International Journal of Advanced Research in Science, Communication and Technology



ternational obarnal of Advanced Research in Ocience, Communication and Technol

International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal



Volume 5, Issue 7, May 2025

Evaluation and Formulation of Herbal Anti-Acne

Gel Vaishanavi S. Tambalkar¹, Rohit R. Kharat¹, Shraddha S. Kamble¹, Mandar V. Kamble¹, Athary D. Pawar¹, Dr. Aditya Madhale¹

Yashwant Redeker Collage of Pharmacy, Nesari, Gadhinglaj, Kolhapur, Maharashtra India

Abstract: Acne vulgaris is a common dermatological condition affecting adolescents and adults, leading to significant psychosocial impacts. Conventional treatments, though effective, often cause adverse effects such as dryness, irritation, and antibiotic resistance. The increasing demand for safer and more sustainable alternatives has led to the exploration of herbal therapies. In this project, an herbal anti-acne gel was formulated using extracts of Neem and Turmeric, known for their antibacterial, antioxidant, and anti-inflammatory properties. The extracts were obtained through Soxhlet extraction using ethanol. The gel was prepared using Carbopol 940 as a gelling agent, with the addition of propyl paraben, CMC, PEG-400, and triethanolamine to optimize stability, pH, and spreadability. The prepared formulations were evaluated for physical appearance, pH, viscosity, spreadability, and washability. Results indicated that the formulations had acceptable physicochemical properties, demonstrating the potential of herbal-based gels as effective alternatives for acne management. This study supports the use of plant-based ingredients in developing safer topical therapies for acne.

Keywords: Acne vulgaris, Anti-acne Gel, Azadirachta-indica, P. acne

I. INTRODUCTION

Acne is derived from the Greek word of '*akme*' means 'peak' or 'apex'. The correct name for acne is acne vulgaris. It is characterized by the formation of inflammatory and non- inflammatory lesions of the hair follicles and sebaceous glands commonly referred to as the *pilosebaceous* unit. ^[1] Acne vulgaris is an extremely common skin disorder that affects areas containing the largest oil glands, including the face, back, and trunk. *Propionibacterium acnes (P. acnes)*, an anaerobic pathogen, plays an important role in the pathogenesis of acne. ^[2]

*Propionibacterium*acnes is an anaerobic gram-positive pathogen that colonizes in sebaceous follicles. It is generally more prevalent in areas of the skin that are densely packed with sebaceous follicles because these follicles produce large volumes of sebum that provide a lipid-rich anaerobic environment that is optimal for *P. acnes*. *P. acnes* appears to be the most probable organism to cause acne vulgaris and is therefore the target of oral and topical antibiotic treatments. ^[3] *P. acnes* is a Gram-positive, non-spore-forming human skin commensal that prefers anaerobic growth conditions. ^[4]

Types of acne

- Whiteheads: They stay underneath the surface of skin and are minuscule.
- Blackheads: They ascend to the outer layer of skin and are dark in colour due to the tint.
- Papules: There are noticeable painful little pinkish bumps on the skin
- Pustules: Have a red base and a discharge tip. They could be noticed on the surface of the skin.
- Nodules: Clearly visible on the skin's surface. These are large, painful pimples that are deep beneath the skin and visible on the surface.
- Cysts: Easily noticeable on the epidermis. They are uncomfortable, discharge, filled permanently implanted and prone to scarring.^[5]

Copyright to IJARSCT www.ijarsct.co.in



DOI: 10.48175/IJARSCT-26867





International Journal of Advanced Research in Science, Communication and Technology

