ABSTRACT

Due to their toxicity, heavy metal ion like Fe^{2+} are a category of contaminants that should be avoided in the aquatic environment. The necessity to develop a low-cost, efficient technology for removing heavy metals from water is inescapable. The purpose of this experiment was to determine the adsorption efficiency and capacity of black, green and white Twinings tea waste in removing $Fe^{2+}_{(aq)}$. The impact of changing several factors such as the starting concentration of Fe^{2+} in solution, the physical texture of the adsorbent used, and the contact duration was studied. Solutions were made in two categories: sonicated and non-sonicated. Each category had a set of both fine and regular tea leaves. Both sonicated and non-sonicated samples were made with increasing amounts of $Fe^{2+}_{(aq)}$. All solutions were treated with 0.025 g of tea waste for 90 minutes. Both sonicated regular and fine black tea samples showed a high adsorption efficiency of 100% while the non-sonicated samples varied with 72.4% as the highest efficiency. Sonicated tea samples yielded a higher adsorption capacity of 4.5 mg/g compared to 3.5 mg/g of non-sonicated tea samples. Based on these calculated adsorption efficiencies and capacities, the experiment demonstrated that sonicated tea samples are the most effective at removing iron contamination in water. This study also showed black tea to be most efficient compared to green and white tea. However, further research is necessary to determine the most efficient tea between green and white tea.

Keywords: Heavy metals, Iron (II), UV-Vis Absorption Spectroscopy, FTIR, Adsorption efficiency, Adsorption capacity, contact time