Effect of Probiotics on the Growth & Soil & Water Quality and Biochemical Composition of *Piaractus Brachypomus* Culture Pond

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Abstract- Probiotics' effects on the biochemical parameters that determine growth performance and the ideal soil and water quality for *Piaracus brachypomus* fish were evaluated. Three phases made up the experiment: the fingerling stage, which lasted from 1 to 30 days; the adult stage, which lasted from 31 to 60 days and the grow-out phase, which lasted from adult to marketing, which lasted from 61 to 90 days. The experiment was conducted in two freshwater earthen ponds. 1.1 pcs/m^2 is the stocking density. Twice a week, the probiotic "Super PS" with a 10 ml/kg concentration of *Rhodococcus* and *Rhodobacter* is fed to fish in the experimental pond (P2) exclusively, supplementing their diet according to their weight. The Control pond (P1) did not receive any probiotic treatment. The trial pond's treated pond demonstrated superior growth performances ($p < 0.05$) in comparison to the control pond. Treatment groups had a considerably ($p < 0.05$) increased survival percentage in the treated pond. This suggests that probiotics could be used as a preventative measure to help *P.brachypomus* fingerlings survive longer. Probiotic-treated pond (P2) had considerably ($p < 0.001$) greater biological parameter levels, but 'Super PS' treated pond had significantly ($p < 0.001$) higher levels of soil and water quality parameters. The results of this study show that using probiotics during *Piaractus brachypomus* culture produced favourable changes. Probiotic effects on the experimental pond (P2) also confirmed biochemical changes, growth performance and ideal soil and water quality parameters in *Piaractus brachypomus* health.

Keywords: *Piaractus brachypomus*; Probiotics *Rhodococcus* and *Rhodobacter;* Biological parameters, growth performance, pond parameters

1. INTRODUCTION

Fish is full of nutrients that are vital for maintaining good health and warding off many illnesses, it is regarded as a very nutritious food. Furthermore, because of fish's high protein availability, palatability and digestibility, it is thought that they constitute a substantial source of animal protein for nutrition. The result was a sharp rise in fish production globally. Bioactive peptides with a variety of biological roles may be found in fish flesh protein hydrolysate, which is produced during hydrolysis.

The protein hydrolysate that was produced through fermentation exhibited superior antimicrobial, antioxidant, antihypertensive and immunomodulatory qualities (Jemil et al., 2014; Sripokar et al., 2019, Bethi et al., 2021). The most plentiful and expensive ingredient in commercial feeds, protein is also the primary organic component of fish tissues. According to Guillaume et al. (1999) fish use protein significantly for energy during regular metabolism in addition to its usage in tissue growth and repair.
In India, *P.brachypomus* was brought to Bangladesh as an exotic species in 2003 and 2004. Fish from South America, specifically the Pacu species, are indigenous to Venezuela, Brazil and Peru. *P.brachypomus* belongs to the family Characidae, order Characiformes and subfamily Serrasalminae of freshwater fish. The fish is referred to locally as Rupchand throughout India, particularly in the states of Tripura, Assam, West Bengal and Andhra Pradesh, despite having a common name. *P.brachypomus* is an omnivore; it has also been observed that it consumes insects, snails, zooplankton and decomposing vegetation. This resilient fish, called characid, has several appealing qualities, including excellent meat quality and rapid growth.

Growth stimulants and probiotics are two examples of the chemical substances that are employed nowadays to improve the immune systems of aquatic life, decrease mortality and create a more robust aquaculture. Microorganisms known as probiotics are consumed for a variety of purposes, including boosting growth, aiding with absorption and digestion and preventing infectious infections. Probiotics are used to improve the microbial balance in the intestine and may benefit the host as a supplemental diet (Fuller, 1989). Probiotics are well recognized as immunological stimulants and their effects are well-corroborated. They may also increase the host's resistance to an unidentified defense system. (Gatesoupe, 1999, Verschuere et al., 2000, Skjermo and Vadstein, 1999). Probiotics have a number of beneficial effects, some of which are worth mentioning: they can promote the growth of beneficial bacteria, get rid of harmful bacteria and strengthen the immune system. (Vandenbergh, 1993, Villamil et al., 2002).

