Study of Different Protein Content of Feeding of Local Raw Materials on Gourami Fish (Osphronemus goramy Lac.) Aquaculture Performance

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Abstract. Gourami (Osphronemus goramy Lac.) is one of the freshwater fish commodities that has high economic value because of its delicious meat taste which is very popular with all people. However, the feed commonly used by carp cultivators is factory-made feed, namely commercial feed which usually costs quite a bit because some of the ingredients for commercial feed are imported from abroad. Therefore, it is necessary to find a solution to reduce the cost of aquaculture production by replacing commercial feed with homemade feed made from local raw materials. The purpose of this study was to examine the use of local raw materials formulated to make feed suitable for the growth of gourami and to analyze the cost of producing carp feed made from local raw materials. This study consisted of 4 treatments and 3 replications using a completely randomized design (CRD). The treatments consisted of treatment A (Protein 30\%), B (Protein 33\%), C (Protein 36\%), and D (Commercial). The results of this study showed that the treatment of feed A, B, and C produced the same growth as commercial feed, and treatment of feed A resulted in the lowest cost of feed production compared to other treatments.

1. Introduction

Gourami is a fish native to Indonesian waters that is well known by all people. This fish has a high economic value because of its delicious taste. The production of gourami is relatively limited and the price is expensive due to the long maintenance period up to 1-2 years to be harvested and consumed \[1\]. The largest component in aquaculture activities is feed which supports the survival and growth of fish, but buying feed takes 50-70\% of production costs \[2\]. For this reason, using an alternative with homemade feed using local raw materials to reduce production costs for cultivation activities is a solution that is worth trying. This study aimed to examine the use of local raw materials that are formulated to make feed that is suitable for the growth of carp in terms of growth parameters and analyze the cost of producing carp feed.
2. Material and methods

2.1. Sample preparation

The materials used in this study for feed were catfish waste flour, corn flour, soybean meal flour, rice bran flour which were mixed and confirmed the protein content by proximate analysis. These materials were obtained from the Faculty of Agriculture, University of Lampung. The gouramy fish used came from the Mina Agung Lestari Fish Aquaculture Group, Lampung with a size of 5 grams and 1-3 cm. The design used in this study was a completely randomized design (CRD) consisting of four treatments with three replications so that there were 12 experimental units, while the treatments used were as follows: Treatment A: feed with 30% protein content, Treatment B: feed with 33% protein content, Treatment C: feed with 36% protein content, Treatment D: control with commercial feed. Each treatment was filled with 30 fish. The feed given during maintenance was pellet feed with a frequency of three times a day at 07.00 am, 12.00 noon and 17.00 pm. For growth sampling, it was done by taking as much as 30% of the total population in the research container, the gourami body weight was calculated using digital scales with an accuracy of 0.01 and sampling is done once every 10 days.

2.2 Research parameter calculation

Observations of proximate analysis, survival rate, growth length and FCR (Food Conversion Ratio) carried out at the beginning and end of the study. Weighing of the test fish was carried out every 10 days using a measuring instrument in the form of a scale. According to previous study, the formula for calculating the weight gain of the test fish was as follows [3]:

\[ W = W_t - W_0 \]

\[ W \]: Weight growth (gram)
\[ W_t \]: Final average weight (gram)
\[ W_0 \]: Initial average weight (gram)

The number of dead fish was counted every day until the end of the study. According to previous study the survival rate of fish was calculated using the formula [3]:

\[ SR = \frac{N_t}{N_0} \times 100\% \]

\[ SR \]: Survival rate (%)
\[ N_t \]: Final number of fish (fishes)
\[ N_0 \]: Initial number of fish (fishes)

FCR was the amount of feed (kg) required to produce 1 (kg) of fish meat in aquaculture. The feed conversion formula was as followed [4]:

\[ FCR = \frac{F}{(W_t + W_d) - W_0} \]

\[ FCR \]: Feed Conversion Ratio
\[ F \]: Amount of feed given (g)
\[ W_0 \]: Initial weight (g)
\[ W_t \]: Final weight (g)
\[ W_d \]: Weight of death fish (g)

Parameters observed and measured were temperature, pH, and DO. Water quality measurements (temperature, pH and DO) were carried out once every day for 15 days of maintenance. The feed cost was obtained by multiplying the feed conversion by the feed price for each treatment. The growth parameter data were analyzed first using normality and homogeneity tests, if the data were normally distributed and homogeneous, the next test was using the variance system (ANOVA) at a 95% confidence level. If the results were significantly different in the analysis, then a further test was carried...
out with the DUNCAN test at a 95% confidence level, while descriptive analysis was carried out on water quality.

