Algal approach for Sustainable Development: A Critical Review

Iqbal Ansari and Kumar Nikhil

Abstract— **Algae is a clearly promising solution for bridging the gap between supply and demand in the oil industry. Its production might be relatively environmentally sustainable. Fuels derived from algae have potential to revitalize the domestic economy by paying for billions of gallons of energy locally rather than exporting money to support other economies. Algae has researched for the feasibility for fuel sources. Algae can grow anywhere there is enough sunshine and some can grow in saline water. All algae contain proteins, carbohydrates, lipids and nucleic acids in varying proportion . This paper focuses on potentiality of algae to be a alternative source of energy and sustainable development for human.**

Index term— **Algae,biodiesel ,phenolic compounds ,fossil fuels , acid rain , transestrification .**

I. INTRODUCTION

The wide spread use of fossil-fuels such as petroleum, coal, and natural gases resultant several environmental consequences that trigger the researchers for finding alternative green biofuel. In past few years ,many researched work has been performed on the conversion of algal biomass into biofuels [1a,1b,1c].Researchers pay attention towards marine algae due to its fast growth rate , great photosynthetic efficiency , superior biomass production and lack of arable land requirements for biofuels [2]. The term biodiesel commonly refers to eco friendly diesel made up of various feed stock by conversion of the triglyceride to ethyle ester by process of tras estrification [3], to produce oil closer to the petrol diesel at the rate of high viscosity [4].

Algae is of great interest to all biologist because of single algal cells which are complete organisms capable to synthesize multitude of compounds and photosynthesis which organise their cell structure [5]. Algae being autotrops provide a base line for aquatic food chains [6]. Different species of algae can be flourished in different habitats such as in fresh, marine, salty, brackish and in polluted waters [7].

Energy consumption in the G20 association of countries soared by more than 5 % in conversion trends on the a\one hand, developed countries which experience sharp decreasing energy demand in 2009 recovery firmly in 2020. Almost back to historical trends oil, gas, coal and electricity markets followed the same trend. India and china showed no sign of slowing down in 2009, continued in their instance demand of all forms of energy [8]. Algae has been harvesting by human for medicinal and food purposes for over 2500 years and have been cultivating for approximately 300 years [9]. Algae have the potential to produce around 100 times more oil per hectare than terrestrial plans in a comparable growing area[10]. Algae contains many biotic compounds such as phenolic compounds, alkaloids, plants acid, terpenoides and glycosides and they are used as antioxidants, anti bacterial, antiviral and anti carcinogenic [11]. Algae can used in producing vitamins in biogas production, pharmaceutical drugs, by anaerobic digestion and methane production from residual form of micro algal [12a, 12b]. Algae can utilise in removing heavy metals from waste water [13], brown algae and red algae are harvested for synthesis of valuable products such as agar and algin acid used in laboratory as nutrient supplement [14].

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Iqbal Ansari, Project Assistant, in EMG, CSIR-CIMFR, Dhanbad, Jharkhand, India,

Dr. Kumar Nikhil, Principal Scientist, EMG, CSIR CIMFR, Dhanbad, Jharkhand, india,

II. ENERGY ,POWER REQUIREMENT OF INDIA AND WORLD

As a developing country our energy requirement is higher side. The energy requirement of our country is 4000Kwh/year per capita electricity consumption [15]. Out of this nuclear shares 2.77%,thermal 54.20%, hydroelectric 21.69%, renewable energy 10.94% and natural gases 10.94% in January 2011..In India the projected energy consumptions by year 2020 in sector of electricity will be 35% , oil 25%, coal 10%, gas 5% and biomass 15% [16]. The world energy consumption by 2013 in coal was 11000 mt, renewable energy 8600 mt, hydroelectric 8500mt , nuclear energy 7600mt , natural gases 7000mt , oil 4000mt [17].The world total energy consumption by year 2000 was 400 quadrllion billion tonne, in 2020 500qbt, and year 2020 projected 610 qbt [18].This implicates that there is a wide gap in energy requirement and available resources in our country which requires an immediate attention for finding out alternative energy resources which may be environmentally sustainable and cost effective .

