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Isolation and characterization of thermo-stable cellulase enzyme producing bacteria from a compost production site

U.A.A.N. Chandrarathna[1,2], P.S.T. Amandani[1,2], H.D.S. Kavishka[1,2], and H.D.D. Sadeepa[1,2*]

[1]Department of Biomedical Sciences, School of Science, BMS Campus, Sri Lanka
[2]Department of Applied Sciences, Northumbria University, United Kingdom

Thermophilic bacteria have altered to thrive and function in relatively hot environments. They can produce thermo-stable enzymes that survive under high temperatures typically between 50^0C – 120^0C. These enzymes are valuable in different industrial and biotechnological applications. Among other enzymes cellulase plays an important role in food, paper, fermentation and textile industries. Cellulase enzyme production has reached 12% of the global enzyme market. Therefore, this study has focused on the isolation and characterization of thermo-stable cellulase enzyme-producing bacteria. The samples were collected from compost production site at *Govijanaseva Department, Kadawatha* (GPS coordinates: 7.035695438637899, 79.96050932347872). The standard pour and streak plate methods were carried out using Nutrient Agar plates at room temperature to isolate morphologically different bacteria. Bacterial isolates were screened for the production of cellulase enzyme using CMC agar plate assay. The secondary screening for the enzyme activity was conducted using a Di-nitro salicylic acid (DNS) assay, and the effect of temperatures and pH levels on crude enzymes of cellulose producing bacterial isolates was determined. The soil sample was collected at 61 ^{0}C of temperature. Out of ten morphologically different bacterial colonies, 08 isolates (GV1, GV2, GV3, GV5, GV6, GV8, GV9 and GV10) were positive for cellulase enzyme production. Bacterial isolate: GV3 possessed the highest enzyme activity (0.38831 U ml^{-1}) at room temperature. Bacterial isolate: GV10 was shown to have the highest optimum temperature of 70 ^{0}C (enzyme activity – 0.48994 U ml^{-1}) and optimum pH 8 for cellulase enzyme activity. As per the results, the bacterial isolate GV10 has been identified as the most potential bacteria that can be successfully used in industrial settings operating under high temperatures. Further optimization of bacterial growth conditions and the effect of other factors on enzyme activity is needed to confirm the utilization of different industrial and biotechnological applications.

Keywords: Biotechnology, Compost, Thermophilic bacteria, Thermo-stable cellulose

*dilini.s@bms.ac.lk
ORCiD ID: https://orcid.org/0009-0004-5594-3193