ABSTRACT

The main objective of the present work is to compare the performance, emission and combustion of biodiesel derived from Sterculia foetida oil with diesel. The higher fuel consumption for B100 and the non-linearity of the fuel consumption with increasing loads indicate the need for further research. The results of the fuel analysis indicate poor mixing and possible separation of the results, which may also attribute to inconsistent Sterculia foetida oil results. The performance parameters evaluated were: brake thermal efficiency, brake specific fuel consumption and power output. The emission parameters such as oxides of nitrogen and smoke opacity with the different ratio of biodiesel are compared with the base line results. The different properties of Sterculia foetida oil were within acceptable ASTM limits.

Experiments were carried out on a Kirloskar make, four-stroke, single cylinder CI engine. AVL make eddy-current dynamometer and an online data acquisition system were used to load the engine. The maximum brake thermal efficiency is reduced for biodiesel–fuelled engine by 1.3% compared with the engine fuelled by diesel, due to the lower energy content and lower calorific value of biodiesel. B25 with MGT produced much closer thermal efficiency of 0.3% variation which occurred with diesel fuel brake thermal efficiency, due to complete combustion by means of polarized biofuel.
At maximum determined brake power, NO$_X$ for biodiesel–fuelled engine increased by 60 ppm compared with engine fuelled by diesel. NO$_X$ was decreased by 440 ppm for B25 with EGR compared with engine fuelled by diesel. NO$_X$ further reduced by 460 ppm for B25 with MGT due to complete combustion.

In the full–load condition, the smoke opacity for biodiesel–fuelled engine decreased by 10 % compared with the engine fuelled by diesel due to the sterculia foetida oil that has more oxygen molecules. The smoke opacity was decreased by 5 % for B25 with EGR compared with the engine fuelled by diesel. The smoke opacity further reduced by 13 % for B25 with MGT compared with that of diesel at the maximum determined brake power.

The results from the experiments suggest that sterculia foetida oil could be a good substitute to diesel fuel in the diesel engine in the near future as far as decentralized energy production is concerned. In view of comparable engine performance and reduction in most of the engine emission, it can be concluded that biodiesel derived from sterculia foetida oil and its blends could be used in a conventional diesel engine without any modification. The same biofuel blend with EGR could be used to reduce NOx further to make the engine eco – friendly. Biofuel with magnetic fuel conditioner replaced EGR and it is proved to be an economical model for the conventional engine it is capable of meeting the emission norms and indicates high performance without requiring any change in the engine configuration.