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Optimization of EM4 Probiotic Supplementation in Feed to Improve the Health and Growth of Sangkuriang Catfish (Clarias Gariepinus Var.Sangkuriang) In an Intensive Cultivation System

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ABSTRACT

Catfish farming is widely recognized as a promising aquaculture business due to its stable market demand and relatively simple cultivation techniques. However, intensive culture systems often face challenges related to feed efficiency, water quality deterioration, and disease outbreaks. One strategy to address these issues is the application of probiotics in fish feed. This study aimed to evaluate the effect of different EM4 probiotic dosages on the growth performance of Sangkuriang catfish (Clarias gariepinus var. sangkuriang) and to determine the most effective dosage under intensive cultivation conditions. The research was conducted using an experimental method with four treatments, consisting of a control (feed without probiotics) and three probiotic treatments at dosages of 6 ml/kg, 8 ml/kg, and 10 ml/kg of feed, each with three replications. Growth parameters, feed utilization efficiency, feed conversion ratio (FCR), survival rate, and water quality were observed over a 30-day rearing period. The results indicated that EM4 probiotic supplementation improved growth performance and feed utilization compared to the control treatment. The highest growth response was observed in the 10 ml/kg probiotic treatment. These findings suggest that EM4 probiotics can be effectively applied to enhance the growth and productivity of Sangkuriang catfish in intensive aquaculture systems.

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INTRODUCTION

Sangkuriang catfish (Clarias gariepinus var. sangkuriang) is one of the most important freshwater aquaculture commodities in Indonesia and plays a strategic role in supporting food security and economic development. This species is widely cultivated due to its rapid growth rate, high adaptability to environmental fluctuations, tolerance to high stocking densities, and ability to survive under low dissolved oxygen conditions (Hermawan et al., 2012; Effendie, 2002). These characteristics make Sangkuriang catfish particularly suitable for intensive aquaculture systems.

The development of catfish farming in Indonesia has shown a consistent upward trend. National production has increased significantly in recent years, driven by strong consumer demand and the expansion of small- and medium-scale aquaculture enterprises (KKP, 2018). The relatively stable market and affordable production costs further strengthen the position of catfish as a promising and accessible commodity for farmers.

Despite its high potential, intensive catfish farming still faces several technical constraints. Inefficient feed utilization is one of the main challenges, as feed represents the largest operational cost in aquaculture. Poor feed efficiency not only reduces growth performance but also contributes to water quality deterioration due to the accumulation of uneaten feed and metabolic waste (Iribarren et al., 2012; Nisa, 2023). Degraded water quality can increase stress and susceptibility to disease, ultimately affecting survival and overall productivity.

The use of probiotics in aquaculture has emerged as a practical and environmentally friendly approach to address these challenges. Probiotics are live microorganisms that provide beneficial effects to the host by improving the balance of intestinal microflora and enhancing digestive processes (Vershuere et al., 2000). Several studies have demonstrated that probiotic supplementation in fish feed can improve nutrient digestibility, increase feed efficiency, and promote better growth and health of cultured fish (Dewi & Tahapari, 2017; Winarni et al., 2008). One probiotic product commonly used in aquaculture is EM4, which contains beneficial microorganisms such as lactic acid bacteria, photosynthetic bacteria, and yeast that contribute to improved feed quality and environmental stability (Mansyur, 2008).

Previous studies have reported positive effects of probiotic supplementation on growth performance and feed utilization in various freshwater fish species, including common carp and tilapia (Tarigan & Meiyasa, 2019; Shofura et al., 2018). However, information regarding the optimal dosage of EM4 probiotics for Sangkuriang catfish under intensive culture conditions remains limited. Therefore, in line with the objectives stated in the abstract, this study was conducted to evaluate the effect of different EM4 probiotic dosages in feed on the growth performance of Sangkuriang catfish and to determine the most effective dosage for application in intensive cultivation systems.

METHOD

This research was conducted from March 1 to April 15, 2024. This activity was conducted at the Fish Farm Polytechnic, Lampung State Polytechnic.

The tools used for this experiment were:

No	Tool name	Material name
1.	Tarpaulin pool	Catfish measuring 4-6 cm
2.	Ph meter	Pribiotic EM4
3.	Thermometer	Feed
4.	Aeration	
5.	Basin	
6.	Ruler	
7.	Stationery	
8.	Scale	
9.	25 ml and 100 ml Pyrex glassware	
10	Camera	

The method used in this study was an experimental method. This study used four treatments and three replications, using 100 catfish per pond, fed twice daily. The treatments used in this study were:

Treatment P: feed without EM4 probiotic (control);

Treatment K1: feed + EM4 probiotic (dose 6 ml/250 grams of feed);

Treatment K2: feed + EM4 probiotic (dose 8 ml/250 grams of feed);

Treatment K3: feed + EM4 probiotic (dose 10 ml/250 grams of feed).

