IMMOBILIZATION OF *Aspergillus niger* IN MICRO- AND NANOSTRUCTURED MAGNETIC SUPPORTS FOR LIPASE PRODUCTION

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Introduction. Lipases (EC 3.1.1.3) are enzymes which hydrolyze triglycerides to fatty acids and glycerol. Lipases are used as catalyzers in food industry, especially in the oilseed processes. Fermentation by adhesion to surface (FAS) is a relatively new category of fermentation, which differs to submerged fermentation (SF) due to the presence of solid support. FAS is a process in which the spores are adsorbed and adhered to a solid support, and the cells grow to form a biofilm in the presence of liquid culture medium [1].
The objective of this work was to evaluate the biofilm formation of *Aspergillus niger* immobilized in nano- and micro magnetic particles for the production of lipase by FAS.

Methods. *Aspergillus niger* CBS 513.88 was reactivated on PDA agar and incubated for 7 days at 25 °C. Magnetic nanoparticles coated with chitosan (NM) and polystyrene divinylbenzene impregnated with magnetite (PS) were synthetized in CIQA [2, 3]. The FAS and SF were carried out in 30 ml of the medium described by Falony *et al.* [4] using 1 x 10^7 spores/ml of *A. niger.* In the case of FAS 2 g of supports were used. Incubation was performed at 29°C and 200 rpm for 72 h. Enzyme activity was determined using p-nitrophenyl propionate as substrate. Proteins were determined using the Bradford´s technique. Biomass was quantified gravimetrically [1]. Biofilm formation was analyzed by scanning electron microscope.

Results. Lipase and protein production (Fig. 1) were similar for both FAS systems: greatest activity was detected at 48 h as 27.37 IU/ml and 21.68 IU/ml with NM and PS, respectively. However, in both cases lipase activities and protein concentrations were higher than in SF system.
Significant difference was observed in kinetics of biomass production: considerably lower biomass concentrations were detected in the FAS system performed with magnetic nanoparticles (Fig. 2, left). Using of magnetic support allowed to simple biomass recuperation under magnetic field.

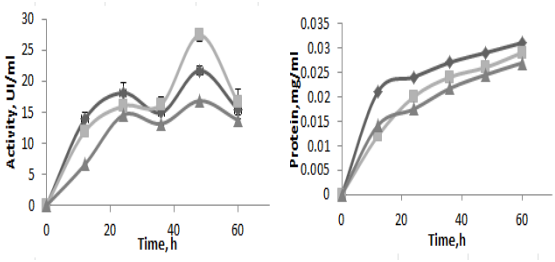

Fig.1 Lipase and protein production by different systems: ▲,- SF; ■,- FAS with nanoparticles; ♦,- FAS with polystyrene derivative microparticles

The spore immobilization on applied supports was observed after first 2 h of incubation (Fig. 2).

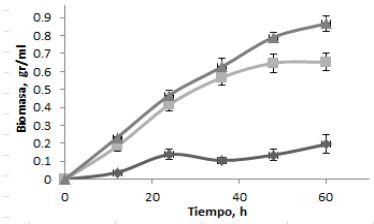

Fig.2 Left, - Biomass production by different systems: ▲,- SF; ■,- FAS with nanoparticles; ♦,- FAS with polystyrene derivative microparticles.

Conclusions. FAS with magnetic supports leads to advantages in terms of enzyme activity, control and ease of biomass recovery compared to SF. Magnetic nanoparticles coated with chitosan allow higher productivity with reduced protein and biomass generation.

References.

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