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Effect of differences in stocking density in round tarpaulin ponds on growth and survival of *Osphronemus goramy*

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ABSTRACT

One way to increase cultivation productivity is by increasing stocking. Gourami (*Osphronemus goramy*) is a freshwater commodity that has a fairly slow growth performance. This study aims to determine the growth performance of Gourami reared at different stocking densities. The 3 cm gourami are reared in a pond containing 35 L of water. ponds P1 of 30 ind, P2 of 50 ind, P3 of 100 ind, P4 of 150 ind, P5 of 200 ind each was repeated 3 times. Growth rate (GR), specific growth rate (SGR), survival rate (SR), and feed conversion ratio (FCR) were measured and analyzed for variance (ANOVA) followed by LSD. The results showed that the fish reared in pond P1 showed the best GR, SGR, FCR, and SR (3.8 g, 3.99 %, 96 %, and 1.11 respectively). The lower the density, the better the growth performance but based on efficiency and productivity the best is at P2.

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1. Introduction

The need of food consumption progressively increases as the demand for foodstuffs such as fish. Fish consumption is growing from year to year led to reducing the supply of fish in the market. Giant gourami (*Osphronemus goramy*) is a freshwater fish commodities that favored the people of Indonesia. Giant gourami is widely cultivated in areas like East Java Blitar city and surrounding areas that make this area one of the biggest fish in Java, so it has the potential to be developed into a center for the cultivation of fish in Indonesia. The demands of this fish encourage the farmers to increase their productivity and apply an intensive cultivation system as an effort to fulfill the requirement for fish on the market in high quantities.

O. goramy is a native freshwater fish species in Indonesia that is found in some parts of Sumatra and Kalimantan. *O. goramy* is considered to be safer for health because of lower cholesterol levels than meat animals. Besides, it has several other advantages, such as the size of a large individual and in nature can reach 120 cm (Susanto, 1991). A large number of high protein feed in intensive aquaculture cause water quality in aquaculture waters decrease. Problems in the cultivation of *O. goramy* occurs during fish hatchery and nursery. Meanwhile, the Giant gourami seed maintenance carried out so far is still traditionally, so that fish production is still small. These fish are excellent because it is readily accepted by the market regardless of the size. *O. goramy* also has a broad market, especially among market, altough the consumption of *O. goramy* size is always in demand among restaurants, hotels, and restaurants. In addition to expensive price, these fish adjuct in wildlife much higher than other fish. An increase in *O. goramy* mass production, both in quantity and quality, will make a breakthrough to cultivate these fish in high density. The use of the pond tarp is believed that maximized *O. goramy* production.

2. Material and methods

This research was carried out for three months in 2017 in the laboratory of the Department of Fisheries, Faculty of Agriculture, Livestock, University of Malang. The equipment used a tarpaulin pond 1 m diameter round, aerators, hose aeration, aeration stone, aerated faucets, thermometer, oxygen meters, universal indicator, API freshwater master kit for freshwater, drain, bucket, hose, waring, analytical balance.

O. gouramy with 3 cm in size was obtained from a group of farmers in Blitar. The method used experimental and a completely randomized design (CRD) four treatments with three times replication. Treatments were consisted of P1 of 50 ind, P2 of 100 ind, P3 of 150 ind, P4 (200 ind), K0 Controls (30 ind). The feed was given as much as 3 % of the fish biomass. Feeding on Giant gourami maintenance is given three times daily at 08.00 am 12.00 pm and 4.00 pm. Each week the pond was siphoned, and the addition of water as the water coming out at the time was siphoned.

The parameters observed in this study, there were two parameters. The main parameters was observed growth rate, specific growth rate, feed conversion ratio, and the survival rate. While supporting parameters were water quality. Data was obtained from observations of the study analyzed using analysis of variance (F test) at 5 % and 1 %, followed by an examination of Least Significant Difference (LSD test) at 5 % and 1 %.

3. Results and Discussion

Tarpaulin pond round mounted on a space provided and assigned numbers for marking the treatment ponds. The pond that had been installed next to the water content of up to 80 cm and then deposited for 24 h. This meant that the deposition of water dissolved oxygen in water could increase, and harmful substances in the water can be minimized. According to Saparinto (2014), the groundwater usually has the nutrients and low oxygen content and the amount of calcium, iron, and carbon monoxide relatively high. Using aeration in container maintenance and groundwater at least 12 h raised the levels of dissolved oxygen.

