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Application of biofloc technology on growth performance and survival rate of Giant Gourami (*Osphronemus goramy*) with different stocking densities

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ABSTRACT

Giant gourami is a freshwater fish that has high economic value. This study is aimed to determine the effect of biofloc treatment at different densities on growth and survival rate of giant gourami. This was an experimental study with a completely randomized design, consisting of four treatments and three replications. The treatments given in this study included:K1 (stocking density of 100 fish without biofloc), P1 (stocking density of 100 individuals with biofloc C/N ratio 12), K2 (stocking density of 150 fish without biofloc, and P2 (stocking density of 150 fish with biofloc C/N ratio 12). The parameters observed were specific growth rate, average daily gain, biomass, and survival rate. The data were analyzed using variance analysis (ANOVA) and Duncan's Multiple Distance Test. The results showed that biofloc treatment with different densities significantly affected the specific growth rate, average daily gain, and biomass but not had significant effect on the survival rate.

Key words: *Biomass, Giant gourami, Spesific growth rate, Survival rate.*

Introduction

Intensive cultivation is an activity of raising fish with high density per unit area. This type of cultivation requires support from production inputs such as seeds and high protein feed. Intensive cultivation requires good management including water quality management that supports optimal growth (Ekasari *et al.,* 2013). In an intensive system, to stimulate the growth of cultured fish, feed with high nutritional value must be supplied in large quantities according to the total biomass of fish being cultured (Crab *et al.,* 2007; Ombong *et al.,* 2016). However, an increase in the amount of high protein feed in intensive cultivation causes a problem, namely a decrease in water quality (De Schryver *et al.,* 2008). This is because only about 20-30% of the feed is absorbed by the fish's body and the residual will be wasted into the water (Rosmawati and Muarif, 2017). Therefore, it is necessary to have a method or material to improve the quality of the aquatic environment, one of which is through the application of biofloc technology (De Schryver *et al.,* 2008). Biofloc technology is one of the technologies currently being developed in aquaculture which aims to improve water quality and increase the efficiency of nutrient utilization (Ekasari, 2009). This technology is used to degrade organic waste by microorganisms and produce microbial clumps (floc microbial) to produce culture media conditions that support fish production (Najdegerami *et al.,* 2016; Muarif, 2018).

Giant gourami is one of the most popular fish because it has several advantages, such as high protein content, low cholesterol and easy to digest. Giant gourami production is still relatively low compared to other freshwater fish (Retno *et al.,* 2019). The obstacle of giant gourami aquaculture production is its slow growth. The slow growth is due to the cultivation system which is still traditional and the feed given still has low nutrition and digestibility. However, improving nutrition in feed will present new problems, such as an increase in production costs and the presence of feed waste. In addition, giant gourami are also prone to stress, so that the water quality factor in aquaculture activities must be considered so that the conditions are optimal and do not cause disturbance to the fish (Muarif, 2018).

At present, research on biofloc technology for gourami cultivation has been carried out by Muarif (2018) with the topic of the biofloc system at 3 different C/N ratio treatments. In addition, Retno *et al.* (2019) also conducted biofloc research on gourami using different feed protein treatments on media without biofloc and media with biofloc. Until now, there has been no research on the biofloc system in gourami cultivation with different densities. The purpose of this study was to determine the effect of biofloc treatment at different densities on growth and survival rate of giant gourami**.**

Methodology

This research was conducted in August-October 2020 and was carried out in experimental pond located at Genteng, Banyuwangi, Jawa timur Indonesia The giant gouramiwith an average body length 4-6 cm was used for this treatment. The research design used a completely randomized design consisting of four treatments and three replications. The treatments given in this study included:

