## Abstract

Fourteen microalgal/cyanobacterial species were examined for their lipid accumulation potential under batch mode study. On the basis of specific growth rate and lipid content, the green microalga *Scenedesmus obliquus* was selected for further study.

Various factors affecting the biomass and lipid yield in *S. obliquus* was investigated. The most significant rise in lipid content, i.e. 43% of dry cell weight (dcw) was recorded under N-deficiency against 13% control. Under P-deficiency and thiosulphate supplementation the lipid content was also increased up to 30% (dcw). Multifactor optimization of the above variables resulted into an accumulation of 58% (dcw) at 0.04, 0.03 and 1.0 g  $1^{-1}$  of nitrate, phosphate and sodium thiosulphate, respectively for an incubation period of 8 days. *Scenedesmus* cultures pre-grown in glucose (1.5%)-supplemented N 11 medium when subjected to the above optimized condition, the lipid accumulation was boosted up to 2.2 g  $1^{-1}$ , the value ~18-fold higher with respect to the control condition.

*S. obliquus* was cultivated in various wastes viz. poultry litter (PL), municipal secondary settling tank discharge (SST) and fish pond discharge (FP). The biofiltration efficiency of *S. obliquus* was reflected by significant reduction in nutrient load of the waste discharges over the experimental period. Lipid content was raised up to 1.0 and 0.9 g  $1^{-1}$ , respectively in cultures pre-grown in 15 g  $1^{-1}$  PL-supplemented SST and FP discharges, when subjected to the optimized condition at the second stage. In outdoor study, biomass and lipid yield of *S. obliquus* was found to be higher in sedimented FP discharge at 15 cm culture depth with stirring, and lipid yield up to 0.8 g  $1^{-1}$  was recorded.

*S. obliquus* biodiesel mainly consisted of palmitate followed by oleate, linolenate and linoleate methyl esters. Cultures grown in waste discharges depicted a rise in saturated fatty acid content and reduction in poly-unsaturated fatty acid pool, which is desired for a good quality biodiesel. The fuel properties of *S. obliquus* biodiesel are found to be comparable with the international and Indian biodiesel standards.

Keywords: Biodiesel, Bioremediation, Lipid, N-limitation, P-limitation, Scenedesmus obliquus, Transesterification, Response surface methodology (RSM), Recirculatory Aquaculture System (RAS), Waste discharges