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A PILOT STUDY ON QUALITATIVE AND QUANTITATIVE ESTIMATION OF CONVERTED CHICKEN FAT INTO BIODIESEL

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ABSTRACT

Biodiesel has become more attractive recently because of its environment need and the fact that it is a non- renewable resource. In this research chicken fat is taken for the production of biodiesel. Chicken fat is considered to be harmful for human health due to cholesterol content in the chicken skin. So there is large quantity of chicken fat is wasted, this wastage can be minimized and it can be converted into a useful non-renewable resource. In this research work chicken waste was converted into a useful product called biodiesel, biodiesel was extracted from the chicken waste then it was analyzed for its quality and quantity analysis. Qualitative analysis like Acid value, Iodine value, Flash point, viscosity, and density was analyzed and quantitative analysis like GC-MS, Total lipid content of the extracted sample is analyzed for the conformation of chicken fat into Biodiesel.

KEY WORDS –Acid Value, Biodiesel, Chicken Fat, GC-MS, Renewable Resource

1. INTRODUCTION

Biodiesel is an important resource in day to day life since because it is a non-renewable resource to overcome this difficulty it was addressed by many research workers

Darnoko and Cheryan [2000] reported data on palm oil kinetics. It was observed that the rate of alkali-catalyzed (KOH) transesterification in a batch reactor increased with temperature up to 60° C. The further increase in temperatures did not reduce the time to reach the maximum conversion of biodiesel so it was not a successful work

Hawash et al. [2009] studied the transesterification of jatropha oil using supercritical methanol in the absence of catalyst under different temperature conditions. Jatropha is one of the cheapest resource and valuable resource for the production of biodiesel.

Ramadhas et al. [2009] reported the use of acid catalyst followed by alkali catalyst in a single process using rubber seed oil with high free fatty acid content. The objective of this study was to develop a process for producing biodiesel from a low-cost feedstock like crude rubber seed oil.

Fukuda et al. [2001] Biodiesel production by transesterification from sunflower oil was discussed by Antolin G. et al. Many researchers have also suggested different processes for the production of biodiesel from transesterification by using different vegetable oils.

Agarwal et al. [1999] evaluated and characterized the performance of linseed oil, mahuna oil and rice bran oil and compared the smoke density produced by all the three oils and thermal efficiency to that of biodiesel fuel.

Herchel et al. [2007] used pure coconut oil gave good result .Increased coconut oil and diesel blend results in lower smoke and NOX emission with an increase in the brake specific fuel consumption.

Biodiesel production was carried out with different sources by different research people aiming for a good result.

2.MATERIALS AND METHODS

Chicken fat was collected from the Porur market and further experiments were carried out using the chicken fat.

2.1. EXTRACTION

Chicken fat was cut into small pieces. The pieces were weighed and homogenized with ethanol and diethyl ether was added. 40 ml of diethyl ether and 20ml of ethanol was added to the homogenized mixture. Mixture was centrifuged at 2000rpm for 15 minutes. 47ml of the extract was obtained.

2.2 SEPARATION

The sample contains both extract and ethanol mixture. The extract was separated using separating funnel. 21ml was obtained after separating from the separating funnel.

2.3. BASE-CATALYZED TRANSESTERIFICATION

The collected extract was mixed with potassium chloride suspended on the top of oil. The potassium chloride collected in a flask and the extract was left behind in the separating funnel which was collected in a separate beaker.

2.4. EVAPORATION

The extracted sample was collected in a beaker and covered with a filter paper with holes impregnated on the filter paper which facilitates the evaporation (Ether and ethanol) 14.5ml was the final extract obtained after evaporation

2.5. HEATING

After evaporation sample was heated to remove the total water content present in it. The remaining sample was used for further analysis to confirm the separated extract.

3. QUALITATIVE TEST:

3.1. SOLUBILITY TEST:[Jesper Larsson 2009]

5 test tubes were taken to that 1 ml of extracted oil is added in each test tube. Then 1ml of water, chloroform, acetone, diethyl ether, and ethanol is added in different test tubes. Solubility was observed

3.2. SUDAN III TEST: [Derek beck]

This test is performed to identify the presence or absence of lipid content in the extract. A small quantity of sample was taken and it was hydrolyzed using glacial acetic acid. Hydrolyzed sample was taken in a test tube. Sudan III reagent was added .Change in colour was observed (red orange color).

3.3. ACEROLEIN TEST:[Hanan atia]

This test was done to detect the presence of fats and glycerin. 5 drops of sample is added to the dry test tube to that 1ml of conc. H2SO4 was added carefully and the mixture was heated till Pungent odour was evolved which indicates the presence of acerolein.

