Chapter 5
Microalgae as an Efficient Feedstock Biomass for Biofuel Production

Kishore Kumar Kadimpati, Sujatha Sanneboina, Narasimha Golla, Sridevi Ayla, Ramesh Kumpati, and Wojciech Skarka

Abstract Solar, biomass, and wind are the main renewable energy resources to fulfill the need of modern society. Biofuels include bio-diesel, bio-methane, bio-ethanol, bio-methanol, bio-ethers, and bio-hydrogen. The nonfood feedstocks such as agricultural wastes, municipal wastes, microalgae, and other microbial sources are most suitable to produce biofuels. Microalgae cultivation for biofuel production can utilize the wastewater as substrate, reduces the greenhouse effect (sequestration of CO_2), and also releases O_2. By utilizing this technology, one can produce bio-ethanol, bio-methanol, biodiesel, and bio-hydrogen along with oxygen release. Microalgae contemplated as substrates for the generation of bio-diesel together with other sources of biomass, such as lignin-cellulose materials, organic wastes that are characterized by high yielding potential, are not utilized as a source of human food. Various steps involved in the bioprocessing of the valuable products and downstream processing techniques along with their merits and demerits have been revealed in this chapter.

Keywords Microalgae · Lipid productivity · Photobioreactors · Circular economy

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N. Srivastava et al. (eds.), *Microbial Strategies for Techno-economic Biofuel Production*, Clean Energy Production Technologies,
https://doi.org/10.1007/978-981-15-7190-9_5

Chapter 4
Cultivation of Microalgae: Effects of Nutrient Focus on Biofuels

Kishore Kumar Kadimpati, Sujatha Sanneboina, Narasimha Golla, Ramesh Kumpati, and Wojciech Skarka

Abstract Several microalgae have potential to produce biofuels, carotenoids, polyunsaturated fatty acids, peptides, and phytosterols. Microalgae are capable of producing biofuels competently as another potential alternate as feedstock and may help to generate extra revenue, when its cultivation is handled scientifically at large-scale. The growth medium components, which is a major part of their cultivation, play a key role to improve its cellular components and mass accumulation. The medium components are varied according to the nature of microalgae, i.e., heterotrophic, autotrophic, and their nature of availability. In this chapter, nutritional factors, suitable compositions of media used for various microalgae cultivation, photosynthesis process, micronutrients requirements, and bioreactors for microalgae are discussed. For enhanced production of biofuels and bioactive compounds, optimized environmental conditions and nutritional factors for effective cultivation of microalgae have been revealed.

Keywords Microalgae · Photosynthesis · Lipid production · Cultivation

Nomenclature

ATP	Adenosine triphosphate
BBM	Bold basal medium
BG 11	Blue-green medium
E	Energy

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N. Srivastava et al. (eds.), *Microbial Strategies for Techno-economic Biofuel Production*, Clean Energy Production Technologies,
https://doi.org/10.1007/978-981-15-7190-9_4

Chapter 6
Microalgae Potential Feedstock for the Production of Biohydrogen and Bioactive Compounds

Kishore Kumar Kadimpati, Sujatha Sanneboina, Narasimha Golla, Sridevi Ayla, Wojciech Skarka, and Yoshiharu Mitoma

Abstract Urbanization and industrialization increase the energy demand, and fossil fuels are depleting drastically due to energy consumption by industrial and domestic purposes. There is a need to increase the production of energy by sustainable renewable sources. Marine microalgae are potential sources of biofuels and feedstock for the production of other bioactive compounds. Microalgae can be easily cultured in photobioreactors for the production of several types of biofuels. This chapter describes about the production of biohydrogen through photolysis followed by dark fermentation. Several types of photobioreactors used in the production of biohydrogen, suitability of microalgae as feedstock, and other microorganism used in the dark fermentation are discussed. The end product of biohydrogen after combustion is only water vapor; hence, there is no air pollution. Because of this nature of hydrogen gas, much attention has been paid by several researchers for the production of biohydrogen. Several bioactive compounds produced by microalgae, possibility of scale up, and industrialization have been revealed. Various parameters involved in the process, bioreactor types, and their design has to be discussed. Further the estimated cost of the pilot project for various biofuel products and the

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N. Srivastava et al. (eds.), *Microbial Strategies for Techno-economic Biofuel Production*, Clean Energy Production Technologies,
https://doi.org/10.1007/978-981-15-7190-9_6

CHAPTER 4

ND BIOLOGICAL METALLIC NANOPARTICLES APPLICATION IN ANTIVIRAL ACTIVITY AND DRUG DELIVERY

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4.1. Abstract. Nanobiotechnology is science of nanoparticle synthesis by using biotechnological applications in biology, physics, engineering, drug delivery, diagnostics and chemistry. The inorganic/organic nanoparticles application as pharmaceutical delivery systems has become extensive in last two decades. The applications of nanomaterials, especially of silver, zinc, copper, gold and platinum are emerging and nanomedicine is now rapidly growing field that uses nanotechnology to boost applications in pharmaceuticals, drug delivery systems and diagnostic purposes. The need for nanoparticles has been well-observed by scientists in recent times due to their various superior features i.e. controlled release of drugs, low adverse reactions, shielding of active drug from degradation (gut enzymes, liposomal enzymes), targeted drug delivery & improves therapeutic index. Nanoparticulate drug delivery systems may alter the drug release kinetics, improves bioavailability, enhances the efficacy and diminish the treatment costs. In this chapter various phytopharmaceutical, metallic and polymeric nanoparticles for synthetic drugs and their synthetic/ biosynthetic characterization procedures were explained. The drug loaded nanoparticles (polymers) are used to reduce the adverse effects, absorption and bioavailability enhancement of the drug (proper dosage and regime) for virus eradication in human beings. The commercialization of developed novel nanoparticles/drug loaded polymeric nanoparticles delivery systems are required to eradicate virus with improved safety measures in the humans with affordable cost.

