

MANGO (*Mangifera indica*) LEAF-DERIVED BIOSORBENT FOR EFFECTIVE TURBIDITY REMOVAL FROM RUBBER PROCESSING WASTEWATER

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Natural rubber (NR) production generates a substantial volume of wastewater characterized by high turbidity (~70 NTU) and chemical oxygen demand (COD) levels of 400 ppm. These values exceed the permissible discharge limits set by the Central Environmental Authority, posing a significant environmental challenge. Current wastewater treatment methods employed by the rubber industry are often energy-intensive, costly, and insufficient in ensuring long-term environmental safety. Therefore, this study aims to develop a sustainable and eco-friendly alternative using biosorbents derived from *Mangifera indica* (mango) leaves. The mango leaf-based biosorbent (MLBS) prepared through drying (100 °C for 4 h), grinding, and sieving of mango leaves (particle size: 1 mm – 2.5 mm), was evaluated through batch adsorption experiments. The results revealed a remarkable reduction in turbidity by 90% and a 38% decrease in COD under optimized conditions (shaking speed: 120 rpm, temperature: 25 °C, initial and final pH ~8.5 and ~6.8). Isotherm and kinetics studies indicated that the optimum dosage and optimal contact time for effective adsorption were 3.0 g L⁻¹ and 30 min, respectively. However, the use of a 2.0 g L⁻¹ dosage was more cost-effective (two replicates were used). Furthermore, the adsorption kinetics were best described by the pseudo-first order model, which yielded the highest coefficient of determination (turbidity: $R^2 = 0.9471$, COD: $R^2 = 0.7599$). This suggests that the biosorption process is predominantly governed by a physical adsorption mechanism rather than chemical bonding. These findings highlight the potential of MLBS as a low-cost, biodegradable, and effective solution for the treatment of rubber industry effluents. The approach not only contributes to pollution reduction but also supports the circular economy by utilizing agricultural waste. Future studies should focus on enhancing the adsorptive capacity of MLBS through chemical modification and incorporation of the biosorbent as filling materials in columns and constructed wetlands.

Keywords: Mango leaves, Turbidity, Rubber, Biosorbent, Wastewater