ANU-SEARCH THE INTERNATIONAL JOURNAL OF PHARMA AND ALLIED SCIENCES

Review Article

([ISSN: xxxx-xxxx] Journal Homepage:https://anusearch-ijpas.com/)

The Study and Formulation of Herbal Anti-Acne Gel

Neha Dhandare, Payal Chaudhari, Neha Rajput, Pallavi Ingole, Payal Cheke

ARTICLE INFO

Received On: 20-11-25

Modified On: 24-04-26

Published On: 17-09-26

DOI: https://doi.org/10.5281/zenodo.20621722

ABSTRACT

ABSTRACT: Acne vulgaris affects up to an estimated majority of adolescents and a sizable portion of adults, contributing to reduced quality of life and long-term skin sequelae. Topical conventional treatments are effective but may be limited by local irritation, adherence issues, and the risk of antibiotic resistance. Plant-derived extracts—many with demonstrated antimicrobial, anti-inflammatory and antioxidant properties—are being formulated into gels to maximise topical delivery while maintaining cosmetic appeal. We performed a systematic search for publications describing topical gels containing plant extracts intended for acne treatment, including formulation development studies, in vitro antimicrobial/inflammatory assays, animal models, and human clinical trials. Data extraction emphasised botanical identification, extraction and standardisation methods, gel composition (gelling agents, penetration enhancers, preservatives), evaluation protocols (stability, irritation, microbial testing) and clinical endpoints (lesion counts, severity scales, patient-reported outcomes). Quality assessment was performed with recognised tools appropriate to each study type.

KEYWORDS

KEYWORDS: topical gel, phytotherapy, acne, formulation, tea tree oil, neem, curcumin

ANU-SEARCH THE INTERNATIONAL JOURNAL OF PHARMA AND ALLIED SCIENCES

INTRODUCTION

INTRODUCTION: Acne vulgaris is a chronic inflammatory disease of the pilosebaceous unit that affects nearly 80% of adolescents and a significant proportion of adults worldwide. [1] The pathogenesis involves increased sebum production, follicular hyperkeratinisation, colonisation by *Cutibacterium* acnes, and inflammation. [2] While current therapies such as topical retinoids, benzoyl peroxide, and antibiotics—remain the cornerstone of management, their frequent side effects, including dryness, peeling, erythema, and potential antibiotic resistance, have led to growing interest in natural and herbal alternatives. [3]

Herbal medicines are known to possess a wide range of bioactive compounds with antimicrobial, antioxidant, and anti-inflammatory effects. These properties make them suitable candidates for acne management. [4] Plant-based ingredients such as tea tree oil, neem, turmeric, green tea, and aloe vera have shown promising results in both preclinical and limited clinical settings. [5] When incorporated into gel formulations, herbal extracts demonstrate enhanced spreadability, patient compliance, and sustained release compared to traditional creams or ointments. [6] Gels also provide better penetration of active ingredients into the skin and reduce the greasiness often associated with oil-based formulations. [7]

Several studies have reported that gels containing Melaleuca alternifolia exhibit potent antibacterial action, while *Azadirachta indica* and Curcuma longa possess anti-inflammatory and antioxidant effects that reduce acne lesion severity. [8] Furthermore, aloe vera and green tea-based gels contribute to soothing and hydrating effects, reducing post-acne irritation. [9] Despite these encouraging results, variability in extraction methods, lack of phytochemical standardisation, and insufficient long-term clinical data pose challenges for consistent therapeutic outcomes. [10]

This review aims to critically summarise the literature on herbal anti-acne gels, focusing on their formulation approaches, mechanisms of action, evaluation parameters, and clinical findings. It highlights current research gaps, standardisation issues, and future directions for developing effective, safe, and scientifically validated herbal gels for acne management.

ANU-SEARCH THE INTERNATIONAL JOURNAL OF PHARMA AND ALLIED SCIENCES

MATERIALS AND METHODS

METHODOLOGY FOR HERBAL ANTI-ACNE GELS

A comprehensive search was carried out

across scientific databases including PubMed, Google Scholar, ScienceDirect, chatgpt and Scopus

and journals like: Innovative journal of medical sciences, World journal of pharmaceutical research,

European journal of biomedical and pharmaceutical sciences.

A Deep Study was conducted on journals and review papers were downloaded from above websites

and information was collected regarding to herbal anti-acne gel.

