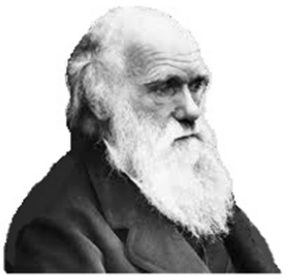
Available online at www.worldnewsnaturalsciences.com



World News of Natural Sciences

An International Scientific Journal

WNOFNS 24 (2019) 54-63 EISSN 2543-5426

Utilization of Liquid Commercial Probiotics to Improve Survival and Growth of Siamese Catfish Fingerlings (*Hypopthalmus pangasionodon* (Sauvage, 1878))

Wulan Sutiandari Meidi*, Walim Lili, Iskandar, Ibnu Bangkit Bioshina Suryadi

Faculty of Fishery and Marine Science, Universitas Padjadjaran, Sumedang, Indonesia

*E-mail address: sutiandari58@gmail.com

ABSTRACT

The purpose of this research is to determine the effect of liquid commercial probiotics usage on improving the survival rate and growth of Siamese catfish fingerlings. This research was conducted on March to May 2018, at Building 4 Laboratory, Faculty of Fisheries and Marine Sciences, Universitas Padjadjaran, Indonesia. This study used an experimental method with Completely Randomized Design (CRD), which consisted of four treatments and three replications. The treatments are feed without the addition of probiotics, and feed with additional probiotics at doses of 2, 4, and 6 mL / kg of feed. The parameters observed were survival rate, absolute weight, absolute length, feed conversion ratio, proximate test analysis, and water quality. Data on absolute weight, absolute length, feed conversion ratio, and survival rate were analyzed using analysis of variance, while nutrition changes of fish feed and water quality were analyzed descriptively. The results showed that the best addition of probiotics for feed, is with probiotic doses of 2 mL / kg of feed, which resulted in a 100% survival rate, an absolute weight value of 1.03%, and a feed conversion ratio of 1.13.

***Keywords*:** Siamese catfish, probiotics, survival rate, growth rate, feed convertion ratio, *Hypopthalmus pangasionodon*

(Received 04 March 2019; Accepted 21 March 2019; Date of Publication 22 March 2019)

1. INTRODUCTION

To increase the survival rate of aquaculture commodities, probiotics are currently used when breeding fish, crustaceans, and shellfish in a hatchery. Probiotics refer to the microorganisms which are beneficial for the consuming animal (host) by balancing the intestinal microorganism floras inside the digestive tract. The probiotics can be distributed through feed, water or by living feed, such as rotifers or brine shrimps. The feed fermentation could breakdown the complex compounds into simple forms so the feed is ready to be consumed by the fish, and several microorganisms could even synthesize amino acids needed by aquatic animals.

The striped catfish (*Pangasionodon hypopthalmus*) is a freshwater fish that has a high economic value if developed. It is widely consumed in Indonesia because of its delicious and savory meat. This catfish contains 28.6% protein, 5.8% fat, and 51.3% water. As of now, there is an increase for the demand of nutrition fulfillment, especially for animal proteins. For this case, fishes could give many benefits because it is cheaper and easier to get. The effort for increasing catfish growth needs to be improved so that the usage of artificial feed could be done more efficiently, which in turn will reduce the production cost (Mokoginta *et al*., 2004). One of the alternatives for improving catfish feed efficiency is by adding probiotics that came from bacteria into the feed which is important for making the feed to have good nutritional values and energy for the catfish.

The improvement of aquaculture businesses caused the increase for the role of fish feed. The feed refers to the single or mixed feed material, either processed or unprocessed, which is given to the animals for their survival, production, and reproduction. An important factor needed to help the growth and development of fish is the feed. Therefore, it is necessary to develop the right method to fulfill the nutritional requirements of the catfish so that its livelihood could be sustained. The feed that is usually used in cultivations is a commercial fish feed which uses about 60-70% out of the total production cost, which means that the cost takes a great amount from the total cost. For this reason, it is necessary to conduct a research to improve the nutritional content in the feed by-adding probiotics, the addition would affect the digestive tract, which in turn would help the feed absorption in the digestive system.

