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Pongamia Bio Diesel – A Review

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ABSTRACT

Day by day vehicle population in the world is increasing and usage of fossil fuel is also increasing. By using fossil fuel as a fuel in I C Engines will cause for health hazards, Global pollution, at the same time sources of fossil fuels are also decreasing. The countries like INDIA are depending on other countries for the petroleum based fuel and it will affect the development of the country also. The usage of Diesel fuel in India is six times greater than the Gasoline (petrol) fuel. The India has lot of resources to produce Liquid alternate fuels like Ethanol, Methanol, and Bio-Diesel etc... Bio-Diesel is a one of the Alternate fuel for Diesel fuel and it is produced from renewable sources (Plants).

The pongamia tree is normally grown in the banks of canals, rivers etc... If the ripen and fallen seeds are collected that is sufficient to produce the bio fuel for the Indian farmers requirements.

This paper presents a brief review about different research work done on the pongamia bio diesel. Plenty of researchers are doing their research on bio diesel by various innovative methods, fuel parameters like blending, pre – heating, dual fuel and engine parameters like compression ratio, fuel injection pressure, injection timing etc... In this paper various journals are collected from web resources and brief study has been done, concluded.

Keywords: *Alternate fuel, Pongamia bio diesel, review, Performance, Emissions*

I. INTRODUCTION

Internal Combustion Engines are the most widely used prime movers. The majority of the IC Engines are running on the fossil based diesel fuel. The usage of diesel fuel in the IC Engine will cause for the health hazards, pollution, global warming and sources are decreasing. To achieve the solution for these problems bio diesel is a common resource.

Bio diesel is liquid based fuel produced from the plant and animal based fat.

Many researchers are used different vegetable oil for production of bio diesel like palm, sunflower, castor, soybean, jatropha, mahua etc. In India plenty of non edible bio diesel resources are available like pongamia, soap nut, tobacco etc…

PREPARATION OF BIO-DIESEL.

Preparation of bio diesel involves following process.

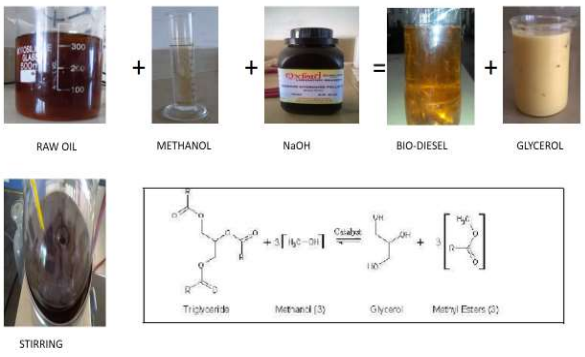
- Collection of seeds from the sources and converting into raw oil.
- Pre-treatment
- Acid-test
- Esterification.(Based on acid value of raw oil)
- Transesterification.
- Settling & separation
- Water washing.
- Post-treatment.

Pongamia tree, seeds, oil extraction

The pongamia seeds are the main resource for production of bio diesel. Ripen and fallen seeds are collected, peeled and seeds are separated. The oil is extracted from the seeds by mechanical extraction process. In mechanical extraction the seeds are squeezed with high pressure and oil is extracted. The output from this process is cake and oil. Now this oil is utilized for the production of bio diesel. Oil cake is used a fertilizer.

The raw pongamia oil is high viscous in nature. In order to use straight raw oil in the engine, viscosity was to be reduced by heating the oil, but other problems associated with using raw oil directly in engine include carbon deposits, oil ring sticking, lubricating problem and incomplete combustion. To reduce the viscosity of the raw oil, four techniques are used like pyrolysis, dilution, micro emulsification and Transesterification.

The raw pongamia oil is having an acid value of greater than 6. To reduce the acid value Esterification process is used. Later the esterified oil is further transferred to Transesterification unit. Transesterification is the process of treating triglycerides such as vegetable oils with alcohol in the presence of a catalyst to produce glycerol and fatty acids ester.



Process involvement

Properties of pongamia bio diesel

S. NO	PROPERTY	PONAGAMIA BIO-DIESEL	DIESEL PROPERTIES (Base Line)
1	CALORIFIC VALUE	39208 kJ/kg	42,000 kJ/kg
2	FLASH POINT	128°c	52-96 C
3	FIRE POINT	134°c	62-106 C
4	CLOUD POINT	7°c	-12°c
5	POUR POINT	2°c	-20°c
6	ACID VALUE	2.016 mg/KOH	0.36 mg/KOH
7	DENSITY	0.880 gm/cc	0.824 gm/cc
8	VISCOCITY	4.8mm^2/sec	1.2 to 2
9	CETANE NUMBER	49	40

