Characterization of Biodiesel produced from Micro Alage Oil

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ABSTRACT

Proceeded with reliance ashore crops for biofuel generation may prompt obliteration of forestlands and furthermore adds to the expansion in discharge of greenhouse gases. Oil extraction was completed on microalgae to assess possibilities for modern and local uses in filling in as substitute for regular oils and non-sustainable non-renewable energy source. The microalgae tests were rejected from the dividers and water surface. Soxhlet extraction strategy was utilized to separate the oils from the examples. The microalgae test yielded 0.00465liter of oil for each 46.5g example. In the wake of drying of the oils, the fats weighed. Microalgae could fill in as wellsprings of oil to substitute traditional oils and non-sustainable biofuels; with microalgae yielding more oil than aquatic plants and has higher growth rates and oil productivity looked at the customary crops.

Index Terms : *Microalgae, Biofuels, Soxhlet Extractor*

I. Introduction

Biodiesel is biodegradable elective fuel when contrasted with fossil fuels. Green growth are generally minute, prokaryotic or eukaryotic, and uni-or plural-cell life forms. Among the photosynthetic life forms, microalgae are the most effective in the ingestion of CO2 and their growth is straightforwardly identified with the decrease of GHGs, since they require expansive amounts of CO2 as carbon source. The utilization of palatable oil to create biodiesel in the creating nations isn't achievable in perspective of a major hole sought after and supply of such oils in creating nations. Be that as it may, there are a few Non-consumable crude materials that can be utilized to supplant such eatable crude materials, for example, green growth, which could be used as a hotspot for production of biodiesel. Green growth as a crude material in biodiesel production have a few appealing qualities, for example,

 By ethicalness of their generally little sizes, green growth can be effectively synthetically treated. Algae can be developed under conditions which are unsatisfactory for traditional harvest production. Algae are fit for settling CO2 in the air, in this way encouraging the diminishment of expanding climatic CO2 levels, which are presently viewed as a worldwide issue.

Preferred standpoint of utilizing microalgae for biodiesel production has been accounted for by various laborers [1]. The enthusiasm for green growth for biodiesel began in 1970s amid the primary oil emergency because of high oil yields. The normal oil yield is accounted for in the vicinity of 1% and 70% yet under specific conditions, a few species can yield up to 90% of dry biomass weight [2]. The variety in fatty acid composition of oil from various green growth species is accounted for by a few creators [3]. Truth be told, a few examinations have detailed the utilization of green growth for the production of biodiesel and different side-effects [4]. Moheimani [5] considered the impact of ph on algal growth in a plate photo bioreactor.

Kaewpintong [6] discovered better growth of microalgae in a transport bioreactor because of better blending of the Microalgae culture.

Thomas et al. [7] contemplated the growth of Microalgae species that develop well in this medium containing carbon dioxide as a carbon source and nitrate as a nitrogen source and deflect mined the impact of nitrogen and additionally the salt on the substance compositions of the green growth. Considered large scale manufacturing of green growth and have been done to build up a photo bioreactor for algal culture.

BIODIESEL PRODUCTION FROM ALGAE OIL

Out of the four oil modification methods, the most reassuring technique to overcome the issue of high consistency is transesterification which is a multi-step reaction containing three reversible steps, where triglycerides are changed over to triglycerides, to monoglycerides and monoglycerides to esters (biodiesel) and glycerol as by thing. Transesterification Microalgae Oil to biodiesel transesterification does not change the unsaturated fat composition of the feedstock and therefore the composition of biodiesel.

II. MATERIALS AND METHODS

Sample collection: Algae collector was used for collect Algae from the ocean in Gubre.

Oil extraction: Green growth was ground with engine and pestle however much as could reasonably be expected. The ground green growth were dried for 20 min at 80°C of every a hatchery for discharging water. Hexane solution (40ml) was blended with the dried ground green growth to extricate oil. At that point the mixture was kept for 24h for settling.

Figure.1. Drying of algae

Figure 2. Grinding of algae sample

Figure 3. Extraction of oil from algae

Biomass collection: The biomass was collected after filtration and weighted.

Evaporation: The removed oil was dissipated in vacuum to discharge hexane a solutions utilizing rotary evaporator.

Figure 4. Evaporating solvent

Mixing of catalyst and methanol: 0.25 g NaOH was mixed with 24 mL ethanol and stirred properly for 20 min.

Figure 5. Mixing catalyst and ethanol with oil

Biodiesel production: The mixture of catalyst and ethanol was poured into the algal oil in a conical flask.

Transesterification: Transesterification is a chemical reaction between triglyceride and alcohol in the presence of a catalyst. The conical flask containing solution will be shaken for 3 h by electric shaker at 300rpm.

Settling: After shaking the solution was kept for 16 h to settle the biodiesel and sediment layers clearly.

Separation of biodiesel: The biodiesel was separated from sedimentation by flask separator carefully. Quantity sediment was measured.

Washing: Biodiesel was washed by 5% water until it was become clean.

Drying: Biodiesel was dried by using dryer and finally kept under the running fan for 12 h.

Storage: Biodiesel production was measured by using measuring cylinder, pH will be measured and stored for analysis.

Procedure of biodiesel production

- ✓ Mixing of the 24ml ethanol and the 0.25g catalyst in a flask
- ✓ The mix ethanol and NaOH was heated to 50°C and stirred by stirring rod until the catalyst was completely dissolved in the ethanol.
- ✓ 0.0043kg algae oil was heated at 80°C.
- ✓ The solution ethanol-catalyst and the oil were mixed in a flask.
- ✓ The flask was introduced at 55°C and stirred by stirring rod. The reaction was performed during 60 minutes.
- ✓ The final solution then settled for about 24 hours until two separate layers were formed.
- ✓ The top layer was the biodiesel and the bottom darker layer was the by-product, glycerol.
- ✓ Separate the glycerol from the biodiesel, and measure the glycerol.
- ✓ The product was washed by distilled water to the top layer, with gentle mixing.
- ✓ Measurement of the amount of produced biodiesel.
- ✓ Finally entered to the dryer in order to remove the moisture.

