Performance and Emission analysis of Diesel by Adding Jamun and Orange Peel Powder

G. Prabhakara Ramesh, J. Tharun, Mareddy Harish Reddy, Vinit Kumar

***Abstract*— In the present scenario of the energy resources available, it is understandable that the non-renewable fuel resources like crude oil are meeting their ends. However, the transformation of the automobiles and other machineries for using renewable resources is a tedious task and almost impossible. So, there is a need for prolonging the period of the availability of non-renewable fuel resources by opting for alternate fuels like Bio-Diesels. This can be done by increasing fuel efficiency and reducing the level of pollutants in the emissions. In this present work, we have concentrated on these Bio-Diesels by adopting two naturally available products Jamun seed and orange peel. After clearly examining the anti-oxidant properties of various natural products we predicted Syzygium_cumin which is also called as jamun fruit and orange peel to have better anti-oxidant properties. Both orange peel and jamun fruit being anti-oxidants, we aimed this paper to decrease the oxide formation levels of the emissions by mixing these two with the diesel. However, few other peculiar results can also be expected.**

***Index Terms*— Syzygium cumin, Jamun seed, Orange peel, Oxide formation.**

I. INTRODUCTION

Internal combustion engines which uses diesel as the fuel has a wide range importance in transportation as well as industrial sectors. This is because of the high efficiency of diesel engines when compared with petrol engines. The gaseous pollutants such as NO, CO, CO_2, HC etc are emitted by these engines which lead to the global warming. So, there is a need to deplete or control the level of pollutants that are emitted. Hence, there is a necessity to develop alternate fuels preferably bio diesels as they are proved to be eco-friendly. Many researchers have worked in this domain of alternate fuels [1-8]. These works resulted in increase in the emission of pollutants. Some studies report varying or opposite results [9]. So, clearly we can see the increase of formation of oxides in the Bio-diesels emission, which clearly shows the need for adding anti-oxidant to the bio-diesel.

Orange fruits are largely produced in countries such as

Brazil, USA, India, China etc. India is third largest country in Producing oranges with annual production 6 million tones. Here the fruit flesh (carpel) is used and the peel is disposed as waste. Researchers have proved that the orange peel can be in used in production of methane as well as a quality fertilizer [10]. The chemical constituents of orange peel are alkaloids, saponins, terpene s, resins, flavanoids, tannins, phenols and sugars but do not contain coumarins and steroids. It has also proved to be a very good anti-oxidant. The orange peel powder diesel solution is proved to be used as an alternative fuel for C.I engine [11-12].

Jamun fruit has also proved to be a very good anti-oxidant [13-14]. Jamun fruit can be generally found in India, Bangladesh, Indonesia, Sri lanka, Nepal, Pakistan. It consists of elements such as Calcium (ca), Magnesium (mg), Iron (Fe), Phosphorous (P), Potassium (K) and Sodium (Na).

Clearly examining these anti-oxidant properties, we decided to use both the Jamun seed powder and Orange peel powder in different proportions in this paper.

II. BLEND PREPARATION

The jamun seed powder was procured in fine grain size; it was filtered with the help of fine mesh in order to remove unwanted impurities. The filtered powder was segregated based on ratios mixing with diesel. The segregated mixtures were added to their corresponding volume of diesel in order to deduce the bio-diesel samples. The table 1 shows the ratios of the samples that were tested in the test engine.

A. Blend Properties

The main properties that have to be considered for a fuel to be used in internal combustion engine are Calorific value, Fire point, Flash point and Density the observations on the properties are made and the following values are concluded in table 2.

