PROCEEDINGS OF ABSTRACS III. INTERNATIONAL BIOLOGICAL & LIFE SCIENCES CONGRESS BIOLIC 2025

16-19 NOVEMBER, 2025

Megasaray Westbeach Hotel, Antalya, Turkey

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Trakya University
International Researchers Association

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WELCOME NOTES

You are welcome to our III. International Biological and Life Sciences Congress (BIOLIC) which is organized by Trakya University and the International Researchers Association. The congress will be held in Megasaray Westbeach Hotel, Antalya, Turkey, on 16-19 November, 2025 will be normal as well as with online participation.

Our meeting is a premier international science, technology and business forum focusing on Agriculture, Biology and Life Sciences. The program will include oral talks by invited prominent scientists and oral and e poster presentations by participants in selected topics. The Congress is intended that the subjects to be kept broad in order to provide opportunity to the science and research community to present their works as oral or poster presentations in a friendly environment of Antalya, Turkey to share their knowledge and experience and benefit from each other.

The first meeting has been organized in Lviv, Ukraine in 2019 by Trakya University, with part of more than 200 participants from all over the world with 376 scientific papers. In the 2nd congress, there were 68 orals and 64 poster presentation in the congress both joining and presenting normal and online with 101 participants from 22 different countries from the world. The 3rd congress will gather scientists from around the world, and present their recent achievements. The attendees will have ample opportunities for learning, reconnecting, engaging and networking with colleagues from academia and industry as well as meeting with various exhibitors.

As there have been many different scientific meetings around the world, we aimed to bring three different communities together, namely science, research and private investment groups considering practical information sharing that is of value for researchers and scientists from around the world, in a friendly environment of Antalya, Turkey to share their knowledge and experience and benefit from each other as well as prospects to overcome the limitation for sustainable crop production to feed the world.

There are record participation in our 3rd BIOLIC Congress with 600 papers contributed by about 1400 authors from 41 different countries from the world. 233 oral and 205 poster presentations existed in the congress program both joining and presenting normal and online presentations by 188 normal and 144 online as total by 322 participants.

With care for our nature and environment, we aim the green congress, meaning that as little as possible papers will be used. Abstract book is published in electronic book and is distributed to the participants by e mail for online participants. All the e-posters are prepared in electronic form and then submit to via the congress e mail and exhibited in electronical poster boards as well as in online e poster hall in our web page during the congress.

Congress Topics:

Agriculture, Forestry, Life Sciences, Agricultural Engineering, Aquaculture and Biosystems, Animal Science, Biomedical science, Biochemistry and Molecular Biology, Biology, Bioengineering, Biomaterials, Biomechanics, Biophysics, Bioscience, Biotechnology, Botany, Chemistry, Chemical Engineering, Earth Sciences, Environmental Science, Food Science, Genetics and Human Genetics, Medical Science, Machinery, Pharmaceutical Sciences, Physics, Soil Science.

We would like to thank all of you for joining this congress and we would like to give also special thanks to our sponsors and collaborators for giving us a big support to organize this event.

Prof Dr Yalcin KAYA
Head of the Organizing Committee

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CONTENTS

PERFORMANCE AND EMISSION CHARACTERISTICS OF A SINGLE-CYLINDER DIESEL ENGINE FUELED WITH A 10% OLIVE POMACE OIL–DIESEL BLEND

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ABSTRACT

This study investigates the effects of using a 10% olive pomace oil–diesel blend on the performance and emission characteristics of a single-cylinder diesel engine under varying load conditions. The blend was prepared by volumetrically mixing 10% olive pomace oil with standard diesel fuel. The engine was tested under four different load conditions: 25%, 50%, 75%, and 100% of full load capacity.The experimental results revealed that the engine power output decreased by a maximum of only 0.1 kW across all load conditions when compared to standard diesel. This minor reduction indicates that the blend maintains comparable engine performance. Fuel consumption increased by a maximum of 16 ml/h, which is a relatively small difference and within acceptable limits for alternative fuel use. In terms of emissions, carbon monoxide (CO) levels decreased slightly—by approximately 0.01%—across all load conditions, suggesting improved combustion efficiency. However, the reduction in CO was minimal. On the other hand, nitrogen oxides (NO_x) emissions showed an increase, particularly at higher loads. A maximum increase of 160 ppm was recorded at 75% load, while other conditions showed moderate increases ranging from 55 to 65 ppm. Despite the slight rise in NO_x emissions, the findings suggest that blending olive pomace oil with diesel at a 10% volumetric ratio can be a viable and sustainable alternative fuel option for diesel engines, with minimal impact on performance and moderate changes in emissions.