II. LITERATURE REVIEW

Baste S.V, Bhonsale A.V. and Chavan S.B are conducted experiment on the feasibility of karanja oil for the production of bio diesel and optimization of CO emission, viscosity, density, flash point parameters for high yield conversion of the karanja oil to biodiesel .In this survey presents the suitability of the pongamia pinnata(karanja) as a source of renewable fuel substituting petrodiesel in C.I engine At full load and engine speed of 1280 to 2400rpm. The exhaust emissions are compared with karanja biodiesel and diesel fuel, the CO, emissions were lesser for biodiesel fuel as compare with diesel fuel. The CO emission of bio diesel was reduced by 78%, at full load, this is because biodiesel contains11% additional oxygen, which leads complete combustion of fuel. CO emission decreases by 80% when diesel fuel is replaced with pure karaja oil. Without any modification karanja bio diesel blend up to 20% can be easily used in C.I engine, the emission of CO were decreased and it found minimum at around 10% blend.

BOBADE S.N, KHYADEV.B

In this experiment is to know the detailed study on the properties of pongamia pinnata(karanja) for the production of bio-fuel. Pongamia pinnata is drought resistance, nitrogen fixing, leguminous tree. This study intends to identify all advantages and disadvantages of pongamia pinnata as a sustainable feed stock for the production of bio diesel. Seed characterization- moisture content at 10%(fresh-seed); oil content-35%(available). Percentage yield of oil, mechanical expeller extraction method is 24% yield, soxhelt extraction 31% yield, and cold percolation extraction 27% yield. Physico-chemical properties are flash point-227°c, fire point-230c, density-0.924gm/cc. the fatty acid composition of crude oil, palmitic acid 65%, stearic acid -7.50%, oleic acid-51.59%. properties of pongamiapinnata methyl ester density – 0.860gm/cc, colorific value -3700 kcal/kg, cetane number-41.7, iodine value -91. The pongamia pinnata which grows in tropical and sub tropical climates across the world. The production of biodiesel from oils provides a valuable local regional and national benefit to develop biodiesel into an economically important option in India.

T.VENKATESWARARAO, G.PRABHAKAR RAO, AND K. HEMACHANDRA REDDY.

In this experimental investigation have been carried out to examine the properties, performance and emission of different blends(B10,B20,and B40) of pongamia as compare to diesel. Result indicated that B20 have closer performance to diesel and B100 had lower break thermal efficiency mainly due to its high viscosity compare to diesel. B100 oil Kinematic viscocity is 25m/s. density is 900kg/m3, flash point 160°c. Pongamia (biodiesel) can be directly used in diesel engines without any engine modifications. Break thermal efficiency of B10,B20,B40 blends are better than B100. When compare to B10, B20, B40 blends the smoke HC,CO emissions are higher for diesel. Bio-diesel from Jatropha, pongamia pinnata can provide a useful substitute for diesel thereby promoting our economy.

S.GHOSH, D.DUTTA.

The aim of this study is to potential use of pongamia oil methyl ester as a substitute for diesel fuel in diesel engine. Various properties of pongamia and diesel(B25,B50,B75 and B100) are prepared on volume basis and used as fuels in a 4 stroke single cylinder direct injection diesel engine to study the performance and emission characteristics of these fuels and compare with neat diesel fuel. The tests were conducted on a direct injection diesel engine for different blends of pongamia methyl ester with diesel. At medium load condition BTE of B50 was slightly higher than the neat diesel but at the full load condition BTE of the neat diesel were only 1.5% higher than B25, 5.5% higher than B100. Fuel consumption at low load condition biodiesel B100 consumption was 0.08kg/hr higher then neat diesel and full load condition it was 0.36kg/hr. higher then neat diesel because colorific value of neat biodiesel is less then diesel. At full load condition bio diesel break thermal efficiency was lower than neat diesel. B25 blend specific fuel consumption was close to neat diesel. EGT of B100 was 60.5°c higher then diesel fuel at full load. Hydrocarbon of B100 was 24% reduction compare to neat diesel. The B25 blend performance and emissions characteristics are closer to diesel.

P.BRAHATHEESWARAN, T.KasiniventhaPerumal, R.Manivasagan, V.Gnanasekaran, N.Karthikeyan.

The experimental analysis has been carried out to evaluate the performance and emission characteristics of a compression ignition engine fuelled with dissimilar compositions of pongamia pinnata biodiesel and its blends at 25%,50%,75% and 100% with mineral diesel. HC,CO,CO2 and smoke were measured. The blends B25 and B50 are much nearer to the diesel. In case of emission characteristics compared to diesel the blends B25 and B50 are not suitable. The blend B100 is suitable for C.I engine to give less toxics which is nearer to diesel. B50 is chosen as a right fuel proportion to run C.I engine with less toxics gas next to the B100.

