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The Addition of Honey Bee to the Feed to Increase the Growth of White Snapper Seeds *(Lates calcarifer)*

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Abstract

The purpose of this study was to determine the effect of adding honey to the feed for growth and the best dosage for the growth of white snapper seeds. The white snapper seeds used have an average weight of ± 2.5 g/fish. This study used an experimental method with a Completely Randomized Design (CRD). The experiment was carried out in 5 (five) treatments and each treatment had 3 (three) repetitions. The treatment consisted of adding honey to the feed with a treatment dose of (A) 0 ml/kg of feed, (B) 50 ml/kg of feed, (C) 100 ml/kg of feed, (D) 150 ml/kg of feed and (E) 200 ml/kg of feed. The results indicated that the addition of honey to the feed had a significant effect on the growth of white snapper seeds. The best dose of honey is at a dose of 200 ml/kg which has the best effect on fish growth. The condition of water quality during the study was in a suitable range for the life of white snapper seeds.

INTRODUCTION

White snapper *(Lates calcarifer)* is a demersal fish that is one of the leading aquaculture commodities in Indonesia, because of its high economic value around IDR 75.000-80.000/Kg (Yaqin *et al*., 2018) and also has relatively fast growth. According to Rayes *et al*. (2013), white snappers have a daily growth rate of approximately 0.51%/day. Its survival rate at 86%, and they are easy to adapt to the cultivation environment. According to Purba *et al.* (2016), white snapper is a type of seawater fish that contains omega-3, the protein content of this fish is about 20%, and has a fat content of 5%. It caused the market demand for this fish quite high.

White snapper is one of the potential aquaculture products due to continuous import demand on the international market. According to FAO (2021), the import of Seabass reached 24.000 tons in 2020. The high market demand shall be balanced with fast and efficient cultivation to fulfill this demand, and one of the most important factors in cultivation is feed. Dalimunthe (2019) explains that in cultivation activities, feed cost contribution may reach 80-90% of the total production cost. Moreover, Ghomi *et al.* (2012) stated that feed manipulation can be a strategy to optimize growth and according to Prihaningrum *et al.* (2015), the dose of artificial feeding in the larval phase is 7-10% of the biomass and is given 3-5 times/day.

Recently, several studies have focused on the improvement of the welfare and sustainability of animal

husbandry in aquaculture by optimizing fish feeds. Such utilization of these feeds may be achieved by adding honeybee. Previous research by Islamiyah et *al.* (2018) stated that adding the honey bee to the feed affected the growth of milkfish. The honeybee is defined as a thick, sweet liquid made by bees from flower nectar or a sweet liquid produced by parts other than flowers. Nectar is a very complex substance produced by plant glands in the form of a sugar solution with varying concentrations ranging from 5-70%. The honey bee is a complex compound.

According to Afroz *et al*. (2016), the nutrients contained in honey bees include carbohydrates, proteins, amino acids, phenols, vitamins, and minerals, According to Bagdanov (2016), the composition of honey bees are carbohydrate 79 %, amino acids, and protein, 0,3 %. This complex compound is needed, especially to spur growth. In addition, honey also contains enzymes, as stated by Putra *et al.* (2018), that the important enzymes contained in honey are diastase, invertase, glucose oxidase, peroxidase, and protease. The purpose of this study was to determine the effect of adding honey bees as a supplement has an important role in increasing the growth of white snapper seeds.

METHODOLOGY

Place and Time

The study was conducted on December 10th, 2020- January 10^{th,} 2021 at the Brackish and Marine Water Laboratory, Faculty of Fisheries, Pekalongan University.

Research Materials

The test fish used was white snapper *(Lates calcarifer)* seed obtained from the Center for Brackish Water Cultivation Fisheries, Situbondo, East Java with an average weight of ± 2.5 g/fish. Fish are reared for 30 days with a stocking density of 1 fish/L (Walusi *et al.*, 2019). The vessel used is a plastic jar with a water volume of 4 liters. The water medium used is seawater with a salinity of 34 ppt. The seeding activity is carried out in the afternoon and first acclimatized for 3 days (Jaya *et al.,* 2013).

The test feed, feed used was in the form of pellets with the size of 4.1-4.3 mm and the addition of honey with a certain dose. The tools and materials used are aquariums, weight digital scales, aerators stone, spray bottles, filter foam, white snapper seeds, seawater, honey bee, artificial feed, and distilled water (aqua dest).