This study employed an experimental research design to evaluate the effect of EM4 probiotic supplementation in feed on the growth performance of Sangkuriang catfish. The experiment consisted of four treatments: a control treatment using feed without probiotic supplementation and three treatments using feed supplemented with EM4 probiotics at dosages of 6 ml/kg, 8 ml/kg, and 10 ml/kg of feed. Each treatment was conducted with three replications.

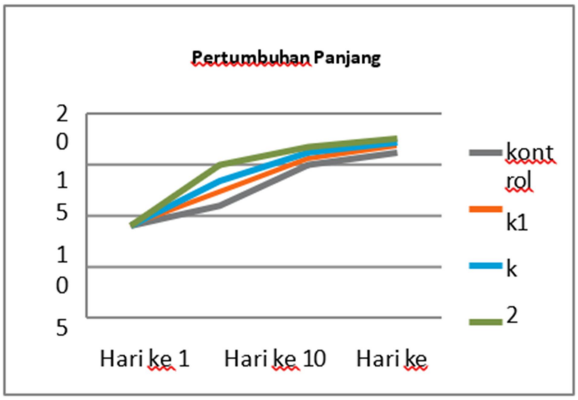
The research samples consisted of Sangkuriang catfish juveniles with an initial body length of approximately 7–9 cm and an average body weight of about 5 g per fish. A total of 100 fish were stocked in each experimental unit. The fish were reared in tarpaulin ponds measuring 100 × 100 × 50 cm^3, each filled with 100 liters of water. Prior to the experiment, the fish were acclimatized to the rearing environment to minimize stress and ensure uniform initial conditions. The rearing period lasted for 30 days. The feed used in this study was commercial feed (781-1), which was then soaked. Feed soaking is the process of adding a liquid to the feed in a certain amount so that the feed becomes soft and moist, but not broken apart.

Data collection focused on growth performance, feed utilization, survival rate, and water quality parameters. Fish growth was evaluated by measuring body length and weight, which were then used to calculate absolute growth and specific growth rate. Feed utilization efficiency and feed conversion ratio (FCR) were calculated based on feed consumption and biomass gain. Survival rate was determined by comparing the number of fish at the end of the experiment with the initial stocking number. Water quality parameters, including temperature and pH, were monitored every seven days.

Data analysis was performed using descriptive quantitative methods by comparing the mean values of growth parameters, feed utilization efficiency, FCR, and survival rate among treatments. The results were presented in tables and figures to facilitate interpretation and to identify the probiotic dosage that produced the most favorable growth response.

RESULTS AND DISCUSSION

Based on the results of the study, the addition of EM4 probiotics in feed increased the length growth of catfish, as shown in Figure 1. From observations of length growth, it was evident that the addition of EM4 probiotics in feed improved both length and weight gain in catfish fry.