H.M.DHARMADHIKARI, PULIRAVI KUMAR, S.SRINIVASA RAO.

In this experiment the performance and emission characteristics of a single cylinder C.I engine fuelled with the blends of mineral diesel and biodiesel at different injection pressures. The optimal value of the injection pressures was observed as 200bar in the range of 180 to 220 bar. the results indicates that the CO emission are slightly less, HC emission were also less for B10 and B20,and NOx emissions decreased by 39% for B10 and 28% for B20, compare toB100. The break thermal efficiency is decreased around 6% for all blends compared to diesel. B10 and B20 specific fuel consumption is slightly more. The B10,

B20, B60's break thermal efficiency is better than B100. The CO and HC exhaust emissions reduced and NOx emissions are increased with biodiesel. Karanja biodiesel can be directly used in diesel engines without any engine modifications.

P.K.HALDER, N.PAUL, and M.R.A.BEG

This paper outlines the medical and energy aspects of pongamia pinnata. It has been assessed that Bangladesh can utilize about 128.95 PJ through Pongamia cultivation in unused lands. The paper reviews the potentiality of Pongamia pinnata is a source of biodiesel. It also reviews also revives that, about 0.52 million tons of biodiesel can be produced only utilizing the unused lands per year in sustainable basis as it reduces CO2, CO,HC, and NO*x*emission compared to pure diesel. The country has about 0.32 million hectares of unused lands which yield about 0.52 million tons of biodiesel per year and can reduce import of diesel fuel approximately by 21.77%. Pongamia bio diesel is environmentally friendly and causes fewer CO2, CO, HC, and NOx emission in C.I engine as an alternative fuel to diesel. Karanja biodiesel blends of 20% with fossile fuel produce approximately 70% less pollution.

SHIVASHANKAR.V.N, PERIYASAMY.S

In this work an attempt has been made to improve the performance of diesel engine by grooving the piston crown tangentially using pongamia bio diesel as a fuel. Different proportions of blends such as B10 and B20, with diesel were studied and compared with conventional piston. The experiment results reveals that grooved piston with B20 blend gives improved break thermal efficiency, lower break specific fuel consumption and less emission of HC ,CO when compare to the conventional piston using diesel as a fuel. The break thermal efficiency of engine is increased due to better combustion produced by tangential grooved piston with 20% blend. The specific fuel consumption of grooved piston with 20% configuration has the low, when compare to diesel engine. With B20 blend for tangentially grooved piston the break thermal efficiency increased 3%. The 10.76% reduced in break specific fuel consumption (BSFC) for tangentially grooved piston. With B20 blend the emission characteristics, hydrocarbon emission has been reduced by 20.45%. biodieselupto 20% blend with diesel shows nearly equal performance characteristics compare with diesel. B20 blend could be used as a commercial applicant.

PROF. VIMAL V PRAJAPATI, DR. RATNESH SHUKLA, DR. TUSHAR M. PATEL AND DR.RADHASHYAM GIRI.

This paper evaluates the possibility of using Karanja oil from Karanja seed by chemical extraction process and mixing of the diesel in varying volume proportions in order to prepare a number of test fuels for engine application.

Performance and exhaust emissions of diesel engine have been experimentally investigated with neat karanja oil (K100) and its blend (K10, K20, K40, K60 and K80) with diesel fuel at different load conditions and at constant engine speed of 1500 rpm. Engine performance parameters namely break thermal efficiency, specific fuel consumption (SFC) and mechanical efficiency, Emission characteristics CO, HC, CO2 and NOx were determined at different load conditions. The results are there is a slight decrease in break thermal efficiency and increase in specific fuel consumption for all blended fuels when increasing load. The drastic reduction in carbon monoxide and hydrocarbon were recorded for all the blended fuels as well as with neat biodiesel. All blends show load increases SFC decreases. Due to higher viscosity, density and lower heat value, the BTE in case of diesel K10, K20, K40, K60, K80 decreases with increasing with proportion of biodiesel. CO emission decreases with increase in load for all prepared test fuels.

BRAHMA KAMAL KR, MAHANTA DR. DIMBENDRA KUMAR.

In This article, oil from the dried seed of Pongamia pinnata was extracted and then biodiesel is produced by Transesterification method and blends with the petroleum diesel for five samples of B00, B10, B20, B30 and B100. The fuels were test in the single cylinder four stroke compression ignition engine. The different properties like Brake power, specific fuel consumption, brake thermal efficiency, heat carried out by water from calorimeter, heat carried away by engine jacket, heat carried out by exhaust gases , heat lost in radiation and uncounted, volumetric efficiency and air consumption were calculated using the collected data. The B20 is almost highest value of break power among all the samples. The specific fuel consumption is better for the sample B10, B20. B10 may be best for practical application. B10 gives good result of break thermal efficiency. The B10 gives

uniform results for volumetric efficiency. B10 is the best fuel among the fuel B00, B20, B30, B100.

