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Experimental Investigation for Suitability of Mixture of CSOME, NOME and OPOME blends with Diesel

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Abstract - **Small amounts of biodiesel blended with petroleum fuel can help reduce air pollution and relieve the strain on limited resources without severely affecting engine performance and efficiency. However, when petroleum diesel is totally replaced by biodiesel, several more studies on engine optimization and modification, low temperature engine performances, new equipment, and measurement technique, etc., need be carried out. In this paper, three biodiesel blends CSOME, NOME, and OPOME are used to analyze performance and investigate C.I. engine exhaust emissions. These three biodiesels are blended with diesel in the amounts of B10, B20, B30, B40, and B50 for the purposes of performance study and research on C.I. engine exhaust emissions. The findings demonstrate that when mix increases, SFC rises and exhaust gas emissions fall. Diesel and biodiesel engines perform similarly in terms of output. Three biodiesels blended is an acceptable alternative fuel for CI engines.**

Keywords: Alternative fuel, Biodiesel, Cotton seed oil, Neem oil, orange peel oil, Performance, Emissions.

1. Introduction

The diesel engine is the main way that cars are powered in the twenty-first century. In order to reduce pollution and handle the energy crisis, researchers from all over the world have long sought to develop diesel engines with low emissions and low energy consumption. Today's diesel engines, however, have superior emission characteristics and use less energy than their forerunners as a result of the development of new technology. To achieve our goal of a clean and effective diesel engine, however, there is still significant work to be done on diesel engines. As a result, investigation into a clean-burning fuel is advised rather than traditional gasoline since it may lessen exhaust gas emissions while also offering more energy alternatives. The use of alternative fuels for internal combustion engines has drawn a lot of interest due to the issue with fossil fuels. Alternative fuels must be affordable, convenient, and ecologically friendly. An effective alternative fuel should address environmental and energy security problems without sacrificing engine performance. We may use local resources and lessen our dependency on fossil fuels by using renewable energy sources. Most biodiesel oils, particularly the non-edible varieties, may be used as diesel engine fuel. One potential substitute fuel for diesel engines is biodiesel. Because oil crops utilize the carbon released after combustion for photosynthesis, biodiesel fuels are renewable. The ability to utilize biodiesel in existing diesel engines without requiring engine upgrades is an extra benefit. Alkyl monoester of fatty acids as bio-diesel, which is produced through the transesterification process from renewable sources of oil and fat, is an excellent substitute. Biodiesel may be produced from unprocessed vegetable oil by transesterification with methanol or ethanol after chemical reactions. Due to their renewable nature and comparable properties to diesel, vegetable oils can effectively substitute diesel oil. Several scientists have studied the use of vegetable oils in diesel engines. The utilization of alternative fuels, especially those that are renewable like vegetable oils and alcohols, warrants more study. Some of the most well-liked biodiesels being considered as diesel alternatives right now include those made from cottonseed, jatropha, karanja, sunflower, and other plants. Understanding the factors that affect combustion, which directly affect thermal efficiency and emissions, is essential when utilizing biodiesel as a diesel substitute. The thermal efficiency of IC engines is being improved while emissions are being reduced in the current energy climate. Due to the conflict between the increasing demand for powerful braking and the quick depletion of gasoline, stringent power control and excellent fuel efficiency are required.

Neem Oil

Neem oil, also known as Azadirachta indica, is widely available in India and other areas of the world. [1] A Neem tree has the capacity to generate thousands of flowers. A mature tree may produce an enormous number of seeds during one flowering cycle. Neem trees start producing harvestable seeds in three to five years, and they can reach maximum production in ten years, with a 150 to 200-year output. A mature Neem tree may yield 30 to 50 kg of fruit annually. According to estimates, there are 20 million neem trees in India. One million tons of fruits and 0.1 million tons of kernels

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may be produced annually by neem trees in India (assuming 10 percent kernel yield). 40% to 60% of neem seed output is oil. Neem is a golden tree that has become well-known around the world because of all of its uses. Along with agroforestry, it is used in pest control, toiletries, cosmetics, medications, plant and animal nutrition, and energy production. Neem trees are regarded as heavenly plants in India because of their many therapeutic benefits. The commercial importance of neem has been understood since the Vedic era. The Neem tree's leaves, flowers, fruits, seeds, kernels, seed oil, bark, wood, twigs, roots, and other components have all been used and sold for a variety of things. The physical and chemical properties of ordinary diesel, neem methyl ester, and neem oil are displayed in Table 1. Neem biodiesel had fuel properties that were comparable to those of regular diesel and were within an acceptable range. Except for calorific value, neem biodiesel was shown to have more favorable fuel properties than diesel. The extensive properties of neem oil and its esters are displayed in table 1 below.

Cotton seed oil

Cotton plant seeds are used to produce cottonseed oil. Long considered the only food and fiber crop in nature, cotton is still grown today. It produces food for both humans and animals as well as an extremely flexible fabric for use in industrial, domestic, and apparel applications. Cottonseed oil contains 65 to 70 percent unsaturated fatty acids, with a 2:1 ratio of polyunsaturated to saturated fatty acids, and a breakdown of 18 to 24 percent monounsaturated (oleic), 42 to 52 percent polyunsaturated (linoleic), and 26 to 35 percent saturated fatty acids. (Palmitic, stearic) The varied features of the previously discussed biodiesels are listed in Table 6. The southern region of the US offers millions of tons of cotton seeds each year, and around 10% of the oil may be extracted and trans-esterified [2].

Orange peel oil

Most countries that produce orange fruits include Brazil, the United States, India, and China. With a 6 million tonne yearly orange production, India ranks third in the globe. In this dish, the fruit flesh (carpel) is used; the skin is discarded. Researchers have discovered that orange peels may produce methane and make excellent fertilizer. The chemical makeup of orange peel includes alkaloids, saponins, terpenes, resins, flavonoids, tannins, phenols, and sugars, however coumarins and steroids are not present. Additionally, it has proven to be a powerful antioxidant. It has been demonstrated that orange peel powder diesel solution may be used as an alternative fuel for C.I engines. With a capacity of 27,600 tones, India has a sizable potential for producing orange peel oil from orange fruits. Currently, 2-3 tons of orange oil are produced for the food and cosmetics industries. There are no other uses for orange oil. The need for orange peel collection may increase along with the demand for vast quantities of orange oil for use in internal combustion engines. Orange oil is a 90% D-limonene fuel that is biomass-derived from orange peel and may be used for several things. It may be used as an agent or source in surface cleaners, hand cleansers, furniture polish, soaps, and shampoos. Additionally, orange oil can be used as a stand-alone product or in combination with gasoline to replace it partially or entirely. Due to its low viscosity and low cold flow plugging temperature, orange peel oil stands out as a strong competitor in the field of alternative oils for BD production [2]. Due to its renewable nature and widespread availability, orange oil is one of the potential replacement biofuels for compression ignition (CI) engines [3].

