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Isolation and Identification of Thermostable Enzyme-Producing Fungi from Compost in Wennappuwa, Sri Lanka

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Abstract

Thermostable enzymes can thrive in extreme conditions, making them highly valuable in industrial biotechnology. They offer environmentally friendly alternatives to chemical catalysts in the production of biofuels, detergents, food processing, textiles, and pharmaceuticals. Compost piles naturally reach high temperatures during decomposition, creating an ideal environment for thermophilic fungi that produce heat-stable enzymes. In this study, thermostable amylase and, cellulase-producing fungi were isolated from compost in Wennappuwa, Sri Lanka. Soil samples were collected from compost piles at 61 °C. Fungal colonies were isolated on potato Dextrose Agar using the spread plate technique. Primary screening for amylase and cellulase enzymes was conducted with starch and carboxymethyl cellulose hydrolysis tests, respectively. The 3,4-dinitrosalicylic acid (DNS) method was used for secondary screening to measure enzyme activity, and temperature and pH optimizations were performed using the same method. Morphological differences in fungal colonies were examined under a microscope, revealing unique hyphal structures. Thirteen fungal isolates (CW 1 to CW 13) with diverse morphologies were obtained, including 8 amylase-producers and 07 cellulase-producers. The fungal isolate CW 3 showed the highest cellulase activity at 60 °C (125.9 U/mL) with an optimal pH of 4, while CW 13 exhibited the highest amylase activity at 60 °C (1,197.07 U/mL) with an optimal pH of 9. These results indicate the presence of thermophilic fungi capable of producing thermostable enzymes suitable for industrial applications in Sri Lankan compost ecosystems. Isolates CW 13 and CW 3, which showed strong potential as producers of thermostable amylase and cellulase, respectively, could be developed for large-scale biotechnological processes requiring stability at high temperatures and extreme pH levels. Future research will focus on molecular identification, protein purification, and further optimization to enhance enzyme productivity and expand industrial utility.

Keywords: *Thermophilic fungi, Thermostable enzymes, Amylase, Cellulase, Compost*