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Addition of Probiotics to Feed on the Growth and Survival of Tilapia Fish Seeds

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ABSTRACT

Introduction: Tilapia (Oreochromis niloticus) is one of the leading commodities of freshwater aquaculture in Indonesia. The problem that is often experienced by farmers is the absorption of fish feed nutrients that are less than optimal, due to the low quality of feed raw materials. The study aims to determine the effect of adding probiotics to feed on growth and survival, in tilapia (O. Niloticus) fry. **Method: The** test organisms used in this study were tilapia (O. niloticus) as many as 200 fish with an initial weight of 1.09-1.28 g/head. Tilapia seeds were obtained from UPR Saluyu, Dolo sub-district, Sigi district, Central Sulawesi. The design used was a complete randomized design (CRD). **Results and Discussion**: Variables observed were daily weight growth rate (LPBH), absolute weight growth (PBM), survival rate, feed conversion ratio (CTR), and water quality. **Conclusion**: The results showed that the highest absolute weight growth in tilapia was found in treatment D (8 mL probiotics) which was 2.04 g, the specific growth rate was (2.86% / day), and the feed conversion ratio produced (1.57), while the survival rate of tilapia obtained during maintenance was (80.00-84.00%).

1. Introduction

Tilapia (Oreochromis niloticus) is one of the leading commodities of freshwater aquaculture in Indonesia. This fish can be cultivated with various systems both traditionally and super intensively. Tilapia has several advantages, namely fast growth, and tolerant of salinity changes [1]. In addition, one of the factors that make tilapia a potential commodity is that it has a distinctive meat flavor and white meat color, does not have many thorns, and contains high nutrition [2]. The high price of feed and its low nutritional quality are obstacles in the cultivation process. Therefore, feed additives are needed that can improve fish growth and feed efficiency so as to increase feed digestibility. Feed additive is an ingredient mixed in feed that can affect health, productivity, and nutritional conditions.

The problem generally faced by farmers in the field is the suboptimal absorption of fish feed nutrients, due to the low quality of feed raw materials. This can be seen from the low growth and high feed conversion ratio in cultured fish [3]. Therefore, it is necessary to have an ingredient mixed in the feed, so that the feed can be absorbed by fish optimally and provide a high growth response, one of the ingredients that can be used is probiotics [4]. The study aims to determine the effect of the addition of probiotics in feed on growth, survival, and tilapia (O. niloticus) fry.

2. The Proposed Method

2.1. Test Organism

The test organism used in this study was tilapia (O. niloticus) with an average weight of 1-1.5 g/per

head. The number of test organisms used was 200 tilapia fry obtained from the People's Hatchery Unit (UPR) Saluyu, Dolo District, Sigi Regency, Central Sulawesi.

2.2. Preparation of Research Containers

The test organism research container is a 45 L volume basin of 20 pieces. The containers were washed using detergent and then cleaned and dried. Furthermore, each basin was labeled according to the treatment and arranged based on the layout of the research container based on the randomization results. Each container was filled with water with a volume of 20 L, and equipped with one aeration stone connected to an aerator to increase dissolved oxygen levels in the maintenance container.

3. Method

Before stocking the test organisms into the maintenance media, tilapia fry that have been taken from the soil pond is acclimatized into styrofoam for 24 hours. The acclimatization process lasted for 60 minutes so that the fish could adapt to the new environment and not experience stress. Water quality was measured in each rearing container, after which the test organisms were weighed as initial data. The test organisms were stocked at a density of 1 fish/ 2 liters of water.

The feed used is commercial feed as much as 1 kg for each treatment. Make a solution that will be mixed with probiotics using 50 mL of water and 2 mg of granulated sugar in each treatment, granulated sugar acts as a substitute for molasses. Then dissolved until homogeneous after that the probiotic Microbacter alfalfa 11 that has been prepared is taken according to the dose of each treatment using a drop pipette and added to the water and sugar solution that has been provided and stirred until homogeneous.

The commercial feed was transferred into a fermentation container in the form of a 5 L jar of 4 pieces and labeled according to the treatment. After that, the feed was sprayed with a probiotic solution using a sprayer until evenly distributed. Then the fermentation container is closed tightly to prevent air from entering the fermentation container. Store in a shady place to avoid direct sunlight. Do the same thing for the next treatment, the feed fermentation process will last for 5 days.

