



Effect of Ammoniated Corn Cob Feeding on the Performance of Brahman Cross Cattle

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Abstract | In Indonesia, the cost of feed for livestock industry is increasing day by day and now researchers are trying to use agriculture waste to overcome the scarcity of feed. In current experiment, corn cobs, an agriculture waste, were ammoniated with urea and used in the feed of Brahman cross cattle to determine their effects on the performance. This research was conducted between October and December 2021, involving Brahman cross cows (n=9) aged 8-12 months. The study utilized a randomized block design (RBD) with three treatments and three groups. The treatments administered were as follows: P0: 80% basal feed + 20% corn cobs without ammonia (0% urea), P1: 80% basal feed + 20% ammoniated corn cobs (2.5% urea), and P2: 80% basal feed + 20% ammoniated corn cobs (5% urea). The variables observed included body weight gain, feed consumption, feed conversion, and income over feed cost (IOFC). The results indicated that there were no significant differences in feed consumption (P0: 7.38 ± 1.26 kg; P1: 7.32 ± 1.47 kg; P2: 7.26 ± 2.10 kg), body weight gain (P0: 0.85 ± 0.16 kg; P1: 0.97 ± 0.13 kg; P2: 0.90 ± 0.23 kg) and feed conversion (P0: 8.79 ± 1.62; P1: 7.56 ± 1.22; P2: 8.04 ± 0.35) among the treatments P0, P1, and P2, respectively; however IOFC was higher (p<0.05) in P1 (Rp. 34.054) and P2 (Rp. 30.620) as compared to P0 (Rp. 28.635) groups. These results demonstrated that the ammoniated corn cob addition in the ration of Brahman cross cattle is beneficial in terms of improved IOFC

Keywords | Ammoniation, corn cob, feed intake, body weight gain, Brahman Cross cattle

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INTRODUCTION

The need for meat in Indonesia is increasing every year along with population growth and public awareness of nutrition from animal protein. However, this is not matched by the availability of domestic beef production, so that the shortage is met by importing cattle. According to the [Director General of Animal Husbandry \(2021\)](#) the demand for cattle and buffalo meat in Indonesia in 2021 was about 696,956 tons, while the availability of this meat was 473,814 tons (67.98%), resulting in a shortage of beef supply of 223,142 tons (32.02%). Among beef cat-

tle, Brahman cross cattle is very important as it have high productivity and resistance to high temperatures ([Isnaini et al., 2022](#)).

One of the main factors that is very important in livestock business is feed, considering that the most spent in livestock business is the cost of feed, which is around 60-70% of the total production cost. However, in the livestock business, the availability of feed ingredients is still a problem. In line with that, the use of agricultural waste is an option to overcome the problem of the need for animal feed. One of the agricultural wastes that can be used as animal feed is

corn cobs (Mierlita et al., 2001; Fitria et al., 2019).

According to Central Bureau of Statistics of Lampung Province (2021), corn production in Lampung is 1,502,800 tons. Corn cob is an agriculture waste of corn crop and has no any proper use. It has great potential as an alternative feed ingredient because it is widely available and cheap, and its potential use as a feed will save the environment (Kanengoni et al., 2015). However, corn cobs have poor quality to be used as animal feed because they have low protein content and high crude fiber, so it is necessary to carry out an ammoniation process to increase the nutritional value and digestibility of corn cobs (Fitria et al., 2021). Ammonia treatment of agricultural waste can loosen lignocellulosic and lignin hemicellulose bonds making it more easily digested by rumen microbes, as well as increasing its nitrogen content (Komar, 1984). Therefore current study was designed to investigate the effect of ammonia treated corn cob feeding on the performance of Brahman cross cattle.

