

## Documents

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**Performance and Emission Analysis of Biodiesel Blends in a Low Heat Rejection Engine with an Antioxidant Additive: An Experimental Study**  
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### Abstract

The rapid depletion of crude oil and environmental degradation necessitate the search for alternative fuel sources for internal combustion engines. Biodiesel is a promising alternative fuel for compression ignition (CI) engines due to its heat content and combustion properties. Biodiesel blends are used in various vehicles and equipment, such as cars, trucks, buses, off-road vehicles, and oil furnaces. Biodiesel can reduce emissions from CI engines by up to 75% and improve engine durability due to its high lubricity. However, biodiesel has some drawbacks, including a performance reduction and increased nitrogen oxide emissions. Therefore, this study aims to investigate using environmentally available biodiesel in a low-heat rejection engine and an antioxidant additive to enhance the performance and reduce nitrogen oxide emissions. India currently has several biodiesel sources, including mango seed oil, mahua oil, and pongamia oil, which can be effectively utilized in CI engines by adding l-ascorbic acid. The experimental work involves a single-cylinder 4-stroke water-cooled direct injection CI engine with a power output of 5.2 kW. The engine's cylinder head, piston head, and valves are coated with lanthanum oxide using the plasma spray coating technique, with a thickness of 0.5 mm. The coated and uncoated engines are tested with different proportions of mahua oil, mango seed oil, and pongamia oil. The results show that the engine's performance is significantly improved compared to the baseline engine at all loads. Additionally, these biodiesels exhibit a notable reduction in nitrogen oxide emissions when combined with l-ascorbic acid. © 2023 The Authors. Published by American Chemical Society.

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