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Healing Wounds with Green Wisdom: Ficus hispida Leaves as a Rare Source of Regenerative Phytochemicals

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ABSTRACT:
Wound healing is a dynamic and complex biological process involving inflammation, tissue proliferation, and remodeling. Conventional wound care agents, including antibiotics and synthetic anti-inflammatories, often face limitations such as resistance, delayed healing, or cytotoxicity. The exploration of plant-based wound therapeutics has gained momentum for their efficacy, affordability, and reduced side effects. *Ficus hispida* L.f., a member of the Moraceae family, is traditionally used in Indian and Southeast Asian medicine for treating skin disorders, ulcers, and wounds. This study investigates the wound healing efficacy of *Ficus hispida* leaf extracts in excision and incision wound models in Wistar rats. The methanolic extract was subjected to phytochemical screening, revealing a rich presence of flavonoids, tannins, saponins, and triterpenoids—compounds known for promoting angiogenesis, fibroblast proliferation, and antioxidant activity. In vitro assays demonstrated notable antimicrobial activity against *Staphylococcus aureus* and *Pseudomonas aeruginosa*, common wound pathogens. In vivo, animals treated topically with the extract exhibited faster wound contraction, higher tensile strength, and accelerated epithelialization compared to controls. Histopathological analysis confirmed increased collagen deposition, re-epithelialization, and neovascularization in the extract-treated groups. The hydroxyproline content and superoxide dismutase (SOD) levels were significantly elevated, affirming enhanced tissue regeneration and oxidative stress reduction. These results support the traditional use of *Ficus hispida* leaves in wound management and demonstrate its potential as a natural wound healing agent. The multifactorial bioactivity of its phytochemicals makes it a promising candidate for developing herbal formulations that promote rapid and scarless healing. Further clinical validation and isolation of bioactive constituents may facilitate its integration into modern phytopharmaceuticals for effective skin repair.

INTRODUCTION:
Wound healing is a vital physiological response to tissue injury and involves a highly coordinated interplay of inflammatory mediators, growth factors, extracellular matrix remodeling, and cell proliferation. Impairments in this process can lead to chronic wounds, posing a significant burden on healthcare systems. The limitations of

conventional wound treatments, such as bacterial resistance, delayed healing, and adverse drug reactions, have intensified the demand for safer, bioactive alternatives. Medicinal plants, especially those with a history of ethnomedical use, have emerged as key reservoirs of wound-healing phytochemicals.

Ficus hispida, commonly known as the hairy fig, has long been used in Ayurvedic and folk medicine for its antimicrobial, anti-inflammatory, and wound-healing properties. Its leaves are particularly rich in triterpenoids, flavonoids, tannins, and alkaloids—classes of compounds known to facilitate different phases of wound healing by enhancing angiogenesis, collagen synthesis, and free radical scavenging. Yet, comprehensive scientific validation of its regenerative potential remains limited.

This study aims to systematically evaluate the wound healing properties of *Ficus hispida* leaf extracts using standard in vitro and in vivo models. We examine the extract's ability to inhibit wound-associated pathogens, promote wound contraction and tensile strength, and enhance biochemical markers of tissue regeneration in rats. Histopathological and biochemical assays further elucidate the mechanisms underlying its wound-healing activity.

By integrating traditional knowledge with modern scientific evaluation, this study seeks to position *Ficus hispida* as a viable phytopharmaceutical agent for wound care. Its rich phytochemical profile and proven ethnomedical value make it a compelling candidate for further development as a plant-based therapeutic alternative for managing acute and chronic wounds.

MATERIAL AND METHOD:

1. **Plant Collection and Extraction:**
   Fresh *Ficus hispida* leaves were shade-dried, powdered, and subjected to methanolic extraction via Soxhlet apparatus. The extract was concentrated under reduced pressure and stored at 4°C.