Since orange oil has much of the same qualities as gasoline, it has been utilized as fuel for spark ignition engines. When combined with low-octane gasoline, the high-octane value of these fuels can raise the blend's octane rating. The knock restricted compression ratio (CR) can then be raised even further as a result. Results show that as compared to a typical low burn engine, a gasoline-orange oil combination with catalytic coating performs better. Table 1 lists many characteristics of orange peel oil and its esters.

2. Literature Survey

An experimental analysis of the production of biodiesel from a mixture of neem (Azadirachta indica) oil and sesame (Sesamum indicum L.) oil, as well as its performance and emission testing on a diesel engine, was done by Mehra et al. The engine's exhaust emissions of carbon monoxide (CO), hydrocarbon (HC), and nitrogen oxides (NOx), as well as braking thermal efficiency, mean effective pressure, and specific energy consumption, were all assessed. The results show that several blends of mixed oil biodiesel, such as B10 and B20, which is produced by mixing neem and sesame oil with diesel, may be used as an alternative fuel. Soloiu and other.[4] Performance of an IDI Engine Powered by Fatty Acid Methyl Esters is their study focus. made with oils from cotton seeds Marcis Jansons, biodiesel made from cotton seed is used as fuel. The energy specific fuel consumption (ESFC) of CS50 was 4.4 percent less than ULSD#2 at 6.3 bar IMEP. With a mechanical efficiency of between 70 and 80 percent, the engine's thermal efficiency was projected to be between 45 and 50 percent. Nitrogen oxide (NOx) and soot levels were at their lowest when using the CS20 gasoline blend. Overall, the study discovered that a small-bore IDI engine's high biodiesel tolerance may be effectively maintained by using up to 50% cotton seed biodiesel in ULSD. Deep et al.[2] They study about Various blends of Orange peel oil methyl ester and isopropyl alcohol with diesel were prepared on a volumetric

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basis and named as B5IP5 (5% Orange peel oil methyl ester and 5% isopropyl alcohol with 90% Diesel), B10IP5 (10% Orange peel oil methyl ester and 5% isopropyl alcohol with 85% Diesel), and B15IP5 (15% Orange peel oil methyl ester and 5% isopropyl alcohol with 85% Diesel). The outcome shows that NOx emissions are significantly lower in the 5 percent IP mix than in other blends with biodiesel content, but they are significantly higher in other blends with biodiesel content.

Niklesh and co..[3] They concentrated on the performance and emission characteristics of a diesel engine running on various bowl-in piston geometries and fueled with diesel and orange oil blends. This study evaluates the performance and emission parameters of a single cylinder, four stroke, direct injection (DI) diesel engine with a power output of 4.4 kW at a rated speed of 1500 rpm when the engine is run with three different piston geometries. An orange oil diesel blend is used as the test fuel in this study. The performance and emission parameters of the engine under orange oil and diesel operation were experimentally determined and compared in this paper.

P. Ravindra Kumar and K. Dilip Kumar [5] they used Bio Diesel mixtures made from cotton seed methyl esters and neem oil methyl esters in studies on a C.I. engine. The transesterification method was used to create cotton seed methyl ester (CSOME) and neem oil methyl ester (NOME), and transesterification characteristics were enhanced. In order to determine which bio diesel was the best choice, mixtures of different ratios of CSOME and NOME with diesel were created, examined, and compared with diesel fuel. The properties and performance of various CSOME and NOME combinations (C05, C10, C15, and C20) in contrast to diesel were investigated through several experiments. In terms of performance, their data indicate that C20 is more equivalent to diesel. On the other hand, its diesel blends showed reasonable efficiency. They also learned that cotton seed methyl esters perform better than neem methyl esters and that these diesel mixtures had fewer emissions and smoke than pure diesel.

AV Krishna Reddy and others.[6] They put a water-cooled, single-cylinder, four-stroke diesel engine with 5.2 BHP to the test. Commercially available Xtramile diesel is combined with cottonseed oil methyl ester. Four different mixtures of cottonseed oil methyl ester (CSOME), ranging from 10% to 40% in ten percent increments, are created. At a 17.5:1 compression ratio, they examined the Xtramile diesel brake thermal efficiency (BTE) and brake specific fuel consumption (BSFC). They got to the conclusion that the 10% and 20% CSOME blends had characteristics that are more like diesel fuel. Engines powered by cottonseed oil methyl ester function on par with diesel engines. The engine could run well on cottonseed oil methyl ester mixtures. Current diesel engines may use these cottonseed oil mixes without any adjustments. As a result, their experiment's findings suggest that esterified vegetable oils are a potential emergency fuel alternative for modern diesel engines.

M. Harinath Reddy and others.[7] They investigated the thermal efficiency of a diesel engine running on diesel fuel and cottonseed oil (CSO) biodiesel and discovered that Jatropha oil, cottonseed oil, and conventional diesel all had comparable thermal efficiency. For testing with diesel fuel and neat bio-diesel, a single cylinder, 4-stroke vertical, water-cooled, self-governed diesel engine with 5 HP at 1500 rpm was used. The study of theoretical data from their experiment revealed that the brake thermal efficiency and suggested thermal efficiency of CSO biodiesel were marginally higher than those of diesel fuel and Jatropha oil. In comparison to conventional diesel fuel, their research shows that the use of cottonseed oil biodiesel improves the performance characteristics of CI engines.

Doctor S.V. Prayagi and Bhojraj N. Kale [8] They examined the thermal efficiency of a diesel engine using regular diesel and cottonseed oil (CSO) biodiesel, and discovered that the thermal efficiency of conventional diesel, cottonseed oil, and jatropha oil was comparable. To accomplish this, a single-cylinder, four-stroke, vertical, water-cooled, self-governed diesel engine (rope brake dynamometer with spring balances and loading screw) with 5 horsepower at 1500 rpm was employed. The braking drum has a 0.400 m diameter.) The engine is chosen for testing using diesel fuel and plain biodiesel, which is cottonseed oil methyl ester, while it is operating at full load. Theoretical research showed that CSO biodiesel has a little higher brake thermal efficiency and indicated thermal efficiency than diesel fuel and jatropha oil. They get to the conclusion that, at a constant speed of 1500 rpm, the braking thermal efficiency (bth) of diesel and biodiesel made from jatropha is somewhat lower than that of CSO methyl ester. The proposed thermal efficiency (ith) with the use of CSO methyl ester is significantly greater as compared to petroleum diesel and jatropha biodiesel (i.e., 20.70 percent).

