IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 5, Issue 11, May 2025
Impact Factor: 7.67

Review on Acne and the Role of Herbal Constituents in Anti-Acne Face Wash Formulation

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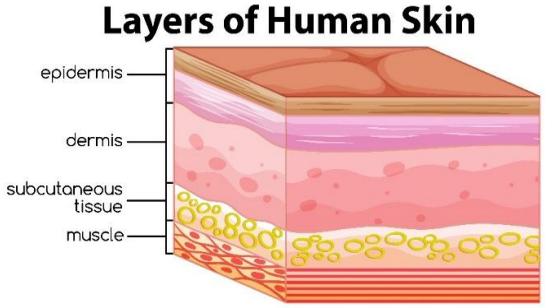
Abstract: *Acne vulgaris is a very common dermatological disorder, mostly occurring in teenagers and young adults. It is mainly due to excess sebum secretion, follicular hyperkeratinization, proliferation of Propionibacterium acnes, and inflammation. Traditional treatments like antibiotics, retinoids, and chemical agents are usually accompanied by side effects such as dryness, irritation, and antibiotic resistance. This has elicited the increased interest in using herbal and natural products in the treatment of acne because of their safety, efficacy, and low side effects. This paper discusses the anatomy and physiology of the skin, the pathophysiology of acne, and the possible role of herbal ingredients in the management of acne. Herbal extracts like neem (Azadirachta indica), turmeric (Curcuma longa), aloe vera (Aloe barbadensis), tulsi (Ocimum sanctum), and tea tree oil (Melaleuca alternifolia) have good antibacterial, anti-inflammatory, and antioxidant activities, rendering them good candidates for use in anti-acne face wash products. The application of these plant-based products is well-suited with the growing trend of green cosmetics and dermatologically safe products. This review summarizes the modes of action, advantages, and scientific evidence in favor of using these herbs. The research points out the therapeutic potential of herbal-based anti-acne products to foster healthy, clear skin while minimizing dependence on chemical-based formulations.*

Keywords: Acne vulgaris, Herbal ingredients, Anti-acne face wash, Neem, Turmeric, Aloe vera.

I. INTRODUCTION

SKIN

The anatomy of the skin, specifically the facial skin, is complex and plays a vital role in protecting the body from external elements while also allowing for sensory perception and regulation of body temperature. Here is a breakdown of the different layers and key structures that make up the skin on the face:



DOI: 10.48175/IJARSCT-27218

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Epidermis

- Stratum Corneum: The outermost layer, made up of dead skin cells that form a protective barrier. This layer constantly sheds and regenerates.
- Stratum Lucidum: Found only in areas of thick skin (e.g., palms, soles), this translucent layer provides extra protection.
- Stratum Granulosum: Where cells begin to die and form a waterproof barrier.
- Stratum Spinosum: Known for its spiny appearance under a microscope, this layer contains keratinocytes and is involved in the formation of the skin barrier.
- Stratum Basale (Stratum Germinativum): The deepest layer, where new skin cells are generated. It also contains melanocytes, which produce melanin, responsible for skin color.

Dermis

The dermis lies beneath the epidermis and is divided into two layers:

- Papillary Dermis: Contains thin collagen fibers, blood vessels, and sensory receptors. It is the layer that forms the "fingerprints" or ridges on the skin.
- Reticular Dermis: The thicker layer beneath the papillary dermis, rich in collagen and elastin fibers, giving the skin strength and elasticity. This layer also contains sweat glands, sebaceous glands, and hair follicles.

The dermis is responsible for providing nutrients to the epidermis and housing the sensory receptors that allow us to feel touch, pain, and temperature.

Hypodermis (Subcutaneous Tissue)

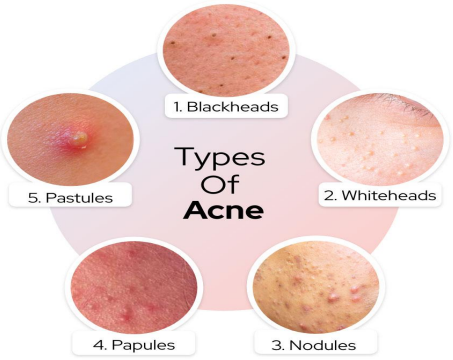
The hypodermis is the deepest layer of the skin, composed primarily of fat cells. This layer helps insulate the body and provides cushioning to protect internal organs.

It also plays a role in storing energy and connecting the skin to underlying muscles and bones.