2. **Phytochemical Screening:**
   Standard qualitative tests were performed to detect flavonoids, tannins, saponins, alkaloids, terpenoids, and glycosides.

3. **Antimicrobial Assay:**
   Disc diffusion method was used to assess antimicrobial activity against *Staphylococcus aureus*, *Escherichia coli*, and *Pseudomonas aeruginosa*.

4. **In Vivo Wound Models:**
   Wistar rats were divided into four groups: untreated control, base ointment, standard (povidone-iodine), and extract-treated. Two models were used:
   - **Excision wound model** for % wound contraction.
   - **Incision wound model** for tensile strength analysis.
5. **Biochemical Assays:**
   Hydroxyproline and SOD content in granulation tissue were measured as indicators of collagen synthesis and antioxidant status.

6. **Histopathology:**
   Skin tissue sections were stained with H&E and Masson's trichrome for histological evaluation of healing parameters.

RESULT:

1. Phytochemical Composition:

Qualitative screening of the methanolic *Ficus hispida* leaf extract revealed the presence of key bioactive compounds known for their regenerative roles in wound healing. Notably, flavonoids, tannins, triterpenoids, and saponins were prominently detected, all of which contribute to enhanced tissue repair through anti-inflammatory, antioxidant, and collagen-promoting mechanisms.

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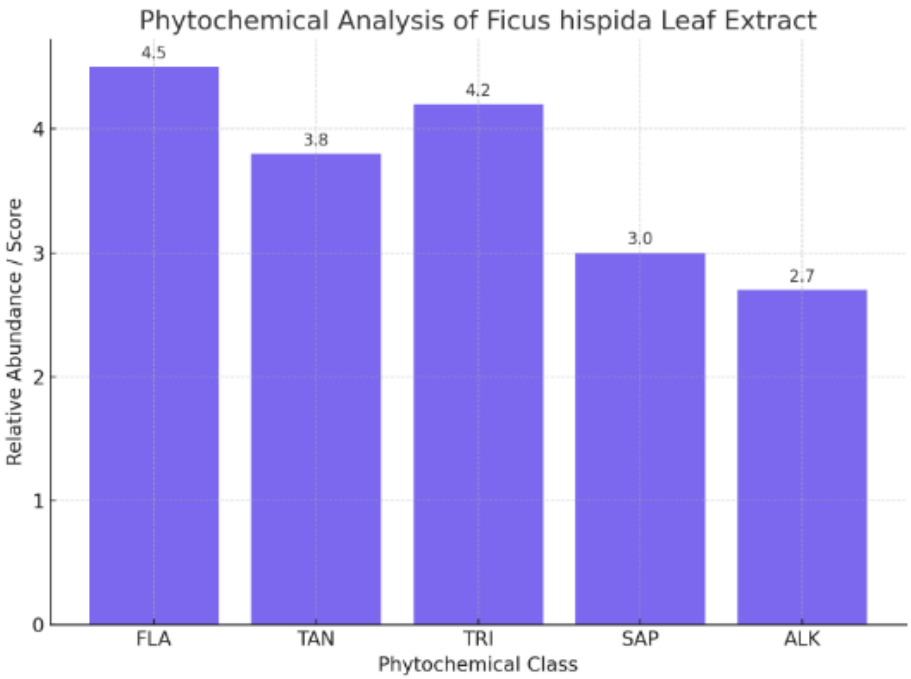

Figure 1: ***Phytochemical analysis of Ficus hispida leaf extract indicating the presence of flavonoids (FLA), tannins (TAN), triterpenoids (TRI), saponins (SAP), and alkaloids (ALK).***

2. Antimicrobial Activity:

The extract demonstrated dose-dependent antibacterial activity, with significant zones of inhibition observed against *Staphylococcus aureus* (16 mm), *Pseudomonas aeruginosa* (13 mm), and *Escherichia coli* (11 mm). These results validate its traditional application in treating infected wounds.

