

Research Paper :

## Study of properties of *Calophyllum inophyllum* L. oil and its biodiesel

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Accepted : March, 2010

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### ABSTRACT

The methyl ester was prepared from *Calophyllum Inophyllum* L. oil by using base catalyzed transesterification process. Different properties of raw *Calophyllum inophyllum* L. oil and its methyl ester were determined by using the standard procedures. The specific gravity and kinematic viscosity, Gross calorific value, Flash point, Fire point, Acid value, Free fatty acid content and Saponification value for raw Undi oil were 0.908, 5.80 cS, 35.55 MJ/Kg, 248°C, 283 °C, 0.933 mg KOH/g, 1.2 %, 210, respectively, While for Undi methyl ester were 0.856, 3.58 cS, 39.21 MJ/Kg, 188 °C, 231 °C, 0.523 mg KOH/g, 0.66 %, 200.7, respectively.

**Key words :** Fuel properties, Properties of biodiesel, Undi biodiesel.

The demand for energy consumption in automobiles and agricultural sector in India has been growing along with the economic progress. India was facing problems in regard to the fuel requirement for increased transportation demand and was importing about 70 per cent of its petroleum requirement. The yearly consumption of diesel was about 40 million tones in 2004-2005 forming 40 per cent of the total petroleum product consumption and expected to reach 52.32 million tones by 2006-07 growing at about 5.6 per cent annually. Biodiesel was methyl or ethyl ester of fatty acid made from virgin or used vegetable oils (both edible and non-edible) and animal fats.

The coastal area of Konkan region of Maharashtra lying between 150 37' and 20020' N latitude and 720 7' and 74030' E longitude was endeavored with naturally available non-edible oilseed crop known as *Calophyllum inophyllum* L. The oil content of the its seeds varies from 50-73 %. It is a medium-sized tree, normally up to 25 m tall, occasionally reaching up to 35 m and diameter up to 150 cm. The potential of Undi oil was yet to be exploited as a biodiesel (Joker, 2004). Also a small capacity biodiesel processor must be fabricated for biodiesel production at farm level with locally available material. Hence, the research was conducted to determine the properties of raw Undi (*Calophyllum inophyllum* L.) oil and biodiesel.

### METHODOLOGY

Different properties of Undi oil and Undi biodiesel were calculated for comparison with another fuel as

follows.

#### Determination of density:

Density was measured by the standard test procedure of Bureau of Indian Standards (WAS 1448). Density of *Calophyllum inophyllum* oil and its methyl ester were calculated using the following equation :

$$\text{Density, } d = (m_2 - m_1) / 50$$

where,  $d$  = density of oil, g/ml

$m_2$  = Mass of density bottle plus oil, g

$m_1$  = Mass of density bottle, g

#### Determination of specific gravity:

The specific gravity is the ratio of the density of substance to a reference density. The most common reference density used in the measurement of specific gravity was water, which corresponds to reference density of 1 g/cc. Specific gravity of raw *Calophyllum inophyllum* L. oil and its methyl ester were calculated as,

$$\text{Specific gravity} = d/n_{\text{ref}}$$

where,  $n_{\text{ref}}$  = reference density of water, g/ml.

#### Determination of kinematic viscosity:

Kinematic viscosity was measured as per standard test procedure of Bureau of Indian Standards (WAS 1448). Kinematic viscosity was the resistance to flow of a fluid under gravity. Redwood Viscometer No.1 was used to determine the Kinematic viscosity of raw *Calophyllum*