Edwin Geo. V., Prithviraj. D., and Leenus Jesu Martin. M, [1] They conducted their trials using cotton seed oil and orange peel oil as fuel. Cottonseed oil cannot be used as a pure fuel for diesel engines due to its high viscosity. A small amount of Orange Peel oil, a light vegetable oil, is used to reduce viscosity and considerably improve engine performance. Blends of cottonseed oil and orange peel oil in a variety of concentrations were created, assessed, and their properties approximated. The effectiveness of the engine running on diesel, mixes, and cottonseed oil was tested using a

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single cylinder, four-stroke, direct injection compression ignition engine. The outcomes were contrasted with information gathered using diesel and raw cottonseed oil as a baseline. For the best performance and trouble-free engine operation, cottonseed oil was combined with 15% Orange peel oil by volume.

Prof. V. Pandu Rangadu and Dr. V. Naga Prasad Naidu [10] This study compares the performance and emission characteristics of two different biodiesels in a single cylinder, four-stroke diesel engine: cotton seed oil and neem oil. Performance is compared using brake-specific fuel consumption, brake thermal efficiency, exhaust gas temperature, and hydrocarbon and nitrogen emissions. According to this study, the engine performance of these biodiesels deviates from diesel just little, and their hydrocarbon emissions are reduced. Neem oil does not perform as well or have better emission properties as cotton seed oil.

Deep and co..[11] The braking thermal efficiency of a 20% mix of OPOME is greater than that of the diesel at peak load, according their research into the experimental investigation of orange peel oil methyl ester on single cylinder diesel engines. As the quantity of OPOME rose, it was discovered that HC and CO emissions were decreased when compared to diesel, indicating enhanced combustion brought on by the oxygenated fuel. There was a considerable increase in NOx when comparing OPOME to diesel. When used in an unaltered single cylinder diesel engine, biodiesel generated from orange peel oil outperformed diesel in terms of performance and emissions.

Deep and co..[12] Performance and emission tests on diesel engines fueled with orange peel oil and n-butanol alcohol blends were done as part of their inquiry into the viability of using the mixtures as an alternative fuel for CI engines. B10OPO90 (10% n-butanol and 90% orange peel oil), B20OPO80 (20% n-butanol and 80% orange peel oil), B30OPO70 (30% n-butanol and 70% orange peel oil), and B40OPO60 (10% n-butanol and 60% orange peel oil) were produced on a volumetric basis (40 percent n-butanol and 60 percent orange peel oil). It was discovered that mixes of n-butanol were becoming less viscous kinematically. However, studies have revealed that blends have poorer brake thermal efficiency (BTE) than pure diesel fuel. In comparison to diesel baseline data, CO emissions demonstrate that increasing the amount of n-butanol in blends dramatically lowers emissions at high loads. While smoke opacity increased for all loads at maximum load, NOx emission was found to be decreased for all blends.

Modi and co..[13] They examined the necessity for a low heat rejection engine as well as the efficiency of LHR diesel engines employing mixtures of diesel and neem biodiesel. The piston's top surface (crown), the valve faces, and the inside wall of the combustion chamber were all coated with magnesium zirconate (MgZrO3). Using neem biodiesel and its blends, the performance of a ceramic coated (LHR) engine was examined experimentally, and the results were compared to the performance of a base engine. To replicate the driving circumstances seen in most cities, experiments were done at a medium speed with varying loads, and measurements including fuel flow, exhaust temperature, and smoke tests were obtained. The outcomes for the LHR engine demonstrated improved fuel economy and decreased pollution levels. It was found that biodiesel has kinematic viscosity, calorific value, flash point, carbon residue, and specific gravity.

3. Experimental set up

Figure 1 illustrates the experimental setup, which consists of a single-cylinder, four-stroke, water-cooled diesel engine. The system is automated.

F1: Fuel flow F2: Air flow
T1: Inlet water temperature
T2: Outlet water temperature from engine
T3: Inlet water temperature to calorimeter
T4: Outlet water temperature from calorimeter
T5: Exhaust gas temperature at inlet to calorimeter
T6: Exhaust gas temperature at outlet to calorimeter

1) Preparation of Testing Fuel

Blends of three biodiesels, such as CSOME, NOME, and OPOME, were employed to evaluate performance and examine C.I. engine exhaust pollution. These three biodiesels are combined in a 2:1:1 ratio with diesel to create the B10, B20, B30, B40, and B50 blends, which are used to research engine performance and analyze C.I. exhaust emissions. 10% biodiesel and 90% diesel are denoted by B10, 20% biodiesel and 80% diesel by B20, 30% biodiesel and 70% diesel by B40, and 50% biodiesel and 50% diesel by B50. In Tables 1 and 2, several characteristics of these biodiesels are displayed. Types may be used if needed for special purposes.

Recommended font sizes are shown in Table 2.

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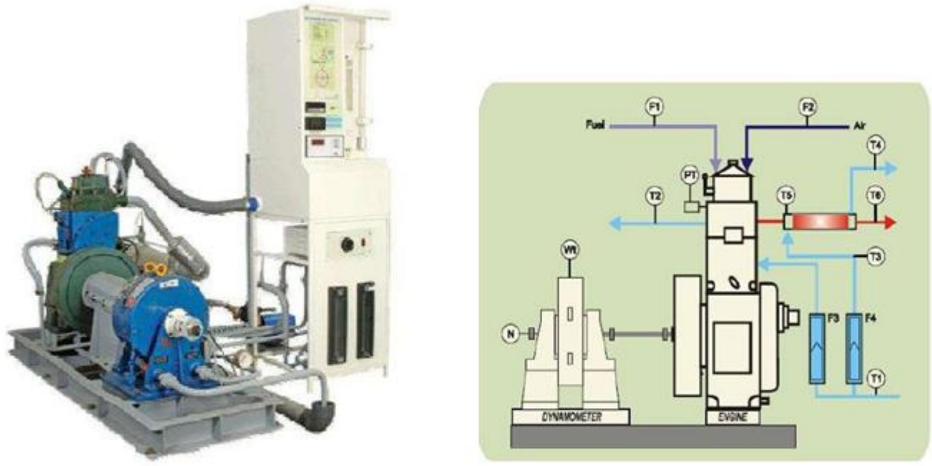