3.4. COPPER ACETATE:[Edward J 2001]

This test was done to distinguish between saturated fatty acid and unsaturated fatty acid.1ml of extracted sample was taken in a test tube to that 1ml of petroleum ether and 5ml copper acetate was taken and then the mixture was shaken well, and it was allowed to stand for few minutes. Formation of blue colour aqueous layer indicates unsaturated fatty acids and green colour indicates saturated fatty acid.

3.5. TEST FOR CHOLESTROL: [Jonny Bowden]

This test was done to detect the presence of cholesterol. 1ml of 0.5 % cholesterol was added in chloroform in a dry test tube to that 5 drops of acetic anhydride was added and 1 drop of conc. H2SO4 was added and mixed well. Appearance of pink color was observed which gradually turned into deep green colour.

3.6. ACID VALUE: [S.kang]

This test was done to calculate the amount of potassium hydroxide required to neutralize the free fatty acid in 1gm of the sample extract. Standard procedure was followed

3.7. IODINE VALUE: [Von Hubi 1884]

Standard procedure was followed to determine the iodine value of fats and oils and thus to estimate the saturation of the fats and oils.

3.8. SAPONIFICATION VALUE:[Kevin M.dunn 2006]

Standard procedure was followed to determine the saponification value.

4. PHYSICAL ASSAYS

4.1.pH

pH of the extracted sample was checked using Digital pH meter

4.2. DENSITY

To determine the density of the extracted sample and it was compared with the standard ASTM value. Empty ependroff tube was taken and it was weighed with 1g of extracted sample was taken and weighed.

4.3. VISIBILITY

Biodiesel was clear, translucent with golden or amber color.

4.4. FLASH POINT

The flash point of the sample is the temperature at which the sample emitted sparks.Flash point was check with the varying temperature 25˚c, 50 ˚c, 75 ˚c, 100 ˚c

4.5. CLOUD POINT

Cloud point is cooling temperature at which sample change to solid state.

4.6. FIRE POINT

Fire point was checked with varying temperature. 25˚c, 50 ˚c, 75 ˚c, 100 ˚c

5.CONFIRMATORY TEST

5.1.Gas Chromatography: An Agilent 6890 gas chromatograph was equipped with a straight deactivated 2 mm direct injector liner and a 15m Alltech EC-5 column (250µ I.D., 0.25µ film thickness). A split injection was used for sample introduction and the split ratio was set to 10:1. The oven temperature program was programmed to start at 35^{o}C, hold for 2 minutes, then ramp

at 20^{o}C per minute to 300^{o}C and hold for 5 minutes. The helium carrier gas was set to 2 ml/minute flow rate (constant flow mode).

5.1. Mass Spectrometry

A JEOL GCmate II benchtop double-focusing magnetic sector mass spectrometer operating in electron ionization (EI) mode with TSS-2000[1] software was used for all analyses. Low-resolution mass spectra were acquired at a resolving power of 1000 (20% height definition) and scanning from m/z 25 to m/z 700 at 0.3 seconds per scan with a 0.2 second inter-scan delay. High resolution mass spectra were acquired at a resolving power of 5000 (20% height definition) and scanning the magnet from m/z 65 to m/z 750 at 1 second per scan.

Mass spectrometry library search

Identification of the components of the purified compound was matching their recorded spectra with the data bank mass spectra of NIST library V 11 provided by the instruments software.

6. RESULT AND DISCUSSIONS

1. Qualitative analysis, Quantitative analysis and confirmatory analysis were performed.
2. It was found that the density, visibility, fire point, flash point, cloud point, pH, GCMS. Results were satisfying the standard ASTM value.
3. From the above results obtained it was found that the chicken waste can be transformed in large quantity and it can be used, as a Biofuel**.**

2.1. EXTRACTION

2.2.SEPARATION

3.1. SOLUBILITY TEST

S.NO	SAMPLE	SOLVENT	SOLUBILITY	RESULT
1	Sample extract	Water	_ _ _	_
2	Sample extract	Acetone	_ _ _	_
3	Sample extract	Ethanol	+ _	_
4	Sample extract	Chloroform	+++	3+ soluble
5	Sample extract	Diethyl ether	++_	2+partially soluble

3.2.SUDAN TEST

Change in colour was observed (red orange color)

3.4.COPPER ACETATE:

Blue color was evolved. It represents the presence of unsaturated fatty acid in it

3.5. TEST FOR CHOLESTROL:

Change in the colour from pink to deep green indicates the presence of cholesterol