P. JAYA PRAKASH, DR. S. SUNIL KUMAR REDDY

This paper describes the literature review of effect of different nano additives on performance and emission characteristics of diesel engine fuelled with different blends of biodiesel. It was reviewed that by using nano additives with blend of biodiesel the performance characteristics were improved significantly but the exhaust emissions were find that more reduced compare to the blend of biodiesel. The nano additives act like a catalysts for combustion of Biodiesel in diesel Engine Because the nano additives has 12-15% of oxygen content with them which helps in increasing the rate of combustion in the engine. The nano additives shows a surprisingly large effect on performance and emission characteristics even when they used in parts per million (PPM) range with the biodiesel. From the study of the above articles published by the Researches / Scientists, We are concluded that the Brake thermal efficiency of the Diesel engine was increased significantly by adding nano additives with the biodiesel compare with only biodiesel. Also the break specific fuel energy consumption is decreased by adding nano additives to the biodiesel compare with only diesel.

S.C.V.RAMANA MURTY NAIDU, G.RAJU, D.SRINIVASULU

This paper presents a brief review on the Karanja (Pongamia Pinnata) biodiesel emission and its performance characteristics as Diesel engine fuel. It was reported that the combustion characteristics of biodiesel are similar to Diesel. Power output of engine was found to be equivalent to that of Diesel fuel. CO, NOx and HC are within maximum limits that safer use as an alternative fuel**.** The emission characteristics of biodiesel are better than Diesel except NOx emission. CO, UBHC and particulate matter emissions were found to significantly decrease with bio diesel and its blends due to more complete combustion caused by higher oxygen content. Hence based on engine emission studies i.e., CO, NOx and HC, it is concluded that the parameters studied were within the maximum limits and are safe to use as an alternate fuel.

S.MANIBHARATHI, B.ANNADURAI, R.CHANDRAPRAKASH.

In this paper The effect of Nano additives [rhodium oxides (Rh2O3)] on the performance and emission characteristics of pongamia bio diesel in a single cylinder direct injection diesel engine. The Nano particles were dispersed in the biodiesel with the help of magnetic stirrer with the optimized surfactant concentration. The addition of Nano additives in fuel reduces NOx emission up to 37% when compared to diesel, also reduces the un burnt hydrocarbon (UBHC) up to 45%. Nano particles are reduces the energy consumption and improves the thermal efficiency, during combustion the additives release the energy to the fuel. Biodiesel having lower efficiency and higher energy consumption, because of its lower heating value. The addition of nano additives there is a significant improvement in efficiency compare to biodiesel operation without additives. By using nano rhodium oxide the marginal enhancement in break thermal efficiency was observed. The rhodium oxide showing 45% reduction in HC compare with biodiesel because its fuel bond O2. There is 45% reduction in CO emission by using nano fuel additives. There is a 37% reduction of NOx using rhodium oxide as a nano fluid.

P.L.NAIK, D.C. KATPATAL.

In this paper various properties of karanja oil methyl ester blends (10%, 20%, and 30%) were used to test the performance at various loads. The engine parameters and emission parameters were recorded. The karanja oil methyl ester blends with diesel fuel, the result showed that the fuel consumption was increased with increase in blend proportions due to calorific value. The emission level of CO and HC level decreased with increase in blend. The bio diesel B20 can be used as alternative without any modification of diesel engine. Break thermal efficiency of karanja oil methyl ester found lower than that of diesel fuel. Thermal efficiency of blends B20 were very close to diesel. BSFC was found to increase with increase in blend proportion as compare to diesel fuel. NOx was increased with increased blend proportion. CO and HC emission decreases with increase in blend proportion. The fuel properties like density, flash point, viscocity and calorific value of B10 and B20 are very similar to diesel fuel. Thus bio diesel B20 and less, can be used as an alternative fuel without modifications.

