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Potential of Blue Green Algae to Compensate Demand of Third Generation Fuel

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Abstract—*Blue green algaes are the earliest inhabitants of plant and these are highly diverse members of the bio-diversity. Making significant contribution to the carbon and nitrogen. Biogeochemical cycle as it sequester a significant quantity of carbon from atmosphere industrial fuel gasses and waste water from urban and rural human activities. The energy crisis and the world food crisis have ignited interest in alga culture for making bio-diesel and other fuels. The mobility of first generation bio-fuel . Production is however questionable because of the conflict with food supply . Renewable and carbon neutral bio-fuels are necessary for environmental and economic sustainability. So algae biomass has dual benefit; it provides biomass for the production of bio-fuels and save environment. Algae are the fastest growing plants in the world and about 50% of any algae weight is oil. Algae oil could be made into diesels, gasoline, Jet fuel and become a renewable Feed stock for making plastics and other chemicals. Fuel from algae could have potential reduce emission of carbon of carbon pollutants. And compensate demand of third generation fuel from its bio-mass.*

Keywords*:- Biomass, Algae, Bio-fuel, Sustainability.*

1. INTRODUCTION

Microalgae are microscope unicellular organisms capable to convert solar energy to chemical energy via photosynthesis. In order to fix carbon dioxide which is in turn used to produce biomass. Algae can grow different types of water bodies waste water, salt water and brackish water. They contain numerous bioactive compounds that can be harnessed for commercial use. The potential of microalgal photosynthesis for the production of valuable compounds or for energetic use is widely recognized due to their more efficient utilization of sunlight energy as compared with higher plants. Microalgae can be used to produce a wide range of metabolites such as proteins, lipids, carbohydrates, carotenoids or vitamins for health, food and feed additives, cosmetics and for energy production. The global economy literally runs on energy.

An economic growth combined with a rising population had led to a steady increase in the global energy demands. If the governments around the world stick to current policies, the world will need almost 60% more energy in 2030 than today, of this 45% will be accounted by China and India together .

Due to depleting reserves and rising prices of fossil fuels, interest has rightly begun in the development of renewable energy sources. In year 2010, fossil fuels accounted for 88% of the global primary energy consumption. The current technological progress, potential reserves, and increased exploitation leads to energy insecurity and climate change by increasing greenhouse gas (GHGs) emissions due to consumption of energy at a higher rate. The use of fossil fuels is now widely accepted as unsustainable due to depleting resources and the accumulation of GHGs in the environment that have already exceeded the "dangerously high" threshold of 450 ppm CO_2.

Biodiesel has become a sustainable substitute to diesel fuel as biodiesel is produced from vegetable oil or animal fat through a chemical process known as transesterification. First-generation biofuels which have attained economic levels of commercial production, have been mainly extracted from food and oil crops (viz. rapeseed oil, palm oil, sugarcane, sugar beet, wheat, barley, maize, etc.) as well as animal fats using conventional technology.

Second-generation biofuel crops and production technologies are more efficient; their production could become unsustainable if they compete with food crops for available land. Thus, their sustainability will depend on whether producers comply with criteria like minimum lifecycle GHG reductions, including land use change, and social standards. The limitations of first-generation biofuels produced from food crops have caused greater emphasis to be placed on second generation biofuels produced from lignocellulosic feedstocks, although significant progress continues to be made to overcome the technical and economic challenges, second-generation biofuels production will continue to face major constraints to execute commercial deployment

Several biofuel candidates were proposed to displace fossil fuels in order to eliminate the vulnerability of energy sector. Biodiesel and bioethanol produced from terrestrial plants have attracted the attention of the world as potential substitute. However, due to food vs. fuel competition as well as land consumption of these biofuels, they have brought much controversy and debate on their sustainability. In this respect, cultivation of microalgae at sea water or industrial or other waste water provides a possible solution for this energy issue. Microalgae are single-cell, photosynthetic organisms known for their rapid growth and high energy content. Some algal strains are capable of doubling their mass several times per day. In some cases, more than half of that mass consists of lipids or triacylglycerides.

Third generation technology is based on algae or cyanobacteria that contain a high oil mass fraction grown in ponds. Microorganisms can convert almost all of the energy in biomass residuals and wastes to methane and hydrogen. Under proper conditions, these micro-organisms can produce lipids for biodiesel with yields per unit area that are many fold higher than those with any plant system.

2. METHODOLOGY

Materials are collected via electronic search using public media, science finder, Google scholar and web of science and library search for articled published in peer reviewed journals.

3. DISCUSSIONS

Biodiesel is a diesel fuel derived from animal or plant lipids (oils and fats). Studies have shown that some species of algae can produce 60% or more of their dry weight in the form of oil. Because the cells grow in aqueous suspension, where they have more efficient access to water, CO_2 and dissolved nutrients, microalgae are capable of producing large amounts of biomass and usable oil in either high rate algal ponds or photobioreactors. This oil can then be turned into biodiesel which could be sold for use in automobiles. Regional production of microalgae and processing into biofuels will provide economic benefits to rural communities. Microalgae can have faster growth rates than terrestrial crops. Also they can convert a much higher fraction of their biomass to oil then conventional crops.

Biobutanol

Butanol can be made from algae or diatoms using only a solar powered biorefinery. This fuel has an energy density 10% less than gasoline, and greater than that of either ethanol or methanol. In most gasoline engines, butanol can be used in place of gasoline with no modifications. In several tests, butanol consumption is similar to that of gasoline, and when blended with gasoline, provides better performance and corrosion, resistance than that of ethanol. The green waste left over from the algae oil extraction can be used to produce butanol.

Biogasoline

Biogasoline is a gasoline produced from biomass. Life tranditionally produced gasoline, it contains between 6 (hexane) and 12(dedecane) carbon atoms per molecule and can be used in internal –combustion engine.

Biomethane

Biomethane, the main constituent of natural gas can be produced from algae in various methods, namely Gasification. Pyrolysis and Anaerobic Digestion. In Gasification and Pyrolysis methods methane is extracted under high temperature and pressure. Anaerobic Digestion is a straight forward method involved in decomposition of algae into simple components then transforming it into fatty acids using microbes like acidific bacteria followed by removing any solid particles and finally adding methanogenic bacteria to release a gas mixture containing methane. A number of studies have successfully shown that biomass from microalgae can be converted into biogas via anaerobic digestion. Therefore, in order to improve the overall energy balance of microalgae cultivation operations, it has been proposed to recover the energy contained in waste biomass via anaerobic digestion to methane for generating electricity.

Bioethanol

The key features of the process involves less intake of energy and simpler compared to the biodiesel production. Besides, the undesired CO_2 released as a by-product can be recycled and cultivate additional microalgae, resulting in the reduction of greenhouse gas emissions. However, the commercial production of bio-ethanol from microalgae is still being investigated.

4. CONCLUSION

These conventional crops have lower environmental impacts than algae in energy use, greenhouse gas emissions, and water regardless of cultivation location. Only in total land use and eutrophication potential do algae perform favorably. Algae grow much faster than food crops, and can produce hundred of times more oil per unit area than conventional crops. As algae have a harvesting cycle of 1-10days , their cultivation permits several harvests in a very short time-frame. Algae can grown on land unsuitable for terrestrial crops, saline soil, minimizing competition with agriculture.

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