

# Identification of Non-edible and Unexploited Oil seed species for biodiesel

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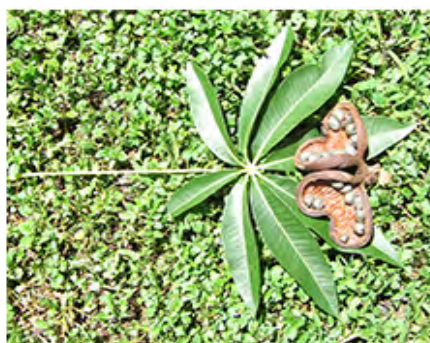
## Abstract

Identification of unexploited non-edible oil seed species for biodiesel production is highly essential to sustain the biodiesel production technology. A total of eight unexploited species and *Millettia pinnata* were collected to study the pod and seed traits viz., pod length, pod breadth, seed length, seed breadth, 100 seed weight and oil content. A wide variation was observed for all the traits studied. The highest oil content was recorded in *Sterculia foetida* followed by *Millettia pinnata* and *Hevea brasiliensis*.

## Introduction

Energy independence has to be our first and foremost priority (Abdul Kalam, 2005) as it is a vital commodity and is commonly recognized that access to energy is closely linked with economic development. Bio-energy generated from bio-fuels (liquid forms of energy generated from biomass) constitutes a sustainable and renewable energy source (Hazell and Pachauri, 2006). Among these bioenergy technologies, biodiesel, bio-ethanol and biomass gasification are the three major bio-energy options, which have huge potential in India to develop as renewable energy sources, where investments made would be economical (Parikh and Walia, 2002). Biodiesel, an alternative fuel, must be technically feasible, economically competitive, environmentally acceptable and readily available (Srivastava and Prasad, 2000).

The use of edible vegetable oils and animal fats for biodiesel production has recently been of great concern because they compete with food materials - the food versus fuel dispute (Srinivasan, 2009). There are concerns that biodiesel feedstock may compete with food supply in



Leaf



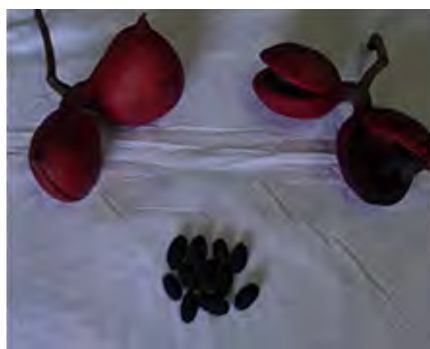
Inflorescence



Immature pods



Mature pods



Pods and seeds



Seeds

**Fig 1. *Sterculia foetida***

the long-term (Lam *et al.*, 2009). Hence, the recent focus is the use of non-edible plant oil source as the feedstock for biodiesel production meeting the international standards. Plant species, which can be processed to provide diesel fuel substitutes, have captured the interest of scientists. The potential sources include *Jatropha curcas*, *Millettia pinnata*, *Madhuca longifolia*, *Azadirachta indica*, *Calophyllum innophyllum* and *Simarouba glauca*. There are many unexploited plant species, which contains oil that can be extracted

and used as bio-diesel. Some unexploited plant species were experimented in this present study for its content.

## Materials and Methods

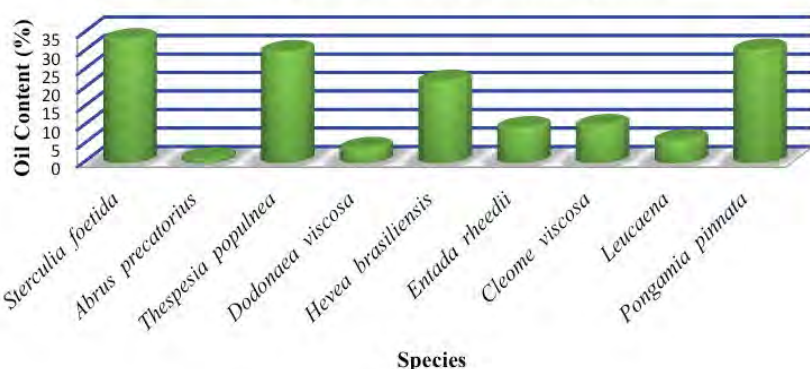
In the present study, eight different non-edible plant species were selected for oil content experiment. The plant species are Wild Almond Tree (*Sterculia*

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**Table 1: Oil seeds parameters**

