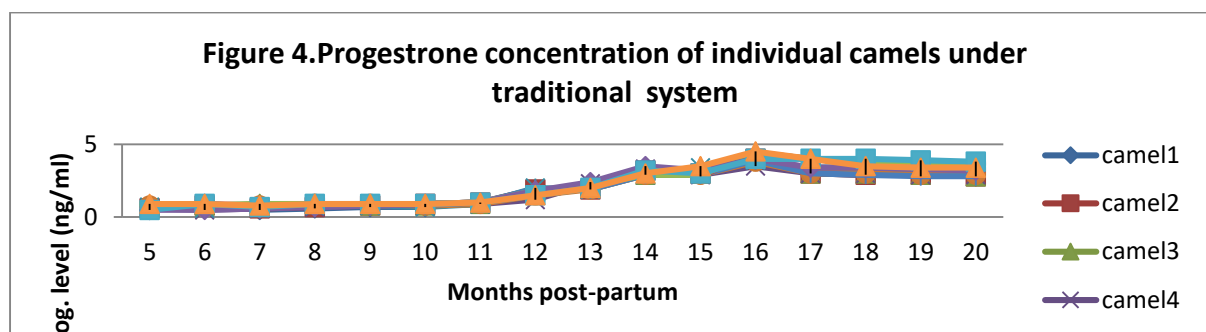
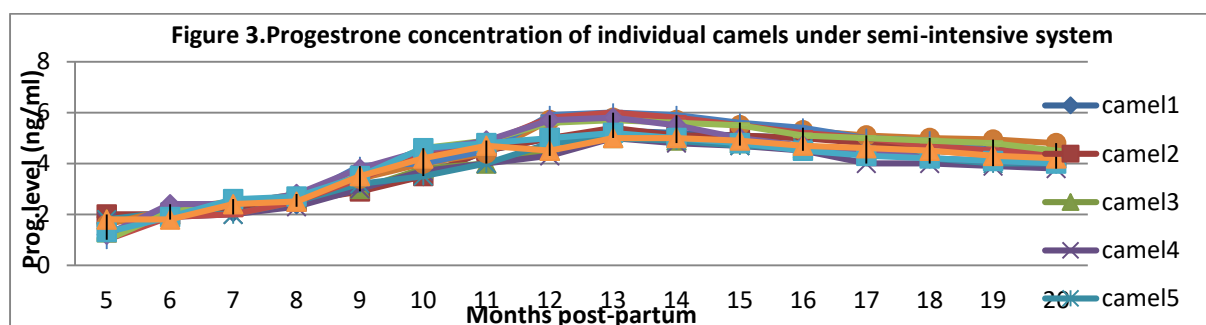
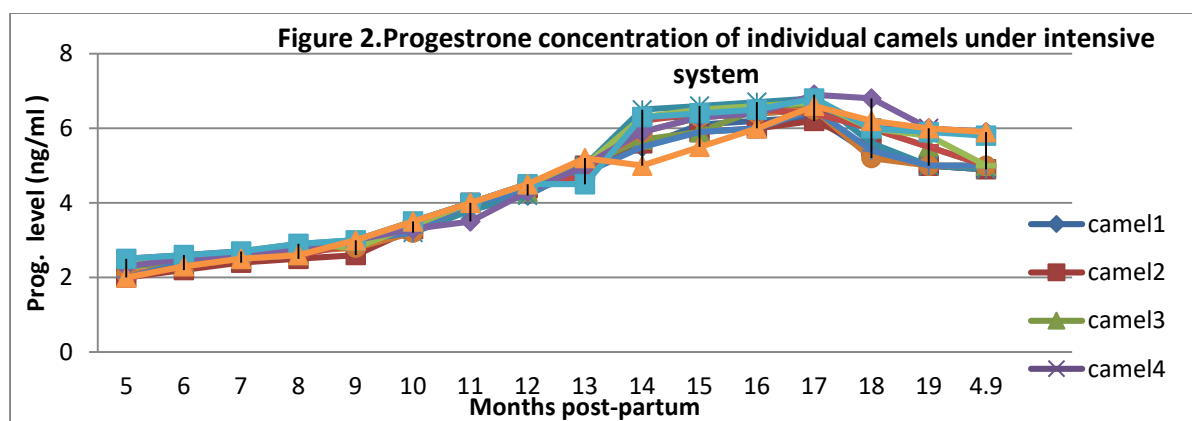
was 2.2 ± 0.4 in the 5th month and highest value was 6.8 ± 0.4 in the 14th months postpartum. The progesterone level within traditional system was recorded the lowest value 0.8 ± 0.52 ng/ml in the 5th month postpartum and the highest value was 3.5 ± 0.25 ng/ml in 18th month postpartum, the lowest value under semi-intensive was 1.9 ± 0.5 ng/ml recorded in the month 5th postpartum and the highest value was 5.7 ± 3.0 ng/ml which recoded in 13th month postpartum. The farming system has a clear effect on the progesterone hormone concentration in she-camels under extensive and semi-extensive system start to be pregnant earlier at the 7th month postpartum that means the supplementation stimulated the ovarian activities, she-camels in traditional were pregnant later, calving interval days in extensive and semi-extensive was a shorter interval than under traditional system. These results are agree with Bakheit et al (2003) Eisa (2006) and Eisa, et al (2001).

Progesterone concentration for she-camels manged in intensive system was showed in figure 2. The lvelevel of the concentration began more than 2 ng/ml milk and increased slowly till the 9th month and there were no clear variation between the the individual animals. in the 14th month the lvelevel reahed 5.5 ng/ml for camel5 and countniued till reached highest level (7ng/ml) for she-camel 11 in the 17th month. In the 18th, 19th and 20th month the level decreased sharply for most the animals and the individual variation was apperead during these months.

Progesterone levels of individual she-camels in semi-intensive system were shown in figure 3. The level of the concentration was ranged from 1 to 2 ng/ml and camel 2 was recorded highest value. Ml. the level of the progesterone increased gradually and reached the peak in the 12th „13th and 14th months for most individuals camels, camel6, camel 8 and camel 10 were recorded the highest value (6 ng/ml) also the clear variation between the individuals camels was appeared during the peak. The progesterone decreased slowly in the 15th month till reached the lowest value 3.8 for camel 5. The results of the present study was in line of findings of Saleh *et al.* (2000) who reported that in pregnant camels at latter half of gestation: The average concentration of Progesterone was relatively higher (5.87 to 12.07 ng/ml) between 23rd to 32nd weeks of gestation than at later stages (2.88 to 5.09 ng/ml).

Figure 4 show the concentration of progesterone for the camels reared under traditional system. In pregnant females progesterone concentration began less than 0.5 ng/ ml in the 5th months for most individuals camels and increased significantly clearly in the 12th month in most individuals camels reached 2 ng/ml . In pregnant females progesterone concentration increased significantly ($P < 0.05$) in 16th month of pregnancy and reached the higher value above 4.5 ng/ml for she camel 12, the variation between individuals females was appeared in 16th months, the clear variation between she –camels continued till the 20th months . These results are disagree with Saleh et al. (2000) and this may be to nutrition variation of the grasses. The values observed in present study resembled all those reported previously in camel studies (Ayoub et al., 2003 and Sghiri, et al. 2004)





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Morphometric and Viability Epididymal Sperms of Swamp Buffalo (*bubalus bubalis*)

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Abstract

The aimed of this research was conducted to described morphometric and viability epididymal sperms of buffalo (*bubalus bubalis*). Three buffalo testes were obtained from abattoir, and sperms collected from cauda epididymal. Morphometrics and characteristics of epididymal sperms were analyzed under phase contrast microscope and viability of epididymal sperms was evaluate by fertilizing ability to mature oosit. The morphometrics value of sperms head length, sperms head with, tail length, ellipticity and elongation were $8.39 \pm 1.18 \mu\text{m}$, $4.06 \pm 0.44 \mu\text{m}$, 2.01 ± 0.33 , 0.33 ± 0.07 , $45.40 \pm 12.06 \mu\text{m}$ and $72.40 \pm 12.06 \mu\text{m}$. The mean percentage of alive sperms, motility and membrane plasma intact were 83.40 ± 2.94 , 76.67 ± 5.77 , 11.07 ± 0.11 and $62.78 \pm 2.51 \%$, respectively. Fertility of epididymal sperm was 44.50 %. In conclusion, epididymal sperms have been potency to fertilized oocyte.

Keywords : buffalo, mophometrics, characteristic, epididymal sperm.

Introduction

Buffalo is one of ruminants plays a important role in meat production in developing countries. Especially in West Sumatera these animal is also kept to produce milk for traditional food is dadih. However, the research for optimalization their potency has not been intensive as well as in cattle. The main constraint in breeding buffalo associated with poor reproductive efficiency, it shown with signs of estrus expression, late sexual maturity, lower conception rate, and longer calving interval. In animal, conception rate are depend on fertility of oocyte and spermatozoa. Beside sperms ejaculate, previous research have been reported succesful of using epididymal sperms to fertilized bovine oocytes (Rodríguez-Villamil, 2016), stallion (Monteiro, et al., 2011) dan ovine (Bergstein-Galan et al., 2017). This study was conducted to described morphometrics, characteristic and viability of epididymal sperms of buffalo. The characteristic of semen can be used as fertility predictor in buffalo.

Methodology

Epididymal sperms colection

Epididymal sperms were collected from cauda epididymal of buffalo testes that obtained from abattoir. The testes were transport to laboratory in fisiologis buffer (0.9 % NaCl) at 37 °C in 4 hours. Cauda epididymal were sliced in peteridish to maximize recovery of sperms. The collected epididymal sperms were diluted with Tyrod's Abumin Lactate Pyruvate Solution (TALPS) supplemented with 50µg/ml gentamicin (final concentration 5×10^{-6} ml).

Sperms morphometric

Sperms morphometric consist of sperm head length, sperm head width and sperm tail

length were measured under phase contrast microscope (Observer A1, Zeiss, with camera Axio cam HRc,) (400x). Resolution of images was 0.08m per pixel in the horizontal and vertical axes. A drop of semen ($\pm 10 \mu\text{l}$) were placed on object microscope glass and added with 50 μl 1 % eosin. After staining, at least 200 epididymal sperms were observed for sperms morphometric analysis. Beside that base on primary measurment of head, the derive parameters of head sperms such as Ellipticity (L/W) and elongation $((L-W)/(L+W))$ were counted (Hidalgo, et al 2008).

Sperms characteristic

Evaluation of semen characteristic consist of sperm motility, morphology abnormality and plasma membrane integrity (hypo osmotic solution test). Sperm motility was assessed subjectively using a phase-contrast microscope (Observer A1, Zeiss, with camera Axio cam HRc,) (400x) with a warm slide (38°C). At least, 200 sperms were evaluated per smear for motility analysis. For assesment sperms morphology abnormality, 15 μl semen were transfered into 100 μl drop of eosin stain in object microscope glass. A total 200 sperms were evaluated for abnormal morphology. Plasma membrane integrity of sperm were assessed using hypo osmotic solution (9 g fructose + 4.9 g sodium citrate dilute in 1000 ml deionized water). After incubation, 20 ml of drop mixture were smeared in object microscope glass. A total 200 sperms were evaluated under 400 x magnification in phase contras microscope and the percentage of swollen and curly were recorded.

In vitro fertilization

Viability of sperms were evaluated by in vitro fertilization technique. Oosit used in this study were obtained from abattoir. The oocytes were matured in TCM 199 medium in incubator 5% CO_2 at 37°C for 24 hours. Thirty matured oocytes were transffered to microdrops (100 μl) containing epididymal sperm 1×10^6 sperms/ml in TALPS medium supplemented with 5 $\mu\text{g/ml}$ caffeine, 50 $\mu\text{g/ml}$ gentamicin and 5 % bovine serum. Oocytes were incubated with epididymal sperms at 37°C in atmosphere 5% CO_2 for 18 hours. Fertilized oocytes were cultured in TCM 199 medium in incubator 5% CO_2 at 37°C until 48 hours and percentage of embryo cleavage were recorded.

Results and Discussion

Sperms morphometric and characteristics of swamp buffalo can be seen in Table 1 and Table 2. Morphopometrics epididymal sperms bufallo, consistent with Estesoa et al (2015) reported sperm head length, sperm head width, tail length were 8.42,4.21, elongation 0.33 and elipticity 2.01 Morphometric value may vary depending on factor intrinsic and extrinsic to semen donor (Yaniza et al, 2015).

Table 1. Epididymal sperms morphometric of swamp buffalo

Variabel	Mean
Sperm head length, L (μm)	8.39 ± 1.18
Sperm head width, W (μm)	4.06 ± 0.44
Ellipticity; L x W	2.01 ± 0.33
Elongation ; L-W/L+ W	0.33 ± 0.07
Tail length (μm)	45.40 ± 12.06
Total sperms length (μm)	72.28 ± 11.80

Tabel 2. Epididymal Sperms Characteristic of swamp buffalo

Variabel	Epididymal			Mean
	1	2	3	
Sperms alive (%)	85.10	80.00	85.10	83.40 ± 2.94
Motility (%)	80	70	80	76.67 ± 5.77
Abnormality (%)	11.20	11.00	11.00	11.07 ± 0.11
MPI (%)	65.10	63.13	60.11	62.78 ± 2.51
Viability %	40.00	46.00	46.00	44

The sperm scharacteristic in this study a lower than reported in cattle, with sperms alive, motility and MPU was 90.7 ± 2.9 , 78.1 ± 3.9 and 86.5 ± 4.2 , respectively. Percentage of cleaved embryos in bovine after using sperms epididymal to fertilized was $44.5 \pm 2.9\%$ (Chaveiro et al., 2015).

Conclusion

This study shiwed that epididymal sperms have been potency to fertilized oocyte.

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Exploration of quality frozen semen in Aceh cattle through observation microscopically

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Abstract

This experiment aimed to determine the quality of frozen semen Aceh cattle through microscopic observation. The material used in this research is twelve units of frozen bulls straw of beef cattle, nine units of bulls frozen Aceh cattle straw from three different bulls of Aceh (Nanggroe, Agam and Rencong). As a comparison, the observations were also conducted on frozen bull Ongole (Orlon) cattle as much as three units of straw. Frozen semen was obtained from the Animal Health and Animal Husbandry Department of Aceh Province produced by Artificial Insemination Center Lembang, West Java. This study was conducted on June 6, 2016 to August 08, 2016. The parameters observed were sperm concentration, mass motility, individual motility, spermatozoa abnormality and viability. The data obtained during the study were then tabulated and determined the mean, standard deviation and standard error using Microsoft Excel Software. The results obtained from the study are "Nanggroe" Aceh cattle bulls have better quality of frozen semen than frozen bulls of other Acehnese bulls with average spermatozoa concentration of 833.33 million/ml, mass motility (++), individual motility 45, 83%, spermatozoa abnormalities 10.33% and viability of 54.17%.

Keywords: Aceh cattle, spermatozoa concentration, quality of semen, frozen semen

Introduction

Cattle are one of the importance domestic animals in Indonesia. They are also regarded as excellent meat producers. To increase the demand for their product, attention has been focused on the genetic improvement of these species. Aceh cattle is one of animal genetic resources from Aceh province (Sari et al. 2016). Aceh cattle population tends to decline as demand and cuts are not proportional to population growth, in addition to uncontrolled marriages and inadequate maintenance systems causing Acehnese cattle to become small-sized.

Biotechnology is a process of processing raw materials derived from living things that are used as biological agents to produce goods and services. Application in the field of animal husbandry in Indonesia one of them is technology Artificial Insemination (AI). Through Artificial Insemination, breeders can determine the types of cattle they will develop and extend marriages with superior males through the use of frozen semen. To achieve this goal many farmers in Aceh Province are using frozen semen from other superior males in the Artificial Insemination program. This will eventually lead to the extinction of the existence of Aceh cattle in the province of Aceh.

Currently Artificial Insemination Center in Lembang has had five bulls of Aceh superior cattle imported from Aceh and has been through a rigorous selection. The production of frozen semen of Aceh cattle aims to meet the needs of frozen semen in Aceh Province. The

Aceh bull frozen cement is expected to increase the population and excellence of Aceh cattle, in addition to maintaining the existence of the bull itself. The success of an AI program is determined by the quality of frozen cement, therefore microscopic testing of frozen cement bulls in Aceh is considered necessary. The purpose of this research is to explore the quality of frozen cement of Aceh cattle through microscopic observation.

Methodology

The study was conducted in Animal Breeding and Reproduction Laboratory, Department of Animal Husbandry, Faculty of Agriculture Syiah Kuala University, Banda Aceh. The equipment used in this research is Stereo Microscope, Object Glass, Glass Cover, Micro Pipette, Ose Needle, Scissors, Petridish Grille, Tweezers, Bunsen, Lighters, Thermometer, Stopwatch and Container Straw. While the materials used are straw frozen cement, N2 liquid, liquid Aeosin 2% and spiritus. This research used observation method with three replicates on each straw of each stud through calculation of the average of microscopic observation on frozen cement straw. The data obtained during the study were tabulated and determined the mean, standard deviation and standard error using Microsoft Excel Software. Parameters observed in this study were spermatozoa concentration, mobility motility, individual motility, spermatozoa abnormality and viability. Research procedure frozen cement to be analyzed is removed from container then thawing with temperature referring to Indonesian National Standard issued by National Standardization Bureau (BSN). Examination of frozen cement immediately after thawing at 37°C for 30 seconds.

Results and Discussion

The concentration of frozen spermatozoa obtained from the four bulls was the highest of the bulls of Aceh Nanggroe (833.33 million/ml) and the lowest was in Rencong Aceh (566.67 million/ml) better than the Ongole (500 million/ml). The value of fresh cement concentration on the three bulls of Aceh is Nanggroe of 936.66 million/ml, Rencong of 970 million/ml and Agam of 1013 million/ml (BIB Lembang). If analyzed the percentage of the decline, Aceh cattle Nanggroe decreased by 11.03%, Rencong 41.68% and Agam 34.18%. The cause of the decrease in the quality of concentrations of frozen cement is due to clotting processes, the decline is still categorized good, because according to Hafez (2000). frozen spermatozoa will be damaged by about 40%. Campbell et al. (2003). suggests that fresh spermatozoa concentrations in adult bulls range from 800-1200 million/ml of spermatozoa. The result of mass motility analysis showed that the mean of mass motility quality showed moderate result (+). Only the Aceh cattle that have good mass motility (++), are probably due to the bulls adaptability to local climatic conditions. (Sarastina, 2006). The highest spermatozoa motility value analysis was owned by Aceh Nanggroe (45.83%) and the lowest was owned by Aceh cattle Agam (21.50%). The motives of the three spermatozoa of Aceh bull cattle are Nanggroe (60%), Rencong (66.11%) and Agam (66.67%) (BIB Lembang). If the percentage of motility quality degradation is analyzed individual due to freezing. Aceh cattle Nanggroe decreased by (14.17%), Rencong (36.44%) and Agam (45.27%). This is in accordance with the opinion of Adikarta and Listianawati (2001) states that the motility of spermatozoa immediately after liquefaction shows the number gradually decreases with increasing storage time. Which means after the freezing process, the quality of cement belonging to the Aceh Nanggroe cattle is still feasible to be inseminated. The lowest abnormality was in the Aceh cattle Rencong (4.17%) and the highest was found in the Aceh cattle Nanggroe (10.33%). The number of abnormal sperm obtained is also within the range of values suggested by Campbell et al. (2003)^[3] who stated that high quality cement contains

a maximum of 5-15% of abnormal sperm. The results of the viability examination on the frozen semen straw of the four bulls showed the results in Figure 1.

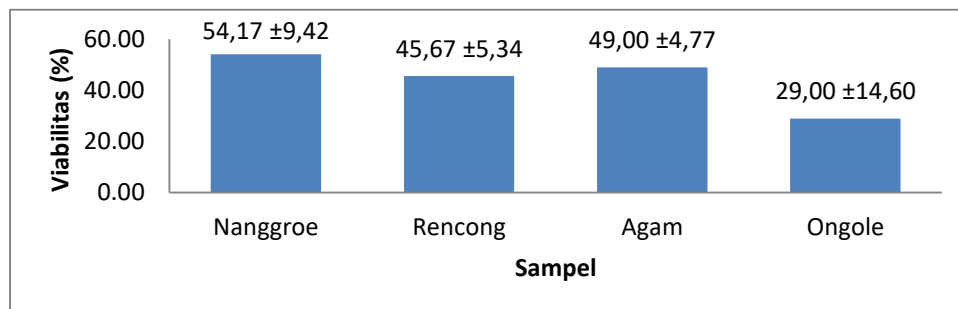


Figure 1. Percentage of viability

The highest value of the viability analysis was owned by Aceh cattle Nanggroe (54.17%) but still better than the quality of Ongole (29.00%). The highly unstable nature of the frozen semen causes the membrane conditions to have a high degree of vulnerability. Also suspected due to the influence of cold shock when the process of freezing. The freezing process resulted in the death of spermatozoa reaching 30% of fresh spermatozoa amount or after dilution and cooling effects due to cooling effect (Goldman *et al* 1991).

Conclusion

The best result of the evaluation was found in Aceh cattle Nanggroe with spermatozoa concentration of 833.33 million/ml, mass motility (++), individual motility 45,83%, abnormality 10,33% and viability 54,17 %.

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Reproductive characteristics of gayo buffalo in Linge District of Central Aceh

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Abstract

A study on reproductive characteristics of gayo buffalo in Linge sub-district, Central Aceh District has been conducted. The purpose of this research is to identify the reproductive ability of gayo buffalo. Data has taken from forty breeders as respondents. The determination of respondents by purposive sampling, who was maintaining two female buffaloes. The data collected includes buffalo reproduction characteristics. The collected data was analyzed descriptively using frequency tables and percentages. Excel sheet is used to process the data. The results showed that the age of gayo buffalo puberty was 27.9 months, with the first mated age of 32.6 months, the average age of buffalo gave birth to the first child was 42.6 months, while the average calving interval was 19.5 months, the sex ratio of male and female buffaloes is 1.2: 1 and the percentage of male 55.92 and females 44.07. Gayo buffalo population in Linge sub district, Central Aceh district, covering four villages namely, Jamat Village, Kute Robel, Lumut, and Owaq are 12.31% males, 48.32% females, 22.01% males and 17.35% females.

Keywords: reproduction, calving interval, sex ratio, age of puberty, gayo buffalo

Introduction

Buffalo are one of the importance domestic animals in Indonesia. They are also regarded as excellent meat producers. Gayo buffalo is swamp buffalo type (*Bubalus bubalis*), and is one of animal genetic resources from Aceh province (Sari et al. 2016). They are living in Bener Meriah, Central Aceh, and Gayo Lues district. Gayo buffaloes live naturally with traditional maintenance management, resulting in poor parental and child birth monitoring, and massive population decline. Another reason is the high livestock expenditure or sale of buffalo between cities and local cuts that exceed the production capability, and on the other hand may be caused by the low level of buffalo reproductivity. The main causes of poor reproductive performance in buffalo are weak signs of lust, calm lust, seasoned anestrus, and the length of the postpartum unestrus period are also found to decrease libido in male buffaloes during the summer (Gordon, 1996). From the fourteen sub-districts in Central Aceh, Linge Sub-district is one of the sub-districts that have a large number of Gayo buffaloes. Although Gayo buffaloes have been designated as animal genetic resources from Aceh Province, but data on Gayo Buffalo reproduction in Linge district is not available. Based on these facts, it is necessary to study on the characteristics of reproductive of Gayo buffalo in Linge district.

Methodology

This research has been conducted for one month from January 20 to February 20, 2017 in four villages in Linge sub-district, Central Aceh covering Jamat village, Kute Robel, Lumut and Owaq. The location of this study was purposive sampling with consideration Linge District has a large buffalo population in Central Aceh. Survey method was used in this research. Direct observation activity conducted to the location of research, with minimum requirement of breeder keep two female buffalo that has two children. Forty farmers as respondents spread over four selected villages. The data has taken from ten farmers as samples in each village. Observed variables: first age of puberty, age of first mated, age of buffalo gave birth of the first child, calving interval, Sex Ratio birth of Male and Female Children.

Results and Discussion

The results showed that the age of gayo buffalo puberty is 27.9 months. While sumbawa buffalo is 29 months. This shows that Gayo's buffalo owned by farmers in four villages in Linge sub-district is relatively fast in puberty. Most of the information indicates both male and female buffalo reach sexual maturity at 3-4 years of age (Fischer and Bodhipaksha, 1992).

The first mated age of gayo buffalo is 32.6 months. These results indicate that gayo buffaloes are still too young to marry. This happens because the maintenance system is herded together. According to Kazimi (1983). that female buffalo was first mated to produce a good and healthy offspring is at age 3.76 years. The age of the first breeds of Gayo buffalo is 3.7 years old. This figure is similar to Chantalakhana (1981) which stated that the age of the first breeds of buffalo in Indonesia ranged from 3.5 to 4.7 years. The results showed that the duration of pregnant of Gayo buffalo is 315-320 days or an average of 10-11 months.

The percentage of the ratio of births of males: females in Linge district is 1.2: 1. From the results of this study it can be said that the ratio of births of males: females, higher birth rates in male when compared with female buffalo. The type of child born was determined at the time of fertilization (Berry and Crome, 2007) with only a combination of one maternal gamete and two paternal gametes producing 50% male and 50% female (Kezyzaniak and Hafez, 1987).

Conclusion

The age of gayo buffalo puberty is 27.9 months, with the first mated age 32.6 months, the average age of buffalo gave birth to the first child at 42.6 months, with an average length of pregnancy 316.5 days, the average of calving interval is 19.5, and sex ratio of male and female 1.2: 1.

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Gelatin quality from Ongole crossbred (PO) and Madura cattle hides using HCl and NaOH curing

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Abstract

The research aimed to know the quality of gelatin from Crossbred Ongole (PO) and Madura Cattle hides using HCl and NaOH curing method. The research materials were rawhide from 2.5-3 years of age males Crossbred Ongole and Madura cattle and curing solutions were hydrochloric acid (HCl 0.25 M) and sodium hydroxide (NaOH 0.25 M). The statistically method was a Randomized Block Design of Nested Experimental Design with 3 replications. The results showed that the cattle hide type had no significant effects ($p > 0.05$) on protein content (%), viscosity (cP), A_w , gel strength (bloom), yield (%) and highly significant difference ($p < 0.01$) at pH. While the type of curing were significantly influenced ($p < 0.01$) on pH, gel strength (bloom), yield (%), and significantly affected ($p < 0.05$) on protein content (%) and viscosity (cP) but not significantly affected ($p > 0.05$) on A_w gelatin. In conclusion, the gelatin from Crossbred Ongole (PO) and Madura cattle hides using HCl 0.25 M and NaOH 0.25 M curing method had different qualities and significantly influenced by the curing types.

Keywords: gelatin quality, PO and Madura cattle hide, HCl and NaOH

Introduction

Based on Livestock Statistics in 2016, beef cattle population increased annually 14,727,000 head in 2014 to 15,420,000 head in 2015 and increased to 16,093,000 head by 2016, then the largest population of beef cattle is in East Java (Anonymous, 2016). Madura and Crossbreed Ongole cattle are Indonesian native cattle. Import gelatin is annually increasing and up to day there is no local industry to produce and supply for the national demands. Therefore it is necessary to explore more deeply the potential of hides from Indonesian native cattle as a raw material of gelatin.

Gelatin is a derived material from a skin, bone or other connective tissue which rich in collagen, both from large and small livestock with acid or base process to convert collagen into gelatin. Commonly used acidic solutions include formic acid, hydrochloric acid, acetic acid and others, while the bases used include lime or sodium chloride, so there are 2 types of gelatin were type A (acid) and type B (base) gelatin. Where the curing type to be used and other processes will affect the quality of gelatin produced. Schrieber and Gareis (2007) founded that the quality of gelatin is influenced by the raw materials, the support materials used and the process of making gelatin. Pharmaceutical, cosmetic, pharmaceutical, food and beverage industries use gelatin because of its multi functional gelatin properties. This research aimed to explore the potential of Indonesian native cattle hides, there were Madura and Crossbreed Ongole cattle by using curing solution of HCl and NaOH and their effects on the gelatin quality since there was no information of the local gelatin production.

Methodology

The materials were fresh male cowhide of Madura and Crossbreed Ongole cattle about 2.5-3 years aged. Curing solution were hydrochloric acid (HCl) 0.25 M and sodium hydroxide (NaOH) 0.25 M. Variables analysis: protein content(%), pH and A_w (AOAC, 2005), viscosity (cP) (Arnesen and Gildberg, 2002), gel strength (bloom) (Muyonga et al., 2004), yield (%) (Gimenes et al., 2005) The method of making gelatin according to Schrieber and Gareis, (2007)^[2] with slight modification, Madura cattle hides (M) and Crossbreed Ongole cattle hides (P) was cured in HCl and NaOH (1: 2) for 2 h, washed to normal pH (7), extracted with aquadest (1: 2) at temperature 55°C for 6 hours, and dried using oven temperature 60°C for 4 days (until dry). The statistically methods was Randomized Block Design of Nested Experiment Design with 3 replications and the mean differences were continued with Duncan Test.

Results and Discussion

Data of protein content, viscosity, gel strength, yield, A_w and pH gelatin were presented in Table 1. It showed that hide types had a very significant effect on gelatin pH ($p < 0.01$) while no effect ($p > 0.05$) on protein content, viscosity, gel strength, yield and A_w . However, based on hides type in each curing type, protein and viscosity levels were significantly difference ($p < 0.05$) and pH, gel strength and yield were very significantly difference ($p < 0.01$). The result of curing treatment with NaOH showed that Madura and PO cattle hides types were significantly difference ($p < 0.01$) at pH.

Table 1. Physicochemical Madura cattle and Crossbreed Ongole (PO) cattle hides gelatin.

	Cattle Hides		Madura Cattle hides		PO cattle hides	
	Madura	PO	HCl	NaOH	HCl	NaOH
1. Protein content (%)	77.81±4.91	75.31±5.98	79.71±4.20	75.91±5.63	77.80±6.28	72.82±5.59
2. Viscosity (cP)	7.67±3.14	7.33±1.51	10.33±1.53 ^a	5.00±1.00 ^b	7.67±2.08	7.00±1.00
3. Gel strength (bloom)	124.46±57.08	123.40±41.35	176.22±6.34 ^a	72.69±8.05 ^b	159.74±9.57 ^a	87.06±14.86 ^b
4. Yield (%)	6.60±2.93	6.93±2.68	9.21±0.99 ^b	3.99±0.32 ^a	9.34±0.57 ^a	4.52±0.32 ^b
5. A_w	0.54±0.02	0.57±0.07	0.54±0.02	0.53±0.03	0.60±0.09	0.53±0.03
6. pH	6.29±2.97 ^a	6.49±3.34 ^b	3.58±0.09 ^b	8.99±0.05 ^a	3.45±0.08 ^b	9.54±0.05 ^a

Note : ^{abc}indicated that rows with different letters are significantly different ($p < 0.05$). All values are mean ± standard deviation from three replications

Gelatin quality of this research have a of 72.82-79.71% of protein content, 5.00-10.33 cP of viscosity, 72.69-176.22 bloom (gel strength), 3.99-9.34% (yield), 0.53-0.60 (A_w) and 3.45-9.54 (pH). The protein content of gelatin was influenced by the dissolution rate of hides collagen in curing solution and resulted the highest protein content in gelatin from Madura cattle hides with HCl curing (79.71%). Wang et al. (2008) suggested that the degree of dissolution of collagen is affected by the curing material because it will affect on collagen microstructure, while the heating during extraction will facilitate the collagen to dissolve or solubilizes. The greatest viscosity value was 10.33 cP on the cowhide of Madura with curing HCl. Leiner (2002) explained that the length of the molecular structure and the arrangement of amino acids that make up proteins affect the increase in gelatin viscosity value. The highest gel strength in the gelatin from cowhide Madura with curing HCl (176.22 bloom). Gel strength value is influenced by the concentration of material and curing time and is one of the parameters to determine the physical quality of gelatin (Kolodziejaska et al., 2003). The smallest gelatin A_w is gelatin with curing of HCl from both Madura cowhide and PO (0.53). The Said (2011) study with CH_3COOH produces a higher A_w than $\text{Ca}(\text{OH})_2$ on goat skin gelatin of caused when using base bond curing occurs only in water molecules with hydroxyl

(OH) groups. This bond is considered weak so that the free water content present in the material is relatively smaller resulting in a lower A_w value. While the best gelatin pH value (close to normal) is on the gelatin from Madura cowhide with curing NaOH (8.99).

Conclusion

Madura and PO cattle hides gelatin have different physicochemical qualities. HCl curing is a higher yield compared to NaOH curing.

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Goat milk kefir increases the phagocytosis activity of peritoneal macrophages in diabetic rat

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Abstract

Kefir is one of the fermented milk product has been demonstrated to increase phagocytosis activity of macrophage in healthy mice. While, soy contains fiber, minerals, and isoflavones, which are beneficial nutrients that may contribute to a reduction in chronic disease risk such as type-2 diabetes. The purpose of this study was to evaluate the effect of goat milk kefir, soy milk kefir, and combined milk kefir (from goat milk and soy milk) on phagocytosis activity of macrophages in diabetic rat. Rats were divided into five groups: normal control, diabetic control, goat milk kefir, soy milk kefir and combination of goat milk-soy milk kefir. All rats were induced by streptozotocin-nicotinamide (STZ-NA), except for normal control. After 35 d experiment, the rats were sacrificed and sampled for peritoneal macrophage. Results showed that there were significant differences between goat milk kefir, soy milk kefir and combined kefir on the phagocytosis capacity ($p \leq 0,01$) and the phagocytosis index ($p \leq 0,05$) of peritoneal macrophage in diabetic rats. Phagocytosis capacity and index in diabetic control rats were the same as the normal control rats. However, goat milk kefir or combined kefir that administered in diabetic rats could enhance the phagocytosis capacity more than the normal control rats. Only goat milk kefir could increase the phagocytosis index in diabetic rats more than soy milk kefir group or the normal control rats. In conclusion, goat milk kefir and combined kefir can play a role in innate immunity, through increasing the phagocytosis capacity of peritoneal macrophage in type-2 diabetic rats.

Keywords: kefir, diabetic, phagocytosis capacity, phagocytosis index

Introduction

Kefir is a natural probiotics, has less acidic taste, yeasty aroma and foamed on stirred due to containing acid, alcohol and CO₂ (Otles and Cagindi, 2003; Adriana and Socaciu, 2008). Various type of microorganism that present in kefir grains are lactic acid and acetic acid bacteria, yeasts and fungi (Witthuhn et al., 2005). In a previous study, kefir combination from goat milk and soy milk can a role as antidiabetic through maintaining in serum triglyceride, decreasing in plasma glucose, increasing in glutathione peroxidase (GPx) activity, and improving the pancreatic β -cells in type-2 diabetic rats (Nurliyani et al., 2015).

Macrophages play an important role in innate and adaptive immunity as professional phagocytes by internalizing and damaging pathogens (Aderem and Underhill, 1999). In a previous study, was demonstrated that kefir stimulate the immune response in healthy mice, enhancing the number of IgA+ cells in the intestinal and bronchial mucosa and the phagocytic activity of peritoneal and pulmonary macrophages (Vinderola et al., 2006). The aim of this study was to evaluate the effect of of goat milk kefir, soy milk kefir, and combined milk kefir (50% of goat milk and 50% of soy milk) on phagocytosis activity of peritoneal macrophages in diabetic rats.

Methodology

Preparation of soy milk kefir according to Kasenkas et al. (2011) with slight modifications. The pasteurized milk were divided into 3 groups of milk combination from goat milk and soy milk (100:0; 50:50; and 0:100) and cooled at room temperature. Kefir grains was inoculated into pasteurized milk as much as 2%, and fermented at room temperature for 18 hours. After separating the grains, kefir samples were stored at 4°C for use in experimental animals.

The male Wistar rats (8-12 weeks old) were randomly assigned into five groups (n=6 per group): 1) negative control (normal rats); 2) positive control (untreated diabetic rats); 3) diabetic rats supplemented goat milk kefir; 4) diabetic rats supplemented kefir combination from goat milk and soy milk; and 5) diabetic rats supplemented soy milk kefir. In group 4, kefir was prepared from combination of goat milk and soy milk 50%:50%. For rat model of type-2 diabetes was done by induction with STZ-NA (Ghasemi et al., 2014). For all treatments received a standard laboratory diet AIN-93G (Reeves et al., 1993). The dose of goat milk kefir was 2 mL/200 g body weight/day orally, for 35 d experiment with force feeding. In negative control, the rats were given 2 mL phosphate-buffered saline (PBS). Furthermore, the rats were sacrificed, and peritoneal macrophages were sampled for phagocytosis activity test. All procedures related to animal experiment in this study were approved by Medical and Health Research Ethics Committee (MHREC), Faculty of Medicine Universitas Gadjah Mada, Indonesia (Approval Number: KE/FK/907/EC).

Isolation of macrophage and culture were carried out according to Garcia et al. (2002). Phagocytic Capacity = (number of macrophages containing latex beads/total of macrophages counted) x (100). Phagocytic Index = number of latex beads inside macrophages/ number of macrophages phagocytosing (Jensch-Junior et al., 2006).

All the data from this study were expressed as mean \pm standard deviation. Two Way ANOVA followed by Duncan's Multiple Range Test (DMRT) were used for statistical analyses, and p-values of less than 0.05 ($p < 0.05$) indicated significant differences. Statistical analyses were performed by using the SPSS version 17.

Results and Discussion

Shown on Table 1, the rats fed goat milk kefir or kefir combination from goat milk and soy milk have higher phagocytosis capacity ($p < 0.01$) and phagocytosis index ($p < 0.05$) than soy milk kefir. In addition, the substitution of 50% goat milk with soy milk in the kefir fermentation

Table 1. The average phagocytosis capacity and index of macrophage in diabetic rat with various treatments

Treatment groups	Phagocytosis capacity (%)**	Phagocytosis index*
Normal control	66.00 \pm 9.00 ^{ab}	1.71 \pm 0.71 ^{ab}
Diabetic control	74.00 \pm 4.00 ^{bc}	2.58 \pm 1.33 ^{abc}
Goat milk kefir	77.00 \pm 7.00 ^c	3.19 \pm 0.39 ^c
Soy milk kefir	60.00 \pm 8.00 ^a	1.30 \pm 1.37 ^a
Combined milk (goat -soy milk) kefir	75.00 \pm 5.00 ^c	2.82 \pm 1.22 ^{bc}

Different letter within the column indicate significantly different ($p < 0.01$ **, and $p < 0.05$ *)

Process cause a decreased in phagocytosis capacity and index, although the decrease was not significantly different. When compared with normal control rats, the phagocytosis capacity of both kefir (goat milk and combined kefir) were significantly higher. However, only

the rats fed goat milk kefir had a higher phagocytosis index than normal control rats. This result indicate that phagocytosis activity of macrophage more influenced by goat milk kefir components than the soy milk kefir components. According to Nurliyani et al. (2015), acidity of goat milk kefir was higher than soy milk kefir. This is indicate that microbia in kefir grain grow better in goat milk, especially lactic acid bacteria and lactose-fermenting yeast. Therefore, macrophage stimulation by probiotics was greater in rats fed goat milk kefir than rats fed soy milk kefir. Probiotics in fermented milk were able to modulate macrophages activity through the TLR2 and TLR4 pathway. After probiotics stimulation orally, receptor could influence phagocytosis activiy and microbicidal of macrophages. Because the macrophage expressed surface receptor, then it can recognize and respond to Microbe-Associated Molecular Patterns (MAMPs). Furthermore, the probiotics mediate macrophages stimulation to induce an innate immune response, and to send signals to enhance the adaptive immune response (Galdeano et al., 2015).

In the present study, goat milk kefir could increase the phagocytosis index. This may be goat milk kefir able to stimulate the production of antibodies. According to Macura et al. (2007), the macrophage phagocytic index enhanced with enhancing doses of antibody despite saturating concentrations and decreased at high concentrations. This is because that blocking of Fc receptors by excess antibody caused a lowering in phagocytic index, but enhanced phagocytosis through complement receptors rapidly compensated for this effect. During fermentation, the bioactive peptides has shown a variety of physiological activities, including stimulation of the immune system in animal models (Farnworth, 2005). Furthermore, stimulation of the immune system may also occur due to the role of exopolysaccharides found in kefir grains (Farnworth, 2005; Furukawa et al., 1992).

Conclusion

Goat milk kefir could increase macrophage phagocytosis capacity and index, while combined milk kefir (from goat milk and soy milk) only increase macrophage phagocytosis capacity in type-2 diabetic rats higher than the normal rats. Therefore, goat milk kefir and combined milk kefir can play a role in innate immunity.

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Antioxidant activity on fermented beverages combined from milk kefir whey and honey

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Abstract

This research aimed to determine the best concentration of honey addition (0%, 20%, 30% and 40%) as sweetener on milk kefir whey to produce fermented beverages on antioxidant activity, total phenol and vitamin C. The final aim was to develop a new fermented beverages and enhance the value of dairy products. The results showed that the addition of honey in milk kefir whey had synergistically able to be each other to produce fermented beverages. The analysis demonstrated that milk kefir whey and honey could give correlated among antioxidant activity compounds, which might explain the mechanism of synergism ability. The addition of 40% honey demonstrated the best fermented beverages with antioxidant activity was 58.30%, total phenol was 752.05 mg GAE/kg and Ascorbic Acid was 0.032%. It was also proven that fermented beverages produced by the combination milk kefir whey and 40% of honey had been organoleptically accepted by the panelists.

Keywords: milk kefir whey, fermented beverage, honey, antioxidant activity

Introduction

Milk kefir whey is a by-product of the process that made a colored kefir like a water. It has concentration of dissolved organic materials such as lactoferrin and ascorbic acid which is role as antioxidants. Milk kefir whey has various nutritional value and functional properties which is beneficial for health. Kefir whey had slightly acidic and alcoholic taste derived from the fermentation whenever less desirable by the consumer. Innovation needs to improve the taste of milk kefir whey to produce fermented beverage by combined with honey as a natural sweetener and antioxidant agent. Honey is known to be rich in both enzymatic and non-enzymatic antioxidants, including glucose oxidase, ascorbic acid, flavonoids, phenolic acids, organic acids, maillard reaction products, amino acids and proteins.

Milk kefir whey and honey are bioactive product that synergistically able to be combined each other. Weiner (1994) reported that some plants or specific combinations of herbs in formulations may act as antioxidants by exerting superoxide scavenging activity or by increasing superoxide dismutase (SOD) activity in various tissue sites. Each of these groups of compounds are substances that may exert that cell-protective action by more than one biochemical mechanism. However, there is limited information available on the combined between milk kefir whey and honey based on antioxidant activity. The objectives of current study were to determine the potential of honey as natural antioxidant if combined with milk kefir whey to produce fermented beverages.

Methodology

The research was conducted using experiment laboratory method and completely randomized design of four treatments and five replications. The treatments were the addition of Honey Longan (*Nephelium longata* L.) to milk kefir whey to produce fermented beverages. The treatment details were P0 = fermented beverages milk kefir whey without honey, P1= P0 + 20% honey, P2= P0 + 30% honey and P4= P0 + honey 40%. The amount of honey used were 20%, 30% and 40% of milk kefir whey based on the report of Codex alimentarius (2011) where drinks based on fermented milk contain a minimum of 40% (m/m) fermented milk. The mixture of milk kefir whey and honey were analyzed for its antioxidant activity using DPPH (1,1 diphenyl-2-picrylhydrazyl) radical scavenging assay as described by Khalaf et al. (2007), total phenol assessed by the method of Miliauskas (2000) and vitamin C content following the method as described by AOAC (2005). The data were subjected to analysis of variance followed by Duncan Multiple Range Test. Sensory evaluation were conducted by 25 panelists, ranging in age from 25 to 65 and selected based on availability and product interest. Most of them had extensive experience with descriptive analysis of a wide range of products. Sensory evaluation analyzed following non-parametric statistical method by Friedman test of Steel and Torrie (1994).

Results and Discussion

Determination of antioxidant activity on fermented beverages

Data in Table 1 showed that the average of free radical scavenging activity using DPPH assay of milk kefir whey with the addition of honey were increase. Tidona et al. (2009) mentioned that the increased antioxidant activity of whey fermentation derived from metabolites formed during lactate fermentation processes such as bioactive peptides. Bioactive peptide is a specific protein fragment that has a positive impact on the condition and function of the body which can affect health. In regards of the average of total phenolic it was found that milk kefir whey with the addition of honey were ranging from 596.91 to 752.05 mg/GAE. The increase of total phenol in fermented beverages due to result from metabolism of microorganisms that produce phenol compound. And also there was a positive correlation total phenol with antioxidant activity of honey kefir whey drink at equation $y = 0.076x + 1,120$ with $R^2 = 0,9729$. Wenzig et al. (2008) mentioned that the activity of DPPH capture of petal rose extract has a strong correlation with the content of phenol compounds ($r = 0.977$). While, the average of vitamin C was ranging from 0.018 to 0.032 %. Increased levels of ascorbic acid in fermented beverage due to honey has an organic acid that is able to maintain the stability of ascorbic acid. There was a positive correlation between ascorbic acid and antioxidant activity of fermented beverage on the equation $y = 910,11x + 112,933$ with $R^2 = 0,9587$. Kim et al. (2003) mentioned that the higher the concentration of ascorbic acid, the greater the capture activity of radical DPPH ($r = 0.993$). Positive correlation between antioxidant activity and total phenol of fermented beverage cause of honey has antioxidant compound (ascorbic acid), the existence of organic acid in honey and existence of microbial activity.

Sensory evaluation

Characterizations of sensory properties of fermented beverage with different honey addition are shown on Table 2. The addition of honey in the fermented beverages produces a sweet taste, desirable aroma and color to be “dark yellow” followed by the increase the panelist's preference. Sweet sensation of fermented beverages was due to fructose content in honey. Typical honey flavor is caused by the content of organic acids, carbohydrates and

nectar. Most honey has a sweet and slightly sour taste. National Honey Board (2005) reported that in most honey, fructose predominates and tends to make honey taste slightly sweeter than sugar. Fiorda et al. (2016) reported that it was observed that L^* and a^* values of honey-based kefir beverage did not change significantly during fermentation time. On the other hand, the luminosity (L) values indicated it is to be more clear than dark, and chroma a^* was 0. honey-based kefir beverage showed that b^* decreased during fermentation time probable due its relation with sugar contents becoming less yellow and more brown.

Table 1. Antioxidant activity on fermented beverage

Concentrated of honey (%)	Antioxidant Activity (%)	Total Phenol (mg GAE/kg)	Ascorbic Acid (%)
0	45.52 ^a ± 1.28	596.91 ^a ± 13.57	0.018 ^a ± 0.0005
20	51.51 ^b ± 1.99	667.28 ^b ± 27.67	0.027 ^b ± 0.0009
30	55.00 ^{bc} ± 1.69	735.55 ^c ± 44.69	0.029 ^{bc} ± 0.0012
40	58.30 ^c ± 1.54	752.05 ^c ± 32.34	0.032 ^c ± 0.0022

Means ± standard deviation in the same column with different letters are significantly different ($P \leq 0.01$)

Table 2. Sensory evaluation of fermented beverages

Concentrated of honey	Color	Aroma	Taste	(L^*) lightness	(a^*) Redness	(b^*) Yellowness
0	1.00 ^a ± 0.30	1.00 ^a ± 0.67	1.00 ^a ± 0.22	32.82 ^b ± 0.66	0.90 ± 0.11	0.075 ± 0.26
20	2.00 ^b ± 0	2.45 ^b ± 0.82	2.20 ^b ± 0.52	32.05 ^{ab} ± 0.46	1.20 ± 0.42	0.075 ± 0.59
30	2.45 ^{bc} ± 0.68	3.05 ^b ± 0.88	2.85 ^{bc} ± 0.81	31.32 ^a ± 0.22	1.05 ± 0.17	0.075 ± 0.12
40	3.25 ^c ± 0.78	3.50 ^b ± 1.14	3.75 ^c ± 1.01	31.57 ^a ± 0.51	0.95 ± 0.12	0.050 ± 0.36

Conclusion

Honey as natural antioxidant is synergistically able to combine with milk kefir whey to produce fermented beverages. It is concluded that milk kefir whey can be produced which maintained antioxidant properties under such conditions, moreover, the products also organoleptically acceptable by the panelists.

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Improving the Indonesian meatball quality using different rice bran varieties of Jombang and Kediri, East Java as natural antioxidant

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Abstract

Meatballs are very popular in every social class in Indonesia and this product is produced either in cottage industries as well as in meat processing manufacture which is distributed by peddlers or pushcart and also in restaurants. Rice bran contains antioxidants, phytosterols, and phytochemicals and therefore the substitution of tapioca starch with rice bran as natural source of antioxidant are expected to improve “bakso” into one of traditional functional restructured meat product. Rice bran have an antioxidant activity and are differently by varieties and condition of the paddy’s growth area. Therefore, the objective of this study was to determine the phytochemical compounds and antioxidant properties of crude extract of local varieties of rice bran from Jombang and Kediri, East Java, Indonesia and to uncover its potential as a natural antioxidant source and to study the effect of rice bran flour to improve nutrition and shelf life quality in meat ball. The best substitution that can be accepted by panelists was observed in sample substituted with Serang rice bran 50% of tapioca starch with organoleptic scores for color, aroma, hardness, taste, flavor, and chewiness were 4.98; 4.84; 4.93; 4.6; 4.5; 4.9 respectively. This substitution also increased the antioxidant activity (16.75% to 35.78%) and total phenol of meatballs (37.82 mg/g to 90.81 mg/g). It can be concluded that substitution tapioca flour with Serang rice bran could improve the quality of meatballs as functional food.

Keywords : meatball, rice bran, antioxidant, bakso, organoleptic

Introduction

Meatballs are restructured meat products which can be produced from ground beef, pork, chicken or fish, where the most popular one in Indonesia are beef meatball. This product is prepared by mixing finely ground beef with tapioca starch, cooking salt and sodium tripolyphosphate and the meatball batter are formed into marble to pingpong ball size before cooked in water at 100°C for 20 minutes (Purnomo and Rahardiyan, 2008).

Antioxidant is a molecule stable enough to donate an electron to neutralize free radical, thus reducing its capacity to damage. Natural antioxidant has been proved in improving meat shelf-life and quality by retarding lipid oxidation and microbial growth (Velasco and Williams, 2011). The use of natural antioxidant in food would be promising alternative for synthetic antioxidant in term highly compatible with dietary and no harmful effect to human body (Lobo et al, 2010). Therefore, substitution of tapioca starch with rice bran as natural source of antioxidant are expected to improve “bakso” into one of traditional functional restructured meat product.