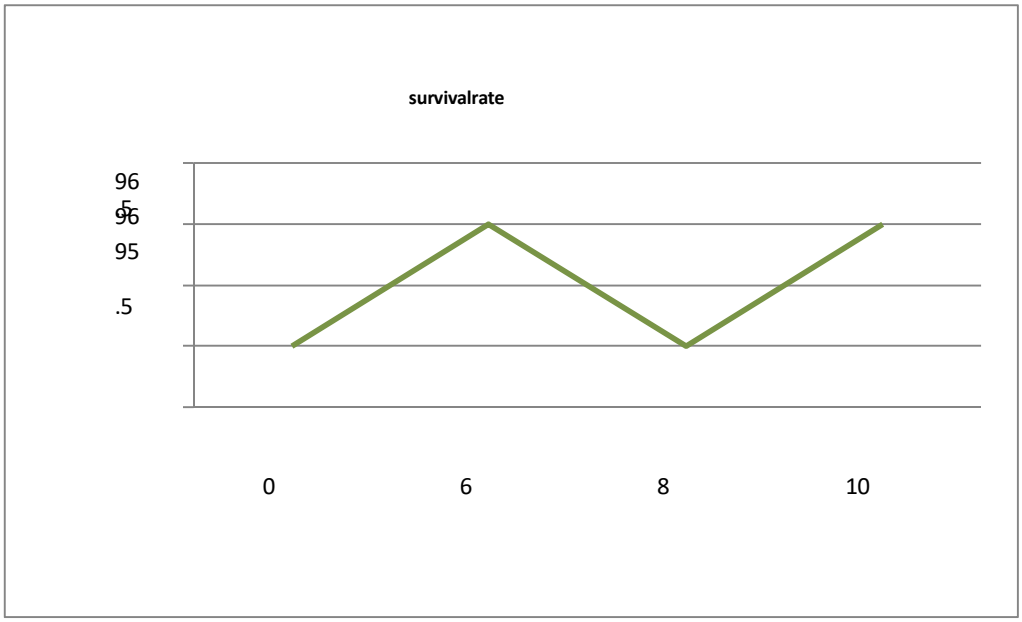
Length Growth

As shown in the table above, the growth in length and weight during the first week indicated that the fish in the 0 ml probiotic treatment had the lowest value, with an average length increase of 2 cm and weight gain of 8.5 g. This was followed by the 6 ml treatment with an average length increase of 3.3 cm and weight gain of 10 g, the 8 ml treatment with an average length increase of 4.4 cm and weight gain of 10.23 g, and the highest value was observed in the 10 ml treatment with an average length increase of 5 cm and weight gain of 11.29 g.

From these results, it can be seen that the addition of probiotics in feed had an effect on fish growth. The dosage of probiotics added to the feed influenced growth because the catfish reared in tarpaulin ponds were able to optimize their growth through the probiotic bacteria introduced into the medium. This indicates that probiotic supplementation in feed for catfish reared in tarpaulin ponds positively affected their growth.

Survival Rate

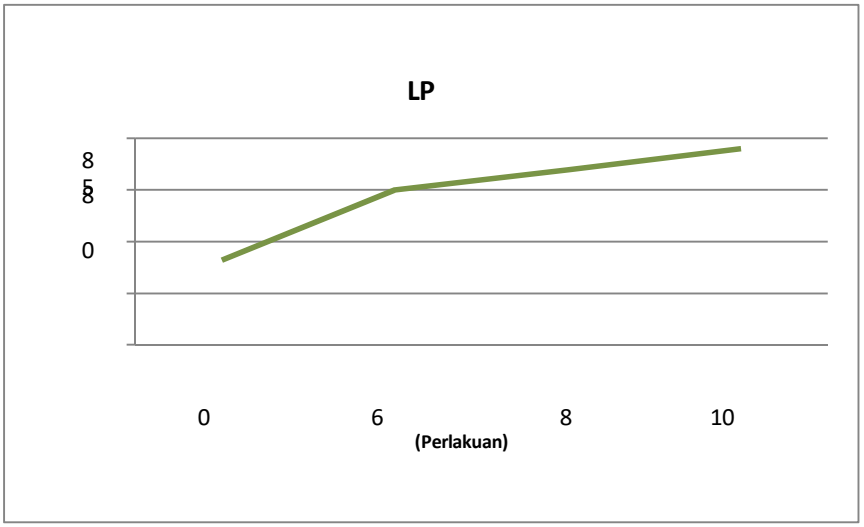
The survival rate of catfish during the study ranged between 95% and 96%, which is considered good. According to Simanjuntak et al. (2020), a survival rate above 50% is categorized as good, a survival rate of 30–50% is moderate, and a survival rate below 30% is considered not good.



The overall survival rate in this study was 95%. Survival is directly influenced by water quality; therefore, water flow treatment also influences catfish survival.

4.3.2. Feed Utilization Efficiency

The results showed that feed utilization efficiency values were highest in each treatment, from highest to lowest. The highest value was found in the 8 ml treatment (78.5%), followed by the 10 ml treatment (77.7%), the 6 ml treatment (65.5%), and the lowest value was found in the 0 ml treatment (60%). The results indicate that the use of EM4 probiotics can increase feed utilization efficiency.



The results showed that the highest feed utilization efficiency values were obtained for each treatment, from highest to lowest. The highest value was found in the 8 ml treatment at 78.5%, followed by the 10 ml treatment at 77.7%, the 6 ml treatment at 65.5%, and the lowest value was found in the 0 ml treatment at 60%. The results showed that the use of EM4 probiotics can increase feed utilization efficiency.

Feed Conversion Ratio - FCR table for each pond during the study

Pond	**Fcr**
Control pond	1,5
6 ml probiotic pond	1,5
6 ml probiotic pond	1,2
6 ml probiotic pond	1,3

The data above shows that all treatments produced different results. The average FCR for all treatments ranged from 1 to 1.5.

CONCLUSION

The addition of EM4 probiotics to feed affected the growth of Sangkuriang catfish. Fish fed with EM4 probiotics grew faster than those not fed. The optimal dose of probiotics was 10 ml/kg of feed, which resulted in significantly faster fish growth compared to doses of 6 ml/kg and 8 ml/kg.

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