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Isolation of Salt-Tolerant Enzyme-Producing Bacteria from Marine Environments in Sri Lanka for Industrial Applications

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Abstract

Microbial enzymes have been used in our day-to-day lives since ancient times. In the current world, microbial enzymes are widely used in industries owing to their environmentally friendly nature and cost-effectiveness. Halophiles are industrially important bacteria due to their high stability in high salt concentrations. Amylases, cellulases, proteases and lipases are the most widely used halophilic hydrolytic enzymes in food production, detergent industry, pharmaceutical industry, biofuel production, paper production, etc. Each of these enzymes plays a vital role in industrial production. Thus, the current study focused on the isolation of salt-tolerant enzyme-producing bacteria from marine environments in Sri Lanka for industrial applications. The water samples were collected from Negombo Lagoon and Panadura Beach in Sri Lanka and transported to the laboratory in ice boxes. Subsequently, the water samples were enriched in quarter-diluted Nutrient Broth (NB) medium. The morphologically different bacterial isolates were isolated by the standard spread plate method. All isolated bacterial isolates were screened for the production of amylase, cellulase, protease and lipase using Starch Agar, CMC agar, Skimmed Milk Agar and Phenol Red Agar plate assays respectively. Then, the growth temperature and salt concentrations for enzyme-producing bacteria were optimized. A total of morphologically different 44 bacterial colonies were isolated from both sample sites 25 bacterial colonies from the Negombo Lagoon sample and 19 bacterial colonies from the Panadura Beach sample. A total of 21 bacterial isolates were positive for amylase production 3 from Negombo lagoon and 18 from Panadura beach samples while 26 bacterial isolates were positive for cellulase enzyme 9 from Negombo lagoon and 17 from Panadura beach samples. Moreover, 15 out of 25 bacterial colonies isolated from the Negombo lagoon sample were positive for Protease enzyme while only 5 colonies from the Panadura beach sample were positive for protease. A total of 22 bacterial isolates were positive for amylase production 14 from Negombo Lagoon and 8 from Panadura beach. As a whole, almost 95% of isolated bacteria were positive for at least one enzyme activity. As per the results, the optimum growth temperature was recorded in a range of 30^o C to 35^o C while the optimum growth was reported in a range of 3% to 12% of NaCl concentration. Thus, marine environmental bacteria can be considered as a potential halophilic enzyme producer and may be utilized in industrial settings successfully. Further studies are in progress to determine the optimum conditions for enzyme activity.

Keywords: Halophiles, Halophilic bacteria, Industrial applications, Marine bacteria. Enzyme producing bacteria