Rice bran contain antioxidant activity and are differently by varieties and condition of the paddy’s growth area (Nam et al, 2006). Sompong et al (2011) has also reported different varieties of paddy give different amount and antioxidant activity of their rice bran. Arab et al

(2011) showed that two varieties rice in Iran had different total phenolic content. Although there were many researches about antioxidant of rice bran, however the potential antioxidant of local rice bran is still lack. Therefore, the objective of this study were to determine the phytochemical compounds and antioxidant properties of crude extract of local varieties of rice bran from Jombang and Kediri, East Java, Indonesia and to uncover its potential as a natural antioxidant source and to study the effect of rice bran flour to improve quality of meat ball as functional food.

Methodology

Preparation of rice bran samples

Rice varieties used in this study are local rice from Jombang (Bramo, and Serang) and Kediri (Menthik). All samples were milled to obtain the rice bran flour. The fresh milled bran samples were collected immediately from the milling system in polyethylene bags. Stabilization of rice bran are carried out according to methods as reported by Amarasinghe et al (2009) and Bagchi et al (2014) with slightly modification. 100 g fresh finely powder rice bran will be exposed to microwave heating for 2.5 minutes in polyethylene pouches and stored in refrigerator at 4°C before laboratory analysis.

Preparation of Indonesian meatball

Finely ground meat, cooking salt, sodium tripolyphosphate, ice cubes, fried garlic and fried red onion were mixed thoroughly using meat cutter. After that, 10% tapioca starch (substituted with rice bran 0%, 50%, 100%) were added to make the meatball batter. The meatball batter were formed into balls before boiling in water at 100°C for 15 minutes, and after cooling to ambient temperature the samples are packed in nylon pouches, vacuumed and stored at -15°C before laboratory analysis (Rahardyan, 2002).

Experimental Design

This study was conducted in two stage laboratory experiments namely first experiment was to study the antioxidant activity, anthocyanin content and total phenolic content from three different rice bran varieties and the second stage was to study the effect of substitution of tapioca flour which usually used as starch source with rice bran in meat ball antioxidant activity, total phenolic content and acceptability of consumers. Experimental design of this study was completely randomized experimental design. All experiments will be carried out with three replications and the data obtained will be processed by mathematical and statistical methods. Data were subjected using one way analysis of variance (ANOVA) using the statistical analysis Microsoft Excel for Mac, significance was defined at $p < 0.05$ (Gedrovica and Karklina, 2013). The means were separated by Tukey's honestly significant difference (HSD) using Realstat-2011 that was added to Microsoft Excel for Mac (Ott and Longnecker, 2001).

DPPH radical scavenging assay

Antioxidant activity test of crude extract of rice bran was determined by the free radical-scavenging 1,1-diphenyl-2-picrylhydrazyl (Lee et al, 2006). The extraction was conducted by mixing 200 mg sample with 5 mL of methanol and shaken for 1 hour. 5 mL supernatan extract was reacted with 1 mL DPPH 0.1mM working solution. The mixture is shaken and incubated for 30 mins in the dark at room temperature (Yen and Chen, 1995). Absorbance will be measured by UV-Vis spectrophotometer at 517 nm. While inhibition will be calculated using following formula:

$$\text{Scavenging ability (\%)} = 1 - \frac{\text{Absorbance}_{517 \text{ nm of sample}}}{\text{Absorbance}_{515 \text{ nm of control}}} \times 100\%$$

Total Phenolic Content

Total phenolic content of crude extract rice bran was determined by spectrophotometric method using the Follin-Ciocalteu reagent (Singleton and Rossii, 1965). Rice bran will be extracted by macerated with 60% ethanol for one night and repeated for 3 times. One hundred microliters of the crude extract rice bran solution (5 mg/mL) will be mixed with 1.5 ml 10% sodium carbonate solution and then a-3 ml of 10% of Follin-Ciocalteu reagent will be added. The final mixture will be kept in the dark at ambient conditions for 2 hours to complete the reaction. The absorbance will be measured by spectrophotometer at 765 nm. All measurements will be determined triplicate and the data will be expressed as mg Gallic Acid Equivalent (GAE) per 100 g of crude extract of rice bran.

Total Anthocyanin Content

Determination of the total amount of anthocyanins was carried out using spectrophotometric method as reported by Markakis (1982) and Moko *et al* (2014). 100 g sample was macerated with 100 mL mixture of 95% ethanol and 1.5 N HCl (85:15, v/v) and stored overnight at 4°C. The mixture was decanted and the pomace washed repeatedly with acidic ethanol solvent and made up to 500 mL. Anthocyanins will be will extracted after centrifugation at 535 nm against a reagent black. Cyanidin 3 glucoside chloride will be used as standard pigment, and total anthocyanin content will be expressed as mg cyanidin 3 glucose equivalent per 100 g flour.

Sensory Evaluation

Consumer acceptance of the meatballs with rice bran were evaluated by 30 untrained panelists each replication with hedonic test (Beinner et al, 2010). Each panelist was served with 7 samples (without rice bran (0), substitution with Bramo rice bran 50 % (B50), substitution with Bramo rice 100% (B100), substitution with Serang rice bran 50 % (S50), substitution with Serang rice bran 100 % (S100), substitution with Menthik rice bran 50 % (M50), substitution with Menthik rice bran 100 % (M100)). Meatballs were offered to panelists for sensory evaluation using 7-point hedonic scale to determine consumer degree of liking each kind of samples (Beinner et al, 2010). That is, 7– very much liked, 6– Liked a lot 5– Liked, 4– liked and did not like, 3 –disliked, 2– much disliked and 1 – very much disliked. Descriptors, description and references were constructed by panel. Three coded samples were served and water was provided for rinsing between samples. The descriptors included color, aroma, hardness, taste, flavor, and chewiness. Panelists was asked to choose the best and the worst with comment for better understanding.

Results and Discussion

Determination of antioxidant properties and phytochemical contents of rice bran from Jombang and Kediri

The overall results of the antioxidant properties and phytochemical contents of rice bran are shown in Table 1. The antioxidant activity was determined with DPPH free radical scavenging for each variety of rice bran and the average radical scavenging activity varied between Bramo, Serang and Menthik which were 15.25 ± 0.07 , 25.37 ± 0.07 , and $28.15 \pm 0.19\%$, respectively and significantly different ($P < 0.05$). Phytochemical content was studied from total anthocyanin content and total phenolic content. Total anthocyanin content range

from 2.23 ± 0.07 to 3.89 ± 0.05 mg/g and significantly different. Total phenolic content was not significantly different between varieties which range was 266.05 ± 19.19 to 286.72 ± 1.37 mg/g. From this study, Menthik rice bran was the best for the antioxidant activity, total anthocyanin content and total phenolic content. Hartati et al (2015) reported that higher total phenolic content of rice bran give a higher antioxidant activity.

Table 1. Antioxidant properties and phytochemical contents of rice bran from Jombang and Kediri*.

Rice Varieties	DPPH (%)	Total Anthocyanin Content (mg/g)	Total Phenolic Content(mg/g)
Bramo	15.25 ± 0.07^c	2.90 ± 0.01^b	266.05 ± 19.19^a
Serang	25.37 ± 0.07^b	2.23 ± 0.07^c	276.92 ± 1.00^a
Menthik	28.15 ± 0.19^a	3.89 ± 0.05^a	286.72 ± 1.37^a

*Means \pm standard deviations with different superscripts within a column are significantly different at $P < 0.05$

Effect of substitution with rice bran in meatballs to antioxidant activity and total phenolic content

Antioxidant activity and total phenolic content from meatball with rice bran substitution are shown in Table 2. Substitution tapioca starch with rice bran could increase antioxidant activity and total phenolic of meatballs. Meatball without rice bran has antioxidant activity 16,75% and total phenolic content 37.82 mg/g and when substitute with rice bran (50% to 100% from tapioca starch), antioxidant activity was increased significantly ($P < 0.05$) from 19.71 to 55.21% and for total phenolic content from 84.06 to 100.76 mg/g. Antioxidant activity and total phenolic content were increased significantly ($P < 0.05$) as percentage of substitution with rice bran was increased.

Table 2. Antioxidant Activity and Total Phenolic Content from Meatball with Rice Bran Substitutions*.

Substitution of Rice Bran	DPPH (%)	Total Phenolic Content (mg/g)
0	16.75 ± 0.18^g	37.82 ± 0.44^f
B50	19.71 ± 0.06^f	84.06 ± 0.68^e
B100	39.53 ± 0.18^c	92.31 ± 0.94^c
S50	35.78 ± 0.31^d	90.81 ± 1.24^{cd}
S100	55.21 ± 0.36^a	100.76 ± 0.99^a
M50	30.49 ± 0.07^e	89.56 ± 0.06^d
M100	42.77 ± 0.31^b	95.31 ± 0.68^b

*Means \pm standard deviations with different superscripts within a column are significantly different at $P < 0.05$

Effect of substitution with rice bran in meatballs to acceptance of consumer

The acceptance test for rice bran meatball has been done by a 7-point hedonic scale (Table 3). Color acceptance was not significantly ($P > 0.05$) different between original meatball and 50% substitution of tapioca, but significantly ($P < 0.05$) different to 100% substitution. Since rice bran has brown color, substitution rice bran made meatball's color became darker. Percentage substitution from 50% to 100% gives significant differences in aroma ($P < 0.05$). Substitution with 50% rice bran was not significantly different with the original ($P > 0.05$), but 100% substitution of tapioca with rice bran was significantly different ($P < 0.05$).

Flavor is the integration of taste odors and oral somatosensory quality. Flavor seems

to be important attribute of food that influence our motivation to consume (Prescott, 2015). Same with color, aroma, hardness, and chewiness, substitution with 50% rice bran was not significantly different with the samples without rice bran, but 100% rice bran substitution significantly decreased flavor score of meatball. From all of the result, the best substitution was 50% substitution with Serang rice bran.

Table 3. Organoleptic Result for Meatballs with Rice Bran Substitutions*.

Substitution of Rice Bran	Color	Aroma	Hardness	Chewiness	Taste	Flavor
0	5.26 ± 0.22 ^a	4.92 ± 0.12 ^{ab}	5.30 ± 0.50 ^a	5.3 ± 0.35 ^a	4.51±0.05 ^a	4.57±0.17 ^a
B50	4.96 ± 0.53 ^a	4.52 ± 0.45 ^{abc}	4.44 ± 0.69 ^a	4.63 ± 0.66 ^{abc}	3.83±0.25 ^b	3.87±0.20 ^{ab}
B100	4.03 ± 0.12 ^c	3.94 ± 0.20 ^c	3.18 ± 0.15 ^b	3.07 ± 0.03 ^{bc}	2.9±0.21 ^c	3.01±0.28 ^c
S50	4.98 ± 0.05 ^a	4.84 ± 0.15 ^{ab}	4.90 ± 0.18 ^a	4.93 ± 0.22 ^{abc}	4.6±0.09 ^a	4.50±0.19 ^a
S100	4.22 ± 0.13 ^{bc}	4.14 ± 0.40 ^{bc}	3.19 ± 0.17 ^b	3.31 ± 0.43 ^{abc}	3.27±0.24 ^{bc}	3.44±0.16 ^{bc}
M50	4.92 ± 0.45 ^{ab}	5.03 ± 0.35 ^a	4.63 ± 0.67 ^a	5.01 ± 0.67 ^{ab}	4.53±0.35 ^a	4.27±0.37 ^a
M100	4.31±0.25 ^{bc}	4.13 ± 0.15 ^{bc}	2.97 ± 0.20 ^b	2.92 ± 0.18 ^c	2.8±0.31 ^c	2.96±0.49 ^c

*Means ± standard deviations with different superscripts within a column are significantly different at $p < 0.05$

Conclusion

Substitution of tapioca with rice bran could increase antioxidant activity and total phenolic content in meatball. In all varieties of rice bran used in this study, although rice bran of Menthik variety showed the best antioxidant activity, anthocyanin, and phenolic content, however if applied into meatball production rice bran of Serang variety showed better antioxidant activity and phenolic content. Too much substitution with rice bran will decrease likeness of meatball and substitution with 50% Serang rice bran are recommended to get a functional meatball that can be accepted by consumers.

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Quality and Marketing Distribution of Milk Products From D-farm Milk Processing Unit, Faculty of Animal Science, Bogor Agricultural University in Bogor Region, West Java Province, Indonesia

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Abstract

D-farm as bussiness unit is a fixed market for dairy cows farmer so that farmer can develop optimal utilization of *on farm* farming without marketing trouble. Developing D-farm as milk processing unit is a form resources utilization of dairy cows farmer to increase their welfare. Up until now, D-farm is able to process 300 litres fresh milk per day that comes from Faculty of Animal Science farm, Darul Falah Bogor farm, and Group of Dairy Farmer Region Cibungbulang Bogor Farm. Pasteurised milk is one of top product from D-farm milk processing unit. This research objective was to evaluate milk quality and pasteurised milk at D-farm milk processing unit. Physico-chemical analysis and microbiological analysis was conducted in this research. The result showed that pasteurised milk produced by D-farm milk processing unit had fulfilled Indonesian standard (SNI) of pasteurised milk for Total Plate Count (TPC), protein, fat, and solid non fat (SNF).

Keywords : quality, marketing, milk, Indonesia

Introduction

Recent milk consumption in Bogor area is about 7 litres per year. Eventhough this amount is little bit lower to National milk consumption 7.7 litres per year, but very difference to Jakarta province milk consumption is about 22 litres per year. Faculty of Animal Science at Bogor Agricultural University, Indonesia, has potential resources in farm like dairy cows. Up until now the dairy cows population in Faculty of Animal Science are about 20 heads with daily production around 10-40 litres per day plus milk production from farmer groups around 200 litres per day that were supervised by Faculty of Animal Science. From milk production, it is needed to build milk processing unit in order to gain higher added value. With this added value D-farm is potential to be developed as an income generating unit. This is similar to Bogor Agriculture University policy that develop venture enterprise as a form of technopreneurship in it.

Developing D-farm as milk processing unit is a form resources utilization of dairy cows farmer to increase their welfare. D-farm milk processing as bussiness unit is a fixed market for dairy cows farmer so that farmer can develop optimal utilization of *on farm* farming without marketing trouble. Up until now, D-farm is able to process 300 litres fresh milk per day that comes from Faculty of Animal Science farm, Darul Falah Bogor farm, Group of Dairy Farmer Region Cibungbulang Bogor Farm. Because of limitation in scale up production, D-farm can not process all milk production in Bogor region.

From above description, developing D-farm milk processing unit has high interest to many stakeholder. D-farm production capacity right now is still not enough for covering potential market around Bogor region. On the other hand, milk production in Bogor region prediction can reach up to 227,500 litres per day. The objective of the study was to evaluate milk quality and pasteurised milk at D-farm milk processing unit also to evaluate marketing distribution of pasteurised milk.

Methodology

Material for this research was pasteurised milk from D-farm milk processing unit, Faculty of Animal Science, Bogor Agricultural University. Pasteurised milk was produced by batch pasteurisation. **Pasteurisation process.** According to Indonesian Standard SNI 01-3951-1995 is a fresh milk, reconstitute milk, recombine milk that had done heating process on 63°C – 66°C for 30 minutes (Low Temperature Long Time/LTLT) or 72°C for 15 seconds (High Temperature Short Time/HTST) (Singh et al., 1980; Fardiaz, 1992; Bylund 1995), after that cooled down until 10°C then aseptically packaged and finally stored maximum at 4.4°C. **Pasteurised Milk quality.** Pasteurised milk quality assessment used Lactoscan was used for assessment for pasteurised milk physico and chemical quality. **Microbiology analysis.** Microbiology quality was assessed with Total Plate Count (Pelczar 2008) and Lactic Acid bacteria growth (Nurwitri and Rahayu 2012) and was conducted at Microbiology lab in Animal Science and Product Technology Integrated Lab, Faculty of Animal Science, Bogor Agricultural University.

Results and Discussion

Pasteurised milk is one milk processing product with the best nutrition. Pasteurisation was done by two methods, Low Temperature Long Time (LTLT) and High Temperature Short Time (HTST). Pasteurised milk should be stored in cold chain, for instance refrigerator for about maximum 14 days. Pasteurised milk handling from D-farm should always be put in cold chain system and handled according to Good Manufacturing Practises (GMP). Microbiology quality for pasteurised milk was shown in Table 1. *E.coli*, *Salmonella sp.*, and *Staphylococcus aureus* contamination was not found, while the result for Total Plate Count had no difference during April-August 2017. This result was fullfilled to Indonesian Standard for pasteurised milk (SNI 01-3951-1995)^[6] which was 3×10^4 CFU/mL or 4.477 log CFU/mL.

Table 1. Microbiology quality of D-farm pasteurised milk

Sample	Month	Milk microbiology assessment (log CFU/mL)			
	2017	Total Plate Count	<i>E.coli</i>	<i>Salmonella sp.</i>	<i>Staphylococcus aureus</i>
Pasteurised Milk	April	4.45	Negative	Negative	Negative
	May	4.41	Negative	Negative	Negative
	June	4.45	Negative	Negative	Negative
	July	4.43	Negative	Negative	Negative
	August	4.45	Negative	Negative	Negative

Pasteurised milk quality assessment was done not only for microbiology quality but also for physico-chemical quality, as shown in Table 2. The result showed no difference during April-August 2017. This result had fullfilled to Indonesian Standard for pasteurised milk (SNI 01-3951-1995). Lead (Pb) was not detected (SNI 01-3951-1995 max 1 ppm), Arsenic (As) was not detected (SNI 01-3951-1995 max 1 ppm), Mercury (Hg) <0.004 ppm, Tin (Sn) < 3.01 ppm and Cadmium (Cd) <0.00011 ppm.

Table 2. Physico-chemical quality of D-farm pasteurised milk

Month		Physico-chemical quality							
2017	Viscosity	Specific gravity	pH	Freezing point	Fat (%wb)	SNF	Protein (%wb)	Total Solid	Water (%wb)
April	1.98	1.0258	6.16	-0.51	3.85	7.73	3.23	11.58	88.42
May	1.88	1.0255	6.20	-0.51	3.83	7.77	3.23	11.60	88.40
June	1.88	1.0296	6.26	-0.53	3.51	7.98	3.45	11.49	88.51
July	1.98	1.0277	6.14	-0.49	3.85	7.73	3.23	11.58	88.42
August	1.98	1.0276	6.20	-0.50	3.67	8.19	3.30	11.86	88.14

Pasteurised milk is one of top product from D-farm milk processing unit. D-farm bussiness partner that continually received pasteurised milk from D-farm was small enterprise “Susu Mbok Darmi” (SMD). Pasteurised milk consumption trend was increase due to the increase number of SMD outlet in campus neighbourhood, or in food court mall. With up-to-date theme, now various pasteurised milk drink is in highly demand by customers. The tagline of pasteurized milk is “Keep your body health with our milk” and now already has eight branches around Bogor area. Average production per day for strawberry pasteurised milk 10 litres, chocolate pasteurised milk 11 litres, plain pasteurised milk 290 litres.

Conclusion

Pasteurised milk produced by D-farm milk processing unit at Bogor Agricultural University Indonesia had fullfilled Indonesian standard (SNI) of pasteurised milk and can be distributed well around Bogor area.

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The use of coconut (*Cocos nucifera* L) flesh and water to improve the physicochemical properties of palm sugar syrup

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Abstract

Palm sap is a sweet and colorless liquid obtained by tapping the stem of the male flowers of sugar palm (*Arenga pinnata*). Palm sap can be used as one of the sources in the manufacture of liquid brown sugar to replace cane sugar. Adding coconut water and flesh can improve the physical and chemical properties of palm sugar syrup. The purpose of this research is to find out the effects of the addition of coconut water and flesh to the physical and chemical properties of palm sugar syrup. The experiment is conducted using a Randomized Block Design (RBD), consisting of two factors. The first factor is the addition of coconut water with 3 levels (0%, 10%, and 20%) and the second factor is the addition of coconut flesh with 2 levels (0% and 1%); each treatment is replicated three times. Observation variables include total dissolved solids ($^{\circ}\text{Brix}$), color intensity, and viscosity. The best treatment is obtained from the addition of 20% coconut water without coconut flesh with 75°Brix , pH 6.6, 1.26 viscosity (10^3cPs), lightness level (L^*) 30.5, redness level (a^*) 23.5, yellowness level (b^*) 22.0. Sugar content identification shows that the levels of sucrose, glucose, and fructose are 69.84%, 29.45%, and 30.76%, respectively. It is concluded that the addition of fresh coconut water can improve the physicochemical properties of palm sugar syrup.

Keywords: palm sugar syrup, physicochemical, sugar content, viscosity

Introduction

Palm sap is a sweet and colorless liquid obtained from tapping the stem of male flowers of sugar palm (*Arenga pinnata*). Palm sap is obtained from sugar palm trees which contain 10% - 12% total sugar content, especially the sucrose (Faridatul et al., 2014). Palm sap produced in average reaches 10 - 15 liter per day with the highest production of 20.83 liter per tree per day for 10-20 year-old sugar palms, whereas 21-30 year-old palms only yield 7.95 liter per tree per day (Abdullah et al., 2014). Palm sap has been used as a sweetener in many Asian countries in the form of palm sugar following a heating process (Ho et al., 2007). Furthermore, the sap can be processed into a coconut soft drink (*legen*), fermented beverage (*tuak*), vinegar, and as a single cell protein medium (Diniyah, 2008). Palm sap can be used as a source in the manufacture of liquid brown sugar to replace sugar cane and to meet the national needs for sugar. The potential of brown sugar as a replacement of cane sugar is not only as a sweetener, but also due to its unique flavor and aroma, as well as its high nutritional content. Brown sugar has low glycemic index; it dissolves and melts almost the same as sugar, very natural, unrefined, and has a superior taste. Compared to cane sugar, brown sugar is high in calcium, phosphorus, and iron content, as well as contains thiamine and riboflavin (Abdullah et al., 2014).

Solid palm sugar has short shelf life; therefore, it is more effective if solid palm sugar is replaced by a syrup form so as to shorten cooking time, increase ease of storage (durability), increase hygiene, as well as to increase the sale value of palm sugar. Palm sugar syrup is

expected to be able to compete with maple syrup, a foreign product with brix level of 66.9°Brix (Vermont minimum standard), in addition to surpass the physicochemical properties of maple syrup. Palm sugar syrup is a syrup which results from the boiling down of palm sap with sugar content of $\pm 75^\circ\text{Brix}$ and at the temperature of 45°C . At that concentration, invert sugar will not crystallize. The quality of palm sugar syrup is strongly influenced by the degree of the purity of the sap, the duration of the boiling process, and the final temperature of the production process (Diniyah, 2008).

Methodology

The purpose of this research is to find out the effects of the addition of coconut water and flesh to the physical and chemical properties of palm sugar syrup. The research is conducted using Randomized Block Design (RBD) with two factors. The first factor is the addition of coconut water with three levels (0%, 10%, and 20%) and the second factor is the addition of coconut flesh with two levels (0% and 1%); each treatment is replicated three times. Observation variables include total dissolved solids ($^\circ\text{Brix}$), pH, color intensity, viscosity, and sugar analysis.

Results and Discussion

Degrees Brix is a unit used to measure the total dissolved solids of a solution counted as sucrose. The results of the study show that the mean value of the brix degree of palm sugar syrup ranges between $72.7 - 75.0^\circ\text{Brix}$. The mean values of the palm sugar syrup brix degree in each coconut water and flesh addition treatment are shown in Table 1. The brix degree of palm sugar syrup tends to increase with the increase of coconut water added. This is due to the sugar and amino acids content in coconut water which contributes to the acceleration of Maillard reaction. The reaction occurs during the interaction between sucrose and amino acids at a high temperature (Amin et al., 2010).

The pH or acidity level is used to express the degree of acidity or basicity of a solution. The mean value of the palm sugar syrup pH ranges between $6.5 - 7.1$. The mean values of palm sugar syrup pH in each coconut water and flesh addition treatment are shown in Table 1. The more coconut water added, the lower the pH value of palm sugar syrup. The addition of coconut water allegedly plays a role in the decrease of the pH value because coconut water has low acidity, ranging between $4.2 - 5.6$ (Tenda, 1992; Runtunuwu et al., 2011). The pH and sugar content values employed in this study are of 5.1 and 4°Brix . Viscosity or thickness is a measure of the extent of movement resistance given by a liquid. The results show that the mean value of the viscosity of palm sugar syrup ranges between $0.84 - 1.26$ (10^3centipoise). The mean values of the viscosity of palm sugar syrup in the additions of coconut water and flesh are shown in Table 1.

Table 1. Mean values of the Brix degrees, pH, viscosity (10^3cPs) of palm sugar syrup in the treatments of coconut water and flesh addition

Coconut Water (%)	Coconut Flesh (%)	$^\circ\text{Brix}$ 1	pH1	Viscosity ¹ (10^3centipoise)
0	0	$72,7a \pm 0,58$	$7,1b \pm 0,38$	$0,84 \pm 0,18$
	1	$72,8a \pm 1,44$	$7,1b \pm 0,15$	$1,02 \pm 0,24$
10	0	$74,3a \pm 1,04$	$6,9b \pm 0,23$	$1,19 \pm 0,75$
	1	$73,8a \pm 1,26$	$6,7a \pm 0,45$	$1,12 \pm 0,37$
20	0	$75,0b \pm 1,00$	$6,6a \pm 0,40$	$1,26 \pm 0,20$
	1	$74,2a \pm 1,61$	$6,5a \pm 0,29$	$1,01 \pm 0,39$

Means followed by different letters show significant differences ($p < 0.05$). Means of 3 replicates

The treatment of adding 20 % coconut water without adding coconut flesh with sugar content of 75.0°Brix reveals highest mean viscosity value of 2.05 (10^3 cPs), where as the lowest mean value is obtained from the treatment without the addition of coconut water and flesh at 0.84 (103cPs). Pato and Fitriani (2009) suggested that the higher the temperature the lower the viscosity of a liquid; conversely, the lower the temperature the higher the viscosity of a liquid.

The measure of the color of palm sugar syrup is conducted with a color reader, in which the parameters read are the L^* , a^* , and b^* . The mean value of the lightness level (L^*) of palm sugar syrup ranges between 26.7 – 31.2, which means that the color of palm sugar syrup tends to be dark (cloudy) since it is below the 50 value which is the mid value between dark and bright (cloudy or clear). The mean value of the redness level (a^*) of palm sugar syrup ranges between 20.8 – 25.0. The mean value of the yellowness level (b^*) of palm sugar syrup ranges between 17.7 – 22.7.

Table 2. Mean values of the color intensity lightness level (L^*), redness level(a^*), and yellowness level(b^*) of palm sugar syrup

Coconut Water (%)	Coconut Flesh (%)	Lightness Level ¹ (L^*)	Redness Level ¹ (a^*)	Yellowness Level ¹ (b^*)
0	0	26,7 ± 6,16	20,8 ± 1,07	20,5 ± 5,55
	1	29,7 ± 1,89	23,8 ± 2,26	21,0 ± 3,54
10	0	29,4 ± 4,82	25,0 ± 3,20	20,1 ± 8,06
	1	31,2 ± 5,65	22,4 ± 3,40	22,7 ± 9,46
20	0	30,5 ± 3,89	23,5 ± 4,51	22,0 ± 6,48
	1	27,6 ± 4,41	21,8 ± 6,50	17,7 ± 8,00

Means followed by different letters show significant differences ($p < 0.05$). Means of 3 replicates

Conclusion

The best treatment is obtained from the addition of 20% coconut water without coconut flesh with 75°Brix, pH 6.6, viscosity 1.26 (10^3 cPs), lightness level (L^*) 30.5, redness level (a^*) 23.5, yellowness level (b^*) 22.0; panel preference level to taste is 4.67, to color 5.27, to aroma 4.77, and to thickness 5.11. The results of sugar content identification reveal that the levels of sucrose, glucose, and fructose are 69.84%, 29.45%, and 30.76% respectively. It is concluded that the addition of fresh coconut water can improve some physicochemical properties of palm sugar syrup.

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Substitution of Red Bean Flour (*Phaseolus vulgaris L*) on Chicken Meatball

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Abstract

Red beans have crude fiber also as source of vegetable protein. The spent hen layer meat has more tough texture compared to the other meat. Preparation technology by taking advantage of relatively small and unstructured meat is known as restructured meat which one of the product is known as meat ball. The purpose of this research was to determine the effect of red bean flour substitution on the properties of fiber content and color of chicken meatball. The material used for this research were chicken meatball that substituted by red bean flour. The method used in this experiment was experiment laboratory using Completely Randomized Design with 5 treatments and 4 replications, if there were significant would be continued with Duncan's Multiple Range Test. The treatments used were substitution tapioca flour with red bean flour using percentration 0%, 25%, 50%, 75% and 100%. The result showed that substitution of red bean flour gave highly significant effect ($P < 0.01$) on fiber content (4.42% – 5.83%), color b^* 11.40 – 14.60, and did not gave significant effect ($P > 0.05$) on color L^* 47.28 – 49.85, color a^* 12.00 – 13.60. It can be concluded, that the meatball with the used 25% red bean flour and 75% tapioca flour gave the best quality of chicken meat ball.

Keywords: Red bean flour, chicken meatball, fiber content, color

Introduction

Spent hen layer is adult hen that maintained to taken their eggs and already produced egg until ± 95 weeks or 24 month. The spent hen layer meat has more tough texture and mushy meat fiber compared to boiler meat, so need technology to improved value added. Restructured meat is food diversification method and preparation technology by taking advantage of relative small meat. The aim of restructured meat processing is to repair and improve the quality of poor meat to be food product that have high value added. One of the product is known as meat ball. Production of meatball need flour or starch as binding agent and filler. The filler in meatball can be from flour and tubers or nuts that already be flour. Red bean flour have some advantages, such as containing protein 25-35%, fiber, and having unique color, because red bean have anthocyanin that can take out red pigment. vitamin B, and complex carbohydrate (Astawan, 2009). Red bean flour as tapioca flour substitution for making spent hen layer chicken meatball have never done yet. Hopefully, Red bean substitution can improve the quality of meatball on fiber content, and color.

Methodology

The material that used were meatball made from spent hen layer meat. Fresh red bean obtained from traditional market in Karang Ploso Malang and having floring process in Materia Medica Operation Unit Batu-Malang. Tapioca flour, seasoning, (flour pepper, salt, sugar, garlic, ice cube, egg, and fried onion) obtained from traditional market in Merjosari Malang.

Ingredients that used for fiber content analysis consist of H_2SO_4 0,3 N, K_2SO_4 10%, NaOH, hot water, aquadest and alcohol 95%. The research method that used was experiment laboratory using Completely Randomized Design with 5 treatments and 4 replications. The variables measured were fiber content and color (L^* , a^* and b^*). Data were analyzed using analysis of variance (ANOVA) if there were significant effect continued by Duncan's Multiple Range Test.

Results and Discussion

The effect of red bean substitution on fiber content of chicken meatball

The analysis result showed that red bean flour substitution with different percentage on chicken meatball gave highly significant effect ($P < 0.01$) on fiber content. The mean value of fiber content can be seen at Table 1.

Table 1. The mean fiber content (%) of chicken meatball with red bean flour substitution

Treatment	Fiber Content (%)
P0	5.46 ^c \pm 0.38
P1	5.83 ^{bc} \pm 0.16
P2	5.30 ^{bc} \pm 0.23
P3	4.89 ^{ab} \pm 0.21
P4	4.42 ^a \pm 0.26

Note: Different superscript within same column gave highly significant effect ($P < 0.01$)

The data showed that fiber content of chicken meatball got decrease with increasing red bean flour. Red bean flour gave a significant value of fiber content to layer chicken meatball, because red bean flour has fiber content 1.67%. Fiber content decreasing because of red bean flour that already given a treatment before. The treatment such as soaked, steamed, and dried before it made fiber content decreasing. Tapioca flour and red bean flour having a different fiber content value. Red bean flour has a fiber content of 1.67% and Malini (2016) said that the tapioca flour has a fiber content of 2.18%, so the fiber content in the P1 treatment using tapioca flour by 75% and 25% red bean flour has the highest fiber value 5.83%. The use of red bean flour 100% has the lowest fiber value because red bean flour that used was given treatment to reduce levels of fiber. Soaking process about \pm 20-25 minutes in water causes half of soluble fibers lost by water immersion.

Wirjatmadi et al., (2002) said that fiber dissolves in water to form a dense network. Red bean flour undergoes soaking, steaming, drying and milling to remove the unpleasant odor caused by the phytic acid. Astawan (2009) said that red beans contained in phytic acid which is largely dominated by leguminous plants which are cause the final product is less accepted by people. Phytic acid forms a complex bond with other minerals such as iron, zinc, calcium and magnesium to form insoluble and difficult to absorbed by the human body (Suhanda, 2007).

The effect of red bean flour substitution on color (L^ , a^* and b^*) chicken meatball*

Table 2. The Mean Value of L^* , a^* dan b^* Color Chicken Meatball with Red Bean Substitution

Treatment	Color L^*	Color a^*	Color b^*
P0	49.85 \pm 0.82	12.00 \pm 1.19	14.60 ^c \pm 0.84
P1	49.40 \pm 1.17	12.80 \pm 0.09	13.70 ^{bc} \pm 0.88
P2	49.08 \pm 1.76	13.35 \pm 1.05	12.95 ^{abc} \pm 0.72
P3	47.40 \pm 2.78	13.50 \pm 1.19	11.95 ^{ab} \pm 0.58
P4	47.28 \pm 1.49	13.60 \pm 0.61	11.40 ^a \pm 1.04

Note : Different superscript within same column showed gave highly significant effect ($P < 0.01$).

Color L (Brightness)*

Table 2 showed that mean value of color L* were decreasing. The higher used of red bean flour and lower used of tapioca flour, then the brightness of chicken meatball will decreasing. The color of tapioca flour is tend to white greyish and red bean flour is white reddish, so tapioca flour substitution to red bean flour in chicken meatball did not gave significant difference. The results are consistent with research Malini (2016) which said that the color of the meatball that produced with the use of tapioca flour is more colorful with a value of 94.09 to 99.38. The meatball with 25% red bean flour (P1) has a slightly dark, meatballs with the use of red bean flour 50% (P2) has a slightly reddish color meatballs, and using flour red beans 75% (P3) has a dark reddish color meatballs, with the use of red bean flour 100% has less brightness. According to Pangastuti *et al*, (2013) states that pretreatment on red bean flour causes decreased bright colors in the red bean. Red bean layer contain anthocyanin substances that causes skin pigment become red. The more red bean flour used in chicken meatball would cause the color of meatball became increasingly dark.

Color a (Reddish or Greenish)*

Variance analysis results showed that the substitution of red bean flour with different concentrations on spent hen layer chicken meatball give a non-significant ($P > 0.05$) to color a*. Color a* in spent hen layer chicken meatball tendency to increase with the use of red bean flour but didnot gave different significant between every treatment. The higher use of red bean flour will produce higher a* color. The red color comes from red beans. Red beans contain anthocyanin pigments substances that produces red color. Anthocyanins are a reddish natural dyes that water soluble and located inside the plant. Anthocyanins has a function in the medical world as a natural antioxidant substance. According Cahyani (2011) claimed that anthocyanin flavonoid compounds substance which has a function as antioxidants. Function of Anthocyanin substances as colorants in plants from red, blue to purple and yellow.

Color b (Bluish or Yellowish)*

Variance analysis results showed that the substitution of red bean flour with different concentrations on layer chicken meatball gave highly significant effect ($P < 0.01$) to the color of b*. Spent hen layer chicken meatball have a tendency to decrease on color b*. This is because is not given red flour substitution so meatball color seems yellowish and bright if it compared with the other meatball treatment. The treatment with 100% red bean flour substitution(P4) has darker color with low value of b* color. It indicates that higher use of red bean flour that substituted, will make the color darker. Higher use of red bean flour substitution, then color b* from layer chicken meatball will get more blue. Tapioca flour has light color that maybe more positive than red bean flour so it an affect darker color tend to blue color. The Color b* in spent hen layer chicken meatball that substituted with red bean flour has value that tendency to decreasing. This is because of the color of meatball is darker, then the value of b* will decrease and meant as blue color. Color is the first parameter for customer receiving level for each product (Susilowati, 2014).

Conclusion

It could be concluded that the 25% red bean flour substitution on chicken meatball produce the best quality of meatball on fiber content (5.83%); color L* 49.40 (a bit gray); color a* 12.80 (slightly red); color b* 13.70 (slightly blue).

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Quality of goat bone gelatin reviewed from protein content, molecular weight, water holding capacity, viscosity and gel strength

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Abstract

Indonesia has the largest Muslim population in the world, It is necessary to provide halal products. Goat bone gelatin is a material extracted from goat bone that is acceptable to all religious people. The aim of this research is to know the quality of goat bone gelatin in terms of protein content, molecular weight, water holding capacity, viscosity and gel strength. The gelatin samples were obtained from leg bone of goat which processed by using lime concentration of 35% with 60 days of liming time. Goat bone gelatin produced has 91.59% protein content, molecular weight 260.15 and 375.93 kDa, water holding capacity 191.93 g, viscosity 3.0 cP and gel strength of 84.06 g Bloom.

Keywords: goat bone gelatin, protein content, molecular weight, water holding capacity, gel strength.

Introduction

Indonesia has a majority Muslim population, and some other Christians, Catholics, Hindus, Buddhists and beliefs. Of course in the future in producing gelatin required raw material source that is halal and acceptable by all religious people, Cheap and available like goat bone. Goat bone can be used as a gelatin making material because the largest component is collagen protein. The content of collagen in the body of animal covers almost 25 percent of the body's protein constituents (Rodwel et al., 1995).

Gelatin is a pure protein extract from collagen which higher protein content and lower fat and minerals content more better quality of gelatin (Boran et al., 2005). The chemicals needed for the manufacture of gelatin are acids and lime. Acid is a material for demineralization and lime is used for ossein swelling. Lime (CaO) is the result of combustion of the lime stone (CaCO₃), and when dissolved with water to form a solution (lime slurry) which has a pH of about 12.4 (AOAC, 1995).

Methodology

The materials used is the leg bones of goats, HCl (PA) purchased from Malang sejati Chemicals store and lime purchased in Druju Village, Malang Regency. The process of making goat bone gelatin is as follows; Leg bone cleaned from meat and fat, cut into 2-3 cm and washed. Degreasing by inserted pieces of leg bone into water of 70°C for 30 minutes and drained. Demineralizations by soaked of bone in 5% HCl solution until bone turn into softening called ossein. Ossein is immersed in a solution of lime pH 12,4 for 60 days and drained. Then gelatin solution to dry in oven of 50°, Gelatin plate blended and sieved with size 40 mesh, Packed in a plastic PP clip bag of 0.02 mm thickness. The parameters were; Protein content (carvalho et al., 2007). Molecular weight, Water holding capacity (Dorothy et al., 1931),

Viscosity (Arnesen et al., 2008) and Gel strength (Liu et al., 2008). The data were analyzed descriptively compared with commercial gelatin and pure cowhide gelatin from SIGMA.

Results and Discussion

The quality of goat bone gelatin is shown in Table 1.

Table 1. Protein content, molecular weight, water holding capacity, viscosity and gel strength of Goat bone gelatin (A), commercial gelatin (B), pure cowhide gelatin from SIGMA (C)

Parameter Gelatin	Protein content (%)	Molecular weight (kDa)	Water holding capacity (g)	Viscosity (cP)	Gel strength (g Bloom)
A	91.59	260.15 and 375.93	191.93	3.00	84.06
B	90.67	375.93	205.84	7.00	412.39
C	93.01	375.93	198.84	6.00	424.42

Protein content

Goat bone gelatin that resulted had protein content of 91.59% higher than commercial gelatin 90.67% but lower than pure bovine gelatin 93.01% and not much different of Bligon goat skin gelatin which processed by acid and bases respectively 89.98 and 92.46% (Said et al., 2011)

Molecular weight distribution

The molecular weight of goat bone, commercial and pure cowhide gelatin is clearly seen. In Table 1 it can be seen that goat bone gelatin has 2 molecular weights of 375.93 and 260.15 kDa, whereas commercial and pure cowhide gelatin have a protein with the same molecular weight as one of the goat bone protein namely 375.93 kDa. Molecular protein can form α , β and γ -shaped chains (Nishimoto et al., 2005). Gelatin extracted from goat skin immersed in acid solution has a molecular weight of ≥ 102 kDa (Said et al., 2011)

Water holding capacity

Based on the Table 1 it is seen that of goat bone, commercial and pure cow hide gelatin had WHC 191.93, 205.84 and 198.84 g respectively. This is due to the amino acid composition present in the gelatin, which includes the abundance of the number of polar amino acids, uniform amino acids and non-polar amino acids. The content of polar and non-polar amino acids from the 3 different types of gelatin tested is similar, but the number of polar amino acid charged are quite distant, where in goat bone gelatin contains only 175.50 mol, whereas commercial and pure cow hide gelatin each containing polar amino acids charged of 189.60 and 182.40 mol. The ability of proteins to bind water is influenced by the nature of the amino acids that make up it.

Viscosity

The viscosity of goat bone gelatin 3.00 cP lower than commercial 7.00 cP and pure cow hide gelatin 6.00 cP (Table 1). Goat bone gelatin may have a shorter protein chain size than commercial and pure cow hide gelatin, which has a lower molecular weight. In addition, the lower polar amino acid content results lower in the ability to absorption of water. In a 6.67% gelatin solution, in goat bone gelatin, the non-flowing solubility capacity of commercial and pure cow hide gelatin has higher levels of polar amino acids. The viscosity of an acid or base process goat bark gelatin each of 1.84 and 2.02 cP (Said et al., 2011)

Gel strength

The gel strength of goat bone gelatin was 84.06 g Bloom, commercial 412.39 and pure cow hide gelatin 424.42 g Bloom. Goat skin gelatin produced by acid or base process has gel strength of 61.23 and 82.10 g Bloom (Said et al., 2011), skin of squid fish extracted in temperatures of 50, 60, 70 and 80°C 132, 122, 116 and 85 g Bloom respectively (Nagaeajan et al., 2012).

Conclusion

It was concluded that goat bone gelatin has a protein content, molecular weight and water holding capacity similar to commercial gelatin and pure cowhide gelatin from SIGMA, but has lower viscosity and gel strength.

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Effects of restraining method with or without stunning on the physicochemical properties of broiler breast and thigh muscles

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Abstract

A study was conducted to determine the effects of restraint and stunning methods on the physicochemical properties of *Pectoralis major* (breast) and *Iliotibialis* (thigh) muscles of broiler chickens. Sixty Cobb 500 broilers were randomly assigned to a 2 × 2 factorial arrangement in a completely randomized design with 15 birds in each treatment group. The birds were assigned to two restraint methods (shackle and cone) and two stunning methods (unstunned and stunned). Samples of breast and thigh muscles at 24 h postmortem were analyzed for pH, drip and cooking loss, shear force, and color. Meat pH and color of breast muscle were significantly ($P < 0.05$) affected by the restraint method. Shackled restrained birds had lower breast meat pH, redness, and yellowness compared to cone restrained birds. However, none of the physicochemical properties of thigh muscle was affected by restraint method. The results demonstrate that restraint and stunning methods affect meat pH and color values of broiler breast muscle but did not affect the physicochemical properties of thigh muscle.

Keywords: cone, shackle, stun, physicochemical properties

Introduction

According to the EU Council Directive (European Community, 1993) on the protection of animals at the time of slaughter, it is stated that horses, ruminants, pigs, rabbits, and poultry brought into abattoirs for slaughter shall be (a) moved and if necessary lairaged, (b) restrained and (c) stunned before slaughter. Animals must be restrained in an appropriate manner, so as to spare them any avoidable pain, suffering, agitation, injury, or contusions. Animals must not be suspended before stunning or killing. However, poultry and rabbits may be suspended for slaughter provided that appropriate measures are taken to ensure that they are in a relaxed state for stunning. Nowadays, shackling is widely practiced in many commercial poultry processing plants. The whole slaughter process involves hanging chickens upside-down on a moving shackle and leading toward a water tank that is constantly supplied with a sufficient amount of electrical current. According to Hillebrand et al. (1996), stunning is required to induce a state of unconsciousness, insensibility, and immobility of birds before neck cutting is performed. However, it is evident that both stunning and shackling can reduce physicochemical properties of broiler chickens (Sparrey and Kettlewell,

1994). In their recent study, Ismail et al. (2016) reported higher drip loss and cooking loss in breast muscle from the shackled birds than those subjected to cone restraint. However, the influence of stunning on the effects of restraint methods was not examined in their work. Electrical stunning was shown to reduce initial pH values when compared to non-stunned broiler chickens (Kim et al., 1988; Papinaho and Fletcher, 1995). Hypothesizing that stunning can influence the effects of restraint method on physicochemical properties of broiler chickens, the current study was conducted in an attempt to examine the effects of shackle and cone restraint with and without electrical stunning on the physicochemical properties of *Pectoralis major* and *Iliotibialis* muscle of broiler chickens.

Methodology

A total of 60 birds (35 days old male broiler chickens at 2.0-2.5 kg) were obtained from a commercial farm located in Negeri Sembilan and transported to a commercial processing plant (Kerabat Processing Sdn. Bhd.), Nilai, Negeri Sembilan. The birds were randomly assigned to a 2 x 2 factorial arrangement in a completely randomized design with 15 birds in each treatment group. The birds were classified into two restraint methods (shackle and cone) and two stunning methods (unstunned and stunned). In the unstunned (US) group, slaughter was performed after 60 s of onset of restraining by severing the jugular veins and carotid arteries to allow bleeding for 4 min. In the stunned (S) group, the birds were restrained for 60 s before stunned using a water bath stunner for 5 s at 200-240 mA. The birds were then slaughtered within 10 s after stunning. All birds were slaughtered in accordance with the Halal slaughtering procedure as outlined in MS 1500:2009 (Department of Standards Malaysia, 2009). Following bleeding for 4 min, all birds were subjected to scalding, feather removal, and evisceration. The carcasses were then kept in a chiller (4°C) and assigned for the meat quality assessment at 24 h postmortem. Samples from the right *Pectoralis major* (breast) muscle and right *Iliotibialis* (thigh) muscle were harvested and divided into four parts. The first part was subjected to pH measurement while the remaining parts were assigned for the determination of drip loss, cooking loss, shear force and color values.

Results and Discussion

Data on the effects of restraint method with or without stunning on the physicochemical properties of *Pectoralis major* muscle are presented in Table 1. Restraint method showed a significant effect ($P < 0.05$) on the pH, redness, and yellowness of the breast muscle. Birds subjected to shackle method had lower ($P < 0.01$) pH, redness and yellowness values compared to those subjected to cone restraining. The reported lower pH in breast muscle could be due to the struggle of birds during shackling (Debut et al., 2005). Cone restraint may block the blood vessels, and minimize the amount of blood leaving the body during bleeding, and thus increase the meat redness (Lambooy et al. 1999). No effect of restraint method on the drip loss, cooking loss, or shear force values of breast muscle was observed. The electrical stunning significantly affected ($P < 0.05$) the color measurements in breast muscle. Higher redness and yellowness values were observed in meat from stunned birds compared to those from unstunned birds. Stunning of broilers can rupture blood vessels and increase blood residues within muscle, leading to a redder meat (Hillebrand, 1996). In the present study, there were significant stunning × restraint method interactions for lightness value as restraint method only had significant effect on lightness in those unstunned birds. Also, stunning did not affect lightness in cone restrained birds. However, stunning resulted in lower lightness value in those shackle restrained birds. The darker meat produced by the cone

group could be explained by the poorer bleed out (Lambooy et al. 1999). Generally, restraint method did not affect the physicochemical properties of *Iliotibialis* (thigh) muscle except for yellowness value (Table 2). In conclusion, cone restraint resulted in higher breast muscle pH and yellowness compared to shackling. When stunning was applied, cone restraint chickens produced redder breast muscle than shackle restraint ones. The absence of wing flapping during cone restraining might reduce the rate of postmortem glycolysis and lead to a higher breast meat pH and redness value. Restraint and stunning method however, did not affect the physicochemical properties of the broiler thigh muscle. Thigh muscle which is made up of slow twitch fibers is less sensitive to struggling than the breast muscle. Therefore, pH and the other physicochemical properties are barely to be affected.

Table 1. Effects of restraining methods with or without stunning on pH, drip and cooking loss, shear force, and color of *Pectoralis major* muscle in broiler chickens

Parameter	Stunning method (SM)	Restraint method (RM)		P value		
		Shackle	Cone	RM	SM	RM*SM
pH (unit)	US	6.05±0.03 ^{bx}	6.19±0.03 ^{ax}	**	ns	ns
	S	6.10±0.03 ^{ax}	6.23±0.05 ^{ax}			
Drip loss (%)	US	1.66±0.56 ^{ax}	2.22±0.56 ^{ax}	ns	ns	ns
	S	1.77±0.50 ^{ax}	2.65±0.50 ^{ax}			
Cooking loss (%)	US	22.21±0.76 ^{ax}	22.39±0.76 ^{ax}	ns	ns	ns
	S	21.62±0.42 ^{ax}	21.49±0.42 ^{ax}			
Shear force (kg)	US	1.41±95.88 ^{ax}	1.29±95.88 ^{ax}	ns	ns	ns
	S	1.23±79.05 ^{ax}	1.22±79.05 ^{ax}			
Lightness (L*)	US	55.24±0.68 ^{ax}	50.39±0.68 ^{bx}	*	*	*
	S	46.77±2.43 ^{ay}	49.89±2.43 ^{ax}			
Redness (a*)	US	5.14±0.50 ^{ax}	6.54±0.50 ^{ay}	**	**	ns
	S	6.68±0.50 ^{bx}	8.11±0.50 ^{ax}			
Yellowness (b*)	US	16.44±0.50 ^{by}	18.76±0.50 ^{ay}	**	***	ns
	S	20.80±0.53 ^{ax}	21.85±0.53 ^{ax}			

SM: stunning method; RM: restraint method; US: unstunned; S: stunned; ns: not significant. Mean±SEM

^{a,b} Means within a row-subgroup with different superscripts are significantly different at $P \leq 0.05$.

^{x,y} Means of each parameter within a column with different superscripts are significantly different at $P \leq 0.05$.

* $P < 0.05$; ** $P < 0.01$; *** $P < 0.001$.

