# ENGINEERING STRATEGIES TO INCREASE LACCASES PRODUCTION BY *Pleurotus ostreatus* IN SUBMERGED CULTURES

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**Introduction.** Efficient laccase production involves the combination of several factors as a highly producing fungal strain, proper culture media and suitable inducers, as well as the choice of the cultivation system and bioreactor design. In stirred tank bioreactors, fungal physiology is strongly influenced, among others, by the hydrodynamic and oxygen concentration prevailing during the culture. Previous studies have shown that the energy dissipation/circulation function (EDCF) is a valuable hydrodynamic parameter through it is possible to control the growth rate and process productivity of fungal cultures (Rocha Valadez *et al.* 2005). The aim of this work was to study the influence of the EDCF, oxygen tension and copper (as inducer) on laccase production by *Pleurotus ostreatus* CP-50.

**Methods.** Initially, the influence of EDCF on laccase production in *P. ostreatus* cultures without oxygen control was studied. Then, laccase production in controlled cultures performed at high EDCF – low oxygen and low EDCF – high oxygen was compared. Based on these results, laccase production by *P. ostreatus* was evaluated in cultures carried out at two consecutive EDCF: 5.94 KW/m$^3$s during growth phase and 0.94 KW/m$^3$s during stationary phase. Finally, the use of copper as inducer was evaluated.

**Results.** Only selected results are presented in this abstract. While fungal growth showed a direct relationship with EDCF (results not shown), laccase specific productivity shows a maximum at EDCF= 0.94 KW/m$^3$s (Fig.1).

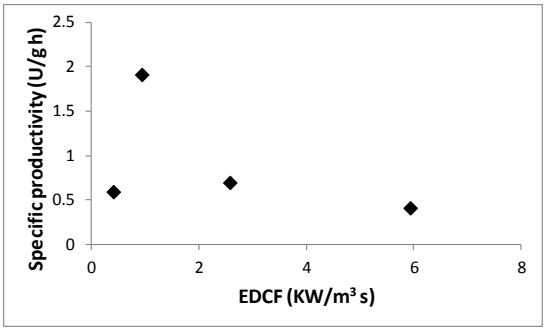


**Fig. 1** Effect of EDCF on laccases specific productivity

Growth and laccases production by *P. ostreatus* were enhanced in cultures carried out at high EDCF (5.94 KW/m$^3$s) and low (5 %) dissolved oxygen (Fig 2).

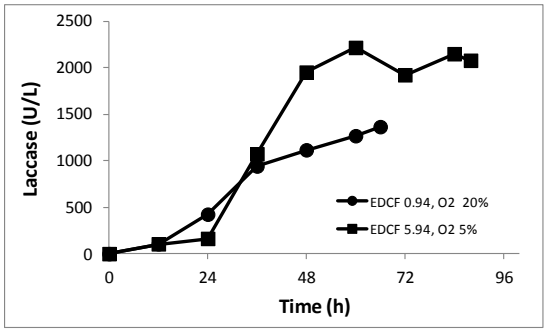


**Fig. 2** Effects of EDCF and dissolved oxygen tension on the production of laccases by *P. ostreatus*.

Laccase production was further improved in two-phase cultivations reaching 6000 U/L when EDCF was switch at 72 h of cultivation (Fig. 3). Finally, copper addition during two-phase cultivation of *P. ostreatus* yielded a significant increase (from 2000 to 14000 U/L) on laccase production (Fig. 3).

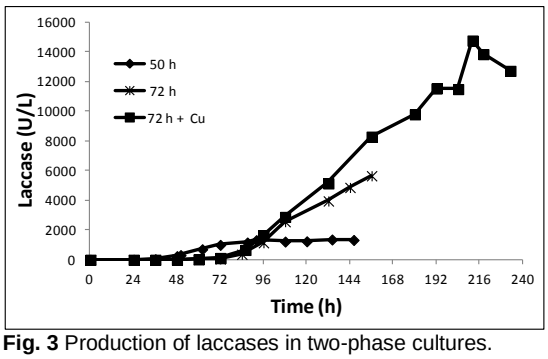


**Fig. 3** Production of laccases in two-phase cultures.

**Conclusions.** Growth and laccase production by *Pleurotus ostreatus* are differentially influenced by hydrodynamic and oxygen concentration conditions prevailing during cultures. Two-phase cultures revealed to be a useful strategy to increase laccase production by *P. ostreatus* in submerged cultivation. Productivity was increased from 25 to 69 U/L·h.

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**References.**

Rocha-Valadez,J.A. Hassan, M. Corkidi, G. Flores C. Galindo, E. Serrano-Carreón,L. 2005. *Biotechnol Bioeng*, 91, 54-61.