

Biodiesel Production from Grilled Chicken Oil Using Hexane as a Co-Solvent

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Abstract

As a result of the high prices of traditional fuels and the pollution problems resulting from the use of this type of fuel, there was an urgent need to search for actual alternatives that directly contribute to reducing global dependence on traditional fuels and reducing the percentage of pollution. Therefore, biofuels are distinguished in solving part of these problems. This research dealt with fuel production Bio-fuel from grilled chicken oil waste innovatively, we have never found its use, so this research relied on the production of biofuel from grilled chicken oil waste using hexane as a co-solvent through the one-step exchange esterification process hexane is reused again through the distillation process. At a low temperature, it had a major role in increasing the yield, reducing the reaction time and reaction temperature, and reducing the ratio of ethanol used to the oil ratio, as well as improving the standard specifications of the resulting fuel. the fuel produced in this way is suitable for mixing with traditional fuels and for use.

Keywords: Biodiesel, chicken oil grilled, hexane, and Co solvents.

INTRODUCTION

Alternative energy has appeared in several forms. It was one of the most important means of electric transportation. It is considered a new alternative to traditional vehicles, but it is not available to everyone because of its high prices and the fact that it needs an electric power source that is not available in all countries and is ineffective in high temperatures (16) Therefore, biofuels are one of the alternatives The good of fuel is the spent imitation, so we notice an increasing interest in the production of this type of fuel. (1) Biofuel has a positive aspect, which is its production from human waste, the diversity of its production methods, and the diversity of primary confiscation, and not only that, but it has an advantage, which is reducing emissions from traditional fuels that cause climate change. (2) Large population centers produce many raw materials that can be used in biofuel production, such as vegetable frying oils and animal oils that contain a high percentage of saturated fatty acids, which are a good source for biofuel production. (3)

Researchers have shown in previous studies that animal oils can be used. In the production of biodiesel (17), the researcher Mohammed Albadre also used hexane as a common solvent in the production of biofuel(13). Mohd Yusuf researches Hexane as a common solvent in biodiesel production The use of biodiesel as fuel is by mixing it in certain proportions with conventional fuels and thus plays a major role in reducing the consumption of fossil fuels(10) This research paper will attempt to develop a new method for biodiesel production from A raw material that was previously used in the production of biodiesel (17). Then we will discuss the advantages and improvements accompanying this method in production and its impact on the physical and chemical properties of the produced diesel.

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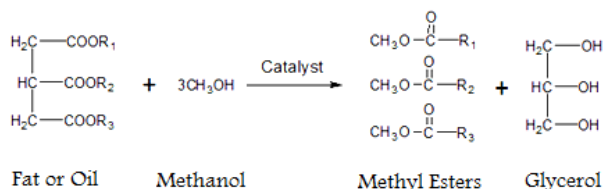
Material and method of work

Extraction and purification of grilled chicken oil

Many restaurants, food vendors, and fast food places throughout the city have donated grilled chicken oil. Filter the oil with a piece of gauze and leave it to separate for a week. There were three levels visible. The bottom layer is divided into two parts: black and white. Dirt, burned residue, and film are all present. The water is in the middle. The pure layer of grilled chicken oil is the top layer of yellow. This top layer has been taken out of the equation to be used in future studies.

The transesterification reaction of roasted chicken oil

The oil-alcohol transesterification reaction is used to produce biofuel. The low acidity of roasted chicken oil (0.832 mg KOH/g) helped complete the one-step reaction to produce biofuel (13)



100 g of oil dissolved in hexane was placed in a three-headed glass vial microscope with a thermostat, condenser, and magnetic stirrer, and then the solid KOH catalyst dissolved in methanol was added, all of which were placed in the experimental reaction conditions. The product was placed in a separating funnel. Two layers were observed. The lower layer is glycerol and the upper layer is impure biofuel because it contains the residues of solid catalyst and unreacted methanol. The upper layer was treated by washing it with warm water to get rid of the soap formed. Then the produced biofuel was saved with Na₂SO₄. To get rid of the effects of residual moisture and by using a mathematical equation used in a previous study, the result was determined.

Physical and chemical properties of grilled chicken oil compared to chicken lard oil.

