

## Investigation of curry leaves (*Murraya koenigii*) as a sustainable biosorbent for cadmium removal in aqueous solutions

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The presence of cadmium in food sources creates significant health hazards due to its toxic nature and inability to decompose naturally. Despite the development of various solutions for contaminant removal from food items, there is a significant demand for cost-effective and efficient biosorbents, particularly in the context of food preparation. This research conducts a preliminary study on how curry leaves can serve as an effective biosorbent for cadmium removal from aqueous solutions, which is beneficial for exploring their potential as a biosorbent in food preparation. Curry leaves were collected from Kurunegala district, Sri Lanka and subsequently, washed, dried and ground to <1 mm particle size. Batch adsorption studies were conducted by varying the parameters such as initial cadmium concentration, pH, adsorbent dosage, and shaking time. Isotherm and kinetic studies were then performed using the obtained optimized conditions. All analyses were performed using Inductively Coupled Plasma-Mass Spectroscopy and conducted triplicates. This study showed an improvement in removal efficiency when increasing initial cadmium concentration and obtained peak removal at 0.6

ppm concentration. pH and adsorbent dosage were optimized at 3.0, and 0.05 g having removal efficiencies of 70.2% and 61.5%, respectively. The best contact time found was 120 minutes (70.83%). The experimental data showed the best match with the Langmuir model during adsorption isotherm analysis ( $R^2 = 0.9373$ ) which indicated monolayer adsorption on a homogeneous surface. The adsorption kinetic was pseudo-second-order ( $R^2 = 0.9814$ ) which indicates chemisorption as the rate-determining step. The maximum adsorption capacity of curry leaves was 6.93 mg/g. Furthermore, according to the equilibrium parameter ( $RL < 1$ ) in this study, indicates a favorable Cd adsorption by curry leaves. The study reveals that curry leaves have a better cadmium removal capacity, offering a natural solution for reducing cadmium toxicity in aqueous solution, indicating further need for investigation under food preparation conditions.

### Keywords:

Curry leaves; Cadmium; bio-adsorption; isotherm; kinetic modeling