Table 1

Sample name	Jamun %	Orange peel %	Diesel %
Sample A	**20**	**0**	**80**
Sample B	**20**	**20**	**60**

Table 2

Test parameters	Sample A	Sample B
Flash point in ^{0}C	158	166
Fire point in ^{0}C	182	178

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Calorific Value	43252	42404
Density	925	924

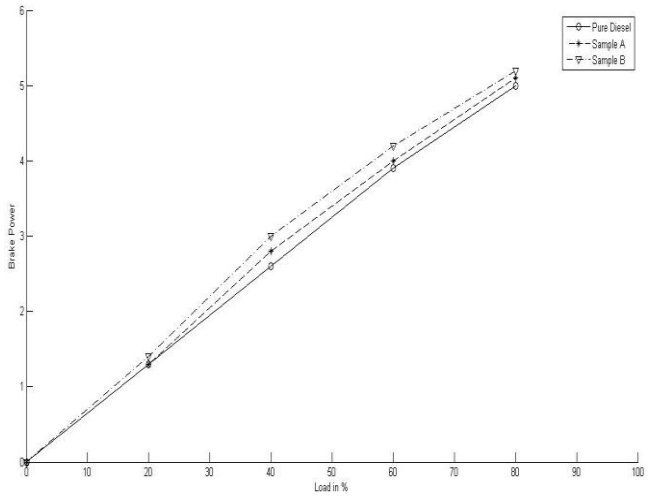

Figure 1

III. PERFORMANCE ANALYSIS

The performance test is carried out in a twin cylinder diesel engine and the parameters like Fuel consumption, Brake power, Fuel power, Brake thermal efficiency are calculated. And graphs are plotted between load and above parameters respectively.

Type	Four stroke twin cylinder water cooled engine
Number of strokes per cycle	2
Type of cooling	Water cooling
Fuel used	Bio-diesel
Speed	1500 rpm
Power	6 kva
Bore	87.5 mm
Stroke	110 mm

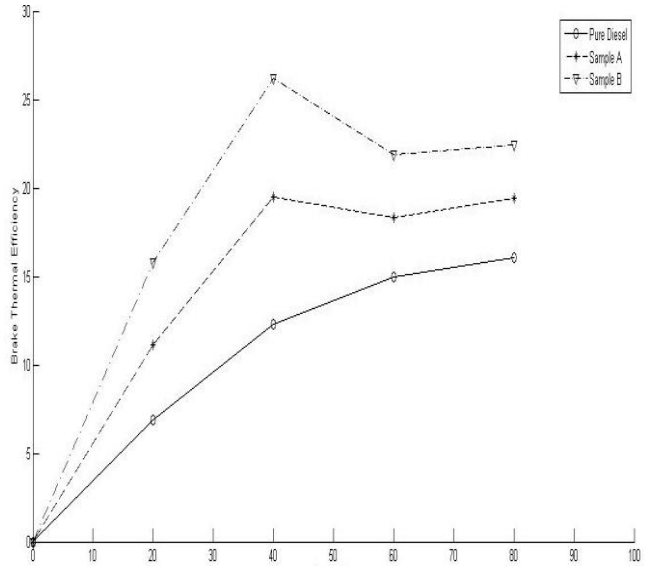

Figure 2

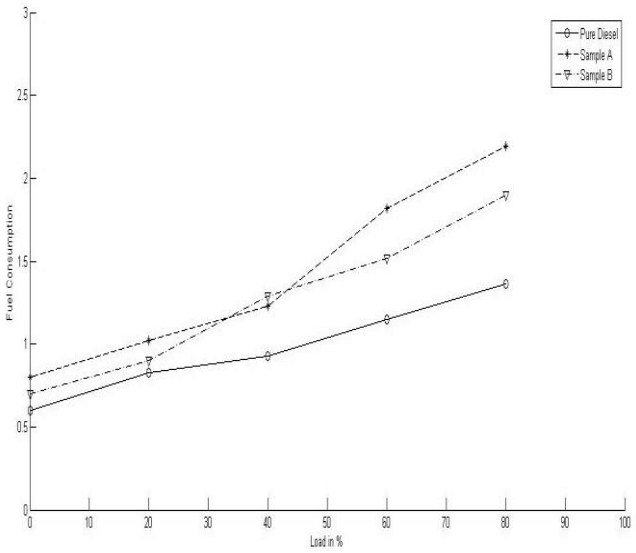

Figure 3

Figure 1-4 gives a comparison of three different samples with various parameters plotted against the load individually. Those parameters include Brake Power, Brake thermal Efficiency, Fuel consumption and Fuel power respectively. The three samples are pure Diesel, Sample A and Sample B. From the graphs it can be concluded that both the samples exhibited the same performance nearly. The fuel consumption is very high when compared with the normal Diesel. However, the Brake thermal Efficiency proved to be extremely high when compared with the normal diesel.