Table 2. Effects of restraining methods with or without stunning on pH, drip and cooking loss, shear force, and color of *Iliotibialis* muscle in broiler chickens

Parameter	Stunning method (SM)	Restraint method (RM)		P value		
		Shackle	Cone	RM	SM	RM*SM
pH (unit)	US	6.67±0.04 ^{ax}	6.76±0.04 ^{ax}	ns	ns	ns
	S	6.70±0.04 ^{ax}	6.78±0.04 ^{ax}			
Drip loss (%)	US	1.16±0.18 ^{ax}	2.44±0.18 ^{ax}	ns	ns	ns
	S	0.98±0.23 ^{ax}	0.90±0.23 ^{ax}			
Cooking loss (%)	US	31.46±0.88 ^{ax}	28.85±0.88 ^{ax}	ns	ns	ns
	S	31.14±1.15 ^{ax}	31.64±1.15 ^{ax}			
Shear force (kg)	US	1.63±87.11 ^{ax}	2.10±87.11 ^{ax}	ns	ns	ns
	S	0.90±75.57 ^{ax}	0.95±75.57 ^{ax}			
Lightness (L*)	US	54.30±1.06 ^{ax}	53.13±1.06 ^{ax}	ns	ns	ns
	S	54.93±1.25 ^{ax}	54.24±1.25 ^{ax}			
Redness (a*)	US	10.31±0.61 ^{ax}	11.47±0.61 ^{ax}	ns	ns	ns
	S	9.84±0.61 ^{ax}	10.21±0.61 ^{ax}			
Yellowness (b*)	US	21.19±0.88 ^{ax}	22.12±0.88 ^{ax}	ns	*	ns
	S	20.80±0.81 ^{ax}	20.78±0.81 ^{ay}			

SM: stunning method; RM: restraint method; US: unstunned; S: stunned; ns: not significant. Mean±SEM

^{a,b} Means within a row-subgroup with different superscripts are significantly different at $P \leq 0.05$.

^{x,y} Means of each parameter within a column with different superscripts are significantly different at $P \leq 0.05$.

* $P < 0.05$; ** $P < 0.01$; *** $P < 0.001$.

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The effect of kolang-kaling (*Arenga pinnata*) addition on characteristics of beverage Kefir

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Abstract

Kefir is the product fermentation of milk with kefir grain. Changes in certain microbiological and chemical characteristics of kefir added with kolang kaling were studied. Kolang kaling is the fruit of the palm tree (*Arenga pinnata*), with chewy texture and an unique taste and smell. Utilization of kolang kaling on availability yeast, pH and mineral compound of kefir never been reported. The objective of this study to evaluate the effect of kolang-kaling addition on pH, total yeast and characteristic mineral of beverage kefir. This study using completely randomized design (CRD) with 5 treatments and 3 replications. The treatment on this study was the percentage of kolang kaling juice. (Kontrol A0=0%, A1=5%, A2=10%, A3=15% and A4=20%). Grain kefir from house hold Indonesia used as starter culture. The results of this study showed that the treatments applied significant effect ($P < 0.05$) on pH, total yeast and Highly significant ($P < 0.01$) on mineral content (Fe, Ca, K and Zn) of beverage kefir. The utilization of the percentage of kolang - kaling at a concentration 15% and 20% caused a decrease on total yeast and mineral content. From this research concluded that the used 5% - 10 % of kolang kaling juice, produced the best of pH, total yeast and mineral content of beverage kefir.

Keywords: Kolang-kaling, beverage kefir, chemical, microbial, grain kefir

Introduction

Kefir is fermented food from cow milk, goat milk or sheep milk and inoculated by starter as grain kefir or kefir granule, with contain a complex mixture of both bacteria and yeast. The bacteria and yeast mixture its bound together with milk casein and complex sugars where are polysaccharide knows as kefiran and protein matrix (Tamime et al, 2011). The benefits of consuming kefir in the diet are numerous. Kefir has frequently been claimed be effective against a variety of complain and diseases (Hosono et al, 1996).

The benefit of consuming kefir in the diet are numerous, as it is reported to possess the antibacterial and hypocholesterolemic effects (Zacconi et al, 1995). The typical of characteristics and quality of beverage kefir depend on the amount of kefir grains and incubation times. Quality of kefir also depend on quality of composition material was used, grain kefir type and also condition of material used before inoculation. (Chen et al., 2011). Irigoyen et al. (2005) in their study reported that kefir produced from cow, goat, sheep and buffalo milk had the following chemical characteristics such as pH about 4.0, alcohol from 0.55 to 2.0%, fat content depends on the type of milk used, and this fermented milk have an acid, prickly and slightly yeasty taste.

Bevegare Kefir by addition of kolang kaling has not been much reported, and used kolang-kaling fruit on produce of Kefir are not study. Kolang kaling is a fruit which good quality such as, protein, carbohidrat, fat, fiber and mineral such as kalsium, ferum and have special quality for healty. The content of nutrients found in kolang kaling include

carbohydrates, protein, fiber, and minerals. Producing beverage of kefir, using cow's milk and kolang kaling is a product diversification. Usage kolang kaling on produce of beverage kefir, it will certainly result in changes both in terms of taste, aroma, texture, color and chemical composition produced, including the viability of microorganisms beverage of kefir. Based on the background above, this study intended to evaluate the quality beverage of kefir produced by the treatment was determined by pH, total yeast and mineral compound analysis. This research is expected as beverage of kefir products can be produced as a healthy beverage from Indonesia.

Methodology

Fresh cow milk were obtain from Faculty of Animal Husbandry, Gadjah mada University, Yogyakarta. Sucrose and skim milk from supermarket in Yogyakarta, while kolang kaling obtain from traditional market in Yogyakarta. Kolang- kaling was prepared on juice form by added of water at 1:5 ratio. Kolang kaling was added in Kefir material. 0, 5,10,15,and 20% respectively. Milk were homogenized and pasteurized at 85°C for 15 minute and mixing with sucrose, skim milk and kolang kaling juice. Material cooled down until its temperature was 24°C. Beverage kefir sample were prepared with added 5% of starter (Grain culture) on milk and incubated at 24°C for 24 hour. After fermentation kefir was restored in refrigerator 24 hour and analysis. pH values of milk kefir were measured by pH-meter with probes from Hanna Instruments. Total yeast were performed on PDA from Oxoid with 1% oxytetracycline at 25°C under anaerobic condition for 5 days (Fardiaz, 1993). Mineral count were measured by AAS (atomic absorption spectroscopy) methode.

Results and Discussion

pH and total yeast beverage kefir

pH analysis range from 4.23 - 4.39 at the end of fermentation. pH beverage of kefir control smallest increase than beverage of kefir added 5% kolang kaling. The changes of pH values as well as as titratable acidity. Kefir that made from cows milk, according to Simova et. al (2002), the pH of kefir between 4.35 - 4.50 and the lactic acid are between 8.18 - 8.20. Irigoyen et al. (2005) in their study reported that kefir produced from cow, goat, sheep and buffalo milk had the following chemical characteristics such as pH about 4.0, and this fermented milk have an acid, prickly and slightly yeasty taste. The statistical analysis showed there were significant effect ($P < 0.05$) between treatments at the end of fermentation process beverage of kefir on pH value. where total yeast increase with 5% dan 10 % kolang kaling addition and decrease with 15% and 20% kolang kaling addition. Total of yeasts on kefir after fermentation 5.0×10^6 - 9.3×10^6 cfu/ml. The addition 5% of kolang-kaling gave the highest amount of total yeast (9.3×10^6 cfu/ml) or log 7.98 cfu/ml sample. Yeast and *Lactobacilli* are mutually dependent and growth in balanced proportions in kefir grains, and symbiosis between yeasts, and *Lactobacilli*. The statistical analysis showed there were significant effect ($P < 0.05$) between treatments

Mineral characteristic

Mineral properties of kefir after fermentation are quite different each other. Total mineral Calcium (Ca), Ferrum (Fe), Kalium (K), and Zinc (Zn) on kefir after fermentation depend on kolang kaling persentase. Total Ca, Fe, K and Zn slight increase was obtained by the kolang kaling addition 5 until 10 % but decrease by addition 15 and 20 % kolang kaling. Total Fe decreasing by kolang kaling addition. Decreasing Fe content on beverage of kefir after kolang

kaling addition because kolang kaling could linkage with kefir grain. Table 1, shown the means of mineral composition of beverage kefir after fermentation at 24 hours.

Table 1. Mineral content of beverage kefir with kolang- kaling addition after incubation at 24 hrs.

Kolang Kaling (%)	Mineral (mg/g sampel)			
	Ca	Fe	K	Zn
A0 (0%)	704.567 ^a ± 1.870	0.941 ^b ± 0.018	1980.35 ^c ± 0.980	4.828 ^d ± 0.041
A1 (5%)	858.32 ^b ± 0.097	1.144 ^c ± 0.048	2093.00 ^e ± 0.018	4.722 ^b ± 0.560
A2 (10%)	1261.39 ^e ± 1.837	0.901 ^b ± 0.003	2239.49 ^d ± 0.526	4.776 ^c ± 0.044
A3 (15%)	1056.76 ^c ± 0.434	0.561 ^a ± 0.526	1841.27 ^a ± 1.236	5.653 ^e ± 0.109
A4 (20%)	1211.07 ^d ± 0.225	0.548 ^a ± 0.017	1905.57 ^b ± 2.567	4.523 ^a ± 0.022

*Mean of three replication ± standar deviation

**Means with differen superscript showed significant different (P<0.01)

In regards of Ca, Fe, K and Zn content on beverage kefir it was found that higher amount of kolang kaling addition at 5 and 10 % caused increasing Ca and Fe content but decreasing after addition 15 and 20 % kolang kaling. The mialral content Ca, Fe, K and Zn were found different each other. The statistical analysis showed there were highly significant effect (P<0.01) between treatments at the end of fermentation process of beverage kefir on mineral Ca, Fe, K and Zn

Conclusion

Percentage of kolang- kaling could inhibit starter or grain kefir and may influence on the growth of grain kefir. The used of 5 % and 10 % of kolang kaling juice, produced the best of pH, total yeast and mineral content of beverage kefir.

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Preparation and characterization of protein extracted from beef heart by acid solubilization isoelectric precipitation

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Abstract

The objective of this study was to investigate the chemical compositions and functional properties of beef heart protein concentrate. The extraction was carried out using acid solubilization and pI precipitation. Beef heart protein concentrates were examined and compared with whey protein concentrates and casein for some functional properties such as emulsion activity and stability, foaming capacity and stability, water and oil binding capacity. Fourier transform infrared (FTIR) spectroscopy was performed to identify the active groups. Beef heart protein concentrates contained 65.75% protein. Protein from beef heart exhibited better water binding capacity and emulsifying property than casein. The FTIR analysis allowed suggesting that there was an effective ionic binding between protein concentrates and other substances.

Keywords: Beef heart, acid solubilization, functional properties, emulsifying activity and stability, water binding capacity.

Introduction

Slaughterhouse by-products are considered to be good sources of valuable bioactive compounds. For example, these by-products exhibit high protein content, between 15 and 20% (w/w). Some of these protein components could also present interesting functional properties, but these have generally not been explored. Consequently, a new method is needed to increase the value of slaughterhouse by-products. The proteins extracted from slaughterhouse by-products could be used as functional ingredients in meat processing.

From the animal and by-product protein sources, Selmane et al. (2010) reported on the extraction, production and functional properties of beef lung protein concentrates. Al Awwaly et al. (2016) also studied functional properties of protein from bovine liver protein concentrate. In this study, some functional properties of beef heart proteins, such as foaming activity and stability, water holding capacity, and oil absorption activity, were determined. The present study suggests that beef heart proteins have the potential for a functional ingredient in the products processing.

Methodology

The material used in this research was the beef heart. The approximate composition of the raw beef heart was determined using AOAC (2005) procedures (moisture: 950.46; protein: 928.08; lipid: 960.39; ash: 920.153) and carbohydrate calculated by difference

method. Protein extraction was conducted under mild conditions to maintain, as far as possible, their functional properties. Extraction was carried out using an acid solubilization method. Proteins were concentrated by isoelectric precipitation (Selmane et al., 2010) at pH 4.0. Proteins obtained after precipitation in the form of a paste were frozen at -20°C and dried using a microwave dryer. The protein content of the final powder was determined by using the Kjeldahl method. Some functional properties of protein such as emulsion activity and stability, foaming ability and stability were measured according to Selmane et al. (2008), whereas oil holding capacity and water holding capacity of the protein concentrates was determined following the procedures previously reported by Kumar et al. (2014). Measurements were done in triplicate. FTIR analysis was performed through scanning by FTIR type IR Prestige-21/FTIR 8400 Shimadzu. The spectra were analyzed with IR Solution Software.

Results and Discussion

The chemical composition of the beef heart used in this study is presented in Table 1.

Table 1. Chemical composition of raw beef heart^a and functional properties of protein extract from beef heart and commercial proteins

Components	Amount ^c	Protein types	Beef heart ^c	Whey protein ^c	Casein ^c
Moisture (%)	76.35 ± 0.61	FA (%)	29.6 ± 4^x	74.4 ± 2^z	48.5 ± 4^y
Protein (%)	15.54 ± 0.28	FS (min)	5 ± 1^x	60 ± 4^z	18 ± 2^y
Lipid (%)	4.95 ± 0.58	EA	0.60 ± 0.03^y	0.44 ± 0.03^x	0.58 ± 0.02^y
Ash (%)	0.93 ± 0.02	ES (min)	10 ± 1^x	35 ± 2^z	16 ± 3^y
Carbohydrate (%) ^b	2.23 ± 0.75	WHC (ml/g)	2.12 ± 0.06^y	2.16 ± 0.02^z	1.96 ± 0.01^x
Protein (%Dry Matter)	65.75 ± 2.53	OHC (ml/g)	3.64 ± 0.04^x	6.58 ± 0.04^z	6.42 ± 0.02^y

^a calculated on the wet basis

^c Mean \pm SD

^b calculated by difference from moisture, protein, lipid, and ash.

Different superscripts x, y, z on the same row indicate a significant difference. FA (Foaming ability), FS (Foaming Stability), EA (Emulsifying Activity), ES (Emulsifying Stability), WHC (Water Holding Capacity) and OHC (Oil Holding Capacity).

Based on the chemical analysis, the second dominant component is protein $15.54 \pm 0.28\%$. When viewed from the protein (% dry matter), the value for the beef heart is still quite large i.e. above 50% ($65.75 \pm 2.53\%$). The beef heart is considered good as a source of food protein concentrate. Several published studies have also obtained high amounts of protein in animal by-products (Meshginfar et al., 2014; Han et al., 2014; Damgaard et al., 2015).

The functional properties of beef heart protein concentrate can be seen in Table 1. The statistical analysis showed that beef heart protein concentrate gave significantly different effect ($P < 0.05$) on the observed functional properties of the beef heart protein compared with other commercial concentrate sources of whey and casein proteins. Beef heart protein concentrates exhibit low foaming activity and foam stability compared with the commercial proteins. For the foaming activity and stability of foam, whey protein has the highest value of $74.4 \pm 2\%$ and 60 ± 4 minutes. High stability of foam can be caused by high surface activity on proteins. Another factor that affects the stability of foam is foam stabilizing mechanism involving protein and lipid droplets encased in proteins (Selmane et al., 2008). Beef heart protein exhibits high emulsion activity, even above the emulsion activity of whey and casein proteins. However, the emulsion stability of the beef heart protein is low, which means that it

is rapidly separating. The low emulsion stability of the good emulsifying agent is due to the higher interface area and the number of droplets that are also more numerous. Beef heart protein concentrate has water holding capacity lower than whey protein, but higher than casein. The low water-binding capacity is due to the higher proportion of hydrophobic groups compared to the hydrophilic groups on the surface of protein molecules. Interestingly, the protein of the beef heart also has a lower oil absorption capacity than whey and casein proteins.

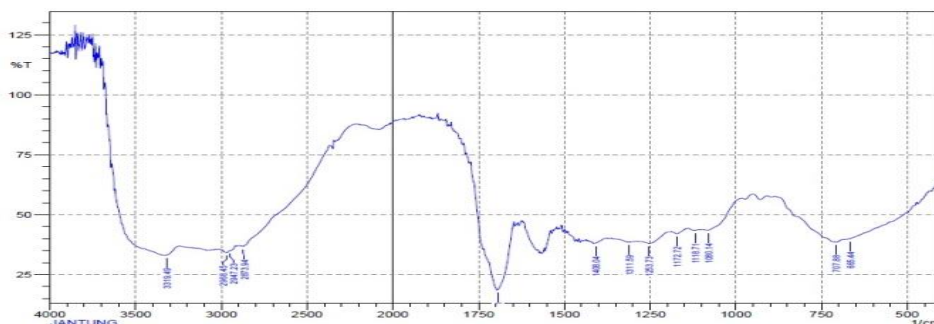


Figure 1. FTIR curves of beef heart proteins

Based on Fig. 1, the FTIR spectra of the beef heart proteins show some peaks. From the peak spectrum analysis, some active groups were observed, which were involved in the interaction between beef heart proteins and other compounds. The peak in the range 675-995 cm^{-1} indicates the -CH group or aromatic CH ring groups, and 1500-1570 cm^{-1} for NO_2 groups of nitro compounds or aromatic ring group C=C. The C=O group of aldehyde/ketone/carboxylic acid/ester was observed at 1690-1760 cm^{-1} , and 3300-3500 cm^{-1} for an amine/amide N-H group.

Conclusion

Protein from beef heart exhibited better water binding capacity and emulsifying property than casein. The FTIR analysis allowed suggesting that there was an effective ionic binding between protein concentrates and other substances. This data suggests that the use of beef heart proteins appears to be an interesting opportunity and challenge to continue innovation towards advanced value-addition of meat by-products.

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Level adoption of artificial insemination (AI) and this relationship with the social economic smallholder business livestock

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Abstract

This study was conducted to find out the correlation between socio-economic factors with the level of adoption of Artificial Insemination (AI) on the beef cattle farm. The method of determining the location of the research was purposive sampling with the number of respondents taken as many as 60 respondents from 3 villages. Data analysis was conducted to test the relationship between socio-economic factors with IB adoption rate using correlation test and to test the significance level of correlation coefficient used t test. The results showed that the rate of adoption of AI in the business of beef cattle farms in Karanganyar District, Central Java Province belonged to medium category with average adoption rate of 17.03, the rate of adoption of AI has a very significant relationship ($t_{count} > t_{table} 2,663$) land and relation livestock income not significant ($t_{count} > t_{table} 2,002$) with income from beef cattle sales, and not significant relation ($t_{count} < t_{table} 2.002$) with the age of farmer, formal education, number of family and farming experience. The conclusion of this study is that overall socio-economic factors have a very significant relationship with the level of AI adoption.

Keywords: beef cattle, livestock farming, socio-economic factors, adoption, artificial insemination (AI)

Introduction

Increased productivity in the business of beef cattle breeding can be done by using artificial insemination (AI) technology. The success of technology development is determined by whether or not the farmer adopts the recommended technology. Adopting an innovation will be influenced by several factors within a person covering the social and economic aspects. Age, land area, education, income, number of family and farming experience are social factors that affect the farmer's acceptance in adopting an innovation (Mardikanto, 2009). Socio-economic factors have influenced farmers in adopting AI technology, they will consider the benefits before implementing AI technology. The purpose of this research is to find out the correlation between socio-economic factors with AI adoption rate in Mojogedang sub district, Karanganyar district.

Methodology

Methods of research by conducting a survey of beef cattle ranchers in Mojogedang sub district, Karanganyar district. The method of determining the location of the study is determined by purposive sampling with certain considerations in accordance with the objectives of the study. The study was conducted with consideration that the area is potential for the development of beef cattle. IB technology has been applied by most of the local farmers and

has been successful well, this is because the purpose of beef cattle ranching in Mojogedang sub distric, Karanganyar distric is a cow breeder that is benefiting from the calves produced. Data analysis used to know the degree of relationship between socio-economic factors with the level of AI adoption in beef cattle ranchers in Mojogedang tested using correlation coefficient (Hasan, 2002).

Results and Discussion

Socio-economic factors include are age, area of farmland, formal education, sales of beef cattle, non-farm income, number of family and farming experience. Most respondents are 50% of age category over 50 years. Age 20-35 years tend to be more active so that knowledge increases. Respondents with farm land area more than 100 m² have the highest adoption rate that is equal to 19,60 whereas the lowest adoption on land area less than 50 m² that is equal to 16,53. Respondents who are educated up to university have the highest adoption rate that is equal to 18,50 while the highest number of respondent is respondent with education <elementary school that is equal to 78,33%. The highest adoption rate on beef cattle sales resulted from sales> Rp 12,000,000.00 with AI adoption rate of 18.22. The highest adoption rate on non-farm income is the respondents with income> Rp 2.000.000,00, the adoption rate of AI is 20,40. Most of respondents have income <Rp 1,000,000.00 which is 56,67%, The highest rate of AI adoption in the number of families is the number of families more than 5 people with the adoption rate of 17.67. The highest adoption rate in farming experience is at an experience level of less than 10 years with an adoption rate of 17.50.

Based on the analysis of the average rate of adoption of IB in beef cattle farming that is 17.03, this shows that the level of AI adoption in beef cattle breeding in Mojogedang in medium category. The rate of adoption of innovation can be taken into consideration to make decisions about the progress of the livestock business (Pebryna et al., 2014). Based on the analysis, it was found that high category adoption rate was only 11.67%, medium category was 76.67% and low category was 11.66%. The relationship between socioeconomic factors with the rate of AI adoption in beef cattle farms can be seen in table 1.

Table 1. The correlation relationship between socioeconomic factors with the rate of AI adoption of beef cattle

Varibel	Y		
	rs	t hit	Ket
Umur	0,201	1,562	NS
Area of farms	0,353**	2,870	SS
formal education	0,211	1,643	NS
The proceeds of beef cattle sales	0,271*	2,143	S
Non-farm income	0,477**	4,132	SS
Number of families	-0,048	- 0,364	NS
Farming experience	-0,129	- 0,992	NS
X total	0,485**	4,227	SS

T table = 2,002 ($\alpha = 5\%$) and 2,663 ($\alpha = 1\%$), Y (IB adoption rate on beef cattle farm), SS (Very significant If T count> 2,663), S (Significant If T count> 2,002), NS (Non significant If T arithmetic <2.002), rs (rank spearman correlation), total X (Overall socioeconomic factors).

There was no significant correlation between respondent age and the rate of IB adoption in beef cattle. According to Kusmiati et al. (2007) younger breeders usually have a passion for wanting to know and more quickly in adopting technology. Respondents with larger farmland

will pay more attention to the increased productivity of beef cattle by improving the understanding of IB technology to increase the population and quality of beef cattle owned.

Maris (2013), that extensive farming is positively associated with the adoption of innovation. Good economic ability will increase the motivation to strive with greater production activities. Respondents with higher sales results are more serious in the maintenance of beef cattle so that the resulting productivity will increase, the innovation offered to the breeder is an effort to improve the maintenance management and business management. Farmers who actively implement innovation lead to better business and income from high livestock business (Pebryna et al., 2014).

There is a very significant relationship between the income of respondents with the level of adoption of IB. Respondents with high incomes will more easily adopt IB technology because they have no difficulty in terms of financing in the implementation of IB in their beef cattle. According to Lestari et al. (2009) increased levels of income will encourage a person to improve the application of innovation in production activities. According Widoyoko (2003), long experience of a breeder in raising his livestock can affect the success rate in his business.

Conclusion

The rate of adoption of IB has a very significant relationship with the area of farmland and non-farm income, has a significant relationship with the sales of beef cattle and has a relationship that is not significant with age, formal education, the number of families and farming experience. Overall IB adoption rates have a very significant relationship with socioeconomic factors.

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The roles of dairy farmer group in the empowerment of conservation farming in the Kaligarang sub-upstream watershed

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Abstract

The aims of the research were to study farmer's potential and the roles of the group and to analyze the relation of farmer potential with the role of dairy cow group on the empowerment of conservation farming. The location of the research was in the sub-upstream watershed of Kaligarang, Semarang Regency having the biggest dairy cattle population. The respondents were 47 dairy farmers of the Dairy Farmer Group in the villages of Lerep and Nyatnyono, determined by the census method. They were the Dairy Farmer Groups of 'Ngudi Makmur' and 'Sumber Hasil' in Lerep and the Dairy Farmer Groups of 'Mardi Mulyo' in Nyatnyono village. The primary data was collected using interview based on questionnaire and field observation, and then it was analyzed descriptively using the contingency table with X^2 test. The research results show that the farmer group of 'Mardi Mulya' was the group with the highest percentage of group members (76.93%) with the basic potency level on the criteria of high. It was followed by the farmer group of 'Sumber Hasil' (28.57%) and 'Ngudi Makmur' (7.41%). The level of group roles to the empowerment of farming in the group of 'Sumber Hasil' is mostly low to moderate (71.43%), whereas in the groups of 'Mardi Mulya' and 'Ngudi Makmur', they were in moderate to high level by 76.92% and 81.48% respectively. The dairy farmer group of 'Ngudi Makmur' shows that farmer potential and member participation have interdependence in group empowerment ($P < 0.01$).

Keywords: conservation, dairy, empowerment, farmer group, roles

Introduction

The function of sub-upstream watershed is a combined function derived from all factors present in the area, i.e. vegetation, topography, soil, and humans. The technology of feed crop intervention provides the benefits, such as converting agricultural waste into useful resources, converting farm waste into organic fertilizer resources and making existing land effective so that land cover by plant canopy can be maintained throughout the year (Sumarsono et al., 2009).

The success of maintaining conservation land in the sub-upstream watershed of Kaligarang is determined by the participation of the community. Participation is a requirement in the empowerment program as a development concept (Friedmann, 1992). The farmers in the river flow area of Kaligarang have been carrying out proper conservation activities with the integration of crops and livestock (dairy cattle) (Sumekar et al., 2015). Therefore, the research was conducted with the aim to analyze the roles of dairy farmer group on the empowerment of conservation farming.

Methodology

The research was conducted on dairy farmer group in the sub-upstream watershed conservation area of Kaligarang. The research was located in the Sub-District of West Ungaran, Semarang Regency which is the region with the most dairy cattle population in the sub-upstream watershed area of Kaligarang. The selected dairy farmer groups were 'Mardi Mulyo' (13 members) and 'Sumber Hasil' (7 members) located in Lerep village and the dairy farmer group of 'Ngudi Makmur' (27 members). The primary data collection was conducted through direct interviews with the chief and the members of the selected dairy farmer group based on the questionnaire lists. The data on the roles of the groups were measured based on the participation level of the members in the groups processed descriptively based on the frequency distribution and the mean of respondents' answers. The association between the farmers' potential levels and the roles of the group of conservation farming empowerment was analyzed using the contingency table with X^2 test (Steel and Torrie, 1980).

Result and Discussion

The research results on the Condition of Dairy Farmer (KTT) based on member characteristics show that all three groups had productive economic potential by the age of most of the group members (<55 years). Most members of the Dairy Farmer Groups of Mardi Mulya and Sumber Hasil (61,54% and 71,43% respectively) had the experience in dairy farming of <10 years, while the Dairy Farmer Group of Ngudi Makmur (74,07%) had the experience of > 10 years . It is in line with the opinion of Sumekar et al. (2015) that high social and economic characteristics are related to the mastery of knowledge and technology and the ability to access the surrounding resources.

The Basic Potentials of the Members of the Dairy Farmer Group examined included the age, education, experience, communication intensity, cattle ownership, and number of family members. Due to the basic potential level of the Dairy Farmer Group Member, Mardi Mulya was the group with the highest percentage of group member (76,93%) with the basic potency level on the criteria of high. It was followed by the dairy farmer group of Sumber Hasil (28,57%) and Ngudi Makmur (7.41%) . The situation was in line with the percentage of the dairy farmer group members of Mardi Mulya (100%) which was included the productive group with 61.54% of its members having dairy cattle businesses with the ratio of > 50% between lactation dairy and total ownership of dairy cattles.

The roles of the groups to farming empowerment in dairy farmer group (KTT) of Sumber Hasil mostly were in the category of low to moderate (71,43%). The situation is not in accordance with the research results of Ilmi et al.(2015), that the groups with large number of members had low relationship level of relationships so that the participation was low to moderate. However, it is in line with the research results of Sumarsono et al. (2017) showing that farmer empowerment in the conservation in the sub-upstream watershed area of Kaligarang with the integration of mixed crops and dairy cattle could increase the farmers' income.

The relationship of farmer potency with member participation in group empowerment as presented in Table 1. The result of X^2 test, only in the farmer group of Ngudi Makmur showing that farmer potency and member participation in group empowerment were interrelated ($P < 0,01$). It is possible because Ngudi Makmur group had the longest experience of breeding dairy cows compared to the dairy farmer group of Mardi Mulya and Sumber Hasil.

Table 1. The Relationship of farmer potency with member participation in the empowerment of Ngudi Makmur group

Participation Farmer Potency	Low (%)	Moderate (%)	High (%)	Total (%)
Low	11,11	7,41	3,70	22,22
Moderate	7,41	40,75	22,22	70,38
High	3,70	3,70	00,00	7,40
Total (%)	22,22	51,86	25,92	100,00

Significant relation ($P < 0,01$), Chisquare test

Conclusion

Based on the research results on the roles of dairy farmer groups in the empowerment of conservation farming in the sub-upstream watershed area of Kaligarang, it is concluded that the group with the basic potency level in high criteria (76,93%) was the farmer group of Mardi Mulya. The level of the group roles to farming empowerment in the group of Sumber Hasil was mostly in the category of low to moderate (71,43%), while the groups of Mardi Mulya and Ngudi Makmur were in the level of moderate to high (76,92% and 81,48% %). The dairy farmer group of Ngudi Makmur showed that farmer potency and member participation in group empowerment have interdependence.

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Carrying capacity index of cattle feed on coconut land in District of West Bolangitang

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Abstract

West Bolangitang is one of the districts in North Bolaang Mongondow Regency which develops cattle. Cattle are cultivated under coconut trees, and consume waste from food crops and grasses that grow wild under the coconut trees. The problem is how far the potential development of cattle under the coconut tree. Based on these problems, we have conducted research with the aim of analyzing the potential of cattle development based on feeding carrying capacity index. This research has been conducted using survey method, and data source is primary data. The sample villages were determined by purposive sampling, with 32 respondents. The research material is coconut land and cattle. Analysis of data used is the analysis of the carrying capacity index (IDD). The results showed that the District of West Bolangitang has a coconut land, 3,668 Ha, with a real population of 2,044 AU. PMSL value of 4,744.24, meaning that based on land resources in this district can still accommodate the population of cattle for the value of PMSL. Total feed requirement amounted to 2,330.16 tons with a value of the carrying capacity of 2.04. Based on result of the research, it can be concluded that population of cattle in West Bolangitang District can still be improved by utilizing the land under coconut tree. Suggestion, need introduction of forage in supporting the development of cattle farms.

Keywords: carrying capacity, feed, cattle, coconut

Introduction

Coconut is known as a plantation commodity, which is export orientation. Coconut as a source of income for some people of West Bolangitang District which are sold in the form of copra. These commodities contribute to farmers' income, as well as the potential employment for agricultural sector growth. West Bolangitang District is one of the districts in North Bolaang Mongondow Regency that develop cattle. Cattle are grazed in the land under coconut trees. The area under the coconut tree is very potential for development of cattle (Salendu dan Elly, 2011). Cattle consume food crops and grass that grows wild under coconut trees. Coconut land cultivated many crops, especially maize and used as cattle grazing land, especially cattle (Malia *et al.* 2010). The problem is how far the potential development of cattle under coconut tree. Based on these problems, we have conducted a study with the aim of analyzing potential of cattle development based on index of carrying capacity of feed in coconut land.

Methodology

The subject of this research is cattle farmers in West Bolangitang District of North Bolaang Mongondow Regency. Cattle are farmers' livestock in West Bolangitang District. Coconut land is unused land for forage feed. The research method is survey method with data

source is primary data. The sample villages were determined by purposive sampling, with 32 respondents. The data analysis used is IDD analysis (Salendu, 2012).

Results and Discussion

Age as a characteristic of farmers affect absorption of technology and success of cattle farming in the District of West Bolangitang, age of respondents mostly included in the productive age. The level of education of farmers is mostly categorized low farmers that have an impact on the success of cattle farming. The farmers manage coconut plant, on average 1.31 Ha, with 92 cattle. The cattle belonging to the respondents were grazed under coconut trees, with food consumed being waste from food crops and wild grasses. This causes productivity of cattle is lower than cattle in other areas. Whereas feed is one of factors that determine both the bad growth of cattle (Prawiradiputra, 2011). Feed is the main problem facing farmers (Salendu, 2012 and Susanti *et al*, 2013). The results of Carrying Capacity Index analysis can be seen in Table 1.

Table 1. Index of carrying capacity of cattle feed in west Bolangitang District

No	Coeffisient/Variable	Value of Variable
1	PMSL (The maximum potential of land resources)	4744.24
2	k (Constant)	1.14
3	POPRIIL (Real Population)	2044.00
4	TK (Total requirement of feed) (kxPOPRIIL)	2330.16
Index of Carrying Capacity		2.04

The data in Table 1 shows that maximum potential value of land resources, under coconut trees is 4,744.24 AU, meaning that based on the land resources in this area can still accommodate cattle for value of the PMSL. The value of Carrying Capacity Index of 2.04 indicates carrying capacity of the land is quite high, meaning that maximum potential of land resources is still greater than need for feed. Based on the land potential, the real population can still be increased up to 2.04 times. The results of analysis are based on potential of effective coconut land. The indication of carrying capacity of feed is greater than population of beef cattle in District of West Bolangitang. Nugraha *et al* (2013) suggests that capacity of ruminant according to results of his research is greater than livestock population due to rainy season, forage production is available in large quantities. According Rahmansyah *et al* (2013) that strategy to achieve success of beef cattle farming, one of which is need for technology intake. Land under coconut trees according to research results, not yet exploited, as stated Rusdiana and Adawiyah (2013), that utilization of plantation land has not been maximized. Land under coconut trees in West Bolangitang District can be used for forage development. According Rasminati and Utomo (2010) that availability of forage land will determine amount of forage feed.

Conclusions

Based on result of the research, it can be concluded that population of cattle in West Bolangitang District can still be improved by utilizing the land under coconut tree. Suggestion, need introduction of forage in supporting the development of cattle farms.

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Forage introduction to support development of cattle In Sangkub District

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Abstract

Farmers in Sangkub District develop cattle as a source of income, so the government seeks to give serious attention to its development. The problem is there are constraints in its development, one of them related to feed. This research has been conducted with the aim to know how far the availability of feed for cattle. The research method used is survey method, with the respondents amounted to 15 farmers determined by purposive sampling ie farmers belonging to the group, the development of science and technology for the region. Data analysis used is descriptive analysis. The results showed the ownership of cattle by each farmer ranged from 2-6 tail with a total of 43 tails. The results showed ownership by each farmers ranged from 2-6 cattle to a total of 43 cattle. Cattle have the potential to be developed in terms of available resources. However, the food consumed is the grass that grows wild and corn waste. This is due to high quality forage, not yet available continuously. Knowledge of farmers about quality feed is still low, so the introduction of feed has been done by the team. Based on results of the research can be concluded that the introduction of cattle feed has been done and responded well by farmers. Suggestions submitted, need to socialize about the development of forage with business orientation and environmentally friendly.

Keywords: cattle, introduction, forage

Introduction

The government's attention to the agricultural sector is closely linked to the livestock sector. According Ikbali (2015), livestock development in this case is always associated with the reorientation of agricultural development policies. Related to the development of livestock, cattle is one of the commodities that support its development. Farmers in Sangkub District develop cattle as a source of income, so the government seeks to give serious attention to its development. The problem is there are constraints in the development of cattle farming, one of which is related to feed. Feed problems are a problem faced by farmers in any area such as according to Rahmansyah et al. (2013) and Nugraha et al. (2013). Based on that thought has been conducted research with the aim to know how far the availability of feed for cattle.

Methodology

The materials used in this study are land, cattle and agricultural waste. Land is land under coconut that is used for the development of cattle. Cattle are amounts owned by farmers.

Agricultural waste is residue of corn consumed by cattle. The forages introduced are dwarf grasses. The research method used is survey method. Respondents as many as 15 farmers are determined by purposive sampling ie farmers belonging to the group development of science and technology for the region. Data analysis used is descriptive analysis.

Results and Discussion

Sangkub district has an area of about 30.58 percent of area of North BolaangMongondow Regency. The agricultural family amounts to 70.93% and 30.13% of family, is a farming family, that is, the family whose members are farm laborers. The agricultural sector is prime mover of the region's economy so that its development becomes government's priority. The number of cattle each farmer ranged from 2-6 to head with a total of 43 head. The results showed that cattle consume corn waste about 8-10 kg and grass about 5-10 kg per head per day. According Nurdiati et al. (2012), development of local cattle is done by utilizing agricultural waste. However, high quality forage is needed to increase productivity of cattle. According to Dianita et al. (2014), sustainable forage production is an important factor in cattle production systems. Constraints that are often encountered in cattle farming is low productivity of cattle due to quality of feed that is not in accordance with nutritional needs of livestock (Lamid et al., 2014). Based on results of the research, introduction of forage through the planting of dwarf grass under coconut tree (Figure 1).



Figure 1. Grasses Developed Under Coconut Trees
In Sangkub District

The introduction of forage referred to as integrated cattle development. These developments according to Walia and Kaur (2013), Suroyo et al. (2013), Baba et al. (2014), and Wahyuni (2015), are known as integration systems of cattle-crop. Munandar et al. (2015) stated that the farming system integration is an alternative to climate change mitigation.

Conclusion

Based on results of the research can be concluded that the introduction of cattle feed has been done and responded well by farmers. Suggestions submitted, need to socialize about the development of forage with business orientation and environmentally friendly.

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The socio-economic creativity effect of livestock operations on dual production geographically under small-scale peasant In Weda, Halmahera, Indonesia

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Abstract

The objective study were to characterize low-income livestock production system, powered by the farmer creativity to have the value added income by forming another income beside cattle as the livestock production system. A farmer and his family income, namely his wife as mother of the family has her own income, also his son (s) has his own income, his daughter (s) has her own income, All the income without livestock operations income formed value added income of farmer family or in this case called *creativity income*. Purposive random sampling were used to select two geographically place namely highland and near coastal land (lowland). From 520 sample 52 respondents were selected as cow farmers from those two places. These two places chosen in which they used to live and cultivated cattle. Interview schedulels were used from them. A descriptive analysis of the data showed that the socio economic creativity of farmers resulted the adding value of the income on the productive age of them. They got income from the livestock production, the creativity of farmers contributed additional household income to increase socio economic benefits. When farmer has more cattle compare to other farmers they usually called richer as the social standard, beside that the farmer's income will be more than other farmers.

Keywords: geographically, creativity, value added, socio-economic

Introduction

Creativity is a human mind to characterized one to each other. Positively when they face the constraints of how to grow the family in a peasants condition. It is well documented that over 900 million people are suffering from supplies in future, under nourishment partly due to insufficient agricultural production (Chawatama et al. 2005). Study about smallholder farming area whereas cow production as draught animal showed how the livestock production system unsatisfied to cover the need (Chawatawa et al 1998). The peasant constraint seemed sufferer especially when they raised the cattle in tropics they usually lack of grazing due to the dry season weather, As (Devendra 1982 and Peacock C 1996) also Shirima EJM et al, 2003). The farmers still had a small area to raise the cattle (Loing, JC 2016). Some creativity has been done. The writer of Indonesia try to review the strategy of marketing in local cattle to strengthen the peasant of Indonesia villages economy (Nyoman et al 2017). The researcher try to write the significance of farmer's through direct survey to alleviate the poverty (Loing, 2013). Also the creativity to increase production using grow enhancer as (Loing,J.C., 2016) but all of them were not the creativity of the peasant. Refereces study about the creativity. The creativity (Taylor and Francis 2010) Creativity and Cultural Policy. Creativity and regional studies (Collis et al, 2013), Creativity as intangible cultural heritage (Cominelli et al, 2012) Also (Nick Wilson, 2010). This individualism conception of creativity extends to the farming of the

creative industries and the creative economy, where creativity is treated as either a quasi-commodity or the preserve of the so-called “creative class”. The objective of this study was to know the creativity in peasant raise cattle in West Halmahera Island who currently have livestock or cattle and have some creativities as a farmer family relate to the age to alleviated their poverty.

Methodology

District of Weda locate in Middle Halmahera region, geographically place in LS 0°15' to LU 0°16'; BT 127°48' BB to 127°59' in North District of Weda, In South Halmahera Region, In West City of Island Tidore, In East Weda Bay (BPS District of Weda, 2015). The cattle used in this study were own by the respondents showed in 1 – 7 cows. All the cattle were managed under grazing system. Most of their feeds used were seasonal and were found from the village surroundings including crop residues, the same as (Shirima, 2005). But in the dry season the farmer used to give water to the cattle. Data were collected by chosen two place by purposive random sampling, were used to select two geographically place namely highland and lowland. From 520 farmers determined 52 respondents as cow farmers. Interview schedulels were used from them to know the income get from cattle and other income. The data from questionnaire were analyzed using IBM SPSS Statistics 20 as The Statistical Package, the result of the analysis and means were compared at 95% level of significance.

Result and Discussion

The age of farmers are 21 to 61 years old divide into three stages 20, 40 and 60 years old as their productive age. Each group of age divide into three categories, namely young group for 20, middle group for 40 and old group. The result showed in next table.

Table 1. Mean productive age of minimum maximum in three parameters of livestock farmer in Weda Halmahera island

Measurement	Productive Age
Minimum 21 Maximum 50	37.7 ± 15.3 ^a
Minimum 25 Maximum 55	41.7 ± 15.3 ^a
Minimum 27 Maximum 50	44.7 ± 16.6 ^a

^{ab} means in the same row for each parameter with different superscripts are significantly different ($p < 0.05$)

The farmer income of livestock in million digit divide into three stages namely three low income, the three middle income and the three high income. The result showed in next table.

Table 2. Mean farmer income of livestock in three parameters in Weda Halmahera island

Measurement	Productive Age
Minimum 10 Maximum 51	33.7 ± 21.2 ^a
Minimum 20 Maximum 120	63.3 ± 51.3 ^a
Minimum 30 Maximum 270	120 ± 130 ^a

^{ab} means in the same row for each parameter with different superscripts are significantly different ($p < 0.05$)

The farmer creativity income of livestock farmer in million digit divide into three stages namely three low added value income, the three middle added value income and the three high added value income. The result showed in next table.

Table 3. Mean creativity income of livestock farmer in three parameters in Weda Halmahera island

Measurement	Productive Age
Minimum 5 Maximum 23	13.3 ± 9.07 ^a
Minimum 7 Maximum 25	15.7 ± 9.01 ^a
Minimum 10 Maximum 50	26.7 ± 20.8 ^a

^{ab} means in the same row for each parameter with different superscripts are significantly different ($p < 0.05$)

Conclusion

This study shown that there was variation for age, income and income generate creativity for 52 farmers and their family as variation of the socio-economic status of peasant livestock production. The creativity produced by the farmer family namely from the head of family and their family members help the to overcome some of the constraints (disease, capital acces, grazing, etc.) they face.

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Potency of forage development under coconut tree in District of Lolak

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Abstract

Farmers in District of Lolak develop cattle by utilizing the land under coconut trees. The area of planting coconut in Lolak District is 7422,81 Ha or 27,98% from area in Bolaang Mongondow Regency. Most of the land under coconut trees is utilized with food crops such as maize. The problem is whether the land under coconut tree has potential for forage development. This research has been conducted with the aim to analyze potential of forage development under coconut. The research material is cattle, land and forage. Cattle are local cattle developed by farmers. Land is land under coconut trees that can be utilized for forage development. Forage is a developed cattle feed. This research has been conducted by using survey method, with data collected are publication data from BPS of Bolaang Mongondow Regency and BPS of Lolak District. The data analysis used is Effective Livestock Development Potency analysis for land under coconut. The results showed that value of PMSL was 6017, KPPTTR (SL) 2028.01, PMKK 13263, KPPTTR (KK) 9274. Based on the research result, it can be concluded that potential of land under coconut trees in Lolak District can still be developed forage for needs of cattle. Need to increase population of cattle accompanied by introduction of forage under coconut trees.

Keywords: cattle, coconut, forage

Introduction

Farmers in District of Lolak develop cattle by utilizing the land under coconut trees. The area of planting coconut in Lolak District is 7422,81 Ha or 27,98% from area in Bolaang Mongondow Regency. Most of the land under coconut trees is utilized with food crops such as maize. However, most of the land is left overgrown with weeds. The problem is whether the land under coconut tree has potential for forage development. Land under coconut based on some research results can be improved through introduction of forage. According to Salendu and Elly (2011) land under coconut can be used for forage crops and cattle are very potential to be developed in the land. Forage as the main feed for cattle, its availability is still limited. This is due to low knowledge of farmers about quality of forage. In addition, farmers have limited land area for forage development, as stated by Alfian et al. (2012). Based on that idea, we have done research with aim to analyze the potential of forage development under coconut in District of Lolak.

Methodology

The research material is cattle, land and forage. Cattle are local cattle developed by farmers. Land is land under coconut trees that can be utilized for forage development. Forage is a developed cattle feed. The method used in this research is survey method, with data

collected are primary data published, BPS of Bolaang Mongondow Regency (2015), and BPS of Lolak District (2015). Analysis of the data used is an analysis of potential for effective livestock development for land under coconut.

Results and Discussion

Cattle need forage as main feed for their growth needs. The development of cattle utilizes land under coconut. The development of beef cattle can not be separated from development of agricultural sector (Hartono, 2012). The results of research on the potential for effective livestock development under coconut trees in District of Lolak can be seen in Table 1.

Table 1. The potential of effective livestock development in the coconut tree in District of Lolak

Coefficient/Variable	Value of Development Potential
PMSL (The maximum potential of land resources)	6017.01
KPPTR (SL) (The capacity increase in the cattle population by land resources)	2028.01
PMKK (The maximum potential based head of family farmers)	13263.00
KPPTR (KK) (The capacity increase in the cattle population by head of family farmers)	9274.00

The data in Table 1 shows value of PMSL for District of Lolak of 6017.01 AU, meaning cattle population, as much as value can be developed when viewed from coconut land resources. Local cattle farming is the mainstay of beef supply so it is necessary to increase the population and productivity of cattle (Santosa et al., 2013) The value of KPPTR (SL) is 2028.01 AU, meaning that cattle population can be increased by that value to meet maximum potential of coconut land resources. According to Nugraha et al. (2013), the capacity of ruminants is greater than population of cattle, which is caused during rainy season of forage production is available in large quantities. The value of PMKK is 13263,00 AU, meaning that cattle population can be increased by that value based on availability of labor which each have 3 UT. The value of KPPTR (KK) amounts to 13263.00 AU, meaning that population of cattle based on the farmer's family can be increased by a number of these values.

An increase in the number of cattle has an impact on improving the social status of farmers (Lambertz et al., 2012). Cattle is a strategic commodity with double function for dry land farmers (Hermawan and Utomo, 2012) (including land of coconut). The availability of forage land will determine amount of forage feed (Rasminati and Utomo, 2010). The development of cattle farms environmentally friendly and local resource based is a strategic step in realizing improvement of the quality and quantity of livestock products (Kusuma, 2012). According to Salendu et al. (2012), land use under coconut trees for forage serves as cover crops so that there is no erosion and can increase soil fertility.

Conclusion

Based on the research result, it can be concluded that potential of land under coconut trees in Lolak District can still be developed forage for needs of cattle. Need to increase population of cattle accompanied by introduction of forage under coconut trees.

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Production performance of Simental and Limosuin Ongole Crossbred on the smallholder business livestock

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Abstract

This study aims to obtain information about the performance of Simpo and Limpo beef cattle in the smallholder business livestock in Karanganyar regency. This research was conducted by using survey method on 30 bulls selected by purposive sampling and data collection was done with Participatory Rural Appraisal. Research observation variables consist of farmer characteristics and production performance data. Age farmers 15-64 years old (88%), not school (48%), farmers job (88%), farmer experience 10-20 years old (56%), 96.67% beef cattle fed on combination of grass, concentrate and straw. The data of the research were tested statistically with t-test and reported descriptively. Appearance of beef cattle production at smallholder business in Karanganyar regency shows not difference ($P > 0,05$). The results of this study show the average feed intake (10.10 ± 1.14 kg / head / day), daily weight gain (0.47 ± 0.10 kg / head / day), feed conversion ($22,22 \pm 3,98$), feed efficiency ($0,05 \pm 0,01$), FC / G Rp 12331,34 / kg and income over feed cost Rp 13534,35. Performance of beef production Limousin Ongole Crossbred and Simental Ongole Crossbred respectively for feed intake (kg/head/day DM) 10.00 ± 1.05 and 10.24 ± 1.28 , ADG (kg / head / day) $0.45 \pm 0,11$ and 0.50 ± 0.08 , FCR 23.51 ± 6.5 and 21.08 ± 16 , FER 0.04 ± 0.01 and 0.05 ± 0.01 , feed cost per gain (Rp) 13,119,6, - and Rp 11,300,5, and income over feed cost (Rp) $12,994,1 \pm 14,240,8$. The conclusion of this research is that the performance of beef cattle production in the smallholder business livestock is not influenced by the difference of cattle breed. Simental Ongole Crossbred cattle farming is more profitable than Limousin Ongole Crossbred.

Keywords: production, Simpo cattle, Limpo cattle, fattening, smallholder business livestock

Introduction

Beef cattle breeding business in Indonesia is generally in the form of community livestock business as a side business with a simple cultivation system. Although the cattle that are reared by breeders use Simental Ongole and Limousin Ongole cattle, but their genetic potential is not maximal because of environmental support that does not support it Riyanto et al., (2010)^[1]. The continuous efforts to increase the productivity of sustainable beef cattle in rural areas can be achieved by increasing productivity such as through improved management of body weight gain, feed consumption, feed conversion, and feed efficiency based on existing environmental conditions.

Methodology

This research has been carried out in cattle farms of beef cattle Subdistrict Mojogedang District Karanganyar. Mojogedang sub-district is used as a research site because the area is very potential for the development of beef cattle in Karanganyar Regency with 6454 cattle

population. This research was conducted by using survey method on 30 bulls selected by purposive sampling and data collection was done with Participatory Rural Appraisal. The data of the research were tested statistically with t-test and reported descriptively. The research variables consist of feed dry ingredients, average daily gain measurement using Animeter tape, feed conversion based on dry matter, feed efficiency in material form, feed cost per gain, income over feed cost. Sampling for each village according to Mardikanto (2001). The data of cow production performance among the cows was tested statistically for each variable with t-test. Research data in the form of quantitative data is reported descriptively.

