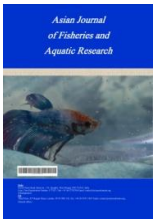

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Effect of Addition of Banana Peel Extract on Commercial Feed as an Effort to Reduce Patin Cannibalism (*Pangasius hypophthalmus*) Larval Stage

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Authors' contributions

This work was carried out in collaboration among all authors. Author KH designed the study, managed the analyses of the study and managed the literature searches. Authors IZ, RR managed the analyses of the study and managed the literature searched. Author WG performed the study, wrote the protocol and wrote the first draft of the manuscript. All authors read and approved the final manuscript.

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ABSTRACT

This research aims to determine the best concentration of banana peel extract used in commercial feed on the survival of patin fish larvae. The research was conducted on April 2, 2019 until June 1, 2019 which took place at the Aquaculture Laboratory of the Faculty of Fisheries and Marine Sciences, Padjadjaran University. The making of banana peel extract was carried out at the Central Labforatory, Padjadjaran University. The research method was carried out experimentally with Completely Randomized Design (CRD). This research uses five treatments that are repeated three times. The treatment in this research consisted of the addition of banana peel extract on commercial feed at a dose of 0%, 0.50%, 0.75%, 1.00 and 1.25% per kilogram of feed. The parameters observed in this research were survival, absolute length growth, daily growth rate, and water quality. The analysis used is the f test and descriptive analysis. Parameters tested using the f test include survival, absolute length growth, and daily growth rate. While water quality was tested descriptively.

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Survival rates, absolute length growth, and growth rates ranged from 75.33% to 86.96%, 1.29 - 1.32 cm and 2.95% -3.00% respectively. The observation of water quality include temperature, pH and DO respectively waters ranged from 28.00 to 30.20 °C, 7.22 to 8.18 and 5.40 to 6.70 mg /L. Based on research results concluded that the concentration of banana peel extract 0% - 1% produced a survival rate of 81.70% - 86.96% and was better than the addition of banana peel extract with a concentration of 1.25% which resulted in a survival rate of 75.53%. The suggestion from this study is to improve the survival of patin fish larvae can be added banana peel extract with a concentration of 0.75% or equivalent to 7.5 g / Kg of feed

Keywords: Banana peel extract; patin fish; cannibalism; survival.

1. INTRODUCTION

Patin fish is a popular fish commodity because the demand for patin fish has recently increased. As the number of patin fish farmers increases, it demands an increase in the number of seed supplies. So far, the supply of Siam Patin fish comes from small and medium-scale seed entrepreneurs (*hatchery* household scale) whose locations are spread in West Java, Jakarta and Southern Sumatra, while large-scale seed entrepreneurs are still rarely found. The supply of seeds from *hatcheries* household scale is relatively limited so that in certain seasons they cannot meet the demand for seeds for cultivation [1]. In general, maintenance of larvae up to the age of 30 days or seeds measuring ± 1 inch only produces survival around 10-30% [2]. The low survival rate is presumed because of the feed and environment have not been fulfilled. To meet the needs of the number of larvae, an increase in the amount of larval production from *existing hatcheries* must be carried out.

Larval maintenance period lasts for 1-3 days, during this time the larvae have not been actively looking for food because they have food reserves in the form of the *yolk sac* or egg yolk, the egg yolk is completely absorbed in the third day so that the larvae swim horizontally. Patin fish larvae are cannibal when very hungry so that one larva can swallow two other larvae in a row [3].

Cannibalism is a predatory type and is generally carried out by larger fishes for smaller fish. Cannibalism can also occur with fellow seeds, ie similar and equal-sized fish seeds that feed on each other [4]. This causes damage to the morphology of patin fish which causes a decrease in the survival rate of patin fish seeds [5].

One effort to control the nature of cannibal fish is a hormonal approach. The hormone that is influential in this case is the hormone serotonin. This increase in serotonin hormone is also thought to be able to reduce the tendency of aggressive traits of fish [6]. The amino acid tryptophan can increase the serotonin hormone in the brain which is expected to reduce the aggressiveness of fish. The source of tryptophan is found in banana peel waste [7].

Banana peel is a rich source of starch (3%), crude protein (6-9%), crude fat (3.8-11%), total fiber (43.2-49.7%), and unsaturated fat double, especially α-linoleic acid and α-linolenic acid, pectin, essential amino acids (leucine, valine, phenylalanine, threonine and tryptophan), and macronutrients (K, P, Ca, Mg) [8].