Fig 1 experimental set up

Table 1 properties of diesel, cotton seed oil, neem oil, orange peel oil and its esters

Properties	Diesel	Cotton Seed Biodiesel	Cotton Seed Oil	Neem oil	Neem biodiesel	Orange Peel oil biodiesel
Flash point (^{0}C)	60	120	260	214	120	74
Fire point (^{o}C)	62	153	230	222	128	82
Density(g/cm3)	830	868	911	912–965	820–940	816.2
μ k (CS) at 300^0c	3.15	9.155	25.03	20.5–48.5	3.2–10.7	3.52
Specific gravity	0.83	0.876	0.911	0.912-0.965	0.820-0.940	0.8162
C.V.(KJ/Kg)	42500	39162	38062	32000–40000	39600–40200	34650
Cetane number	45	49-50	43	31–51	48–53	47

Table 2 Test Report for Different Properties of Diesel and Biodiesel and its Blends

Property	Ref. Standard	Reference		Diesel	CSOME + NOME +OPOME biodiesel blends					
		Unit	Limit	B00	B10	B20	B30	B40	B50	B100
Density	D1448	gm/cc	.800-.900	0.835	0.836	0.838	0.844	0.846	0.849	0.874
Calorific Value	D6751	MJ/Kg	34-45	42.5	42.36	42.1	41.89	41.5	41.2	38.5
Cetane no.	D613		41-55	49.5						51.6
Viscosity	D445	mm2/sec	03-Jun	2.7						5.2
Moisture	D2709	%	0.05%	NA	NA	NA	NA	NA	NA	0.05
Flash point	D93	0C		64						168
Fire point	D93	0C		71						179
Ash	D482	%wt.	0.1% Max	0.05						0.05
Cloud point	D2500	0C		-6						7

Table 3 Shows experimental set up details.

Table 3 Experimental set up details

Feature	Description	Feature	Description
Make and Model	VCR Engine test setup 1 cylinder, 4 stroke, Diesel (Computerized)	**Cylinder diameter**	87.5 mm
		Stroke length	110 mm
Type of engine	4 stroke, Variable compression diesel engine	**Connecting rod length**	234 mm
No. of cylinder	Single cylinder	**Compression ratio**	12:1-18:1
Cooling media	Water cooled	**Orifice diameter**	20 mm
Rated capacity	3.5 KW at 1500 rpm	**Dynamometer**	Eddy current dynamometer
		Dynamometer arm length	145 mm