K1: Stocking density of 100 fish without biofloc

P1: Stocking density of 100 fish with biofloc C / N ratio 12

K2: Stocking density of 150 fish without biofloc

P2: Stocking density of 150 fish with biofloc C / N ratio 12

Twelve units of outdoor tarpaulin pond were used in this study. The pond was filled with water as much as 50% from a water level of 60 cm, then given salt at a dose of 1 kg/m^3 and given molasses with bacterial floc, aerated, and allowed to stand for four days which aims to grow floc-forming bacteria. The addition of molasses to the culture medium was carried out by adapting the calculations of De Schryver *et al.* (2008). The basis for the use of the C/N 12 ratio comes from Rosmawati and Muarif (2017) which results in high growth rates and feed efficiency for gourami. After four days, the water was filled to a height of 60 cm. Henceforth, molasses is added once a week. The experiment period of fish was carried out for 42 days. Fish are fed 2 times a day with a feeding rate of 5 % of fish biomass, in the morning and evening. A sample of 30 fish was taken to measure the fish body weight.

Specific growth rates were calculated according to the formula (Huisman, 1987):

$$SGR\ (\%) = [\sqrt[t]{Wt/Wo\text{-}1}] \times 100$$

SGR = specific growth rate (% day^{-1}), Wt = final average fish body weight (g), Wo = initial average fish body weight (g), t = experimental period (day).

Average daily gain were calculated according to the formula (Bahnasawy *et al.,* 2003):

$$ADG = \text{weight gain}/t$$

ADG= Average Daily Gain (g/day), t = experimental period (day).

Survival rate were calculated according to the formula (Huisman, 1987):

$$SR\ (\%) = [N_t/N_o] \times 100$$

SR= survival rate, N_t = final number of fish, N_0= initial number of fish

The data were analyzed using Variant Analysis (ANOVA) and Duncan's distance test with a confidence level of 0.05.

Results and Discussion

Specific Growth Rate

The results showed that P2 treatment (biofloc with a density of 150 individuals / treatment) obtained the highest specific growth rate value of 2.97%. The biofloc treatment had a higher specific growth rate than the control treatment. In general, biofloc treatment with different densities significantly affected the specific growth rate ($p < 0.05$). The results showed that K1, K2, and P1 did not show significant differences, but P2 was significantly different from K1, K2, and P1, while P1 and P2 did not show significant differences.

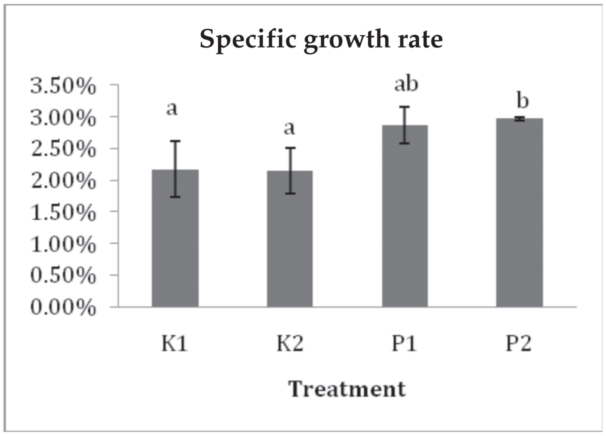

Fig. 1. Spesific growth rate of giant gourami in each treatment

Average Daily Gain

The results showed that the best average daily gain was found in treatment P1 with a value of 0.038 g/day. The value of average daily gain of gourami in biofloc media with different densities showed a significant difference between treatments ($p < 0.05$). There was a significant difference between the biofloc treatment and without biofloc, where P1 was significantly different from K1, and P2 was also significantly different from K2. However, for K1 and K2 were not significantly different, P1 and P2 also did not show significant differences.

