

Formulation And Evaluation of Anti Acne Gel

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Abstract—The historical utilization of folk herbal medicine for skin health spans thousands of years, with even great apes observed using herbs for self-treatment. Currently, the World Health Organization estimates that over 80% of individuals in developing countries rely on traditional medicine for primary health needs. India, often called the "botanical garden of the world," remains a central hub for this research due to its vast collection of medicinal herbs. The resurgence of interest in herbal treatments is driven by a shift toward holistic healthcare, as patients seek alternatives to conventional medications to avoid side effects and chemical exposure. Medicinal plants serve not only as direct therapeutic agents but also as critical starting materials for drug synthesis.

I. INTRODUCTION

The history of humanity is inextricably linked to the natural environment, particularly in our quest to maintain physical health and integrity. Historically, folk herbal medicine has been used to treat skin health problems for thousands of years, representing a repository of ancestral knowledge passed down through generations. This practice is not unique to humans; observational evidence suggests that our evolutionary cousins, the great apes, actively select and utilize specific plants for self-treatment, demonstrating that the instinct to heal through nature is deeply ingrained in primate behavior. These early observations formed the foundation of what would eventually become structured systems of traditional medicine.

The application and implementation of these herbal practices have varied significantly across continents, heavily dictated by local flora, climate, and environmental availability. In tropical regions, medicinal plants with high alkaloid or resin content were utilized, while in more temperate climates, herbs with different aromatic and antiseptic properties became staples. This global diversity in

traditional medicine reflects the adaptability of ancient societies in identifying remedies within their immediate surroundings.

In the modern era, the significance of these traditions remains profound. According to the World Health Organization, over 80% of individuals in developing countries rely on traditional medicine to meet their primary health care needs. For these populations, traditional medicine is not merely an alternative or a cultural preference; it is the frontline of health maintenance, providing essential care where synthetic pharmaceuticals may be unaffordable, inaccessible, or scarce.

Within this global context, India holds a position of singular importance and is widely considered the "botanical garden of the world" due to its unparalleled and extensive collection of medicinal herbs. The country's diverse geography, ranging from the Himalayan foothills to the coastal plains, provides a natural laboratory for thousands of species of therapeutic value. This rich biodiversity has allowed India to remain a central hub for ethnopharmacological research, attracting global attention for its potential to provide sustainable, plant-derived solutions to modern health challenges.

The utility of medicinal plants extends far beyond their traditional applications. Beyond being non-toxic and easily accessible, these plants are vital for advanced pharmacological research, serving either as direct therapeutic agents or as essential precursors for the synthesis of complex drugs. Modern pharmaceutical chemists frequently study the structural properties of active plant metabolites to develop new, more effective medications. This synergy between traditional knowledge and modern science represents a critical pathway for drug development in the 21st century.

The recent, rapid shift toward holistic and natural healthcare models has significantly fueled the surging demand for herbal treatments. This movement is

driven by a conscious consumer choice; individuals are increasingly seeking to avoid the adverse side effects, chronic chemical exposure, and environmental sustainability issues frequently associated with mass-produced conventional medicine. Synthetic treatments, while often fast-acting, can occasionally cause skin barrier disruption, increased sensitivity, or long-term issues like antibiotic resistance. In contrast, herbal treatments are perceived as more harmonious with the body's natural physiological processes, offering a gentler approach to healing.

Furthermore, scientific validation of these traditional herbs continues to grow, providing empirical data to support long-standing anecdotal claims. Clinical research is now confirming the efficacy of various plant extracts in managing dermatological symptoms such as redness, itching, and inflammation the hallmark signs of many skin disorders. By identifying the specific phytochemicals responsible for these anti-inflammatory and soothing effects, researchers are successfully bridging the gap between historical folk wisdom and evidence based clinical practice.

As we look toward the future, the integration of traditional herbal knowledge into contemporary medicine offers a promising avenue for dermatological research. By prioritizing sustainable cultivation, standardized extraction, and rigorous clinical evaluation, we can continue to refine the use of these natural resources. The ongoing scientific interest in herbal alternatives underscores a universal desire to return to nature as a reliable, safe, and effective partner in the pursuit of lifelong dermatological health. This evolving landscape ensures that the legacy of folk medicine will continue to play a pivotal role in shaping the therapeutic future of global health services.

