

Characterization of a Surfactant-stable α -amylase Produced by Solid-State Fermentation of Cassava (*Manihot esculenta* Crantz) Tubers Using *Rhizopus oligosporus*: Kinetics, Thermal Inactivation Thermodynamics and Potential Application in Laundry Industries

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Abstract: α -Amylase is a foremost hydrolytic enzyme used for various industrial processes. In the present study, *Rhizopus oligosporus* α -amylase (ROAA) produced during solid state fermentation of cassava (*Manihot esculenta*) tubers by the fungus was partially purified and biochemically characterized. The kinetic and thermal inactivation thermodynamics properties of the partially purified enzyme were also evaluated as well as the potential application in cloth washing. The ROAA was purified by 4.11-fold and had a molecular weight of 60 kDa. ROAA was optimally active at 60 °C, pH 5.0 and had a salt tolerance of 1–100 mM NaCl for 120 min. The activity of the α -amylase was significantly ($p < 0.05$) increased in the presence of various inorganic salts especially at 10 mM. Ethylenediaminetetraacetic acid (EDTA), urea and thiourea enhanced ROAA activity. Triton X100 enhanced ROAA activity by 141.97%, whereas sodium dodecyl sulphate (SDS) decreased it by 28.58%. Tween 20 and Tween 80 did not significantly affect ROAA activity at 1 mM. V_{max} , K_m and K_{cat} of ROAA were 37.59 U/mg protein, 16.39 mg/mL and 0.016 s⁻¹, respectively. Thermal stability indicators such as half-life, D-value at 70 °C and Z-value were 101.91 min, 338.70 min, and 48.78°C, respectively. Cloth washing efficiency of a mixture of the isolated enzyme and commercial detergents was high relative to detergent-only trial. The enzyme had high thermal stability, optimized activity in the presence of some inorganic salts, and resistance to several surfactants and a chelating agent. The fungal α -amylase reported in this study would find relevance not only in starch-based industries but also in laundry.

Keywords: Cassava tuber, Fermentation, *Rhizopus oligosporus*, α -Amylase, Surfactant resistant, Thermostable,