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THE EFFECT OF ADDITION LIQUID-POWDER COMBINATION PROBIOTIC ON GROWTH, FEED CONVERSION RATIO AND SURVIVAL OF GOURAMY FINGERLINGS (*OSHPRONEMUS GOURAMY*)

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KeyWords
Probiotic, *Oshpronemus gouramy*, Growth Rate, Feed Conversion Ratio and Survival Rate.

ABSTRACT

This research aims to obtained the combination of liquid-powder probiotic concentrations on fish feed for growth, feed conversion ratio and survival of gouramy fingerlings (*Osphronemus gouramy*). This research used a completely randomized design (CRD) with 6 treatments 3 replications. The treatments that used in this research was concentration of probiotic Liquid 100% (15 ml/kg), 75% (11,25 ml/kg) : Powder 25% (2,5 g/kg), 50% (7,5 ml/kg) : Powder 50% (5 g/kg), 25% (3,75 ml/kg) : Powder 75% (7,5 g/kg), 100% (10 g/kg) and (Control), with each treatments used for 1 kg of feed. The parameters observed were specific growth rate, absolute weight, feed conversion ratio and survival rate. The results showed that the addition probiotic combinations of (Liquid 75% : Powder 25%) had the best result with a growth rate of 1.63±0.09%, absolute weight growth 25.27±2.62 g, feed conversion ratio 1.59±0.02 and survival rate 93.3±5.77%.

INTRODUCTION

Gouramy is one of the most cultivated freshwater fish commodities because it has a high economic value, which ranges from Rp. 35,000 - Rp. 50,000/kg (Indonesian Ministry of Maritime and Fisheries Affairs, 2019). However, gouramy has a slow growth rate if compared to other freshwater fish, so it requires a long maintenance and needs to improved in terms of growth. At the fingerlings stage, the digestive tract of the fish is still incomplete, making it difficult to digest the feed and resulting in suboptimal nutrient absorption. Feeds that have high crude fiber are difficult to digest in the digestive tract, so it requires a long time to be absorbed by fish digestion. An alternative way to improve feed efficiency so that it is easily digested and enzymes can work more effectively is by adding probiotic in commercial feed (Haetami et al, 2008).

Probiotic bacteria can produce several enzymes that contain amylase, protease and lipase enzymes. These enzymes can breakdown molecules such as carbohydrate, protein and lipid into molecules more easily, so that it can facilitate the digestion process and absorb nutrients in the digestive tract of fish, this can increase fish growth (Putra, 2010). Probiotic that are circulating in the market are mostly in liquid dosage forms, these liquid dosage probiotic have a relatively cheap price compared to those in solid dosage form, but are less efficient in terms of stability (expiration date, storage) or in packaging, besides that the possibility for other bacteria to grow is greater, whereas powder or encapsulated probiotic are changing liquid components into solid components and protecting material from environmental effect and the price is relatively expensive (Yulinery and Nurhidayat, 2012). The combination treatment of liquid and powder probiotic is based on the role of microorganisms contained in probiotic, so it is expected that these roles can complement each other and their effects become better.

Several research have shown that probiotic in feed can increase growth rates in fish. According to the results of the research of Rinaldi et al. (2017) with liquid probiotic of 15 ml/kg, giving a growth rate of 2.44%, efficient of feed 82.36%, and survival of 100% in gouramy. While in powder probiotic, according to research results Noviana et al. (2014) in tilapia, powder probiotic 10 g/kg of feed with a growth rate of 3.20%, efficient of feed 77.23% and survival 90%. This research be expected to share information to farmers about providing concentration of combination of liquid-powder probiotic in the feed of gouramy can produce the best growth, feed conversion ratio and survival of gouramy fingerlings.

MATERIALS AND METHODS

Tools and Materials

Tools

The tools used are 18 aquariums with a size of 60 x 40 x 40 cm^3, aerator devices, water quality device, bucket, ruler, digital scales, scoop, hose, plastic zipper, pipette, spray bottles, trash bags, stationery.

Material

1) Fish

   The fish used for this research is using 4-6 cm gouramy fish with an average weight of 2.85 g of 180 fish. Each aquarium is filled with 10 fish. Test fish were obtained from the Southern Ocean and Fisheries Service Office (CDKPWS) Tasikmalaya, West Java.

2) Feed

   The feed used during the research was Hi Pro Vite 781-1, with the nutritional value can be seen in Table 1.

