Scholarly Research Journal for Interdisciplinary Studies,
Online ISSN 2278-8808, SJIF 2018 = 6.371, www.srjis.com
PEER REVIEWED JOURNAL, JULY-AUG, 2018, VOL- 6/46

DIVERSITY OF ALGAE PRODUCING LIPIDS-A COMPREHENSIVE REVIEW

S. A. Firdousi[1], Ph. D. & Mehrun Jalgaon[2]

H. J. Thim college of Arts and Science, email: shakeel.talk@gmail.com

Abstract

Now a a days, energy security and energy demand have become a serious global issue and problem To meet this demand, a number of research is being carried out to look for economically viable and environment-friendly alternatives. The only solution that appears to meet futuristic needs is the use of renewable energy. The prospects of producing carbon-neutral biofuels from microalgae appear bright because of their unique features such as suitability of growing in open ponds required for production of a commodity product, high CO_2-sequestering capability, and ability to grow in wastewater/seawater/brackish water and high-lipid productivity.. The objective of this review article is to provide a comprehensive review on various aspects of lipids producing in algae has not yet emerged, Till now algal classes which have lipids are Cyanophyta,Chlorophyta, Cryptophyta, Bacillariophyta, Haptophyta, Dinophyta and Pheophyta.. Major alge which produce lipids are Chlorella, Haematocccus, Nanochloropsis, Chlymydomonas (. Chisti, Y. (2008) Chinnasamy, S (2012) Arumugam,(2014)

***Keywords**: Lipids, Algae, Polar lipids, Non polarlipids. Phospholipids, Glycolipids Betaine lipids, Neutral lipids*

Introduction

In the age science and technology, environmental concerns and alarming energy crises are the major issues of the twenty-first century. To solve with environmental concerns, creation of a pollution-free green environment is the need of the hour. At the same time, energy is inevitable in today's global scenario as almost all activities are driven by energy security has become a nationwide as well as a global issue, and a serious attempt is needed to search for viable alternatives in the form of renewable energy sources to meet the futuristic demand. Although prices are escalating, fossil fuels are a major source for use in transport and other sectors, and aside from this, they emit large amounts of carbon and hence have become a major cause of global warming.

Algae are a large and diverse group of simple, typically autotrophic (sometimes heterotrophic also) organisms, ranging from unicellular to multicellular forms. Algae are: — Cryptogamous — Ubiquitous — Prokaryotic or Eukaryotic — Photosynthetic — Reproduce asexually sometimes sexually also — They can be planktonic or benthic They are sunlight driven cell factories that convert carbon dioxide to potential biofuels. he term "algae" refers to a great diversity of organisms—from microscopic cyanobacteria to giant kelp—which convert sunlight into energy using photosynthesis, like plants. There are over 100,000 genetically diverse strains of algae. This is an advantage for researchers, who can harness algae strains' numerous unique properties to develop promising algal biofuels and bio products. Due to the fact that the oceans cover over 70% of the earth's surface, aquatic algae are major producers of oxygen and important users of carbon dioxide. Phytoplankton is predominantly made up of unicellular algae. This phytoplankton is a major source of food for many animals, large and small.

, There is the urgent need to search for non-edible and eco-friendly alternative sources that paved the path for the emergence of the so-called "second- and third-generation biofuels." Second-generation biofuels are derived from any renewable feedstock other than edible feedstock sources, and the third-generation biofuels particularly emphasize the use of microorganisms. In this regard, microalgae seem to emerge as a potential viable alternative biofuel source because of their unique features, i.e., shorter generation time, suitability of growing in culture vessels and open ponds, high CO-sequestering capability, ability to grow in wastewater/seawater/ brackish water, non-interference of food chain, an The world population continuous growth increases the primary energy consumption while unsustainable sources like fossil fuels are both contributing to global warming and declining. In this context, microalgae that have the highest photosynthetic efficiency of all plants to convert solar energy and carbon dioxide into oxygen and biomass received a large attention as an alternative fuel source. Microalgae have also the advantage to grow in a wide range of waters from freshwater to seawater and even wastewater from which they can convert nitrates, phosphates and sulfate. As a result the culture of microalgae has a limited impact on the environment compared with other terrestrial sources of biomass developed for biofuel production. Today, the initial enthusiasm in this environmentally friendly source of fuel seems to be diluting. Despite the potential of microalgae to serve as an alternative to fossil fuels major companies.

a) Phospholipids

Phoslipids represents 10-20% of total lipids in algae They are located in ePxtra - chloroplast membrane with the exception of PG which occurs in significant amounts in thlakliods membrane. The amphiphilic nature of phospholipids to maintain structural integrity and selective permeability while PG acids glycolipids in maintain the stability photosynthesis apparatu.Red algae also contain small amounts of sphingolipids such as cerrebrosides and ceramides detected in Chondrus crispus, Polysiphonia lanosa, Ceratodictyon spongiosum and Halymenia sp.

b) Glycolipids.