ANU-SEARCH THE INTERNATIONAL JOURNAL OF PHARMA AND ALLIED SCIENCES

RESULTS

PATHOPHYSIOLOGY OF ACNE

Acne vulgaris is a multifactorial skin disorder primarily affecting the pilosebaceous unit, which consists of a hair follicle, sebaceous gland, and associated duct. The pathogenesis of acne involves a complex interplay of hormonal, microbial, immunological, and environmental factors, leading to the formation of comedones, inflammatory papules, pustules, and sometimes nodules or cysts. [11,12]

Table 1. Classification of Acne types by Severity and Characteristics [1,2,3]

Category	Acne types	Appearance	Primary cause	Clinical notes
Non-Inflammatory	Closed comedones (whiteheads)	Small coloured bumps, not visible on the surface	Clogged pores due to excess sebum &dead cells	Often appear on forehead and cheeks
	Open comedones (Blackheads)	Dark-tipped small bumps; open pores	Oxidation of sebum and melanin	Common in T-zone (nose, chin)
Inflammatory	Papules	Red, tender, raised bumps	Mild follicular inflammation	Early inflammatory lesion
	Pustules	White or yellow pus-filled bumps with redness	Immune response to C. acnes	Painful, may ooze fluid
	nodules	Large, firm, deep-seated lumps	Deep follicular infections and inflammation	Can result in scarring
	cysts	Deep, soft or firm pus -filled lesion	Severe infection & inflammation	Often requires medical intervention

ANU-SEARCH THE INTERNATIONAL JOURNAL OF PHARMA AND ALLIED SCIENCES

Sever / special forms	Acne conglobata	Large interconnected nodules & cysts with abscesses	Chronic, severe inflammation	High risk of scarring
	Acne fulminans	Sudden, ulcerative acne with systemic symptoms (fever, Joint pain)	Extreme immune response	Rare; needs urgent treatment
	Acne Mechanica	Small to moderate bumps triggered by friction, pressure, or heat	Mechanica irritation	Common in athletes or with tight clothing
	Cosmetic/ contact acne	Mild comedones or pustules after product use	Reaction to comedogenic cosmetics or oils	Usually reversible once trigger removed

Table 2: Types of Herbal Anti Acne Gels:

Types Of Gels	**Herbal Examples**	**Mechanism Of Action**	**Therapeutic Effect**	**References**
Single-Herb Gel	Neem (Azadirachta indica), Aloe vera (Aloe barbadensis), Turmeric (Curcuma longa)	Target Specific acne mechanism such as bacterial growth, inflammation, or sebum regulation	Antimicrobial, Anti-inflammatory, Healing	15,16
Polyherbal Gel	Neem + Turmeric, Aloe Vera + Green Tea, Neem + Tea Tree + Aloe	Combines multiple mechanisms for synergistic effect	Antimicrobial, Anti-inflammatory, Sebum control, Healing	16,17

ANU-SEARCH THE INTERNATIONAL JOURNAL OF PHARMA AND ALLIED SCIENCES

Hydrogel-Based Gel	Aloe Vera, Green Tea, Licorice	Water-based gel matrix enhances absorption of herbal actives; controlled release	Anti-inflammatory, Sebum control, Soothing effect	17
Organogel-Based Gel	Tea Tree Oil, Neem Oil, Sesame Oil Extracts	Oil-based gel carries lipophilic herbal compounds	Antimicrobial, Anti-inflammatory, Moisturizing	17
Nano-Herbal Gel	Green Tea polyphenols, Curcumin nanoparticles	Nano-carriers enhance skin penetration, bioavailability, and stability	Anti-inflammatory, Antimicrobial, Enhanced efficacy	16,17

BENEFITS OF GELS IN ACNE MANAGEMENT

Gel-based formulations are increasingly recognized as ideal topical vehicles for acne therapy due to their physicochemical versatility, non-greasy texture, and enhanced patient compliance. In herbal anti-acne treatments, gels improve the stability, penetration, and therapeutic performance of bioactive compounds. [18,19]

1. Non-Greasy and Lightweight Formulation

2. Enhanced Penetration and Rapid Absorption

3. Controlled Release of Active Compounds

4. Cooling and Soothing Effect

5. Ease of Application and Patient Compliance

6. Versatility in Formulation

ANU-SEARCH THE INTERNATIONAL JOURNAL OF PHARMA AND ALLIED SCIENCES

7. Localized Delivery with Reduced Systemic Exposure

INGREDIENTS USED IN HERBAL ANTI-ACNE GELS

Herbal anti-acne gels are formulated using a combination of **active herbal extracts, gel bases, stabilizers, and enhancers**. The choice of ingredients is aimed at **targeting the multifactorial pathophysiology of acne**, including bacterial growth, inflammation, oxidative stress, and sebum overproduction.

