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SYNTHESIS AND CHARACTERISTICS OF OIL FROM ORANGE RIND

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ABSTRACT

In Spite the Fact that People Consider the Rind of Orange as a Waste in India. This Exploration is Purposed to Convert the Waste or the Rind of oranges to a Fortune Product. By Setting Up the Production of Biodiesel from the Oil Extracted from the Rind of Orange, by Undergoing the Transesterification process. The Orange Rind is Dried Under the Sun to Extract the Oil Using Cyclohexane as a solvent. The Transesterification Process is Carried out at the Range of Temperature 80-82˚C. Depending on the Type of Oil Used the Temperature Range Varies. The Process is done using Oil and Methanol in a 1:3 Mole ratio and Potassium Hydroxide is used as an Acid Catalyst. The Parameters Scrutinized are Physicochemical Characteristics of yielded Biodiesel and Extracted Oil such as Density, Viscosity, and Concentration of K, Na, Mg, P, Ca of biodiesel and Acid value, Iodine value and Peroxide value of the Extracted oil. The biodiesel extracted has a density and viscosity of 822kg/m^3 and 2.8Cst. The Concentrations of Na, Ca, K, Mg, P are 3ppm, 4ppm, 7ppm, 4ppm, 9ppm Severally. The Parameter values are Nearer to ASTM Standard Values. The Glycerol is Recycled Thrice Before it loses its Concentration. Hence it is Perceived that the Orange Rind is the Best Inception for the Production of Biodiesel.

Keywords: Transesterification, Extraction, Catalyst, Density, Viscosity.

I. INTRODUCTION

Citrus sinensis is the Botanical name of the Sweet Orange. It belongs to the Rutaceae family and the Order Sapindales. The Orange tree can be grown in various varieties of soil. But the soil should be in the pH Range Between 5.2 to 6.4 and it should be rich in loam, which is a Unification of sand, silt, clay. It should be relocated into rich, well-drained humus. So that the roots can be perforated with the new soil. Most orange trees are self-prolific. Orange is a citrus fruit and it is a hybrid of pomelo and Mandarin Orange. It is traditionally used to treat infirmities like cramps, constipation, cold, cough, angina, obesity, anxiety, depression, and stress. The rind of oranges is opulent in fiber, calcium, vitamin C, folate, and vitamin B6. The rind has anti-cancerous properties, thanks to the presence of limonene. The rind has the presence of polyphenols which shield them from several diseases. Orange oil is an essential oil used as a food flavoring agent. It is used for structural pest control, biological pest control, domestic cleaning Agents, aromatherapy, and Aromatherapy material for humans. Orange rind is a parched or impertinent exterior part of the pericarp of ripe. It is aboriginal to India and lucratively cultivated in Spain, the USA, Morocco, and Sicily. Grafting and cutting is the method for the cultivation of orange. The rind is treated to extract the oil or parched and conserved for additional use.

Bioethanol and biodiesel are the two well-known biofuels derived from the crops and their products. Bioethanol is a substitute for fossil transportation fuels. It is a kind of alcohol made by microbial fermentation from sugar or starch-containing plants. The chemical process is also involved in the production of bioethanol by reacting the ethylene with steam. The standard requirement of fuel ethanol in ASTM D4806 should contain a minimum of 92.05% ethanol by volume, with the denaturant volume ranging from 1.94% to 4.73%.

Biodiesel is extracted from vegetable oil, animal fats, etc., Biodiesel is the fuel yielded from the mono-alkyl esters of long fatty acids derived from the vegetable oils. It is Innocuous, Environmental-friendly, and yielded from Renewable resources and Conduces a Minimal amount of net greenhouse gases, such as CO_2 and NO_2. The main privilege of using biodiesel is carbon neutral. Biodiesel is an Auspicious substitute source of energy. Nowadays, the feedstock of biodiesel is animal fats, microalgal oil, and currently, vegetable oils are used widely as a raw material for biodiesel production which includes sunflower oil, soya bean oil, cottonseed oil, rapeseed oil, peanut oils, coconut oil, neem oil, palm kernel oil, and waste cooking oil. Biodiesel has a higher flash point when compared to fossil diesel. So, it's safer inside the event of a crash. Biodiesel is usually used as a calefaction fuel in domestic and mercantile boilers has different applications.

