

# Performance Evaluation of Turmeric Leaf Oil as an Alternative fuel

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**Abstract** – This paper describes an experimental study about performance evaluation of turmeric leaf oil used as an alternative fuel. Turmeric leaves are the waste product for farmers after removing turmeric plant. From that wasted leaves oil is extracted by hydro distillation process. The turmeric leaves have combustible properties. In a study carried Mr. Nilesh Mundle in 2011, he indicated presence of terpenes in turmeric leaf oil. Extracted oil was used to run four stroke engines. Engine eliminates environment harmful products with turmeric leaf oil as compared to petrol and diesel. In this work turmeric leaf oil is used in three different blends with petrol and diesel, and tested on a multi fuel engine from which the emissions are compared with each other as well as BS III and BS IV standards. It has been concluded that the blend of 30% turmeric leaf oil with diesel and 20% of turmeric leaf oil with petrol is optimum with hazardous pollutants.

**Key Words:** Turmeric Leaf Oil, Multi fuel Engine, Emission, Performance, Alternative Fuel, Blends

## 1. INTRODUCTION

The world energy demands has for the last two decades witnessed uncertainties in two dimensions. The price of conventional fossil fuel is too high and has added burden on economy of importing nations and the combustion of fossil fuels is main culprit in increasing the global warming and depletion of conventional sources are also cases of concern and have prompted research world-wide into alternative energy sources for internal combustion engines. Bio fuels appear to be a potential alternative “greener” energy substitute for fossil fuels.

Search for alternative is continuing all over the world because of finite petroleum resources. The development of an alternative fuels and renewable energy sources for transportation has become critical in the national effort towards maximum self-reliance the corner stone of our energy security strategy.

The production of bio fuels from various food sources result in many problems such as, increase in food prices and world-wide food crisis. These problems forced the researchers to look for the new sources of alternative fuels

and these new alternatives are known as second generation bio fuels. This project work is all about exploring the turmeric leaf oil as an alternative fuel. The rhizomes of turmeric are used in many ways but the leaves of turmeric are having no use so far. However in this work we are proposing to use the blends of oil with petrol and diesel in their respective engines and find an optimum blend with low emissions.

## 2. OBJECTIVES

Conventional energy sources such as oil, coal, natural gas are limited that are expected not to last for an extended period. As world reserves of fossil fuels & raw material are limited but it has stimulated active research interest in nonpolluting and non-petroleum fuels. Diesel and petrol engines are the major sources of power generation & transportation hence both are being used extensively but due to gradual impact of environmental pollution there is an urgent need for suitable alternate fuels for use in SI and CI engines without any modification.

## 3. PROPERTIES

**Table-1:** Comparison of properties of turmeric leaf oil with diesel and petrol

Properties	Diesel	Turmeric leaf oil	Petrol
<b>Chemical formula</b>	C <sub>12</sub> H <sub>23</sub>	C <sub>21</sub> H <sub>20</sub> O <sub>6</sub>	C <sub>6-97</sub> H <sub>14</sub>
<b>Molecular weight</b>	196.23	368.379	106.22
<b>Density (m<sup>3</sup>/kg) at 20°C</b>	842	925	750
<b>Kinematic viscosity (mm<sup>2</sup>/s) at 40°C</b>	2.5	7.82	4.94
<b>Calorific value (kJ/kg)</b>	44000	43672	42600
<b>Flash point (°C)</b>	70	102	95-100

## 4. EXTRACTION OF OIL

To evaluate the performance of oil, the oil must be extracted from turmeric leaves. This oil will be blended with petrol and diesel on a percentile basis. The oil needs

to be extracted by hydro-distillation process or by steam distillation process. Three different percent of oil will be used with petrol and diesel that is 50%, 30% and 20%. All these blends will be used as a fuel on the multi-fuel engine and the emission and performance will be recorded.

The readings that are recorded will be compared with each other and blend with optimum performance and minimum emission will be selected. An alternative fuel is always useful for automobiles but the blend which gives optimum performance with minimum emission is something that needs to be studied.

### 5. EXPERIMENTAL SETUP

A Single cylinder, 4-stroke, water cooled multi-fuel engine is used for evaluation of the performance and emission characteristics of turmeric leaf oil blending with diesel and petrol, which is uses as alternative fuel diesel as well as petrol engine. The performances of turmeric leaf oil blending with diesel as well as petrol at different loading condition were evaluated. The exhaust gas coming out from the engine is first passed to the calorimeter and then to the exhaust gas analyzer.

