Fermentation Technology
ISSN: 2167-7972

Jha and Das, Ferment Technol 2017, 6:2
DOI: 10.4172/2167-7972.1000143

Short Communication Open Access

Waste Cooking Oil – Revolution in Biodiesel Production

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Received date: April11, 2017, **Accepted date:** May 18, 2017, **Published date:** May 25, 2017

Abstract

High disparity in global cost of petroleum crude oil has an ominous impact on national economy of raw petroleum dependent nations like India. According to the study, petroleum crude oil utilization in India was 3.182 million barrels per day in 2010, in 2002 utilization rate incremented by 3.28% while in 2010, it incremented by 6.77%. In this manner, searching for the ecofriendly way to create trade for the petroleum based fuel like diesel is the current undertaking for green technologists. Remembering these issues, Biodiesel, a clean sustainable power source has drawn attention to the world owing to its non-toxicity, biodegradability, and superior efficiency. However, several feedstock have been proven impractical or infeasible because of their extremely high cost due to their usage. India, with a population of over 1.27 billion people generates millions of gallons of used cooking oil and organic waste every day which is disposed of without use and is a potent bane to the environment. This paper reviews the possibility of the generation of biodiesel from waste cooking oil trying to help decrease the price of biodiesel.

Keywords: Biodiesel; Waste cooking oil (WCO); Feedstock

Introduction

Today it is extremely basic to utilize alternative fuel due to vitality security, ecological concerns, and financial reasons. Raising oil costs and exhaustion of oil reserves require better options of alternatives of energy from fossil fuels. With the ascent in sympathy toward contamination brought on by fossil fuels, for example, petroleum, coal and natural gas, alternative fuels and renewable supplies of energy, for example, biodiesel are coming in trend [1]. Furthermore, the symptom of petroleum based fuels is that throughout the years there has been magnification and accumulation in the measure of pollution created by these fuels. The over exploitation of these energy sources over numerous years have detrimentally affected the worldwide temperature levels with alarming increase in it specifically known as global warming [2].

In the course of the most recent couple of years biodiesel has picked up significance as an option fuel for diesel motors. Fabricating biodiesel from utilized vegetable oil is moderately simple and has numerous natural advantages. Utilized vegetable oil is portrayed as a 'renewable fuel' as it doesn't include any additional carbon dioxide gas to the environment, rather than fossil fuels, which cause changes in the air. Their utilization for biodiesel production has the benefit of their low cost. The most widely recognized approach to deliver biodiesel is by trans-esterification, which alludes to a catalyzed compound response including vegetable oil and an alcohol to yield fatty acid alky esters and glycerol [3]. Alnuami scrutinizing the cost of biodiesel production in context of the materials utilized. It can be inferred that among the four materials, for example, palm oil, jatropha oil, soya bean oil and waste cooking oil, waste cooking oil can be viewed as the most reasonable and advisable raw material for biodiesel production.

Waste Cooking Oil (WCO) as rational feedstock for Biodiesel production

Biodiesel is a mono alkyl ester of unsaturated fatty acids formed from vegetable oils or animal fats. As such, when a vegetable oil or animal fat chemically responds with an alcohol, it can deliver Fatty Acid Methyl Ester (FAME), a vegetable oil which can be utilized as a part of diesel motors after a few changes and alterations. There are various processes to decrease the viscosity of the vegetable oils to make the fuel more efficient in nature. In this context, there are many methods which can be applied for biodiesel production like Direct use and blending, Micro emulsion process, Thermal cracking process and Trans-esterification process. The most widely recognized approach for biodiesel production is the trans-esterification method, which alludes to a catalyzed chemical reaction including vegetable oil and alcohol to yield fatty acid alkyl esters (i.e., biodiesel) and glycerol [4]. The yield of biodiesel amid the procedure of trans-esterification is impacted by various methodology parameters which consist of, presence of moisture and free fatty acid (FFA), reaction time, reaction temperature, catalyst and molar proportion of alcohol and oil [5].

