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MICROALGAE AND BIO FUEL: RISING ENERGY SOURCE

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ABSTRACT

As requirement of energy sources are increasing day by day, uses of fuels is also increasing. We are using only 10% of renewable energy resources and 90% of fossil fuel in day to day life. As side effects of fossil fuels use global warming and natural imbalance are also issues. On other hand, we don't have much amount of fossil fuel for upcoming years but as per day to day requirement of energy resources it is highly demanded that alternate option for fossil fuel must be found. Microalgae seem to be very useful microorganism which can produce biofuel. But production of microalgae is very expensive due to its quantity of lipid, carbohydrate and hydrogen. Cost of production of biofuel from microalgae made production of microalgal biofuel infeasible. Here pros and cons as well as introduction of biofuel from microalgae is discussed.

Keywords: Microalgae, Biofuel, Energy resources

INTRODUCTION

An algae use sun, carbon dioxide and nutrients to grow. In controlled environment, algae can multiply many times each day. Algae consume many useful things within it like, fat, protein, oil etc. Mass production of algae is important to derive these things from it. Selected algae can produce 50% oil and 50% biomass which convert to fuel products. Algae tank technology can produce fuel at 50% cost compared to current crude production prize. It can be used in transporting power.

Related Work (Figure 1)

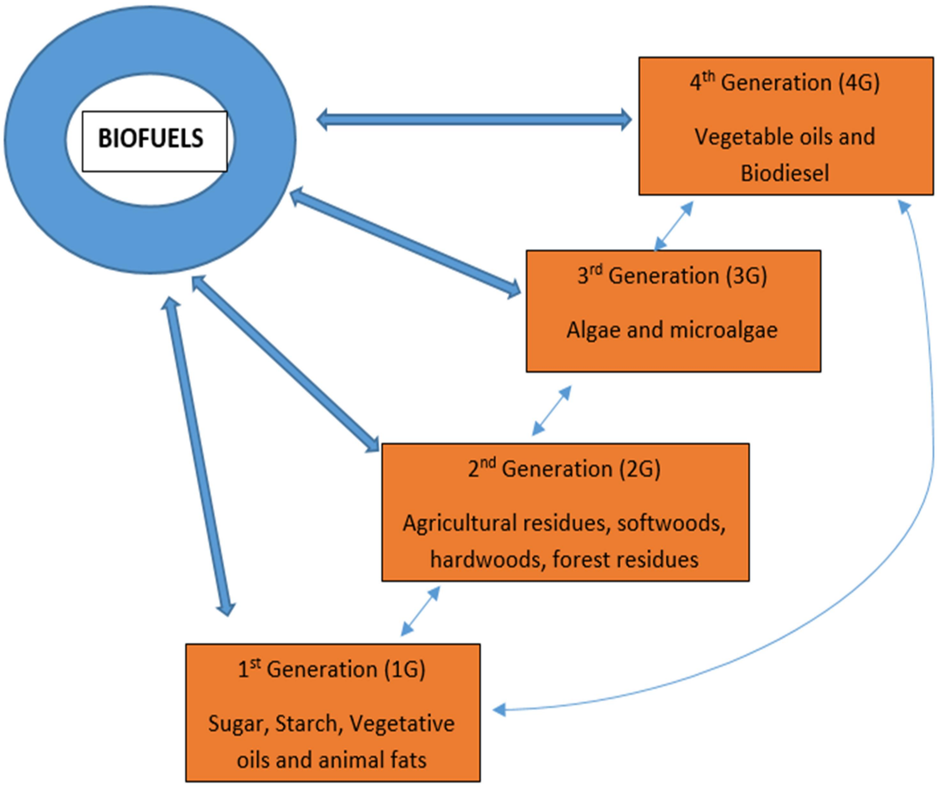

Figure 1: Classification of biofuels with respective raw materials [1]

The main objective of this study was to delineate the synergistic impact of microalgal biofuel integrated with nano-additive applications. Numerous nano-additives such as nano-fibers, nano-particles, nano-tubes, nanosheets, nano-droplets, and other nano-structures' applications have been reviewed in this study to facilitate microalgae growth to biofuel utilization. The present paper was intended to comprehensively review the nano-particles preparing techniques for microalgae cultivation and harvesting, biofuel extraction, and application of microalgae-biofuel nano-particles blends. Prospects of solid nano-additives and nano-fluid applications in the future on microalgae production, microalgae biomass conversion to biofuels as well as enhancement of biofuel combustion for revolutionary advancement in biofuel technology have been demonstrated elaborately by this review **[2]**.