Whereas the second world scenario is entirely different as mentioned above implicates that they have already started utilized alternate energy resources like soybean maize, another lignocellulosic materials for production of methanol and finally biodiesel. Since some of the dis advance and developed countries have zero waste management in the field of energy production and more emphasis were green for the energy production from bio available resource like algae, castor, maize, soybean and other bio waste.[19]. Indeed our country has also started thinking and in the midway of other utilised bio resource available for the production of direct and indirect energy and fuels in sustainable and cost effective

ways. Research and policy should give emphasis to achieve the projected goal.

III. HEALTH HAZARDS AND ENVIRONMENTAL IMPLICATION OF FOSSIL FUELS.

Burning of fossil fuels n the thermal power stations leads to pollution and emits harmful pollutants like CO_2, SO_2, which causes acid rains and global warming and badly effect flora, fauna and human. [20]. The main sources of particulate matter mission are result of burning fossil fuel combustion[21a,21b], thus the burning 0f an enormous amount of fossil fuels has increased the CO_2 level in atmosphere causing global warming[22a, 22b]. Due to air pollutants several toxicological and epidemiological studies reviles to haven bad effect on human health.[23-a, b, c].

Children are at high risk from the toxic and carcinogenic effects of air pollution from burning of fossil fuels. Nitrogen oxides can have a toxic effect on the air ways leading to inflammation, asthmatic reactions and worsening of allergic and asthma symptoms.[24]. Air pollutants produced during burning of coal and other fossil fuels leads to great lose of fauna and flora habitat [25].

IV. BIOMASS FOR AN ALTERNATIVE ENERGY SOURCES

Biomass is one of the better source of energy[26], large scale introduction of biomass energy could contribute to sustainable development on several fronts, environmentally, socially and economically[27]. With the real potential for rising petroleum prices in the future and ever increasing concerns over energy independence, security and global warming, the nation of using micro algal feed stocks for biofuels production has steadily gained momentum over the last few years. Lipid derives from micro algae have been the predominant focus of this interest because these oil contain fatty acid and triglyceride compounds which their terrestrial seed oil, counter parts can be converted into alcohol esters (biodiesel) by using conventional transestrification process[28].

Thus the oils can be used to produce a renewable or "green diesel" produced by a process known as catalytic hydro processing and will zero waste [29]. The conversion of solar energy into renewable liquid transportation fuels from algal lipids has been shown to be technically feasible[30]. Recent studied have been shown that micro algal biomass is one of the most source of renewable biodiesel that is capable for meeting the global demand for transport fuels. Biodiesel production by algae will not compromise the production of food, fodder, and other products derived from crops[31].

The idea of using micro algae as a source of biofuel is not a new but it now being taken seriously because of the rising price of petroleum and more significantly the emerging concerned about global warming that is linked with burning of fossil fuels[31]. Algal biodiesel has similar physical and chemical properties to petroleum diesel.

V. CONSTRAINTS

Growing biofuel industry is facing a large reasonable and viable for feed stock. Biofuel production from algae for its commercialization is still needed to minimise the level of uncertainity and insecurity due to techno economic constraints [32a, 32b]. Production cost also varies significantly with production scale and the system of production open or closed pond. Oil production from algae is expensive due to its high energy requirements and the capital cost[33]. Photo bioreactor designed at present time play a vital operation but lacks due to its limitation of gaseous exchange thus it cannot be fruitfully about 100 cm sq and open ponds suffer from contamination [34].

Algae grow at normal temperature for its biological activities above the optimum temperature biological activity decline and some time abruptly tends to zero [35]. Cultivation of algae also requires a proper and suitable pH value for its growth[36]. Another barriers in development of biodiesel from algae are the high cost and harvesting and processing of algal biomass.

VI. CONCLUSION

Algae can play important role in the bio economy. Algae are efficiently cultivated in places that are unsuitable forother purposes but also many other products such as proteins, colorants and raw materials for bioplastics is achievable. Biodiesel derived from oil crops is a potential renewable and carbon neutral alternative to petroleum fuels. However, the high cost and limited supply of renewable oils prevent it from becoming a top competitor for petroleum fuels. Optimising the cultivation harvesting and conversion of algal lipids into bio fuels and maximizing the added benefits, will hopefully make algal bio fuels, economically competitive for fossil fuels for the next decades.

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