Removal of Chromium (VI) From Aqueous Solution using Chemically-Modified Vetiver (*Vetiveria zizanioides)* Root Powder as Adsorbent

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Chromium is toxic metal which is introduced in to the ecosystem as a result of various industrial operations like leather tanning, textile, electroplating, metal finishing, paint industry, chromate preparation, etc. Since the Cr(VI) is priority toxic, mutagenic, carcinogenic, non-biodegradable and can accumulate in the tissues, the presence and release of this element through the effluents is associated with dangerous effect on life cycle. Thus, it should be removed from effluents before allowing it to enter aquatic system. In the present study, the removal of Cr(VI) from aqueous solution on the chemically modified vetiver root powder (MVR) as adsorbent has been investigated in the batch experiments. The various parameters such as pH, initial Cr(VI) ion concentration, adsorbent dose, and contact time were optimized in batch experiment method. The experimental data were modeled by Langmuir and Freundlich isotherm. The pseudo-first-order and pseudo-second-order kinetic models were used to describe kinetic data. The bio-adsorption capacity of the MVR was dependent on the pH of Cr(VI) solution, with pH 1 being optimal. The adsorption capacity of Cr(VI) ions increased with increase in contact time and remained constant after an equilibrium time of 240 min. The removal of Cr(VI) ions increased with increase in bioadsorbent dose with optimal adsorbent dosage at 5g/L. The increase in initial Cr(VI) ion concentration led to an increase in percentage removal of Cr(VI).The maximum adsorption capacity was found to be 412.50 mg/g at optimum conditions. The equilibrium adsorption data fitted well with Langmuir isotherm model with R^2 =0.997. The best correlation of data was provided by the pseudo-second-order kinetic model. On the basis of the present study, it can be concluded that MVR is expected to be an effective, efficient and economically viable adsorbent for hexavalent Chromium from waste water.

Keywords: MVR, bio-adsorption, adsorbent, batch experiment, adsorption isotherm.