Maintain health and enhance the resilience of the innate immune system by the use of probiotics, prebiotics and other immunostimulants (Akhter et al., 2015). Fish growth and survival as well as water quality can be enhanced by the employment of microorganisms such Bacillus species (Banerjee et al., 2010; Lalloo et al., 2007; Rengpipat et al., 1998). According to El-Haroun et al. (2006), the use of probiotics in aquaculture has led to lower operating costs and a higher profit margin—roughly 20% higher than farming without the use of probiotics. Originally, probiotics were added to feed to promote health and growth by boosting immunity to illness (Fuller, 1992). Gram-positive and gram-negative bacteria have both been employed as probiotics in aquaculture, according to Hai (2015). Likewise, the application of Bacillus species in aquaculture is common to improve growth efficiency, innate immunity and resistance to illness. (Heo et al., 2013). Given that crude protein is frequently the primary component that limits growth, the amount of protein required in fish diets is an important nutritional factor. Fish that are fed at the ideal levels of dietary protein retain a correspondingly higher amount of protein in their bodies during growth, which lowers production costs and pollution. (Thoman et al. 1999)

The *Rhodococcus* and *Rhodobacter* type of bacteria found in probiotics are added to the environment to improve its quality by converting organic matter into minerals and harmful substances like ammonia and nitrite into free non-toxic compounds. Probiotics are added to maintenance medium with the goal of enhancing water quality through biodegradation, preserving microbial balance and managing harmful bacteria. (Purwanta and Firdayati (2002). By dissolving fish feces and residual feed that accumulates at the bottom of the water, probiotics added to maintenance media should improve the quality of the water (Mansyur and Tangko 2008). Probiotics from the photosynthetic bacterium *Rhodobacter* can enhance the environment and water quality (Trisna et al. 2013). Phototrophic bacteria use light waves from the sun to stimulate the photosystem membrane. They can survive in environments with low oxygen levels. Both organic and inorganic substances, including H_2S, nitrite, Fe_2 and ammonia, are utilized as electron donors by photosynthetic bacterial groups (Widiyanto, 2001). Complex polysaccharides can be produced from complex chemical molecules by photosynthetic bacteria employing source (Hiraishi et al., 1995).

The information on the biochemical parameters needed for these species' growth is crucial and research on their nutrition should be done to create fish that are nutrient-balanced. The goal of the current study was to examine the requirements for biochemical parameters, assess their impacts on growth performance and determine the ideal temperatures for maintaining soil and water quality in *P.brachypomus* culture ponds (Borghetti JR, 1993).

2. MATERIALS AND METHODS

2.1. Source of fish and accumulation

Piaractus brachypomus fingerlings (Figure 1) fingerlings were taken from the Sri Venkateswara Hatchery in the Nellore District of Andhra Pradeshwere brought in and given enough aeration and dechlorinated water for a week in order to acclimate them to laboratory settings. . Additionally, the intestinal bacterial load was evaluated and selected uniformly sized, healthy, disease-resistant P.brachypomus fingerlings. in the two rectangular freshwater ponds at Veguru Village, Kovur Mandal, Nellore District, Andhra Pradesh, India, which together measure 0.4 hectares.

Figure:1,2: *Piaractus brachypomus*

Piaractus brachypomus has a body shape that is compressed. The mandible projects somewhat downward. Both before and after the pelvic fins, the abdomen is serrated. The anal fin's initial rays have a little elongation. The base of the caudal fin is scaled. The body has a metallic shine and is light lead-grey in color. The pre-operculum and operculum on the ventral part of the body are vermilion, extending from the anterior tip of the lower jaw to the anus. The anal fin has a black border around it. Grey are the caudal and dorsal fins. The edge of the caudal fin is broad and black. (Ribeiro, F. M et al,. 2016).

