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Traditional Plant Remedies from the Sétif Region for Metabolic Disorders: An Ethnobotanical Investigation, and Toxicological Assessment of *Atriplex halimus* L.

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Abstract

Atriplex halimus L. is one of the most commonly used medicinal plants in Algeria and is traditionally employed for the management of several metabolic and hormonal disorders due to its richness in bioactive compounds, including polyphenols, flavonoids, alkaloids, and saponins. The present study aimed to document traditional knowledge related to the use of medicinal plants, with particular emphasis on *Atriplex halimus*, and to evaluate its acute toxicity in rats. The study consisted of two complementary parts: an ethnopharmacological survey designed to identify the most commonly used medicinal plants and their modes of use, and an experimental study assessing the effects of *Atriplex halimus* extract administered at two doses (2 g/kg and 5 g/kg body weight). The survey results revealed that *Atriplex halimus* is among the most frequently used medicinal plants, particularly for the management of polycystic ovary syndrome (PCOS) and certain metabolic disorders. Experimental findings showed no significant changes in the relative weights of the examined organs. However, slight variations were observed in some hematological and biochemical parameters, including an increase in creatinine levels, a slight decrease in red blood cell count, and a relative increase in lymphocyte and platelet levels. Overall, the results suggest that *Atriplex halimus* extract does not exhibit evident acute toxicity at the tested doses. Nevertheless, further investigations are required to confirm its long-term safety and to better understand its biological effects.

Keywords: Medicinal plants, Chronic diseases, Ethnopharmacology, *Atriplex halimus*, acute toxicity, Biomarkers, Rat.

الملخص

يُعد نبات القطف المالح (*Atriplex halimus* L.) من النباتات الطبية الشائعة في الجزائر، ويُستعمل تقليديًا لعلاج العديد من الاضطرابات الاستقلابية والهرمونية بفضل احتوائه على مركبات فعالة مثل البوليفينولات والفلافونويدات والقلويدات والصابونينات. هدفت هذه الدراسة إلى توثيق المعارف التقليدية المتعلقة باستعمال النباتات الطبية، مع التركيز على نبات القطف المالح، إضافة إلى تقييم سميته الحادة لدى الجرذان. اعتمدت الدراسة على شقين رئيسيين: دراسة ميدانية للاستخدامات العلاجية التقليدية للنباتات الطبية لتحديد النباتات الأكثر استعمالًا وطرق استخدامها، ودراسة تجريبية لتقييم تأثير مستخلص *Atriplex halimus* بجرعتين مختلفتين (2 غ/كغ و5 غ/كغ من وزن الجسم). أظهرت نتائج الاستبيان أن نبات القطف المالح يُعد من أكثر النباتات استخدامًا، خاصة في علاج متلازمة تكيس المبايض وبعض الاضطرابات الاستقلابية. أما النتائج التجريبية فقد بينت عدم وجود فروق ذات دلالة إحصائية في أوزان الأعضاء المدروسة، مع تسجيل بعض التغيرات المحدودة في المؤشرات البيوكيميائية والدموية، من بينها ارتفاع مستوى الكرياتينين وانخفاض طفيف في عدد كريات الدم الحمراء، إضافة إلى زيادة نسبية في الخلايا اللمفاوية والصفائح الدموية. بصفة عامة، تشير النتائج إلى أن مستخلص *Atriplex halimus* لا يُظهر سمية حادة واضحة عند الجرعات المدروسة، مع ضرورة إجراء دراسات إضافية لتأكيد سلامته وفهم آليات تأثيره البيولوجية بشكل أدق.

الكلمات المفتاحية: النباتات الطبية، الأمراض المزمنة، علم الأدوية الشعبي، *Atriplex halimus*، السمية الحادة، المؤشرات الحيوية، جرذ.

