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Short Communication

Application of Microalgae in Biodiesel Production

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DESCRIPTION

Environmental developments are forcing us to reduce our use of fossil fuels and promote the use of green and renewable energy. The increased share of renewable energy in total energy usage pattern reflects growing research interest in renewable fuels. Climate change is the most challenging environmental concern of the twenty-first century, as a result of the rapid increase in fossil fuel consumption [1]. Global warming is producing unusual weather changes that are affecting people all around the planet. Biodiesel has been found as a viable transportation fuel substitute. The major advantage of biodiesel is that it can be utilised in current diesel engines alongside petro diesel without requiring any modifications. Due to the high cost of microalgae oil relative to crude oil, previous research efforts in algal biodiesel were abandoned [2]. Cost increases, combined with dwindling crude oil sources and environmental concerns, have refocused attention on the use of microalgae as a feedstock for biodiesel. Such research investigations are especially important for a growing country like India, which is highly reliant on petrofuel imports. Researchers have investigated a third and fourth generation of biofuels employing microalgae and macro algae (third generation) and metabolic engineering of photosynthetic organisms to manufacture biofuels to address these major concerns (fourth generation). In this sense, algae have garnered considerable attention in recent years due to their vigorous growth and ability to amass a lot of lipids, carbohydrate, and protein, all of which can be easily turned into different biofuels (biodiesel, bioethanol, and biogas) [3].

Microalgae, often known as phytoplankton, are basic tiny heterotrophic or autotrophic photosynthetic organisms. They can be found in fresh, marine, and brackish water, and their growth is fueled by photonic energy (light sources), carbon dioxide (CO_2), and water. The amount of lipid accumulated varies by species, and it also depends on the algae growing methods. Microalgal species such as *Dunaliella*, *Chlorella*, *Isochrysis*, *Nannochloris*, *Scenedesmus*, *Tetraselmis*, and *Nannochloropsis* have been found to acquire 15–60 percent lipid content on a dry weight basis. Microalgal species are regarded a viable feedstock for biodiesel synthesis due to their comparatively high lipid accumulation. Because the lipids derived from microalgae are chemically comparable to normal vegetable oils, they have been touted as a potential biodiesel source. When opposed to fossil fuel sources, microalgal triglycerides can readily be turned into biodiesel, which is renewable, biodegradable, and environmentally benign [4].

The many biochemical properties of microalgal biodiversity constitute a significant biotechnology potential for metabolite generation. These organisms are real plants that can produce a wide range of bioactive chemicals. Microalgae are also a good source of vitamins and carotenoids like beta-carotene, astaxanthin, lutein, and zeaxanthin, which can help protect against oxidative stress. Different forms of sterols can be created by microalgae, such as clionasterol, which is produced by *Spirulina* sp. Clionasterol has been demonstrated to boost plasminogen activation factor synthesis in vascular endothelial cells, assisting in the prevention of cardiovascular disease. They are recognised for producing polyunsaturated fatty acids, particularly the omega 3 and omega 6 series, which act as powerful antioxidants. These fatty acids are utilised in cosmetics and are regarded pharmacologically essential for their nutritional and medicinal characteristics. These metabolites have valuable properties in this field of application, such as anti-aging, moisturizing, sunscreen, and even hair care products [5].

CONCLUSION

Microalgae or their derivatives are also employed as supplements and food additives in the food sector. Hydrocolloids derived from macroalgae, such as alginate, agar, and carrageenan, are widely utilised as viscosity-modifying agents in the food sector and in several pharmaceutical applications. Astaxanthin, a pigment found in many microalgae species, enhances the pink colour of salmon and crustaceans. The genera *Chlorella*, *Tetraselmis*, *Isochrysis*, *Pavlova*, *Phaeodactylum*, *Chaetoceros*, *Nannochloropsis*, *Skeletonema*, and *Thalassiosira* are the most widely employed as food sources in aquaculture. Because of their non-toxicity and simplicity of growing, they have a lot of potential.

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These microalgae are small enough to be consumed. Because of the unsaturated fatty acid content and vitamins in their cell walls, they are easily digested and have a high nutritional value.

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