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Global warming and pollution control through biodiesel production from a consortium of microalgae

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The aim of the research work is to look for alternative energy source so as to minimize the greenhouse gases emission, which are the main causes for global warming, from non-renewable energy sources and parallelly reduce the water pollution load due to the discharge of nutrient-rich wastewater from industries that lead to eutrophication. It mainly focuses on determining and analyzing the factors that affect the yield of biodiesel production from algal biomass and to optimize the processing conditions. Microalgae oil was extracted from dried and grinded consortium microalgae through the Soxhlet extraction method and the physicochemical properties were determined. Design Expert 7.0.0 software application was used to statistically analyze data obtained from experimental work. The factors that affect the biodiesel yield were investigated. The density, viscosity, acid value, saponification value, and free fatty acids were recorded as 0.94g/ml, 41.85mm²/s, 4.63mgKOH/g of oil, 201.72mg/g of oil, and 2.32% respectively. Alkali catalytic methanol transesterification method was employed to produce biodiesel from the oil and to improve the physicochemical properties of the oil. Temperature is found to be the factor that highly affects the yield of biodiesel. An optimum yield of 89.61% (44.8ml) biodiesel was obtained at reaction temperature of 53.270c, 1.99% catalyst and 6.18 alcohol to oil molar ratio. The physicochemical properties of the optimum obtained biodiesel were determined and the results were compared with the ASTM and EN standards. The physicochemical properties were recorded as density (0.89g/ml), viscosity (5.5mm²/s), acid value (0.78mgKOH/g of oil), moisture content (0.026%w/w), ash content (0.022%), and free fatty acid (0.39%). The results showed that the fuel properties are within the ASTM and EN standards and it suggests the potential of algal oil as a feedstock for the biodiesel industry which could be exploited as an alternative source of fuel.

Biography

Birhanu Ayalew has completed his MSc in Environmental Engineering at the age of 30 years from Addis Ababa University Institute of Technology. He has been working for Ethiopian Leather Industry Development Institute for more than four years. Now he is working as a researcher at Ethiopian Biotechnology Institute, a premier Bio-technology research institute. He has published 2 papers in reputed journals.

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