Effects of addition local microorganisms (LM) in commercial feed to the growth of *Osphronemus goramy*

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**Abstract.** This study aimed to determine the effect of adding local microorganisms as probiotics in commercial feed to accelerate the growth of *Osphronemus goramy*. This research was conducted in December 2018 to February 2019 at the Marine Biology Laboratory, Faculty of Marine and Fisheries, Universitas Syiah Kuala, Banda Aceh. The method used in this study was an experimental method with Completely Randomized Design (CRD) consisting of 6 levels of treatment and 3 replications. The concentration treatment tested were the addition of LM 0 mL 100g\(^-1\) of feed (A), 2 mL 100g\(^-1\) of feed (B), 4 mL 100g\(^-1\) of feed (C), 6 mL 100g\(^-1\) of feed (D), 8 mL 100g\(^-1\) of feed (E) and 10 mL 100g\(^-1\) of feed (F). The ANOVA test results showed that administration of LM in commercial feed at a dose of 4 mL 100g\(^-1\) had an effect on absolute length growth, absolute weight growth, specific growth rate, feed conversion ratio and survival (p<0.05), but did not affect the value feed efficiency (p>0.05). The best treatment was obtained in treatment C (addition of 4 mL 100g\(^-1\) LM of feed) namely absolute length growth (3.08 cm), absolute weight growth (0.31g), specific growth rate (2.42%), feed conversion ratio (3.22) and survival rate (74.35%). Water quality parameters in this study were within the normal tolerance range for the life of carp.

1. **Introduction**

Carp (*Osphronemus goramy*) is a fish known to have slow growth in cultivation. It is caused by several factors among other poor seed quality, the environment does not support and the use of the feed are not optimal by fish. Efforts that can be done to overcome such problems are through the application of probiotics. Asaduzzaman *et al.* [1] mentioned that in modern aquaculture, probiotic dietary supplementation is a new approach to improve the growth performance of slow-growing fish.

Probiotics are living microorganisms that have a good influence for host life. Probiotic applications in aquaculture activities can be done through oral (feed) and water media. Carnevali *et al.* [2] said that in the last decade efforts to maintain environmentally friendly aquaculture has encouraged the use of beneficial bacteria (including probiotics) as feed enrichment. Kavitha *et al.* [3] said the use of probiotics in aquaculture helps improve the survival, growth and health of fish because it is a sustainable aquaculture practice.
Natural probiotics, also known as Local Microorganisms (LM), is a microorganism that is cultured using natural materials for its development medium. LM can be obtained from various materials from the environment such as banana humps, snails, shrimp fermentation, papaya, coconut water, fish bones and kitchen waste. These ingredients are mixed, then used as a growth medium for microorganisms. Some studies have proved that adding LM in feed can accelerate growth in catfish *Clarias gariepinus* [4] and *Anguilla marmorata* [5]. Application of local microorganisms as probiotics in the field of aquaculture plays a role in maintaining microbial balance/control of pathogens in the gastrointestinal tract or aquatic environment. This study aimed to determine the effect of adding local microorganisms as probiotics in commercial feed to accelerate the growth of *Osphronemus goramy*.

2. Materials and Methods

2.1. Tools and materials

The tools used during the study were buckets, scales, spuid, DO meters, thermometers, litmus paper, and ruler. While the materials used were carp seeds, brown sugar, water, watermelon, papaya, old coconut water, Air leri (rice laundry).

2.2. Method

The study was conducted in Desember 2018 to February 2019 in Marine Biology Laboratory, Faculty of Marine and Fisheries of Universitas Syiah Kuala, Banda Aceh, Indonesia. The containers used during the study were 26 L plastic buckets as much as 18 units of water filled with 10 L and equipped with aeration. The seeds of carp used had a body length of 3-4 cm with a weight of 0.40 - 0.70 g and were stocked as 13 fish in each container. Fish were kept for 30 days. Sampling was done every 7 days. Then 30% water change was done every afternoon.

The research method used experimental methods. The experimental design used was a completely randomized design (CRD) with 6 treatments and 3 replications, namely:

- A = Addition of LM 0 mL 100g⁻¹ of feed
- B = Addition of LM 2 mL 100 g⁻¹ of feed
- C = Addition of LM 4 mL 100 g⁻¹ of feed
- D = Addition of LM 6 mL 100 g⁻¹ of feed
- E = Addition of LM 8 mL 100 g⁻¹ of feed
- F = Addition of LM 10 mL 100 g⁻¹ of feed

2.3. Process of making Local Microorganisms (LM)

Making Local Microscopy (LM) was carried out in a 5 L bucket. First the watermelon and papaya were mashed and taken the juice, then put in a bucket, then added old coconut water and leri water (rice laundry) of 500 mL each, brown sugar slices 1/2 kg, then adding water to 1500 mL, then the bucket was closed and the lid portion of the bucket was hollowed out as a drainage channel to the drain hose. Incubation for 14 days.

