XIV Congreso Nacional de Biotecnología y Bioingeniería

LACCASE PRODUCTION BY *Peniophora cinerea* IMMOBILIZED ON SYNTHETIC FIBER

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Keywords: laccase; immobilization; Peniophora cinerea.

Introduction. Laccases are oxidoreductases usually produced by ligninolytic fungi. These enzymes have several biotechnological applications, including pulp bleaching, bioremediation of soils and water effluents, and others. *Peniophora cinerea* is a ligninolytic fungus with great ability to degrade reactive dyes, to decolorize textile effluents and to produce halotolerant laccases. Additionally, immobilization of fungal strains has been considered an interesting strategy to increase the laccases production by filamentous fungi (1).
The present study evaluated the laccase production by *P. cinerea* immobilized on synthetic fiber, as an alternative to increase the laccase production by this fungal strain. Assays were performed in shaking flasks and in a stirred tank bioreactor.

Methodology. *P. cinerea* was cultivated in 250-mL Erlenmeyer flasks containing 50 mL of TDM medium (2). Assays were performed in medium containing only free cells, and in medium containing cells immobilized on synthetic fiber (Scotch Brite, 3M Spain, SA, particle sizes of approximately 0.2 cm^2). The fermentation runs were maintained at 25 ºC during 30 days. For the assays in bioreactor, a 1.6-L stirred tank bioreactor containing 1 L of fermentation medium was used. Fermentation was maintained at pH 5.0, 25 ºC, during 10 days. Laccase activity was determined by the ABTS oxidation method. Scanning electron microscopy of the support material before and after the cells immobilization was performed to verify the cells adhesion.

Results and Discussion. Assays in Erlenmeyer flasks revealed a significant increase in laccase production when *P. cinerea* was immobilized on synthetic fiber (Fig. 1). The enzyme production by immobilized cells achieved 3505 U/L after 15 d of cultivation, while only 122 U/L was obtained by the free cells even after 30 d of cultivation. Images obtained by scanning electron microscopy revealed that the cells immobilization mainly occurred by adhesion (Fig. 2), as it was expected due to the high roughness of the support material. Results obtained in flasks were not reproduced in the bioreactor (Fig. 3), probably because the used fermentation conditions were not suitable to allow good performance of the strain. Under optimum fermentation conditions, assays in bioreactor usually promote better and faster fermentation results than in Erlenmeyer flasks.

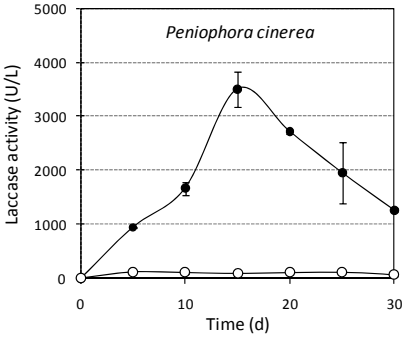

Fig. 1. Laccase production by free (open circles) and immobilized (closed circles) *P. cinerea,* in 250 mL-Erlenmeyer flasks.

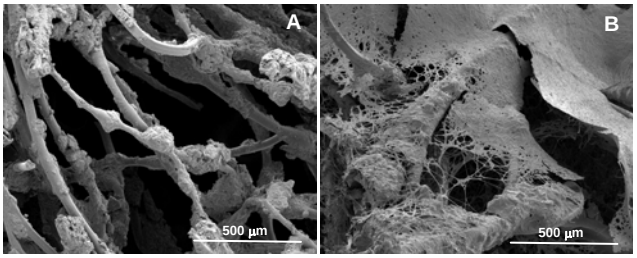

Fig. 2. Scanning electron microscopy images of synthetic fiber in the original form (A) and after colonization by *P. cinerea* (B).

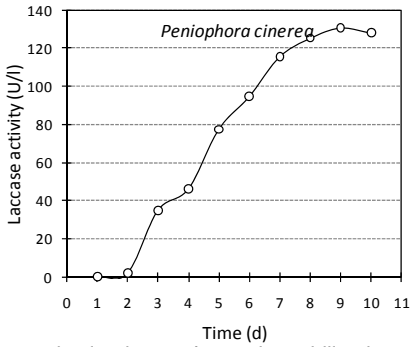

Fig. 3. Laccase production by *P. cinerea* immobilized on synthetic fiber, in a stirred tank bioreactor.

Conclusion. Laccase production by *P. cinerea* is greatly improved when using immobilized cells. Further assays to establish the most suitable fermentation conditions are needed to maximize the enzyme production in bioreactor.

Acknowledgements. CNPq (Brasil).

References.

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