The oil was continuously and for a long time exposed to high temperatures in the presence of moisture and air, and processes such as cracking of the fatty acid chain, external oxidation, polymerization, and thermal oxidation occurred. During the heating and roasting process (14), therefore, the following observations appeared during the experiments (as shown in Table 1). The values of many physical and chemical properties of the oil derived from chicken fat are often lower than those of grilled chicken oil, such as low acidity, viscosity, and high flammability while remaining Refractive Point and Freezing Point Constant (10)

Table (1) Physical and chemical properties of grill chicken oil compared to chicken lard oil

Property	Chicken fat-extracted oil	grill oil
Density g/ml	0.888	0.854
viscosity when °40C(ml ² /sec)	13.7	14.1
Flash degree °C	165	180
Spill degree °C	+ 6	+ 6
refractive index	1.4671	1.4670
Acid values (mg KOH/g oil)	0.982	0.832
water content %	0.0439	0.0346
free fatty acids%	4	3.4
iodine number (mg I ₂ /100 g oil)	88	86

Fuel Characteristics Test

The physical and chemical properties such as viscosity, flash point, and pour point was studied. The iodine value was determined using the Hanus method (5). Experiments were conducted three times and the average was taken for each reading. And comparing it with the properties specified by ASTM by following the same approved protocols. Also, the glycerin concentration of the product was calculated (6). As shown in Table (2)

Table 2 Physical and chemical properties of biodiesel produced from grilled chicken oil using hexane as a solvent compared to standard biodiesel.

Property	Test	Std. BD	Values
Density (g/ml)	ASTM D 4032_91	0.86-0.90	0.932
Viscosity °C at 40 (ml ² /sec)	ASTM D 445	1.6-6.00	14.3
Flashpoint degrees Celsius	ASTM D 93	47-130	185
per point Celsius	ASTM D 2500	by country	+ 7
refractive index		0	1.420
Acid value mg KOH/g oil	ASTM D 664	0.50 max	0.832
water content%	D 2709	0.50 max	0.124
% free stearic acid		3%	3.2
I'm Odin's number mg i ₂ /100gm (oil)	Hanus method	-	80
saponification number (mg KOH/g oil)	ASTM D 5555-95	-	0.809

contrasted with standard biodiesel, BD from barbecue chicken oil yields higher thickness. How much water and the thickness of BD created involving hexane as a Co dissolvable have similar qualities. Then again, the refractive list and corrosive qualities have a bigger number for the BD created in this review

Results and discussion

The main source of energy in this universe is fossil fuels that contain many chemical compounds such as sulfur compounds, hydrogen, and oxygen that pollute the environment. Therefore, it was necessary to find alternatives, and one of these alternatives was biofuels. (7). Biodiesel is a type of biofuel and is the best alternative to use in diesel engines. In general, vegetable oils and chicken fat are used And Palm oil and rapeseed oil for biodiesel production(8). has been used in Microalgae fluids for biodiesel production using hexane as a former Co solvent(9). However, to the best of our knowledge, no previous studies have been performed demonstrating the process and production of biodiesel from grilled chicken oil using hexane as a Co solvent(13). The result of the present study showed that after keeping the reaction conditions constant if the concentration of the co-solvent was varied, it was observed that the yield was initially increased and that 25% volume of hexane relative to methanol gives the highest yield of biodiesel. In a previous study by Youssef and Athar, it was reported that hexane was used as a Co solvent that could be successfully produced from Jatropha oil. This study also reported that 25% vol of hexane yielded a higher biodiesel concentration than Jatropha oil. (10). Product yield decreases with increasing concentration As shown in figure No (1). Rate solvent It was studied where it was noted that 5:1 methanol volume to the oil was perfect for higher production biofuel yield. High rates of value adversely affected the yield. (13) As the process of turning into soap increases)14(As shown in figure No. (2) The concentration of the base catalyst KOH is a major factor affecting the production rate of biodiesel. The production percentage (BD) is yielded at a maximum concentration (0.25%) of the base catalyst. . It yields 94.434% while it yields 88.45% when increasing the concentration of the catalyst. The reason for the decrease in the yield is due to the soap-forming property in the ester-methyl layer (BD) During the washing steps, soap molecules are emulsified with water (11) as shown in figure No. (3). It is also noted that the percentage of production of fuel (BD) decreases with increasing temperature (below the boiling point of methanol alcohol when the concentration of the KOH catalyst remains constant), although many researchers have performed the esterification transfer reaction n at a temperature close to the boiling point of the alcohol used (16), increasing the reaction temperature leads to trans esterification not completed There are many published studies that show the best results when the reaction is carried out at room temperature. The reason

for the high production rate at 30°C can be attributed to the fact that higher temperatures reduce transesterification and thus lead to soap formation and reduce the separation between the ester layer and the glycerol layer. (12) As shown in figure number (4) The experiment was conducted at different times. It was noted that 30 minutes is the ideal time As 20 minutes, was Not Enough to carry out an esterification reaction, a time of 40 minutes leads to soap formation(15). The reaction was carried out at 600rpm. As shown in table number (3)