Life cycle assessment (LCA) is a valuable tool for determining the environmental impacts associated with different products. It has been widely used to assess biofuel production pathways and increase the value of biofuel in the face of environmental impacts. A wide variety of biofuel production pathways have been assessed, but the relatively limited system boundaries may not capture full impacts of the processes. Most biofuels production processes could be sustainable due to low emissions and use of renewable sources, but biofuels production from microalgae is not environmentally competitive due to high energy consumption of harvesting and oil extraction **[3]**.

The microalgae-to-TAG/glucose chains incorporate the development and pre-treatment measures. To address the most minimal energy utilization of delivering 1 kg TAG/glucose, first the self-assertively orchestrated mixes of gear can be found by two alternatives for the development, seven choices for the collecting, four choices for the dewatering, five choices for the phone interruption, three alternatives for the lipid extraction, and corrosive hydrolysis. Second, the ideal blend for the microalgae-to-TAG/glucose chains are dictated via looking through the most reduced all out-energy utilization of creating 1 kg TAG/glucose through an arranging calculation. As indicated by the particulars of all discretionary hardware, 840 blends for the microalgae-to-TAG chain are gotten and the comparing energy utilization for creating 1 kg TAG are assessed if the TAG substance of microalgae is half. Likewise, 56 blends for the microalgae-to-glucose chain are acquired and the comparing energy utilization for creating 1 kg glucose are assessed if the glucose substance of microalgae is half. Also, an ideal mix of raceway lake, settling with woolly, belt channel press, blender, and wet extraction for the microalgae-to-TAG chain is gotten and the comparing energy utilization and TAG portion are 16.18 kWh/kg TAG and 0.26 kg/kg dry load of algal biomass, separately. Likewise, an ideal blend of raceway lake, settling with hairy, chamber channel press, and corrosive hydrolysis for the microalgae-to-glucose chain is acquired and the relating energy utilization and glucose division are 1.22 kWh/kg glucose and 0.44 kg/kg dry load of algal biomass, individually **(Figure 2) [3]**.

Microalgae are considered as promising cell industrial facilities for the creation of different kinds of biofuels, counting bioethanol, biodiesel, and biohydrogen by utilizing carbon dioxide and daylight. Regardless of remarkable benefits of these microorganisms, the commercialization of microalgal biofuels has been thwarted by poor financial highlights. Metabolic designing is among the most encouraging methodologies set forth to defeat this test. In this section, metabolic pathways associated with lipid and hydrogen creation by microalgae are explored and examined. Besides, metabolic and hereditary designing methodologies examined for improving the pace of lipid (as a feedstock for biodiesel creation) and bio hydrogen combination are introduced. At long last, hereditary designing devices and approaches utilized for designing microalgal metabolic pathways are expounded. An intensive bit by bit convention for reproducing the metabolic pathway of different microorganisms including microalgae is additionally introduced **[5]**.

