AXIAL TEMPERATURE GRADIENT IN A COLUMN BIOREACTOR ON SOLID STATE FERMENTATION OF *A.versicolor*.

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Introduction. Large-scale solid state fermentation (SSF) processes present difficult conditions for heat transfer. This is mainly due to the low thermal conductivity of the materials used as support [1]. Heat accumulation in SSF induces temperature gradients that may cause damage of microbial activity, dehydration of the support and undesirable metabolic deviations [2]. The aim of this work was evaluate axial heat accumulation using wood particles as inert support in a column bioreactor.

Methods. Inocula for SSF were prepared harvesting spores of *Aspergillus versicolor* with tween 80 0.05%. Pine wood particles previously washed (0.42 – 3.36 mm) were used as inert support. The inoculum size was $2x10^7$ espores/gDM and the culture media was Czapek-Dox modified as follow (g/L): Sucrose ($C_{12}H_{22}O_{11}$) 90, sodium nitrate ($NaNO_3$) 9, potassium phosphate monobasic (KH_2PO_4) 8.25, potassium phosphate dibasic (K_2HPO_4) 10.57, magnesium sulfate ($MgSO_4 \cdot 7H_2O$) 1.5, potassium chloride (KCl) 1.5, ferrous sulfate ($FeSO_4 \cdot 7H_2O$) 0.03 and yeast extract 1.5. Initial pH and humidity were 6.5 and 65% respectively. Cultures were incubated at 30 °C in a water bath. The inoculated support was packed in glass column bioreactors with inner diameter of 4.5 cm and 15 cm height. Four thermocouples were axially fixed at 0, 3, 6 and 9 cm from the bottom at center of the bioreactor. Carbon dioxide was monitored by an automatic analyzer. Data were adjusted to logistic equation and kinetic parameters were estimated.

Results. Figure 1a shows carbon dioxide production rate and CO_2 production adjusted by logistic equation. Kinetic parameters (table 1) associated to the production of CO_2 are similar to values obtained with isothermal experiments carried out under same conditions (data not shown). By other hand, highest temperature was achieved at 24 h at 9 cm and the maximum increment of temperature was 1.5 °C (Fig 1b). Hasan y col., found that the maximum temperature increment at 10 cm was 2 °C using *A. niger* growing on rice bran. These values indicate that the level of heat accumulation did not have a negative effect on the growth of *A. versicolor*.

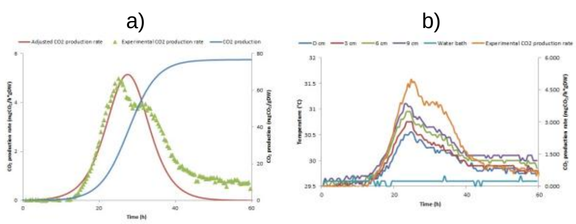

Fig.1 a) Data adjusted to logistic equation and b) Experimental CO_2 generation rate and axial profiles of temperature in SSF of *A. versicolor*.

Table 1. Estimated kinetic parameters.

Parameter	Value	
CO_2 max ($mgCO_2$/gds)	76.712	± 1.716
μ (h^{-1})	0.268	± 0.002
Fase *lag* (h)	20.170	± 0.057

After 24h of culture temperature decrease since the used air flow rate was sufficient to remove the metabolic heat. The use of a water bath helped to remove heat by conduction.

Conclusions. The use of pine wood particles allowed the growth of *A. versicolor* and avoided heat accumulation due to porosity of the support. Although temperature gradient was generated due to metabolic activity of *A. versicolor*, it was negligible. The use of forced aeration and water bath contributed to preventing metabolic heat accumulation in the fermentation material.

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