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The effect of probiotic system application on Catfish growth in Cinta Mutiara ponds

Pengaruh penerapan sistem probiotik terhadap pertumbuhan Ikan Lele pada Kolam Cinta Mutiara

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Abstract. This research aimed to determine the effect of probiotic system application on the growth of Mutiara Catfish (*Clarias gariepinus var. Mutiara*) in Cinta Mutiara ponds, Tompobulu District, Maros Regency, South Sulawesi Province. The research was conducted using an experimental method with two treatments: a probiotic pond and a control pond. Sampling used purposive random sampling; twenty fish were taken from each pond and observed every two weeks throughout the catfish cultivation period. Growth was measured based on length and weight gain, and average values were compared between treatments. The results indicated that fish in the probiotic pond exhibited greater growth in both length and weight compared to the control group. The average final length and weight of fish in the probiotic pond were 18.4 cm and 37.7 g, respectively, while those in the control pond were 17.275 cm and 32.85 g. These findings demonstrate that probiotics significantly enhance the growth efficiency of Mutiara catfish.

Keywords: *Catfish, Cinta Mutiara Ponds, Growth, Probiotic.*

Abstrak. Penelitian ini bertujuan untuk mengetahui pengaruh penerapan sistem probiotik terhadap pertumbuhan ikan lele mutiara (Clarias gariepinus var. mutiara) di Kolam Cinta Mutiara, Kecamatan Tompobulu, Kabupaten Maros, Provinsi Sulawesi Selatan. Penelitian menggunakan metode eksperimen dengan dua perlakuan: kolam probiotik dan kolam kontrol. Sampel diambil sebanyak 20 ekor ikan per kolam dan diamati setiap dua minggu selama masa pembudidayaan ikan Lele. Pertumbuhan diukur berdasarkan pertambahan panjang dan berat, dan nilai rata-ratanya dibandingkan antar perlakuan. Hasil menunjukkan bahwa ikan pada kolam probiotik mengalami pertumbuhan panjang dan bobot yang lebih tinggi dibandingkan kontrol. Nilai Rata-rata panjang dan bobot akhir ikan di kolam probiotik mencapai 18,4 cm dan 37,7 gram, sedangkan di kolam kontrol panjang 17,275 cm dan berat 32,85 gram. Probiotik terbukti meningkatkan efisiensi pertumbuhan ikan lele.

Kata kunci: *ikan Lele, Kolam Cinta Mutiara, pertumbuhan, probiotik.*

INTRODUCTION

Fisheries-based foods are an important source of nutrition in meeting the community's animal protein needs. Fish, including freshwater fish such as catfish (*Clarias* sp.), are rich in protein and healthy fats, which play a crucial role in human growth and development. Globally,

efforts to ensure nutritious and sustainable food supplies align with the Sustainable Development Goals (SDGs). These efforts focus particularly on increasing food security and improving nutrition by strengthening inclusive and sustainable food systems, including those in the fisheries sector (Munandar, Darjono & Aprilasani, 2021).

Meanwhile, the importance of efficiency and sustainability in food production systems is also emphasized. Catfish farming, as one of the types of aquaculture businesses widely developed in Indonesia, plays a strategic role in supporting both of these objectives. Catfish are not only easy to farm, but also have high nutritional value and a continuously increasing level of consumption among the population. On a national scale, the Indonesian government, through its local resource-based food security program, continues to encourage the development of the aquaculture sector as an alternative source of nutritious food.

Catfish (*Clarias* sp.) is a type of freshwater fish recognized as one of Indonesia's leading aquaculture commodities. Dinas Perikanan dan Kelautan (DKP) has designated catfish as one of ten fisheries commodities prioritized for development. Catfish is a highly sought-after commodity, primarily due to its preferred taste and high nutritional value. One of the leading varieties of catfish is the pearl catfish (*Clarias gariepinus var. Mutiara*), a cross between the Egyptian catfish, phyton, sangkuriang, and dumbo. The rapid growth of pearl catfish makes it a promising choice for aquaculture, with the potential to replace other types of. Catfish farming is in high demand because it is relatively easy to manage, has a wide market demand, and is high in protein.