2. RESULTS AND EXPERIMENTAL

2. 1. Materials

1) Test Fish
    a. The test fish used in this study were seeds of Siamese catfish (*Pangasiodon hypopthalmus*) which were obtained from CDKPWU Subang with a size of 2-3 cm (± 0.28 g /head). The number of test fish used for the study was 1 fish / L, with a total number of test fish equal 240 head and 100 for stock.
2) Commercial Pellet
    a. The used commercial pellet is HI-ProVite 500.
3) Liquid Commercial Probiotic

a. The used probiotics is Heryaki brand probiotics, which contains *Lactobacillus casei* and *Monascuss* sp. bacteria. The amount of probiotics colony is 10^5 cfu/mL which is obtained from the Faculty of Animal Husbandry, Universitas Padjadjaran.

2. 2. Method

This study used a completely randomized design (CRD) with 4 treatments each, repeated 3 times, as follows:

Treatment A : Without probiotics
Treatment B : Probiotic doses of 2 mL / kg of feed
Treatment C : Probiotics as much as 4 mL / kg of feed
Treatment D : Probiotic doses of 6 mL/ kg of feed.

2. 3. Observation Parameters

2. 3. 1. Survival Rate

Tilapia survival rate (SR) is calculated using the Effendie (1997) formula, as follows:

$$SR = \frac{\mathrm{Nt}}{\mathrm{No}} \times 100\ \%$$

where:

SR = Survival Rate (%)
Nt = Number of live fish at the beginning of the observation
No = Number of live fish at the end of the observation.

2. 3. 2. Absolute Length Growth

Measurement of fish length uses a length growth formula according, as follows:

$$L = L_t - L_0$$

where:

L = Length growth (cm)
L_t = Fish lenght at the end of the observation (cm)
L_0 = Fish lenght at the beginning of the observation (cm).

2. 3. 3. Absolute weight Growth

Absolute weight Growth use growth formula:

$$\Delta W = W_t - W_0$$

where:

ΔW = Absolute Weight (g)
W_t = The weight at the end of the observation (g)

W_0 = The weight at the beginning of the observation (g).

2. 3. 4. Feed Conversion Ratio

Feed efficiency FCR uses the formula below:

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

where:

F = Number of feed given during maintenance
W_t = Fish total weight at the beginning of the maintenance
W_0 = Fish total weight at the end of the maintenance
D = Dead fish weight during maintenance (g).

3. DATA ANALYSIS

To determine the effect of treatment on Siamese catfish survival and growth, diversity analysis was carried out with F-test with 95% confidence level, if there were differences between treatments with Duncan's distance test with also 95% confidence level. Water quality data (temperature, pH and DO), were analyzed descriptively and presented in **Table 1**.

3. 1. Survival Rate

The result of the research that was conducted for 30 days by cultivating striped catfish seeds showed that each treatment has a high survival rate. The results can be seen in **Figure 1**.