MATERIALS AND METHODS

STUDY DESIGN

This research was carried out from October to December 2021 which took place at the Maju Sejahtera KPT, Wawasan Village, Tanjung Sari District, South Lampung Regency, Indonesia. The study used Brahman cross cows (n=9) aged 8-12 months which were divided into the 3 treatment groups. The rations used were corn cobs, cassava peels, jenjet, elephant grass, soybean meal, palm oil meal, cassava, molasses, urea, and water. The design used was a randomized block design (RBD) consisting of 3 treatments and 3 groups. The treatments given were P0: 80% basal feed + 20% non ammoniated corn cobs (0% urea), P1: 80% basal feed + 20% ammoniated corn cobs (2.5% urea), and P2: 80% basal feed + 20% ammoniated corn cobs (5% urea). Corn cobs were chopped into small pieces (about one cm length) and ammoniation was carried out as described in earlier study (Oji et al., 2007). After treatment corn cobs were stored in anaerobic conditions for 21 days. Nutritional content of ammoniated corn cobs were expressed in Table 1.

VARIABLES STUDIED

The variables observed in this study were body weight gain, feed consumption, feed conversion, and income over feed cost (IOFC).

Body weight gain: Body weight gain was calculated by estimating the difference between the final body weight and

the initial body weight (Pitono et al., 2014).

Feed intake: Feed intake was calculated as a difference between the amount of feed given and the amount of feed left (Diki, 2008).

Feed conversion: Feed conversion was calculated by dividing the amount of feed consumed with body weight gain in unit time (Diki, 2008).

Income over feed cost (IOFC): Income over feed cost (IOFC) was calculated by subtracting the cost of rations during rearing from the revenue achieved from the selling of cattle (Kasim, 2002).

STATISTICAL ANALYSIS

The data obtained was tested with Analysis of Variance (ANOVA), however IOFC was tested descriptively. If the ANOVA results show a significant effect, then it was tested further with the Least Significant Difference (LSD) test at the 5% level.

RESULTS AND DISCUSSION

FEED INTAKE

The results presented in Table 2 showed that the feeding of ammoniated corn cobs had no significant effect ($P>0.05$) on the feed intake of Brahman cross cattle. This is presumably due to less variation in feed between treatment rations, so that the average feed intake was almost the same. This is in accordance with Soeharsono et al. (2010) who state, feed intake will remain the same if there is less variety of feed, because it cannot affect the cow's appetite. Palatability is affected by different types of feed that make up different rations and nutrients, causing differences in the amount of feed consumed by livestock (Musrifah et al., 2011; Wachirapakorn et al., 2016).

The results show that the average feed consumption was highest in the treatment ration using non ammoniated corn cobs (P0) i.e., 7.38 ± 1.26 kg/day compared to the treatment ration using ammoniated corn cobs (P1 and P2) 7.32 ± 1.47 kg/day and 7.26 ± 2.10 kg/day respectively. This is not in accordance with McDonald et al. (1995) who reported that fermented feed is more easily digested by the enzymes of microorganisms due to the decomposition of crude fiber bonds. Feed with high digestibility usually stays in the rumen for a shorter time so that the rumen empties more quickly and can be filled with new feed. This is presumably because the body weights of the experimental cows in the treatment rations P1 and P2 were quite different so that their feed requirements were also quite different. Factors that affect the amount of feed needed by livestock include type of livestock, age, phase (growth, ma

Table 1: Nutritional content of ammoniated corn cobs with different levels of urea

Sr.No.	Urea doses (%)	Nutrient Content (%)*						
		Dry matter	Crude Protein	Crude Fat	Crude Fiber	Ash	NFE	TDN
1.	0	90	3	0.5	36	2	48.5	48
2.	2.5	89	6.9	0.4	21.2	12.1	48.4	69.4
3.	5	88.5	8.4	0.4	21.6	16.4	53.2	72.1

*NFE: Nitrogen Free Extract; TDN: Total Digestible Nutrients

Table 2: Effect of ammoniated corn cobs on the Feed Intake of Brahman Cross cattle

