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RESEARCH ARTICLE

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Effort to Increase Growth of Tilapian Fish (*Oreochromis niloticus*, Linnaeus) Using Different Doses of Ozonation

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Tilapia (*Oreochromis niloticus*, L.) has been kept in an aquarium with ozone administration with different doses. Granting DSM ozone generator using ozone Aero 13.6 kV, currents of 7.3 mA, and a frequency of 2.8 kHz, with output of 6.66 mg/min. Each aquarium contains 10 tilapia. There are six treatment has been tested and a control. The volume of water in the tank is 12 liters, the treatment given is the provision of ozone for 4 minutes, 6 minutes, 8 minutes, 10 minutes, 12 minutes and 14 minutes. In this study was obtained Specific Growth Rate (SGR_{body}) and $SGR_{biomass}$, which the percentage growth ofish per day. Rated Highest $SGR_{biomass}$ row is on Treatment V (1.77 ± 0.16), Treatment VI ($1,75 \pm 0.10$), treatment III (1.53 ± 0.18), treatment II (1.36 ± 0.13), treatment IV (1.26 ± 0.22), controls (1.24 ± 0.11), treatment I (1.09 ± 0.12). While the value of the highest SGR_{body} row show on treatment III (0.70 ± 0.009), treatment VI (0.67 ± 0.038), treatment V (0.65 ± 0.009), treatment II (0.53 ± 0.008), treatment IV (0.48 ± 0.796), controls (0.48 ± 0.009), treatment I (0.38 ± 0.009). From the results of the *F* test, the value of *F* table $\geq$99% confidence level. Furthermore, the advanced test.

Keywords: Tilapia, Specific Growth Rate, Ozone, LSD Test, Growth.

1. INTRODUCTION

Technological developments in modern times is not only aimed at the technology itself, but more importantly is to human welfare. Ozone is a gas composed of three atoms of oxygen that is highly reactive and more volatile than oxygen. Ozone is a powerful oxidizing the oxidation strength of six times the power of chlorine oxidation. Because of the nature of ozone are widely used for the sterilization of water from organic waste, colors and disinfectants as well as kill viruses and increase the supplement in the water because the end result in the form of oxygen reaction.[1] Shaped dielectric barrier discharge plasma Coaxial (Coaxial Dielectric Barrier Discharge) is a closed system. The plasma discharge is generated in ce1ah between two electrodes, namely the active electrode as the electrode wire on the inside and the outer electrode (passive electrode) in the form of sheet aluminum hear pyrex glass tube as a barrier.[2] When the two electrodes is given voltage will produce an electric field that is not homogeneous, cargo space (space-charge) will arise before the total translucent and electric field distribution that occur will affect the value of the voltage.[3]

Naturally ozone present in the stratosphere and the troposphere fraction. Ozone in the stratosphere is situated at an altitude of between 15 to 30 km from the sea surface commonly known as the ozone layer. Ozone is generated from the chemical reaction. Ozone is toxic when inhaled in large volumes. Ozone has a pungent odor. Ozone is also formed at low levels in the air due to electric currents such as lightning, and by high energy as electromagnetic radiation. Ozone in the earth formed by light purple outlining O_2 molecules to form oxygen ions (O^*). These elements combine with oxygen molecules that do not decompose and form ozone. Ozone can be formed through two different processes, namely through the process of collision and through the process of light.[4]