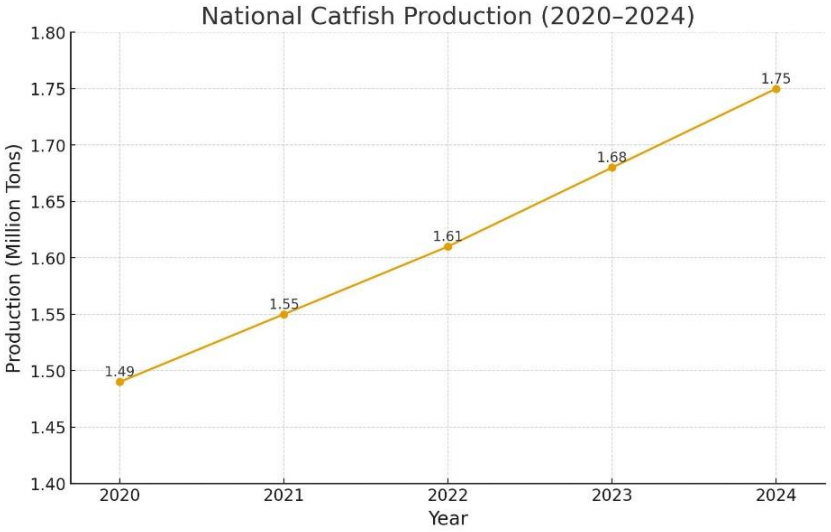

Figure 1. Catfish Production Trends in Indonesia (2020-2024)

The advantages of catfish over other types of freshwater fish lie in their rapid growth rate, ease of maintenance, and resistance to various diseases. High market demand for catfish has encouraged many producers to engage in catfish farming, which in turn has led to a significant increase in production (Permana, Muhaimin, Pardede, Hamidah, Brata & Honest, 2024). In the last five years, catfish production in Indonesia has shown a positive trend. In 2020, catfish production reached 1.49 million tons and is projected to increase to 1.75 million tons in 2024, recording an average increase of around 4% per year.

Probiotic systems are one of the strategic alternatives developed to support increased food availability, particularly through the optimization of catfish farming as a source of animal protein.

The use of probiotics in farming systems aims to increase production efficiency, reduce operational costs, and create a healthier and more sustainable farming environment. Probiotics are live microorganisms that provide benefits to their hosts, including modifying the digestive tract microflora, improving feed digestibility, strengthening the immune response to disease, improving water quality, and inhibiting the growth of pathogenic bacteria in the farming environment.

The Cinta Mutiara Pond, located in Tompobulu District, Maros Regency, is one of the pearl catfish aquaculture farms that utilizes probiotics. The pond uses a small ring-shaped aquaculture system where water is mixed with specific ingredients and probiotics, then fermented for approximately seven days before being used as a medium for catfish aquaculture. The use of probiotics in catfish cultivation media has been shown to influence catfish growth and boost immune responses against disease. One of the probiotics widely used in aquaculture is GB#1 Proquatic, a culture of beneficial microorganisms specifically formulated to improve pond water quality and support fish productivity. This probiotic contains various strains of microorganisms, including proteolytic, lignolytic, cellulolytic, amylolytic, and lipolytic microbes, as well as microorganisms that degrade sulfur and phosphate.

In addition, Profeed GB#1 probiotics were also incorporated into the catfish feed. This product contains 32 species of microorganisms, including various types of beneficial bacteria, fungi, actinomycetes, and other positive microbes with proteolytic, lipolytic, cellulolytic, hemicellulolytic, and ligninolytic activities. These are dominated by photosynthetic bacteria, lactic acid bacteria such as *Lactobacillus* sp., and other microbial groups such as *Actinomycetes* sp., *Streptomyces* sp., and yeast.

Despite the potential benefits of probiotics in aquaculture, most previous studies have been limited to laboratory or controlled pond experiments. There is a lack of comprehensive research evaluating the real-world application of probiotic systems in field-scale aquaculture, particularly in small ring-shaped ponds. This knowledge gap limits our understanding of how probiotics perform under practical farming conditions.

This study aims to analyze the effect of probiotic application on the growth performance of Mutiara catfish (*Clarias gariepinus var. Mutiara*). Specifically, the research compares growth rates between ponds treated with probiotics and untreated control ponds, providing reliable field-based evidence.

This research proposes probiotic-based aquaculture management as a strategic solution to enhance production efficiency and sustainably improve fish growth. The findings are expected to support the adoption of probiotic systems as a scalable and environmentally friendly approach to strengthen national food security through aquaculture.