International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal

Volume 5, Issue 7, May 2025





In addition to inducing physiological aspects of acne, there are other variants of it, such as, acne induced by drugs, in particular corticosteroids, anticonvulsants and tuberculosis. In a case of acne induced by amineptine, a tricyclic antidepressant, which is characterized by disfiguring and monstrous lesions. Neonatal acne, caused by the passage of maternal androgens to the baby through the placenta, affects new born babies of 2 to 3 months. Contact acne caused by the use of cosmetics and medicines expropriated topics. Mechanical acne, pressure induced localized skin by an object or aggressive washing. Excoriated acne, the most common in adolescents when they tend to squeeze and blast injuries. Tropical acne caused by environmental factors such as heat, sun and humidity. During pregnancy, women's skin suffers intense immune, endocrine, metabolic and vascular changes and becomes more susceptible to physiological and pathological changes, such as acne. In a study of 124 pregnant women in four health units in São Paulo, Brazil, 3.5 % reported a decrease in acne during pregnancy. ^[6] Acne develops due to blockage of follicles, hyperkeratinisation and keratin plug formation and sebum with increased androgen production sebaceous glands are enlarged and sebum production is increased. The micromedo may enlarge to from an open comedo (blackhead) or closed comedo. comedones occur as a result of clogging of sebaceous gland with sebum naturally occurring oil and dead skin cells. The naturally occurring commensal bacterium propionibacterium acnes can cause inflammation and inflammatory lesions like infected pustules or nodules and papules in the dermis around the microcomedo or comedone resulting in redness, scaring or hyperpigmentation.^[7] It is a Gram-positive, anaerobic bacterium which produces propionic acid as a metabolic by-product. Therefore, the compounds targeting acne vulgaris should have ability to inhibit P. acnes. Antibiotics have been used to treat acne for so many years; however, the presence of antibiotic resistance strains has been increased as reported. Therefore, there's a challenge to discover new substances derived from nature to overcome this problem.^[8] Selection of topical therapy should be based on the severity and type of acne. Topical retinoid, benzoyl peroxide, and azelaic acid are effective treatments for mild acne. Topical antibiotics and medications with bacteriostatic and anti-inflammatory properties are effective for treating mild to moderate inflammatory acne. Proper selection of topical formulations may decrease side effects and increase patient compliance. Fortunately, most acne medications are available in several forms. Creams and lotions typically are reserved for dry or sensitive skin, whereas gels are prescribed for oil-prone complexions. During treatment with prescribed medications, patients should use bland facial washes and moisturizers.^[9] External factors play an important role in the development of acne lesions. Cigarette smoking and dietary factors increase acne risk and disease severity. In addition, certain skin and hair products and use of occlusive clothing articles contribute to acne development. The removal of any of these factors may lead to an improvement in disease severity. The epidemiology of acne continues to evolve with changes in hormone levels that vary with age. An Italian study of paediatric outpatients aged 9-14 found that 34.3% patients had acne, with the lowest

Copyright to IJARSCT www.ijarsct.co.in



DOI: 10.48175/IJARSCT-26867



International Journal of Advanced Research in Science, Communication and Technology

International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal

Volume 5, Issue 7, May 2025



prevalence rate of 6% at age 9, and the incidence of acne increased to 36.3% after the age of 13 (24). From the prevalence of acne among Chinese adolescents, we found increased age was related to higher prevalence and severity of acne vulgaris: 15.6, 44.9, and 70.4% for 10, 13, and 16 years old (25). The European study showed the prevalence of acne was highest at the age of 15–17 and decreased with age (22). These studies confirmed that acne was more common during adolescence. ^[10] The link between smoking and acne is well established.13 Even though smoking avoidance and cessation should be encouraged in all patients; this preventive message is especially important for patients suffering from acne. Practitioners should emphasize not only that smoking increases acne risk but also that a dose-dependent relationship exists between daily cigarette use and acne disease severity. ^[11]

A gel is a semisolid dosage form that is typically composed of a mixture of a liquid and a gelling agent. Gels are often used in pharmacy to deliver active pharmaceutical ingredients (APIs) through topical or transdermal routes. They are commonly used for skin conditions.