II. DERMATOLOGICAL DISORDERS

The human skin, as the largest organ and the primary barrier between the body and its environment, is frequently subjected to a wide array of pathological conditions. These dermatological disorders, ranging from inflammatory responses to infectious diseases, significantly impact the quality of life and self-esteem of affected individuals. The following section delineates common skin conditions and explores the therapeutic potential of various herbal management

strategies.

Acne Vulgaris: This condition is primarily characterized by the clogging of pores due to excess sebum and dead skin cells, which leads to the development of blackheads, whiteheads, and painful, inflammatory pimples. Conventional management often focuses on exfoliation to clear these blockages. Natural therapeutic approaches utilize fruit acids-specifically glycolic and citric acids-which promote exfoliation and skin turnover. Furthermore, medicinal plants such as *Acacia catechu* and *Allium sativum* are utilized in traditional treatments to mitigate the bacterial growth and inflammation associated with the condition.

Psoriasis: Psoriasis is recognized as a chronic, hyper-proliferative autoimmune disorder that affects approximately 1-3% of the global population. It manifests as itchy, painful, and raised patches of skin, caused by the body producing new skin cells at an abnormally accelerated rate. Herbal management focuses on soothing these plaques and regulating skin cell growth, with *Aloe vera* and *Curcuma longa* (Turmeric) being particularly noted for their significant management properties in reducing symptoms.

Ringworm (Tinea Corporis): This is a highly contagious fungal infection that can affect nearly any part of the body, most commonly appearing on the limbs. It is distinguished by the development of red or silvery, ring-shaped scaly rashes. Traditional medicine frequently employs antifungal plant remedies, most notably *Neem* and black walnut, to manage the infection and alleviate the associated discomfort.

Furuncles (Boils): A furuncle is a deep-seated infection of the hair follicle, scientifically identified as a form of folliculitis. These painful, swollen lesions are typically caused by *Staphylococcus aureus* bacteria and often involve the accumulation of pus and necrotic tissue. Traditional herbal protocols for addressing boils center on the use of agents like *Neem*, garlic, and *Amla*, which are valued for their antimicrobial and anti-inflammatory characteristics.

Other Dermatological Conditions: Beyond the conditions listed above, the research encompasses a broader spectrum of skin health challenges.

o **Warts (Verrucae):** These are common, benign viral infections caused by the Human Papillomavirus (HPV) that affect the skin and mucous membranes.

o Dermatitis: This term describes a diverse range of skin irritations and rashes triggered by various factors, including genetic predisposition, allergies, environmental irritants, and immune system overactivity.

o Scabies: An intense, itchy rash caused by the burrowing of the mite *Sarcoptes scabiei*, which often thrives in skin folds and is particularly irritating during the night.

o Skin Cancer: This involves the abnormal and uncontrolled growth of skin cells, frequently associated with excessive exposure to ultraviolet radiation.

o Vitiligo: A condition characterized by the loss of skin pigmentation, occurring when the immune system destroys melanocytes, resulting in lighter or white patches on the skin.

By investigating these conditions, researchers continue to identify specific herbs—such as chamomile for dermatitis, red ginseng for skin cancer, and various others that offer safe, natural alternatives to synthetic interventions.

III. PHARMACOLOGICAL PROFILES OF KEY HERBS

The therapeutic efficacy of the formulated herbal gel is rooted in the synergistic pharmacological properties of four primary medicinal plants. Each herb has been selected based on its historical use and established biological activity, which, when combined, offer a multifaceted approach to treating dermatological disorders.

Azedarach indica (Neem): This plant is renowned for its diverse bioactive constituents, most notably azadirachtin. It demonstrates potent anti-inflammatory, antibacterial, and anticarcinogenic properties, making it an essential component for treating conditions such as boils, eczema, and septic sores.

Aloe vera: Widely recognized for its ability to accelerate wound healing, *Aloe vera* serves as a critical agent in improving overall skin health. Clinical research has highlighted its effectiveness in dermatological care, with studies reporting significant improvements in plaque psoriasis patients who were treated with aloe-based topical creams compared to placebos.