Keywords: Nanotechnology, metallic nanoparticles, polymeric nanoparticles, antiviral, *S*-protein

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Chapter - 4

Controlled Drug Delivery Systems

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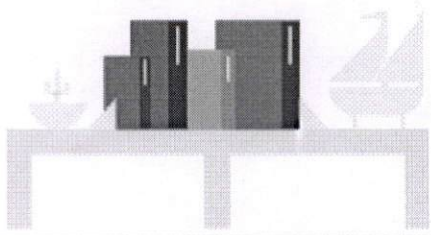

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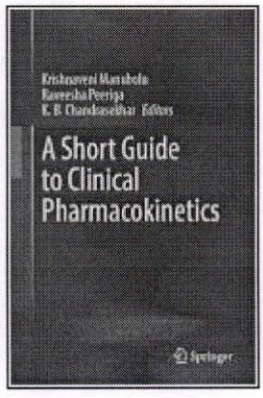

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Springer Nature Singapore, 5 Sept 2024 - Science - 190 pages

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About the author (2024)

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FORMULATION & EVALUATION OF POLYHERBAL FRUIT PEEL SHAMPOO

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ABSTRACT:

Scalp disorders are now-a-days affecting all the ages of people. Different types of Scalp disorders include dandruff, seborrheic dermatitis and even parasitic infections like Pediculosis capitis. Various microbes (Bacteria and Fungi) and Non-microbes are responsible for the scalp disorders. The study intends to formulate and evaluate the polyherbal fruit peel Shampoo. The prepared formulation not only cleans the dirt and dandruff but also makes hair soft and lustrous and promotes hair growth. The formulation eliminates the use of harmful chemical ingredients that damages hair. The formulation uses various fruit peel such as Pomegranate, Banana, grapes, oranges for preparing shampoos with the additives such as SLS, gelatin, sodium benzoate which acts as surfactants, viscosity modifiers and preservatives. The formulated shampoo was subjected to evaluation parameters like visual inspection, pH, viscosity, dirt dispersion, surface tension, foaming ability, foam stability, antimicrobial test and stability studies, etc. The major goal of the present study is to formulate and evaluate shampoo for treating various hair issues. Invitro anti-bacterial activity was done against *Staphylococcus epidermidis* MTCC-435. Zone of Inhibition was found to be 9.5mm at 250µg/ml. The formulated shampoo has anti-bacterial activity and it is used in treating scalp problems which cannot be completely eliminated but can only be managed and effectively controlled.

Key Words: Fruit peels, Staphylococcus, Shampoo, Scalp disorders, Herbal products

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105 COMPARATIVE PHYTOCHEMICAL INVESTIGATON AND EVALUATION OF IN VITRO ANTI-INFLAMMATORY ACTIVITY OF DIFFERENT HERBAL EXTRACTS

Mallam Salma, Shaik Moheeth, Vadanala Anudeepthi, Vadanala Anupama, Vemula Yamini, Guttikonda Udaya*

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ABSTRACT

In Ayurveda, many natural plant compounds are used to inhibit inflammatory pathways for centuries with fewer side effects. Inflammation is a defense mechanism that enables the body to protect itself against infection, burn, toxic chemical allergens or any other harmful stimuli. Denaturation of protein causes production of auto-antigens in conditions such as rheumatoid arthritis, cancer and diabetes which are conditions of inflammation. Hence, by inhibition of protein denaturation, inflammatory activity can also be inhibited. Egg albumin method provides a cheap alternative method of testing the anti-inflammatory activity of herbal medicine. Hence in the present study different aqueous extracts from plants- *Lantana camara* (leaf), *Tagetes erecta*(flower), *Azardirachta indica* (leaf) *and Mutingia calabura* (leaf) and Hydroalcoholic extract from *Calotropis procera* (leaf) were prepared and evaluated for presence of various phytochemicals and *in vitro* anti-inflammatory activity. Aqueous extract of *Lantana camara* showed the presence of carbohydrates, proteins, Tannins, phenols, flavonoids and glycosides. Aqueous extract of *Azardirachta indica* exhibited the presence of carbohydrates, proteins, alkaloids, Tannins, phenols and glycosides. Whereas *Mutinga calabura, Tagetes erecta* and *Calotropis procera* were reported to contain all these phytoconstituents. In the present investigation, two types of drugs-NSAID-Ibuprofen and steroid- Prednisolone were used as reference. Concluding the results, among all the extracts tested for activity the highest % inhibition rates were observed for Neem extracts followed by Calotropis and Marigold at a concentration of 1000µg/ml. Extracts exhibited % inhibition in a dose dependent manner. The incorporation of these three extracts in the polyherbal formulation could be a novel treatment strategy for various inflammatory ailments.

Keywords: Denaturation, in *vitro*, Anti-inflammatory activity, Egg Albumin, Phytochemicals

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ISBN Number: **978-93-340-5589-4**