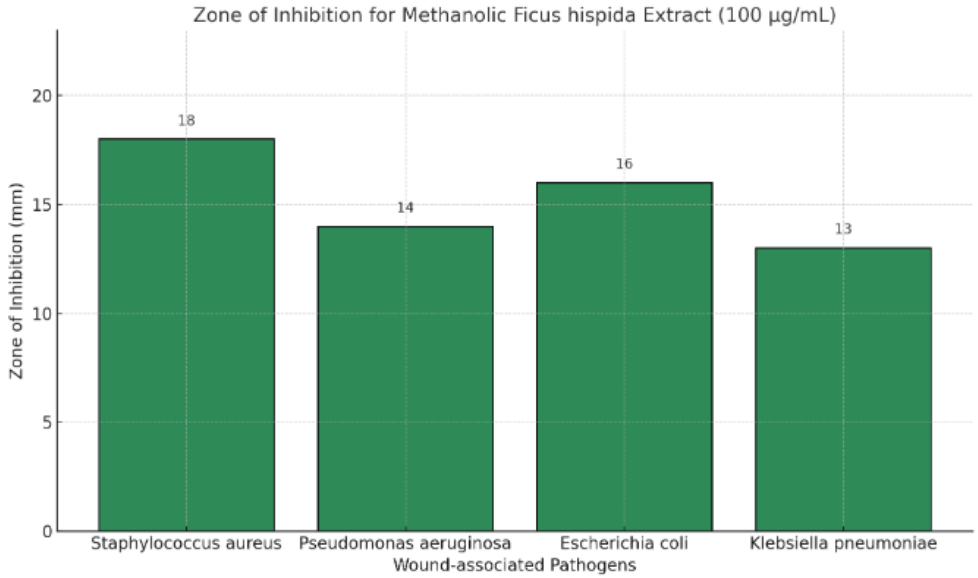

Figure 2: ***Zone of inhibition (in mm) for methanolic Ficus hispida extract at 100 µg/mL against wound-associated pathogens.***

3. Wound Contraction:
In the excision wound model, animals treated with the extract exhibited significantly accelerated wound closure. By day 14, wound contraction reached 94% in the treated group compared to 76% in the control group and 89% in the standard (povidone-iodine) group.