VenkatramanMANI ,Gnanamoorthi VENKADESAN ,and Devaradjane GOPALAKICHENIN

This paper investigate on the performance and emission characteristics of pongamia oil and diesel fuelled direct injection compression ignition (DICI) and homogeneous charge compression ignition (HCCI) engine. The HCCI engine tested in the present work is fuelled by 40% neat pongamia oil and 60% diesel fuel through direct injection and vapour induction, respectively. The experiment shows that the neat pongamia oil performed well in HCCI mode and offered approximately ten times lower NO and smoke emission. In this investigation using 40P in both DICI and HCCI mode of operations. The results of DICI mode revealed that 40P offered 6% lower BTE, 12% lower NO, and 16% higher smoke than that of diesel baseline operation. Also, this mode offered 16% higher CO and 33% higher HC than that of diesel baseline operation. The results of HCCImode showed that the 40P offered 5%lower BTE, 4% lower NO, and 25% higher smoke than that of diesel fuel used in the same mode of operation. Also, this mode offered 7% higher CO and 10% higher HC than that of diesel fuel operation. the results of the experiments proved that the 40P performed well in both DICI and HCCI mode of operations.

HCCI- Homogeneous charge compression ignition.

DICI- Direct injection compression ignition.

K. NANTHA GOPAL, R.THUNDIL KARUPPARAJ.

In this paper, bio-diesel from pongamia oil is prepared (PME 100), tested on a diesel engine for different blends such as PME 20, PME 40, PME 60 and PME 80. Parameters such as brake thermal efficiency, brake specific fuel consumption, carbon monoxide, unburned hydrocarbons, smoke and NOx emissions are evaluated. Study reveals the effect of bio-diesel on a DI engine when compared to diesel and evolves conclusions with respect to performance and emissions. Diesel engine can perform satisfactorily with pongamia oil methyl esters and their blends without any engine modifications. Due to lower heating value of biodiesel SFC increases with increase in percentage of biodiesel in the biodiesel blends. NOx emission of PME biodiesel is marginally higher than that of petroleum diesel. The pongamia oil methyl ester can be used as an alternative and environment friendly fuel for a diesel engine.

SUSHMA. S, DR. R. SURESH, YATHISH K V.

In this paper, study dairy waste scum oil and karanja oil (in equal quantities) is used to produce hybrid oil biodiesel. using sodium hydroxide as catalyst. The physiochemical properties of hybrid oil biodiesel (HOBD) is studied and compared with scum oil biodiesel (SOBD) and karanja oil biodiesel (KOBD). Tests have been conducted at different blends of biodiesel with standard diesel on a four stroke diesel vertical single cylinder engine. Biodiesel is produced from hybrid oil (dairy waste milk scum and karanja). Some important properties like flash point, fire point, density, calorific value, kinematic viscosity, are determined. At 100% load 1.44% increased in break thermal efficiency. The Brake thermal efficiency of B10 is very close to that of diesel fuel. The specific fuel consumption of biodiesel and its blends at all loads is higher than diesel fuel. The BSFC of B10 is very close to that of diesel fuel at full load condition. The EGT of B30 is very close to that of diesel fuel at full load condition. HC, CO and CO2 are reduced with the use of biodiesel and its blends with diesel fuel compared to that of neat diesel fuel at full load except NOX.

DEBABRATA BARIK , S. MURUGAN.

In this paper experimental investigation on de-oiled seed cake of Karanja (SCK), an organic industrial waste obtained from Karanja biodiesel industries was mixed with cow dung (CD) in four different proportions, viz., 75:25, 50:50, 25:75, and 0:100 percentages on a mass basis, and the mixtures were denoted as sample S1, S2, S3 and S4 respectively. The parameters, such as the pH, temperature, hydraulic retention time (HRT), and carbon/nitrogen ratio (C/N) were evaluated and analyzed. The de-oiled SCK has the potential for biogas production and up to 73% methane is obtainable. The sample S3 gave a better result in comparison with other samples, with respect to pH, temperature, C/N ratio, and gave the maximum methane and maximum quantity of biogas. The C/N ratio of S3 was 25.3%, higher than that of S4 which holds good for faster anaerobic digestion. The fertilizer values of the slurry were increased after digestion, due to the decomposition of proteins. S3 and S2 gave better fertilizer values than that of other samples.

SAMEET KESHARI PATI, SUSANT KUMAR SAHU.

This paper study about the production of biodiesel using karanja (Pongamia pinnata) seeds as a raw material). study of its characteristics and potential as a substitute for Diesel fuel in CI engines. Performance and emission study of Karanja Biofuel and compared to the base diesel fuel had been investigated. It can be concluded that besides considering the economy part blends of B10 and B15 of Karanja biodiesel can be considered as a sustainable fuel.

The specific gravity, Kinematic viscosity of Karanja Oil blends is much closer to diesel. The B15 blend have higher break power at higher load. BTE shows better result than diesel. Exhaust gas temp is more or less compare to diesel. NOx emissions are found to be more for KOME blends while CO_2, HC and smoke emissions are lowered as compared to diesel. The fuel properties like density, flash point, viscosity and calorific value of B-10 and B-15 are very similar to diesel fuel thus biodiesel B-15 and less can be used as an alternative fuel without modification of diesel engine.