Results and Discussion

Characteristics of respondents that have been studied consist of age, education level, occupation and farming experience. Age of farmers in Mojogedang is 15-64 years as many as 22 farmer or 88% of the total respondents. The average respondent in the study is still classified in the productive age or working age Daniel (2002) states that potential workforce that can work that is aged 15-64 years, productive age has a good physical condition, a good way of thinking, and dynamic in managing his business. As many as 48% of farmers in Mojogedang are mostly not educated. As many as 28% only educated at elementary level and 24% of all respondents who have high school education. The lower the level of one's education the ability of a person in developing the business is also less than the maximum (Martono, 1995). Most of the farmers are 88% or 22 farmers of all respondents. This shows that some people have jobs as farmers and do not make the main job as a famer. According to Diatmojo (2012) small scale of cow breeding business that kept causing beef cattle fattening business into farmer-run business with limited capital, labor and management. Most of the experience of cattle breeding in cattle fattening is 10-20 years, as much as 56%. According to Riyanto et al. (2010) added that the farmer's livestock breeding experience influences the acceptance of innovation and is closely related to the level of animal health and production efficiency,

The feed used by breeders is grass, straw and concentrates or other feed ingredients available in the area. A total of 96.67% of beef cattle in the Mojogedang were given combination feed of grass, concentrate and straw. The usual grass is grass kalanjana and king grass. The types of straw used during the study were rice straw, corn straw and peanut stover. Concentrate used by farmers is bran and pollard. The results of research include feed consumption, ADG, feed conversion, feed efficiency and FC/G can be seen in Table 1.

Table 1. Dry Matter Intake, Average Daily Gain (ADG), feed conversion, feed efficiency and FC/G on Cattle farm in Subdistrict Mojogedang

Variable	Beef Cattle		Average
	Limousin Ongole Crossbred	Simental Ongole Crossbred	
Dry Matter Intake (kg/head/day)	10,00±1,05	10,24±1,28	10,10±1,14
Average Daily Gain (kg/head/day)	0,45±0,11	0,50±0,08	0,47±0,10
Feed Conversion	23,51±6,50 ^a	21,08±3,16 ^b	22,46±5,38
Feed Efficiency	0,04±0,01	0,05±0,01	0,05±0,01
FC/G (Rp/kg)	13119,60	11300,53	12331,34

^{ab} different superscripts in the same row showed significant differences (P<0,05). FC/G (feed cost per gain)

Mean of consumption-feed of beef cattle in Subdistrict Mojogedang is higher than consumption of beef cattle feed in Subdistrict Bantul by $6,97 \pm 0,4$ kg / head / day (Carvalho, et al., 2010) ADG cattle Limousin Ongole Crossbred and Simental Ongole Crossbred are lower than the result of Lestari et al. (2011) . ADG Limousin Ongole Crossbred and Simental Ongole Crossbred cattle are not influenced by breed differences (Yantika et al., 2016). The average of

feed efficiency in research is higher than the efficiency of cattle feed result of Nurdianti *et al*, (2012) in Semin sub-district by 0,021. The higher feed efficiency value indicates that the ration consumed is lower to produce weight gain. Based on the economic aspect of cow feed efficiency Simental Ongole Crossbred cattle better than Limousin Ongole Crossbred cattle. So the Simental Ongole Crossbred cattle have a value of feed cost per gain lower than the Limousin Ongole Crossbred cattle (Priyanti *et al.*, 2012). The advantages obtained in Simental Ongole Crossbred cattle farms are larger than the Limousin Ongole Crossbred cattle because of the consumption value of dry matter, average daily gain and the feed efficiency of Simental Ongole Crossbred larger than Limousin Ongole Crossbred cattle.

Conclusion

The performance of the beef cattle production in Mojogedang Sub-district of Karanganyar Regency is not influenced by cattle breed differences. The consumption of cattle feed in Mojogedang Sub-district is high, but the feed consumed is less efficient to produce high average daily gain in all cattle breed. Based on the economic aspect it seems that Simental Ongole Crossbred cattle fattening is more profitable than Limousin Ongole Crossbred cattle.

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Accessibility of Farmers toward Resources of Broiler Livestock Farming With Use Partnership System in Malang Regency

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Abstract

Partnership system is business collaboration between mikro business with intermediate business and/or makro business that followed with founding from mikro business and/or makro business with showed principle of need each other, mutual need, and mutual benefit. The aim of this research was to (1) formulated profile business partnership system of broiler livestock farming with close house system in malang regency and 2) reviewed accessibility of farmers toward resources of broiler livestock farming with use partnership system. Analysis of the data was used descriptive analysis. The result showed that (a) There are three models of partnership system of broiler livestock farming with close house system in malang regency namely profit sharing, sub-contract, and management fee; and b) The accessibility of farmers toward resources with profit sharing of partnership system at upstream sector is the provision of land, pen, labor, feeder, nipple, and blowers, at on farm sector is the provision of vitamins, medicines and husk, at downstream sector is the timing of harvest, sale of chicken and feces. The accessibility of farmers toward resources with sub-contract of partnership system at upstream sector is the provision of land, pen, labor, feeder, nipple and blower, at on farm sector is the provision of husk, and at downstream sector is sale of feces. The accessibility of farmers toward resources with management fee of partnership system at upstream sector is the provision of labor, feeder and nipple, at on farm sector does not exist, and at downstream sector only the sale of feces.

Keywords: broiler, partnership system, close house system, accessibility of farmers, resources.

Introduction

The high growth of Indonesian population (1.38 per year) is directly proportional to the increasing public demand for chicken meat which reaches 9 kilograms per capita per year. This shows that the poultry industry in the broiler sector is an industry that has great potential to be developed in developing countries such as Indonesia. The potential is seen from several advantages of poultry sector such as: a) short harvest period, b) efficiency of land, c) small capital, and d) availability of industries from upstream to downstream which is a unity of agribusiness and agro-livestock systems, much labor (Banjoko et al., 2014).

Government Regulation No. 44/1997 states that partnerships are business partnerships between small and intermediate businesses and/or large companies accompanied by the development of intermediate and/or large companies by demonstrating the principle of need each other, mutual need and mutual benefit. The objectives of developing agriculture and

livestock sectors through business partnerships are: 1) increasing revenues, 2) balancing business, 3) increasing group resources, 4) increasing business scale, and 5) improving business capability, making it strong and independent (Akinola, 2014). Partnership system of broiler livestock farming are very diverse, so that will influence the partnership system that will be developed with the principle of partnership that is need each other, mutual need, and mutual benefit. The objectives of the research are 1) to formulate profile of business partnership in broiler farming system of close house system in Malang Regency, and 2) to reviewed accessibility of farmers toward resources of broiler livestock farming with use partnership system.

Methodology

Location and time of research

Data was collected from April to September 2017. The research location in Malang Regency become consideration that Malang Regency is the second largest production center of broiler livestock farming in East Java with 27,642,192 (Ditjennakkeswan, 2016) after Lamongan with density 7,830 tail/km², and with an area of 3,530.65 km² with 27 sub-districts, so it has the potential of supporting areas for the development of broiler livestock farming, while East Java Province is the second largest production center of broiler livestock farming after West Java.

Sample collecting method

The study respondents were participants of core-plasma partnership from broiler farming with partnership system. Criteria of the respondent farmers are: 1) farmers cooperating with core-plasma partnership with partnership system for one year or six periods, 2) have complete recording data, 3) livestock farming conducted in Malang Regency, 4) farmers has a minimum three years of farming experience, 5) broiler farming using a close house system, and 6) broiler population at least 10,000 for each period. Data were collected using survey method, observation, and direct interview with farmers. The method is used to collect primary and secondary data.

Results and Discussion

Profile of partnership system of broiler livestock farming with close house system

The partnership system of livestock farming can help broiler farmers in terms of maintenance and marketing of chicken. The partnership system is divided into two principles, namely the type of maintenance and the type of marketing. Based on maintenance management and marketing management, the general partnerships system of broiler farming are divided into: 1) profit sharing, 2) sub-contract, and 3) management fee.

Profit sharing

A form partnership of core-plasma where the core company provides sapronak and plasma farmers provides pen, operations, and labor. Marketing can be done by the core and plasma. Sapronak price is based on the highest retail price, profit sharing is calculated from the sale of chicken that appropriate with market price and reduced by the cost has spent. Losses incurred in a profit sharing of partnership system are together responsibility that accordance with the agreement. Benefits of profit sharing system include there are a sense of responsibility from both parties, the core get benefit from the sale of sapronak and plasma farmers get a capital loan that is sapronak, and assistance that is founding maintenance technical. The weakness of profit sharing system is plasma farmers follow responsibility for losses if the

selling price at below the cost of production and the benefit is relatively smaller because there is a profit sharing.

Sub-contract

A form partnership of core-plasma where the core company is obliged to provide sapronak (feed, DOC, vitamins and medicines) and technical supervisors (extension agents and veterinarians), while the farmers as partners are obliged to provide pen, equipment, operations and labor. Cooperation is set in the contract document containing sapronak price, chicken selling price, achievement bonus, and SOP (Standart Operational Procedure). Benefits of sub-contract system include guarantee marketing and certainty of chicken price, while the weakness is less benefit of plasma farmers due to the addition of sapronak price and when the chicken selling price is above the contract price, so the profit and loss calculation uses the agreed price contract at the beginning.

Management fee

A form partnership of core-plasma where the core company provides sapronak until land and pen, whereas plasma farmers provide labor. Large and small profits of plasma farmers are based on IP (production index) determined by the core calculated per chicken harvest, and everything is determined by the core company such as DOC strain, feed, and harvest time, and plasma is not allowed to sell its own chickens. The benefits of management fee system is that farmers do not responsibility for losses, except the losses caused by operational costs that have been spent, while the weakness is if the IP that produced below the standard so the benefits that obtained by plasma farmers are very small.

Accessibility toward esources

Table 1. Accessibility of broiler partnership system at upstream sector

Partnership System (Agribusiness)	Profit Sharing		Sub-contract		Management Fee	
	Core	Plasma	Core	Plasma	Core	Plasma
Up Stream						
1. DOC	x		x		x	
2. Area/Land		x		x	x	
3. Pen		x		x	x	
4. Labor		x		x		x
5. Feeder		x		x		x
6. Nipple		x		x		x
7. Blower		x		x	x	

Source: Data processed (2017)

Accessibility of broiler livestock farming with partnership system at the upstream sector includes: provision of DOC, provision of land, provision of pens, labor supply, provision of feeder, provision of nipple, and provision of blowers. Upstream sectors in the partnerships system of profit sharing and sub-contracts there is no difference of partner farmer accessibility, while in management fee of partnership system there is different. The difference is in the access of partners farmers of resources that is provision of land, pen, and blowers provided by the core companies, so that the operational costs of partner farmers to be very low.

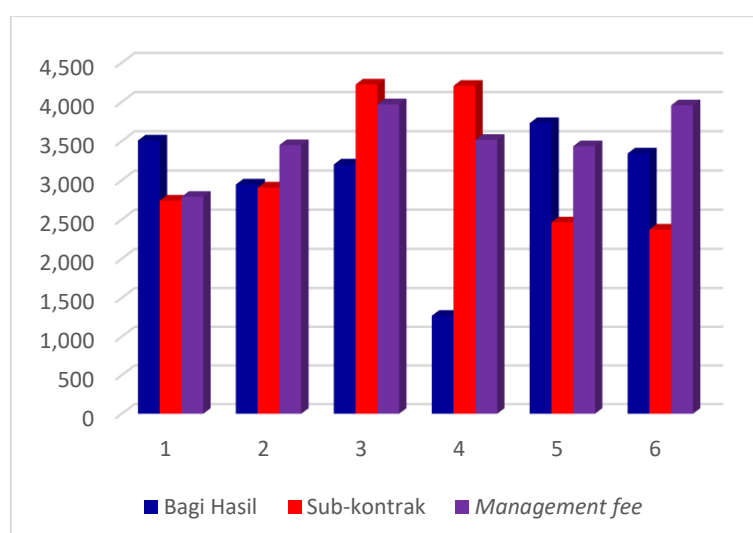


Figure 1. DOC Cost during Six Periods

Table 2. Accessibility of broiler partnership system at on farm sector

Partnership System (Agribusiness)	Profit Sharing		Sub-contract		Management Fee	
	Core	Plasma	Core	Plasma	Core	Plasma
On Farm						
1. Mortality	x		x		x	
2. FCR	x		x		x	
3. Vitamin	x		x		x	
4. Medicine	x	x	x		x	
5. Feed	x	x	x		x	
6. Husk		x		x	x	

Source: Data processed (2017)

Accessibility of broiler livestock farming with partnership system at on farm sector includes: mortality ratios, FCR, provision of vitamins, provision of medicines, provision of feed, and provision of husk. On farm sector in profit sharing system for the provision of access to drugs and feed becomes the responsibility of core and plasma simultaneously, whereas in the partnership system it becomes the responsibility of the core company. The provision of husks in profit sharing system and sub-contracts system is the responsibility of the plasma farmers, while the management fee system is the responsibility of the core company.

Table 3. Accessibility of broiler partnership system at down stream sector

Partnership System (Agribusiness)	Profit Sharing		Sub-contract		Management Fee	
	Core	Plasma	Core	Plasma	Core	Plasma
Down Stream						
1. Time of Harvest		x	x		x	
2. Sale of Chicken	x	x	x		x	
3. Sale of Feces		x		x		x
4. Bonus	x		x		x	
5. Incentive	x		x		x	

Source: Data processed (2017)

Accessibility of broiler livestock farming with partnership system at the downstream sector include: times of harvest, sales of chicken, sales of feces, bonuses, and incentives. The downstream sectors of the profit-sharing system that are the responsibility of the core company are chicken sales, bonuses, and incentives, while those that are also the responsibility of plasma are chicken sales. Time of harvest and sale of feces is entirely left to the plasma farmers. The downstream sectors in profit sharing system is different with sub-contract system and management fee systems, while at the downstream with sub-contract system is similar to the management fee system, which is the times of the harvest, chicken sales, bonuses and incentives by core companies, while the sale of feces is left to plasma farmers.

Conclusion

There are three partnership system of broiler livestock farming with close house system in Malang Regency, that is profit sharing, sub-contract, and management fee. Accessibility of farmers toward resources in profit sharing system at upstream sector is the provision of land, pen, labor, feeder, nipple, and blowers, at on farm sector is the provision of vitamins, medicines, and husks, at downstream sector is the time of the harvest, the sale of chicken and feces. The accessibility of the farmers toward resources in sub-contract system at upstream sector is the provision of land, pen, labor, feeder, nipple and blower, at on farm sector is provision of husks. The accessibility of farmers to resources in the management fee partnership system at the upstream sector is the provision of labor, feeder and nipple, at on farm sector there is no, and at the downstream sector only the sale of feces.

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Utilization of signal grass pasture to support cattle production and economic value of coconut based farming

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Abstract

Integrated pasture and livestock in coconuts based farming systems were expected to enhance the efficiency and the sustainability of land utilization. The objective of this experiment was to study the effects of stocking rate and grazing systems on production and quality of forage, performance of pasture, average daily gain and the yield of coconuts. Treatments were put on Split Plot arrangement based on Randomized Block Design. The results show that: a) all highest performances measured were found on interaction of rotational grazing system and stocking rate three, b) Daily gain of rotational grazing was significantly higher than continue grazing system. Even the higher the stocking rate the lower daily gain but the value of cattle gain provide almost double than the value of copra per ha. As a conclusion rotational grazing system and suitable stocking rate are needed to sustain the productivity and quality of signal grass, cattle gain and economic value of integrated systems.

Keyword: Signal grass, cattle, economic, coconut, farming.

Introduction

Negative effects of defoliation frequency decrease dry matter production and growth of forage, inhibit develop and even cause death of the rooting (Mousel et al., 2005) due to limitation nutrient absorption and the effectiveness of photosynthesis. However, recent research results show that the increase in the frequency of defoliation contrary raised the concentration of TNC in the crown and root (Gittins et al., 2010) and even earlier it was reported that heavy grazing of yaks up to 2.9 head/ha produced root/shoot ratio biomass higher than the lighter grazing pressure (Gao et al., 2007).

Methodology

The research was conducted on Palma Research Center in Manado. A total of 36 adult cows of local breeds with an average initial weight of 270 kg were used, received Ivomec to control Endo and Ecto parasites. The average daily gain was measured using a digital scale with the capacity of 1000 kg, and area of was 6 hectares with local coconut trees about 50 years old with a spacing of 9x9 meters and planted with signal grass, was divided into sub-paddock for the rotational grazing purposes. Two grazing systems that continuous (CS) and a rotational (RS), and three stocking rate tested in this study. Rotation was done based on the accumulation of heat units, while stocking rate consisted of $SR_1 = 0.77$; $SR_2 = 1.54$ and $SR_3 = 2.31$ AU (animal unit). The treatments were arranged in a split plot design based on the Randomized Block Design. The measured variabes were the number of the planted signal, tiller number, the weight of the crown and root, botanical composition and the average daily gain of cattle.

Results and Discussion

Performance of signal grass and botanical composition is presented in Table below.

Table 1. Performance of signal grass botanical composition.

Interaction of grazing systems and stocking rate	Parameter				
	Planted signal/20 cm ²	Ground tiller/20 cm ²	Dry weight root-crown (g/10 cm ²)	Signal grass (%)	Legume (%)
CS-SR ₁	6,22 ^b	13,22 ^b	9.46 ^c	79,21 ^b	3,72 ^b
CS-SR ₂	6,44 ^b	18,78 ^b	12.47 ^b	70,38 ^b	10,45 ^a
CS-SR ₃	9,22 ^b	26,55 ^a	15.84 ^b	63,41 ^c	14,49 ^a
RS-SR ₁	2,66 ^c	3,67 ^c	7.55 ^c	78,89 ^b	0,78 ^c
RS-SR ₂	7,00 ^b	14,00 ^b	14,81 ^b	83,46 ^b	0,95 ^c
RS-SR ₃	12,22 ^a	27,89 ^a	25.43 ^a	90,42 ^a	1,33 ^c
Sign	***	***	***	***	***

***: highly significant different

Of all parameters of signal grass shows the interaction of treatment RS-SR₃ gave the best results, high number of planted signal, ground tiller, dry weight root and crown may be associated with most of the forage biomass taken away by cattle, causes the less mulch (Diaz-Filho, 200) more light penetrating soil surface and increased temperature, further stimulated the growth of new tiller from the crown (McMaster et al., 2003) highest yield dry weight of roots and crown, consistent with previous reports with an increasing the concentration of TNC in the crown and root (Gittins et al., 2010), is a mechanism to ensure regrowth after grazing (Wang et al., 2003), indicate persistent on heavy grazing (Gittins et al., 2010).

Rising in stocking rate in the continuous grazing treatment (CS) causing a lowering in the components signal grass, increasing the component of legume, but followed with increasing significantly the portion of weeds. In contrast, to the rotational grazing (RS), there was an increase in the portion of the grass significantly, with markedly lower of dead material portions compared with other interaction.

Average daily gain. The interaction treatment showed no significant differences on the average daily gain (ADG) of cattle. Therefore, a separate analysis was done and the results show that rotational grazing systems provide ADG 406.30 higher than continuous grazing 382.30 g/h/d. Furthermore, the increasing of stocking rate followed by a significant decrease in ADG of 465.65, 387.60 and 338.85 g/h/d. These results are consistent with those reported previously by Pereira *et al* (2009)^[9] daily gain cattle grazing on pasture signal grass. ADG at SR₃ was low due to the less availability of grass. The high ADG on rotation system might be due to the crude protein (CP) content of pasture was 8:09%, similarly reported by Anis *et al* (2011)^[11], meets the minimum requirements for ruminants (Coleman et al., 2003)^[2], on the other hand CP on continuous grazing was lower at 6:27%. Despite lower ADG in stockings SR₃, this treatment gave the highest results in weight gain per ha around 366 kg body weight per year with local price IDR 30.000 per kg equal to IDR 10.980.000 as a value of cattle production. The results of these interactions contributed to the increasing of the net primary production of monoculture coconut plantations, which only produced between 6.60-12.60% of the maximum potential productivity of 280.5 tonnes DM / ha / yr (Magat, 1990)^[6].

Economic value. Assume that one ha of coconut area with 100 trees of coconuts produced average 1200 nuts per harvest multiply by 4 time a year 4800 nutes equivalent to 960 kg copra with local price IDR 7500 per kg or IDR 6.320.000 per year or around half compared to value provide by cattle production.

Conclusion

Sustainability of production and quality of the signal grass is determined by the system and proper grazing pressure to ensure the biological life of the grass, which is in turn support the productivity of cattle and economic value of this integrated systems.

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Labor allocation for beef cattle breeding on dry-land area in South Malang region

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Abstract .

The objective of research was aimed analyze labor allocation for beef cattle breeding on dry-land area in South Malang Region. Sampling frame type used in this research was Two-Stage Cluster Sampling. The sample was 276 respondents who would be allocated to proportionally selected villages based on number of farmer in the village. Data collection technique involves interview and field observation. To achieve the goal of interview as the key instrument, the selected type of interview was structured interview with predetermined schedule. Data analysis method was the analysis of labor allocation given by household to the activity of beef cattle breeding. Result of research indicates few findings. (1) Woman labor is used only on the searching of green feed for the livestock and the cleaning of the cattle shed, while man labor was utilized for cleaning or showering the cattle. Woof, green feed, and water are almost available around the breeders' land. (2) The greatest labor allocation was found in the activity of feed searching, while other activities were given with labor at relatively low level. The searching for green feed was done everyday.

Keywords: beef, cattle, dry-land, labor allovation, woman

Introduction

Recently, the government has given huge attentions to agriculture development on dry land area. Some development projects have been launched and aimed to increase agriculture productivity, to improve income of the farmers, and to encourage participation of farmers as the conserver of land and water resources. Great attention has been already given since 1966 after considering a fact that upstream flood has swept flagrantly few river stream regions, and the identified cause is the upsurging criticality of land in upstream region.

The development of beef cattle breeding is a supplement to this crop planting. Livestock would be very functional because it is an important part of integrated farming of crop and beef cattle (known as crop-livestock farming). The capacity of farmers in implementing this farming system differs based on their physicality, economic, and social aspects. One proximate reason is that development level of beef cattle breeding is different with region (Kompang, et.al, 1983). The utilization of dry-land for the development of crop-livestock farming is still problematic. The problem is the lack of availability for resources and the inefficient usage of family labor in beef cattle breeding. Taking this problem into account, then labor allocation for beef cattle breeding on dry-land in South Malang Region is then analyzed.

Methodology

Location of Research in Kalipare District is selected as location of research due to some reasons The width of Kalipare District is larger than five observed districts in Malang Regency, including Donomulyo District, Bantur District, Pagak District, and two neighbouring Districts

of Sumbermanjing Wetan and Sumbermanjing Kulon. Geographically, if measured from north to south, Kalipare District remains in the middle of topography. Kalipare District has the most number of beef cattle breeder of and the busiest animal market of all districts compared. The sample is 276 respondents who would be allocated to proportionally selected villages based on number of farmer in the village. Data analysis method is applied by analyzing labor level allocated by household to the activity of beef cattle breeding.

Results and Discussion

Family structure of the respondents can be described as follows. The family with 4 members means that there are a father, a mother and two children. Family with 5 members would include father, mother and three children. If a family has 6 members, it involves father, mother and four children, or it has a same composition with 5-member type but with one relative out of children. Family with 7 members consists of father, mother, with three or four children, or with two or three relatives out of children. Family with 5 members is a family type mostly reported, as shown by 81 respondents (29.34%). Therefore, it becomes the most dominant family type among respondents. It means that a farmer household comprising of father, mother and 3 children is perceived as having a needed capacity to work on the farming. Family structure in Java and Bali is not greatly different. Widodo (1984) asserted that family member in Pujon farmer household was averagely 5.50 persons.

The participation of a certain person outside key membership of family to be used at farming work is a tradition strongly professed by rural people. This tradition is aimed to deepen kinship bonding and it is done by inviting the relative to live together and work with farmer family without requiring a formal engagement. Such relationship is usual but successfully providing non-formal employment, and also plays important role to prevent youth from going to big cities for jobs.

Structure of labor allocation at beef cattle breeding

Labor allocation structure in beef cattle breeding is defined as the allocation of time (hour) at beef cattle breeding in a year. This breeding involves several activities, such as: (1) searching for green feed for the cattle, (2) applying food and beverage to the cattle, (3) cleaning the cattle and shed, (4) observing cattle's lust, (5) helping cattle in mating process, and (6) managing the dung.

Table 2. Labor Allocation in Beef Cattle Breeding in a Year By Activity Type

Activity Type	Labor					
	Man		Woman		Total	
	Hour	%	Hour	%	Hour	%
Searching for green feed for the cattle	261	38.40	98	14.43	359	82.86
Applying food and beverage to the cattle	90	13.25	64	9.43	154	22.68
Cleaning the cattle and shed	48	10.15	44	6.48	92	16.63
Observing cattle's lust	15	3.17	0	0.00	15	3.17
Helping cattle in mating process	5	0.74	0	0.00	5	0.74
Managing the dung.	54	7.95	0	0.00	54	7.95
	473	69.66	206	30.34	679	100.00

The use of man and woman labors can be explained as following. Man labor is allocated at 473 hours or 69.66%, while woman labor is given at 206 hours or 30.34%. The use of woman labor is only limited on searching for green feed and cleaning the shed. Meanwhile, man labor is used for cleaning or showering the cattle. Woman labor is only the supplement to beef cattle breeding because green feed, and also water, are easily found around residence, especially at

their non-irrigated land. The greatest labor allocation is given on the activity of searching for the feed, while other activities only needs relatively low labor. The searching for the feed is done everyday (Bernsten, 1981)

One constraint against labor allocation to the searching for green feed is seasonal fluctuation. During rain season, the availability of green feed may be abundant, and therefore, time allocation for green feed searching is very short. Conversely, dry season has reduced the natural stock of green feed, and therefore, searching for green feed would need longer time. Few farmers even have to ride their bicycle or motorcycle to go outside Kalipare District just for searching for green feed. Some farmers rent a truck to help them transporting green feed in longer distance, such as from Kepanjen or Kebon Agung, both located in Malang Regency.

Labor allocation for green feed searching may differ with month depending on the availability of green feed. In rain season, the demand for labor to search green feed is quite low if compared with dry season. However, woman labor in dry season is less available than rain season. The reason is because during dry season, man labor is more dominant to be used for green feed searching in other region.

Conclusion

The involvement of woman labor in beef cattle breeding is limited to the searching of green feed for the livestock and the cleaning of cattle shed, while man labor is utilized for cleaning or showering the cattle. The role of woman labor is only the supplement to beef cattle breeding because green feed and also water are easily found around residence, especially at their non-irrigated land. The greatest labor allocation is found in feed searching activity, while labor allocation for other activities is relatively low. The activity of searching for green feed is done everyday.

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Characteristic and right of consumer to satisfaction of dendeng sapi using regression method

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Abstract

The aims of this research are to analysis characteristic of consumer on satisfaction dried beef meat product (Dendeng Sapi in local Bahasa). The data obtained in this study is taken by accidental sampling during three months from March-May 2016, and found 20 people from two Dendeng Sapi Shop in Banda Aceh City, they are Blangrakal and Gunung Selawah Shop, and then they will be analysis using multiple linear regression as a tool. The result shows that the average value of CS is 11.50 with standard deviation 2,626. The average value of CC is 13.90 with standard deviation 2,827 and CR is 38.00 with standard deviation 9.684. Results of ANOVA Test above shows that the test F arithmetic obtained is 8.602 and significant, with a significance level of $0.003 < 0.05$ so that all independent variables together significantly affect the dependent variable (H_a accepted and H_o rejected), and partially, the significance value of CC $0.63 > 0.05$ is not significant effect on the Consumer Satisfaction, but at Consumer Right value is $0.001 < 0.05$, ie Consumer Right is partially significant and significant to the Consumer Satisfaction and Consumer Characteristic.

Keywords: characteristic customer, dried beef meat industry product, satisfaction, egression method

Introduction

The problem that happens still has an entrepreneur in developed country likes in Banda Aceh, not see customer satisfaction especially in livestock product that is dried meat beef (jerky/ dendeng). At the present, Banda Aceh has visited by tourist from national and international besides local society, because of one of Tsunami affected area on 2004, so there are many museum Tsunami exhibitions in there. The tourist buys dendeng as a souvenir for their family and friends so this is potential for developing marketing that product relevant with customer needed. The purpose of this is how to make the product suitable for customer needed to fulfill satisfaction customer to dendeng product. The contribution of the paper is the entrepreneur can develop product related consumer needs and for local government can empowerment and support the entrepreneur to produce product related satisfaction consumer.

Livestock industry is a raw material processing industry with livestock commodities to produce a product of economic value, meet consumer needs and development of animal food security, among others: (1) available food not only meet the needs of calories but has a nutritional composition that suits the needs of metabolism and Free from material and or pathogenic organisms; (2) food should be equally distributed, both from space and time dimension; (3) social cultural in accordance with the wishes and perceptions of the people; (4) food should be properly utilized to meet the nutrients needed for growth, health, and productivity. Efforts to achieve the provision of animal food are based on local resources, institutions, and cultures (Government Regulation No. 68 of 2002), and have an important role

in transforming comparative advantage into a competitive advantage that can ultimately strengthen the competitiveness of regional agribusiness products.

Methodology

The research was conducted in Banda Aceh, to Blangrakal and Gunung Selawah Consumer, Indonesia since 6 months from March - August 2016.

The first model of regression equation used is:

$$Y_1 = \beta_0 + \beta_1 X_1 + \dots + \beta_{20} X_{20} + e \quad \dots \quad (1)$$

The second model of regression equation used is:

$$Y_2 = \beta_0 + \beta_1 X_1 + \dots + \beta_{20} X_{20} + e \quad \dots \quad (2)$$

Explanation:

- Y_1 = Satisfaction of Dendeng Sapi Business Actor
- Y_2 = Dendeng Sapi Consumer Satisfaction
- X_{1-5} = Dendeng Sapi Consumer Characteristic
- X_{6-20} = Dendeng Sapi Consumer Right
- e = residual

Results and Discussion

Based on the results of validity test in this study, shows that the value of each arithmetic r is greater than the value of r table, with r table value of 0.444. So all questions in the questionnaire are valid and can be used for research. Reability test technique by comparing the calculated value of cronbach's alpha value with r table obtained on the validity test that is = 0.444. Thus the question used in this study is proven reliable or reliable and can be relied upon as a variable measuring.

Based on the Test F arithmetic obtained is 19.629 and significant, with a significance level of $0.000 < 0.05$ so that all independent variables together significantly influence the dependent variable and regression model can be used as a tool to measure Satisfaction of Business Actor ADS Aceh. According to Badri (2017) that attention to consumer characteristics and consumer rights is the optimal sales and productivity strategy in marketing a product / service by business actors.

Based on the Coefficient Test Result that partially, the significance value of CC $0.615 > 0.05$ is not significant effect on the Satisfaction of agro industry actor, but at CR value is $0.000 < 0.05$, that CR is partially significant and significant to Satisfaction of ADS Aceh Actor. Therefore, Satisfaction of ADS Aceh Business Actor is not influenced by Consumer Characteristics of Dendeng Sapi but influenced by Consumer Rights Dendeng Sapi. This is in accordance with Utkarsh (2017) that business actors can seek information about consumer rights to the products produced in order to gain confidence and consumer motivation and customer satisfaction before making a decision to buy products / services wide and diverse by consumers.

Based on Pearson correlation gives information that the correlation between the two variables (CC and CR) is 0.706 (positive correlation) and significant, ie the significance level of $0.000 < \alpha (0.05)$. Based on Law no. 8 of 1999 of Indonesia on Consumer Protection that the business actor must pay attention to the consumer's right to the product produced before the consumer takes the decision to buy the product / service and partially, the significance value of CC $0.63 > 0.05$ is not significant effect on the Consumer Satisfaction of Dendeng Sapi, but at CR value is $0.001 < 0.05$, ie CR is partially significant and significant to the Consumer

Satisfaction of Dendeng Sapi. Therefore Consumer Characteristics (CC) has no effect on consumer satisfaction but Consumer Right affects consumer satisfaction to decision making process in purchasing the product of beef jerky. According to Alexander (2011) that consumer demographic characteristics affect to buy products / services. In particular, age and sex factors are the most important factors in purchasing products / services. However, consumer's right to product / service influence to consumer's satisfaction. Therefore, business actors can recognize and understand about consumer rights that have the impact of purchasing a product / service high, in order to be able to allocate resources for marketing products / services.

Conclusion

Satisfaction of Dendeng Sapi Product as Simultaneously obtained is 19.629 and significant, with a significance level of $0.000 < 0.05$ so that all independent variables together significantly influence the dependent variable and regression model can be used as a tool to measure Satisfaction of Business Actor Dendeng Sapi, and *Partially* that the significance value of CC $0.615 > 0.05$ is not significant effect on the Satisfaction of agro industry actor, but at CR value is $0.000 < 0.05$, that CR is partially significant and significant to Satisfaction of agro industry Actor. Customer Satisfaction to dendeng sapi agro industry, are correlation between the two variables (CC and CR) is 0.706 (positive correlation) and significant, ie the significance level of $0.000 < \alpha (0.05)$. Partially, the significance value of CC $0.63 > 0.05$ is not significant effect on the Consumer Satisfaction of Dendeng Sapi, but at CR value is $0.001 < 0.05$, ie CR is partially significant and significant to the Consumer Satisfaction of Dendeng Sapi..

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Impacts of improved extension services on awareness, knowledge, adoption rates and farm productivity of smallholder dairy farmers in Pakistan

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Abstract

The provision of effective extension services to smallholder farmers across both developing and developed countries remains a challenge world-wide. The objective of the study is to demonstrate the impacts of improved extension services on awareness, knowledge, adoption rates and farm productivity of smallholder dairy farmers in Pakistan. An extension program was developed and implemented in five districts of Punjab (Okara, Pakpattan, Jhelum, Kasur and Bhakkar) and two districts of Sindh (Thatta and Badin) provinces. The extension program involved the provision of research based information on a monthly basis to smallholder farming families ($FF=523$) over a four year duration. No financial incentives were provided to farmers for their participation. A 'whole family approach' was used in the extension program where comprehensive interdisciplinary training on the whole dairy farming system was provided to the males, females and children of the farming household. Overall awareness, knowledge, adoption rates and farm productivity relating to seven different recommendations in the extension program were significantly higher ($P<0.05$) in the registered farmers compared to the non-registered and traditional farmers. These results suggest that improved extension services can significantly enhance the awareness, knowledge, adoption rates and farm productivity of smallholder dairy farmers in Pakistan.

Keywords: extension services, dairy, smallholder, adoption rates, impact assessment,

Introduction

Extension services play a vital role in the improvement of the dairy sector in developing countries. The goal of extension is to provide research based knowledge to rural communities to improve their farm productivity leading to poverty reduction, rural development and more sustainable rural livelihoods (Swanson, 2008; Zwane, 2012). The role, function and structure of extension services in any country depend on farmer education level, availability and use of technologies, level of commercialization and value of the product (Swanson, 2008).

Pakistan has a rural agricultural based economy. Livestock contributes 56.3% to the agricultural economy, providing 20.9% of the gross domestic product (GDP) (Economic Survey, 2015). The livestock sector has been declared as one of the fastest growing sectors with an annual growth rate of 3.63% during 2015-16 and is an important source of livelihood for more than 35 million rural communities deriving 30-40% of their income from this source (Economic Survey, 2015). The average milk production per lactation in these small holdings in buffaloes (1226 L) and cows (1027 L) is much lower than the National Herd average for both species (buffalo: 2300 L; and cow: 2200 L (Warriach et al., 2012; Iqbal, M, Ahmad &

Jehangir, 1999). The productive potential of these native dairy animals has not been fully exploited due to poor quality feed, limited genetic selection, high risk of diseases, uncertain marketing channels and the lack of proper extension services throughout the country.

The major objectives of this study working in collaboration with the provincial livestock departments in Pakistan are (1) to demonstrate the impacts of improved extension services on awareness, knowledge, adoption rates and farm productivity of smallholder dairy farmers and (2) to capture the impact of these improved extension services on farmers who did not wish to participate in this extension program but still retained interest as passive observers.

Methodology

In 2010, a five year dairy project “Improving dairy value chains in Pakistan through improved extension services” was commenced with the objective of increasing the productivity of smallholder dairy farms through the provision of improved extension services. The project was supported by the Australian and Pakistani Governments and implemented in Punjab and Sindh targeting farmers with four to ten dairy animals (buffalo/cattle). The project selected 22 motivated early-career extension workers from the Livestock Departments of Punjab ($n=14$) and Sindh ($n=8$) on the basis of their extension aptitude, social linkages and the effectiveness of their communication and leadership skills. The project placed emphasis on the provision of a comprehensive interdisciplinary educational program for their capacity building using a series of training workshops offered every three months. Each of the extension workers was allocated two to three selected villages where they provided improved extension services to the smallholder farmers over the four-year duration of the study.

In November 2013, an interview-based survey containing closed ended questions (Survey1_n=560) was conducted with farmers, academia and researchers in order to filter one key message from each of the seven modules that had been delivered to the farmers during the four years of the extension program. After selecting which key recommendations would be investigated, a second adoption and impact survey was carried out in February 2014. A comprehensive questionnaire including 113 closed and 8 open-ended questions were used in order to gauge the impacts of improved extension services on the awareness, knowledge, adoption rates and farm productivity of smallholder dairy farmers. Questions were asked in Punjabi & Sindhi languages from three groups of farmers, including ‘registered’ farmers directly involved in the extension program ($n=179$), ‘non-registered’ farmers indirectly benefiting from the program ($n=116$) and ‘traditional’ farmers not associated with any project activities ($n=104$).

The proportions of farmer groups (registered, non-registered and traditional) were assessed and compared for their responses to the impact survey questions. A chi-square test was used to determine significant differences in responses between the farmer groups. ($P<0.05$) was regarded as significant.

Results and Discussion

Overall awareness, knowledge and adoption rates of all the seven key extension messages were higher ($P<0.05$) among registered farmers compared to the non-registered and traditional farmers Table 1. The values in this table show that there is a clear difference between the groups of farmers with higher values of awareness, knowledge and adoption for ‘registered’ farmers as compared to ‘non-registered’ and ‘traditional’ farmers.

Table 1. Comparison of awareness, knowledge and adoption rates between categories of smallholder farmers.

Farmers categories	Awareness (%)			Knowledge (%)			Adoption rate (%)		
	Low *	Medium **	High** *	Low w	Medium m	High h	Low	Medium m	High
Registered (n=179)	1	1	98	1	13	86	8	54	38
Non-Registered (n=116)	3	15	82	15	30	55	29	61	10
Traditional (n=104)	15	16	69	32	40	28	58	42	0

*Low: Farmers who demonstrated awareness/knowledge/adopted 1-2 specific messages out of seven key messages

** Medium: Farmers who demonstrated awareness/knowledge/adopted 3-4 specific messages out of seven key messages

***High: Farmers who demonstrated awareness/knowledge/adopted 5-7 specific messages out of seven key messages

There was a significant difference ($P < 0.05$) between each farmer category for awareness, knowledge and adoption. The values in this table are percentages of farmers with high/medium/low levels of the different measurements. The second component of this survey assessed if there were any observed impacts (eg an increase in milk production) on farm following the adoption of a particular practice. Table 2 shows the percentage of farmers who, after adopting the extension message recommendation, observed on farm impacts.

Table 2. Proportion of farmers observing impacts on farm after adopting extension message recommendation.

Extension message recommendation	Impact observed	Farmer Category		
		Registered (%)	Non-registered (%)	Traditional (%)
Untying animals and giving them free access to water	Increase in milk production	40	78.57	0
Drying off dairy animals prior to calving	Improvement in Body Condition Score (BCS) in animals	50.96	52.5	52.38
Vaccination against infectious diseases	Disease prevention	68.9	58.51	28.79
Using a selected elite bull/semen for breeding	Breed improvement in terms of calf birth weight	72.22	72.22	47.06
Providing colostrum ad lib prior to the expulsion of the placenta	Low calf morbidity	69.18	61.11	70.59
Providing a balanced/concentrate feeding to animals	Increase in milk production (8-12 L)	31.27	22.58	30
Using improved fodder seed varieties	Increase in fodder yield	83.12	84.62	82.35

Note: The percentages presented in this table are the proportion of farmers who had adopted the recommendation, farmers that had not adopted the message are not included in this table.

To our knowledge this is the first report which clearly describes the impacts of improved extension services on awareness, knowledge, adoption rates and farm productivity of smallholder dairy farmers in Pakistan. Higher adoption rates of registered farmers (compared with non-registered and traditional farmers, Table 1) were achieved in response to the implementation of the 'whole family approach' to extension with male, female and their children all being involved in the extension program. This whole family participation has clearly led to enhanced farm productivity. Traditionally, women and children are ignored in

training and skills development programs by many organizations aiming to improve the livelihood of smallholder dairy farmers. Normally women remain in their home to conduct domestic duties and cannot leave their families for sufficient time to participate in training programmes. The limited availability of trained female extension workers provides a further limitation since these are required for cultural reasons to work with the female farm workforce. In order to run a effective extension program there is need to incorporate more female in extension team.

Pakistan's agricultural industries are evolving rapidly to service the needs of millions of the smallholder farmers. The government invests in infrastructure and human resources in their departments of agriculture, livestock and research institutions as a high priority. The current high priority projects are to provide effective vaccination and deworming strategies at the farmer's door step. However, other equally important aspects for profitable animal husbandry and extension services are being neglected. As a whole the livestock farming communities are aware of the importance of diseases management but they are not aware of improved farm practices which are the key factors to enhance farm productivity and profitability. There is a dire need to run a countrywide extension program including both mass awareness and 'one to one' extension processes without offering any incentives. These programs need to be tailored to meet the differing needs of farming communities across the farming regions of the country. The results of the present study clearly demonstrated that extension program can be scaled-out efficiently using the existing resources provided by the government. The program must be run on a sustainable basis with effective linkages with the Veterinary Universities and research institutions.

Conclusion

Adopting improved extension services using a whole family approach we can significantly achieve higher adoption rates and farm productivity of smallholder dairy farmers in Pakistan.

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Cost effectiveness and effect of buffalo and cow milk feeding on growth performance of pre-weaned buffalo calves

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Abstract

The objective of this study was to determine the cost effectiveness and effect of buffalo and cow milk feeding on growth performance of pre-weaned buffalo calves. Sixteen, day old Kundi buffalo calves (11 female; birth weight 35.0 ± 1.35 kg and 5 male: 37.5 ± 0.76 kg) were reared at Sindh Agriculture University (SAU) Farms, Tandojam. All calves were given colostrum *ad libitum* through nipple drinkers for the first 24 hours post-partum. They were housed separately and randomly allocated to two groups fed cow milk (2.8MJ/kg) or buffalo milk (3.5MJ/kg) at 15% of their body weight and adjusted weekly to day 42 with a maximum of 5L/day. Milk was gradually withdrawn until weaning at day 56. Calves fed with cow milk attained a significantly lower live weight (58.7 ± 5 kg) compared to buffalo milk fed calves (65.0 ± 4.1 kg). However, the average daily gain (570g) of calves fed cow milk did not differ significantly from those given buffalo milk (582g). Using cow milk for rearing buffalo calves reduced the cost of rearing and can be recommended for use on farm without compromising growth rate of calves.

Keywords: milk feeding, cost effectiveness, calf rearing, Pakistan

Introduction

Calves play a significant role in the development of the dairy sector as they represent the future of the industry. Rearing healthy calves through provision of appropriate nutrition and health management ensures a productive herd. Better calf care is not only essential for sustainability of the dairy industry but also essential in the wake of preserving and maintaining good quality germ-plasm. Important aspects of calf rearing are health management and proper nutrition for the calves. Raising the calves is a labor intensive and costly segment of livestock production. Calves in Pakistan are generally neglected because of their high feeding cost and low financial return (Bhatti, Khan et al., 2009). Calves are mainly kept with their dam to facilitate milk let down and allowed to suckle a very limited amount of both colostrum and milk and are weaned around one year of age (Khan, Bhatti et al., 2007)

High feeding costs of pre-weaned buffalo calves coupled with a high mortality rate constitute major limitations to productivity in the Pakistan dairy system. Therefore calf rearing is most often a very low priority, as the commercial value of this practice is not apparent to farmers (Wynn, Warriach et al., 2009). This is exacerbated by increasing milk prices with farmers preferring short term financial gain through the sale of milk rather than utilising the product for rearing calves.. The market price for a weaned male buffalo calf is usually less than half the milk feeding cost (Bhatti, Ali et al., 2012). It is therefore necessary to determine cost

effective feeding systems that will ensure a realistic profit margin for calf rearing in the farming community.

Previous feeding and nutritional studies on calf rearing have focused on optimising feeds with little consideration for economic and resource management under smallholder dairy production conditions. There are different alternatives to reducing feeding cost during the pre-weaning period without compromising their growth rate and health. This study was conducted to determine the cost effectiveness of substituting buffalo milk with cow milk for rearing buffalo calves and its effect on their growth performance.

Methodology

Sixteen, day old Kundi buffalo calves (11 female; birth weight 35.0 ± 1.35 kg and 5 male: 37.5 ± 0.76 kg) were reared at Sindh Agriculture University (SAU) Farms, Tandojam (latitude $25^{\circ}25' N$, and longitude $68^{\circ}32' E$). All calves were given colostrum *ad libitum* through nipple drinkers for the first 24 hours *post partum*. They were housed separately and randomly allocated into two groups fed (1) cow milk (2.8 MJ/kg) or (2) buffalo milk (3.5 MJ/kg) at 15% of their body weight adjusted weekly to day 42 with a maximum of 5 L/day. Milk was gradually withdrawn until weaning at day 56. Calf starter ration (sourced from 'Big Feed, Lahore' with 16% protein) and fresh drinking water were offered *ad libitum* to all calves from day three of age. Calves were then offered berseem, either green chopped berseem (28 % DM) or berseem hay with 18% DM) up to 98 days of age. Intake of milk, calf starter was measured daily. Growth rate in terms of live-weight gain and body conformation measurements (height at withers, heart girth and length from poll to tail head) were assessed after every week.

Results and Discussion

Milk and starter intake

Intake of milk and calf starter ration intake was not statistically significant between treatment groups ($p > 0.05$). However, calves reared on buffalo milk tended to consume less starter than those fed cow milk.

Weight gain and structural growth measurements

There was no significant difference in birth weights of the two groups ($P = 0.35$). Overall growth of the calves given buffalo milk was significantly higher than calves given cow milk. The growth difference was significant from week 6 to 13, although it was non-significant at week 14 (Fig.1).

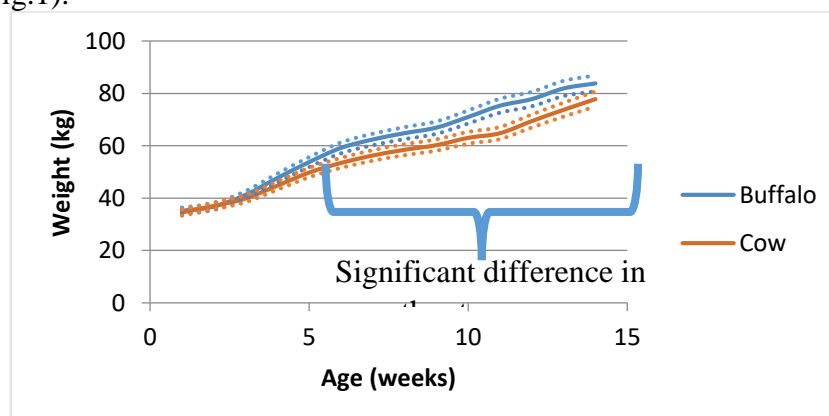


Figure 1. The relationship between calf age (week) and live weight (kg) in calves offered either buffalo or cow milk to weaning.

Average daily weight gain for both buffalo and cow milk fed groups were 0.582 kg/d and 0.570 kg/d. The live weight of calves offered buffalo and cow milk at day 56 was 65.0 ± 4.1 and 58.7 ± 5.3 kg respectively ($p < 0.05$). Measures of conformation, height, heart girth and length were not influenced by treatment shown that these parameters were unaffected by the treatments and showed no significant difference (Table 1).

Table 1. Body growth parameters of calves fed buffalo and cow milk

	Height	Heart girth	Length
Buffalo milk	$88.18 \pm$	$100.15 \pm$	$82.66 \pm$
Cow milk	$88.41 \pm$	$96.75 \pm$	$83.26 \pm$

Economic comparison

The economic benefit of using cow milk as a substitute for buffalo milk was determined by calculating the total costs of variables (all expenses including calf purchase, medicine costs, calf starter, labor, fodder, bedding and miscellaneous) and feeding cost per kilogram live weight gain of the calves. The total cost of calf rearing was 15200 PKR and 12400 PKR and total cost per kilogram weight gain was 331.3 PKR and 310.3 PKR for buffalo and cow milk respectively. Based on this observation, substituting buffalo milk with cow milk decreased the feeding cost of calf rearing up to 2800 PKR. The non-significant differences in terms of average daily gains fed either with buffalo milk or cow milk indicated that 570 g/day is considered as normal growth rate for buffalo calves. This has confirmed that use of cow milk for rearing buffalo calves is an effective and cheaper strategy for adoption at the farm level

Conclusion

The above findings support the use of cow milk as substitute for rearing buffalo calves. The use of cow milk is economical, easily available and can promote the growth of buffalo calves effectively.

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Impact of dairy extension training on knowledge, communication skills and self-confidence of livestock extension workers in Pakistan

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Abstract

The objective of this study was to assess the impact of dairy extension training on knowledge, communication skills and self-confidence of livestock extension workers. Livestock extension workers (n=26) were trained and a questionnaire was developed to gauge their technical knowledge level and a nominal scoring scale (1to10) used to assess their level of self-confidence. A scoring system (1 to 5) was used to evaluate communication parameters of trained extension workers (TEWs). The level of technical knowledge acquisition, self-confidence and communication skill of TEWs was higher than observed in the control group. This study indicated that the training of extension workers has had a significant impact on their knowledge and skills.

Keywords: livestock extension workers, trainings, Pakistan

Introduction

Extension services play a crucial role in transferring the research-based knowledge to rural communities triggering socio economic change at the grass-roots level. Dairy farming constitutes the major segment of the livestock industry in Pakistan. It is estimated that 70 % of dairy production is conducted at the smallholder farming level (Burki et al., 2005) . Smallholder farmers are not reaching the full productive potential of their animals due to lack of technical information available to them. This can be improved through the provision of innovative extension services. The lack of skilled extension workers in Pakistan exacerbates this problem. (Warriach et al., 2012) . Training is one of the most effective methods for enhancing the productivity of individuals (Arthur Jr et al., 2003). Ironically, most organizations do not examine the effects of their training interventions. However, there is no published data on the effectiveness of trainings especially in the livestock sector of the country. The objective of this study is to assess impact of dairy extension training on knowledge, communication skills and self-confidence of livestock extension workers

Methodology

The Australian Centre for International Agricultural Research (ACIAR) has initiated a program to increase milk production of smallholder farmers through the provision of comprehensive extension services. The project trained¹extension workers (n=26) from Punjab and Sindh on all aspects of small-holder dairy farming systems for two days at intervals of

three months over a period of four years. After every training, the extension workers (TEWs, $n=26$) introduced new acquired knowledge at monthly farmer training sessions. A questionnaire was developed to gauge technical knowledge level and a nominal scoring scale (1 to 10) was used to assess self-confidence of TEWs. A scoring system (1 to 5) was used by external evaluators to determine the level of acquisition of new knowledge by TEWs while addressing in farmer meetings. A control group of extension workers (CEWs) ($n=26$) was randomly selected who did not receive any training from the project. A simple linear regression was used to assess if there were differences between TEW and CEW groups in their total scores for knowledge, communication skills and self-confidence. Further comparisons were made between trained veterinary officers (TVOs) and trained veterinary assistants (TVAs).

