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Effectiveness of Automatic Feeder in Catfish Cultivation (*Clarias gariepinus*) with Biofloc System

Alfajri Yuda Permana[1], Ayu Putu Wiweka Krisna Dewi[1], and Gde Raka Angga Kartika[1,2,*]

[1]Department of Aquatic Resources Management, Faculty of Marine Science and Fisheries, Udayana University Bali
[2]Laboratory of Fisheries, Faculty of Marine Science and Fisheries Udayana University, Bali
[*]Corresponding author: raka.angga@unud.ac.id

Abstract. Catfish is a popular fish species in the community and is cultivated by many people. Catfish are considered superior to other freshwater fish. One system that can improve catfish quality and ability is the biofloc system. Biofloc system is considered more effective compared to other systems because it increases the productivity of cultivated fish. Unfortunately, cultivation in general is considered a traditional system that only uses manpower to do all activities such as feeding. One application of feeding technology is automated feeding machines. This research is aimed to determine the effectiveness of the automatic feeder on catfish cultivation with biofloc system. The research method was experimental and compared 2 treatments, which were A (biofloc without an automatic feeder) and B (biofloc with an automatic feeder). Fish samples used were 5-7 cm in size and reared for 44 days at the cultivation pond of Marine and Fisheries Faculty, Udayana University. The results of this research are SGR, FCR, and SR. Based on the results, treatment B had better SGR (3.37%), FCR (2.03) and SR (45%) compared to treatment A. The conclusion of this research is the usage of automatic feeder in catfish cultivation with biofloc system has better results than without the usage of automatic feeder.

Keywords: Automatic Feeder; *Clarias gariepinus*; Fish Autamatic Feeder, FCR; SGR

I. INTRODUCTION

Catfish is a popular fish species in the community and is widely cultivated. According to the Central Database, Statistics, and Information of the Marine and Fisheries Ministry in 2020 the production of catfish cultivation in Indonesia was 993,768 tons. The value of catfish is highly superior in the market compared to other freshwater fishery commodities such as tilapia, carp, and mujair [1]. Catfish are classified as superior to other freshwater fish because catfish are classified as fast-growing fish, tolerant of poor water quality, disease resistant, and capable of living or being cultivated in various types of media and systems [2]. One such system could improve the catfish's quality and ability, called biofloc system.

The biofloc system utilizes living organisms as additional feed for cultivated fish. The biofloc system is more effective than other systems because it can increase the productivity of cultured fish. The advantages of biofloc systems are lower maintenance costs, less land required, higher and faster production, and odouriness [3]. However, cultivation activities generally remain quite traditional and only use manpower for all activities such as hand-feeding [4]. One solution to overcome this issue is by adding automatic feeding technology.

Automatic feeder is an automated feeding device that allows you to control the time of feeding and the amount of feed to be given as desired by the cultivators. The amount of feed is based on calculations according to the requirements of the cultivated organism so that the nutritional needs of the organism are maintained and not excessive [5]. Automated feeding allows farmers to avoid operational costs for labour. The automatic feeder has several advantages such as the even amount of feed given, adjustable feeding time and controllable remotely. The utilization of automatic feeders has given promising results and is highly effective in shrimp cultivation with the lowest FCR value at 1.08 [6]. automatic feeding machine is an affordable, energy-efficient, and environmentally friendly solution for freshwater aquaculture in developing countries while reducing the cost of the fishing industry [7] [8] [9]. However, the automatic feeder also has disadvantages, such as the high price and more electricity usage compared to traditional systems [10]. Feeding technology in catfish cultivation has both advantages and disadvantages. Based on this, this study aims to determine the effectiveness of the use of automatic feeders in catfish cultivation seen from the specific parameters of growth rate, feed conversion ratio and survival.

II. METHOD

Time and Place of Research

This research was conducted for 4 months starting from December 2022 up to March 2023 with a rearing period of 1 month and 14 days. Sampling was carried out every 11 days with the number of fish samples observed being 10 per pond. This research took place in the Cultivation Pond at the Faculty of Marine and Fisheries, Udayana University.

Experimental Design

This research used an experimental method. The experimental method aims to determine the differences in the treatments used. In addition, investigate the possible cause and effect by applying one or more treatments and comparing the results. This research used 2 treatments, which were treatment A (biofloc system without automatic feeders) and treatment B (biofloc system with automatic feeders) with 3 repetitions. The catfish cultivation design with 2 treatments can be seen in Figure 1.

A	B
2	3

A	B
1	2

A	B
3	1

Fig. 1. The catfish cultivation design

Data Analysis

The collected data used in this research are specific growth rate (SGR), feed conversion ratio (FCR) and survival rate (SR). SGR and FCR data will be tested using the Independent T-test method using the SPSS application with a 95% confidence level. The calculation of the SGR value can be calculated using the formula:

$$SGR = \frac{(lnWt - lnWo)}{t} x100\%$$

SGR = specific growth rate (%)
Wt = Average final weight of fish (g)
Wo = Average starting weight of fish (g)
t = Rearing period (day)

The calculation of the FCR value can be calculated using the formula:

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

FCR = *Feed Conversion Ratio* (%)
F = Feed provided (g)
Wt = Catfish final weight (g)
D = Dead fish weight (g)
W = Catfish starting weight (g)

The SR value calculation can be calculated using the formula:

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

SR = Survival Rate (%)
Nt = Number of individuals at the end of the research
No = Number of individuals at the start of the research.