Tabel 1. Nutritional content of Hi Pro-Vite 781-1

Nutrien Content	Percentage (%)
Protein	31 – 33
Lipid	3 – 5
Crude Fibre	4 – 6
Ash	10 – 13
Water	11 – 13

3) Probiotic

   Probiotic used are "Heryaki" probiotic which are liquid and powder. Liquid probiotic contain microorganisms as follows L. Casei and M. Fumeus. Microorganisms contained in heryaki powder probiotic include C. ethanolica, M. fumeus and Bacillus sp. Density of probiotic is 10^5 Cfu/ml in liquid probiotic and 10^5Cfu/g in powder probiotic.

Research Procedures

Prepared the fish feed and Probiotic. Then, homogenized liquid and powder probiotic with molasses and fresh water with a dose of molasses as much as 0.1 ml and fresh water as much as 2 ml (Suminto and Chilmawati, 2015). Then, sprayed a homogeneous probiotic on the feed and fermented for 2 days.

Calculated gouramy fingerlings according to stocking density and weighed, then put into the aquarium. Fish fed are 3 times a day at 08.00, 12.00 and 16.00 with a feed rate of 5% of biomass (SNI 01-6485.3, 2000). To maintained of the water quality due to siphoning every 2 days. Then, calculated the weight of the gouramy and measurement of water quality every 8 days. The conducted of the research for 40 days.

Methods

This research uses a completely randomized design (CRD) with 6 treatments 3 replications as follows:

Treatment A : Addition of probiotic by Liquid 100% (15 ml/kg)
Treatment B : Addition of probiotic by Liquid 75% (11,25 ml/kg) : Powder 25% (2,5 g/kg)
Treatment C : Addition of probiotic by Liquid 50% (7,5 ml/kg) : Powder 50% (5 g/kg)
Treatment D : Addition of probiotic by Liquid 25% (3,75 ml/kg) : Powder 75% (7,5 g/kg)
Treatment E : Addition of probiotic by Powder 100% (10 g/kg)
Treatment F : Without probiotic (Control)
Note : Every treatments for 1 kg feed

Observation Parameters

Parameters observed during the research included daily growth rate, absolute weight growth rate, feed conversion ratio and survival rate. The data obtained were then analyzed using analysis of F test variance with a 95% confidence level and water quality data analyzed descriptive.

1. Spesific Growth Rate

SGR (Specific Growth Rate) of fish is calculated using the formula (Effendie, 1997) :

$$\mathbf{SGR} = \frac{\ln Wt - \ln Wo}{t} \mathbf{\ x\ 100\ \%}$$

Information :

SGR : Specific growth rate (% per day)
Wt : The weight at the end of the maintenance (g)
W_0 : The weight at the beginning of the maintenance (g)
t : Observation time (day)

2. Absolute Weight Growth

Absolute weight growth using the formula (Effendie, 1997) :

$$\mathbf{Wm = Wt - Wo}$$

Information :

Wm : Absolute weight growth (g)
Wt : The biomass weight at the end of the maintenance (g)
W_0 : The biomass weight at the beginning of the maintenance (g)

3. Feed Convertion Ratio

Feed convertion ratio using the formula (Effendie, 1997):

$$\mathbf{FCR} = \frac{F}{(Wt+D)-Wo}$$

Information :

FCR : Feed convertion ratio
Wt : The biomass weight at the end of the maintenance (g)
D : Dead fish weight of the maintenance (g)
Wo : The biomass weight at the beginning of the maintenance (g)
F : Number of feed given during maintenance (g)

4. Survival Rate

Survival rate using the formula (Effendie, 1997) :

$$\mathbf{SR} = \frac{Nt}{No}\mathbf{X\ 100\%}$$

Information :

SR : Survival rate (%)

Nt : Number of live fish at the end of the maintenance

No : Number of live fish at the beginning of the maintenance

5. Water Quality

Water quality parameters observed included temperature, dissolved oxygen (DO) and acidity (pH) (Table 2). Water quality parameters are measured once every 8 days.

Tabel 2. Water Quality Parameters

Parameters	Units	Tools
1. Temperature	^{o}C	Lutron WA-2015
2. Dissolved oxygen	mg/L	Lutron WA-2015
3. pH	-	Lutron WA-2015

RESULTS AND DISCUSSION

Spesific Growth Rate

During the research the fish experienced an increase in growth. The increase in the average growth of gouramy, seen in Figure 1.