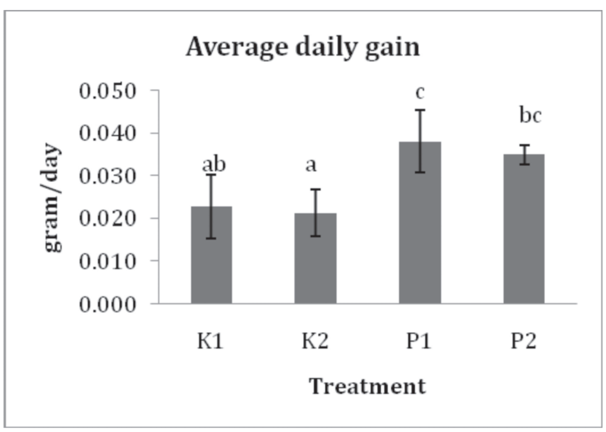

Fig. 2. Average daily gain of giant gourami in each treatment

Final Biomass

Fish biomass with biofloc treatment had a higher value than the control or without biofloc. Fish biomass P1 was greater than K1 and P2 was greater than K2. The value of gouramy seed biomass reared in biofloc media with different densities showed a significant difference between treatments ($p < 0.05$). The real difference was in the K1 and P2 treatment. However, for K1, K2, and P1 did not show a significant difference. The treatments of K2, P1, and P2 also did not show any significant differences.

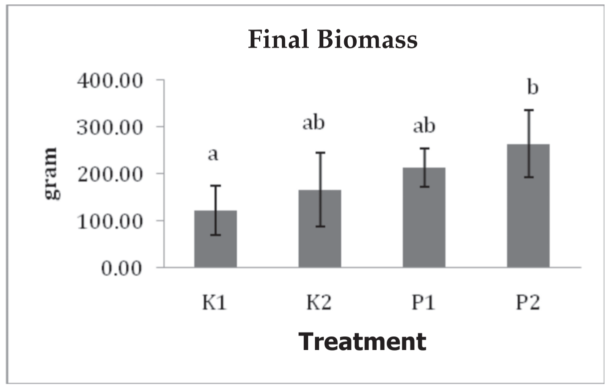

Fig. 3. Final biomass of giant gourami in each treatment

Survival Rate

Based on these results, the treatment with the best survival rate was P1with a value of 92.33%. This shows that the use of biofloc media has an effect on increasing the survival rate. However, based on the ANOVA test, it showed that the SR value of gourami in biofloc media with different densities and their controls did not show significant differences between treatments ($p > 0.05$).

Discussion

In general, growth of giant gourami with biofloc media produced higher growth than the control including specific growth rate, average daily gain, and biomass. For the specific growth rate, P2 is higher than P1, although not much different. The use of biofloc media was proven to have an effect on the SGR value. This is because giant gourami will eat the bacterial floc contained in the media so that it has a higher SGR value when compared to the control treatment. Hermawan *et al.* (2014) added that

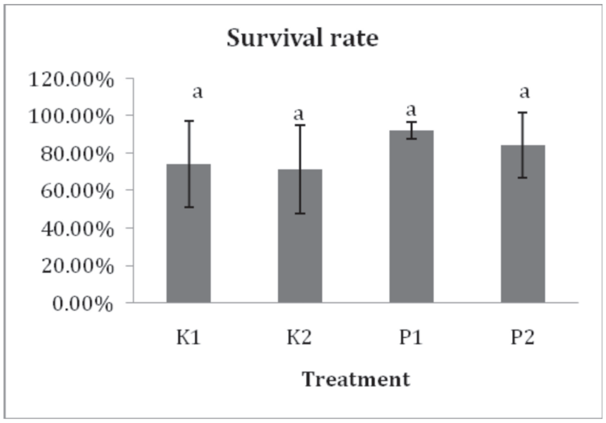

Fig. 4. Survival rate of giant gourami in each treatment

biofloc technology can increase growth and feed efficiency. This technology can provide additional protein feed in the form of bacterial flocks. For average daily gain value, P1 treatment was higher than P2. It is indicated that density affects the average daily gain of giant gourami. This is consistent with the statement of Sarah *et al.* (2009), that the value of individual growth is influenced by the increase in density during maintenance.

The highest survival rate obtained in this study was P2 92.33%, then P1 84.33%, K1 74.33%, and K2 71.33%. This value is still classified as normal when compared to other studies. Verawati *et al.* (2015), in his research regarding the different stocking densities of giant gourami in the recirculation system, the SR values ranged from 71.76% - 83.33%. Fish mortality that occurred during the study was thought to be due to water quality not optimal and the presence of sick fish. There is some condition of water temperature of the pond below the standard. It can decrease the fish's appetite, so that the fish become sick and reduce the survival rate.

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