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Solid State Fermentation Process Development for Trichoderma asperellum Using Inert Support in a Fixed Bed Fermenter

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Abstract : The disadvantages of using natural substrates in SSF processes have been well recognized and mainly are associated to gradual decomposition of the substrate, formation of agglomerates and decrease of porosity bed generating limitations in the mass and heat transfer. Additionally, in several cases, materials with a high agricultural value such as sour milk, beets, rice, beans and corn have been used. Thus, the use of economic inert supports (natural or synthetic) in combination with a nutrient suspension for the production of biocontrol microorganisms is a good alternative in SSF processes, but requires further studies in the fields of modeling and optimization. Therefore, the aim of this work is to compare the performance of two inert supports, a synthetic (polyurethane foam) and a natural one (rice husk), identifying the factors that have the major effects on the productivity of T. asperellum Th204 and the maximum specific growth rate in a PROPHYTA L05® fixed bed bioreactor. For this, the six factors C:N ratio, temperature, inoculation rate, bed height, air moisture content and airflow were evaluated using a fractional design. The factors C:N and air flow were identified as significant on the productivity (expressed as conidia/dry substrate•h). The polyurethane foam showed higher maximum specific growth rate (0.1631 h-1) and productivities of 3.89 x107 conidia/dry substrate•h compared to rice husk (2.83x106) and natural substrate based on rice (8.87x106) used as control. Finally, a quadratic model was generated and validated, obtaining productivities higher than 3.0x107 conidia/dry substrate•h with air flow at 0.9 m3/h and C:N ratio at 18.1.

Keywords : bioprocess, scale up, fractional design, C:N ratio, air flow
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