# PRODUCTION AND YIELD OF MILKFISH REARED IN A POND USING PROBIOTICS

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## ABSTRACT

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The study was conducted to determine the potential of using probiotics to enhance milkfish production in ponds. The experiment, spanning 90 days, employed commercially available probiotics applied once a week. Two treatments, each with two replications, were carried out in a 200 sq. meter pond divided into four compartments. Milkfish fingerlings with an initial weight of 20.68 g were stocked at a density of one per sq. meter. Growth performance, water quality, and physicochemical parameters were monitored. The results revealed that milkfish reared with and without probiotics showed comparable growth and production, with no significant differences in final weight, daily weight gain, and survival rate. This finding provides reassurance about the effectiveness of probiotics in maintaining water quality, particularly in controlling ammonia levels. These findings suggest that probiotics can be a valuable tool in milkfish pond culture, allowing for improved growth and water quality management with limited water exchange.

# INTRODUCTION

The aquaculture industry, a rapidly growing sector, faces challenges such as diseases and unfavorable culture conditions, often leading to low production. To address these, technologies such as probiotics offer potential for improving the fishpond environment. This study, which aims to determine the potential of using probiotics to enhance milkfish production in ponds, is significant in this context.

The use of probiotics has been widely promoted in aquaculture, though information on their economic benefits remains limited. Large aquaculture operators already integrate probiotics into their management, but small-scale fishpond owners are often hesitant due to the additional cost. Probiotics are living microorganisms that confer beneficial effects on the host and play a crucial role in aquatic environments by recycling nutrients, degrading organic matter, and protecting fish against diseases (El-Haroun, 2008). They can be used to control pathogens and improve feed utilization, survival, and fish growth, with minimal adverse effects on cultured organisms (Qi et al., 2009; Iribarren et al., 2012). Probiotics can also produce inhibitory substances, enhance immunity, and prevent colonization by pathogens in the gut (Gao, 2017; Lee et al., 2019).

The application of probiotics in aquaculture has shown favorable results for more than a decade (Verma & Gupta, 2015; Pieters et al., 2008), and they are widely recommended as eco-friendly alternatives to antibiotics (Jahangiri & Esteban, 2018; Das et al., 2017; Munirasu et al., 2017). However, most studies have been conducted under laboratory conditions, emphasizing growth, health, and water quality improvements, but with less focus on direct economic gains. Previous laboratory trials at SPAMAST confirmed the beneficial effects of probiotics on water quality, and further application during grow-out phases showed positive results for productivity.

This study aims to validate the use of probiotics to improve the milkfish pond culture environment, focusing on growth performance, feed efficiency, survival, and water quality.

## General Objectives

This study aimed to validate the potential of using probiotics in improving milkfish pond production. Specifically, it sought to:

Evaluate the effect of probiotics on growth performance, feed conversion ratio (FCR), and survival of milkfish reared in a grow-out pond.

Validate the effect of probiotics on water quality in milkfish pond culture.

## MATERIALS AND METHODS

### Study Site

The study was conducted in the nursery pond of SPAMAST, Malita, Davao Occidental. Data collection spanned 90 days, from February to April 2021. Commercially available probiotics were applied once a week.

### Experimental Design and Stocking

The study employed an experimental design with two treatments and two replications. A 200 sq. meter pond area was divided into four compartments, each measuring 50 sq. meters. The compartments were stocked at a density of one fingerling per sq. meter (a total of 50 per compartment), with an average initial size of 20.68 g.

### Growth Performance Monitoring

Daily weight gain (DWG) was calculated as (final weight – initial weight) / 40 (g day–1). Specific growth rate (SGR) was calculated as $100 \times (\ln W_2 - \ln W_1)/T$, where $W_1$ and $W_2$ are initial and final weights, respectively, and T is the number of days of feeding. Survival was recorded at the end.

### Feeding Management and Sampling

Commercial feed was used throughout the experiment. Initially, the feeding rate was 5% of body weight for the first month, then reduced to 3% for the remainder of the period. Feedings occurred three times daily. Sampling was conducted every 15 days to monitor weight and length; survival was monitored to update feeding ratios accordingly.

### Water Management

For ponds not treated with probiotics, regular water exchange was practiced during spring and neap tides. No water exchange was performed in probiotic-treated ponds.

### Physico-chemical Monitoring

Temperature, dissolved oxygen, and pH were monitored every other day. Ammonia levels were checked using a test kit twice a week and validated by spectrophotometer readings.

## RESULTS AND DISCUSSION

The results of the growth performance of milkfish (*Chanos chanos*) treated and untreated with probiotics are presented in Table 1. At the end of the feeding trial, fish reared in ponds, both with and without probiotics, showed comparable results. There was no significant difference ($P > 0.05$) between the two treatments. No differences were observed in final weight, daily weight gain (DWG), or survival rate between the treated and control groups.

**Table 1.** *Growth and production data of milkfish (Chanos chanos) reared in ponds with and without probiotics.*

| Parameter | Untreated with Probiotics | Treated with Probiotics |
|---|---|---|
| Initial weight (g) | 20.68 | 20.68 |
| No. of stocks (pcs) | 100 | 100 |
| Initial length (cm) | 10 | 10 |
| Average weight at harvest (g) | 110 | 115 |
| Average length at harvest (cm) | 19.15 | 21.99 |
| Daily growth rate (g/day) | 0.99 | 1.048 |
| Survival rate (%) | 65 | 64.5 |
| Total production (kg) | 7.15 | 7.42 |
| Feed Conversion Ratio (FCR) | 2.8 | 2.5 |

**Physico-chemical Parameters**

During the period of observation, the variations in the different physicochemical parameters between the two treatments were very minimal (Table 2). There were no significant differences in total ammonium (0.09–0.3 mg $L^{-1}$) and pH (7.0–7.5) of the water among all experimental ponds. Similarly, the pH, temperature, and dissolved oxygen remained within the standard requirements for aquatic animals.

**Table 2.** *The range of physicochemical properties of Water in the Experiment Pond*

| Parameter | Untreated with Probiotics | Treated with Probiotics |
|---|---|---|
| Temperature (°C) | 26–33 | 26–30 |
| pH | 7.6–7.9 | 7.2–7.8 |
| Dissolved Oxygen (mg/L) | 5.1–5.3 | 5.0–5.3 |
| Ammonia (mg/L) | 0.09–0.2 | 0.08–0.30 |

The comparable level of ammonia observed in the two treatments might be attributed to the presence of nitrifying bacteria introduced through the probiotics. These bacteria are known to convert ammonia to nitrite, and the subsequent oxidation of various forms of inorganic nitrogen in the well-oxygenated surface water could have resulted in increased concentrations of nitrates. Probiotic bacteria are reported to improve water quality. In particular, heterotrophic bacteria—requiring organic sources of carbon and other organic compounds for growth—play a significant role in decomposing organic matter and producing particulate food materials from dissolved organics (Jana & De, 1990; Guo et al., 1988).

## CONCLUSIONS

The growth of milkfish treated with probiotics was comparable to that of those reared in ponds with minimal water exchange. Similarly, the use of probiotics helped maintain water parameters—such as temperature, pH, dissolved oxygen, and ammonia—within the optimal range required for the healthy growth of milkfish in ponds with limited water exchange.

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