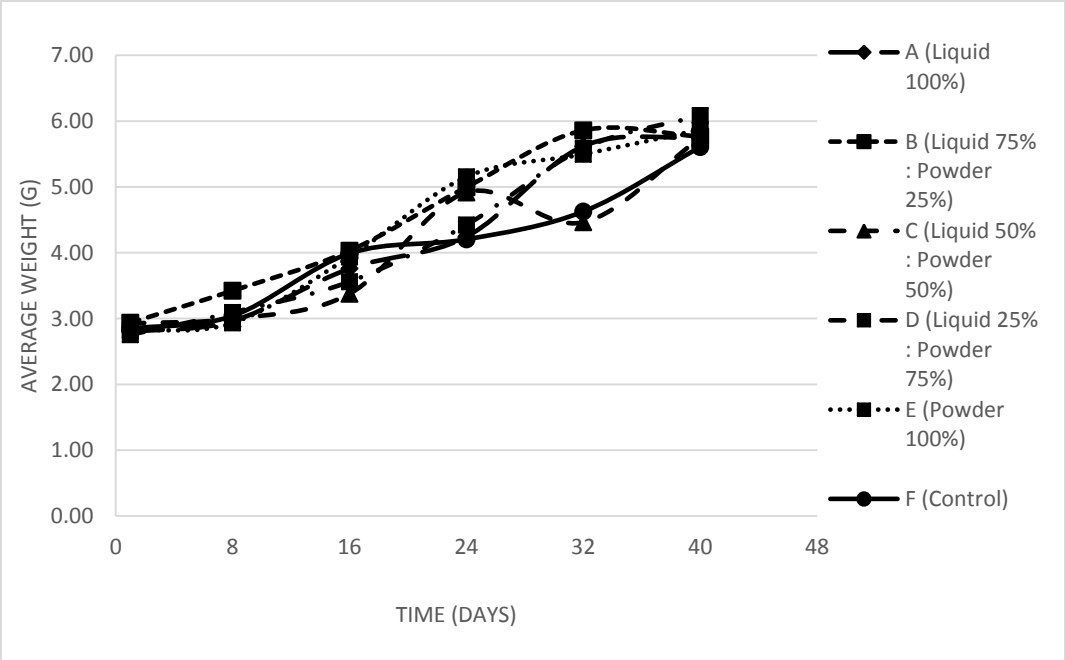

Figure 1. Average weight of Gouramy fingerlings

The results obtained during the maintain of gouramy in 40 days, with feeding combination of heryaki probiotic give to increased weight growth at each treatments. The average weight of gouramy fingerlings at the beginning of the research ranged from 2.75 to 2.94 g, while at the end of the research ranged from 5.61 to 6.09 g. Increased growth during the maintenance period indicates that fish are able to take advantage of the feed that has been given. The growth rate of fish is affected by various factors, feed is one of them. The feed used by fish, to support the body and replace damaged body cells (Effendie, 1997). The energy in feed consumed exceeds the energy requirements needed for body maintenance and other bodily activities will be used for growth (Ahmadi *et al.* 2012).

Table 3. Spesific Growth Rate of Gouramy

Treatments		SGR (%)
A	: (Liquid 100%)	1.48±0.09
B	: (Liquid 75% : Powder 25%)	1.51±0.08
C	: (Liquid 50% : Powder 50%)	1.58±0.07
D	: (Liquid 25% : Powder 75%)	1.63±0.09
E	: (Powder 100%)	1.49±0.29
F	: (Control)	1.38±0.08

Based on Table 3, shows that the value of the growth rate of gouramy ranged from 1.38 to 1.63%. Where the highest growth rate is in the treatment D with a value of 1.63%, followed by treatments A, C, E, B and F with the lowest growth rate with a value of 1.38%. Based on analysis of variance it is known that the specific growth rate does not significant difference between treatments (p> 0.05). Addition of probiotic provides an active work in the digestive tract of gouramy fish when compared to without probiotic addition. According to Haetami (2008) states that the use probiotic directly will increase the effectiveness of intestinal microbes which can increase growth. Heryaki probiotic have several microbes that can produce amylase, protease and lipase enzymes. These enzymes can break down complex molecules such as carbohydrates, proteins and lipids into simpler molecules, so that it can help the process of digestion and absorption of nutrients in the digestive tract of fish, this can increase fish growth (Putra 2010). According to the research of Lili et al. (2019) about the combination of probiotic in catfish, the growth rate of fish with probiotic is better, namely 1.91 - 2.66 compared to without probiotic with a value of 1.85.