ACNE

Types of acne

- Blackheads (Open Comedones): Small, dark bumps formed when hair follicles are clogged with oil and dead skin cells. The dark color is due to oxidation, not dirt.
- Whiteheads (Closed Comedones): Small, white or flesh-colored bumps that occur when pores are clogged but remain closed at the surface.
- Nodules: Large, painful, solid lumps that form deep under the skin, often inflamed and can lead to scarring.
- Papules: Small, red, raised bumps that are tender to the touch. They are an early stage of inflammation.
- Pustules: Red, inflamed bumps filled with pus, often with a white or yellow center, indicating infection



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Causes of Acne:

- Excess oil production: Sebaceous (oil) glands become overactive and produce excess sebum, which can clog pores.
- Clogged hair follicles: Dead skin cells that don't shed properly can accumulate in the pores and lead to acne.
- Bacteria: *Propionibacterium acnes* can multiply in blocked pores, leading to inflammation and infection.
- Hormonal changes: These are a major cause of acne, particularly during puberty, menstruation, pregnancy, or conditions like PCOS.
- Diet and lifestyle factors: Certain foods, stress, and lifestyle choices (like inadequate skincare or lack of sleep) can exacerbate acne.
- Medications: Some drugs, such as corticosteroids or birth control pills, can trigger or worsen acne.

Each type of acne requires specific treatments, ranging from over-the-counter topical treatments (like benzoyl peroxide or salicylic acid) to oral medications prescribed by a dermatologist for more severe cases.

HERBAL FACE WASH

A herbal anti-acne face wash is a skincare product formulated with natural, plant-based ingredients aimed at cleansing the skin while preventing or reducing acne.

BENEFITS OF HERBAL ANTI-FACE WASH

- Fights Acne Naturally: By using plant-based ingredients, herbal face washes help clear acne without harsh chemicals, which can sometimes cause further irritation or dryness.
- Promotes Healthy Skin: Many herbal ingredients also nourish and heal the skin, promoting a healthier complexion in the long term.
- Balances Oil Production: Herbal ingredients like neem and witch hazel help regulate sebum production, preventing both excessive dryness and oiliness that can lead to acne.
- Reduces Acne Scarring: Some ingredients, like aloe vera and turmeric, are known to help reduce pigmentation and promote healing, leading to a reduction in acne scars over time

II. INGRADIENTS

- NEEM EXTRACT
- TURMERIC EXTRACT
- ALOE VERA GEL
- HONEY
- LEMON JUICE
- GLYCERINE
- XANTHUM GUM
- SODIUM LAURYL SULFATE (SLS)
- ROSE WATER
- LEUCIDAL

NEEM EXTRACT

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Biological Source:
Scientific Name: *Azadirachta indica*
Common Name: Neem
Family: Meliaceae
Chemical Constituents:

- Azadirachtin
- Nimbin
- Nimbidin
- Salannin
- Quercetin

TURMERIC EXTRACT

Biological Source:
Scientific Name: *Curcuma longa*
Family: Zingiberaceae
Chemical Constituents:

- Curcumin
- Demethoxycurcumin
- Bisdemethoxycurcumin
- Zingiberene
- Turmerones (α-turmerone, β-turmerone)

Uses of Turmeric:

- Anti-Aging
- Acne Treatment
- Skin Brightening

ALOE VERA GEL

Biological Source:
Scientific Name: *Aloe barbadensis Miller*
Family: Asphodelaceae

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Chemical Constituents
Aloin (or Barbaloin)
Anthraquinones
Saponins

Uses

- Soothes Inflammation: Aloe vera has anti-inflammatory properties that help reduce redness, swelling, and irritation associated with acne.
- Controls Oil Production: It helps balance the skin's oil production, preventing the pores from becoming clogged, which can lead to breakouts.
- Fights Bacteria: Aloe vera has mild antibacterial properties, helping to reduce acne-causing bacteria on the skin.
- Heals and Repairs Skin: It accelerates the healing process of acne lesions and helps prevent scarring by promoting cell regeneration.
- Hydrates and Moisturizes: Aloe vera is a natural moisturizer that keeps the skin hydrated without making it greasy, which is important for acne-prone skin.
- Reduces Redness **and Scarring**: Regular use of aloe vera gel can help lighten dark spots and scars left by acne.

HONEY

Biological Source:
Scientific Name: *Apis mellifera*
Family: Apidae
Chemical Constituents:

- Fructose (about 38%)
- Glucose (about 31%)
- Sucrose (about 1%)
- Maltose (about 7%)
- Other sugars (about 4%)

USES

- Antibacterial Properties: Honey has natural antibacterial qualities that help fight acne-causing bacteria, reducing the likelihood of breakouts.
- Anti-inflammatory: It helps reduce redness, swelling, and irritation, soothing inflamed acne lesions.
- Moisturizes Skin: Honey is a natural humectant, meaning it attracts moisture to the skin, keeping it hydrated without making it oily, which is important for acne-prone skin.

