

FORMULATION AND EVALUATION OF ANTI-ACNE HERBAL FACEWASH

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Abstract

*The idea that natural medicines are safer and have fewer negative effects than synthetic ones make them more acceptable. Herbal formulations have significant demand in the globe market. The current research work focuses aqueous extracts of neem leaves (*Azadirachta indica*), turmeric (*Curcuma longa*), aloe vera, lemon juice, peppermint oil, xanthan gum and rose water were developed and evaluated as a natural anti-acne face wash. Although there are several topical herbal treatments for acne on the market, we suggest making a pure herbal formulation without the use of any synthetic ingredients. The plants have good anti-microbial, anti-oxidant, and anti-inflammatory properties, according to published reports. In order to prepare the different formulation batches, namely F1 to F3, different amounts of xanthan gum were used. The prepared formulations (F1 to F3) were evaluated based on a number of criteria, including color, consistency, washability, pH, and spreadability. From the evaluation studies it was concluded that the prepared formulations underwent satisfactory results tests for color, smell, consistency, pH, spreadability, washability, and grittiness. Batch F2 was shown to be the best spreadability across all the formulation studies. The herbal face wash with neem leaves, turmeric and aloe vera in its aqueous extract was a pretty successful attempt.*

Key Words: *Neem, Aloe vera, Acne, Herbal ingredients*

INTRODUCTION

Acne is a skin disorder (follicular unit) that nearly everyone will experience at some point in their lifetime. Although the prevalence of acne increases during adolescence, it affects many men and women between the ages of 20 and 30. There are five types of acne: comedogenic, pustular, cystic, and nodular. Whiteheads and blackheads are two variations of comedonal acne, which is not inflamed. While blackheads show as open pores with dark skin roughness made up of melanin, sebum, and hair follicle cells, whiteheads look as cool or white lumps. Papules are often smaller than 5mm in diameter and look as red, firm, elevated lesions. Localized cutaneous elevations with purulent material are called pustules [1]. Nodules and cysts are elevated, solid lesions that affect the subcutaneous tissue and deeper dermis. Nodules have a diameter greater than 5mm, while cysts have a diameter less than that. Many physiological elements, such as excessive follicular contraction, enhanced biogenesis due to raised amounts of androgens, and biological systems, such as sub-pituitary euberanum and staphylococcus epidermidis, are all part of the molecular pathogenesis [2]. Hypothetical ideas, such as variations in the target cell sensitivity, biomarkers, neuroendocrine, genetic, and environmental factors, are meant to aid enhance pathogenesis. Vulgaris, which contains both herbal and artificial substances, has a remarkable healing impact on a variety of pimples [3].

They can have different mechanism, for example [4]

- Control of sebum production.
- An Antibiotics that inhibits Propionibacterium and Staphylococcus epidermidis, the main bacteria responsible for acne.
- A Keratolytic that removes the keratin layer and prevents the trapping of sebum from getting stuck under the skin.
- Anti-inflammatory effect, which can prevent deterioration of the condition caused by inflammation or redness, etc.

ANATOMY OF SKIN [5, 6]

In terms of weight and surface area, the skin is the biggest organ in the body. Its surface area is roughly 16000 cm². Skin makes up 8% of adult body weight. It is the live body's outermost layer or tissue.

Skin acts as a defense against the outside environment. When exposed to sunshine, skin can create a beneficial chemical compound known as vitamin D. The skin serves as a sensory organ and aids in controlling body temperature. Skin has a variety of biological components, including keratinocytes, melanocytes, and erythrocytes. Because of many components like cells and fibers, it exhibits multilayered structures. The skin consists of skin layers

A. The Epidermis [5, 6]

The epidermis, which has a thickness of around 0.2 mm, is the word for the skin's outermost layer. In this stratum, veins and capillaries are absent. The position of the body affects the epidermis' thickness. Keratinocytes and dendritic cells make up the majority of the epidermis' cells. Melanocytes, Langerhans cells, and other types of cells are also present. The layer of the epidermis is often referred to as the metabolically active tissue.

The outermost layer is classified into five sub layers and these are

- 1)Stratum corneum
- 2)Stratum lucidum
- 3)Stratum granulosum
- 4)Stratum spinosum
- 5)Stratum basale

1)Stratum corneum: Stratum corneum refers to the epidermis' outermost sublayer. It also goes by the name "horny cell layer," and it is between 8 and 15 micrometers thick. The layer, which has a hexagonal form, aids in protecting skin from severe dryness. Its primary ingredient, "ceramide," has a significant role in water retention.

