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Effect of Addition of Soybean Oil to Feed on Eggs Hatching of Dumbo Catfish (*Clarias gariepinus*)

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Abstract. Many freshwater fish farming activities are carried out to meet the increasing demand for fish consumption. One commodity with high market demand is African catfish (*Clarias gariepinus*). The success of cultivation activities is the maintenance of broodstock is very influential on the eggs production. It is necessary to pay attention to the nutrients in the feed during cultivation. This study aims to determine the effect of adding soybean oil to feed on hatching eggs carried out at the Regional Technical Implementation Unit (UPTD) of Freshwater Aquaculture, Denpasar City. African catfish (*C. gariepinus*) were fed twice a day with feed mixed with soybean oil with three treatments namely 0%, 3% and 5% for five months. The fecundity and hatchability of eggs were calculated using a 10x10cm transect and analyzed using Anova analysis. Water quality observations were carried out once a week and ammonia at the end of each month. The results of this study obtained that fecundity values ranged from 214-546 grains/transect and egg hatchability values ranged from 0-62.62%. The results of observations of water quality showed a value that could still be tolerated by African catfish during the study. These results indicate that adding of 3% soybean oil to the broodstock feed of African catfish helps to increase the quality and quantity of hatching eggs.

Keywords. Aquaculture, Catfish, Fecundity, Feed Additives, Hatching Rate, Tarpaulin Ponds

I. INTRODUCTION

Freshwater fish farming is a cultivation activity that is mostly carried out in Indonesia. It is being cultivated to meet the increasing demand for consumption fish. The freshwater fish commodities that are cultivated also vary. One of them is African catfish which has a high market demand. African catfish is the result of cross-breeding between *Clarias fuscus* catfish from Taiwan and *Clarias mossambicus* from Africa. The results of this cross produce African catfish with superior characteristics, including being able to grow quickly and have a large size in a short time compared to local catfish [1].

African catfish (*Clarias gariepinus*) entered Indonesian territory through trade and began to spread throughout Indonesia to be cultivated. Unit Pelaksana Teknis Daerah (UPTD) Perikanan Budidaya Air Tawar in Denpasar City is a government agency under the auspices of the Department of Fisheries and Food Security of Denpasar City, which provides fresh water fish seeds to be cultivated by aquaculture groups in the Denpasar City area. UPTD Perikanan Budidaya Air Tawar has a land area of 0.70 Ha, and the cultivated freshwater fish commodities include tilapia (*Oreocromis niloticus*), african catfish (*Clarias gariepinus*), koi fish (*Cyprinus* sp.) and komet fish (*Carassius auratus*). Cultivation activities are inseparable from hatcheries which include brood rearing, spawning, hatching to produce seeds [2].

The maintenance of broodstock in aquaculture activities is necessary to produce eggs of the highest quality, hence it is also necessary to maintain good and correct broodstock in order to meet market demand for fish seeds. The maintenance of broodstock is considered good and correct, but the eggs produced do not have good quality or quantity. The quality and quantity of eggs is affected by a lack of nutrition in broodstock feed [3]. Fish feed nutrition is one of the determining factors in the development of fish eggs [4]. Quality fish feed contains protein, vitamin E, vitamin C, minerals and fat according to the needs of fish [5].

Fat is a source of energy in fish feed. Fatty acids which are the composition of fat are used to support the growth

of the larvae when they hatch later. Unsaturated fatty acids are given to fish through their feed because fish are unable to synthesize these fatty acids. Unsaturated fatty acids can be found in soybean oil, olive oil, peanut oil, cottonseed oil and canola [6]. Soybean oil contains unsaturated fats which are able to meet the nutritional quality of eggs, especially African catfish (*Clarias gariepinus*) eggs.

The addition of soybean oil which acts as a supplement is expected to provide good quality and quantity for fish eggs to hatch properly, therefore it is necessary to do research on adding soybean oil to feed for hatching African catfish (*Clarias gariepinus*) eggs at UPTD Perikanan Budidaya Air Tawar, in order to be able to provide information regarding improving the quality of African catfish (*Clarias gariepinus*) eggs in aquaculture activities.

II. METHODS

Time and Place of Research

This research was conducted for 5 months, from March to July 2022. The data were obtained at UPTD Perikanan Budidaya Air Tawar Denpasar City.

Experimental Design

The method used in this study was an experimental method with a randomized block design (RBD). The number of pools used is 9 tarpaulin pools with a diameter of 2 meters. Fecundity sampling uses a random sampling technique with a 10x10 cm transek. The test material used was African Catfish (*Clarias gariepinus*) broodstock. Additional feed in the form of soybean oil which will be mixed in the feed. Feed is given twice a day at 8 a.m and 3 p.m. This study used three treatments, namely treatment A (control), treatment B (3% soybean oil administration) and C treatment (5% soybean oil administration), in which each treatment consisted of five repetitions using the transect method presented in Figure 1.

