



## Efficient utilization of bio-energy process residue for removal of Drimarine Yellow HF-3GL dye from aqueous solution

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Received 12 July 2017; Accepted 24 December 2017

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### ABSTRACT

Bio-energy is an emerging field to address the energy crisis. The biomaterials used in bio-energy production processes undergo various chemical/physical/biological treatments which lead to the activation of biomass. The exploitation of residual biomass of bio-energy processes for wastewater treatment is an attractive option. In this work, the de-oiled/residual biomass of an insect species; *Trogoderma granarium* (khapra beetle) which was neither previously exploited for biofuel production nor for wastewater treatment was tested for the adsorptive removal of Drimarine Yellow HF-3GL dye from aqueous solution. The study was designed in batch mode, and important influencing parameters have been optimized including pH, contact time, biomass dosage, temperature and initial dye concentration. The residual insect biomass depicted maximum adsorption capacity (481.9 mg/g) by keeping solution pH 2 and temperature at 30°C. Adsorption of Drimarine Yellow HF-3GL dye onto insect residual biomass was found to be a quick process and equilibrium was attained within 15 min. The adsorption mechanism was investigated by applying different equilibrium models. Thermodynamic study was also conducted to check out the feasibility of process. Different kinetic models have been applied on experimental results and pseudo-second-order kinetic model was found to be best fitted on the experimental results. The biomass was characterized by Fourier transform infrared spectrometer analysis, scanning electron microscope analysis and point of zero charge determination ( $pH_{pzc}$ ). The study results indicated that *Trogoderma granarium* de-oiled biomass has good adsorption potential and bio-energy process residues can be an attractive option for reducing the water pollution.

**Keywords:** *Trogoderma granarium* (khapra beetle); Adsorption; Equilibrium study; Kinetic study; Thermodynamic study

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