



BIODIESEL PRODUCTION: FRESHWATER ALGAE AS A RENEWABLE SOURCE OF ENERGY

Y. Ranjith* & T. Parameswara Naik**

Department of Botany, Sahyadri Science College (Autonomous),
Shivamogga, Karnataka

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Abstract:

All algae contain proteins, carbohydrates, lipids and nucleic acids in varying proportions. Algae have the potential to produce more oil per acre than any other feedstock being used to make biodiesel. Biodiesel is a nontoxic and biodegradable alternative fuel that is obtained by the transesterification of triglyceride oil with monohydric alcohols. In this study three naturally occurring algal samples were collected from different areas of Shivamogga. Algae were identified in the Botany lab as *Spirogyra spp.* and *Zygnemaspp*oil was extracted from the dried algal samples. These results indicate that biodiesel can be produced from *Spirogyra spp.*

Key Words: Algal Oil, Biodiesel, Transesterification, Glycerine & Biomass.

Introduction:

The microalgae are microscopic photosynthetic microorganisms that use light energy and carbon dioxide, with a higher photosynthetic efficiency than plants for the production of biomass (Spolanore *et al.*, 2006).

Biodiesel from oil crops, waste cooking oil and animal fat cannot realistically satisfy even a small fraction of the existing demand for transport fuels. Recent researchers involved not only the existing renewable sources available from land plants, but also those coming from aquatic systems. Algae (macro and micro) have been taken in consideration as a residual biomass ready to be used for energy purposes. Algae, especially micro algae, were found to be the only source of renewable biodiesel that is capable of meeting the global demand for transport fuels (Chisti 2007 and 2008).

The idea of using algae as a source of fuel is not new, but it is now being taken seriously because of the increasing price of petroleum and more significantly, the emerging concern about global warming that is associated with burning fossil fuels (Chisti 2005).

The current study was conducted to assess the biodiesel production efficiency of various species of algae. A comparison was made to find out the algal species with high oil contents and biodiesel production efficiency.

Materials and Methods:

Algal Samples:

The Algal samples were collected from the Santhekadur pond, Shivamogga. The algal biomass was collected from freshwater bodies by mesh net, after collection the samples were brought to the laboratory, Department of Botany, Sahyadri Science College (Autonomous), Shivamogga. And they were identified as *Spirogyra spp.* and *Zygnemaspp.*

Oil Extraction:

Algae were ground with motor and pestle as much as possible. The ground algae were dried for 20 min at 80°C in an incubator for releasing water. Hexane and ether solution (20 and 20 mL) were mixed with the dried ground algae to extract oil. Then the mixture was kept for 24h for settling. Then the biomass was collected after filtration and weighted.

Evaporation:

The extracted oil was evaporated in vacuum to release hexane and ether solutions using rotary evaporator, and 0.25g NaOH was mixed with 24ml methanol and stirred properly for 20 min.

Biodiesel Production:

The mixture of catalyst and methanol was poured into the algal oil in a conical flask. The following reaction and steps were followed.

Transesterification:

The conical flask containing solution was shaken for 3h by rotatory shaker at 300rpm. After shaking the solution was kept for 16h to settle the biodiesel and sediment layers clearly. The biodiesel was separated from sedimentation by flask separator carefully. Quantity sediment (glycerin, pigments, etc.) was measured. Biodiesel was washed by 5% water until it was become clean. Biodiesel was dried by using dryer and finally kept under the running fan for 12h, and measured by using measuring cylinder.

Results and Discussion:

Samples	Fresh Weight	Dry Weight	Oil Percentage
<i>Spirogyra spp</i>	32 g	16.11g	14.68%
<i>Zygnema spp</i>	32 g	17.01g	7.44%

Result shows that the production of Biodiesel was found maximum in *Spirogyra spp* but minimum in *Zygnemaspp*, and the byproducts also obtained from these species such as glycerol and biomass. Biomass can be used as fertilizer or fodder and glycerol is used in food industries as sweetener in pharmaceutical formulations. These results indicate that biodiesel can be produced from *Spirogyra spp*.

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