Extra salt was added to remove germs in treated-water. The fundamental to grow heterotrophic bacteria according to McIntosh (2001), namely: (1) stocking density, (2) the number of sufficient aeration to maintain the mixing water, and (3) the input of organic matter to be used as a source of food by fish and bacteria. The heterotrophic bacteria was let growing in water media for over ten days. The water media ready to use was characterized by a brownish color, indicating the dominance of bacteria. This was reinforced statement Taw (2014) that the water medium could be identified biofloc green if the flock was dominated by algae, while if the flock came to be dominated by bacteria, the color will change to brown. High density of flock and suspended-solids lead to a water medium to be dark brown. Basically, the heterotrophic bacteria are also used in the manufacture of an biofloc media, only the addition of enough carbon to enrich the bacteria. Purnomo (2012) states that the addition of carbohydrates increase the abundance of bacteria in the cultivation media and the effect on production.

3.1 Absolute growth

The study showed that the highest growth rate of *O. goramy* was P1 of 4.30 g followed by treatment P2 of 3.80 g, P3 of 2.23 g and the last treatment, P4 of 1.73 g (Figure 1).

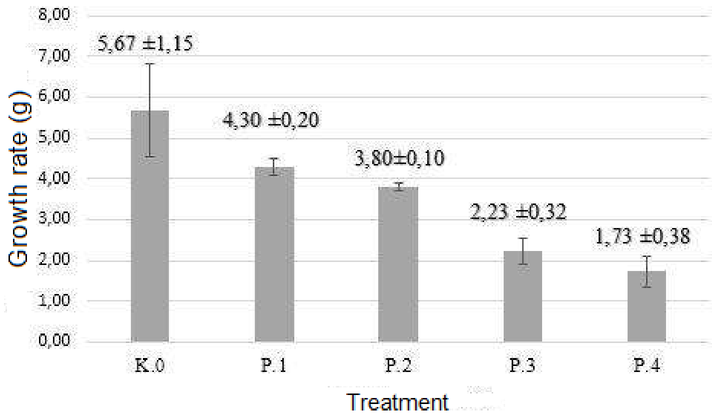

Figure 1. The growth of *O. Gouramy*

The growth of *O. goramy* during the study showed F value (60.9) was greater than F table, it can be concluded that in every treatment showed a difference to the growth of *O. goramy*.

Table 1. List of significant difference of *O. gouramy* growth rate

Treatment	P4 (1.73)	P3 (2.23)	P2 (3.80)	P1 (4.30)	Notation
P4 (1.73)	-	-	-	-	b
P3 (2.23)	0.50^{ns}	-	-	-	b
P2 (3.80)	2.07**	1.57**	-	-	a
P1 (4.30)	2.57**	2.07**	0.5^{ns}	-	a

** = were significantly different
ns = not significantly different

Significant Difference Test (LSD) (Table 1) showed results that the growth of *O. goramy* in P1 (4.3) was not significantly different from P2 (3,8). However, the highly significant with the P3 (2.23) and P4 (1.73). In the P2 (3.8) revealed highly significant with the P3 (2.23) and P4 (1.73). Meanwhile, in the P3 (2.23) and P4 (1.73) was found not significantly different. The growth was directly proportional to the survival and feed conversion ratio. Wherein the low of stocking density led to increase growth, survival rate and decrease feed conversion ratio.

According to Abidin (2009), the stocking density had a significant effect on the rate of growth and feeding efficiency. The stress arising from the higher stocking density increases energy maintenance that reduce the energy for growth. Research from Shafrudin et al. (2006) on the effect of density on the African catfish fish seed production cultivation system with nitrogen control through the addition of wheat flour also showed significantly different results to the stocking density and growth rate of catfish. It showed that during the maintenance. Not unlike the catfish, *O. goramy* on the research showed that in P1 and P2 treatment did not differ significantly and treatment P3 and P4 not significantly different to the same reason as the channel catfish.

This study applied the system with minimal change of water that intended pests and diseases could be controlled. According New (1995) in a closed aquaculture system that virtually no or little do water changes, water quality, feed and disease prevention can be well controlled, so that the fish can be reared in high densities, grow rapidly and uniformly. According to SNI (2000) The protein requirement for *O. goramy* size of 4 cm to 6 cm is 32 %. The existence of the protein as a nutrient in fish has a dual role as an energy source to grow and be used simultaneously. Utilization of proteins takes place almost simultaneously to both metabolic processes is inflicting damage on the efforts to optimize the growth of the fish, as a consequence of an optimal utilization of the protein as a growth agent for most of the protein used as an energy source. For example in this case, the environmental conditions such as poor water quality has more effect on fish than the environmental adaptation is metabolized to gain the fish.