2.2. Experimental design and feeding method

The two treatments for fresh water ponds in this study were "Super PS" .The majority of its composition, at 10^9 CFU/ml, is made up of *Rhodobacter* and *Rhodococcus* species. Using H_2S, preserving the ideal pH scale of water, breaking down sludge through biodegradation and boosting the populations of beneficial microorganisms are some of the advantages of "Super PS." six replicants of each treatment were collected. "Super PS" probiotics dispersed throughout the pond preparation, mixed with the water in the treatment pond (P2) and probiotic-free in the control pond (P1). Fingerlings of *P.brachypomus*, weighing between 5-7 g, were used in the study.

With a stocking density of 1.1 pieces/m2 and 4500 fingerlings, the experimental and control earthen ponds measured 0.4 hectares each. Samples were taken in six replicates throughout the course of 30, 60 and 90 days over the 90-day experiment. Until fish fingerlings reach adult maturity, they are fed commercial fish feed, which is sold at the local market as floating pellets (Vinod, S.A. et, al., 2021). While probiotic "Super PS" was supplied to the feed of the experimental pond P2 twice a week at a rate of 10 ml/kg to feed a meal, probiotics were absent from the control P1 pond. For both the control and experimental diets, 28% crude protein, 3% fat, 7% fiber, 20% ash and 11% moisture of 1 tonne of feed was nutritionally complete.

2.3. Pond preparation and stocking:

In this study, farm biosecurity was ensured by allowing the two 0.4 ha control and experimental ponds to dry for fifteen days. Before the trial began, all aquatic weeds from a few ponds were carefully removed. Since the water quality of the chosen freshwater fish ponds has been split into three groups. In order to preserve healthy soil and water quality, each pond was given a 50 kg/acre calcium oxide (CaO) lime treatment and was watered down to a depth of 1.3 to 1.7 meters. After liming the land for five to seven days in order to increase the production of natural feed, the land was further fertilized with cow dung 200 kg/acre, urea 5 kg/acre, triple super phosphate 2.5 kg/acre, etc. Simultaneously, the control and experimental ponds (P1, P2) received equal treatment from these techniques. Furthermore, to develop the beneficial bacterial community and utilize the organic matter in the experimental pond (P2), 20 liters/acre of "Super PS" probiotic were sprayed on the bottom after the silt was removed. In this study, *P.brachypomus* is the only species in a monoculture. Fingerlings (ABW, 6.0 g) of *P.brachypomus* were planted in the Experimental and Control ponds. Before being stocked, the fingerlings had a proper acclimatization to the pond water. (Nur Mohammad et, al., 2021).

2.4. Growth performance analysis

For determining the weight increment Sambhu and Jayaprakas (2001), specific growth rate (SGR) Ravi S, et al (1988), survival percentage Biswas G et al., (2011), food conversion rate (FCR) Mustafa and Ridzwan (2000), 6 replicates fishes from each pond were taken at 30, 60 and 90 days of interval and calculated using the formulae were estimated followed by Lee et al (2000).

Weight Gain (WG %) = Final body weight – Initial body weight ÷ Initial weight
Weight increment = Final body weight (g) – Initial body weight (g).
Feed Conversion Ratio (FCR) = Feed given (dry weight) (g) ÷ Body weight gain (wet weight) (g)
Specific growth rate (SGR) = ([(Ln FBW - Ln IBW) /day] ÷ days) x 100
Survival Rate (%): (Total number of fish survived ÷ Total number of fish stocked) x 100

2.5. Determination of Biochemical Parameters
After 30, 60 and 90 days, biochemical studies were performed on the muscle of *Piaractus brachypomus* to assess the contents of total protein, lipid, carbohydrate, amino acid, moisture and ash. Fish moisture and ash content (AOAC 2000), protein content (Lowry et al., 1951), lipids (Folch J, et al., 1957), carbohydrates (Dubois et al., 1956) and amino acid content (Ishida et al., 1981) were all estimated.

2.6. Soil and water quality parameters
An electrode pH meter was used to determine the pH of the soil electrochemically (Jackson, 1973). Using an EC meter, the electrical conductivity of the soil was determined. The organic carbon content of the samples was ascertained using the wet oxidation method developed by Walkley and Black. (Ghosh et al,.1983). Fish development depends on the characteristics of water quality. Monitoring of water quality measures was done on a monthly basis. These included temperature, transparency, pH, dissolved oxygen (DO), ammonia and nitrite. From the ponds, water samples were taken and several parameters were evaluated, such as dissolved oxygen, total ammonia (APHA 1989), nitrate (Boyd 1984) and pH (Corning pH meter). The temperature was assessed using a handheld mercury thermometer. Water transparancy was measured using a Secchi disk.

