

Formulation and Standardization of Herbal Cream for Acne Vulgaris

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Abstract: At some point in their lives, everyone develops acne, pimples, sunburn scars, and pigmentation. In order to treat their skin issues and provide them a good, healthy complexion, customers have started shopping for goods like anti-acne cream. However, the majority of anti-acne creams on the market are loaded with ingredients to which some people may have an adverse reaction. Using two gram-positive bacteria (*Staphylococcus aureus* and *Bacillus cereus*) and two gram-negative bacteria, the extract and cream's antibacterial activities were tested using the disc diffusion method (*Escherichia coli* and *Salmonella enterica*). The bactericidal effects of the extract were investigated at dosages of 5, 10, and 25 mg/ml. The extract's antibacterial properties were incredibly ineffectual against all investigated species. As soon as the extract was added to the cream's recipe at Concentrations of 10, 25, and 50 successfully maintained this activity. After two months, the cream's formulation remained the same. After clinical and toxicology testing are complete, this cream formulation can be successfully utilised to treat skin infections, including acne vulgaris. The primary pathogenic factors include androgen-stimulated stimulation of sebaceous gland secretion, hyperkeratinization, abnormal infundibular epithelium keratinization that blocks sebaceous follicles, and *Propionibacterium acnes* colonisation of the pilosebaceous unit, which causes inflammation around the sebaceous follicles. The common formulations that are already on the market typically have a variety of unfavourable consequences, including poor patient compliance, skin irritation, dryness, peeling, and itching, as well as decreased therapeutic efficiency. A skin condition called acne vulgaris will almost certainly affect everyone at some point in their lives. Herbal therapies are thought to be safer than allopathic ones because they are less likely to have adverse effects such contact allergies, localised irritation, scaling, photosensitivity, itching, pruritus, skin peeling, etc. This study showed that a variety of herbal extracts had anti-acne properties. The cream's recipe included a sizeable amount of poly herbal extract. An in vitro method of measuring antibacterial activity was used to test the anti-acne effects of the suggested formulation (broth dilution method and sub culturing method). Using the skin feel test, the spreadability, greasiness, tackiness, film-forming, softening, soothing, and pleasantness of cream were evaluated. The outcomes demonstrated that the formula chosen also possessed potent anti-acne properties. As a result, we might encourage more in-vivo research and testing on items that are already on the market. Acne is a pilosebaceous-related skin condition that is continuously inflammatory. This condition is widespread and affects 85% of youngsters worldwide. Acne's disfiguring dermatosis might significantly lessen emotional discomfort by weakening self-confidence. Available as topical and systemic therapy for treating acne are comedolytic medicines, antibiotics, and many anti-inflammatory medications. Because of the undesirable side effects, frequently high cost, and antibiotic resistance in acne-causing bacteria, the need for medicinal plants has been gradually rising. This review provides the most recent information on medicinal plants and the phytoconstituents used to treat acne. The most popular anti-acne drugs, like as retinoids, systemic and topical antibiotics, and hormones, have a number of dangerous side effects. According to the literature, *Calendula officinalis*, *Rosa canina*, *Zataria multiflora*, *Trigonal foeman graecum*, and *Glycine max* all have antibacterial, anti-inflammatory, and antioxidant qualities that could be used to treat the disease's inflamed sores. Before making changes, a standard washing cream recipe containing bees wax, spermaceti, borax, liquid paraffin, and water was considered.

Keywords: Keratinization, Skin, and Acne Vulgaris

I. INTRODUCTION

Acne vulgaris is a concerning issue, especially among teenagers and during adolescence. Around 85% of persons between the ages of 12 and 25 will suffer this skin issue, according to statistics from all across the world. Between the ages of 35 and 44, acne vulgaris affects only 3% of adults. Even while some skin illnesses are self-limiting, they can nevertheless have negative psychosocial impacts on a person, such as low self-esteem, social withdrawal because of embarrassment, and in the worst cases, suicidal thoughts.

Propionibacterium acnes and Staphylococcus aureus were the acne-causing bacteria since they were both found in the sample from the acne patient. The rise in antibiotic resistance among acne-causing bacteria is also a worrying development [2].