3.6. ACID VALUE: Found to be satisfactory.

S.NO	TEST	ASTM VALUE	VALUE
1	ACID VALUE	0.5	0.561

3.7 IODINE VALUE:

S.NO	TEST	ASTM VALUE	VALUE
1	IODINE VALUE	120	58.42

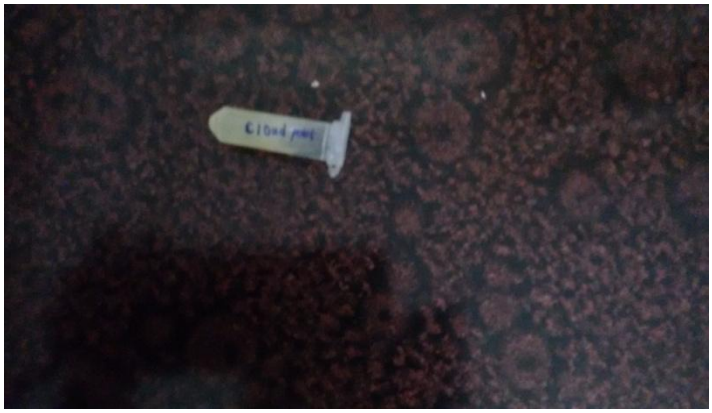
3.8SAPONIFICATION VALUE RESULT:

S.NO	TEST	ASTM VALUE	VALUE
1	SAPONIFICATION	31.08	28.05

4.1. pH: 7 is a satisfactory pH for a biodiesel.

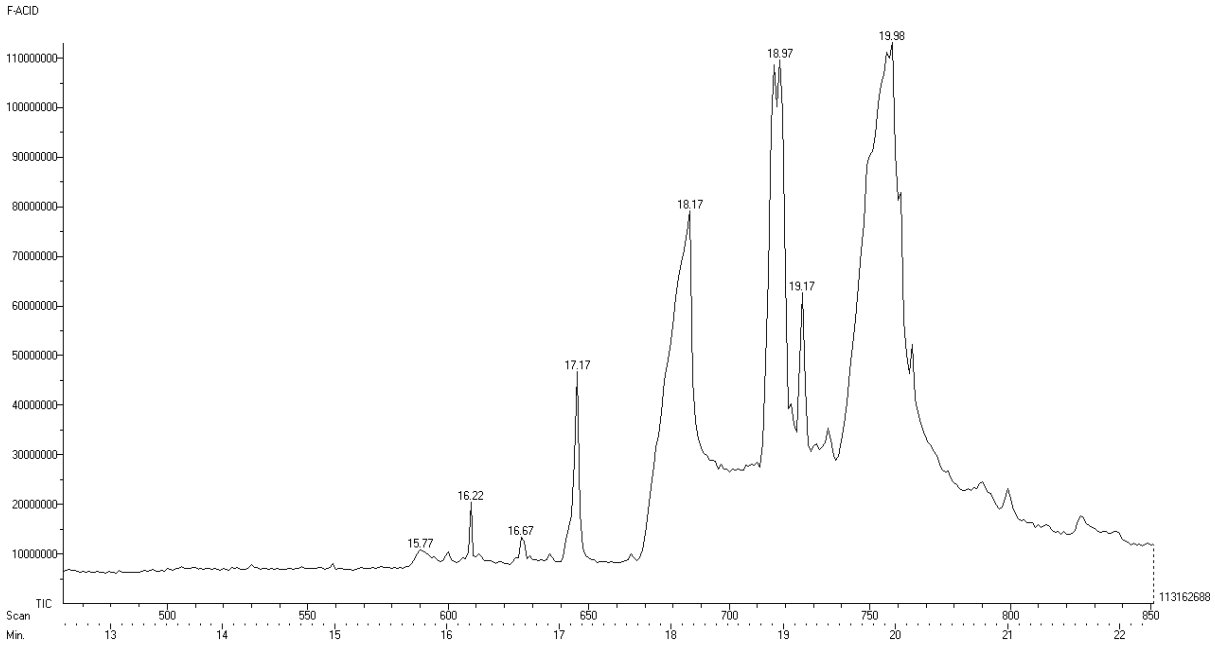
4.2. DENSITY: 0.81g

4.6. CLOUD POINT :Cloud point was observed at 40˚after 1hour 45 min



4.4. FIRE POINT: Flash point was observed at 100˚c

5.1.GC-MS:



6.SUMMARY:

- Biodiesel is an important source in the present situation. Future world is going to face a demand for diesel. In present scenario, it is necessary to produce an alternative resource since diesel is a non-renewable resource.
- Alternative source produced should not disturb the food chain
- In the present study it is found that the biodiesel produced from the chicken fat act as very good alternative resource.
- It possess an excellent source of palmitic acid (2.40%), linolenic acid(4.52%),octanic acid(2.94), pentaderylicacid(10.32%), palmiticacid(16.32%), oleic acid(24.18%),margaric acid(13.84%),oleic acid(24.98%)
- Thus it acts a very good source for the biodiesel production.

7.CONCLUSION:

- From the result obtained from the quantitative, qualitative &confirmatory test. Thus the biodiesel obtained from the chicken fat can be produced in large scale industry.
- Further improvements and large scale study may lead the world in a new path
- This can be a very good resource (biodiesel).

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