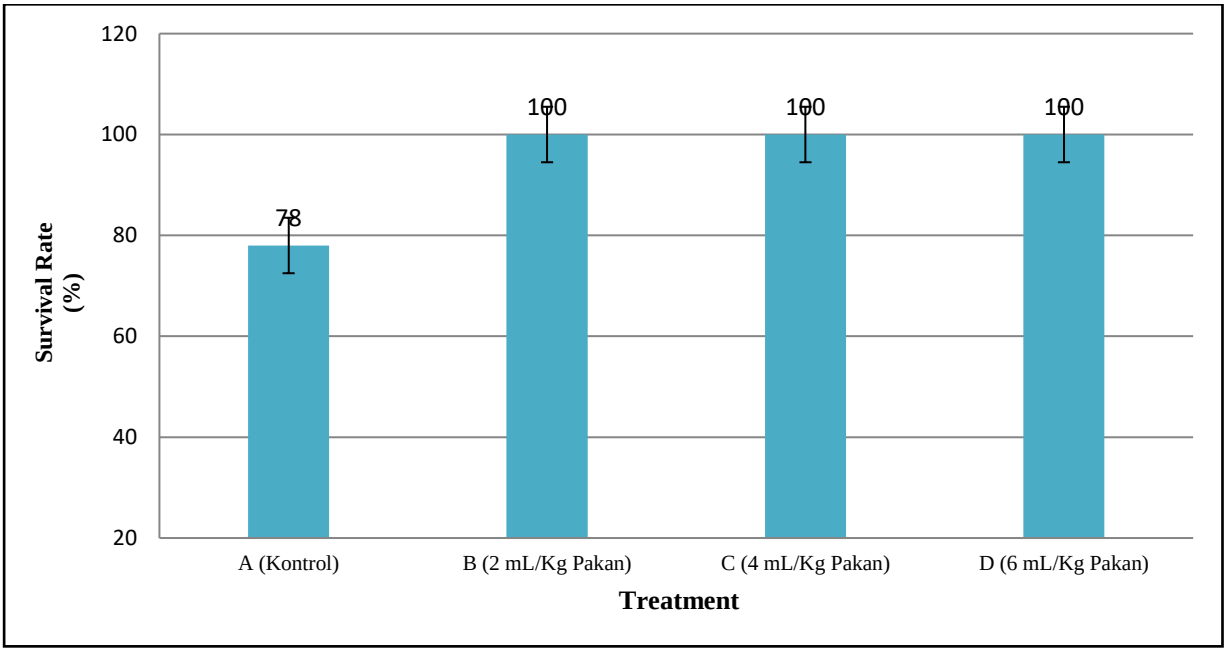


Figure 1. Survival Rate

Based on the results, the survival rate of the striped catfish seed ranges between 78-100%. Treatment A (control) has the lowest survival rate because of the absence of probiotics addition; this showed that by adding probiotics, the survival rate would increase. Meanwhile, other treatment showed the highest survival rate which is 100%, which means that all of the fish survived. The results obtained did not come from the probiotics per se, but it is also came from a well-conditioned container, the usage of nutritious feeds, and by regularly controlling the water quality. The high survival rates are affected by the once per day syphoning before feeding. By syphoning, the water quality can be maintained and it will prevent the fish to die, stated that good water quality would affect the fish survival rate and growth.

3. 2. Absolute Length Growth

Based on the results which came from four different treatments, the addition of heryaki probiotics could affect the striped catfish seeds' length growth with various length growth average. During the research, the striped catfish seeds length increased with the duration of cultivation.

