

“Experimental Investigation of Performance and Combustion of vegetable Oils and Blends as Fuel in a Single Cylinder DIC Engine”

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One of the renewable fuel sources for diesel engine is vegetable oil, which can be used with or without modification in engine hardware/ molecular structure of the fuel. Vegetable oils reduce net CO₂ emissions, which is a significant concern of present era.

One of the biggest challenge in utilization of straight vegetable oils (SVO) as fuel in the engines is its viscosity, which can be reduced by blending these with mineral diesel or by preheating the oil before in-cylinder injection. For present study, two non-edible vegetable oils; Jatropha and Karanja are utilized in a direct injection compression ignition engine, which is typically used in agricultural sector, with and without preheating of SVO and its blends. Performance emissions and combustion experiments were conducted for unheated fuel blends at optimum fuel injection pressure (200 bars), and for preheated fuel blends for four different injection pressures (180, 200, 220 and 240 bars). Performance, emission and combustion investigations were also done for straight vegetable oils for all fuel injection pressures. During experiments, many technical issues were faced which are reported. It was observed that preheated oil blends show improved performance (lower brake specific fuel consumption (BSFC), lower brake specific energy consumption (BSEC), lower exhaust gas temperature (EGT) and high brake thermal efficiency (BTE)) for Jatropha lower blends and Karanja oil (100%). Low emissions (CO₂, CO and smoke opacity) and high NO emissions were found for higher injector pressure for Karanja oil. Jatropha oil and its blends show shorter ignition delay than Karanja oil and its blends however longer combustion duration. Karanja oil blends show higher heat release and low combustion duration for preheated fuel at fuel injection pressure of 200 bars. Overall, SVO and blends can be successfully used as diesel engine fuel with additional hardware and change in maintenance schedule, which can be derived after conducting long-duration tests.