M.PERIYASAMY , N.VADIVEL

In this paper utilization of Liquefied Petroleum Gas (LPG) as a primary fuel and biodiesel from pongamia pinnata as a pilot fuel used in a compression ignition engine. In this experimental work by varying the LPG flow rates, performance and emission characteristics of the engine were measured. The exhaust gas components such as smoke and CO2 were quiet decreased while comparing with the base fuel. The engine runs smoothly for the LPG flow 2.5-4 kg/min at medium load conditions. Brake thermal efficiency was increased from medium to higher load operations. NOx emission was decreased with increase of LPG flow rate. The HC and CO emissions were observed in optimized level in dual fuel mode.

AMAN MAMUALIYA, AND HARVINDER LAL.

In this paper the main objective is to produce biodiesel from Pongamia pinnata(Karanja) oil using esterification followed by transesterification. Various proportions of Karanja oil methylester blends (10%, 20%, and 30%) were used for conducting the performance test at varying load conditions. The B20 blend was found to be the best and effective blend which improves the brake thermal efficiency and reduced brake specific fuel consumption. The karanja biodiesel can be used in CI engine without any modification. The blends B10 and B20 show the same results. The B10, B20 were improved BTH, EGT and reduced BSFC. They also reduced emissions like CO2, CO, HC and smoke density and increases NOx level as compared to diesel.

GAURAV DWIVEDI, SIDDHARTH JAIN, MAHENDRA PAL SHARMA.

In this paper the Pongamia it can be developed as the alternative source of fuel by replacing diesel. In the present study attempt has been made to study the scope of Pongamia in India. Billions of trees exist all over India. This tree can be cultivated in our water storage reservoirs up to 1.5 meters depth and reap additional economic value from unused reservoir lands. Pongamia oil may stands as Bio-diesel which is renewable, safe and non-polluting. Researchers are to be carried out on Pongamia to standardize agro-technology, low cost and efficient mechanical device to expel oil, to find out the economics, high yielding and high oil content varieties suitable to the different agro-climates of India. By planting Pongamia on roadsides, river bank, on the two sides of irrigation canals, marginal and degraded soils. India will able to produce tons of Bio-diesel and organic fertilizers (Oil cake) in near future.

DEVARAPAGA MADHU , SUPRIYA B. CHAVAN , VEENA SINGH , BHASKAR SINGH , YOGESH C. SHARMA

In this paper Millettia pinnata (karanja) oil extracted from its seeds was used as a feedstock for the synthesis of biodiesel. Biodiesel was synthesized through esterification followed by transesterification in a two-step process. Characterization of biodiesel was done using proton NMR spectroscopy. Reaction parameters such as reaction time, reaction temperature, concentration of catalyst and stirrer speed were optimized. Biodiesel from karanja oil has been synthesized using crab shells as solid catalyst. The catalyst was characterized by using sophisticated techniques. Karanja and biodiesel both were also characterized and a high yield (94%) of biodiesel was obtained.

The optimized reaction conditions were

oil: methanol molar ratio, 1:8; reaction time, 120 min; catalyst amount, 2.5 wt%; at 65 ^{0}C and 700 rpm. The fuel properties of the biodiesel were determined as per the US biodiesel standards and found to adhere to the specifications.

A. HAITER LENIN, N. AZHAGESAN, C.R. BERLIN SELVAREX, K.THAVAGARAN.

In this paper the methyl ester of the pongamia oil is investigated for its performance over the conventional diesel. Combustion and emission characteristics are determined at constant speed of 1500 rpm. The performance parameter such as break thermal efficiency, specific fuel consumption, exhaust gas temperature, emissions such as CO, CO2, NOx were tested. The pongamia oil based methyl esters (bio diesel) can be directly used in diesel engine without any modifications. The B25 blend of pongamia oil is having effective exhaust gas temperature, specific fuel consumption compare to diesel. The CO emissions of B25 blend is decreased significantly. With increase in concentration of biodiesel blends the carbon dioxide emission is found to be increased. The methyl ester of pongamia oil can be used as an alternative fuel of diesel without any engine modifications.

