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Research Article

# Isolation of Diatom *Cyclotella meneghiniana Kützing* and Characterization of Oil Extracted for Biodiesel Production

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## Abstract

Diatoms are a very important group of algae and are most common type of phytoplankton in aquatic ecosystems. These unicellular, eukaryotic and photosynthetic organisms belong to class Bacillariophyceae. This attempt is made to screen these diatoms for their biochemical contents especially for their lipid contents. Geologists claim that much of crude oil comes from diatoms. Present study deals with lipid contents of genus *Cyclotella meneghiniana* (Kützing) isolated from fresh water. Along with biochemical studies morphological features of this genus also have been explored. The gas chromatography mass spectrometry showed the presence of Benzenedicarboxylic acid, Methyl tetradecanoic acid (Myristic acld), Hexadecanoic acid methyl ester (Palmitic acid), Octadecanoic acid (Stearic acid) and Lupeol as major fatty acids in *Cyclotella meneghiniana* Kützing.

**Keywords:** Diatoms; Bacillariophyceae; Oil; Fatty Acid

## Introduction

Biodiesel is a type of biofuel derived from a variety of feedstocks through transesterification of triglycerides into fatty acid methyl esters and glycerol. Grease, waste cooking oil, and animal fats may be used as feedstocks, but they do not occur in sufficient amounts to meet daily consumption of transport fuels [1]. Terrestrial crop plants such as soybean, corn, and canola (rapeseed) are the primary feedstocks for biodiesel production in the United States. Unfortunately, the use of food crops for biodiesel production leads to competition between the use of agricultural land for food production and its use for fuel production with a resulting increase in food costs and potential habitat and biodiversity losses [2].

Diatoms are a very important group of algae and are one of the most common types of phytoplankton. They are the common producers of organic matter in water bodies. These unicellular, eukaryotic and photosynthetic organisms belong to class Bacillariophyceae. Freshwater diatoms serve as a source of lipids for biofuels [3]. This attempt is made to screen these diatoms for their biochemical contents especially for their lipid contents. Geologists claim that much of crude oil comes from diatoms. Present study deals with lipid contents of genus *Cyclotella meneghiniana* (Kützing) isolated from fresh water. Along with biochemical studies morphological features of this genus also have been explored.

## Materials and Methods

Samples were collected from all possible localities wherever the growth of diatoms was noted. Samples were digested with nitric acid and potassium dichromate and cleaned diatoms were preserved in 4% formaldehyde solution. Further study *viz.* measurement, identification and microphotography were carried out in permanent specimens using Olympus CH20i microscope. Scanning electron microscopy was done at SP Pune University,

Pune. Identification of taxa was done with the help of monograph and standard literature [4-6].

Samples were cultured in the axenic forms. Two grams of pure powered sample was mixed with methanol, incubated overnight and extracted with the help of Soxhlet extractor. The filtrate was used for Gas Chromatography- Mass Spectroscopy for analysis and determination of fatty acids. GC- MS analysis was carried out at Common Facility Centre, Shivaji University, Kolhapur. Mass spectrum was interpreted with the help of the database of National Institute of Standards and technology (NIST) [7-12].

## Results and Discussion

### Morphology of *Cyclotella meneghiniana Kutzing*:

Valve circular, 5 - 40 µm in diameter, central area large and punctuate striae broad, radially arrange towards the margin of the valve. Striae 8 - 10 in 10 µm.

### Scanning electron microscopy description:

Frustules are drum shaped with tangential undulations. Marginal zone with strongly radial striae, broader at the marign and tapering towards the center. Central region with 1-5 valve face fultoportulae. The fascicles are not clearly visible in LM, but separated by interfascicular costae.

### GCMS chromatogram of *Cyclotella meneghiniana Kützing*

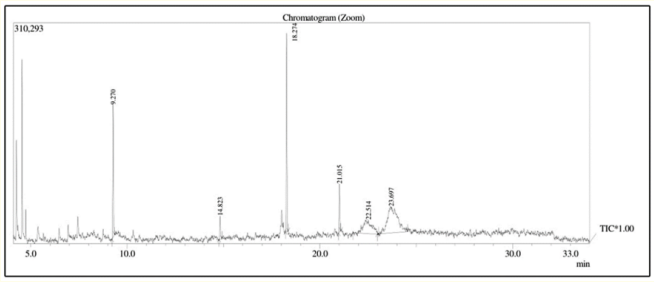


**Figure 1**

In all five constituents were located and identified with their retention time, molecular weight and peak area percentage are as follows.

| Sr. No. | Retention Time | Name of fatty Acid |
|---|---|---|
| 1 | 9.270 | Benzenedicarboxylic acid |
| 2 | 14.825 | Methyl tetradecanoic acid (Myristic acld) |
| 3 | 18.275 | Hexadecanoic acid methyl ester (Palmitic acid) |
| 4 | 21.015 | Octadecanoic acid (Stearic acid) |
| 5 | 23.685 | Lupeol |

**Table 1**

## Conclusion

The gas chromatography mass spectrometry showed the presence of Benzenedicarboxylic acid, Methyl tetradecanoic acid (Myristic acld), Hexadecanoic acid methyl ester (Palmitic acid), Octadecanoic acid (Stearic acid) and Lupeol as major fatty acids in *Cyclotella meneghiniana* Kützing.

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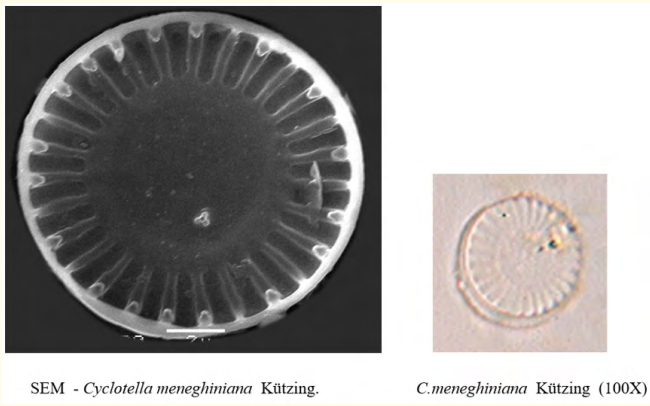

SEM - *Cyclotella meneghiniana* Kützing. *C.meneghiniana* Kützing (100X)

**Figure 2**

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