

Single metal and mixture toxicity of Cd²⁺ and Zn²⁺ to a microalga (*Chlorella* spp.) isolated from a water body receiving industrial effluent

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Chlorella sp. was isolated from a water body receiving industrial effluent and the effects of a range of environmentally realistic concentrations of Cd²⁺ (0.025, 0.050, 0.100, 0.150, and 0.200 mg/L) and Zn²⁺ (0.100, 0.150, 0.200, 0.250, and 0.300 mg/L) on its survival were assessed in Bold's basal medium based on optical density change patterns. Single metal EC₅₀ values after a 24 hour exposure were 0.134 and 0.100 mg/L for Cd²⁺ and Zn²⁺ respectively. These experimental results suggested that the isolated *Chlorella* spp. was more sensitive to zinc than to cadmium. Moreover, the survival of the microalga was gradually reduced by 96 hours with declined EC₅₀ values for each metal ion, indicating the increased toxicity of Cd²⁺ and Zn²⁺ with prolonged exposure. The combined effect of Cd²⁺ and Zn²⁺ on the isolate was determined using the metal mixture containing permissible discharge levels of these two metal ions into inland surface water (Cd²⁺= 0.100 mg/L, Zn²⁺= 0.200 mg/L) as assigned by environmental authorities. Statistical analysis revealed a significant difference ($p < 0.05$) between the metal mixture and each single metal during an exposure of 96 h. Further observations noted the mixture of Cd²⁺ + Zn²⁺ acted synergistically on the survival of the organism up to 72 h, and there onwards antagonistically, implying the resistance acquired by the organism over an extended period of time in the presence of this metal mixture, hence a potential candidature for monitoring and remediation of contaminated water with cadmium and zinc.

Keywords: *Chlorella*, cadmium, zinc