EXTRACTION AND PHYSICOCHEMICAL ANALYSIS OF BIOFUEL FROM MANIKARA ZAPOTA (L)

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INTRODUCTION:
The increasing industrialization and motorization of the world has led to a steep rise for the demand of petroleum – based fuels. Today fossil fuels take up 80% of the primary energy consumed in the world, of which 58% alone is consumed by transport sector. The sources of these fossil fuels are becoming exhausted and found major contribution in greenhouse emission which may lead to negative effects like climate change, loss of biodiversity etc. And these Fossil fuels are depleting day by day and they are non-renewable, it is also assessed that these sources will be depleted in a certain period of time and it is not possible to meet the future requirements. Hence there is a need for development of renewable energy sources to meet the requirements of future and it has become an essential to explore the reasonable substitution of diesel. Biodiesel helps in conservation of nature and natural resources in many ways. It produces lower emissions and is more energy efficient when compared to other forms of energy. Biodiesel helps in the reduction of greenhouse emissions, biodegradation and pollution. The present study is based on use of the Manilkara zapota for production of bio-diesel. Manilkara zapota, popularly known as sapodilla, a forest tree with long life span is mostly found in southern Mexico, Caribbean and Central America; It is also cultivated in larger scale in India.

OBJECTIVES:
- Isolation of Biofuel from Manilkara zapota.
- Physicochemical Analysis of Extracted Oil.
- Physicochemical Analysis of Byproducts Obtained

MATERIALS AND METHODOLOGY:
1. Collection of Seeds: Seeds were collected mainly from the Juice centers of Karwar and Sapota farm in Bascod.

2. Extraction of Oil by Soxhlet method:
- The kernels which were separated from the dried seeds of M.zapota were crushed into the fine powder and packed in Whatman no .1 filter paper.
- The packed filter paper containing the seed powder was placed in the Soxhlet Apparatus.
- The extraction process was carried out by using hexane as a solvent and Refluxed for 5-6 hours.
- Extracted Oil is then subjected to distillation to remove solvent.
3. Transesterification: Oil is taken in a round bottom flask with thermometer, mechanical stirring and condenser. The oil is heated to 60°C, after reaching desired temperature methanol and catalyst were added and stirred using stirrer. The reaction was performed for 60 minutes at 60°C, the reaction product was poured into a separation funnel and was left overnight for settlement. Two layers were obtained, upper layer consists of biodiesel, lower layer consists of glycerin. Biodiesel was washed with water to remove unreacted oil and catalyst and further characterized.

**RESULTS:**

**Properties of Sapota Seed Oil**

<table>
<thead>
<tr>
<th>Property</th>
<th>Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yield of Oil</td>
<td>30%</td>
</tr>
<tr>
<td>Moisture content</td>
<td>3.7%</td>
</tr>
<tr>
<td>Density</td>
<td>0.8948 g/cm³</td>
</tr>
<tr>
<td>Viscosity</td>
<td>37.347 poise</td>
</tr>
<tr>
<td>Refractive index</td>
<td>1.572</td>
</tr>
<tr>
<td>Saponification Value</td>
<td>269.344 mgKOH/g</td>
</tr>
<tr>
<td>Unsaponified matter</td>
<td>17.3%</td>
</tr>
<tr>
<td>Acid Value</td>
<td>5.814 mgKOH/g</td>
</tr>
<tr>
<td>FFA Value</td>
<td>2.90 mg KOH/g</td>
</tr>
<tr>
<td>Ester Value</td>
<td>263.399 mg KOH/g</td>
</tr>
<tr>
<td>Iodine Value</td>
<td>67.45 gm/100 gm</td>
</tr>
</tbody>
</table>

**Fatty acid Composition:**

HPLC conditions
1. Column: C18
2. Mobile phase; methanol: water 90:10
3. Rate off low 0.2 ml/min
4. Sample dissolved in methanol
5. Injected volume 5 u lts.
6. uv-vis wave number 254 nm

MS conditions
L. probe
APCI: atmospheric pressure chemical ionization mainly used for non polar compounds to analyze
ESI: electron spray ionization mainly used for polar compounds to analyze
+Ionization: which gives protonated M⁺ I values
- Ionization: which gives deprotonated M⁻ I values?
+Or - ionization and the type of probe can be identified in data file name.
In presence of halogens (chlorine and bromine) the values will show M and M+2 in positive;
M and M-2 in negative.

Liquid Chromatography analysis of M. Zapota Seed Oil
Fatty acid composition was found to be Palmitoleic acid of Mol wt 254.414g/mol, Linoleic acid of Mol wt 280.452g/mol
and Oleic acid of Mol wt 282.452g/mol.

Properties of Biodiesel

<table>
<thead>
<tr>
<th>Properties</th>
<th>Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Density</td>
<td>0.88g/cm³</td>
</tr>
<tr>
<td>Viscosity</td>
<td>29.88 Poise</td>
</tr>
<tr>
<td>Flash point</td>
<td>174 C</td>
</tr>
<tr>
<td>Acid Value</td>
<td>0.37mg KOH/g</td>
</tr>
</tbody>
</table>

Conclusion: Oil was extracted from the collected M.zapota seeds and Biodiesel was obtained by the process of transesterification. It was found that yield was better. Hence we conclude that in the era of industrialization and motorization we can contribute towards our environment and our economic structure by using Eco-friendly biodiesel obtained from renewable resources rather than using ecounfriendly fossil fuels.

Scope for Future work:
Oil quantity is good in the seeds of M.zapota. It is proved that it can be used as a source of biodiesel. Hence we know that plant based oil is a renewable resource of energy; we can conduct research related to isolation and purification of biodiesel in the seeds of wild and cultivated plant species. Even we can focus on the byproducts like cake as manure of M.zapota seeds after the extraction of biodiesel. Even oil cake can be used in the study of antioxidants.