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Increased Dissolved Oxygen On Cultivation of Nilem (Osteochilus sp.) With the addition of Aerator Diffuser

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ABSTRACT

Characteristics of water quality is dynamic or fluctuating easily, one important factor that needs to be maintained is dissolved oxygen (Dissolve Oxygen). Handling is done to keep the dissolved oxygen concentration is the addition of aeration. Aeration added to the aquaculture container in this study is a diffuser aerator that has the characteristics of easy maintenance, high oxygen transfer efficiency, and economical. The purpose of this research is to know the effect of diffuser aerator to the increase of dissolved oxygen at different density of fish nilem. The treatments were A treatment (50 fish/m^3), B (75 fish/m^3), C (100 fish/m^3) and D (125 fish/m^3). This research was conducted in February - March 2018 at Natural Feed Farming Laboratory Faculty of Fisheries and Marine Sciences Padjadjaran University. The method used is experimental method by using descriptive analysis of komperatif. The results showed that the use of Diffuser Aerator has an influence on dissolved oxygen on the cultivation of fish nilem that is ranging from 6.0 - 7.9 mg/L higher than using ordinary aeration and 100 fish stocking stock is the best amount during the study with a lifetime of 86% with fish population of 86 fish.

Keywords: diffuser aerator, nilem, dissolved oxygen

Introductions

Nilem (Osteochilus sp.) is one of the commercial and potential freshwater fish commodities in its development. The economical value of nilem can be increased after being processed for products such as abon, jerky and boiled fish, smoked and canned, or baby fish fry. Another potential is the nilem eggs that people love because it tastes delicious and has the opportunity as an export commodity (Mulyasari et al. 2010).

Factors affecting the growth of nilem include food, environment, and water quality. According to Dhahiyat (2014), water quality management is the maintenance effort of water so as to achieve the desired water quality in accordance with its allocation to ensure that the quality remains in its natural condition. Poor water quality can cause stress, trigger disease, and can also cause death in cultivated fish.

Water quality characteristics are dynamic or fluctuate easily. One important factor that needs to be maintained is dissolved oxygen, because when viewed from the interests of the waters, oxygen tops the list (Kordi and Tancung 2010). The content of dissolved oxygen in the culture medium will also be reduced quickly if the density is too high and will impact on the quality of water in it. Handling that can be done to maintain dissolved oxygen concentration is by adding aeration. Aeration is used to increase dissolved oxygen to reduce gas saturation (Islami 2017).

Aeration added to the fish tank in this study is aerator diffuser which is a type of aeration that adds air into the water by diffusion of a thin layer of bubbles that can increase the oxygen concentration in water and can increase the productivity of nilem seeds. According to Haryanto et al. (2005), the selection of this type of aerator diffuser is based on easy maintenance, high oxygen transfer efficiency, and economical. Based on the above description, a study was conducted to see how the effect of diffuser aerator to increase of dissolved oxygen at different density of fish nilem.

Method

This research was conducted in February - March 2018 at Natural Feed Farming Laboratory Faculty of Fisheries and Marine Sciences Padjadjaran University. Observation and maintenance of nilem fish on fiber fiber media and direct measurement of water quality parameters in Table 1.

Tabel 1. Water Quality Parameters

Parameters	Unit	Measuring Instrument	Analysis
A. Physics			
- Water temperature	^{o}C	Termometer	Insitu
B. Chemical			
- DO	mg/L	DO meter	Insitu
- pH	mg/L	pH meter	Insitu

The survival of Nilem is obtained by following the formula Effendie (1979), which is as follows:

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

Information:

SR = Animal survival (%)

Nt = Amount fish test at the end of the study

No = Amount fish test at the start of the study

The method in this research is experimental using descriptive analysis of komperatif. The materials used during this research were 5-7 cm nilem obtained from Sumedang Fish Seed Hall. The feed given to maintenance is the PF-800 pellet (with 39-41% protein). Solid fish stocking in this research are:

A : intensiveness nilem 50 fish/m^3

B : intensiveness nilem 75 fish/m^3

C : intensiveness nilem 100 fish/m^3

D : intensiveness nilem 125 fish/m^3

Measure of tank is 80 cm x 80 cm x 40 cm by 12 units. Type aerator diffuser brand Ying Xin Air Stone type A-10502 with specification 300 mm x 50 mm x 6 mm and cas output 30 L / minute. Provision of feed given 3 times a day at 08.00 pm, 12.00 pm and 16.00 pm. Water quality parameters measured were pH, temperature, and dissolved oxygen measured twice daily at 08.00 WIB and 16.00 WIB.

