UDC 639

THE EFFECT OF CHINESE POND MUSSEL (ANODONTA WOODIANA) AS A BIOFILTER ON BIOCHEMICAL OXYGEN DEMAND LEVEL IN CATFISH (CLARIAS SP.) FARMING WASTE

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ABSTRACT
Catfish farming, especially intensive farming will produce waste in the form of feces and leftover feed containing organic matter. Fish feeds are the highest (80%) contributor to organic matter in the farming environment. The amount of fish feeds not consumed or wasted in the bottom waters is about 20-50%. Waste from fish feeds and feces will accumulate and degrade the water quality. Chinese pond mussel (*Anodonta woodiana*) is a filter feeder capable of removing materials such as sediments and organic matter from the water column. The purpose of this research is to identify the effect of Chinese pond mussel (*Anodonta woodiana*) on the COD level in catfish farming waste. This study used a completely randomized factorial design with three treatment factors. The treatment factors were treatment factor of size (S) i.e. S0=control, S1=6-7 cm, S2=10-11 cm, treatment factor of density (D) i.e. D0=control, D1=5 mussels, D2=10 mussels, and D3=15 mussels, and treatment factor of time (at the 9th, 18th, and 36th hour). This experiment used three replications in a 10-liter container. Water quality parameters analyzed were temperature, pH, and COD. The result of this research showed that the best effect of Chinese pond mussel on the COD level was found in the treatment factor of density of 10 mussels with the size of 6-7 cm at the 9th hour. Factors having a significant effect on the COD level were size and density. The interaction between time and density factors and between size and density factors had a significant effect on COD level. The interaction between time, size, and density factors had a significant effect on COD level.

KEY WORDS
Catfish waste, Chinese pond mussel, COD.

Environmentally friendly fish farming becomes a must in order to preserve the environment. It is very influential on the quality of water in the farming pond and waste generated from fish farming. Catfish (*Clarias sp.*) farming in Indonesia is growing rapidly because catfish can be farmed in narrow places with high stocking densities, can be harvested in a short time, and has high market demand. Catfish farming, especially intensive farming will produce waste in the form of feces and fish feeds containing high organic matter (Ghate *et al.*, 1993).

Organic matter is a material which can be renewed or recycled with the reshuffle of bacteria in the waters into reused elements (Gunawan, 2000). In general, organic matter is in the form of waste able to be decomposed or degraded by microorganisms. Apart from the water source, organic matter in the farming pond is also from the waste of the fish feeds and feces.

Feeds not consumed by fish are about 1-5% of dry feeds, 5-10% of moist feeds, and 10-30% of wet feeds. Fish feeds are the highest (80%) contributor to organic matter in the farming environment. The amount of fish feeds not consumed or wasted in the bottom waters is about 20-50%. Waste from fish feeds and feces will accumulate and degrade the water quality. Organic matter pollution in aquatic environment may occur in the form of dissolved or suspended solids. The solid material contains carbohydrates (CHO), protein (CHONS), and fat (CHO).

Chinese pond mussel (*Anodonta woodiana*) is a filter feeder capable of removing materials such as sediments and organic matter from the water column. Through the filtering activity, *Anodonta woodiana* also has an important role in the water biofiltration. Putra (2016) stated that the use of Chinese pond mussel as a biofilter was able to purify water and reduce ammonia levels. Parameters of water quality can be lowered by *Anodonta woodiana* was organic matter, COD, and ammonia. Palinussa (2010) also confirmed that organic matter can be reduced to 88%, TSS can be reduced to 84%, and ammonia levels can be reduced to 0%.

METHODS OF RESEARCH

The purpose of this research is to identify the effect of Chinese pond mussel (*Anodonta woodiana*) on the COD level in catfish farming waste. This research was conducted in February 2018 at the catfish farming ponds in Kepanjen, Malang. This study used completely randomized factorial design with three treatment factors i.e. treatment factor of size (S), treatment factor of density (D), and treatment factor of time. The experiment used three replications in a 10-liter container. Water quality parameters analyzed were temperature, pH, and COD.

RESULTS AND DISCUSSION

Water quality parameters measured in this study showed that temperature and pH did not present fluctuating changes. From the beginning to the end of the treatment, the temperature ranged from 28-26^0. This temperature range was still within normal water temperature threshold values. The pH values also showed normal values of 6-8 mg/l. Fluctuating changes occurred in the COD and dissolved oxygen levels in the treatment media.