Curcuma longa (Turmeric): The efficacy of turmeric

is largely attributed to curcumin, a powerful polyphenol known for its antioxidant and anti-inflammatory properties. Traditionally used in India to provide skin luster, it is also clinically significant for its role in wound healing, reducing scarring, and providing potential protection against skin cancer.

Triad procumbens (Coat Button): Rich in flavonoids and alkaloids, this plant is characterized by its significant immunomodulatory and antimicrobial activities. It has a long history of use in folk medicine for the management of various wounds and skin diseases.

The integration of these four plants allows the formulation to leverage a broad spectrum of healing mechanisms, addressing both the symptoms and the underlying causes of various skin conditions. By synthesizing these pharmacological profiles, the resulting gel aims to provide a natural, effective, and well-tolerated therapeutic option for dermatological care.

IV. CONVENTIONAL VS. HERBAL APPROACHES

The management of dermatological disorders has traditionally been bifurcated between the rapid, targeted actions of synthetic pharmaceutical preparations and the holistic, systemic benefits of herbal remedies. Understanding the distinctions between these two modalities is essential for evaluating the potential of new herbal formulations.

Drawbacks of Conventional Treatments: Conventional skin therapies often rely on synthetic active ingredients that, while potent, carry significant drawbacks for the patient.

o Side Effects: Many standard topical treatments, including corticosteroids and retinoids, are frequently associated with localized side effects such as excessive dryness, burning, itching, and general irritation, which often lead to poor patient compliance.

o Chemical Sensitivity: A substantial portion of the population exhibits sensitivity or allergic responses to the synthetic chemical compounds used as preservatives, stabilizers, or active ingredients in conventional drugs.

o Antibiotic Resistance: The heavy reliance on antibiotics in conventional acne management has significantly contributed to the emergence of

antibiotic-resistant bacterial strains, a major global health concern that complicates long term treatment.

- o **Diminished Efficacy:** Prolonged use of synthetic medications often leads to a "plateau effect," where the body becomes accustomed to the treatment, requiring higher, more concentrated doses that can exacerbate adverse reactions.

- o **Cost Barriers:** The high cost of specialized dermatological prescription medications often limits access for low-income populations, preventing consistent follow-through on treatment plans.

Benefits of Herbal Alternatives: Herbal medicine offers a compelling alternative that aligns with the growing global shift toward sustainable and personalized healthcare.

- o **Natural Composition:** By utilizing natural ingredients, herbal formulations significantly reduce the probability of harsh chemical reactions and offer a safer, gentler profile for patients with sensitive skin.

- o **Holistic Mechanisms:** Unlike synthetic drugs that often suppress only the surface symptoms, herbal remedies are frequently designed to address the underlying physiological and metabolic causes of skin conditions.

- o **Cultural Reliability:** Many herbal treatments are grounded in centuries of traditional and cultural use, which creates a strong foundation of public trust and historical evidence regarding their effectiveness.

- o **Safety Profile:** Herbal alternatives generally report fewer and less severe side effects compared to synthetic drugs, which significantly enhances patient adherence to daily application regimens.

- o **Environmental Sustainability:** The manufacturing and cultivation of herbal ingredients typically involve lower environmental impacts compared to the chemical synthesis of pharmaceuticals, aligning with modern preferences for "green" healthcare.

- o **Personalized Care:** The rich, diverse chemical profiles of medicinal plants allow for more personalized dermatological interventions, catering to specific skin types and conditions with a level of adaptability that synthetic compounds rarely possess.

The shift toward herbal solutions is not merely a rejection of modern science but an embrace

of a more nuanced approach to dermatological health. By integrating the safety of natural ingredients with the effectiveness of modern formulation science, herbal alternatives provide a viable, sustainable path forward.

V. METHODOLOGY

The primary objective of this project was to systematically analyze common dermatological disorders and successfully formulate a stable, effective herbal gel utilizing the extracts of *Triad procumbens* and *Azedarach indica* (Neem). The methodology was designed to ensure quality control, potency, and reproducibility throughout the formulation process.

Selection and Collection: Herbal drugs were meticulously selected at the growth stage corresponding to their maximum phytochemical yield, ensuring that diseased or subpar plant materials were rejected. Skilled labor was employed to ensure accurate identification based on morphological features such as height, leaf shape, size, and branching patterns.