Résumé

Atriplex halimus L. est l'une des plantes médicinales les plus utilisées en Algérie. Elle est traditionnellement employée dans le traitement de plusieurs troubles métaboliques et hormonaux grâce à sa richesse en composés bioactifs tels que les polyphénols, les flavonoïdes, les alcaloïdes et les saponines. Cette étude avait pour objectif de valoriser les connaissances traditionnelles relatives à l'utilisation des plantes médicinales, avec un intérêt particulier porté à *Atriplex halimus*, ainsi que d'évaluer sa toxicité aiguë chez le rat. Le travail a comporté deux volets complémentaires : une enquête ethnopharmacologique visant à identifier les plantes médicinales les plus utilisées ainsi que leurs modes d'utilisation, et une étude expérimentale destinée à évaluer les effets d'un extrait d'*Atriplex halimus* administré à deux doses (2 g/kg et 5 g/kg de poids corporel). Les résultats de l'enquête ont montré qu'*Atriplex halimus* figure parmi les plantes les plus utilisées, notamment dans la prise en charge du syndrome des ovaires polykystiques (SOPK) et de certains troubles métaboliques. Les résultats expérimentaux n'ont révélé aucune modification significative du poids relatif des organes étudiés. Toutefois, de légères variations ont été observées au niveau de certains paramètres hématologiques et biochimiques, notamment une augmentation de la créatinine, une légère diminution du nombre de globules rouges et une augmentation relative des lymphocytes et des plaquettes. Dans l'ensemble, les résultats suggèrent que l'extrait d'*Atriplex halimus* ne présente pas de toxicité aiguë évidente aux doses testées. Cependant, des études complémentaires demeurent nécessaires afin de confirmer son innocuité à long terme et de mieux comprendre ses effets biologiques.

Mots-clés: Plantes médicinales, Maladies chroniques, Ethnopharmacologie, *Atriplex halimus*, Toxicité aiguë, Biomarqueurs, Rat.

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Introduction

Metabolic and chronic diseases constitute a major and increasing burden on global healthcare systems due to their multifactorial nature, long-term progression, and widespread systemic consequences. These disorders include a wide range of conditions such as diabetes mellitus, hypertension, cardiovascular diseases, obesity, gastrointestinal disorders, and chronic inflammatory states. In addition, they encompass endocrine and organ-specific diseases, including polycystic ovary syndrome (PCOS), colonic disorders, and chronic kidney failure. The development and progression of these diseases are strongly associated with shared pathogenic mechanisms, particularly oxidative stress and persistent low-grade inflammation, both of which contribute to metabolic imbalance, cellular injury, and dysfunction across various organ systems **(Alberti *et al.*, 2015; World Health Organization [WHO], 2024)**. Consequently, the effective management of these interconnected disorders requires therapeutic approaches capable of targeting multiple biological pathways while maintaining safety and minimizing adverse effects.

Medicinal plants have long served as important therapeutic agents in traditional medicine for the prevention and management of metabolic and chronic diseases. Numerous botanical species contain bioactive compounds including polyphenols, flavonoids, terpenoids, and alkaloids that exhibit a wide range of pharmacological activities. These natural constituents have been utilized to improve glycemic control in diabetes mellitus, reduce elevated blood pressure in hypertension, and provide protective effects against cardiovascular complications. In addition, plant-derived metabolites have shown therapeutic potential in the management of obesity, digestive disorders, systemic inflammation, PCOS, colonic diseases, and renal dysfunction. Owing to their multitarget mechanisms of action, medicinal plants represent a promising complementary or alternative strategy to synthetic drugs, with the added advantage of extensive traditional use and a potentially lower incidence of side effects **(Boudjelal *et al.*, 2017; Wink, 2015)**.

The primary objective of this thesis is to evaluate the biological efficacy and toxicological safety of a selected medicinal plant extract against a spectrum of chronic conditions. By integrating phytochemical screening with *IN VIVO* validation, this research aims to substantiate the therapeutic potential and safety profile of this specific natural product. Ultimately, this study seeks to provide a rigorous scientific basis for the application of this extract in the management of complex metabolic and systemic disorders.