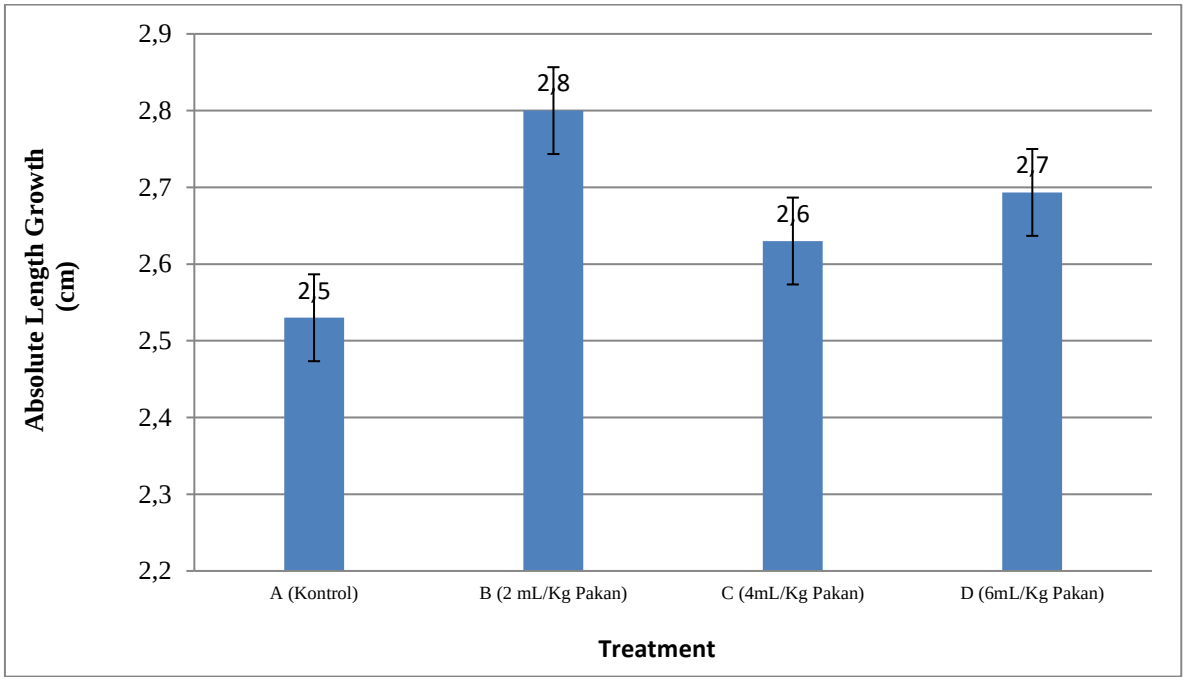


Figure 2. Absolute Length Growth

Based on the results shown in **Figure 2**, treatment B (2 mL/kg of feed) showed the highest length growth by 2.8 cm, while treatment A (control) has the lowest by 2.5 cm, followed by treatment C (4 mL/kg of feed), and D (6 mL/kg of feed) by 2.6 cm and 2.7 cm, respectively. Treatment B, which has a probiotic concentration of 2 mL/ kg of feed, has the highest growth length by 2.8 cm This is caused by the high level of digestibility of the seeds, which then make the feed was absorbed to be used for length growth and *Lactobacillus casei* has the ability to process lactose, which is a form disaccharide, from carbohydrate into glucose phosphate which is used as an energy source for the fish. One may compare to the research which showed that 5

mL/kg probiotic addition could result in a length growth rate of 4.01 cm and could increase the length of tilapia fish seeds. To sum up, the length growth of the striped catfish seeds that have probiotics, show an increased length when compared to the control, which didn't have probiotics.

3. 3. Absolute Weight Growth

The results showed that there is no significant difference of mass growth in each of the treatments, but treatment B has the highest mass growth by 1.03 g, and treatment A has the lowest mass growth by 0.84 g. The increase in probiotics addition is directly proportional with the high length growth of the striped catfish seeds. This is caused by the presence of energy supply from the feed. The energy inside the feed exceeds the energy needed for metabolism and other activities, so the excess energy was used for growth.