MATERIALS AND METHODS

Research Site and Period

This research was conducted from April to July 2025 at the Agricultural Technology Incubator Garden, located on Jl. Poros Masale, Tompobulu District, Maros Regency, South Sulawesi Province, Indonesia.

Research Approach

This research employed a quantitative experimental design to evaluate the effect of probiotic application on the growth performance of Mutiara catfish (*Clarias gariepinus*). Experimental research, as described by Rachman, Yohanan, Samanlangi & Purnomo (2024), is designed to determine the causal relationship between treatment and outcome by comparing a treatment group with a control group.

Two ring-shaped ponds serve as maintenance units, each stocked with 200 catfish fry of the same species, size, age, and seed source, and maintained in a nearly uniform environment. The treatment pond received 'GB#1 Proquatic probiotic', whereas the control pond did not. Key variables such as stocking density, feed type, and feeding frequency were kept constant across both ponds to minimize confounding factors.

Treatment	Description	Number of Fish
Control Pond (C)	No probiotic applied	200
Probiotic Pond (T)	Probiotic applied	200

The study population consisted of 400 catfish distributed evenly between the treatment and control ponds. This approach was chosen to clearly observe the potential causal effect of probiotic application on catfish growth.

Experimental Design

1. Pond and Media Preparation

The research was initiated with the construction of a circular pond measuring 80 cm in diameter and 40 cm in height, using cement as the main material. To eliminate the cement odor that could potentially disrupt water quality, the pond was soaked with banana tree trunks until the odor completely disappeared. Fermented manure was then placed into plastic burlap bags together with dolomite lime and coarse salt to serve as a mineral source for waste decomposition. The main probiotic agent, 'GB#1 Proquatic', was applied to the pond at a dosage of 100 ml. Chopped papaya leaves were also added as a natural immunostimulant for the fish. All media components were subsequently fermented for seven days before stocking the fish.

2. Seed Preparation and Stocking

In this stage, catfish fingerlings were first placed individually in plastic bags and floated in the treatment ponds for 5–10 minutes without unsealing the bags, allowing for gradual temperature acclimatization. Afterward, the fingerlings were transferred into an adaptation solution consisting of water from the treatment ponds mixed with supertetra and vitamin B

complex, and were soaked for 3–5 minutes. The fingerlings were then carefully and slowly released into the culture ponds.

3. Maintenance and Care

Following stocking, the fish were subjected to a 12-hour fasting period to acclimate to the new environment. Feeding was initiated on the first day and was conducted consistently every afternoon after 5:00 p.m. WITA. The feed used was PF1000, which was pre-soaked for 3–5 minutes in water mixed with ‘GB#1 Profeed’ and vitamin B complex.

‘GB#1 Profeed’ functions by breaking down feed components in the digestive system of the fish, thereby improving digestion and nutrient absorption. As a result, the excreted waste consists only of indigestible residues and is odorless. Furthermore, Profeed is capable of degrading materials that cannot normally be digested by the fish, by decomposing cellulose, hemicellulose, and lignin bonds found in crop residues such as straw, thus increasing their nutritional value by more than twofold. This combination works synergistically to improve the quality of the cultivation medium and support optimal growth efficiency. In addition, a supplementary feed consisting of boiled chicken intestines was provided as a booster feed.

4. Harvesting

Harvesting was carried out after a cultivation period of approximately three months. The cultivation of catfish using the probiotic system reaches the harvesting stage within approximately 70–75 days following the stocking of fingerlings. This indicates a significantly shorter production cycle, with harvest occurring 15–20 days earlier compared to conventional catfish farming practices in earthen ponds (Fauzi, Herlambang, & Wijayanti, 2022).

Data Collecting

The data collection procedure in this study was conducted by periodically measuring the growth parameters of Mutiara catfish throughout the rearing period. The observed parameters included body weight (grams) and body length (centimeters).

Data were collected every two weeks, starting two weeks after the stocking of catfish fry and continuing consistently until the end of the study period (Eliyani Y, Suhrawardhan, & Sujono, 2015). The two-week interval was chosen to obtain sufficient growth data while minimizing potential stress or disruption to the fish's physiological condition due to excessive handling.