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II. PROBLEM STATEMENT

The major problem of the people using diesel is the credence of fossil fuel as a primary source for domestic and industrial applications in various countries. Quite 80% of our energy comes from fossil fuels the problem with this is that burning them causes pollution. Fossil fuels are the most important donators of greenhouse gases to the atmosphere mainly due to the huge transportation, thermal energy production, and electricity. Fossil fuels are made from decomposed plants and animals which have ended its life due to natural disasters. Those fossil fuels contain carbon and hydrogen hence, they're called hydrocarbons. Some of the samples of fossil fuels are coal, oil, and gas. The main usage of fossil fuels results in environmental degradation, human health issues, and global climatic changes. Fossil diesel is most ordinarily used for trucks, buses, and enormous sorts of machinery. Fossil diesel is distilled from crude oil or petroleum. The emission of greenhouse gases is amenable to global warming and has adverse impacts on an ecological community like the decrease in dissolved oxygen in oceans, liquefaction of the icebergs and glaciers, and drought. carbon dioxide is produced in huge quantities when fossil fuels are burnt. Carbon emissions trap heat within the atmosphere and cause global climate change.

So, the planet has begun to produce renewable and more parsimoniously feasible alternative fuel sources to scale back credence on fossil fuel. A number of those substitute and renewable sources of energy are solar power, hydroelectric power, fuel cells, wind generation, and biofuels.

III. METHODOLOGY

Extraction of Orange rind Oil

Orange rinds were collected from the market. The orange rind was parched under the sun for 3 days for 72 hours. The parched orange rind was ground into a powder form employing a manual grinder. The Oil is extracted from the powdered orange rind using a Soxhlet extractor and cyclohexane as a solvent. The crude oil of orange rind was detached from the cyclohexane by permitting the oil to cohere under the fan for cyclohexane to volatilize to a fixed weight of the oil. Then the oil was parched in a hot air oven at 58°C for 60 minutes.

1). Physical properties

The physical properties of the crude orange peel oil include specific gravity, refractive index, optical rotation, and maximum ultraviolet absorption at 250nm.

Property	Value ± SD
Specific Gravity	0.853±0.002
Refractive Index	1.484±0.003
Optical Rotation	+90±1.645
Maximum ultraviolet absorption at 250nm	0.386±0.004

2). Chemical Properties and composition

The chemical properties of the extracted oil from orange rind include the free fatty acid (FFA) composition, Iodine value, Acid value, Peroxide value, and the saponification number and unsaponifiable matter. The chemical properties are the foremost important properties that determine the condition of the oil. A free fatty acid is created from the hydrolysis of oils and fats. Free fatty acid and Peroxide values measure the quality of the oil. The measure is defined because of the amounts of milligrams of potassium hydroxide (KOH) required to neutralize the free fatty acid available in one gram of fat. The peroxide value is portrayed as the amount of peroxide oxygen per 1 kg of fat or oil. It's a measure of the expanse of oxidation of fat or oil. The Iodine Value (IV) is the mass of iodine in grams that's squandered by 100grams of a chemical substance. It is used to ascertain the quantity of unsaturation in fats, oils, and waxes. Saponification value (SV) portrays the amounts of milligrams of potash (KOH) Or Caustic soda (NaOH) required to saponify one gram of fat under the conditions designated. It's the fraction of substance in oil and fat which isn't dissolved by the alkali such as NaOH or KOH etc. But it's soluble within the ordinary fat solvent is named unsaponified matter. The unsaponifiable matter in vegetable oils is of impressive significance for oil attributes and stability. The chemical composition of the

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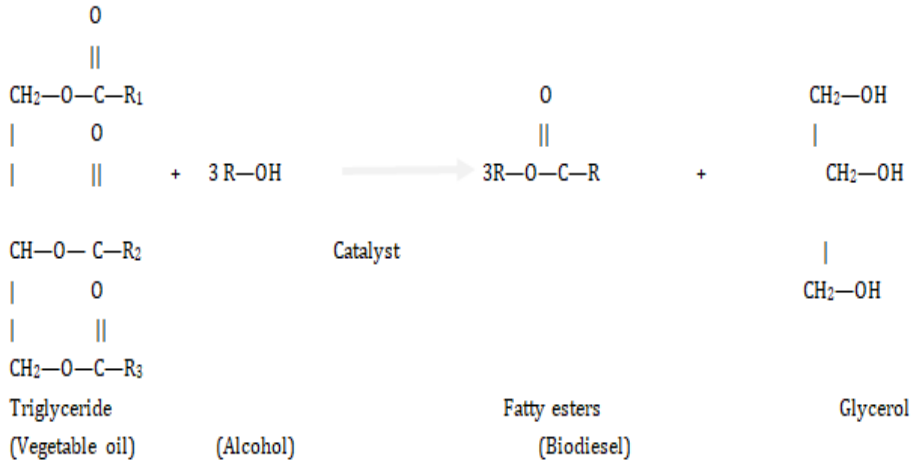
orange rind oil is monoterpene hydrocarbon, terpene alcohols, aliphatic aldehydes, and terpene aldehydes. Most compounds were limonene, myrcene, α-pinene, β-pinene, linalool, octanal, and decanal.