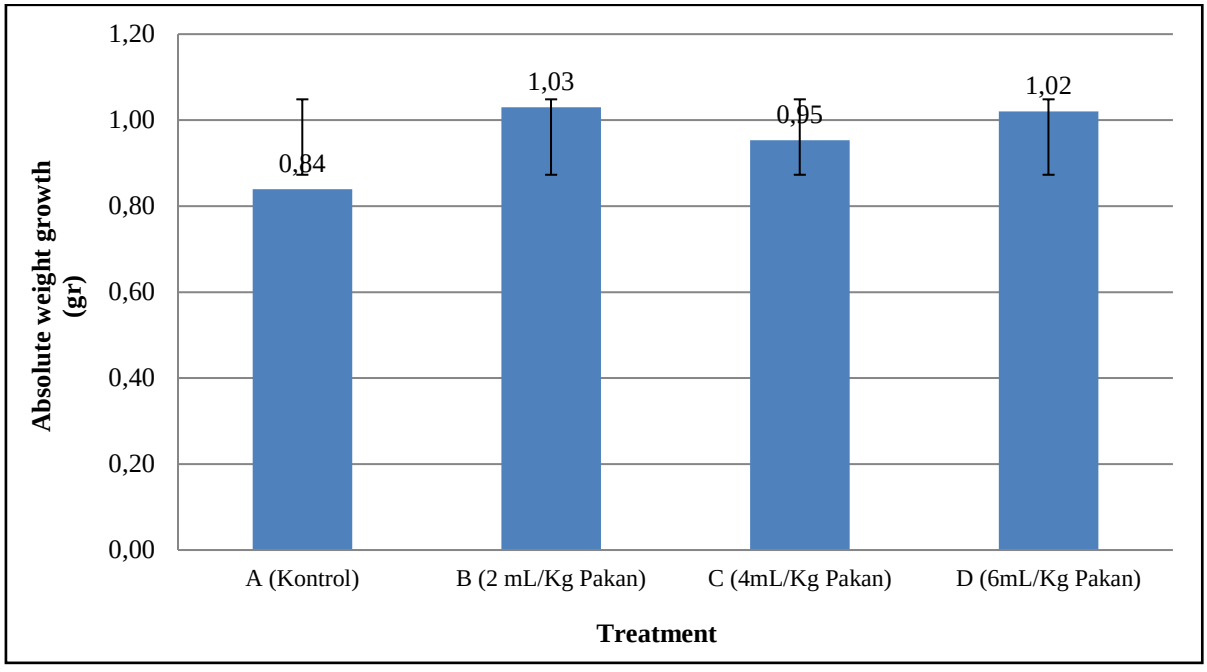


Figure 3. Absolute weight growth

Based on the results displayed in **Figure 3**, treatment B showed the best growth rate, followed by treatment D, C, and A. The absolute mass growth of the striped catfish seeds from each treatment showed varying results. These varying results show that each treatment gave various responses. Based on the results (Figure 3), treatment A showed 0.84 g of mass growth, treatment B showed 1.03 g, treatment C showed 0.95 g, and treatment D 1.02 g. Treatment B, that has a probiotic concentration of 2 mL/kg of feed, shows the highest mass growth caused by the high level of feed digestibility as the cause of the probiotic *Lactobacillus casei* activities. The bacteria activity in the digestive system would dratically change when other microbes enter through the water or feed, causing balance between the existing bacteria and the new ones.

3. 4. Feed Conversion Ratio

The feed is an important factor in aquaculture activities. The addition of commercial probiotics on striped catfish seed feeds showed different results foreach treatment. The smaller FCR value shows it is better because it shows that the fish can digest the feed given well and indicates that it is possible to reduce the production cost, especially for the feed. Based on the results, Treatment B has the best FCR value which is 1.13, followed by treatment C with the value of 1.17. The amount of feed mass needed for the growth is the conversion value, the smaller number of the conversion value indicates better feed quality.

