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# Characterization of Thermostable Cellulase Enzyme Isolated from a Hot Spring Bacterium: *Bacillus* sp.

**Herath M.N.[1], Sadeepa, H.D.D.[2, 3], Manage, P.M.[2, 3]*, Sirisena, K.A.[4]**

*[1]Business Management School, Colombo, Sri Lanka*
*[2]Centre for Water Quality and Algae Research, Department of Zoology, University of Sri Jayewardenepura, Nugegoda, Sri Lanka*
*[3]Faculty of Graduated Studies, University of Sri Jayewardenepura, Nugegoda, Sri Lanka*
*[4]Department of Environmental Technology, University of Colombo, Colombo 03, Sri Lanka*
**pathmalal@sjp.ac.lk*

## Abstract

Cellulase is a complex of enzymes which consists of β-1,4-endoglucanase, cellobiohydrolase, and β-glucosidase. Cellulase contributes a significant share to the world enzyme market and is used in number of industries viz; paper and pulp, food and beverage, bioethanol, detergent and textile. The harsh industrial conditions such as high temperature, extreme pH levels and high substrate concentration etc. which is used in such industries adversely effect on structure and activity of enzymes. Therefore, huge amount of chemical catalysts which cause chemical wastes are used in industrial settings instead of enzymes. Since the chemical wastes adversely affect the ecosystem, isolation and characterization of thermostable cellulase enzyme-producing bacteria and exploring the industrial perspective of thermostable enzymes is a better approach towards green chemistry. The present study focused on characterization of cellulase enzyme produced by *Bacillus* sp., which shows optimum activity at 60° C under neutral conditions, isolated from Gomarankadavala hot spring in Sri Lanka. The effect of different Carbon sources: glucose and lactose, Nitrogen sources: peptone, tryptone, yeast extract and urea on enzyme production and different Carboxymethylcellulose (CMC) concentrations; 0.5%, 1.5% and 2%, on enzyme activity were measured using the DNS method. Under the optimum conditions, cellulase enzyme activity on different substrates: corn cob, rice bran and raw leaves were measured. The highest enzyme production was recorded in the culture medium which added tryptone as the nitrogen source and adding carbon sources to the culture medium showed an increase of cellulase enzyme production. The optimum CMC concentration for the enzyme activity was recorded as 1% and from all the optimized parameters, the substrate; raw leaves showed the highest enzyme activity of 11.305 U/ml. Further, a considerable amount of enzyme activity was recorded on corn cobs and rice bran as well. Thus, the thermostable cellulase enzyme produced by bacterium identified as *Bacillus cereus* isolated from Gomarankadavala hot spring could be successfully used in industrial settings such as kitchen/industrial waste management, bioethanol production, paper and pulp industry and textile industry which use high temperatures and cellulosic substrates as raw materials.

***Keywords:*** Thermostable enzymes, Cellulase, Industrial applications, Hot springs