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Bioconcentration of Heavy Metal Cu in Different Tissues of Milkfish [*Channos channos* (Forsskal, 1775)] in Ujung Pangkah, Gresik, East Java, Indonesia

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Abstract

The concentration of Cu in milkfish organs, muscle and liver as well as in water ponds located in Ujung Pangkah, Gresik in April 2015 were investigated. The milkfish in three ponds with different size which were 26 cm (small size), 32 cm (medium size) and 46 cm (large fish) were taken. The liver of mikfish with size 26 cm, 32 cm and 46 cm contained the highest concentration of Cu. Moreover, Bioconcentration Factor of Cu in liver small milkfish (26 cm) was 2 983 which is approximately 100 times higher compare to Biocencentration Factor of Cu in muscle of similar size of fish.

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Keywords: Accumulation; heavy metal Cu; liver; milkfish; muscle

1. Introduction

Gresik Regency is well known as industrial areas. Various industries were found such as cement industry, wood industry, steel industry, chemical industry and power plant. Wastewater that is produced from those industries may contain heavy metal materials. If the industries do not handle properly, the wastewater may contaminate the

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surrounding environment. One of pollutants found in the Gresik's environment is Cu. Presence of Cu in aquatic environment is in low condition naturally. However, Cu concentration become high due to anthropogenic discharge from industrial activities (Joseph and Kundig, 1999) .

Cu that is presence in high concentration in the environment will give detrimental impacts. Although it is confirmed as a toxic material, Cu in sufficient concentration is involved in organisms' metabolism. So that, in this case Cu is classified as essential element (Puig and Thiele, 2002).

Once Cu enters the environment, they may presence in river water, sediments as well as coastal and marine environment. Supriyadi (2002) reported that Cu in water of Bengawan Solo Estuary in Gresik, Indonesia gained 0.218 mg · L^{-1}. This number is higher compare to environmental quality standard issued by Indonesia's Ministry of Environmental Affair. Unfortunately, there are many milk fish [*Channos channos* (Forsskal, 1775)] ponds around Bengawan Solo's Estuary which belong to administrative area of Ujung Pangkah District. According to Central Agency of Statistics of Gresik, this area has approximately 3 964 ha of milk fish ponds. High content of Cu in river water may transfer to water pond since the local resident use the river as the source of water to fill their milk fish ponds. Hence, the pond water as well as the milk fish may contaminate to heavy metal Cu. Henny (2011) stated that the higher concentration of metals in water environment, the higher metals content exposed to the fish in water. Fish such as milkfish can absorb metals from their environment and food web and concentrate it in various organs at different level concentration. This process also depends on environmental quality parameters such as salinity, pH and temperature. The concentration of accumulate metals in fish may higher compare than concentration metals in water and sediment (Hesni et al., 2011; Bhattacharya et al., 2008; Sani, 2011).

Metals in aquatic environment dominantly are not be dissolved in lipid. Hence, metals tend to more accumulate in non lipid rich tissue of fish such in muscle and liver. Hence, the aims of present study were to determine the bioconcentration of heavy metal Cu in muscle and liver tissue of milk fish grown from Ujung Pangkah ponds, Gresik, East Java, Indonesia. This study also wants to reveal the influence of different size of milkfish on the accumulation of Cu in their tissues. So, this work tries to give information on heavy metal Cu content in aquaculture milkfish as a concern of harmful impact of heavy metal consumption.

2. Material and methods

The study was conducted in milkfish aquaculture ponds located in Ujung Pangkah District, Gresik, East Java. The sampling and water quality measurement was carried out in April 2015. The study area is presented in Figure 1.The sampling of milkfish was taken from three ponds. Milkfish that were taken randomly in each ponds was grouped into three different sizes which were average length of 26 cm, 35 cm, and 47 cm. The fish was catch by using net. Then, they were sectioned to get liver and muscle. The liver was taken from inside part of body, behind of heart or it can be found near intestines of milkfish. However, muscle was removed from abdominal part of milkfish. The samples liver and muscle were weighed and then stored in plastic samples.

The water samples were obtained in three ponds. The Van dorn water sampler was employed to take water sample near surface. The taken water was placed into 1 L of polyethylene bottle which was previously rinsed by HNO_3 2.5 N and distilled water. All samples were put in cool box with temperature ± 4 ºC. Measurement of Cu content in milkfish's tissue and water ponds was conducted by Shimadzu AA-7000 Atomic Absorption Spectrophotometer according to SNI method No. 06-6596-2001. The measurement was done in Laboratory of Environmental Quality and Process Engineering, Environmental Engineering Field of Study, Institut Teknologi 10 November. The other measured parameters for water quality were water temperature, pH, DO, salinity and TSS. Moreover, data were analyzed descriptively and statically (correlation and ANOVA) using SPSS 16.0.Bioconcentration factor was gained from ratio between concentration of Cu in tissue of milkfish and in waterpond.