



Faculty of Science
Microbiology Department

Productivity improvement and biochemical characterization of xylanase from rice straw by *Trichoderma*.

Presented by

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M.Sc. in Microbiology, Helwan University (2009)

T H E S I S

*Submitted for the Philosophy Degree of Doctor in Science in
Microbiology*

**MICROBIOLOGY DEPARTMENT
FACULTY OF SCIENCE
AIN SHAMS UNIVERSITY**

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ABSTRACT

Name: Ahmed Moselhy Abd El-Aziz Moselhy.

Title of thesis: Productivity improvement and biochemical characterization of xylanase from rice straw by *Trichoderma*.

Trichoderma reesei F418 has a potential for xylanase production using rice straw (RS) as carbon source under solid state fermentation conditions (SSF). A hyperproducing fused isolate *Trichoderma reesei* F418FS was obtained after UV-mutagenesis followed by intra-specific protoplast fusion. The optimized SSF conditions for maximum xylanase production by *T. reesei* F418FS (6875 IU/gDW) was achieved at pH 7.0, 35°C and 90% moisture content at the 5th day of incubation. A major xylanase isoenzyme was purified to homogeneity and has molecular weight of 33 kDa, optimum pH at 5.0, stable at pH ranged from 3.5 to 8.0, optimum temperature for activity at 50°C with activation energy (E_a) 22.93 Kcal mol⁻¹ (5.48 KJ mol⁻¹) and stable at temperature up to 70°C. *T. reesei* F418FS xylanase exhibited a high specificity towards xylans with a low activity for cellulosic substrates such as avicel cellulose and carboxymethyl cellulose which concluded that *T. reesei* F418FS xylanase can be described as a cellulase-free xylanase. The K_m values for *T. reesei* F418FS xylanase are

2.8, 2.65 and 7.7 mg ml⁻¹ for BiWX, BeWX and OSX, respectively. *T. reesei* F418FS xylanase slightly stimulated by monovalent cations K⁺ and Li⁺, inhibited by Hg²⁺ and also inhibited by Cu²⁺, confirmed the presence of at least sulfhydryl group in the active site of the enzyme. The inhibitory effect of EDTA suggested that *T. reesei* F418FS xylanase is a metalloprotein. *T. reesei* F418FS xylanase can be described as an acidic cellulase-free xylanase, has a possible application in biobleaching in paper and pulp industry.

Key Words:

Xylanase, *Trichoderma reesei*, UV-mutagenesis, intraspecific protoplast fusion, rice straw, agroindustrial waste, purification and characterization.

PUBLICATIONS

Magda A.M. Soroor, Hoda H. El Hendawy, Abd-Elhady M. Ghazy, Nermeen A. El Semary, Kamal M.A. Khalil, Ahmed M. Abd El Aziz (2009). Characterization of an Alkaline Metalloprotease Secreted by the Entomopathogenic Bacterium *Photorhabdus Sp.* Strain EK1. Research Journal of Agriculture and Biological Science, 5(4): 349-360.

Magda A.M. Soroor, Abd El-Hady M. Ghazy and Ahmed M. Abd El-Aziz (2013). Proteolytic Enzymes Secreted by the Bacterium *Photorhabdus sp.* strain EK1, Symbionts to *Heterorhabditis bacteriophora* EK1. Journal of Applied Sciences Research, 9(8): 4683-4694.

Magda A. M. Soroor, Abd El-hady M. Ghazy, Khattab A. A., Ahmed M. Abd El-Aziz, Einas H. El- Shatoury, Al Zahraa A. Karam El-Din (2014). Enhancement of xylanase production from rice straw by *Trichoderma reesei* through UV- mutagenesis and protoplast fusion. Egyptian Journal of Experimental Biology, 10(2): 125-134.

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