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4. Experimental Results

Performance Graphs

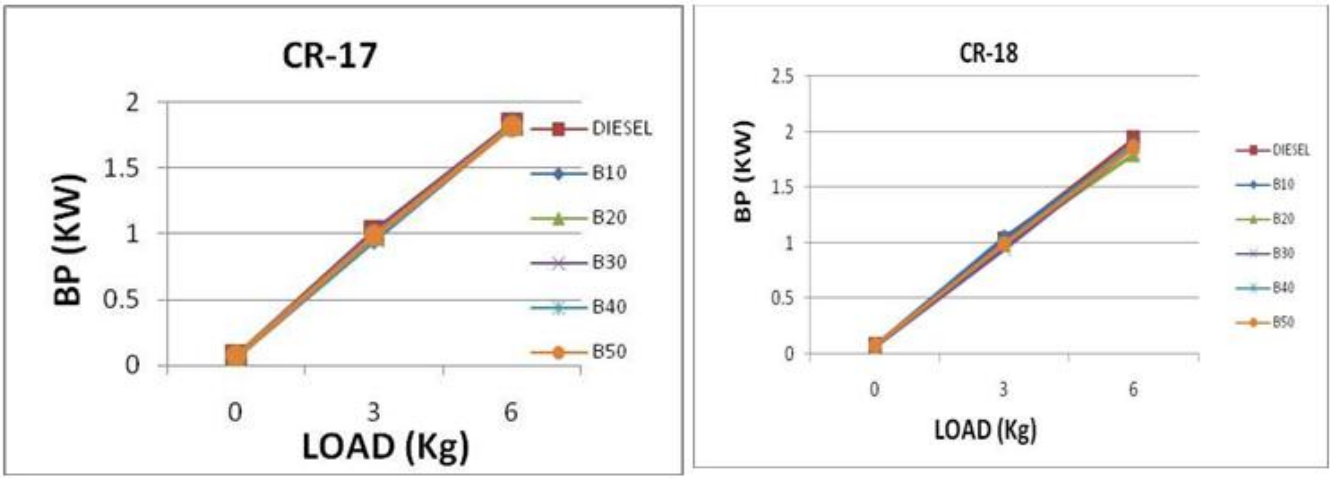

Fig. 2 BP vs Load for different Blends at CR 17 and 18

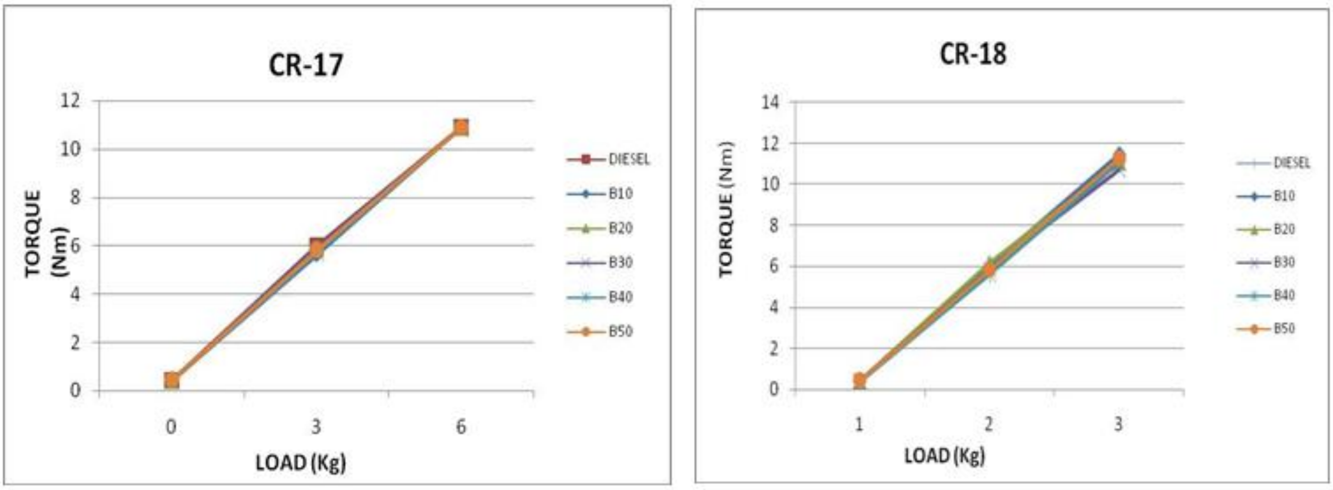

Fig. 3 Torque vs Load for different Blends at CR 17 and 18

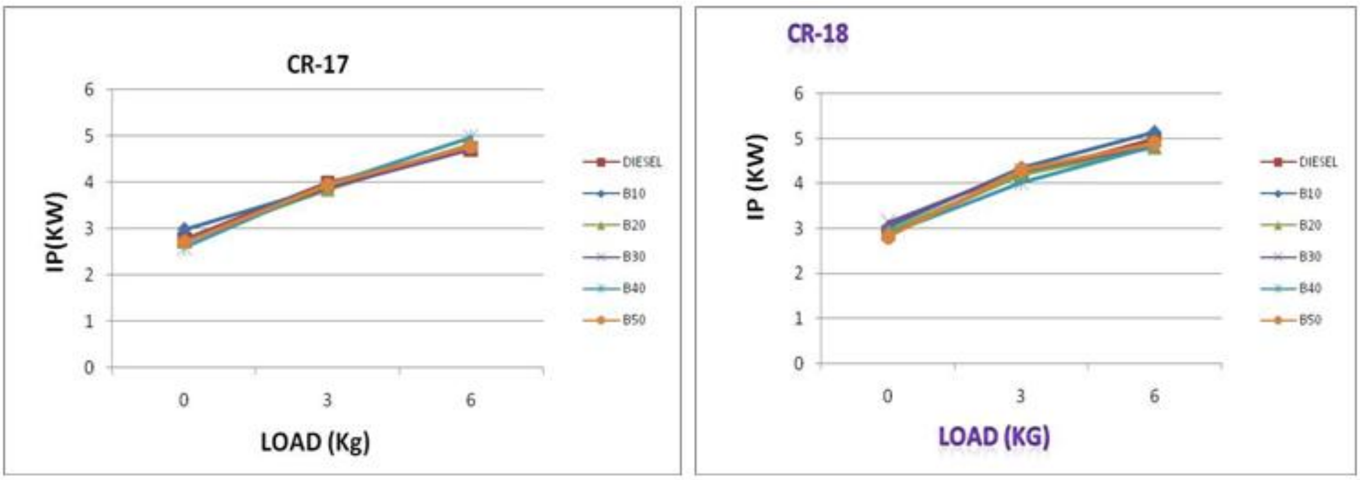

Fig. 4 IP vs Load for different Blends at CR 17 and 18

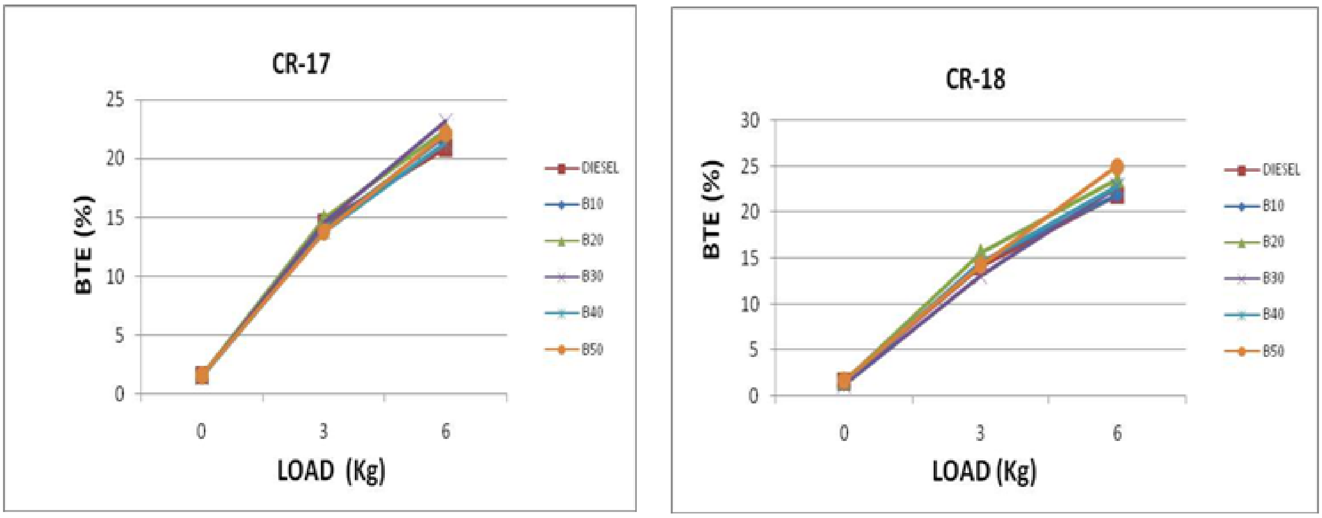

