

Industrial effluent treatments using heavy-metal removing bacterial biofloculants

J Lin* and C Harichund

School of Biochemistry, Genetics, and Microbiology, University of KwaZulu-Natal (Westville),
Private Bag X54001, Durban, South Africa

Abstract

Biofloculants produced by *Herbaspirillum* sp. CH7, *Paenibacillus* sp. CH11, *Bacillus* sp. CH15 and a *Halomonas* sp. were preliminarily evaluated as flocculating agents in the treatment of industrial wastewater effluents. Industrial (1 local chemical-industry and 2 textile-industry: Biavin 109-medium blue dye and Whale dye) effluent (9 ml) containing various heavy metals was vortexed with 1 ml of biofloculant in a 25 ml test tube. One ml of water (Millipore Elix purification system, 17 mega Ω) was substituted for the biofloculant in the control. After 5 min, the heavy metal concentrations, the microbial population and the turbidity of the top layer of the industrial effluent were determined using ICP-OES, spread-plate technique and a turbidity meter respectively. The flocculating activity was calculated based on absorbance at a wavelength of 550 nm. Biofloculants produced in this study were capable of removing several heavy metals from industrial effluents simultaneously and effectively. This was significant ($p < 0.05$) when applied to Biavin medium blue dye, with 95% of Cr²⁺ and 94% of Ni²⁺ removed by the presence of biofloculants. Biofloculants also removed almost all of the bacteria and reduced 50-80% of the turbidity of the chemical effluent sample, simultaneously. Bacterial biofloculants may provide an alternative means of treating industrial wastewater resulting in environmental and economical benefits. However, our findings suggest that the treatment of industrial effluents using biofloculants might be effluent-dependent. In order to explore the potential of biofloculants in the treatment of industrial effluents, a preliminary study to determine the optimal conditions is crucial.

Keywords: Biofloculant; Heavy metals; industrial effluent; flocculating activity, bacterial removal