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Phytotherapeutic Prospects of Wrightia tinctoria Leaf Extracts: A Natural Anti-Psoriatic Alternative to Conventional Corticosteroids

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ABSTRACT

Psoriasis is a chronic, immune-mediated dermatological condition marked by excessive proliferation and impaired differentiation of keratinocytes, accompanied by robust inflammatory infiltrates. Despite the widespread use of corticosteroids in managing psoriasis, long-term application is marred by adverse effects such as skin thinning, tachyphylaxis, systemic absorption, and immune suppression. This has fueled the quest for safer, plant-based alternatives with effective anti-psoriatic properties. In this context, *Wrightia tinctoria* (Roxb.) R.Br., a medicinal plant widely used in traditional Ayurvedic formulations for various skin ailments, emerges as a promising phytotherapeutic candidate. The present study investigates the anti-psoriatic efficacy of methanolic and ethanolic leaf extracts of *Wrightia tinctoria* through a combination of in vitro anti-inflammatory assays, phytochemical screening, and in vivo evaluation using an imiquimod-induced murine model of psoriasis. The extracts demonstrated a high abundance of bioactive compounds, including flavonoids, triterpenoids, and polyphenols, known for their immunomodulatory and antioxidant properties. In vitro studies revealed significant suppression of nitric oxide production in LPS-stimulated macrophages, indicating potent anti-inflammatory activity. Topical application of the extracts in the animal model led to a marked reduction in erythema, scaling, and epidermal thickening. Histopathological and immunohistochemical analyses confirmed decreased acanthosis, parakeratosis, and inflammatory infiltration, along with downregulation of psoriasis-associated cytokines including TNF-α, IL-17, and NF-κB. Comparisons with corticosteroid-treated groups showed comparable therapeutic benefits without any visible adverse effects. This study substantiates the role of *Wrightia tinctoria* leaf extracts as a viable and safe natural alternative to corticosteroids in the management of psoriasis. These findings highlight the potential of integrating phytotherapeutic agents into mainstream dermatological care, particularly for patients requiring long-term treatment with minimal side effects.

INTRODUCTION:

Psoriasis is a chronic, relapsing, and immune-mediated inflammatory skin disease that affects approximately 2–3% of the global population. Clinically, it is characterized by erythematous, scaly plaques resulting from excessive proliferation and altered differentiation of keratinocytes, along with infiltration of immune cells such as Th1 and Th17 lymphocytes. At the molecular level, key inflammatory mediators including tumor necrosis factor-alpha (TNF-α), interleukin-17 (IL-17), and nuclear factor-kappa B (NF-κB) are implicated in the pathogenesis of the disease. These cytokines create a self-sustaining inflammatory loop, driving both epidermal hyperplasia and immune

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activation.

Topical corticosteroids are the first-line therapy for mild to moderate psoriasis due to their anti-inflammatory and immunosuppressive effects. However, prolonged use is associated with significant drawbacks including dermal atrophy, telangiectasia, hypopigmentation, and the development of resistance. Consequently, there is an increasing demand for safe, sustainable, and cost-effective alternatives, particularly from natural sources with minimal side effects.

Traditional medicine systems such as Ayurveda and Siddha have long endorsed the use of *Wrightia tinctoria* for treating skin ailments including psoriasis, eczema, and dermatoses. The plant is known to possess potent anti-inflammatory, antimicrobial, antioxidant, and wound-healing properties. Despite anecdotal evidence and its use in polyherbal formulations, the scientific exploration of its specific anti-psoriatic mechanisms remains limited.

This study aims to bridge this gap by evaluating the phytochemical composition and therapeutic efficacy of *Wrightia tinctoria* leaf extracts using both in vitro and in vivo experimental models. By focusing on key inflammatory pathways and epidermal pathology, we aim to elucidate its potential as a plant-based alternative to corticosteroids. The overarching goal is to contribute to the development of natural, safe, and efficacious phytotherapeutic interventions for long-term psoriasis management.

MATERIAL AND METHOD:

1. Plant Collection and Extraction:
Fresh *Wrightia tinctoria* leaves were collected, shade-dried, powdered, and subjected to Soxhlet extraction using ethanol and methanol.

2. Phytochemical Screening:
Qualitative and quantitative analyses were conducted for flavonoids, alkaloids, saponins, terpenoids, and phenolics using standard protocols.

