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# Phytochemical and Immunological Foundations of *Euphorbia tirucalli* L. Against Human Papillomavirus Warts

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# Introduction

The use of medicinal plants in the treatment of dermatological conditions dates back to antiquity and remains widely practiced in traditional medicine systems around the world. Among the vast plant pharmacopoeia, *Euphorbia tirucalli* L. (Euphorbiaceae), commonly known as the "pencil tree" or "aveloz", holds a particular place due to its caustic, cytotoxic, and immunomodulatory properties. This succulent plant, native to the arid regions of Africa, produces a white latex rich in secondary metabolites, including diterpenes, triterpenes, flavonoids, and phorbol esters, which confer both remarkable therapeutic potential and significant toxicity (Mwine and Van Damme, 2011; Gupta *et al*., 2013).

Cutaneous warts, caused by human papillomavirus (HPV) infection, are among the most common dermatological conditions in the general population, particularly in children and adolescents. Although generally benign and self-limiting in immunocompetent individuals, these hyperkeratotic lesions may persist, multiply, cause physical discomfort (especially on plantar surfaces), and lead to significant aesthetic embarrassment. Conventional treatments (cryotherapy, salicylic acid, laser, immunotherapy) have high recurrence rates, and no single therapeutic modality is universally effective (Sterling *et al*., 2014; Doorbar *et al*., 2012). In this context, traditional medicine has for centuries advocated the topical application of *Euphorbia tirucalli* latex as a remedy against warts, a practice that deserves rigorous scientific evaluation.

The objective of the present work is to provide a synthetic and updated review of knowledge concerning, on the one hand, *Euphorbia tirucalli* (taxonomy, phytochemistry, biological activities, toxicity) and, on the other hand, cutaneous warts (epidemiology, classification, conventional treatments), in order to understand the mechanisms of action of this plant in the elimination of HPV-induced lesions. This work also aims to identify existing scientific gaps and to propose perspectives for future clinical studies.

**This thesis is divided into two main parts:**

- The first chapter provides a comprehensive overview of *Euphorbia tirucalli*, including its taxonomy, ecology, phytochemistry, pharmacological activities, and toxicity.

The second chapter focuses on cutaneous warts (epidemiology, classification, conventional treatments) and analyzes in detail the mechanisms of action of *E. tirucalli* latex against HPV-induced lesions.

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## ملخص

. شجرة القلم Euphorbia tirucalli L هو نبات عصاري يحتوي على لاتكس غني بالمركبات الثانوية الأيضية (مثل ثنائيات التربين ، ثلاثيات التربين ، الفلافونويدات وإسترات الفوربول) ويمتلك هذا النبات خصائص كاوية، سامة خلوياً، مضادة للالتهاب ومعدِّلة للمناعة. يُستخدم هذا النبات تقليدياً ضد الثآليل الجلدية الناتجة عن فيروس الورم الحليمي البشري (HPV)، الهدف من هذه الدراسة معرفة خصائصه النباتية، تركيبه الكيميائي النباتي، نشاطاته الدوائية وسميته. كما تُوصف الثآليل بآفات جلدية حميدة لكنها شائعة ومتكررة من الناحية الوبائية، السريرية والعلاجية. حيث أوضحت عمل لاتكس ضد هذه الآفات تأثيراً حالّاً للطبقة القرنية، تحفيز موت الخلايا المبرمج لخلايا الكيراتين المصابة، نشاطاً مضاداً للفيروسات وتنشيطاً للمناعة الموضعية. تؤكد جميع البيانات المتاحة الخصائص العلاجية لهذا النبات ضد الثآليل الناتجة عن HPV .



**الكلمات المفاتيح:** Euphorbia tirucalli L ، الثآليل الجلدية، HPV، الكيمياء النباتية، تعديل المناعة، الطب التقليدي.



## Abstract

*Euphorbia tirucalli* L. (Euphorbiaceae) is a succulent plant whose latex, rich in secondary metabolites (diterpenes, triterpenes, flavonoids, phorbol esters), possesses caustic, cytotoxic, anti-inflammatory, and immunomodulatory properties. Traditionally used against cutaneous warts induced by human papillomavirus (HPV), this plant is the subject of a synthetic review of its botanical characteristics, phytochemical composition, pharmacological activities, and toxicity. Warts, benign but frequent and recurrent epidermal lesions, are also described from epidemiological, clinical, and therapeutic perspectives. The mechanisms of action of E. tirucalli latex against these lesions include a keratolytic effect, induction of apoptosis of infected keratinocytes, antiviral activity, and stimulation of local immunity. All available data confirm the therapeutic potential of this plant in the treatment of HPV-induced warts and justify further clinical and toxicological research.



**Keywords:** *Euphorbia tirucalli*, cutaneous warts, HPV, phytochemistry, immunomodulation, traditional medicine.



## Résumé

*Euphorbia tirucalli* L. (Euphorbiaceae) est une plante succulente dont le latex, riche en métabolites secondaires (diterpènes, triterpènes, flavonoïdes, esters de phorbol), possède des propriétés caustiques, cytotoxiques, anti-inflammatoires et immunomodulatrices. Utilisée traditionnellement contre les verrues cutanées induites par le papillomavirus humain (HPV), cette plante fait l'objet d'une revue synthétique de ses caractéristiques botaniques, de sa composition phytochimique, de ses activités pharmacologiques et de sa toxicité. Les verrues,

lésions épidermiques bénignes mais fréquentes et récidivantes, sont également décrites sur les plans épidémiologique, clinique et thérapeutique. Les mécanismes d'action du latex d'*E. tirucalli* contre ces lésions incluent un effet kératolytique, l'induction de l'apoptose des kératinocytes infectés, une activité antivirale et une stimulation de l'immunité locale. L'ensemble des données confirme le potentiel thérapeutique de cette plante dans le traitement des verrues à HPV et justifie la poursuite des recherches cliniques et toxicologiques.

**Mots-clés :** *Euphorbia tirucalli*, verrues cutanées, HPV, phytochimie, immunomodulation, médecine traditionnelle.