A REVIEW PAPER ON MORINGA OLEFERIA BIODIESEL AS ALTERNATIVE FUEL FOR CI ENGINE

[1]Pallavi S. Sarode , [2]Prof. S. S. Jawre , [3]Rushikesh A.Padwe
[1]M.Tech. Student, Department of Mechanical Engineering, SSPACE, Wardha, (MS).
[2]Assistant Professor, Department of Mechanical Engineering, SSPACE, Wardha, (MS).
[3]Research Scholar, RTMNU, Nagpur, (MS).
[1]pallavi1.sarode@gmail.com , [2]jawre.sandip@gmail.com, [3]rushi.padwe@gmail.com

ABSTRACT

The growth and development of any modern economy depends on the efficient supply of energy and the consumption pattern. Over the years, most economies depend on non-renewable sources of energy, such as petroleum and coal, as the major sources of energy. This increasing dependence on fossil fuel has led to a fast depletion of fossil fuel and environmental pollution. Biodiesel is an alternative to petroleum like conventional diesel fuel and is defined as the mono-alkyl esters of vegetable oils and animal fats. Biodiesel has been prepared from various vegetable oils, such as cotton seed, palm, peanut, soybean and sunflower oils as well as a variety of less common oil. Biodiesel was obtained by a transesterification procedure with methanol and an alkali catalyst at 60 °C and alcohol/oil ratio of 6:1. M. oleifera oil has a high content of oleic acid with saturated fatty acids comprising most of the remaining fatty acid profile. As a result, the biodiesel obtained from this oil exhibit a high cetane number of approximately 67, one of the highest found for a biodiesel fuel. Fuel properties of biodiesel derived from Moringa oleifera were determined and in light of biodiesel standards such as ASTM D 6751 and EN 14214. Overall, M. oleifera oil appears to be an acceptable feedstock for biodiesel.

Key Words: Moringa Oleifera, Moringa Oleifera biodiesel, Di-ethyl ether, Diesel, C I Engine, Performance parameters.

1. INTRODUCTION

Moringa oleifera is a fast-growing softwood tree indigenous to sub-Himalayan tracts of Northern India. It is one of 13 species within the same genus, and has become the most diffuse in tropical and subtropical areas at altitudes up to 2000 m Nowadays, M. oleifera is mainly found in the Middle East and Asian countries, but, due to its adaptability, it is spreading to other areas, especially tropical and subtropical lands affected by drought.

All parts of the Moringa tree such as leaves, seeds, roots and flowers are suitable for human and animal consumption. The leaves, which are rich in protein, minerals, β-carotene and antioxidant compounds, are used not only for human and animal nutrition but also in traditional medicine The seeds, instead, have attracted scientific interest as M. oleifera seed kernels contain a significant amount of oil with a high quality fatty acid composition. After refining, a notable resistance to oxidative degradation .The oil is known commercially as “Ben oil” or “Behen oil”. Its properties make it suitable for commercial purposes. Indeed, Moringa oil could be a good substitute for olive oil in the diet as well as for non food applications, like biodiesel, cosmetics, and a lubricant for fine machinery. Moreover, after oil extraction, the seed cake can be used in waste water treatment as a natural coagulant or as an organic fertilizer to improve agricultural productivity

With the increasing demand every day, the reserves of petroleum derived fuels are diminishing. The combustion of petroleum

products and non renewable fuels are considered harmful to the environment. Some factors like drain of petroleum derived fuel, global warming, and hike in the price of petroleum products have generated interest in searching alternative energy sources among the many researcher in the world.

In the last decade, many researchers worldwide have search for new alternative energy source that are available, technically feasible, economically viable and environmentally acceptable. Bio-diesel is considered one of the best alternative energy source. Because it can be blended with a diesel fuel at any proportion and it can be used in CI engine without any modification. It does not contain any harmful substance. Biodiesel can be obtain through transesterification of vegetable oil, animal fat, waste cooking oil. In the recent years lots of studies has been carried out in the search of alternative fuel from Palm oil, coconut oil, Cotton seed oil, Jatropa, Mahua, Castor oil, Moringa oil etc. The present study aims to evaluate the potential of Moringaoleifera biodiesel as a promising alternative that is easily available worldwide.This study determines the physiochemical properties of Moringaoleifera biodiesel and its 10%, 15% and 20% by-volume blends. Then, the performance of the 10%, 15% and 20% by-volume blends of Moringa oleifera biodiesel will assess in a diesel engine. The relevant fuel properties of Moringaoleifera biodiesel, such as engine performance will be investigated and compared with those of diesel fuel.