Results and Discussion

The results showed that technical knowledge, communication skills and self-confidence of TEWs, was significantly improved ($p<0.001$), ($p<0.002$) and ($p=0.013$) respectively relative to the same scores for the CEWs (Fig 1) (Fig 2) (Fig 3). There were no significant differences ($p=0.86$) between TVAs and TVOs

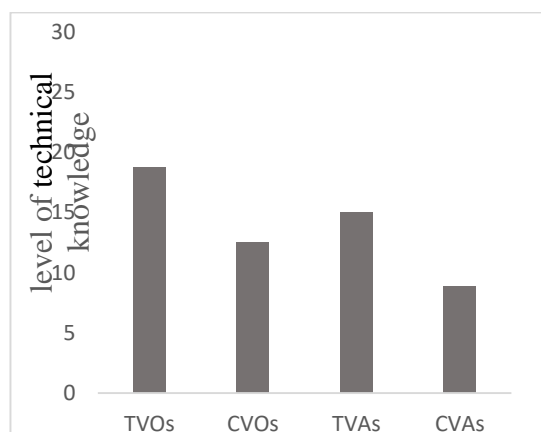


Figure 1. Comparison of technical knowledge of TEWs and CEWs

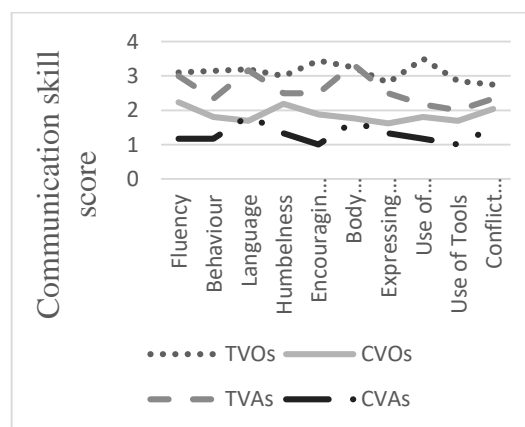


Figure 2. Comparison of communication skills of TEW and CEWs

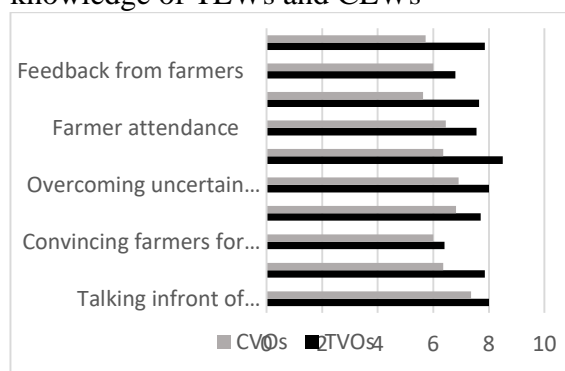


Figure 3. Comparison of self-confidence of TVOs (black) and CVOs (grey).

To our knowledge this is the first report which clearly describes the impact of dairy extension trainings on knowledge, communication skills and self-confidence of livestock extension workers in Pakistan. Regular training of livestock extension workers increases their technical knowledge which improves their impact in the dissemination of information during farmer group meetings (Gulbrandsen et al., 2013). The primary justification for spending time, money, and effort on training is to eliminate or reduce performance deficiencies (Charles,

1990). Technical training improves the communication skills and self-confidence of extension workers. It also improves the performance of extension staff by building on their knowledge, skills and positive attitude (Ajayi, 2001).

Conclusion

The study indicted that training has a significant impact on technical knowledge, self-confidence and communication skills of livestock extension workers.

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Productive and reproductive performance of buffaloes under smallholder production system in Pakistan

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Abstract

The objective of this longitudinal study is to observe the trends of milk production of Nili-Ravi and Kundi breeds of buffalos and their seasonal variation in reproductive behavior under smallholder production system in Pakistan. Data were collected from ($n=34$) farmers located in the districts of Kasur and Bhakkar from Punjab, Thatta and Badin from Sindh. Preliminary results indicate that average milk production per liter per day was higher in Nili- Ravi buffalo compared with Kundi buffalo. Significant differences in milk production of buffalo breeds were observed in the months of January ($p= 0.028$), February ($p= 0.055$) and October($p= 0.015$). The results show that there were highly significant changes in estrus rates of Nili- Ravi and Kundi buffalo during the year ($p = 0.008$), with higher estrus rates in winter (January/February) and spring (September/October).

Keywords: production, reproduction, buffalo, smallholder, Pakistan

Introduction

Livestock sector plays an important role in the rural economy of Pakistan. However, Pakistan is one of the largest milk producing country in the world. Pakistan is blessed with two main dairy breeds of buffalo Nili-Ravi and Kundi. Currently buffalo milk production is very low and it does not meet per capita milk demand. Buffaloes have the potential to produce more milk within their current systems but farmers are not optimizing production potential due to a number of factors like age of maturity, feed and fodder resources and lack of technical awareness (Hussain et al., 2010, Rabbani et al., 2010). This study aims to observe the trends of milk production of Nili-Ravi and Kundi buffalos and their seasonal variation in reproductive behaviors under smallholder production system. The study will help to probe the most suitable season for buffalo breeding under smallholder production system which will subsequently reduce the cost of production.

Methodology

A dairy extension project LPS/2010/2007, funded by Australian Centre for International Agricultural Research aimed to increase dairy production of smallholder farmers having four to ten milking buffalo or cattle. The project worked in five districts of Punjab and two districts of Sindh Province. The project had developed a herd recording booklet for record keeping which holds one year's data on monthly basis. It comprises of different sections like husbandry, reproduction, nutrition, health, milk production and marketing in order to assess

the farm productivity of smallholder dairy farmers. Data were collected from ($n=34$) farmers located in the districts of Kasur and Bhakkar from Punjab, Thatta and Badin from Sindh. Buffaloes were tagged to maintain accurate records and milk production data from one lactation (from parturition in January 2013 to 305 days in milk) were collected from Nili-Ravi ($n=26$) and Kundi ($n=22$) buffaloes. The data were collected for 305 days as there was huge variation among farmers for providing dry period to buffalos. Reproductive parameter including estrus detection was observed from ($n=90$) animal. Data were collected by project team and hence reproductive parameter was collected from all selected farmers. Estrus detection records were noted on the basis of behavioral signs of heat detection like mounting, bellowing, fluid discharge, tail raising, sniffing to other female.

Results and Discussion

Average milk production per liter per day was higher in Nili- Ravi buffalo compared with Kundi buffalo. The significant differences between breeds was observed in the months of January ($p= 0.028$), February ($p= 0.055$) and October ($p= 0.015$). Average milk production of Nili-Ravi and Kundi buffalo have been presented in (Fig. 1). The results show that there were highly significant changes in estrus rates of Nili- Ravi and Kundi buffalo during the year ($p = 0.008$), with higher rates in winter (January/February) and spring (September/October). The percentage of estrus detection have been presented in (Fig2).

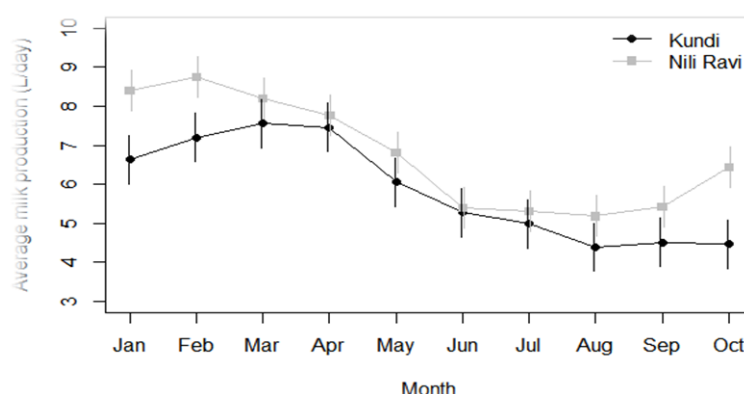


Figure 1. Milk production trends of Nili-Ravi and Kundi buffaloes for one lactation, from January 2013 until October 2013 under smallholder production system in Pakistan (305 days in milk for those animals giving birth in January).

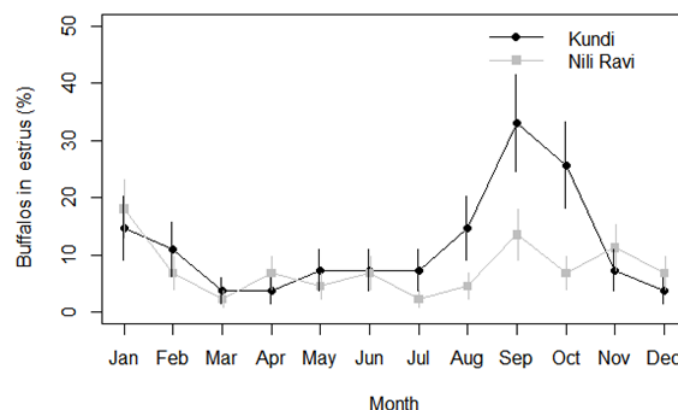


Figure 2. Pattern of estrus in Nili-Ravi and Kundi buffalo from January until December under smallholder production system in Pakistan

The present study demonstrates that average milk production per liter /day was higher in Nili-Ravi ($2,066 \pm 127$ L) than Kundi buffalo ($1,785 \pm 158$ L) with the significant differences in the months of January, February and October. According to Aujla and Hussain (2015), Nili-Ravi have higher milk production (1800-2500 liters) compared to Kundi milk production (1700-2200 liters) per lactation. Iqbal et al. (1999) reported that average milk production per lactation of Nili-Ravi and Kundi buffaloes are 2300 and 2000 liters respectively.

The present study reveals that the percentage of estrus in Nili-Ravi and Kundi buffaloes was significantly higher during January, February, September and October as compared to rest of the year. The results of present study are also in line with the findings of (Hussain, 2007, Suthar and Dhami, 2010) that the estrus percentage in buffaloes is higher in October and November while it is lower in the month of June followed by May, April and March due to increase in daily ambient temperature.

Conclusion

Preliminary results indicate that production of Nili-Ravi buffalo is higher than Kundi and seasonal stress also affects the reproductive performance of buffalos under smallholder production system.

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Characteristic of dairy farmers as the member of pujon milk cooperative Malang East Java Indonesia

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Abstract

The objective of research is to understand the characteristic of dairy cattle breeders as the member of Pujon SAE Dairy Cooperative. Research is located at Pujon “SAE” Dairy Cooperative starting from 1 October to 1 November 2016. Research type is descriptive which attempts to look for properly adequate description about all activities, objects, processes, and humans related in dairy cattle breeding. Population of research includes all dairy cattle breeders who would be the official members of Pujon “SAE” Dairy Cooperative, breeders who are activist but yet officially registered in this Cooperative, and members who leave from the Cooperative. Data collected in this research are primary and secondary. Data analysis method involves qualitative and quantitative descriptive analyses. Based on result of research, some conclusions are made. Breeder as the main job is one characteristic with the strongest effect in determining whether breeders have high or low motivation to join with the Cooperative. Based on psychological perspective, breeders assume that income from their main job would improve economic wellbeing of the household, and increase their purchasing power to afford the cost of social benefits and health packages.

Keywords: characteristic, dairy farmers, cooperative

Introduction

Pujon “SAE” Dairy Cooperative is an economic organization in Pujon District which attempts to invite community participation into organization. There are ten villages in Pujon but the community is still traditional. Changing them from traditionalist into one with national economic mindset is too much challenging. An effort to improve community wellbeing could be done through increasing economic capacity of dairy cattle breeders. This activity actually supports national economic, especially in agriculture sector (Rusyana et al., 2016) Pandesari Village, Pujon District, is the biggest dairy production center in East Java Province because it covers 98% capacities of the province.

Relationship between Pujon “SAE” Dairy Cooperative and breeders is equal and emphasizing on win-win solution. This equal standing means that both sides respect the importance of equity (*justness*) either for the Cooperative or the breeders. This position becomes the fundamental principle behind the creation of partnership relationship. The obligations of the Cooperative are to set more competitive price for the dairy products to help dairy cattle breeders coping with price of imported dairy products, to make available the capital for breeders, to produce a just work remainder based on service given by members to the Cooperative, and to do a fostering session with Cooperative members in order to improve quality and quantity of dairy products. The requirements for becoming member of Pujon “SAE” Dairy Cooperative include having dairy cattle breeding as main job, living around Pujon, able to implement rights and obligations as member, and possessing senses of individuality, solidarity and activity.

Members of Pujon “SAE” Dairy Cooperative have reported some problems. Some breeders find more attractive to make cooperation with entities outside the Cooperative due to a consideration of higher profitability. There is also an assumption that planting vegetables is giving more profits than breeding dairy cattle. Such problems are quite problematic to the Cooperative despite the fact that the membership level is always increasing or that members themselves determine their own wellbeing when Cooperative’s work remainder is available.

Methodology

Research is conducted in Pujon “SAE” Dairy Cooperative from 1 October to 1 November 2016. It is implemented as a case study by reasoning that Pujon “SAE” Dairy Cooperative is the biggest dairy cooperative in East Java with dairy supply level attaining 98% of total dairy circulation in East Java. The problem tried to resolve is that too many members of Pujon “SAE” Dairy Cooperative have decided to leave from organization. Type of this research is descriptive. As said by Singarimbun, M dan Effendi (2001) “such research type attempts to look for a proper and adequate description about all activities, objects, processes, and humans”. Population of research is breeders who are official members of Pujon “SAE” Dairy Cooperative, those who are activist but yet officially registered in this Cooperative, and also those who leave from the Cooperative. Sampling is conducted to reduce population into proportional size or into a portion involving only relevant subjects. Data source in this research is primary and secondary. Data analysis method involves qualitative and quantitative descriptive analyses.

Results and Discussion

The success rate of dairy cattle breeding cannot escape from the characteristic of breeders. Indeed, breeder characteristic is one of important factors influencing the progress of dairy cattle breeding. The characteristic of breeders as respondents includes age, education level, job and breeding experience.

Age

The members of Pujon “SAE” Dairy Cooperative who work on dairy cattle breeding come from various age group. Breeder aged around 41-50 years old is 37.68%. These data indicate that dairy cattle breeding is mostly worked on by breeders with young age or productive age. During their productive age, breeders have still their strong physicality, are able to work in long hour, and can still be energetic in managing the dairy cattle breeding. Breeders in their productive age are more courageous in taking a risk and have their greater interest to adopt new technology (Krisna dan Manshur, 2006).

Education

Education level of breeders is important factor in the dairy cattle breeding because this work always needs certain degree of proficiency, experience, and insight about business management (Pratomo dan Tauran, 2016). Education level of dairy cattle breeders as the member of Pujon “SAE” Dairy Cooperative is Senior High School with 43.48%.

Job

Job of the majority of respondents is farmer and breeder. Farmer and breeder can alternately be main job and also side job. Most have dairy cattle population comprising of 3-5 cattle because the population is determined by investment and economic capacity of breeders. Pujon topography is quite potential for any jobs in agriculture sector. This sector has given a capacity to respondents to improve their household economic. Pujon people mostly decide to work in agriculture sector because the nature is very supporting.

Breeding experience

The longest breeding experience is the interval of 11-15 years, and it is shown by 33.33%. Experience helps breeders to make decision in relation with breeding work which would support the success of breeding. More experiencing breeders may deal with their problem without difficulty, and conversely, breeders with lacking of breeding experience are easily troubled with their issue. The majority of breeders have quite long experience in breeding and it sends an implication to the production (Santoso et al., 2013)

Conclusion

Breeder as the main job is one characteristic with the strongest effect in determining whether breeders have high or low motivation to join with the Cooperative. Based on psychological perspective, breeders assume that income from their main job would improve economic wellbeing of the household, and increase their purchasing power to afford the cost of social benefits and health packages.

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Study of marketing campaign model to increase egg consumption

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Abstract

This study was intended to assess (1) knowledge and the preferences of elementary school-aged in low income family in regards to eggs (2) to evaluate marketing campaign model that aimed to the increasing of eggs. The research was conducted in Gadjah Wong urban communities in Umbulharjo Subdistrict, Yogyakarta City and Candibinangun in Pakem Subdistrict, Sleman Regency which were two villages with the highest number of low-income family. Sample was determined by judgmental sampling method that were mothers and the children who were elementary school-aged children. The results show majority of children have good knowledge about eggs benefit, but however only 2.00% children preferred to eat, 15.30 is neutral and majority that is 82.60% respondents do not like to eat eggs. Pattern of eggs consumption either from rural and urban areas reveal consistent results that eggs are part of the staple food for the children even still in small number. 90.20% children reported that at least they have two eggs in a week. The increase of egg consumption as an affordable source of protein is still hindered by the huge proportion of children that disapprove the consumption of egg. To overcome that issue, improvements for marketing communication model is required give experience to mothers as the one who create buying decision and also to increase the skills to cook eggs in more innovative ways.

Keywords: marketing campaign, eggs, low income family

Introduction

Marketing communication is a company effort to both directly and indirectly inform, persuade, and remind consumer about a product they offer (Kotler and Keller, 2016). Generally, marketing communication for commodity is either done by association of producers alone or alongside with the government. One of the marketing communication activities done for livestock commodity is a marketing campaign intended to increase the consumption of animal protein. The campaign for that objective is done considering the importance to have sufficient consumption of animal protein since early age as an effort to have a healthy generation. Food with balance nutrient is a basic need for children, not only for survival but also for developing strong and healthy body as well as intelligence (Thakar and Patil, 1990).

Egg is one of animal protein sources that is widely available with relatively cheaper price in comparison to the other sources of animal protein. The average monthly average price of egg in the level of farmer, in Yogyakarta Special Province through 2012-2016 that released by PINSAR Petelur Nasional, a name of Indonesia layer farmer association varied between Rp. 13,935 – Rp. 19,950 /kg and with the average price of Rp. 17.254,00 per kilograms in the period of January – Juli 2017. The margin between farmers' price and retail price ranges around Rp. 2.000-3.000 per kilograms, hence with the average weight of egg around 62,5gr, the retail price is Rp. 1286,00/egg. With protein content of 6.4 in one egg, it is the most affordable source of protein.

The activity of marketing campaign to increase egg consumption is almost in the same model with the campaign intended to the other livestock products, in which it is held in the form of event aimed to introduce the products and its benefits, and usually finished with eating the products together. In more detailed perspective, data shows the number of egg consumption at low income family is 5.35/cap/week in rural areas and 5.95/cap/week in urban areas (Susenas DIY, 2016). It is undeniable that this is far below the number of egg consumption in middle-high income family, even compared to the number of consumption in several neighbouring countries. However, on the other hand, the number also indicates that there is no urgency to introduce egg as it has become staple food for low income families although the level of consumption haven't reached the recommended standard. In contrast with the profile of milk consumption where it is relatively low in terms of volume and frequency of consumption (Syahlani and Muzzayanah, 2017), thus milk requiring a model of campaign of introduction stage of product life cycle. Egg that is already known requires a study that precisely identifies the issue within the campaign thus making the arrangement of the campaign become more efficient. This study was aimed to identify knowledge and the preferences of elementary school-aged in low income family in regards to egg and evaluate marketing campaign model that aimed to the increasing of egg consumption.

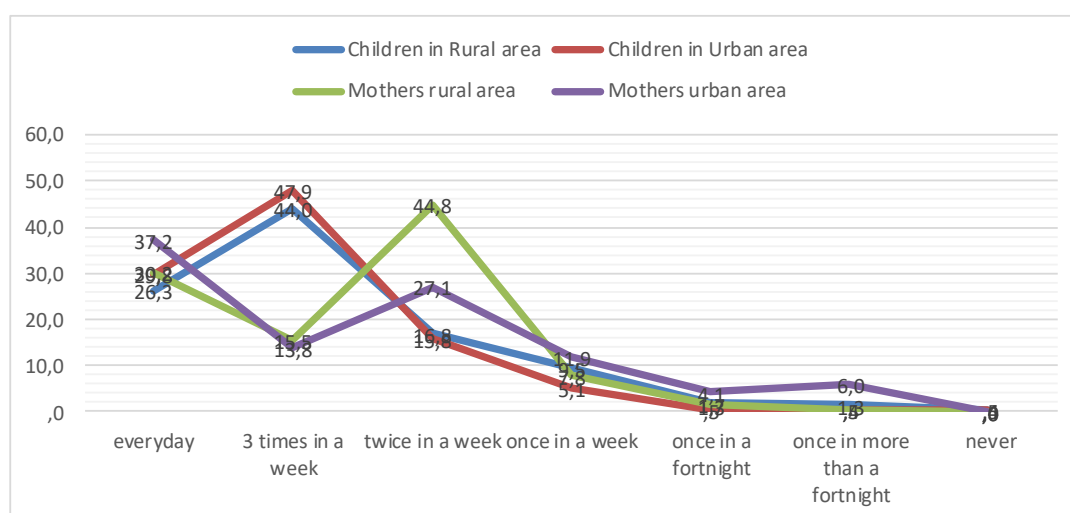
Methodology

This research was conducted by survey design in two sub-districts with the lowest income level in Yogyakarta which is Riverbank Gadjah Wong area, Umbulharjo Sub-district that representative of urban area and Candibinangun Subdistrict, Sleman District, that representative of rural area in Yogyakarta Province, Indonesia. Questionnaire was developed to measure perception, preference and amount of egg consumption. Data was collected from respondents that determined by using judgemental sampling method with the criteria that respondents were mother and the children who were in elementary school-aged. Mother was considered as respondent since mostly family decision maker for food buying is mother or housewife (Schifmann dan Kanuk, 2010). The total number respondents were 232 from urban and 218 from rural area. Data were analyzed by using descriptive analysis.

Results and Discussion

The results show that 88.40% children respondents agree that eggs maintain healthy body while only 11.60% not agree and also able to prevent disease (72.90%) while 27.10% not agree. The analysis of children preference in eggs consumption shows that only 2.00% children preferred to eat, 15.30 is neutral and majority that is 82.60% respondents do not like to eat eggs. Egg is comestibles that the availability exists in the household as 84.40% of household owned supply of eggs, thus there are difficulties for children to consume egg. Data of egg consumption gathered by dyadic method indicated consistent result. The result based on child respondents showed that 28% of respondent consume egg on daily basis, 45.9% consume egg three times a week, 16.3% consume egg two times a week. The data gathered from mothers indicated that 32.7% of children consume egg once a day, 13.60% consume egg three times a week, 46.60% consume egg two times a week. Figure 1 shows the similarities of children's egg consumption pattern in rural and urban area, both from the perspective of the children and mother. However, the independent t-test based on child respondent indicated the frequency of consumption in urban area (2.22) is higher than in rural area (2.02) ($p \leq 0.05$). The result exhibited in this research is partially consistent with the previous study with conclusion that the biggest proportion in animal protein fulfilment of poor families in rural area came from egg consumption (Muzayyanah et al., 2012).

The analysis of eggs preference implies is unexpected and it is a reminder to the institution involved to review various programs intended to increase egg consumption. The model of campaign currently used is a form of communication that emphasizes on delivering information, but not through persuasive method to increase the likeness to the product. Marketing communication tools varied at buyer readiness stage, when the product has become part of the consumption or in the reorder stage, thus making the introduction of product becoming less effective (Kotler and Keller, 2016). In line with that concept, using concept of product life cycle, eggs already stand in the maturity stage, hence the using events experiences tools become more essential. The events experiences model should also involve the actor who create buying decision of food. Based on that, integrating events and experiences tools that is capable to provide profound impression upon certain product to targeted audience is important. Integrated marketing approach need to be developed to change the target behavior (DeBar et al., 2009) Considering the result of the research, children's disapproval towards egg was potentially caused by the limited capacity of the mother in cooking eggs, therefore the model of activity has to be aimed to increase mother's cooking skills as it leave profound impression as well.



Picture 1. Eggs consumption frequency in rural and urban areas based on children and mothers perception

Conclusion

Egg in low income family in either rural or urban area has become part of daily consumption although it is small in number. The increase of egg consumption as an affordable source of protein is still hindered by the huge proportion of children that disapprove the consumption of egg. To overcome that issue, improvements for marketing communication model is required give experience to mothers as the one who create buying decision and also to increase the skills to process egg.

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Economic assessment of the native honeybee farming (Case study at Kediri regency East Java of Indonesia)

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Abstract

Beekeepers in the study area located at Kediri Regency, East Java, Indonesia in contrast, have been participated in Bintang *Mulia* group farmer in which supplied raw materials of apiculture and facilitated in marketing bee-products. Research proposed to examine: (i) the structure of production cost and revenue, profit, and (ii) R/C ratio and Profit Margin of apiculture farming. Total sampling method was carried out to obtain 22 beekeeper respondents who divided into two strata, namely stratum-1 (having 50-80 beehives, n=8) and stratum-2 (owning 100-150 beehives, n=14). Primary and secondary data were collected from 16th February to 16th March 2016. Data analysis employed descriptive method and applying economic formulation (i.e. production cost, revenue, profit, R/C ratio) to answer the research objectives. Results demonstrated that Stratum-2 has performed IDR 462,420 or US\$ 34.25 of production costs (composed by 43.60% of labour cost, 21.32% of bee-colony, and 14.83% of honeybee feed) and IDR 963,129 or US\$ 71.34 of revenue (consisted of 72.28 % of honeybee, 16.80% of pollen, 5.73% of propolis, and 5.19% of royal jelly) in producing one beehive. The efficient of apiculture farming was also evident among beekeepers in stratum-2 in terms of IDR 500,709 or US\$ 37.09 of yearly profit per beehive and 2.08 of R/C ratio.

Keywords: production costs, Profit, R/C Ratio, revenue.

Introduction

Honeybee farming encountered financial obstacles such as high cost of beehives and lack of fund (Kenmogne et al 2014). The apiculture practice hasn't guarantee the sustainability of honeybee farming since the maximum production have less formed through allocating given set of inputs and the bee-keeping (Adedeji and Joseph 2016). Furthermore, pesticides and herbicides application and the presence of pest and predators (Kebede and Tadesse 2014), honeybee diseases (Fikru et al 2015), insecticides, and birds (Serda et al 2015) become major challenges of honeybee production.

Marketing problems and inadequate of honey storing facilities revealed a major problem of the three types (Traditional, Movable comb top-bar and modern) honey bee production systems (Fikru et al 2015). Beekeepers have also encountered honeybee poor market and lack of trained development agents (Serda et al 2015), and. lack of training (Serda et al 2015). Beekeepers in this study in contrast, participated in *Bintang Mulia* group farmers that might bring great potential honeybee productivity and ensuring the competitive bee product marketing. It becomes interesting to explore: (i) the structure of production cost and revenue, and (iii) profit and R/C ratio of apiculture farming.

Methodology

Small-scale honey bee farmer participated in the *Bintang Mulia* group farmer in which supplied raw materials of apiculture and facilitated in marketing bee products. Group farmer has managed 22 beekeepers as representative respondent in this study. The selected honeybee farmers were categorised by two strata involving stratum-1 (having 50-80 beehives; n= 8) and stratum -2 (controlling 100-150 beehives, n=14). The collection of primary data used survey method with a structured questionnaire. The farmer group of *Bintang Mulia* and related institutions has provided secondary data. Data analysis employed descriptive technique to depict the profile of beekeepers and using economic formulation including profit, and Revenue-Cost Ratio (R/C Ratio).

Results and Discussion

Production costs structure of honeybee farming

Table 1 exhibited that stratum-2 appeared more efficient expenditure (IDR 462,420) than stratum-1 (IDR 475,885). Production costs of stratum-2 composed 52.16 % of fixed cost and 47.84 % of variable cost, whereas it was about 50.23% and 49.77 %, respectively for stratum-1. Variable cost composed more for purchasing bee-colony for both stratum-1 (IDR 103,846 or 21.82%) and stratum-2 (IDR 98,571 or 21.32 %).

Table 1. Production costs structure of honeybee farming by stratum

Revenue	Stratum-1			Stratum-2		
	IDR/farm	IDR/ beehive	%	IDR/farm	IDR/ beehive	%
1.Depreciation:						
a. Ware house	947,917	14,583	3.07	1,398,808	11,190	2.42
b.Housing						
Equipment	2,256,249	33,911	7.29	3,217,855	25,743	5.56
2. Labour						
salary	12,000,000	184,615	38.79	25,200,000	201,600	43.60
3. Water diesel						
machine	333,333	5,128	1.08	333,333	2,667	0.58
depreciation						
Total fixed costs	15,537,500	239,038	50.23	30,149,997	241,200	52.16
Variable cost						
1.Bee colony	6,750,000	103,846	21.82	12,321,429	98,571	21.32
2.Sugar	4,050,000	62,308	13.09	8,571,429	68,571	14.83
3.Medicine	120,000	1,846	0.39	240,000	1,920	0.41
4.Harvest						
worker	1,725,000	26,538	5.58	2,457,143	19,657	4.25
5.Transportation	1,312,500	20,192	4.24	1,937,500	15,500	3.35
6.Diesel oil	1,437,500	22,115	4.65	2,125,000	17,000	3.68
Total variable cost	15,395,000	236,846	49.77	27,652,500	221,220	47.84
Total costs	30,932,500	475,885	100	57,802,497	462,420	100

The price of bee-colony quite expensive ranging from IDR 90,000- IDR 100,000 and therefore, *Bintang Mulia* group farmer offered their members a credit for this product with honey-bee products as payment on harvesting time. Beekeepers have choice to obtain bee-colony either through group farmer or getting its product from outside. The second larger variable costs come from sugar expenses about IDR 62,308(13.09 %) of stratum-1 and IDR 68,571 (14.83%) of stratum-2. The smallest variable cost was medicine approximately IDR 1,846 (0.39%) of stratum-1 and IDR 1,920 (0.41 %) of stratum-2. Regarding this study,

stratum-1 has required less expense in either IDR 1,846 (0.39%) than IDR 1,920 (0.41 %) those for stratum-2.

Revenue structure of honeybee farming

Table 2 showed that stratum-2 (owning on average 68 beehives) performed highest yearly revenue of IDR 120,391,187 than IDR 58,628,595 of stratum-1 (rearing on average 125 beehives). Apiculture farming of stratum-2 indicated the high productivity with revenue of IDR 963,129 in comparison with stratum-1 of IDR 862,185 on beehive basis. This farm have allocated fairly efficient the available resources especially in Tolon-Kumbungu district of Northern region of Ghana (Abdul-Malik and Mohammed 2012).

Table 2. Revenue structure of honeybee farming by stratum

Revenue	Stratum-1			Stratum-2		
	IDR/farm	IDR/ beehive	%	IDR/farm	IDR/ beehive	%
1.Selling honye	43,934,800	646,100	74.94	87,018,750	696,150	72.28
2. Selling royal jell	3,007,948	44,235	5.13	6,248,303	49,986	5.19
3. Selling propolis	3,400,799	50,012	5.80	6,898,415	55,187	5.73
4. Selling pollen	8,285,049	121,839	14.13	20,225,719	161,806	16.80
Total revenue	58,628,595	862,185	100	120,391,187	963,129	100

Selling honey represented the highest contribution on beekeeping revenue which stratum-1 appeared more dominant (74.94 %) than those for stratum 1 (72.28%). The average honey yield per hive/year was 9.94 Kg (stratum-1) and 10.71 Kg (stratum-2) which higher than those of previous study that frame hive produced about 8.2 ± 2.62 Kg (Kebede and Tadesse 2014). Selling pollen, however, structured outweigh for stratum-2 than stratum-1 that was about 16.80% compared to 14.13%, respectively.

Bee-farming profit and R/C ratio

Profit per beehive appears the higher for beekeeping in stratum-2 of IDR 500,709 compared to IDR 386,301 of those in stratum-1 (Table 3). Apiculture in stratum 2 exhibited as profitable farming because they use more efficient (IDR 462,420) in production costs than those for stratum-1 (IDR 475,885). Stratum-2 also appeared more productive with revenue of IDR 963,129 than IDR 862,185 of stratum-1.

Table 3. Beefarming profit, R/C ratio, and profit margin by strata

Explanation	Stratum-1		Stratum-2	
	IDR / farm	IDR / beehive	IDR / farm	IDR / beehive
1.Total revenue	58,628,595	862,185	120,391,187	963,129
2.Total production cost	58,628,595	862,185	120,391,187	963,129
3.Profit	27,696,095	386,301	57,802,497	500,709
4.R/C ratio	1.9		2.08	

The ratio between revenue and production cost (R/C ratio) was higher (2.08) than those of stratum-1 (1.9). Even though, mostly (42.56%) bee-farmers in stratum-2 aged between 51-60 years old, they still involved in productive age in which they were more likely to access the technology in operating the livestock farming to acquire the high farm productivity and the optimal profit.

Conclusion

The study of two strata apiculture farming namely stratum-1 (controlling 50-80 beehives; n = 8) and stratum-2 (owning 100-150 beehives; n= 14) demonstrated two findings: Stratum-2 has performed IDR 462,420 or US\$ 34.25 of production costs (composed by 43.60% of labour cost, 21.32% of bee-colony, and 14.83% of honeybee feed) and IDR 963,129 or US\$ 71.34 of revenue (consisted of 72.28 % of honeybee, 16.80% of pollen, 5.73% of propolis, and 5.19% of royal jelly) in producing one beehive. The efficient of apiculture farming was also evident among beekeepers in stratum-2 in terms of IDR 500,709 or US\$ 37.09 of yearly profit per beehive and 2.08 of R/C ratio.

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Antibacterial and antifungal activities of *Muntinga calabura* leaves extract as alternative to antibiotic in mastitis treatment

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Abstract

Mastitis is the most damaging worldwide disease of dairy industry. The aim of the study was to evaluate the antibacterial and antifungal effects of *Muntinga calabura* leaves extract against mastitis infection in dairy cattle. Experimental treatments were subclinical mastitis milk added with different levels of ethanol extract of *Muntinga calabura* leaves (EEMC) (6.25%, 12.5%, 25% and 50%) in a completely randomized design with five replications. The result showed that total bacterial *Staphylococcus aureus* and fungal counts were significantly decreased ($P < 0.01$) with increasing EEMC concentration. The EEMC concentration of 50% had the highest ($P < 0.01$) antimicrobial activity among the groups. The EEMC could reduce 87.2% – 94.8%, of total bacteria, 71.1- 95.8% of *Staphylococcus aureus*, and 64.4% - 97.8% of fungi in mastitis milk. Taken together, current findings suggested that *Muntinga calabura* leaves have antibacterial and antifungal activities and can be used as an alternative to synthetic antibiotic for mastitis treatment to prevent the antibiotic residue in milk.

Keywords: mastitis, antibacterial, antifungal, *Muntinga calabura*, antibiotic alternative

Introduction

Mastitis is an inflammation of the mammary gland caused by bacterial infection. In the previous research, it has been reported that fungi is another causative agent of mastitis (Pachauri et al., 2013). One of the challenge to treatments of bovine mastitis due to many of the causative agents, especially fungi do not respond to antibiotic therapy, however they use some antibiotics like tetracycline as their source of energy (Tarfarosh and Purohit, 2008). Moreover, the use of antibiotics to treatment the disease is limited due to public concerns for the antibiotic residue on milk and it will be resisten to the humans who consumed milk. Recently, numbers of studies focused to find alternatives to changes antibiotics with herbal plants. Plant-derived natural bioactive compound is very potential to be use as an alternative antibiotic for mastitis treatment. *Muntinga calabura* is one of the most common trees in Indonesia and have been used as a traditional medicine to treatment of fever, cold, liver, and to decrease gastritic. It also has anti-inflammatory activities (Balan et al., 2015). Therefore, this study was aimed to elucidate the potential of *Muntinga calabura* leaves extract as antimicrobial against bacteria and fungi in mastitis milk, as well as to evaluate the prevalence of mastitis in Central Java.

Methodology

Examination of mastitis prevalence was conducted in Semarang Regency, the center of dairy farming in Central Java. A total of 105 lactating cattle were tested by California Mastitis Test (CMT) (Bovivet, Kruuse Denmark). Milk samples from 20 quarters were aseptically collected and tested against *Muntinga calabura* leaves extract.

Muntinga calabura leaves were collected from the area of Diponegoro University in Semarang. Fresh leaves were oven-dried at 50°C for 24 h then grinded. The leaves powder was soaked in the 96% ethanol in the ratio of 1:10 (w/v) for 24 h. The supernatant was filtered and then evaporated using rotary evaporator at 40°C. The EEMC was dissolve in 10% DMSO just before used. The experimental groups were: mastitis milk added with either 6.25%, 12.5%, 25%, or 50% EEMC (M1, M2, M3, and M4 respectively), mastitis milk added with synthetic antibiotic (K+) and mastitis milk only (K-). The synthetic antibiotic was used TERREXINE (combination of Kanamycin and Cefalexine, Univet Ireland). Mastitis milk sample were analyzed for total bacterial count, gram staining, *Staphylococcus aureus* and fungal counts.

Results and Discussion

The positive results of CMT were categorized as clinical and sub-clinical mastitis. Mastitis prevalence was 67%, whereas the healthy udder was only 33% (Figure 1). In the current study, mastitis prevalence in Central Java was similar with in West Java, that is 67.5% (Susanti et al., 2017). The dominant cases were sub-clinical mastitis not sign of abnormality of mammary gland and milk, thus farmers could not recognize the symptoms and they were depend on the paramedic person to check the animal health status. Good milking practices may give contribution to the mastitis problem. Most of farmers applied traditional dairy practices. Our previous study reported that 80% of farmers used plastic bucket for milking rather than using stainless steel (Prihutomo et al., 2015) with improper disinfection procedure.

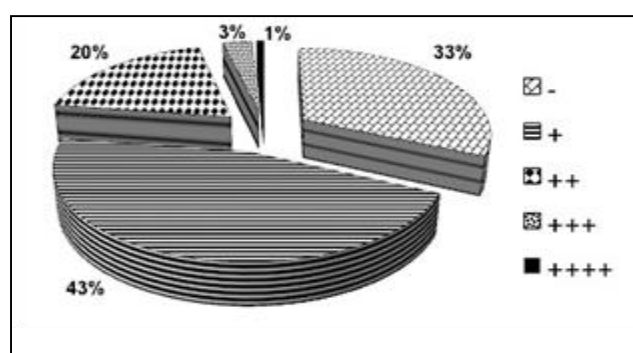


Figure 1. CMT result from each quarter

The ECMC at the concentration of 50% showed to possess the highest antibacterial and antifungal activity among the treatment groups (Table 1). The antimicrobial activity of synthetic antibiotic (K+) has shown the best among others, however the possibility of antibiotic residue in milk should be considered. Bacterial and fungal counts were significantly decreased ($P < 0.01$) with increasing extract concentration. The number of total bacteria reduction in milk was varied from 87.2% to 91.4%, whereas the fungi reduction in milk was varied from 64.4% to 97.8% (Table 2). Since this is a preliminary screening for the presence of antimicrobial properties in the *Muntinga calabura* leaves extract, at the moment, the identification of chemical constituents or bioactive compounds is not part of the objective from this study. Based on previous studies on the antibacterial activities of *Muntinga calabura* leaves, the antimicrobial activity is suggested to be due to the presence of phytochemical compound such as sterol, flavonoid, alkaloid, saponin, glycoside and tannin (Buhian et al., 2016). Gram staining of the individual colony has showed gram-positive cocci and gram-negative bacilli spore-forming bacteria (Figure 2). The mechanisms by which microorganism survive the action of antimicrobial agents still poorly understood. However, the present data suggest that ethanol extract of *Muntinga calabura* leaves is very potential used as an alternative to synthetic antibiotic due to high antibacterial and antifungal activity.

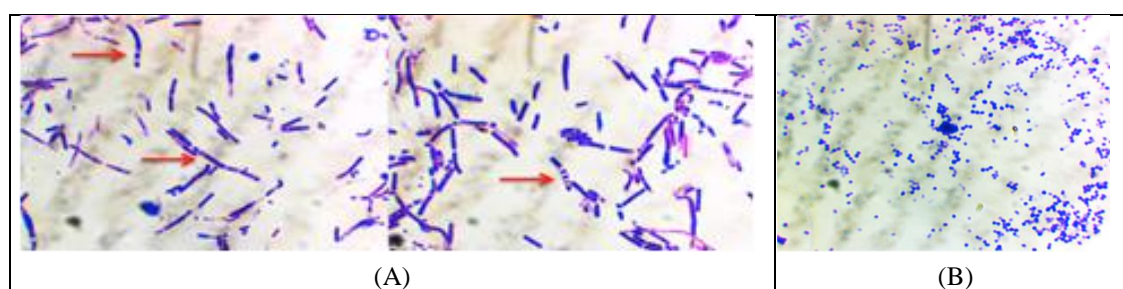
Table 1. The number of total bacteria, *Staphylococcus aureus* and fungi in mastitis milk added with ethanol extract of *Muntingia calabura* leaves (EEMC)

Microbes (cfu/ml)	K-	M1	M2	M3	M4	K+	National standard
Total bacteria	3.711.299 ^A	472.800 ^B	395.200 ^B	191.200 ^C	131.200 ^C	0 ^D	Max 10 ⁶
<i>S. aureus</i>	18.850 ^A	5.450 ^B	2.750 ^B	2.100 ^C	800 ^D	0 ^D	Max 100
Fungi *	450 ^A	160 ^B	110 ^B	40 ^C	10 ^C	0 ^D	-

*The maximum tolerated amount of fungi contamination in milk is not available at the Indonesian National Milk Quality Standard SNI 3141.1:2011. Fungi is defined as yeast and mold; ^{ABCD}Different superscript letters in the same row denotes significance (P<0.01)

Table 2. Percent decrease in the number of bacteria and fungi in milk

Parameters	M1	M2	M3	M4
Total bacteria (%)	87.2	89.4	91.4	94.8
<i>Staphylococcus aureus</i> (%)	71.1	85.4	88.9	95.8
Fungi (%)	64.4	75.6	91.11	97.8

**Figure 2.** Gram-negative bacilli spore-forming bacteria (red arrow) (A), and Gram-positive cocci bacteria (B)

Conclusion

A *Muntingia calabura* leaf has antibacterial and antifungal activities and can be use as an alternative to synthetic antibiotic for mastitis treatment to prevent the antibiotic residue on milk.

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Factors influencing the incidence of *Eimeria leuckarti* in horses

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Abstract

A cross sectional survey was carried out to determine the prevalence of coccidiosis in horses and risk factors associated with their prevalence in district Toba Tek Singh, Punjab from April, 2009 to March 2010. Faecal samples were collected from whole the district using two stage cluster random sampling method and analysed by standard parasitological procedures. Of the total 484 faecal samples examined for *Eimeria*, 244 (50.41%) were found infected with *Eimeria leuckarti*. Peak prevalence was observed in August (OR=1.156; $\chi^2=20.055$) indicating higher prevalence at higher humidity while least number of animals were found infected with *Eimeria leuckarti* in months of April to June, being the driest period of the year in Pakistan. Wet season was found favourable for propagation of *Eimeria*. Foals (124/197; 62.94%; OR=0.422; $\chi^2=20.825$) and mares (196/347; 56.48%; OR=0.512; $\chi^2=13.265$) had significantly higher prevalence ($P<0.05$) of *Eimeria* than adults (120/287; 41.81%) and males (48/137; 35.04%) respectively. Among management and husbandry practices; Farming type, feeding system and floor type strongly influenced the prevalence of *Eimeria*. Coccidiosis was more prevalent in mix farming, ground fed, pond watered animals and non-cemented floor ($P<0.05$) as compared to single farming, tap watered animals, trough fed and partially cemented floor type respectively. Body condition of animals were not found risk factors ($P>0.05$) influencing prevalence of *Eimeria*. Study reports first time in detail the risk factors influencing prevalence of *Eimeria* in horses. Furthermore, this is first report of occurrence of *Eimeria* in horses of Pakistan.

Keywords: *Eimeria*, horse, prevalence, risk factors, Pakistan

Introduction

Coccidiosis in birds and domestic animals is caused by genus *Eimeria*. Over 1000 species of *Eimeria* have been identified. Most species of *Eimeria* are host specific. In horses, coccidiosis is caused by *E. leuckarti*, *E. solipedum*, and *E. uniungulsti* (Ghahfarrokhi et al., 2014). It is an enteric intracellular protozoa which belongs to phylum Apicomplexa. *Eimeria leuckarti* infect intestinal epithelial cells which then migrate to lamina propria. The disease is often associated with nonspecific digestive disorders viz poor assimilation of the nutrients and fermentation of the intestinal contents, loose irregularly formed bowels (Sudan et al., 2013).

Coccidiosis in domestic animals has been reported from various regions of Pakistan (Khan et al., 2011) but the information on Eimeriosis in horses in Pakistan is lacking. Moreover, research has been done on coccidiosis in birds and ruminants but little is known about life cycle, morphology, epidemiology and treatment of coccidiosis in horses. Because of emergence of drug resistance, research in parasites has been tuned for exploration of non-chemical control strategies. Knowledge about factors influencing the prevalence of *Eimeria* in one area or in a certain type of equine population assists in their diagnosis and effective control. Epidemiological investigations of risk factors are expected to leverage non-chemotherapeutic management options and to enhance more targeted use of drugs.

Methodology

A total of four hundred and eighty four animals were examined in this survey. Samples were collected from district Toba Tek Singh which is situated in Punjab Province of Pakistan. Two stage cluster random sampling technique was adopted for collection of samples. Primary units were union councils and elementary units were animals. Number of primary and elementary units was calculated by using formulae as described by Thrusfield (2008). Information regarding season, age, sex feeding system, floor type, farming system were collected on a pre designed questionnaire.

Five to ten grams of fresh fecal samples were collected in plastic bottles and preserved with 2.5% potassium dichromate. Fecal samples were examined microscopically through fecal flotation using saturated zinc sulfate solution. The procedure was adopted as described by Zajac and Conboy (2006). Quantitative fecal examination was performed by McMaster technique to determine the number of oocysts per gram of feces (OPG) as per the procedures of MAFF (1986). Identification of oocyst was carried out by determining morphological feature of oocyst like color, shape, size, presence or absence of micropyle and polar cap (Soulsby, 2006). Data about temperature, rainfall and relative humidity was recorded from meteorological cell, Department of Crop Physiology, University of Agriculture, Faisalabad.

Logistic analysis was carried out by using logit model including all variables in the model with backward elimination procedure. Factors with paired characteristics were analyzed using Odds Ratio (OR) and Mantel–Haenszel (M. H.) chi-square. Hosmer-Lemeshow goodness-of-fit test indicated that model fits well. All the analyses were carried out using SAS software package (1998) at 95% confidence level (SAS1998).

Results and Discussion

Only species identified in feces of horses of Toba Tek Singh was *Eimeria leuckarti*. Fecal examination of total number of samples (484) revealed that 50.41% (244) animals were found infected with coccidiosis. Analysis of all the hypothesized risk factors by stepwise multivariate logistic regression model and M. H. chi-square analysis revealed that season, age, sex, floor, farming and feeding system were the factors significantly influencing the prevalence of *Eimeria* in horse population of district Toba Tek Singh, Pakistan. Highest prevalence (74.36%) was found in month of August (rainy season). There was a strong negative correlation between age and occurrence of infection. Odd's of finding oocysts of *Eimeria* in foals during fecal examination was higher (62.94%; $\chi^2=20.8252$) as compared to those in adults (41.81%; OR= 0.422). Females were found to be more frequently infected with coccidiosis (56.48%; $\chi^2=13.2653$; OR=0.512) as compared to males (35.04%). Body condition of animals was found to be non-significantly associated (P value=0.2434) with infection.

Among management risks, farming type, floor type and feeding system were found to be significantly influencing the infection. Statistical analyses showed that Odd's of finding *Eimeria* was higher in feces of animals which are kept singly (58.06%; $\chi^2=11.8863$; OR=2.671) as compared to those kept with other species like ovine, bovines, backyard poultry (42.37%). Higher prevalence was recorded in ground fed animals (62.17%; $\chi^2=9.5973$; OR=1.741) as compared to trough fed animals (42.61%). Floor type strongly predisposed the infection in horses. Horses kept at non-cemented floor type was found to highly infected (58.04%, $\chi^2=12.5122$, OR=) as compared to those kept at partially cemented / cemented floor type (41.92%).

This is the first large scale epidemiological survey investigating the association of various risk factors with the occurrence of *Eimeria* in horses. *Eimeria leuckarti* has been reported from various countries and its prevalence ranges 0.34% to 80% (Germany 64.9% &

80.0%, Greece 3.1% & 4%, Kashmir 0.34%, Nigeria 1.2%, Poland 6.7%, Romania 1.90%, Turkey 4.5% & 5.88%, USA 41.0%) (Ghahfarrokhi et al., 2014; Papazahariadou et al., 2009). Higher prevalence may be due to unhygienic conditions, illiteracy, no regular deworming treatment.

It is believed that coccidiosis in horses mainly concerns the young horses especially foals. During an investigation on *Eimeria leuckarti* in horses of Romania, Ioniță et al., (2013) observed higher prevalence in foals (i.e., 15%) comparing with the overall prevalence (1.90%). Papazahariadou et al. (2009) investigated occurrence of *Eimeria* in four different age groups and found that 73% of 2 to 5 year-old age group, 45% of 6 to 10-year-old animals, 28% of 11 to 15 year-old animals, 14% of 16- to 20-year-old animals were infected. Similar results were recorded by Ghahfarrokhi et al., (2014). Higher prevalence in females has been recorded earlier in case of other species of *Eimeria* in domestic animals (Khan et al., 2011).

Results of our study support the principle that management systems are of major importance as predisposing factor to parasites. Lower infection in mix farming may be attributed to the fact that range of host species diluted the parasite concentration and hence lowered the prevalence as *Eimeria* species are host specific. Our findings of higher prevalence of *Eimeria* in ground fed horses are in agreement of recommendations of Radostits et al., (2009) to avoid the feeding on the ground as this increase the chances of contamination of the feed with *Eimeria* oocysts. Similar results were obtained by Papazahariadou et al. (2009) investigated that grazing horses were infected with more parasitic genera as compared to stabled horses. Mitchell et al. (2012) found that frequent emptying and cleaning of water troughs resulted in reduced exposure of infection and hence lower prevalence of *Eimeria* in cattle. The observation regarding higher prevalence in animals kept at non-cemented floor may be true because it is easy to clean cemented floor than non-cemented floor.

