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Bioaccumulation Of Lead (Plumbum) In Red Tilapia Fish From The Jombor Swamp

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Bioaccumulation Of Lead (Plumbum) In Red Tilapia Fish From The Jombor Swamp

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Abstract. Lead (Plumbum, chemically known as Pb) is a dangerous heavy metal usually found in daily activities, such as fuel. Jombor swamp is located in Krakitan village, Bayat, Klaten. Daily routines by people inside or around the swamp cause a lot of pollution, which came from the waste of floating shops, agricultures, households, and fisheries. The purpose of this research was to analyze lead concentration inside the meat of red tilapia fish (*oreochromis sp*) in Jombor swamp. This research used an observational method, which means that researchers did not investigate the effect of intervention. The samples were taken with cluster sampling method consisting of 3 clusters. They included north cluster I, east cluster II and south cluster III. 25 grams of samples taken from each cluster, in which the fishes were cultured in Jombor swamp for 3 months with the same size. The analysis was conducted with atomic absorbance spectrophotometer, and the data obtained were processed with computerization spectrophotometry method of atomic absorption and the data are processed with computerization programme to examine the mean and deviation standard. This research found that the median of cluster I was 1,45275 mg/kg, cluster II was 0,3143 mg/kg and cluster III was 0,3129 mg/kg. Conclusion: meat of red tilapia fishes cultured in Culture I Jombor swamp positively contained lead as many as 1,45275 mg/kg with safety limit of 0,2 mg/kg.

1. Introduction

Swamps are formed due to blocked drainage and have special physical, chemical and biological characteristics. It creates scientific puddles that occur continuously or seasonally. Swamp in Jombor is a land used by local residents for fish farming as a source of income. Tilapia is a fish that is widely cultivated, consumed and marketed by local residents. Tilapia is a freshwater fish that has high economic value. This fish has a fast growth rate and is not difficult to cultivate. It also has a high tolerance level for stress from the environment (Nirmala et al, 2012).

Residents around the river that empties into the swamp jombor often dispose of waste and other pollutants. This activity can affect the quality of water and fish that live in it (Palar, 2004). The amount of garbage and passing vehicles is assumed to have a lot of heavy metal pollutants. The presence of heavy metals such as lead (Pb) in the body is still unknown or can even be toxic. This heavy metal can cause health effects for humans depending on where the heavy metal is bound in the body. If the density of these metals is higher than normal, these metals will become a threat to human health if they enter the food chain (Yudo, 2006). Lead causes renal failure andliver damage in humans (Zhang *et al.,* 2007).

Bioaccumulation of heavy metals in the human body needs to be prevented, so a study is needed to analyze the content of heavy metals (lead) in tilapia. This study aims to determine the safe limit for consuming fish containing lead metal.

2. Experimental
2.1 Materials
Materials that have been used in this study are red tilapia meat taken from 3 places in Rawa Jombor, namely the first cluster in the south (karamba area), the second cluster in the northern region (floating stall area), the third cluster in the eastern region (fishing area).

2.2 Sample Preparation of Red Tilapia Fish
Samples were prepared by the Microwave Digestion method (Azaman *et al*, 2015). Fresh tilapia cleaned and taken as much as 25 grams of meat. then mashed and dried in an oven at 50-60 ° C for 3 days. Dried fish mashed and weighed as much as 0.5 grams. The fish is put into the vessel and added 10 ml then homogenized until the tilapia fish powder dissolves, waiting for 15 minutes. Inserted into the device and programmed according to Animal Tissue guidelines, wait about 35 minutes. Cooled in a fume hood and filtered with Whatman filter paper No. 40 and given aquadest until it reaches 50 ml then tested for lead content with SSA (Anonymous, 2007).

3. Results and Discussion
Fish is a bio-indicator of environmental pollution, including chemical contamination. This is because fish show reaction to contamination in waters with certain concentration limits such as changes in activity, effects on abnormal growth and death (Cahaya, 2003). Pollution of heavy metals in the waters of Rawa Jombor is thought to have come from household waste that flowed from several rivers to empty into Rawa Jombor. It was also affected by passing motor vehicle fumes. Non-essential metals are not known to play any metabolic function although, as a consequence to their bioaccumulation in fish, these metals can be toxic for humans, even at very low concentrations (Rajeshkumar and Li, 2018).The results of the analysis of the content of heavy metal (plumbum) in red tilapia meat can be seen in table 1.

Table 1. Content of Lead from Red Tilapia Fish

No.	Cluster	Average of content (mg/kg)
1.	I	1,4527
2.	II	0,3143
3.	III	0,3129

Cluster I has an average lead level of 1.4527 mg / kg, which is the highest karamba area compared to other areas. This is because the karamba area is very close to residential areas, and many motorized vehicles pass around it and the fish culture net area is in the middle of the Swamp so it is assumed there is more lead exposure compared to other regions. Another factor that causes fish to have high lead levels is the weight of the sample which is heavier than the other samples.

Cluster II with an average lead level of 0.3143 mg / kg in the area of the floating stalls. This area has lead content which also exceeds the safe standard of lead content set by BPOM Regulations. This is because the sampling area has less vehicle intensity in the karamba area and the fish cultivation area is located protruding into the middle of the Swamp and close to the tributary inflow from the surrounding villages.

Cluster III with an average lead level of 0.3129 mg / kg in the fishing area. Samples were taken in areas where there were few visitors or the intensity of motor vehicles that passed a little and fish farming was close to the flow of water leading out of the Swamp, so it was assumed that lead levels in this area were the lowest among the three clusters. The low lead content in red tilapia meat can also be affected because the sample age has not reached 3 months. this is because in this area it is difficult to identify whether the fish has reached the age of 3 months or not.

All three clusters have varied results and exceed the threshold set by the Regulatory Agency for Drugs and Food which is more 0.2 mg / kg. Heavy metals such as lead enter the fish's body through water, sediment and food consumed by fish. Heavy metals that enter the water will generally settle to the bottom of the water because lead has a greater density than sea water. Pb metal will accumulate in sediment and detritus, so that the chance of Pb entry into the body of sediment-eating and detritus-eating fish will be even greater and will eventually accumulate in large numbers (Simbolon et al, 2010).

Lead contamination must be watched out because it gives a very dangerous effect to the body. And will take its adverse effect when it reach its certain level inside the human body (Solidum et al., 2013). Therefore, it is clear that fish contaminated with lead are not only directly harmful to human health but also cause indirect effects that can harm humans, as lead contamination renders some locations unsuitable for fishing and also reduces fishing yields (Hasmi and Mallongi, 2016). Efforts to protect from lead contamination can be minimized by installing filters on house ventilation, greening the side of the road, not throwing garbage in the river, wearing masks when driving and not consuming food containing lead or sold on the roadside.

4. Summary
Lead exposure (Pb) occurred in red tilapia (Oreochromis sp) in Rawa Jombor, Krakit Village, Bayat District, Klaten Regency. The average lead content of the three clusters exceeds the limit set by the Regulatory Agency for Drugs and Food of 0.2 mg / kg.

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