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Research Article

Evaluation of Growth Performance, Feed Conversion Ratio and Survival Rate of Juvenile Milkfish *Chanos chanos* (Forsskal, 1775) Treated By Giant Grouper Recombinant Growth Hormone.

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Abstract

The problems of milkfish culture are slow growth and limited availability of good seeds. This study was aimed to evaluate the growth performance, feed conversion ratio and the survival rate of juvenile milkfish treated by Giant Grouper Recombinant Growth Hormone (rElGH). Two weeks juvenile were used, stocked at 112 fish/60 litre, and reared for 76 days. This experiment was conducted with six treatments: K- (without the addition of rElGH, egg yolk, and *phosphate buffer saline*), K + (without the addition of rElGH, but egg yolks added, and *phosphate buffer saline*), addition of rElGH to the feed (mg / kg of feed) at doses of 3 (P1), 6 (P2), 30 (P3), 60 (P4) with individual replications on each treatments. The results showed that the addition of rElGH had a significant influence on the specific growth rate, absolute weight growth, absolute length growth, and feed conversion ratio. However, no significant effect on survival rates. The best treatment is addition of rElGH by 6 mg / kg of feed with a specific growth rate increasing 2,01% per day, absolute weight 21%, absolute length 39,4%, and feed conversion ratio is lower 42% compared to negative control.

Keywords: Recombinant Growth Hormone, *chanos chanos*, Growth Performance, Seeds

1. Introduction

Milkfish (*Chanos chanos*) requirement has increased every year, not only for domestic but also foreign consumption. Based on data DKP, 2015 reported that milkfish production in Lampung Province increased about 45% from 5795.34 tons to 8413.73 tons between 2012 and 2015 (Marine and Fisheries Ministry Lampung Province, 2015). Furthermore, based from DJPB, 2015 milkfish production not only for domestic demand, becaused around 15 percent has exported especially for Philippines requirement. Milkfish required for domestic in 2015 reached 1,2 million tons, therefore at the same times milkfish required around 7,2 million tons to recovered domestic and foreign consumption (Ministry of Marine Affairs and Fisheries Republic of Indonesia, 2015). However, there are several problems during milkfish culture like slow growth

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and limited availability of good seeds (Winarsih *et al*., 2011). Therefore, a study is needed to solve these problem through application of recombinant growth hormone.

Recombinant growth hormone derived by a polypeptide consisting of a series of single-chain amino acids with size about 22 kDa has produced in the front pituitary gland with pleiotropic function in vertebrate animals (Acosta *et al*., 2009; Rothan *et al.,* 2014). Rousseau & Duofur (2007) reported that growth hormone has an important role in the regulation of body growth and development, but also affected the reproduction, immunity, and osmoregulation in *teleostei* animals. One of product from recombinant growth hormone is rFGH (recombinant fish growth hormone) that produced by mechanism of genes combination that cloned by outside body with help of transformed cells. Growth genes from the target fish are isolated and transformed with help of microbes, such as *Escherichia coli, Bacillus, Streptomyces, and Saccharomyces* (Rothan *et al*., 2014). Production of rFGH which is better known as rGH in Indonesia has been done by construction derived from carp (*Cyprinus carpio* recombinant growth hormone) (rCcGH), gouramy (*Osphronemus goramy* recombinant growth hormone) (rOgGH), and grouper (*Ephinephelus lanceolatus* recombinant growth hormone) (rElGH).

The growth hormone of rElGH has the best biological bioactivity value that can improve the growth performance of tilapia (Alimuddin *et al*., 2010). This is one of reason using the rElGH in this study. Based on the three methods of rElGH application, the best method which is quite applicable for seed stage is by feeding (oral) method. So far, there is none information of application hormone rElGH for growth performance of milkfish by the oral method, so it is needed to conduct research on addition of rElGH for milkfish to increase the growth performance, feed conversion ratio, and survival rate. This research was aimed to evaluate at least there is an effect from the different rElGH dose of growth performance, feed conversion ratio, and survival rate of juvenile milkfish.

2. Materials and Methods

2.1 Rearing Experiments and Research Materials

Milkfish seeds has cultivated for 76 days, this study used of age 2 weeks seeds with stocking density 112 fishes/60 litre. Sampling was conducted on first day cultivated, and continued once every 2 weeks by random sampling. The samples used milkfish seeds which kept from 6 treatment tanks, each treatment taken 20 fishes. Fish samples are placed into a basin filled with water and anesthetized with clove oil dose 3cc, then sample has measured length and weight. Fish was fed with commercial pellet feed that contains 40% protein at a satiation level three times daily.

2.2 Growth Performance Measurements

Sampling was done on first day cultivated and continued once every 2 weeks and also on the last day of cultivation by random sampling. Growth performance data was taken by measuring length and weight of the fish with ruler and digital scale of 20 fishes in each treatment.

2.3 Feed Conversion Ratio

Feed conversion is an indicator to find out the effectiveness of feed has utilized by aquatic organisms by calculated total of feed that given during the reasearch and divided the weight of fishes at the beginning and end of the reasearch also the dead fishes.