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Longitudinal humoral immune response comparison between high and low Newcastle disease virus titer of in house inactivated vaccine using single vaccination in layer chicken

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Abstract

The aim of present study was examined the humoral immune response against Newcastle disease comparison between high and low titer of in-house inactivated vaccine using single vaccination in layer chicken. The virulent stain of Newcastle disease virus (NDV) was inactivate using formaldehyde. Before mixing with adjuvant, namely Montanide®, virus titer was examined by hemagglutination test. Fifteen 1-day-old white-leghorn layer chicken, were divided 3 groups such as un-vaccinated, low and high NDV titer group. Both vaccinated groups were vaccinated by subcutaneous injection as 0.5 ml per chick using low and high NDV titer, respectively. Another is un-vaccinated group. All chickens were collected sera at 0, 1, 2, 3, 4, and 5 month-post vaccination and antibody evaluated by hemagglutination inhibition (HI) test. The results indicated that even low or high titer of seed NDV for in-house inactivated vaccine, both condition could produce a lot of antibody and steady at high level at least 5 months after single vaccination.

Keywords: Newcastle disease, in-house inactivated vaccine, single vaccination, layer chicken

Introduction

All strains of Newcastle disease virus (NDV), synonymous with Avian paramyxovirus-1, is belong to the order Mononegavirales, family Paramyxoviridae, and genus Avulavirus. (Alexander and Senne, 2008). NDV can infect over 236 species of birds (Kaleta and Baldauf, 1988) and virulent NDV (vNDV) strains are commonly isolate in pigeons and double crested cormorants (Diel et al., 2012b; Kim et al., 2008; Pchelkina et al., 2013) and occasionally in some other wild bird species (Kaleta and Kummerfeld, 2012). Biosecurity and vaccination, are a critical component to control ND (Marangon and Busani, 2006; Seal et al., 2000). The goal of vaccination is induced an immune response that reduces or completely prevents clinical disease and mortality from ND, including decreases the amount of vNDV shed into the environment, and increases the amount of virus needed to infect the vaccinated animal (Marangon and Busani, 2006; Miller et al., 2009). The aim of present study was examined the humoral immune response against ND comparison between high and low titer of in house inactivated vaccine using single vaccination in layer chickens.

Methodology

Virus and vaccine preparation: The Virulent stain of Newcastle disease virus (NDV) was propagated in 9-day-old chicken embryonic eggs. The allantoic fluid was harvested and

inactivated by formaldehyde as 1:2000 ratio, then incubated at 4°C. This inactivated NDV were tested the ability by chicken embryonic egg inoculation and repeated at least 3 passages for virus inactivating confirmation. Before vaccination, the complete inactivated NDV was tested by hemagglutination (HA) assay before mixed with adjuvant, namely Montanide® (Seppic Asia Singapore, Singapore).

Experimental designs: Fifteen 1-day-old white-leghorn layer chickens, were obtained from chicken house of Veterinary Medicine Faculty, Mahanakorn University of Technology, Thailand. The chickens were fed *ad libitum* (Betagro, Bangkok, Thailand). These chicken were divided 3 groups such as un-vaccinated, low and high NDV titer group. Both vaccinated groups were vaccinated by subcutaneous injection as 0.5 ml per chick using low and high NDV titer, respectively. Another is un-vaccinated group.

Humoral immunity evaluation: All chickens were collected sera at 0, 1, 2, 3, 4, and 5 month-post vaccination and antibody evaluated by hemagglutination inhibition (HI) test.

Statistical analysis: HI antibody titer in each group, was calculated using mean and standard deviation (SD) value then analyzed using analysis of variance (ANOVA) as repeated measurement with Turkey HSD's multiple range test with SPSS 10.0 software. The difference between parameters was regarded as significant when the p value was less than 0.05.

Results and Discussion

The HA titer of both inactivated viruses before mixing with adjuvant is <2 and 64. And the result of HI titer before and after vaccination was showed in Table 1. At 5-month-post vaccination, HI titer still steady and did not significantly difference between low and high NDV titer group as 4.00 ± 1.15 and 5.00 ± 1.15 , respectively.

Table 1. The results is shown mean and standard deviation value (mean \pm SD) of hemagglutination inhibition titer using log₂

	0 mpv	1 mpv	2 mpv	3 mpv	4 mpv	5 mpv
Low titer	1.6 \pm 0.55	5.80 \pm 1.30 ^a	5.00 \pm 1.58 ^a	4.75 \pm 1.71 ^a	4.00 \pm 1.15 ^a	5.00 \pm 0.00 ^a
High titer	1.4 \pm 0.55	6.40 \pm 1.14 ^a	5.00 \pm 1.83 ^a	5.00 \pm 1.15 ^a	5.00 \pm 1.15 ^a	4.00 \pm 1.15 ^a
unvaccinated	1.33 \pm 0.58	2.33 \pm 0.58 ^b	1.00 \pm 0.00 ^b	1.67 \pm 0.58 ^b	2.00 \pm 0.00 ^b	1.67 \pm 0.58 ^b

^{a,b} Values within the same column with different superscripts mean statistically significant difference ($p < 0.05$)

The present study shown the longitudinal humoral immune response against ND compared between high and low titer of in house inactivated vaccine using single vaccination in layer chicken. These results indicated that even low and high titer of seed NDV, both condition could produce a lot of antibody and steady at high level at least 5 months after single vaccination. Generally, inactivated vaccines are often administered to layers and breeders to provide long lasting high antibody titers that can be passed to offspring (Al-Garib et al., 2003). Van Boven et al (2008) reported that HI titer greater than 8, is achieved from virulent ND more than 85%. However, HI titers greater than 16 using multiple vaccinations will survive from vNDV challenge while 66% of the flock succumbed with titers less than that (Kapczynski and King, 2005). In addition, HI titers at least 32 could protect from disease (Allan et al., 1978)

Although, commercial breeder and layer chicken must be vaccinated multiple vaccination and combine attenuated and inactivated vaccine, but present study shown that only single vaccination using low and high NDV titer, could produce high level of antibody. However, virulent NDV challenging, should be examined for ND protection including study on multiple vaccination.

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Studies on *Escherichia coli* and *Salmonella* Infantis inactivation using slaked lime and food additive calcium hydroxide

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Abstract

The aim of the present study, was to evaluate the inactivating activity of food additive calcium hydroxide (FdCa(OH)₂) and slaked lime (SL) in solution form as 0.17% and 3% against *Escherichia coli* (*E. coli*) and *Salmonella* Infantis (SI) even the absence and presence of organic materials. The result demonstrated that 0.17% of FdCa(OH)₂ and SL solution even absence and presence of organic materials could inactivate *E. coli* within 5 min, however, at 3% of both solution sample, inactivated within 3min. While 0.17% and 3% of both solution samples, could inactivate within 3min even absence and presence of organic materials. In conclusion, the FdCa(OH)₂ could inactivate *E. coli* and SI even in the absence and presence organic materials and might potentially be used as an alternative material for biosecurity applying especially on and around poultry farms not only commercial chicken farms.

Keywords: food additive calcium hydroxide, slaked lime, *Escherichia coli*, *Salmonella* Infantis

Introduction

Strategy for biosecurity management is very important for disease protection especially in chicken farm. Generally, organic solvents, detergents and disinfectants were used for microorganism inactivation however, even organic materials contamination, their efficacy is decreased (Thammakarn *et al*, 2014). Alkaline agents such as slaked lime, bio-ceramic powder (Thammakarn *et al.*, 2015b), scallop-shell powder (Thammakarn *et al.*, 2015a) and calcinated egg shell (Ota *et al.*, 2016), have been applied for biosecurity enhancement at poultry farm. The aims of the present study, was to evaluate inactivation activity of Food additive calcium hydroxide (FdCa(OH)₂) against *Escherichia coli* (*E. coli*) and *Salmonella* Infantis (SI), in the absence and presence of organic materials.

Methodology

Samples and sample preparation: Food additive calcium hydroxide (FdCa(OH)₂) powder provided by Fine Co., Ltd. (Japan) and Slaked lime (SL) (Zapco®, Homeinter supply Co., Ltd., Thailand), were used for bactericidal testing. The suspension of each sample was prepared as 0.17% or 3% (w/v) using distilled water and centrifuged at 3,000 ×g for 10 min, then the resulted supernatants were used as solution sample in the absence of organic materials. In the presence of organic materials, each solution sample was added fetal bovine serum (FBS) as final concentration at 5%.

Bacterials and medium: *Escherichia coli* (*E. coli*) and *Salmonella* Infantis (SI), supported by microbiology section, Mahanakorn veterinary diagnostic center, Mahanakorn University of Technology, Bangkok, Thailand, were sub-cultured onto deoxycholate hydrogen sulfide lactose (DHL) agar and incubated at 37°C incubator for overnight. The bacterial colony was picked up and cultivated in Luria-Bertani (LB) medium (1% Bacto Tryptone, 0.5% Bacto Yeast Extract and 1% NaCl, pH 7.4) and titrated on DHL agar (Ota *et al*, 2016). Both culturing bacteria were removed organic materials by centrifugation at 1,750xg for 10 min before tested.

Inactivating testing: Four hundred and fifty microliters of each solution sample, was mixed with 100µl of *E. coli* or SI, then incubated at room temperature for indicated time such as 1min, 3min or 5min. After that the solution mixer, was neutralized pH using 450µl of 1M Tris-HCl pH 7.2. Each sample treatment was titrated onto DHL agar plates for bacteria titration. Even presence organic materials, 500µl of fetal bovine serum (FBS) was added to 10 ml of FdCa(OH)₂ or SL, namely 5% organic materials, before tested. To confirm the neutralizing efficacy of Tris-HCl, it was added into each solution sample before bacteria adding, namely 0 sec. Each treatment was tested in triplicates, and the titers were shown in mean with standard deviation.

Titration: Each *E. coli* and SI treatment was also diluted in 10-fold serial dilution using phosphate buffer saline (PBS) and inoculated on DHL agar for bacterial titration on 90mm petri-disk. All inoculated petri-disk were incubated at 37°C incubator for overnight, and the number of colonies was counted after 24 hr-post inoculation. The bacteria titer was calculated in colony forming units (CFU)/ml.

Inactivation analysis: The reduction factor (RF) was used for determine bacteria inactivation. The RF is calculated using the following equation: $RF = t_{pc} - t_a$; Where t_{pc} is the titer converted into an index in log₁₀ of the positive control, and t_a is the converted titer an index in log₁₀ of the recovered pathogen from treated sample. The efficacy of inactivation was considered effective when RF was greater than or equal to 3 log₁₀ (Lombardi 2008, Takehara *et al.*, 2010, Thammakarn *et al.*, 2014).

Results and Discussion

The efficacy of *E. coli* using 0.17% and 3% of FdCa(OH)₂ and SL even absence and presence of organic materials, was showed in Table 1. Even absence and presence of organic materials, 0.17% of FdCa(OH)₂ and SL could inactivate *E. coli* within 5min, however, 3% of both samples inactivated within 3 min. Table 2 shown *Salmonella* Infantis inactivating activity, both 0.17% and 3% solution samples, and both FdCa(OH)₂ and SL samples, could inactivate within 3 min. In addition, all pH of 0.17% SL, 3% SL, 0.17% FdCa(OH)₂ and 3% FdCa(OH)₂ showed as 12.5 by pH paper strip test

Normally, several disinfectants such as hypochlorine, quaternary ammonium compounds and glutaraldehyde, could not inactivate bacteria and virus even contaminated with organic materials. The present study was confirmed, both alkaline agents in present study, could inactivate *E. coli* and SI even presence of organic materials. The result demonstrated that 0.17% of FdCa(OH)₂ and SL solution even absence and presence of organic materials could inactivate *E. coli* within 5 min, however, at 3% of both solution sample, inactivated within 3min. While 0.17% and 3% of both solution samples, could inactivate within 3min even absence and presence of organic materials.

The main composition of food additive calcium hydroxide (FdCa(OH)₂) and slaked lime (SL) is calcium hydroxide as 97.2% and 95%, respectively, and the solubility level is 0.17% and 0.185% respectively (National Organic Standards Board, 2002; Paditporn *et al*, 2016). Both FdCa(OH)₂ and SL could dissolve in water and changed to Ca⁺⁺ and OH⁻, which

are high alkalinity as pH=12.5 (National Organic Standards Board, 2002; Paditporn et al., 2016). Generally, pH greater 9 is effected to microorganism such as bacteria and viruses (Aiello, 1998). Present study was show bacterial inactivating efficacy of FdCa(OH)_2 and SL, both sample could be inactivated both *E. coli* and *Salmonella* Infantis even in the absence and presence of organic materials. However, 3% of both samples could inactivated shorter than 0.17%, especially SI inactivation.

In conclusion, the FdCa(OH)_2 solution-form could inactivate *E. coli* and SI even in the absence and presence organic materials. Thereby, FdCa(OH)_2 might be use as alternative materials, which applying to prevent spreading of poultry disease on commercial chicken farms.

Table 1. The result is shown as $\log_{10}\text{CFU/ml}$ (mean \pm SD) of *Escherichia coli* inactivating activity using 0.17% and 3% food additive calcium hydroxide solution even absence and presence organic materials.

	food additive calcium hydroxide				Slaked lime			
	0.17% ^a		3%		0.17%		3%	
	w/o FBS	5%FBS ^b	w/o FBS	5%FBS	w/o FBS	5%FBS	w/o FBS	5%FBS
t_{pc} ^c	9.10 \pm 0.19	9.10 \pm 0.19	9.10 \pm 0.19	9.10 \pm 0.19	8.85 \pm 0.33	8.85 \pm 0.33	8.85 \pm 0.33	8.97 \pm 0.17
0 sec ^e	9.09 \pm 0.45	8.84 \pm 0.25	8.94 \pm 0.31	8.75 \pm 0.32	9.10 \pm 0.48	8.80 \pm 0.20	8.90 \pm 0.14	8.88 \pm 0.17
1 min	7.60 \pm 0.00	7.60 \pm 0.00	7.60 \pm 0.00	7.44 \pm 0.29	7.60 \pm 0.00	7.60 \pm 0.00	7.60 \pm 0.00	7.60 \pm 0.00
3 min	6.57 \pm 0.49	6.96 \pm 0.36	4.51 \pm 0.27	5.31 \pm 0.41	6.64 \pm 0.73	6.56 \pm 0.43	5.02 \pm 0.22	5.28 \pm 0.67
5 min	3.81 \pm 1.05	4.24 \pm 1.44	2.60 \pm 0.00	2.60 \pm 0.00	2.98 \pm 0.66	4.62 \pm 1.03	2.60 \pm 0.00	2.60 \pm 0.00

^a Concentration of food additive calcium hydroxide solution (%w/v). ^b Fetal bovine serum was added to food additive calcium hydroxide solution as 5% organic materials of total volume. ^c t_{pc} is the titer converted into an index in \log_{10} of the bacteria control. ^d Added 1M Tris-HCl before bacteria. ^e t_a is the titer converted into an index in \log_{10} of the recovered bacteria after indicated time of treated.

Table 2. The result is shown as $\log_{10}\text{CFU/ml}$ (mean \pm SD) of *Salmonella* Infantis inactivating activity using 0.17% and 3% food additive calcium hydroxide solution even absence and presence organic materials.

	food additive calcium hydroxide				Slaked lime			
	0.17% ^a		3%		0.17%		3%	
	w/o FBS	5%FBS ^b	w/o FBS	5%FBS	w/o FBS	5%FBS	w/o FBS	5%FBS
t_{pc} ^c	8.65 \pm 0.19	8.65 \pm 0.19	8.65 \pm 0.19	8.65 \pm 0.19	8.67 \pm 0.19	8.67 \pm 0.19	8.67 \pm 0.19	9.13 \pm 0.63
0 sec ^d	8.85 \pm 0.51	8.70 \pm 0.17	8.67 \pm 0.20	8.69 \pm 0.14	8.58 \pm 0.42	8.67 \pm 0.40	8.95 \pm 0.48	8.85 \pm 0.13
1 min ^e	6.73 \pm 0.66	6.66 \pm 0.52	6.38 \pm 0.38	6.30 \pm 0.48	6.64 \pm 0.53	6.66 \pm 0.88	6.40 \pm 0.36	6.14 \pm 0.67
3 min	2.70 \pm 0.17	3.25 \pm 0.75	3.38 \pm 1.34	3.51 \pm 1.58	2.94 \pm 0.35	5.33 \pm 1.56	2.60 \pm 0.00	3.76 \pm 2.00
5 min	2.60 \pm 0.00	2.70 \pm 0.17	2.60 \pm 0.00	2.60 \pm 0.00	2.60 \pm 0.00	3.40 \pm 1.38	2.60 \pm 0.00	2.60 \pm 0.00

^a Concentration of food additive calcium hydroxide solution (%w/v). ^b Fetal bovine serum was added to food additive calcium hydroxide solution as 5% organic materials of total volume. ^c t_{pc} is the titer converted into an index in \log_{10} of the bacteria control. ^d Added 1M Tris-HCl before bacteria. ^e t_a is the titer converted into an index in \log_{10} of the recovered bacteria after indicated time of treated.

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The Concentration of Serum Proteins, Albumin, Globulin and A/G Ratio in Calves and Adult Friesian Holstein

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Abstract

Protein levels in serum are influenced by several factors such as age and sex factors and thereby affect clinical interpretation. The objective of this experiment was to study the effect of total protein, albumin, globulin and ratio A/G in calves and old male Friesian Holstein (FH). Ten healthy cows were divided into two groups and each group consisted of five cows. Group 1 was male calves at 6-8 months of age and group 2 was male cows at 16-18 months of age. Blood samples were taken from jugular vein for total protein, albumin, globulin and albumin-globulin ratio (A/G ratio) analysis. Concentration of total serum proteins and albumin were determined by spectrophotometer. Value of protein total, albumin and globulin tended to increase in calves (6th and 8th month of age) compared to adult (16-18 months of age).

Keywords : Serum total proteins, albumin, globulin, calves, Friesian Holstein

Introduction

Proteinogram profiles provide reliable information on the health status of animals. They also reflect the responsiveness of an animal to its internal and external environments (Esonu et al., 2001). Several factors may influence the concentration of serum globulins in healthy cows and thereby affect clinical interpretation; however, few studies have addressed sources of variation in globulin value. Protein level varies in many diseases such as liver dysfunction, terminal stages of cancer, parasitism and renal disorders. Several factors affect on biochemistry serum, such as age, sex, nutrition (Egbe Nwiyi et al., 2000). On the other hand, several physiological factors may affect serum protein levels, including the age of the evaluated animals. Several studies confirmed that changes in nutrition in young animals, body growth and development are accompanied by dynamic changes in many indices of hematological, protein, mineral, enzymatic, energy and other profiles, including serum protein profile. Therefore, age-related reference values should be ideal for interpreting serum protein pattern, but such data in calves rarely are available. Age has been found to influence proteinogram in some animals. Sex differences in immune function are well established in vertebrates. Male generally exhibit lower immune response than female and under pathogenic conditions. But information about the status of proteinograms between calves and adult in male FH cow has not been informed. The present study was therefore designed to ascertain the value of protein total (TP), Albumin (Alb), Globulin (Glob) and Ratio Albumin/Globulin (R A/G) in calves and male FH Cows.

Methodology

This research was carried out at a dairy farm in Ciawi Bogor, and at Clinical Pathology Laboratory of Clinical, Reproduction and Pathology Department, Faculty of Veterinary Medicine, Bogor Agriculture Institute. Ten healthy cows were divided into two groups and each group was consisted of five cows. Group 1 was male calves at 6-8 months of age and group 2 was male cows at 16-18 months of age. Feed is given daily as needed according to NRC (Nationally research council). Drinking water is given in *ad libium*. Blood samples were taken from jugular vein for total protein, albumin, globulin and albumin-globulin ratio (A/G ratio) analysis. Concentration of total serum proteins and albumin were determined by spectrophotometer and with the biuret method. The globulin concentration in the serum and the A/G ratio was calculated from the known total protein and albumin concentration in the serum.

Results and Discussion

Plasma proteins are the key components of plasma and they play crucial role in maintaining homeostasis. Plasma proteins consist of albumin, globulin and fibrinogen. These proteins have multiple functions; albumin is the most abundant and osmotically active plasma protein, and it is an important carrier of many substances in the peripheral circulation. Change of physiological at parturition increased plasma volume and decreased total protein. Low total protein at partum was due to increase of protein requirement for production of colostrums which do not is immediately fulfilled by intake of protein (Widhyari, 2005). The effect of sex on plasma proteins has been shown to vary in birds, depending on the breed of the birds. Significantly higher total protein level had been reported in the females than in male guinea fowls and chickens. However, no significant sex variation in total protein was observed in local ducks and pigeons (Oladele et al., 2005; Yaqub et al., 2013). Result of this experiment had indicated that protein total and globulin values in adult were tended lower than in the calves. The results can be seen in Table 1.

Table 1. Proteinogram value in calves and adult male cows

Parameters	Proteinogram (g/dL)			
	Calves	Value range	Adult	Value range
Tp (g/dL)	7.76 ± 0.805	6.8-9.0	6.68 ± 0.415	6.2-7.2
Albumin (g/dL)	3.58±0.057	3.51-3.67	3.77 ± 0.185	3.51-3.98
Globulin (g/dL)	4.18 ±0.768	3.23-5.33	2.91 ±0.492	2.22-3.53
R A/G	0.88 ± 0.154	0.69-1.11	1.33 ± 0.291	1.04-1.79

Result of this experiment had indicated that the concentration of total protein was 6.8-9.0 g/dL and 6.2-7.2 in calves during and in adult male cows respectively. Albumin concentration was from of 3.51-3.67 g/dl, while globulin concentration was range between 3.23 and 5.33 in calves. Value of protein total, albumin and globulin tended to increase in calves (6th and 8th month of age) as compared than in adult (16-18 months of age). Decreasing in protein contend in the blood could be caused by low protein intake, decreasing in protein synthesis or increasing protein excretion. Some conditions such as dehydration, external hemorrhage, inflammatory disorders, stress and stage of estrous cycle have been reported to affect plasma protein concentration. The A/G ratio indicates increased albumin levels or reduced globulin levels. Decreases globulin will have an impact on the decrease of body immunity system. The high immunity in young than adults is thought to be due to high levels of IgG after colostrums administration

Conclusion

The concentration of protein total, albumin and globulin tended to be higher in young as compared than in adults, while the opposite of albumin and globulin ratio.

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Production of IgG against avian influenza from bovine colostrum to control bird flu infection

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Abstract

This experiment was conducted to produce the bovine colostral of specific antibody (IgG) against avian influenza (AI H5N1) for passive immunotherapy to control avian influenza infection. The healthy pregnant Frisian Holstein cows, on 2nd-3th lactation, clinically healthy, were injected by commercial *Avian Influenza* (AI) H5N1 killed vaccine given double doses subcutaneously three times every two weeks. Prior to vaccination, the cows were given immunomodulator 0.1 mg/kg BW administered orally in three days. The animals then were injected by inactive H5N1 antigen without adjuvant intravenously to meet the dose of 10⁴ HAU. Blood samples were collected from jugularis vein before 1st vaccination (0 week), repeated every week until calving. Serum specific antibody against AI H5N1 were determined using *Agar Gel Precipitation Test* (AGPT). Results of this study showed that serum IgG against H5N1 were detected at two week after the 3rd vaccination. Positive samples indicated by the formation of white line of precipitation (complete line) between the antigen and test serum (sample). The results of this research concluded that pregnant Frisian Holstein cows injected by commercial killed *Avian Influenza* (AI) vaccine were able to produce IgG against AI H5N1 in their blood.

Keywords : *bovine colostrum, Avian Influenza H5N1, passive immunotherapy,, IgG against AI H5N1*

Introduction

H5N1 virus is a highly pathogenic avian (bird) flu virus that has caused serious outbreaks in domestic poultry in parts of Asia and the Middle East. Highly pathogenic refers to the virus's ability to produce disease. Although H5N1 does not usually infect humans, nearly 650 cases of human cases of H5N1 have been reported to the World Health Organization (WHO) from 15 countries since 2003. About 60% of these people died from their illness (USDA, 2016).

Indonesia is one of the countries where the occurrence of HPAI subtype H5N1 cases in poultry have been reported since 2003. The first case of HPAI H5N1 in human has been reported in 2005. Although the cases of H5N1 has decreased significantly since 2010, according to WHO until 2015 there have been reported 199 cases H5N1 in human with 167 cases of deaths. This is indicate Indonesia as the highest fatal case of H5N1 globally. The avian influenza H5N1 has been believed remain to threaten Indonesia following the last case reported in poultry on February 2016 (Kementan RI, 2016).

Passive immunization using specific antibody (IgG) against avian influenza (AI H5N1) from bovine 470olostrums is one of an alternative to control H5N1 virus infection due to lack

of H5N1 vaccine production for human. Bovine colostrums have a potency or prospect as a “biological factory” to produce antibody against AI H5N1 for passive immunotherapy purposes on controlling avian influenza (Esfandiari et al., 2008). Hopefully, passive immunization approach through the use of bovine 471olostrums can be applied in efforts to control bird flu.

Methodology

Hyperimmunization of pregnant Holstein cows

Pregnant Frisian Holstein cows, on 2nd-3th lactation, clinically healthy were used in this experiment as a source of colostrum hyperimmune. The pregnant cows were injected by commercial killed *Avian Influenza* (AI) H5N1 vaccine given double doses subcutaneously three times every two weeks. Prior to vaccination, the cows were given immunomodulator 0.1 mg/kg BW administered orally in three days. The animals then were injected by inactive H5N1 antigen without adjuvant intravenously to meet the dose of 10⁴ HAU.

Blood samples collection and analysis

Blood samples were collected from jugular vein, starting before the 1st vaccination (0 week), every week until four weeks after the 3rd vaccination for serum antibody (IgG) against AI H5N1 analysis. Serum IgG against AI H5N1 were detected using agar gel precipitation test (AGPT) (Wibawan & Laemmler, 1992)

Results and Discussion

Detection of blood antibody against avian influenza H5N1

The specific antibody against H5N1 in the blood can be determined by Agar Gel Precipitation Test (AGPT). The AGPT is a simple and economical serological test. The basis for the AGP test is the concurrent migration of antigen and antibodies toward each other through an agar gel matrix. When the antigen and specific antibodies come in contact, they combine to form a precipitate which is trapped in the gel matrix and produces a visible line. The precipitin line forms where the concentration of antigen and antibodies is optimum (Schmitt, 2006).

The results indicated that AGPT before the 1st vaccination on all of animals were negative. These showed that there were no serum antibody against AI H5N1 in all of pregnant cows. One and two weeks after the 1st vaccination, antibody against AI H5N1 were not detected until several weeks after booster (one and two weeks after the 1st and the 2nd vaccinations and one week after the 3rd vaccinations).

Table 1. The results of Agar Gel Precipitation Test

Vaccination (week)	Result	
	Control	Treatment
0 (pre-1 st vaccination)	-	-
1 & 2 (post-1 st vaccination)	-	-
1 & 2 (post-2 nd vaccination)	-	-
1 (post-3 rd vaccination)	-	-
2 (post-3 rd vaccination)	-	+

Serum antibody against H5N1 were detected at two week post-3rd vaccination. Positive samples produced a complete line (precipitation line) between the antigen and test serum. This results showed that antibody were detected in the pregnant cows blood with high titer (optimal) at two weeks after the 3rd vaccination. This mean, at two weeks after the 3rd vaccination, the

antibody reached an optimal titer. Where the reactants (antibody-antigen) meet in optimal proportions, an opaque white line of precipitate will appear (Figure 1).

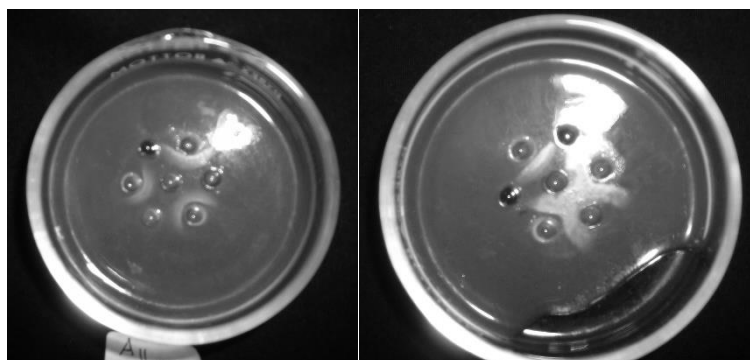


Figure 1. Results of immunodiffusion test of blood IgG anti AI H5N1 (+) reaction indicated by the formation of white line of precipitation between antigen H5N1 and sample (test serum)

An extreme variation in the concentration of antigen or antibodies will alter the location of the line or cause it to be dissolved. Electrolyte concentration, buffer, pH and temperature also affect precipitate formation (Schmitt 2006). The low of antibody concentration may affect the result of AGPT, because the ratio between antibody and antigen is in imbalance, so the reaction that forms a visible precipitation line is not happen. The ratio between antibody and antigen is an important factor on formation of presipitation line. When the antibody and antigen ratio combined in proportions at or near equivalence (in optimal proportion), an opaque white line of precipitation will appear (Tizard 2000).

Conclusion

Pregnant Frisian Holstein cows injected by commercial killed *Avian Influenza* (AI) H5N1 vaccine, double doses, subcutaneously, three times every two weeks, were able to produce IgG against AI H5N1 in their blood. Serum antibody against H5N1 were detected at 2 week after the 3rd vaccination by agar gel precipitation test. Bovine colostrums have a potency or prospect as a “biological factory” to produce antibody against AI H5N1.

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Acute phase proteins as early biomarkers in buffaloes infected with *Pasteurella multocida* type B: 2 and its Immunogens (LPS and OMP)

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Abstract

Sudden death is usually the main finding in field animals during haemorrhagic septicaemia outbreaks in Malaysia due to the acute, fatal, and septicaemic disease of cattle and buffaloes. The aim of this study was to determine the acute phase responses in buffaloes infected with *Pasteurella multocida* type B: 2 and its immunogens lipopolysaccharide and outer membrane proteins. 21 buffalo heifers were divided into 7 treatment groups. Group 1 buffaloes were inoculated orally with 10 mL of sterile phosphate buffered saline (PBS) pH7 which act as negative control group. While Group 2 and 3 were inoculated subcutaneously and orally with 10 mL of 10¹² colony forming unit (cfu) of *Pasteurella multocida* type B: 2 respectively. Group 4 and 5 buffaloes were inoculated with 10 mL of lipopolysaccharide broth intravenous and oral route respectively. Buffaloes in Group 6 and 7 were administered with 10 mL of outer membrane proteins broth subcutaneous and orally respectively. During the post infection period, all buffaloes were observed for clinical signs and clinical response for 21 days. Blood samples were also collected according to time interval for analyses of acute phase proteins concentration. All buffaloes from Group 1, 3, 4, 5, and 7 were able to survive throughout the stipulated experimental period of 21 days. Group 2 and 6 buffaloes were only able to survive for 12 hours and 3 days respectively. Buffaloes in all treatment groups of *Pasteurella multocida* type B: 2 and its immunogens lipopolysaccharide and outer membrane proteins showed significant increase in haptoglobin and serum amyloid A concentrations during early and late infection period respectively. There were significant different ($p < 0.05$) in all treatment groups compared to control group. Buffaloes infected with *Pasteurella multocida* type B: 2 and its immunogens lipopolysaccharide and outer membrane proteins showed changes in both haptoglobin and serum amyloid A concentrations during the early and late infection period respectively. Information on this will play a significant role in understanding the acute phase response during haemorrhagic septicaemia outbreaks.

Keywords: *haemorrhagic septicaemia, pasteurella multocida type B: 2, lipopolysaccharide, outer membrane proteins, haptoglobin, serum amyloid A*

Introduction

In Malaysia, Haemorrhagic septicaemia has long been present as early as 1800's. Haemorrhagic septicaemia is an acute, fatal, and septicaemic disease of cattle and buffaloes (Chung, et al., 2015). The disease is of great economic importance in Malaysia and throughout South-east Asia where cattle and buffaloes are abundant for beef and milk production (Abubakar, et al., 2012). Haemorrhagic septicaemia is a disease, caused by *Pasteurella multocida* type B: 2 that cause acute, highly fatal septicaemia with high morbidity and mortality in cattle and more susceptible in buffaloes. Sudden death is usually the main finding in field animals during haemorrhagic septicaemia outbreaks in Malaysia due to the acute, fatal and septicaemic disease (DeAlwis, 1999). This situation may be due to failure in early detection of the disease where early treatment of antibiotics may improve the prognosis of the animals.

Acute phase proteins are serum proteins which increase in concentration during the acute phase response to inflammation or infection. Acute phase proteins will be the first line of immune defence mechanism against preliminary infections of inflammations (Khaleel, et al., 2013). However, the acute phase response measured in serum is nonspecific because it may be activated by a number of stimuli. These Acute phase proteins will either increase or decrease in cases of infection and inflammation (Jesse, et al., 2013). This response occurs in all animals, but in different species the response of individual proteins can be significantly different (Eckersall, et al., 2010). Haptoglobin and serum amyloid A are the major acute phase proteins in ruminants which show a negligible circulating level in normal animals, but increases over 100 fold on stimulation. Oral and intramuscular inoculation with *Pasteurella multocida* showed significant changes of haptoglobin and serum amyloid A concentration in mice and cattle respectively (Jesse, et al., 2013; Khaleel, et al., 2013). Nevertheless, the route of administration and stimulation of acute phase proteins changes in the real host buffalo after infected with *Pasteurella multocida* and its immunogens were still unknown.

Thus, the aim of this study was to determine the acute phase responses in buffaloes infected with *Pasteurella multocida* type B: 2 and its immunogens lipopolysaccharide and outer membrane proteins. The development of biomarkers in the future such as the acute phase response may play a vital role in early diagnosis of the disease where fatality can be prevented and treatments can be administered promptly. Therefore, the mortality and morbidity rate among buffaloes and cattle of this disease can be reduced significantly.

Methodology

Animal model

21 clinically healthy, 8-month-old buffalo heifers were used in this study. This research was approved by the Animal Care and Use Committee of Universiti Putra Malaysia (approval number: R056/2014).

Inoculums preparation

Wild-type *Pasteurella multocida* used in this study was isolated from previous outbreak of haemorrhagic septicaemia in the state of Kelantan, Malaysia. LPS extraction kit from Intron Biotechnology was used to prepare the lipopolysaccharide broth extracts. Qprotome™ Bacterial Protein Extraction kit was used to prepare the inoculums of outer membrane protein from 10^{12} cfu of *Pasteurella multocida* type B: 2.

Experimental design

The whole cell *Pasteurella multocida* type B: 2 and its immunogens lipopolysaccharide and outer membrane proteins were inoculated into buffaloes via different routes of inoculation

using protocols previously used in studies of the pathogenesis of the whole organisms which have been established at UPM (Jesse, et al., 2013). All the 21 buffaloes were further divided into 7 treatment groups. Group 1 buffaloes were inoculated orally with 10ml of sterile phosphate buffered saline (PBS) pH7 which act as negative control group. While Group 2 and 3 were inoculated subcutaneously and orally with 10ml of 10^{12} colony forming unit (cfu) of *Pasteurella multocida* type B: 2 respectively. Group 4 and 5 buffaloes were inoculated with 10ml of lipopolysaccharide broth intravenous and oral route respectively. Buffaloes in Group 6 and 7 were administered with 10ml of outer membrane proteins broth subcutaneous and orally respectively. During the post infection period, all buffaloes were observed for clinical signs and clinical response for 21 days. Blood samples were also collected according to time interval for analyses of haptoglobin and serum amyloid A concentrations using QAYEE-BIO ELISA test kit.

Statistical analysis

All the data were analyzed using JMP® 11. NC: SAS Institute Inc. software Version. The data were considered significant at $p < 0.05$.

Results and Discussion

Clinical Findings

All buffaloes from Group 1, 3, 4, 5, and 7 were able to survive throughout the stipulated experimental period of 21 days although these buffaloes exhibit some mild clinical signs such as elevated temperature and serous nasal discharge. Nonetheless, Group 2 and 6 buffaloes were exhibiting typical haemorrhagic septicaemia signs such as pyrexia, submandibular edema, congested mucous membrane, mucopurulent nasal discharges and laboured breathing. The buffaloes were only able to survive for 12 hours and 3 days respectively and were euthanized following the Animal Welfare Guidelines where the animals were in recumbency and were having respiratory distress.

Acute Phase Proteins

Buffaloes in all treatment groups of *Pasteurella multocida* type B: 2 and its immunogens lipopolysaccharide and outer membrane proteins showed significant increase in haptoglobin concentration during early infection period. There were significant different ($p < 0.05$) in all treatment groups comparing to control group. Buffaloes in Group 2 were having 7 times increase of haptoglobin with mean value of $3.20 \pm 0.18 \text{ ng/mL}$ which maintain high throughout 12 hours post inoculation. All buffaloes in Group 3, 4 and 5 were having 8 times increase of haptoglobin with mean value of $3.42 \pm 0.95 \text{ ng/mL}$, $3.21 \pm 0.95 \text{ ng/mL}$, and $3.65 \pm 0.95 \text{ ng/mL}$ respectively that were maintained high throughout the 21 days experiment. Buffaloes in Group 6 were having 5 times increase of haptoglobin with mean value of $2.10 \pm 0.21 \text{ ng/mL}$ which maintain high throughout 3 days post inoculation. Group 7 buffaloes had the highest mean concentration of haptoglobin at 20 times increase with mean value of $10.09 \pm 0.95 \text{ ng/mL}$ (Figure 1).

Buffaloes in all treatment groups also showed significant increase in serum amyloid A concentration during late infection period. Similar to haptoglobin, there were significant different ($p < 0.05$) in all treatment groups comparing to control group. Buffaloes in Group 2 were having 3 times increase of serum amyloid A with mean value of $2.38 \pm 0.15 \mu\text{g/mL}$ which maintain high throughout 12 hours post inoculation. All buffaloes in Group 3, 4 and 5 were having 4 times increase of serum amyloid A with mean value of $2.91 \pm 0.77 \mu\text{g/mL}$, $2.75 \pm 0.77 \mu\text{g/mL}$, and $3.26 \pm 0.77 \mu\text{g/mL}$ respectively that were maintained high throughout the 21 days experiment. Buffaloes in Group 6 were having 3 times increase of serum amyloid A

with mean value of $2.36 \pm 0.15 \text{ ng/mL}$ which maintain high throughout 3 days post inoculation. Group 7 buffaloes had the highest mean concentration of serum amyloid A at 11 times increase with mean value of $7.85 \pm 0.77 \mu\text{g/mL}$ (Figure 2).

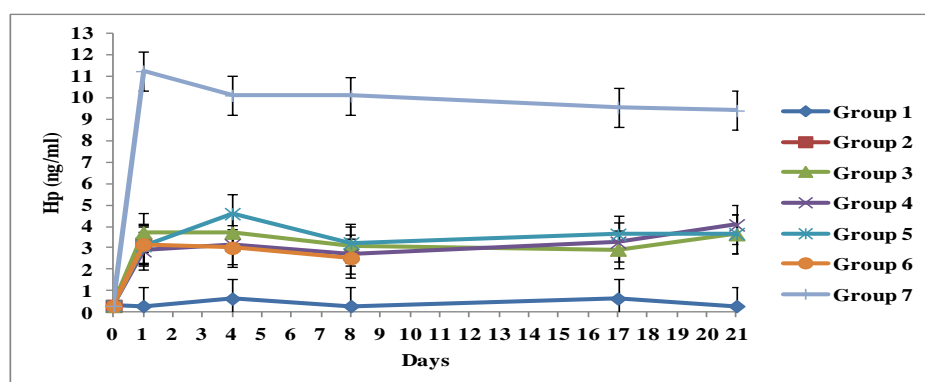


Figure 1: Haptoglobin concentration in buffaloes infected with *Pasteurella multocida* and its immunogens lipopolysaccharide and outer membrane protein via different route of inoculations

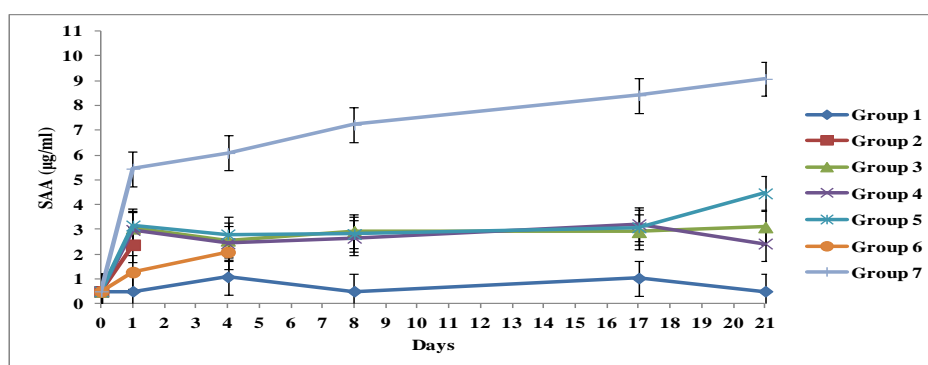


Figure 2: Serum amyloid A concentration in buffaloes infected with *Pasteurella multocida* and its immunogens lipopolysaccharide and outer membrane protein via different route of inoculations

Haptoglobin is the major acute phase protein in ruminants which show a very low circulating level in normal animals, but increases over 100 fold on stimulation which was observed in all treatment group buffaloes (Eckersall, et al., 2010). In the present study, the haptoglobin levels were very low but increases 7 to 20 folds during early post infection period and maintain high throughout the experiment. In this study, the increase of haptoglobin in the early period of infection and inflammation could be due to the bacteriostatic and immunomodulatory effects of re-establishing homeostasis and healing (Khaleel, et al., 2013). This finding was consistent to previous findings who reported that haptoglobin were involved primarily in immune and inflammatory responses due to the ability to stimulate cells of the neutrophil, monocyte and macrophage lineage (Levy, 2004; Quaye, et al., 2006).

Serum amyloid A binds to a range of Gram-negative bacteria including *Pasteurella multocida* organism due to the present of outer membrane protein which could represent a potential pathogen-associated molecular pattern. Besides assisting in phagocytosis, serum amyloid A synthesize by the liver also promotes neutrophil, macrophage, tumour necrotic factor and interleukin-10 production leading to humoral response (Eckersall, et al., 2010). In the present study, serum amyloid protein A which is also a major acute phase reactant in ruminant were low in concentrations but increases 3 to 11 folds during the late infection period in different treatment groups. The increase in serum amyloid A during late infection and inflammation was associated with the inhibitory effect of the inflammatory cells This findings

were similar to previous research who reported that serum amyloid A stimulations were associated with chronic inflammatory disease and tumours. A prolonged inflammatory reaction of this type can contribute to the development of chronic inflammatory states, tissue damage and disease which can be prevented with the present of serum amyloid A (Khaleel, et al., 2013). In this present experiment, buffaloes inoculated orally with outer membrane proteins showed the highest concentration of haptoglobin and serum amyloid A which was first time documented. According to Abubakar, et al. (2012), oral route may not play a major role in the development of haemorrhagic septicaemia but they carried *Pasteurella multocida* organism in the gastrointestinal organs which may act as carrier animal. Thus, outer membrane proteins inoculated orally in this study did not cause severe clinical responses in buffaloes but was present along the gastrointestinal tract which leads to continuous infection and inflammation throughout the study period. Acute phase proteins especially serum amyloid A binds to mainly gram negative bacteria including *Pasteurella multocida* through the outer membrane protein family (Jesse, et al., 2013). Therefore, buffaloes inoculated orally with outer membrane exhibited the highest acute phase proteins response with mild clinical responses. Thus, the findings of haptoglobin and serum amyloid A concentrations in the present study after infected with *Pasteurella multocida* and its immunogens could be used as early potential biomarkers in diagnosis and detection of haemorrhagic septicaemia in both cattle and buffaloes where fatality can be prevented and treatments can be administered promptly.

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Research experience animal model potential of *Lactobacillus bulgaricus* to prevent against livestock aflatoxicosis based on clinical pathology on hepatic malondialdehyde (MDA) and blood triglycerides (TG)

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Abstract

Livestock aflatoxicosis as a economic disease impact against loss of production primary caused by Aflatoxin B₁ (AFB₁) is a mycotoxin produced by a fungi *Aspergillus flavus* that mostly found in nuts in concentrated animal feed., especially on high humidity and low of quality. In livestock amount of AFB₁ caused Aflatoxicosis, could be decrease of animal production and accumulated in product such as milk and meat as food chain disease transferred to human health. This research model designed to study potential *Lactobacillus bulgaricus* (LAB) to interfere the toxic activity AFB₁ in vivo, in order to prevent Aflatoxicosis (by challenged for 2 weeks AFB₁:2 µg/200 g b.w). To ensure the inactivation of AFB₁ is indicate to calculate number of Malondialdehyde (MDA) and Triglycerides (TG).as an indicator of reduced aflatoxicosis risk. This experiment research animal model used CRD and statistical analyse resulted after 14 days treatment different CFU LAB (1x10⁵, 1x10⁷, and 1x10⁹ CFU/ml) against aflatoxicosis in rat as animal models. MDA measured by thiobarbituric acid method and spectrophotometry for TG. The result of this research showed that *Lactobacillus bulgaricus* (LAB) significantly effects (p<0.05) decrease hepatic MDA and blood TG level, especially in a optimum dose of 1x10⁹ CFU/ml..Conclusion of this research were *Lactobacillus bulgaricus* (LAB) could be used as microbe potentially effect prevented against aflatoxicosis That could be suggestion to mix *Lactobacillus bulgaricus* (LAB) on livestock feed stuff especially concentrate composite with bean or nut as an prevention of aflatoxicosis threats.

Keywords: Aflatoxin B₁ (AFB₁), *Lactobacillus bulgaricus* (LAB), Aflatoxicosis Malondialdehyde (MDA), Triglycerida (TG)

Introduction

Aflatoxins (AFB₁) are produced by toxigenic strains of *Aspergillus flavus* and mycoparasit on peanuts, soybeans, corn (maize), and other cereals either in the field or during storage when moisture content and temperatures are suitable for mold growth. The toxic response varies depend on the duration of intake and level of aflatoxins in the ration. Risks were classified as a carcinogenic and mutagenic substance, especially in the tropical climate such as Indonesia, This toxin were mainly formed on mixed of livestock concentrated feedstuff as maize and peanuts, especially if it expired..Earlier recognized disease outbreaks called “moldy corn toxicosis,” “poultry hemorrhagic syndrome,” and “Aspergillus toxicosis” may have been caused by aflatoxins. The economic impact of reduced productivity is many times the impact caused by fatalities. Milk production may drop by more than 15%, also have been shown to have the effect of making Gumboro disease (infectious bursal disease (IBD)) a much more severe disease and changing the symptoms (Chang and Hamilton, 1982).

Aflatoxin M1 (principal metabolite of aflatoxin B1) can be detected in urine, liver, kidney, or milk of lactating animals if toxin intakes are high. Aflatoxin residues in organs and dairy products generally are eliminated within 1–3 wk after exposure ends. The objectives of this research were to in vivo search the possibility of microbe LAB that can be mixed in livestock feedstuff as a prevention of aflatoxicosis based on clinicopathology responses such as hepatic cell MDA and blood TG.

Methodology

Material and methods

Aflatoxin AFB1 available from Cayman Chemical Company (Ann Arbor, MI, USA). Triglycerides (TG) used spectrophotometry and Malondialdehyde (MDA) used thiobarbituric acid method. The microbe of *Lactobacillus bulgaricus* (LAB) concentration of 10^{10} CFU/ml were isolated from, stored in the De Man Rogosa Sharpe/MRS broth.

Experimental design

Adult Wistar male rats (150-250g), after a week of acclimatization, divided into five groups (4 rats/group), about 4 groups given with single concentrate of AFB1 diet for 3 weeks as follows: Negative control as a placebo; all the groups challenged with 1 ml AFB1 ($7.2 \mu\text{g}/200 \text{ g b.w}$) and followed by given different treatments of LAB except on positive control without treatment, the other groups challenged LAB orally technique amount of 1×10^5 CFU/ml (Group 1); 1×10^7 CFU/ml (Group 2); 1×10^9 CFU/ml (Group 3). At the 29th day, blood samples were collected through intracardiac for TG determination used spectrophotometer. After blood samples were collected, all animals were dissected and sample of liver tissue was dissected and stored inside a phosphate buffer saline (PBS). Lipid peroxidase was estimated by measuring the formed malondialdehyde (MDA) used Liquid Chromatography with Fluorometric Detection thiobarbituric acid method according to Berganoo, et al., (1998). The level of MDA were expressed in nanogram per milliliters.

Statistical analysis and ethics

The number of Triglycerides and MDA were statistically analyzed using One Way ANOVA. The significance of the difference among treatment groups was determined by Tukey test. The probability used in this study was based on $\alpha = 5\%$. All animals received human care compliance with Research Ethics Committee of Brawijaya University.

Results and Discussion

In the current study, evaluated the preventive role of *L. bulgaricus* (LAB) against AFB1 effects on MDA and TG. The dosage we were given was an experimental one, derived from the work of Hernandez- Mendoza et al (2009) that stated the effective dosage of treatment using lactic acid bacteria was $2-5 \times 10^9$ CFU/ml. Using dosage of 1×10^9 CFU/ml for three consecutive weeks could protect the liver from acute hepatic injury. These results serve as the basis of whether *L. bulgaricus* can prevent aflatoxicosis occurring in the livestock liver tissues. The effect of AFB1 and *L. bulgaricus* preventive treatment were showed in Table 1. There's an increase level of MDA formed at the liver and TG in the blood on positive control. Malondialdehyde (MDA) in this study, were high increased in positive group and showed slight increased since 1×10^5 CFU/ml and turn decreased in 1×10^7 CFU/ml treatment allow in 1×10^9 CFU/ml treatment still decreased closed with negative group. All the phenomenon occur because there was a change of H2O2 formed inside the cells.

Table 1. Result of hepatic cell MDA and blood TG

Parameters	Groups				
	Negative	Positive	Preventive Group 1	Preventive Group 2	Preventive Group 3
MDA (ng/ml)	704 ± 62.1490 ^a	1121.375 ± 174.4326 ^b	810.875 ± 116.4112 ^a	769.000 ± 49.6236 ^a	717.625 ± 58.5169 ^a
TG (mg/dl)	43.750 ± 9.9121 ^a	81.250 ± 5.3151 ^c	64.000 ± 3.1623 ^b	55.250 ± 6.1847 ^{a,b}	48.250 ± 7.3655 ^a

Increased levels of MDA are influenced by increased ROS production, so MDA is used as a marker for the presence of oxidative stress in the body (Bruch & Janet, 2002). Increased MDA signaling increased lipid peroxidation also accelerates liver cell death by increasing the permeability of cell membranes, and resulted in necrosis of hepatic tissue (Bischoff & Ramaiah, 2007). ROS and lipid peroxidation is a normal function in the cell, but it always stopped at the termination by an anti-oxidant substance that donated the hydrogen atom to stop the process from creating another hydrogen peroxide (Ayala, et al., 2014). Increased lipid peroxidation caused an inflation of mitochondria, it sped up the necrosis because the pores between inner and outer membrane opened. The opening of this pores will lead into spilling of mitochondria matrix so the oxidative phosphorylation in crisis (Yanriswati, 2006).

