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ISOLATION OF CELLULOSE DEGRADING BACTERIA FROM SOIL AND OPTIMIZATION OF THEIR CELLULASE PRODUCTION

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Utilization of microbial cellulases is a promising approach towards feasible and cost-effective processing of accumulating cellulosic waste. As there is a less emphasis on cellulases of bacterial origin, the current study was designed as an attempt to isolate and screen soil bacteria possessing cellulolytic potential and to optimize their cellulase production. Bacteria in soil samples collected from locations in and around the premises of the University of Peradeniya were isolated using a selective medium and screened for cellulolytic potential by congo red and iodine methods. Cellulase produced by isolates that screened positive for cellulolytic activity were quantified by 3,5-Dinitrosalicylic acid (DNS) method. To determine optimal culture conditions to enhance cellulase production, culture parameters, such as incubation period (day 1 to 6), temperature (30 – 70 °C), pH (4 to 12) and varying carbon and nitrogen sources, were tested. Two potent cellulolytic isolates, CDB 2 and CDB 9 were identified out of a total of 11 presumptive cellulose degrading isolates. CDB 2 showed maximum enzyme activity at an incubation period of 24 hours recording an activity of 1.64 U mL^{-1} and CDB 9 at 48 hours with 2.25 U mL^{-1}. The temperature assessment demonstrated the highest cellulase activity at 40 °C in both isolates CDB 2 (2.66 U mL^{-1}) and CDB 9 (2.89 U mL^{-1}), respectively. Among pH ranges tested, highest activity was at pH 8 for CDB 2 (1.57 U mL^{-1}) and pH 7 for CDB 9 (2.03 U mL^{-1}). As carbon sources, glucose for CDB 2 (19.95 U mL^{-1}) and lactose for CDB 9 (17.73 U mL^{-1}) were determined as the best for enhancing cellulase activity while as nitrgeon sources tryptone for CDB 2 (1.81 U mL^{-1}) and $(NH_4)_2SO_4$ for CDB 9 (1.51) displayed the highest activities. Ideal culture conditions for CDB 2 were hence identified as, pH 8, at a temperature of 40 °C, incubated for 24 hours with glucose and tryptone as the carbon and nitrogen sources, respectively, while CDB 9 exhibited optimal cellulase activity when cultured for 48 hours in a media of pH 7, at a temperature of 40 °C, with lactose as the carbon source and $(NH_4)_2SO_4$ as the nitrogen source. It is evident that culture conditions and composition profoundly affect and alter cellulase production and activity. Identification of optimal culture media specifications can therefore tremendously contribute towards integral findings in terms of industrial applications.

Keywords: Bacterial cellulases, Cellulose, Optimization, Screening, Soil bacteria