XYLANASE AND CELLULASE PRODUCTION FROM WATER HYACINTH BY SOLID STATE FERMENTATION WITH *TRICHODERMA HARZIANUM*

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Introduction. Water hyacinth (*Eichhornia crassipes*) grows in water bodies in tropical countries. Its presence at high surface density prevents the passage of light and oxygen, limiting growth of natural organisms (1). In Mexico, water hyacinth (WH) is present in about 34,000 hectares of water bodies. Cellulose and hemicellulose present in WH can be used as raw material for several biotechnological purposes (food additives, constituents of culture media, feedstock for biofuel production, among others); for that, total or partial hydrolysis of this polymers can be needed. Roots and leaves can be used for lignocellulolytic enzyme production by solid state fermentation with fungi. Filamentous fungi have been widely used for the production of lignocellulolytic enzymes (2). The objective of this work was to produce cellulases and xylanases from WH by SSF with *Trichoderma harzianum* (PBLA) in a tray and flask bioreactor.

Methods. Leaves of WH were collected from Xochimilco, dried, milled and impregnated with a modified Pontecorvo medium. The inoculum size, pH and initial moisture content were $2x10^7$ spores/gdm, 5.5 and 75% respectively. Samples were periodically taken for cellulase and xylanase activity assays with CMCellulose and birchwood xylan respectively; for that, DNS (3) was used as reagent. SSF were carried in 250 mL conical flasks and in a tray bioreactor. In the later case a water saturated air flow rate of 1 L/min was used.

Results. Kinetics of xylanase and cellulose production in both reactors is shown in Fig. 1. The results obtained in the kinetic at 72 hours in a flask and tray reactor are shown in the graphic. Xylanase production in the tray reactor was higher (98 U/gdm) than the obtained in the conical flask (64 U/gdm). However, cellulase production present a different relationship. It was higher in flask (19 U/gdm) than in the tray bioreactor (7.3 U/gdm). In all cases, maxim activity was obtained after 48 h of SSF. pH and moisture contain remained nearly constant during the 72 h of SSF.

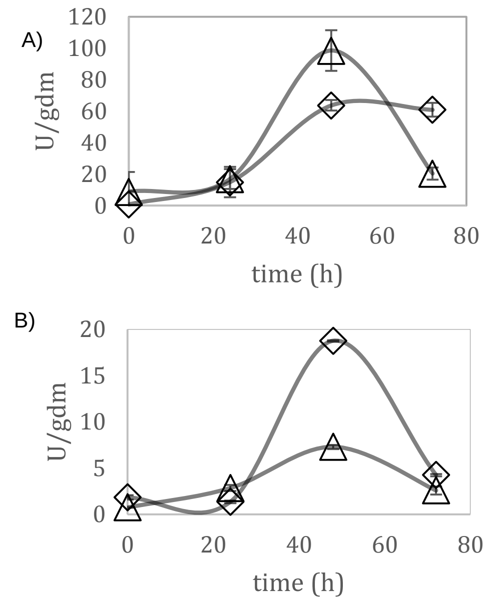

Fig.1 Production of xylanase (A) and cellulase (B) in flask (◇) and tray reactors (△).

Table 1. Kinetic of pH and moisture percentage in flask and tray reactor.

Reactor	Flask		Tray	
Tiempo (h)	pH	% Moisture	pH	% Moisture
0	5.7	72.0	5.7	74.0
24	5.9	71.5	6.0	70.6
48	6.5	72.8	6.6	70.1
72	7.1	68.7	7.5	59.2

Conclusions. Use of tray bioreactor allowed xylanase and cellulase production at similar levels than the obtained in laboratory scale without drying of the solid material. This geometry of try bioreactor can be effectively used for scale-up of this type of processes.

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References.

(1) Jafari N. (2010), Journal of Applied Sciences and Environmental Management, Vol. 14, 43-49
(2) Jorgensen H., Bach J., Felby C. (2007), Biofuels, Bioprod, Bioret, Vol. 1, 119-134.
(3) Miller, G.L and Col (1960), Analytical Biochemistry 2, 127-132.