Research Design

The study used a Completely Randomized Design (CRD) with 5 treatments and 3 repetitions. The dosage used is as follows: Treatment A (feed + 0 ml/kg of feed); Treatment B (feed + 50 ml honey bee/kg of feed); Treatment C (feed + 100 ml honey bee/ kg of feed); Treatment D (feed + 150 ml honey bee/ kg of feed); and Treatment E (feed + 200 ml honey bee/ kg of feed).

Determination of dosage refers to the study of Arifin and Rumondang (2017), which states that the best dose of adding honey in feed is 150 ml/kg of feed.

Work Procedure

Feed Production

The feed used is in the form of commercial pellets measuring 4.1-4.3 mm which are adjusted to the fish mouth opening. The feed is then sprayed with a honey solution that has been diluted with distilled water (aqua dest) about 100 ml for each treatment. The spraying was done by turning the feed (pellets). Furthermore, the pellets are aerated for 15-20 minutes so that they are dry and not moldy (Arifin and Rumondang, 2017).

Maintenance and Feeding

Maintenance of fish seeds is carried out for 30 days, with a percentage of feed as much as 7% of the weight of the tested fish biomass and given 3-5 times a day (Prihaningrum *et al.,* 2015). The protein content given to support seed growth in

artificial feed is not less than 40%. The feed given shall be sufficient since lack of feed will result in cannibalism in white snapper.

Absolute Weight Growth

Absolute weight growth is calculated using the formula from Effendi (1979) as follows:

$W = Wt - Wo$

Where:

W : Growth absolute weight (grams)
W_t : Final average weight (grams)
W_o : Initial average weight (grams)

Survival Rate

The calculation of the survival rate is calculated as follows:

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

Where :

N_t : Number of live fish at the end of the study
N_o : Number of fish at the beginning of the study

Data Analysis

Data analysis using ANOVA, but first the normality and homogeneity tests were carried out. The normality test was carried out using the Liliefors test (Nasoetion and Barizi, 1983), carried out to determine the growth rate in each treatment is normally distributed. The homogeneity test uses the Barlett test (Sudjana, 1996) to determine whether the data is homogeneous or not. Furthermore, variance analysis (ANOVA) was carried out, if the variance test was obtained significantly different then the Tukey test was carried out, while the water quality data were analyzed descriptively.

RESULTS AND DISCUSSION

Results of Absolute Weight Growth

The results of observations of absolute weight growth from this study are presented in graphical form in Figure 1 below.

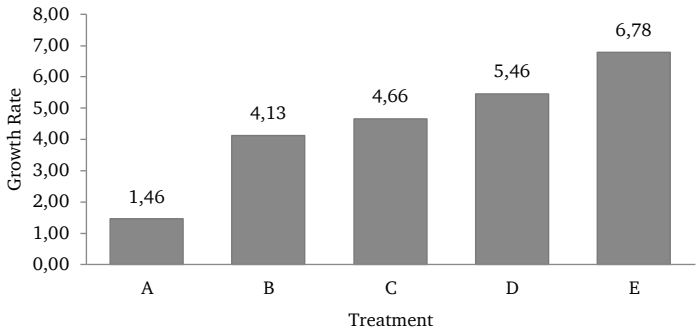

Figure 1. Growth chart.

Based on graph 1, it can be seen that the growth of white snapper seeds which have the highest value is in treatment E with an average value of 6.78 gr while the lowest biomass growth was obtained by treatment A with a mean value of 1.46 gr. The results of the normality test obtained indicate that the data is normally distributed, then followed by the homogeneity test and produce homogeneous data so that the data can be analyzed for variance (ANOVA).

Based on the analysis of variance F count (24.464)> from the F table value 5% and 1% (3.478 and 5.035), this means that the data resulting from the addition of honey to the feed with different doses for the growth of white snapper seeds have a significant effect on the growth of white snapper seeds (Table 1).

Table 1. Analyzed for variance.

SK	DB	JK	KT	F Count	F TABLE	
					5%	1%
Treatments	4	36,194	9,048		3,478	5,035
Error	10	3,6988	0,369			
Total	14	39,893				

Survival Rate

Table 2. The survival rate of fish.

	A	B	C	D	E
No	12	12	12	12	12
Nt	10	12	12	12	12
SR	83%	100%	100%	100%	100%

Note : SR = Survival Rate, Nt = Number of live fish at the end of the study, No = Number of fish at the beginning of the study.

From Table 2, it was found that the observation results for each treatment, the survival rate of the white snapper seeds on treatments B, C, D, and E showed very good results, it is 100%, whereas treatment A only got a percentage of 83%.

