

Proteomics and Genomics of microorganisms for sequestration of carbon dioxide for production of biodiesel

InduShekhar Thakur and Randhir Kumar Bharti

School of Environmental Sciences, Jawaharlal Nehru University, India

Carbon dioxide is one of the Green House Gases may be mitigated by sequestration of microorganisms and production of biomass and biofuels. Microorganisms isolated from the sediment and water of marble rock was enriched in minimal salt media with different concentrations of sodium bicarbonate, CO₂ and light source. Microorganisms were identified as chemolithotrophic bacteria, *Serretiamarcescens*; cyanobacteria, **Lyngbya spp.**, by 16S RNA sequencing, and microalgae as *Chlorella* sp. Proteomics approaches evaluated by 2D gel electrophoresis and MALDI-TOF/MF and genomics by amplification and analysis of carboxylating genes indicated presence of carbonic anhydrase, ribulose-1, 5- bisphosphate carboxylase/oxygenase, acetyl-CoA carboxylase, propionyl-CoA carboxylase, succinyl-CoA synthetase, pyruvate synthase, 3-hydroxybutyryl dehydrogenase, succinate dehydrogenase, pyruvate dehydrogenase, malate/L-lactate dehydrogenase and citrate synthase enzymes related to sequestration of carbon dioxide, and acyl CoA dehydrogenase, fatty acid desaturase type 1, lipoic acid synthetase, enoyl CoA hydratase, branched chain alpha-keto acid dehydrogenase, holo-acyl carrier protein synthase and tartrate dehydrogenase for fatty acid metabolism. GC-MS results indicated formation of major organic compounds, dodecane 1-fluoro by *Chlorella* sp., heptylcyclohexane by **Lyngbya spp.** and cyclododecane methanol by *Serretiamarcescens*. *Chlorella* sp. applied for sequestration of CO₂ at different concentrations (0.05%, 5%, 10% and 15%) produced lipid 15.0, 25.0, 26.0 and 28.3 mg/L/d respectively and produced biodiesel (7.02 g/L) with calorific value 29.8 kJ/g suggested possible scale up the method for low carbon society.

Biography

InduShekhar Thakur graduated and obtained Ph.D. from the Jawaharlal Nehru University, New Delhi, India. He is Professor in the School of Environmental Sciences, JNU, New Delhi. He published more than 75 research papers in reputed journals and two books. He has patents and technology related to bioremediation, bioconversion and detoxification of organic and inorganic compounds in the environment.