2)Stratum lucidum: Stratum lucidum is composed as thin clear layer of dead skin cells. It is found only in areas of thick skin on the palms of the hands and soles of the feet.

3)Stratum granulosum: The layer, which has a 3 m thickness, is also known as a granular cell layer. There are two to four layers of granular cells. As more keratin fibers are inserted into the cells, the shape of the cells becomes flatter.

4)Stratum spinosum: It is also called prickle cell layer having thickness ranges from 50- 150µm. It consists of number of cells, which may differ in shape and structure.

5)Stratum basal: The deepest and sublayer of the epidermis, stratum basal is made up of a single layer. Keratinocytes are formed in the stratum basal and travel upward to the surface. The term "turnover" refers to the mobility of keratinocytes. It takes days for this process to complete one cycle, and keratinocytes also undergo structural and functional modifications. This layer, also known as the basal cell layer, contains 8% of the water in the epidermis.

B. The Dermis

Most of the dermis is made up of collagen and elastin as well as fibroblasts.

This layer has several functions.

- 1) In the dermis there are blood vessels and the lymphatic vessels that nourish the skin and eliminate waste products or toxins.
- 2) Sweat glands are present in the dermis. They create sweat through your pores, removing impurities as cool your body.
- 3) The hair follicles (where your hair attaches) and the sebaceous glands, which produce the oils that make the skin soft and smooth the skin- sometimes overzealously resulting in rashes and oily skin — are also found in the dermis.

C. The Subcutaneous layer [5, 6]

1) The deepest layer of skin is the layer of fat that connects your bones to your muscles and bones. It goes deep that the active ingredients in your skincare products can never reach.

2) The subcutaneous layer is like a thermostat. It protects the body and can also be used as a source of energy in a pinch.

3) Fat also acts as a filter, protecting your muscles, bones and organs from damage.

4) Finally, the subcutaneous layer contains additional blood vessels, nerve endings, hair follicular roots and the deepest oil-producing sebaceous glands.

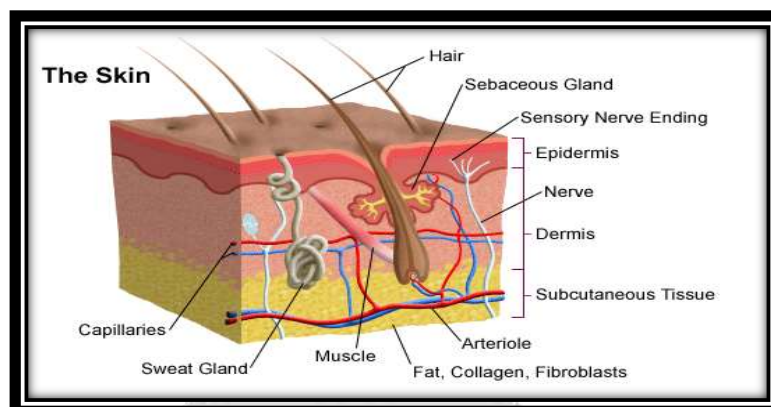


Fig. 1: Diagram of skin

FACE WASH [7, 8]

A facial cleanser is a facial care product used to clean the skin on the face of make-up, dead skin cells, oil, grime, and other sorts of pollution. It aids in pore cleaning and the prevention of skin conditions like acne. Together with a toner and moisturizer, a face cleanser can be used as part of a skincare routine.

Benefits of Face wash [8]

- Helps keep skin clear and healthy.
- It makes the skin radiant.
- The combination of dead skin cells and excess oil can clog pores, causing acne, white heads, black heads and a tired appearance.
- Regular pore exfoliation prevents all of the above skin problems.
- Exfoliation accelerates the blood circulation. It helps to remove dead skin cells and helps new skin cells replace old ones.
- Promotes skin regeneration and rejuvenation.
- Removes dead skin cells, which means your skin wrinkles more slowly.

Disadvantages of Face wash [8, 9]

- Facial cleanser only cleans the face, it is a safer body wash.
- Use face wash only twice a day. Using more than twice may cause dry skin.
- Removes dead skin cells, which means your skin wrinkles more slowly.
- The biggest drawback is its limited use.

Properties of Face-Wash [10]

- It should soften when applied to the skin.
- It should be stable and look good appearance.
- It should spread easily without dragging.
- After evaporation of the water, the creamy residue must not become viscous.
- There must be no greasy feeling during application.
- Should leave a fine emollient film on the skin after use.
- Its physical action should be to flush the skin and open the pores rather than to absorb.

