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The Effect of Additional Probiotics on Different Media to Gourami Fish *Osphronemus goramy*; Lacépède, 1801 Efficiency of Feed and Growth

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Abstract: Treatment in this study results from the first study where the treatment of feed formulation C gives the best results compared to other feed formulas. Therefore the formula of feed C is used in the 2nd phase of research, in different probiotic media, namely probiotic media CA (0 ml/L), CB (5 ml/L), CC (10 ml/L), and (15 ml/L) CD, while the feed for each treatment was added with probiotic 6 ml/kg of feed. The feed is with 32% protein. The test fish that is used is an average individual weight of 6.04±0.2 g/head. The test fish is maintained with a solid spread of 10 heads/m3 using bucket containers with a volume of 10 liters with a maintenance length of 42 days. Feeding was at 08.00, 12.00, and 16.00 on a *fixed feeding rate*. This research is conducted by an experimental method using Complete Randomized Design (RAL) with four treatments and three repeats. The data is observed including feed consumption rate (TKP), relative growth rate (RGR), feed utilization efficiency (EPP), the protein efficiency ratio (PER), feed conversion ratio (FCR), survival rate (SR), and water quality (temperature, pH, DO and NH_3). The most optimal EPP treatment is CC 95.92±2.49%, PER value is 3.00±0.077%, and FCR is 1.67±0.03. The most optimal growth treatment is the C treatment, RGR 6.11±0.07%/day, and the absolute long growth value is 4.14±0.05 cm. The water quality in maintenance media is in a feasible range for the maintenance of fish tests.

Keywords: Gourami, probiotic media, efficiency of feed, fish growth.

附加益生菌對古拉米魚牛至戈蘭的不同培養基的影響；拉塞佩德, 1801 飼料和生長效率

摘要：本研究中的處理來自第一個研究，其中飼料配方C的處理與其他飼料配方相比，效果最好。因此，飼料C的配方用於第二階段的研究，用於不同的益生菌培養基，即益生菌培養基認證機構（0毫升/升），認證機構（5毫升/升），抄送（10毫升/升）和（15）光盤/毫升），而每種處理的飼料均添加了6毫升/千克的益生菌飼料。飼料含32％的蛋白質。所使用的測試魚的平均個體重量為6.04±0.2 g/頭。使用容量為 10 升的桶式容器以 10 頭/立方米的固體撒播量維持測試魚，維持時間為 42 天。以固定的餵食速度餵食分別為08.00、12.00和16.00。這項研究是通過使用完全隨機設計（RAL）的實驗方法進行的，該方法具有四種治療方法和三種重複方法。觀察數據包括飼料消耗率（TKP）、相對生長率（RGR）、飼料利用效率（EPP）、蛋白質效率比（每）、飼料轉化率（FCR）、成活率（SR）和水質（溫度，pH，做和氨水3）。最佳的EPP處理為抄送 95.92±2.49％，每值為3.00±0.077％，FCR為1.67±0.03。最佳的生長處理是C處理，RGR為6.11±0.07％/天，絕對長生長值為4.14±0.05厘米。維持培養基中的水質在維持魚類試驗的可行範圍內。

关键词：古拉米，益生菌培養基，飼料效率，魚類生長。

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1. Introduction

Gourami *Osphronemus goramy*; Lacépède, 1801, is a freshwater fish species in Indonesia with high economic value in aquaculture products and high nutrient con t [1]. The gourami has a rather slow growth than other omnivorous fish. The growth pattern usually affects a large proportion. The Gourami is herbivorous fish. These fish eat leaves, aquatic plants and can adapt to artificial feed. Based on its food habits, many studies have been carried out to find out what alternative ingredients optimize the growth of Gourami with low costs manufactured. One of the materials used and widely available in nature is spinach and bean sprouts waste. According to Subkhan [2], anting spinach may contain active compounds in the form of secondary metabolites such as flavonoids, tannins, alkalonoids, triterpenoids, and steroids. The active compound in anting spinach (*Acalyphaindica*) can be isolated produce probiotics as an antimicrobial agent. Bacteria strains isolated from plant ves of papaya, cassava, sugarcane, and taro can be potential probiotic properties. Four isolated from plant leaves were identified as *Lactobacillus Plantarum*, *Enterecoccusfacalis*, *Lactobacillus paraplantarum*, and *Weissellaparamesenteroides* [3]. Probiotic was proved as promising factors to enhance fish production by remodeling intestinal microbial balance, boosting the immune system and reducing antibiotic uses. Lactic acid bacteria such as probiotics can be a nutritional strategy to increase fish's immune response and growth performance [4]. In many countries, especially in aquaculture, probiotics improve fish growth performance and stimulate the immune system to inhibit pathogen growth. In addition, probiotics also promote the phago ic activity and lysosome levels of fish effectively [5, 6, 7].