Gels can be used to treat skin conditions such as acne, psoriasis, and eczema.^[12] collapsible tubes are energy absorbing devices that cushion the passengers and consignments during accidents by undergoing irreversible plastic deformations. These devices expend the impulse energy and dampen the shock force that otherwise would have caused loss of lives and property. Vehicle crash may lead to deformations atstrain ratesofthe order of 102 s–1 with hinge points and folds being subjected to local rates of the order of 103 s–1. Collapsible tubes should have low initial peak force and high energy absorption (EA) under axial andoblique impacts for satisfactory performance. Literature uses some other parameters such as mean crushing force (MF), crush force efficiency (CFE) and specific energy absorption(SEA) to compare the relative potential of different collapsible tube designs. Many antecedent studies involving these tubes have concentrated on the influence of their geometry on energy absorption. Thin-walled tubes are perhaps the most researched structures. Recently, corrugated tapered tubes, windowed tubes and tubes with functionally graded thickness have been investigated for their suitability as energy absorbing devices. Novelauxeticstructureshave also been studied to improve the designs of such devices, which are occasionally fabricated with new materials, and often required to operate at greater velocities of impact than ever before.^[13]

AIM AND OBJECTIVE

AIM: Formulation and evaluation of herbal Anti-Acne gel.

OBJECTIVE:

IJARSCT

ISSN: 2581-9429

- To formulate Anti-Acne gel.
- To evaluate Anti-Acne gel.

PLANT PROFILE

 Turmeric: Biological source: It is fresh rhizomes of curcuma longa. Family: zingiberaceae
 Phytoconstituents: curcumin, curcuminoids



Copyright to IJARSCT www.ijarsct.co.in



DOI: 10.48175/IJARSCT-26867





International Journal of Advanced Research in Science, Communication and Technology

International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal

Volume 5, Issue 7, May 2025



2) Neem:
Biological source: It is obtained from fresh leaves of Azadirachta-indica
Family: Meliaceae
Phytoconstituents: Quercetin, nimbin, nimbidin. ^[14]



II. EXTRACTION PROCEDURE

The Soxhlet apparatus was assembled in the Pharmacognosy Lab and hot and continuous extraction was performed for 24 hours.

Method:

Hot and continuous extraction

Firstly, we assemble the Soxhlet apparatus, the Soxhlet extraction procedure involves the following steps.

First, the sample material the turmeric powder and neem leaves powder (70 g each) separately. is packed in filter paper and placed in the thimble.

Next, vapour of a fresh solvent (Ethanol 500ml in each of the apparatus), produced in a distillation flask, pass through the thimble containing the material to be extracted and are liquefied in the condenser. (78-degree Celsius boiling point of ethanol).

Let the process of extraction continued for 24 hours.

Collect the eluent and let it be vaporized the alcohol content.

The concentrated part i.e., extract is collected and transferred into the Petri dish. ^[15]



Fig. Extraction of Neem



Fig. Extraction of Turmeric

Copyright to IJARSCT www.ijarsct.co.in



DOI: 10.48175/IJARSCT-26867





International Journal of Advanced Research in Science, Communication and Technology

International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal

Volume 5, Issue 7, May 2025



METHOD OF PREPARATION OF GEL

1 gm of carbapol 940 was dispersed in 50 ml of distilled water kept the beaker a side to swell the carbapol 940 to form gel. Take 5ml of distilled water and required quantity of propyl paraben were dissolved by heating on water bath solution was cooled and propylene glycol 400 and CMC added. Further required quantity of extract was mixed to the above mixture and add this solution into the carbapol 940 gel with continuous stirring and add triethanolamine was added dropwise to the formulation for adjustment of required skin pH and to obtain the gel at required consistency.^[14]



Fig. Formulation of Anti -Acne gel

Copyright to IJARSCT www.ijarsct.co.in



DOI: 10.48175/IJARSCT-26867





International Journal of Advanced Research in Science, Communication and Technology

