Performance Analysis on Diesel Engine using Neem and Soya Bean Oil

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Abstract- A study on performance analysis on Diesel Engine using Neem and Soya bean oil was investigated. The experimental investigations were carried out in a single cylinder 4-stroke water cooled diesel engine developing 3.7 kW at 1500 RPM. The engine was coupled to a rope brake dynamometer to measure the output, fuel flow rates were timed with calibrated burette. The blends of B10, B15, and B20 of Methyl Ester of Neem and Soya bean oil - Diesel was prepared by volume basis and used for experimental purpose. The engine was loaded in steps of 1.5 kg, 3kg and 4.5 kg. The engine speed, fuel consumption were recorded. Various performance parameters were evaluated such as BTE, BSFC, and TFC. The Study showed that using 100% Diesel, the Brake Thermal Efficiency decreases compared to base engine where as Brake Specific fuel Consumption increases. B15 blend of Neem oil yield the best blend with diesel and had the better results with Brake Thermal Efficiency, Brake Specific Fuel Consumption.

Index Terms – BTE, BSFC, TFC, Neem, Soya bean-Diesel, Blends

INTRODUCTION

An alternative fuel to petro,diesel must be technically feasible, economically competitive, environmentally acceptable, and easily available. The current alternative diesel fuel can be termed biodiesel. Biodiesel can offer other benefits, including reduction of greenhouse gas emissions, regional development and social structure, especially to developing countries. However, for quantifying the effect of biodiesel it is important to take into account several other factors such as raw material, driving cycle, and vehicle technology. Use of biodiesel will allow a balance to be sought between agriculture, economic development, and the environment. Biodiesel methyl esters improve the lubrication properties of the diesel fuel blend. Biodiesel reduced long term engine wear in diesel engines. Biodiesel is a good lubricant (about 66% better than petro diesel).

The Pongamia, Jatropha, Soya bean and Neem based methyl esters can be directly used in Diesel engine without any engine modifications. Brake thermal efficiency of B10, B15 and B20 blends are better than Diesel and also when the engine tested at different brake load condition, Consequently this method was taken to investigate the effect on the stated parameters of various blends of Soya bean and Neem oil with Diesel.

1.1 Bio Diesel Raw materials

Typical raw materials of biodiesel are rapeseed oil, canola oil, soybean oil, sunflower oil and palm oil. Beef and sheep tallow and poultry oil from animal sources and cooking oil are also sources of raw materials. There are various other biodiesel sources: almond, andiroba (Carapaguianensis), babassu (Orbignia sp.), barley, camelina (Camelina sativa), coconut, copra, cumaru (Dipteryxodorata), Cynaracardunculus, fish oil, groundnut, Jatrophacurcas, karanja (Pongamiaglabra), laurel, Lesquerellafendleri, Madhucaindica, microalgae (Chlorella vulgaris), oat, piqui (Caryocar sp.), poppy seed, rice, rubber seed, sesame, sorghum, tobacco seed, and wheat. Various oils have been in use in different countries as raw materials for biodiesel production owing to its availability. Soybean oil is commonly used in United States and rapeseed oil is used in many European countries for biodiesel production, whereas, coconut oil and palm oils are used in Malaysia and Indonesia for biodiesel production . In India and South East Asia, the Jatropha tree (Jatrophacursas), Karanja (Pongamiapinnata), and Mahua (M. indica) is used as a significant fuel source.