2.4 Mixing Local Microorganisms (LM) in feed

Commercial feed provided has a protein content of 30%. Mixing LM in feed through spraying with sprayer. Then the feed was dried about 5-10 minutes. Feed given to the test fish as much as 5% of body weight. Frequency of feeding was twice a day (8:30 a.m., and 5:00 p.m).

2.5 Growth parameter

2.5.1 Growth rate. The absolute weight growth (W) was calculated according Effendi [6]

\[ W = Wt - Wo \]

Where: W= absolute weight growth (g); Wt= Average biomass at the end of the study (g); Wo= Average biomass at the start of the study

2.5.2 Absolute length growth. Absolute length growth (L) was calculated according Tacon [7]
\[ L = L_t - L_o \]

Where, \( L \) = Absolute Growth Length (cm); \( L_t \) = Average length of test fish at the end of the study (cm); \( L_o \) = the average length of the test at the beginning of the study (cm)

2.5.3 Specific growth rate. Specific growth rate was calculated according [8]

\[ SGR = \left( \frac{\ln W_t - \ln W_o}{t} \right) + 100\% \]

Where, \( SGR \) = Specific growth rate (%); \( W_t \) = Final weight of study (g); \( W_o \) = Average initial weight of the study (g); \( t \) = Research Time (days)

2.5.4 Feed conversion ratio. Feed conversion ratio was calculated according [9]

\[ FCR = \frac{F}{W_t - W_o} \]

Where, \( F \) = Feed weight given during maintenance (g); \( W_t \) = Fish biomass at the end of maintenance (g); \( W_o \) = Fish biomass at the beginning of maintenance (g)

2.5.6 Feed efficiency. Feed efficiency was calculated according [10]

\[ FE = \frac{(W_t + D - W_o)}{F} \times 100 \]

Where, \( FE \) = Feed efficiency (%); \( W_t \) = Weight of test animals at the end of the study; \( W_o \) = Test animal weight at the beginning of the study; \( D \) = Number of dead fish; \( F \) = number of feed consumed.

3. Results and Discussions

Fish growth is the result of the difference between intake energy and energy out, and the intake energy is obtained from the food consumed [11]. Application of beneficial local microorganism products or probiotics in the cultivation field is very important nowadays. Applied of probiotics with the ability to produce enzymes gets attention in cultivation to promote nutritional benefits for fish that can be cultivated [12] [3]. Banerjee et al. [13][14] stated that the enzymes secreted by the endosymbionts of the permanent intestine and probiotics are very important for use from a nutritional perspective.

Based on the ANOVA test, addition of Local Microorganisms (LM) in feed influenced the growth of carp seed (\( P <0.5 \)). The results of the study showed optimal concentration in increasing fish growth was found in treatment C (addition of LM 4 ml 100 g\(^{-1}\) feed) (Figure 1 and 2). It is suspected because the concentrate bacteria that enters the gastrointestinal tract is able to balance the amount of bacteria that exist in the digestive tract of fish thereby helping to optimal food absorption. According to Ray et al. [15], Kavitha et al. [3], the microbial population is one of the most important components of the intestinal ecosystem which is essential for the health and nutrition of animals. Furthermore, Nawawi and Wahidah [5] the types of bacteria produced from the solution of LM media products are Acetobacter, Aspergillus sp., Azospirillum, Bacillus sp., Lactobacillus sp., Pseudomonas, Saccharomyces sp. Some researchers reported that microorganisms used as probiotics in aquaculture activities include Bacillus sp. [16], Lactobacillus spp. [17]. Administration of the probiotic Bacillus pumilus and Bacillus clausii can increase the growth of fish Epinephelus coioides [16].
Research on addition of probiotic bacteria in fish is much done. Research by Jariyah et al. [18], regarding the addition of probiotics to diets with different concentrations of catfish namely 5 mL/kg, 10 mL Kg\(^{-1}\) and 20 mL Kg\(^{-1}\) of feed, produced the highest daily growth rate of 0.25% in the treatment 10 mL Kg\(^{-1}\). Putri et al [19] study, regarding the effect of giving probiotic bacteria on pellets containing Calliandra calothyrsus of the tilapia using 5 treatments, namely 5 mL/kg, 10 mL Kg\(^{-1}\), 15 mL Kg\(^{-1}\) and 20 mL Kg\(^{-1}\) of feed showed the best results at treatment of 15 mL Kg\(^{-1}\) of feed with a daily growth rate of 2.76%. Furthermore, research on the utilization of LM in the cabbage waste in feed against the catfish seeds conducted by Bisma et al [20], obtained the optimal concentration in the treatment of 0.15 mL 10g\(^{-1}\) of feed with an absolute length of 3.9 cm.