International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal

Volume 5, Issue 7, May 2025



FORMULATION TABLE

Sr.no	Name of	F1	F2	F3	F4	Role
1	Neem extract (gm)	1	1	1	1	Antibacterial
2	Turmeric extract (gm)	1	1	1	1	Antioxidant
3	Carbopol-940(gm)	1	2	3	4	Gelling agent
4	Propyl paraben (gm)	1	2	3	4	Preservative
5	Triethanolamine	0.10	0.20	0.30	0.40	Neutralizer
6	Carboxy methyl cellulose (CMC)(gm)	1	1.5	2.0	2.5	Thickening agent
7	Polyethylene glycol (PEG) - 400(gm)	2.50	5	7.50	10	Gelling base
8	Distilled water	100(Q.S.)	100(Q.S.)	100(Q.S.)	100(Q.S.)	Diluent

EVALUATION PARAMETERS

1. Physical evaluation

Physical parameters such as colour and odour were checked manually.

2. pH Determination of Gel Formulations

The pH of the gels was detected with a digital pH meter. An amount of 0.5 g of gel was dissolved in 50 ml of distilled water and stored for two hours. Each formulation's pH was measured in triplicate and the average values were taken.^[17] 3. Determination of viscosity

Viscosity of herbal gel formulations was determined using Brookfield Viscometer (Brookfield Engineering Laboratories, USA) with spindle # C 50-1 having a speed of 50 rpm. All the measurements were done in triplicate at room temperature.^[18]

4. Spreadability

Spreadability denotes the extent of area to which the gel readily spreads on application to the skin or affected part. Bioavailability of gel also depends on its spreading value.

The Spreadability was expressed in terms of time taken in seconds taken by two slides to slip off from the gel, placed in between the slide under certain load. Lesser is the time taken for separation of two slide, better is the spreadability.

A volume of 20 g weight was tied to the upper slide carefully. The time taken for the upper slide to travel the distance of 6.0 cm and separated away from the lower slide under the influence of the weight was noted. The experiment was repeated by 3 times and the mean time taken for calculation.

Spreadability was calculated using the following:

Formula: S = M*L/T

Where,

S- spreadability

M-Weight tied to the upper slide

L-Length of the glass

T-Time taken in seconds.^[19]

5. Washability

Formulations were applied on the skin & then ease & extent of washing with water were check manually.^[20] 6. Microbial Evaluation of Prepared Gels

The prepared gels were subjected to microbial testing. Bacterial sub-cultures were introduced into sterilized nutrient agar medium, which was then thoroughly shaken to ensure even distribution of the organism throughout the medium (5

Copyright to IJARSCT www.ijarsct.co.in



DOI: 10.48175/IJARSCT-26867





International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal

Volume 5, Issue 7, May 2025



x 10⁵ cfu/ml). The agar mixture was subsequently poured into sterilized petri dishes, with each dish containing approximately 45-50 mL of the medium. It was left to solidify at room temperature.

Sterile corn borers (6 mm diameter) were used to create cups in the solidified agar. The formulations were then carefully poured into these cups and allowed to spread within the agar. The petri dishes were incubated at 37°C for 24 hours. After the incubation period, the zones of complete inhibition were measured using sliding callipers or a ruler. The measurement was taken in millimetres, including the diameter of the cups, and the size of the cups was subtracted from the total measurement to determine the inhibition zone.

III. RESULT AND DISCUSSION

1) Physical appearance

Visually checked the physical appearance of the formulation.

Sr.no	Physical appearance	F1	F2	F3	F4
1	Colour	Brown	Dark brown	Pale Yellow	Yellow
2	Odour	Aromatic	Aromatic	Aromatic	Aromatic

2) pH

IJARSCT

ISSN: 2581-9429

Firstly, using a metre scale calibrating a metre and check out the pH of Anti-acne Gel.

