

Sugar distillery waste as a source of nutrients for microalgae biomass and lipid production in biodiesel application



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Abstract

Microalgae have potential to convert CO₂ into carbon skeleton biomass that stores mainly starch and lipid rich compounds, which can be processed for sustainable biofuel production. Although, the high culture cost and low lipid productivity are foremost hurdles for its commercial feasibility in biodiesel application. Hence, these challenges are trying to overcome by establishing mixotrophic mode of cultivation using waste organic carbon sources as low cost substrates. In the present work, the molasses was collected from a sugar refinery and microalgae were isolated from sugar molasses by successive plating on BG-11 supplemented with 1% agar. The microalga isolated was identified as *Chlorella sorokiniana* (MS) by using 18 S rDNA marker.

Spent wash, a waste effluent of sugar distillery was collected from the same site and characterized for physico-chemical properties including chemical oxygen demand (COD), total nitrogen (TN), total phosphorus (TP) and total carbon (TC). Cultivation of microalgae was optimized in spent wash media by varying carbon concentration, nitrogen, pH, light intensity and photoperiod using response surface method (RSM). Maximum microalgae biomass of 3g/L was obtained by using 289.6 ml/L of spent wash maintaining at pH 6.5. Fluorescence microscopy confirms the increase in neutral lipids in the cell. Lipid was extracted by solvent extraction method and transesterified to obtain Fatty acid methyl esters (FAME) that was analysed by GC-MS. The FAME profile obtained includes the compounds like palmitic acid, oleic acid, linoleic acid, linolenic acid in a requisite ratio, those are essential for biodiesel synthesis. This study highlights the recycle of sugar distillery waste material spent wash as a nutrient source for microalgae biomass and lipid production for its potential application in biodiesel.

Biography:

Dr. Monika Prakash Rai has completed her Ph.D. from IIT-BHU Varanasi, India jointly with Johannes Gutenberg University, Mainz, Germany in the year 2005. She is Associate Professor at Amity Institute of Biotechnology, Amity University Uttar Pradesh, Noida, India. She has expertise in microbial culture systems and synthesis of value added products. Her major focus area is algal biodiesel, bioremediation, waste utilization, enzymes production, and synthesis of other industrially important products. Her work also emphasizes on the production of green materials from microbial origin and application in the area of nano-biotechnology, corrosion inhibition and antimicrobial activity. She has published more than 25 papers in reputed journals and published many book chapters.

Speaker Publications:

1. "Pivotal role of levoglucosenone and hexadecanoic acid from microalgae *Chlorococcum* sp. for corrosion resistance on mild steel: Electrochemical, microstructural and theoretical analysis"; *Journal of Molecular Liquids* Volume 266, 15 September 2018.
2. "Potential Applications of Antioxidants from Algae in Human Health"; *Oxidative Stress: Diagnostic Methods and Applications in Medical Science*, 26 October 2017.
3. "Effect of nitrogen on growth and lipid content of *Chlorella pyrenoidosa*"; *Am J Biochem Biotechnol*, vol.7, issue 3, published in 2011.
4. "Response of growth and fatty acid compositions of *Chlorella pyrenoidosa* under mixotrophic cultivation with acetate and glycerol for bioenergy application"; *Journal of Biomass and Bioenergy* / Vol 50, 01/11/2013.
5. "Glycerol on Lipid Enhancement and FAME Characterization in Algae for Raw Material of Biodiesel"; *International Journal of Renewable energy and research*/ Vol 07, 2017.

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