Tryptophan ($C_{11}H_{12}N_20_2$) is a precursor of serotonin and serotonin can be converted into melatonin. Giving tryptophan amino acid can increase serotonin synthesis in the brain. Serotonin is a *neurotransmitter* and melatonin is a neurohormone. Serotonin and melatonin have sleep effects. Melatonin is a hormone that can control other hormone levels of hormones [7]. Serotonin has a modulatory role in nerve information processing [9]. Serotonin is *a hormone neurotransmitter* that undergoes metabolism to form melatonin which works directly to affect organ activity [10]

The purpose of this study was to determine the effect of banana peel extract on the cannibalism properties of patin fish larvae and to determine the concentration of banana peel extract use in commercial feed on survival in patin fish larvae.

2. MATERIALS AND METHODS

2.1 Materials

The research was conducted in April 2019 until June 2019 which took place at the Aquaculture Laboratory of the Faculty of Fisheries and Marine Sciences, Padjadjaran University. The making of

banana peel extract was carried out at the Central Laboratory, Padjadjaran University.

2.2 Methods

The larvae was obtained from Sukabumi Freshwater Aquaculture Center with an average length of 1.4-1.6 cm, weights ranging from 2.1 to 6.6 mg which were stocked in 15 stocked solid aquariums. in each aquarium is 15 tails/liter. The fish feed used is commercial feed in the form of a crumble Bintang brand produced by PT. Central Proteinaprima, Tbk with 40% protein content.

The experimental design used in the study was a completely randomized design (CRD) with 5 treatments, and 3 replications. The treatments in this study were:

Treatment A: Feed without banana peel extract
Treatment B: Feeding fish by mixing 0.5% concentration of banana peel extract
Treatment C: Feeding fish by mixing 0.75% concentration of banana peel extract
Treatment D: Feeding fish by mixing 1% concentration of banana peel extract
Treatment E: Feeding fish by mixing 1.25% concentration of banana peel extract

2.3 Procedure Research

2.3.1 Extraction preparation

The extraction method was maceration method, carried out at the Central Laboratory of the University of Padjadjaran. The steps in making banana peel extract according to Fatimah et al (2016) [11] are as follows, 4.8 kg of wet Ambon yellow banana peel cut to small size, then immersed in a macerator tube that contains 3 liters of methanol. The solution is homogenized by stirring and allowed to stand for 2 x 24 hours. After 2 x 24 hours, the supernatant is distilled from the macerator and evaporated at 40^{o}C

2.3.2 Preparation of the container

The aquarium first cleaned using running water to remove impurities filled with water and equipped with aeration as oxygen supply left for 1 x 24 hours and checked for the water quality. Each aquarium is filled with 15 tails/liter of test fish which will then be tested for approximately 21 days of maintenance.

2.4 Implementation of Research

2.4.1 Addition of extracts to feed

The addition of banana peel extract to feed begins with weighing the extract according to the predetermined concentration and dilution of the extract using 5 ml of distilled water. After dilution, the extract is then mixed with feed and stirred homogeneously in a wet state. Then after mixing well, the feed is dried again by aerating [11].

2.4.2 Sampling

The process *sampling is* carried out to support the data during the implementation of the research. Analyze the morphology of patin fish during maintenance. 30% water change are carried out every 2 days. Survival observations were carried out at the beginning of the study and the end of the study. *A sampling* of test fish to collect long data is done every 7 days. Water quality measurements are carried out every 7 days to measure temperature, dissolved oxygen, and pH .

3. PARAMETERS OF RESEARCH

3.1 Survival *(Survival Rate)*

According to Effendie (1979) [8] the percentage of survival is obtained using the formula:

$$SR = \frac{Nt}{No} x100\%$$

Description:

SR = Survival (%)
Nt = Number of test fish at the end of the study (tail)
No = Number of test fish at the beginning of the study (tail)

3.2 Absolute Length

Growth of absolute length is calculated using the Effendie formula (1979) [12], namely:

$$Lm = Lt - Loa$$

Description:

Lm : Growth of absolute length (cm)
Lt : Average length at the end of the study (cm)
Lo : Average length at the beginning of the study (cm)

