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PENGARUH SISTEM AERASI YANG BERBEDA TERHADAP PEFORMA PERTUMBUHAN IKAN LELE (*Clarias* sp.)

The Influence Of Different Aeration Systems On Growth Performance Catfish (Clarias sp.)

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ABSTRAK

Ikan lele merupakan ikan konsumsi air tawar yang paling banyak dibudidaya di Indonesia menempati urutan teratas pada jumlah produksinya, ikan lele telah menyumbang lebih dari 10% produksi perikanan budidaya nasional dengan tingkat pertumbuhan mencampai 17 hingga 18%. Ikan lele memiliki kandungan protein yang cukup tinggi dan sangat berkompeten untuk meningkatkan gizi manusia, karenatergolong makanan yang berkualitas tinggi dan keunikannya merupakan suatu keharusan. Karena marak dibudidaya dengan kepadatan tinggi maka diperlukan teknologi yang mendukung terjaganya kandungan oksigen yaitu *microbubble.* Penelitian ini dilakukan selama 50 hari dengan melihat pertumbuhan ikan lele dalam 3 kondisi yang berbeda yaitu tanpa aerator, dengan aerator konvensional dan *microbubble.* Hasil penelitian menunjukan bahwa berat mutlak dan panjang mutlak tanpa aerasi adalah 5,2 g dan 3,5 cm. kemudian dengan aerator konvensional menghasilkan 5,3 g dan 3,5 cm. dan pada *Microbubble* adalah 9,2 g dan 7,2 cm. dilihat dari beberapa hasil uji parameter menunjukan bahwa pemeliharan ikan lele dengan menggunakan *microbubble* meningkatkan laju pertumbuhan dan produktivitas dari ikan lele.

ABSTRACT

Catfish is the most widely cultivated freshwater consumption fish in Indonesia, ranking at the top in terms of production. Catfish has contributed more than 10% of national aquaculture production with a growth rate of 17 to 18%. Catfish has a fairly high protein content and is very competent to improve human nutrition, because it is classified as a high quality food and its uniqueness is a must. Because it is widely cultivated at high density, technology is needed that supports maintaining oxygen content, namely microbubbles. This research was carried out for 50 days by looking at the growth of catfish in 3 different conditions, namely without an aerator, with a conventional aerator and microbubble. The research results show that the absolute weight and absolute length without aeration are 5.2 g and 3.5 cm. then with a conventional aerator it produces 5.3 g and 3.5 cm. and in Microbubble it is 9.2 g and 7.2 cm. Seen from several parameter test results, it shows that rearing catfish using microbubbles increases the growth rate and productivity of catfish.

Kata Kunci	*Ikan Lele*, *Pertumbuhan*, *Aerasi*
Keywords	*Catfish, Growth, Aeration*
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INTRODUCTION

The Ministry of Maritime Affairs and Fisheries (KKP) is targeting aquaculture production to reach 22.46 million tons in 2017. Meanwhile, according to the statistical and information data center of the Ministry of Maritime Affairs and Fisheries in 2018, catfish production reached 1,125,526 tons in 2017 in terms of developments in fish production. catfish during the year (2013-2017) showed very significant results, namely 72.47% with an increase the average every year is 37.49% (Maria, 2020). Catfish is a type of fish that is very popular and is also very easy to get and has an affordable price. Catfish has a fairly high protein content, catfish is an animal food which is a very competent food for improving human nutrition.

Amino acids, heme iron or substances obtained from animal hemoglobin which are easily absorbed with good protein digestibility, which meet the needs of the human body and also contain minerals and vitamins that the body needs. Fish cultivation can also be carried out in various types of areas, development and growth are easy to monitor and catfish can also be harvested more quickly which can be an effective alternative business opportunity and can improve the quality of life of the community (Adi, 2000 in Plantaxia, 2017). Microbubble is an aertor that releases air in the form of micro-sized bubbles, which is used as water control in fish farming businesses. Using this tool can make it easier to estimate according to the desired target, by fulfilling the basic requirements. The main principle of this microbubble technology is to utilize more effective aeration technology, as well as increase business efficiency through the use of microbubble oxygen generators and is one of the efforts to make the cultivation system environmentally friendly (Zidni et al. 2013).