3.1. Research Design

The study was designed using a completely randomized design (CRD), consisting of 4 treatments and 5 replicates, resulting in a total of 20 experimental units. The probiotic dose used refers to the results of research from [4].

a) Treatment A = 2 mL probiotic/kg feed
b) Treatment B = 4 mL probiotics/kg feed
c) Treatment C = 6 mL probiotic/kg feed
d) Treatment D = 8 mL probiotic/kg feed

The layout of the research container based on the results of treatment randomization can be seen in Figure 1.

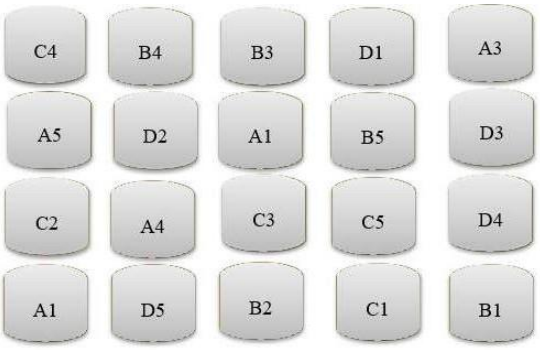

Fig.1: Layout of the research container

3.2. Data Analysis

Data on absolute weight growth rate, specific weight, survival, and feed conversion ratio were tabulated using the Microsoft Excel program and analyzed using One Way Anova analysis on the Minitab 16 application. If there is an effect of the treatment, it is continued with the BNT further test. Survival and water quality were analyzed descriptively by displaying them in the form of graphs and tables.

4. Results and Discussion

The addition of probiotics to tilapia fry feed with different doses resulted in different absolute weight growth in Figure 2. The highest absolute weight growth of tilapia fry was produced in treatment D (8 mL/kg feed) which amounted to 2.04 g followed by treatment C (6 mL/kg feed) which produced 1.95 g, then treatment B (4 mL/kg feed) which produced 1.81 g, and the lowest was in treatment A (2 mL/kg feed) which produced 1.72g.

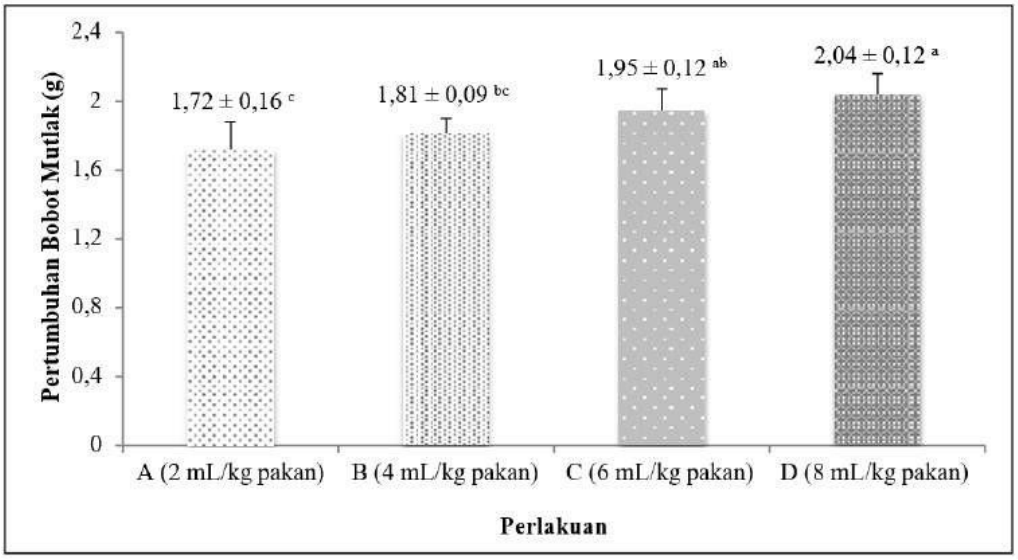

Fig. 2: Absolute weight growth of tilapia fry

The results of the analysis of variance at the real level α 5% showed that the addition of probiotics to tilapia seed feed with different doses had a significant effect ($P < 0.05$) on absolute weight growth. The results of the Honest Real Differences (BNJ) further test showed that treatment D was significantly different from A and D but not significantly different from treatment C. Treatment C was not significantly different from treatment B and D but not significantly different from treatment C. Treatment C was not significantly different from treatment B and D but was different from treatment A. Treatment B was significantly different from treatment D but was not significantly different from treatments A and C. Treatment A is significantly different from treatment C and D, but not significantly different from treatment B.