IV. EMISSION ANALYSIS

The emission analysis is carried out in a twin cylinder diesel engine and the exhaust gases emitted like CO, CO_2, NO, HC hexane percentage volume levels are calculated**.**

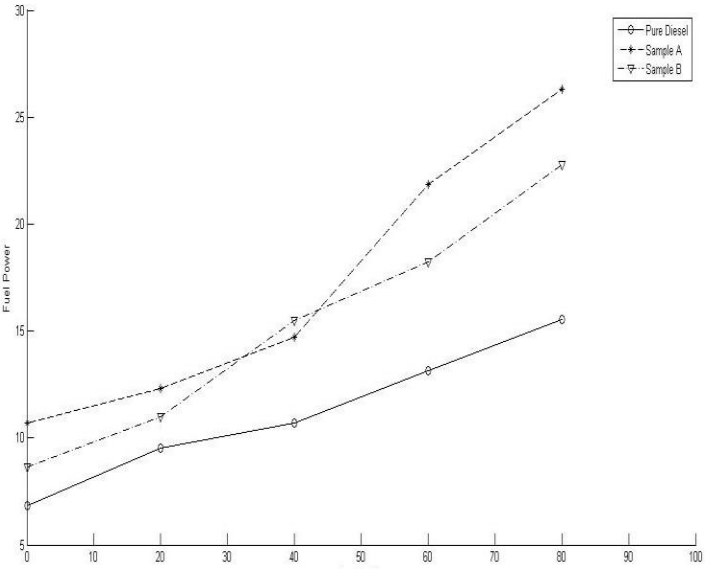

Figure 4

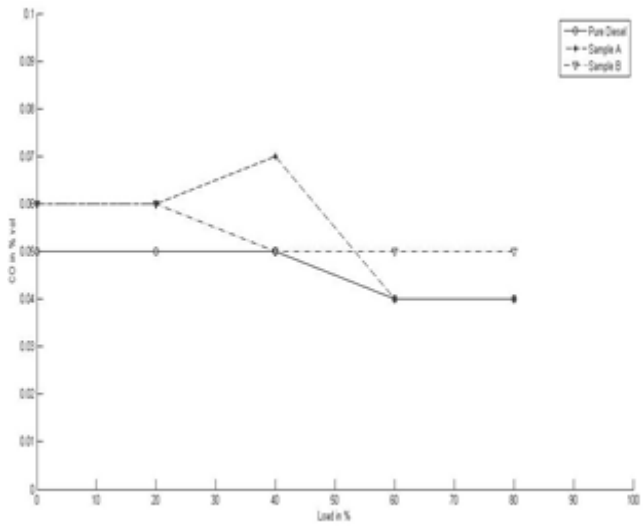

Figure 5

Figure 5-8 shows the comparison of three different samples and the emitted gases variations with respect to the load. The analysis had been taken for the major pollutants like Carbon monoxide, Carbon dioxide, HC Hexane and Nitric Oxide respectively. The results tend to give absolutely negative results. Sample A gives a positive run for HC Hexane whereas the sample B gives high emission of all the pollutants indicating the ineffectiveness of the anti- oxidant properties of both the orange peel and jamun seed. The emissions of Carbon dioxide and nitric oxide are very high with respect to the normal diesel.

