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Full Length Article

COMPARISON ON THE PERFORMANCE AND EMISSION CHARACTERISTICS OF THE BLEND B25 OF PAPAYA OIL METHYL ESTER AND DELONIX REGIA OIL METHYL ESTER ON SINGLE CYLINDER DIESEL ENGINE

V. DINESH KUMAR[1], N. MANOHARAN[2]

[1]*Ph.D scholar, Department of Mechanical Engineering, AMET University, Chennai*

[2]*Co-Vice Chancellor, AMET University, Kanathur, Chennai*

***Corresponding Author**
jv.dhinesh@yahoo.com
(V.Dinesh kumar)
Tel.: +91 9092799160

ABSTRACT: The fluctuating prices of petroleum fossil fuels and their gradual depleting has made many researchers to focus on alternate fuel source. Biodiesels gained its better attention to be used as an alternate source of fuel. In general the biodiesels are easily renewable and they produce less hazardous exhaust emissions when used as a fuel. In this paper a comparison is made on the performance and emission characteristics of the blend B25 of papaya oil methyl ester (POME) and delonix regia oil methyl ester (DROME) under variable load condition from no load to full load condition in the incremental of 20% and at a constant speed of 1500 rpm.

Keywords: : performance and emission characteristics, POME and DROME

1 Introduction

In recent days the automobile engine has to satisfy the strict environmental constraints and the standards of fuel economy to meet the competitiveness of the global market. The Production of world's crude oil from its reserves is expected to be peak between the years 2010 and 2030. The demand of petroleum diesel fuel has grown from 39.81 million metric tons in the year 2001-2002 to 52.32 million metric tons in the year 2007-2008. Therefore it is very important to explore the feasibility for the substitution of diesel with a suitable alternate fuel, which can be produced within the country on a massive scale for commercial utilization (Murugu Mohan Kumar Kandasamy November 2009). Biofuel was discovered earlier before the discovery of fossil fuels, the exploration and imports of fossil fuels minimizes the production and use of biofuel in the later days. In 1893, Rudolf Diesel, the inventor of diesel engine tested his engine using vegetable oil. In 1800 the corn derived ethanol was first used to power early cars such as Henry Ford's model-T. In 1970, scientists discovered that the viscosity of vegetable oils could be reduced by simple chemical process and that it could perform as diesel fuel in modern engine.

2 Seed Collection and Oil Extraction

The seeds of papaya discarded as waste are collected from the nearby fruit shops and the seeds of delonix regia are collected from the road side trees. The collected seeds of papaya and delonix regia are winnowed and washed twice with clear water. The washed seeds are then shade dried for a period of three days. The oil is then extracted from the seeds of papaya and delonix regia with the help of rotary oil extractor available in the local market.

3 Transesterification

The oil thus extracted from the seeds of papaya and delonix regia are highly viscous and hence employed for the chemical process transesterification. The process of transesterification is carried out in a reactor in presence of

methanol as alcohol and sodium hydroxide as catalyst. The oil to methanol ratio is maintained as 1:6 to getter better yield and the reaction temperature is maintained at 60^0C under constant stirring with the help of magnetic stirrer. Methyl esters of papaya oil and delonix regia oil and glycerol are the end products of transesterification. The papaya oil methyl ester and delonix regia oil methyl ester thus obtained is removed from the bye product glycerol by gravity separation method.

4 Experimental Setup

The experimental investigation is carried out in a single cylinder water cooled diesel engine equipped with data acquisition system, exhaust gas analyzer and smoke meter.

5 Experimental Procedure

1. Before starting the engine check fuel level, water level and oil level
2. Allow the engine to run for a period of 10 minutes to get initial warm up
3. Initially with the blend B25 of papaya oil methyl ester as fuel, note down the performance and emission readings recorded by data acquisition system, exhaust gas analyzer and smoke meter
4. later with the blend B25 of delonix oil methyl ester as fuel, note down the performance and emission readings recorded by data acquisition system, exhaust gas analyzer and smoke meter
5. The performance and emission values of the blend B25 of papaya oil methyl ester and delonix regia oil methyl ester are compared and the optimum is suggested