Alternative treatments for acne have been studied and tested. Among alternative medical systems, the use of topical therapeutic agents is more feasible. The majority of people are becoming more and more interested in adopting herbal medicines. According to the WHO, herbal medicine is reportedly the major method of healthcare for four billion people. 3]

The most exposed part of the human body is its skin. UV rays, pollution, dust, chemicals, and other factors are continually coming into contact with human skin, leading to a number of skin disorders such as acne, pimples, hyperpigmentation, and sunburn-like markings. Acne vulgaris, often known as acne, is the most prevalent follicular skin disorder, mostly affecting the pilosebaceous follicular unit of the face, neck, and trunk. There are many artificial chemical-based topical and systemic therapies available for the management of acne vulgaris. The most common demographics for acne vulgaris, popularly known as acne, are teenagers and young adults. The development of bacteria in the pilosebaceous entities and the blockage or inflammation of the pilosebaceous units are some of the pathogenetic factors that contribute to it. Other factors include an abrupt increase in body androgens, epidermic hyperproliferation, obstruction of the sebaceous glands on the skin, and epidermic hyperproliferation.

Acne is a bacterial anaerobe that develops as a result of androgen-activated, hyperactive sebaceous glands and sebum retention in the pilosebaceous ducts. Acne on the skin can manifest as both inflammatory (papules, pustules, and nodules) and non-inflammatory (comedones, open and closed) lesions. Due to the development of antibiotic resistance in these bacteria as well as adverse effects associated with the current treatment regimens, the introduction of innovative therapeutic medicines for acne vulgaris is important. Acne is usually seen in clinical patients with larger oil glands on their faces, upper chest, and back. Acne is routinely treated with topical, systemic, hormonal, herbal, and combination therapy.

Acne and infectious skin conditions patients regularly eat herbal medicinal plants. Herbal plants have a long history of use and are recognised to have few side effects. Nano-technological techniques, such as particulate (solid lipid nanoparticles and microspheres), vesicular (liposomes and niosomes), colloidal drug delivery systems (micro- and nano-emulsions), and other systems, play a key role in the treatment of acne (aerosol foams and micro-sponges). These techniques have great potential for creating innovative, targeted, low-dose therapy regimens for acne vulgaris. In this review, we specifically focus on the several nanotechnological approaches to the effective management of acne. 4]

Acne vulgaris is a persistent, disfiguring inflammation of the pilosebaceous units. Low self-esteem, melancholy, anxiety, as well as difficulties in relationships and at work, are possible psychological repercussions of acne. The clinical acne appearance includes black and whiteheads (comedones), pinheads (papules), pustules, nodules, and pitted or hypertrophic scars.

The face, shoulders, upper chest, and back are among the affected locations [6].

Acne vulgaris is mostly attributed to an increase in androgen production throughout adolescence in both males and females. The pilosebaceous units produce more sebum as a result, which causes follicular hyperkeratinization and blockage of the hair follicles. Because sebum can't get to the skin's surface, anaerobic bacteria like Cutibacterium acnes (formerly known as Propionibacterium acnes) thrive in the plugged follicle. The skin becomes irritated as a result of these germs, producing heat, swelling, redness, and pus. 7]

The Global Burden of Disease (GBD) ranked acne vulgaris as the eighth most common skin disorder in 2010 with an estimated global prevalence (for all ages) of 9.38% 8].

More than 85% of youth have the illness, which affects boys more frequently than girls in its severe forms [9].

More than \$100 million USD is spent annually on over-the-counter acne medications [10].

Acne treatment aims to control present lesions, reduce morbidity, shorten the length of the condition, limit permanent scarring as much as possible, and prevent the emergence of new lesions. Anti-acne drugs could reduce sebum production by reestablishing normal follicular keratinization. Others act as an antibacterial agent against *C. acnes* to reduce inflammation and decrease sebum oxidation, which encourages the growth of *Cutibacterium acnes*. For more severe cases, topical treatments may be combined with systemic medications. Topical treatments are frequently used alone to treat acne. Agents used topically include comedolytic agents, antibiotics, and other anti-inflammatory drugs. Hormones, antibiotics, zinc, and retinoids are a few examples of medications that are given systemically [11].

Patients with pustulocystic scarring of the acne require local and systemic medications, while the majority of patients with comedo-papular acne receive topical therapy [12].

A disadvantage of conventional therapy is the rise in antibiotic resistance of the bacteria that cause acne (*C. acnes* and *S. epidermidis*).

13]

Additionally, the growing number of pregnant women exposed to oral tretinoin, a known teratogen, and the poor safety profile of systemic retinoid therapy [14].

