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Paper-recycling wastewater treatment using *Ocimum basilicum L.* along with alum: Optimization by response surface methodology (RSM)

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ABSTRACT

The application of natural coagulants in coagulation-flocculation (CF) process in water and wastewater treatment includes many advantages compared with chemical agents, such as particular biodegradability, low toxicity, being economical and generating low volumes of sludge. In this research, *Ocimum basilicum L.*, as an active plant-based coagulant, in combination with alum, has been evaluated to treat paper-recycling wastewater. Response surface methodology (RSM), based on central composite rotatable design (CCRD), was employed to optimize the treatment process. The effect of three parameters including pH, alum- *O. basilicum* ratio and slow mixing contact time on the chemical oxygen demand (COD) and turbidity removal was analyzed. Results revealed that the maximum removal of COD and turbidity could be achieved in optimum conditions, i.e., pH value of 8.3, alum-*O. basilicum* ratio of 2.8 and contact time of 48.8 min, in which the reduction efficiencies of COD and turbidity were 39.7 and 81.4 %, respectively. The model predictions also agreed well with experimental data. In order to gain further insights into the properties of coagulants and produced flocs, Fourier Transform Infrared Spectroscopy (FTIR) and Thermal Gravimetric Analysis (TGA) employed as characterization methods. Results suggested presence of active functional groups on *O. basilicum* and the thermal stability of formed flocs. Furthermore, CF mechanism was most likely based on charge neutralization and adsorption with interparticle bridging. The present study showed that *O. basilicum* mucilage could be used as a coagulant aid in combination with alum in the treatment of paper-recycling wastewater.

Keywords: Ocimum basilicum; Coagulation; Paper-recycling wastewater

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