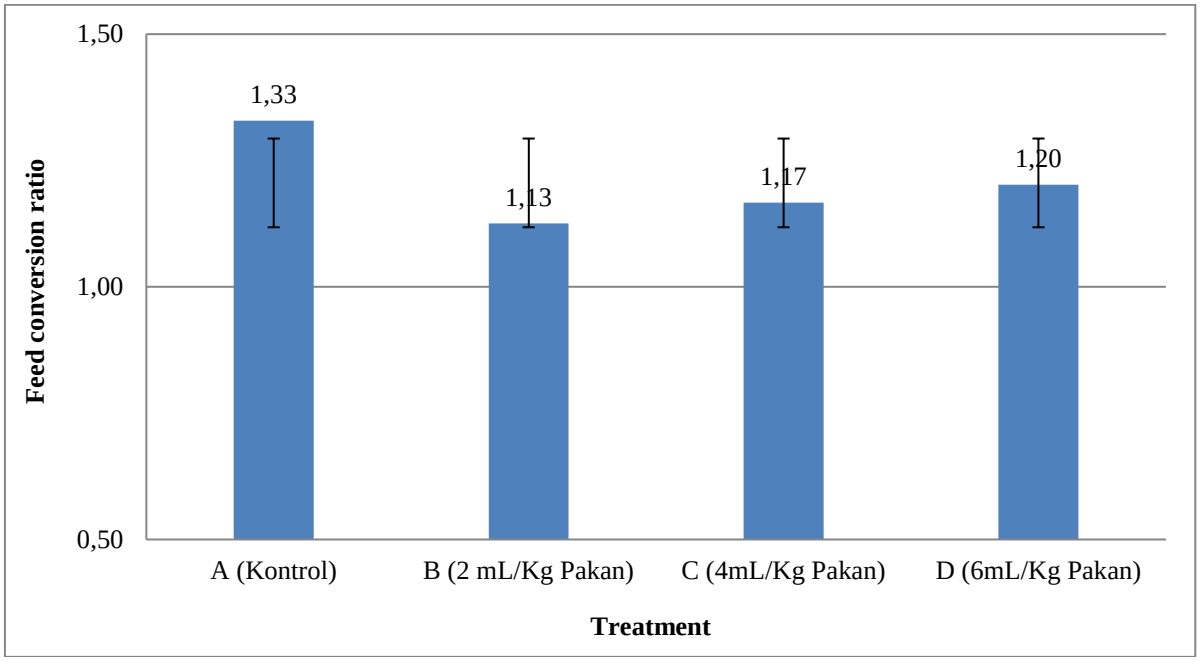


Figure 4. Feed Conversion Ratio

Based on the obtained FCR data (**Figure 4**), treatment A has an FCR value of 1.33, treatment B with 1.13, treatment C with 1.17, and treatment D with 1.20. It can be seen on Figure 4 that treatment B (2 mL/kg of feed) has the best FCR result when compared to other treatments with a value of 1.13. This result indicates that the nutrition requirements can be fulfilled and more efficient use of feed, this confirms Barrows and Hardy (2001) research that showed that the FCR value is affected by the feed protein, specifically, proteins that are suitable with the fish nutrition needs will lead to more efficient feeding. This indicates that by adding probiotics into the feed, it is assumed that this would increase the test fish protease enzym activity where the protease enzym can breakdown proteins into simple compounds so it could be absorbed easier, which would then increase the amount of protein saved. In addition, it is also affected by the amount of feeds given, the lesser amount of the feeds given then the more efficient it is.

One can see that the high response of the fish growth on the probiotics addition resulted in a more efficient feed utilization when compared to the control. The lower the FCR value, the better quality of the feed, but if the feed conversion value is high then the feed quality is not good enough.

3. 5. Nutritional Value of Fermented Fish Feed

The results of feed fermentation that has been given probiotics, aims to keep the food storability longer, so that the feed is easily absorbed and can be utilized by the body optimally. Proximate test results can be seen in **Table 1**.

Table 1. Proximate Test results

Parameters	Feed Materials			
	A (Control)	B (2 mL)	C (4 mL)	D (6 mL)
Rough Protein %	39.19	40.39	39.41	39.43
Water Content %	40.39	2.79	3.1	3.71
Rough Ash %	9.62	9.6	9.49	9.61
Rough Fat %	9.44	7.51	6.98	7.41
Rough Fiber %	4.8	6.25	4.92	6.83

Source: Proximate Test Results of the Nutrition Laboratory of the Animal Husbandry Faculty, Padjadjaran University (2018)

Based on Table 1, A test feed (control) which was not given probiotics obtained crude protein that is 39.19%, then water content 40.39%, then crude ash fiber 9.62%, crude fat content 9.44%, and crude fiber content 4.8%. In treatment B (2 mL / kg of feed), the obtained crude protein value was 40.39%, water content of 2.79%, crude ash content of 9.6%, crude fat 7.51%, then crude fiber 6.25%. In treatment C (4 mL/ kg of feed), the obtained crude protein was 39.41%, moisture content 3.1%, crude ash content 9.49%, crude fat 6.98%, then crude fiber 4.92%; and treatment D (6 mL / kg feed), the obtained protein was 39.43%, with moisture content 3.71%, 9.61% rough ash content, 7.41% rough fat, and 6.83% rough fiber.

From the proximate test results it can be seen that the addition of Heriyaki probiotics in fermented feed can increase (as can be seen in Table 3), the addition of probiotics in treatment B (2 mL / kg of feed), a rough protein content of 40.39% compared to treatment A (control) the protein content obtained is 39.19%.

3. 6. Water Quality

The life quality of fish will depend on the the environment condition. Good water quality can support the growth, development, and fish survival.

The results of water quality measurements during the study showed that the average temperature ranged from a value of 29-30 ºC. The optimal temperature for catfish is in the range of 28-32 ºC. The life of catfish begins to be disrupted if the water temperature begins to decline to 14-15 ºC or increases to 35 ºC. The range of dissolved oxygen content (DO) at the time of research was in the optimal range and in each aquarium during the study it was in the optimum range and could be said to have good oxygen content. According to Legendre *et al*. (2000), they

stated that the optimal oxygen content for catfish is> 3. The degree of acidity (pH) during the study is still in the normal range of 7.3-7.7 that value is good for the growth of catfish. The optimal pH for catfish is in the range of 6-8.5.

Table 2. Water Quality.