Sr.no	Formulation	pH
1	F1	4.06
2	F2	4.54
3	F3	4.80
4	F4	4.63

3) Viscosity

Sr.no	Formulation	Viscosity (CPS)
1	F1	2502CPS
2	F2	2830CPS
3	F3	2980CPS
4	F4	3010CPS

4) Spreadability

Sr.no	Formulation	Spreadability
1	F1	3.94gm/sec
2	F2	3.57gm/sec
3	F3	4.16gm/sec
4	F4	4.63gm/sec

5) Washability

Sr.no	Formulation	Washability		
1	F1	Easily washable		
2	F2	Easily washable		
3	F3	Easily washable		
4	F4	Easily washable		

Copyright to IJARSCT www.ijarsct.co.in



DOI: 10.48175/IJARSCT-26867





International Journal of Advanced Research in Science, Communication and Technology

International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal

Volume 5, Issue 7, May 2025



6) Microbial evaluation

Formulation code	F1	F2	F3	F4
Zone of inhibition	-	2	23	32





Fig. Formulation F1



Fig. Formulation F2 2mm.

No inhibition Zone



Fig. Formulation F3 23mm.



Fig. Formulation F4 32mm.

V. CONCLUSION

The present study focused on the formulation and evaluation of herbal anti-acne gel utilizing neem and turmeric extracts, both known for their potent antibacterial, antioxidant, and anti-inflammatory properties. The prepared gel formulations exhibited satisfactory physical properties including good appearance, appropriate pH, adequate viscosity, easy spreadability, and good washability. The results suggest that herbal ingredients can serve as an effective and safer alternative to conventional chemical-based acne treatments, minimizing the side effects commonly associated with synthetic drugs. Thus, the developed herbal anti-acne gel offers a promising, natural therapeutic option for the management of acne vulgaris, with potential for further clinical evaluation and development into a commercially viable product.

REFERENCES

- [1]. Aruna, M. S., Sravani, A., Resshma, V., Priya, N. S., Prabha, M. S., & Rama Rao, N. (n.d.). Formulation and evaluation of herbal acne gel, 4(5), 2324–2330.
- [2]. Sawarkar, H. A., Khadabadi, S. S., Mankar, D. M., Farooqui, I. A., & Jagtap, N. S. (2010). Development and biological evaluation of herbal anti-acne gel. *International Journal of PharmTech Research*, 2(3), 2028– 2031.

Copyright to IJARSCT www.ijarsct.co.in



DOI: 10.48175/IJARSCT-26867





International Journal of Advanced Research in Science, Communication and Technology

International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal

Volume 5, Issue 7, May 2025



- [3]. Fox, L., Csongradi, C., Aucamp, M., Du Plessis, J., & Gerber, M. (2016, August 13). *Treatment modalities for acne*.
- [4]. Platsidaki, E., &Dessinioti, C. (2018). Recent advances in understanding *Propionibacterium acnes* (Cutibacterium acnes) in acne. *F1000Research*, 7.
- [5]. Kaur, L. (n.d.). From nature to skin: A comprehensive review of anti-acne herbs and their efficacy.
- [6]. Batista, A. S., & Ana, P. (2016). Types of acne and associated therapy: A review. *American Research Journal of Pharmacy*, 2016, 1–9.
- [7]. Khunt, V., Khanpara, P., Vyas, S., & Faldu, S. (n.d.). A review: Natural remedies for anti-acne therapy.
- [8]. un Nabi, S. A., Sheraz, M. A., Ahmed, S., Mustaan, N., & Ahmad, I. (2016, June 19). Pharmaceutical gels: A review. *RADS Journal of Pharmacy and Pharmaceutical Sciences*, *4*, 40–48.
- [9]. Reddy, D. M., & Jain, V. I. (2019). An overview on medicinal plants for the treatment of acne. *Journal of Critical Reviews*, 6(6), 7–14.
- [10]. Feldman, S., Careccia, R. E., Barham, K. L., &Hancox, J. (2004, May 1). Diagnosis and treatment of acne. *American Family Physician*, 69(9), 2123–2130.
- [11]. Yang, J., Yang, H., Xu, A., & He, L. (2020, September 17). A review of advancement on influencing factors of acne: An emphasis on environmental characteristics. *Frontiers in Public Health*, *8*, 450.

Copyright to IJARSCT www.ijarsct.co.in



DOI: 10.48175/IJARSCT-26867

