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Biosorption of Fluoride from Aqueous Medium by Indian Sandalwood (*Santalum Album)* Leaf Powder

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Highlights

- This study illustrates the usefulness of adsorption technology for removal of toxic fluoride ions from aqueous medium by using leaves of Indian sandalwood (Santalum Album), the second most expensive wood in the world, next to the African Blackwood (Dalbergia melanoxylon).
- The work elaborately explains kinetic, thermodynamics and different isotherms for biosorption of fluoride on sandalwood leaf powder.
- Biosorption is the widely accepted defluoridation technique due to its green, simple to operate and cost-effective applications.
- The results obtained in this work are at a significant level in compared to the chemical adsorbents for removal of fluoride from aqueous medium.

Abstract:

Sandalwood leaf powder prepared from mature, dried Indian sandalwood (*Santalum album*) leaves was investigated to assess its ability to remove fluoride from aqueous solutions using adsorption process. Effects of solution pH, contact time, adsorbent amount and solution temperature on fluoride sorption had been investigated. The biosorbent was effective at the pH range of 5.0 –7.0 and its fluoride removal capacity was found to be above 75.0%. The kinetics of the interactions was measured with pseudo first order Lagergren equation (mean k_1: 2.22×10^{-2} min^{-1}), simple second order kinetics (mean k_2: 4.43×10^{-1}g/mg/min), and intra-particle diffusion (mean k_i: 8.31×10^{-2} $mg/g/min^{0.5}$) mechanism. The adsorption data gave good fits with Langmuir, Freundlich and Temkin isotherms and yielded Langmuir monolayer capacity of 4.66 mg/g. The negative values of the thermodynamic parameters, ΔH, ΔS and ΔG showed the adsorption process to be exothermic in nature and thermodynamically favourable at lower temperature. These results indicated that Sandalwood leaf powder might be an effective adsorbent for treatment of water contaminated with fluoride.

Key words: adsorption, Indian Sandalwood, fluoride, Freundlich, Langmuir, Temkin,