Taller: Estrategias de enseñanza en Microbiología

Código de Resumen: BF-012

Sección: Biotecnología y Fermentaciones

Modalidad: Poster

ALPHA-L-RHAMNOSIDASE ACTIVITY IN NON-AQUEOUS SOLVENT SYSTEMS

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Enzymes are highly specific catalysts that typically function in aqueous solvents. However, many enzymes retain their catalytic activities at high concentrations in non-aqueous environments. Non-aqueous biocatalysis is suitable for synthesis of commercially important pharmaceutical precursors and drugs, such as pure enantiomers, chiral molecules, single isomers and biopolymers. α-L-Rhamnosidase (EC 3.2.1.40) was partially purified from *Brevundimonas* sp. Ci19 intracellular extracts by ultrafiltration and gel-filtration chromatography with a performance of 27-fold purification. α-L-Rhamnosidase displayed high activity in 20% solvent (dimethylsulfoxide, ethylenglycol, glycerol, methanol, 2-propanol, and propilenglycol) at 30 ºC. Especially in the case of DMSO and 2-Propanol solutions, enzymatic activity was higher compared to aqueous system. The α-L-rhamnosidase produced by the psychrotolerant bacterial strain*Brevundimonas* sp. Ci19 showed interesting properties and could be used in industrial processes containing organic solvents mixtures.

Código de Resumen: BF-013

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SCALE-UP OF PHENOL BIODEGRADATION PROCESS BY TWO NATIVE BACTERIAL STRAINS

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Several industries produce and release high phenol concentrations generating a severe environmental impact. Therefore, simple, environmentally-friendly and novel methods are needed to remove this compound from effluents, water and soil. In previous works, we have isolated two bacterial strains identified as *Acinetobacter tandoii* RTE1.4 and *Rhodococcus* sp. CS1 from polluted environments, which have shown ability to degrade phenol in Erlenmeyers flasks. Thus, the objective of the present study was to evaluate the scaling-up of the process, analyzing the effect of different agitation rates and air flows on phenol bioremediation by both bacteria using stirred tank bioreactors.

Biodegradation was evaluated in bioreactors (2-5 L capacity) containing mineral media supplemented with 200 mg/L phenol and inoculated with *A. tandoii* RTE1.4 or *Rhodococcus* sp. CS1 (10% V/V). The bioreactors were operated at 200-600 rpm of agitation and 1-3 vvm of aeration. Phenol degradation, pH changes, bacterial growth and kinetic parameters were determined at different time intervals.

A. tandoii RTE1.4 showed high biodegradation efficiencies at agitation rates of 400 rpm and air flow of 1 vvm whereas 600 rpm and 3 vvm were the optimal conditions obtained for *Rhodococcus* sp. CS1. Under these conditions, complete phenol degradation was achieved after 7 and 12 h, for *A. tandoii* RTE1.4 and *Rhodococcus* sp. CS1, respectively. However, high degradation efficiencies were also observed in the other evaluated conditions, except for *Rhodococcus* sp. CS1 growing at 600 rpm speed and 1 vvm aeration that only showed 38% of phenol degradation. The pH remained constant or slightly declined during degradation process of both bacteria. Moreover, kinetic parameters such as maximum specific growth rate (μ_{max}) and biomass yield ($Y_{x/s}$) calculated for *A. tandoii* RTE1.4 did not varied or increased with increasing agitation rates and the air flow while, in general, the same parameters decreased for *Rhodococcus* sp. CS1 cultures, suggesting that *A. tandoii* RTE1.4 is quite robust with respect to hydrodynamic forces. Therefore, the scale-up of the process using this strain, should be related to provide sufficient gas transfer given the relatively high oxygen demand. Despite this, the biodegradation performance showed by both microorganisms in bioreactors was suitable because they were capable of degrading the contaminant in larger volumes of culture media and faster than in Erlenmeyer flasks. Thus we can conclude that *A. tandoii* RTE1.4 and *Rhodococcus* sp. CS1 could be appropriate microorganisms for effective bioremediation of different phenol contaminated solutions at bioreactor scale.