

## **Evaluation of suitability of biodiesel extracted from different plant oil sources for agricultural tractors**

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### **Abstract**

Due to unstable oil prices in the world, many countries have been looking for alternative energy sources to substitute petroleum oil. Biodiesel or Methyl ester, produced from transesterification of plant oil or animal fat is one of the alternative fuels for diesel engine. In Sri Lanka, there are different sources of oil for biodiesel production.

The objective of the research was to conduct the comparative assessment of the biodiesel with the mineral diesel (Lanka Auto diesel). The biodiesels were produced from the plant oil, extracted from the Jatropha, Palm and Used Scraped Coconut with transesterification process using Biodiesel plant. The single cylinder diesel engine was run by using Jatropha Methyl Ester (JME), Palm Methyl Ester (PME), Coconut Methyl Ester (CME) and mineral diesel (MD). Performance related characters such as Torque ( $\tau$ ), Break Power ( $P_B$ ), Specific Fuel Consumption (SFC), and thermal efficiency were measured by using Prony Break dynamometer coupled to the engine and Kinematic viscosity, Specific gravity, Flash point, Heating value, distillation curve, pH, Copper strip corrosion, CO and NO<sub>x</sub> in exhaust gas were measured in different fuels.

Torque was reduced by 17.5% in PME and JME; it was significantly different from mineral diesel. Torque of the CME was not significantly different from MD at 5% significant level. The maximum torque had been developed by CME at 2000rpm.  $P_B$  was positively correlated with the engine rpm in CME.  $P_B$  of the CME was not significantly different from MD at 5% significant level but JME and PME were significantly different from MD. SFC of the CME and PME were not significantly different from MD, but SFC of the JME was significantly different from MD. Thermal efficiency of the CME and JME were significantly different from MD but PME was not significantly different from MD. Also thermal efficiency of the PME was not significantly different from JME.

The JME and PME have higher kinematic viscosity compared to CME and Mineral diesel. Specific gravity of the Biodiesel was higher than mineral diesel. pH values of

the biodiesels were in base region, and Mineral diesel was in acidic region. The higher heating value was observed in mineral diesel than in biodiesel. Other properties of the biodiesel, such as, Flash point, distillation curve, copper strip corrossions fulfilled the ASTM standards. The CO was reduced by around 45% in all biodiesels, but NO<sub>x</sub> was increased by 10%.

Performance characters and fuel property of the JME, CME, and PME were not largely different from the standard condition and CO emission was comparatively better than mineral diesel. Therefore CME, JME and PME can be used as alternative fuels for tractor engine under local condition.

**Keywords:** Biodiesel, Transesterification, Engine Performance, Break Power, Gas Emission