Keywords: Energy**,** Olive pomace oil, Engine performance, Exhaust emissions

INTRODUCTION

The depletion of fossil fuel reserves and growing environmental concerns have increasingly driven interest toward renewable and sustainable energy sources. In this context, biodiesel fuels are extensively investigated as alternative fuels for diesel engines due to their renewability and eco-friendly properties. Particularly, the use of agricultural waste oils, such as olive pomace oil, for biodiesel production offers significant economic and ecological advantages [1]. Although biodiesel is one of the most widely researched biofuels for diesel engines, it is commonly produced from edible vegetable oils, which raises concerns over the

competition between food and energy production. This situation has led to debates on whether agricultural land should be used for energy crops or food cultivation. In this regard, waste oils that do not compete directly with the food sector, such as olive pomace oil, have emerged as promising alternative raw materials for biodiesel production. Therefore, olive pomace, a by-product of olive oil processing, is increasingly being considered a valuable green energy source for biodiesel production [2]. In the past, these wastes received limited attention due to their negative environmental impacts, high disposal costs, and the geographical dispersion of olive oil mills [3–4]. A review of the literature shows that olive pomace methyl ester has been tested both in pure form and in various blends with diesel fuel in a Perkins direct injection diesel engine, and the results were compared with conventional fossil diesel. The tests were conducted under full load and at various engine speeds. For each fuel type, detailed performance characteristics were analyzed. In the exergy analyses, the operating conditions where the engine delivered maximum power were considered for each fuel. The results showed that all fuel types exhibited similar performance characteristics. When pure biodiesel was used, engine power decreased by approximately 5.6%, while fuel consumption increased by up to 7% [5]. Another study on olive pomace biodiesel not only examined exhaust emissions but also proposed a methodology based on multi-response optimization. Using blends of olive pomace and diesel, the variation in engine characteristics was investigated under three different load conditions (50%, 75%, and 100%). The study found a direct correlation between emissions and engine load [6]. In a different study, olive pomace waste, generated after olive oil production, was subjected to transesterification to obtain olive pomace methyl ester. This biodiesel was blended with standard diesel at volumetric ratios of 5% (B5), 7% (B7), and 10% (B10), and tested for power, torque, and specific fuel consumption in comparison to pure diesel. According to the experimental data, the B5 blend yielded the most favorable results, providing values closest to those of conventional diesel in terms of power, torque, and fuel consumption. It was also observed that increasing the blend ratio beyond 7% negatively affected the engine's performance characteristics [7]. Although there are several studies focusing on the use of various biofuels in internal combustion engines, most remain limited to the evaluation of basic engine parameters when comparing biodiesel with diesel fuel [8-10]. In another study, biodiesel obtained from waste olive oil through transesterification was blended volumetrically at 30% with conventional diesel and tested in a single-cylinder direct injection diesel engine. The study investigated the effects of this blend on engine performance and emissions. Results indicated that the thermal efficiency of biodiesel was 1% to 5% lower than that of diesel. However, carbon monoxide (CO) emissions decreased by 37.5%, while carbon dioxide (CO_2) and nitrogen oxides (NO_x) emissions increased compared to diesel fuel [11].

In our study, the performance and emission characteristics of diesel fuel blended with 10% olive pomace oil were comprehensively examined using a single-cylinder diesel engine. The results indicated that the biodiesel blend led to a slight reduction in engine power, minor increases in fuel consumption, a decrease in CO emissions, and load-dependent increases in NO_x emissions. These findings highlight the potential of olive pomace oil-based biodiesel as a sustainable alternative fuel for diesel engines and emphasize the importance of emission control strategies during biodiesel utilization.