2.7. Statistical analysis:
Version 23 of SPSS was used for statistical analysis. The data is shown as mean ± SD. ANOVA or one-way analysis of variance, was used to analyze the data. Duncan's multiple range test (DMRT) was used to compare significant means and a ($P<0.001$) was deemed statistically significant.

3. RESULTS AND DISCUSSION

3.1. Growth performance of *Piaractus brachypomus*
Table 1 displays the weight gain gain of *P.brachypomus* fingerlings fed the experimental probiotic (P2) diet for 90 days, together with the control diet (P1). The findings indicate that *P.brachypomus* fingerlings' weight gain significantly ($P<0.001$) as rearing times extended for both the experimental and control groups. Notably, fingerlings given the probiotic P2 diet showed a considerable rise in weight.
The fingerlings fed the control (P1) and experimental (P2) diets had initial body weights of 5.42 g and 5.28 g, respectively, on the first day of stocking. On days 30, 338.53 g and 382.80 g, respectively, on day 60 and 473.60 g and 583.65 g, respectively, on day 90, the fingerlings fed the control diet (P1) and the experimental probiotic diet (P2) gained 185.48 g and 187.76 g, respectively. But there is currently a noticeable increase in the experimental P2 probiotic diet as compared to the P1 diet. The findings revealed that *P.brachypomus* can gain weight more readily on the probiotic P2 diet than on the control P1 diet.

Table 1: Weight gain (g) of *Piaractus brachypomus* fed control (P1) and experimental probiotic (P2) diet during rearing period of 30, 60 and 90 days.

P.brachypomus	Control Diet (P1)			Experimental Diet (P2)		
Growth parameters	30 days	60 days	90 days	30 days	60 days	90 days
Initial weight (g)	5.42±0.50^a	185.48±2.56^b	338.53±3.28^c	5.28±0.41^a	187.76±2.67^b	382.80±3.44^c
Final weight (g)	185.48±2.56^a	338.53±3.28^b	473.60±3.74^c	187.76±2.67^a	382.80±3.44^b	583.65±2.80^c
Weight gain (%)	33.22±2.25^c	28.23±2.65^b	24.92±2.15^a	34.56±2.54^a	36.93±2.28^b	38.03±2.74^c
Feed Conversion ratio (FCR %)	1.172±0.025^a	1.681±0.018^b	1.908±0.024^c	1.118±0.031^a	1.474±0.015^b	1.58±0.023^c
Specific growth rate (SGR %)	2.261±0.185^a	2.522±0.146^b	2.675±0.112^c	2.274±0.152^a	2.581±0.128^b	2.761±0.188^c
Survival rate (%)	92.88±5.28^c	88.22±5.34^b	85.33±5.62^a	98.88±5.82^b	97.77±5.54^a	97.77±5.69^a

* Data expressed as mean ± SD (n = 6)

* Values bearing different superscripts in a row differ significantly (p<0.001) (DMRT).

P.brachypomus fed control (P1) and experimental (P2) diets showed variations in feed conversion ratio (FCR) from day 1 to day 90 (Table 1). The findings unequivocally demonstrate that, in both the control and experimental groups, the fingerlings' feed conversion ratio dramatically declined with increasing rearing time (P<0.001), with the fingerlings fed the probiotic diet (P2) seeing a larger decrease than those fed the control diet (P1). The real findings on the variations in the specific growth rate (SGR) of *P.brachypomus* fingerlings given a probiotic experimental diet (P2) and a control diet (P1) for a period of 90 days. The specific growth rate of *P.brachypomus* increased somewhat with increased rearing time in both the experimental and control groups, according to the data.

