

The Reduction of Lead in Fish Meat from Floating Net Cages in Cirata Reservoir by Citric Acid

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Abstract

The objective of the research is to reduce the lead content in the meat of carp, tilapia and catfish cultured in floating net cages (FNCA) in Cirata Reservoir by citric acid solution. The experimental method uses two treatments. The first treatment is by citric acid solution at four level concentration of 15, 20, 25 and 30%. The second treatment is the arrangement of the duration period of the soaking process at five condition of 30, 60, 90, 120 and 150 minutes. Each combination of the treatments is repeated twice. The observation has been done to determine the lead content of fish meat using AAS (Atomic Absorption Spectrometry). The lead content data is analyzed descriptively and compared to the standard.

The results indicate that the lead content in carp meat is under the allowed standard when treated with 15% citric acid and 150 minutes soaking time. The initial concentration of lead in the carp meat is 3.152 ppm. The lead content in the tilapia meat is under the allowed standard when treated with 25% citric acid and 150 minutes of soaking time. The initial concentration of lead in the tilapia meat is 3.878 ppm. The lead content in the catfish meat is below the permissible quality standard at the treatment of 25% concentration of citric acid with the duration of soaking time of 120 minutes. The initial content of lead in the catfish meat is 3.911 ppm.

Keywords: Heavy metal, FNCA, Cirata Reservoir, Citric Acid.

Introduction

Fish freshwater species commodities that are generally traded in Bandung and West Java Province are the Carp (*Cyprinus carpio*), Tilapia (*Oreochromis niloticus*) and Pangasius (*Pangasius pangasius*). These species are the post-harvested products from the intensive aquaculture in the floating cage system (FCS) in Cirata reservoir. Nevertheless, several studies reveal that the water quality in this reservoir is contaminated by the heavy metals i.e. cadmium, zinc, lead and mercury.

The concentrations of those heavy metals are extremely above the allowed national standard water quality according to the Indonesian government regulations. The heavy metals in the water of Cirata reservoir can be bio-accumulated in

the aquatic organisms including the cultured fish species. The bio-accumulation of heavy metals may occur in the meat part¹. Furthermore, it is estimated that the heavy metals uptake from the waters into the body tissue can be through the skin, digestive system and respiration². Moreover, the bioaccumulation levels in fish meat were affected species, metals-specific and also by the physical parameters of water such as pH, temperature and salinity³.

The accumulation of heavy metals in the fish meat can have a fatal impact to the human who consumed it⁴. The heavy metals contained in fish meat cannot be metabolized or accumulated in the human body⁵. Moreover, they can significantly affect the health condition. Several health disorders can be observed such as dizziness, allergies and impaired growth of abnormal cells⁶.

Therefore, efforts should be made to overcome this health problem. One possible solution may be conducted such as the heavy metals binding from the heavy metals contaminated fish meat to decrease their concentration. This alternative solution can be implemented before the contaminated fish meat is processed and consumed by human.

A study from Junianto et al⁷ estimated that intensively cultured Tilapia, Carp and Pangasius in Cirata reservoir are heavily contaminated by the lead metal. The concentration of this contaminant has extremely surpassed the allowed national standard quality (2 ppm).

Heavy metals binding in fish meat can be performed using acid compounds such as citric acid⁸. The effectiveness of heavy metals reduction in fish meat can be influenced by the type of fish, acid concentration and submersion time as well as the preparation technique either in a whole fish form or in fillet form⁹.

However, this research on heavy metals binding to reduce the metal concentration in fish meat is still less documented. Most importantly, this technique is expected to support the food security in the future. Therefore, this study is aimed to determine the concentration levels, submersion time and preparation technique in order to decrease the lead concentration in the Carp, Tilapia and Pangasius fish meat by using citric acid as the binding agent.

Material and Methods

The present study consists of two stages. First is by evaluating the heavy metals contamination on the three most consumed freshwater fish, namely the Carp, Tilapia and