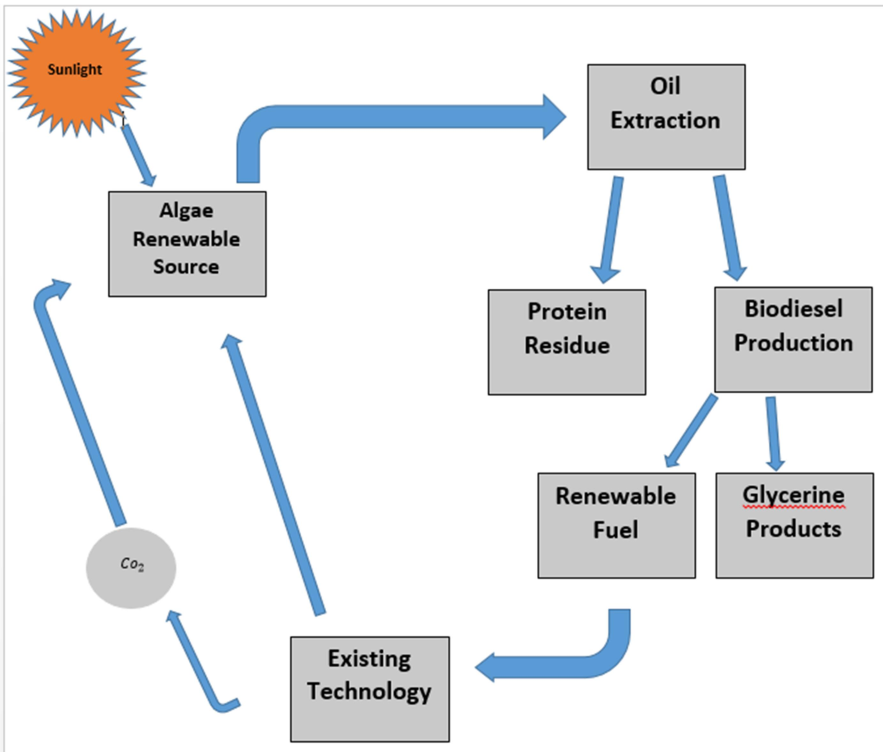

Figure 2: Cyclic-representation-of-biofuel-production-from-algae

The flight fuel ignition discharges nitrogen oxides, carbs, monoxide, sulphur oxides, part of the way copied hydrocarbon, follow mixtures, and particulates. The fuel business devours 5 million barrels of oil a day because of the interest for movement. The aeronautics business should decrease its carbon impression using elective fills to influence the environmental creation that causes ozone consumption and environmental change. Green growth biofuels created from algal feedstock are turning out to be more feasible on the grounds that their rich oil structure is firmly connected to their photosynthesis. Green growth ingests CO_2, which changes over into oxygen, and their enormous oil creation is diminished by cell structure detachment All energy supplies are transformed into esteem added biofuels by green growth biofuels. Microalgae oil moved to stream fuel mixed with modern fuel named hydro-treated vegetable oil (HVO), bio-determined manufactured paraffin lamp oil (Bio-SPK), or hydro-treated inexhaustible fly (HRJ). Hydrotherapy has been authorized to ASTM Standard D7566. Utilizing conventional cleaning procedures, oil is first washed to arrange Bio-SPK/HEF. The oil is changed over into short chain diesel-show paraffin to the removal of oxygen and olefins to hydrogen paraffin. Warm and oxidative adjustment improves the extraction of olefins, and the decrease of oxygen improves the strength of ignition. In the subsequent response, the isomerized diesel fuel isolates paraffin from the stream assortment, bringing about a fuel with indistinguishable particles typically found in conventional oil. The Fischer–Tropsch strategy is another approach for the handling of excellent energizes, wood, coal, and flammable gas fuel rocket. From algal biomass, fluid energizes were created utilizing the gasification venture There are numerous flow research projects in the advancement of microalgal biofuel on account of security issues in avionics fuel **[6]**.

Expulsion of weighty metals from wastewaters utilizing microalgae is acquiring interest in light of the fact that microalgae additionally absorb carbon, nitrogen and phosphorus. Here, we audit algal digestion and development; algal biomass transformation to biodiesel, bioethanol, biohydrogen, methane, power and composts; and evacuation of metals with microalgae. The mixotrophic approach empowers the compelling treatment of both natural and inorganic squanders in water. For development, photobioreactors are found proficient because of the control of operational conditions. Bioremediation of weighty metals by physiochemical measures shows up to be more productive than algal take-up **[6]**.

