Improvement of fungal lipids esterification process by bacterial lipase for biodiesel synthesis

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Abstract:

Lipase-catalyzed biotransformation of fungal lipids into biodiesel via bacterial enzymes or whole cell catalysts has been considered as one of the most promising methods to produce applicable, renewable and environmentally friendly alternative liquid fuels. Four highly lipolytic bacterial isolates were isolated from seeds and grains of some plant species and screened for their potentiality to synthesis of fatty acid methyl esters (FAME) by lipase esterification process for the production of cost-competitive biodiesel. The four isolates were identified based on phenotypic and gene encoding 16S rRNA as Bacillus vallismortis ASU 3 (KP777551), Bacillus tequilensis ASU 11 (KP777550), Bacillus amyloliquefaciens ASU 16 (KP777549) and Bacillus firmus ASU 32 (KP777552). Among the four tested bacterial lipases, extracellular lipase of B. firmus ASU 32 (KP777552) showed the highest activity toward the transesterification of fungal lipids as 71.2% of total fatty acid methyl esters (FAMEs). B. firmus ASU 32 lipases displayed a higher thermal stability and methanol tolerance ensuring their application as a promising biocatalyst for FAME synthesis. The results proved that, the most active acyl acceptors for biodiesel production from fungal lipids by B. firmus lipase were methanol and ethyl acetate. B. firmus has applicable future as a whole cell biocatalyst for FAME synthesis from fungal lipids. Alleviation the inhibitory effect of methanol in the transesterification process of fungal lipids by lipases might be performed through separation of hydrolysis step from esterification process by methanol for FAME synthesis. This paper is expected to provide a competitive economic outcome for industrial FAME synthesis.

Keywords:

Bacillus firmus FAME Cunninghamella echinulata Fungal lipids Lipase

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