Journal Of Harmonized Research (JOHR)

Journal Of Harmonized Research in Engineering
5(4), 2017, 157-161

ISSN 2347 – 7393

Review Article

REVIEW ON KARANJA OIL IN CI ENGINE AS SMART BIODIESEL

Ankit Singh, H.S. Sahu

Department of Mechanical Engineering, Millennium Institute of Technology Bhopal Madhya Pradesh

Abstract: Several woks have already been done in production of biodiesel from edible oils. In developing countries like India where consumption and cost of edible oil is very high, the biodiesel production from edible oils does not seems to be economically feasible. But biodiesel production from non-edible oils is economically feasible due to less consumption and cost of non-edible oils. However a lot of work has also been done on non-edible oils such as Neem, Jatropha, Karanja, and Mahua not much work has been reported on biodiesel production from Karanja oil. Limited amount of work has been done on the optimization of biodiesel production and the evaluation of performance and emission characteristics of diesel engine fueled with karanja biodiesel.

Keywords: Karanja. Jatropha, Mahua, Palm, Soybean, Performance.

Introduction: Fossil fuels are one of the major sources of energy in the world today. Their popularity can be accounted to easy usability, availability and cost effectiveness. But the limited reserves of fossil fuels are a great concern owing to fast depletion of the reserves due to increase in worldwide demand.

Fossil fuels are the major source of atmospheric pollution in today's world. So efforts are on to find alternative sources for this depleting energy source. Even though new technologies have come up which have made solar, wind or tidal energy sources easily usable but still they are not so popular due to problems in integration with existing technology and processes. So, efforts are being directed towards finding energy sources which are similar to the present day fuels so that they can be used as direct substitutes.

Diesel fuel is a major source of energy, especially in the transport sector. During the World Exhibition in Paris at 1900, Rudolf Diesel was running his engine with 100% peanut oil. In 1911 Rudolf Diesel stated ''the diesel (CI) engine can be fed with vegetable oils

For Correspondence:
ankit383baghel@gmail.com
Received on: October 2017
Accepted after revision: December 2017
Downloaded from: www.johronline.com

and would help considerably in the development of agriculture of the countries, which use it''. Studies have shown that vegetable oils can be used in diesel engines as they are found to have properties close to diesel fuel it is being considered a breakthrough because of availability of various types of oil seeds in huge quantities.

Literature review:

Hitesh J. Yadav et al.2012 [1] give an overview to biodiesel prepared from the non-edible oil of Karanja by transesterification of the crude oil with methanol in the presence of NaOH as catalyst.

Venkata Ramesh Mamilla et al. 2012 [2]they deals with the study and analysis of the potential substitution of Karanjamethyl ester blend with diesel as fuel for automobiles and other industrial purposes.

C. Bhattacharyulu et al.2012 [3] overcome the problem of high viscosity in vegetable oil by one possible method oscillatory baffled reactors.

Nagarhalli M.V. et al.2012 [4] investigation an attempt has been made to use blends 10% to 90% of two biodiesels (jatropha and karanja) oils to run a single cylinder, 4 stroke, constant speed, and D.I. diesel engine

V.V. Prathibha Bharathi et al. 2012 [5] studied about influence of exhaust gas recirculation (EGR) in the engine cylinder upon the performance and emission characteristic of a single cylinder diesel direct injection engine is presented

N. Panigrahi et al.2012 [6] studies the production of biodiesel from karanja oil which is known as karanja oil methyl ester (KOME) and oil content fuel properties . He also evaluates an engine testing and check the performance characteristic from these oil

Lohith N. et al.2012 [7] investigated the Karanja methyl ester (KOME) as alternative fuel for diesel (CI) engine.

H.K. Amarnath et al.2012 [8] compared the performance and emissions characteristics of Karanja, Jatropha and Palm oil while running in a four stroke diesel engine.

K.Sivaramakrishnan et al 2012 [9] optimized the direct injection (DI) single cylinder diesel engine with respect to brake power, fuel economy and emissions through experimental investigations and DOE methods.