1.2 Experimental setup

Make	Kirloskar
Stroke	4
No. of cylinder	1
Rated Speed (RPM)	1500
Bore (mm)	80
Stroke (mm)	110
Compression Ratio	16.5:1
Rated Power (kW)	3.7

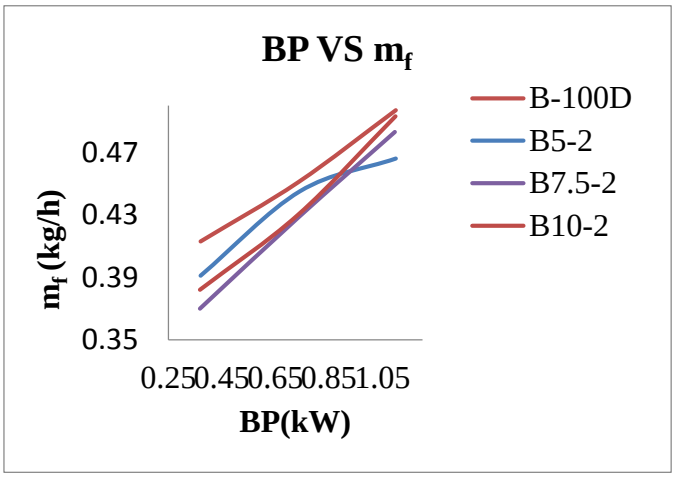
Table 1. Engine specification

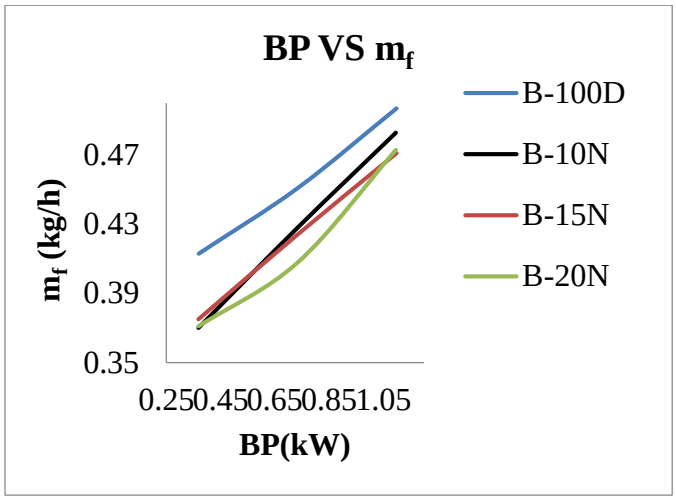
The experimental investigation carried out in a single cylinder 4-stroke water cooled diesel engine developing 3.7 kW at 1500 RPM was used. A rope brake dynamometer was used for loading the engine. The blends of B10, B15, and B20 of Methyl Ester of Neem and Soya bean-Diesel was prepared by volume basis and used for experimental purpose.