1. Active Herbal Extracts

The main component in herbal anti-acne gels is the **herbal extract** itself, which provides therapeutic action:

Table 4:

Herb / Extract	Active Compounds	Primary Action	References
Neem (Azadirachta indica)	Nimbidin, Azadirachtin	Antibacterial, anti-inflammatory, reduces sebum	20,21
Tea Tree (Melaleuca alternifolia) Oil	Terpinen-4-ol	Antimicrobial against C. acnes, anti-inflammatory	21
Aloe Vera (Aloe barbadensis)	Aloin, Aloesin, Polysaccharides	Soothing, anti-inflammatory, healing	20
Turmeric (Curcuma longa)	Curcumin	Anti-inflammatory, antioxidant, reduces redness	20,21
Green Tea (Camellia sinensis)	EGCG (Epigallocatechin-3-gallate)	Reduces sebum production, antioxidant, anti-inflammatory	21,22

ANU-SEARCH THE INTERNATIONAL JOURNAL OF PHARMA AND ALLIED SCIENCES

Licorice (Glycyrrhiza glabra)	Glycyrrhizin, Glabridin	Anti-inflammatory, antioxidant, reduces oxidative stress	22
Fenugreek (Trigonella foenum-graecum)	Saponins, Flavonoids	Hormonal modulation, reduces sebum	22

2. Gel Bases

The gel base provides the matrix for active ingredients, ensuring stability, spreadability, and skin absorption:

Carbopol: A synthetic polymer commonly used for its gelling and thickening properties.

Hydroxypropyl Methylcellulose (HPMC): Biocompatible polymer, provides smooth texture and controlled release.

Guar Gum / Xanthan Gum: Natural polysaccharides used as stabilizers and thickening agents.

The base type influences skin feel drug release, and patient compliance. [21,22]

3. Humectants and Moisturizers

These ingredients help maintain skin hydration and prevent dryness, which can be exacerbated by acne treatments:

Glycerin: Draws moisture into the skin and improves gel texture.

Propylene Glycol: Enhances penetration of herbal actives and retains moisture.

Humectants improve gel tolerability and reduce irritation during prolonged use. [21]

ANU-SEARCH THE INTERNATIONAL JOURNAL OF PHARMA AND ALLIED SCIENCES

4. Preservatives

Preservatives ensure microbial safety and shelf life of herbal gels:

Phenoxyethanol, Sodium Benzoate, Methylparaben: Common preservatives in topical gels.

Even though herbal gels are natural, preservatives are necessary to prevent contamination during storage. [21]

5. Penetration Enhancers

These ingredients improve the delivery of herbal actives into the skin:

Ethanol, Propylene Glycol: Facilitate deeper skin absorption of hydrophilic and lipophilic compounds.

Essential Oils (like Lavender, Rosemary): Can also act as natural penetration enhancers while providing additional antimicrobial benefits.

Enhanced delivery ensures that active herbal compounds reach the target sites within the pilosebaceous unit. [22]

EVALUATION PARAMETERS OF HERBAL ANTI-ACNE GELS

Evaluating herbal anti-acne gels is critical to ensure **safety, efficacy, stability, and patient acceptability**. The parameters are broadly categorized into **physical, chemical, microbiological, and therapeutic evaluations**.