2.4 Survival Rate

Survival rate was observed every day where survival rate was percentage of number fishes that lived at the end of the study and the number of fish at the beginning of the study.

2.5 Analysis Data

Growth performance data were analyzed quantitatively with Microsoft Excel 2013 software applications, and SAS 9.4 statistical data processing with a 95% confidence level, then if significantly different proceed with the Duncan test. Whereas the feed conversion ratio and survival rate data were analyzed descriptively.

3. Results and Discussion

3.1 Growth Performance

Treatments of different rElGH doses was significantly affected the specific growth rate, growth in weight and absolute length ($P < 0.05$). Judging from the value of Prob> F 0.001 this indicates that the experiment was carried out 10,000 times, only one trial failed. The highest specific growth rate, is at P2 treatment that obtained 2.01 ± 0.03% / day, then in the P3 treatment the specific growth rate was obtained at 1.95 ± 0.01% / day, then K- obtained at 1, 77 ± 0.01% / day, while P1 and P4 were 1.73 ± 0.02% / day, and 1.71 ± 0.03% / day respectively. The lowest result was at the K + treatment was obtained 1.68 ± 0.08% / day. The results of absolute weight growth parameter, the highest during the study was in the P2 treatment that obtained at 15.1 ± 0.49 g, in the P3 treatment the weight growth was obtained of 14.1 ± 0.21 g, while in the treatment of K-, P1, and P4, respectively obtained 11.9 ± 0.22 g, 11.4 ± 0.28 g, and 11.2 ± 0 , 40 g. The lowest result was obtained at K + treatment which is 10.8 ± 0.08 g. Meanwhile, the highest growth of absolute length fishes during the study was in the P2 treatment of 6.52 ± 0.49 cm, then the P3 and P1 treatments was same results were obtained, 5.24 ± 0.47 cm and 5.24 ± 0.16 cm. The absolute length results of P4 and K + treatments were obtained 4.86 ± 0.58 cm, and 4.73 ± 0.39 cm, respectively. The lowest results was obtained at the K-treatment which 3.95 ± 0.64 cm.

3.2 Feed Conversion Ratio

The results of feed conversion ratio showed that (Figure 1.) the highest K + and P1 treatments obtained respectively were 2.46, and 2.44 while in the P2 treatment the lowest results were 1.43. Furthermore, in the K- and P4 treatments obtained the same feed conversion ratio value is 2.18, and the P3 treatment was obtained for 1.48.

3.3 Survival Rate

The Reults of parameters survival rate showed that (Figure 2.) were obtained are not significant. The data obtained cannot be statistically tested so it cannot be further tested. The average of survival rate milkfish seeds for this study during 76 days from 6 treatments was reached 96,88%.

Discussion

Based on this studies, the treatment of rElGH dose 6 mg / kg of feed and also treatment of r-ElGH 30 mg / kg has increased growth performance of milkfish. This is proved by the results of specific growth, weight growth, and also length growth of milkfish that increased compared to negative controls. The treatment of rElGH dose 6 mg / kg of feed has increased the growth performance of milkfish obtained 3,31% compared to negative controls, this results was lower compared to similar studies of application r-ElGH of snakehead. Vahira (2019) was reported addition of r-ElGH has increased growth performance of snakehead obtained 5,04% compared to control treatment. However, comapred to the other results studies of application r-ElGH of growth performance eel fish was obtained 1,78% compared to control treatment (Handoyo,2017) it was lowest compared to the results of milkfish studies.

The mechanism of growth hormone at influencing the growth performance and milkfish feed conversion ratio was through the IGF-1 (Insulin-like Growth Factor) the mechanism which stimulates milkfish to absorb food efficiently which is proven by increased the specific growth rate result of 2.01% compared to negative

control, absolute weight growth was 21% compared to negative control, absolute length growth was 39.4%, and the value of feed conversion ratio was lower by 42% compared to negative control. Addition of rElGH by oral method in this study was improved feed efficiency, so rElGH hormone has influenced at the value of milkfish feed conversion. The low amount of feed conversion in the treatment of r-ElGH dose of 6 mg / kg and 30 mg / kg of feed is related to the ability of rElGH in protein synthesis, so milkfish that given rElGH at a dose of 6 mg / kg of feed and 30 mg / kg of feed have greater ability in digesting food, absorbing nutrients, and more for convert the proportion of food to form fish body composition (Debnath, 2010).

The specific growth rate parameters, absolute weight and length growth, also survival rate and feed conversion ratio that given at 60 mg / kg of feed was not produce a better increase compared to dose of 6 mg / kg of feed. Meanwhile, based on statistical tests with a confidence level of 95%, it showed that the negative control treatment was not significantly different from the highest dose treatment, 60 mg / kg of feed. This phenomenon occurs because the dose of rElGH at a dose of 60 mg / kg of feed causes over stimulation or has antagonistic properties which results in the inhibition of GH secretion by the gland. This case happened because, besides to stimulating increased growth in target organs, rElGH consumed by milkfish also gives negative feedback for pituitary gland to stimulate somatostatin and inhibit the action of GH (Wong *et al*., 2006). Then addition of rElGH dose must be appropriate, because if IGF-1 content is excessive it can give negative feedback to the gland for stopped secrete GH (Moriyama & Kawauchi, 2001), and if it is deficient, then growth is relatively slow. Exponential periods of milkfish growth occur at age 2-3 months, it is suspected that the growth of milkfish can still increase after 3.5 months of milkfish.