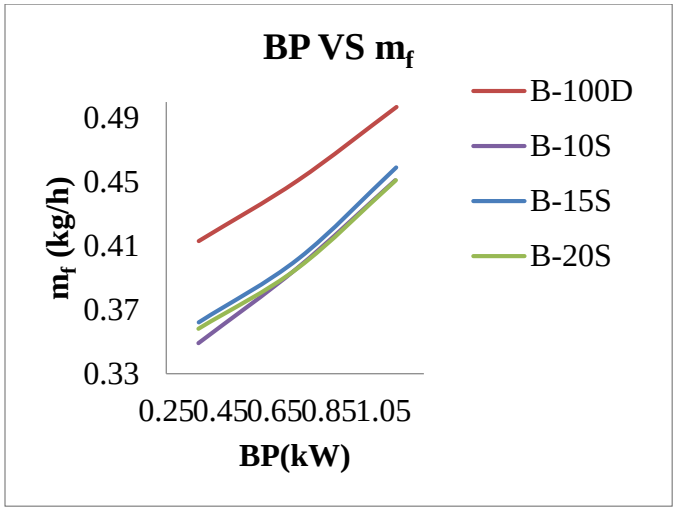
Figure 1. Engine setup

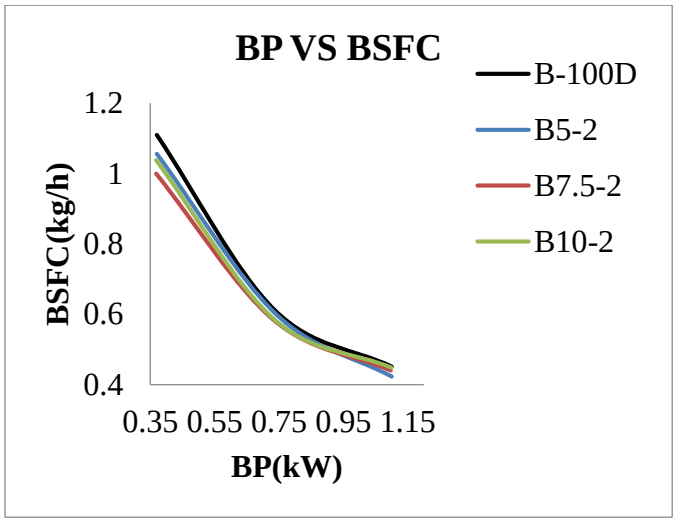
1.3 Results and Discussion

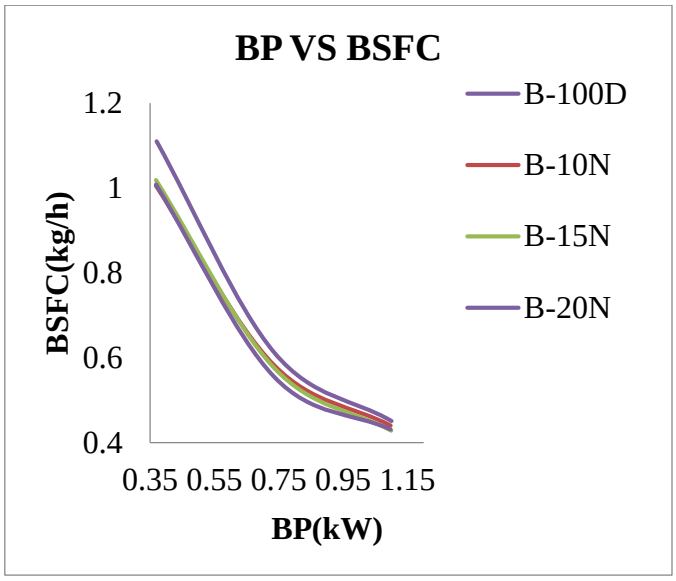
The blends of B10, B15, and B20 of Methyl Ester of Neem and Soya bean- Diesel was prepared by volume basis and used for experimental purpose. The engine was loaded in steps of 1.5, 3 and 4.5 kg. The engine was tested. The engine speed, fuel consumption was also recorded. Various performance parameters was evaluated such as brake thermal efficiency, BSFC, TFC were calculated.

