



Feasibility of tea tree oil blended with diethyl ether and diesel as fuel for diesel engine

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ABSTRACT

In this study, the combustion, performance, and emission characteristics of a multi-cylinder diesel engine using tea tree oil (TTO) blended with diethyl ether (DEE) and diesel are investigated. The blends considered are virgin diesel, B20 (80% vol. diesel +15% vol. TTO +5 vol% DEE), B30 (70% vol. diesel +22.5% vol. TTO +7.5 vol% DEE), and B40 (60% vol. diesel +30% vol. TTO +10 vol% DEE). The results show that the cetane numbers of B20, B30, and B40 blends are four to five times higher than that of TTO. Compared with diesel, those values are lower by 5.46%, 8.2%, and 10.9%, respectively. At 75% engine load, the brake power generated by B40 is comparable to that of virgin diesel, whereas those generated by B30 and B20 are 2.2% and 3.8% lower, respectively. Similarly, the average thermal efficiencies of B40, B30, and B20 are 2%, 7.4%, and 11.3% lower than that of virgin diesel, respectively. Meanwhile, all the TTO blends emit equal amounts of carbon dioxide, whereas their carbon monoxide and hydrocarbon emissions reduced significantly by 17%–35% and 13%–25%, respectively. However, the TTO blends emit 11%–19% more nitrogen oxide than diesel. It is demonstrated that B40 may be a viable replacement for virgin diesel that affords comparable performance and reduced emissions.

Abbreviations

BD	Biodiesel
BTE	Brake thermal efficiency (%)
CN	Cetane number
CO	Carbon monoxide
CO ₂	Carbon dioxide
CV	Calorific value (MJ/kg)
DE	Diesel engine
DEE	Diethyl ether

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