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A Comparative Account of Potential Biological Resources for Biodiesel-Their Production and Advantages: A Review

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Abstract—*Biofuels have become one of the fastest growing markets in the world. Many environmental NGOs strongly support biofuels as one of many renewable technologies needed to reduce our dependence on hydrocarbons and to avert the worst of climate change. Biodiesel is found to burn more efficiently than diesel by reducing the emission of carbon monoxide, hydrocarbons etc.*

Biodiesel is fatty acid methyl or ethyl esters made by trans-esterification of edible, non edible oils and animal fat with short chain alcohols. Vegetable oils are a renewable and potential inexhaustible source of energy with energy content close to that of diesel. A comparative advantage of castor is that its growing period is much shorter than that of Jatropha and pongamia, and there is considerably greater experience and awareness among farmers about its cultivation. Waste cooking oil (WCO) like soyabean oil leads to the production of good quality diesel oil however the best results were obtained from 1:1 molar ratio of methanol to waste soyabean oil at 50^{o}C for 2 hr with 1.0 wt% catalyst of NaOH. In one piece of the research work done by a group using waste palm oil and comparing it with petroleum diesel and fresh un-used palm oil the BD obtained from WCO is perhaps the greenest liquid fuel and its performance was found to be marginally poorer at part loads compared to the baseline diesel performance.

In tropical countries palm and coconut oil are most common source of biodiesel. The fatty acid composition of dewaxed/degummed Rice bran (byproduct obtained from husked rice kernel) oil (RBO) is similar to other vegetable oil and is also used as biodiesel feed stock. RBO is known as heart oil as it decreases the risk of cardiovascular diseases but it is not a common source of edible oil compared to other oils (sunflower, soyabean, cotton etc) as it is difficult to refine but crude RBO is low cost feed-stock for BD production as compared to traditional oils. Thus by using 2 step lipase catalysed enzymatic process for methanolysis of RBO, 98% rich fatty acid methyl esters could be obtained in a total reaction time of less than 5 h.

Biodiesel is also generated from oleaginous yeast, Rhodotorula glutinis and it has shown great promise for industrial application as it could assimilate a wide range of sugars, thus producing high quality, low cost biodiesel from microbial oil suggesting that lignocellulosic biomass can be utilized for biodiesel production.

As petroleum fuels cost rise and supplies decrease, biodiesel will become more attractive to both investors and consumers. Because biodiesel from oil crops, waste cooking oil and animal fat cannot fulfill a small fraction of the existing demand for transport fuels, microalgae appear to be the only source of renewable biodiesel that is capable of meeting the global demand for transport fuels.

Keywords*: fatty acid methyl ester, transesterification, rice bran, microalgae*