

**EXECUTIVE SUMMARY**  
**UGC-MAJOR RESEARCH PROJECT**  
**F. No. 42-457/2013 (SR)**

**Proteomic analysis and lipid profiling of *Chlamydomonas reinhardtii*  
and its relevance towards bio-fuel production**

**Submitted by**  
**Prof. Pratyosh Shukla**  
**Professor and Head**  
**Department of Microbiology**  
**Maharshi Dayanand University,**  
**Rohtak-124001**

## **SUMMARY**

In the present project the efforts were made to evaluate the potential of *C. reinhardtii* to produce fatty acid under nitrogen limitation. The Isolation of various strains of *C. reinhardtii* was completed, total of four cultures were isolated including three from marine samples. The Strains and growth conditions and microscopic studies for *Chlamydomonas spp* CRP7 (indigenously isolated strain)] was done and Growth rate, florescent microscopy studies was performed. Further, partial FTIR analysis of isolated cellular components from microalgae was also done. Isolated cellular components were further processed towards FTIR analysis and FTIR spectra will be recorded and analyzed. Further, Gas chromatography- mass spectrometry (GC/MS) analysis of purified samples was done. The Bioinformatics analysis of *Chlamydomonas reinhardtii* v4.0 genome assembly and protein filtered model annotation was searched through the Joint Genome Institute (JGI). The non redundant database was used from National Centre for Biotechnology Information (NCBI). Further, sequence similarity search of the *Chlamydomonas reinhardtii* genome will be carried out and we will try to find out the possibility of protein products of certain genes associated with lipid bodies.

## **SIGNIFICANCE OF WORK**

Microalgal biofuel systems can theoretically achieve higher yields per hectare than traditional crops owing to their short life cycles and high production efficiencies. This together with the fact that they can offer improved water use efficiencies and the ability to produce the feedstocks for a wide range of fuels (e.g. biodiesel, methane, ethanol, and H<sub>2</sub>) explains why the microalgal biofuel sector has seen a rapid increase in investment over the past three years. Biodiesel production from microalgae needs much research and efforts at various levels. There is strong need in the country for backbreaking research on the biosynthesis of algal lipids e.g. TAGs, if we aim to understand and manipulate microalgae for the production of biodiesel thus this project is of prime national importance. Using bioinformatics tools it's easy to identify the crucial lipids having role in biofuel production. Further this concept can be well adapted with wider algal proteins being studied leading to a good source of fuel oil making India self-reliant in algal biofuel production.

## PUBLICATIONS

1. Banerjee, A., Banerjee, C., Negi, S., Chang, J. S., & **Shukla, P.** (2018). Improvements in algal lipid production: a systems biology and gene editing approach. *Critical Reviews in Biotechnology*, 38 (3), 369-385. (IF 6.542).
2. Roshan Kumar, Koushik Biswas, Puneet Kumar Singh, Pankaj Kumar Singh, S. Elumalai, **Pratyoosh Shukla** and Sunil Pabbi (2017) Lipid production and molecular dynamics simulation for regulation of accD gene in cyanobacteria under different N and P regimes. *Biotechnology for Biofuels*. DOI: 10.1186/s13068-017-0776-2. (IF 6.444) ISSN: 1754-6834
3. Anand, V., Singh, P. K., Banerjee, C., & **Shukla, P.** (2017). Proteomic approaches in microalgae: perspectives and applications. *3 Biotech*, 7(3), 197.
4. Banerjee Chiranjib, Singh, Puneet K., **Shukla, Pratyoosh** (2016) "Microalgal bioengineering for sustainable energy development: Recent transgenesis and metabolic engineering strategies. *Biotechnology journal* 11 (3), 303-314 (Impact factor- 3.78). ISSN: 1860-7314.
5. Banerjee, C., Dubey, K. K., & **Shukla, P.** (2016). Metabolic engineering of microalgal based biofuel production: prospects and challenges. *Frontiers in Microbiology*, 7(432):1-8 <http://dx.doi.org/10.3389/fmicb.2016.00432>, Electronic ISSN: 1664-302X. Impact factor-4.165

## BOOK CHAPTER:

1. Computational Modelling and Prediction of Microalgae Growth Focused Towards Improved Lipid Production (2018) Avik Banerjee, Niwas Kumar, Sunita J Varjani, Chandan Guria, Rajib Bandopadhyay, Pratyoosh Shukla, Chiranjib Banerjee, Book: Biosynthetic Technology and Environmental Challenges, 223-232 Publisher Springer, Singapore