Sampling used purposive random sampling**.** As described by Rai and Thapa (2015), random sampling, also referred to as probability sampling or chance sampling, is a method in which each unit of the population possesses an equal probability of being included in the sample. According to Sugiharto (2009), as cited in Widjayana, Solichin A & Saputra (2015). 10% of the total population may be selected as a representative sample for measurement. Therefore, 10% of the fish from each pond were randomly selected (20 per pond, 40 fish in total), ensuring that the sample accurately represented the entire population.

Data Analysis Method

Data were obtained from 20 pearl catfish in each pond (treatment and control) every 2 weeks. The parameters observed included fish length and weight, and the averages were calculated using Microsoft Excel. The results were presented in tables and graphs and analyzed descriptively. The analysis was conducted to compare the average growth of catfish from each treatment.

RESULTS AND DISCUSSION

Growth is one of the determining factors in achieving cultivation success, especially in increasing production value. Growth is defined as an increase in the weight and length of organisms, as indicated by changes in these measurements across defined time intervals (Mulqan, Rahimi, Dewiyanti, 2017).

Length Growth of Catfish

Catfish sampling was conducted biweekly throughout the maintenance period. The obtained data revealed significant length growth in catfish from the treatment pond compared to the control group. Observations of catfish length growth in the Cinta Mutiara pond during the maintenance period demonstrated consistent growth increases every two weeks, with length increments presented in Table 1.

Table 1. Statistics and parameters of catfish length (cm)

Data Number	Treatment Pond	Control Pond
1	6.645	6.3
2	10.345	9.775
3	13.425	12.6
4	16.3	15.475
5	18.4	17.275

The subsequent growth in catfish length is illustrated in the figure below.

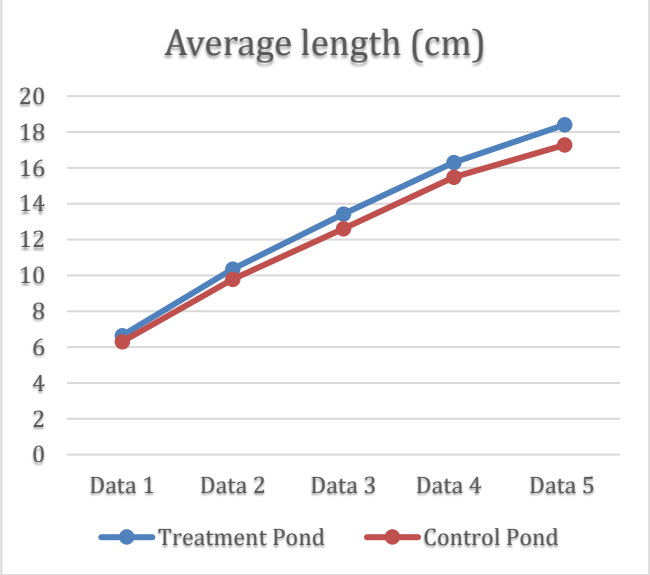

Figure 2. Graph showing the growth of catfish length (cm) in the treatment pond and control pond

The treatment pond showed significant effects and the most optimal results during the maintenance period. Fish length growth in the treatment pond showed consistent improvement from the first two weeks after treatment until the end of the maintenance period. The average fish length in the treatment pond was 18.4 cm, while in the control pond it was 17.275 cm.

Weight Growth of Catfish

Weight serves as the primary indicator for assessing cultivation success and feed efficiency. Optimal weight growth demonstrates that energy from feed is utilized efficiently for metabolism and body tissue formation in fish (Funome, Rebhung, Liufeto., 2024). The findings revealed that catfish receiving probiotic treatment exhibited a significant increase in weight compared to the control pond. The results are presented in the corresponding table.

Table 2. Statistics and parameters of catfish weight (g)

Data Number	Treatment Pond	Control Pond
1	5.05	4.7
2	8.4	7.55
3	16.25	13.35
4	23.8	20.6
5	37.7	32.85

The subsequent growth in catfish weight is illustrated in the figure below.