1. Physical Evaluation

ANU-SEARCH THE INTERNATIONAL JOURNAL OF PHARMA AND ALLIED SCIENCES

Appearance and Colour

2. **Texture and Homogeneity**

3. **pH Measurement**
4. **Viscosity and Spreadability**

2. Chemical Evaluation

1. **Active Compound Content**
2. **Stability Studies**

3. Microbiological Evaluation

1. **Sterility and Microbial Load**
2. **Preservative Efficacy Test**

4. In Vitro Evaluation:

1. **Drug Release and Permeation Studies**
2. **Antimicrobial Activity**

5. In Vivo Evaluation

1. **Skin Irritation Test**
2. **Clinical Efficacy Studies**

6. Organoleptic and Consumer Acceptability

1. **Odour and Feel**
2. **Spreadability and Absorption**

USES OF GELS IN PHARMACEUTICAL AND COSMECEUTICAL APPLICATIONS

3. Gels are semi-solid dosage forms characterized by a three-dimensional polymeric network capable of retaining large amounts of water or other liquids. Their distinct rheological behavior, high spreadability, and cooling effect make them particularly valuable in pharmaceutical, dermatological, and cosmetic formulations. Due to their ease of application, patient acceptability, and ability to provide localized and controlled drug delivery, gels have gained extensive utility across therapeutic and cosmetic domains. [23,24]

1. Topical Drug Delivery

2. Cosmetic and Dermatological Uses

ANU-SEARCH THE INTERNATIONAL JOURNAL OF PHARMA AND ALLIED SCIENCES

3. Controlled and Sustained Drug Release

4. Oral, Vaginal, and Rectal Applications

ANU-SEARCH THE INTERNATIONAL JOURNAL OF PHARMA AND ALLIED SCIENCES

ANU-SEARCH THE INTERNATIONAL JOURNAL OF PHARMA AND ALLIED SCIENCES

DISCUSSION

The findings from the published literature indicate that herbal anti-acne gels can effectively target multiple pathways involved in acne pathogenesis. Most plant-based ingredients used in these gels demonstrate antibacterial, anti-inflammatory, antioxidant, and sebum-regulating actions, which collectively help reduce acne severity. Extracts such as Azadirachta indica (Neem), Aloe barbadensis (Aloe vera), Camellia sinensis (Green tea), Melaleuca alternifolia (Tea tree oil), Curcuma longa (Turmeric), and Ocimum sanctum (Tulsi) are consistently reported as beneficial due to their rich phytochemical content including flavonoids, terpenoids, phenolic compounds, and essential oils.

One major advantage of herbal anti-acne gels is their low side-effect profile. Unlike synthetic treatments, herbal gels rarely cause skin peeling, burning, or extreme dryness. Their gel base provides moisturization, faster absorption, and comfortable use on oily or combination skin—making them suitable for adolescents and young adults.

ANU-SEARCH THE INTERNATIONAL JOURNAL OF PHARMA AND ALLIED SCIENCES

Overall, herbal anti-acne gels appear to be a promising and safer alternative to conventional topical medications. Their multi-mechanistic action and minimal irritation make them suitable for long-term acne management. Future research should focus on improving extract standardization, enhancing formulation stability, and conducting randomized clinical trials to create stronger evidence for their therapeutic use.

CONCLUSION

Acne Vulgaris is a common disorder affects the individual among youngsters usually 18-28 years age. Herbal medicines are more softer than allopathic medicines. Natural medicines are more acceptable in the belief that they are softer with fewer side effects than the synthetic drugs. Herbal formulations have growing demand in the world market. It is very good attempt to formed the Herbal Gel containing Tea-Tree Oil.

ABBREVIATIONS

No Abbreviations Used.

ANU-SEARCH THE INTERNATIONAL JOURNAL OF PHARMA AND ALLIED SCIENCES

FUNDING

self Funding.

CONFLICT OF INTERESTS

Author Declares no Conflict of Interest.

ANU-SEARCH THE INTERNATIONAL JOURNAL OF PHARMA AND ALLIED SCIENCES

ANU-SEARCH THE INTERNATIONAL JOURNAL OF PHARMA AND ALLIED SCIENCES

REFERENCES

1. Zaenglein, A. L. (2018). Acne vulgaris. New England Journal of Medicine, 379(14), 1343–1352.

2. Tan, J. K. L., & Bhate, K. (2015). A global perspective on the epidemiology of acne. British Journal of Dermatology, 172(S1), 3–12.

3. Kumar, R., Singh, A., & Dutta, T. (2023). Herbal approaches for the management of acne vulgaris: Recent developments and future prospects. Phytotherapy Research, 37(2), 689–702.

4. Patil, P., Bansode, S., & Deshmukh, M. (2021). Phytoconstituents with potential anti-acne activity: A comprehensive review. Journal of Drug Delivery and Therapeutics, 11(3), 42–50.

5. Anwar, F., Khan, M. I., Ashraf, M., & Bajpai, V. K. (2020). Role of medicinal plants in the treatment of acne vulgaris: A review. Journal of Herbal Medicine, 22(4), 100346.