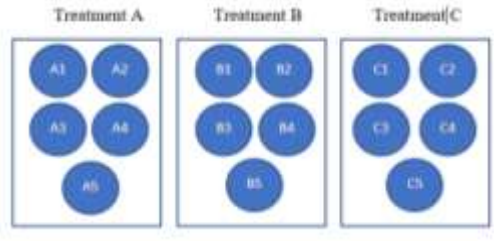

Figure. 1. Research Experiment Design

Data Analysis

Fecundity and hatchability calculation data for African catfish (*Clarias gariepinus*) eggs will be processed using SPSS software version 25 with one way Anova analysis with a 95% confidence interval and further tested by Tukey HSD. Fecundity can be calculated by the formula:

$$\boldsymbol{F} = \left(\frac{\boldsymbol{N}}{\boldsymbol{b}} \times \frac{\mathbf{1}}{Transect\ Area}\right) \times Net\ Area$$

F : Total number of fish eggs
N : Number of eggs in the transect
b : Number of egg samples taken by transect

Calculation of egg hatchability can be calculated using the formula:

$$HR = \frac{a}{b}\ x\ 100\%$$

HR: Hatching rate (%)
a : Number of eggs hatched
b : Number of eggs sampled

III. RESULTS AND DISCUSSION

Fecundity

The result of the fecundity calculation obtained different values for each treatment (Figure 2). The highest value was obtained for treatment C with a value of 188,080 items. Statistical test results stated that each treatment had a significant difference (P <0.05). The number of eggs produced is influenced by the feed given when rearing which contain fat and protein, which is added through the soybean oil content will have a good impact on the quality of the African catfish broodstock as the object of the study. This result is also in accordance with the statement that the number of eggs will increase in accordance to the increase in protein and fat content in the feed which has an effect on the production of fish eggs [7].

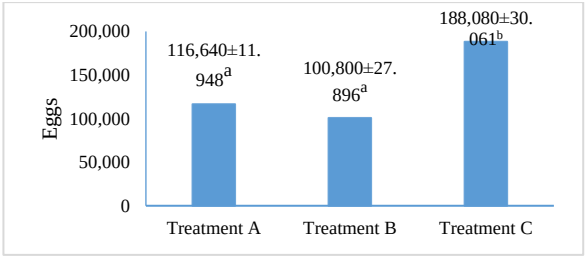

Figure. 2. Fecundity Average Value

Hatchability of Eggs

The results of calculating egg hatchability obtained different values for each treatment (Figure 3), the highest value was obtained for treatment B with a value of 61.20% and the lowest value was obtained for treatment C with a value of 0% or not hatching at all. Statistical test results stated that each treatment had a significant significant difference (P <0.05). The low degree of hatching in treatment C was caused by the high dose of soybean oil, which disrupted the composition of the enzymes in the egg cell membrane. Fatty acids affect the fluidity of the egg

cell membrane, so that high dose of soybean oil makes it difficult for the larvae to hatch from the egg. Phospholipids are one of the building blocks of cell membranes that are influenced by fatty acids, and the changes in the composition of fatty acids in the cell membrane can result in changes in the fluidity of the cell membrane. These changes can disrupt the process of enzymatic metabolism in the cell membrane [8].

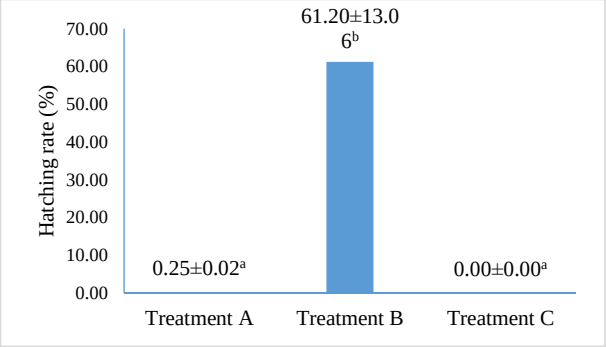

Figure 3. The Average Value of Eggs Hatchability

Water Quality

The temperature during the five months of the study ranged from 25°-29°C and the average value fluctuated each month (Figure 4). Treatment A had the lowest temperature at 26,4°C in July, and the highest temperature reached 28,2°C in May. Treatment B had the lowest temperature at 26,3°C in July, and the highest temperature reached 28,2°C in May. Treatment C had the lowest temperature at 26,1C in July, and the highest temperature reached 28,2°C in May. The highest temperature occurs in May and the lowest temperature occurs in July where this is influenced by the intensity of rain each month and also the intensity of sunlight. Changes in rearing pond temperature due to weather affecting the activities of African catfish (*Clarias gariepinus*) broodstock are still within the tolerance limits. The water temperature can affect fish respiration, behavior, feed efficiency and reproduction of cultivated fish [9]. Catfish are very tolerant of high temperature levels, ranging from 20-35°C [10]. Temperature is an important aspect in the gametogenesis to achieve good results in spawning and egg hatchability [11].