The use of herbal therapy for acne has been encouraged by its advantages, including higher patient tolerance, a long history of use, less side effects, and being comparably more cost-effective. The market for "cosmeceuticals" is growing, and there are currently numerous herbs that have a long history of use in traditional cultures. Due to their antibacterial qualities and effects on sebum production, irritation, and hyperkeratinization—all of which are associated with acne—herbs used to treat acne are helpful. The most recent knowledge on medicinal plants and the phytoconstituents used to treat acne will be presented in this review. 15]

Types of Acne



Symptoms of Acne

Whiteheads and blackheads are two types of non-inflammatory acne.

Acne that is inflammatory

Pustules

pustules,

nodules

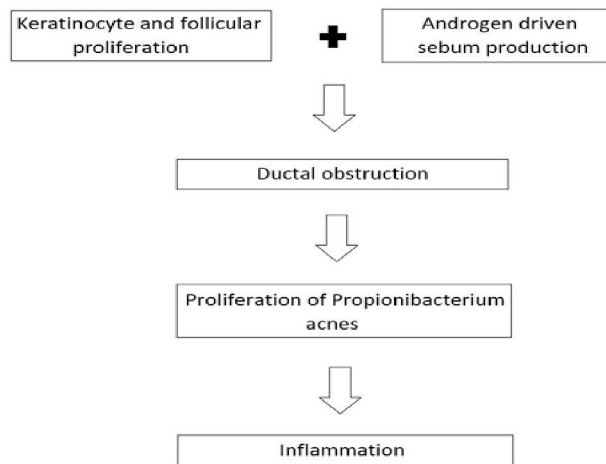
Social indicators:

A decline in self-esteem

Depression and anxiety

May isolate oneself from society.

Causes of acne vulgaris



a. An oil-based cosmetic:

The pores on your skin can become clogged by makeup, moisturising creams, lotions, and hair treatments that include pore-clogging sulphates, mineral oil, coconut and cocoa butter, and silicones.

b. A surplus of sun:

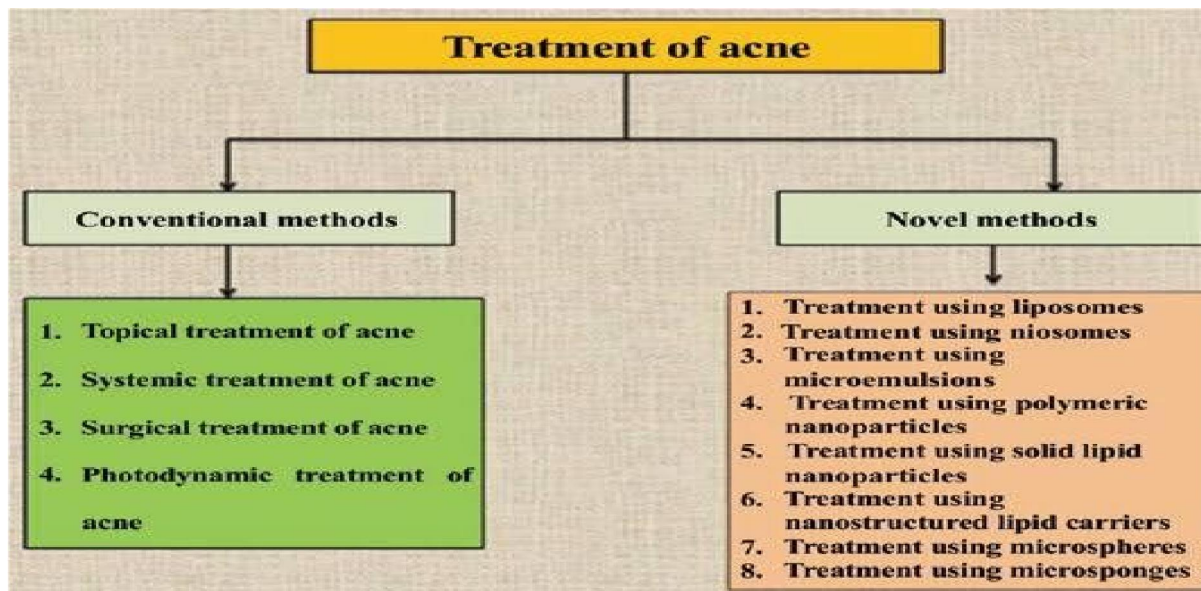
Your skin dries out after getting a sunburn, which causes extra oil to be produced to make up for it. More acne is brought on by too much oil.