The pH measurements were performed by using pH meters dipped directly into the cultivated tank of nilem until the numbers appear constant. Temperature measurements are made using a thermometer. Measurements DO meter by means of DO meters are inserted electroda

into the container cultivation until the sensor is submerged, then wait until it appears a constant number. The results to be obtained in this study is seen the effect of diffuser aerator on dissolved oxygen and other water quality parameters such as pH and temperature at different density of fish nilem.

Result and Discussion

Water Quality

The value of water quality range in each treatment obtained during this study can be seen in Table 2.

Tabel 2. Quality Range of Nilem Fish Seed Water During Research

Parameters	Perlakuan			
	A (50 fish/m^3)	B (75 fish/m^3)	C (100 fish/m^3)	D (125 fish/m^3)
Dissolved oxygen (mg/L)	6,1 – 7,9	6,0 – 7,5	6,0 – 7,5	6,0 – 7,5
pH	6,0 – 8,5	6,0– 8,5	6,4 -8,5	6,5 – 8,4
Temperature (^oC)	24,2 – 26,7	24,1– 26,5	24,0 – 27,0	24,1 – 26,2

Dissolved Oxygen Concentration

The results of the research obtained in each treatment can be seen in Figure 1.

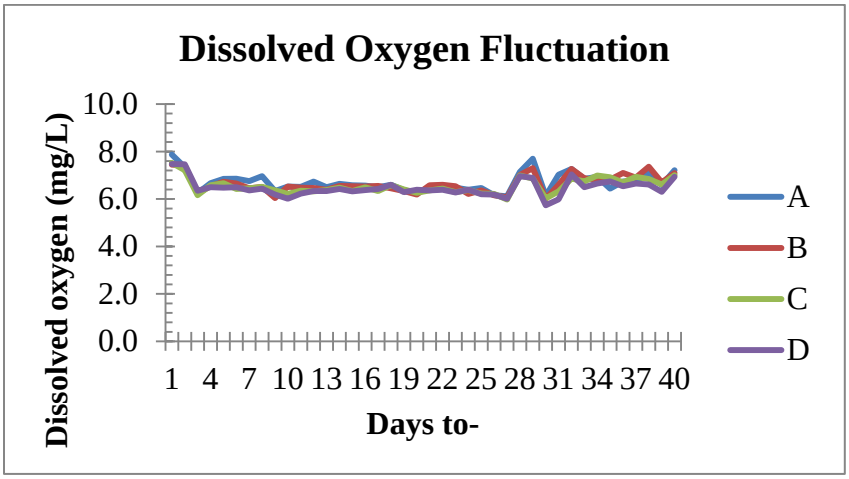

Figure 1. Dissolved Oxygen Fluctuation in Nilem Cultivation

The dissolved oxygen fluctuations in Fig. 1. show the more dense the dispersed nilem content of the dissolved oxygen content tends to have the same concentration as the low density

treatment. The highest dissolved oxygen content at treatment A 50 fish/m^3 is 6,1-7,9 mg/L, that is because treatment A is the least dense treatment so that oxygen consumed fewer fish and oxygen count in water more high, while the treatment of B 75 fish/m^3, C 100 fish/m^3 and D 125 fish/m^3 has a range of dissolved oxygen content which is not different ie 6.0-7.5 mg/L. It is influenced by several factors such as air diffusion, water change, the process of decomposition of organic material by aerobic bacteria (Dhayiyat 2014). If it is seen that the range of results obtained at each treatment, it can be said that dissolved oxygen content by using aerator diffuser in the tank can work very well, because the stability of the DO can be maintained with the aid of an aerator that pumps oxygen into aeration media, and the aerator used in this study is very effective to stabilize the dissolved oxygen content in the cultivation tank.

The fluctuation of dissolved oxygen of nilem using regular aeration in Rizaqi (2016) ranged from 6.2-6.7 mg/L, whereas in this study the concentration ranged from 6.0 to 7.9 mg/L. It also shows that the aerator diffuser provides a better DO rating than regular aeration. The value of DO can be said optimal because in accordance with the literature PP No.82 of 2001 which states that the limit of dissolved oxygen concentration for freshwater fish culture is 4.0 mg/L.

Sarah (2009) mentions, oxygen supply should be enough to maintain normal growth. If the supply of dissolved oxygen concentration in low waters then the fish will not grow optimally, because it can interfere with the breathing of the organism and will reduce the rate of metabolism. If oxygen supply dissolves in waters below 20% of normal requirements, fish will be weak and can cause death (Ispandi 2016).

