

Enzymatic cyanide detoxification by partially purified cyanide dihydratase obtained from *Serratia marcescens* strain AQ07

ABSTRACT

The partially purified enzyme of indigenously isolated *Serratia marcescens* strain AQ07 was utilised to develop the best form of cyanide detoxification method that is eco-friendly and cost effective. The present study evaluates the feasibility of the enzyme to degrade high cyanide concentrations and the possible metabolic pathways involved, for which the protein concentration and cyanide detoxification activity were quantified. Bacterial cells grown in cyanide incorporated medium were disrupted by sonication and the resultant cell free extract were tested for metabolic pathway. The cell free extract was precipitated by ammonium sulphate precipitation and partially purified by ion exchange chromatography using DEAE cellulose. The maximum enzyme activity achieved was 2125 $\mu\text{M}/\text{min}$. The partially purified enzyme was found to be able to detoxify 82% of 2 mM KCN in 10 min of incubation and cyanide degradation (or depletion) rate showing a linear increase with increasing enzyme concentration. The effective accruing of ammonia as metabolite illustrated that the detoxification was ensued via the function of cyanide dihydratase. Additional confirmation through SDS-Page showed that the molecular weight of enzyme was assessed to be ~38 kDa, which is tandem with the reported cyanide dihydratases. Hence, the use of enzyme as a substitute to live bacterial cells in detoxification of cyanide illustrates various advantages such as the capacity to withstand and detoxify higher cyanide concentration and total reduction in the total cost of process since nutrient provision is immaterial.

Keyword: *Serratia marcescens*; Detoxification; Enzyme; Cyanide dihydratase