Table (3) shows the ideal reaction to produce biodiesel from grilled chicken oil

sodium hydroxide concentration	Rat methanol to oil	Rat hexane to methanol	Time	reaction temperature	number of revolution	yield
0.25	1:5	25%	30 minute	30 Celsius	RVE/ min 600	94.434

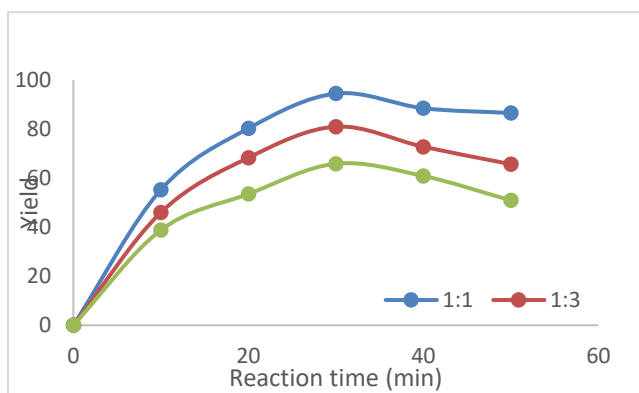


Figure (1) Co-Solvent Effect

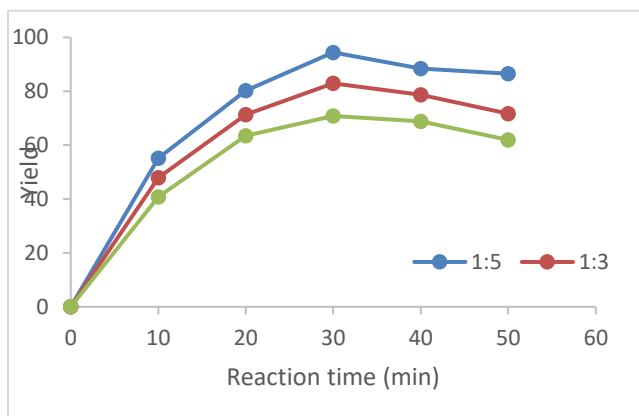
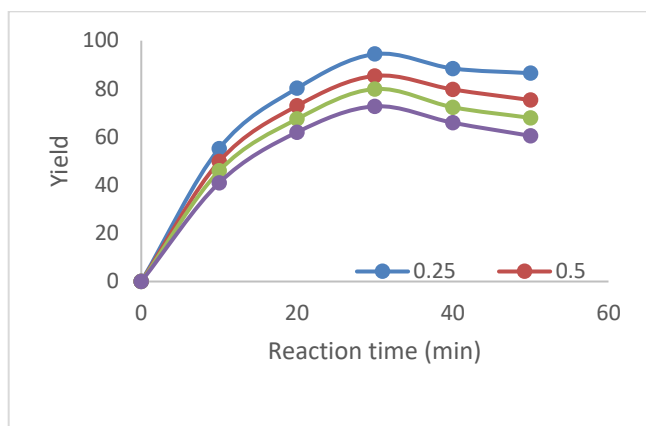


Figure (2) Ethanol Amount To Oil



Catalyst Effect Figure (3)

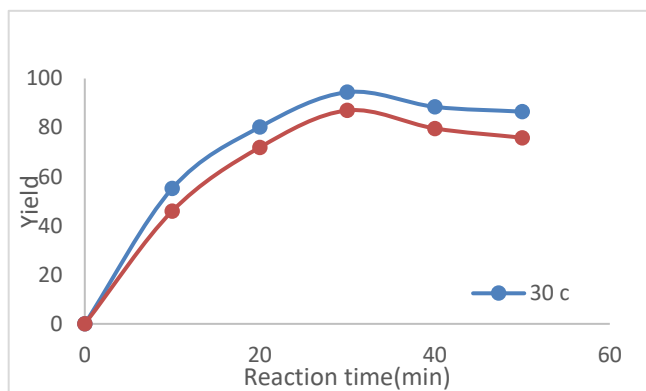


Figure (4) Temperature Effect

Result

Through this study, it was concluded that the use of hexane as a common solvent had a significant role in improving the physical and chemical properties of the biofuel, increasing the percentage of the product, accelerating the reaction time, lowering the reaction temperature and reducing the ratio of methanol to the used oil, and the use of hexane opened the way for its use on raw materials.

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