

ABSTRACT

The study reported the use of banyan aerial roots as effective biosorbent for the removal of Reactive orange 16 and calcon dye from aqueous media. Various analytical techniques such as FTIR and XRD were utilized to characterize the adsorbent. The effects of adsorption process parameters namely adsorbent dose(0.1g to 1.0g), solution pH(2 to 10), temperature(35°C to 115°C), initial dye concentration(10ppm to 70ppm) and contact time(10 min to 90min) were studied by batch experiments. The experimental results indicate that the highest removal of 95.78% was achieved at the optimum conditions of adsorbent dose (0.2g for RO 16, 0.8g for calcon), solution pH(2 pH for calcon, 8 pH for RO 16), dye concentration of (30mg/L for calcon dye and 20mg/L for RO 16) at 55°C and 110rpm for (40min for RO 16, 60min for calcon). Adsorption studies revealed that the experimental data fitted best to pseudo second order kinetics and *Langmuir* isotherm than other models with $R^2 > 0.999$. The values of maximum adsorption capacities Q_{max} of calcon and RO 16 were calculated as 135.13mg/g and 140.84mg/g indicating the high adsorption capacity of aerial roots of banyan tree towards calcon and reactive orange 16. The spontaneity and feasibility of adsorption mechanism was validated by the negative values of $\Delta G^\circ < -20\text{kJ/mol}$. Furthermore, enthalpy values (13.18KJ/mol and 9.82KJ/mol) also indicated the physical and endothermic nature of the adsorption process on banyan aerial roots. The study proved the banyan aerial roots could be applied for the removal of other toxic dyes and pollutants from effluents.