Ionization is defined as the process of release of electrons an atom or molecule of the bond. The energy required to remove one or more electrons from their orbits in an atom or molecule can be defined as the ionization energy E_i. The magnitude of the ionization energy is expressed in units of electron-volts (eV). An atom or molecule will be a positive ion if it has excess positive charge, and will become negative ions if the excess negative charge.[5] While the events in which electron excitation is located at a lower energy level to move to a higher energy level by absorbing energy electrons pounding.[6] Ionization events can cause dissociation, also called the separation of a molecule into its constituent atoms. Dissociation process is shown in the following equation:

$$e^- + A_2 \rightarrow e^- + A + A \qquad (R.1)$$

$$e^- + AB \rightarrow e^- + A^+ + B^- \qquad (R.2)$$

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This dielectric barrier discharge plasma can easily generate O^*, O_2^*, OH^* and H^*, due to the radical formation of the order of 10 eV, the energy of electrons in the plasma discharge is approaching the amount of energy required for radical formation. Ozone formation in the plasma discharge is preceded by the formation of oxygen free radicals by the following reaction:

$$\text{Dissociation } e^- + O_2 \rightarrow 2O + e^- \quad (R.3)$$

$$\text{Binding dissociative } e^- + O_2 \rightarrow O + O^- \quad (R.4)$$

$$\text{Dissociativeionization } e^- + O_2 \rightarrow O + O + 2e^- \quad (R.5)$$

Then the oxygen radicals react with oxygen to produce ozone.

$$O + O_2 + M \rightarrow O_3 + M \quad (R.6)$$

With $M = N_2$ or O_2.[7] Oxidation of compounds in general, ozone is the second after the fluorine compound. If the energy of free electrons enough, experiencing dissociation of ozone molecules into oxygen molecules and atoms. Oxygen atoms then mashing ozone is formed so as to produce two molecules of oxygen. This is in accordance with the equation described as follows:

$$e^- + O_3 \rightarrow O_2 + O + e^- \quad (R.18)$$

$$O + O_3 \rightarrow O_2 + O_2 \quad (R.19)$$

$$O^- + O_3 \rightarrow 2O_2 \quad (R.20)$$

$$O_3 + hv \rightarrow O + O_2 \quad (R.21)$$

The longer the O_3 molecules that decompose more O_2 molecules are formed from the partial decomposition will be released into the air and partly soluble in water. O_2 continue to form until the lifetime of O_3 in the water runs out (about 40 minutes).

2. EXPERIMENTAL DETAILS

This study was conducted in September 2014 until November 2014 at the Laboratory Bionanoteknologi and Ecology, UPT Integrated Laboratory, University of Diponegoro in Semarang. From the data collected is recorded and displayed in the form of tables and graphs. To determine the effect of treatment on the response of the test parameters used variance analysis or F test if the test was significantly different F or very real, then proceed to the LSD (Least Significant Difference). To know the difference between treatment and to know where the best dosage then tested the least significant difference (LSD).

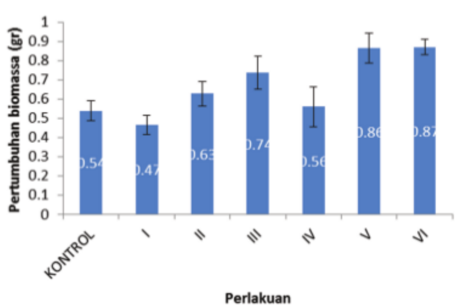

Fig. 1. *Tilapia* biomass growth histogram for each treatment.

Table I. Ozone concentration in each treatment using DSM Aero.

Treatment	Time (min)	Ozone (mg/l)
Control	0	0
I	4	2,22
II	6	3,33
III	8	4,44
IV	10	5,55
V	12	6,66
VI	14	7,77

3. RESULTS AND DISCUSSION

3.1. Effect of Ozonation on Growth Biomass Tilapia Fish

Ozone concentrations were given to each treatment based on the results of the calculations are shown in Table I. Effect of ozonation treatment on the growth of tilapia fish include biomass growth and the length of the fish. Biomass is an important variable in the growth of tilapia fish. Ozonation treatment in the water causes the oxygen content will be available as a result of ozonation is a form of oxygen. Ozone concentrations were given to each treatment based on the results of the calculations are shown in Table I. Effect of ozonation treatment on the growth of tilapia fish include biomass growth and the length of the fish. Biomass is an important variable in the growth of tilapia fish. Ozonation treatment in the water causes the oxygen content will be available as a result of ozonation is a form of oxygen.