3.3 Daily Growth

The long daily growth rate of patin fish is calculated based on the average length average fish at the beginning and end of the study. Daily length of daily growth rate is calculated based on the formula De Silva and Anderson (1995) [13], namely:

$$aL = \frac{ln\ Lt - ln\ Lo}{t} \times 100\%$$

Description:

aL : Daily length growth rate (cm / day)
Lo : The average length of the initial fish of the study (cm)
Lt : The average length of the final fish of the study (cm)
t : Time (days)

3.4 Data Analysis

Data of obtained survival rates and absolute growth were analyzed using variance analysis. If the treatment gives a significant or significantly different effect, then it is followed by the Duncan test at the confidence level of 5% to find out the difference in influence between treatments while the water quality data is analyzed descriptively.

4. RESULTS AND DISCUSSION

4.1 Survival Rate

The *survival rate* is the percentage of fish that live on the number of fish that are kept during a certain maintenance period in a maintenance container. Fish survival is influenced by several factors including water quality, availability of feed according to fish needs, ability to adapt and stocking density. Survival rates can be used in knowing tolerance and the ability of fish to live [14].

The percentage of the survival rate of patin fish larvae shows different results for each treatment during 21 days of observation. Percentage of survival rates, respectively, treatment A (control) was 81.70%, then treatment B (0.50%) was 84.67%, treatment C (0.75%) was 86.96%, treatment D (1.00%) of 84.59%, and treatment E (1.25%) of 75.33%. The highest survival was found in treatment C (0.75%) at 86.96% and the lowest at treatment E (1.25%) at 75.33% (Fig. 1). The survival rate of all treatments has a value above 75% which is considered high enough and has conformity with SNI: 6483.4-2016 [15] indicating that patin fish larvae respond well to feed that has been added by banana peel extract.

Differences in the survival rate of patin fish larvae in each treatment were tested using variance analysis. The results showed that treatments A, B, C, and D had significantly different effects on treatment E (Table 1).

Duncan test results at the 95% confidence level showed that the administration of banana peel extract in treatment E (1.25%) of 75.3% gave a significantly different effect with treatment A (0.00%) amounting to 81.70%. The results of this study are supported by the results of research from Hseu *et al* (2003) [16], where the effective concentration of the amino acid tryptophan required is 0.25% - 1% of the standard dry weight of the feed. The difference that is not evident in each other treatment occurs because the synthesis of serotonin in the form of the amino acid tryptophan contained in banana peel extract has not been able to work optimally in increasing serotonin hormones in the brain which are expected to be able to reduce the activity of fish.

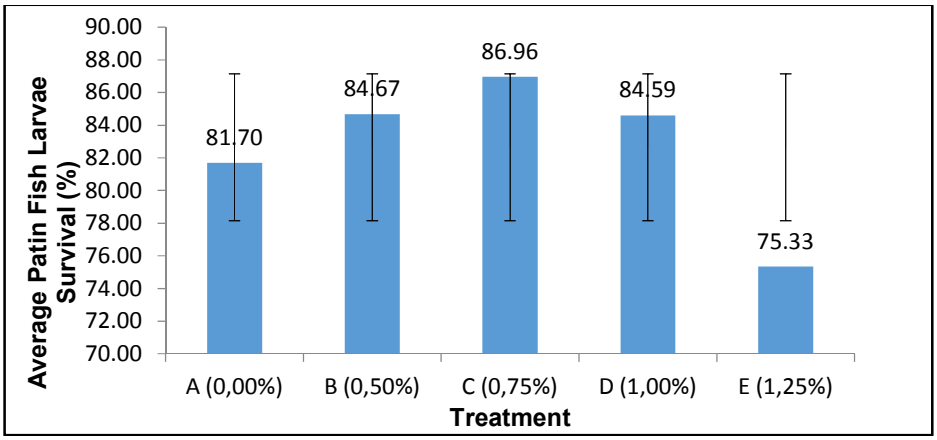

Fig. 1. Average patin fish larvae survival rate

Table 1. Average patin fish larvae survival rate

Treatment	SR(%)
A (0.00%)	81.70 ± 0.13[b]
B (0.50%)	84.66 ± 0.09[b]
C (0.75%)	86.96 ± 0.10[b]
D (1.00%)	84.59 ± 0.17[b]
E (1.25%)	75.33 ± 0.37[a]

Description: Values followed by lowercase letters the same was not significantly different at the 95% level of confidence

The survival rate of fish is mainly influenced by the physical and chemical properties of water, media, and feed quality. During the process of maintaining patin fish larvae, water quality conditions are at a level that is good for the survival and growth of patin fish larvae. The quality of feed given during maintenance can also be said to be good and sufficient for nutritional needs.