Fig. 5 BTE vs Load for different Blends at CR 17 and 18

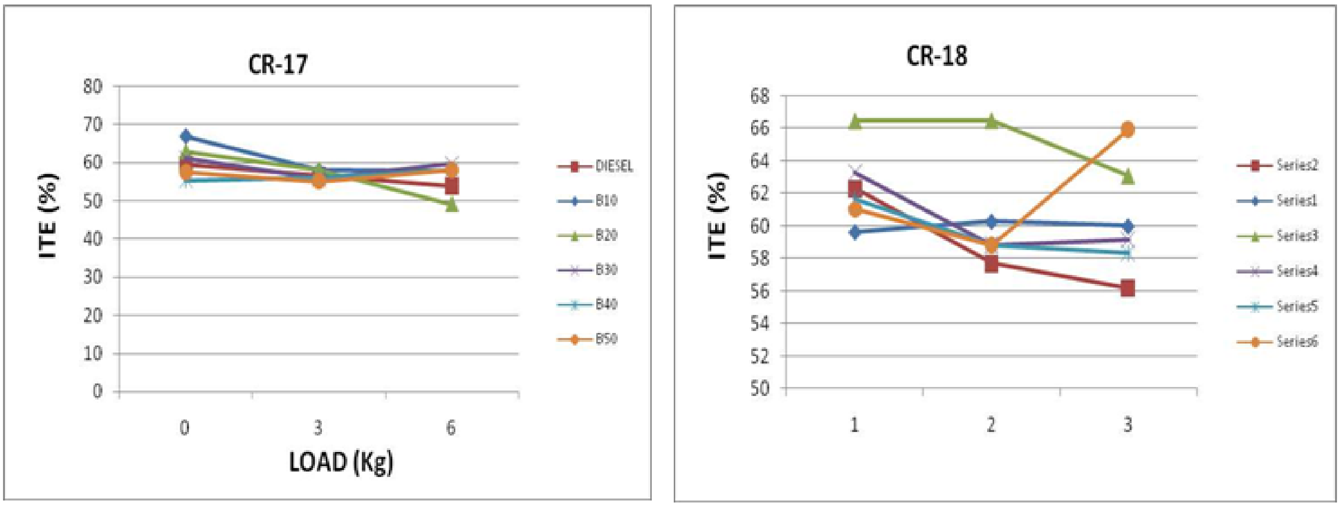

Fig. 6 ITE vs Load for different Blends at CR 17 and 18

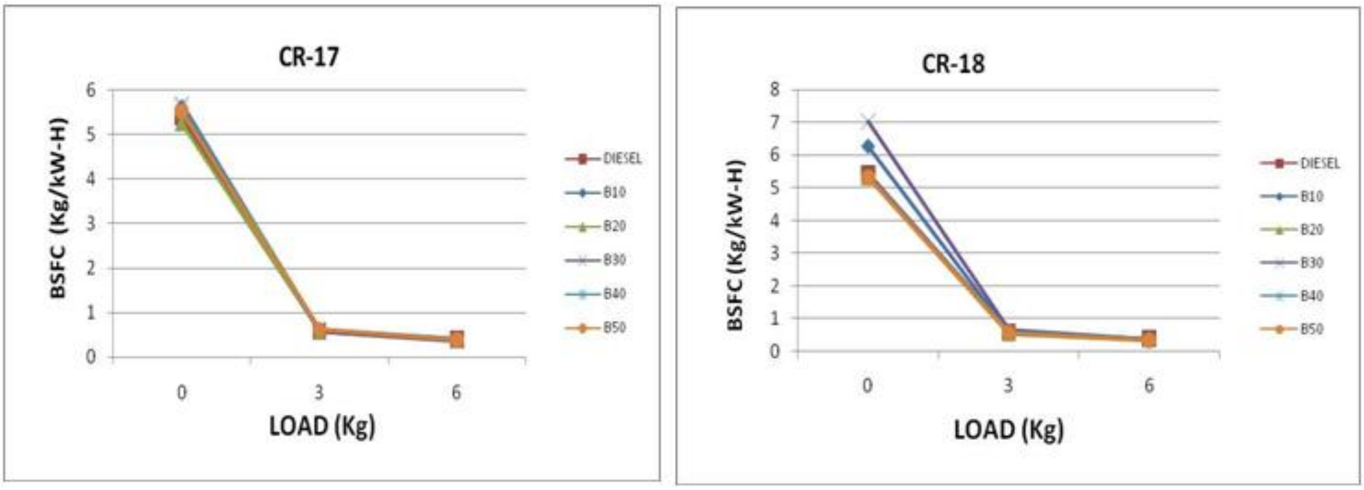

Fig. 7 BSFC vs Load for different Blends at CR 17 and 18

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Exhaust Gas Emissions

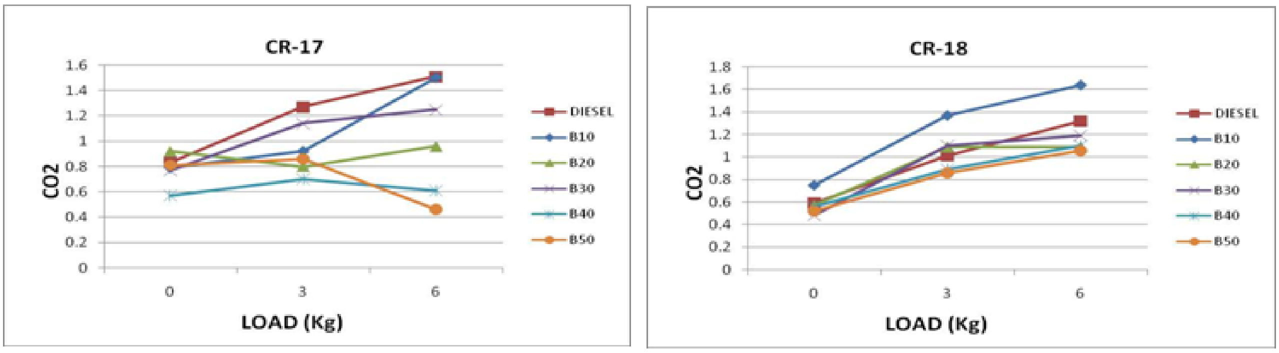

Fig. 8 CO_2 vs Load for different Blends at CR 17 and 18