Species	Pod length (cm)	Pod breadth (cm)	Seed length (cm)	Seed breadth (cm)	100 Seed weight (g)	Oil content (%)
<i>Sterculia foetida</i>	4.07	3.57	2.50	1.00	92.33	33.40
<i>Abrus precatorius</i>	2.80	1.73	0.70	0.60	31.33	1.20
<i>Thespesia populnea</i>	3.10	2.10	0.80	0.50	16.33	30.20
<i>Dodonaea viscosa</i>	1.33	1.60	0.40	0.33	20.00	4.00
<i>Hevea brasiliensis</i>	3.60	2.07	2.50	2.00	25.00	22.20
<i>Entada rheedii</i>	153.60	10.00	4.80	4.00	1760.67	9.60
<i>Cleome viscosa</i>	5.60	0.57	0.33	0.10	7.67	10.20
<i>L.leucocephala</i>	15.67	2.17	0.73	0.52	19.67	6.20
<i>Millettia pinnata</i>	3.67	2.40	2.33	1.37	108.33	30.60
Mean	21.49	2.91	1.67	1.15	231.25	16.40
S.Ed	1.05	0.33	0.14	0.20	2.99	2.18
CD (0.05)	2.23	0.70	0.30	0.44	6.33	4.63



**Fig 2. Estimation of oil content in different species**

*foetida*), Rosary Pea (*Abrus precatorius*), Portia Tree (*Thespesia populnea*), Hopbush (*Dodonaea viscosa*), Rubber Tree (*Hevea brasiliensis*), African Dream Herb (*Entada rheedii*), Asian Spider Flower (*Cleome viscosa*), White Lead Tree (*Leucaena leucocephala*). The selected species of trees were located by using GPS and fruits were collected. The seeds were collected from the pods and they were kept for drying under sunlight. The seeds collected from each species were kept separately in cotton bags. The bags were labeled with, date of collection, locality and the information of the species. The experiment was carried out in the Biotechnology Laboratory at Forest College and Research Institute, Mettupalayam, Tamil Nadu Agricultural University.

The seeds of Indian beech (*Millettia Pinnata*) was collected and used as comparison for oil content with other species. Oil was extracted from each species by means of solvent extraction method using Petroleum ether (40 - 60° C) as solvent (A.O.A.C. 1975) using Soxhlet Equipment (Model: Soxtec™ 2043) and the percentage of oil content was calculated.

**Result and Conclusion**

Before the oil extraction, various pod and seed traits were studied such as pod length and breadth, seed length and breadth and weight of the one hundred seeds were recorded for the reference (Table 1). A comprehensive variation was observed in the seed traits studied. When observed the oil content of the seeds it differed

significantly among different species. It ranges from 1.2% to 33.4%. We understand that there was a big variation among the species. The highest oil content of the species was *Sterculia foetida* and its oil percentage is 33.4% and the lowest oil content of the seed was *Abrus precatorius* with 1.2%. The average oil content of eight species recorded was 16.4%. The individual seed oil content of the selected species was *Millettia pinnata* (30.6%). This value was compared with other species oil content because this species is already extensively used in biofuel extraction. This was second highest oil content species after *Sterculia foetida*. Other species oil content was: *Thespesia populnea* (30.2%), *Hevea brasiliensis* (22.2%), *Cleome viscosa* (10.2%), *Entada rheedii* (9.6%), *Leucaena leucocephala* (6.2%) and *Dodonaea viscosa* (4.00%).

Out of these eight species experimented, the three species *Sterculia foetida* (33.4%), *Thespesia populnea* (30.2%), *Hevea brasiliensis* (22.2%) seeds have highest oil content. So, these three species or *Sterculia foetida* alone could be commercially cultivated in large scales to meet demand for the biofuel production as an alternative source to fossil fuel.

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## Announcement

### Advanced School on Earth System Modelling & Workshop on Climate Change and Regional Impacts over South Asia, July 18-29, 2016, IITM, Pune



The Indian Institute of Tropical Meteorology (IITM) and the Abdus Salam International Centre for Theoretical Physics (ICTP, Trieste, Italy) are jointly organizing an Advanced School on Earth System Modelling (ESM) during (18-27 July), followed by a Workshop on Climate Change & Regional Impacts over South Asia during (28-29 July), at the IITM, Pune, India.

#### Participation

The ESM School and the following Workshop will benefit Ph.D. students, Post-docs and Scientists from Universities and Research Institutions, particularly from the South Asian region and the Indian Ocean rim countries. The school will cover all topics of Earth System Modelling, from the ocean and atmosphere systems to land and ocean biogeochemistry. At the end of the school, we expect student teams to have completed a model run and make a public presentation of key results of the simulation.

A limited number of grants are available to support the travel and living expenses of selected participants. The School will be conducted in English. Registration is free-of-charge for all attendees.

The "On-line Application" form can be accessed on the ICTP activity website at: <https://e-applications.ictp.it/applicant/login/2837> inclusive of a step by step instruction guide.

Deadline: 30 April 2016

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