Another reason for the decline in the survival rate of patin fish larvae is due to the level of stress experienced by fish in the maintenance container. According to Budiawan (2011) [17], stress can be caused by several factors and one of them is environmental factors. In this research, stress is caused by temperature fluctuations at the time the research took place. Patin fish larvae have not been able to tolerate environmental changes that have occurred resulting in stress and can cause cannibalism which has an impact on decreasing the survival rate of patin fish larvae.

Cannibalism during maintenance occurred when the patin fish larvae experience stress caused by factors that influence the cannibalism process. In Fig. 2 it can be seen that there is damage to the morphology of the patin fish larvae in the head, abdomen, fins, and tail. Although during the cannibalism process the fish that are preyed can escape but generally have suffered injuries so that they cannot survive long. According to Marhamah (2010) [5], cannibalism behavior in fish is characterized by an attack carried out. Attacks can be the behavior of chasing larvae, attacking or biting other larvae. This causes damage to the morphology of patin fish, which causes a decrease in the survival rate of patin fish larvae.

The concentration of banana peel extract with the highest average survival rate occurred in treatment C (0.75%), which amounted to 86.96%. This is because the concentration of banana peel extract is given into the right feed, resulting in the amino acid tryptophan which can trigger serotonin in the brain to reduce the aggressiveness of patin fish larvae. Serotonin is *a hormone neurotransmitter* that undergoes metabolism to form melatonin which works directly to affect organ activity [10]. However, it is different from what happened in treatment E (1.25%) having the lowest average survival rate of 75.33%. This is probably caused by the administration of banana peel extract has crossed the threshold to affect the aggressiveness of patin fish larvae. According to Almatsier (2009) [18], the excess amino acids in the body have an unfavorable effect because it affects metabolism. In this banana peel extract, there are saponin compounds that function as antibacterial and painkillers. However, if excessive saponin is given to fish, death will occur because saponins become toxic compounds. Saponins are toxic to cold-blooded animals such as fish if they are overused (Gunawan and Mulyani 2004). The results of this study are supported by the results of the study of Hseu *et al* (2003) [16], where effective concentrations for the amino acid tryptophan ranged from 0.25% to 1% from the standard dry weight of the feed.

Fig. 2. Larval conditions of patin fish due to cannibalism

4.2 Growth

Fish growth is the increase in weight and length of the fish body in a given period. Physically, there is a change in form due to the increase in length, weight, and volume in a certain period individually. Growth in individuals is a net increase due to cell division that occurs due to excess energy inputs and amino acids (proteins) derived from food [19].

Based on the results of observations on the growth rate, it shows that there is a different length of increase in each treatment. The addition of banana peel extract to commercial feed gave a positive and good response to the growth rate of patin fish larvae. In Fig. 3 it can be seen from the average length increments for 21 days of maintenance that there is a relatively equal length of value-added.

Length increment is the difference between the length of fish between the head to the tail end of the body at the end of the study with body length at the beginning of the study [14]. The results of the study for the absolute long growth of patin fish larvae with the addition of banana peel extract on the feed were obtained from the results of the long difference in the body of patin fish larvae at the beginning and end of the study. From the results of variance (Table 2), it can be seen that the addition of banana peel extract to feed for patin fish larvae was not significantly different from the absolute growth rate. The highest absolute long growth observations occur in treatment C (0.75%) which is equal to 1.322 cm, then followed by treatment A (control) of 1.321 cm, treatment E (1.25%) of 1.318 cm, treatment B (0, 50%) of 1,298 cm, and treatment D (1.00%) of 1.925 cm.

The absolute long growth average data that has been obtained will affect the value of the long daily growth rate. Based on the results of observations, it shows that there are different values of daily growth rates for each banana peel extract with varying concentrations. The increase in the average length of the fish's body shows that the feed provided can meet nutrient intake and can be digested and absorbed by the body of the fish. Ramadhana et al (2012) [20] stated that growth occurs when food nutrients that are digested and absorbed by the body of the fish are greater than the amount needed to maintain the body. The increase in the average body weight of fish indicates that the given feed can meet nutrient intake and can be digested and absorbed by the body of fish

Based on Fig. 4 shows the value of a fluctuating growth rate in each treatment addition of extra banana peel. The results showed that the highest daily growth rate of patin fish larvae was highest in treatment A (control) which was equal to 3.004%, then followed by treatment E (1.25%) of 3.001%, treatment B (0.50%) of 2,977 %, treatment D (1.00%) of 2.954%, and treatment C (0.75%) of 2.954%.