MATERIALS AND METHODS

In this study, the experimental investigations were carried out on a single-cylinder, four-stroke diesel engine with a power output of 11.5 kW, located at the R&D center. A general view of the test engine is presented in Figure 1, while its technical specifications are detailed in Table 1. Two types of test fuels were prepared in separate stages. The first test fuel was 100%

conventional diesel, which is widely used in the country. The second test fuel was prepared by blending 90% conventional diesel with 10% biodiesel derived from olive pomace oil. Olive pomace oil, obtained from olive processing residues, is considered a waste biomass source and is suitable for evaluation in alternative energy production. Before initiating the experiments, the engine was run without load until it reached its steady-state operating temperature (82°C) as specified by the manufacturer. Once the target temperature was reached, the first test commenced using 100% diesel fuel. At this stage, the engine was subjected to incremental loads of 25%, 50%, 75%, and 100%, during which the engine output power, fuel consumption, and exhaust gas emissions were measured. Subsequently, the same experimental procedure was repeated using the biodiesel blend containing 90% diesel and 10% olive pomace biodiesel. The same parameters were recorded at each load level, and all data were meticulously logged. In addition, exhaust gas emissions were monitored at regular intervals simultaneously with engine performance tests. Upon completion of all experiments, the collected data were used to generate comparative graphs illustrating the changes in engine power, specific fuel consumption, and emission characteristics, and detailed evaluations were conducted accordingly.

Figure 1. Experimental Diesel Engine Used in the Study

Table 1: *Technical Specifications of The Test Engine*

General Characteristics	**Technical Specifications**
Engine type	Erin Motor Base Model
Number of Valves	4
Continuous Power (kw/rpm)	11.5 / 1500
Bore (mm)	108
Stroke (mm)	127
Combustion System	Direct Injection
Compression Ratio	14.6 : 1
Engine Cooling	Water
Weight (kg)	157

RESULTS AND DISCUSSION

The experimental data obtained from this study reveal the effects of a 10% olive pomace oil-based biodiesel blend on engine performance and emission parameters. As seen in the engine power output graphs, the slight reduction in power observed with the biodiesel blend indicates that there is no significant change in the operational characteristics of the engine. This is an important finding that supports the viability of olive pomace oil as an additive to diesel fuel. Fuel consumption graphs show a slight increase in consumption when using the biodiesel blend. This increase may be attributed to the lower energy density of biodiesel compared to standard diesel fuel, and is consistent with similar findings reported in the literature. In terms of emission analysis, the reduction in carbon monoxide (CO) levels suggests that the combustion efficiency was partially improved with the addition of biodiesel.

On the other hand, a notable increase in nitrogen oxides (NO_x) emissions was observed, particularly at higher engine loads. This indicates that biodiesel may raise combustion temperatures, which in turn promotes NO_x formation.The trends presented in the graphs highlight both the performance and environmental potential of olive pomace-based biodiesel, while also emphasizing the need to evaluate additional emission control techniques, especially to mitigate NO_x emissions. Overall, the results demonstrate that biodiesel can be considered a sustainable alternative fuel, and future studies are recommended to focus on emission balancing strategies to optimize both environmental and performance outcomes.