Categories of therapeutic agents used in face wash [11]

A. Antimicrobial

Generally speaking, an antimicrobial is an agent that interferes with the growth and reproduction of bacteria. While antibiotics and antimicrobial attack bacteria, the terms have evolved over the years to have two different meanings. Antimicrobials are now most often described as agents used to disinfect surfaces and eliminate potentially harmful bacteria.

B. Anti acne

Antiacne Medications are used for different purposes, depending on the severity of the condition.

Advantages of Herbal Cosmetics over Synthetic Cosmetics [12, 13]

These remedies are gaining popularity because most women these days prefer natural products over chemical products for their personal care to enhance their beauty because these products are the body nourishes, improves health and provides satisfaction. These are free of

synthetic chemicals and have relatively few side-effects compared to the synthetic cosmetics.

Table 1: Advantages of Herbal Cosmetics

A. Suitable for all Skin Types	Natural Cosmetics is suitable for all skin types. Whether you have a dark or light complexion, you will find natural cosmetics such as foundation, eye shadow, and lipstick adapted to your complexion. Coal tar is a known human carcinogen and the biggest problem with individual colors of coal tar (whether coal tar or synthetic) is carcinogenicity. But the natural colors of herbs are safer [14].
B. Wide Selection	There is a wide variety of plant extracts such as a <i>Andrographis paniculata</i> , <i>Asparagus racemosus</i> , <i>Boswellia serrata</i> , <i>Bitumen</i> .
C. Not tested on Animals	<i>Andrographis Paniculata</i> (Kalmegh), However, natural cosmetics do not to be tested on animals.
D. No side effects	With natural cosmetics, you don't have to worry about it. The natural ingredients used guarantee the absence of side effects, it can be applied anytime and anywhere. And is suspected of interfering with hormonal function. Clears mild to moderately severe acne. Isotretinoin (Accutane) is an oral medication on used only to treat very severe and disfiguring acne.

Various herbs used in cosmetics [15, 16]

- **Amaranth:** Cover and cook for five minutes.
- **Neem:** Neem is valued in Ayurvedic medicine for its various healing properties due to its antibacterial, antifungal and antiviral abilities.
- **Lemon:** Removes dirt and oil. Then use a cotton ball to remove the dirt and oil.
Use this method once a week.
- **Basil:** Soak the basil leaves. Place the leaves in a cup of boiling water, soak for 10-20 minutes, let cool, and apply to the pimples.
- **Cucumber:** Another variation of this diet is to drink four or five glasses of cucumber juice a day for a week.
- **Grape:** Grape seed extract is a powerful all-around antimicrobial agent and is an excellent disinfectant.
- **Chickpeas:** Wash your face with hummus paste. Dry with a clean towel. It also good remedy for acne.
- **Beet:** Use a mixture of one part beet juice, three parts carrot juice and two parts waters to stimulate the liver and cleanse the system.

Additives used in Facial cleanser [17, 18, 19]

A. Gelling agent

Gelling Agents ingredient which converts the aqueous or oily phase into a gel, which becomes thick but, not rigid. A lotion thickened with a gelling agents will be runnier and runnier than stiff. Some of these gels thin out under the effect of the force (thixotropy).

B. Preservatives

Some of these organisms can secrete toxic substances ("toxins") harmful to human health and can even be fatal. Examples: methylparaben, propylparaben.

C. Humectant

A humectant is a hygroscopic substance used to keep objects moist, it is the opposite of a desiccant. It is usually a molecule with multiple hydrophilic groups, mostly hydroxyl groups Humectants absorb and hold moisture from nearby air by absorption, drawing the water vapor into and/or below the surface of organism/objects.

Uses of Facial cleanser

- Remove all traces of makeup daily.
- To cleanse the skin.
- Anti-aging.

- Shower Renew Keeps the skin clean and radiant.
- Stimulates the production and renewal of skin cells.