Whereas, at sex differentiation of milkfish was still difficult to analyze the gonad cells, it is suspected that the milkfish is at the differentiation period so it needs to takes a long time from 3.5 months to be able analyze the milkfish gonad cells. In the observation of gonad cells, there is a phenomenon of the begin of appearance somatic cells surround the gonads that have not clearly seen. Then there are appearance of primary oocytes in the gonads. Primary oocytes will develop into follicles which are develop into female gonads and male gonads was not found. Based on this phenomenon, it cannot be found out for differentiation of milkfish and the possibility of milkfish at the age of 3.5 months was female sex.

4. Conclusion

In sumarry the addition of rElGH had a significant influence on the specific growth rate, absolute weight growth, absolute length growth, and feed conversion ratio. However, no significant effect on survival rates. The best treatment is addition of rElGH by 6 mg / kg of feed with a specific growth rate increasing 2,01% per day, absolute weight 21%, absolute length 39,4%, and feed conversion ratio is lower 42% compared to negative controls.

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TABLE AND FIGURE

Table 1. Growth performance parameters (mean ±SD) of milkfish (*Chanos chanos*) fed on commercial pellet feed for 76 days in Tank of Rearing Universitas Lampung.

Parameter	Treatments					
	K-	K+	P1	P2	P3	P4
Spesific growth rate (SGR)	1,77 ±0,01^{c}	1,68 ±0,08^{e}	1,73±0,02^{cd}	2,01 ±0,03^{a}	1,95 ±0,01^{b}	1,71 ±0,03^{de}
Absolute weight growth (AWG)	11,9 ±0,22^{c}	10,8 ±0,08^{d}	11,4 ±0,28^{cd}	15,1 ±0,49^{a}	14,1±0,21^{b}	11,2±0,40^{d}
Absolute length growth (ALG)	3,95 ±0,649^{c}	4,73 ±0,39^{bc}	5,24 ±0,16^{b}	6,52 ±0,49^{a}	5,24 ±0,47^{b}	5,24 ±0,16^{bc}

Description: K-(Negative control), K+(Positive control), P1(r*El*GH dose 3mg/kg feed), P2(r*El*GH dose 6mg/kg feed), P3(r*El*GH dose 3omg/kg feed), P4(r*El*GH dose 60mg/kg feed). Different superscripts in the same column shows that there are significant differences (p >0.05).

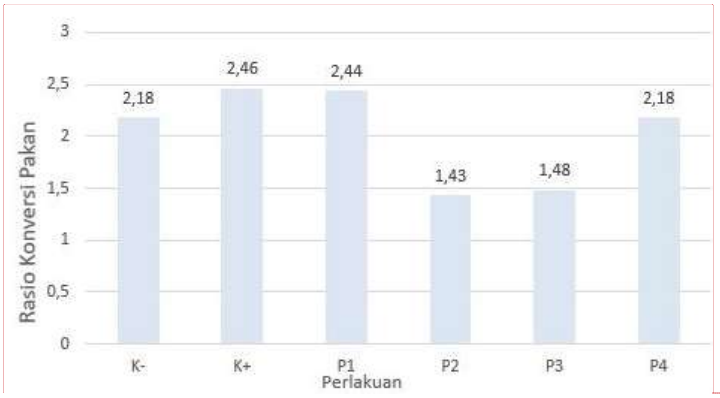

Figure 1. Feed Conversion Ratio of milkfish (*Chanos chanos*) fed on commercial pellet feed for 76 days.

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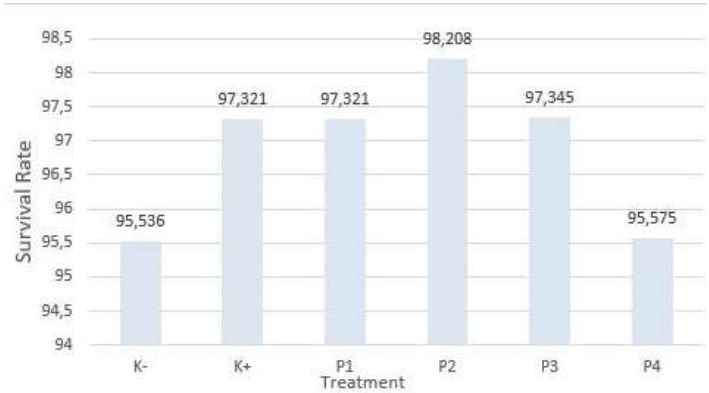

Figure 2. Survival rate of milkfish (*Chanos chanos*) for 76 days in Tank of Rearing Universitas Lampung