Biodiesel can be utilized as an option for petro diesel for it is renewable, nonpoisonous and biodegradable fuel [6]. As an alternative fuel, it has many favorable circumstances as it is derived from a renewable, domestic resource, in this manner calming dependence on petroleum fuel exchange. It is biodegradable and nontoxic when contrasted with petroleum based diesel. Biodiesel has a better burning emission profile, for example, low emissions of carbon monoxide, particulate matter, and unburned hydrocarbons. Carbon dioxide delivered by burning of biodiesel can be recycled by photosynthesis, in this manner limiting the effect of biodiesel ignition on the greenhouse effect. Biodiesel has a generally high flash point, which makes it less explosive and more secure to transport or handle than petroleum diesel. Motor wear and long engine life are focal points that can be given by biodiesel as it has lubricating up properties. Therefore,

utilization of biodiesel is being developed vibrantly amid the most recent years [7].

The properties of biodiesel and diesel fuels, by and large, indicate numerous identicalness, and in this way, biodiesel is evaluated as a reasonable fuel as another option to diesel. This is because of the way that the change of waste cooking oil into methyl esters through the trans-esterification process lessens the atomic weight to one third, diminishes the thickness by about one seventh, lessens the flashpoint to an extent and expands the volatility barely, and decreases pour point extensively.

Feedstock like Jatropha, in the present day scenario suffers from certain limiting factors, which need to be kept in mind while dealing with the specie. The rate of its germination from the seeds is poor, cultivation of jatropha alone may not be economically viable, and Jatropha cannot be grown on waterlogged lands or Algal fatty acids, where expensive process optimization keeps the product cost high. The use of waste cooking oil for production of fuel purposes can be solved by efficient management practices. Waste cooking oil gives a doable answer for the twin crises of non-renewable energy source exhaustion and natural degradation. Waste vegetable oil is a low cost feedstock in comparison with fresh vegetable oil. Practically, its price is only comprised by the collection and transportation, since the suppliers release it free of charge, avoiding disposal fees at the same time. The key to the successful utilization of WCO is establishing a reliable and continuous supply. The main providers are food manufactures, food processing plants, restaurants, and fast foods. The use of biodiesel made from cooking oil reduces lifecycle carbon emissions by 80 percent over carbon-based diesel, according to the Environmental Protection Agency. In many researches WCO biodiesel showed net energy ratio (NER) of 5-6 compared to 2-3 for rapeseed or soybean biodiesel and 0.8 for petro diesel. The benefits of utilizing waste cooking oils to produce biodiesel are the minimal effort and anticipation of environment pollution. These oils should be dealt with before arranging to the environment to avoid pollution. Because of the high cost of discarding, numerous people dispose waste cooking oils specifically to environment particularly in country region. Encinar (2006) conclude that utilization of waste cooking oils is a successful approach to lessen the cost of biodiesel generation.

Hence, waste oil or used cooking oil will always be produced and since it being an alternative, cheap feedstock it is conventional to be always available for the generation of cost effective biodiesel.

Conclusion

Barring hydropower and atomic energy, the significant piece of all energy consumed overall originates from petroleum, charcoal, and natural gas. However, these resources are constrained, and will be depleted soon in coming future. Along these lines, Biodiesel being one of the best fuel alternatives that researchers are focused on and efforts are being made to produce it at a lower cost and with outstanding fuel properties. The trans-esterification reaction is the best strategy for generation and variation of biodiesel till date. There are different forms of vegetable oils and animal fats that can be utilized as a part of this procedure however using waste cooking oil can diminish biodiesel generation costs. Waste cooking oil is cheap and abundantly available and will never go out of stock. This waste can be converted into a usable and cost effective fuel, decreasing our dependency on the use of petroleum based fuels (diesel/petrol/kerosene/coal/LPG).

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