Provision of Fitoimun® in Feed for the Growth and Survival of White Snapper (*Lates calcarifer*) Raised in Silvofishery Ponds in Muara Badak Ulu Village, Muara Badak District, Kutai Kartanegara Regency

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ABSTRACT

This study aims to analyze the effect of adding Fitoimun® as a natural medicine on barramundi/white snapper (Lates calcarifer). Maintenance is carried out for 30 days, white snapper fry measuring 72-103 g with floating net cage containers measuring 4x4 m^2 with a stocking density of 14 heads / repeats. The method used in this study was using Complete Randomized Design (RAL) with 3 treatments 3 replications with doses P0: 0 mL/kg feed, P1: 20 mL/kg feed, P2: 24 mL/kg feed. Parameters observed include survival, absolute weight growth, specific growth rate, and feed conversion ratio. The results obtained from the study showed that the administration of Fitoimun® had no real effect, although the application of Fitoimun® dose of 20 mL/kg feed had a survival rate of 100%, absolute weight growth of 78.7g, a specific growth rate of 2.1%, and the best feed conversion ratio of 1.63 than other doses.

INTRODUCTION

The barramundi (*Lates calcarifer*) is a species of brackish and marine fish with a relatively fast daily growth rate, reaching up to 0.51% per day (Rayes et al., 2013). The cultivation of barramundi should continue, given the demand from several countries such as Australia, China, Hong Kong, Taiwan, and the USA. Barramundi exports in the first quarter of 2021 increased by US$1.2 million, or around 24%, compared to the same period in the previous year (Sugiari, 2021). Efforts to enhance barramundi farming can be conducted in ponds, but expanding pond areas is no longer feasible due to the fact that pond expansion usually goes hand in hand with the clearing of mangrove ecosystems. This situation can lead to the destruction of mangrove forests due to continuous deforestation for farming land. Therefore, appropriate farming management is needed to avoid damaging the mangrove forest areas. One solution is to apply the silvofishery farming method.

Silvofishery is a traditional pond system that integrates fish farming with mangrove forest planting, following the concept of introducing a management system that minimizes and reduces environmental impacts (Noor et al., 2012). Barramundi farming activities often face challenges in terms of feed, water quality, and diseases. One of the diseases that affect barramundi is caused by the Vibrio bacteria, which can make the fish weak, reduce their appetite, and slow their swimming, thereby disrupting their growth (Novita et al., 2020). Efforts to prevent diseases in barramundi farming can be made by using plant extracts as antibacterial agents and immunostimulants. One of the plants that can be used is Temu Kunci (*B. pandurata*) and Terung Asam *(S. ferox*). A study by Linayati et al. (2022) using Terung Asam extract in feed for vannamei shrimp larvae showed a significant effect on the growth of the larvae, with the highest average weight growth being 5.05 g.

This study attempts to provide a natural remedy called Fitoimun® produced by CV. Bio Perkasa, applied through feed. Fitoimun® is a natural medicine for fish made from a combination of extracts of Temu Kunci (*B. pandurata*) and Terung Asam (*S. ferox*). These plant extracts contain compounds such as levamisole, flavonoids, steroids, and carbohydrates, which are capable of inhibiting pathogenic bacteria (Hardi et al., 2018). According to a study by Rachmawati et al. (2022), administering a dose of Fitoimun® 20 mL/kg of feed through feed application yielded better growth results for mud crabs (*Scylla serrata*).

METHODOLOGY

Time and Place of Research

This research was conducted from November 2021 to February 2022. The research site was a silvofishery pond located in Muara Badak Ulu Village, Muara Badak District, Kutai Kartanegara Regency, East Kalimantan Province.

Tools and Materials

The tools used in this research included scales, styrofoam, feed containers, floating net cages measuring 4x4 m², water quality measuring instruments, 1 mL and 3 mL syringes, measuring glasses, trays, and writing instruments. The materials used were 126 barramundi fish (*Lates calcarifer*) weighing 72-105 g. Other materials included Fitoimun®, trash fish species (tembang, layang, selar, and ruma-ruma).

