Ramachandran Sivaramakrishnan et al., J Bioremediat Biodegrad 2017, 8:5(Suppl)
DOI: 10.4172/2155-6199-C1-008

Biorefinery approach of microalgae feedstock for the production of bioethanol and biodiesel

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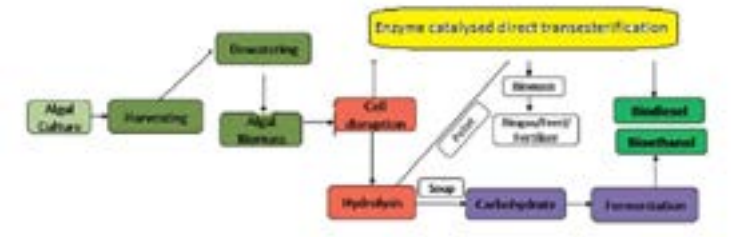
The continued use of fossil fuels depletes the reserves; more than 75% of petroleum based fuels are burnt in the transportation sector. The utilization of global energy is expected to be increased in the future due to increased population and demand. Therefore, there is a need for alternative fuel, which is not only satisfying the need, but also solving the environmental problems. Microalgae feedstocks, a reliable biofuel source, have drawn much attention as an alternative and renewable. This is due to the microalgal species have the excellent photosynthetic efficiencies and the biomass reproducibility potential than any other terrestrial crops. In this study the integrated approach of ethanol and biodiesel production from algal biomass has been proposed. This integrated method is to develop the microalgae based biorefinery model. The present study focuses on the biorefinery approach of integrated production of bioethanol and biodiesel from microalgae feedstock. Various pretreatment methods were used to determine the maximum recovery of sugars from *Scenedesmus* sp. The total sugar yield of 84% was obtained when pretreated separately by acid hydrolysis. The hydrolysate produces 90% of ethanol (theoretical yield) after the fermentation. Enzyme catalyzed ultrasound assisted direct transesterification of biomass was performed and the maximum of 91% methyl ester yield, 2.6% glycerol carbonate and 5.6% glycerol dicarbonate was obtained. The integrated process of initial acid hydrolysis produces 84% of total sugar. The sugar extracted biomass was initiated with enzyme catalyzed direct transesterification with ultrasound irradiation. The obtained hydrolysate was further fermented with S. cerevisiae and at the optimized conditions of fermentation 90% of ethanol (theoretical yield) was obtained. The conditions of direct transesterification using enzyme were optimized and produces 89% of biodiesel yield with 2.1% glycerol carbonate and 4.9% glycerol dicarbonate. Thus, the microalgal biomass efficiently produces both ethanol and biodiesel as well glycerol carbonate, which could be the biorefinery model for sustainable future development.



Biography

Ramachandran Sivaramakrishnan has been working in the production of biofuels from microalgae. He is working as a Post-doctoral researcher in the Department of Biochemistry, Chulalongkorn University. His Doctoral studies were about methyl ester production from macroalgae using lipase catalyst. He has been awarded as Junior Research Fellow by Department of Science and Technology, India. He has published five research articles in international journals.

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