ABSTRACT

This present study deals with the Biotechnological applications of commercially important α-Amylase produced from *Penicillium digitatum* using surface culture fermentation. To enhance the output, the One Factor at a Time (OFAT) approach was used in the production of α-amylase by altering fermentation parameters such as incubation temperature, incubation period, pH, and Carbon and Nitrogen sources. To increase enzyme yield, different concentrations of sucrose, yeast extract, potato peel, KH_2PO_4, $MgSO_4$, $MnSO_4$, $FeSO_4$, $ZnSO_4$, and NaCl were tested. Optimized production was reached with 2.5 g Sucrose, 5 g Yeast Extract, 3.5 g Potato Peel, 0.25 g $MgSO_4$,0.75 g KH_2PO_4, 1 g $MnSO_4$, 0.75 g $FeSO_4$, 0.5 g $ZnSO_4$, and 1.25 g NaCl. The enzyme yield was 2.958 ± 0.1 U/mL for the extracellular extract and 2.147 ± 0.1 U/mL for the intracellular extract. Fermentation was carried out at pH 5.5 and 27°C for 5 days. The enzyme was partially purified by adding sodium sulphate to the crude enzyme generated from solid-state fermentation, which was then stirred at room temperature. The enzyme's stability was examined at a variety of temperatures, pH levels, and substrate concentrations. α-Amylase remains stable at 37°C and perform best at pH 5.5. *Penicillium digitatum* was treated to UV irradiation and ethyl methane sulfonate (EMS) mutagenesis to increase α-amylase synthesis. This resulted in the creation of mutant strains with greater enzymatic activity. *Penicillium digitatum* has been shown to be a sustainable and cost-effective source of α-amylase for industrial applications such as food processing, bioremediation, and bio-fertilizer production. This research reveals that α-amylase from *P. digitatum* can be effectively used in numerous biotechnological applications.