2. Materials and Methods

2.1. O. Goramy Preparatio

Test fish were Gourami with an average individual weight of 101.25 ± 0.42 g / fish. The fish were cultured with a density of 1(one) fish L^{-1} in the aquariums with volumes of 10 L. The experiment lasted 42 days. This earch was conducted at the BPAP Mijen and Aquaculture, Faculty of Fisheries and Marine Sciences, Diponegoro University, Indonesia.

The feed was adjusted to the size of the fish with a diameter of 1.3-1.7 mm. Diameter pelleted with the protein contained approximately 31,48 - 32,68, and each treatment added 6 ml / L of probiotic. Feeding was at 08.00, 12.00, and 16.00 by fixed feeding rate. While the water medium was added with probiotics in the treatment CA = 0 ml / L probiotics, CB = 5 ml / L probiotics, CC = 10 ml / 1 L probiotics and CD = 15 ml / L probiotics, the length of observation was 42 days.Next, the treatment of feed C (formula C) was the best in phase I, then each CA, CB, CC, and CD feed was added with probiotic 6 ml / L of feed, which can be seen in Table 1.

Protein content was determined by the Kjendahl method (Nx6.25), and lipid was measured as ether extract. Ash was obtained after burning at 600°C for 14 h (Laboratory of Animal Feed Nutrition and Food, Agriculture, Diponegoro University).

Table 1 Test feed formulation after adding 6 ml/L probiotics and the results of the proximate analysis

	Treatment:			
Type of material	**CA**	**CB**	**CC**	**CD**
Fish meal	31,47	31,47	31,47	31,47
Indian nettle flour	11	11	11	11
Mung Beam sprouts flour	11	11	11	11
SoybeanFlour	20,9	20,9	20,9	20,9
Bran al	11,63	11,63	11,63	11,63
Fish oil	5	5	5	5
Corn oil	3	3	3	3
Vit-Min mix	5	5	5	5
CMC (Carboxymethyl cellulose)	1	1	1	1
Total (g)	100	100	100	100
Protein (%)	31,48	31,69	32,31	32,68
NFE (%)	24,23	24,48	24,69	24,86
Fat (%)	8,96	9,85	10,54	11,24
En. (kkal/g)	243,33	251,90	260,16	267,57
Ratio E/P (kkal/g P)	7,73	8,95	8,05	8,19

Note: NFE = Nitrogen Free Extract; E/P = energy per protein

2.2. Total of Feed Consumption (TKP)

The total feed value of feed consumption, according to Poernomo et al. [8], can be calculated by weighing the total amount of feed consumed by test fish every day during maintenance, as follows:

Total = F1 – F2

where: Total – feed consumption (g); F1 = total feed at the beginning of the experiment (g); F2 = Total feed at the end of the experiment (g).

2.3. Relative Growth Rate (RGF)

According to Zonneveld et al. [9], the relative growth rate of fish is calculated using the formula:

$$RGR = \frac{Wt\text{-}Wo}{Wo \times t} \times 100\%/\text{ a daily}$$

where:

RGR Relative growth rate (% per day);

W_t: total final weight (g);

W_o: total initial weight (g);

t: days of the experiment.

2.4. Survival Rate (SR)

According to Zonneveld et al. [9], the survival rate

can be calculated using the following formula:

$$SR = \frac{Nt}{N_0} \times 100\%$$

where:
SR: survival rate (%);
Nt: the number of fish at the end of the observation;
No: the number of fish at the beginning of the observation.

2.5. The Efficiency of Feed Utilization (EPP)

The calculation of feed utilization efficiency (EPP) is calculated by the formula according to Tacon [11]:

$$EPP = \frac{W_t - W_0}{F} \times 100\%$$

where:
EPP: Efficiency of feed utilization (%);
Wt: end of fish biomass (g);
Wo: the beginning of fish biomass (g);
F: feed amount during culture (g).