Shikha Khandelwal et al. 2013[10] studied the evaluation of the energy consumed by Karanja and Neem trees at each stage during the growth cycle and conversion its seed oils to bio- diesel fuels and global warming potential. According to them Neem and Karanja are the promising tree species suitable for providing oil for biodiesel production

K.V. Yathish et al. 2013[11] carried out the effect of variables on the reaction and investigate the optimum conditions of karanja biodiesel in the presence of KOH as catalyst. In this study, crude mixed oil was used as feedstock for biodiesel production by Homogeneous Catalyst.

Yashvir Singh et al.2013 [12] evaluate the chemical feasibility of karanja seed oil to use as in diesel engine using 4- stroke, single cylinder, direct injection CI engine.

Raghavendra prasada S.A, K V Suresh 2014 [13] studied the various methods for to improve the performance of karanja oil fulled with CI engine and finally conclude that the karanja oil can be used as an alternative fuel for diesel engine without any engine modification.

Taoju zhang, 2015 [14] studied the possibilities of alternative vehicle fuels, Student thesis, Bachelor degree, 15 HE Energy Systems Bachelor Program in Energy Systems

Auwal Aliyu et al. (2003) biodiesel has been produced from waste soybean oil via NaOH catalyzed transesterification reaction. Several properties of the waste soybean oil and the produced biodiesel have been measured. It was found that the, kinematic viscosity, density, cloud point and flash point of the waste soybean oil were found to be higher than those of the produced biodiesel. The measured cetane number of the produced biodiesel is greater than that of the waste soybean oil; hence, trans esterification process improves the combustibility of the waste soybean oil. This research paper clarifies that this experimental investigation on diesel engine using soyabean biodiesel with its blends and its performance and analysis of emission test. So this biodiesel using in diesel engine very extremely better.

Also collect from this research paper soyabean biodiesel property is as given below.

Table – 1: Properties of soybean oil biodiesel

Density at 20°C, g/cm^3	0860
Kinematic viscosity at 20°C, mm^2/s	4.1
Cloud point, °C	2
Flash point, °C	178
Cetane number	46

R.K. Singh et al. (2009) there have been greater awareness on biodiesel in developing countries in the present times and significant activities have picked up for its production especially with a view to boost the rural economy. In the present investigation jatropha curcaslinn.in this research jatropha oil (non-edible) and its methyl ester have been chosen to find out their suitability for use as petro-diesel. Experimental investigation has been done to find out the different properties of jatropha oil. Also collect from this research paper jatropha biodiesel properties are as given below.

Table – 2: Properties of Jatropha biodiesel

Density at 15°C, kg/m^3	880
Viscosity at 40°C, mm$^{2/s}$	4.84
Flash point, °C	162
Pour point, °C	-6
Water content, %	Nil
Ash content, %	Nil
Carbon residue, %	0.025
Sulphur content, %	Nil
Acid value, mgKOH/g	0.24
Iodine value	104
Saponification value	190
Calorific value, MJ/kg	37.20
Cetane number	51.6

Gaurav Dwivedi et al. (2011) Pongamia Pinnata (Karanja) trees are usually planted along the highways, roads, canals to stop soil erosion. Billions of trees exist in different part of India. As the seeds of karanja oil fallen on earth, it collected and oil is extracted from expellers. This oil is used by villager for lighting in lamp. This is best suitable for kerosene in rural area. Reported and analyses that in complete or partial filling up of transfer port by air/cooled exhaust gases which scavenges the burnt products and avoids the loss of fresh A/F (Air-fuel ratio) mixture during scavenging. Hence it results in improvement of specific fuel consumption and reduction of hydro carbon emissions. Also collect from this research paper pongamia biodiesel properties are as given below.

Table – 3: Fuel properties of pongamia oil methyl ester.

Property	Pongamia oil methyl ester
Viscosity (cst) (30°C) 52.6	5.51
Specific gravity (15°C /4°C)	0.917
Solidifying Point (°C)	2
Cetane Value	51
Flash Point (°C)	110
Carbon Residue (%)	0.64
Distillation (°C)	284 – 295
Sulfur (%)	0.13 - 0.16
Acid Value	1.0 - 38.2
Saponification Value	188 – 198
Iodine Value	90.8 - 112.5
Refractive Index (30°C)	1.47

Bobade S.N et al. (2012) it was fully based on preparation of karanja (pongamia pinnata) biodiesel (fatty acid methyl ester) which is derived from triglycerides by transesterification, has attracted considerable attention during the past decade as a renewable, biodegradable and nontoxic fuel. Different processes of biodiesel fuel production have been developed, among which transesterification using Alkali as a catalyst gives high level of conversion of triglycerides to their corresponding methyl ester in a short duration. This process has therefore been widely utilized for biodiesel fuel production in several Countries this research paper concludes that the Karanja(pongamia pinnata) biodiesel properties are good and also it can be used CI engine with blended diesel as well as b100 are used. Also collect from this research paper Karanja biodiesel properties are as given below.