6 Result and Discussion

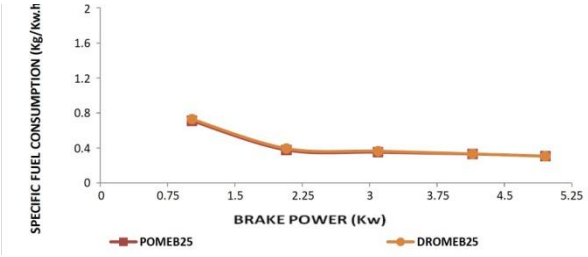

Figure 1.Variation of BSFC with BP

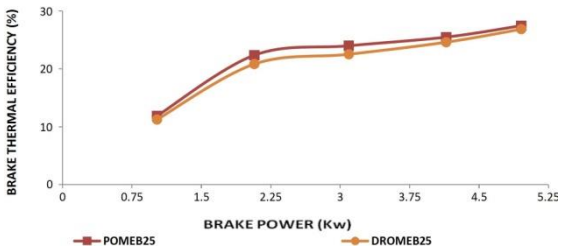

Figure 2.Variation of BTHE with BP

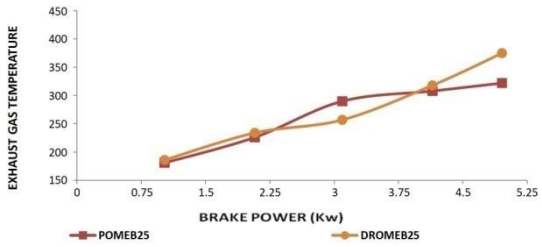

Figure 3.Variation of exhaust gas temperature with BP

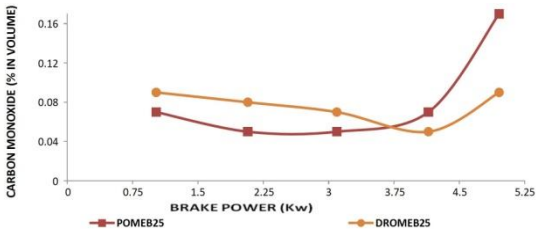

Figure 4.Variation of carbon monoxide emission with BP

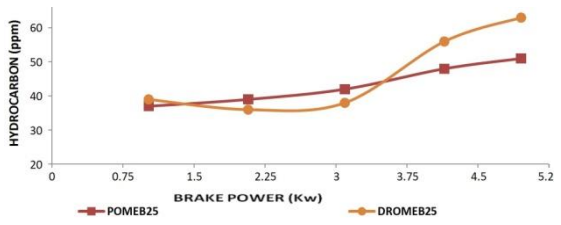

Figure 5.Variation of hydrocarbon emission with BP

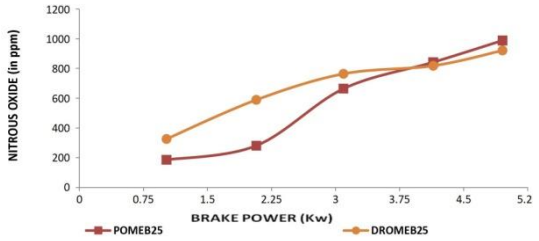

Figure 6.Variation of nitrous oxide emission with BP

From the results of experimental investigation it is concluded that the brake specific fuel consumption of the blend B25 of papaya oil methyl ester is found less when compared with the blend B25 of delonix regia oil methyl ester except at full load condition. The brake thermal efficiency of the blend B25 of papaya oil methyl ester is found high when compared with the blend B25 of delonix regia oil methyl ester except at load condition. Except at 60% load condition the blend B25 of papaya oil methyl ester recorded less exhaust gas temperature when compared with the blend B25 of delonix regia oil methyl ester. The emission of carbon monoxide for the blend B25 of papaya oil methyl ester is found less at low load condition and high at higher load condition when compared with the blend B25 of delonix regia oil methyl ester. Except at 40% and 60% load condition the blend B25 of papaya oil methyl ester recorded less rate of hydrocarbon emission when compared with the blend B25 of delonix regia oil methyl ester. The nitrous oxide emission of the blend B25 of papaya oil methyl ester is found less at low load conditions (20%, 40% and 60%) and found high at high load conditions (80% and 100%).

7 Conclusion

The performance and emission rate of the blend B25 of papaya oil methyl ester is found better when compared with the blend B25 of delonix regia oil methyl ester, especially at low load conditions. The blend B25 of papaya oil methyl ester is found optimum when compared with the blend B25 of delonix regia oil methyl ester.

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