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DEPARTMENT OF MECHANICAL ENGINEERING

A PROJECT REPORT ON

**“EXPERIMENTAL ANALYSIS OF CI-DI ENGINE USING
PARADISE TREE BORNE-OIL (BIOFUEL)”**

(APPROVED BY KSCST)

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ABSTRACT

World energy demand is expected to increase due to expanding urbanization, better living standards and increasing population. Depleting fossil reserves, high petroleum prices and increasing environmental concerns have lead to a search for renewable fuel sources. Non-edible vegetable oils are a vital source for bioenergy and do not compete with the resource base and products of edible oils. More than 300 species of oil bearing tree species are known and a preliminary evaluation of several tree/bush oilseed crops for their growth, productivity and adaptability indicates that plant species such as *Jatropha curcas*, *Pongamia pinnata*, *Simarouba glauca*, *Calophyllum inophyllum*, *Hevea brasiliensis*, *Madhuca indica*, *Shorea robusta*, *Mesua ferra*, *Mallotus phillippinensis*, *Garcinia indica*, *Salvadora*, etc., are promising for consideration as potential fuel crops. Most of these tree borne oilseeds have multiple uses such as commercial, pharmaceutical and pesticidal properties. There is an urgent need to introduce the area under wastelands or culturable fallows with genetically improved oil yielding tree species. This would require systematic efforts towards tree improvement program, identification of candidate plus trees and standardization of nursery raising techniques (i.e. vegetative/seed/tissue culture) for raising large plantations.

Major limitations with Tree Borne Oilseeds are uncertain growth parameters, tedious management of plantation (maintaining proper population, developing superior varieties), and complex methods for improving the quality of extracted oil (removal of toxic compounds, storage quality, etc.). In addition, long gestation period of these tree borne oilseed plants, coupled with inherent constraints like their habitat, agronomic aspects and poor economics during initial years of establishment often deter investments in such plantations. Harvesting and post harvest operations such as de-pulping, decorticating, storage and further processing for oil extraction must be improved to make tree oil seeds plantations for biofuel generation a reality. The key for success of biofuels is high energy conversion efficiencies combined with low production costs. Liberal policies for sustainable development of non-edible oilseed crops further encourage achieving eco-friendly energy security. Cultivation of non-edible bio-fuel crops also has huge potential for carbon trading.

Biodiesel production is a modern and technological area for researchers due to constant increase in the prices of petroleum diesel and environmental advantages. This paper presents review of the alternative technological methods that could be used to produce this fuel. Biodiesel from Simarouba oil was produced by alkali catalyzed transesterification process. Performance of IC engine using Simarouba biodiesel blending with diesel and with various blending ratios has been evaluated. The properties like flash point, fire point, viscosity and calorific values were found out. The engine performance studies were conducted with a single cylinder diesel engine set up. Parameters like speed of engine, fuel consumption and torque were measured at different loads for pure diesel and various combinations of dual fuel. Brake power, brake specific fuel consumption and brake thermal efficiency were calculated.

Keywords: Transesterification, IC engine, Simarouba, Biodiesel