Absolute Weight Growth

The results obtained by the absolute weight value of carp during the study ranged from 20.84 - 25.27 g, where the highest absolute weight value was in treatment D with a value of 25.27 g, followed by treatments A, C, E, B and F with value of 20.84 g. Absolute weight growth, seen in Figure 2.

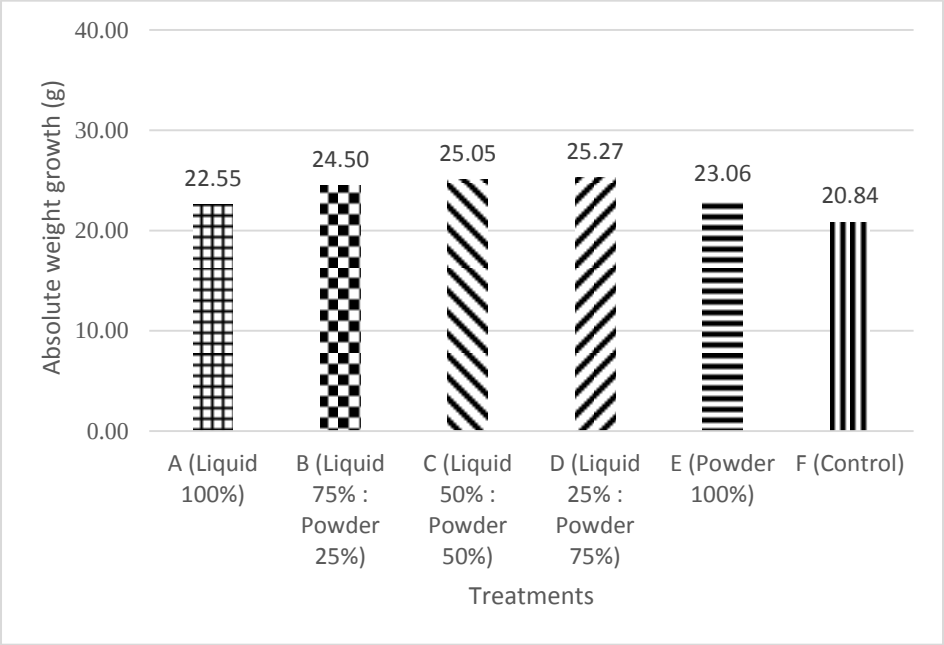

Figure 2. Absolute Weight Growth of Gouramy

The results obtained show that the treatment is no significant difference (p>0,05), but addition of probiotic produce higher weight compared than control treatment This is because, the use of feed with addition of probiotic microbes such as L. Casei and Bacillus sp. can work optimally so that feed absorption is more efficient, so that the growth in absolute weight of gouramy is better with addition of probiotic compared to without probiotic addition. According to the research of Meidi et al. (2019) states that addition of liquid heryaki probiotic to catfish seeds produces absolute weights ranging from 0.95 to 1.03 g, while those without probiotic addition have a value of 0.84 g, this value due to by high digestibility levels of feed as L. casei microbial activity.

According to Gatesoupe (1999), bacteria activity in digestion will change when there are microbes that enter through the media of maintenance and feed, resulting in a balance between bacteria that are already in the digestion system. Probiotic bacteria that enter the digestive tract of fish are antagonistic to pathogenic bacteria in the digestive tract of fish so that it makes the digestive tract of fish better in digesting food.

Feed Conversion Ratio

Feed Conversion Ratio is a ratio between the amount of feed spent to produce fish body weight gain over a certain period. The results obtained from the value of the conversion ratio of gouramy feed during the research ranged from 1.59 to 1.66, where the best feed conversion ratio is in treatments B, C and D with a value of 1.59, followed by treatments A, E and F. Feed conversion ratio, seen in Figure 3.

