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Hexavalent chromium removal from wastewater using a continuous fixed-bed system with date palm stems

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ABSTRACT

In this study, we explore a cost-effective, environmentally friendly method for hexavalent chromium (Cr(VI)) removal from wastewater at the Ben Chaabane treatment plant in Blida, Algeria, using date palm stems. Our approach utilises an abundant agro-industrial by-product, aiming to replace conventional materials with a more sustainable alternative. We conducted experiments to optimise the contact time, bed height, and flow rate in a fixed-bed column setup. The results indicate that under optimal conditions—specifically, a contact time of 90 min, a bed height of 1 cm, and a flow rate of 1 mL/min—the Cr(VI) removal efficiency reaches 99.26%. This process reduces the chromium concentration to 0.031 mg/L, significantly below Algeria's discharge standard of 0.1 mg/L. These results highlight the potential of using sustainable materials for effective heavy metal removal in wastewater treatment.

Keywords: Hexavalent chromium removal; sustainable wastewater treatment; date palm stems; environmental remediation; Algerian discharge standards

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