

APPLICATION OF GUM GUAR AS A COAGULATION AID

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Guar Gum (*Cyamopsis tetragonolobus*) is a plant from the leguminous family. Guar is of interest to a variety of industries because the pulverised endosperm from its seeds forms a naturally viscous colloidal dispersion when it is hydrated. Since guar gum is a non-toxic water-soluble polymer, there is potential to use it as a coagulation aid / flocculant in potable water treatment. Traditionally, synthetic polyacrylamide based chemicals have been used as coagulation aids in water treatment. However, there is a growing concern about using acrylamide as it is known to be a neurotoxic, affects germ cells, and impairs reproductive function. The aim of this work was to investigate the suitability of using guar gum as a polymeric coagulation aid in potable water treatment and to optimise its dose by statistical analysis.

In the first phase of this study, a set of jar tests were used to establish the optimum experimental conditions in terms of pH, coagulant (alum) and flocculant aid (guar gum) dose necessary to promote colloidal destabilisation resulting in a clarified water turbidity of 1NTU. Response Surface Methodology (RSM) was used in the design and analysis of the experimental data. Among the solutions generated in phase 1 of this study, the solution corresponding to the factor levels: alum (44.97 mg/l), guar gum (1.80 mg/l) and pH (5.79) was chosen owing to the small alum dose involved. The optimum experimental condition identified in the first phase was then applied to the second phase to determine the effect of guar gum on the settling velocity of floc particles. For settling velocity distribution studies, two experimental runs, namely, A (with guar) and B (without guar) were carried out. Settling curves were obtained by plotting turbidity values of the samples drawn from a fixed depth below the liquid surface in each column at various sampling times, namely, 1, 2, 4, 8, 16, 32, and 64 minutes. The use of guar gum as a flocculant aid along with the primary coagulant alum significantly improved the settling velocities of flocs and enhanced the rate of clarification. For example, in experimental run A, approximately 81.2 % (100-18.8) of the raw water turbidity settled at a rate equal to or greater than 12 cm/min when guar gum was used compared to only 47 % (100-53) that settled when the same experimental run was carried out in the absence of guar gum (run B).