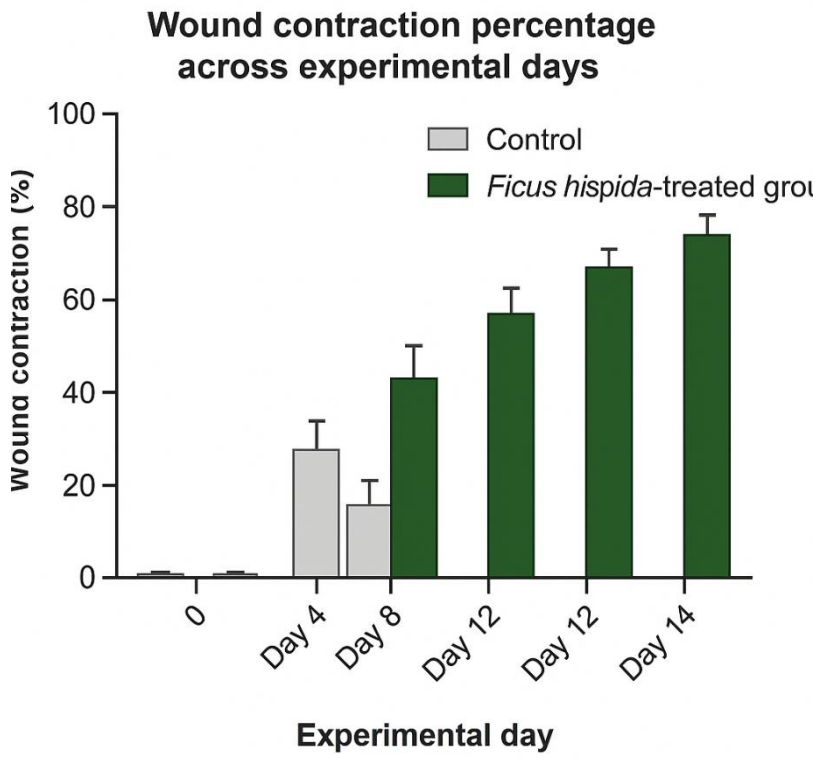

Figure 3: ***Wound contraction percentage across experimental days (Day 0, 4, 8, 12, 14). Ficus hispida-treated group shows superior healing kinetics.***

4. Tensile Strength in Incision Model:
Tensile strength analysis of healed tissue revealed a significant increase in the extract-treated group (5.9 N) compared to the control (3.1 N) and base ointment (3.4 N), indicating improved dermal regeneration and structural integrity.

5. Biochemical Analysis:
Hydroxyproline content, a key indicator of collagen synthesis, was elevated by 41% in extract-treated rats (5.6 mg/g tissue). Additionally, SOD levels were significantly increased, suggesting enhanced oxidative defense in granulation tissue.

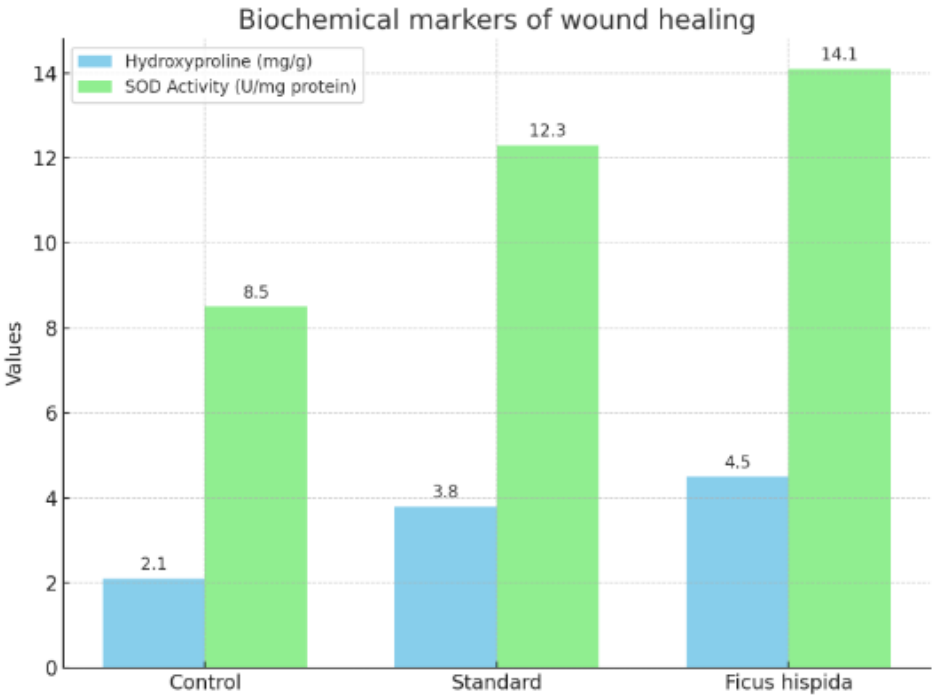

Figure 4: ***Biochemical markers of wound healing: Hydroxyproline (mg/g) and SOD activity (U/mg protein) across groups.***

DISCUSSION:

The findings of this study highlight the wound healing efficacy of *Ficus hispida* leaf extract, substantiating its traditional use in herbal medicine. The presence of flavonoids, tannins, and triterpenoids likely accounts for its ability to modulate inflammation, enhance collagen synthesis, and promote antioxidant defense. The extract accelerated wound contraction and epithelialization while significantly improving tensile strength—markers of effective tissue remodeling. Elevated hydroxyproline levels confirm enhanced collagen deposition, while higher SOD activity indicates reduced oxidative damage at the wound site. Histological evidence showed better-organized dermal layers and neovascularization in treated groups. Importantly, the extract's antimicrobial activity against *S. aureus* and *P. aeruginosa* supports its dual role in infection control and tissue repair. These results suggest that *Ficus hispida* exerts a multifactorial healing effect, making it a viable candidate for developing plant-based wound care formulations. Future work should focus on isolating active compounds and validating clinical efficacy.