The multi-fuel engine having 87.5mm bore diameter and 110mm stroke length. The engine works at compression ratio adjustable from 5:1 to 11:1 for petrol and 12:1 to 20:1 for diesel and it is extendible up to 22:1 when using bio-diesel blends. The exhaust gas analyzer is used to measure exhaust gas mass flow rate. An Eddy Current Dynamometer is used. Maximum power for dynamometer is 25 B.H.P. @4200-10000 RPM and maximum torque is 41.8 N-m @2700-4200 RPM.

### 6. RESULTS

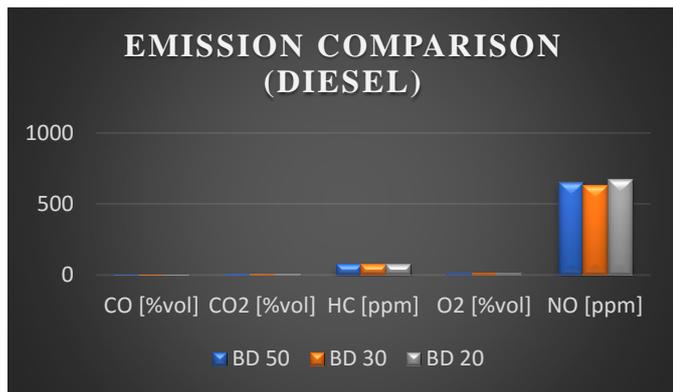


Chart-1: EMISSION COMPARISON (DIESEL)

The above graph shows the comparison of three blends of Turmeric leaf oil with different proportions of Diesel and the sample with lowest emission is BD 30 i.e. 30% Turmeric leaf oil and 70% Diesel.

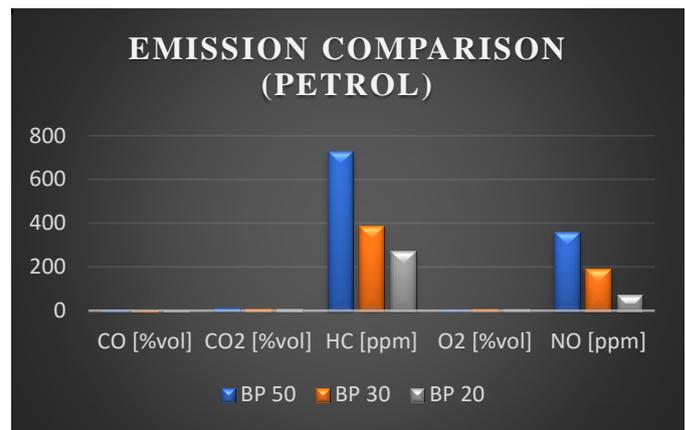


Chart-2: EMISSION COMPARISON (PETROL)

The above graph shows the comparison of three blends of Turmeric leaf oil with different proportions of Petrol and the sample with lowest emission is BD 20 i.e. 20% Turmeric leaf oil & 80% Petrol.

### 7. CONCLUSIONS

In this report, innovative idea to make Turmeric leaf oil as a Universal secondary fuel is discussed and three different blends are used to find a final optimum blend which gives high performance and low emissions. Turmeric leaf oil is extracted from turmeric leaves which is a waste product for majority of the farmers.

In this research work of using Turmeric leaf oil as secondary fuel for both the Petrol and Diesel engines, it is seen that the BD 30 blend i.e. 30% oil and 70% diesel is giving good performance with lowest emissions as compared to other blends of BD 20 & BD 50. Also the same way it is seen that that the BP 20 blend i.e. 20% oil and 80% petrol is giving good performance characteristics in a petrol engine and as well has low exhaust emissions readings.

Also in this study the dependency on fossil fuels can be reduced and thus help reduce the global crisis slowly but steadily. With India being a nation of producing turmeric on larger scale the oil from leaves will be helpful in saving the foreign currency. The extraction process when carried on a larger scale will give more pure and large amount of oil can be extracted in a more economical way.

As seen from this research work we can get more effective about the fuel used in our automobiles and with the increasing standards of emission norms the BD 30 & BP 20 blends can be potential winner in automobile fuel market.

## 8. ACKNOWLEDGEMENT

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