Effect of pH on Oxygen

The tendency of pH level in each treatment showed a normal but bending condition with an insignificant range of differences between each treatment. According to Kordi and Tancung (2010), acidic waters are less productive, may even kill aquaculture animals. At low pH or high acidity, the dissolved oxygen content will decrease, as a result of decreasing oxygen consumption, increased respiratory activity and appetite will decrease. Under alkaline conditions, it will happen otherwise.

Fluctuations in pH levels of each treatment measured at the time of this study can be seen in Figure 2.

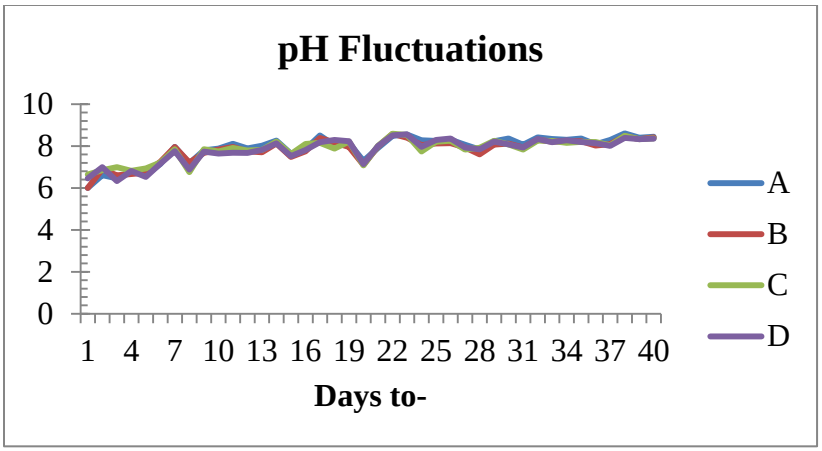

Figure 2. pH Fluctuations of Nilem Cultivations

Figure 2. demonstrate showed if the pH the higher than the dissolved oxygen will be higher too, it can be seen that during the study the highest dissolved oxygen range has a high pH range as well. The content of the pH of the media at treatments A, B, C and D has a range that is not much different that is between 6.0 - 8.5. In Rizaqi (2016) research, nilem can grow optimally in the pH range 6.0 - 7.0, and based on the standard of water quality of PP No.82 Year 2001, good pH for freshwater fish cultivation is ranging from 6- 9, it shows that the measurable pH in this study is within reasonable limits for cultivation and is a good water quality for optimal growing fish.

Batara et al. (2017) mentions, if the pH became higher of water the oxidation reaction in the aeration process faster. Excessively high pH levels can also increase ammonia in water that is toxic. When the pH has a fairly constant value then the dissolved oxygen concentration can also be stable (Kordi and Tancung 2010). One of the things that keep this water pH fluctuation can be prevented by way of frying fish pierce and feed residue that is not consumed in maintenance media and doing 30-75% stepwise water replacement every day.

Effect of Temperature on Dissolved Oxygen

Oxygen will be inversely proportional to temperature then if the temperature is high then the oxygen solubility will decrease (Kordi and Tancung 2010). According to Sinaga et al. (2016), the impact of extreme temperature changes has the potential to interfere with the consumption of oxygen in fish and the maximum daily change of normal temperature is not more than 2 or 3 degrees.

Based on the measurement results obtained water temperature range can be seen in Figure 3.