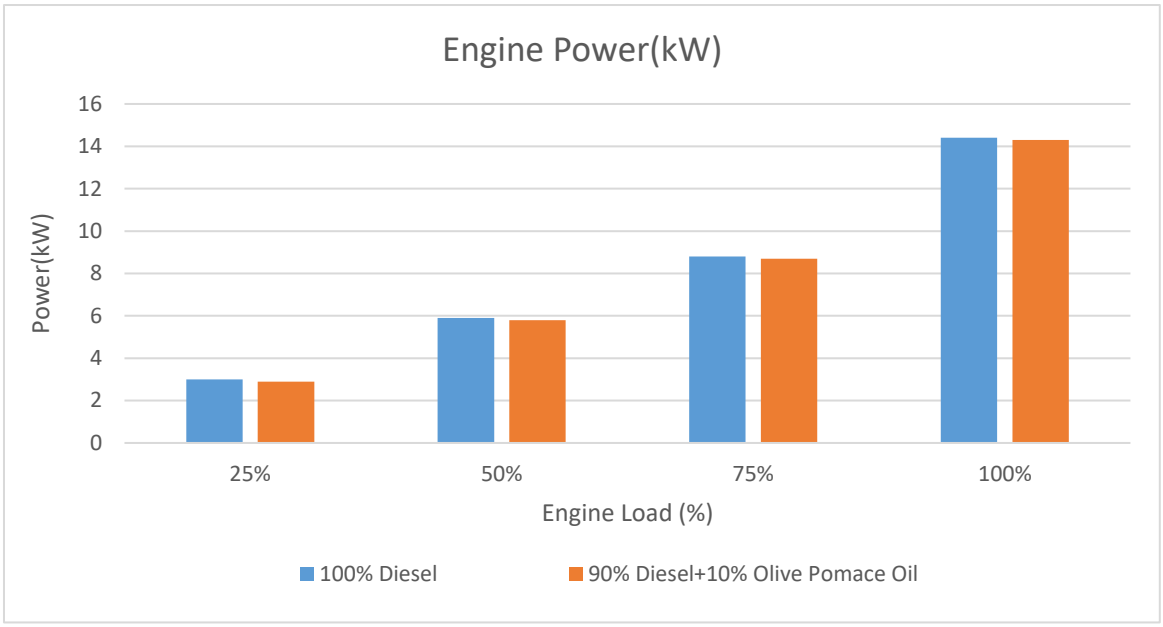

Figure 2. Comparison of Engine Power Output for Different Fuel Types

As shown in Figure 2, a consistent power reduction of approximately 0.1 kW was observed at all engine load levels when using the biodiesel blend. This slight decrease can be attributed to the lower energy density of biodiesel compared to standard diesel fuel. However, the minimal loss in power indicates that the biodiesel blend largely preserves engine performance and that the addition of olive pomace oil does not cause any significant negative impact on engine operating efficiency. This finding serves as an important indication of the practical applicability of biodiesel in diesel engines.