Moringa oleifera is the most widely cultivated species in the genus Moringa, the only genus in the plant family Moringaceae. Common names include moringa, drumstick tree and benoil tree or benzoil tree.

Moringaoleifera is a fast-growing, drought-resistant tree, native to the southern foothills of the Western Ghats in southwestern India, and widely cultivate in tropical and subtropical areas where its young seed pods and leaves are used as vegetables, and many parts of the tree are used in traditional herbal medicine. It can also be used for water purification and hand washing.

The moringa tree is grown mainly in semiarid, tropical, and subtropical areas, corresponding in the United States to USDA hardiness zones 9 and 10. It tolerates a wide range of soil conditions, but prefers a neutral to slightly acidic (pH 6.3 to 7.0), well-drained sandy or loamy soil. In water logged soil, the roots have a tendency to rot.Moringa is a sun and heat loving plant, thus doesnot tolerate freezing or frost. Moringa is particularly suitable for dry regions, as it can be grown using rainwater without expensive irrigation techniques.

In India the moringa is cultivated in large scale with an annual production of 1.1 to 1.3 million tonnes of fruits from an area of 380 km². Among Indian states, Andhra Pradesh leads in both area and production (156.65 km²) followed by Karnataka (102.8 km²) and Tamil Nadu (74.08 km²). Moringa is grown in home gardens in West Bengal and Odisha and as living fences in southern India and Thailand, where it is commonly sold in local markets.

2. REVIEW OF LITERATURE

1. S. Imtenan :-An investigation was conducted for the improvement of Palm biodiesel-diesel blend(P20) with the help of diethyl ether (DEE) which is commonly used as oxygenated cold starting fuel. The selected improved fuels were P15 D5 (80% Diesel + 15% Palm biodiesel + 5% DEE) and P10 D10 (80% Diesel + 10% Palm biodiesel + 10% DEE). Comparative improvement of the DEE blends than P20 was evaluated in the context of combustion and emission characteristics. Oxygenated nature of DEE reduced the CO and Smoke emissions on average 25% and 35.5% than P20. NO emission reduced for P10 D10 on average 20% than P20. However, the HC emission was higher for the DEE blends. Combustion parameters like in-cylinder pressure profiles and the heat release rates of the modified blends were also unlike the P20 blend due to number of dissimilarities of chemical properties.

2. M. Vijay Kumar: - The subsequent results and future scope research were able to be concluded from this literature work. An additive is playing a magnificent task in increasing the performance of the diesel engine, improving the combustion and reducing the emissions. The additives are blended with additives fueled in diesel engine and investigated the characteristics of performance, combustion and emissions and compared with the diesel fuel.

3. Uzama, D: - A blend of Moringa Oleifera oil with diesel was developed which was considered as an alternative fuel for diesel engines. The study considered the cost of transesterifying vegetable oil, is adds to the cost of blending biodiesel with diesel for a diesel engine. The results indicated M15, a blend of diesel with 15% Moringa Oleifera oil, as the most cost effective blend. The blending was done using a vortex mixer. The Moringa Oleifera seed oil was mechanically extracted by crushing the seed, followed by solvent extraction. The oil was filtered, degummed and then the physicochemical properties were determined. The fuel properties of the blend, M15, such as the kinematic viscosity, acid number, flash point, water and sediments were determined and compared with the standard specifications of biodiesel. The aim of the study was to develop a cost effective blend of fuel for diesel engines.