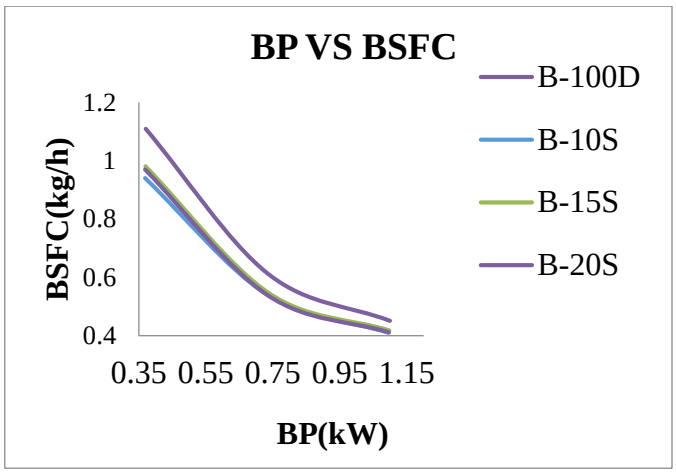


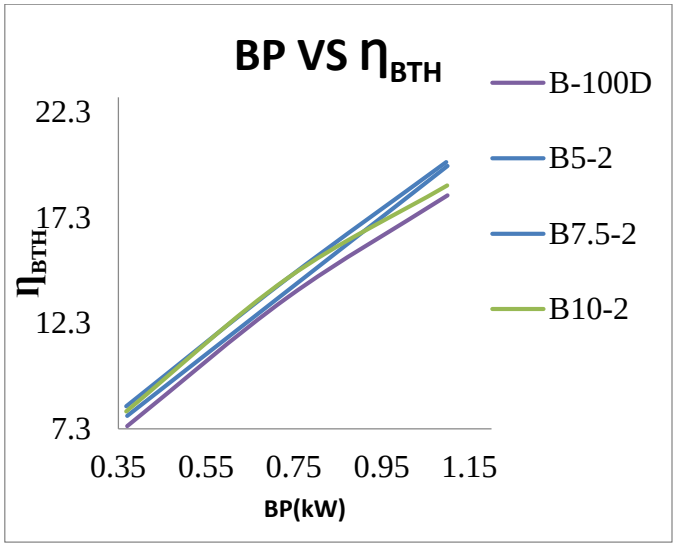


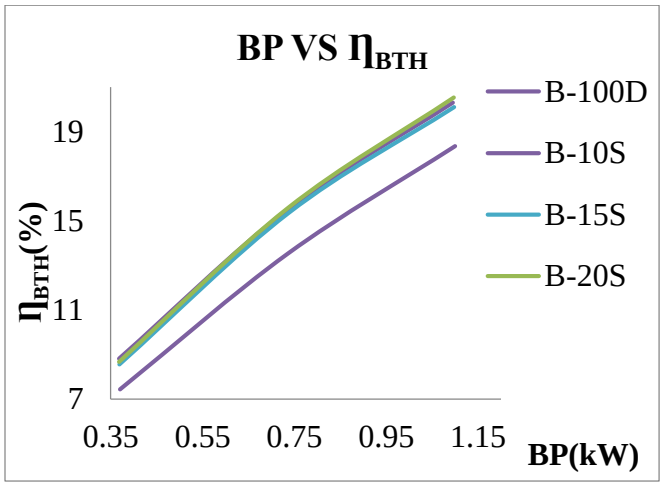


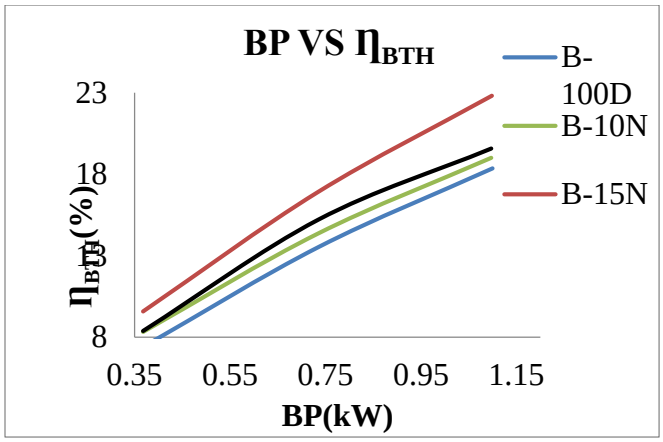












The study has shown that using B10 Blend, B15 Blend and B20 Blend, with the Brake Thermal Efficiency decreases whereas Brake Specific Fuel Consumption increases compared to base engine. In 100% Diesel and also in all the blends of Soya bean and Neem oil the Total Fuel consumption increases compared to naturally aspirated engine The BSFC value increases in all blends of Soya bean and Neem oil compared to normal diesel operation. The ISFC value increases in all blends of Soya Bean and Neem oil compared to normal diesel operation. The Total fuel consumption values are also increased in all blends of Neem and Soya Bean oil compared to normal diesel operation. When the percentage of Soya bean and Neem oil blended with Diesel decreases Specific Fuel Consumption, Total Fuel Consumption and Specific Energy Consumption

Best blend with EGR

B15 Neem Oil was found the best blend with diesel showed better results with Brake Thermal Efficiency, Brake Specific Fuel Consumption, Total Fuel Consumption when compared to other blends.

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