The application of bubble generator technology, namely the microbubble generator, can supply oxygen for fish farming activities efficiently and can also increase dissolved oxygen levels. The buoyancy of microbubbles increases to the surface, indicating that their diameter decreases (Minagawa, 2005). Research on the application of microbubbles was carried out by Iswanto (2019), the treatments used were different stocking densities in a 60 liter container volume, namely 15 individuals, 30 individuals, and 45 individuals. The results obtained were quite significant, successful in increasing the growth rate and increasing stocking density. The importance of carrying out this research is to see the role of microbubbles in optimizing the growth of catfish.

METHODS

Place and Time

This research was carried out for 50 days from August-September at the Aquaculture Laboratory, Faculty of Agriculture, Mataram University.

Tools and Materials

The research tools used are as follows:

No	Tool Name	Function
1.	Container box	As a container for cultivating catfish.
2.	Thermometer	As a water temperature meter
3.	DO meters	As a measure of oxygen levels in water
4.	pH meter	As a water pH meter
5.	Aerator	Add oxygen to the cultivation container
6.	Refractometer	As a measure of water quality
7.	Microbubble	As an oxygen bubble enhancer
8.	Spectrophotometry	As a tool for measuring water quality
9.	Water Pump	As a water distributor
10.	Pipe Electric Hose	As a microbubble water pump
11.	Net	As a catfish waste siphon
12.	T Pipe	As a water distributor

The research materials used

No	Material name	Function
1.	Catfish	As research biota
2.	Commercial Feed	As catfish food
3.	Pipe glue	As a material for gluing pipes
4.	Freshwater	As a maintenance medium
5.	Aerator	Add oxygen to the cultivation container
6.	Pipe	As a measure of water quality.
7.	Spectrophotometry Microbubble	As an oxygen bubble ehancer
8.	Refractometer	As a tool for measuring water quality
9.	Water Pump	As a water distributor

Research Methods

This research method is to use a randomized block design and test the ability of a microbubble aerator compared to using a conventional aerator system in determining water quality status, catfish NVC, condition factor (K), and performance of catfish with a recirculation system. With three treatment replications, namely: Treatment A: Catfish rearing without aeration Treatment B: Catfish rearing using conventional aerators Treatment C: Catfish rearing using Microbubble Variables measured during the research included survival tests, specific growth rate, feed conversion ratio (FCR), quality water which includes temperature, pH, dissolved oxygen (OT), nitrite (NO2-), ammonia (NH3).

Preparation of containers is carried out by making recirculation, installing a Microbubble Generator in the container tub, installing aerators in the tub and 3 other tubs without aeration, 12 maintenance tanks with a volume of 80 liters, where when filling the volume is 60 liters and the water flow is maintained in the correct condition. the same from the start of the study

This microbubble tool uses a water pump engine that has 225 watts of power. This pump machine is placed above the water reservoir aquarium. This microbubble device consists of a ½ inch aeration hose, a ¼ inch aeration hose, a T aeration hose connection, and an aeration tap. This microbubble tool uses a space narrowing system, where a ¼ inch hose will be used to narrow the water outlet through a ½ inch hose, thus producing micro-sized bubbles.

Catfish Maintenance

Before rearing, uniform catfish seeds are selected. During rearing, feeding catfish is carried out twice, namely at 08.00 in the morning, 16.00 in the afternoon and 20.00 in the evening. The feed given is 5% of the fish's body weight, according to Ernawati (2016) that feeding catfish ranges between 3%-5% of their body weight. During the first stage of the maintenance process, the feed given is commercial feed with the trademark HI-PRO-VITE 781 with a protein content of 31-33%, fat 3-5%, fiber 4-6%, ash content 10-13% and water content. 11-13%. Feeding is done 3 times a day.