4. Harish Venu :-This work focuses on improving the performance of ternary blends (alcohol-biodiesel-diesel) by using DEE (diethyl ether) as ignition enhancer. The test fuels used for engine are diesel, a blend of ethanol (20%), biodiesel (40%), and diesel (40%) (denoted as EBD), blend of methanol (20%), biodiesel (40%),diesel (40%) (denoted as MBD), a blend of EBD with 5% Diethyl ether (denoted as EBD-5DEE), a blend of EBD with 10% Diethyl ether (denoted as EBD-10DEE) and a blend of MBD with 5% Diethyl ether (denoted as MBD-5DEE). MBD-10DEE blend was very viscous and the engine stopped working at higher engine loads. Hence, MBD, 10DEE was not considered among the test fuels for engine. The experimental results revealed that, the addition of DEE in EBD increased the combustion duration, cylinder pressure and BSFC with reduced NOx, PM and smoke emissions due to reduced ignition delay and higher latent heat evaporation.As DEE addition in MBD increased the PM, CO, CO2 and smoke emissions with lowered BSFC, cylinder pressure, heat release rate (HRR) and combustion duration. In comparison with EBD-10DEE, EBD-5DEE effectuated in higher cylinder pressure, HRR, EGT and NOx with lowered combustion duration, THC, CO2 and PM. This is form due to improved fuel atomization and enhanced fuel spray characteristics. The peak HRR of EBD is highest and that of MBD-5DEE is lowest. Overall, EBD-5DEE and MBD-5DEE reflects better engine performance, combustion and emission characteristics than EBD blend.

5. M. Mofijur biodiesel from CMOO was produced through transesterification process. Then the physico-chemical properties of biodiesel-diesel blending of 10-90% by volume are determined. It was found that the fuel properties such as KV, D, CV, CP, PP, CFPP and FP increases with blending ratio either linearly or exponentially as applicable & CV decreases with blending ratio. Finally, the empirical models of fuel properties are proposed. The outcome of the study will help to predict the properties of biodiesel-diesel blend at any blend ration which will be a substantial assistance to design the fuel system of biodiesel engine.

3. CONCLUSIONS

The paper presented an overview review the intrinsic properties qualities, extraction methods, and potential applications of Moringa oleifera seed oil (MSO) based biodiesel. These findings suggest that Moringa oleifera Methyl ester (MOME) biodiesel is an acceptable substitute for petroleum diesel. In comparison, MOME compared favorably against other biodiesel fuels derived from other vegetable oil. Furthermore, the fuel properties of MOME were observed to be within ASTM standard limits and comparable fatty acid profile with respect to other species except oleic acid (72.2%).

4. REFERENCES

[1] S. Imtenan , H.H. Masjuki , M. Varman, I.M. Rizwanul Fattah , H. Sajjad, M.I. Arbab, “Effect of n-butanol and diethyl ether as oxygenated additives on combustion–emission-performance characteristics of a multiple cylinder diesel engine fuelled with diesel–jatropha biodiesel blend”,Energy Conversion and Management 94 (2015) 84–94.

[2] M. Vijay Kumar, A. Veeresh Babu, P. Ravi Kumar, “The impacts on combustion, performance and emissions of biodiesel by using additives in direct injection diesel

engine", Alexandria Engineering Journal (2018) 57, 509–516.

[3] Uzama, D., Thomas, S.A.; Orishadipe, A.T, and Clement, O.A, "The Development of a Blend of Moringa Oleifera Oil with Diesel for Diesel Engines", Journal of Emerging Trends in Engineering and Applied Sciences (JETEAS) 2 (6): 999-1001.

[4] Harish Venu, Venkataramanan Madhavan, "Influence of diethyl ether (DEE) addition in ethanol-biodiesel-diesel (EBD) and methanol-biodiesel-diesel (MBD) blends in a diesel engine".

[5] M. Mofijura, H.H. Masjukib, M.A. Kalamb, M.G. Rasula, A.E. Atabanic, M.A. Hazrata,H.M. Mahmuduld, "Effect of Biodiesel-Diesel Blending on Physico-Chemical Properties of Biodiesel produced from Moringa oleifera",6th BSME International Conference on Thermal Engineering (ICTE 2014), Procedia Engineering 105 (2015) 665 – 669