

# Mitigation of NO<sub>x</sub> emission by monophenolic antioxidants blended in POME biodiesel blends

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## ABSTRACT

Biodiesel is among the solutions to substitute petroleum-based fuel. However, the autoxidation ability of biodiesel, which results in degradation of the existing oxygen, has delayed its use on a global level. A potential solution to this problem is the addition of antioxidant additives. Palm oil methyl ester (POME) is the most popular biodiesel in Malaysia. Diesel 80%+POME 20% (B20) was added with two types of monophenolic antioxidant additives, which were butylated hydroxytoluene and butylated hydroxyanisole, at 1000 ppm and 1500 ppm concentrations, respectively, to examine their effects on combustion characteristics, engine performances and exhaust emissions. Hielscher UP400S ultrasonic emulsifier was used to prepare the fuel blends at 20% of the maximum stirring speed. Yanmar TF120M single-cylinder diesel engine was employed at a constant speed of 1800 rpm with various engine loads. The results showed that B20 and antioxidant-treated B20 produced a mean increase in brake specific fuel consumption of 8.33%–23.27% and reduced brake thermal efficiency by a mean that was 8.40%–24.95% greater than that of diesel fuel. Both antioxidants reduced nitrogen oxide emission by a mean of 12.92%–30.54%, compared to B20.

**KEYWORDS:** diesel fuel; biodiesel; POME; antioxidant; engine performance; emission

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