INGREDIENTS USED IN FORMULATION [20, 21, 22]

A. Aloe Vera



Fig: 2 Aloe Vera

- 1) Scientific name: Aloe vera.
- 2) Order: Asparagus.
- 3) Family: Asphodelaceae
- 4) Subfamily: Asphodeloideae.
- 5) Kingdom: Plantae
- 6) Family: Vincaceae
- 7) Botanical name: Aloe barbadensis miller

The use of aloe vera on the face is beneficial because of its:

- Anti-inflammatory properties that help in relieve pain, swelling and pain in wounds and promote formation and release of collagen.
- It reduces the time needed to recover from first- and second-degree burns.
- It is a reliable source for the treatment of bacterial and fungal diseases.
- The creamy residue should not thicken after evaporation of the water.
- Its physical effects must not be absorption, but rinsing of the skin and opening the pores.
- After application, a thin layer of emollient should remain on the skin.
- It has an antioxidant property that can aid in the repair of UV damage and slow down the aging process of the skin.
- It protects the skin from the harmful effects of radiotherapy.
- It contains 98% water, which hydrates, soothes, and hydrates the skin.
- It makes the skin more supple instead of stiff and hard.
- It soothes rashes and sunburns by cooling.

Active components of Aloe Vera: Vitamins, enzymes, minerals, carbohydrates, lignin, saponins, salicylic acid, and amino acids are among the 75 potentially active components of aloe vera.

Vitamins: It contains antioxidant vitamins A(beta-carotene), C, and E. Vitamin B12, folic acid and choline are also present.

B. Rose Water [23]



Fig: 3 Rose water

Benefits OF Rose Water for Face

- 1) Balances natural oils in the skin

- 2) It can help reduce the appearance of temporary redness
- 3) Natural Hydration
- 4) It has antioxidant properties
- 5) It can help prevent fine lines and wrinkles
- 6) It can help to unclog pores and create a smoother look
- 7) Reduces large pores
- 8) It helps to remove impurities and prepares your skin for success

Active Components of Rose Water

Rose water is rich in vitamins A, C, E and B, as well as anti-inflammatory properties.

C. Raw Honey



Fig: 4 Raw Honey

Benefits of Raw Honey for Skin and Face:

Deeply Hydrates Skin, cleans pores, Lightens Scars, Gently Exfoliates, Helps fight bumps
Helps reduce wrinkles

Components of Honey

Honey, mainly sugar, and certain vitamins, minerals, iron, zinc, and antioxidants are good standards of measurement. Besides being a natural sweetener, honey is also used as an inflammatory, antioxidant and antimicrobial.

D. Turmeric Oil



Fig: 5 Turmeric Oil

Turmeric Benefits for Skin:

- 1) Hydrates the stratum corneum of the skin.
- 2) Improves the skin barrier function.
- 3) Provides anti-irritant protection for the skin.
- 4) Accelerates wound healing.
- 5) Eliminate dry skin.
- 6) May be beneficial for psoriasis.

Components of Turmeric Oil: Turmeric oil is a natural chemical substance extracted from vegetable oil.

E. Peppermint Oil



Fig: 6 Peppermint Oil

Benefits of Peppermint oil for Skin

- 1) Conditions skin: Adding peppermint oil to any skincare formula help your skin feel refreshed and energized.
- 2) Reduces Acne.
- 3) Cools skin and scalp
- 4) Kills bacteria and odor
- 5) Reduces sebum
- 6) Astringent: Peppermint oil has natural astringent properties. It improves the appearance of pores by tightening skin cells. It also prevents pores from becoming clogged or clogged.

Components of Peppermint Oil: Menthone and menthol are the two main chemical constituents of peppermint oil.

F. Glycerin



Fig: 7 Glycerin

Benefits of Glycerin for Skin

- 1) Hydrates the stratum corneum of the skin.
- 2) Improves the skin barrier function.
- 3) Provides anti-irritant protection to the skin.
- 4) Accelerates wound healing.
- 5) Eliminates dry skin

G. Neem



Fig: 8. Neem

1)Scientific name: Azadirachta indica

1) Order: Rutales

2) Suborder: Rutinae

- 3) Family: Meliaceae
- 4) Subfamily: Melioideae
- 5) Genus: Azadirachta
- 6) Species: indica

Benefits of Neem for Skin

- 1) Heal wound
- 2) Reduce scars
- 3) Treat dry skin and wrinkles
- 4) Purifies the blood
- 5) Soothes inflamed and irritated skin
- 6) Treats uneven skin tone
- 7) Fight multiple signs of premature aging
- 8) Moisturizes the skin

Components of Neem: Neem leaves contain ingredients such as nimbin , nimbanene , 6-desacetylnimbinene, nimbadiol, nimbolide and ascorbic acid , n-hexacosanol and amino acid and nibiol [24, 25] .

2. METHODS AND MATERIALS

Materials

All the ingredients which are used in the preparation of herbal face wash like Aloe vera, rose water, peppermint oil, turmeric oil, glycerin, xantham gum, honey, lemon juice and neem powder are purchased from local market of baddi, Himachal Pradesh.

