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Water Hardness Removal by Coconut Shell Activated Charcoal

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Abstract

Excess water hardness is a problem in many parts of the world including Sri Lanka. It is a measure of the quantity of divalent ions such as Calcium and Magnesium. The long-term consumption of hard water has directly been associated with a number of challenges including the Chronic Kidney Disease (CKD) in Sri Lanka. Therefore, removal of water hardness has become a challenging issue for all communities especially in underdeveloped areas, who mostly rely on groundwater sources. Thus, it is important to reveal water softening applications with the aim of providing safe drinking water by introducing the low-cost natural materials.The most common means of reducing water hardness rely on reverse osmosis or ion-exchange resin but according to the traditional knowledge in Sri Lanka, coconut shell activated charcoal has been used to purify well water. The present study was aimed to check the truthiness and the most suitable amount of activated charcoal to reduce water hardness as the shells of the *Cocos nucifera* is a cheap and easily available source to produce activated charcoal in Sri Lanka. Activated charcoal of the coconut shell was prepared by heating at 350^{o} C by 15minutes at Muffle furnace. Natural hard water samples were collected from three selected water sources near the research site in Badulla with the 300 mg/L hardness. Three replicates were done for each dosage of 15 g, 20 g and 25 g activated charcoal with the controller and water hardness was determined by the EDTA titrations. All the data were analysed using the one way anova.According to the results there was a significant difference between initial water hardness (300mg/L) and final water hardness of samples within the two hours time period. Water hardness removal efficiency was calculated, and it was between 40%-50% within that time period. When increasing the weight of the coconut charcoal the water hardness removal efficiency was increased by 2% respectively Water hardness removal efficiency became into the range between 50%-60%, within the increasing time period up to four hours in each sample. Therefore, it is a more effective water softening natural material that can be easily used in day to day life and it is one of the best alternatives which can be used as an efficient purifier of water with low cost.

Keywords: Activated Charcoal, Water Softening, Water Hardness Removal Efficiency, Coconut shell