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Enhancement of Pumpkin Seed Coagulant Efficiency Using a Natural Polyelectrolyte Coagulant Aid

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Abstract : Recent studies have pointed out several serious drawbacks of using chemical coagulants such as aluminium and iron salts. These drawbacks include Alzheimer's disease occurring as a result of residual aluminium normally present in treated water and production of large sludge volumes [1]. To eliminate the problems associated with these chemical coagulants, the use of natural coagulants produced from microorganisms, animals, or plants have been found promising. Based on that, in this work, coagulation process has been used to treat dairywastewater that was synthesized by dissolving instant powdered milk in borehole water for turbidity removal. The coagulant used, which was aided with tamarind tree bark, was prepared from pumpkin seed. In order to investigate turbidity removal efficiency of the coagulants and coagulation process kinetics, three sets of experiments were carried out using conventional jar method. The first and second experimental sets were carried out to determine the optimum pH and optimum time for the coagulation. In the third set of experiments, the coagulant and the aid concentration were varied while keeping pH and time at their optimum values already found. The results showed that the optimum operating conditions for turbidity removal from the dairy wastewater were pH of 5, coagulation time of 15 min and concentrations of both coagulant and its aid were 0.5 g/L aid each. Under these optimum conditions, 93.67% turbidity removal was found to be achieved. The results of this work were found to be better than those of [2] in which the maximum efficiency obtained was 71.09%. Therefore, it can be said that the efficiency of the coagulant has been enhanced with the addition of the tamarind tree bark, which is a polyelectrolyte coagulant aid. Furthermore, the kinetics study carried out on the process at the obtained optimum conditions revealed that the process reaction order and rate constant were 3.48 and 2.35×10⁻⁶min⁻¹NTU^{-2.48}, respectively.Based on the results obtained, the use of pumpkin seed as natural coagulant and tamarind tree bark as aid for treatment of industrial wastewater is recommended as a pretreatment step for industries because of its promising environmental friendliness. Keywords:Coagulation, pumpkin seed, polyelectrolyte coagulant aid, dairy wastewater, coagulation kinetics.

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