Experimental Design

The experimental design used in this research was a Completely Randomized Design (CRD) with 3 treatments and 3 replications. The treatments involved the administration of different doses of Fitoimun® during fish maintenance, as follows:

1. P0: Feed without the addition of Fitoimun®
2. P1: Feed with the addition of 20 mL/kg Fitoimun®
3. P2: Feed with the addition of 24 mL/kg Fitoimun®

Research Procedure

1. **Fish Preparation**
   This research used 126 barramundi fish weighing 72-103 g, sourced from the Brackish and Marine Fish Hatchery (UPTD) Manggar, Balikpapan City, East Kalimantan Province.
2. **Preparation of Containers**
   Fish maintenance was carried out in a ditch model silvofishery pond. The containers used were floating net cages (KJA) measuring 4x4 m², made of wood. Each cage was divided into 3 compartments, with each replication having a width of 120 cm. The height of the net in each cage was 2 m, and the average water depth was 1.5 m. The net used had a diameter of 44 mm².
3. **Preparation of Fitoimun®**
   This research used the natural medicine Fitoimun®, made from a combination of bitter eggplant (*Solanum ferox*) and lesser galangal (*Boesenbergia pandurata*), produced by CV Bioperkasa. The doses of Fitoimun® used were 0 mL/kg feed, 20 mL/kg feed, and 24 mL/kg feed.
4. **Preparation of Test Feed**
   The feed used in this research consisted of trash fish species, including tembang, ruma-ruma, selar, and layang. The trash fish feed was mixed with Fitoimun® according to the treatment before being given to the barramundi (*L. calcarifer*) as follows:
   1. P0: Feed without the addition of Fitoimun®

2. P1: Feed with the addition of 20 mL/kg Fitoimun®
3. P2: Feed with the addition of 24 mL/kg Fitoimun®

The first step was cutting the trash fish to match the fish's mouth opening, around 1-2 cm. Next, 100 mL of Fitoimun® was dissolved in 100 mL of water and poured into the container with the trash fish feed. The feed mixed with the Fitoimun® solution was left to sit for 20 minutes before being given to the fish. Feeding was done three times a day at 08:00, 12:00, and 16:00 WITA. The amount of feed given was 5% of the fish's biomass. The feed with Fitoimun® was provided for 30 days during the research period.

Parameters

The parameters measured in this study included survival rate, absolute weight growth, daily growth rate, feed conversion ratio, and water quality, calculated using the following formulas:

1. **Survival Rate**
   According to Effendi (2003), survival rate is the percentage of the surviving cultured fish, calculated as follows:

$$SR\ (\%) = \frac{Nt}{N0} x100$$

   Explanation:

   - **SR**: Fish survival rate (%)
   - **Nt**: Number of fish at the end of the study (individuals)
   - **N0**: Number of fish at the beginning of the study (individuals).

2. **Absolute Weight Growth**
   According to Effendi (1997), absolute weight growth can be calculated as follows:

$$\Delta W = Wt - W0$$

   Explanation:

   - **ΔW**: Absolute weight growth of the fish (g)
   - **Wt**: Average body weight at the end of the study (g)
   - **W0**: Average body weight at the beginning of the maintenance period (g)

3. **Specific Growth Rate**
   The specific growth rate (SGR) can be calculated using the formula proposed by Jaya et al. (2013) as follows:

$$SGR = \frac{LnWt - LnW0}{t} x100\%$$

   Explanation:

   - **SGR**: Specific growth rate (%)
   - **Wt**: Average weight at the end of the maintenance period (g)
   - **W0**: Average weight at the beginning of the maintenance period (g)
   - **t**: Duration of the maintenance period (days)

4. **Feed Conversion Ratio**
   The feed conversion ratio (FCR) is calculated at the end of the study to determine the ratio of feed consumed by the fish during the maintenance period. The FCR is calculated using the formula by Effendi (1997):

$$FCR = \frac{Feed\ given\ (g)}{Fish\ weight\ gain\ (g)}$$

Data Analysis

The data obtained from this study on barramundi included absolute weight growth, specific growth rate (SGR), feed conversion ratio (FCR), survival rate (SR), and water quality.

RESULT AND DISCUSSION

Survival Rate

The observation of the survival rate of barramundi (*Lates calcarifer*) was conducted over 30 days in the silvofishery pond. The results for the survival rate of barramundi in each treatment can be seen in Figure 1.

Survival rate is a crucial factor in fish farming. A high survival rate significantly impacts the success of a production activity (Nurmasyitah et al., 2018). Several factors can influence fish survival, including stocking density, feeding, disease, and water quality (Fahrizal & Nasir, 2017). This study used a low stocking density, with 14 fish per replication.

The results showed a 100% survival rate for barramundi reared in floating net cages over the 30-day maintenance period, both with and without Fitoimun®. These findings, illustrated in Figure 1, indicate that the results can be categorized as excellent. The high survival rate of barramundi in the silvofishery pond may be attributed to the low stocking density, which minimizes competition for food, space, and oxygen.

