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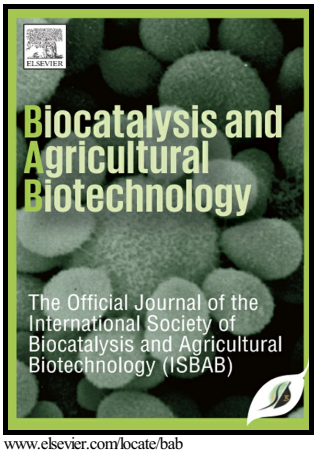

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Thermodynamics characterization and potential textile applications of *Trichoderma longibrachiatum* KT693225 xylanase

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Abstract

Our study was a trial to participate in solving two main problems namely, environmental pollution resulting from accumulation and bad disposal of agro-industrial wastes, and high cost of industrial xylanase enzyme production. This was achieved through successful xylanase production by solid-state fermentation of low cost disposable agricultural wastes by marine fungal isolate *Trichoderma longibrachiatum* KT693225. The highest xylanase production 7.13±0.11 $U.ml^{-1}$ was obtained utilizing rice straw (RS) waste after 7days of fermentation. Xylanase was purified by fractional precipitation with ethanol causing 4.24-fold purification. The 75% ethanol fraction was rich in cellulase, pectinase and α-amylase enzymes beside xylanase. The maximal xylanase activity was obtained at 60ºC, pH 5 and 2.5% xylan concentration. The K_m and V_{max} were calculated to be 20 mg ml^{-1} and 20 µmol min^{-1} ml^{-1}, respectively. The thermostability of *T.longibrachiatum* KT693225 xylanase was indicated by low E_a (activation energy)and high E_d (energy of denaturation). High $T_{1/2}$ (half life), D-value (decimal reduction time), ΔH^o (enthalpy), ΔG^o (free energy) and low K_d (denaturation rate constant), ΔS^o (entropy) values at 70ºC emphasized high *T.longibrachiatum* KT693225 xylanase stability. *T.longibrachiatum* KT693225 xylanase showed high effectiveness at several textile wet-processing stages including desizing, bioscouring and biofinishing of cellulosic fabrics without adding any additives. These findings in this study have great implications for the future applications of xylanases.

Keywords: xylanase; thermodynamics; textile applications.

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