After 30, 60 and 90 days, the survival rate (%) of *P.brachypomus* fed control (P1) and experimental probiotic (P2) diets was measured. The survival rates for P2 and P1 were compared to the experimental ponds fed with probiotic (P2) diet and the survival rate of *P.brachypomus* fish in the control ponds (P1) rapidly decreases with increasing rearing time. Table 1 displays the statistical data on survival rate (%) on day 30. These findings showed that the probiotic-fed pond (P2) outperforms the control (P1) in terms of increasing the survival rate.

3.2. Biochemical Parameters of *Piaractus brachypomus*

Table 2 displays the biochemical characteristics of the experimental and *P.brachypomus* control muscle tissue. Protein values of the experimental probiotic diet (P2) of *P.brachypomus* muscle tissue were substantially greater than those of the control diet (P1) in the present investigation. It took 30, 60 and 90 days to ascertain the protein values of the experimental and control groups. Day 30 (16.68±2.42 to 21.25±3.25), Day 60 (23.11±3.50 to 31.58±3.08) and Day 90 (31.52±2.68 to 42.12±3.45) saw considerably (P < 0.001) greater protein levels in the experimental probiotic treated group compared to the control group receiving probiotic treatment.

At days 30, 60 and 90 of the experimental probiotic treatment (P2) and control group (P1), the tissue lipid content of *P.brachypomus* was evaluated. In comparison to the control group, the experimental probiotic-treated group had a considerably greater lipid content of *P.brachypomus*. Three separate time periods are used to capture the results. The lipid content increased considerably on day 30, going from 11.13±2.03 to 17.29±2.11, on day 60 from 17.18±1.85 to 26.46±1.52 and on day 90 from 26.22±2.23 to 33.58±1.86).

The carbohydrate content of *P.brachypomus* from the control (P1) and experimental probiotic-treated (P2) groups was measured. In comparison to the control group, the glucose concentration in the experimental probiotic-treated group increased gradually between days 30 to 60 and day 90. Three distinct time intervals were used to record the results. On days 30, 60 and 90, the amount of carbohydrates in *P.brachypomus* in the experimental group was substantially higher than in the control group (31.25±2.82 to 35.48±2.19; 36.38±2.34 to 41.63±1.95; and 40.52±2.61 to 48.75±2.18).

In the control (P1) and experimental (P2) groups, *P.brachypomus* moisture and ash content were assessed at 30, 60 and 90 days. On days 30, 60 and 90 (73.84±2.95 to 75.52±2.81), as well as day 90 (74.89±3.24 to 76.32±3.47), the moisture content was marginally higher (Figure 28). Also, the ash content gradually rose from day 30 to day 90, from day 60 to day 90, from day 60 to day 90 and from day 30 to day 90. It went from 1.21±0.19 to 1.98±0.69).

It was also determined how many amino acids the *P.brachypomus* fish had. Following the initiation of feeding with control (P1) and experimental (P2) diets, the experimental group's amino acid content was found to be considerably higher than that of the control group on days 30, 60 and 90. It was 46.14±1.29 to 52.35±2.31 on days 30, 60 and 90; 56.27±2.04 to 69.21±2.15 and 63.62±1.97 to 78.44±1.89), respectively.

Table 2: Biochemical parameters of the *Piaractus brachypomus* in control (P1) and experimental probiotic treated (P2) groups

P.bachypomus	Control Diet (P1)			Experimental Diet (P2)		
Biochemical Parameters	30 days	60 days	90 days	30 days	60 days	90 days
Protein (mg/g)	16.68 ± 2.42[a]	23.11 ± 3.5[b]	31.52 ± 2.68[c]	21.25 ± 3.25 [a]	31.58 ± 3.08[b]	42.12 ± 3.45[c]
Lipids (mg/g)	11.13 ± 2.03[a]	17.18 ± 1.85[b]	26.22 ± 2.23[c]	17.29 ± 2.11[a]	26.46 ± 1.52[b]	33.58 ± 1.86[c]
Carbohydrates (mg/g)	31.25 ± 2.82[a]	36.38 ± 2.34[b]	40.52 ± 2.61[c]	35.48 ± 2.19 [a]	41.63 ± 1.95[b]	48.75 ± 2.18[c]
Moisture (%)	72.42 ± 2.62[a]	73.84 ± 2.95[b]	74.89 ± 3.24[c]	74.25 ± 3.13 [a]	75.52 ± 2.81[b]	76.32 ± 3.47[c]
Ash (%)	1.21 ± 0.19[a]	2.36 ± 0.22[b]	3.34 ± 0.38[c]	1.98 ± 0.69[a]	3.14 ± 0.57[b]	4.25 ± 0.21[c]
Amino acid (mg/g)	46.14 ± 1.29[a]	56.27 ± 2.04[b]	63.62 ± 1.97[c]	52.35 ± 2.31[a]	69.21 ± 2.15[b]	78.44 ± 1.89[c]

