

Critical Evaluation of Long Chain Hydrocarbons with Biofuel Potential from Marine Diatoms Isolated from the West Coast of India

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Abstract : Introduction :Biofuels could replace fossil fuels and reduce our carbon footprint on the planet by technological advancements needed for sustainable and economic fuel production. Micro algae have proven to be a promising source to meet the current energy demand because of high lipid content and production of high biomass rapidly. Marine diatoms, which are key contributors in the biofuel sector and also play a significant role in primary productivity and ecology with high biodiversity and genetic and chemical diversity, are less well understood than other microalgae for producing hydrocarbons. Method :The marine diatom samples selected for hydrocarbon analysis were a total of eleven, out of which 9 samples were from the culture collection of NCAAH, and the remaining two of them were isolated by serial dilution method to get a pure culture from a mixed culture of microalgae obtained from the various cruise stations (350&357) FORV Sagar Sampada along the west coast of India. These diatoms were mass cultured in F/2 media, and the biomass harvested. The crude extract was obtained from the biomass by homogenising with n-hexane, and the hydrocarbons was further obtained by passing the crude extract through 500mg Bonna Agela SPE column and the quantitative analysis was done by GCHRMS analysis using HP-5 column and Helium gas was used as a carrier gas(1ml/min). The injector port temperature was 2400C, the detector temperature was 2500C, and the oven was initially kept at 600C for 1 minute and increased to 2200C at the rate of 60C per minute, and the analysis of a mixture of long chain hydrocarbons was done .Results:In the qualitative analysis done, the most potent hydrocarbon was found to be Psammodictyon Panduriforme (NCAAH-9) with a hydrocarbon mass of 37.27mg/g of the biomass and 2.1% of the total biomass of 1.395g and the other potent producer is Biddulphia(NCAAH 6) with hydrocarbon mass of 25.4mg/g of biomass and percentage of hydrocarbon is 1.03%. In the quantitative analysis by GCHRMS, the long chain hydrocarbons found in most of the marine diatoms were undecane, hexadecane, octadecane 3ethyl 5,2 ethyl butyl, Eicosane 7hexyl, hexacosane, heptacosane, heneicosane, octadecane 3 methyl, triacontane. The exact mass of the long chain hydrocarbons in all the marine diatom samples was found to be Nonadecane 12C191H40, Tritriacontane,13-decyl-13-heptyl 12C501H102, Octadecane,3ethyl-5-(2-ethylbutyl 12C261H54, tetracontane 12C441H89, Eicosane, 7-hexyl 12C261H54. Conclusion:All the marine diatoms screened produced long chain hydrocarbons which can be used as diesel fuel with good cetane value example, hexadecane, undecane. All the long chain hydrocarbons can further undergo catalytic cracking to produce short chain alkanes which can give good octane values and can be used as gasoline. Optimisation of hydrocarbon production with the most potent marine diatom yielded long chain hydrocarbons of good fuel quality.

Keywords : biofuel, hydrocarbons, marine diatoms, screening

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