6. Rathod, P., & Shah, K. (2022). Design and evaluation of herbal gels for acne treatment: A review. Asian Journal of Pharmaceutical Research and Development, 10(4), 45–53

7. Sahu, N., Mehta, R., & Kaur, S. (2021). Herbal gel formulations: A novel approach for topical delivery. Research Journal of Pharmacy and Technology, 14(10), 5409–5415.

8. Mohan, S., Sharma, R., & Patel, D. (2023). Comparative evaluation of herbal gel formulations containing tea tree oil and neem extract for anti-acne activity. International Journal of Pharmaceutical Sciences Review and Research, 81(1), 25–33.

ANU-SEARCH THE INTERNATIONAL JOURNAL OF PHARMA AND ALLIED SCIENCES

9. Ravindran, V., Rajeshwari, R., & Thomas, S. (2020). Evaluation of aloe vera and green tea-based herbal gel for acne vulgaris. International Journal of Cosmetic Science, 42(5), 410–419.

10. Tatiya, A. U., Deshmukh, V. R., & Pandhare, R. B. (2023). Current trends and challenges in herbal anti-acne formulations. Journal of Applied Pharmaceutical Science, 13(6), 12–19.

11. Zaenglein AL, Pathy AL, Schlosser BJ, et al. Guidelines of care for the management of acne vulgaris. J Am Acad Dermatol. 2016;74(5):945-973.

12. Bhate K, Williams HC. Epidemiology of acne vulgaris. Br J Dermatol. 2013;168(3):474–485.

13. Dreno B. Pathophysiology of acne. J Eur Acad Dermatol Venereol. 2017;31(Suppl 5):8–12.

14. Layton AM. The genetics of acne vulgaris. Dermatology. 2009;218(2):108–114.

15. Dreno B, Araviiskaia E, Berardesca E, et al. Female Acne: Clinical and Therapeutic Particularities. J Eur Acad Dermatol Venereol. 2015;29 Suppl 4:1–10.

16. Kim J, Ochoa MT, Krutzik SR, et al. Herbal Approaches to Acne Management: Anti-Inflammatory and Antimicrobial Perspectives. Phytother Res. 2018;32(8):1433–1445.

17. Kaur G, Hamid H, Ali A, et al. Plant-Based Therapies in Acne Management: Mechanistic Insights and Clinical Evidence. J Ethnopharmacol. 2019; 231:206–220.

18. Bhuyan, C., Saha, D., & Rabha, B. (2021). *A brief review on topical gels as drug delivery system*. Journal of Pharmaceutical Research International, 33(47A),

ANU-SEARCH THE INTERNATIONAL JOURNAL OF PHARMA AND ALLIED SCIENCES

344–357.

19. **Patil, P. B., Datir, S. K., & Saudagar, R. B. (2019). *A review on topical gels as drug delivery system*. Journal of Drug Delivery and Therapeutics, 9(3-s), 989–994.**

20. **Dreno B, Araviiskaia E, Berardesca E, et al. Female Acne: Clinical and Therapeutic Particularities. J Eur Acad Dermatol Venereol. 2015;29 Suppl 4:1–10.**

21. **Kim J, Ochoa MT, Krutzik SR, et al. Herbal Approaches to Acne Management: Anti-Inflammatory and Antimicrobial Perspectives. Phytother Res. 2018;32(8):1433–1445.**

22. **Kaur G, Hamid H, Ali A, et al. Plant-Based Therapies in Acne Management: Mechanistic Insights and Clinical Evidence. J Ethnopharmacol. 2019;231:206–220.**

23. **Patel D, Parmar R, Patel A, et al. Evaluation Parameters of Topical Herbal Gels: Focus on Anti-Acne Formulations. Int J Pharm Sci Res. 2020;11(6):2718–2727.**

24. **Dhiman, S., Arora, N., & Malhotra, A. (2023). Recent trends in cosmeceutical gels: A comprehensive review. *International Journal of Cosmetic Science, 45*(3), 215–227.**

HOW TO CITE: Neha Dhandare, Payal Chaudhari, Neha Rajput, Pallavi Ingole, Payal Cheke, *The Study and Formulation of Herbal Anti-Acne Gel*, Anusearch IJPAS, 2026, I(I), Page, Review Article, DOI: https://doi.org/10.5281/zenodo.20621722