Treatments*	Cattle			Mean±SEM
	1	2	3	
	----- (kg/day)-----			
P0	6.15	7.33	8.67	7.38±1.26 ^{NS}
P1	6.42	6.52	9.02	7.32±1.47 ^{NS}
P2	5.29	7.02	9.46	7.26±2.10 ^{NS}

* P0: 80% basal feed + 20% non ammoniated corn cobs (0% urea); P1: 80% basal feed + 20% ammoniated corn cobs (2.5% urea); P2: 80% basal feed + 20% ammoniated corn cobs (5% urea); NS: Non Significant

Table 3: Effect of ammoniated corn cobs on the Body Weight Gain of Brahman Cross cattle

Treatment*	Cattle			Mean±SEM
	1	2	3	
	----- (kg/day)-----			
P0	0.84	0.70	1.02	0.85±0.16 ^{NS}
P1	1.04	0.82	1.05	0.97±0.13 ^{NS}
P2	0.66	0.91	1.13	0.90±0.23 ^{NS}

* P0: 80% basal feed + 20% non ammoniated corn cobs (0% urea); P1: 80% basal feed + 20% ammoniated corn cobs (2.5% urea); P2: 80% basal feed + 20% ammoniated corn cobs (5% urea); NS: Non Significant

Table 4: Effect of ammoniated corn cobs on the Feed Conversion rate of Brahman Cross cattle

Treatment*	Cattle			Mean±SEM
	1	2	3	
P0	7.32	10.53	8.51	8.79±1.62 ^{NS}
P1	6.20	7.94	8.56	7.56±1.22 ^{NS}
P2	8.00	7.71	8.41	8.04±0.35 ^{NS}

* P0: 80% basal feed + 20% non ammoniated corn cobs (0% urea); P1: 80% basal feed + 20% ammoniated corn cobs (2.5% urea); P2: 80% basal feed + 20% ammoniated corn cobs (5% urea); NS: Non Significant.

Table 5: Income Over Feed Cost (IOFC) of Brahman Cross cattle given ammoniated corn cobs.

Treatment*	Cattle			Average
	1	2	3	
	----- (Rp/day)-----			
P0	29.748	21.649	34.509	28.635
P1	38.198	28.420	35.544	34.054 [#]
P2	22.380	31.568	37.913	30.620 [#]

* P0: 80% basal feed + 20% non ammoniated corn cobs (0% urea); P1: 80% basal feed + 20% ammoniated corn cobs (2.5% urea); P2: 80% basal feed + 20% ammoniated corn cobs (5% urea).

[#] Significantly higher than P0 group at p<0.05.

^{##} Significantly higher than other groups at p<0.01.

turity, pregnancy, lactation), body condition (normal, sick), climate where livestock live (temperature, humidity), and body weight of cattle (Winugroho, 2002; Arwinsyah et al. 2018).

BODY WEIGHT GAIN

The results of the study regarding the effect of adding ammoniated corn cobs on body weight gain of Brahman Cross cattle can be seen in Table 3.

The results showed that the administration of ammoniated corn cobs had no significant effect ($P > 0.05$) on body weight gain of Brahman cross cattle. This is due to the less variety of feed and nutritional content that is not much different, so that the body weight gain of the experimental cows is not much different or almost the same. This is in accordance with the statement of Parakkasi (1995), the level of feed intake can be used as an indicator of the level of production that can be achieved by livestock. If the consumption capacity is not much different, we can be sure that the production level will be almost the same. The National Research Council (2006) adds that the factors that affect the body weight gain of livestock are the amount of protein consumed each day, age, type of livestock, climatic conditions, the condition of each individual (healthy, sick), and livestock management.

