# Algae Utilization Regarding Renewable Source of Energy

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***ABSTRACT***: ***Energy sources have advanced to the point that the whole world is dependent on them. Because they are the most plentiful, fuels are the most significant source of energy. There has been increasing worry about the depletion of available resources for biofuel production during the past several decades. Algae is getting the greatest attention as a source of biofuel in light of the food crisis. The advantages and disadvantages of solar energy technology are discussed in this article. Algae are thought to be a good source of renewable energy because of their rapid growth rate and ability to grow in waste water or waste land. As a result, a lot of corporations and government agencies are working to reduce operational and capital costs in order to make algae fuel processing economically viable. This review article examines at algae's potential as a perfect biofuel reactant as well as a possible fossil fuel substitute. As a consequence, the progress achieved in algae research and development as a renewable energy source since its beginnings is examined in this article. Begin with a broad review of algae, their many forms, and the biomass they produce. It also tries to demonstrate the current and future difficulties connected with algae cultivation. It also seeks to highlight the future significance of algae.***

***KEYWORDS****: Algae, Biomass, Environment, Renewable Energy, Water.*

## 1. INTRODUCTION

The globe's energy demand is rapidly rising. As a source of energy, only fossil fuels are used. Environmentally friendly power sources, for example, sun oriented, wind, hydro, flowing, and biomass have become progressively famous all over the planet because of consumption of petroleum derivatives, rising petrol based fuel costs, energy preservation, and expanded an Earth-wide temperature boost [1]. Biomass has been considered as a hotspot for biodiesel creation of biofuels, for example, biodiesel, bioethanol, and biogas from a wide scope of sources, including horticultural, ranger service, and amphibian [2]-[3]. Then again, the natural effect of fuel ignition fundamentally affects the carbon cycle (carbon balance) that is connected to non-renewable energy source burning. Moreover, the depletion of different existing biomass, as well as an absence of sufficient pay, brought about huge biomass shortage, as well as arising ecological issues like deforestation and biodiversity misfortune. Algal biomass have recently caught the interest of researchers and entrepreneurs as an alternative feedstock for biofuel production [4]-[5].

A great deal of research has been done on various aspects of algae in various contexts. A systematic examination of the current body of information, on either side, is lacking. This type of systematic review is useful for identifying common research sources and also identifying potential research trends. The focus of this research is to provide a critical review of algae-related research in order to highlight the current state of the art and future needs in this area [2]-[6].

### *1.1 Algae:*

The word "algae" refers to every organism which can produce oxygen gas. They are to the Protista kingdom and come in a variety of sizes and shapes. They can be single microscopic cells, macroscopic and multicellular cells, colony cells, or to have a leafy look as giant kelp[7]. Algae vary from plants in that they have a unique character. They have roots, stems, and leaves, and a vascular system that allows water and nutrients to start flowing through their bodies [8]-[9].

### *1.2 Types of Algae:*

Algae pigment may be used to establish their habitat distribution. Only a few species of Algae are present in harsh environments for example snow, ice or hot springs, despite the fact that the majority of Algae are found in aquatic ecosystems such as freshwater or sea water. Algae can be separated into 4 main categories, which are mentioned underneath [10]-[11].

*i. Blue-Green Algae:*

Cyanobacteria are the bacteria that make up blue-green algae. When scums die, they usually appear green but may also turn bluish. Large amounts of blue-green algae cause a variety of taste and odor issues, and certain species may produce toxins. Figure 2 depicts a simple example of blue-green algae [12]-[13]**.**

*ii. Green Algae:*

Green Algae are members of the Chlorophyta phylum and include chlorophyll a, b, carotenoids, and xanthophylls. They come in two varieties: unicellular and multicellular. Although a few species can be found in the ocean, they are mainly found in freshwater habitats. These species, along with some members of the Chromista, Rhodophyta, and Photosynthetic bacteria, are called "Algae" because they are aquatic and provide their own food, despite having no close relationship with any of these groups. Figure 3 shows the most basic example of a Green Algae [14]-[15].

*iii. Red Algae*:

Red algae are the oldest eukaryotic algae group, with over 6000 species. Protista is to the kingdom Protista, and Rhodophyta is to the phylum Rhodophyta. They produce chlorophyll and can prepare their own food by photosynthesis. Freshwater red algae remain mostly found in streams and rivers, but they can also be found in lakes, hot springs, soils, caves, and even sloth fur. Figure 4 depicts the most simple example of algae [16]-[17].

- *Biofuel Production Using Algae*

Algae contain varying amounts of oil with various compositions depending on the species. Some species have been described as having high fatty acid values. Similarly, certain algae have higher fatty acid content in their dry masses [18]-[19]. Micro algae can thrive in a variety of environments, even when nutrients are scarce. It is better to choose them for cultivation. The processing of samples requires caution so that the entire biofuel content can be collected by careful instrument handling. The blending method is an easy way to remove fatty acids and separate biodiesel on a small or experimental scale.