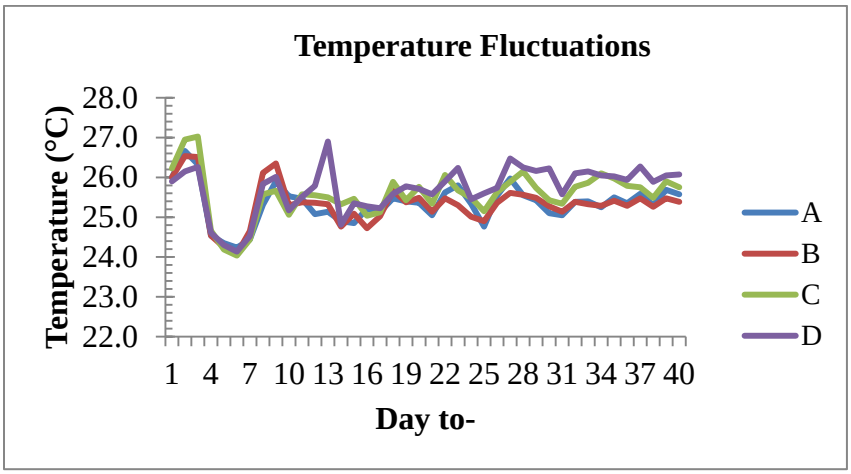

Figure 3. Temperature Fluctuations on Nilem Cultivations

In this study the temperature range has a fluctuation that does not vary much each treatment, in treatment A has temperature range 24.2-26,7^{o} C, treatment B 24,1-26,5^{o} C, C treatment 24,2-26,7^{o} C ,compared to Susanto (2006) which said that the optimal temperature for nilem is 18-28^{o} C and according to Kordi and Tancung (2010) stated that the temperature suitable for water biota activity is 23-32^{o} C. Then the water temperature during the research is still classified optimal for fish survival, when associated with dissolved oxygen concentration, the highest temperatures have lower oxygen levels and for the highest dissolved oxygen have the lowest temperatures.

On the 5th day the temperature of the water medium decreases compared to the normal day, it is due to the decrease of rain water which makes the temperature lower. Based on Figure 3. it can be seen that the treatment D has the highest temperature range on the last day of the study compared to other treatments, it is because the more dense stocking increases then the rest of the metabolism is also issued more and more energy, therefore densely stocked high will have high temperatures as well.

Survival Rate

Survival is important in cultivation. Many factors affect the survival rates of nilem fish such as water quality, feed and stocking density (Rizaqi et al, 2016). Survival Rate along with the existing population on the cultivation of fish nilem is presented in Figure 4.

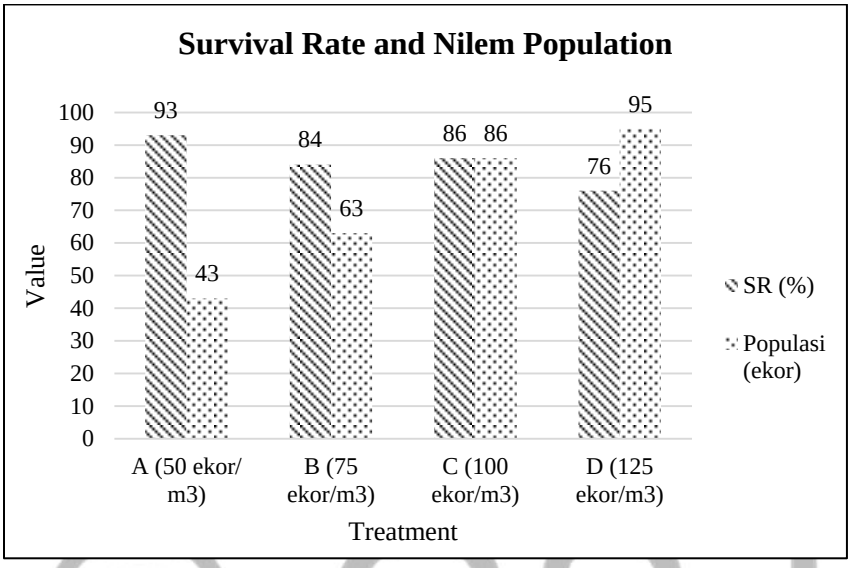

Figure 4. Survival Rate and Nilem Population

In Fig. 4. The highest SR (%) showed that the treatment of A 93% and the lowest was 76% D treatment, according to Widiastuti (2009), stated that if fish are kept in low density the growth is better when compared to high stocking densities. During the study, the survival of seeds of nilem averaged above 50%. Based on the observation, that the dead fish at the time of the research was caused by the beginning of the research of fish still experiencing the adaptation process with its environment and allegedly related to stress due to the process of sampling.

The population that exist in the cultivation tank of nilem seeds in each treatment is very diverse, the treatment of A, B, C, and D has 43 fish, 63, 86, and 95, respectively. aerators that help improve water quality so that the number of fish that can live higher. When compared to survival, C treatment is the best treatment compared to others. At treatment C has fish population (86 head) higher than other treatment that is 86% from initial number of fish stocked.

Conclusions

1. The use of Diffuser Aerator has an influence on dissolved oxygen on the cultivation of nilem that is ranging from 6.0 - 7.9 mg/L higher than using a regular aeration.
2. Dense stocking of 100 fish is the best amount during research with survival rate equal to 86% with fish population counted 86 fish.

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