

Removal of Copper from Water System using Moringa oleifera Press Cake

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Abstract— Moringa oleifera is a multipurpose tree with most of its parts being useful for a number of applications. This study is carried out to investigate the potential of Moringa oleifera press cake (MOPC) to be used as biosorbent for Cu (II) ions from water system as a natural, environmentally friendly biosorbent. Copper and other heavy metals present in water are harmful and poisonous and need to be removed from water; using natural biosorbent is one of the solutions. The synthetic water with 200 NTU was used in this study to monitor the biosorbent efficiency. The stock solution of copper with different concentration were added to synthetic water and different dosages of press cake was added and the copper concentration before and after addition of the biosorbent was measured using atomic absorption spectrometry (AAS). The residual turbidity was measured as using jar test and reported. The results showed that the Moringa oleifera press cake is reducing the copper concentration up to 53.49%, and turbidity removal up to 75.45%. More research need to be carried out to find the optimum conditions to remove Cu (II) from water.

Keywords—Biosorbent, Copper (II), Moringa oleifera press cake, Turbidity.

I. INTRODUCTION

Moringa oleifera is a multipurpose tree with most of its parts being useful for a number of applications (Fig. 1). It is generally used in a number of developing countries as a vegetable, medical plant and a source of vegetable oil. It has an impressive range of medicinal uses with high nutritional value [1]. On the other hand, Moringa oleifera seeds have been found to be a natural coagulant, flocculants, softener, disinfectant, and sludge conditioner [2], [3], [4], heavy metal remover in water and wastewater treatment [5], [6].

Copper is both an essential nutrient and a drinking water contaminant. It is an important trace element required by humans for its role in enzyme synthesis, tissue and bone development [3]. However, excessive amounts of copper consumed is toxic and carcinogenic and it leads to its deposition in the liver and causes many diseases such as Wilson disease, liver and kidney failure and finally gastrointestinal bleeding [7].



Fig. 1. Moringa oleifera tree

The excessive amounts of Cu (II) in fresh water resources and aquatic ecosystem damage the osmoregulatory mechanism of the freshwater animals and cause mutagenesis in humans [8]. Large quantities of copper are released to the environment by discarding industrial waste without further treatment [9]. According to World Health Organization (WHO) the permissible limit of Cu (II) in water is 1.5 mg/l [8]. According to the Ministry of Health Malaysia the acceptable limits of Cu (II) in drinking water should be 1 mg/l [10].

Since Malaysia is widely recognized as one of the centers of biological diversity, rich with wild plants, it will be beneficial for the researchers to further screen the valuable biosorbent. All of these resources could provide renewable useful products not only for the current generation but also for the future generations to come. Hence, this study is initiated to target the miracle tree Moringa oleifera to be used as a potent biosorbent for Cu (II) ions. To help in finding an alternative methods to treat water, which could be economically and environmental friendly techniques.

Copper and other heavy metals present in water are harmful and poisonous and need to be removed from water; using natural biosorbent is one of the solutions. Few studies reported the removal of some heavy metals from water by Moringa oleifera, however the use of Moringa oleifera press cake adsorb Cu (II) from water still not too much targeted and minimally used in this field, thus more research is needed. Therefore, this project is an investigation of removing mainly copper from water.

Copper can be produced from electronics plating, paint manufacturing, wire drawing, copper polishing, and printing operations. The high presence of copper can cause acute toxicity, dizziness, diarrhea [8], [10].

Copper is an essential nutrient and a drinking water contaminant. It is an important element required by humans in trace amounts, used by human body for enzyme synthesis, tissues and bones development [3]. However, the excessive amount of it, is toxic and carcinogenic. Deposition of copper in body causes health problems such as Wilson disease, liver and kidney failure and gastrointestinal bleeding [8]. The excessive amounts of Cu (II) in fresh water resources and aquatic ecosystem damage the osmoregulatory mechanism of the freshwater animals. Large quantities of copper are released by the disposal of untreated