2.6. Feed Conversion Rate (FCR)

FCR was calculated based on Takeuchi [10].

$$FCR = \frac{F}{(W_t - W_0) + D}$$

where:
FCR: Feed conversion ratio;
Wt: Weight gross at the end of study (g);
Wo: Weight gross at the beginning of the study (g);
F: weight of feed consumed (g);
D: weight of fish death (g).

2.7. Protein Efficiency Ratio (PER)

Calculation of the protein efficiency ratio (PER) is calculated by the formula according to Tacon [11],

$$PER = \frac{(W_t - W_0)}{Pi} \times 100\%$$

where:
PER: Protein Efficiency Ratio (%);
Wt: Weight of tested fish biomass at the end of the study (g);
Wo: Weight of tested fish biomass at the beginning of the study (g)
Pi: Weight of feed consumed x protein content of the feed (g).

2.8. Water Quality Parameters

Water quality data parameters measured include dissolved oxygen (DO), pH, temperature, and ammonia. DO, pH, and temperature were measured using a water quality checker (WQC), and ammonia measurements were carried out in the Aquatic Resource Management Engineering Laboratory, UNDIP. DO, pH, and temperature measurements were carried out every three days. Ammonia was measured at the beginning, middle, and end of the study.

2.9. Data Analysis

Data were verified with a normality test, homogeneity test, and additivity test to verify normal, homogeneous, and addictive properties. Data were analyzed by variance tests (F-test) at a 95% confidence level to see its effect. If a significant difference was obtained in the analysis of variance ($p<0.05$), then Duncan's multiple region tests were performed to determine differences between treatments.

3. Result

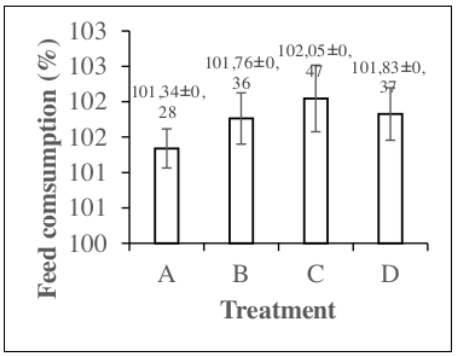
The results of the study the effect of treatment on the total value of feed consumption (TKP), relative weight growth rate (RGR), protein efficiency ratio (PER), relative growth rate (RGR), feed utilization efficiency (EPP), feed conversion ratio (FCR), the protein efficiency ratio (PER), and survival rate (SR) can be seen in Table 2.

Table 2 Total value of feed consumption, relative weight growth rate, protein efficiency ratio, relative growth rate, feed utilization efficiency, feed conversion ratio, protein efficiency ratio, and survival rate

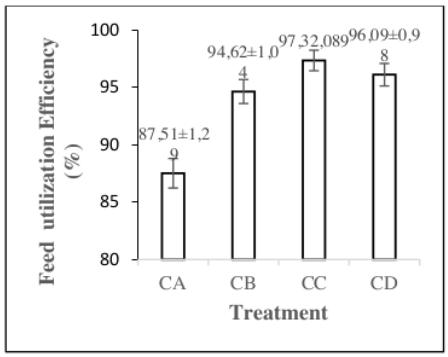
Treatment	Observed variables					
	TKP (g)	RGR (%/day)	EPP (%)	PER (%)	FCR	SR (%)
CA	101,34±0,28^{a}	2,85±0,06^{a}	87,51±1,29^{a}	1,88±0,33^{a}	1,12±0,02^{a}	86,67±2,89^{a}
CB	101,76±0,36^{c}	3,09±0,04^{b}	94,62±1,04^{c}	2,00±0,20^{c}	1,03±0,01^{c}	85,00±5,00^{c}
CC	102,05±0,47^{b}	3,20±0,03^{c}	97,32±0,89^{a}	2,44±0,10^{a}	1,01±0,01^{a}	88,33±5,77^{a}
CD	101,83±0,37^{a}	3,1±0,02^{d}	96,09±0,98^{b}	2,40±0,16^{b}	1,02±0,01^{b}	85,00±5,01^{c}

Note: Values with different superscript letters show significantly different results ($P<0.05$)

