Enhancement the Cellulase Activity Induced by Endophytic Bacteria Using Calcium Nanoparticles

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Abstract:

The huge applications of cellulosic and lignocellulosic materials in the various fields of life lead to accumulation of its wastes that became one of the major sources of environmental pollution. In this study, a Gram-positive cellulose-decomposing endophytic bacterium (Chi-04) was isolated from medicinal plant Chliadenus montanus which inhabitant Saint Catherine (Sinai) region in Egypt. The bacterial strain was identified based on the sequence analysis of 16S rRNA genes as Lysinibacillus xylanilyticus. This isolate was capable of degrading 58% of cellulosic filter paper (100 g/l) within 15 days of incubation. The soluble and reduced sugars were spectrophotometrically determined as cellulose decomposition metabolites. The bacterial isolate exhibited an obvious activity toward cellulase enzyme production. The maximum cellulase activity (0.18 U/min) was detected after 12 days of incubation while the maximum release of soluble sugars (11.85 mg/ml) was detected after 15 days of incubation. CaCl2 nanoparticles (100 nm) were chemically prepared to enhance the activity of the enzyme. The optimum concentration of CaCl2 nanoparticles that showed the highest activity of cellulase (0.3 mg/ml reduced sugar) was 0.6%. The bacterial isolates showed potential convert of cellulose into reducing sugars which could be used in several applications.

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