Copper biosorption using local Iraqi natural agents


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ABSTRACT

Industrial effluents loaded with heavy metals are a cause of hazards to the humans and other forms of life. Conventional approaches, such as electroplating, ion exchange, and membrane processes, are used for removal of copper, cadmium, and lead and are often cost prohibitive with low efficiency at low metal ion concentration. Biosorption can be considered as an option which has been proven as more efficient and economical for removing the mentioned metal ions. Biosorbents used are fungi, yeasts, oil palm shells, coir pith carbon, peanut husks, and olive pulp. Recently, low cost and natural products have also been researched as biosorbent. This paper presents an attempt of the potential use of Iraqi date pits and Al-Khriet (i.e. substances locally available in Iraq and found in the legs of Typha domingensis) as basements. The important factors studied which affect the removal of copper ion are solution pH value (4–8), adsorbent dosage (0.5–2 g), contact time [(1/2–4) h] for Al-Khriet and (1/2–24) h for date pits]; and (50–200) ppm copper ion concentration. The results showed that it is possible to remove 96% of Cu$^{2+}$ after 4 h contact time using Al-Khriet, and 84% of Cu$^{2+}$ after 24 h contact time using date pits. The kinetic data agree with a pseudo-second-order equation. Isotherm analysis showed that the adsorption process describes Langmuir better than the Freundlich.

Keywords: Biosorption; Date pit; Low-cost absorbent; Isotherm; Kinetic model; Copper ions