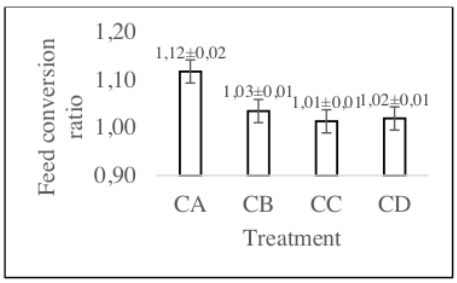
The analysis of variance showed that the addition of probiotic and water media with different doses of probiotic artificial feed on *O. goramy* had a significant effect ($P<0.05$) on the TKP, RGR, EPP, FCR, PER, and SR values.



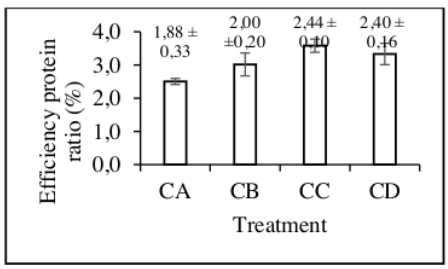
(a) Feed consumption (%)



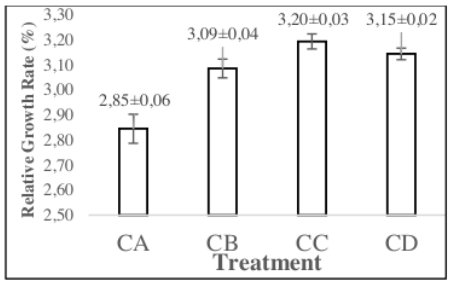
(b) Feed utilization efficiency



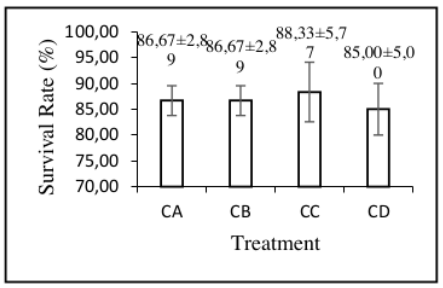
(c) Conversion ratio



(d) Efficiency ratio (%)



(e) Relative growth rate



(f) Survival rate

Fig. 1 The TKP, RGR, EPP, FCR, PER, and SR values

4. Discussion

4.1. Feed Consumption

Based on the observations made on the total value of feed consumption in Gourami (*O. goramy*) treated with artificial feeding (CA), artificial feeding with the content of earring spinach (CB) flour, artificial feed containing earring spinach flour, bean sprouts flour (CC) and giving artificial feed with bean sprouts flour (D) with different doses, the results of CC treatment were obtained with a mean of 102.05 ± 0.47 followed by CA, CD treatment and the lowest was CB treatment with a mean sequentially 101.76 ± 0.36, CA 101.34 ± 0.28, and CD 101.83 ± 0.37. The results of the analysis of variations in probiotic media for total feed consumption of Gourami (*O. goramy*) with different doses showed a significant effect (P <0.05). The highest value was CC treatment, namely the addition of probiotic media, while the lowest was BB treatment.

Total feed consumption is influenced by fish appetite. One of the factors affecting fish appetite is feed, feed attractant, and water quality. According to [12], poor water quality and attractants can stress fish, resulting in fish appetite reduction and disruption of the metabolic system. According to Oktavianto et al. [13], temperature can affect the growth and appetite of fish. High temperatures can reduce dissolved oxygen and affect the fish's appetite.

Apart from water quality, fish appetite is also influenced by the nutritional content of the feed. Gourami that lived on probiotic media 6 ml/L CC had a higher TKP value than Gourami without the addition of 0 ml/L CA, 3 ml/L CB, and 9 ml/L CD. Treatment B

has the lowest TKP value because for 42 days of maintenance, treatment B has decreased appetite. Meanwhile, CC treatment had the highest TKP value compared to CB treatment. The treatment had the highest TKP because, during 42 addition of 6 ml / L CC probiotic, the day of maintenance experienced a high appetite, this is presumably because the maintenance medium containing 6 ML/L probiotics had better quality, where the feed was made from ingredients that were of good quality so that it gives rise to a distinctive aroma of feed and is preferred by Gourami. According to Aslamyah and Karim [14], good test feed comes from raw materials containing strong attractants to produce a sharp aroma of feed and be favored by test fish.