Analysis of variance (Table 2) showed that the growth rates of patin fish larvae feed without the addition of banana peel extract (0%), 0.50%, 0.75%, 1.00%, and 1.25% were not significantly different. The effect that was not significantly different in all treatments for the addition of banana peel extract to 1.25% of feed indicated no negative impact on the growth of patin fish larvae and did not inhibit or disrupt the growth rate of patin fish larvae. This is because the protein content in the feed is in accordance with the protein requirements of patin fish. According to Tribina (2012) [21] that if the need for maintenance *(maintenance)* which exceeds the amount of feed given, there will be a process of dismantling the energy in the body of the fish itself (catabolism). A sufficient amount of feed for fish means enough for body maintenance, daily activities and fish growth, if there is an excess or lack of feed can affect the growth rate.

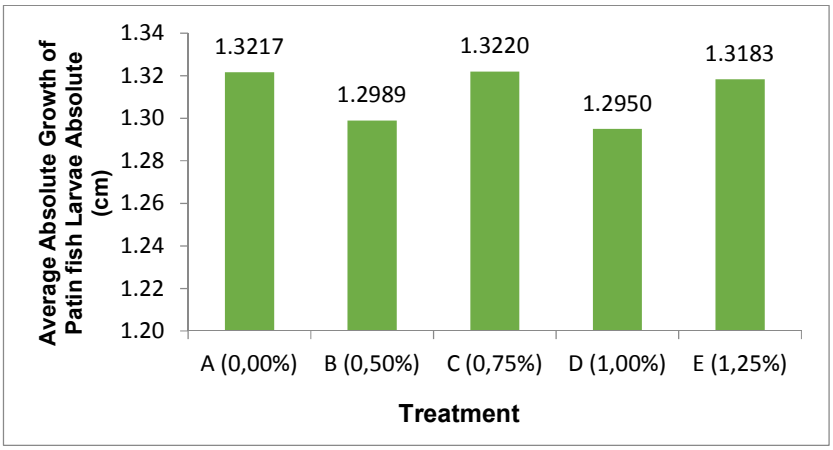

Fig. 3. Average absolute growth of patin fish larvae absolute

Table 2. Average growth of absolute and LPH lengths of patin larva length

Treatment of	Absolute length (cm)	LPH Length (%)
A (0.00%)	1.321 ± 0.013 [a]	3.00 ± 0.047 [a]
B (0.50%)	1,298 ± 0,003 [a]	2.98 ± 0.056 [a]
C (0.75%)	1.322 ± 0.033 [a]	2.95 ± 0.052 [a]
D (1.00%)	1,295 ± 0.015 [a]	2.95 ± 0.021 [a]
E (1.25%))	1.318 ± 0.021 [a]	3.00 ± 0.045 [a]

Description: Values followed by the same lowercase letters are not significantly different at the 95% confidence level