The results show that experimental cattle with treated rations using ammoniated corn cobs (P1 and P2) gave a higher average body weight gain than experimental cattle with treated rations using non ammoniated corn cobs (P0), although feed consumption in cattle with P0 treatment ration was higher than in experimental cows with other treatment rations. This is presumably because ammonia treatment can increase the digestibility and crude protein content of corn cobs consumed by experimental cows, so that more nutrients can be digested by the body than treatment rations that use corn cobs without ammonia treatment. The results of Astuti (2004), indicated the highest average daily gain (ADG) of sheep in the treatment ration using 2.5% ammoniated corn cobs of 51.48 g/day, while the lowest ADG was in the treatment ration using corn cobs without ammonia treatment that is equal to 38.5g/day. Munier et al. (2021) used the fermented corncob feed and reported increased daily weight gain of cattle by 0.75 ± 0.02 kg/head/day.

FEED CONVERSION

The results presented in Table 4 showed that the ammoniated corn cobs had no significant effect on the feed conversion of Brahman cross cattle. This is presumably because the feed consumption and body weight gain of the experimental cattle did not have a significant effect, so that the feed conversion results also found non-significant.

According to Bogart (1977), feed conversion is how much feed is consumed by livestock to produce one kilogram of body weight gain. Therefore, the lower the feed conversion number, the more efficient the use of feed, conversely, the higher the feed conversion number, the more inefficient the use of feed by livestock. The results of the current study showed that the average feed conversion was lowest in the P1 and P2 treatment rations i.e., 7.56 ± 1.22 per day and 8.04 ± 0.35 per day respectively compared to the P0 treatment ration (8.79 ± 1.62 per day). This is presumably because the ammonia treatment can reduce the crude fiber content and increase the nitrogen content in the corn cobs, so that the digestibility of the corn cobs given to the experimental cows increases. Therefore, the nutrients that can be absorbed by the animal's body are more than corn cobs without ammonia treatment. So it can be concluded that the efficiency of the treatment ration using ammoniated corn cobs (P1 and P2) was better than the treatment ration using non ammoniated corn cobs (P0). This is in accordance with Amin et al. (2018), who reported that factors that affect the efficiency of feed use include age, feed quality, and body weight. The better the quality of feed, the better the efficiency of use of feed by livestock. Astuti (2004), obtained the lowest average feed conversion (i.e., 6.72) for sheep in the treatment ration using 2.5% ammoniated corn cobs, while the highest average feed conversion was in sheep with treatment rations using corn cobs without ammonia was 8.62.

INCOME OVER FEED COST (IOFC)

The results of the study regarding the effect of ammoniated corn cobs on IOFC of Brahman cross cattle can be seen in Table 5. The results exhibited that the ammoniated corn cobs has an effect on IOFC in Brahman cross cattle. This is presumably because the ammonia treatment can increase the digestibility and protein content of corn cobs, so that the nutrient content of ammoniated corn cobs is more digested by the body than non-ammoniated corn cobs as a result, the body weight gain of experimental cows that consume ammoniated corn cobs was higher than that of control cows who consumed non ammoniated corn cobs (Table 3), thus affecting the results of IOFC. The profit of animal husbandry will be better when the IOFC getting higher. Our research results indicated that treatment ration that uses ammoniated corn cobs has a better efficiency value than the treatment ration that uses non ammoniated corn cobs.

CONCLUSION

Based on the research results obtained, it can be concluded that the ammonia corn cob treatment in the ration had no effect on feed consumption, body weight gain, and feed conversion, however it increased the IOFC in Brahman

CONFLICT OF INTEREST

The authors have declared no conflict of interest.

NOVELTY STATEMENT

The main objective of this research work was to find out the impact and the best dose of urea in the administration of ammoniated corn cobs on feed intake, body weight gain, and feed conversion of Brahman cross cattle.

AUTHORS CONTRIBUTION

All authors worked equally, KA designed research and drafted manuscript, MTS and Lm collected, tabulated, and analyzed data, AQ and KA critically reviewed and revised final manuscript. All authors have read and agreed to the published version of the manuscript.

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