The total feed consumption in the CC treatment and CB treatment experienced a difference due to the different amounts of feed consumed. CB treatment experienced a low level of feed consumption, and there was leftover feed in the Gourami (*O. goramy*) rearing bucket. This was due to low consumption of feed resulting in reduced fish growth. In contrast, if it is too much, it will result in inefficient metabolism so that it is not digested properly and is wasted, which allows water quality pollution. Therefore the correct frequency of feeding is needed to increase feed efficiency. This is reinforced by Pinandoyo et al. [15]. The feed provision at the right time is related to the frequency of feeding, namely the number of times the feed is given in one day to cultivated organisms. Fish feed consumption is influenced by several factors, including body size, stage, availability of feed, gastric emptying rate, water temperature, activity, and body health of fish.

According to Khasani [16], fish interest in feed or stimulation to eat feed is very important in fish feed formulation. The balance of the nutritional components becomes less effective if the feed does not contain components that can spur the fish's response to the feed. This is confirmed by Abidin et al. [17] stated that the total size of fish feed consumption is influenced by several factors, including physical characteristics of the feed such as smell, taste, size, and color. Other factors that influence such as water quality, for example, the temperature in water.

4.2. The Efficiency of Feed Utilization

The efficiency of feed utilization during maintenance obtained the highest result was CC treatment with a value of 97.32 ± 0.89, not significantly different from CA treatment with a value of 87.51 ± 1.29 but significantly different from CD treatment with a value of 96.09 ± 0.98 and CB treatment with a value of 94.62 ± 1.04. CA treatment was not significantly different from CD treatment but significantly different from CB treatment. CD treatment was not significantly different from treatment B. The EPP value in each treatment in this study was considered good because all treatments had an EPP value close to 100%. Protein efficiency ratio (PER) is one of the methods used to evaluate protein quality in feed. This is confirmed by Pinandoyo et al. [15] that the calculation of the protein efficiency ratio is based on the weight gain of the tested fish divided by the amount of protein in the feed consumed during the study period. PER is used to evaluate protein quality in feed. The feed industry uses PER as the standard for evaluating the quality of feed protein. The nutritional value of protein as guide requirements for the effectiveness of a protein source. PER is a method for quantifying the nutritional value of protein in the feed. According to Puspasari et al. [18], good feed utilization efficiency is more than 50% or even close to 100%.

The analysis of variance showed that the EPP data of Gourami, which was given probiotics with different doses, had a significant effect. The Duncan test results showed that CD and CB treatment were not significantly different. According to Maulidin et al. [19], a good EPP value shows that the feed consumed is of good quality so that it is easily digested and used efficiently by fish. The efficiency of feed utilization is closely related to the digestibility of the fish to the feed given. According to Yanti et al. [20], the digestibility of fish to a feed is influenced by several factors, namely the chemical properties of water, water temperature, type of feed, size and age of fish, the nutritional content of the feed, frequency of feeding, and amount.

The highest protein efficiency ratio of Gourami (*O. goramy*) was CC treatment with a value of 3.00 ± 0.077, which was not significantly different from CA treatment with a value of 2.98 ± 0.069 but significantly different from CD treatment with a value of 2.87 ± 0.035 and treatment. CB with a value of 2.80 ± 0.095. The results of the analysis of variance stated that artificial feeding with the addition of probiotics had a significant effect on the protein efficiency ratio of Gourami (*O. goramy*). Energy in feed is used for maintenance and growth. Gourami growth can take place if energy needs as maintenance are met first, then the remaining energy in the feed is used for the growth of Gourami. Protein needs and fish growth have a proportional relationship. Therefore, protein content and feed energy ratio are in accordance with fish needs so that feed becomes efficient and provides maximum growth. This is confirmed by Johnson et al. [21], who stated that growth is closely related to the availability of protein in fish feed. Protein in feed with high biological value stimulates protein synthesis more than protein with low biological value. The role of protein in fish's body needs to be provided continuously with adequate quality and quantity. The quality of feed protein is determined by its essential amino acid content. The lower the essential amino acid content, the lower the protein quality is needed. The metabolic rate also influences the effectiveness of Gourami feed

utilization. According to Haetami [22], feed energy is used by fish for metabolism, maintenance, growth, and reproduction. According to Thalib [23], the thyroxine hormone can change the pattern of carbohydrate metabolism by increasing the activity of the amylase enzyme so that digestibility and absorption of carbohydrates are high. Thyroxine also affects increasing the digestive enzymes protease and lipase so that fish can stimulate protein digestibility and increase absorption of amino acids and fatty acids through the intestine.