Catfish rearing is carried out for 50 days. Observations were made every two days. Water samples were taken to measure nitrite and nitrate at the beginning after the seeds were stocked, then every ten days to determine fluctuations in ammonia in the rearing medium. Temperature and dissolved oxygen measurements are carried out every morning and evening during maintenance.

Research Parameters

Survival Rate (SR)

The degree of survival/Survival Rate is the percentage of the number of live fish and the number of fish at the end of the study (Effendi, 1997 in Pratama 2017).

$$SR = Nt/No \times 100\ \%$$

Information:

SR : Survival rate (%)
Nt : The number of fish at the end of the study (tail)
No : The number of fish at the start of the study (tail)

Specific Growth Rate

Daily specific growth rate is the rate of individual weight gain in percentages and can be calculated using the formula of Takeuchi et al. (1981) in Muchlisin et al., (2016), is as follows:

1. Specific Weight Growth Rate

$$SGR = [\frac{(Ln\ Wt - Ln\ Wo)}{t}]x\ 100\%$$

Information:
SGR = Specific Weight Growth Rate (%)
Wt = average weight of fish at the end of rearing (g)
Wo = average weight of fish at the beginning of rearing (g)

2. Specific Length Growth Rate

$$LGR = \left[\frac{(Ln\ Lt - LnLo)}{t}\right] x\ 100\%$$

Information:
LGR = Specific Length Growth Rate (LGR)
Lt = average length of fish at the end of rearing (cm)
Lo = average length of fish at the beginning of rearing (cm)
T = maintenance time (days)

Feed Conversion Ratio

The formula used to calculate feed conversion is :

$$FCR = F/Wt - Wo$$

Information:

FCR = Food Conversion Ratio
Wo = Initial weight of fish
Wt = Final weight of fish
F = amount of feed consumed

Absolute Growth Rate

Absolute Growth is the average growth rate of white snapper seeds during rearing which is calculated using the Effendie (1979) formula in Bond (2011), which is as follows:

1. Absolute Weight Growth

$$W = Wt - Wo$$

Information:

W = Absolute Growth (gram)
Wt = Average weight of fish at the end of rearing (gram)
Wo = Average weight of fish at the start of rearing (gram)

2. Absolute Length Growth

$$L = Lt - Lo$$

Information:

L = Absolute Length Growth (cm)
Lt = Average length of fish at the end of rearing (cm)
Lo = Average length of fish at the beginning of rearing (cm)

Water Quality

In this research activity there are also water quality parameters that must be measured, including temperature, dissolved oxygen, and pH, etc., which are measured every day to maintain water quality during the research activity.

Data Analysis

Observational data was analyzed using ANOVA with a confidence level of 95%. If there is a difference, continue with Duncan. Analysis was carried out using the SPSS software program (Rasidi, 2012).

RESULT

Absolute Weight

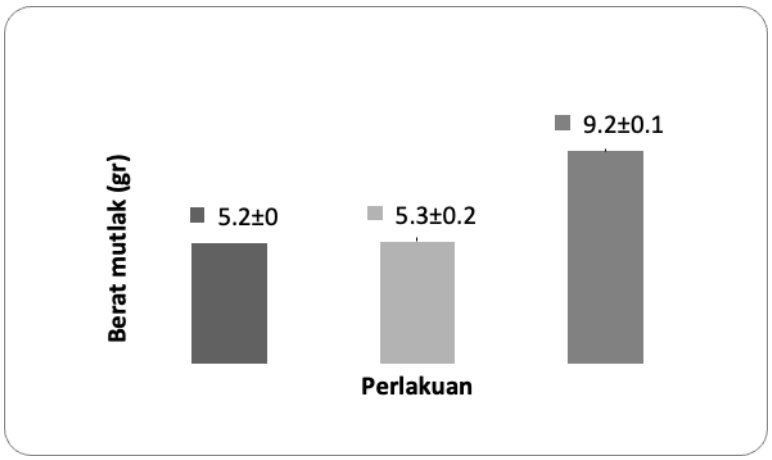

Figure 1. Average Absolute Weight Growth for catfish using different aeration systems

Figure 1 shows that treatment in microbubble (P3) gave the highest average absolute weight growth of catfish at 9.2 g, followed respectively by treatment in aerator (P2) at 5.3 g, and treatment without aeration (P1) gave the lowest average absolute weight of catfish, namely 5.2 g. ANOVA results show that maintenance using microbubbles has a significant effect ($P<0.05$) and P3 shows the best results.

