Valorization of *Inula viscosa* waste extraction, modeling of isotherm, and kinetic for the tartrazine dye adsorption

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**ABSTRACT**

The aim of this study was the tartrazine dye removal from aqueous solutions using a solid waste from the essential oil extraction of *Inula viscosa*. Experiments carried out in batch mode showed that the adsorption depended on physical parameters such as pH, adsorbent dose, initial pollutant concentration, and temperature. The results of scanning electron microscopy and energy dispersion X-ray indicated that the potential to adsorb tartrazine dye onto *I. viscosa* was related to the adsorbent structure. The nature of the surface groups on the adsorbent was determined from the Fourier transform infrared spectroscopy and specific surface area. The dye retention was found to be pH-dependent and the tartrazine adsorption decreased with increasing pH over the pH range (1–6). The Langmuir, Freundlich, Temkin, and Dubinin–Radushkevich isotherm models were used to analyze the adsorption behavior. The maximum adsorption capacity was found to be ~43.1 mg g\(^{-1}\) at pH 2 and 298 K. Dye adsorption kinetic was well described by a pseudo-second-order model. The thermodynamic parameters indicated that the adsorption of tartrazine was spontaneous and endothermic, and the process was governed by physisorption owing to the low enthalpy. Therefore, *I. viscosa* is promising as a low-cost adsorbent for the dye removal from aqueous solutions.

**Keywords:** Adsorption; Tartrazine; Isotherm; Kinetic; Thermodynamic parameters

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