4.3. Feed Conversion Ratio

Feed quality is seen from the value of feed efficiency and can be shown from the feed conversion value. The FCR value shows how much of the feed is consumed into fish body biomass. Based on the research that has been done, the highest feed conversion ratio value in CC treatment is 1.01 ± 0.01. At the same time, the lowest FCR value in the CB treatment was 1.03 ± 0.01, which was not significantly different from the CD treatment 1.02 ± 0.01. CA treatment resulted in a feed conversion value of 1.12 ± 0.02. The feed conversion value shows the efficiency of the utilization of feed nutrients by the fish. The lower the resulting feed conversion value, the more efficient the use of feed is [8]. The FCR results of all treatments during the study were declared good because they were less than 1.5. This is confirmed by Craig and Helfrich [24] that food conversion in fish ranges from 1.5-8. The results of research conducted by Safir [25] of Gourami FCR were 1.18-1.46. The analysis of variance showed that the FCR data of Gourami fed with antibiotic feed had a significant effect. The Duncan test results showed that the FCR values of CC and CA treatments were not significantly different but tended to be higher in CC treatment. Meanwhile, the CD and CB treatment were not significantly different but tended to be higher in CD. The FCR value is strongly influenced by the amount of feed consumed. Judging from the TKP data, CC treatment had the highest TKP value, and CB treatment had the lowest TKP value. This is reinforced by Syaputra et al. [26], who state that FCR is the ratio of the amount of feed consumed to body weight growth. The lower the FCR value, the more efficient the feed, and it can be used better by the fish.

4.4. Relative Growth Rate (RGR)

The relative growth rate value of Gourami (*O. goramy*) fed artificial feed with the addition of probiotics with different doses was obtained in the CA (2.85 ± 0.06), CB (3.09 ± 0.04), CC (3) treatment, 20 ± 0.03), and CD (3.15 ± 0.02). The results of the analysis of various RGR data on Gourami (*O. goramy*), which were given artificial feed with the addition of earring spinach flour and bean sprout flour with different doses, showed significant results ($P < 0.05$). The highest RGR value was obtained in treatment C, which significantly affected CA, CB, and CD treatment. The treatment with the lowest RGR value was CB treatment.

The CC treatment (artificial feeding with the addition of earring spinach flour and bean sprouts flour) had a higher specific growth rate than the CB treatment (artificial feeding with the addition of earring spinach flour). This is presumably because feeding too little will inhibit growth. This is confirmed by Maloho et al. [27], who state that the growth rate depends on the amount of feed consumed, water quality, and other factors such as heredity, age, endurance, and the ability of the fish to use feed so that the amount of feed consumed must be more. Much of the amount is used for body maintenance and activities so that the fish can continue to grow. Furthermore, this is supported by a statement according to Tribina [28], who states that if the need for maintenance exceeds the amount of feed given, there will be a process of unloading energy in the fish's body itself (catabolism). An adequate amount of feed for fish means that it is sufficient for body maintenance, daily activity, and fish growth. If there is an excess or lack of feed, it can result in decreased growth rate.

The feed in CC treatment contained bean sprouts flour with crude protein of 30.21% and earring spinach containing 19.64% crude protein. The high protein content in this feed in bean sprouts is thought to cause high fish growth. Marzuqi et al. [29] provided feed with a higher protein content, the more protein in the feed used by fish for growth. As a result, the fish body weight gain is higher. The protein efficiency ratio value is influenced by the ability of the fish to digest protein in the feed given. The need for fish is strongly influenced by the availability of feed with the appropriate quality and quantity of feed nutrients because the nutrients contained in the feed affect fish growth. According to Soedibya [30], the quality and quantity of protein given will affect the body's protein retention and subsequent fish growth. Suppose the protein in the feed is insufficient. In that case, it will result in slow fish growth so that the protein in the body's tissues will be used to maintain the function of the body's more important tissues. Still, if the protein in the feed is excess, it will be excreted as nitrogen in the form of ammonia. According to Juliana et al. [31], providing quality feed, both artificial feed in Gourami cultivation, is important. The fish feed has an important role in the growth and survival rate of fish. Different types of feed will affect the growth and survival of cultivated fish seeds.

