IOCBI 2026 Conference

The 1st International Online Conference on Biology

10–12 February 2026 | Online

MDPI

In Vivo Assessment of *Rosmarinus officinalis* and *Olea europaea* Leaf Extracts Enriched in Rosmarinic Acid and Oleuropein as Modulators of Metabolic Inflammation

Fatima Zohra ALACHAHER 1, Djamil KROUF 2

[1]Laboratory of Beneficial Microorganisms, Functional Foods and Health (LMBAFS), Department of Food Sciences, Faculty of Life and Natural Science, Abdelhamid Ibn Badis University, Mostaganem 27000, Algeria

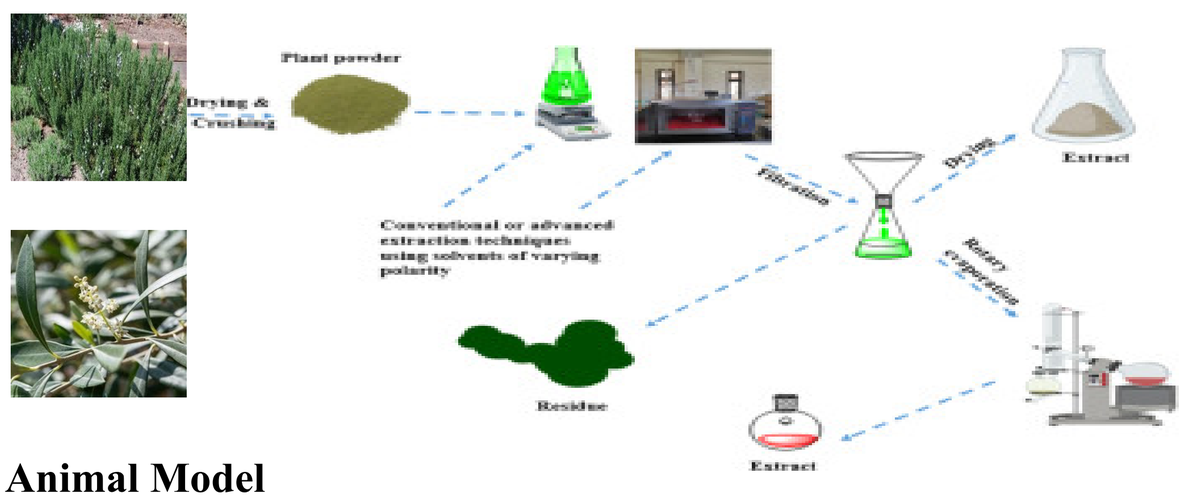
[2] Laboratory of Clinical and Metabolic Nutrition, Department of Food Sciences, Faculty of Life and Natural Science, University of Oran1 Ahmed Benbella, 31000, Algeria 1

INTRODUCTION & AIM

- High-fat diet–induced metabolic disorders are closely linked to oxidative stress and chronic inflammation, which contribute to metabolic and cardiovascular complications (Furman *et al.*, 2019; Liguori et al., 2018).
- Plant-derived phenolic metabolites, structurally related to phytohormone signaling molecules, exhibit strong antioxidant and anti-inflammatory activities (Crozier *et al.,* 2020). Rosmarinus officinalis and Olea europaea leaves are rich in rosmarinic acid and oleuropein, respectively, known to modulate redox homeostasis and inflammatory mediators (Petersen & Simmonds, 2003; Gorzynik-Debicka et al., 2018).
- These compounds may therefore attenuate metabolic inflammation and oxidative damage associated with high-fat diets (Rahmani et al., 2023).

The aim of this study was to evaluate the in vivo antioxidant and anti-inflammatory effects of methanolic extracts of Rosmarinus officinalis and Olea europaea leaves in a high-fat diet–induced metabolic disorder model.

METHOD



Animal Model

Adult male Wistar rats (8–10 weeks old, 200–250 g, n = 6 per group) were used in this study. The animals were maintained under standard laboratory conditions with free access to water and food.

