EFFICIENCY OF COAGULATION PROCESSES FOR THE TREATMENT OF GROUNDWATER

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ABSTRACT

Groundwater is formed by infiltration of precipitation, surface runoff or water stored in surface bodies including rivers and lakes to an aquifer. Ground water quality is important as it is the main factor determining its suitability for drinking, domestic, agricultural and industrial purposes. Groundwater is being polluted by various ways. Seasonal flood is one of the ways of polluting the groundwater severely in most of the areas of Batticaloa District. Turbidity is an easily measured parameter in water treatment that provides information about water quality. In drinking water treatment, alum coagulation and flocculation are common processes used to remove turbidity and natural organic matters. In these processes, the addition of alum typically neutralizes negatively charged particles in solution minimizing electrostatic repulsive forces. This leads to the formation of particles which aggregate into larger particles known as flocculant particles or "flocs". The aggregated flocs can then be removed by filtration.

This study was designed to determine the optimal alum dose required to treat the ground water in Sithandi village, Sithandi G. N. Division in Eravur Pattu D.S Division, Batticaloa District. The total of 15 wells which were polluted by recent seasonal flood, were selected randomly from the village for analyzing the samples. The most problematic well among the 15 wells, was selected to collect the samples during the period from November 2015 to January 2016 with three replicates. Analyzing of sample was done at the laboratory of Agricultural Engineering, Faculty of Agriculture, Eastern University, Sri Lanka. Water quality parameters tested included turbidity, alkalinity, total suspended solids, total dissolved solids, total solids, electrical conductivity, pH and temperature.

Collected water sample was treated with Ammonium alum at different dosage (control, 2.5 mg/l, 5 mg/l, 7.5 mg/l, 10 mg/l, and 12.5 mg/l) with three replicates. In these treatments, 2.5 mg/l of alum resulted the pH of (8.39$\pm$0.01), turbidity of (8.45$\pm$0.12 FTU), alkalinity of (2.20$\pm$0 mg/l), total suspended solids of (166.67$\pm$57.74 mg/l), total dissolved solids of (500.00$\pm$0 mg/l), total solids of (600.00$\pm$0 mg/l) and electrical conductivity of (500.00$\pm$0 μs/cm). Alum of 5mg/l resulted the pH of (8.39$\pm$0.01), turbidity of (1.33$\pm$0.03 FTU), alkalinity of (2.20$\pm$0 mg/l), total suspended solids of (0.00$\pm$0 mg/l), total dissolved solids of (533.33$\pm$33.33 mg/l), total solids of (533.33$\pm$57.74 mg/l), electrical conductivity of (516.67$\pm$5.77 μs/cm). Alum of 7.5 mg/l resulted the pH of (8.35$\pm$0.01), turbidity of (1.30$\pm$0.02 FTU), alkalinity of (2.13$\pm$0.06 mg/l), total suspended solids of (0.00$\pm$0 mg/l), total dissolved solids of (533.33$\pm$33.33 mg/l), total solids of (533.33$\pm$57.74 mg/l) and electrical conductivity of (530.00$\pm$0 μs/cm). Alum of 10 mg/l resulted the pH of (8.29$\pm$0.01), turbidity of (1.24$\pm$0.01 FTU), alkalinity of (2.07$\pm$0.06 mg/l), total suspended solids of (0.00$\pm$0 mg/l), total dissolved solids of (566.67$\pm$33.33 mg/l), total solids of (566.67$\pm$57.74 mg/l), electrical conductivity of (540.00$\pm$0 μs/cm) and 12.5 mg/l of alum resulted the pH of (8.24$\pm$0.01), turbidity of (1.22$\pm$0.01 FTU), alkalinity of (2.00$\pm$0 mg/l), total suspended solids of (0.00$\pm$0 mg/l), total dissolved solids of (600.00$\pm$0 mg/l), total solids of (600.00$\pm$0 mg/l) and electrical conductivity of (563.33$\pm$5.77 μs/cm). Even the alum doses of 5 mg/l, 7.5 mg/l, 10 mg/l, and 12.5 mg/l effectively reduced the turbidity, total suspended solids and total solids, the alum dose of 5 mg/l is recommended to because of minimum dosage and effective treatment.

Key words: Alum, Coagulation, Groundwater, Turbidity

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