Study presents the practicality of microalgae recuperation utilizing ASDEPS as bio-flocculant. EPS, removed by warm, compound and sonication conventions, were upgraded with the improvement in flocculation action of microalgae. The general consequences of the container test showed that flocculation exercises definitely expanded as bio-flocculant was added, notwithstanding microalgal species. Moreover, it gave greater reasonableness to low self-amassed microalgal species. The biochemical qualities of the distinction in the flocculation action were ascribed to the biochemical attributes of EPS, particularly, starch focus. The compound extraction convention had a low flocculation productivity just as a hindering impact on the lipid substance of recuperated microalgae. Warm removed EPS was profoundly viable for gathering microalgae and recuperation of lipids. The techniques recommended in this investigation could be ecologically solid without utilizing plentiful synthetic compounds. All things considered, to improve the pertinence of the techniques recommended in this examination, it is important to consider the ideal strategy to deal with the leftover materials after lipid recuperation in what's to come **[7]**.

The photosynthetic limit of green growth as an essential maker in nature and the general simplicity of its development on a enormous scope make it alluring to investigate openings and create algal innovation for synchronous sequestration of mechanical and environmental CO_2 (to relieve environmental change), while creating supportable cycles for assembling inexhaustible energizes close by biochemicals of worth. The advancement of techniques that expand algal item yield while advancing the CO_2 gas supply is required for the suitable scale-up of algal innovation. One of the fundamental focuses of this innovation is the expected abuse of vent gases, a reasonable and carbon-rich source. Up until now, the development of microalgae has dominatingly been researched utilizing generally low CO_2 focuses that are a long way from the levels offered by pipe gas (6–25%), which are more valuable for energy age with associative advancement of carbon impartial cycles. Here, we tried a progression of gas supply methodologies to examine microalgal development at high CO_2 levels with the plan to improve algal CO_2 obsession and lipid aggregation. Ideal development of *Nanno chloropsissalina* (a marine green growth) happened at 6% CO_2, while few cells developed under 20% CO_2. Abundance CO_2 brought about medium fermentation, colour decrease, and development restraint. In any case, the obsession limit of CO_2 and the creation of explicit lipids were improved by O_2 expulsion from the channel gas by up to 4.8-overlap and 4.4-crease, individually. These boundaries were additionally improved by 72% and 25%, individually, through a steady expansion in CO_2 focus. Very high CO_2 levels (100%) totally hindered cell development, yet this impact was switched when air containing climatic CO_2 levels was presented instead of 100% CO_2. These discoveries will consider the future advancement of more powerful procedures utilizing algal biotechnology for delivering biofuel while moderating fossil fuel by products **[8]**.

To successfully use microalgae-determined biofuel, denitrogenating (evacuation of NCCs, for example, carbazole and benzonitrile) was done by means of adsorption with a MOF having multifunctional gatherings (or, MOF called M101-OC, acquired by post-engineered alteration of MIL- 101-NH_2 with oxalyl chloride). The adsorptive exhibition of the adsorbent M101-OC was superior to some other announced adsorbent for the expulsion of NCCs present in biofuels. Or on the other hand, M101-OC had 3.8-and 19.6- times adsorption limit with regards to CBZ and PhCN that of AC, individually. This recognizable adsorption limit/execution may be clarified with hydrogen holding association or because of the presence of four hydrogen acceptors (O or N iota) and two hydrogen benefactors on the M101- OC. Besides, the adsorbent showed prepared reusability after straightforward washing the utilized M101-OC with ethanol. Subsequently, the M101-OC may be a promising adsorbent for the sanitization of microalgae-inferred biofuel NCCs like CBZ and PhCN **[9]**.

Methodology

As part of the photosynthesis process algae produce oil and can generate 15 times more oil per acre than other plants used for biofuels, such as corn and switch grass. Algae can grow in salt water, freshwater or even contaminated water, at sea or in ponds, and on land not suitable for food production. Thus first of all in this process oil is abstracted mechanically from algae in plant. This process will separate access oil and provide pure algae structure as an output. We can perform further experiment/process on these algae.