III. RESULT AND DISCUSSION

Processing green growth for biodiesel Algae were dried by using dryer for over 20 minute. The well drying was simple when we extricated oil and furthermore for grinding before extraction process. To create biodiesel by extracting oil from dried and ground biomass of green growth using hexane as dissolvable. In the season of extracting oil we should be take mind since it had some multifaceted nature, for instance the hardware of extraction (Soxhlet extractor) was does not fit with each other we don't ready to extricate oil as a result of the dissolvable was evaporate and the procedure progress toward becoming stop. Additionally we should control our working temperature unless if the cup may broke and furthermore the water inlet and outlet process must be continuous in light of the fact that to keep the condenser security (the cool water not inter continuously condenser may break). Transesterified to biodiesel by sodium hydroxide or potassium hydroxide as impetus and methanol or ethanol yet in this investigation we utilized sodium hydroxide as impetus and ethanol in the place of methanol however methanol was better for more response . for 46 .5 - 50gm green growth utilized impetus was not more than 0.25gm - 0.3gm for glycerol amount on account of it utilized more similarly the glycerol amount turn out to be high which may take more time in division process and may make partition intricacy. Biodiesel created was isolated from glycerin by separating channel and washed with water to get unadulterated biodiesel. In the wake of washing the isolated biodiesel from glycerol must it washed to remove unwanted material or more purified

Raw material preparation

The moisture content test of the dry algae was calculated and the results were summarized in the table below.

Moisture content (W) = [(W1– W2) / W1]

Where, W1= original weight of the sample before drying

W2= weight of the sample after drying

Run	Weight before drying(Kg) W1	Time	Weight after drying (kg) W2	Temp(c)	Moisture content (%) [(W1 W2) / W1]
1	0.0465	4 day	0.0365	25	0.215

Oil extraction

0.00465kg of algae was used for oil extraction. After extraction, about 0.00465liter of oil or 0.0043 kg of oil was obtained. Then the density (ρ) of oil was calculated and the result was: Density (ρ) =mass of the oil / volume of the oil ρ = m/v=0.0043/0.00465= 0.925kg/L Oil yield (%) = (mass of extracted oil / mass of algae used)*100% = (0.0043kg / 0.0465kg)*100%=9.1% Specific gravity Oil sample was brought to 25oC and density of the sample was calculated for specific gravity calculation. SG = ρ oil/ ρ water Where, ρ oil= Density of oil used = 0.925kg/L Density of water = 1kg/L SG=0.925kg/L/1kg/L= 0.925

Biodiesel characterization

Moisture content:

The moisture content of biodiesel was calculated and the result are summarized in the table 4.2 Moisture content (W) = [(W1– W2) / W1]*100% Where, W1= original weight of the sample before drying W2= weight of the sample after drying

Run	Weight before drying(Kg) W1	Time	Weight after drying (kg) W2	Temp(c	Moisture content (%) [(W1 W2) / W1]
1	0.0226	12h	0.00195	115	0.137

Density of Biodiesel:

After production of biodiesel, about 0.00228Lit or 0.00195kg was obtained.

From the result density of biodiesel was calculated as follow Density of biodiesel (ρ) = mass of biodiesel/volume of biodiesel

(ρ) = 0.00195kg/0.00228lit=0.855gm/cm3

PH MEASUREMENT

The PH of biodiesel was measured using digital PH meter and its value was 7.4. The value of specific gravity and PH were under the range of standard values in the literature. The standard values are 0.856-0.91 And7-8 respectively.

REFRACTIVE INDEX

The refractive index of biodiesel was measured using refract meter and the obtained value was 1.457 and the value was similar to standard value of biodiesel. Biodiesel yield (%) = (total mass of biodiesel produced/total mass of oil used)*100=0.00195kg/0.0043kg=45.25%

Table 4. Comparison between biodiesel and diesel

Properties	Biodiesel produced from Lab	Standard biodiese	Fossil diesel
Density	0.874gm/cm3	0.875gm/cm3	0.876gm/cm3
Specific gravity	0.875	0.856-0.9	0.85
Refractive index	1.457	1.445	1.45-1.475
Moisture content	0.137	0.05	0.02
PH	7.4	7-8	3-5.6

IV.CONCLUSION

In our investigation, micro algae were utilized to remove oil and its transformation to biodiesel. The examination uncovered that algae are quickly developing and successful organism for biodiesel production as these can be developed in wastewater and also in counterfeit media. Biodiesel was delivered by extracting oil from dried and ground biomass of algae using hexane as dissolvable. These algae were transesterified to biodiesel using sodium hydroxide as an impetus and ethanol. From this investigation, we demonstrated that the proposed cycling process, which uses a little measure of delivered biodiesel as a dissolvable for the extra oil extraction from new microalgae, has a practical plausibility for dried or wet algae extraction. Findings in this investigation uncover the possibility of obtaining oils extricates from microalgae, however, these qualities were high. Resultant biodiesel was examined and isolated from by product by flask separator carefully.

RECOMMENDATION

Fuel from fossil sources such as petroleum, coal and natural gases have been the main sources of energy throughout the world for a long time as well as this diesel consumption was higher than that of biofuel . Therefore we recommend that the consumption of fuel which producing from fossil sources must be decreased by algae oil biodiesel production because it does not release non greenhouse gases like CO2, NOX, etc, also which is eco-friendly to environment.

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