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Research Article

**FORMULATION AND EVALUATION OF HERBAL CREAM
USING NEEM AND ALOE VERA****Abhishek J¹, Nandakishor B. Deshmukh², Dr. Swati P. Deshmukh³**¹ Student, shraddha institute of pharmacy, kondala zambre, washim-444505² Associate professor, department of industrial pharmacy, shraddha institute of pharmacy
washim-444505³ Principle, shraddha institute of pharmacy, department of pharmacology, kondala zambre,
washim-444505**Abstract:**

Skin disorders such as acne vulgaris and inflammatory conditions are commonly observed due to environmental exposure microbial infection and hormonal imbalance the present study aims to formulate and evaluate a herbal topical cream using neem (azadirachta indica) and aloe Vera (aloe barbadensis) as primary active ingredients along with other supportive herbs like turmeric and tulsi. These medicinal plants are rich in bioactive compounds that exhibit antimicrobial, anti-inflammatory, antioxidant and wound healing properties making them suitable for treating acne and skin inflammation.

The cream was formulated using an oil in water (o/w) emulsion method by incorporating suitable excipients such as beeswax stearic acid liquid paraffin and preservatives to ensure stability and effectiveness. Three different formulations (f1, f2 and f3) were prepared by varying the concentration of herbal ingredients. The prepared formulations were evaluated for various physio chemical and dermatological parameters including order colour texture pH stability washability irritancy and stability.

All formulation showed acceptable organoleptic properties with smooth texture and semi solid consistency. The pH was found to be within or close to the skin compatible range. Among the formulations F3 exhibited better spreadability appropriate viscosity and good stability. No signs of irritation such as redness or itching were observed during testing, confirming its safety for topical use. The study concludes that the formulated herbal cream is safe effective and suitable for managing acne and skin inflammation offering a natural alternative to synthetic products with minimal side effects.

Keywords: Polyherbal cream, acne vulgaris, azadirachta indica, aloe vera, herbal formulation, anti-inflammatory, antimicrobial, skin inflammation, topical drug delivery, herbal cosmetics

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INTRODUCTION:

Skin is the largest organ of the human body and plays a vital role in protecting the body from environmental factors such as pollution, ultraviolet radiation, and microbial invasion. Various skin conditions such as acne vulgaris, eczema, dermatitis, dryness, and minor infections are commonly observed due to continuous exposure to these harmful factors.

Herbal creams are semisolid preparations containing plant-based ingredients known for their therapeutic and cosmetic benefits. These formulations are rich in bioactive compounds such as flavonoids, tannins, alkaloids, and essential oils, which exhibit antimicrobial, anti-inflammatory, antioxidant, and wound-healing properties. Due to these multiple actions, herbal creams can be designed as multi-functional products, providing benefits such as moisturizing, protection, healing, and treatment of various skin disorders simultaneously.

Several medicinal plants are widely used in herbal cream formulations. For example, *azadirachta indica* (neem) possesses strong antimicrobial activity, *aloe vera* provides soothing and moisturizing effects, and *curcuma longa* exhibits anti-inflammatory and antioxidant properties. Additionally, herbs like *calendula officinalis* and *chamomilla recutita* are known for their skin-healing and soothing effects. The combination of these herbal ingredients enhances the overall effectiveness of the cream by targeting multiple skin concerns rather than a single condition.

Formulating an effective herbal cream for acne and skin inflammation requires careful selection of ingredients, as well as the appropriate vehicle to deliver the active compounds to the skin. The choice of excipients and the formulation process play a critical role in determining the stability, texture and efficacy of the final product. The selection of an appropriate base is crucial to ensure proper absorption and stability of active ingredients and maintains the stability of the active ingredients over time.

In addition to their antimicrobial and anti-inflammatory properties many herbal ingredients are rich in antioxidants, which help protect the skin from oxidative stress and environmental damage.