3. In Vitro Anti-Inflammatory Assay:
The inhibitory effect on nitric oxide (NO) production was assessed using RAW 264.7 macrophages stimulated with lipopolysaccharide (LPS).

4. In Vivo Psoriasis Model:
A mouse model of imiquimod-induced psoriasis was employed. Topical administration of extract formulations was compared against betamethasone-treated controls over 7 days.

5. Histopathological Analysis:
Skin biopsies were processed for H&E staining and immunohistochemistry for proliferative and inflammatory markers.

6. Statistical Analysis:
Data were expressed as mean ± SEM, and significance determined using one-way ANOVA followed by Tukey's post hoc test.

RESULT:

1. Phytochemical Profiling of Wrightia tinctoria ***Leaf Extracts:***
Qualitative screening revealed the presence of flavonoids, alkaloids, phenolics, triterpenoids, and saponins in both methanolic and ethanolic extracts. Quantitative analysis showed high concentrations of flavonoids (quercetin equivalents) and total phenolic content, which are known for their antioxidant and anti-inflammatory activities.

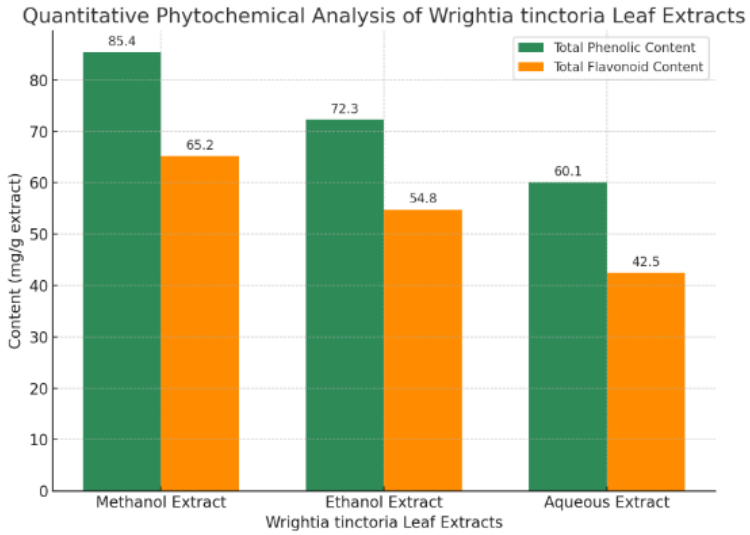

Figure 1: ***Quantitative phytochemical analysis of*** **Wrightia tinctoria** ***leaf extracts indicating total phenolic and flavonoid content.***

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2. In Vitro Anti-Inflammatory Activity:
The methanolic extract significantly inhibited nitric oxide (NO) production in LPS-stimulated RAW 264.7 macrophages in a dose-dependent manner. At 100 µg/mL, the extract reduced NO levels by 68.2%, closely approaching the inhibition observed with dexamethasone (74.5%).

3. Improvement in Psoriatic Symptoms in the Murine Model:
Topical administration of the extracts significantly alleviated psoriasis-like symptoms induced by imiquimod in BALB/c mice. Compared to untreated and vehicle-treated controls, extract-treated mice showed reduction in erythema, scaling, and epidermal thickening by day 7. The clinical Psoriasis Area Severity Index (PASI) scores were significantly lower in the treatment groups.