In this pap

S.NO	AUTHOR	WORKIG AREA	INPUT PARAMETERS	CONCLUSION
1.	Baste S.V Bhonsal A.V Chavan S.B	Optimization of different parameters for high yield/conversion of karanja oil to biodiesel.	Pure bio diesel, and Neat diesel.	CO emissions decreases by 80% at full load condition.
2.	Bobade S.N Khyade V.B	Production of biodiesel and identify all advantages and disadvantages of pongamiapinnata	Biodiesel, trans-esterification reaction pongamia oil, ASTM.	The oil extracts exhibited good physical and chemical properties. It is used for industrial applications.
3.	T.Venkateswararao. G.Praphakarrao. K.Hema Chandra reddy	Examine properties, performance and emission of different blends of biodiesel compare to diesel.	Different blends B10, B20, and B40.	Properties close to diesel fuel, biodiesel from jatropha, pongmiapinnata and neem seed oil can provide a useful substitute for diesel
4.	S.Ghosh, D.Dutt.	Potential use of pongmia oil methyl ester s a substitute for diesel fuel.	Various properties B25, B50, B75, B100. Are prepared in Transesterification process.	The blend B25 substantially reduces the CO emission and emission of NOx in exhaust gas.
5.	P.Brahatheeswaran	Performance and emission	Pongamia is blend upto25%,50%,75%	B50 is chosen for s a right fuel

	T.Kasiniventhaperuml R.Manivasagan. V.Gnanasekaran. N.karthikeyan.	characteristics with dissimilar compositipon.	and 100% with mineral diesel.	proportion to run C.I engine with less toxics gas next to the B100.
6.	H.M.Dharmadhikari Puli.Ravikumar. S.Srinivasarao	Performance and emission characteristics of a blends at different injection pressures.	Biodiesel, Karanja oil, Injection pressure, exhaust emission.	Karanja biodiesel can be directly used in diesel engine without any modifications. B10, B20, and B60 are better than B100 in break thermal efficiency.
7.	P.K.Halder, N.Paul, M.R.A.Beg.	Review articl on prospect of pongamia in Bangladesh a sustainable source of liquid fuel.	Chemical characteristics, soil erosion seedcake as fertilizer, density, flashpoint, Kinematic viscosity.	Karanja biodiesel blends of 20% with fossil diesel fuel produce approximately 70% less pollution.
8.	Shivashankar.V.N, Periyaswamy.S.	Performance of diesel engine by grooving the piston crown tangentially using pongamia bio diesel.	Pongamia, brake thermal efficiency, Grooving piston.	B20 is nearly equal performance characteristics and emission characteristics compared to diesel.
9.	Prof.Vimal V Prajapathi, Dr. Ratnesh Shukla, Dr.Tushar M. patel And Dr.Radhashyamgiri.	Evaluate the performance and emissions parameters of the engine.	Neat karanja oil K100 and its blends K10, K20, K40, K60 and K80 with diesel constant speed 1500rpm.	CO emission decreases hydrocarbon emission increases. BSFC and BTE for all blends Were decreases.
10.	Brahma kamalkr, Mahanta Dr. Dimbendrakumar.	The different nano additives on performance and emission of characteristics of diesel engine with	Biodiesel, blends of biodiesel, B00, B10,B20 B30, And B100.	Sample B10 is the best among the fuel B00, B10, B20, B30, B100.

		different of biodiesel.		
11.	P.Jaya Prakash. Dr.S.Sunilkumarreddy.	Effect of different nano additives on performing and emission characteristics of diesel engine with different of bio diesel.	Blends, biodiesel exhaust emission nano additives performance.	BTE was increased by adding nano additives to biodiesel compare with only diesel.
12.	S.C.V.Ramanamurthynaidu, G.Raju, D.Srinivasulu.	Review on the karanja (pongamia pinnata) biodiesel emission and its performance characteristics.	Karanja biodiesel, diesel engine emission and performance.	Combustion characteristics of biodiesel are similar to diesel.
13.	S.Manibharathi, B.Annadurai, R.Chandraprakash.	The effect of nano additives on the performance and emission characteristics of the pongamia bio diesel.	Nano particles, rhodium oxides (Rh2O3),fuel additives, optimized surface concentration.	Reduction in HC emission, 45%reduction in CO emission, 37% reduction in NOx.
14.	P.L.Naik, D.C.Katpatal.	Reduce high viscosity of pinnata oil, performance and emission characteristics of the diesel engine.	Blends with 10%, 20%, And 30%.	Density and viscocity, flash point, is higher. Break thermal efficiency is lower; B20 were very close to diesel.
15.	Venkatraman MANI, Gnanamoorthi VENKADESAN, Devaradjane GOPALAKICHENIN.	Performance and emission of pongamia oil and diesel fuelled DICI and HCCI engine.	Homogeneous charge, exhaust gas, recirculation, vaporaizer, raw pongamia oil, 40P in both DICI and HCCI.	DICI mode offered 4% high BTE then that of HCCI mode. The HCCI mode offerd 55% reduced smoke and 80% reduced NO, than that of DICI mode of operation.

