

## Microalgae- Role In Development Of Bio (H<sub>2</sub>, Ethanol And Diesel) Fuels

Sara Janiad<sup>\*1,2</sup>, Mehboob Ahmed<sup>1</sup>

<sup>1</sup> Institute of Microbiology and Molecular Genetics, Quaid-e-Azam Campus, University of the Punjab, Lahore-54590, Pakistan

<sup>2</sup> Department of Microbiology and Molecular Genetics, The Women University Multan

### Abstract

Equilibrium between financial, agriculture and ecological progress could be made by using substitute fuel which should be economically inexpensive, technically feasible, readily obtainable and environmentally satisfactory. Biohydrogen, bioethanol and biodiesel obtained from biomass of renewable raw material has all the above mentioned properties. Microalgae (Chlorophytes) also known as 3<sup>rd</sup> generation biofuel producers are the photosynthetic organisms. Biodiesel is monoalkyl esters of long chain fatty acids, and several microalgal species have diverse types of lipids for production of biodiesel. Microalgae are direct ethanol secretors in the medium, also well known to produce biohydrogen. Thirty-three different microalgae isolates were obtained from different geographic regions of Pakistan. Lipids were extracted and quantified by transesterification. Light, Fluorescent and Confocal microscope was used for the observation and detection of lipids by using lipid staining dyes. FTIR analysis was also performed for the detection of lipids. Gas Chromatography was also performed for the lipids analysis. Biodiesel obtained from the isolates was also measured. Biohydrogen and bioethanol production potential of the strains was investigated under various culturing conditions (i.e., dark and light, glucose supplementation, nitrate effect). The maximum biodiesel productivity (120 mg L<sup>-1</sup> day<sup>-1</sup>) was observed in the *Chlorococcum* sp. SM-MFUM-16 in nitrate-less BG11 media. 7.61 µm<sup>3</sup> lipid droplets were measured in the cells of *Gloeocystis* sp. SM-MFUM-4. Maximum biohydrogen production was obtained as 357 µmol mg Chl-a<sup>-1</sup> h<sup>-1</sup> by *Chlorella* sp. SM-MFUM-22. UV treated *Dunaliella* sp. SM-MFUM-41 enhanced 380% H<sub>2</sub> production as compared to the respective unmutated strain. Maximum bioethanol secretion was 482 mg L<sup>-1</sup> acquired by *Chlorella* sp. SM-MFUM-22. Hence, the microalgal isolates showed varying ability to produce the three types of tested biofuels under different conditions.

**Key Words:** Biofuels, Lipids, Microalgae, Triglycerides, Biohydrogen, Bioethanol.