We need alcohol to stop contamination. So we can store algae for long process. Solutions contain 70% ethanol to white town of interior of laminar flow hood and all items keeps in hood. Surface sterilization is important in reducing possible contamination. Lighten up ethanol lamp. 10mm of culture added into fresh media and heat it on lamp. This will remove extra unnecessary microorganism so they can affect in process. Devices should not touch during transfer anything. That’s why fresh untouched hand gloves are wore by scientists during process.

Specially made medium will store in flask for scaling up. Add culture from existing tube to that media Store it in lab under special conditions. Store it for 2-4 weeks for completion of transformation. Culture is transfer to photobior reactor system after lab process. 18000 gallon system designed to produce algae on large scale. Reactor must be clean internally as well as externally regularly. Due to regular cleaning external microorganism will not affect algae quality. This maintenance will maximize algal growth. Check contamination and water quality on regular basis.

Now, here we have large scale of algae and there may be different size of algae in it. We can't use all type of them for further process. That's why algae are harvesting by using rotating drum filter size of 1micron. It will remove the algae of 4 micron. On other hand primary challenge of using algae as a fuel is oil extraction. That's why high frequency ultrasound is used to burst algal cells and release the oil.

Final stage is centrifugation. In this process components are separated based on density. It extracts cellulolipid on the centrifugation fraction. It concentrated on bottom. Then water and protein layered on it and then fats and oil differentiates on the former layer of the surface. Each component can be deriving individually. In the result of this process oil get extracted successfully.

Advantages:

1. **Energy Security**

   a. **Domestic energy source**

   Algae is easily growing microorganism which can be available at almost everywhere.

   b. **Locally distributed**

   Algae can be different at different location. That's why we can say that algae is locally distributed.

   c. **Higher reliability**

   Algae is a complete natural source which can be grow easily and also can be available everywhere. In addition it is highly reliable for process. There are so many things we can get from algae while processing that in form of product or by-product.

   d. **Ready availability**

   Once algae is grown completely, there is no need to add or modify it. It contains everything we want from it. So we can directly take it to the process and get whatever we want.

   e. **Renewability**

   Algae is natural source. It doesn't requires any support to grow. It can be grow in simple sunlight with the help of nutritious available through water. In other hand, once we use algae for any process, we can also take it in the use to grown another algae and other purposes. That's why we can say that algae is renewable.

   f. Reduce use of fossil fuels

2. **Economic Impact**

   a. **Price stability**

Price can be stable by using bio fuel because of fixed process is decided for biofuel generation.

b. Fuel diversity

Algae can be produce bio oil and bio diesel as well. It can produce other things as a by-product.

c. Rural development

Rural areas are most proper areas for algae growth. Thus, by using micro algae for such purpose we can generate better revenue for rural area developments.

d. Increased income tax

e. New industrial dimension

This can be new direction for all fuel related industries.

3. **Environmental Impacts**
   - **a.** Improve land and waste utilization
   - **b.** Reduced air pollution
   - **c.** High combustion efficiency

Disadvantages:

1. **Technology**
   - **a.** Pretreatment
   - **b.** Enzyme production
   - **c.** Technology cost
   - **d.** Efficiency improvement
2. **Policy**
   - **a.** Land use change
   - **b.** Fund for research and development
   - **c.** Commercial scale development
   - **d.** Policy for biofuels
3. **Feed Stock**
   - **a.** Collection network
   - **b.** Storage facilities
   - **c.** Food-fuel competition

CONCLUSION

Algal biofuels are in trouble. This alternative fuel source could help reduce overall carbon emissions without taking land from food production, like many crop-based biofuels do. It is not much developed due to high expense, lake of awareness and regular maintenance. But it is more useful product from many sides and that's why it can be very important energy source in future. It can be more helpful for growth of many rural as well as industries areas. It can be trend changing if it will be successful and less complex. There is no doubt in saying that it can be next generation's most popular fuel.

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