Method of herbal face wash preparation:

- Firstly, according to Table 2, various formulation batches were created. The appropriate concentration of the gelling agent Xanthium gum, was precisely weighed, mixed with moderate stirring to prevent air entrapment
- And then allowed to soak overnight in hot rose water (not more than 60°C; 50% weight of the batch size).
- By gently swirling, the right amount of honey was combined with the necessary amount of lemon juice.
- The desired amount of concentrated herbal extracts was added to the left-over rose water and gently combined with the honey mixture above.
- Eventually, this was blended with the previously soaked gel composition. Formulations were prepared, poured into the appropriate container and perform evaluation test.

Table 2. Composition of Herbal face wash

SR. NO.	INGREDIENTS	Quantity			USES
		F1	F2	F3	
1	Aloe Vera	0.3gm	0.5gm	0.7gm	Hydrating agent, Anti-wrinkles
2.	Turmeric Oil	0.5ml	0.1ml	0.15ml	Antimicrobial agent, Anti-inflammatory, Antioxidant
3.	Peppermint Oil	0.1ml	0.1ml	0.1ml	Antibacterial
4.	Neem	0.5g	0.5g	0.5g	Antiseptic
5.	Glycerin	0.1ml	0.1ml	0.1ml	Humectants

6.	Honey	0.5ml	0.5ml	0.5ml	Antioxidant, Sweetener
7.	Xantham gum	0.5g	0.1g	0.15g	non-toxic thickener and stabilizer
8.	Lemon juice	0.1ml	0.1ml	0.1ml	natural pH adjuster
9.	Rose Water	q.s	q.s	q.s	Flavoring agent, Emollient, Cooling agent

EVALUATION TEST FOR FACE WASH

In Vitro Evaluation [24]

- 1) Physical evaluation:** Physical characteristics like color, look, and uniformity were visually assessed.
- 2) Determination of pH:** A calibrated digital pH meter was used to measure the pH of the formulation's 1% aqueous solution at a fixed temperature.
- 3) Grittiness:** The product was checked for the presence of any gritty particles by applying it on the skin
- 4) Spreadability:** On the wooden block a ground glass slide was mounted. On this ground slide, 2 gram of the prepared gel was put. Thereafter, a second glass slide with the same dimensions as the fixed ground slide was sandwiched between this slide and the gel preparation. The hook is provided on the second glass slide. For five minutes, a weight of 500 mg was placed on top of the two slides to remove air and produce a homogenous gel film between them. A specified amount of weight was added to the pan, which was connected to the pulley. The top slide's time (in sec) needed to travel a distance of 5 cm was recorded [25].

Spreadability was calculated by using the following formula,

$$S = M \times L / T$$

Were, S- Spreadability

M- Weight tied to the upper slide (20gm).

L- Length of the glass (6.5cm).

T- Time in sec.

- 5) Washability:** The product will be painted by hand and was observed under running water [25].

Result and Discussion

The prepared formulations underwent satisfactory results tests for color, smell, consistency, pH, spreadability, washability, and grittiness. Comparatively, the F12 formulation batch was more spreadable than the F1, and F3 batches.

Table: 3 Physical examination of formulations

Sr. no.	Physical Parameters	Inference		
		F1	F2	F3
1.	Color	Slightly green	Slightly green	Slightly green
2.	Odor	Pleasant	pleasant	pleasant
3.	Appearance	Translucent	Translucent	Translucent

4.	Feel on application	Smooth and slipper	Smooth and slipper	Smooth and slipper
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Table:4 Evaluation of formulations

Formulation	pH	Grittiness	Spreadability coefficient (Gm-cm/sec)	Washability	Consistency
F1	4.9	No gritty particle	4.193	Good	Semi-solid
F2	5.3	No gritty particle	5.416	Good	Semi-solid
F3	5.4	No gritty particle	2.6	Good	Semi-solid

CONCLUSION

In this research three formulations of herbal facewash were prepared and evaluated on the basis of their physiochemical properties like color, odor, taste, pH, spreadability, grittiness, consistency, washability. The formulation were contained herbal ingredients like Neem (as a antibacterial, analgesics), turmeric oil, peppermint oil, aloe vera, lemon juice and rose water. From the evaluation studies it was concluded that the prepared formulations underwent satisfactory results tests for color, smell, consistency, pH, spreadability, washability, and grittiness. Comparatively, the F12 formulation batch was more spreadable than the F1, and F3 batches.

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