III. RESULTS AND DISCUSSION

Specific Growth Rate (SGR)

The SGR value obtained from both treatments (Figure 2) is significantly different according to the independent T-test results (Table 1) where a higher SGR was obtained in treatment B (3.4%) compared to the SGR obtained in treatment A (2.6%). This is allegedly due to the daily feed requirements of fish in treatment B being more fulfilled than in treatment A which could be seen from the remaining feed in both treatments. The remaining feed in treatment A appeared more than the remaining feed in treatment B so the amount of feed consumed by catfish in treatment A was less than the amount of feed consumed by catfish in treatment B. The growth is affected by the amount of feed available for the fish cultivated [11]. The use of automatic feeders allows feeding at regular intervals throughout the day so that feeding becomes efficient in increasing the growth rate of fish [12] [13]. Similarly, other studies have shown that feed consumption and growth generally increase with feeding frequency up to a certain limit [14] [15] [16].

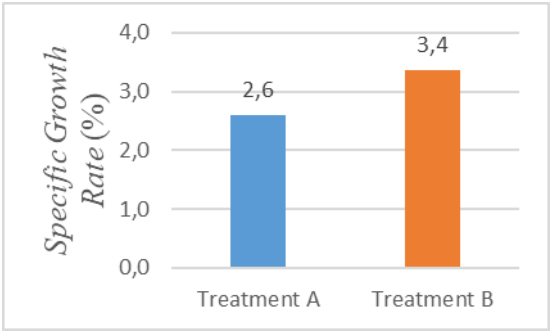

Fig. 2. Average Value of Specific Growth Rate (%)

TABLE 1
INDEPENDENT T-TEST DATA OF SPECIFIC GROWTH RATE AND FEED CONVERSION RATIO

Comparison Type	Variable	Criteria	Results	Description
Comparison of Significance	SGR	Significance	0,008	Sig < α
		Confidence level (α)	0,05	
	FCR	Significance	0,004	Sig < α
		Confidence level (α)	0,05	

Feed Conversion Ratio (FCR)

The FCR values in both treatments were significantly different according to the T-test results where the FCR in treatment B was lower than the FCR in treatment A. The FCR value in treatment A was 2.56 while the FCR value in treatment B was 2.03 (Figure 3). The difference in FCR results is allegedly due to different feeding intensities. The higher the feeding intensity, the lower the FCR values obtained. The results of this research are also in line with research [17] which showed that the FCR in the 5 times feeding treatment was lower than the 3 times feeding treatment. However, the FCR values in this research are considered high because normally the maximum FCR value is at 1.6 [18]. This is probably due to poor SR values in this research.

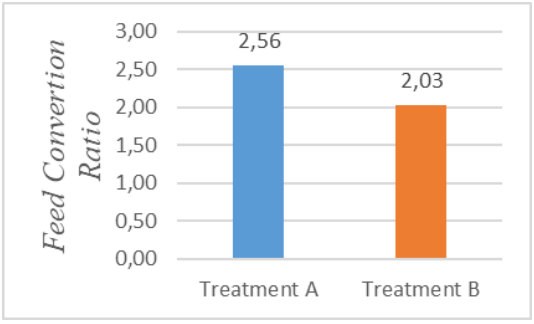

Fig. 3. Average Value of Feed Conversion Ratio

Survival Rate (SR)

The catfish survival rate (SR) obtained from treatment A and treatment B ranged at 37. 66% to 46. 10% (Figure 4). The SR value of this study was relatively poor. This is probably because the catfish suffered stressful conditions during the research due to decreased conditions of water quality in the rearing medium. The decreased conditions of water quality during this research were caused by the buildup of feed residues. However, the degradation was not seen in the monitored parameters which are temperature, pH and DO. The degradation was suspected to occur in another parameter, which was ammonia, considered to be toxic to the water. The rising level of ammoniac may cause a loss of appetite in fish and even fish death [19].

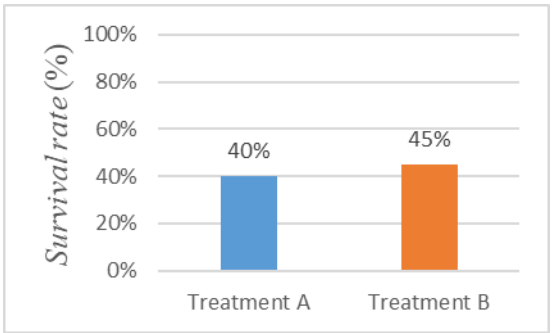

Fig. 4. Average Value of Survival Rate (%)

Water Quality Parameters

The values of water quality in treatment A and treatment B were similar. According to the results of this research, the pH values in treatment A and treatment B ranged from 6.6-7. This pH value is considered a normal value because it is still within the water quality standards [20] which is in the range of 6-9. This result is similar to [21] which was 6.24-6.47 where the ideal pH is in the range of 6-9 in fish cultivation. The DO value obtained from both treatments ranged from 6.4-12.3 mg/L. Similar to the results of research by [22] where the optimal DO level for cultivated fish is 5 mg/L. This is because fish will suffer stress and unusual behaviour due to the decrease of oxygen supply into the brain if the DO level is less than 5 mg/L. While the water temperature parameters in both treatments ranged from 27-29.7oC. The water temperature obtained from the research was ideal for cultivated fish. The ideal temperature value for cultivated fish ranges from 25-30 oC [23]. Water quality values with pH, DO, and temperature parameters in both treatments can be seen in Table 2.

IV. CONCLUSIONS

This research concludes that using automatic feeders in catfish cultivation produces a higher specific growth rate, feed conversion ratio and survival rate than catfish cultivated without the addition of automatic feed. It is recommended that catfish cultivators should use automatic feeders to get better SGR, FCR and SR results. To get the maximum SGR, FCR and SR results, it is recommended to do further research by adding water quality parameters, such as ammonia.

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