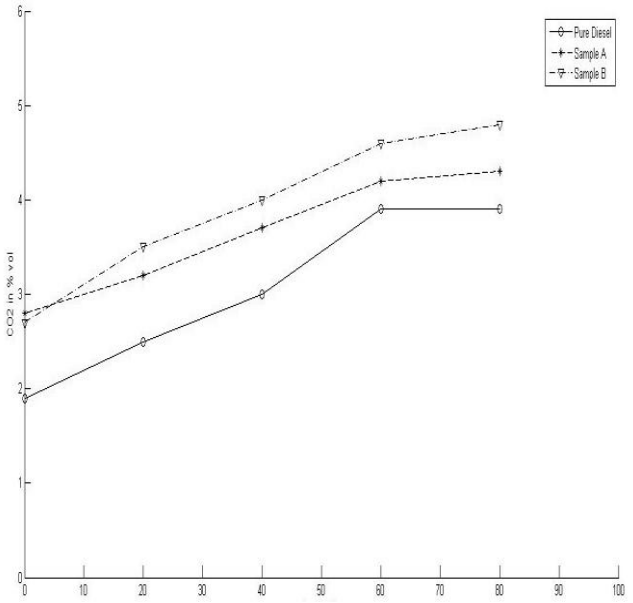

Figure 6

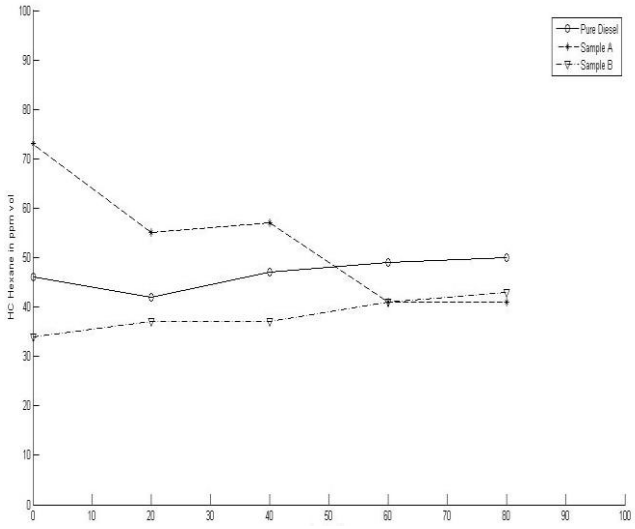

Figure 7

V. CONCLUSION

From the experiments done few conclusions can be made.

1) The anti-oxidant properties of both the orange peel and jamun seed are ineffective to control the oxide formation of the emission gases.
2) The oxide formation in the emission gases had increased tremendously particularly for Carbon dioxide and Nitric oxide proving that it cannot reduce the oxide formation in a small fraction also.
3) The performance analysis is up to the mark by giving a different result. Though the fuel consumption is very high, proportionately the brake thermal efficiency.

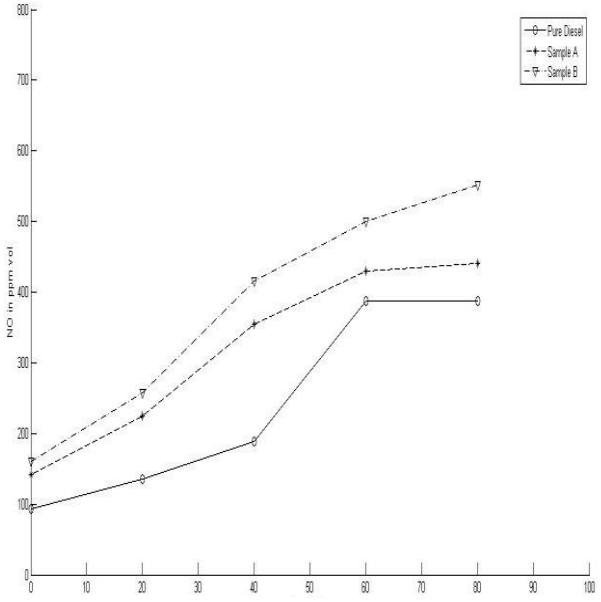

Figure 8

4) It can be concluded that the anti-oxidant properties of Orange peel and Jamun seed or fruit when mixed together cannot reduce the oxide formation of the emissions.

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