SPORE PRODUCTION OF *Trichoderma harzianum* BY SOLID-STATE FERMENTATION UNDER HYDRIC STRESS

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Introduction. For the modern agriculture, it is very important to find alternative to use of chemical pesticides, since these are generating resistance in a lot of phytopathogenic microorganisms, with high environmental damages and human health (Brand, 2006). An alternative to this situation can be the use of fungi as biological control agents, because they are natural antifungal compounds (Kerry, 1987). *T. harzianum* is very important in the industry due to its use on cellulase production, antibiotics and biopesticides (Roussos, *et al*., 1991). An important application of SSF is spore production, which is the principally way for application in field crops, due it is the most virulent and viable for a stock long time (Brand, 2006; Hassouni, 2007). The goal in this study was spore production of *T. harzianum* with high grade aggressiveness against phytopathogens through SSF, agro-industrial wastes and the novel hydric stress technic on fermentation in Raimbault's columns, which allows a high spore production per substrate gram and the advantage to obtain dry material.

Methods. The strategy of this work was to evaluate a solid state fermentation with several agro-residual wastes and *T. harzianum* to produce highest levels of spores. The SSF was carried out into a Raimbaul's columns and the conditions of temperature, humidity and CO_2 released was monitoring by respirometry in PNEO equipment (Lakhtar, 2009). After spore production was evaluated stability and viability under several stock methods.

Results. Lot-3 of SSF allowed the highest spore production with respect to control culture (PDA) but without significant difference with SSF-2 (Table 1). This behavior it probably due to substrate mixes. Obtained results agree with those reported by Chen *et al.,* (2005), who mentioned that carbon source in SSF is mainly used to biomass production, then the fungus synthetize more spores which are formed permitting high yields in SSF.

Table 1. Spore production in all SSF process.

Sample	PDA	SSF-1	SSF-2	SSF-3	SSF -4a	SSF -4b
Spore/ g dm	$8.32E^{9}$	$4.33E^{9}$	$8.90E^{9}$	$9.93E^{9}$	$1.25E^{9}$	$1.26E^{9}$

To show that conservation method is less aggressive with spores was evaluated the viability stored under different conservation conditions: lyophilization (LSS), frozen (FSS), dry (DSS) and PDA (PSS) (Table 2).

Table 2. Spores viability percentage of *T. harzianum* under different stock methods.

Treatment	Total spores/ g dm	Viables spores/ g dm	% viable spores
LSS	1,26E+10	4,00E+08	3,17
FSS	7,56E+09	1,19E+09	15,67
PSS	8,30E+10	2,13E+10	25,70
DSS	4,24E+09	9,64E+08	22,75

The results suggested that best way to stored spores is in PDA, but significantly close is the treatment dry obtained by hydric stress, therefore is a feasible alternative to reduce storage cost.

Conclusions. SSF of agro-industrial wastes allowed demonstrate that it was possible a spore production similar to obtained in synthetic mediums like PDA. Under stress hydric conditions the spore production was not significantly enhanced but trough this methodology we can storage the dry fermented matter with viability of 22.75 %, similar value obtained in PDA. Therefore we can use this new method of spore's production and stored reducing cost of refrigeration or liophylization.

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References.

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