4.1. Specific Growth Rate

The highest specific growth rate of tilapia seeds was obtained in treatment D (8 mL/kg feed) which resulted in 2.86%. The lower specific growth rate was obtained in treatment C (6 mL/kg feed) which resulted in 2.72%, followed by treatment B (4 mL/kg feed) which resulted in 2.62%, and the lowest was in treatment A (2 mL/kg feed) which resulted in 2.55%.

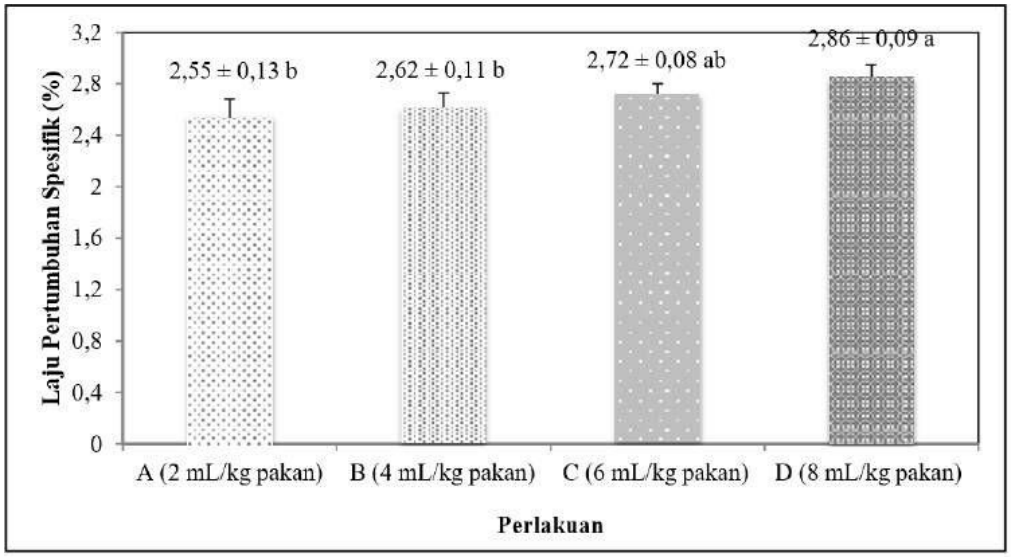

Fig. 3: The specific growth rate of tilapia fry.

The results of the analysis of variance at the real level α 5% showed that the addition of probiotics to tilapia feed with different doses in tilapia seed feed had a significant effect ($P < 0.05$) on the specific growth rate. The results of the Honest Real Differences (BNJ) further test showed that treatment D was significantly different from A and B but not significantly different from treatment C. Treatment C did not differ from all treatments. Treatment C is not different from all treatments. Treatment B was significantly different from treatment D, but not significantly different from treatment A and C. Treatment A is significantly different from treatment D, but not significantly different from treatments B and C.

4.2. Feed Conversion Ratio

The addition of probiotics to tilapia seed feed with different doses resulted in the feed conversion ratio shown in Figure 4. The lowest feed conversion ratio was obtained in treatment D (8 mL/kg feed) which resulted in 1.57. The higher feed conversion ratio was obtained in treatment C (6 mL/kg feed) which produced 1.64, followed by treatment B (4 mL/kg feed) which produced 1.75, and the highest was obtained in treatment A (2 mL/kg feed) which produced 1.82.

