Lipid Production by Oleaginous Fungi Grown on Rice Straw for Potential Biodiesel Resource

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Biodiesel can be produced from lipid sources such as oleaginous fungi grown on various types of biomass like rice straw. Besides, in Vietnam, over 50 million tons of rice straw ’re annually produced, most of which is commonly burnt, causing many serious environmental problems while yielding little practical values. Therefore, to utilize this unused rice straw, this research aims to use the solid-state co-fermentation of 2 oleaginous fungi strains grown on rice straw to produce lipid. From 45 fungi strains isolated from straw and soil samples in Vietnam, we selected micro fungi based on capacity to hydrolyze cellulose and accumulate lipid. After thorough research, we selected: 1) R4.4 Aspergillus oryzae with cellulase activity of 10.5 U/ml and lipid-accumulation capacity of 17.6% dry cell weight) and 2) NM1 Lipomyces starkeyi (cellulase activity of 4.8 U/ml and lipid-accumulation capacity of 61% dry cell weight). Moreover, R4.4 can utilize pentose to grow and accumulate lipid efficiently while most common oleaginous fungi cannot. Basically, the process was carried in 2 following steps: 1) pretreatment, 2) fermentation. Moreover, to save time, reduce expenses, and increase productivity, the research uses solid-state co-fermentation in a simple self-designed system using compressed air with cheap catalyst (slaked lime) instead of saccharide solution fermentation. We finally produced 19.1 grams of lipid, containing mainly palmitic acid (34.5%) and oleic acid (44.26%) of the fatty acid components, from 100 grams of dry straw after 21 days of solid-state co-fermentation in the self-designed system. This result proves that the process is effective and promising for practical application.

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