3.2 Specific Growth Rate

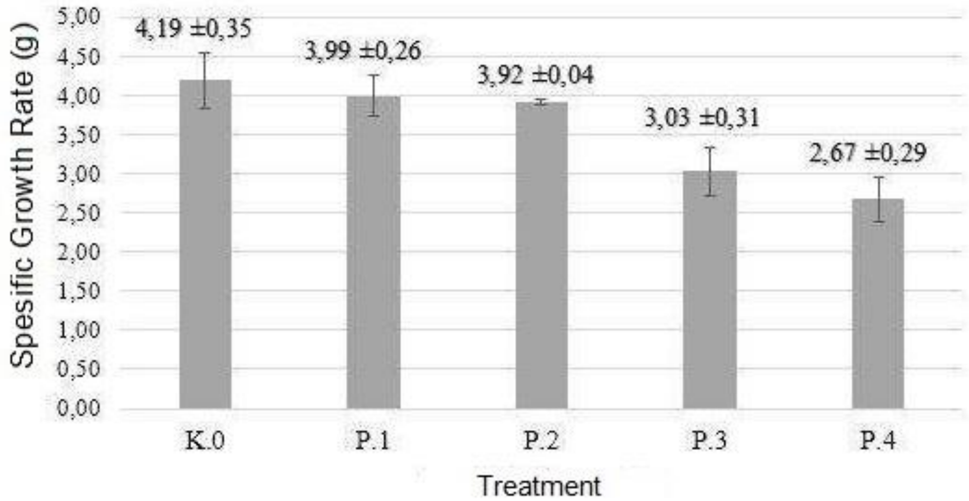

Figure 2. Specific growth rate of *O. gouramy* during treatment

Figure 2 proved that the highest of SGR was P1 with 3.99 % followed by P2 with 3.92 % and the last was P4 with 2.67 %. the SGR of *O. goramy* during the study showed F count larger than F table that it can be concluded ANOVA showing significantly different. To determine differences in each treatment was analyzed by Least Significant Difference Test (LSD).

Table 2. List of significant difference of *O. gouramy* spesific growth rate

Treatment	P4 (2.67)	P3 (3.03)	P2 (3.92)	P1 (3.99)	Notation
P4 (2.67)	-	-	-	-	b
P3 (3.03)	0.36^{ns}	-	-	-	b
P2 (3.92)	1.25**	0.89**	-	-	a
P1 (3.99)	1.32**	0.86**	0.08^{ns}	-	a

** = Were significantly different
ns = not significantly different

Table 2 can be deduced that the calculation of the SGR on P1 (3.99) was not significantly different with P2 (3.92). However, it was significantly different with P3 (3.03) and P4 (2.67). In the treatment P2 (3.92) showed significantly different to P3 (3.03) and P4 (2.67). Meanwhile, in the treatment P3 (3.03) and P4 (2.67) were not significantly different. In the treatment was not significantly different because *O. goramy* getting proper nutrition, good environmental adaptability. This was because *O. goramy* could be fulfilled properly so that *O. goramy* could grow well. According to Shafrudin et al. (2006) the control of organic waste can improve the survival rate, stocking densities and growth rates.

The data showed that SGR decreased in higher density. This is in accordance with the opinion Abidin (2009) that the stocking density had a significant effect on the rate of growth and feeding efficiency. Stress arising from the higher stocking density increases energy maintenance used for growth. This cultivation way can minimize the change of water and control water quality. According New (1995) in aquaculture systems, the minimal or no change of water, quality of water, food and disease prevention can be controlled. Growth could also be influenced by feeding with protein. The present study used commercial feed with a protein content of 39 % to 41 %. Murtidjo (2001) explained that the need for fish protein is affected by the level of feeding and energy content, whereas the amount of feeding is influenced by the capacity of the digestive tract of fish. If the level of protein energy exceeds the needs will decrease so that the consumption of other nutrients including protein-making will decrease. Therefore we need the right balance between energy and protein in order to achieve efficiency and effectiveness of feed utilization.