Treatments	Water Quality Parameters		
	Temperature (°C)	DO (mg/L)	pH
A (kontrol)	30	4,5	7,7
B (2 ml)	29,7	4,7	7,6
C (4 ml)	29,6	4,8	7,5
D (6 ml)	29,8	4,3	7,3
SNI (2000)	25-30	>4 mg/l	6,7-8,6

4. CONCLUSIONS

Based on the results of the research that has been done, it can be concluded that giving probiotics to feed in treatment D with a dose of 6 mL / kg of feed can provide absolute weight growth values of 1.03%, Feed Conversion Ratio of 1.13, with 100 % Survival Rate.

References

[1] Barrows, F.T. and R.W. Hardy. 2001. Nutrition and Feeding. In: Wedemeyer, G (Eds). Fish Hatchery Management. Second Edition. American Fisheries Society. Bethesda. Maryland. pp 483-558.

[2] Fahrizal1, A. and Nasir, M. 2017. Effect of Adding Probiotics with Different Doses on Feed Against Comparison and Conversion Ratios (Fcr) of Tilapia (Oreochromis Niloticus). *Median Journal,* Volume IX Number 1 of 2017

[3] Gatesaupe, F.J. 1999. The use of probiotics in aquaculture. *Aquaculture* 180: 147-165

[4] Glencross, B., T.T.T. Hien., N.. Phuong, and T.L. Cam Tu. 2011. A factorial approach to defining the energy and protein requirements of Tra catfish, Pangasiodon hypothalamus. *Aquaculture Nutrition* 17: 396-405

[5] Legendre, M., J. Stembrouck, R. Gustiano, A.H. Kristanto, J. Subagja, O. Komarudin, and Sudarto, dan Maskur. 2000. Pangasius djambal: A new candidate spesies for fish culture in Indonesia. *IARD Journal.* 22(1): 1-14

[6] Mokoginta D., Jusadi E., and Gandara. 2004. Effect of Addition of Probiotics Basillus sp. on Commercial Feed Against Feed Conversion and Patin Fish Growth (Pengasius Hypophthalmus). *Indonesian Aquaculture Journal,* 3 (1): 15-18

[7] Ardiansyah, Junianto, Nia Kurniawati, and Emma Rochima. The Effect of Red Tilapia Bone Gelatin Powder Addition on Preference Level of Panna Cotta. *World Scientific News* 115 (2019) 68-90

[8] Yuli Andriani, Firdausi Nurfalah, Ayi Yustiati, Iskandar, and Irfan Zidni. Utilization of Fermented Mangrove Propagules (Rhizophora mucronata) as Feeding Material for Nile Tilapia (Oreochromis niloticus). *World Scientific News* 111 (2018) 74-86

[9] Chau Thi Da, Torbjörn Lundh, Jan Erik Lindberg, and Håkan Berg, Growth performance, feed utilisation and biological indices of Tra catfish (Pangasianodon hypophthalmus) cultured in net cages in pond fed diets based on locally available feed resources, *International Aquatic Research*, 8, 4, (309), (2016).

[10] Muhammad Anamul Kabir, Alireza Ghaedi, Allah Dad Talpur, and Roshada Hashim, Effect of dietary protein levels on reproductive development and distribution of amino acids in the body tissues of female Pangasianodon hypophthalmus (Sauvage, 1878) broodstock in captivity, *Aquaculture Research*, 46, 7, (1736-1747), (2013).

[11] Carlos Frederico Marques Guimarães, Eliane Teixeira Mársico, Maria Lúcia Guerra Monteiro, Môsar Lemos, Sergio Borges Mano, and Carlos Adam Conte Junior, The chemical quality of frozen Vietnamese Pangasius hypophthalmus fillets. *Food Sci Nutr*. 2016 May; 4(3): 398–408. doi: 10.1002/fsn3.302

[12] C.T. Da, T. Lundh, and J.E. Lindberg, Digestibility of dietary components and amino acids in animal and plant protein feed ingredients in striped catfish (Pangasianodon hypophthalmus) fingerlings, *Aquaculture Nutrition*, 19, 5, (741-750), (2013).

[13] Chau Thi Da, Torbjörn Lundh, and Jan Erik Lindberg, Evaluation of local feed resources as alternatives to fish meal in terms of growth performance, feed utilisation and biological indices of striped catfish (Pangasianodon hypophthalmus) fingerlings, *Aquaculture*, 364-365, (150), (2012).