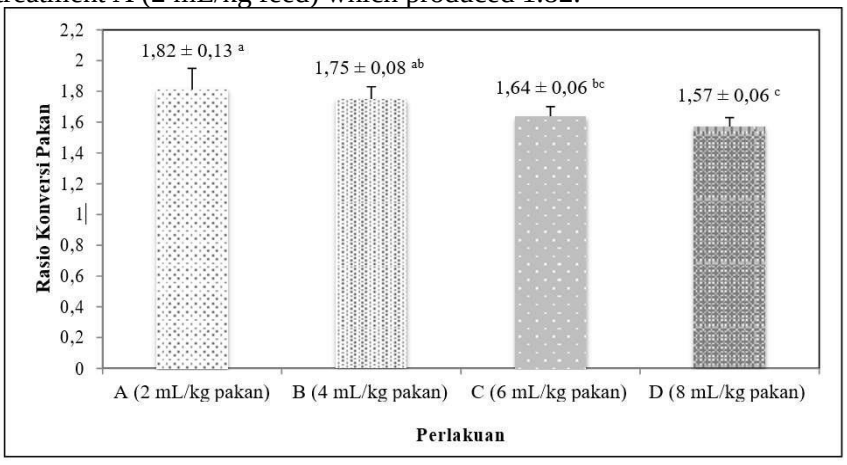

Fig. 4: Feed Conversion Ratio of Tilapia Fry.

The results of the analysis of variance at the real level α 5% showed that the addition of probiotics to tilapia feed with different doses in tilapia seed feed had a significant effect ($P < 0.05$) on feed conversion ratio. The results of the Beda Nyata Honest (BNJ) further test showed that treatment D was significantly different from treatment A and B, but not significantly different from treatment C. Treatment C was not significantly different from treatment B and D. But significantly different from treatment A. Treatment B was significantly different from treatment D, but not significantly different from treatment A and C. Meanwhile, treatment A is significantly different from treatment C and D, but not significantly different from treatment B.

4.3. Survival Rate

The addition of Microbacter Alfalfa 11 probiotics to feed with different doses has no effect on the survival rate of tilapia seeds. The survival rate of tilapia obtained in the maintenance of treatments A, B, C, and D amounted to 78.00-84.00%. The lowest survival rate was found in treatment A at 78.00%, this is thought to be due to the lack of microorganisms or positive bacteria that live in the body of tilapia fish seeds so that fish are easily attacked by diseases and pathogenic bacteria. This is in accordance with the statement [5] that feed supplementation with lactic acid bacteria can increase the immunity of tilapia so that it has a better immune system. [6] states that the availability of sufficient feed is an important factor in supporting survival.

During the rearing period, there is no escaping the occurrence of some fish mortality. One of the influencing factors is internal factors which include differences in age and ability to adapt to the environment, and external factors which include environmental conditions, competition between individuals, the presence of predators and parasites, and overcrowding [7].

4.4. Water Quality

The results of measuring the pH value during the study obtained a range of 7.3-7.9. This is in accordance with SNI [8], the optimal pH value for tilapia rearing is 6.5 - 8.5. The pH value shows no sharp fluctuations and is still within the limits that can be tolerated by tilapia fish seeds. This is in accordance with [9], which states that a pH value of 6-8 is a feasible range for the life of tilapia [10], explaining that a low pH value will cause a decrease in fish survival, while a high pH can cause the growth rate of fish to be inhibited.

The measurement results of dissolved oxygen concentration in the maintenance media are in the range of 4.5-5.9 mg/L. This is in accordance with SNI [8], the optimal dissolved oxygen level for tilapia is more than equal to 3 mg/L. According to [11], dissolved oxygen levels of less than 2 mg/L can result in fish death. Fish need sufficient oxygen to ensure their survival. [12] states that the presence of dissolved oxygen in the maintenance media needs to be maintained so that the fish respiration process continues to run normally and supports fish survival.

So in this study, an aeration device was used to supply dissolved oxygen during maintenance. The measurement results of ammonia concentration during maintenance obtained 0.007 0.012 mg/L. These ammonia levels can still be tolerated by tilapia fish seeds as indicated by the high survival rate. Ammonia concentrations can be tolerated by no more than 0.2 mg/L, where the continuous increase in ammonia causes a decrease in the concentration of dissolved oxygen in the water.

5. Conclusion

Based on the results and discussion, it can be concluded that the addition of Microbacter Alfaafa probiotics to feed with different doses has a significant effect on absolute weight growth, specific growth rate, and feed conversion ratio of tilapia. The treatment with the addition of probiotics in the feed as much as 8 mL/kg feed gave the best results which resulted in the highest absolute weight of 2.04, g, a specific growth rate of 2.86%, and the lowest feed conversion ratio of 1.57 with a survival rate of 84%.

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