16.	K. Nantha Gopal, R. ThundilKarupparaj	bio-diesel from pongamia oil is prepared (PME 100), tested on a diesel engine for different blends such as PME 20, PME 40, PME 60 and PME 80. Comparison is made with diesel operation.	brake thermal efficiency, brake specific fuel consumption, carbon monoxide, unburned hydrocarbons, smoke and NOx emissions are evaluated.	SFC increases, significant reduction in CO, UBHC and smoke emissions for all biodiesel blends when Compared to diesel fuel. NOx emission of PME biodiesel is marginally higher than that of petroleum diesel
17.	Sushma. S, Dr. R. Suresh, Yathish K V	Tests have been conducted at different blends of biodiesel with standard diesel on a four stroke diesel vertical single cylinder engine	Biodiesel, diesel engine, hybrid oil, Transesterification, performance	The Brake thermal efficiency of diesel fuel is increased about 1.44% , BSFC decreases, The BSFC of B10 is very close to that of diesel fuel at full load condition.
18.	DebabrataBarik, S. Murugan	de-oiled seed cake of Karanja (SCK), an organic industrial waste obtained from Karanja biodiesel industries was mixed with cow dung (CD) in four different proportions, viz., 75:25, 50:50, 25:75, and 0:100 percentages on a mass basis.	the pH, temperature, hydraulic retention time (HRT), and carbon/nitrogen ratio (C/N) were evaluated and analyzed.	Up to 73% methane is obtainable. sample S3 gave a better result in comparison with other Samples cumulative biogas production was about 89.9% higher for S3 in comparison to S4. S3 and S2 gave better fertilizer values than that of other samples.

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19.	SameetKeshariPati, Susant Kumar Sahu	study of karanja (Pongamia pinnata) seeds as a raw material), and its characteristics and potential as a substitute for Diesel fuel in CI engines.	Pongamia pinnate, Transesterification, biodiesel, karanja oil methyl ester, KOME, emission, blends of B10 and B15 of Karanja	Specific gravity, Kinematic viscosity of Karanja Oil blends is much closer to diesel. BSFC reduces BTE shows better result than diesel.
20.	M.Periyasamy ,N.Vadivel.	varying the LPG flow rates, performance and emission characteristics of the engine were measured	Diesel, biodiesel, LPG, performance, emissions.	engine run smoothly for the LPG flow 2.5-4 kg/min at medium load conditions. Brake thermal efficiency was increased from medium to higher load.
21.	AmanMamualiya , Harvinder Lal	Various proportions of Karanja oil methyl ester blends (10%, 20%, and 30%) were used for conducting the performance test at varying load conditions	karanja oil blends (10%, 20%,and 30%), performance, emissions	B20 blend was found to be the best, reduced all exhaust Emissions like CO, CO2, HC and smoke.
22.	Gaurav Dwivedi, Siddharth Jain, Mahendra Pal Sharma	study the scope of Pongamia in India.	Biodiesel, Viscosity, Density, Flashpoint Pongamia	Pongamia oil may stands as Bio-diesel which is renewable, safe and non-polluting. It holds great promise to the rural sectors of India to meet the energy and organic fertilizer

				requirements.
23.	DevarapagaMadhu , Supriya B. Chavan , Veena Singh Bhaskar Singh , Yogesh C. Sharma	Characterization of biodiesel was done using proton NMR spectroscopy.	reaction time, reaction temperature, concentration of catalyst and stirrer speed	high yield (94%) of biodiesel was obtained. oil: methanol molar ratio, 1:8; reaction time, 120 min; catalyst amount, 2.5 wt%; at 65 C and 700 rpm.
24	A. Haiter Lenin, N. Azhagesan, C.R. Berlin Selvarex, K.Thavagaran.	In this paper the methyl ester of the pongamia oil is investigated for its performance over the conventional diesel	Combustion and emission characteristics are determined at constant speed of 1500 rpm	The B25 blend of pongamia oil is having effective exhaust gas temperature, specific fuel consumption compare to diesel.

CONCLUSION:

Majority of the work is done in the area of blending. Blend B20 (80% bio diesel+20% diesel) is showing better results in terms of performance, combustion, emission when compared to other blends.

- The brake specific fuel consumption (BSFC) is almost nearer to diesel fuel. The fuel consumption of bio diesel and its blends are high compared to diesel fuel due to its calorific value.
- The brake thermal efficiency of the blend B20 is around 30%.
- CO emissions are slightly less for the blend B10 and B20 compared to diesel fuel.
- HC emissions were also less for B10 and B20.
- NOx emissions are high for neat bio diesel.
- NOx emissions decreased by 39% for B10 and 28% for B20, compare toB100.

The blend B20 acts as a neat diesel. Pongamia bio diesel viscosity is high; less colorific value compared to diesel. A Pongamia bio diesel blend of B20 is suggested for the diesel engine without any modifications.

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