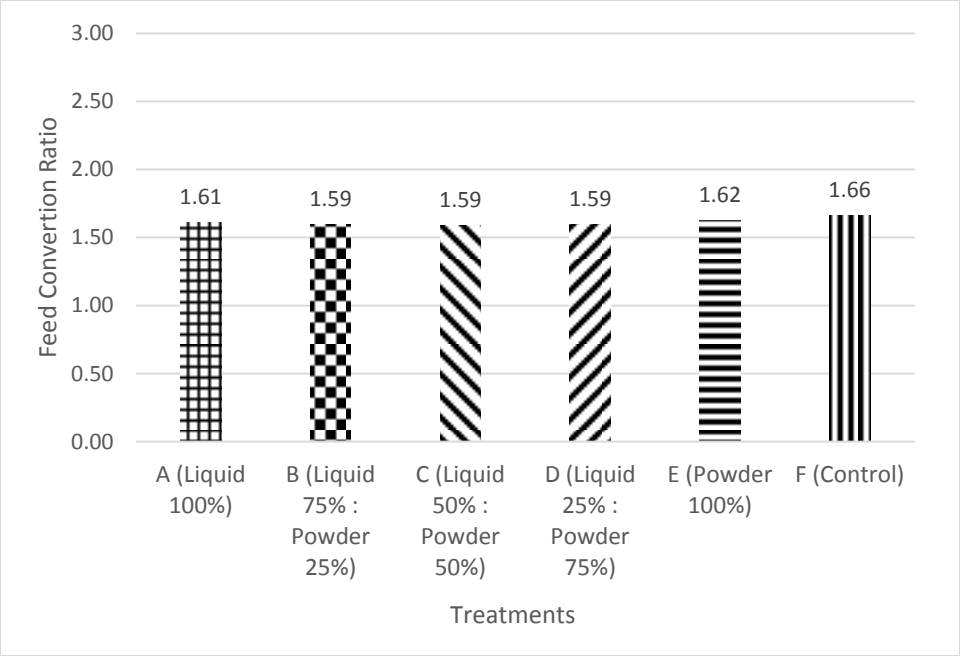

Figure 3. Feed Conversion Ratio of Gouramy

Control treatment has a value of feed conversion ratio which is quite large compared to the probiotic treatment. Feed conversion ratio values show the amount of feed consumed by fish can converted to 1 kg of meat, so the smaller the value of feed conversion, the feed provided can put to good use by fish. According to the research of Lili et al. (2019), research on combination of probiotic in feed conversion ratios has a very different effect with addition of probiotic that give better FCR than without giving probiotic. Based on analysis of variance, there are no significant differences ($p > 0.05$). There are various factors that affect the amount of feed consumption in fish are feeding habits, physiological status, fish weight, temperature, dissolved oxygen, feed composition and the level of preference so that each treatment has different feed conversion values. According to Verschuere et al. (2000) when probiotic had successfully entered and inhabited the digestive tract of their host, they can secrete exoenzymes that can help degrade feed ingredients into smaller molecules (monomers) there by increasing the effectiveness and efficiency of their absorption process.

Survival Rate

The survival rate of gouramy during the research ranged from 83.33% - 93.33%, where the highest survival rate was in treatments C and D that were 93.33%, while the lowest survival was in treatments F which were 83.33%. The survival of gourami, seen in Figure 4.