Based on the analysis of variance (Table 3), that F count (1) < from the F table value 5% (5,19216). This means that the data resulting from the addition of honey to the feed with different doses have no significant effect on the survival rate of White snapper seeds.

Table 3. The analyzed variance of SR.

Source of Variation	SS	df	MS	F	P-value	F Table
Treatment	1.6	4	0.4	1	0.4856	5.19216
Error	2	5	0.4			
Total	3.6	9				

Growth is an increase in size within a certain time with the same intervals, for example, one week, ten days, two weeks, and one month (Fujaya, 2004). Fish growth may occur if the number of feed nutrients digested and absorbed by the fish is greater than the amount needed for body maintenance.

According to Putra *et al.* (2018), honey contains diastase, invertase, glucose oxidase, peroxidases, and protease enzymes. These enzymes would help hydrolyze feed nutrients (complex molecules), such as breaking down carbohydrates, proteins, and fats into simpler molecules that will facilitate the process of digestion and absorption in the digestive tract of fish (Putra, 2010).

The growth of white snapper seed biomass with the highest result was shown in treatment E resulting in average biomass of 6.78 gr. A higher dose of the honey bee would increase the number of enzymes and nutrition on it. This condition would bring a positive impact to the total digestion and the intake of nutrients that are absorbed and utilized by the fish body in the metabolic process. Furthermore, high content of nutrition in honey bees such as carbohydrates, lipid, vitamins could promote fish growth and increasing immunity. Carbohydrates as a source of energy for metabolism, include energy for growth, life, and food intake. According to Amel *et al.* (2014), honey incorporation into the diet improves the growth rate in tilapia.

The average weight of biomass obtained after treatment E then followed by treatment D resulted in an average biomass value of 5.46 g treatment C had a mean biomass value of 4.66 g, while treatment B produced a mean biomass value of 4.13 g. The lowest value of

biomass is in treatment A of 1.46 g. The difference in biomass values is due to different doses of honey added to the feed, thus affecting the number of enzymes contained in the feed. In the study of Arifin and Rumondang (2017), honey bee also affects the growth of catfish, where the higher the dose of honey given then the higher the fish growth.

Survival Rate

The survival rate for white snapper seeds was the same in treatment B, C, D, and E with a 100% survival rate, which means that the white snapper seeds did not experience mortality during the maintenance time. These results are analyzed descriptively. The 100% life percentage in treatment B, C, D, and E may be caused by feed added with honey bee contains good complex compounds such as antioxidants which may increase body resistance. This is following the opinion of Afroz *et al.* (2016), which states that honey contains complex compounds (chemical and biochemical) including sugars (carbohydrates), proteins, amino acids, phenols, vitamins, minerals, and antioxidants. Treatment A showed the lowest percentage of seed life, it is 83%. This is due to the absence of protection from stress by honey. Latumahina *et al.* (2011) stated that honey bees can inhibit oxidative stress with their antioxidant content. Honey Bee also can protect fish from *Aeromonas hydrophila* infection by up to 93% (El-Asely *et al.*, 2014). Moreover, the presence of antioxidants could prevent fish from aquatic animal disease and increase their performance (Choobkar *et al.*, 2017).

The results of temperature observations during the study showed a temperature range of 28-30°C. This is still suitable for the growth of white snapper seeds, with a temperature range of 27-29˚C (Wirasakti *et al.*, 2021). In observing pH during the study, it was found that a pH range of 7.0-7.5, the pH value is considered to be supportive for the life of white snapper seeds as stated by Windarto *et al.* (2019). Salinity values of 33-34 ppt are still in the appropriate range. The dissolved oxygen (DO) in water ranges from 5.5 to 7.0 ppm within the appropriate range according to Windarto *et al.* (2019).

The value of water quality in this study generally supports the life of white snapper seeds.

Table 4. Value of water quality.

Parameter	Observed value	Standard value	Reference
Temperature (°C)	28-30	27-29	Wirasakti *et al.* (2021)
Salinity(ppt)	33-34	32-34	Nurmasyitah *et al.* (2018)
DO (ppm)	5,2-7,0	4≤	Windarto *et al.* (2019)
pH	7,0-7,5	7,0-7,8	Windarto *et al.* (2019)

CONCLUSION

Based on the results of the study that has been done, it can be concluded that the addition of honey to the feed with different doses for the growth of white snapper seeds has a very significant effect on the growth of white snapper seeds.

The best growth was obtained in treatment E with a dose of 200 ml/kg of feed with a biomass value of 6.78 gr and the water quality observed during the study was considered good for white snapper seeds since it was following the existing literature, with a temperature range of28-30°C, pH 7.0-8.5, DO

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