

Abstract

In Chavakachcheri area in Jaffna, water is brown color in some dug wells and tube wells, but not in all. In certain tube wells, once water is taken out, with time brown color is formed. Brown coloration cause many adverse effects. The aim of the research is to identify the color causing substance and to investigate the possibility of color removal or prevention using two biosorbents, charcoal of coconut shell (CS) and charcoal of rice husk (RH) and to optimized the removal ability with respect to weight of biosorbents and time. Seven water samples of colored (C) and five of non-colored (NC) of both tube wells and dug wells were taken for the analysis. Qualitative and quantitative analysis (physical and chemical) were carried out for both C (precipitate and filtrate) and NC. RH and CS were prepared with particle size of 212 μm and 600 μm respectively. With the quantitative analysis, total iron (0.2 ppm), SO_4^{2-} (103 ppm), Cl^- (486 ppm) were found in the filtrate of C, Fe^{3+} ions (6.2 ppm) in precipitate of C and SO_4^{2-} (326 ppm), Cl^- (75 ppm) were found in NC. With these evidence, it was suspected that $\text{Fe}(\text{OH})_3$ is the colored substance. The mean value of pH, EC, turbidity, total alkalinity, DO, COD for C and NC were 7.15, 2177 $\mu\text{S}/\text{cm}$, 24.2 NTU, 266 ppm, 3.77 ppm, 7.4 ppm and 8.15, 1638 $\mu\text{S}/\text{cm}$, 0.28 NTU, 253 ppm, 5.38 ppm, 3.5 ppm respectively. After carrying out a preliminary study, for the weight optimization experiment, different weights of biosorbents (0.025 g, -0.750 g) were equilibrated (100 rpm) for 30 min. in synthetic water (25.0 mL of 7 ppm) of Fe^{2+} and Fe^{3+} solutions at pH 8.5. Concentrations of total iron before and after equilibration (in the filtrate) were determined. Then optimal weight of each biosorbents was equilibrated for different time periods (1- 20 min.) in the same above conditions to determine the optimal time. For Fe^{2+} and Fe^{3+} solutions, optimized weight and time for both biosorbents were 0.025 g/25.0 mL for 1minute with a removal of total iron 93% (Fe^{2+}) and 94% (Fe^{3+}) by RH and 88% (Fe^{2+}) and 88% (Fe^{3+}) by CS respectively. The maximum concentrations of Fe^{2+} and Fe^{3+} solutions that can retain without forming the color at different pH were determined and for ferrous it was 8.31 and 8.21 respectively. The findings were applied to synthetic water (7 ppm, pH 4.0) and natural tube well water before the formation of color. With natural water, total iron reduction was 80% after 1min and 82% after 24 hrs. for RH and for CS it was 78% after 1min. and 82% after 24 hrs. With synthetic water it was