The pH values during the study ranged from 7-8 and tended to decrease from May to July (Figure. 5). Treatment A had the lowest pH value of 7.2 in July, and reached the highest pH value of 7.8 in May. Treatment B had the lowest pH value of 7.3 in March and July, while the highest reached pH value of 7,8 in May. Treatment C had the highest pH value of 7.8 in March, and continued to decrease to pH value of 7.2 in July. The pH value of all treatments during the study was still within the normal range for African catfish (*Clarias gariepinus*) and for activity. The optimal pH for the growth and development of catfish ranges from 7 – 8 [12].

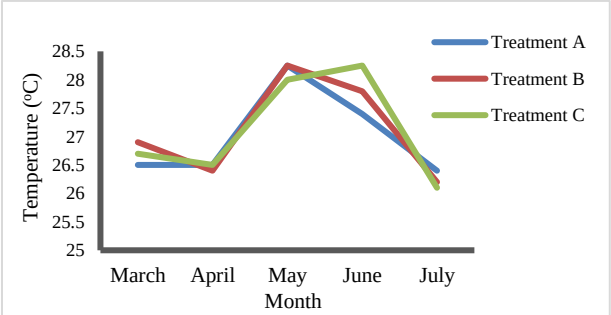

Figure 4. Temperature Measurement Result

The activity of plankton and microalgae in the aquaculture pond also produces O_2 when there is sunlight which causes an increase in the pH value [13]. The decrease in pH during the study occurred when entering the rainy season from June to July. Rainwater that occurs at night causes a decrease in the pH of pond waters. Rainwater has a pH value of 5.6 which usually happen in big cities with high traffic and vehicles usage that produces exhaust gases [14][15].

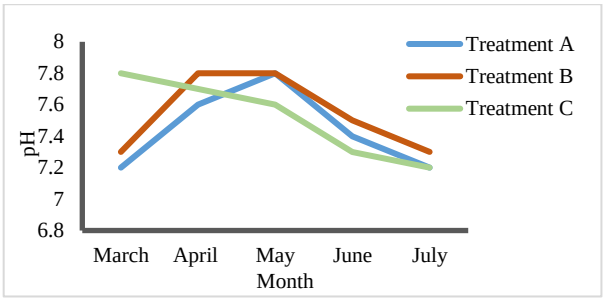

Figure 5. pH Measurement Result

Ammonia measurements were carried out at the end of each month during the study. Treatment A obtained an average value of 0.01 mg/L in March, and remained stable until July. The ammonia measurements in Treatment B obtained an average value of 0.03 mg/L in March, and decreased to a value of 0.01 mg/L until July. Treatment C obtained an average value of 0.06 in March, and decreased to a value of 0,01 mg/L until July. The highest ammonia measurement results were obtained in treatment C with a value of 0.07 mg/L in March and the lowest value in treatment A with a value of 0.01 mg/L and tended to be stable in all treatments after March passed (Figure 6.). This is due to the draining of 50% of the tarpaulin pool water and refilling it with 50% new water. This dewatering is done to remove leftover feed that settles under the tarpaulin pond to reduce toxic levels that can interfere with the development of the African catfish (*Clarias*

gariepinus) broodstock. States that conventional cultivation pond usually has a higher rate of ammonia compared to aquaponic cultivation pond, because of the lack of ammonia management system in the cultivation system [16][17].

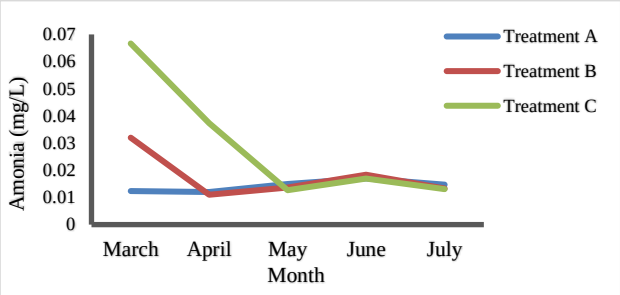

Figure 5. Ammonia Measurement Result

IV. Conclusion

Giving soybean oil to African catfish broodstock gave a significant difference in each treatment. Treatment B with 3% oil has a significant effect on the hatching of African catfish (*Clarias gariepinus*) eggs. It has a significant difference from other treatments and can be applied to aquaculture activities. Giving soybean oil did not affect the water quality of the study medium.

External factors during study in hatching and spawning activities need to be considered. It is necessary to carry out further tests in the form of proximate tests and DO measurements on water quality.

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