Applying pressure to your skin:

Acne might get worse if you touch your face a lot or expose it to a lot of friction. Sweat and bacteria can accumulate against your skin due to cellphones, hoodies, caps, helmets, tight collars, and even your own hands



Treatment of Acne



Benefits of nanocarriers include:

- Better trapping effectiveness and increased stability of the active component.
- Preserve the physiochemical properties of the medication.
- Superb penetration boosters.
- Greater skin toleration
- Action for targeted drug delivery.
- Reduces the negative consequences.
- Take into account medication compounds with a variety of solubilities.
- Includes both hydrophilic and lipophilic medications.
- Greater stability as a result of less oxidation and hydrolysis.
- Increases the amount and rate of medication absorption.
- Effective and rapid drug

Administration method	Drug or dosage form*	Feature of the treatment	References
Oral	Doxycycline,	1. Several hundred mg of drugs should be taken daily	[8,7,35-41]
	Tetracycline,	2. High patient compliance	
	Minocycline,	3. Adverse reactions limit the therapeutic window of the drugs	
Topical	Isotretinoin (13-cis-retinoic acid)		[43-53]
	Benzoyl peroxide (BPO),		
	Clindamycin,	1. Locally administration of drugs	
	Erythromycin,	2. Ease of termination of drug action	
	Tetracycline,	3. Adverse reactions limit the long-term use of topical drugs	
	Tretinoin,		
Particle-based DDS	Tazarotene,		[54-68]
	Green tea extracts		
	Liposomes,		
	Solid lipid nanoparticles,	1. Sustained release of the drugs	
	Nanostructured lipid carriers,	2. More effective than topical gel	
Light-based therapy**	Microemulsions	3. Higher flux of drug across the skin	[69-134]
	Endogenous porphyrins	4. Effective for follicular targeting	
	(coproporphyrin III),	1. Fewer adverse reactions than those systemic/topical administration and DDSs	
	5-aminolevulinic acid (5-ALA)	2. Light therapy alone or along with liposomal drugs has been reported.	
		3. Not a first-line therapy for acne vulgaris	

II. METHODOLOGY

Making Anti-Acne Cream requires following a suitable procedure.

1. Selection of active
2. Collection of Aegle marmelos
3. Extraction Method
4. Formulation
5. Preparation
6. Evaluation

Selection of active:-

Many bacterial strains have been shown to be sensitive to various extracts of bael leaves, roots, and fruits. *Escherichia coli* has been demonstrated to be responsive to leaf extracts. The root's ethanolic extract has demonstrated activity against *Vibrio cholerae*, *Salmonella typhimurium*, *Klebsiella pneumoniae*, *Escherichia coli*, *Pseudomonas aeruginosa*, *Bacillus subtilis*, and *Staphylococcus aureus*. *Aeromonas* sp., *Escherichia coli*, *Pseudomonas salanacearum*, and *Xanthomon*..

Collection:-

aegle marmelos fruit was obtained from the RCPIPER, Shirpur, medicinal garden.

Fruit extraction technique using the maceration process:-

The fruits were properly rinsed in water to remove the contaminants. Before being mechanically blended into a coarse powder, the fruits were peeled, sliced into little pieces, and dried in the shade for a week. Using the maceration process for about a week while intermittently shaking 2.5 L of 70% ethanol as the solvent, 200 g of powdered Aegle marmelos fruits were extracted. Using a rotary evaporator under decreased pressure and a regulated temperature, the ethanolic extract of Aegle marmelos fruits was filtered and concentrated to dryness. Up until its next usage, the extract was kept in airtight containers at a temperature of 4°C in a refrigerator

Table of Formulations:-

Sr.No.	Ingredients	Parts used	Category	Quantity 20%
1.	Aegle Marmelos	Fruit Extract	Antibacterial , Antioxidants	2
2.	Stearic acid	—	Emulsifier	4
3.	Cetyl alcohol	—	Stabilizer	1.6
4.	Liquid paraffin	—	Lubricant	1.6
5.	Glycerin	—	Humectant	2
6.	Triethanolamine	—	Neutralizer	2
7.	Distilled Water	—	Vehicle	6.65
8.	Methyl paraben	—	Preservatives	0.15

