Advances in Agricultural Technology & Plant Sciences
Chembio Publishers
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Editorial *Volume 1; Issue 2*

Microalgal Biomass for Multiple Purpose and Production

Hesam Kamyab* and Shreeshivadasan Chelliapan

Department of Engineering, University of Technology, Malaysia,

***Corresponding author:** Dr. Hesam Kamyab, Department of Engineering, UTM Razak, School of Engineering and Advanced Technology, University of Technology, Kuala Lumpur, Malaysia, Tel no: +60177820054; Email: hesam_kamyab@yahoo.com

Received Date: July 09, 2018; **Published Date:** July 10, 2018

Keywords: Microalgae; Products; Energy; Fuel; Waste; Cultivation

Abbreviations: POME: Palm Oil Mill Effluent; CDW: Cell Dry Weight

Editorial

Microalgae are sustainable sources of biomass for fuel, food, and feed as well as pollutant removal from waste water. Microalgae are group of photosynthetic, heterotrophic organisms and can be cultivated under several different conditions. They are known to produce a wide range of commercially important by-products like fats, oils, sugars and are of interest for the development of the future renewable energy scenario. The lipid products from algae are suitable for the direct use as high-energy liquid fuels. The resources for growing algae to produce lipid from synthetic media are costly, therefore the derivation of cheap sources from waste is useful to cultivate algae in larger scale. Therefore, the current study is emphasized on determining the effectiveness of industrial wastewater such as palm oil mill effluent (POME) to serve as main carbon source for the growth of microalgae and hence to increase the production of lipid. Modified Bald's Basal medium was also used in order to selectively enhance the growth of microalgae in the presence of Palm Oil Mill Effluent (POME). In addition, glucose ($C_6H_{12}O_6$) was also used to compare the effectiveness of their cultivation. Furthermore, investigation was carried out using the strains of microalgae namely *Chlorella pyrenoidosa* isolated from POME and another strain of *Chlorella sorokiniana*(UTEX 1602) obtained from the culture collection of Alga-Tech Co. Kuala Lumpur. During screening the isolated strain of, *Chlorella pyreniodosa* was found to be dominant when compared to *Chlorella sorokiniana* along with the other existing species (*Chlorella vulgaris, Tetraselmis sp., Chlorella sorokiniana*) that were used in further experiments. All the cultivations of microalgae were carried out in 250 mL Erlenmeyer flask containing 100 mL medium, under ± 30°C of temperature with continuous illumination of (± 14 µmol/m^2/s) up to 20 days of incubation period.

The study demonstrated that *Chlorella sorokiniana* and *Chlorella pyrenoidosa* are the predominant species for its specific growth rate (µ), biomass productivity and lipid content in presence of diluted POME with the production rate of 0.099/day, 8.0 mg/L. day, 2.68 mg lipid/mg of cell dry weight (CDW), respectively and *Chlorella pyrenoidosa* was found to show highest biomass productivity and lipid productivity under continuous illumination, 0.58 g/L.d and 44.06 mg/L.d. However, *Chlorella sorokiniana* showed more lipid productivity when it utilized $C_6H_{12}O_6$ as carbon source, compared to POME. The optimization was carried out using different carbon-to-total nitrogen (C:TN) ratio and light/dark (L:D) cycles, respectively. The results shows that *Chlorella sorokiniana* highest lipid content was achieved in presence of controlled condition C:TN (100:7) and continuous light duration (24 hr), with the recorded

Citation: Hesam Kamyab and Shreeshivadasan Chelliapan. Microalgal Biomass for Multiple Purpose and Production. Adv Agri Tech Plant Sciences 2018, 1(2): 180006.

value of 17 mg lipid/mg CDW. The *Chlorella pyrenoidosa* when grown under low nitrogen concentration, C:TN of 100:6, the lipid productivity obtained was 0.115 g/L.d and simultaneously high biomass productivity (0.155 g/L.d) was also recorded. These results show that *Chlorella sorokiniana* had partially highest growth rates and lipid production in the presence of diluted POME when compared to the other strains of microalgae. In conclusion, the study carried out have suggested several improvements in performing the experiment in order to achieve higher lipid production at steady - state condition by altering the ratio of carbon-to-total nitrogen and the medium of light intensity.