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- Promotes Healing: Honey promotes skin healing and regeneration, helping to reduce acne scars and speed up the recovery of broken skin.
- Gentle Exfoliation: Honey contains enzymes that provide mild exfoliation, removing dead skin cells and preventing clogged pores that can lead to acne.

LEMON JUICE

Biological Source:
Scientific Name: *Citrus limon*
Family: Rutaceae
Chemical Constituents
Citric Acid
Vitamin C (Ascorbic Acid)
Uses

- **Natural Astringent**: Lemon juice acts as an astringent, helping to tighten pores and reduce excess oil production, which can prevent clogged pores and breakouts.
- **Antibacterial**: The citric acid in lemon juice has antibacterial properties that help kill acne-causing bacteria, reducing the risk of infection and inflammation.
- **Exfoliation**: Lemon juice contains alpha hydroxy acids (AHAs), which help gently exfoliate the skin by removing dead skin cells, promoting cell turnover, and preventing clogged pores.
- **Brightening and Fading Scars**: The vitamin C in lemon juice helps brighten the skin and fade dark spots or acne scars by reducing hyperpigmentation over time.

GLYCRINE

Biological Source: Glycerine is typically derived from natural sources such as **vegetable oils** (e.g., **soybean oil**, **coconut oil**, **palm oil**), **animal fats**, or it can be synthesized from **petroleum** through chemical processes.
USES

- **Hydrates the Skin**: Glycerine is a powerful humectant, meaning it draws moisture from the environment into the skin, keeping it hydrated and preventing dryness that can result from acne treatments.

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- **Gentle on Skin**: It is mild and non-irritating, making it suitable for sensitive, acne-prone skin that might react to harsher ingredients.
- **Maintains Skin's Natural Barrier**: Glycerine helps to maintain and strengthen the skin's natural moisture barrier, preventing the skin from becoming overly dry or irritated, which is important when managing acne.
- **Improves Skin Texture**: Regular use of glycerine can smooth and soften the skin, helping to reduce roughness or dryness caused by acne treatments or breakouts.

XANTHUM GUM

Properties:
Solubility: SLS is highly soluble in water.
Appearance: It is typically a white or yellowish powder or a viscous liquid.
Foaming: It is well known for its ability to produce a rich, stable foam.
pH: SLS is mildly acidic, with a pH around 7-9 in its solution.

ROSE WATER

Biological Source:
Scientific Name: *Rosa damascene*
Family: Rosaceae
Chemical Constituents:
Eugenol
Uses

- **Hydrates the Skin**: It provides gentle hydration without making the skin oily, helping to maintain the skin's moisture balance, which is essential for acne-prone skin.
- **Tightens Pores**: Rose water acts as an astringent, helping to tighten pores, reduce their appearance, and prevent clogged pores, a common cause of acne.

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- **Brightens and Evens Skin Tone**: The antioxidants in rose water help to brighten the complexion, reduce dark spots, and promote a more even skin tone, including fading acne scars.
- **Calms and Refreshes**: Rose water has a calming effect, making it perfect for sensitive skin. It refreshes and revitalizes the skin, helping to reduce stress-related breakouts

LEUCIDAL

Leucidial is a term commonly associated with **Leucidal Liquid**, which is a **natural preservative** used in cosmetics and personal care products. It is derived from **Lactobacillus**—a genus of bacteria that is often used in **fermentation** processes. Leucidial is known for its **antimicrobial** and **antifungal** properties, making it effective in protecting formulations from microbial growth without the need for synthetic preservatives.

FORMULATION TABLE

Sr. No.	INGRADIENTS	QUANTITY	ROLE
1	Neem Extract	3g	Anti-bacterial agent
2	Turmeric Extract	2g	Anti-inflammatory agent
3	Aloe Vera Gel	5g	Anti-pigmentation
4	Honey	4g	Nourishing agent
5	Lemon Juice	2ml	Natural cleanser and pH adjuster
6	Glycerine	3ml	moisturizer
7	Xanthan Gum	0.5g	Thickening agent and stabilizer
8	Sodium Lauryl Sulfate (SLS)	12g	Foaming agent
9	Rose Water	5ml	Cooling agent
10	leucidal	0.5g	Natural preservative
11	Distilled Water	60ml	Solvent

METHOD OF PREPARATION

Phase 1 – Mixing Water-Based Ingredients:

In a clean mixing container, combine distilled water (70.7g) and rose water (6g). Heat gently to about 40°C to dissolve ingredients effectively. Stir occasionally.

Add glycerine (5g) to the water phase and mix until fully dissolved. This helps to keep the skin hydrated and prevents moisture loss.