Specific Weight

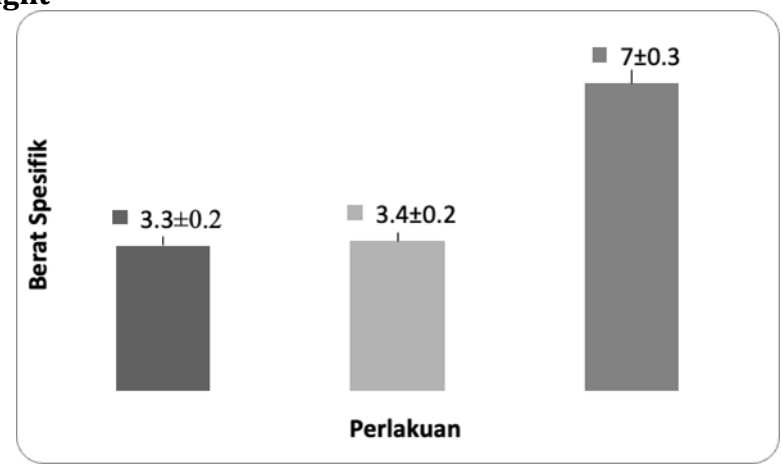

Figure 2. Average specific weight of catfish using different aeration systems

Figure 2 shows that the Microbubble treatment (P3) gave the highest average absolute weight growth of catfish at 7%, followed successively by the Aerator addition treatment (P2) at 3.4%, and the control treatment (P1) gave The lowest average absolute weight of catfish is 3.3%. ANOVA results show that maintenance using microbubbles has a significant effect ($P<0.05$) and P3 shows the best results.

Absolute Length

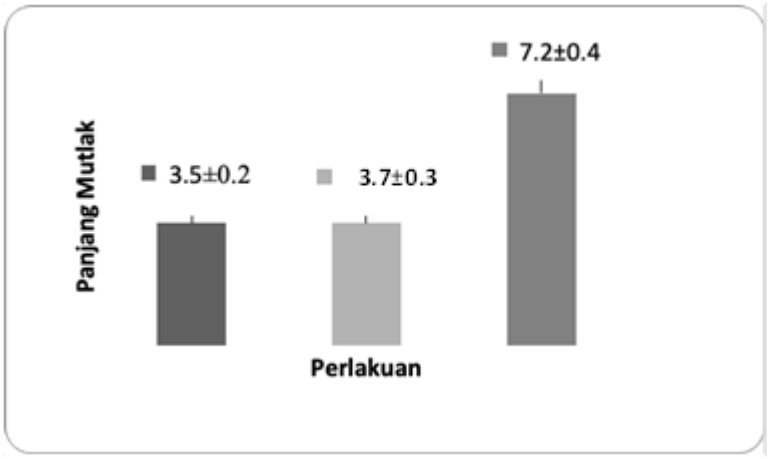

Figure 3. Average absolute length of catfish using different aeration systems

Figure 3 shows that treatment using microbubble (P3) gave the highest average absolute growth rate for catfish, namely 7.2 cm. and the lowest treatment was in (P1) and (P2), namely 3.5 cm. ANOVA results show that maintenance using microbubbles has a significant effect ($P<0.05$) and P3 shows the best results.