4.5. Survival Rate

Based on observations made on the survival value of Gourami (*O. goramy*) fed with different doses of

artificial probiotic, the results were obtained in the CA treatment (86.67 ± 2.89), CB (85.00 ± 5.00), CC (88.33 ± 5.77), and CD (85.00 ± 5.01) and the results of the analysis of the variety of survival variables in Gourami (*O. goramy*) showed no significant effect (P <0.05). The death of several Gourami fish at the beginning of the maintenance occurred allegedly due to stress due to being transferred to a different rearing medium than before. In addition, stress is generated after weighing the fish. According to Aliza et al. [32], changes in fish behavior during stress can be in the form of rapid operculum movement, fish taking the air on the water's surface and becoming inactive. According to Samsundari and Wirawan [33], fish survival is influenced by biotic and abiotic factors. Biotic factors are competitors, parasites, population density, adaptability of animals, and human handling, while abiotic factors are physical and chemical characteristics of water.

The feed given to Gourami (*O. goramy*) is an artificial feed that has a protein content of ± 32%. The high survival rate of Gourami is thought to be due to the fulfillment of feed needs for maintenance activities, survival, and environmental conditions that are in the proper range. According to Budiana and Rahardja [34], the size of life is influenced by internal factors, including gender, heredity, age, reproduction, disease resistance, and external factors, including water quality, stocking density, the number and composition of amino acids in the feed.

4.6. Water Quality

The measurement results of several water quality parameters, including temperature, pH, DO, and ammonia, are presented in Table 3.

Table 3 Water quality parameters' values

Treatment	Parameter values			
	Temperature (^{0}C)	pH	DO (mg L^{-1})	NH_3 (mg L^{-1})
CA	28.3-29.45	7.2-7.9	3.8-4.8	0.004-0.062
CB	28.5-29.9	7.2-8	3.8-4.4	0.004-0.062
CC	28.2-29.2	7.2-7.7	3.8-4.6	0.004-0.062
CD	28.6-29.6	7.2-7.8	3.8-4.5	0.004-0.062
Optimal range	28-30 [13]	6.5-9 [12]	3-7 [12]	0-0.12 [12]

Note: DO - dissolved oxygen

The temperature during maintenance was in the optimal range, the normal 25-30^{0}C. Oktavianto et al. [13] stated that low temperatures below or above the normal limits could cause gourami decreased appetite, disease susceptibility, and even death.

The pH value in the maintenance media ranged from 6.5 to 8. The pH value was in the normal range. The DO during maintenance was in the range of 3.8-4.5 mg L^{-1}. The DO level is within normal limits. According to Nirmala & Rasmawan [12], DO content for the maintenance of gourami should be between 3-7 mg L^{-1}. Gourami has an additional breathing device in the form of a labyrinth that allows it to take oxygen from the air directly so that it can survive in waters with low DO concentrations [35].

The value of ammonia from fish feces and leftover food was in the range of 0.004-0.062 mg L^{-1}. This value is within the tolerance range of gourami. The water was siphoned and changed every three days to remove leftover food and feces that could have increased the value of ammonia. According to Nirmala & Rasmawan [12], ammonia is toxic when it exceeds 0.2 mg L^{-1}. Syahrizal et al. [36] state that ammonia is the result of protein metabolism. Ammonia in its non-ionized form (NH3) is poisonous to fish even at very low concentrations.

5. Conclusions

The conclusions obtained from this research are that the addition of probiotics to artificial feed had a significant effect (P <0.05) on the efficiency of feed utilization, growth, and survival of Gourami (*O. goramy*). The addition of 6 ml / L probiotic to the best CC treatment was able to produce a total feed consumption of 102.5 ± 0.35, a relative growth rate of 3.20 ± 0.03% / day, a feed utilization efficiency of 97.32 ± 0.39 %, protein efficiency ratio value 2.44 ± 0.10%, feed conversion ratio 1.02 ± 0.01, and fish survival rate 88.33 ± 5.77%.

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