Extraction Process: The extraction of both *Triad procumbens* and *Azedarach indica* was achieved through a rigorous 7-day maceration process. The dried, coarsely powdered plant materials were placed in a container and covered with ethanol as the solvent. Following the maceration period, the mixture was filtered, and the solvent was evaporated to produce a concentrated herbal extract.

Formulation Development:

- o **Dispersion:** The active herbal extracts (5% concentration each) were carefully dispersed into pure propylene glycol to ensure uniform solubility.

- o **Thickening and Stabilization:** Carbopol 940 (3%) was used as the rheology modifier to achieve the desired gel consistency. Methyl paraben was added to the formulation as a preservative to prevent microbial growth, and the mixture was agitated continuously at 300 rpm for 2–3 hours to ensure homogeneity.

- o **pH Adjustment:** The pH of the final gel was adjusted to 6 using monoethanolamide (MEA), a critical step to ensure compatibility with the natural mantle of the skin.

VI. RESULTS AND DISCUSSION

The formulated polyherbal anti-acne gel containing extracts of *Azadirachta indica* (Neem) and *Triadax procumbens* was successfully prepared and evaluated for its physicochemical characteristics. The formulation exhibited a white to translucent

appearance with a characteristic odor and a smooth, homogeneous texture. The pH of the gel was found to be 6.0, which is within the acceptable physiological range of human skin (4.5–6.5), indicating its suitability for topical application without causing irritation. The viscosity of the formulation was recorded as 0.37 poise, providing adequate consistency for easy application and prolonged retention on the skin surface. Furthermore, the gel demonstrated good spreadability and homogeneity, ensuring uniform distribution of the active ingredients over the affected area.

The favorable characteristics of the gel can be attributed to the optimized concentration of Carbopol 940, which provided appropriate rheological properties, and propylene glycol, which enhanced the dispersion of herbal extracts. The incorporation of Neem extract contributed significant antibacterial and anti-inflammatory activities, which are essential for controlling *Cutibacterium acnes* and reducing inflammatory lesions associated with acne vulgaris. Similarly, *Tridax procumbens* is rich in flavonoids and alkaloids that possess antimicrobial, antioxidant, and wound-healing properties, thereby supporting skin repair and reducing post-acne scarring.

The findings of the present study are consistent with previous reports demonstrating the effectiveness of herbal formulations in managing acne and other dermatological disorders. Unlike conventional anti-acne products that may cause skin dryness, irritation, or antibiotic resistance with prolonged use, the herbal gel showed desirable physical properties and is expected to offer a safer therapeutic profile. The synergistic action of the selected medicinal plants may enhance therapeutic efficacy while minimizing adverse effects. Therefore, the developed polyherbal gel represents a promising natural alternative for acne management. However, further microbiological studies, stability assessments, and controlled clinical trials are recommended to confirm its long-term safety, efficacy, and therapeutic potential in dermatological practice.

Sno.	PARAMETER	OBSERVATION
1	Colour	White
2	Odour	Characteristics

3	Consistency	Good
4	PH	6
5	Viscosity	0.37 Poise
6	Spreadability	Good
7	Homogeneity	Good

VII. CONCLUSION

The present study successfully demonstrated the formulation and evaluation of a polyherbal anti-acne gel incorporating extracts of *Azadirachta indica* (Neem) and *Tridax procumbens*, two medicinal plants well known for their antimicrobial, anti-inflammatory, antioxidant, and wound-healing properties. The developed formulation exhibited satisfactory physicochemical characteristics, including appropriate pH, good homogeneity, desirable viscosity, and excellent spreadability, making it suitable for topical application. These properties ensure patient acceptability, ease of application, and effective delivery of active phytoconstituents to the affected skin area.

The review of available literature further supports the therapeutic potential of herbal medicines in the management of acne vulgaris and other dermatological disorders. Herbal formulations offer several advantages over conventional therapies, including reduced risk of adverse effects, lower incidence of antibiotic resistance, improved patient compliance, and greater environmental sustainability. The synergistic action of the bioactive compounds present in Neem and *Tridax procumbens* may contribute to enhanced antibacterial activity against acne-causing microorganisms while simultaneously promoting skin healing and reducing inflammation.

