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The protective effect of lemon peel essential oil on pancreas and brain oxidative stress and inflammation induced by streptozotocin nicotinamide in rats: Behavioral and biochemical evidences

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Introduction: The objective of this study is to investigate the effects of Moroccan lemon peel essential oil (LPEO) on various aspects such as anti-hyperglycemic, anti-inflammatory, antioxidant, and anxiolytic activities in diabetic rats. The animals were divided into five groups:normal control group, diabetic control group, diabetic group treated with metformin (300mg/kg), and two diabetic groups treated with LPEO at doses of 0.6ml/kg and 1.2ml/kg, respectively. T2DM was induced in the rats by administering intraperitoneal injections of Streptozotocin and Nicotinamide. Treatment with LPEO or metformin was initiated immediately after confirming the presence of hyperglycemia and continued for a duration of four weeks. Anxiety-related behavior in the rats was assessed using two behavioral tests. 24 hours after conducting the behavioral tests, all rats were anesthetized, and blood samples were taken for the analysis of lipid parameters. The pancreas and brain were dissected to assess TNF alpha, SOD, and MDA levels. Treatments with LPEO contributed significantly to the preservation of lipid profile and reduction of the atherosclerosis index in diabetic rats ($p<.05$). Additionally, there was a notable decrease in MDA and TNF-α concentration in the pancreas and brain of diabetic rats treated with LPEO associated with a remarkable increase in SOD activity in the pancreas and brain compared to diabetic control group ($p<.05$). These positive effects could potentially be attributed to the potent antioxidant and anti-inflammatory activities of both treatments.

KEYWORDS: Diabetes mellitus, Lemon peel, Essential oil, Inflammation, Oxidative stress.

Biography

I hold a PhD in Biochemistry and Biotechnology, obtained in 2025 from the Faculty of Sciences at Ibn Tofail University in Kenitra, Morocco. My doctoral research focused on the ethnobotanical exploration, chemical composition, biological properties, and pharmacological activities of essential oils extracted from Citrus limon peels from Morocco.I have published six Scopus-indexed scientific articles and have presented my research at several national and international scientific conferences. Among my presentations, I have delivered two oral communications:

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