1.1 acne and skin inflammation

1.1.1 acne

Acne vulgaris is a common chronic inflammatory disorder of the pilosebaceous unit highly prevalent among adolescents and young adults in India. It is characterized by a spectrum of lesions including comedones (open and closed) papules, pustules and in more severe cases nodules and cysts primarily affecting the face followed by the back and chest.

1.1.2 symptoms and causes

Symptoms

Blackheads (open) and whiteheads (closed), red bumps (papules), pus-filled bumps (pustules), larger painful lumps and deep primarily on the face, neck, chest and back.



Fig 1: acne

Causes:

- ✓ Overproduction of oily skin secretion.
- ✓ Dead skin cells and sebum block hair follicles.
- ✓ Proliferation of *Cutibacterium acnes* within blocked follicles triggers inflammation.
- ✓ Immune response to bacteria and follicle blockage.
- ✓ Androgens (male hormones) often play a significant role

1.2 skin inflammation

A fundamental process in various dermatological conditions is the skin's response to injury or infection. It involves a complex cascade of events characterized by redness, heat, swelling and pain

1.2.1 symptoms and causes

Symptoms:

Increased blood flow to the affected area, feeling warm to the touch, fluid buildup in the tissues, discomfort or tenderness, common in many inflammatory skin conditions, visible changes in skin appearance (bumps, blisters, scales etc).



Fig 2: skin inflammation

Causes:

- ✓ Direct contact with substances that damage the skin (e.g. Harsh chemicals).
- ✓ Immune reaction to substances the body is sensitive to (e.g. Pollen, metals).
- ✓ Bacteria, viruses, fungi or parasites.
- ✓ The body's immune system mistakenly attacks healthy skin cells (e.g. Psoriasis).
- ✓ Predisposition to certain inflammatory skin conditions (e.g. Eczema).

1. Plant & drug profile**4.1 neem**

Biological source: the biological source of neem is the tree *azadirachta indica*.

Family: meliaceae (mahogany family)

Common name: neem, nim, margosa, indian lilac.

Chemical constituents

- ✓ Azadirachtin – antifungal, insecticidal.
- ✓ Nimbin & nimbidin – antibacterial, anti-inflammatory.
- ✓ Gedunin & salannin – antifungal, insect repellent.
- ✓ Quercetin – antioxidant, antifungal.
- ✓ Tannins & fatty acids – astringent, antimicrobial properties.

Medicinal properties:

- ✓ Antifungal,
- ✓ Antibacterial,
- ✓ Anti-inflammatory.



Fig 3: neem leaves

Application in cream

The potent antimicrobial activity can target cutibacterium acnes. Its anti-inflammatory properties can help reduce redness, swelling and pain associated with acne and other inflammatory skin conditions.

4.2 turmeric

Biological source: turmeric is derived from the dried rhizome of the plant *curcuma longa*.

Family: zingiberaceae

Common name: turmeric, indian saffron, curcuma.



Fig 4: turmeric

Chemical constituents

- ✓ Curcumin: primary active compound with anti-inflammatory and antioxidant properties.
- ✓ Bisdemethoxycurcumin: another curcuminoid with therapeutic benefits.
- ✓ Turmerone: essential oil with neuroprotective and anti-inflammatory effects.

Medicinal properties

- ✓ Anti-inflammatory, antioxidant, antimicrobial
- ✓ Wound healing
- ✓ Liver protection

Application in cream

The potent anti-inflammatory properties can significantly reduce redness, swelling and pain. Its antioxidant and mild antimicrobial actions are also beneficial for acne-prone, inflamed skin.

Aloe vera

Biological source: parenchymatous tissue (inner leaf gel) of aloe vera (*aloe barbadensis miller*) leaves.

Family: asphodelaceae (formerly liliaceae).

Common names: ghritkumari (hindi, marathi), barbados aloe, true aloe.

Chemical constituents:

- ✓ Polysaccharides (acemannan, glucomannan).
- ✓ Anthraquinones (aloin, barbaloin - primarily in the latex less in the gel).
- ✓ Enzymes (lipase, amylase, catalase).
- ✓ Vitamins (a, c, e, b12).
- ✓ Salicylic acid.