COD (Chemical Oxygen Demand) is an indicative measure of the total amount of oxygen used to chemically oxidize the organic matter, whether it is biodegradable or degradable organic matter, to CO_2 and H_2O. Thus, it can be assumed that the COD level can indicate the presence of organic matter. In this research, it can be seen that the up and down fluctuations of COD level illustrated increase and decrease of organic matter concentration on catfish wastewater. The COD level on the control treatment from the results of the study showed an insignificant decrease from the beginning to the end of the study. It was because there was no activity which significantly reduced the COD level in the control treatment.

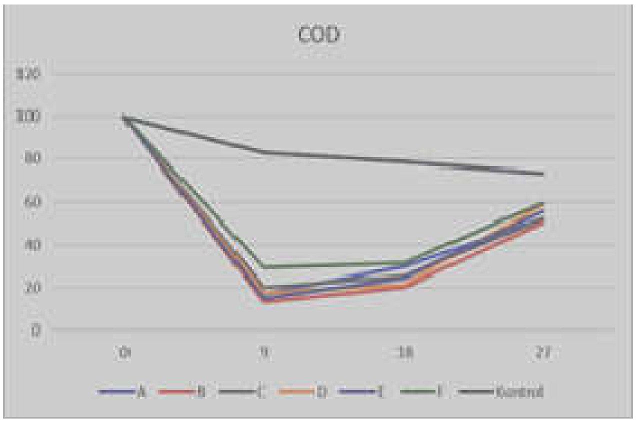

Figure 1 – Graph of COD fluctuations

The observation results showed that the treatments of A, B, C, D, E, and F decreased at the 9th hour and subsequently increased at the 18th and 27th hour. The decrease in the COD level at the 9th hour indicated the absorption of organic matter by Chinese pond mussel. At the beginning of the study, the COD level was 100 mg/l and decreased in almost all treatments at the 9th hour to the range of 13 mg/l-29.33 mg/l, approximately decreased to

82%. These results are in line with Palinussa's (2010) research that Chinese pond mussel can reduce the amount of organic matter into 88%. Chinese pond mussel is a marine biota able to utilize organic matter directly without having to be overhauled first into inorganic matter. The ability of Chinese pond mussel in water absorbing or filtering of 40 liters/day (Karnaukhov, 1979) becomes one of the factors in the COD level decrease in water. Thus, a decrease in the COD level in a very large amount is possible by comprehending the ability of Chinese pond mussel to absorb water.

At the 18th hour, there was an increase in the COD level in wastewater. It was supposed that Chinese pond mussel had metabolism and extracted organic matter as well. It could also happen because the absorption rate of organic matter by Chinese pond mussel has reached the peak or saturation point. In absorbing foods, Chinese pond mussel does sorting or selection, meaning the appropriate organic matter will be absorbed in the body, while the useless matter will be rejected and thrown back. From the data, it was assumed that the activity of food absorption (organic matter) by Chinese pond mussel occurred actively (fast) until the 9th hour, along with the process of feces disposal. Two activities of Chinese pond mussel above were assumed as the cause of increased organic matter as indicated by increasing levels of COD in water.

ANOVA test was conducted to see the effect of immersion time, the size, and the density of Chinese pond mussel on the COD level in catfish farming waste. From the calculation results, the effect of the time, size, and density factors on the COD level can be determined. The effect of time factor showed $F_{value}<F_{table}$, thus H0 was accepted. The effect of size and density factors showed $F_{value}>F_{table}$, thus H0 was rejected. The effect of the interaction between time and size factors showed $F_{value}<F_{table}$, thus H0 was accepted. The effect of the interaction between time and density factors and between size and density factors showed $F_{value}>F_{table}$, thus H0 was rejected. The effect of the interaction between time, size, and density factors showed $F_{value}>F_{table}$, thus H0 was rejected.

CONCLUSION

From this research, it can be concluded that:

- The best effect of Chinese pond mussel on the COD level was found in the treatment factor of density of 10 mussels with the size of 6-7 cm at the 9th hour;
- Factors having a significant effect on COD level were size and density;
- The interaction between time and density factors and size and density factors had a significant effect on COD level;
- The interaction between time, size, and density factors had a significant effect on COD level.

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