## LITERATURE REVIEW

Shuvashish Behera et al. discussed in this paper discusses around Algal biomass-derived third-generation biofuels. According to studies, that's the best alternative bio resource in avoiding the drawbacks of first- and second-generation biofuels. The in analysis was conducted while keeping the value of algae as a renewable energy source in view. In addition, this study focuses on the significance of algal cell contents, as well as different tactics for product creation using various fuel cells, as well as recent findings and advanced developments in algal biomass for improved biofuel production [20].

Simon Jegan et al. demostrated and mention that green growth is believed to be a solid wellspring of environmentally friendly power because of its quick development rate and capacity to be filled in squander water or waste land. A few organizations and government offices are endeavoring to decrease capital and functional expenses to make green growth fuel handling monetarily reasonable. At long last, a few arising issues in store for green growth were distinguished, and it was reasoned that microalgae for biofuels creation is planned to assist individuals in the last billions with food and energy security, as well as bring in cash and advantage the climate [21].

After conducting research on the overhead-mentioned research paper, it may be concluded that while the research was conducted using various methods of algae, a balanced perspective was not given, as some research papers failed to address the major challenges and potential perspectives of algae as a renewable foundation of energy, which is a major concern. As a result, our research paper overcomes all of these limitations by carefully analyzing and mentioning all of these variables such as the complete overview about the Algae and their types and biomass generation through Algae so that it should be considered as an important source of renewable energy cutting-edge such a way thatThey are simple to comprehend, and most importantly, the major obstacles and possible points of view are clearly listed and discussed to provide such a balanced viewpoint. This study is beneficial to those interested in learning more about algae research, as it provides a comprehensive overview of algae, their forms, and biomass production by algae.

## 2. DISCUSSION

### *2.1 Major Challenges and the Future Perspective of Algae:*

Green growth biofuels have the guarantee to be a worth option in contrast to petroleum products, however they should conquer a huge number of obstacles prior to getting general help in the fuel business. The difficulties are strain distinguishing proof and development, both as far as oil yield and harvest preservation, as well as supplement and asset appropriation and use, and co-item creation to raise the entire framework's financial matters. So there is a great deal of excitement about the capability of green growth biofuels, there is still a ton of work to be finished. We hope to clarify the major obstacles to monetizing algae biofuels at scale in this area, as well as raise the scientific community's focus on the issue. In this segment, we seek to clarify the major obstacles to selling algae biofuels on a large scale, as well as to urge the scientific community to work harder to attract algal biofuels from promise to reality [22].

- *Making Algal Growth & Harvesting More Efficient:*

Algae biofuel production would greatly benefit from improved engineering. With above effective nutrient circulation and light exposure techniques are one of these improvements. In rundown, engineers deal with critical issues assuming it fabricate minimal expense photograph bioreactors (PBRs) for enormous scope arrangement or working together with researcher to make species that flourish in minimal expense open frameworks. PBRs get a benefit over open frameworks in that they can support axenic societies and give more controlled development conditions, which can prompt expanded efficiency; in any case, gas trade efficiencies and the requirement for strengthening cooling represent a danger to contained frameworks. Notwithstanding the advantages of lower defilement and more productivity, its indistinct assuming PBRs will at any point be more exorbitant than open lake frameworks. Anything development approach is picked, critical enhancements in current innovations for developing, gathering, and extricating oil from green growth should be made, besides scientists and engineers will need to join closely. Irrespective of the growth plan chosen, huge improvements in current technologies for cultivating, processing, and extracting oil from algae, as well as concerted efforts to integrate science and engineering, must be made [5].

- *Improving Oil Extraction & Downstream Processing:*

Another issue that can be addressed most effectively with designing is oil extraction. Oil squeezes/expellers, hexane extraction, and supercritical CO2 liquid extraction are the three principle strategies for separating oil from green growth. These advances have been demonstrated to work, yet they are somewhat expensive as far as one or the other hardware or energy expected to separate the oil. Designing, luckily, can assist with these. The designing difficulties of changing over green growth oil to usable fluid energizes are like those looked by oil organizations since rough algal oil is synthetically like unrefined petroleum product oil. Another issue that can be tackled most effectively by means of designing is oil extraction. Oil squeezes/expellers, hexane extraction, and supercritical CO2 liquid extraction are the three fundamental techniques. These advancements have been displayed to work, however they are moderately exorbitant as far as one or the other gear or energy utilized it to remove the oil. Designing, luckily, can assist with these issues. Since rough algal oil is synthetically like unrefined non-renewable energy source oil, the designing difficulties of changing over green growth oil to usable fluid energizes are like those looked by petrol organizations.