Phase 2 – Active Ingredient Addition:

Slowly incorporate aloe vera gel (8g) and honey (4g) into the mixture, stirring continuously to avoid separation. Aloe vera provides soothing effects, while honey offers antibacterial properties.

Add turmeric extract (1g) and neem extract (2g), which are known for their anti-inflammatory and antibacterial properties, helping to target acne. Stir well to ensure an even distribution.

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Phase 3 – Adding Surfactants and Thickeners:
Add Sodium Lauryl Sulfate (SLS) (1g) to the mixture. This surfactant will provide the face wash with its foaming and cleansing properties. Mix well to fully incorporate.
Sprinkle in xanthan gum (0.3g), stirring to ensure it thickens the formulation without clumps. Xanthan gum helps to stabilize the gel-like consistency.
Phase 4 – Final Adjustments:
Finally, add lemon juice (1g) for its astringent and brightening effects, and incorporate Leucidal (1g) as a natural preservative to ensure the stability and safety of the product. Stir thoroughly to combine all ingredients.
Cooling and Packaging:
Allow the mixture to cool down to room temperature while stirring occasionally. Once the product is fully cooled, transfer the face wash into a clean, sterilized bottle for storage. Ensure the container is tightly sealed to prevent contamination.

Marketed Product
Himalaya Herbals Purifying Neem Face Wash

Key Ingredients: Neem, Turmeric, Glycerin, Distilled Water.
Description: Himalaya's Neem Face Wash is known for its antibacterial properties. Neem helps fight acne-causing bacteria, while turmeric helps reduce inflammation. The glycerin hydrates and softens the skin.
Key Benefits: Helps clear acne, prevents pimples, and reduces excess oil without over-drying the skin.
Patanjali Neem & Tulsi Face Wash

Key Ingredients: Neem, Tulsi (Holy Basil), Aloe Vera, Glycerin, Distilled Water.
Description: This face wash from Patanjali combines neem and tulsi to combat acne and clear skin while aloe vera soothes and moisturizes. The glycerin adds hydration, and the formula is mild enough for daily use.
Key Benefits: Anti-acne, antibacterial, and moisturizing.

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Nivea Men Oil Control Face Wash

Key Ingredients: Lemon Juice, Glycerin, Distilled Water.
Description: Aimed at oily and acne-prone skin, this face wash from Nivea Men has a lemon extract that helps control oil production while giving a refreshing clean. The glycerin in the formula helps maintain skin moisture balance.
Key Benefits: Reduces excess oil and helps prevent acne breakouts.

III. FUTURE SCOPE

1. Personalized Skincare

Customized Formulations: The future of anti-acne face washes will see a move towards personalized skincare. Products could be tailored to the specific needs of individuals based on their skin type, acne severity, and lifestyle factors. DNA testing and skin assessments may help create customized formulas.
Skin Typing Technology: Advances in skin analysis technologies (like AI and skin scanning devices) can provide real-time data for creating face washes that target specific acne concerns more effectively, leading to better treatment outcomes.

2. Natural and Sustainable Ingredients

Plant-Based Formulas: As consumers increasingly demand eco-friendly and natural products, anti-acne face washes will incorporate more plant-based and organic ingredients such as neem, tea tree oil, green tea, and witch hazel.
Sustainability: With growing concern about the environment, brands will focus on sustainably sourced ingredients, recyclable packaging, and cruelty-free formulations. Biodegradable surfactants and non-toxic preservatives will become more common.

3. Advanced Delivery Systems

Nanotechnology: Future anti-acne face washes may use nanotechnology to deliver active ingredients like salicylic acid, benzoyl peroxide, and tea tree oil deeper into the skin layers for more effective results. This allows the active ingredients to work at the root cause of acne.
Encapsulation Technology: Active ingredients like retinoids or salicylic acid may be encapsulated to ensure controlled release, reducing irritation while enhancing the product's efficacy.

4. Microbiome-Friendly Products

Balancing the Skin Microbiome: There is a growing understanding of the skin microbiome's role in acne. Anti-acne face washes will evolve to be more microbiome-friendly, containing prebiotics, probiotics, or ingredients that promote a healthy skin flora to prevent acne without stripping the skin of its beneficial bacteria.
Non-Drying Formulas: Future formulations will aim to cleanse acne-prone skin without disrupting the skin barrier or causing excessive dryness, helping to prevent the overproduction of sebum and inflammation.

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IV. CONCLUSION

The future of anti-acne face washes will be driven by advancements in personalization, biotechnology, and sustainable practices. With a focus on targeted treatments, gentle formulations, and clinical efficacy, these products will cater to the diverse needs of acne-prone skin while promoting overall skin health

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