Medicinal properties:

- ✓ Anti-inflammatory.
- ✓ Wound healing.
- ✓ Moisturizing.
- ✓ Antimicrobial.

**Fig 5: aloe vera****Uses in pharmaceuticals and cosmetics:**

- ✓ Lotions
- ✓ Creams for burns
- ✓ Wounds
- ✓ Sunburn

Application in cream

- ✓ Its anti-inflammatory properties can soothe redness and swelling.
- ✓ The moisturizing and wound-healing properties can help repair skin damage caused by acne and inflammation.
- ✓ The mild antimicrobial action may also be beneficial.

4.3 tulsi extract (holy basil)**Biological source**

Tulsi consists of the fresh and dried leaves and flowering tops of *ocimum tenuiflorum* (syn. *Ocimum sanctum*), collected during the flowering stage and used for preparation of extract

Family: lamiaceae (mint family)

Common names: tulsi, holy basil, sacred basil, vishnu priya (in ayurveda)

Chemical constituents: tulsi contains volatile oils and phenolic compounds

- Volatile oil (0.5–1%)
- Phenolic compounds
- Triterpenoids

**fig 6: tulsi****Tulsi extract shows multiple pharmacological activities:**

Antimicrobial, anti-inflammatory, antioxidant, antipyretic, antitussive & expectorant, immunomodulatory, adaptogenic (reduces stress), antidiabetic, cardioprotective

Therapeutic uses: treatment of cold, cough, and bronchitis

1.1 Beeswax

Biological source: beeswax is a purified wax obtained from the honeycombs of the honeybee *apis mellifera*.

Family: apidae

Common names: beeswax, cera flava (yellow beeswax), cera alba (white beeswax)

**Fig 7: bee wax**

Application in acne and skin cream

- ✓ acts as a thickening and stabilizing agent.
- ✓ forms a protective barrier on skin to prevent moisture loss.
- ✓ provides smooth texture and consistency to cream.

2. Material and equipment

Sr. No	Ingredient	Role/uses
1	Neem extract	Antibacterial, anti-inflammatory
2	Aloe vera gel	Soothing, anti-inflammatory
5	Turmeric extract	Anti-inflammatory, healing
6	Tulsi extract	Antimicrobial agent
7	Bee wax	Skin softening, moisturizing
8	Stearic acid	Emulsifier, stabilizer
9	Liquid paraffin	Emollient and moisturizing agent.
10	Methyl paraben	Preservative
11	Rosewater	Regreens, hydration
12	Distilled water (optional)	Solvent, additional hydration

Table 1: material and role**MATERIALS AND METHODS:****2.1 Method preparation of cream****Step 1: preparation of oil phase**

The oil-soluble ingredients such as stearic acid, beeswax, liquid paraffin components were accurately weighed and transferred into a clean beaker.

The mixture was heated on a water bath at 70–75°C until completely melted and a uniform oil phase was obtained.

Step 2: preparation of aqueous phase

In a separate beaker, aloe vera gel, neem extract, turmeric extract, tulsi extract, rose water, and distilled water were measured accurately.

The aqueous phase was heated separately to 70–75°C to maintain the same temperature as the oil phase.

Step 3: emulsification

The heated aqueous phase was slowly added to the oil phase with continuous stirring using a magnetic stirrer to form a uniform emulsion.

Stirring was continued for 10–15 minutes to ensure proper mixing and formation of a stable cream base.

Step 4: addition of preservative

The mixture was allowed to cool to about 40°C, and the preservative (e.g., methyl paraben or phenoxyethanol) was added with continuous stirring to ensure uniform distribution.

Step 5: cooling and homogenization

The formulation was continuously stirred until it reached room temperature. The cream was homogenized to obtain a smooth, uniform, and lump-free consistency.