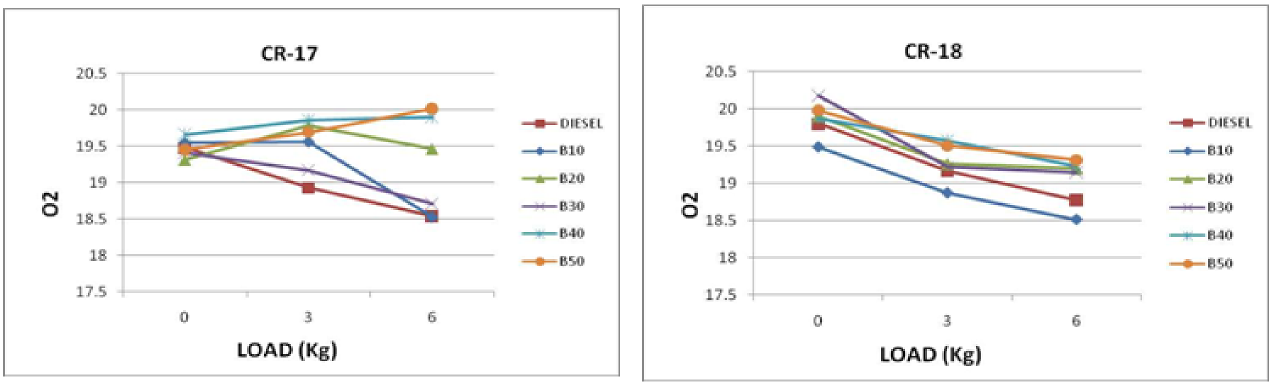

Fig. 9 O_2 vs Load for different Blends at CR 17 and 18

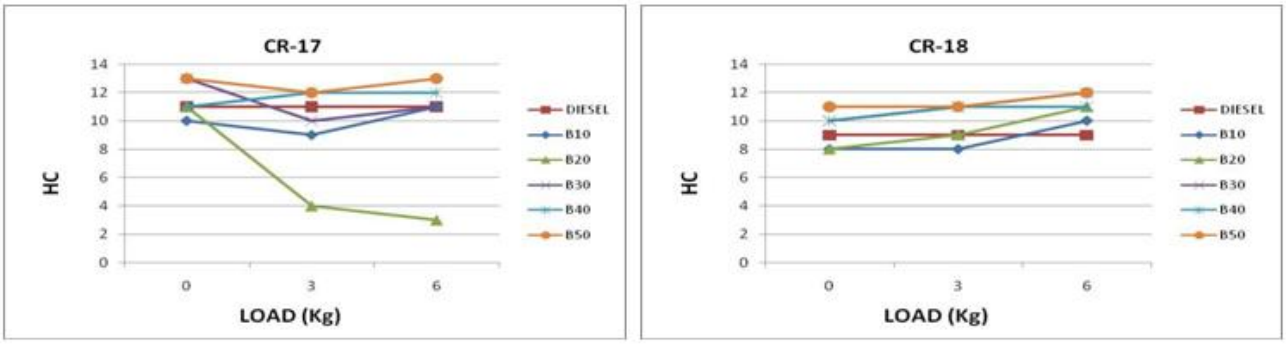

Fig. 10 HC vs Load for different Blends at CR 17 and 18

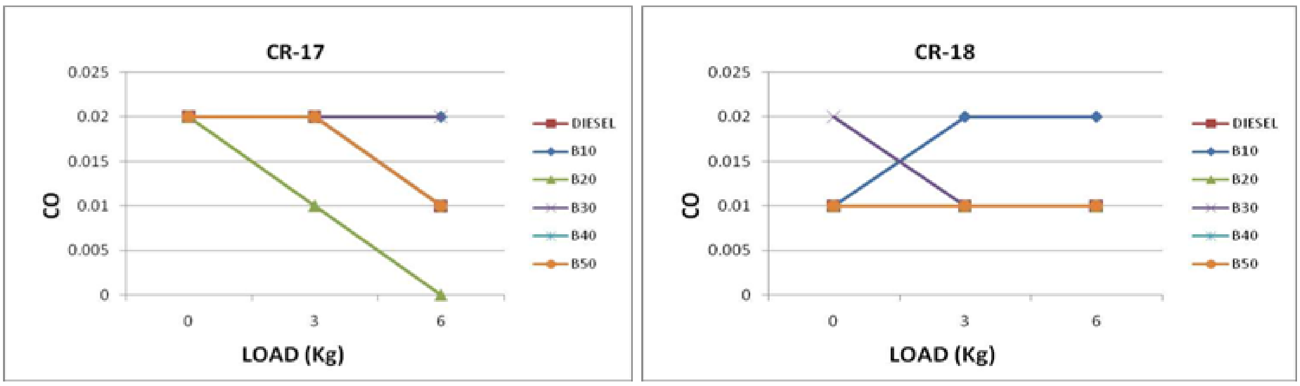

Fig. 10 HC vs Load for different Blends at CR 17 and 18

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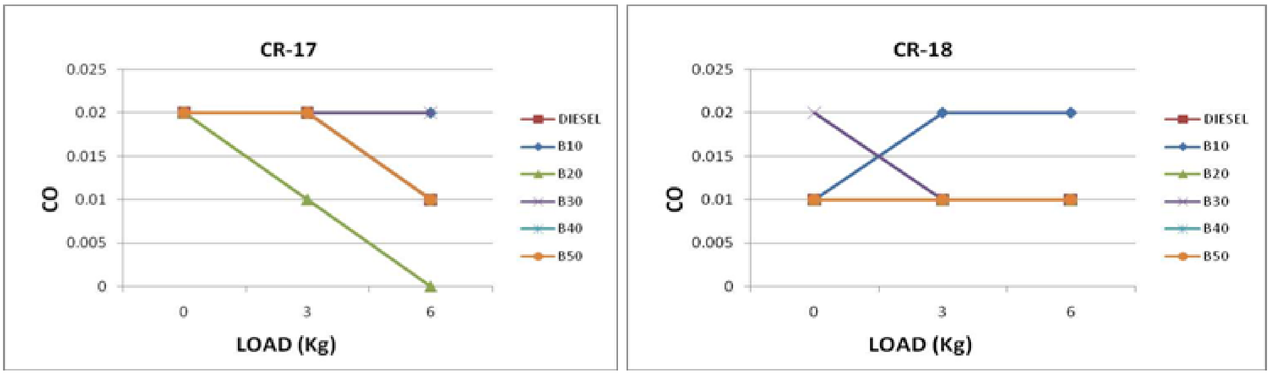