Overall, the findings suggest that the formulated herbal anti-acne gel represents a safe, effective, and economical alternative to synthetic topical preparations. However, further investigations involving stability studies, microbiological evaluations, toxicity assessments, and well-designed clinical trials are necessary to establish its long-term safety, efficacy, and commercial viability. The growing interest in plant-based therapeutics

highlights the potential of herbal formulations as promising candidates for future dermatological applications.

REFERENCES

- [1] Alburyhi, M. M. (n.d.). Formulation and evaluation of natural herbal anti-acne as gel delivery systems. *World Journal of Pharmaceutical Research*.
- [2] Ansong, J. A., et al. (2023). Formulation and Evaluation of Herbal-Based Antiacne Gel Preparations. *BioMed Research International*, 2023. <https://doi.org/10.1155/2023/7838299>
- [3] Aslani, A., Zolfaghari, B., & Fereidani, Y. (2018). Design, formulation, and evaluation of a herbal gel contains melissa, sumac, licorice, rosemary, and geranium for treatment of recurrent labial herpes infections. *Dental Research Journal*, 15(3), 191. <https://doi.org/10.4103/1735-3327.231865>
- [4] Baby, A. R., et al. (2022). Azadirachta indica (Neem) as a potential natural active for dermocosmetic and topical products: A narrative review. *Cosmetics*, 9(3), 58.
- [5] Chanchal, D., & Swarnlata, S. (2008). Novel approaches in herbal cosmetics. *Journal of Cosmetic Dermatology*, 7(2), 89–95.
- [6] Eshun, K., & He, Q. (2004). Aloe vera: A valuable ingredient for the food, pharmaceutical and cosmetic industries-A review. *Critical Reviews in Food Science and Nutrition*, 44(2), 91–96.
- [7] Hamman, J. H. (2008). Composition and applications of Aloe vera leaf gel. *Molecules*, 13(8), 1599–1616.
- [8] Hammer, K. A., et al. (2006). Melaleuca alternifolia (Tea Tree) oil: A review of antimicrobial and other medicinal properties. *Clinical Microbiology Reviews*, 19(1), 50–62.
- [9] Hekmatpou, D., et al. (2019). The effect of Aloe vera clinical trials on prevention and healing of skin wound: A systematic review. *Journal of Wound Care*.
- [10] Huang, Y., et al. (2023). Efficacy of herbal medicine in acne vulgaris: A systematic review. *Dermatological Science*.
- [11] Kumar, D. (n.d.). Formulation, evaluation, and optimization of polyherbal gel for effective antifungal action. *Asian Journal of Pharmaceutical and Pharmacological Sciences*.
- [12] Li, X., et al. (2024). Trends in natural product development for dermatological applications. *Journal of Ethnopharmacology*.
- [13] Mhaske, S., et al. (2026). Formulation and Evaluation of a Polyherbal Anti Acne Gel: Incorporating Dual Gelling Agent. *Research Journal of Topical and Cosmetic Sciences*, 17(1), 15–20. <https://doi.org/10.52711/2321-5844.2026.00004>
- [14] Nasri, H., et al. (2015). Medicinal plants for the treatment of acne vulgaris: A review of recent evidences. *Jundishapur Journal of Microbiology*, 8(11). <https://doi.org/10.5812/jjm.25580>
- [15] Patil, M., et al. (2024). A review on polyherbal antiacne gel. *World Journal of Pharmaceutical Research*, 13(2), 469–483.
- [16] Pattanayak, P., et al. (2010). Ocimum sanctum Linn. A reservoir plant for therapeutic applications: An overview. *Pharmacognosy Reviews*, 4(7), 95–105.
- [17] Ruchiatan, K. (n.d.). Herbal therapies for acne vulgaris: A systematic review of clinical evidence. *Perinatal Journal*.
- [18] Surjushe, A., Vasani, R., & Saple, D. G. (2008). Aloe vera: A short review. *Indian Journal of Dermatology*, 53(4), 163–166.
- [19] Vaughn, A. R., et al. (2016). Effects of turmeric (Curcuma longa) on skin health: A systematic review of the clinical evidence. *Phytotherapy Research*, 30(8), 1243–1264.
- [20] Wynn, S. G., & Fougère, B. J. (2007). *Veterinary Herbal Medicine: A Systems-Based Approach*. Elsevier.