3) Transesterification

Transesterification is an organic reaction during which the alkyl group of an alcohol is exchanged with the different alkyl groups of an ester. The transesterification process was administered with methanol and oil in a mole ratio of 1:3 to produce biodiesel (fatty esters) and glycerol. 30ml of oil from the orange peel was assorted with 90ml of methanol and 1g of potash (KOH) during a reflux system assigned with a magnetic stirrer. The KOH is employed as a catalyst to enhance the speed of reaction and yield. The mixture was ardent at the range of temperature 80-82˚C for 120 minutes. The mixture was then permitted to settle for 48 hours at which two separate layers were acquired. A 500ml separatory funnel was used to distinguish the ethyl ester from the other layer. The pH range of the ethyl ester was tested to ascertain its purity and therefore the purification of the ethyl ester was done with sulphuric acid (H_2SO_4). Since it acts as a dehydrating agent. The mixture was then permitted to settle for 72 hours at which two layers were acquired. The highest layer which is acquired is ethyl ester. The performed biodiesel was concerning in observance with ASTM standards. The biodiesel produced from this process features a lower viscosity. The glycerol was recycled thrice to produce biodiesel with the fresh oil. The biodiesel produced during this process is often used as a fuel for diesel engines. The reaction involved within the transesterification process undergoes the nucleophilic attack and yields



IV. RESULTS AND DISCUSSION

In the extraction process, 30ml of oil yields 25.0ml of Biodiesel.

Table 1: Physicochemical characteristics of extracted oil

PARAMETER	EXTRACTED OIL
ACID VALUE	9.3
PEROXIDE VALUE	11.5 mg/kg
IODINE VALUE	108.06g of I_2/ 100g
SAPONIFICATION VALUE	154.00mg of KOH/g of Oil

Table 2: Physicochemical characteristics of the biodiesel produced from orange rind oil

PARAMETERS	EXPERIMENTAL VALUE	ASTM STANDARD
Density	822 Kg/m^3	820-845 Kg/m^3
Viscosity	2.8 CST	1.9-6.0 CST
Magnesium	4ppm	5ppm
Sodium	3ppm	5ppm

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Potassium	7ppm	5ppm
Phosphorous	9ppm	10ppm
Calcium	4ppm	5ppm

The produced biodiesel from the orange rind oil has the best agreement with ASTM standards as shown in Table 2 and the parameters of the extracted oil are shown in Table 1. Nevertheless, potassium concentration transcended the ASTM standard requisite for biodiesel production. We attribute the increased level of potassium to the introduction to KOH in the transesterification process and may thus not act adversely on the quality of biodiesel. Since the other parameters measured are pedantic with standard requirements of produced biodiesel. This shows that biodiesel can be produced on a huge scale from orange rind oil. The study performed in the production of biodiesel shows that biodiesel has the content of Mg, K, Na, P, and Ca as 4ppm, 7ppm, 3ppm, 9ppm, and 4ppm individually. When the produced biodiesel from the orange rind oil's ASTM standard requirement compared with the biodiesel from neem oil, soyabean oil, cottonseed oil, sunflower oil, rapeseed oil, waste cooking oil, coconut oil, palm kernel oil, and peanut oil excluding for the minimal difference in potassium content(7ppm) which is overhead the ASTM standard(5ppm) requirement for biodiesel, Hence, the biodiesel produced could be the best substitute if the potassium content is removed.

V. CONCLUSION

This study insinuates that the provision of biodiesel from the orange rind oil was 1:3 oil to methanol volumetric ratio, 1g of potassium hydroxide (KOH) at the 80-82˚C reaction temperature. Thus, the study provides the information that oil from the orange rind could be used as a considerable feedstock for the production of biodiesel for diesel engines. Since because the biodiesel produced has the best attribute in the ASTM standard method specifications.

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