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ISOLATION AND CHARACTERIZATION OF THERMO-STABLE CELLULASE ENZYME PRODUCING BACTERIA FROM GOMARANKADAWALA HOT SPRING, SRI LANKA

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Abstract

Discovering eco-friendly alternatives for chemical catalysts used in industrial sector is essential to overcome the negative impacts of chemical wastes, impose on the environment. Identification of novel microbial enzymes and enzyme-producing bacteria has been recognized as a better solution. Amylase, cellulase, proteinase, and xylanase play a leading role in biotechnological studies while cellulase plays a major role in bio-fuel, pulp and paper, food and beverage, animal feed, textile, pharmaceutical industries and contribute8% of the world enzyme market. Therefore, the present study aimed at the isolation and identification of thermo-stable cellulose-producing bacteria from hot springs. In the present study, water samples were collected from Gomarankadawala (Rankihiriya / Ulpotha) hot spring in Sri Lanka. Temperature, Electric Conductivity (EC), pH, and Dissolved Oxygen (DO) were measured at the site. The standard pour plate method was performed to isolate bacteria and screened for cellulase production by spot test on Carboxy Methyl Cellulose agar plates. Temperature and pH stability of crude enzyme extracts were measured using the spectrophotometric method. Molecular-level identification of bacterial isolates was performed using the16S rRNA gene sequencing. Temperature, EC, pH, DO levels of hot spring were ranged between 36.3 – 36.8 ^{0}C, 621 - 572 µS/cm, 6.76 – 6.78, and 2.75 – 2.83 mg/L respectively. Six morphologically different, cellulose-producing bacteria isolates were observed. Thermo-stable cellulase producing bacterial isolate GS_2 was identified as *Bacillus cereus strain RW074* using 16S rRNA sequencing and optimum temperature and pH for the enzyme activity was found to be 60^{0}C and 7 respectively. The results of the study revealed that the Gomarankadavala hot spring bacterial isolate GS_2 which produces cellulase could be successfully used for industrial settings operates under temperatures around 60 ^{0}C in neutral pH. Thus, further optimizations studies are in progress to enhance the production of enzymes, so that the bacteria can be effectively used for industrial perspectives.

Keywords: *Hot springs, Thermo-stable Enzymes, α-amylase, Biotechnology, Exteremophiles*