Identification and screening for potential biodiesel yielding microalgae from North-East India

Executive summary

The Algal Biofuel Network Project of India aims at exploration of potential algal strains from the biodiesel perspective for freshwater and marine environment. TERI-NER Centre, Guwahati, was assigned to explore microalgae and cyanobacteria from Assam and Meghalaya. Altogether 103 sites in nine districts of lower Assam and Barak valley and Meghalaya were explored for microalgae and cyanobacteria in various habitat, soil, sewage water discharge, rivers, paddy field, hot springs, lakes, rainwater pool, etc. From these sites, 225 unialgal isolates were purified following agar pour plate, streaking techniques and deposited to the recognized repository at Institute of Bioresources and Sustainable Development (IBSD), Imphal. The repository had 181 assigned accession numbers, BTA 4000-40181, for the algal isolates. For smooth project implementation six Principal investigators' meetings were held at various participating institutes of which TERI had hosted two meetings and hands-on training on lipid analysis. Biomass production have been standardized for 70 isolates in tap water enriched NPK and urea following semi-continuous harvesting. Lipid content and FAME (Fatty Acid Methyl Ester) profile were analyzed for 70 isolates. The lipid content varied from 2.29 per cent to 18.08 per cent dry wt basis where 23 strains (22 unialgae and 1 composite) with <5 per cent, 31 strains (24 unialgae and 7 composite) contained 5-10 per cent, 12 strains (8 unialgae and 4 composite) showed 10–15 per cent and 4 strains (1 unialgae and 3 composite) showed >15 per cent lipid content. The FAME profile for these isolates varied from C11:0 to C26:0 along with unknown hydrocarbon. Eight strains contained 50–67 per cent total Saturated Fatty Acids(SFA), 16 strains with 40–50 per cent SFA and 25 strains with 30–40 per cent and 21 strains with 20–30 per cent of the total fatty acids. Likewise for total Mono Unsaturated Fatty Acids (MUFA) 1 strains with >30–40 per cent, 10 strains with 20–30 per cent, 55 strains with 10–20 per cent, and 4 strains with<10 per cent MUFA of the total fatty acids. In addition, the Poly Unsaturated Fatty Acid (PUFA) analysis showed 6 strains with 50–60 per cent, 18 strains with 40–50 per cent, 16 strains with 30–40 per cent, 17 strains with 20–30 per cent, 11 strains with 10–20 per cent and 2 strains with <10 per cent PUFA of the total fatty acid content. The most preferred fatty acids for biodiesel are C16 and C18, 3 strain with 50–67 per cent, 9 strains with 40–50 per cent, 15 strains with 30–40 per cent, 38 strains 20–30 per cent, and 5 strains with 10–20 per cent of the total fatty acids. The division time calculated, as per Guillard (1973), ranged between 1.4–6.9 days. Since identification of microalgae based on morphological features is difficult, therefore molecular tools have been adopted. Isolation of genomic DNA for molecular characterization of 22 isolates were carried out with ITS2 region with primer ITS 2 F 5' GAG CAT GTC TGCCTC AGC 3', ITS 2 R 5' GGT AGC CTT GCC TGA GC 3'. The sequence was deposited to the GenBank with assigned accessions JX839966-JX839986.