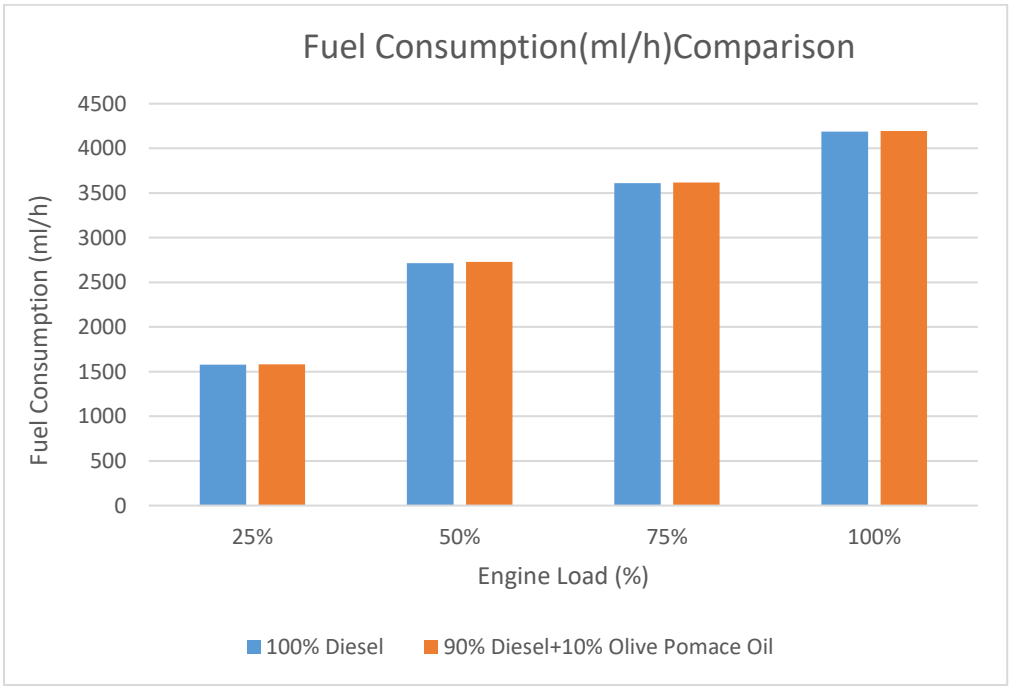

Figure 3. Engine Fuel Consumption for Various Fuel Types

As illustrated in Figure 3, slight increases in fuel consumption were observed at various engine load levels when using the biodiesel blend. Depending on the applied load, the increase in fuel consumption ranged from a minimum of 2 ml to a maximum of 16 ml.This indicates that the biodiesel blend causes a limited and load-proportional increase in fuel consumption under different operating conditions.

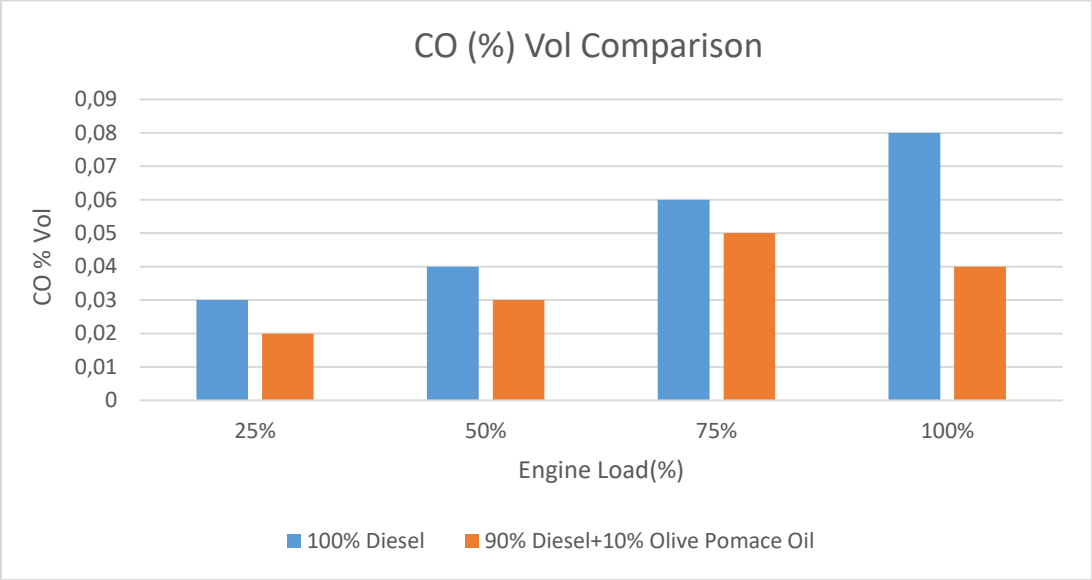

Figure 4. Carbon Monoxide(CO) Emission Levels for Different Fuel Types

As shown in Figure 4, the effect of biodiesel usage on carbon monoxide (CO) emissions was examined, and a very slight reduction of approximately 0.01% in CO levels was observed under 25%, 50%, and 75% load conditions. This minor decrease may be attributed to the cleaner combustion characteristics of biodiesel, which promote more complete fuel burning. Interestingly, under 100% load, a more significant reduction of around 4% in CO emissions was recorded. This suggests that biodiesel enhances combustion efficiency more noticeably at higher loads. Overall, the addition of biodiesel improves the environmental performance of the engine by reducing CO emissions, demonstrating its environmental benefits as an alternative fuel.