CONCLUSION:

This study demonstrates that *Ficus hispida* leaf extract possesses significant wound healing potential through a combination of antimicrobial, antioxidant, and regenerative effects. The enhanced wound contraction, tensile strength, and biochemical markers observed in vivo indicate that the extract promotes faster and more effective skin repair. Its phytochemical richness—including flavonoids, saponins, and triterpenoids—appears to synergistically facilitate collagen formation, fibroblast activity, and oxidative balance. Histopathological analysis further corroborates these findings with evidence of mature granulation tissue and complete re-epithelialization. As a natural, non-toxic alternative to synthetic wound healing agents, *Ficus hispida* holds strong promise for integration into herbal and modern phytopharmaceutical applications. Its dual role in tissue regeneration and infection control positions it as a valuable botanical asset in managing acute and chronic wounds. Further preclinical and clinical evaluations, as well as formulation development, are warranted to establish its therapeutic profile and translational potential.

REFERENCES:

1. Abood, W. N., Al-Mahmood, S. M., & Abdullah, R. (2021). Evaluation of wound healing activity of herbal ointments. *Journal of Pharmacy & Bioallied Sciences*, *13*(1), 122–126.
2. Akhtar, M. S., & Farooq, M. (2016). Flavonoids and their antimicrobial activity. *International Journal of Pharmacognosy*, *3*(2), 95–102.
3. Alam, M. B., Ju, M. K., & Lee, S. H. (2017). Antioxidant and anti-inflammatory activities of *Ficus hispida* L. and its major compounds. *BMC Complementary and Alternative Medicine*, *17*(1), 1–12.
4. Ali, M., & Chaudhary, N. (2020). Saponins: Pharmacological and toxicological aspects. *Journal of Pharmacognosy and Phytochemistry*, *9*(4), 1057–1061.
5. Ananthakrishnan, R., & Doss, A. (2019). Evaluation of antibacterial activity of *Ficus hispida* leaf extract. *Asian Journal of Pharmaceutical and Clinical Research*, *12*(8), 280–283.
6. Anwar, F., Latif, S., Ashraf, M., & Gilani, A. H. (2007). Moringa oleifera: A food plant with multiple medicinal uses. *Phytotherapy Research*, *21*(1), 17–25.
7. Bhat, R. S., Al-Daihan, S., & Al-Mulhim, A. (2017). Phytochemical and antioxidant evaluation of *Ficus hispida*. *Pharmacognosy Research*, *9*(2), 136–140.
8. Chanda, S., & Baravalia, Y. (2011). Antioxidant and wound healing potential of *Cassia fistula* extracts. *Journal of Ethnopharmacology*, *138*(3), 556–561.
9. Charde, R. M., Fulzele, S. V., Satturwar, P. M., & Joshi, S. B. (2010). Wound healing and anti-inflammatory activity of extract of *Ficus benghalensis* Linn. *Indian Journal of Pharmacology*, *42*(3), 123–126.
10. Choudhary, A., & Singh, V. (2018). Natural wound healing agents: A review. *International Journal of Pharmaceutical Sciences Review and Research*, *49*(1), 129–137.
11. Dai, T., Huang, Y. Y., & Hamblin, M. R. (2010). Wound healing and photodynamic therapy. *Journal of Investigative Dermatology*, *130*(3), 915–924.
12. Das, A., & Banerjee, S. (2022). Role of phytochemicals in tissue regeneration. *Biomedicine & Pharmacotherapy*, *150*, 112993.
