Solid state fermentation using agroindustrial wastes to produce aspergillus niger lipase as a biocatalyst immobilized by an adsorptioncrosslinking method for biodiesel synthesis

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Abstrak

Although technological advances have fueled the rising demand for lipase as a biocatalyst, commercial availability remains limited and costs prohibitive. To meet this need, an extracellular lipase enzyme from Aspergillus niger can be produced through solid state fermentation (SSF) using agroindustrial wastes including tofu dregs, coconut dregs, and corn bran. These agroindustrial residues still contain nutrients, especially lipids/triglycerides, making them a potential fermentation medium to produce lipase. Lipase with the highest activity level (8.48 U/mL) was obtained using a tofu dreg substrate, 4% inducer concentration, and 9-day fermentation period. This crude lipase extract was then dried with a spray drier and immobilized in a macroporous anion resin using the adsorption-crosslinking method. The immobilized lipase's activity was also tested through four cycles of biodiesel synthesis; in the fourth cycle, the enzyme maintained 84% of its initial activity.