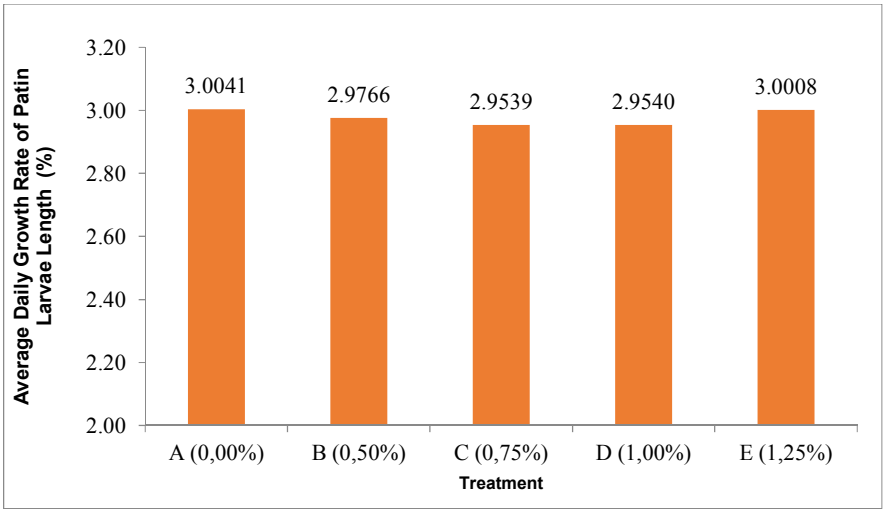

Fig. 4. Average daily growth rate of patin larvae length

The results of the study of the addition of banana peel extract on commercial feed given to patin fish larvae showed that the administration of banana peel extract with a concentration of 0.75% obtained the highest average survival value of 86.96% but had no effect on larval lengths stain yourself. This research was supported by the research of Agustina and Saraswati (2007) [10] that the length increase in treatment was smaller than the control treatment, thought to be caused by lower levels of fat and carbohydrate in the treatment with tryptophan, while higher protein levels in the treatment of these proteins were more used for the formation of neurotransmitters namely serotonin and melatonin. According to Suharyanto and Himawan (2015) [22], the addition of tryptophan to feed did not significantly affect the growth of giant prawns. Likewise with Laranja Jr.study *et al., (*2010) that the addition of tryptophan to feed did not significantly influence the growth of mangrove crabs.

4.3 Water Quality

The success of fish farming is largely determined by the environmental factors that influence it. Water quality is a physical and chemical factor that can affect the maintenance media environment and indirectly affect the metabolic processes of test fish. The water quality parameters observed in this study include dissolved oxygen (DO), pH, and temperature. The results of observations of water quality during maintenance are presented in Table 3 and compared with SNI: 6483.4-2016 [15].

Table 3. Water quality data research

Parameter	Unit	Value	Standard quality/ Standard (SNI)
Temperature	^{o}C	28.00 - 30.20	27 – 30
pH	-	7.22 - 8.18	6-8
DO	mg / L	5, 40 - 6.70	> 3

The water temperature in maintenance media ranges from 28 ^{o}C to 30.2 ^{o}C. This value is in accordance with water quality standards according to SNI: 6483.4-2016 [15]. In addition, according to Kordi and Tacung (2010) [23], the optimal temperature range for the life of patin fish is 25˚C-32˚C. Water temperature is one of the factors that can affect the appetite and metabolic processes of fish. At low temperatures, the process of digestion of food in fish takes place slowly, while in warm temperatures digestion takes place faster. Based on the results of measurements of water quality, it can be concluded that banana peel extract into the feed does not affect the quality of the aquaculture water.

The results of the pH range measurement on maintenance media are 7.22 - 8.18. This value is still in the same range as SNI: 6483.4-2016 [15]. This is supported by PP water quality standards No. 82 of 2001 (Class II) pH which is good for aquaculture activities ranging from 6-9. At low pH (high acidity) dissolved oxygen content will decrease, as a result of oxygen consumption decreases, breathing activity increases and appetite will decrease [24]. The opposite happens in an alkaline atmosphere. According to Kordi (2010) [25], aquaculture business will succeed well in water with a pH of 6.5 - 9.0 and the optimal range is pH 7.5 - 8.7. Therefore the pH value of a cultivation pond must be maintained.

The content *Dissolved Oxygen* (DO) in maintenance media is above the minimum quality standard according to SNI: 6483.4-2016 [15] which states that the minimum DO content in waters to support the growth of patin fish larvae is above 3 mg / L. The dissolved oxygen content in this research has a fairly good value due to the continuous rotation of water which can increase dissolved oxygen content and filtration work which reduces organic matter on maintenance media. Recirculation (water rotation) in the maintenance of fish is very functioning to help biological balance in the water, maintain temperature stability, assist the distribution of oxygen and maintain the accumulation or collection of toxic metabolites so that the level of power of poisons can be suppressed [26].

5. CONCLUSION

Based on research results concluded that the addition of banana peel extract to commercial feed can reduce the cannibalism of patin fish larvae. The concentration of banana peel extract 0% - 1% produced a survival rate of 81.70% - 86.96% and was better than the addition of banana peel extract with a concentration of 1.25% which resulted in a survival rate of 75.53%. The suggestion from this study is to improve the survival of patin fish larvae can be added banana peel extract with a concentration of 0.75% or equivalent to 7.5 g / Kg of feed

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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