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Opinion

Biodiesel: The Quintessential Move Towards Ecofriendliness

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Towards what the world is soaring when the current energy resources are biting the dust???

Depletion of fossil fuels, due to burgeoning population, bubbling up economic growth and rapid industrialization, has caused an adverse impact on global energy security. Since Edwin Drake drilled oil well in 1859, over 1.5 trillion barrels of oil equivalent have been produced and people around the world would be in need of the same amount of fuel in the next 25 years. The International Energy Agency (IEA) has reported that the basic need of energy globally would steer up to 55% between 2005 and 2030, at an average annual rate of 1.8% per year [1]. Those countries which do not produce fuels import crude oil among which USA and China rank first and second respectively and India third [2]. Nonetheless, scientists of this period across the globe have emerged to look out for a new alternative energy source that could reduce conventional fuel consumption. The inventor of the diesel engine, Rudolf Diesel, had already foretold about the use of vegetable oils as the replacement of petrofuels and was the first to run an engine using peanut oil in 1900. In 1911, he stated 'the diesel engine can be fed with vegetable oil and would help considerably in the development of agriculture of the countries which use it' and in 1912, he said 'the use of vegetable oils for engine fuels may seem insignificant today, but such oil may become, in the course of time, as important as the petroleum and coal tar products of the present time' [3].

Renewable energy is the novel advancement in the field of fuels. Biofuel technology is currently enjoying an incredible popularity as it is continuing to be successful in developing a new energy avenue. Biodiesel, one of the most accomplished biofuels and diesel-like fuel, not only serves as an energy source but also is capable of reducing or eliminating greenhouse gases [4,5]. Biodiesel is commonly produced from oils of diversified biological sources-from unicellular algal cells to multicellular plants and animals [6,7]. National policy on biofuel, established by the Ministry of New and Renewable Energy department, Government of India (GOI), has set a goal of making biofuels readily available to the public and marked a target of 20% blending of biodiesel by 2017 [8].

Though biodiesel generated using plant raw materials, is beneficial in many ways food vs. fuel issue spears up significantly [9]. GOI in its policy on biofuel has mentioned that biodiesel can be generated from seeds of non-edible plant sources, thus securing the food for the society. The GOI has launched the National Biodiesel Mission (NBM) and considered *Jatropha curcas* seeds as the most effective inedible oil for biodiesel production. In 2016, India has produced 140 million liters of biodiesel from multiple feedstocks like oil seeds of *Pongamia pinata*, *Azadirachta indica, Schleicera oleosa, Madhuca longifolia* and waste edible oils. It is also being proposed that other resources like used cooking oils, fatty acid oils and palm sludge could be eminent oil resources and production would be increased upto 150 million tones [8].

Various countries across the globe have involved in generating biodiesel as future fuels, each of them advancing in their own respects and come out with exceptionally large volumes of biodiesel. According to Monthly Biodiesel Report on US biodiesel industry, soybean oil remained as the largest biodiesel feedstock with 610 million pounds consumed, in December 2016. In December 2016, US production of biodiesel was 143 million gallon which was 1 million gallon higher than that in December 2015 (108 million gallon) and 2014 (123 million gallon) [10]. In Indian markets biodiesel is produced and used up in several sectors, but higher distribution is towards diesel locomotion and on road transport systems. Also, biodiesel has been used directly as fuel or as blend mixed with petrofuels. In countries like the US

and China, B100 (100% biodiesel) is being employed in vehicles. In India, a blend of 0.09% was used in 2016. However, the current average Indian blending rate is only 0.1%. Nevertheless, B5 is to be made available for the customers across the country in the near future [2].

Plants have been identified as the potent resources of oil for biodiesel production but shortage of land and water curtails the use of crops and put researchers in a fix [11]. To substitute higher organisms, oil producing microbial organisms have been identified as potential replacements. Algae are interestingly diverse organisms, ubiquitous and fast growing lipid containing photosynthetic apparatuses [10]. They are more advantageous than terrestrial plants as they do not require cultivable land, can use up waste water for growth thereby remediating the effluent and absorb the pollutant gases [12]. The prime advantage is that they do not compete with plants for food, fodder and other plant derived products [1]. Oswald and Golueke were the first technologists to propose the idea of using algae as the raw material to produce biodiesel in 1960 [13]. Different microalgal cultures are utilized for this purpose. Few commonly used microalgae are *Botrycoccus braunii, Chlorella vulgaris, Nannochloropsis* sp., *Schizochytrium* sp. and *Dunaliella* sp. [1]. The standard plant in biodiesel production, Jatropha produces an oil yield of 202 gallon/ acre whereas microalgae grown in open pond system produced around 6283 - 14641 gallon/acre in 2006 [14].

Commercially microalgal biodiesel still remain a challenge, but various advantages as mentioned make the environmental scientists to utilize algae for fuel production. Producing biodiesel from microalgae is laborious and cost intensive though they replace plant systems. Isolation of strain, nutrient supplement, harvesting of cells, product recovery are processes that make the production tough. The conversion of lipid to biodiesel and increasing the concentration of lipid in cells are considered to be strenuous. Improvement of strain through genetic modifications is performed to enhance the lipid concentration and biomass multiplication but sets back due to heavy expenditure [12,15,16]. In India production of biodiesel using municipal solid wastes, microalgae and other photosynthetic organisms are still under trials [2].

In order to keep up the success of biodiesel linger, it is mandatory that the professionals, public and entrepreneurs continue being committed and supporting the biofuel projects. Though the commercial growth is slow but steady, the society must learn to walk towards sustainable energy and use of bioresources effectively. Investment is the main obstacle in the field of biofuel; investors can lead the world to a new energy economy bringing up a green and pollution free ecosystem.

Use green-generate bioenergy-save earth!!

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