Experimental Design and Analysis

Rats were randomly assigned to four groups for 28 days: control diet, high-fat diet (HFD), HFD supplemented with Rosmarinus officinalis extract (200 mg/kg/day), and HFD supplemented with Olea europaea extract (200 mg/kg/day). At the end of the treatment period, serum lipid profiles (triglycerides, total cholesterol), hepatic oxidative stress markers (MDA, SOD, CAT), and inflammatory cytokines (TNF-α, IL-6) were measured.

Data were expressed as mean ± SD, and statistical significance was considered at $p < 0.05$.

RESULTS & DISCUSSION

1. Serum Lipid Profile

Group	TG (mg/dL)	TC (mg/dL)
Control	85.3 ± 5.1	120.5 ± 6.2
HFD	145.7 ± 8.3 ▲	175.2 ± 9.0 ▲
HFD + *R. officinalis*	105.4 ± 6.0 *	121.3 ± 5.5 *
HFD + *O. europaea*	104.2 ± 5.8 *	120.8 ± 6.1 *

* p < 0.05 vs HFD, ▲ p < 0.05 vs Control

High-fat diet significantly increased serum triglycerides (TG) and total cholesterol (TC). Treatment with R. officinalis and O. europaea extracts restored lipid levels close to control values, indicating hypolipidemic effects.

2. Hepatic Oxidative Stress Markers

Group	MDA (nmol/mg protein)	SOD (U/mg protein)	CAT (U/mg protein)
Control	2.8 ± 0.2	6.5 ± 0.4	48.3 ± 2.1
HFD	4.4 ± 0.3 ▲	4.6 ± 0.3 ▲	32.7 ± 1.8 ▲
HFD + *R. officinalis*	2.8 ± 0.2 *	6.5 ± 0.4 *	46.9 ± 2.3 *
HFD + *O. europaea*	2.9 ± 0.2 *	6.4 ± 0.3 *	47.2 ± 2.0 *

* p < 0.05 vs HFD, ▲ p < 0.05 vs Control

3. Inflammatory Cytokines

Group	TNF-α (pg/mL)	IL-6 (pg/mL)
Control	18.4 ± 1.5	22.1 ± 1.8
HFD	35.7 ± 2.2 ▲	41.5 ± 2.5 ▲
HFD + R. officinalis	19.8 ± 1.7 *	23.5 ± 1.6 *
HFD + O. europaea	20.1 ± 1.6 *	23.2 ± 1.5 *

* p < 0.05 vs HFD, ▲ p < 0.05 vs Control

High-fat diet induced a significant increase in TNF-α and IL-6, indicating metabolic inflammation. Supplementation with R. officinalis or O. europaeamarkedly downregulated inflammatory cytokines, highlighting their anti-inflammatory properties.

CONCLUSION

Methanolic extracts of Rosmarinus officinalis and Olea europaea leaves, enriched in rosmarinic acid and oleuropein, significantly attenuate high-fat diet-induced metabolic disturbances in rats. They effectively improve serum lipid profiles, enhance hepatic antioxidant defenses, and reduce inflammatory cytokines (TNF-α, IL-6). These findings highlight their potential as natural modulators of oxidative stress and metabolic inflammation, supporting their use in preventive strategies for diet-related metabolic disorders.

FUTURE WORK / REFERENCES

- Investigate the mechanistic pathways by which rosmarinic acid and oleuropein modulate NF-κB, Nrf2, and other redox/inflammatory signaling in metabolic disorders.
- Evaluate the long-term efficacy and safety of these extracts in chronic high-fat diet models.

Furman D. et al., 2019. Chronic inflammation in the etiology of disease across the life span. Nat. Med., 25, 1822–1832.
Liguori I. et al., 2018. Oxidative stress, aging, and diseases. Clin. Interv. Aging, 13, 757–772.
Crozier A. et al., 2020. Plant secondary metabolites and human health. Annu. Rev. Food Sci. Technol., 11, 1–23.