

Emission characteristics of a diesel engine using different blends of simarouba glauca biodiesel

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Abstract

The exhaust gas from automobiles is a prime cause for air pollution in recent times. The use of fossil fuels is one of the major contributing factors to this. Therefore substantial research is going on for replacing the fossil fuels. The use of biodiesel which is a liquid alternative fuel is a nice attempt in this context. It has become very popular as it can be prepared from both edible and nonedible oil. The use of nonedible oils such as karanja, Jatropha, Kusuma, Mahua, Neem etc., to produce biodiesel mainly in tropical country like India is an added advantage due to their wide availability. Several research works is going on for use of the biodiesel to run internal combustion engine and subsequent analysis of engine emission levels. In the present work, a diesel engine is run by using Simarouba glauca biodiesel and engine emission is analysed. The amount of exhaust gases present in engine emission are found to be reduced significantly that supports its use as an alternative fuel.

Keywords-Emissions, Diesel Engine, Blends, Simarouba, Biodiesel

I. INTRODUCTION

The extensive use of petroleum fuels in automobile is the main reason behind air pollution in recent times. The emissions from the automobiles consisting of hazardous gases like Carbon Monoxide (CO), Carbon Dioxide (CO₂), Oxides of Nitrogen (NO_x), and Hydrocarbon (HC). This emission from automobiles is the reason behind global warming and possesses threat for the mankind. Hence use of alternate fuel is a wise option as the emission comes out as a result of burning these fuels is very less as compared to petroleum fuels. Biodiesel which is a liquid alternative fuel is an excellent option to be used as fuel in automobiles. It is alkyl esters of long chain fatty acid and having properties resembles with diesel. Moreover it can be used in automobile engines without or very little modification in engine. This biodiesel can be obtained from large variety of plants which are the sources of edible and non-edible oils. The non-edible oils, such as Jatropha, Microalgae, Neem, Karanja, Rubber seed, Mahua, Silk cotton tree, etc., are easily available in developing countries and are very economical comparable to edible oils. Simarouba glauca is a flowering tree normally found in tropical countries. Simarouba oil is potential edible oil which is prepared from its seeds as a result of crushing in mills. It has wide variety of industrial and medicinal use.

Several works have been carried out by different researchers on different biodiesels regarding their property and emission analysis. Madiwale and Bhojwani [1] presented an overview on production, properties, performance and emission analysis of different biodiesels. Ismail et al. [2] worked on the production of biodiesel from simarouba oil and its application in running a diesel engine. However they have not studied their emission characteristics. Prasada Rao and Appa Rao [3] carried out their research on performance and emission analysis of diesel engine using mahua biodiesel. Padhi and Singh [4] carried out their work towards the optimization of biodiesel from mahua oil. Rathore and Pandey [5] carried out experimental work on diesel engine performance and emission with mixed biofuel of karanja and coconut. Mahalingam et al. [6] did their search on emission analysis by mixing alcohol with mahua oil and reported a reduction in CO, HC and NO_x. Jena et al. [7] carried out their investigation on biodiesel preparation from mahua and simarouba oil. Ogunkunle and Ahmed [8] experimentally evaluated the performance of a diesel engine using sand apple (Parinari polyandra) oil biodiesel. Padhi [9] carried out the performance analysis of a variable compression ratio diesel engine using castor biodiesel. In the present work, Biodiesel was prepared from simarouba oil by esterification followed by transesterification process. Then different blends of biodiesel were prepared by mixing with diesel in required proportions. The biodiesel