* Data expressed as mean ± SD (n = 6)

* Values bearing different superscripts in a row differ significantly (p<0.001)

3.3. Soil quality parameters of *Piaractus brachypomus P*1 and P2 Ponds

Soil samples were taken from P1 and P2 cultivation ponds. Samples were taken throughout the experiment, for example, prior to draining, during culture and following harvest. After measurement, it was discovered that the samples fell within the culturable range displayed in Table 3. The pH of the soil is one of the most important parameters for successful fish cultivation. While the pH ranged from 6.5 to 7.0, the probiotic-treated pond had an electrical conductivity that was 4.5 and 5.9 higher than the control pond. The current investigation's data showed that there was a substantial difference in total organic carbon (1.13% - 1.14%) (P<0.001) between the probiotic-treated ponds and the control ponds. As a result, the commercial "Super PS" probiotic treatment for water and soil caused discernible changes in the sediment's levels.

Table 3: Soil quality parameters in ponds with *Piaractus brachypomus* fingerlings under probiotic treatment (P2) and control (P1) conditions.

P.brachypomus	Control Pond (P1)			Experimental Pond (P2)		
Soil parameters Ranges	Before culture	duration of culture	After culture	Before culture	duration of culture	After culture
pH	6.5±0.80[a]	6.5±0.45[a]	6.9±0.65[a]	6.5±0.20[a]	7.0±0.85[b]	7.4±0.60[b]
Electrical Conductivity (ds/m)	4.5+0.095[a]	4.5±0.125[a]	4.6 ±0.160[a]	4.3± 0.385[a]	5.9 ±0.438[b]	6.0 ± 0.350[b]
Organic Carbon (%)	1.13±0.022[a]	1.13±0.062[a]	1.13±0.054[a]	1.13±0.070[a]	1.14±0.086[a]	1.15±0.020[a]

*Data are Mean values ± S.D (n=3)

*Values in the same row with the same superscripts are not significantly different (P<0.001) (DMRT).

3.4. Water quality parameters of *Piaractus brachypomus P*1 and P2 Ponds

Important water quality parameters such temperature, turbidity, pH, dissolved oxygen, ammonia and nitrite were examined in the current study. Table 4 displays the average values and standard deviations (n = 3) of these parameters after they were given supplements of a probiotic diet (P2) and a control diet (P1). Every measurement of the water quality fell within the permissible range for the cultivation of freshwater fish. The recent study indicated that the probiotic-treated ponds improved water quality assessments, which may be related to the different roles that the bacteria play. The pond's water's appropriate pH was preserved in part by probiotics. The ponds that were fed the experimental probiotic diet maintained the optimal amount of dissolved oxygen content. The beneficial effects of probiotics on the mineralization of organic molecules may be related to this. Different patterns of nitrite (NO2) and ammonia (NH3) nutrient distribution were seen in the pond water. Chemical or physical interactions could have been the source of these alterations. In comparison to the experimental pond (P2) that had received probiotic treatment, the amounts of ammonia and nitrite in the control pond (P1) were a little bit higher.

Table 4: Water quality parameters of control (P1) and probiotic treated (P2) ponds that contain *Piaractus brachypomus* fingerlings.