3. Result and discussion
The results of the proximate test of the test feed can be seen in Table 1. The results of the proximate test showed that there were differences in the protein content of the feed with different amounts. Based on the quality standard of feed for gourami, the treatment feed in this study was in accordance with the quality of fish feed issued by the National Standards Agency [5].

| No. | Parameter | Treatment | Optimum Value |
|-----|-----------|-----------|---------------|
| 1.  | Air (%)   | 7.79      | 7.02          | 7.76          | 11 – 13 | Max 12° |
| 2.  | Protein (%) | 28.01     | 31.42         | 35.39         | 31 – 33 | Min 32° |
| 3.  | Lemak (%) | 7.05      | 3.63          | 6.62          | 3 – 5   | Min 6°  |
| 4.  | Abu (%)   | 11.03     | 11.43         | 11.11         | 10 – 13 | Max 13° |
| 5.  | Serat (%) | 3.92      | 3.71          | 4.51          | 4 – 6   | Max 6°  |

Source: [5]

The weight growth of gourami could be seen in the Figure 1. Based on the results of the variance test at the 95% confidence level, it showed that treatments A, B, C and D did not have a significant effect on absolute weight growth (p> 0.05). Growth or body tissue formation was strongly influenced by balance of feed nutrients such as protein and energi [6]. From this statement it could be assumed that the nutrient balance in treatment A, B and C diets had the same nutrient balance as treatment D feed.

![Figure 1. Weight growth of gourami in this study](image)

The daily growth rate of gourami showed in the Figure 2. Based on the results of the variance test at the 95% confidence level, it showed that treatments A, B, C and D did not have a significant effect on the daily growth rate (p> 0.05). Hasan and Khan (2013) stated that the addition of non-protein nutrients as energy producers could balance feed nutrients so as to increase fish growth. From the statement above, it was related to the daily growth rate that the nutrients contained in the feed treatments A, B and C are the same as the nutrients in feed D.
The ratio of gourami feed conversion could be seen in the Figure 3. Based on the results of the variance test at the 95% confidence level, it showed that treatments A, B, C and D did not have a significant effect on the feed conversion ratio (p > 0.05). The value of the feed conversion ratio was influenced by several factors including the nutrient content and amount of feed given, as well as the cultivation environment [8]. This statement was in line with the results of the feed conversion ratio, which was not significantly different, so that the A, B and C treatment feeds had the same nutritional content as the D treatment feed.

The survival rate of gourami could be seen in the Figure 4. From the data obtained, it was known that there were no deaths in this study. Environmental conditions of water quality could affect survival, if the environmental conditions of water quality were poor it could affect the appetite of fish so that most of the feed given would settle and caused diseases that made the survival rate lower. [9].
Figure 4. Survival rate of gourami in this study

The water quality in the gourami in this study could be seen in Table 2. Water quality was one of the supporting factors for success in fish farming. Water quality was a physical and chemical factor that could affect the environment of the maintenance media and indirectly was a description of the effect of treatment [10]. From the water quality results, temperature, pH and DO were in optimal value because the water quality values obtained were in the recommended optimal range.

Table 2. Water quality parameter in gourami pond during research

| No. | Parameter       | Treatments | Optimum Value |
|-----|-----------------|------------|---------------|
| 1.  | Temperature (°C) 27.0-27.3 | 26.9-27.3 | 27.0-28.2 | 27.0-27.9 | 25-30° |
| 2.  | PH              7.0-7.2 | 7.0-7.3 | 7.2-7.4 | 7.1-7.3 | 6.5-8.5* |
| 3.  | DO (mg/l)      4.7-5.7 | 4.6-5.7 | 5.0-5.6 | 4.7-5.5 | >4** |

Source : *[5]  **[3]

The cost of feed was an estimate of the cost required to buy the desired feed. The cost of feed in this study could be seen in the Table 3. The cost of feed produced in test feeds A, B and D was different due to different formulations. Self-made feed could reduce large feed costs so that production costs in fish farming would decrease and the profits received by cultivators were more than using commercial feeds.

Table 3. Feed cost of gourami feed in this study

| Parameter          | A         | B         | C         | D         |
|--------------------|-----------|-----------|-----------|-----------|
| FCR (g)            | 1.61      | 1/81      | 1.56      | 1.59      |
| Feed Price 1 Kg (Rp) | 6,572    | 6,981    | 7,412    | 10,000    |
| Feed cost (Rp)     | 10,580    | 12,635    | 11,562    | 15,900    |

4. Conclusion
The results of this study showed that the treatment of feed with protein 30%, 33% and 36% produced the same growth as commercial feed, and treatment of feed A resulted in the lowest cost of feed production compared to other treatments.

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