Ozonation treatment in the water causes the oxygen content will be available as a result of ozonation is a form of oxygen (Q.5), because oxygen is a key parameter water quality.[10] Specific or Specific Growth Rate ($SGR_{biomass}$) as shown in Table III was obtained from the amount of change in the average biomass of individual fish by time. ANOVA tables biomass growth can be seen in Table II. F value obtained using analysis of variance, it can be concluded that the addition of ozone significantly affect length growth of Tilapia fish. The results showed that each treatment gives a different response or treatment effect on the growth of tilapia fish length. During the study, the rate of survival of fish reaches 100% because no dead fish.

Table II. ANOVA tables in *tilapia* sp. biomass.

					F tabel	
SK	db	JK	KT	*F* det	5%	1%
Treatment	6	0,4663	0,0777	15,40**	2,85	4,46
Error	14	0,0706	0,005			
Total	20	0,537				

Table III. *Tilapia* $SGR_{biomass}$ value for each treatment.

Treatment	$SGR_{biomass}$ (% per day)	Notation
Control	$1,24 \pm 0,11$	*a*
I	$1,09 \pm 0,12$	*b*
II	$1,36 \pm 0,13$	*c*
III	$1,53 \pm 0,18$	*d*
IV	$1,26 \pm 0,22$	*e*
V	$1,77 \pm 0,16$	*f*
VI	$1,74 \pm 0,10$	*g*

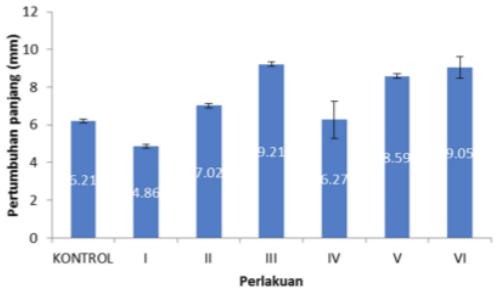

Fig. 2. Growth length *Tilapia* fish in each treatment.

3.2. Ozonation Influence on the Growth of Tilapia Fish Length

Length growth is determined by the difference between the final length to he initial length of maintenance shown in Figure 2. Growth of Tilapia fish in each treatment due to an input of energy derived from feed given and the environment. In Table IV shows the real effect $(F_{det} > F_{table})$, meaning that statistically there is obtained real influence on the growth of ozonation treatment Tilapia fish. In Table IV shows the value of F count greater than F tabel 5% or 1%, it is stated that the ozonation treatment effect on the growth of biomass is very significant. Further test Least Significant Difference (LSD) to determine the effect of treatments. Table V shows the results of LSD test Tilapia fish biomass growth.

Descriptively, the highest value Specific Growth Length (SGR-panjang) achieved in the maintenance treatment of tilapia by ozone for 8 minutes or III treatment that is equal to (0.70 ± 0.009 percent per day).

Table IV. ANOVA table length *tilapia*.

SK	db	JK	KT	*F* hitung	*F* tabel 5%	*F* tabel 1%
Treatmen	6	49,980	8,330	43,23**	2,85	4,46
Error	14	2,698	0,193			
Total	20	52,678				

Table V. *Tilapia* SGR_{body} value for each treatment.

Treatment	SGR_{body} (% per day)	Notation
Control	0,48 ± 0, 01	*a*
I	0,38 ± 0, 01	*b*
II	0,53 ± 0, 01	*b*
III	0,70 ± 0, 01	*c*
IV	0,48 ± 0, 08	*d*
V	0,65 ± 0, 01	*d*
VI	0,67 ± 0, 03	*d*

4. CONCLUSION

Based on the research that has been done, it can be concluded that the administration of ozone have a significant influence on the growth of tilapia fish.

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