BIO-OIL FROM THE SEED OF PONGAMIA PINNATA FOUND IN ASSAM, NORTH-EAST INDIA

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Abstract: The seed of Pongamia pinnata which is popularly known as Karanja in Hindi and Indian beech in English is very much available in region of the Assam, North-east India. The seeds of Pongamia pinnata were collected from the Assam Engineering College Campus, Jalukbari, Guwahati, Assam, India. The oil from the dried seed of Pongamia pinnata was extracted through rotary vacuum evaporator and the components of the oil were identified through the proximate analysis, the physiochemical of the oil like density, pour point, Kinematic viscosity, inorganic and total acidity, ash content, conradson carbon residue and caloric value (gross) were determined

Keyword: Pongamia pinnata, physiochemical, viscosity, chromatography.

1. INTRODUCTION

Majority of the world's energy needs are supplied through petrochemical sources, coal and natural gases, with the exception of hydroelectricity and nuclear energy.(1) However, these energy resources are non-renewable and will be exhausted in the near future. Pongamia pinnata or karanja or Indian beech is a medium sized glabrous tree with short bole attaining height of around 18-20 meter and its habitat is in the littoral region of south east Asia, Australia(2). It is adaptable tree for tropical and subtropical regions which requires excellent drainage and sunny location. The leaves are soft, shiny burgundy in summer and mature to a glossy deep green as the season progress. Small clusters of flowers blossom on branches through the year maturing into brown pods. The leaves are good source of green manure and being leguminous, they enrich the soil with nitrogen. Seeds are elliptical, reniform, compressed redish brown, fairly hard and 2-3cm long. The seed contains 12.5% to 28.0% of oil, which has been identified as a good source for bio-fuel(3) . Pongamia pinnatafound in Assam Engineering College Campus, Guwahati has studied for its oil properties. We have designed this study to investigate the physiochemical properties and elemental analysis of seeds of Pongamia pinnata. Its oil is a source of biodiesel. It has also alternative source of energy, which is renewable, safe and non pollutan.

II. Materials and Methods

The seeds of the Pongamia pinnata were collected for the sample from the campus of Assam Engineering College, Guwahati area. The seeds were dried in the sunlight (Fig. 1) and around 48% of moisture removed then subjected to the rotary vacuum evaporator apparatus using solvent(4) . The dry seeds were grinded and powdered with the help of grinder. 50ml of solvent (5ml/g) and 10g of powdered seed were taken in a round bottom flask. The mixture is stirred by
using magnetic stirrer with hot plate for 2h, 3h and 4h. Then the mixture of powdered seed and solvent is filtered and filtrate is taken in a round

bottom flask (pre-weighted). The solvent present in the oil is removed under reduced pressure using a rotary vacuum evaporator to obtain the crude oil(5).

The process is repeated for three solvents viz. diethyl ether, hexane and petroleum ether. Three extractions were carried out for each solvent with different duration of stirring viz. 2h, 3h and 4h. Extraction of oil from the seeds of Pongamia pinnata was carried out with three different solvents namely diethyl ether, hexane, and petroleum ether (40-60oC). With each solvent, three experiments were done allowing different times for stirring the mixture of grinded seeds and the solvents. Results are shown in Table (1). It can be seen from the Table that stirring for three hours increases the yield of oil only marginally over that with two hours of stirring. Extending time beyond three hours does not increase the yield. Therefore three hour time can be considered as optimum time. With three hours stirring, it is seen that hexane and petroleum ether (40-60oC) give almost equal yield of oil i.e. about 23% in each case. But with diethyl ether yield of oil is slightly lower i.e. about 20%. Thus, it appears that increase in solvent polarity has no beneficial effect in the extraction of oil by solvent. Among the two solvents, hexane and petroleum ether, the former is more expensive and therefore, petroleum ether is a better choice for extraction of oil from the grinded seeds

Fig 1 Seed of *Pongamia pinnata*

Table (1) Extraction of Pongamia pinnata seed oils with different solvents

Solvent	*Weight of seed (g)*	*Stirring time (h)*	*Weight of crude oil (g)*	*Yield of oil (wt.%)*
Diethyl Ether	10.040	2	2.048	20.40
	10.050	3	2.067	20.57
	10.070	4	2.081	20.66
Hexane	10.040	2	2.116	21.08
	10.060	3	2.223	22.09
	10.050	4	2.138	21.27
Petroleum Ether	10.030	2	2.030	20.24
	10.015	3	2.307	23.04
	10.020	4	2.265	22.60

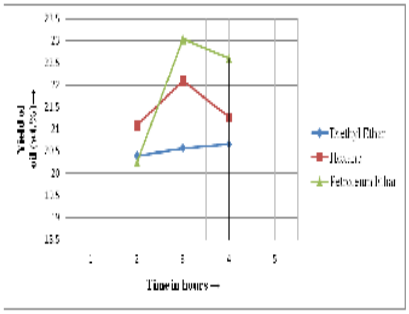

Fig (2) Extraction of Pongamia pinnata seed oils with different solvents

III. Physiochemical Analysis

The physiochemical analysis of the seed oil for density, pour point, Kinematic viscosity, acidity, ash content, conradson carbon residue and caloric value (gross) were done and the results are as given in the table below:

Table (2) Physiochemical Analysis of seed oil

3.

No.	Test parameters	units	Test method IS 1448/ASTM	Results
1	Density at 15° C	Kg/m^3	P:16	929.3
2	Pour Point	°C	P:10	+6
3	Kinetic Viscosity at 40 °C	Cst	P:25	33.42
4	Acidity (Inorganic)	mg KOH/g	P:2	Nil
5	Acidity (Total)	mg KOH/g	P:2	2.14
6	Ash content	%mass	P:4	0.047
7	Conradson carbon residue	%mass	D 189	0.80
8	Caloric value (gross)	Cal/g	P:7	10573

IV. Results and Discussion

Oil extraction from the seed is carried out by the Rotary Vacuum Evaporator Apparatus extraction method. The solvents like hexane, diethyl ether and petroleum ether were used as extracting solvent seeds. Seeds were soaked into the solvents and extraction carried out for three hours for the each case. The solvents were evacuated under the vacuum and pure oil is dried. It was thick acrid smell having yield of 23.04%. Physiochemical analysis were carried out and it was given density value at 15oC 929.3Kg/m3, pour point +6, Kinematic viscosity at 40oC 33.42Cst, acidity (Inorganic) Nil, Acidity (Total) 2.14 mg KOH/g, ash content 0.047 %mass, conradson carbon residue 0.80% mass and caloric value (gross) 10573 Cal/g

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