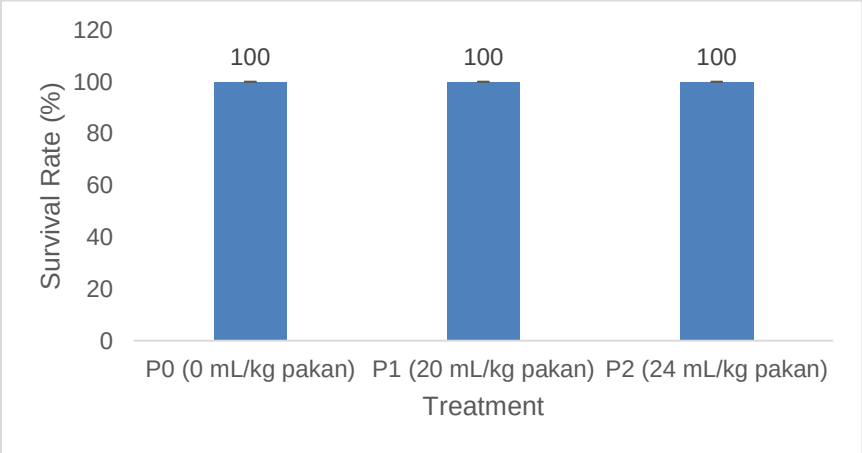

Figure 1. Survival rate of barramundi

Absolute Weight Growth

The results obtained for the absolute weight growth of barramundi (*Lates calcarifer*) during the 30-day rearing period for each treatment can be seen in Figure 2. The absolute weight growth results for

barramundi (L. calcarifer) show that the lowest average absolute weight growth was in the P0 treatment (0 mL/kg feed) with 43.7 g, while the highest average absolute weight growth was in the P1 treatment (20 mL/kg feed) with 78.7 g. The results obtained in this study are considered quite good. This is supported by Novriadi et al. (2014), who stated that the absolute weight growth rate of barramundi during the grow-out phase ranges from 50-60 g/35 days. Similarly, a study by Windarto et al. (2019) conducted over 32 days resulted in a growth of 47 g.

The analysis of variance (ANOVA) on the absolute weight growth of barramundi showed no significant effect between treatments (P>0.05). Although the ANOVA analysis indicated no significant differences between treatments, the treatments given Fitoimun® showed better results compared to those without Fitoimun®. This is due to the content in Fitoimun®, which includes levamisole, flavonoids, steroids, and carbohydrates.

One of the active compounds in Fitoimun®, flavonoids, can increase the growth of *Lactobacillus* bacteria in the digestive tract. This bacterium is a type of fermentation microbe that can optimize digestion and stimulate growth when included in feed, thereby enhancing feed quality (Linayati et al., 2022). Another important nutrient in Fitoimun® is carbohydrates, which act as an energy source. Carbohydrates are often added in specific amounts to allow protein to be used efficiently as an energy source to support the growth of fish (Yanto et al., 2019).

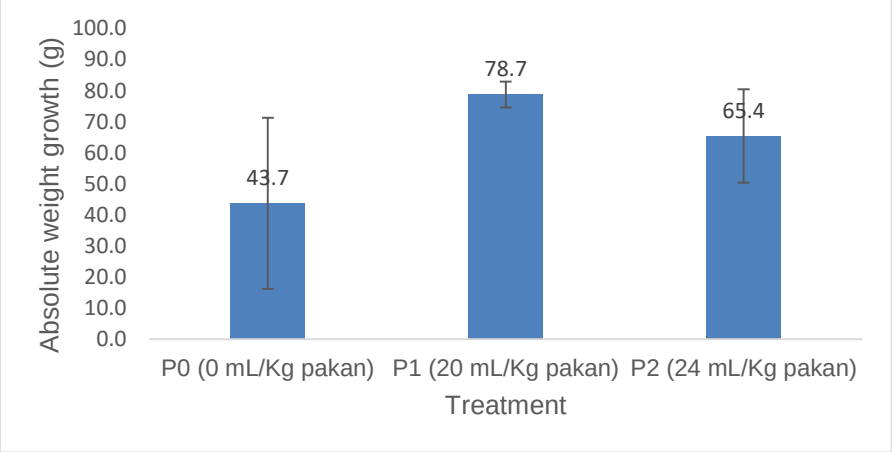

Figure 2. Absolute Weight Growth

The Specific Growth Rate

The specific growth rate (SGR) is a parameter used to calculate the percentage of weight growth in fish on a daily basis (Jaya et al., 2013). The results of the daily specific growth rate for barramundi over a 30-day rearing period can be seen in Figure 3.

The results indicate that the lowest specific growth rate percentage for barramundi was in the P0 treatment (0 mL/kg feed), with a specific growth rate of 1.3%. In contrast, the highest specific growth rate was in the P1 treatment (20 mL/kg feed), with a specific growth rate of 2.1%. Rayes et al. (2013) noted that the daily growth rate of barramundi can reach up to 0.51% per day. The analysis of variance (ANOVA) for the specific growth rate of barramundi showed no significant effects between treatments (P>0.05).

