

Abstract

With the gradual depletion of petroleum and environmental degradation, intensive research activity has been addressed to the utilization of alternative fuels in internal combustion engines. In the present work, an experimental investigation is carried out to study the effect of eucalyptus biodiesel and natural gas under dual fuel combustion mode on the performance and the exhaust emissions of a single cylinder DI diesel engine. The natural gas (NG) is inducted with the intake air through the inlet manifold. The liquid pilot fuel (eucalyptus biodiesel or diesel fuel) is injected into the combustion chamber to cover approximately 10% of the maximum power output. Then, keeping constant the pilot fuel flow rate, the power output is further increased using only natural gas. The combustion characteristics (cylinder pressure, ignition delay and heat release rate), performance and exhaust emissions of the dual fuel mode (NG–diesel fuel and NG–biodiesel) are compared with those of conventional diesel engine mode at various load conditions. The combustion analysis has shown that biodiesel as pilot fuel exhibits similar pressure–time history, with highest peak, as diesel fuel in conventional and dual fuel modes. The performance and pollutant emission results show that, compared to diesel fuel in dual fuel mode, the use of eucalyptus biodiesel as pilot fuel reduces the high emission levels of unburned hydrocarbon (HC), carbon monoxide (CO) and carbon dioxide (CO₂) particularly at high engine loads. However this is accompanied by an increase in the brake specific fuel consumption (BSFC) and the nitrogen oxide (NO_x) emissions, which can be explained by the lower calorific value and the oxygen presence in the molecule of the eucalyptus biodiesel, respectively