Evolution of Bio-fuels through Valorisation of Algae Biomass: A Complete Study

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Abstract

In recent decades, exploration and production of conventional hydrocarbon resources for the demand of energy have given dangerous impacts on ecosystems and mankind. In addition, these energy sources are depleting which is the backbone of every country's economy. This results in search for an efficient renewable energy sources that overcome energy demand without giving hazardous impact on environment. Algae are found to be a remarkable energy source feedstock among all the biofuels derivatives.

Algae biomass is known to mankind for many centuries in the form of food and energy source. They are generally collected from natural or cultivated sources. The importance have recently increased due to their application in biofuels. This paper elaborates the evolution of algae biomass in terms of isolation, cultivation, conversion and characterisation methods for biofuel application. These methods varies depends on the type of biofuel and circumstances where they are applied.

Most of the algal species can grow fast in small land area without any external cost when compared to other biofuel potentials. Recent, application of biotechnology in algae cultivation tremendously increase the productivity and tolerance to harsh condition and decrease sensitivity to oxygen saturation (Dickinson et al., 2017). Based on this, the species, climate, optimized cultivation process etc. are chosen. Cultivation of algae can be achieved via photoautotrophic, heterotrophic or mixotrophic means which also have their own advantages and disadvantages. The problems related to contamination such as supply and mixing of O_2 and CO_2 in conventional and advanced system for small and large scale cultivation are discussed briefly. Similarly, the efficient management and sequencing the

available methods is needed for scalable system designs, nutrients, scaling, sustainability, water conservation, climate and pH control, etc are elaborated.

This review also gives brief discussion on different secondary processes such as thermochemical, chemical and biochemical processes. Depending upon desired products method for production may vary so to solve the confusion on that this review will give precise idea. To perform these processes special type of reactors are used to get economic and efficient fuel product which has given more emphasis. Some advancement in reactors to increase production with decreasing operating cost like flash pyrolysis, plasma gasification, photobiological hydrogen production and other are also discussed (Poudyal et al., 2015; Sikarwar et al., 2016). Recently some new Catalysts are invented to optimize the process and production. So as increase in biofuel demand, attracts the interest of various researchers which also have done experiments on algae to get optimized product.

Keywords: Algae, Cultivation, Biofuel; Optimisation.

References

Dickinson, S., Mientus, M., Frey, D., Amini-Hajibashi, A., Ozturk, S., Shaikh, F., Sengupta, D., El-Halwagi, M. M. (2017). A review of biodiesel production from microalgae. *Clean Technologies and Environmental Policy*, *19*(3), 637-668.

Poudyal, R. S., Tiwari, I., Koirala, A. R., Masukawa, H., Inoue, K., Tomo, T., … Veziroğlu, T. N. (2015). Hydrogen production using photobiological methods. *Compendium of Hydrogen Energy*, 289-317.

Sikarwar, V. S., Zhao, M., Clough, P., Yao, J., Zhong, X., Memon, M. Z., … Fennell, P. S. (2016). An overview of advances in biomass gasification. *Energy and Environmental Science*, *9*(10), 2939-2977.