- *Land Use:*

The size of execution expected to supplant a lot of non-renewable energy source, no matter what the development strategy or the productivity with which oil is removed, is critical. To affect this figure, green growth, or some other biofuel feedstock, would require a lot of land devoted to creation offices, with gauges assessing that 30 million sections of land would be important to satisfy US oil interest. A few models for accomplishing enormous scope hydroponics have been introduced. While both earthly and marine procedures might be required, this article will zero in on earthbound hydroponics since marine systems are obscure as of now and may require designing. While both earthly and marine methodologies might be required, this article will zero in on earthbound hydroponics since marine techniques are obscure right now and may require designing that is totally different based on what is presently drilled. The earthly models use land that isn't as of now utilized for food creation and has minimal laid out natural or monetary worth.

- *Water Use:*

Water can possibly be a significant obstruction to algal development. Water would be expected to extend algal development into nonarable land; fortunately, a considerable lot of these areas have enormous soluble or saline water holds underneath them, which give a huge wellspring of nonpotable water ideal for the development of numerous green growth species. Green growth filled in open lakes require a similar degree of water per unit region as cotton or wheat, yet not as much as maize (for a rundown of water prerequisites of earthbound plants utilized in biofuel creation, see here). To keep away from a "water versus fuel" banter, consider water use while pondering a huge scope green growth arrangement. Notwithstanding the accessibility of enormous basic supplies, water will keep on being a central issue for green growth biofuels creation, and it should be painstakingly thought to be as the business develops.

- *From The Bench to The Pond: Strategies to Make Algae Biofuels Viable:*

The monetary reasonability of green growth as an enormous scope biofuel maker, as well as the apparent worth of CO2 moderation by this innovation, will characterize whether it turns into a huge scope biofuel source. Early accomplishments in the business and scholarly regions will likewise attempt to help cash for the exploration expected to refine and approve this innovation. We made an improved on financial review utilizing a Scenedesmus spp., which created 0.21 g/l/day of biomass with a lipid content of 21%, to get a vibe of the conceivable advancement required. For this life form to be financially suitable at these development and fat collection rates utilizing current creation innovations, petrol based oil needs to cost around $710 per barrel in our model. The connection among development thickness and development rate is one of most essential features of development thickness.

Since the expense of collecting and fuel extraction offsets the capital expense of building a bigger office to accomplish a similar generally speaking absolute result, our model predicts that higher development densities support monetary practicality more rapidly than a corresponding expansion in development rate. Assuming we accept that point by point of existing species would prompt the distinguishing proof of an animal types with a development pace of 0.3 g/l/day and a 40% oil content, the cost of green growth oil would be roughly $310 per barrel. This number could be worked on further to augment the advancement strain by reproducing and determination or atomic hereditary qualities, yet there is no assurance because of the intricate connection between development rates and oil collection.

We've investigated ways of making green growth based energizes less exorbitant than petro fills. Bioprospecting is fundamental for observing green growth species that can be developed on minimal expense media and have helpful qualities, (for example, high lipid content, high development rates, high development densities, or potentially the presence of valuable co-items). Notwithstanding its true capacity, bioprospecting is probably going to observe organic entities that are less expensive than petrol, requiring more hereditary designing and reproducing to get these strains to business reasonability. Designing green growth has a wide scope of utilizations, crossing from improving lipid biogenesis and yield security to creating helpful catalyst or protein co-items. Each supportable innovation has downsides, however advancing them without taking a gander at the long outcomes prompts techniques who’s drawn out results offset their momentary advantages. We've featured the current and future difficulties which green growth biofuels persevere, however similarly as with any new industry, the more we learn, the more obstructions we face. In spite of these vulnerabilities, we anticipate that green growth based fuel creation should be cost-cutthroat, broadly versatile, and deployable inside the following 7-10 years, yet provided that how we might interpret these amazing creatures, as well as our capacity to design them for the particular undertaking of fostering another energy industry, moves along [23].

## 3. CONCLUSION

In recent years, finding new renewable energy sources to replace fossil fuels has become a difficult task. Algal biofuels have been rated as the best resource for replacing liquid petroleum fuel because of several advantages, like low land requirements for biomass production and high oil content with high efficiency. Low biomass output is one of its bottlenecks, which is an obstacle to industrial production. All steps of algae biofuel processing must be done for long-term sustainability and environmental benefits, especially drying, should be simplified without requiring a huge amount of energy. Furthermore, especially in third-world countries, the

methods should be simple to incorporate into the existing biofuels industry and implemented quickly. This is because growing microalgae for biofuels is about more than just making money.

This paper has covered a wide range of subjects related to algae, which plays a vital role in the creation of a smart, sustainable environment. Algae, in particular, has its description completed. A number of major challenges and potential perspectives have also been discussed, as well as the development of biomass from algae. This research is useful for those looking to learn more about algae as a renewable energy source. In order to provide a fair perspective, this paper also addresses the current state of algae and its future potential.

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