Step 6: filling and storage

The prepared cream was transferred into, airtight containers stored in a cool and dry place.

Formulation table

Ingredient	Quantity (g)		
	F 1	F 2	F3
Neem extract	2 g	3 g	4 g
Aloe vera gel	3 g	4 g	4 g
Tea tree extract	2 g	3 g	4 g
Turmeric extract	1.5 g	2 g	3 g
Shea butter	4 g	4 g	5 g
Jajoba oil	4 g	3 g	3 g
Neem oil	3 g	2.5 g	3 g
Stearic acid	1 g	1 g	1 g
Tea tree oil	0.5 g	0.5 g	1 g
Phenoxyethanol	0.5 g	0.5 g	0.5 g
Rosewater	2 g	2 g	2 g
Distilled water	1 g	1 g	1.5 g
Total	20.5	22.5	19

Table 3: formulation table**RESULTS:****1. physical evaluation**

Physical evaluation such as colour, odour, texture, and state was checked. The colour was found to be yellow, odour found to be pleasant, texture found to be smooth and state was found to be semi solid.

Sr. No	Parameter	F1	F2	F3
	Colour	Pale yellowish cream	Pale yellowish cream	Pale yellowish cream
	Odour	Pleasant	Pleasant	Pleasant
	Texture	Smooth	Smooth	Smooth
	State	Semisolid	Semisolid	Semisolid

Table no. 4: physical evaluation

- 2. Irritancy:** it was laid on the layer of skin and allow to absorb. An hour was used for examining the skin for any symptoms of

inflammation, redness, itching or discomfort.

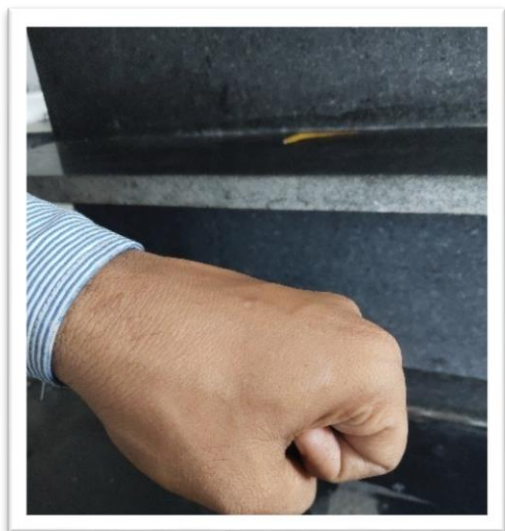


Fig 10: irritancy test

- 3. Ph:** the observed ph (6.95) is slightly higher than the ideal skin ph range (5.0–6.5) but still within acceptable topical limits.

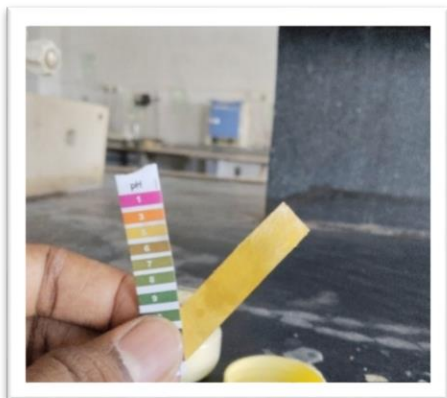


Fig. No. 11: ph test

- 4. spreadability test:** creams and showed shear-thinning behaviour so spread easily. The spreadability of creams were ranging from 5.26 ± 0.18 to 6.24 ± 0.24 g.cm/s. Cream base should spread easily without too much drug and should not produce greater friction in the rubbing process.
- 5. Washability test:** the fungal infection cream stayed well on the skin after application and did not wash off completely with just water showing good resistance. It was easily removed with soap and water leaving the skin clean and without irritation. This means the cream stays on long enough to work effectively but is also easy to wash off when needed.