Table 1 showed the highest specific growth rate of carp obtained at treatment C (addition of LM 4 mL 100g\(^{-1}\) of feed). The addition of LM concentration above 4 mL 100g\(^{-1}\) of feed caused a decrease in the specific growth rate of fish (treatment F = addition of LM 10 mL 100g\(^{-1}\) of feed). This is thought to be an imbalance in the among of bacteria in the digestive tract of fish, because in the treatment F the number of bacteria administered high concentration gives rise to overgrowth of bacteria. The high density of bacteria in the gastrointestinal tract leads competition in taking high substrate or nutrients, so that bacterial activity becomes inhibited. The number of bacteria causing too much bacteria undergo sporulation (forming spores), so that the function and activity of Lactobacillus sp. not optimal [21].

The value of feed conversion given by LM was lower compared to without the administration of LM (addition of LM 0mL 100g\(^{-1}\) of feed). This indicated that the fish can utilize feed optimally with the help of LM bacteria. The bacteria contained in LM solutions have a mechanism to produce some enzymes for digestion of feed such as amylase, protease, lipase and cellulase. These enzymes help in hydrolyzing feed nutrients, such as breaking down carbohydrates, proteins and fats into simpler molecules that will facilitate digestion process and absorption of feed in fish. The enzyme produced by Bacillus sp. is a protease enzyme. This bacterium is a proteolytic bacterium that can break down proteins into amino acids. Banerjee and Ray [14] said that probiotics produce microorganisms that provide several beneficial effects for the host (increasing immunity, assisting digestion, protecting from pathogens, improving water quality, boosting growth and reproduction) and can be used as a substitute for antibiotics.
Table 1. Specific Growth Rate, Feed Conversion Ratio and Feed Efficiency of carp given commercial feed with the addition of LM

| Research parameters | Treatments | Specific Growth Rate (%/day) | Feed Conversion Ratio | Feed Efficiency (%) |
|---------------------|------------|------------------------------|-----------------------|---------------------|
|                     | A          | 1.82±0.01<sup>c</sup>       | 3.90±0.06<sup>b</sup> | 25.58±0.40          |
|                     | B          | 1.99±0.00<sup>c</sup>       | 3.71±0.15<sup>b</sup> | 26.98±1.11          |
|                     | C          | 2.42±0.08<sup>a</sup>       | 3.22±0.23<sup>ab</sup>| 31.05±2.27          |
|                     | D          | 2.20±0.00<sup>ab</sup>      | 3.63±0.07<sup>ab</sup>| 27.48±0.57          |
|                     | E          | 2.07±0.22<sup>bc</sup>      | 3.40±0.50<sup>ab</sup>| 29.81±4.56          |
|                     | F          | 1.95±0.00<sup>c</sup>       | 3.24±0.17<sup>a</sup> | 30.91±1.70          |

Description: Different superscript letters in the same column show significantly different (P<0.5)

The value of feed conversion ratio has a close relationship with fish efficiency in utilizing feed for growth. The highest feed efficiency value was found in treatment C (Table 1), but it did not significantly different from all existing treatments (P> 0.5). Feed efficiency is derived from the comparison of body weight with the amount of feed spent during maintenance period. Feed efficiency values are related to the growth rate as the higher the growth rate the higher the value of feed efficiency.

Growth is an important parameter that is influenced by internal factors (age, heredity, disease resistance) and external factors (temperature, dissolved oxygen, stocking density and amount of feed quality). Based on the results of water quality measurements, it showed that all treatments are in the condition of tolerance limits for carp cultivation (temperature 27-29°C, DO 5.02-5.06 ppm and pH 7-8). According to Amri and Khairuman [22] the optimal temperature ranges from 26.9-29°C and pH between 6.5-8.0.

4. Conclusion

Based on the results of research, the addition of local microorganisms in commercial feed has an effect on the growth of carp (P <0.5), but has no effect on feed efficiency (P> 0.5). The optimal concentration of addition local microorganisms in carp was found in the treatment C (addition of LM 4 mL 100g<sup>-1</sup> of feed).

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