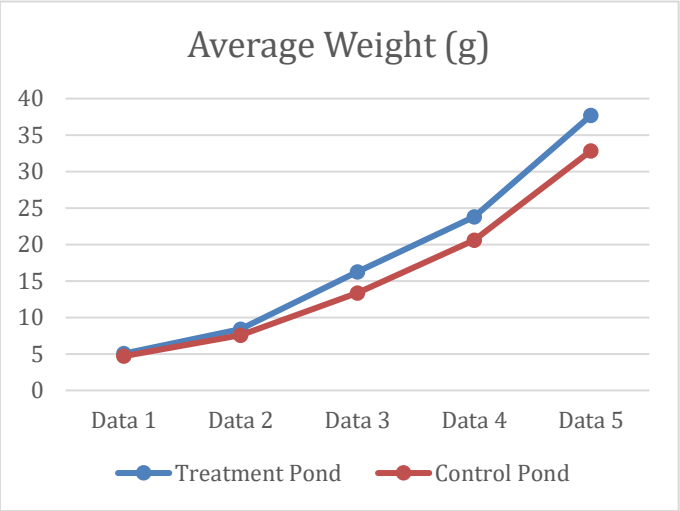

Figure 2. Graph showing the growth of catfish weight (g) in the treatment pond and control pond.

Based on observations during the maintenance period, data on catfish weight growth showed significant differences between the probiotic pond and the control pond. The group of catfish given probiotic treatment showed higher weight growth compared to the control pond. At the end of the study, the group of catfish given probiotic treatment reached an average final weight of 37.7 g, while the control pond group only reached 32.85 g.

These results strongly support that the application of probiotics in catfish culture at Cinta Mutiara Ponds had clear and beneficial effects on growth performance, particularly in improving body weight. The combined use of 'GB#1 Proquatic' in the culture water and 'GB#1 Profeed' in the feed proved to work effectively by creating a healthier rearing environment and supporting optimal nutrient utilization. 'GB#1 Proquatic' actively decomposed fish feces and uneaten feed into simpler compounds, preventing the accumulation of organic waste while recycling nutrients back into forms that could be reabsorbed by the fish. At the same time, 'GB#1 Profeed' improved intestinal microbial balance, stimulated digestive enzyme activity, and enhanced feed conversion efficiency. These complementary functions ensured that catfish in the treatment ponds were able to grow more efficiently, with visible improvements in both body length and body weight.

The effectiveness of these probiotics is supported by their diverse microbial composition. Lactic acid bacteria maintained intestinal balance and improved nutrient absorption, photosynthetic bacteria contributed to water purification and bioactive compound production, and Actinomycetes sp. together with Streptomyces sp. produced natural antibiotics that suppressed harmful bacteria. Yeast further enriched fish nutrition by providing proteins, B-complex vitamins, and immune-boosting compounds. This strong microbial synergy created a powerful system where more energy from the feed was directed to body growth rather than being lost to stress or disease defense, resulting in stable and significant weight gain among the cultured catfish.

Enzymatic activity further confirmed the strength of this approach. Proteolytic, lipolytic, cellulolytic, hemicellulolytic, and ligninolytic microbes accelerated the breakdown of proteins, fats, fibers, and other complex organic materials, making nutrients more available and easier to absorb. This process directly translated into improved feed efficiency and faster weight gain. As also highlighted by Hoseinifar, et al. (2018), probiotics play a key role in maintaining intestinal microbial balance, stimulating immunity, and suppressing pathogens, all of which were evident in the Cinta Mutiara Pond trials.

In addition, the supplementation of vitamin B complex further strengthened the impact of 'GB#1 Profeed'. Acting as enzymatic cofactors, these vitamins supported energy production, red blood cell formation, and tissue development, leading to improved metabolism and overall growth. When integrated with probiotics, vitamin B complex created an even stronger effect on nutrient utilization and fish health. The consistent improvements observed in the treatment ponds at Cinta Mutiara Ponds clearly demonstrate that the application of 'GB#1 Proquatic 'and 'GB#1 Profeed', combined with vitamin B complex, works effectively and reliably to enhance the growth performance of catfish, especially in achieving higher body weight.

CONCLUSION

Based on the results of the research, it can be concluded that the application of catfish farming using a probiotic system in the Cinta Mutiara pond has a significant effect on the growth and weight of catfish. Fish farmed in ponds with probiotic treatment showed a more significant increase in length and weight compared to fish in control ponds without probiotics.

It is recommended that, in order to increase catfish production, maintenance procedures involving the use of probiotics should be used. In addition, further research is needed on catfish cultivation in the Cinta Mutiara Pond with more intensive feeding and more effective observation times.

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