Glycolipids. are predominantly located in - photosyntheticmembrane with MGDG and SQDG. The algae, Thermosynnochococcus elonngatus. Contains glucolipids. In the red algae such as Palmaria stenogona, Ceramium kondoi, Laurencia nipponica, Anfeltia Tobuchiensis and Exopphyllum wentii where DGDg was characteristic glycolipids

c) Betaine lipids

Betaine lipids are widely distributed in algae DGTS in Lomentaria articulata, Mastocarpus stellatus, Phyllophora pseudoceranoides, Membranoptera alata and Phycodrys rubens. These DGCC is the characteristic of Haptophyceaeand contains palmitic, stearic, oleic, AA, EPA, DPA and DHA as major FAs. DGTS abundantly occurs in green algae with 5.2–56.5% of polar lipids and DGTA in brown algae with 7.3–96.8% of polar lipids

d) Neutral lipids-

Triacyglycerol (TGA) is the most common neutral lipids accumulate in algae as a storage product and energy reservoir. Its level is highly plastic in algae and ranges between 1% and 97%.The algae which have neutral lipids are Parietochloris incise, Phaeeodactylum tricortu, Porphyridi, curuntum, Nitzschia leaves, and Nanochloropsis sp

e) Unusual lipids-

A large number of unusual lipid have been reported in various algal classes and are mentioned here.

f) Fatty acids.

Fatty acids are carboxylic acids with long aliphatic chains that may be straight chains , Aa, EPa and Ala have reported in SQDG of ahnfeltia touchiensis. Ulva fenestrate and Undaria pinatifida

Lipid content (% dry wt. biomass)

S.N	Microalgae speMicroalgae	Lipid content % dry wt biomass
	Anisktrisodemus sp	24-41
	Botryococcus braunii	45-75
	Chlorell Chrlorella emersonii	14–57
	Dunaliella sp	17–67
	Zitschia sp	14–57
	Isochrysis sp.	7-40
	NanoChloropsis sp.	20-56

Naochlorisoleo abundans	29–65
Chlorella minutissima	57
Phaeodacylum tricornutum	18–57
Scenedesmus sp.	50-77

Parveen Kumar et.al. (2018)

Conclusion

This review focused research on different aspects of lidids producing algae. The development of high throughput methods with greater recoveryof algal lipids, fatty acids and sterols would greatly enhance their utilizationin functional foods in a cost-effective manner.Algae are known as the potential source of Lipids. The lipid classes are present in all the algal species are C16:0, C16:1ω7, C18:1ω9, C18:3ω3, C18:3ω6. They have the ability to produce TAG as a storage lipid under photo-oxidative stress or other adverse environmental conditions

References

Arumugam, M., Agarwal, A., Arya, M. C., and Ahmed, Z. (2011). Microalgae: a renewable source for second generation biofuel. Curr. Sci. 100, 1141–1142.

Chisti, Y. (2008). Biodiesel from microalgae beats bioethanol. Trends Biotechnol. 26, 126–131. doi:10.1016/j.tibtech.2007

Chinnasamy, S., Rao, P. H., Bhaskar, S., Rengasamy, R., and Singh, M. (2012). "Algae: a novel biomass feedstock for biofuels," in Microbial Biotechnology: Energy and Environment, ed. R. Arora (Wallingford: CAB International), 224–239.

Demirbas, A. (2009). Production of biodiesel from algae oils. Energ. Source 31, 163–168.

Milanoa J, Onga HC, Masjukia HH, Chonga WT, Lamb MK, Loha PK, Vellayana V.Microalgae biofuels as an alternative to fossil fuel for power generation. Renewable and Sustainable Energy Reviews 2016;58:180-197.

Hannon M, Gimpel J, Tran M, Rasala B, Mayfield S. Biofuels from algae: challenges and potential. Biofuels 2010;5:763-784 [3]Ridley C. Can we save the algae biofuel industry? The Conversation 2016 [4]

Williams PJ le B, Laurens LML. Microalgae as biodiesel & biomass feedstocks: Review & analysis of the biochemistry, energetics & economics. Energy Environ. Sci. 2010;3:554-590

Zhu L. Biorefinery as a promising approach to promote microalgaeindustry: An innovative framework. Renewable and Sustainable Energy Reviews 2015; 41:1376-1384

Vanthoor-Koopmans M, Wijffels RH, Barbosa MJ, Eppink MHM. Biorefinery of microalgae for food and fuel. Bioresource Technology 2013;135:142-149

Markou G, Nerantzis E. Microalgae for high-value compounds and biofuels production:A review with focus on cultivation under stress conditions. Biotechnology Advances 2013;31:1532-1542