Making Anti-Acne Cream

Table provided information on the anti-acne cream's composition. Octadecanoic acid makes up the oil phase, which also contains dissolved liquid paraffin and other oil-soluble substances like cetyl alcohol. Inside the beaker in the water bath, the oil phase was added. The temperature the heating period, the temperature of the water bath was set to 75 °C. components that are soluble in water The aqueous solution contained dissolved preservatives (glycerine, methylparaben, and triethanolamine).phase while being heated to 75 °C in the same water bath. the aqueous phase is heated after until the emulsifier cooled, was gradually added to the oil phase while being stirred continuously happened. The bottom was combined with fragrance and various concentrations of Aegle marmelos fruit extract (5% and 10%).

III. EVALUATION OF ANTI-ACNE CREAM

- **PH:** A standard solution was employed to calibrate the pH metre. The cream, which was weighed and dissolved in 50 cc of water, had its pH measured.
- **Homogeneity:** The homogeneity of the formulation was evaluated by touch and outward appearance.
- **Aesthetics:** The cream's colour, pearlescence, and roughness were used to judge its look.
- **Following sensation:** The qualities of the cream's emolliency, slipperiness, and residue were all assessed.
- **Smear's type:** The kind of film or smear that formed on the skin after the cream application was inspected.
- **Washability:** It was possible to assess how easy it was to remove the cream by rinsing the applied dispense with water.
- **Stability study:** For the stability study, the anti-acne cream was stored for two months at three different temperatures: 8°C, 27°C, and 40°C.
- **Disposal:** By washing the area where the cream had been applied with tap water, the cream's ease of removal was evaluated.

IV. EVALUATION DATA

1. Color :-White
2. Pleasant :-Aroma
3. Consistency :-Good 4. PH :-7.4+/- 0.8
4. Spreadability :-Good
5. Washability :-readily washable
6. Feel :-emollient and slippery after
7. Smear type :-non-greasy
8. Homogeneity :-Good
9. Simple removal

V. DISCUSSION

It was found that the formulation of the cream has a pH between 4.6 and 4.8, which is a healthy and optimum pH for the skin.

The created acne cream underwent a number of physicochemical tests, with the results shown in Table. The type of smear that appeared on the skin following the use of both creams wasn't oily. The creams were easy to remove after use by washing with water. Thanks to the formulas, the extracts can be dispersed uniformly throughout the cream. This was confirmed by both touch and visual examination. The colour of the cream did not change even after being kept for a very long period. After a feel test, the lotions were slippery and emollient.

Throughout the process of accelerated stability, all physicochemical characteristics were preserved. experiments were conducted over an eight-week period at 8°C 0.1°C in the refrigerator, 25°C 1°C, and 40°C 1°C in the incubator. The results of the rapid stability test revealed that the cream's colour had not changed at all.

VI. CONCLUSION

The majority of people will at some point in their lives develop acne vulgaris, a skin disorder. Acne sufferers may experience major psychological side effects, including sadness, low self- esteem, and a social withdrawal due to humiliation. It is believed that herbal medicines are safer than allopathic ones because they are less likely to have side effects such contact allergies, localised irritation, scaling, photosensitivity, itching, pruritus, skin peeling, etc.

It would be highly acceptable because herbal anti-acne cream uses herbal extracts and is non-toxic, safe, and efficient while also increasing patient compliance. Due to the idea that they are more secure and have less adverse effects than synthetic treatments, natural ones are chosen.

The effectiveness of each herbal extract against acne was determined by this study. The cream's recipe was made using a high amount of poly herbal extract. We evaluated the anti-acne efficacy of the suggested formulation using an in vitro method of assessing antibacterial activity (broth dilution method and sub culturing method).

The spreadability, stickiness, tactiness, film-forming, softening, soothing, and pleasantness of cream were assessed using the skin feel test. As a result, we may suggest that more analysis and in vivo studies will help this formulation become a useful commercial product.

VII. RESULTS

In Table, the outcomes of several physicochemical tests on the created anti-acne cream are displayed. The skin did not develop an oily smear after using either cream. They were easily removed by washing with water after applying the creams. Consistent dispersion of the cream extracts was accomplished by the formulations. A examination of the skin's texture and visual inspection both confirmed this. The product's stability is demonstrated by the fact that, despite the fact that the colour does not change over time, a reaction does occur when it is left at room temperature.

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