Table no. 5 evaluation test of acne and skin inflammation cream

Sr. No.	Evaluati on test	Batch 1	Batch 2	Batch 3
1	Ph	5.5 – 6.0	5.0 -5.5	5.2-5.7
2	Viscosity	High (smooth and thick texture)	Slightly dense and stiff	Medium high (balanced texture)
3	Irritancy	No redness or itching	No itching	No reaction suitable for skin
4	Spreadability	Good (easily spread)	Moderate (needs more effort)	Excellent (spread easily and evenly)
5	Washability	Poorly washable	Moderately washable	Easily washable
6	Melting point	35°C	37°C	37°C

DISCUSSION:

The physical evaluation of the prepared formulations indicated that all batches exhibited acceptable organoleptic properties. The cream showed a pale-yellow colour, characteristic herbal odor, smooth texture, and semisolid consistency.

The ph of the formulated cream was found to be within or close to the acceptable range for topical application (5.0–6.5), which is compatible with the natural ph of the skin. Although one observed value was slightly higher, it remains within tolerable limits and is unlikely to cause irritation.

Spreadability studies revealed that the formulations exhibited good spreading characteristics, which is an important parameter for patient compliance and ease of application. Among the batches, formulation f3 showed comparatively better spreadability,

The irritancy test demonstrated that the formulated cream did not produce redness, itching, or edema on the skin, confirming its safety for topical use. This non-irritant nature can be attributed to the use of natural ingredients such as aloe vera, which possesses soothing and anti-inflammatory properties.

Washability studies indicated that the cream exhibited moderate to good adherence to the skin, ensuring sufficient contact time for therapeutic action. At the same time, it could be easily removed with water or mild cleansing agents, which is desirable for topical formulations to maintain hygiene and user convenience.

CONCLUSION:**10.1 conclusion**

The present investigation successfully achieved the formulation and systematic evaluation of a polyherbal topical cream intended for the management of acne and skin inflammation. The formulation was designed using carefully selected herbal ingredients such as neem, aloe vera, turmeric, and tulsi, each contributing distinct pharmacological activities including antimicrobial, anti-inflammatory, antioxidant, and wound-healing effects.

The prepared formulations (f1, f2, and f3) were subjected to comprehensive evaluation parameters such as organoleptic properties, ph, spreadability, washability, irritancy, and stability studies. All batches demonstrated satisfactory physical characteristics, including uniform consistency, smooth texture, and absence of phase separation, indicating good formulation stability. The ph of the formulations was found to be within or near the acceptable physiological range of skin, suggesting compatibility and reduced risk of irritation.

In comparison to conventional synthetic formulations, the developed herbal cream offers significant advantages such as reduced side effects, better patient tolerance, and suitability for long-term use. The study strongly supports the growing trend toward herbal and natural skincare products as safer alternatives in dermatological therapy.

10.2 summary

The present study focused on the formulation and evaluation of a polyherbal cream incorporating natural ingredients like neem, aloe vera, turmeric, and tulsi. These herbs are rich in bioactive compounds such as flavonoids, alkaloids, tannins, and essential oils, which exhibit antimicrobial, anti-inflammatory, antioxidant, and healing properties.

Three formulations (f1, f2, and f3) were developed using different concentrations of active ingredients along with suitable excipients such as beeswax, stearic acid, oils, and preservatives to ensure stability and effectiveness. The creams were prepared using standard emulsification techniques to achieve a stable oil-in-water system.

The formulations were evaluated using various physicochemical and dermatological parameters:

- Organoleptic properties confirmed acceptable colour, odor, and texture
- Ph analysis showed compatibility with skin physiology

- Spreadability indicated ease of application
- Washability demonstrated practical usability
- Irritancy tests confirmed safety and non-reactivity
- Stability studies showed no phase separation or degradation

This study highlights the potential of herbal creams as multi-functional dermatological preparations capable of addressing multiple skin concerns simultaneously. The use of plant-based ingredients not only enhances therapeutic efficacy but also minimizes adverse effects, making these formulations suitable for prolonged use.

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