Table – 4: Properties of Karanja biodiesel

Density, gm/cc	860
Kinematic Viscosity @ 40°C, Cst	4.78
Acid value, mgKOH/gm	0.42
Free glycerine wt%	0.015
Cloud point °C	6
Flash point °C	144
Cetane number	41.7

Calorific value, Kcal/KG	3700
Iodine value	91
Saponification value	187
Moisture %	0.02
Carbon residue %	0.005
Ash content wt %	0.005

K.P. Prajapati et al, (2015) According to this research paper the Mahua trees are indigenous to India, grow even in draught prone areas and are found abundantly over several parts of India. As the seeds falle on earth, it collected, and oil is extracted at village level expellers, few million tons of oil will be available for lighting lamps in rural area. In some countries, Mahua oil is considered edible as it is used only for preparing ghee, but in our country it has been considered as non-edible oil. In this research paper studied about measure properties of Mahua biodiesel. In this research paper satisfies that using Mahua biodiesel in diesel engine and its characteristics are given. Also collect from this research paper Mahua biodiesel properties are as given below.

Table – 5: Properties of Mahua Biodiesel

Specific gravity	0.86
Iodine value(g/100g)	12.82
Free fatty acid content (%)	0.0002
Kinematic viscosity(cst)	4.8
Sulfur content(mg/kg)	20
Acid value(mg KOH/g)	4.67
Cetane number	65
Flash point	125
Saponification number (mg/KOH)	82.98
Ethanol content (%)	1.13
Cloud point (°C)	7

Sumedh Ingle *et al* 2015the demand of biodiesel increasing day per day because fuel of properties and compatibility with Petroleum-based Diesel fuel. Therefore, in this research the prospects and opportunities of using methyl esters of Palm oil as fuel in an engine are studied. In the present research work tests were conducted on a four stroke, single cylinder, D.I. (direct injection) diesel engine with Diesel and different blends of Biodiesel at various preheating temperature. The performance and emission characteristic of these oil were measured at different blends of palm oil biodiesel with that of neat diesel. Also collect from these research paper palm biodiesel properties are as given below.

Table – 6: Properties of palm oil biodiesel

Viscosity at 40°C, mm2/s	4.1
Density at 15°C,kg/m^3	875.1
Flash Point	175°C
Pour Point	-12°C
Cloud Point	Not Applicable
Specific gravity @15oC	0.8722
Calorific Value, kJ/kg	37254
Visual appearance	Dark Brown liquid
Ash content	0.001%
Cetane number	52

Conclusion: For study above literature review it is studied and observed that the analysis of different biodiesel properties such as edible oil and non-edible oil. Good properties of all biodiesels are collect which directly or indirectly effect the performance and emission characteristic of on diesel engine. Smart Biodiesel properties are comparing with diesel properties. It is found that properties wise blending biodiesel and make smart biodiesel properties. So it is concluding from the above literatures, different type biodiesel in exhaust system directly affects the performance and the emission characteristics of the internal combustion engine. For improvement in the performance of an engine, it is necessary to control the temperature in automotive exhaust system. So it is economical and environment Friendly, which is the reason of selects bio-fuel as a fuel. Finally, I have selected five biodiesels like as jatropha biodiesel, palm oil methyl ester, mahua oil methyl ester, soyabean oil methyl ester and karanja oil methyl esters. Now I use a karanja oil to replace all these oil, karnja oil blended with diesel fuel and performance and emissions characteristics were measured. The karanja oil used for production of biodiesel has the following properties.

Viscosity at 40°C, cst	40.2
Density at 15°C,gm/cc	0.924
Flash Point	134°C
Calorific Value, kcal/kg	9193
Visual appearance	Pale yellow liquid
Sulphur content	1.76%
Cetane number	42

Ash content	*0.07 %*
Fire point	*76 °C*

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