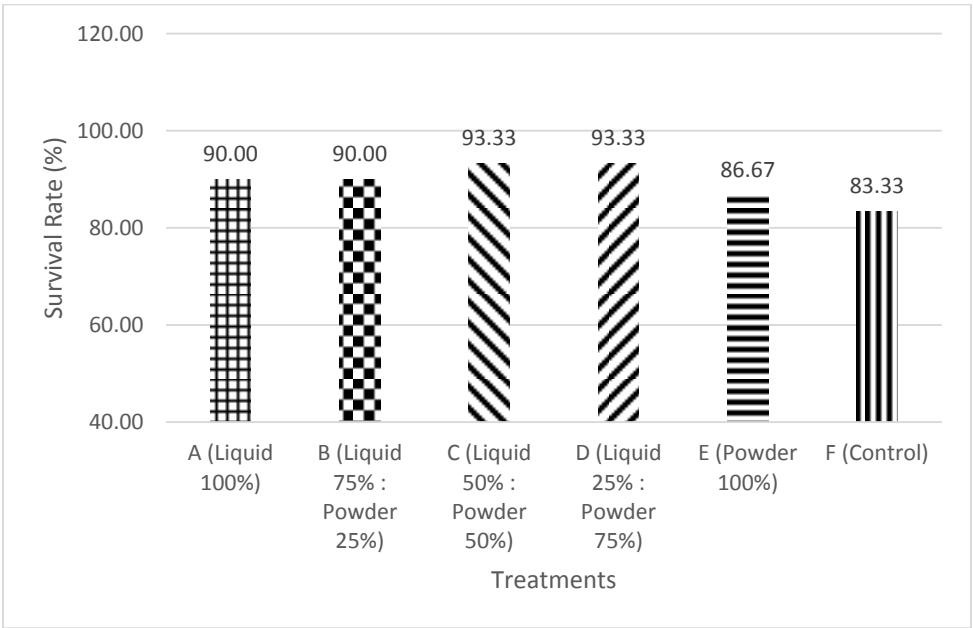

Figure 4. Survival Rate of Gouramy

The survival of gouramy obtained during the research there were deaths in all treatments. Death occurs at the beginning of maintenance, suspected that the fish is still in the stage of adaptation to the new environment and gouramy is a classified fish as difficult to adapt so that the survival value of gouramy is low. However, the survival value of gouramy during research is still relatively good according to the statement stated by Husen (1985) in Mulyani et al. (2014) if survival rate ≥50% is good survival rate, if its value 30-50% moderate survival and less than 30% survival is not good. The survival rate is still relatively good due to siphoning every 2 days so that the water quality can maintained properly. Fish survival is affected by various factors such as adaptability of fish to food, the environment, fish health conditions, stocking density and water quality.

Water Quality

Table 4. Water Quality of Gouramy

Treatments	Temperature (ºC)	DO (mg/L)	pH
A	27.9 – 32.4	4.3 – 7.6	6.91 – 8.66
B	27.8 – 30.9	4.0 – 7.4	6.63 – 8.05
C	27.8 – 32.2	4.2 – 7.9	6.67 – 8.42
D	27.9 – 32.5	4.6 – 7.9	6.82 – 8.20
E	27.4 – 32.1	4.0 – 7.1	7.00 – 8.63
F	27.5 – 32.8	3.9 – 7.2	6.45 – 8.05
SNI : 01- 6485.3 – 2000	25 – 30	Min. 2	6.5 – 8.5

Water temperatures obtained during the research ranged from 27.4 - 32.8ºC, where according to SNI: 01-6485.3 - 2000 the proper temperature is in the range of 25 - 30ºC. This is a little different between SNI: 01-6485.3 2000 and what happened during the study, where the temperature is relatively warmer but this temperature can still be tolerated by fish. According to Gusrina (2008) Water temperature affects the response of fish to feed, if the ideal temperature, the response of fish to feed will also be optimal. In addition, if the temperature ranges between 8-10ºC or 36-38ºC, the fish will not respond to the bait given and if the temperature of 38-42ºC the fish approaches the critical period.

Dissolved oxygen (DO) obtained during the research ranged from 3.9 to 7.9 mg/l. Oxygen content is good for gouramy between 4 - 6 mg/l (Sitanggang and Sarwono, 2007). Dissolved oxygen in research tends higher, this is because used aeration, gouramy can life with a shortage of dissolved oxygen. Oxygen used of fish to breathe and metabolism in the body which will produce movement, growth and reproduction. The optimum dissolved oxygen value causes the appetite of fish to increase so that absorption of feed will be more and the growth of fish will be higher (Effendi, 2003).

The degree of acidity (pH) obtained during the research ranged from 6.45 - 8.66, while the good pH value according to SNI: 01-6485.3 - 2000 is in the range of 6.5 - 8.5 so that the pH range during the research is still classified well. At low pH (high acidity), the dissolved oxygen content will decrease. As a result, oxygen consumption decreases, respiratory activity rises, and appetite decreases (Kordi 2010). The degree of acidity (pH) of waters that have a value of less than or equal to 4 and more than or equal to 11 can cause death in fish. If the pH value is not in this range for a relatively long time, fish reproduction and growth will decrease and can cause physiological symptoms (Boyd, 1990).

CONCLUSIONS

The results obtained during 40 days of maintenance showed that administration of probiotic in growth, feed conversion ratio, and survival had a good effect. Probiotic treatment with combination 25% (3,75 ml/kg) : Powder 75% (7,5 g/kg) has the best results with a value of 1.63 ± 0.09% specific growth rate, absolute weight growth 25.27 ± 2.62 g, feed conversion ratio 1.59 ± 0.02 and a survival rate of 93.3 ± 5.77%.

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