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Determination of the effect of biodiesel use on power take-off performance characteristics of an agricultural tractor in a test laboratory

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Abstract: Tractor performance tests conducted under laboratory test conditions are important because these tests determine the performance characteristics used to compare strengths and weaknesses of tractors. The objective of this study was to determine the effect of diesel fuel (B0) and 3 different biodiesel blends made of canola oil (B10, B20, B30) on tractor power take-off (PTO) performance characteristics. Performance characteristics studied were PTO power, engine torque, engine fuel consumption, and specific fuel consumption on an agricultural tractor (Massey Ferguson 3056 2WD) at the test laboratory of the Directorate of Agricultural Machinery Test Center (TAMTEST), Ministry of Agriculture and Rural Affairs, Ankara, Turkey. The maximum PTO power (32.35 ± 0.06 kW), the minimum specific fuel consumption (288.72 ± 0.11 g Kw⁻¹ h⁻¹), and the minimum fuel consumption (11.08 ± 0.13 L h⁻¹) were achieved by using B20 at an engine speed of 2100 min⁻¹. The nominal engine speed for petrodiesel was 2200 min⁻¹, whereas the greatest engine power was accomplished at 2100 min⁻¹ for all biodiesel blends. Even though 2%-4% reduction was obtained in fuel consumption by using biodiesel blends at 2100 min⁻¹, the mean fuel consumption was statistically insignificant ($P > 0.05$), whereas average fuel consumption was higher with petrodiesel at 2200 min⁻¹ ($P < 0.05$). It was concluded that B20 (20% biodiesel + 80% petrodiesel) could be a more efficient alternative to petrodiesel fuel.

Key words: Tractor, power take-off, performance characteristics, biodiesel

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