3.3 Survival rate

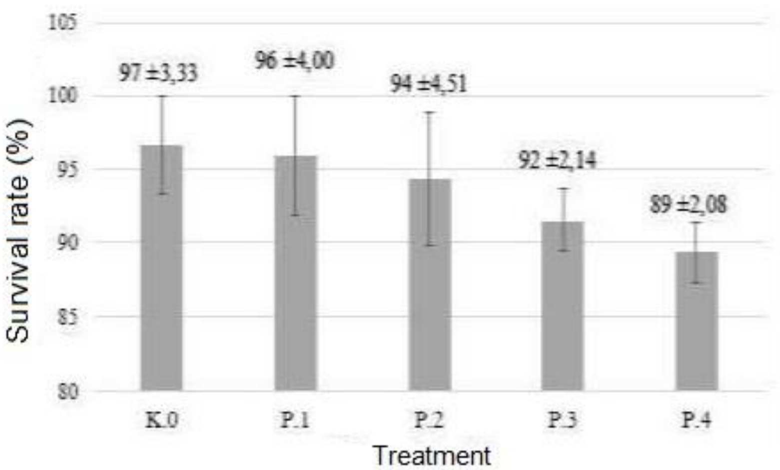

Figure 3. The survival rate of *O. Gouramy*

Figure 3. The survival rate of *O. Gouramy* can be concluded that the survival of *O. goramy* on the research showed the highest SR was P1 with 96 % followed by P2 with 94 % and last was P4 with 89 %. The survival rate in this study was quite high, this is because the water quality on any media is maintained. According to Maryam (2010), the survival rate is one of the parameters that indicates the success of a farming influenced by various factors, one of which is water quality. It is presumed that the water quality of the media in optimal conditions and maintenance of water shipon can dispose of leftover feed and fish feces. Swimming sheeting also has the advantage to perform a high stocking density on condition regularly. This is supported by Wagiran and Harianto (2010) that the excess tarpaulin pond increased the production of fish with high stocking density. Water quality is also greatly affect the value of the fish survive which affect the productivity of farming.

According to Mijani (2017), the water quality can be tested on the water using chemistry, physics, and biology.

3.4 Feed Conversion

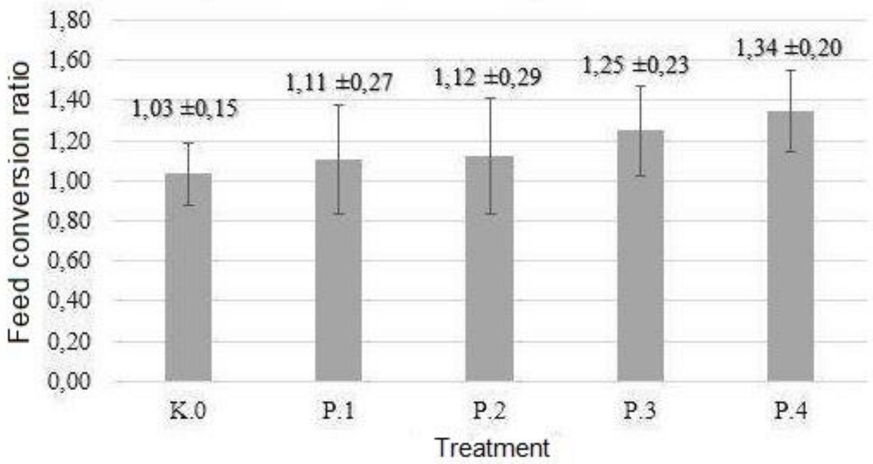

Figure 4. Feed Conversion Ratio (FCR) of *O. gouramy* during treatment

Based on Figure 4, FCR of P1 with 1.11 followed by P2 with 1.12 and the last was P4 with 1.34. The results of data analysis in Table 6 showed no significantly different among treatments (P < 0.05). According to Arifin et al. (2019), the lowest FCR in *O. goramy* was 1.53. Treatment P1 had the lowest FCR due to the stocking density was low. The fish can be more freely and not much competition food from another individual. Supported by Unisa (2000), the low density of fish are able to utilize the feed more efficiently than the higher density.

The FCR represent the level of efficiency of feed given to the fish. The smaller the value of FCR, the better the efficiency of feed given to the fish. Handajani (2006) explained that the size of the feed conversion ratio is influenced by several factors but the most important is the quality and quantity of feed, species, size and quality of the water. The FCR determines the effectiveness of the feed. Feed utilization is the amount of feed given each day that can be utilized fish to support the process of metabolism and growth. It represents how efficiently feed used by the fish. The sampling was conducted once a week as much as 10 % of the total number of fish. Fish sampling was conducted to determine the growth and needs of fish feed. According to Sudjana (1996) Withdrawal of samples are needed because it is impossible to do observations of the overall population.

4. Conclusion.

Based on the data, the differences in the density of *O. goramy* in round tarp affected growth but not survival

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