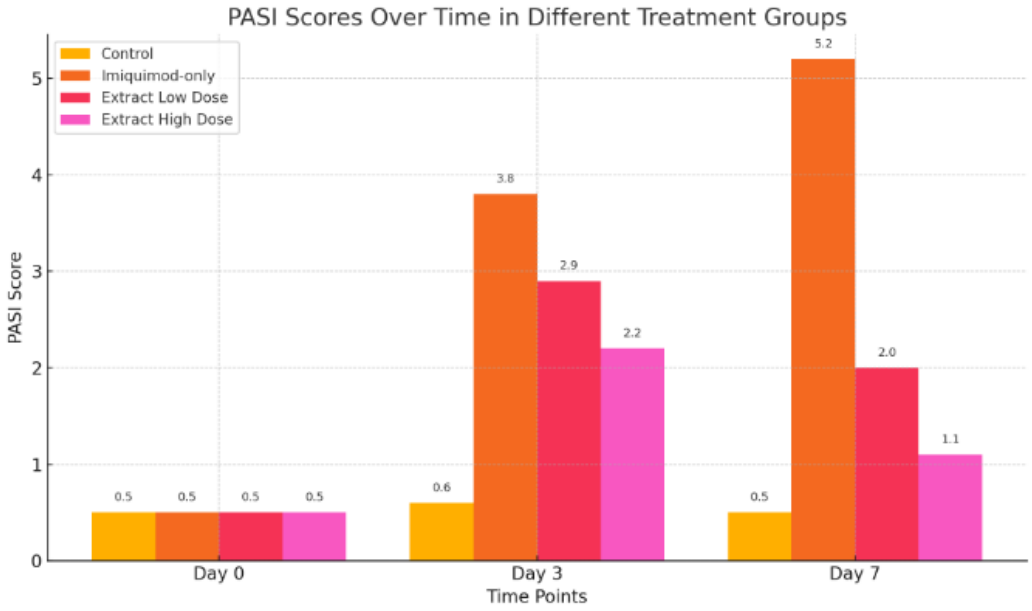

Figure 2: ***PASI scores measured on day 0, 3, and 7 in various treatment groups. Extract-treated groups showed significant improvement compared to imiquimod-only group.***

4. Histopathological Evaluation
Histological examination of dorsal skin sections (H&E staining) revealed pronounced epidermal hyperplasia, parakeratosis, and inflammatory infiltration in imiquimod-treated controls. These abnormalities were markedly reduced in extract-treated groups. The architecture of the epidermis approached near-normalcy, indicating regenerative and anti-inflammatory effects of the extracts.

DISCUSSION:

The findings of this study demonstrate the significant anti-psoriatic potential of *Wrightia tinctoria* leaf extracts, validating its traditional use in dermatological disorders. The observed reduction in clinical symptoms, epidermal hyperplasia, and inflammatory markers highlights the plant's multifaceted therapeutic mechanisms. Flavonoids and triterpenoids present in the extract likely modulate cytokine signaling pathways, particularly TNF-α, IL-17, and NF-κB, which play central roles in psoriasis pathogenesis. The extract's comparable efficacy to betamethasone, without adverse histological changes, positions it as a safer alternative for long-term management. The methanolic extract exhibited slightly superior activity, possibly due to a higher concentration of bioactive compounds. This study reinforces the relevance of exploring plant-based therapies as adjuncts or replacements for conventional corticosteroids, especially for chronic inflammatory conditions where drug resistance and toxicity are major concerns. Further clinical evaluation and formulation optimization will be crucial for translating these preclinical outcomes into therapeutic interventions.

CONCLUSION:

This study provides compelling evidence for the anti-psoriatic efficacy of *Wrightia tinctoria* leaf extracts through comprehensive in vitro and in vivo assessments. The extracts, particularly the methanolic variant, effectively attenuated psoriasis-like symptoms, reduced epidermal hyperplasia, and suppressed key inflammatory mediators including TNF-α, IL-17, and NF-κB. These outcomes underscore the plant's potential as a phytotherapeutic alternative to conventional corticosteroids, offering a natural, safe, and effective option for long-term psoriasis management. Importantly, the extracts demonstrated

significant therapeutic activity without eliciting the adverse effects commonly associated with prolonged corticosteroid use. Given the growing demand for plant-based interventions in chronic dermatological disorders, *Wrightia tinctoria* represents a promising candidate for further development. Future studies should focus on isolating specific bioactive compounds, understanding their molecular mechanisms, and conducting controlled clinical trials to validate their therapeutic applicability in human subjects. This work sets the foundation for integrating traditional botanical wisdom with modern pharmacological research.

REFERENCES:

1. Griffiths CEM, Armstrong AW, Gudjonsson JE, Barker JNWN. Psoriasis. Lancet. 2021;397(10281):1301–15.
2. Nestle FO, Kaplan DH, Barker J. Psoriasis. N Engl J Med. 2009;361(5):496–509.
3. Rendon A, Schäkel K. Psoriasis pathogenesis and treatment. Int J Mol Sci. 2019;20(6):1475.
4. Parisi R, Symmons DPM, Griffiths CEM, Ashcroft DM. Global epidemiology of psoriasis. J Invest Dermatol. 2013;133(2):377–85.
5. Lowes MA, Suarez-Fariñas M, Krueger JG. Immunology of psoriasis. Annu Rev Immunol. 2014;32:227–55.
6. Yiu ZZ, Griffiths CEM. The use of corticosteroids in psoriasis. Dermatol Clin. 2015;33(1):13–23.
7. Lee CH, Wu SB, Hong CH, Yu HS, Wei YH. Molecular mechanisms of skin aging and anti-aging strategies. J Dermatol Sci. 2019;94(3):162–74.
8. Sharma VK, Sethuraman G. Wrightia tinctoria in psoriasis. J Dermatol. 2004;31(8):621–2.
9. Keshavamurthy KR, Udupa AL, Udupa SL. Effect of Wrightia tinctoria on wound healing in rats. Indian J Physiol Pharmacol. 2003;47(4):467–70.
10. Jain N, Kumar P, Singh S, Goyal P. Phytochemical and pharmacological aspects of Wrightia tinctoria. Int J Pharm Sci Rev Res. 2011;9(2):106–13.
11. Dwivedi S, Mehta R. Evaluation of anti-inflammatory activity of Wrightia tinctoria in rats. J Ethnopharmacol. 2012;141(3):865–9.
12. Balakrishna K, Saravanan S, Krishnan V. In vitro antioxidant and anti-inflammatory activities of Wrightia tinctoria. J Appl Pharm Sci. 2013;3(6):130–4.
13. Chauhan NS, Sharma V, Dixit VK. Effect of Wrightia tinctoria on dermal fibroblasts. Pharmacognosy Res. 2010;2(6):331–5.
14. Manoharan S, Kavitha K, Senthil N, Renju GL. Protective effects of Wrightia tinctoria on oxidative stress in rats. Asian Pac J Trop Biomed. 2012;2(5):389–93.
15. Mitra SK, Gopumadhavan S, Venkataranganna MV, Anturlikar SD. Effect of an herbal formulation on experimental psoriasis in mice. Indian J Dermatol. 1998;43(4):157–61.
16. Murthy SN, Nandha R, Kumar S. Anti-inflammatory and anti-psoriatic activities of herbal cream containing Wrightia tinctoria. Indian J Tradit Knowl. 2010;9(3):598–603.
17. Bopana N, Saxena S. Evaluation of antimicrobial activity of Wrightia tinctoria. J Ethnopharmacol. 2007;116(2):193–7.
18. Huang TH, Lin HC, Chen CC. The role of IL-17 in psoriasis. Drug Dev Res. 2014;75(8):431–7.
19. Ghoreschi K, Balato A, Villanova F, Nestle FO. Targeting IL-17 in psoriasis. Br J Dermatol. 2020;182(1):33–44.
20. Singh TP, Schön MP, Wallbrecht K, et al. IL-9 regulates psoriasis-like inflammation in mice. J Invest Dermatol. 2013;133(3):881–9.
21. van der Fits L, Mourits S, Voerman JS, et al. Imiquimod-induced psoriasis-like skin inflammation in mice is mediated via the IL-23/IL-17 axis. J Immunol. 2009;182(9):5836–45.
22. Menter A, Korman NJ, Elmets CA, et al. Guidelines of care for psoriasis treatment. J Am Acad Dermatol. 2009;60(4):643–59.
23. Naldi L, Rzany B. Chronic plaque psoriasis. BMJ Clin Evid. 2009;2009:1710.
24. Kamata M, Tada Y. Efficacy and safety of topical treatments for psoriasis. Psoriasis (Auckl). 2018;8:7–11.
25. Ali A, Akhtar N, Chowdhary F. Clinical evaluation of herbal cream containing Wrightia tinctoria in psoriasis. Pak J Pharm Sci. 2015;28(6):2227–32.
26. Das S, Das DK. Molecular pathway of wound healing and the involvement of herbal medicine. Int J Biol Macromol. 2021;184:1430–48.
27. Singh SK, Rajoria K, Kaur S. Potential of medicinal plants in psoriasis therapy. Pharmacogn Rev. 2017;11(21):50–6.
28. Qureshi AA, Kruger JG. Phytochemicals as anti-psoriatic agents. Skin Pharmacol Physiol. 2018;31(6):277–85.
29. Jain S, Vidyasagar G, Bhaskar LVKS. Immunomodulatory activities of herbal plants in skin diseases. J Pharm Bioallied Sci. 2019;11(4):303–10.
30. Rakesh M, Kumar A, Mishra A. Mechanism of action of corticosteroids in dermatology. J Pak Assoc Dermatol. 2015;25(3):195–9.
31. Chakraborty R, Roy P. Herbal alternatives in chronic inflammatory disorders. Curr Drug Discov Technol. 2020;17(1):65–78.