Specific length

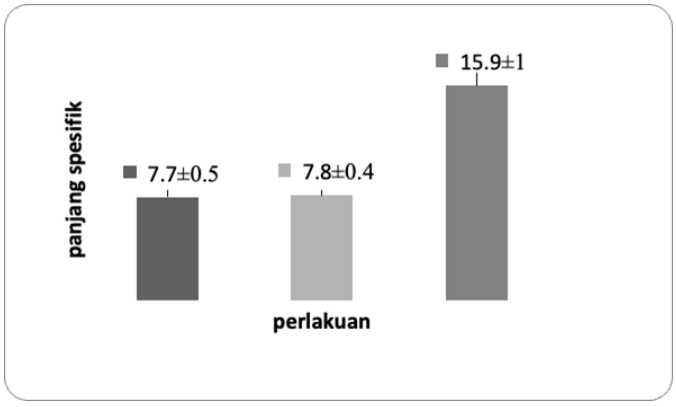

Figure 4. Average specific length of catfish using different aeration systems

Figure 4 shows that treatment using microbubble (P3) gave the highest average specific growth rate for catfish, namely 15.9%. followed respectively by treatment using aertor (P2) at 7.8%, and the lowest treatment without aeration or control, namely 7.7%. ANOVA results show that maintenance using microbubbles has a significant effect ($P<0.05$) and P3 shows the best results.

Feed Convertion Ratio (FCR)

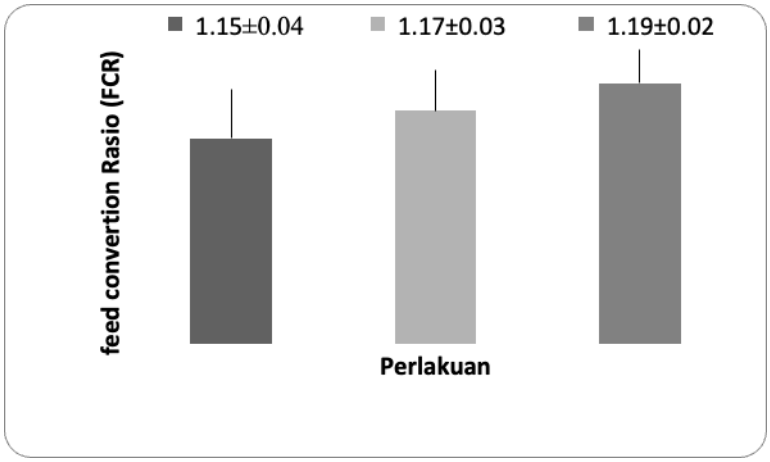

Figure 5. Average FCR for catfish using different aeration systems

Figure 5 shows that the lowest FCR was found in the control treatment (P1) at 1.15, followed by the treatment using aeration (P2) at 1.17 and the lowest treatment was found in the treatment using microbubbles (P3) at 1.19. ANOVA results showed that maintenance using microbubbles had no significant effect (P>0.05).

Survival Rate

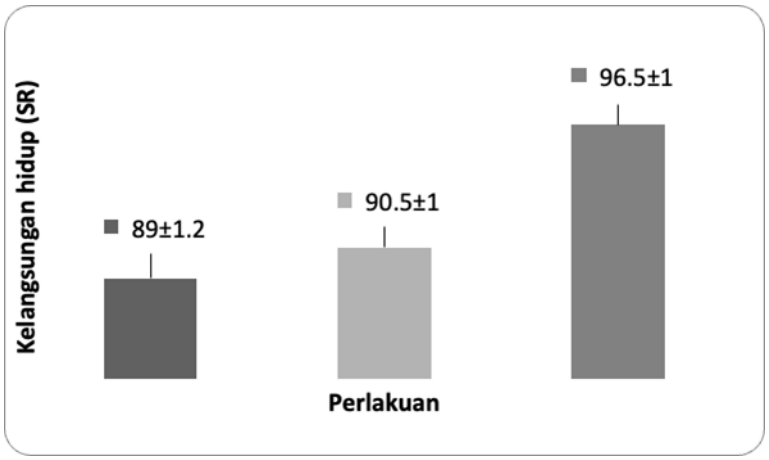

Figure 6. Average SR for catfish using different aeration systems

Figure 6 shows that treatment using microbubble (P3) gave the highest average specific growth rate for catfish, namely 96.5%. followed respectively by treatment using aertor (P2) at 90%, and the lowest treatment without aeration or control, namely 89%. ANOVA results show that maintenance using microbubbles has a significant effect (P<0.05) and P3 shows the best results.