P.brachypomus ponds Water quality Parameter	Control Pond (P1)	Experimental Pond (P2)

S.No	Duration of culture Period (Days)	01 - 30	31 - 60	61 - 90	01 - 30	31 - 60	61 - 90
1	Temperature (C)	28.25±1.31^{a}	29.20 ± 1.25^{b}	30.40±1.89^{c}	30.25±1.17^{a}	31.35±1.55^{b}	32.10 ± 0.33^{c}
2	Turbidity (cm)	30.24±1.32^{c}	29.60±1.45^{b}	28.52±1.38^{a}	34.62±1.22^{b}	33.80±1.32^{a}	34.05±1.4^{b}
3	pH	6.40±1.20^{a}	7.60±1.15^{b}	8.40±0.95^{c}	7.20±1.35^{a}	7.40±1.85^{a}	7.60±1.05^{a}
4	Dissolved oxygen (mg L- 1)	3.0±2.25^{a}	4.0±2.65^{b}	4.5±1.8^{b}	6.5±2.45^{a}	8.0±1.50^{b}	8.5±1.20^{b}
5	Ammonia (mg L-1)	0.11±0.01^{a}	0.25±0.05^{b}	0.30±0.05^{c}	0.00±0.001^{a}	0.00±0.002^{a}	0.00±0.01^{a}
6	Nitrite (mg L-1)	1.25±0.06^{a}	1.70±0.08^{a}	1.82±0.04^{a}	0.00±0.001^{a}	0.00±00.1^{a}	0.00±0.02^{a}

*Data are Mean values ± S.D (n=3)

*Values in the same row with the same superscripts are not significantly different($P<0.001$) (DMRT).

3.5. DISCUSSION

In the current study, feed was supplemented with a commercial probiotic called "Super PS" for use in water and soil. Utilizing "Super PS" improved the pond bottom's health, decreased harmful microorganisms and preserved an aquaculture-friendly environment. A genus of Gram-positive, aerobic, non-sporulating bacteria called *Rhodococcus* has endured in a range of environments, such as dirt, water and eukaryotic cells. *Rhodobacter* is a common gram-negative bacterium found in freshwater, saltwater and marine habitats. It is a significant participant in the bioconversion process, which turns cheap starting materials into more valuable compounds by means of biological systems. (Engelhart-Straub, S. et al., 2022, Murthy L.N. et al., 2015).

In the current study, feed supplementation with 'Super PS' probiotics (R.bacter and R.coccus) improved growth, reduced feed consumption rate. Fish that were fed diets treated with probiotics showed the best growth performance in the current study. This could be explained by better biochemical parameters performance (Table 2). The present study suggests that fish fed on probiotic-supplemented diets demonstrated the highest growth performance, which could be due to better nutritional availability and digestibility.

When *P.brachypomus* was cultivated in freshwater, it produced sufficient levels of protein and a greater percentage of unsaturated fatty acids and necessary amino acids. The protein to lipid ratio is carefully watched while creating feed, particularly for carnivorous fish like barramundi, whose needs for protein in their diet are far higher than those of herbivorous fish (Glencross, 2004).

High-quality feed is necessary for *P.brachypomus* and it's important to balance the fish's dietary protein and lipid requirements because they're higher for proteins than for lipids, with fish having lower lipid requirements than terrestrial animals (Miller, 2003). Therefore, in order to guarantee that fish diets are generated that match their nutritional needs at a reasonable cost, feed formulations must strictly control the amount of proteins and fats in fish diets. (Thoman et al., 1999).

The study finds that the clean soil and water ponds have the maximum fish yield. Pond management, as well as soil and water quality, are highly significant, according to the study's findings. A better management approach and additional feed provided greater nutritional support for increased fish output. The soil and water quality of slightly and heavily contaminated ponds can also be enhanced by using "Super PS," which contains *Rhodococcus* and *Rhodobacter*. Appropriate management can result in increased production and survival rates as well as satisfy the requirement for the supply of biochemical parameters.

4. CONCLUSION

We conclude that the commercial probiotic "Super-PS," which is primarily made up of *Rhodobacter* and *Rhodococcus* species, is a significant catalyst for improving growth with a profitable FCR, decreasing pathogens and maintaining a friendly culture environment in fish farms. To raise the level of productivity in our nation, the current study might be widely implemented to farmers. Higher productivity would result for farmers. For freshwater fish *Piaractus brachypomus*, the introduction of Super PS probiotic as a feed supplement results in a notable improvement in dirt and water quality parameters.

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