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Production of biodiesel and other industrially important co-products from microalgal biomass under an algal refinery approach

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The urgent need to deal with the energy crisis arising out of over exploitation of non-renewable resources for energy generation has brought microalgae into prominence due to their potential to act as an energy-rich renewable resource. One of the most efficient ways to generate energy from microalgae is through utilization of the algal lipids to produce biodiesel. Lipid productivity, a primary factor influencing higher biodiesel production from microalgae, requires enhancement of both, the biomass yield and lipid content of the microalgae. Nutrient stress is a conventional approach used for increasing lipid accumulation in microalgae, but the reduced growth under such conditions eventually affects biodiesel production through reduced lipid productivity. To overcome this drawback, mixotrophy can be preferably considered for increasing the microalgal growth. In the present study, the effect of mixotrophy with six different exogenous carbon sources was assessed for growth and lipid accumulation in a green microalga, Scenedesmus obliquus (Trup.) Kutz. (SAG 276-3a). The results of the individual and interactive supplementations of the carbon sources demonstrated maximum lipid accumulation up to 29% of dry cell weight (dcw) in the test microalga under the combined supplementations of 0.16% citrate and 0.16% acetate in N 11 medium. The multifactor optimization study using Response Surface Methodology further boosted the lipid content to 56.4% (dcw). The biodiesel (transesterified lipids) obtained was found to be predominated with saturated and monounsaturated fatty acid methyl esters.

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