After the cell undergoing necrosis, the leftover and still produced Tri glyceride (TG) to kept circling inside the body. Increased TG could indicated there were acute hepatic injury. TG inside the body, were supposed to be bounded by mitochondria and converted into energy. The data of TG decreased level along G1,2,3 closed with TG in negative Group.

The preventive role of *L. bulgaricus* in this study, is the role of teichoic acid that were binding the AFB₁ inside the intestine. By binding it, the body could compensate the normal lipid peroxidation process using SOD as anti-oxidant, thus halted the death of hepatocyte and preventing acute hepatic injury. Which at the preventive group of 1, 2 and 3 there were a gradually decrease. Both in MDA and TG. it gradually decrease by each dosage ($P < 0.05$), that is mean LAB potentially acted as a prevention of Aflatoxicosis based on decreased of both MDA and Triglyceride compared with positive control. Group 3 (highest dose) was by far, the closest one to the negative control group

Conclusion

The current research revealed that LAB could be given preventive treatment against aflatoxicosis caused by AFB₁ (Aflatoxin) based on low of MDA and TG as a significant metabolic chemical changes. Preventive treatment group 3 with the dosage of 1×10^9 CFU/ml. was by far the most promising results as it were the closest one to the normal negative control. The conclusion of this study were *Lactobacillus bulgaricus* (LAB) as proven, could be used for a preventive against aflatoxicosis of animal laboratory as a model.

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Efficacy maternal antibody (IgG) transfer to protect against infectious diarrhea on 1st week post natal calves

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Abstract

Efficacy maternal antibody (IgG) transfer acted as determine of calves health especially on the first six hours is a golden period for IgG absorption soon after birth. The research aim was to observe the successfully of antibody transfer from mother to calves and its effect toward calves diarrhea protection. The different concentration of IgG about P1 (50 mg/ml), P2 (60 mg/ml), P3 (70 mg/ml) in 4 L/head of colostrum milk gives along 4 hours post natal of calves and followed by measured of blood IgG 48 hours post treatments. Quality of infectious diarrhea observed along 6 days based on formed, consistency and smell of faecals. Result of research analysis showed that blood IgG has significant effect ($P < 0.05$) among different concentration colostrum antibody, and successfully transferred especially on 70 mg/ml as a highest resulted about $17,55 \pm 1,14$ mg/mL mostly higher than the normal standard of IgG in the calf's blood (10 mg/mL). Results from the quality and frequency of diarrhea are visible along 6 days showed there was no appeared any signs of infectious diarrhea based on bad smell and watery of faecal. The conclusion of this research were colostrum drinking in 4 liters colostrum milk which contains at least 50mg/mL maternal antibody (IgG) administration is effective against the protect of infectious diarrheal in calves based on the succeed of maternal IgG transfer to calf's blood and enough to provoke calves immunorespons.

Keywords; maternal antibody, IgG, colostrum antibody , infectious diarrhea

Introduction

Colostrum is an important first week milk to start the life of perinatal calves, as soon as possible milk intake is important towards a newborn calves. The newborn calves has not yet have enough immunoglobulin as a imunresponse to protect of non self infection. Therefore mostly need the maternal immunity almost 1-2 first months of age, until they have immun system develop completely. Colostrum milk contains antibodies or immunoglobulins (essential proteins) necessary to provide the calf against protection infection agents. This immunoglobulin of newborn calves receive as a maternal passive immunity route.

Colostrum milk production responsible by mammary gland at 5-7 days post partum, contain of high protein up to 18 % compared with fresh milk contain amount 3-5% protein. Nutrient contains in colostrum proteins that exist among others are lactoalbumin, lactoglobulin, immunoglobulin (IgG1, IgG2, IgA, IgM), peptida (laktoferin, transferin), hormon (insulin, prolaktin, thyroid, cortisol), growth factor, prostaglandin, enzym, citokine, nucleotide, poliaminase, mineral, pro-vitamin, and somatic cells. Also contains a laxantia that has the role of cleaning waste substances form of the calf's intestine from the feces clumps and helps opportunities for antibodies could be absorbed well as much as the calves required. In natural life a calf should receive 5 to 6 % of its body weight from colostrum within the first six – twelve

hours of life. Based on the size of the stomach, the calf can receive 4 lbs of colostrum on the first day per feeding (Georgiev, 2008).

Naturally concentration of blood IgG would be influenced to support calves health. The blood immunoglobulin G (IgG) concentration in normal condition, usually at range of 5,65 – 17,65 mg/ml. If the concentration of IgG at calf increase or high, this condition showed immunresponses to protected by self against infections. Therefore feeding colostrum after birth is important for immunity and disease protection (Margerison and Downey, 2005). Infectious diarrhea is the one of any cases, mostly have a high prevalency and has a mortality rate about 52.2% in calves, observed by quality and frequency (Philip Toye, et all, 2013). While post-natal non-infection diarrhea is common caused by sudden feed changes, cold climate, poor sanitation and hygiene, but not sign on bad smell and watery. Infectious diarrhea could be occur due to poor management such as lack of cleanliness of stable, started from poor sanitation and hygiene should be predisposing the occurrence of infection, while the calves has still not yet has strong immunity towards threat infection. The other predisposition factors are less maternal colostrum antibody contents, temperature changes and poor milk feeding.

Methodology

The objectives of this research is to know how about successfully and efficacy of amount concentration colostral milk maternal immunoglobulin (IgG) transferred fate into calf's blood for 48 hours since birth and observation of the incident diarrhea along 6 days later. Conducted in Green Field Dairy Factory, Malang, Indonesia. IgG concentration in colostral milk and blood serum measured by colostrometer digital refractometer, samples as much as 0.5 ml. Research study used 15 female calves aged 1-6 days, birth weight 30 -35 kg. Treatment in this study is colostrum milk with the difference concentration of IgG were about 50mg/ml (P1), 60mg/ml (P2) and 70 mg/ml (P3), in amount of 4 L colostral milk given as a first drink after born with esophageal feeding tube. Parameters measured were titer of IgG were subjected to ANOVA followed by Duncan Multiple Range Test and quality of faecal used deskriptif analyses.

Results and Discussion

The result of this research showed that the different concentration IgG at 48 hours after colostral milk suckling gives impact on succesfully of passive maternal transfer.(Table.1) higher than IgG standart protecting calves against diarrhea. Concentration of IgG blood serum at 48 hours afterbirth have significantly different ($P < 0,05$) among treatments. The colostral IgG concentration (P3) about 70 mg/ml showed the highest IgG ($17,546 \pm 1.14$ mg/mL) of calves blood serum, almost higher than normal standard about 10 mg/ mL The result should be assumed minimal treatments in this research showed enough of successful IgG transfer maternal antibody. It's mostly contribution for optimal metabolism at the body and increase immunity to protect infection. (Quigley, 2005). Maternal antibodies are believed to play a major role in protecting young animals from infectious disease until they acquire endogenous antibody through exposure to pathogens to estimate by total protein value (Quigley, 2002). The result of research showed that started on 50mg/ml (P1) of IgG in 4 L colostral milk, could be acted as immune protective against calves at first weeks ages (Table.1).

Table.1 The average result of calves blood serum IgG concentration at 48 hours aged

Treatment of different IgG concentration in 4 L colostrum	Variable
	IgG concentration (mg/ml) in calves blood serum
P1 (50 mg/ml)	11,822±3,97 ^a
P2 (60 mg/ml)	13,73±1,63 ^{ab}
P3 (70 mg/ml)	17,546±1,14 ^b

Along 6 days to determine diarrhea observation after meconium was totally excreted at 1st day postnatal. Faecal macroscopic observations (liquidity and smell) done transferred with scoring number to determine percentage incidence of infectious diarrhea or natural diarrhea as a excrets form of first faecal. Incidence of diarrhea analysed by description method

The result of research showed that there were no infectious diarrhea as showed in Table 2. that more increase of IgG colostral impact on quality of faecal.

Table. 2 Percentage of quality of faecal diarrhea

Concentration of Colostral IgG	Diarrhea Quality		
	+	++	+++
P1 (50 mg/ml)	40%	20%	40%
P2 (60 mg/ml)	30%	20%	50%
P3 (70 mg/ml)	20%	20%	60%

severe watery (+), severe watery with foam (++), light watery (+++),

The data showed that based on defecation quality mostly were light watery and normal appearance without manifestation of infectious diarrhea along first weeks of aged of calves.

Conclusion

The colostral IgG feeding concentration successfully transfer towards newborn calves and protect the incidence of calves infectious diarrhea. This research proved that gives 4 L colostrum with amount of 50 mg/mL IgG maternal antibody at first day post natal showed high efficacy of transfered IgG to protect against diarrhea infectious agent.

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Benthic foraminifera as bio-indicators of estuarine environment: a pilot study from Quang Tri province, Vietnam

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Abstract

Foraminifera are tiny unicellular animals living in a wide range of environments (from the open marine to brackish) and have a big potential as bio-indicators because they quickly respond to environmental changes. Therefore benthic foraminifera studies provide the opportunities to assess the estuarine environmental status. In order to achieve preliminary information we carried out benthic foraminifera analyses in 7 sediment samples collected from the estuaries Cua Viet and Cua Tung in Quang Tri Province, Vietnam. This Province has peculiar geographic characteristics, and due to the brackish environment these estuaries are very good sites for aquaculture. The results show that benthic foraminifera occur in all the sediment study and their abundance and diversity depend on the environmental status particular with salinity. Finally, based on this work result, we expect to provide baseline data, enhance the use of benthic foraminifera as bio-indicators and to apply foraminifera bio-monitoring more intensively to improve sustainable aquaculture in the future for Quang Tri.

Keywords: foraminifera, bio-indicators, Quang Tri, estuary, environmental status

Introduction

Foraminifera are single celled protozoans that consist of successive chambers and widely distributed in marine environment but they can live also in brackish water condition (estuary and lagoons), they are roughly divided into two major groups: the planktonic and the benthic. Benthic foraminifera constitute the most diverse group and small compared to the other shelled taxa (Sen Gupta, 1999). Because of their short life cycles (Boltovskoy, 1965), high biodiversity, and specific ecological requirements, benthic foraminifera are particular sensitive to respond with environment changes and can be successfully used as bio-indicators of environmental status in a wide range of marine and marginal marine environment. In coastal and estuarine environments, under natural conditions, foraminifera tend to reveal the relative inflow of salt water with fresh water, which affects salinity (Nichols, 1974) and other variables. The Quang Tri Province is located in the central of Vietnam with a total area of 4.592 km² and a large rivers network that provides the useful places for aquaculture. Many local farmers shifted to culture shrimp because of high economic income from some successful models. Consequently, shrimp farm area developed, was unplanned and brought several problems, environmental issues in particular, and is unsustainable. The main objectives of this report are: (1) To characterize the previously undocumented distribution and biodiversity of modern living benthic foraminifera in Quang Tri; (2) To document the suitability of using living benthic foraminifera as bio-indicators in sediments collected from estuarine environment in Quang Tri; (3) Provide baseline data for future to achieve or maintain good environmental status for sustainable aquaculture in Quang Tri.

Methodology

Sediment samples were collected from 7 stations at the end of April, 2017. The positions of the sampling stations were determined using the global position system. Following Walton's technique (1952) and Lutze & Altenbach, (1991), sediment samples, after sampling, were preserved, in the laboratory, in 10% formalin buffered with sodium borate, with Rose Bengal solution (1g l⁻¹)-for a maximum time of 14 days for distinguish between living and death foraminifera following the FOBIMO protocol (Schönfeld et al, 2012). All samples were washed through a 125 µm sieve with water to remove clay, mud, alcohol and excess stain. With the residual fraction, 4 samples were wet split (MX, CT1, CT2, and CT3) and 3 samples were dry split (CV1, CV1/175, TP) for sample partitioning. The counted living (stained) benthic foraminifera were hand-picked and stored in micropalaeontological slides. The World Register of Marine species (WORMS, <http://www.marinespecies.org/>) classification was used for species identification largely. In this analyze, there are 3 main groups of foraminifera divided by shell components: Calcareous, Calcareous imperforate (Miliolid) and Agglutinated.

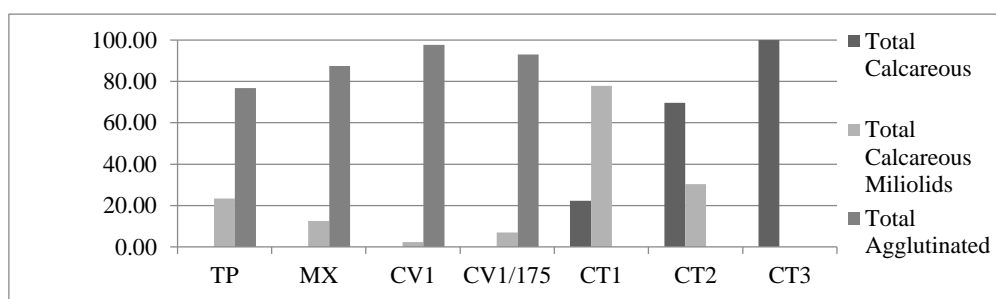


Figure 1: Percentage of foraminiferal species

Table 1. Diversity of foraminiferal species of Cua Tung and Cua Viet estuaries

Station	Abundance	Species	H'	D	Salinity(‰)
Trieu Phuoc	30	3	0.945	2.261	12
Mai Xa	255	3	0.513	1.374	10
Cua Viet 1	86	5	0.927	1.832	11
Cua Viet 1/175	43	4	0.822	1.786	12
Cua Tung 1	45	7	1.210	2.325	25
Cua Tung 2	56	13	2.011	5.124	25
Cua Tung 3	5	1	0.000	1.000	1

Note: H' = Shannon-Weiner Diversity Index; D = Simpson Diversity Index

Species evenness, richness, and diversity indices as Shannon-Weiner (Shannon and Weaver, 1949) and Simpson Index (Simpson, 1949) were used to evaluate foraminiferal species diversity in order to compare these data to the environmental status of estuaries

Results and Discussion

Figure 1 shows that different locations have different type of foraminifera. Comparison between Cua Tung and Cua Viet estuaries, shows that agglutinated foraminifera are absent in the stations of Cua Tung (CT1, CT2, CT3) and calcareous foraminifera are absent in the stations of Cua Viet (TP, MX, CV1, CV1/175) when salinity ranges vary from 10‰ ~ 12‰. In particular, in CT3, only *Ammonia tepida*, a species which normally is found in brackish water, occurs in the studied sediment sample. The abundance of living benthic foraminifera

gives clues about the environmental status of the estuaries in Quang Tri. Table 1 suggests that the diversity of foraminiferal species reflects salinity of water. Shannon-Weiner index value obtained for foraminifera was estimated to be 0 (lowest) at CT3 with lowest salinity is 1‰ and 2.011 (highest) at CT2 with highest salinity is 25‰. Similar to Simpson index, value was estimated lowest to be 1.000 at CT3 and highest to be 5.124 at CT2. Diverse of CT1 and CT2 increasing to 7 and 13 species meanwhile diverse of TP1 is 3, MX1 is 3, CV1 is 5, CV 1/175 is 4 and CT3 is only 1.

Conclusion

The living benthic foraminifera of Cua Tung and Cua Viet estuaries are abundant and moderately diversified, but their abundance is closely related to salinity. General trends with increasing salinity include: decreasing abundance of agglutinated species, increasing abundance of porcelanaceous species, calcareous perforate species and increasing diversity. This preliminary research has shown that benthic foraminifera abundance correlates to the environmental status and encourage exploiting their use as bio-indicators also in relationship with a eutrophic gradient in the estuary. As the objective of this report, it must consider how to continuously improve environmental sustainability in Quang Tri Province.

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POSTER PRESENTATION

Effect of Papaya Leaf (*Carica papaya* L.) on Gold and Silver Arab Chicken Egg Production and Quality

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Abstract

Egg is the main product of Arab chicken. Egg production and quality are the important factors in the success of Arab chicken farms. The aim of this research was to perceive the effect of papaya leaf level in feed on Gold and Silver Arab chicken egg production and quality. The research method was experimental method. The result of this research showed that feather color was not significantly different ($P > 0.05$) to egg number, eggshell thickness, yolk color and yolk cholesterol. However it was significantly different ($P < 0.05$) to egg weight. Papaya leaf level was not significantly different ($P > 0.05$) to egg number, egg weight, eggshell thickness and yolk cholesterol. Meanwhile, it was significantly different ($P < 0.05$) to yolk color. The interaction of feather colors and papaya leaf levels gave no significant effect ($P > 0.05$) on egg numbers, egg weight, yolk color and yolk cholesterol but it gave significant effect ($P < 0.05$) on eggshell thickness. Thus it could be concluded that Silver Arab chicken produced lighter egg weight and tended to produce more eggs than Gold Arab chicken. Papaya leaf level could increase the yolk color and tended to decrease yolk cholesterol. The use of 12% papaya leaf level produced the thickest egg shell (0.49 ± 0.05) mm on Silver Arab chicken.

Keywords: yolk cholesterol, eggshell thickness, yolk color, egg weight, egg number

Introduction

Egg is the main product of Arab chicken. Egg production and quality are the important factors in the success of Arab chicken farms. According Roberts (2008), Arab chicken can be categorized based on its feathers which are Gold Arab (red) and Silver Arab (white) chicken. It is possible if different feather color groups have different production level and feeding adaptation. Feed cost is the biggest production cost in Arab chicken farm. Hence a solution for feed efficiency is needed. Papaya leaf can be used as an alternative to improve feed efficiency. Papaya is a medicinal plant which can be found in Indonesia. There are abundant papaya leaves in Indonesia and its price is very cheap. Apart from that, papaya leaf has many benefits. Papaya leaf contains feed and active substances that are beneficial to boost production and health. According to Krishna, et al, (2008), papaya root, leaf, fruit and seed can be utilized as nutrients and medicines since they contain feed substances such as vitamins, minerals, proteins and phytochemicals such as papain enzymes, alkaloids, saponins and flavonoids. Consumers always demand for high quality eggs. The purpose of this research was to perceive the effect of using papaya leaf for feed on the egg production and quality of Gold and Silver Arab chicken.

Methodology

This research was conducted in Arab chicken farm in Malang and the egg analysis was at Biochemistry Laboratory, Faculty of Animal Husbandry, UGM. The research materials were

60 Gold Arab chickens and 60 Silver Arab chickens in layer period. Basal feed was mixed with papaya leaf based on the treatment. The content of feed substances in each treatment was the same (CP; 16% and ME 2650 kcal / kg). Research method: experimental method with completely randomized factorial design was employed in this research. The treatments consisted of feather colors (Gold and Silver) and papaya leaf levels (0%, 6% and 12%). The data were analyzed by using Microsoft with GenStat software program. The observed variables were egg number, egg weight, eggshell thickness, yolk color and yolk cholesterol.

Results and Discussion

The effect of feather colors on egg number, egg weight, eggshell thickness, yolk color and yolk cholesterol content during the research period (8 weeks) is presented in Table 1.

Table 1. The average of egg number, egg weight, eggshell thickness, yolk color and yolk cholesterol based on feather colors in 8 weeks.

Parameter	Silver Arab Chicken	Gold Arab Chicken
Egg number (per egg)	34.90 ± 7.92	32.38 ± 8.11
Egg weight (g/egg)	39.77 ± 4.16 ^a	41.57 ± 4.78 ^b
Eggshell thickness (mm)	0.43 ± 0.05	0.42 ± 0.06
Yolk color	10.25 ± 1.49	10.50 ± 1.24
Yolk cholesterol (mg/100g)	820.40 ± 92.42	848.10 ± 93.22

Notes: Different superscripts on the same line showed significant different (P < 0.05)

The analysis result indicated that feather color was not significant (P > 0.05) to egg number, eggshell, yolk color and yolk cholesterol content. However, it was significant different (P < 0.05) to the egg weight. Silver Arab chicken had smaller egg weight but its egg number tended to be more than Gold Arab chicken. It happened because Gold and Silver Arab chicken actually came from the same rooster but different hen. According to Pambudhi (2003), Gold and Silver Arab chicken actually come from the same rooster which is native Arab chicken (Silver Braekels) but different hen; Gold Arab chicken is the result of a cross breeding between a native Arab rooster and a laying-hen or Merawang hen. Silver Arab chicken is the result of a cross breeding between a native Arab rooster and a local hen. According to Bell and Weaver (2002), egg production is affected by many factors such as genetic, feed, age, temperature and disease. The effect of papaya leaf levels to egg number, egg weight, eggshell thickness, yolk color and yolk cholesterol content in 8 weeks is presented in Table 2.

Table 2. The average of egg number, egg weight, eggshell thickness, yolk color and yolk cholesterol based on papaya leaf levels in 8 weeks.

Parameter	Papaya leaf (0%)	Papaya leaf (5%)	Papaya leaf (10%)
Egg number (per egg)	34.55 ± 7.45	35.18 ± 8.22	31.20 ± 8.20
Egg weight (g/egg)	39.89 ± 4.08	41.20 ± 3.97	40.93 ± 5.48
Eggshell thickness (mm)	0.44 ± 0.05	0.43 ± 0.05	0.39 ± 0.06
Yolk color	9.00 ± 0.53 ^a	10.25 ± 0.89 ^{ab}	11.88 ± 0.35 ^b
Yolk cholesterol (mg/100g)	864.00 ± 95.13	817.00 ± 89.31	777.00 ± 74.81

Notes: Different superscripts on the same line showed significant different (P < 0.05)

The result showed that papaya leaf level was not significantly different (P > 0.05) to egg number, egg weight, eggshell thickness and yolk cholesterol, but it was significantly different (P < 0.05) to yolk color. Higher papaya leaf level tended to decrease the yolk cholesterol content. It happened because the feed given to each treatment had the same feed substances. The egg yolk color increase was due to the high content of papaya leaf beta-Carotene. Thus it

increased the color of egg yolk. The egg yolk cholesterol decrease was due to the high content of crude fiber and vitamin C in papaya leaf. According to Bell and Weaver (2002) and Yamamoto, et al. (2007), food substances in eggs such as proteins, fats, carbohydrates, vitamins, minerals are derived from consumed food. According to Amrullah (2003) and North and Bell (1990), in addition to genetic factor, the main factor affecting egg production is the amount of feed which is consumed and the content of the feed substance. According to Widjastuti (2009), beta-Carotene in feed is widely used for egg yolk pigment. According to Ariani (2002), papaya leaves contain high crude fiber and vitamin C; crude fiber can lower fat level and vitamin C can also hydrolyze the fat.

Conclusion

Silver Arab chicken produced a lighter egg weight and tended to produce more eggs than Gold Arab chicken. Papaya leaf could increase the yolk color and it tended to lower the yolk cholesterol. The use of 12% papaya leaf level resulted in the thickest eggshell (0.49 ± 0.05 mm) in Silver Arab chicken.

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Expression of stearoyl-CoA desaturase (SCD) gene and mono-unsaturated fatty acids content in goat and sheep fed high concentrate diet

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Abstract

The present study was conducted to co-compare the expression of stearoyl-CoA desaturase (SCD) gene as related to the mono-unsaturated fatty acids content in goat and sheep offered fattening diet. Six animals of three to four months old from each species were used in this study and were fed 30% hay and 70% concentrate, at 4% dry matter of their body weight. Animals were raised for 100 days before being sacrificed. Liver tissue was obtained for gene expression study and determination of mono-unsaturated fatty acids content. Results of the study showed lower expression of SCD gene in sheep compared to goats suggesting lower production of SCD enzyme and thus lower desaturase activity. The mono-unsaturated fatty acids (MUFA) content was in agreement with the above with sheep having lower MUFA, including the oleic acid content. The results suggested softer fat which score well with flavour of meat in goats compared to sheep, and possibly higher saturated fatty acids content in sheep which deserves further investigation.

Keywords: gene expression, mono-unsaturated fatty acids, goat, sheep

Introduction

Stearoyl-CoA desaturase (SCD) gene is the gene responsible for codifying SCD enzyme, or also known as $\Delta 9$ desaturase enzyme. According to Mannen (2012), SCD gene has been identified as a candidate gene which is responsible for genetic variation in fatty acids composition. Stearoyl-CoA desaturase (SCD) enzyme is among the many catalytic enzymes involved in the whole process of fatty acids synthesis (Lalot et al., 2010). Generally, stearoyl-CoA desaturase enzyme catalyses the synthesis of mono-unsaturated fatty acids (MUFA) from saturated fatty acids (Postic and Girard, 2008). Besides that, SCD enzyme also act as the rate-limiting enzyme that converts palmitoyl- and stearoyl-CoA to palmitoleoyl- and oleoyl-CoA, respectively, which is needed to regulate the lipid composition of cellular membranes to maintain membrane fluidity (Ntambi, 1999). This study co-compared the expression of SCD gene and the monounsaturated fatty acids content of goat and sheep under high concentrate feeding.

Methodology

Six Boer-crosses male goats and six Dopper- crosses sheep between the ages of three to four months old were used in this study. Animals were given fattening diet (high concentrate) consisted of 30% alfalfa hay and 70% concentrates, offered at 4% (DM basis) of their body weight (BW). Animals were raised for 100 days and liver samples were taken for gene

expression study. The RNA extraction and reverse transcription-polymerase chain reaction was performed prior to the quantitative real time PCR (qPCR). Mono-unsaturated fatty acids content was analysed by using the gas chromatography. Results of study were analysed by using the student's t test comparing between species (goat vs. sheep) and probability was considered at $P < 0.05$.

Results and Discussion

Majority of the MUFA are produced endogenously from desaturation of the corresponding SFA and are mediated by SCD ($\Delta 9$ -desaturase) enzyme (Soyeurt et al., 2008). Therefore, the expression of SCD gene correlates with the MUFA content. Oleic acid, being the most abundant fatty acid in all tissue, is produced from $\Delta 9$ desaturation of stearic acid (Smith et al., 2009). Result of the present study showed that concentration of oleic acid, as well as total MUFA content, were both higher in goats compared to sheep (Figure 1) and also significantly higher expression of SCD gene in goats as compared to sheep. In agreement to the above, Barber et al. (2000) reported that the expression of SCD gene correlated well with the oleic acid content. Oleic acid content is important and often associated with the softness of fat and has been reported to score well with flavour of meat (Woodfield and Easton 2004). In addition, SCD enzyme has also been reported to participate in the formation of conjugated-linoleic acid (CLA), from vaccenic acid (*trans*- 11 C18:1) in the animal tissues (Griinari et al., 2000), thus suggesting a possible higher health-beneficial CLA in goats.

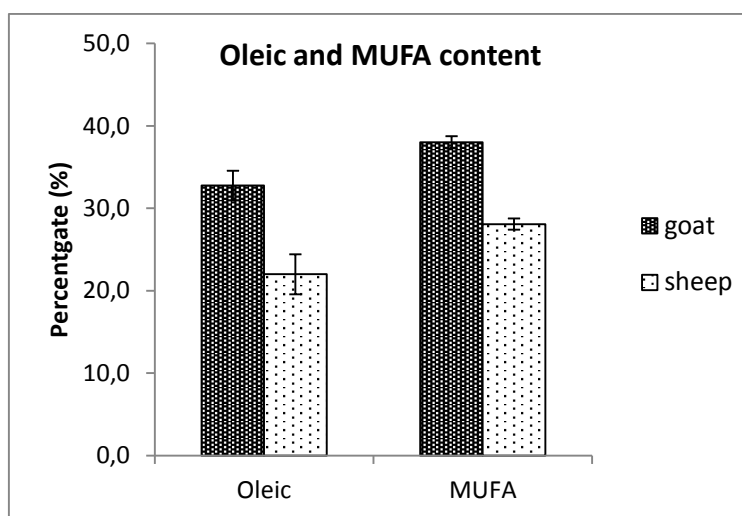


Figure 1. Oleic acid and MUFA content in goat and sheep fed high concentrate diet.

Conclusion

Under fattening diet feeding, goats had higher MUFA and oleic acid contents compared to sheep. The expression of SCD gene, which codify SCD enzyme was also higher in goats, thus explains for their higher MUFA content than sheep.

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Exterior characteristics of female Gembrong Goat in Karangasem, Bali

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Abstract

Gembrong goat is one of local genetic resources of livestock in Bali Province. The population is categorized as endangered and critical breed based of *World Watch List for Domestic Animal* in 1997. Currently its population under 50 individual were spread in Bali Province. This paper explain the exterior characteristics of female Gembrong Goat was found in Karangasem Regency, Bali Province. Twelve female Gembrong Goat were observed including face appearance, coat colour, horn, ear appearance. Head and body measurements were obtained, including head length, head girth, ear length, chest girth, body length, withers height, hip height. The descriptive statistical analysis was applied due to the small size numbers of goat in this research. Female Gembrong goat have flat face appearance, small pointed horn, hanging to the side ear, and have white, brown, black coat colour dominant is 50%, 25% and 25% respectively. Result of the head measurement show that the average of head length, head girth, ear length, is $18,20 \pm 1,14$ cm, $11,30 \pm 0,82$ cm, and $14,20 \pm 2,04$ cm respectively, so the head index is $62,08 \pm 0,72$. Body size of female Gembrong Goat such as chest girth, body length, withers height, hip height respectively were $67,42 \pm 3,21$ cm, $48,50 \pm 4,40$ cm, $51,50 \pm 3,21$ cm and $54,58 \pm 3,55$ cm. In case compared with the Exterior characteristics of female Gembrong goat in previous research in 2004 and 2014, appears to decrease ear length and all of the body size, this indicates a decrease in genetic quality of Gembrong Goat was raised with traditional management by small farmer in Karangasem, Bali.

Keywords: *gembrong goat, exterior characteristics, body size, karangasem bali, critical breed*

Introduction

Indonesia owns several goat germ plasm some of which are known as Kacang goat, Etawah Crossbred goat, Bligon goat, Kejobong goat, Gembrong goat, Kosta goat, and Marica goat. Each has its own different characteristics related to its natural spreading areas, most of those breeds have limited spreading areas which mean they are not widely distributed. Amongst those breed, the most endangered population is Gembrong goats (Budisatria, 2009). Gembrong is one of Indonesian indigenous breed of goats raised in Karangasem, Bali Gembrong goat mostly has the long shiny white hair that covering its whole body including its necked and face (Maharani et al., 2014)

Based on the report the World Watch List for Domestic to Animal, in 1997 a population of Gembrong Goat as many as 100 heads (Scherf, 2000), while population is not currently more than 50 heads. The recent research found that the population of Gembrong goats at Karangasem district were only 26 heads, consisted of 10 head male and 16 head female (Budisatria et al., 2014; Maharani et al., 2014; and Bintara et al., 2015).

Conserving genetic of domestic animals such as Gembrong goats urgently required, primarily because their population decreased annually and once lost, genetic material is

irreplaceable (budisatria et al., 2014). Many studies reported that Gembrong goats is a specific type of goat differ from the indigenous breed (Kacang goats) and their Ettawa-crossbreds (Oka et al. 2011). Several studies have reported on exterior characteristic of Gembrong goats. However, the population of the gembrong goats is limited, and its development is very slow from year to year. So, currently indicated a change of the exterior characteristics. This paper explain the exterior characteristics of female Gembrong Goat was found in Karangasem Regency, Bali Province.

Methodology

The study of Gembrong Goat in Karangasem Regency, Bali province was conducted in May-June 2016. The data used for this study were collected from 12 Does (adult female with age range 1-3 years old), that was found located in Bug-Bug village, Abang village, and tumbu village (location of conservation). Gembrong Goat were observed including face appearance, coat colour, horn, ear appearance. Head and body measurements were obtained, including head length, head girth, ear length, chest girth, body length, withers height, hip height. The Gembrong goats were raised in similar management systems (traditional system) at those locations by small farmer.

The following linear head and chest girth measurements were measured by using the tailor's type measure (butterfly[®] in cm), for body length, withers height, hip height measurements were measured by using the stick measure (FHK[®] in cm). For this data collection for face appearance, coat colour, horn, ear appearance by using Guideline for Phenotypic Characterization of Animal Genetic Resources (FAO, 2012). The descriptive statistical analysis was used due to the small size of goat was found and we presented by comparing with previous research was done.

Results and Discussion

Qualitative character of adult female Gembrong goat was found in Karangasem regency such as face/head, horn, ear and hair coat. The observation based on Guidelines for Phenotypic Characterization of Animal Genetic Resources (FAO, 2012). The result showed that female Gembrong goat have straight or flat face appearance, present horn and the shape is straight, small and pointed, erect and straight ear or hanging to the side. Hair coat type is straight hair, smooth and glossy. The previous research report that female Gembrong goat was observed, faceline is a bit concave, have small horns, ears are straight upright although hanging ears are also noticed (Budisatria et al., 2014).

Result of hair coat colour dominant is white, brown and black with a percentage 50%, 25% and 25% respectively. in contrast to the previous report by Fahmilia et al. (2004) that dominant body color of goat Gembrong generally white 61.51%, and several is light brown 23.08% and brown 15.38% as well as the results of observations obtained by Setiadi et al. (1998), where the white color is 91.16% and the rest is light brown and black. The frequency decrease of this dominant (white) color and emergence of new (black) color may be related to uncontrolled matting patterns with another breeds likely Peranakan Etawah (PE) and kacang by farmers, because the population of Gembrong goat is very small.

The mean and standard deviation of head and body measurements that was obtained from the study are presented in Table 1. Table 1 show the comparison of result and previous study about the head and body size of female gembrong goat. The result of head size was obtained in this study greater than with the previous study (2014 and 2015), especially the head length and for ear length was similar (2015) and smaller than study was reported in 2004. Similar from the table, all of the body size of Gembrong goat was measured on this study lower

than study was reported in 2004, 20014 and 2015. Body length, withers height and hip height of Gembrong does from this study were also lower with Kacang does, as reported by Setiadi et al (2000) which was 47-55 cm, 55,26±1,31 cm and 58,40±1,61 cm, respectively. However, chest girth of Gembrong does were bigger than Kacang does which having chest girth 62,11±1,49 cm (Setiadi et al., 2000).

Table 1. The mean and standard deviation of head and body measurements of female gembrong goat that was obtained from the study and previous study

No	Trait	Mean±SD (cm) ^a	Mean±SD (cm) ^b	Mean±SD (cm) ^c	Mean±SD (cm) ^d	Mean±SD (cm) ^e
1	head length	18,20±1,14	16,83±2,14	14,41±1,32	-	-
2	head girth	11,30±0,82	11,50±1,05	8,18±0,60	-	-
3	ear length	14,20±2,04	14,17±1,33	-	-	18,50±3,54
4	chest girth	67,42±3,21	70,00±5,06	64,45±5,45	71,00±6,90	70,90±3,47
5	body length	48,50±4,40	56,17±4,63	57,64±5,71	56,70±6,90	62,60±1,14
6	withers height	51,50±3,21	55,08±1,69	53,91±4,74	59,80±4,90	64,20±4,55
7	hip height	54,58±3,55	57,42±1,80	-	-	66,60±4,56

^a this study; ^b Hasinah et al., 2015; ^c Zein and Sulandari, 2014; ^d Maharani et al., 2014; ^e Fahmilia et al., 2004.

The difference of head and body size, in case was lower with the previous study was reported several researcher (Table 1) probably caused by an uncontrolled mating patterns, may be like inbreeding, because lack of the Gembrong buck and there isn't rotation of mating. In difference case, the decrease of body size may be caused by mating with another breeds likely Kacang goat by farmers.

Conclusion

Based on the body size from the study and compared to the previous research, Gembrong Goat was raised with traditional management by small farmer in Karangasem, Bali was indicates a decrease in genetic quality.

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Effect of high energy feed source on *in vitro* ruminal fermentation and *in situ* digestibility

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Abstract

The present study was conducted to investigate the effects of high energy diet on *in vitro* rumen fermentation and *in situ* digestibility. Diet formulated with high energy sources was assigned to treatment and relatively low and commercially used diet was used for control. Two diets were submitted to *in vitro* rumen simulated fermentation and *in situ* digestibility determination. Significantly great gas production was found in treatment at 12 and 24 h incubation of *in vitro* fermentation ($P < 0.05$). However, at 48 h, control showed significantly greater gas production compared to treatment ($P < 0.05$). No significantly different concentration of ammonia nitrogen ($\text{NH}_3\text{-N}$) between treatment and control was found at 48 h ($P > 0.05$). *In vitro* dry matter digestibility (IVDMD) of treatment was significantly greater at 24 and 48 h than the control ($P < 0.05$). Total volatile fatty acids (VFAs) in treatment were significantly greater than the control at 12, 24 and 48 h ($P < 0.05$). Diet of treatment showed significantly greater *in situ* digestibility compared to the control regardless of incubation time ($P < 0.05$). As a conclusion, a diet formulated with high energy source in this study did not show negative influence on rumen fermentation and could be used for ruminant with the purpose of increasing carcass performance.

Keyword: Hanwoo steer, high energy feed source, short term-fattening, *in vitro*, *in situ*.

Introduction

Carcass yield and meat quality are great concerns in beef cattle farm. Skeletal growth during growing and early fattening periods, and fat deposition during late fattening period are crucial strategies in terms of carcass performance and meat quality improvement. Protein and energy are regarded as important nutrients for these strategies. However, unbalanced or coarse diet formulation can negatively influence on rumen fermentation regardless of its energy density. Therefore, *in vitro* assessment should be advanced to its practical application. *In vitro* rumen simulated fermentation and *in situ* digestibility assay using cannulated ruminant animal are regarded as an acceptable assessment technique for the evaluation of ruminant diet. The present study investigated the effect of newly formulated diet with high energy sources on rumen fermentation and digestibility.

Methodology

For *in vitro* rumen fermentation, rumen fluid was collected from two Hanwoo steers (350 ± 20 kg of body weight) before morning feeding. The collected rumen fluid was strained and diluted at a ratio 1:4 with McDougall's solution (McDougall, 1948). Aliquot 50 mL of rumen inoculum was mixed with 0.5 g of finely ground roughage and incubation was

performed at 39°C. For fermentation parameters, ruminal pH, total gas, ammonia nitrogen (NH₃-N, Chaney and Marbach, 1962), volatile fatty acid (VFA, Erwin et al., 1961) and IVDMD (Moore, 1970) were determined. *In situ* digestibility, bags containing 5 g of the respective test samples were inserted in duplicate at each time point in each steer at 0, 4, 8, 12, 24, 48, and 72 h. After incubation, all bags were removed at the same time, washed with cold water for 30 min to stop bacterial activity, and dried for 48 h at 60°C. The *in situ* nylon bag digestive experiment was conducted by using the method of Ørskov McDonald (1979).

Results and discussion

Table 1. Effects of different energy feed on *in vitro* rumen fermentation

Incubation time, h	Control	Treatment	SEM	P-value
pH				
12	6.70	6.64	0.010	<0.05
24	6.65	6.57	0.014	<0.05
48	6.59	6.53	0.011	<0.05
Gas production (mL)				
12	59.67	71.33	2.048	<0.05
24	79.00	96.00	2.995	<0.05
48	107.67	94.33	2.501	<0.05
Ammonia nitrogen (mg/100mL)				
12	1.63	0.94	0.146	<0.05
24	6.46	6.43	0.141	<0.05
48	14.96	15.67	0.274	<0.05
Dry matter digestibility (%)				
12	44.38	49.13	1.027	0.115
24	54.10	65.37	1.970	<0.05
48	69.87	79.69	1.574	<0.05
Volatile fatty acid (mM)				
Total VFA				
12	55.45	63.16	1.178	<0.05
24	70.46	76.71	1.192	<0.05
48	86.47	92.72	1.378	<0.05
Acetate				
12	31.88	35.32	0.513	<0.05
24	40.86	42.86	0.500	0.278
48	46.03	48.42	0.513	<0.05
Propionate				
12	14.14	16.62	0.392	<0.05
24	17.26	19.65	0.443	<0.05
48	20.63	22.46	0.425	<0.05
Butyrate				
12	7.85	9.07	0.196	<0.05
24	9.51	11.18	0.298	<0.05
48	13.32	14.88	0.347	<0.05
Valerate				
12	2.21	2.14	0.056	0.829
24	2.83	3.03	0.038	<0.05
48	6.48	6.94	0.116	<0.05
A/P ratio				
12	2.25	2.13	0.023	<0.05
24	2.37	2.18	0.037	<0.05
48	2.23	2.16	0.021	<0.05

Control, conventional feed source; Treatment, high energy feed source; SEM, standard error of mean.

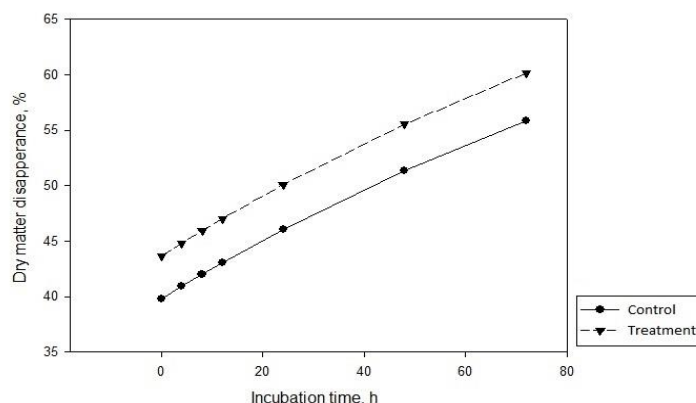


Figure 1. *In situ* dry matter degradation of different feed sources. Control, conventional feed source; Treatment, high energy feed source

Ruminal pH measured from treatment and control were an optimum range for normal rumen function, 5.8 to 7.2 (Hiltner and Dehority, 1983). Total gas production was significantly greater in treatment than control at 12 and 24h ($P < 0.05$). $\text{NH}_3\text{-N}$ concentration was not significantly greater in treatment compared with control at 48h ($P > 0.05$). IVDMD was shown to be significantly greater treatment than control at 48h ($P < 0.05$). In total VFAs production, treatment showed significantly great production than control at 12, 24 and 48 h. And among treatments, T1 was significantly greater than T2 at both 48 and 72 h ($P < 0.05$). For *in situ*, significantly great digestibility was found in treatment at all incubation time.

Conclusion

As a conclusion, high energy feed source was within optimum range for normal rumen function and effect on *in vitro* rumen fermentation and *in situ* digestibility.

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Effect of feed additive supplementation on reduction of heat stress of Holstein dairy cow and broiler during summer season

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Abstract

The present study was conducted to evaluate the effect of feed additive supplementation on performance of Holstein dairy cow and broiler during summer season. Two strategies were employed to diminish heat stress of animal as energy supplementation in dairy cow and protein uptake improvement in broiler. In dairy cow, 200 grams of saturated fatty acids were supplemented to cow per a day for three months during summer season. In broiler, plant extracts which was specifically designed to increase amino acid absorption rate in intestine was added into diet in 0.1% rate. Feeding trial of broiler was performed at three farms during summer season. In all trial, animal groups fed normal diet without additives described above were assigned as control. Milk yield, milk fat and protein content were investigated as milk productivity of dairy cow, and covariance analysis was used for statistical analysis. Average daily gain (ADG), body weight at slaughter day (BWS) and feed requirement were used as investigation factors for the performance of broiler. A meta-analysis using standardized mean difference was employed for evaluation of effect of treatment from three different farms. As a result, dairy cow provided energy supplementation showed significantly increased milk fat compared to the control ($p < 0.05$). Milk yield and protein content of dairy cow assigned to treatment trended to more than the control ($0.05 < p < 0.01$). Broiler provided plant extract showed significantly greater ADG and BWS compared to the control ($p < 0.01$).

Keyword: heat stress, fat, protein, dairy cow, broiler

Introduction

Heat load above thermos-neutral zone under hot climate condition is known as heat stress and it is reported a cause of consequent economical loss (Cho et al., 2014). A reduced feed intake is regarded as characteristic physiological response to heat stress. Providing high energy diet to compensate for reduced energy intake can also trigger metabolic heat load and consequently can result in more heat stress. The present study hypothesized that energy and protein supplementation without additional metabolic heat load could be a solution for reduction of heat stress and prevention of loss of productivity. Fat source is regarded as the most convenient energy supplementation in dairy cow, and most of fat escaped from the rumen and entering intestine is saturated fatty acid, particularly palmitic and stearic acids (Loften et al., 2014). Improved protein uptake and utilization efficiencies can reduce nitrogen excretion and consequently diminish the risk of ammonia secretion from litter in broiler. These two hypotheses were evaluated using farm trail in this study.

Methodology

An additive formulated with saturated fatty acids (palmitic and stearic acids) and plant extract composed of polyphenols extracted from sweet chest-nut were used in lactating dairy cows and broiler, respectively. Aliquot 200 g of fat additive was supplied to dairy cow for a day. Four dairy farms were employed in feeding trials and two of them were assigned to treatment. Farms of treatment were switched to control after one month for trial. Feeding trial was performed for 3 months from July 2016 to September 2016 in South Korea. Milk yield, fat and protein contents were measured at the end of each month of experiment. Covariance analysis was employed for analysis of effect of treatment. In broiler feeding trial, feed additive composed of plant extract was added to diet at 0.1% (w/w). Three farms and two of broiler houses in each farm were employed in trial. Two feeding trial in each farm were conducted from July 2016 to September 2016 in South Korea. Broiler houses for experiment groups were switched each other after first trial. Meta-analysis using standardized mean difference was employed for evaluation of effect of treatment.

Results and discussion

Table 1. Effect of energy supplementation during summer season on milk yield, fat and protein of Holstein dairy cow

Items	Intercept			Slope		
	Estimate	SE	P value	Estimate	SE	P value
Milk yield, kg	39.86	0.79	<0.01	1.15	0.63	0.07
Milk fat, %	3.48	0.07	<0.01	0.27	0.06	<0.01
Milk protein, %	2.92	0.03	<0.01	0.04	0.02	0.08

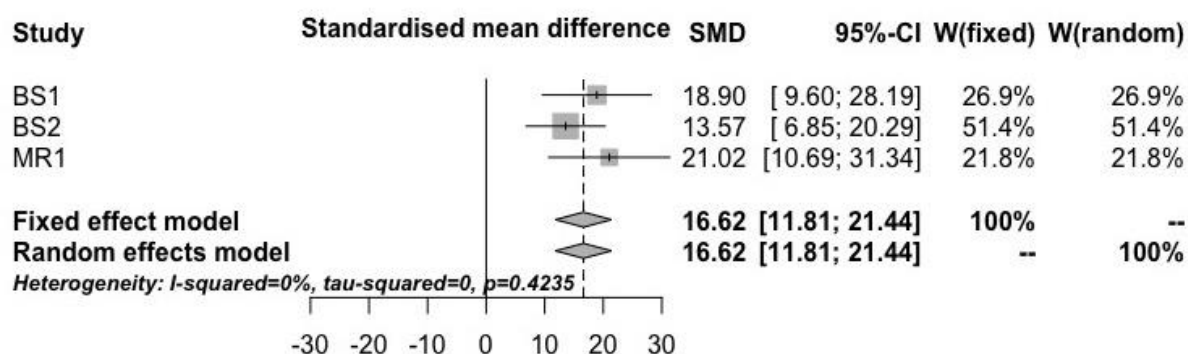


Figure 1. Effect of plant extract supplementation during hot summer season on average daily gain of broiler. BS1, BS2 and MR1 mean broiler farms

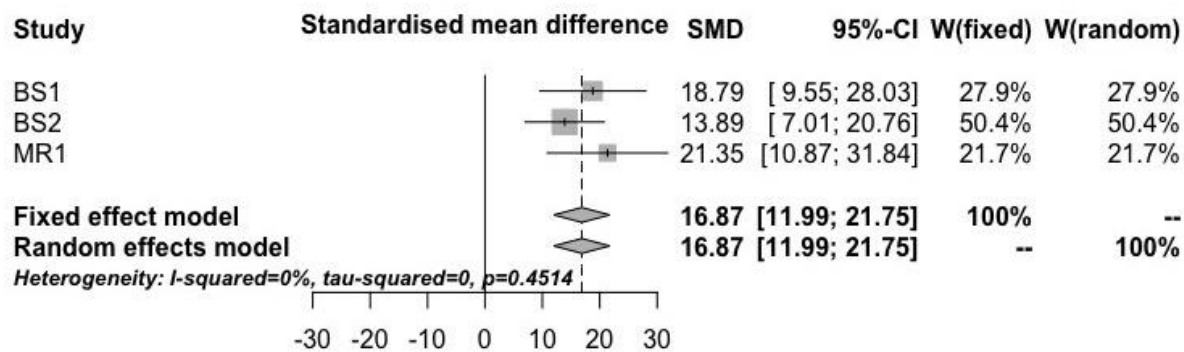


Figure 2. Effect of plant extract supplementation during summer season on body weight of broiler at slaughter day. BS1, BS2 and MR1 mean broiler farms

Fat additive composed of saturated fatty acid showed a trend to increase milk yield compared to the control ($p=0.07$). Milk fat content in treatment was significantly greater than the control ($p<0.01$). A trend of increased milk protein content was found in treatment compared to the control ($p=0.08$) (Table 1).

Effect of plant extract supplemented diet feeding from three farms were slightly different each other in ADG (Figure 1) and BWS (Figure 2). However, summary effect showed that plant extract supplementation significantly increased ADG and BWS compared to the control ($p<0.05$).

Conclusion

As a conclusion, it was found that energy supplementation and improved protein utilization rate can be acceptable strategies to diminish heat stress of dairy cow and broiler, respectively.

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Feed supplementation for dairy cattle by using multi nutrient feed supplement without molasses (MFSWM)

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Abstract

This study aims to determine the benefits of multi nutrient feed supplements without molasses (MFSWM) to consumption, nutritional balance, and dynamics of weight gain dairy cattle. Feed treatment was divided into 2 groups: Group I: king grass and concentrate (tofu waste and wheat bran), while Group II: I + 400 g MFSWM/head. The experimental design used an independent sample t test. The parameters observed were feed consumption, balance of nutritional needs and the dynamics of weight gain. The balance of nutritional requirements crude protein (CP) and total digestible nutrient (TDN) in control feeds was -503.65 g and -0.27 kg, whereas with the addition of MFSWM, the deficiency of protein requirement was 388.6 g, and the consumed TDN exceeded 0.21 kg. The dynamics of weight gain were significantly different ($P < 0.05$) between at weeks 12 and 14.