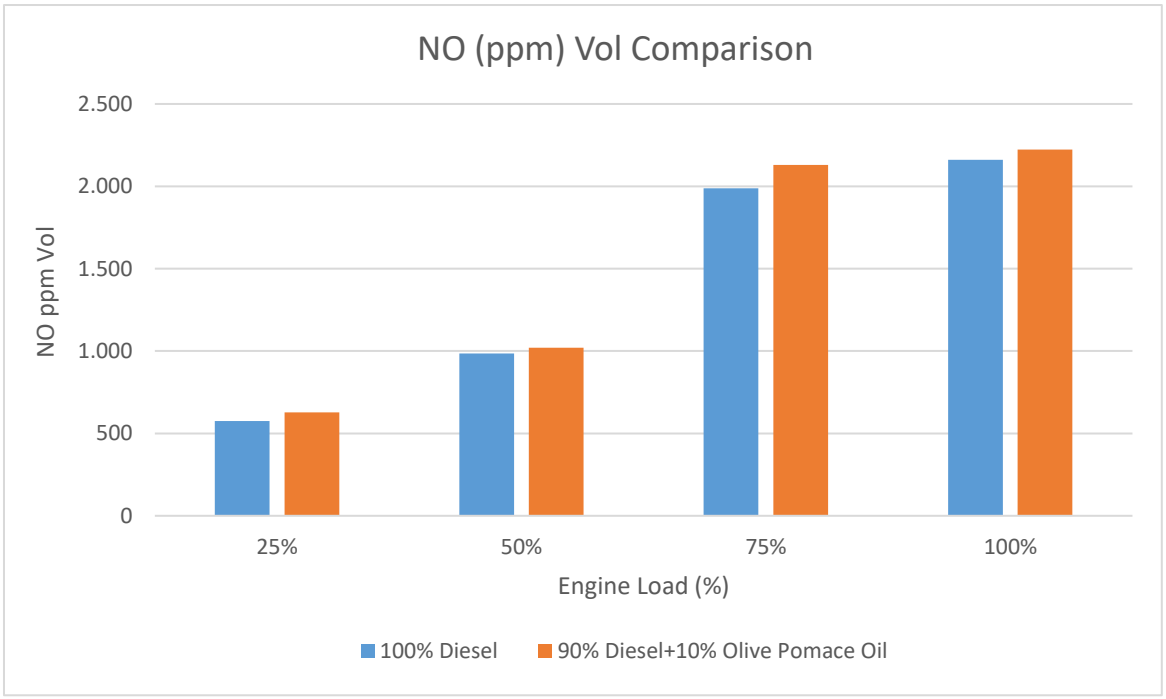

Figure 5. Nitrogen Oxide (NOx) Emissions for Different Fuel Types

As seen in Figure 5, the use of biodiesel under varying engine load levels resulted in increases in nitrogen oxides (NO_x) emissions, ranging from a minimum of 36 ppm to a maximum of 142 ppm. These increases can be explained by the fact that biodiesel tends to raise combustion temperatures, which in turn promotes NO_x formation. The notable rise in NO_x levels, particularly under high load conditions, is a critical issue that must be carefully considered when assessing the environmental impact of biodiesel use. Therefore, additional measures or technological improvements are required to effectively control NO_x emissions in engines operating on biodiesel.

CONCLUSION

In this study, the effects of a diesel–biodiesel blend containing 10% olive pomace oil on the performance and emission characteristics of a single-cylinder diesel engine were investigated. The test results indicated that the blend caused only a very limited decrease of 0.1 kW in engine power, and a maximum increase of 16 ml/h in fuel consumption. These changes demonstrate that the overall engine performance was largely preserved.Emission analysis showed an approximately 0.01% reduction in carbon monoxide (CO) emissions, indicating a slight improvement in combustion quality. However, a notable increase in nitrogen oxides (NO_x) emissions was observed, especially under higher load conditions (particularly at 75% load), reaching up to 160 ppm.

In conclusion, the biodiesel blend containing 10% olive pomace oil can be considered a technically viable alternative fuel for diesel engines. Nevertheless, the observed increase in NO_x emissions highlights the need for implementing appropriate emission control strategies when using such biofuels**.**

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