The specific growth rate can be influenced by several factors, one of which is feed. According to Sahputra et al. (2017), natural feed types that can aid the growth of barramundi include various types of shrimp, snails, and trash fish. These natural feed types are known for their high protein content. During the rearing period, the types of feed used included trash fish such as flying fish, sardines, round scad, and mackerel. Trash fish has a high nutritional content, with crude protein at 64.33%, carbohydrates at 1.14%, fat at 7.40%, and calcium at 4.15% (Suci, 2013 in Hanif & Herlina, 2021).

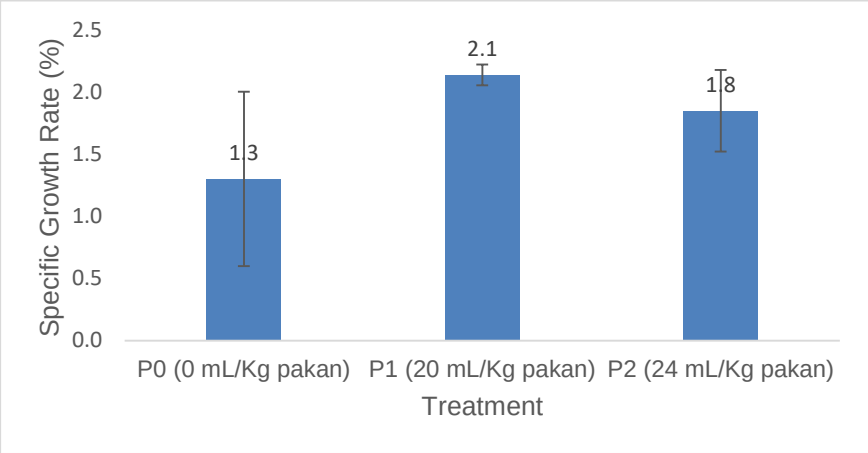

Figure 3. Specific Growth Rate

Feed Conversion Ratio

The Feed Conversion Ratio (FCR) is a calculation of the feed conversion efficiency conducted at the end of the study. This calculation aims to compare the amount of feed consumed by the fish during the rearing period. The FCR values for barramundi reared for 30 days can be seen in Figure 4.

The results of the feed conversion ratio obtained from this study, as shown in Figure 4, indicate that the lowest feed conversion ratio was in the P1 treatment (20 mL/kg feed), with a value of 1.63, while the highest feed conversion ratio was in the P0 treatment (0 mL/kg feed), with a value of 2.13. The analysis of variance (ANOVA) showed no significant effect ($P>0.05$).

According to Rayes et al. (2013), the optimal range for feed conversion ratios that support fish growth is between 1.5 and 2.0. Maldonado-García et al. (2012) stated that a lower feed conversion ratio indicates that the feed provided can be absorbed by the fish optimally, allowing for weight gain. Surnawati et al. (2020) also explained that a smaller feed conversion ratio signifies better feed efficiency, whereas a larger feed conversion ratio indicates poorer feed efficiency.

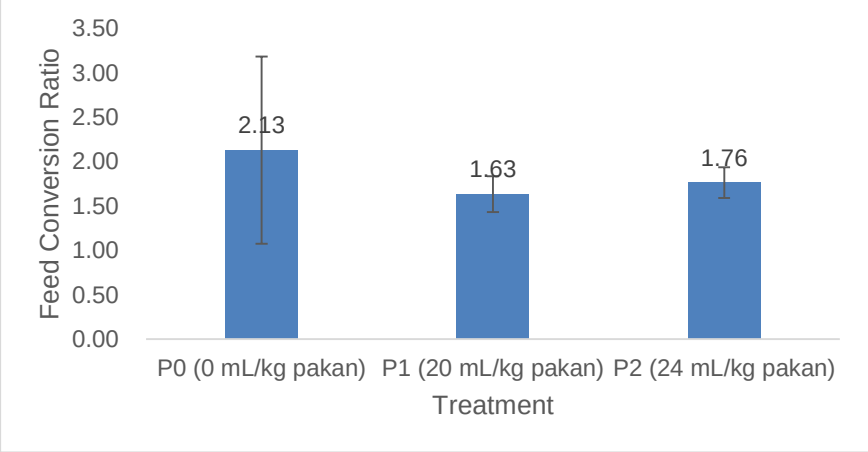

Figure 4. Feed Conversion Ratio

CONCLUSION

The results from all treatments, whether given Fitoimun® or not, showed a relatively equal survival rate of 100%. The administration of Fitoimun® at different doses did not have a significant effect on the absolute weight gain, specific growth rate, and feed conversion ratio of the barramundi reared in the silvofishery ponds. However, the administration of Fitoimun® at a dose of 20 mL/kg of feed showed better results compared to other treatments.

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