Keywords: supplementation, feed supplement, dairy cattle, nutrient, molasses

Introduction

One of the factors that influence the increase or decrease of milk production is the lack of needed nutrients (Soetarno, 2003). Furthermore, to meet the nutritional needs of dairy cattle, someone must pay attention to the quality of feed. Suharyono et al. (2014); Suharyono et al. (2015) reported that MFSWM as a dietary supplement improved in quality and production when tested in beef cattle and late pregnancy sheep. Dairy cattle owned by some farmers are usually fed and concentrated, but the quality is low. With the addition of MFSWM in dairy cows, it is expected to meet the nutritional needs for body weight gain and increased milk production.

Methodology

This research used cross bred dairy cows of Frisian Holstein (FH). The dairy cows used were 6 heads. The average cows weight used was 400 kg. According to feeding treatments, the cows were divided into two groups, the first group (G1) was given a king grass and concentrate (18% of tofu waste and 7% wheat bran) and G2: G1 + 400 g MFSWM/head/day. G2 Cows were given 400g/day of MFSWM supplement. Analysis of nutritional contents were by using AOAC 2005 method (AOAC, 2005). Observed parameters included nutrient content of feed ingredients, and the dynamics of weight gain. Statistical analysis was done by using independent sample t-test using software Statistical and Service Solution (SPSS) version 15.

Results and discussion

The results of measuring the nutritional content for MFSWM feed supplements showed that ash, CP, fat and TDN were able to increase feed consumption and the respective nutrients consumed of 16.36, 20.49, 14.28 and 62.50% respectively. This means that the nutritional content of feed ingredients given to dairy cattle in this study showed that the addition of MFSWS in G2 enhance nutrient consumed. A calculation of feed consumption showed that MFSMW additive was able to supply a higher source of nutrients in dairy cows, so the total feed consumption increased by 0.35 kg, from 13.81 kg to 14.65 kg, consequently the nutritional needs will increase body weight of postpartum offspring. Nutritional requirements of CP and TDN for dairy cows with a body weight of 400 kg are 1609.8 g and 7.98 kg respectively (NRC, 2001). Total feed intake in G1 (control) and G2 treatments were 13.81 kg and 14.65 kg/head/day or 3.45% and 3.66% DM/body weight, respectively. Hartadi et al. (2005) reported that the total consumption required by FH cross bred dairy cattle was between 2% to 4% DM/body weight. The nutrient content of CP and high energy in feed, played a positive role on the digestibility and feed consumption (Chamberlain and Wilkinson, 2009).

The total nutrient requirements of CP and TDN for dairy cattle fed with G1 (control) and G2 treatments were 1106.15 g and 7.69 kg vs 1221.64 g and 8.17 kg, respectively, and statistically calculation only tended to differ. This means that the addition of MFSWM in G2 tended to increase the total consumption of CP and TDN in the dairy cattle with the values were 81.96 g and 0.22 kg, respectively. Addition of calculated CP was 115.49 g, while for TDN increased 0.48 kg, so that the TDN was more than 0.21 kg. Nutritional deficiencies of CP and TDN in G1 (control) were 503.65 g and 0.27 kg, respectively. While those given MFSWM (G2), nutrient deficiency of CP was only 388.16 g. This smaller deficiency was caused by high CP levels in MFSWM (20.49%). The changes in live weight gain of dairy cattle was strongly influenced by nutritional balance and milk production during the initial period of lactation. The mean weight of dairy cows given MFSWM G2 at 2 weeks prior to 100 days after calving is presented in Table 1.

Table 1. Average body weight gain given MFSWM feed supplement at 14 days prior to 100 days after calving (kg).

Feed treatment	Time								Total
	2 days after postpartum ^{ns}	Week 2 ^{ns}	Week 4 ^{ns}	Week 6 ^{ns}	Week 8 ^{ns}	Week 10 ^{ns}	Week 12	Week 14	
Control (G1)	-101.7	-3.7	-4.3	-5.0	-5.3	-1.0	-4.0 ^a	-1.3 ^a	-126,3
MFSWM (G2)	-83	-5.5	-6.5	-1.3	0.5	3.0	3.8 ^b	5.3 ^b	-83,7

^{ns}: non-significant (P<0.05)

^{a,b} different superscript on the same line show the real difference (P <0.05)

The results showed that G1 cows fed control feed, live body weight (BW) on 2 days post partum decreased to 101.7 kg, while G2 fed treatment feed only decreased 83 kg. The decrease in BW continued from week 2 to week 10, in addition the BW of MFSWM G2 treatment only decreased from week 2 to week 8, although both not significantly different at P <0.05. The addition of MFSWM in G2 significant affected BW (P <0.05) at 12 and 14 week, with an increase of 3.8 kg and 5.3 kg compared with -4 kg and -1.3 kg. Decrease in the acquisition of BW is strongly influenced by nutrient balance in that period. This is supported by the result of less nutrient balance in G1 (control feed) for requirement of CP and TDN when compared with in G2. A negative energy balance will occur in the early days of lactation because feed consumption can not meet the energy requirements imposed to sustain life and decrease milk production (De Vries and Veerkamp, 2000).

Conclusion

The results of this study conclude that MFSWM supplementation was able to meet the nutritional needs of dairy cattle based on BW gain at weeks 12 and 14 after calving. Feed supplementation of MFSWM tended to increase the total consumption of CP by 115.49 g although the nutritional requirement was less but the deficiency was lower by 12.95% when compared with the control diet.

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Nutritive value of botanical fraction in maize by-products from various varieties

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Abstract

Study was conducted to evaluate botanical fraction from three varieties of maize by-products. Maize varieties evaluated were Bisi 816, Pioneer 12 and Bima2 which obtained from different locations. At grain maturity the plant was harvested by cutting the stalk 10 cm above ground level. The stover was partitioned based on its botanical fraction into cobs and stover component. The cobs were separated into grain, earhusk and cob, while stover was separated into leaf and stem. Each fraction was cut and dried then ground and ready to be evaluated. The evaluation done was chemical analysis (crude protein, neutral detergent fibre, acid detergent fibre, lignin, gross energy) and in vitro dry matter and organic matter digestibility (IVDMD and IVOMD). The study was conducted in randomized complete design for each varieties. The study revealed that leaf fraction had highest content of crude protein (CP) in all varieties with ranges 6.1-11.58%. Though earhusk has lower CP content than leaf, it has high IVDMD and IVOMD in all varieties. The highest in vitro digestibility among botanical fraction were in the leaf and ear husk. From this study can be concluded that the good nutritive quality of botanical fraction in all varieties as ruminants feed were in leaf and earhusk.

Keywords: nutritive value, botanical fraction, maize, varieties

Introduction

Corn is one of food crops targeted by Indonesian government to be domestically self sufficient and can be exported in 2018. The increased of production will be followed by increased by-products from corn production which can be utilized for ruminant feeds. To achieve this target, high production corn varieties was introduced and developed in Indonesia. Those varieties included Bisi816, Pioneer12 and Bima2. Each of this variety has superiority from corn production and survivability from disease attack and environment condition.

By-products from maize crop (such as stover, cob and earhusk) usually used as ruminants feed. Corn variety was reported affect its by-products quality. Umiyasih and Anggraeni (2005) and Langoy et al (2012) reported that nutritive value stover from various variety of corn was varied. This nutritive value was affected by composition of its botanical fraction. Corn stover which contained high proportion of leaf had higher nutritive value than stover which had high contained of stem. Because leaf had higher nutritive value than other parts of stover (Lynch et al, 2014). Limited information available in Indonesia on the effect of varieties on the nutritive value of botanical fraction of corn by products. The objective of this study was to evaluate the nutritive value botanical fraction of corn by-products

Methodology

The study was conducted using three corn varieties consisted of 2 hybrid varieties bred in overseas (Bisi816 and Pioneer12) and 1 hybrid variety (Bima2) bred in Indonesia (bred by Indonesian Cereals Research Institute, Maros, South Sulawesi). Bima 2 is dual purpose variety selected for high grain production and stay green stover used for feed source. The by-product from harvested corn of each variety was collected from different field farm. Pioneer variety was collected from farm in Kec. Kec. Cicurug, Kab Sukabumi and Bisi variety collected from Kec. Wirasari, Kab Grobogan. Whereas Bima2 variety was collected from IRIAP field station in Bogor. The corn was harvested at mature grain. After the ear was harvested, the stover was collected by cut the plant and stem was left at 10cm above ground. The stover was separated between stem and leaf. While the ear was separated between grain, cob and ear husk. Those botanical fraction of stover and ear, was chopped into 5 cm in length, then dried in oven at 60°C for 48 hours. After dry the samples were then ground and ready to be analysed. To determine the nutritive value of the samples, the ground samples were analysed for their chemical composition and *in vitro* digestibility. Gross Energy (GE), crude protein (CP) content were analysed according to AOAC (1990). Neutral detergent fiber (NDF) and acid detergent fiber (ADF), content were analysed according to Van Soest et al (1991). The *in vitro* digestibility was carried out using method of Menke and Steingass (1988). To measure the *in vitro* digestibility the residue from the incubation was refluxed with NDF solution for 1 hour (Blummel *et al.* 1997). The rumen fluid used for medium was collected from rumen of sheep fed on fresh elephant grass and concentrate. The study was conducted using randomized complete design for each variety of maize by-product. Data obtained were analysed using SAS 9 vs 1 (2004). To determine the differences between mean, the data was analysed using LSD.

Results and discussion

Compare to other botanical fraction, leaf had the highest protein content in all varieties. Lynch and Doyle (2014) and dan Methu et al. (2001) also reported that leaf had highest protein content than other fraction. However CP content in leaf between variety was different, this difference could be caused by different variety (Barbosa et al., 2016). The lowest CP content between varieties was varied. In Pioneer the lowest CP content was in ear husk, while Bisi and Bima variety the CP content of earhusk, stem and cob was not significantly different.

The highest GE energy content in all varieties were in the cob followed by ear husk. While the lowest was in the leaf. Similar to GE content the NDF content was also highest in the cob followed by ear husk. The highest of NDF content of this fraction might be the reason of the highest GE content of this fraction. NDF is the component of plant cell wall, which needed to support the plant for standing. Therefore the highest NDF content was in the stem (Slewinski, 2012). Beside that by the time the plant reach maturity stage, the cell wall component deposited in the stem than in the leaf, therefore leaf usually had low content of cell wall (Lynch and Doyle, 2014). In all varieties leaf had the lowest NDF content. The ADF content between cob, stem and earhusk were similar in all varieties. The leaf had the lowest ADF content.

Dry matter and organic matter *in vitro* digestibility (IVDMD and IVOMD) were highest in leaf and followed by earhusk. The highest digestibility in the leaf caused by the lowest cell wall content in the leaf. Beside that the leaf also had highest protein content. Therefore leaf had highest digestibility. Lynch and Doyle (2014) reported that protein content in the leaf was the degradable protein in the rumen in which the ammonia available from this degradable protein is needed for Synthesize protein microbial which in turn it will increase feed digestibility. Piriera et al (2012) also reported that leaf had highest degradability than other

botanical fraction of corn plant. Meanwhile earhusk also had higher in vitro digestibility compare stem and cob. Eventhough earhusk had high content of NDF but this NDF had higher digestibility as reported by Ming-Yuan et al (2014). Moreover earhusk also had lower lignin content than other fraction. The higher digestibility in the leaf and earhusk influence its palatability. Methu et al (2001) reported that when dairy cattle given free choice feeding of botanical fraction of corn stover, the cattle choose to consume the leaf and earhusk. Considering the protein content and digestibility of the leaf, therefore the quality of biomass from corn farming is affected the by the proportion of the leaf. Therefore, to be used as ruminants feeding the selection of maize variety also recommended to select the plant with high leaf proportion beside high grain production.

Table 1. Chemical composition and in vitro digestibility of botanical fraction from by-product of maize plant.

Chemical composition	Variety	Botanical Fraction			
		Ear husk	Stem	Leaf	Cob
Crude protein (%)	Bisi816	1.54c	1.89b	6.10a	1.56c
	Pioneer12	1.15c	3.22b	11.58a	3.60b
	Bima2	3.79b	3.68b	7.10a	3.78b
Gross Energy (kkal/kg)	Bisi816	3823b	3857b	3815b	3998a
	Pioneer12	3861b	3767c	3736c	4054a
	Bima2	3861b	3767c	3736c	4054a
NDF (%)	Bisi816	80.21b	75.7c	64.9d	82.3a
	Pioneer12	80.7a	69.9b	60.6c	80.5a
	Bima2	74.4b	72.6c	63.3d	73.5a
ADF (%)	Bisi816	42.0b	43.3a	36.6c	43.8a
	Pioneer12	44.3a	43.4ab	34.8c	42.5b
	Bima2	41.5b	50.5a	42.5b	40.4b
Lignin (%)	Bisi816	3.11c	4.5b	3.05c	6.01a
	Pioneer12	2.78d	4.1b	3.36c	6.59a
	Bima2	5.10bc	7.3a	4.68c	5.2b
IVDMD (%)	Bisi816	62.5b	60.4c	68.9a	50.4d
	Pioneer12	63.1a	61.0b	62.71ab	51.8c
	Bima2	64.5a	48.8b	63.4a	60.1a
IVOMD (%)	Bisi816	62.0b	58.3c	66.9a	49.9d
	Pioneer12	62.2a	58.6b	61.23a	51.7c
	Bima2	64.2a	44.0b	62.0a	60.7a

Different letter in one row indicated significantly different ($P < 0.05$).

Conclusion

In all varieties evaluated, good nutritive quality of botanical fraction as ruminants feed were in leaf and earhusk.

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Used dried cassava leaves with enzymes from fermented tomato pomace with *Aspergillus niger* in laying duck diet on nutrient digestibility

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Abstract

This study was aimed to determined effects of cassava leaves with enzymes from fermented tomato pomace with *Aspergillus niger* replacing laying duck diets on nutrient digestibility. Twelve laying ducks (aged 30 weeks, 4 ducks per treatments) were used in complete randomized design (CRD). There were three dietary treatments (T1 = basal diet; T2 = basal diet substituted cassava leaves 20%; and T3 = basal diet substituted cassava leaves 20% + enzymes 0.2%). The laying ducks were randomly taken to individual cages for 17 days period for total collection method. The results showed that nutrient digestibility were significantly difference ($P < 0.05$), not including EE and NDF digestibility. Cassava leaves replaced laying duck diet were reduce nutrient digestibility when compare with control diet. However, laying duck fed the diet with cassava leaves and enzymes was improved ADF digestibility ($P < 0.05$) and tend to higher most of nutrient digestibility than ducks fed the diet with cassava leaves ($P > 0.05$).

Keywords: laying duck, fibrolytic enzymes, Aspergillus niger, nutrient digestibility

Introduction

Consumption rate of egg in Thailand increased by 4.77% annually during 2010-2014, mainly due to the fact that eggs are available at lower costs than other protein sources (Agricultural Statistics of Thailand, 2015). Khaki Campbell ducks in Thailand has the important animal for produced egg. It is one of good protein sources for human. The price of duck feeds were raising and more expensive. Farmers must find ways to cut the cost of feed.

Cassava Leaves contain an average of 25% crude protein, depending on the cultivar and climatic conditions. It was recommended that farmer blending of cassava leaves as a source of protein and vitamins. Although the potential for the use of cassava leaves in the feeding of laying animals is thinkable, there were high fiber content. Could be reduced nutrient bioavailability, nutrient uptake and digestibility (Latif and Muller, 2015).

Fibrolytic enzymes have the ability the break down these structural polysaccharides, making the nutrients available to the animal (Bedford, 2000). There are various benefits to be gained from the use of enzymes in poultry diets. Some of the benefits influencing the performance of poultry are increased feed value of the dietary raw materials and increased nutrient utilization (Sarmiento-Franco et al., 2003, Botha, 2011).

The main goal of this research is improve utilization of dried cassava leaves with enzymes from fermented tomato pomace with *Aspergillus niger* on nutrient digestibility of laying duck.

Methodology

A total of 12 ducks excluded from receiving feed, 1.64 kg BW and 30 weeks old, were randomly allocated to 12 pens in an environmentally open room conditions throughout the experimental period (7 days of preliminary period and 7 days of data collection). Each ducks were put in individual cage for excreta and endogenous collection by using total collection method. Excreta was collected in seven days, then sample was analyzed in laboratory to measure nutrient content according to standard methods and calculate digestibility. The experiment using a completely randomized design with three treatments and four replications. Dietary treatments were based on laying diet contained 18% crude protein and substituted by dried cassava leaves and enzymes. Laying ducks were received dietary treatments as followed: Treatment 1 (T1) = Basal diet, Treatment 2 (T2) = Basal diet substituted 20% dried cassava leave, Treatment 3 (T3) = Basal diet substituted 20% dried cassava leave plus enzymes 0.2%. Diets were presented in mash form and given ad-libitum of feed per duck per day; unconsumed feed was measured each morning and free access to water. The treatment means were compared using analysis of variance. Duncan's multiple range test.

Results and discussion

The data results of the feeding treatment of laying duck diet substitution by cassava leaves with or without enzymes on nutrient digestibility were presented on Table 1. Results showed that the substituted of cassava leaves in duck diets have significant decreased nutrient digestibility ($P < 0.05$). However, addition enzymes in diet containing cassava leaves (T3) tend to increase nutrient digestibility ($P > 0.05$) and significant increased for ADF digestibility ($P < 0.05$) when compared with dietary diets containing cassava leaves (T2).

Table 1. Dry matter intake and nutrient digestibility of laying duck

	T1	T2	T3	SEM	Sig
DMI (g/d)	104.85	109.88	130.05	9.551	0.198
DM (%)	75.09 ^b	64.20 ^a	67.98 ^{ab}	2.302	0.024
CP (% DM)	73.75 ^b	57.86 ^a	62.20 ^a	3.425	0.025
EE (% DM)	73.93	72.03	77.04	1.515	0.114
NDF (% DM)	53.17	39.22	42.68	4.108	0.074
ADF (% DM)	45.75 ^c	16.76 ^a	34.84 ^b	3.107	0.000
Ash (% DM)	60.64 ^b	44.02 ^a	50.36 ^a	3.723	0.033
Ca (% DM)	66.79 ^b	55.78 ^a	55.36 ^a	2.925	0.036
P (% DM)	71.31 ^b	54.67 ^a	59.28 ^a	2.908	0.008

^{a,b} Means within column with difference superscripts differ significantly ($P < 0.05$)

The enzymes from tomato pomace fermented with *Aspergillus niger* was contain xylanase (Saykhammy et al., 2017). Previous research report that exogenous xylanase can partially hydrolyze the arabinoxylans and release the enclosed nutrients for the birds to use (Williams et al., 1997). Consequently, birds can digest the nutrients more easily and achieve better growth performance. This experiment shown that additional enzymes in the diets tend to improved nutrient digestibility similarly with Adeola et al. (2007) reported that supplementation of wheat-based diets with cocktail enzymes resulted in improvements in DM and nitrogen digestibility.

Conclusion

In conclusion, effective enzymes from fermented tomato pomace with *Aspergillus niger* onto diet tended to increase utilization of cassava leaves in diet and improved nutrient digestibility.

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Study on a polymorphism in the promoter region of the *SIRT1* gene in Agerolese cattle breed

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Abstract

Sirtuins (Sir two-like proteins) are mammalian homologs of the silent information regulator 2 (sir2) gene of *Saccharomyces cerevisiae*. In mammals there are seven sirtuins (SIRT1-SIRT7) encoded by different genes. SIRT1 plays key physiological function in liver, muscle, pancreas, testis, ovary and adipose tissue to regulate cell proliferation, cell survival and apoptosis. It has an important function in endocrine signaling, specifically in glucose and fat metabolism inducing the transcription of several genes involved in metabolism. Moreover SIRT1 is expressed in mammary gland where it regulates normal mammary gland development by modulation of insulin like growth factor 1 (IGF-1) signaling. To date, in bovine species, only few *SIRT1* polymorphisms were reported in literature. Based on the biological role of SIRT1 in metabolism regulation and mammary gland development, it is possible to suppose an association between *SIRT1* polymorphisms and milk production traits. So, the aims of the present study were to estimate the allele and genotype frequencies of a polymorphism in the promoter region of the *SIRT1* gene (c.-274C>G) and to investigate the relationship among different genotypes and total milk yield in a sample of cows belonging to Agerolese breed. This is an autochthonous Italian cattle breed reared in the province of Naples characterized by the ability to produce a milk with excellent organoleptic properties. The investigated population was found to be polymorphic at *SIRT1*/*SmaI* locus: in particular, 13 individuals out of 46 were genotyped as CC; 17 as GG and 16 were heterozygotes. So, the frequencies of C and G alleles were 0.46 and 0.54, respectively. Moreover, total milk yield was significantly affected by *SIRT1*/*SmaI* polymorphism, with CC cows producing more milk if compared with GG (5638.01±321.73 vs. 4537.01±297.34 kg, respectively; P<0.05).

Keywords: agerolese cattle, *SIRT1* gene, gene polymorphism

Introduction

Sirtuins (Sir two-like proteins) are mammalian homologs of the silent information regulator 2 (sir2) gene of *Saccharomyces cerevisiae*. They are categorized as class III NAD⁺-dependent histone deacetylases. In mammals there are seven sirtuins (SIRT1-SIRT7) encoded by different genes (Haigis and Guarente, 2006). Sirtuins are considered key regulator factors in many biological processes, such as gene transcription, DNA repair, genome stability and energy metabolism acting as sensors of the cellular energy status (Houtkooper et al., 2012). Mammalian SIRT1 is the most investigated sirtuin; it is mainly found in the nucleus and interacts with several transcription factors in accordance with its role in gene silencing and heterochromatin formation (Vaquero et al., 2004). SIRT1 plays key physiological function in liver, muscle, pancreas, testis, ovary and adipose tissue to regulate cell proliferation, cell

survival and apoptosis (Shoba et al., 2009). It has an important function in endocrine signaling, specifically in glucose and fat metabolism inducing the transcription of several genes involved in metabolism (Li et al., 2013a). Moreover SIRT1 is expressed in mammary gland where it regulates normal mammary gland development by modulation of insulin like growth factor 1 (IGF-1) signaling (Li et al., 2007). In the bovine species, the *SIRT1* gene has been assigned to chromosome 28; it consists of 9 exons (Ghinis-Hozumi et al., 2011). To date, in bovine species, only few *SIRT1* polymorphisms were reported in literature (Li et al., 2013a,b). Based on the biological role of SIRT1 in metabolism regulation and mammary gland development, it is possible to suppose an association between *SIRT1* polymorphisms and milk production traits. So, the aims of the present study were to estimate the allele and genotype frequencies of a polymorphism in the promoter region of the *SIRT1* gene (c.-274C>G) and to investigate the relationship among different genotypes and total milk yield in a sample of cows belonging to Agerolese breed. This polymorphism is a transversion in the promoter region of the *SIRT1* gene and it is detectable by enzymatic digestion with *SmaI* (Li et al., 2013a,b). Agerolese cattle is an autochthonous Italian cattle breed reared in the province of Naples. In particular, this dual-purpose (milk and meat) breed has been established on Lattari mountains during the nineteenth century starting from an autochthonous nucleus of Podolica cows crossed with Brown Swiss, Dutch Friesian, and Jersey bulls. After the Second World War, Agerolese breed underwent to genetic contamination with Italian Brown and Holstein Friesian cattle (Felius, 1995). Agerolese breed is characterized by the ability to produce a milk with excellent organoleptic properties. Presently, this breed is used almost exclusively for milk production which is mainly used for butter and cheese production such as “fior di latte” (stretched curd) and Provolone del Monaco a cheese recognized by the Protected Designation of Origin (Reg. CE n. 121/2010) and Slow Food Foundation for Biodiversity (Peretti et al. 2013).

Methodology

A total of forty-six cows belonging to Agerolese breed were included in this study. Animals were maintained in a single farm located in Campania region, in southern Italy. All the cows were fed with the same lactation diet, according to the energy recommendations for lactating cows, being able to graze for about 8–10 h after the morning milking. They had free access to water. The animals were milked twice a day. Data concerning total milk production (kg) during whole lactation for each animal in the first, second, third, and fourth lactation were obtained from monthly records provided by the National Breeders Association. Individual blood samples for DNA genotyping were collected from all the cows on K3-EDTA tubes and stored at -25°C. Genomic DNA was isolated from whole blood using ZR Genomic DNA II Kit™ (Zymo Research). After genomic DNA isolation, all the samples were genotyped for *SIRT1/SmaI* gene polymorphism by PCR–RFLP technique. The following primers were used to amplify a fragment of 273bp: SIRT1F (*forward*): 5'- GTA TAG TCC ACG GGG TTA CAG - 3'; SIRT1R (*reverse*): 5'- CCA AAC TTG TCT TTC AGA GTC - 3'. The *SIRT1* gene fragment was amplified using 34 amplification cycles of 94°C for 1 min, 56°C for 1 min, and 72°C for 1 min. The amplified 273bp product was digested with *SmaI* restriction endonuclease and then analyzed on a 3% agarose gel in a TBE buffer. The allele frequencies were calculated by simple allele counting (Falconer and Mackay 1996). A mixed model for repeated measures (Littell et al. 1998) implemented with the SAS software (SAS 9.2 Institute, Inc., Cary, NC) was used to detect associations between *SIRT1* genotypes and performance traits under study. The values were considered significant at $P < 0.05$ and presented as least squares means \pm standard errors.

Results and Discussion

The nuclease cuts the 273-bp amplification product into 235- and 38 bp fragments for allele G, while allele C remains uncut. The following DNA restriction fragments were expected: 235 and 38 bp for the GG genotype; 273, 235, and 38 bp for the CG genotype, and 273 bp for the CC genotype. The investigated population was found to be polymorphic at *SIRT1/SmaI* locus: in particular, 13 individuals out of 46 were genotyped as CC; 17 as GG and 16 were heterozygotes. So, the frequencies of C and G alleles were 0.46 and 0.54, respectively. Moreover, total milk yield was significantly affected by *SIRT1/SmaI* polymorphism, with CC cows producing more milk if compared with GG (5638.01 ± 321.73 vs. 4537.01 ± 297.34 kg, respectively; $P < 0.05$). No significant difference was found by comparing the total milk yield of cows carrying CG genotype (4855.27 ± 288.26 kg) and the other two genotypes.

Conclusion

This is the first report on the possible association between different genotypes at *SIRT1/SmaI* polymorphism and milk production in bovine species. Although other studies should be carried out on sirtuins, this result could be promising and encourages to further investigate the effect of the considered polymorphism on milk performance traits.

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Analysis of a polymorphism at *STAT5A* gene in Agerolese cattle breed

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Abstract

Signal transducers and activators of transcription (STATs) are a 7-member family of latent cytoplasmic transcription factors that mediate actions of a variety of peptide hormones and cytokines within target cells. STAT5 is known as a main mediator of growth hormone (GH) action on target genes; it is a key intracellular mediator of prolactin signaling. Two forms of STAT5 (STAT5A and STAT5B), encoded by two different genes, have been identified in many species including cattle. Flisikowski et al. (2003, 2004) described the substitution T→C at position 12,743 within exon 16, which causes a conservative change of the amino acid sequence (Val/Ala) at position 686. The amino acid substitution was shown to modify DNA-binding properties of the STAT5A. The objective of this work is to study the genetic polymorphism of the *STAT5A/MslI* in a sample of Agerolese cattle breed, an autochthonous Italian breed reared in the province of Naples able to produce a milk with excellent organoleptic properties. Only two out of three possible genotypes were identified and the frequencies of T and C alleles were 0.875 and 0.125, respectively. Moreover, some population genetic indices were also reported.

Keywords: agerolese cattle, *STAT5A*, gene polymorphism

Introduction

Signal transducers and activators of transcription (STATs) are a 7-member family of latent cytoplasmic transcription factors that mediate actions of a variety of peptide hormones and cytokines within target cells (Darnell et al., 1994). STAT5 is known as a main mediator of growth hormone (GH) action on target genes (Argetsinger and Carter-Su, 1996); it is a key intracellular mediator of prolactin signalling (Wakao et al., 1994). Initially a single *STAT5* gene was identified in sheep but subsequently two forms of STAT5 (STAT5A and STAT5B), encoded by two different genes, have been identified in many species (Herrington et al. 2000). Flisikowski et al. (2003, 2004) described the substitution T→C at position 12,743 within exon 16, which causes a conservative change of the amino acid sequence (Val/Ala) at position 686. The amino acid substitution was shown to modify DNA-binding properties of the STAT5A. The objective of this work is to study the genetic polymorphism of the *STAT5A/MslI* in a sample of Agerolese cattle breed. This is an autochthonous Italian cattle breed reared in the province of Naples. It is characterized by the ability to produce a milk with excellent organoleptic properties. Presently, this breed is used almost exclusively for milk production which is mainly used for butter and cheese production such as “*fior di latte*” (stretched curd) and Provolone del Monaco a cheese recognized by the Protected Designation of Origin (Reg. CE n. 121/2010) and Slow Food Foundation for Biodiversity (Peretti et al. 2013).

Methodology

Individual blood samples for DNA genotyping were collected from 92 Agerolese cows on K3-EDTA tubes and stored at -25°C. Genomic DNA was isolated from whole blood using ZR Genomic DNA II Kit™ (Zymo Research). After genomic DNA isolation, all the samples were genotyped for *STAT5A/MsII* gene polymorphisms by PCR–RFLP technique as described in Selvaggi et al. (2016). The amplicon contains two *MsII* restriction sites, only one of these appears to be polymorphic. The T→C substitution deletes one cutting site of *MsII* so that three different patterns can be observed: 169 and 118 bp for TT genotype; 169, 67, and 51 bp for CC homozygotes; and 169, 118, 67, and 51 bp for TC genotype. The allele frequencies were calculated by simple allele counting (Falconer and Mackay 1996). The differences between observed and expected frequencies of genotypes were tested using a χ^2 test in order to verify if the population was in Hardy–Weinberg equilibrium. Population genetic indices, namely, gene heterozygosity (H_E), gene homozygosity (H_o), effective allele numbers (N_E), and fixation index (FIS) were performed by POPGENE32 software version 1.32 (Yeh et al., 2000). Moreover, PIC (polymorphism information content) was calculated according to Botstein et al. (1980).

Results and Discussion

As shown in Table 1, only two out of three possible genotypes were identified in this population.

Table 1. Observed and expected numbers and percentage (in brackets) of *STAT5A* genotype detected by *MslI* RFLP analysis in Agerolese cattle breed

	<i>STAT5A/MsII</i> genotype		
	TT	TC	CC
Observed	69 (75.00%)	23 (25.00%)	-
Expected	70.38 (76.50%)	20.24 (22.00%)	1.38 (1.50%)
$\chi^2=1.79$ P=0.18			

Table 2 shows the allelic frequencies obtained at *STAT5A/MsII* locus in Agerolese breed and in different cattle breeds as previously observed by other authors. The allelic frequencies observed in the present study were similar to those reported in some meat purpose breed, such as Hereford and Aberdeen Angus. On the other hand, the allelic frequencies obtained in our population were similar to those observed in some dairy breed (Jersey, Polish Friesian) and this may reflect the more recent genetic contamination of Agerolese breed. Interestingly, allelic frequencies at *STAT5A/MsII* locus were quite different from those recently reported in Podolica breed (Selvaggi et al. 2016).

Table 2. Frequencies of *STAT5A/MsII* T and C alleles in Agerolese and in different cattle breeds as reported by other authors

Breed	Allelic frequencies		References
	T	C	
Simmental	0.909	0.091	Flisikowski et al. (2003)
Aberdeen Angus	0.900	0.100	Flisikowski et al. (2003)
Hereford	0.875	0.125	Flisikowski et al. (2003)
Agerolese	0.875	0.125	Present work
Jersey	0.853	0.147	Selvaggi et al. (2013)
Polish Friesian	0.850	0.150	Flisikowski et al. (2004)
Limousin	0.812	0.188	Flisikowski et al. (2003)
Charolais	0.805	0.195	Flisikowski et al. (2003)
Polish Friesian	0.756	0.244	Flisikowski et al. (2003)
Podolica	0.653	0.344	Selvaggi et al. (2016)

In the present population, H_O , H_E , N_E , FIS and PIC values are shown in Table 3. FIS is a measure of the deviation of genotypic frequencies from panmictic frequencies in terms of heterozygous deficiency or excess. Negative FIS values indicate heterozygote excess and positive values indicate heterozygote deficiency when compared with Hardy-Weinberg equilibrium expectations. As reported in Table 3, a slight excess of heterozygosity was found. PIC is a parameter indicative of the degree of informativeness of a marker. The PIC value may range from 0 to 1. In the studied population, PIC values were 0.195. According to the classification of PIC (low polymorphism if PIC value < 0.25, median if $0.25 < \text{PIC value} < 0.50$ and high if PIC value > 0.50), this *locus* possessed low genetic diversity. The observed N_E (1.28) and the PIC value, indicates a low level of genetic variability in Agerolese breed at the considered *locus*.

Table 3. Genetic indices calculated at *STAT5A/MslI* locus in Agerolese cattle breed

Gene homozygosity (H_O)	Gene heterozygosity (H_E)	Effective allele number (N_E)	Polymorphism information content (PIC)	Fixation index (FIS)
0.75	0.25	1.28	0.195	-0.143

Conclusion

The low level of genetic variability in Agerolese breed found at the considered *locus* may be connected with the strong reduction of number of Agerolese cattle and its restitution on the basis of a very limited number of animals. To look for genetic polymorphisms in small population could be an opportunity to preserve the existing variability.

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Levelled-container: a new utility for determining the testicular volume in small ruminants

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Abstract

This study is conducted to assess the validity of a designed utility, suitable for measuring testicular volume. We describe a beaker, equipped with two vial levels, based on a water displacement method, known as a “levelled container” for measuring testicular volume. Testicular volumes of 47 Boer bucks were measured using two different tools, namely an overflow vessel and a levelled container as the standard and targeted equipment respectively. A Passing-Bablok regression analysis (to assess linearity) and a Bland-Altman method plot were performed to assess the validity of testicular volume measurement of the levelled-container method compared with that from the overflow vessel. The results indicated that the levelled-container is a valid utility and its results have a significant linear association with the estimated testicular volume from the overflow vessel. In conclusion, the levelled container can be recommended as an alternative method to measure testicular volume in goats, particularly because of its ease of use.

Keywords: Levelled container. Testicular volume. Overflow vessel. Water displacement. Animal reproduction

Introduction

Testicular volume can be measured using two main procedures i.e., water displacement based on Archimedes principle (TVw), and testicular dimension methods (Abdullahi et al. 2012). From the point of view of animal welfare, water displacement is more convenient and is therefore applied to assess breeding soundness evaluations (BSE), body condition scores (BCS), semen quality evaluation and gonadsomatic Index (GSI). The particular equipment used to measure TVw are an overflow vessel along with a graduated cylinder. Since this equipment is not designed for measuring TVw on farm, maintaining a level position, handling both pieces of equipment during measuring and reading the volume raises difficulties (Gupta, 2002; Valenstein et al. 2006) and requires at least two trained persons to operate the equipment. Furthermore, the overflow vessel is not a fast method. Despite these limitations, TVw is a beneficial trait to measure in farm animals (Strina et al. 2016), and hence a more user-friendly utility is required. A modified beaker was designed to measure TVw which we term a “levelled container”. Since a reliability assessment of this invented equipment is essential, the present paper provides the results of a pilot study to assess the statistical reliability and validity of the levelled container compared with a conventional overflow vessel used for goat TVw measurement.

Methodology

Fifty-two mature crossed Boer bucks of 18 - 52 months old were used for this experiment. The study was conducted over one season. The farm was located in the Negeri Sembilan state, Malaysia. To conduct the analysis, testicular volume of bucks were recorded three times from each buck at 2-week intervals with both a levelled container and overflow vessel. The tools were filled with 500 ml warm water at 37°C. A specific length of the scrotum was marked to ensure that the equal length of scrotum was immersed in both the tools. To measure TVw the testes were pushed slightly to the bottom of the scrotum.

The levelled container is designed from a 1500 ml plastic beaker with handle, equipped with two bubble level vials. These were attached in a vertical direction perpendicular to each other, in order to track stability in roll and pitch of the beaker vertical axis. The standard equipment, used for the water displacement technique, was an overflow vessel. Both Passing-Bablok regression and Bland-Altman plot procedures were used to test reliability and validity of testicular volume in goats by the levelled container ($\alpha = 0.05$) (Giavarina. 2015) [2]. The regression coefficient was estimated using the Passing-Bablok method, in addition to Bland-Altman plot using MedCalc 15.8 software.

Results and Discussion

The paired *t*-test result did not show a significant ($P = 0.45$) difference between TVw obtained with the levelled container ($M = 268.57$, $SD = 96.48$) and the conventional equipment ($M = 266.17$, $SD = 96.00$). According to Table 1, the estimated slope was 1.00, and the estimated intercept was 0.00 and these results were not significantly different from perfect agreement ($P = 0.57$). A scatterplot with fitted regression line of the levelled container by overflow vessel (Figure 2) and the Bland-Altman plot, exhibited random points (Figure 3) showed a significant relationship between two methods studied. The result demonstrated that the levelled container is a useful and reliable tool for measuring testicular volume in goats.

The non-significant differences between the two methods with regards to measuring TVw, showed extremely similar means (i.e., 268.57 ml for the levelled container and 266.17 ml for the conventional method). Although the means of both pieces of equipment were quite close, the overflow vessel compared to the levelled container, required more time, attention, care and skill, to read the volume accurately.

Table 1. Estimated regression coefficients using a Passing-Bablok regression procedure

	Estimate	Lower bound 95% CI	Upper bound 95% CI
Intercept	0.00	-3.09	12.50
Slope coefficient	1.00	0.96	1.01
Testing* $a = 0$ and $b = 1$			$P = 0.57$

*Regression model is $y = a + bx$, and the P -value is testing for equality of methods ($y = x$)

The estimated coefficient (Table 1) indicates that the slope interval (0.96 to 1.0177) and the intercept interval (- 3.097 to 12.50) contain the values 1 and 0, respectively. Therefore, the slope does not differ from zero and the intercept does not differ from 1. The linear model validity test (Table 1, $P = 0.57$) indicates that there is sufficient evidence to accept the existence of linearity between measured TVw by the levelled container and the overflow vessel.

The random pattern in the Bland-Altman plot represents that although two values were beyond the error limits, the mean difference was very close to zero, indicating no bias in estimates, and there were neither proportional bias nor did higher/lower mean values tend to

have higher/lower differences (Giavarina, 2015). Due to the beneficial value of measuring testicular volume as a measure of fertility, the modified beaker (levelled container) can allow an expanded usage of TVw in the management and selection of bucks (Strina et al. 2016) even for rural farmers.

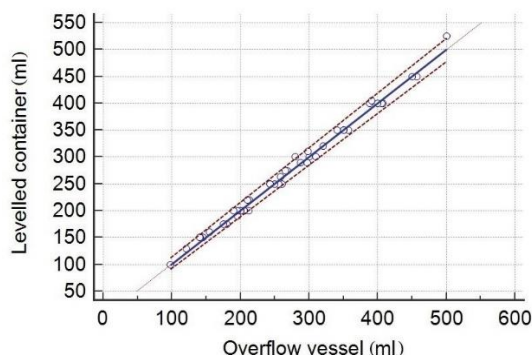


Figure 1. Passing-Bablok regression

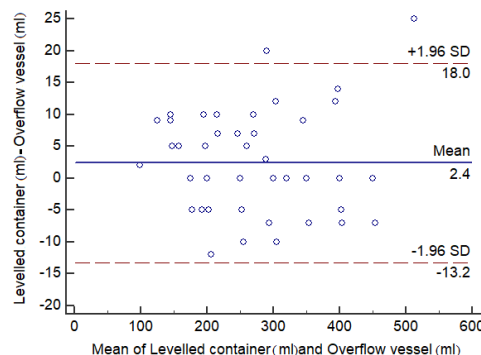


Figure 2. Bland–Altman plots

Conclusion

It is concluded that the evaluation provided here indicates sufficient evidence to introduce the levelled container as a user-friendly alternative for measuring testicular volume in livestock.

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Analysis of technical, economic, and allocative efficiency and factors affecting beef cattle business profit (A case study in Tumpang Sub-district, Malang Regency)

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Abstract

This study was aimed to analyze technical, allocative and economic efficiency as well as the factors affecting beef cattle business profit. The research method used was survey method and the sampling was based on Multistage Purposive Sampling. The number of samples involved was 75 breeders. The data were analyzed by using Cobb-Douglass production function analysis with frontier version 4.1. and multiple regression. The result indicated that technically 80% of breeders had efficiency which was greater than 0.8 meaning that breeders had used input to produce output efficiently. However, the percentage for economic efficiency of beef cattle business was 78.67% which was less than 0.8. Allocative efficiency obtained by 42 breeders (56%) was still below 0.8 with an average efficiency of 0.806. Then, factors affecting beef cattle business profit were feed cost, electricity cost and business scale.

Introduction

Low productivity of cattle can be caused by several factors such as local beef cattle quality decrease due to inbreeding, excessive productive female cattle slaughter and traditional business management. Economic conditions, different knowledge and skills among breeders will affect the decision made by the breeders in allocating the resources owned so that the results obtained will be varied. Serious business management is needed so that the breeders can combine production factors efficiently to maximize the benefits. Technical and economic efficiency achievement in a beef cattle business should consider certain things including feed provided, cages, medicines, breeding and livestock types. The efficiency of technical, allocative (price) and economic from breeders who keep both local and crossed beef cattle has not mapped yet. Therefore, it is necessary to conduct this research in order to provide an overview of the current efficiency conditions in each livestock business. Thus it can be useful for business development. This research was aimed to analyze technical, allocative and economic efficiency as well as factors affecting beef cattle business profit.

Methodology

Multistage purposive Sampling Method was employed in determining the research location. It involved some stages and considered the following aspect. Malang Regency was chosen because it was one of the backbones of beef cattle producers in East Java and it had 240.746 cattle. In 2012, Malang regency was awarded with the title of pioneer of the AI promotion from the Province. Jeru and Benjor villages were chosen as research sample villages because it had more local cattle and cross breeds than the other regions which was about 32%. The data were analyzed by using technical efficiency with Stochastic Frontier Production Function (SFPF) model, FRONTIER version 4.1 program (Aigner et al., 1977). Based on the

results of cost function decrease, the value of allocative and economic efficiency could be calculated.

Result and Discussion

The respondents involved in this study were beef cattle breeders who lived in Benjor and Jeru village, Tumpang Sub-district, Malang Regency. Most respondents were in productive age; 72 farmers (96%) were at the age between 20- 65 years old. In general, the main occupation of respondents was farmer with 47 respondents (62.67%), elementary school graduated (57.33%) (SD). Almost all the respondents had technical efficiency value which was greater than 0.8, so most of the cattle business was technically efficient (Table 1). Index value technical efficiency classified as efficient if large 0,8 (Coelli,1998). It could happen due to the control of small livestock which made it easier to raise the livestock. Small livestock ownership with high technical efficiency could give more opportunities to increase productivity by increasing livestock ownership. However, the calculation of economic efficiency of beef cattle business in Tumpang sub-district which was below 0.50 was 24%. There were only 16 respondents (21.33%) who had good standard economic efficiency (> 0.8). It indicated that farmers were still economically unable to make their livestock business efficient, in the sense that farmers have not succeeded in utilizing the costs for their production needs (Table 2).

Table 1. Distribution of technical efficiency using stochastic frontier production function

Technical Efficiency		
Interval	Amount	Percentage
0.66 - 0.70	1	1.333
0.71 – 0.75	2	3
0.76 – 0.80	12	16.000
0.81 – 0.85	10	13.333
0.86 – 0.90	8	10.667
0.91 - 0.95	12	16.000
0.96 – 1	30	40.000
Total	75	100.00
Average	0.8952	
Minimum	0.6605	
Maximum	1.0000	

The range of allocative efficiency of the respondents between 0.2692 - 1.1801, 42 farmers (56%), was still below 0.80. So it could be said that 56% of farmers were not efficient in utilizing resources to gain profit.

Allocative efficiency still varied between one and other breeders because the utilization of input resources has not been done optimally; livestock business was still not the main business so the management was not well conducted. Meanwhile, factors affecting the business profit of beef cattle were feed cost, electricity cost and business scale with regression coefficient -0.271, -0.260 and 0.561 respectively.

Table 2 Distribution of Allocative and Economic Efficiency Using Stochastic Frontier Production Function

interval	Allocative Efficiency		Economic Efficiency	
	Amount	Percentage	Amount	Percentage
≤ 0.50	13	17.333	18	24.00
0.51- 0.55	6	8.000	4	5.33
0.56- 0.60	5	6.667	7	9.33
0.61- 0.65	2	2.667	5	6.67
0.66- 0.70	5	6.667	7	9.33
0.71- 0.75	5	6.667	7	9.33
0.76- 0.80	6	8.000	11	14.67
0.81- 0.85	10	13.333	5	6.67
0.86- 0.90	5	6.667	8	10.67
0.91- 0.95	5	6.667	3	4.00
0.96- >1.00	13	17.333	0	0
Total	75	100	75	100
Average	0.7315		0.6467	
Minimum	0.2692		0.2393	
Maximum	1.1801		0.9233	

Conclusion

The average technical efficiency of beef cattle business in Tumpang sub-district was 0.8952, breeders who had efficiency value > 0.8 were 60 breeders (80%). Breeders who had economic efficiency value > 0.8 were 16 breeders (21.33%), and 78.67% of their efficiency was <0.8. The majority of breeders (56%) had an allocative efficiency of <0.8. Factors affecting the business profits of beef cattle were: feed costs, electricity costs and business scale.

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Bovine respiratory syncytial virus and bovine viral diarrhea virus antibodies – detection and effect to milk composition in dairy cattle

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Abstract

The objective of this study was to determine the antibody levels of individual cows against bovine respiratory syncytial virus (BRSV) and bovine viral diarrhea virus (BVDV). Moreover, the effect on milk production based on antibody levels were investigated. Serum samples from 220 animals were tested using a competitive ELISA for the presence of antibodies against BVDV and BRSV. Additional data regarding milk composition for some animals were available. The most animals have high antibody levels against BRSV while more than a half of for BVDV. The percentage of animals with high antibody titer were 51.66% and 89.57% for BVDV and BRSV, respectively. In the effect in milk composition, somatic cell count of groups A and B were statistically significant than group C ($P > 0.05$). The somatic cell count of A, B and C levels were 170.43, 197.87 and 438.46, respectively. Other milk composition considered in this study did not show significance among groups. Overall, BVDV and BRSV antibodies were detected in studied population and milk components were not greatly affected by the levels of the antibody for BVDV and BRSV except for somatic cell count.

Keywords: bovine respiratory syncytial virus, bovine viral diarrhea virus, cattle, antibody, ELISA

Introduction

Infections with bovine respiratory syncytial virus (BRSV) (Sacco et al., 2014) and bovine viral diarrhea virus (BVDV) (Stahl and Alenius, 2012) are endemic in the cattle populations in most countries and result in major economic losses. BRSV has an integral role in enzootic pneumonia in young dairy calves and summer pneumonia in nursing beef calves. On the other hand, BVDV cause many disease syndromes in cattle, including respiratory infections, gastrointestinal infections, reproductive failure such as embryonic loss, abortion, and stillbirth (Cornish et al., 2005).

Several methods are available for detection of antibodies against BRSV and BVDV, including virus neutralization tests and different ELISAs, like competitive ELISA. The aim of this study was to detect the antibody levels of individual cows against BRSV and BVDV. Also, the effect on milk production were investigated.

Methodology

Data used in this study were from experimental dairy herd. Total of 816 phenotypic records for milk components were available. Milk components that were included in this study were milk fat, protein, lactose, somatic cell count and milk yield. Serum samples were collected

from 220 normal dairy cattle for detection of antibody levels against BRSV and BVDV. The sera were separated from blood samples and stored at -20°C until they were analyzed.

Analysis for the presence of antibodies against BRSV and BVDV was performed using a competitive ELISAs kits (eBioscience, San Diego, CA, USA) according to the manufacturer's instructions. The optical density (OD) was measured at 450 nm and corrected by subtraction of OD for the negative control antigen. If the OD value was ≥ 0.2 , the sample was classified as positive.

Results and Discussion

The descriptive statistics for milk composition of dairy cattle herd investigated in this study were presented in Table 1. The mean milk fat, protein, lactose, somatic cell count and milk yield were 4.01, 3.39, 4.74, 290.14 and 25.22, respectively.

Table 1. Descriptive statistic for milk composition

Traits	N	Mean	SD	Minimum	Maximum
Milk fat	816	4.01	0.89	1.92	10.23
Milk protein	816	3.39	0.44	2.36	5.38
Milk lactose	816	4.74	0.19	3.66	5.21
Somatic cell count	816	290.14	734.75	5.69	5963.21
Milk yield	816	25.22	7.72	10.10	50.60

The distribution of animals based on OD values against BVDV and BRSV were presented in Table 2. The higher the OD values the lower antibody levels against specific disease. The table shows that most animals have high antibody levels against BRSV while more than half of the animals against in BVDV. The percentage of animals with high antibody titer were 51.66% and 89.57% for BVDV and BRSV, respectively. In BRSV, 22 animals out of 211 have low antibody titer.

Table 2. Number of animals and mean OD value for BVDV and BRSV

Optical density	BVDV		BRSV	
	N	Mean	N	Mean
0 - 0.19	109	0.08	189	0.07
0.20 - 0.59	51	0.41	19	0.23
≥ 0.60	51	0.80	3	0.47

The milk components by antibody titer classification for BVDV were shown in Table 3. The analysis for BRSV was not shown because of high unequal number of animals. The amount of milk fat, protein, lactose and milk yield were almost the same for all category except for somatic cell count. The somatic cell count of groups A and B were statistically significant than group C ($P > 0.05$). The somatic cell count of A, B and C levels were 170.43, 197.87 and 438.46, respectively. However, the mean somatic cell count for all categories indicates uninfected. Park et al., (2016) also investigate the effects of BVDV in the milk composition of dairy cattle. They also found out higher somatic cell count on positive BVDV animals.

Table 3. Analysis of milk composition by antibody levels for BVDV

Traits/Level	A (0 - 0.19)	B (0.20 - 0.59)	C (≥ 0.60)
Milk fat	4.01	4.02	3.76
Milk protein	3.38	3.35	3.25
Milk lactose	4.76	4.76	4.79
Somatic cell count	170.43 ^b	197.87 ^b	438.46 ^a
Milk yield	25.65	24.57	26.58

* $P > 0.05$

Explaining the association between BVDV pathogenesis, milk fat, protein, lactose and milk yield and somatic cell count cannot be definitively determined using cross-sectional studies like the one presented here. Only longitudinal studies following cows over longer periods of time, measuring new infections and progression of infections and the immune function will yield definitive answers to many of the questions raised above.

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