Removal of Reactive Red Dye (Cibacron FN-R) from Synthetic Wastewater by Using Natural Substance

Abstract — Synthetic textile wastewater was simulated by using Cibacron reactive red dye FN-R. Pomegranate peels were used as adsorbents to remove the red dye by applying a continuous fixed bed column reactor system having a filter with a diameter of 30mm and a length of 110mm. The effect of different parameters on the removal efficiency was studied; pH levels (2, 4, 6, 8, 10, and 12), flow rate (27, 45, and 60 ml/min), initial dye concentration (10, 15, 20, and 25 mg/l), and the contact time (30, 60, 90, 120, 150, and 180 min). It was found that the optimum pH level was within the range of 6 to 6.5. In addition, the removal efficiency was found to increase with decreasing the flow rate and the initial concentration of dye and increasing the contact time. The maximum percentage removal of dye obtained was 90% at pH, flow rate, initial concentration of dye ,and the contact time equal to 6, 27 ml/min, 10 mg/l, and 180 min respectively. Langmuir and Freundlich isotherm models were applied. The following equations were found for Langmuir and Freundlich respectively; 

\[ Y = 0.017X + 1.110 \] 

\[ Y = 0.810X + 0.083 \]

The corresponding correlation coefficients were 0.961 and 0.994, respectively, indicating that the Freundlich isotherm model being more representing to the data obtained in this study.

Keywords — Reactive red dye, Pomegranate peels, Continuous flow reactor, Adsorption.