ABSTRACT

The innovative research looked at the degree to which sawdust, rice husk, and corn husk, both raw and chemically modified, could absorb dyes like methylene blue and congo red from synthetic waste water. Utilizing (H_2SO_4), (NaOH), and detergent powder, sawdust (SD), rice husk (RH), and corn husk (CH) were chemically treated as biosorbents. Based on the adsorption intensity (qmax) and the percentage removal effectiveness (% RE) of the dyes methylene blue (MB) and congo red (CR), the adsorption potential was calculated. The impacts of pH, contact time, biosorbent dose, and dye initial concentrations were also studied on raw sawdust (RSD), rice husk (RRH), and corn husk (RCH). The biosorption of MB and CR dyes was dependent on pH and maximum biosorption of MB dye was attained at pH 10, and congo red was achieved at pH 2. The greatest % RE was obtained at a dose of 1.0 g of biosorbents, and an optimal contact time of 120 minutes. The impact of dye initial concentration showed that biosorption intensity declined as the dye concentration rose, with MB and CR dyes having the optimal dye concentration of 10 mg/L. In comparison to raw biosorbent, chemically treated biosorbents have increased surface porosity, according to a SEM study of surface morphology. Similarly after chemical modification, the FTIR spectrum demonstrated the existence of active surface functional groups. According to the percentage removal efficiency (%), the detergent treated sawdust (DTSD), detergent treated rice husk (DTRH), and detergent treated corn husk (DTCH) demonstrated 99.26 ± 0.14 (%), 80.71 ± 1.72 (%), and 98.15 ± 0.07 (%) elimination. In contrast, the base treated sawdust (BTSD), base treated rice husk (BTRH), and base treated corn husk (BTCH) demonstrated 83.74 ± 2.34 (%), 78.67 ± 2.69 (%), and 94.52 ± 0.17 (%) percentage removal efficiency for methylene blue dye from synthetic wastewater, respectively. The findings of % RE show that the detergent treated sawdust (DTSD), detergent treated rice husk (DTRH) and detergent treated corn husk (DTCH) showed 72.54 ± 3.75 (%), 65.02 ± 2.50 (%) and 48.42 ± 2.51 (%) elimination as compared to base treated sawdust (BTSD), base treated rice husk (BTRH) and base treated corn husk (BTCH) which show 91.44 ± 0.21 (%) and 78.40 ± 2.62 (%) 69.10 ± 2.90 (%) percentage removal efficiency for congo red dye from synthetic wastewater , respectively. MB and CR dye removal potential was lower for sawdust, rice husk, and corn husk in their raw and acid-treated forms. The best fitting models for predicting the adsorption methods were the Freundlich isotherm model and the Langmuir isotherm model.