Water Quality

Table 3. Water Quality During Research

Parameters	Unit	Result	References (Adekayasa, 2015)
pH	˚C	27-28.2	27-32
DO	-	7.1-7.4	6.8-8
temperature	mg/l	5.5-5.7	5.0-7.0
Ammonia	mg/l	0.06-0.75	0.05-1,5
Nitrate	mg/l	0.64-1.23	5.0-7.0
Nitrite	mg/l	0.01-0,1	0.01-1.0

DISCUSSION

Overall, from the research that has been carried out, the results show that the addition of different aeration systems in catfish rearing has a significant influence on the growth performance of catfish, including absolute weight gain, specific weight, absolute length increase, specific length growth, survival, FCR and also water quality in catfish cultivation.

The treatment with the addition of microbubbles to the maintenance media resulted in significant absolute weight growth when compared to the absolute weight growth in treatments that only used aerators and also without aeration (control). The treatment with the addition of microbubbles (P3) provided an average absolute weight growth of catfish for 45 days. This is thought to occur because microbubbles will add dissolved oxygen content to the rearing media, so that the growth of catfish in this treatment can increase more quickly. according to Heriyati et al., (2020) who stated that treatment using microbubble aeration was able to increase fish growth compared to conventional aeration because the stable oxygen from microbubbles caused higher fish growth. because dissolved oxygen is needed by all living organisms for respiration, metabolic processes or exchange of substances to produce energy used in fish growth.

The treatment with the addition of microbubbles to the rearing media produced significant absolute length when compared to the growth in absolute length in the treatment that only used aertor and also without aeration (control). The treatment with the addition of microbubble (P3) gave an average absolute length growth of catfish during 45 days of rearing of 7.2 cm and the lowest absolute length growth was found in two treatments, namely aerator (P2) and without aeration (P3) which only provided absolute length growth. only 3.5 cm. This is thought to occur because the addition of microbubble as a source of aeration in catfish rearing can increase fish growth. Because the energy possessed by fish is mostly used to form new cells which can increase the weight of the fish. According to Kusmini et al., (2014) who stated that as a result of the accumulation of energy and this energy ends up being used in the formation of new cells so that they can function to increase the fish's body mass.

Feed that contains high protein will result in rapid fish growth so that the catfish's conversion of feed into meat is also high. This is in accordance with the statement (Arifin and Rumondang, 2017) that FCR below catfish 2 is still considered very good for the growth of catfish. If the feed used is of good quality, and the health of the fish is good and the fish's living environment is supportive, then it can be said that catfish have low feed conversion. According to (Heriati, et al., 2020) which states that microbubbles provide lower FCR levels. Survival rate is one of the parameters used as a parameter for the success of cultivation or maintenance activities carried

out. Based on research conducted, survival causes of fish to die were at the start of the research, such as weekly length and weight sampling activities which caused the fish to become stressed and die. The highest survival rate for catfish was found when using microbubbles, this is thought to be the influence of the best media water quality conditions so that the fish can tolerate it. This statement is in accordance with the opinion of (Khobir et al, 2021) that microbubble can improve water quality so that fish survival can increase to 97.51%.

CONCLUSION

The use of microbubble technology as an aeration system is able to increase dissolved oxygen levels in waters and has a significant influence on absolute length growth, absolute weight growth, specific length growth, specific weight growth, feed conversion ratio (FCR) and survival (SR).

The treatment with the best survival, growth and feed conversion ratio was obtained in the P3 treatment which used microbubble density (50 fish/60 liters of water), where catfish survival was 96.5%, absolute length growth was 7.2 cm, weight growth absolute growth of 9.2 gr, specific length growth of 15.9%, specific weight growth of 7%, and feed conversion ratio of 1.17.

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