13. Dharmani, P., & Palit, G. (2006). Exploring Indian medicinal plants for antiulcer activity. *Indian Journal of Pharmacology*, *38*(2), 95–99.
14. Ghosh, P. K., & Playford, R. J. (2003). Bioactive natural compounds for wound healing. *British Journal of Pharmacology*, *139*(4), 453–465.
15. Govindappa, M. (2011). A review on role of plant(s) extracts and active compounds in wound healing. *International Journal of Pharmaceutical and Biomedical Research*, *2*(4), 105–120.
16. Gupta, R., Bajpai, P., & Johri, S. (2019). Wound healing potential of *Ficus* species. *Journal of Ethnopharmacology*, *239*, 111911.
17. Harborne, J. B. (1998). *Phytochemical methods: A guide to modern techniques of plant analysis* (3rd ed.). Chapman and Hall.
18. Jain, R., Jain, A., & Jain, C. P. (2010). Herbal therapy for wound healing: A review. *International Journal of Pharmaceutical Sciences and Research*, *1*(11), 1–12.
19. Joseph, B., & Raj, S. J. (2010). Pharmacognostic and phytochemical properties of *Ficus* species: A review. *International Journal of PharmTech Research*, *2*(4), 2174–2182.
20. Khare, C. P. (2007). *Indian Medicinal Plants: An Illustrated Dictionary*. Springer.
21. Kiran, S., & Lalitha, K. G. (2015). Evaluation of wound healing activity of *Ficus hispida* Linn leaves in albino rats. *International Journal of Current Pharmaceutical Research*, *7*(2), 38–42.
22. Kokate, C. K., Purohit, A. P., & Gokhale, S. B. (2008). *Pharmacognosy* (45th ed.). Nirali Prakashan.
23. Krishna, V., Sreeja, S., & Nair, R. (2013). Anti-inflammatory effects of *Ficus hispida* leaf extract. *Journal of Ayurveda and Integrative Medicine*, *4*(4), 223–226.
24. Kumar, S., & Pandey, A. K. (2013). Chemistry and biological activities of flavonoids: An overview. *The Scientific World Journal*, *2013*, 162750.
25. Motawea, A., & El-Sharkawy, E. (2021). Medicinal plants in skin wound healing. *Clinical Dermatology Research Journal*, *6*(1), 19–25.
26. Mukherjee, P. K., Nema, N. K., & Maity, N. (2014). Phytochemical and therapeutic profile of *Ficus* species. *Current Pharmaceutical Biotechnology*, *15*(11), 999–1007.
27. Nayak, B. S., Anderson, M., & Pinto Pereira, L. M. (2007). Evaluation of wound healing activity of *Morinda citrifolia* L. leaf. *Evidence-Based Complementary and Alternative Medicine*, *4*(4), 493–497.
28. Ncube, B., Afolayan, A. J., & Okoh, A. I. (2008). Assessment of antimicrobial and phytochemical properties of *Ficus sur* extracts. *African Journal of Biotechnology*, *7*(25), 4389–4393.
29. Panda, V., & Sonkamble, M. (2012). Antioxidant and wound healing potential of *Lagerstroemia speciosa*. *Indian Journal of Pharmacology*, *44*(6), 689–694.
30. Patel, N. J., & Patel, P. M. (2020). Herbal formulations for wound healing: A review. *Journal of Drug Delivery and Therapeutics*, *10*(4), 165–171.
31. Rai, M. P., & Thilakchand, K. R. (2010). Antimicrobial activity of *Ficus* species: A comparative study. *Pharmacognosy Journal*, *2*(16), 16–19.
32. Zhang, L., & Li, Q. (2020). Plant-derived natural products in wound healing. *Current Pharmaceutical Design*, *26*(24), 2917–2929.