# SPORE PRODUCTION IN 7 L AND 75 L STIRRED TANK BIOREACTORS

Jazmín Zúñiga Zamudio, Carlos Orozco Álvarez, Sergio García Salas.
Unidad Profesional Interdisciplinaria de Biotecnología. Departamento de Bioingeniería. Av. Acueducto s/n. La Laguna-Ticomán. México, D. F., sgarciasa@ipn.mx

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**Introduction.** Among the agents used for biological pest control are fungi and their spores. One way to produce them at large scale is to grow fungi in liquid medium using bioreactors. In a study of scaling up, the type of bioreactor and its operating conditions should be specified, with them a mixing conditions and mass and heat transfer should allow to obtain at large scale at least the same productivity and yields obtained at smaller scale. There are different strategies for scaling up process, the most used are those based on the power consumed per unit volume (1) and the volumetric ratio of oxygen transfer (2).
The objetive of this work was to study the production of *Beauveria bassiana* spores in 7 L and 75 L stirred tank bioreactors.

**Methods.** *Beauveria bassiana* BbPM inocula were prepared using spores obtained in PDA medium after 21 days of growth at 21 $^0$C, at a concentration of $10^6$ spores/mL. The culture medium used in the inoculum and in the bioreactors was constituted by 14.5 mL/L of molasses, 6 g/L of $(NH_4)_2SO_4$, 3.5 g/L of $KH_2PO_4$, 0.5 g/L of $MgSO_4$, 0.1 g/L of NaCl and 0.1 g/L $CaCl_2$. The temperature was 24 °C and pH 5.4. The bioreactors were geometrically similar. The stirred tank had two Rushton turbines. The spore count was performed in a Neubauer chamber. The oxygen transfer rate was determined with the dynamic method.

**Results.** Fig. 1 shows the growth kinetics, substrate consumption and production of *Beauveria bassiana* spores in 75 L stirred tank bioreactor. The behavior of all variables is similar to that obtained with the 7 L stirred tank bioreactor. The highest concentration of spores reached was 1.69 x $10^8$ spores/mL. This concentration is of the same order of magnitude as that obtained in 7 L stirred tank biorreactor, showing that the operating conditions employed in the 75 L bioreactor were adequate to meet the target of scaling up.

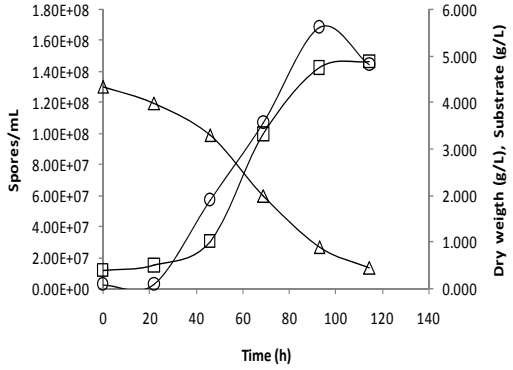


**Fig.1** Growth kinetics, substrate consumption and production of *Beauveria bassiana* spores in 75 L stirred tank bioreactor. Spores (○), dry weight (□) and substrate (Δ).

The development of the scaling strategy resulted in that it is feasible to produce the *Beauveria bassiana* spores using low power requirements in the order of 0025 W/L and a oxygen transfer rate of 0.02 g/Lh, This was possible because the fungus has a low growth rate (μmax=0.044 $h^{-1}$) and the culture reaches a relatively low cell concentration (≈ 5 g/L).

**Conclusions.** Spore production in 7 L and 75 L was similar in spite of at 75 L the power input and oxygen transfer rate was lower than in 7 L. Thus, the same spore productivity can be obtained at large scale with lower operating costs.

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**References.**

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