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Activation of wood biochar and red brick using natural coconut vinegar

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Number of studies have been carried out to determine the efficiency of strong oxidizers in activating natural raw materials used in low cost water purification processes. However, rural communities find it difficult to acquire most of such chemicals. Therefore, this study was aimed to determine the ability of natural coconut vinegar, which is a common domestic acidic solution, in activating abundantly available potential water purifying materials to reduce calcium (Ca^{2+}) ions from water, further reducing the water hardness. In this study mature barks of Glyricidia (*Glyricidia sepium*), Gadumba (*Trema orientalis*) and Ipil Ipil (*Leucaena leucocephala*) were collected and air dried. These were carbonized (400-450 °C) in a closed vessel (2 hours) to produce biochar. Both biochar and brick particles in the range of 2.0-5.6 mm were selected for the analysis. For the activation these samples were soaked in natural coconut vinegar (biochar/brick: vinegar, 1:2 V/V) for 24 hours and completely dried in an oven (120 °C) for 3 hours. Laboratory scale glass columns (2 cm in diameter) were used to calculate Ca^{2+} adsorption and retaining capacities. Filtrates were analyzed for Ca^{2+} using flame photometer. Ca^{2+} adsorption and retaining capacities of each material were calculated per unit bulk volume of the material. Each test was duplicated, and the average was recorded. Untreated red brick and biochar of Glyricidia, Gadumba, Ipil Ipil showed Ca^{2+} adsorption capacities of 0.44, 0.30, 0.31, 0.27 mg cm^{-3} and retaining capacities of 0.19, 0.01, 0.02, 0.02 mg cm^{-3} respectively. Activated red brick and biochar of Glyricidia, Gadumba and Ipil Ipil showed Ca^{2+} adsorption capacities of 0.76, 0.58, 0.68 and 0.63 mg cm^{-3} and retaining capacities of 0.25, 0.20, 0.23 and 0.15 mg cm^{-3} respectively. Increase in Ca^{2+} adsorption and retaining capacities were observed in all the materials tested after activation with vinegar. Further studies are continued to use the vinegar activated natural materials in a low-cost domestic drinking water purification process.

Keywords: Adsorption, Biochar, Calcium, Vinegar

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