Fig. 11 HC vs Load for different Blends at CR 17 and 18

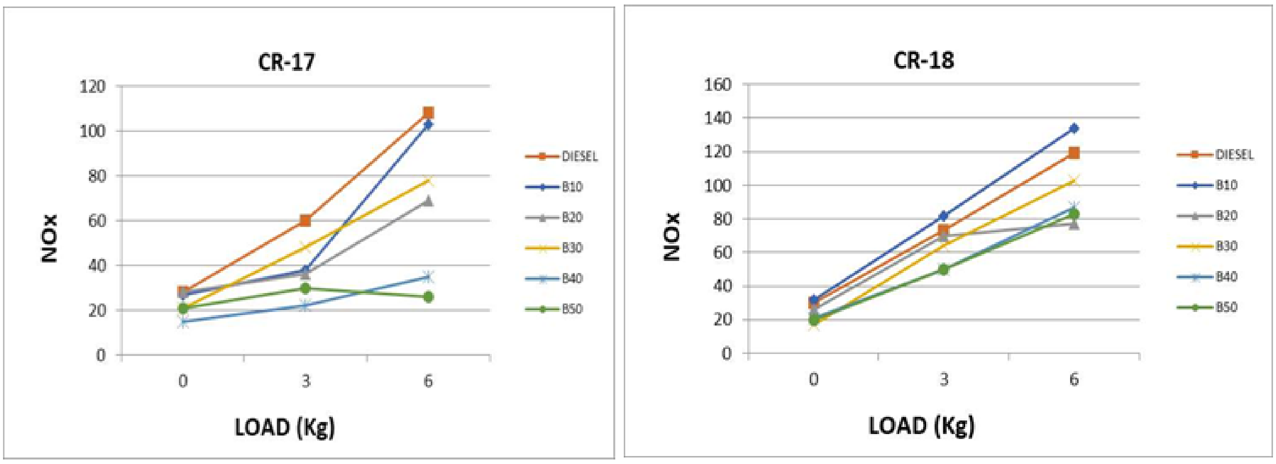

Fig. 12 NOx vs Load for different Blends at CR 17 and 18

5. Conclusion

1) For all blends, CO_2 levels drop with increasing load in comparison to diesel.
2) With increasing blend, brake power somewhat drops and increases with load.
3) For all mixes, indicated power has the same trend as diesel.
4) For all sorts of blends, BTE rises with load and mix.
5) For all blends, BSFC drops as load rises.
6) For all blends save diesel, O_2 levels drop as the load rises.
7) Compared to diesel, CO stays constant as load increases for all mixes.
8) Compared to diesel, NOx reduces with mix but increases with load for all blends.

Because the combination of CSOME, NOME, and OPOME has given very significant performance with little decrease in NOx emission, emission reduction can be achieved with some modification to the fuel, such as adding additives, modification to in-cylinder methods, such as varying Injection pressure, delaying injection timing, or by other technique.

There are some limitations to the use of ternary blends of CSOME, NOME, and OPOME with diesel as an alternative fuel for CI engines. One major limitation is the high viscosity of the blends, which can lead to poor atomization, incomplete combustion, and increased emissions of unburned hydrocarbons and particulate matter. This can be mitigated using appropriate additives to improve the fluidity of the blends.

Another limitation is the relatively low cetane number of the blends, which can result in longer ignition delays and increased emissions of NOx. This can be addressed by the addition of cetane improvers, such as 2-ethylhexyl nitrate (EHN), which can improve the ignition quality of the blends and reduce emissions of NOx.

Additionally, the stability of the blends can be a concern, as they may be prone to oxidation and polymerization, leading to increased viscosity and potential engine deposits. This can be addressed using antioxidants and stabilizers, such as butylated hydroxytoluene (BHT) and butylated hydroxyanisole (BHA), to improve the oxidative stability of the blends.

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Overall, while ternary blends of CSOME, NOME, and OPOME with diesel show promise as alternative fuels for CI engines, further research is needed to address these limitations and optimize their performance in terms of emissions, efficiency, and engine durability.

Conflicts of Interest

"The author(s) declare(s) that there is no conflict of interest regarding the publication of this paper."

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REFERENCES

[1] T. Mehra, N. Kumar, S. Javed, and A. Jaiswal, "An Experimental Analysis of Biodiesel Production from Mixture of Neem (Azadirachta indica) Oil and Sesame (Sesamum indicum L .) Oil and its Performance and Emission Testing on a Diesel Engine," 2018, doi: 10.4271/2016-01-1264.Copyright.

[2] A.Deep, N. Kumar, D. Gupta, A. Sharma, J. S. Patel, and A. Karnwal, "Potential Utilization of the Blend of Orange Peel Oil Methyl Ester and Isopropyl Alcohol in CI Engine," SAE Tech. Pap., vol. 2014-Octob, 2014, doi: 10.4271/2014-01-2778.

[3] P. Niklesh Reddy, S. K. Paruvada, A. Killol, G. Murugan, K. Naseem, and M. Sivalingam, "Performance and Emission Characteristics of a Diesel Engine Fueled with Diesel and Orange Oil Blends Using Different Bowl-In Piston Geometries," SAE Tech. Pap., vol. 2018-April, pp. 1–11, 2018, doi: 10.4271/2018-01-0915.

[4] V. Soloiu et al., "Performance of an IDI Engine Fueled with Fatty Acid Methyl Esters Formulated from Cotton Seeds Oils Marcis Jansons," 2015, doi: 10.4271/2015-01-0806.

[5] K. D. K. and P. R. Kumar, "Experimental Investigation of Cotton Seed Oil and Neem Methyl Esters as Biodiesel on CI Engine," Int. J. Mod. Eng. Res., vol. 2, no. 4, pp. 1741–1746, 2012.

[6] M. S. S. and K. A. A. V. Krishna Reddy, "Experimental Determination Of Brake Thermal Efficiency And Brake Specific Fuel Consumption Of diesel engine fuelled with biodiesel," Int. J. Eng. Technol., vol. 2, no. 5, pp. 305–309, 2010.

[7] D. N. R. and D. K. V. M.Harinathareddy, "Experimental Investigation of Compressed Ignition Engine Using Cotton Seed Oil Methyl Ester as Alternative Fuel," Int. J. Eng. Sci., vol. 2, no. 1, pp. 06–10, 2013.

[8] D. S. V. P. Bhojraj N. Kale, "Performance Analysis of Cottonseed Oil Methyl Ester for Compression Ignition Engines," Int. J. Emerg. Technol. Adv. Eng., vol. 2, no. 8, 2012.

[9] P. D. Leenus Jesu Martin. M, Edwin Geo. V, "Effect of orange peel oil addition on the performance of cottonseed oil fuelled DI diesel engine," Int. J. energy Environ., vol. 2, no. 2, pp. 383–390, 2011.

[10] P. V. P. R. Dr.V. Naga Prasad Naidu, "Comparison and Evaluation of Performance and Emission Characteristics of Four Stroke Diesel Engine with Neem and Cotton Seed Bio Diesels," Int. J. Eng. Tech. Res., vol. 2, no. 2, 2014.

[11] A.Deep, A. Singh, V. Vibhanshu, A. Khandelwal, and N. Kumar, "Experimental investigation of orange peel oil methyl ester on single cylinder diesel engine," SAE Tech. Pap., vol. 6, 2013, doi: 10.4271/2013-24-0171.

[12] A.Deep, N. Kumar, M. Kumar, A. Singh, D. Gupta, and J. S. Patel, "Performance and emission studies of diesel engine fuelled with orange peel oil and n-butanol alcohol blends," SAE Tech. Pap., 2015, doi: 10.4271/2015-26-0049.

[13] A.J. Modi and D. Patel, "Experimental Study on LHR Diesel Engine Performance with Blends of Diesel and Neem Biodiesel Need of Low Heat Rejection Engine," 2015, doi: 10.4271/2015-26-0052.Copyright.

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