

Formulation and Evaluation of Herbal Anti Acne Gel Containing Aloe Vera, Neem and Turmeric

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Abstract— Acne vulgaris is a common dermatological disorder affecting a large population, particularly adolescents. The present study focuses on the formulation and evaluation of an herbal anti-acne gel using natural ingredients such as Aloe vera, Azadirachta indica (neem), and Curcuma longa (turmeric), known for their antimicrobial and anti-inflammatory properties. The gel was prepared using a suitable gelling agent and evaluated for physicochemical parameters including pH, viscosity, spread ability, homogeneity, and stability. Antimicrobial activity was assessed against acne-causing microorganisms. The formulated gel exhibited acceptable pH, good spread ability, and stability without phase separation. It also demonstrated significant antimicrobial activity, indicating its effectiveness in acne management. The study concludes that the developed herbal gel is safe, effective, and a promising alternative to synthetic anti-acne formulations.

Index Terms— Acne vulgaris, Aloe vera, Anti-inflammatory, Anti-microbial, Azadirachta indica, Herbal gel, Spread ability and Stability

I. INTRODUCTION

A topical formulation called herbal anti-acne gel uses natural plant-based substances to both treat and prevent acne. Usually, these gels contain medicinal plants with anti-inflammatory, antibacterial, and restorative qualities [1]. The skin is a multilayered organ with numerous histological layers in its anatomy and comprising 1.8 m² of surface area and 16% of body weight. The epidermis, dermis, and subcutis are the three structural layers that make up the skin. Sweat,

apocrine glands, hair, nails, and sebaceous glands are thought of as skin derivatives. The skin's pH ranges from 4 to 5.6. The pH of the skin's surface is affected by sweat and fatty acids released by sebum. It is hypothesized that the skin's acidity aids in stopping the growth of infections and other organisms. Acne is another name for acne vulgaris. The term "acne," which comes from the Greek word "Akme," which meaning "peak" or "apex," refers to either inherited or acquired pilosebaceous unit affections. It is a prevalent long-term condition brought on by aberrant sebum production in skin follicles. The most prevalent condition among young people, typically between the ages of 18 and 25, is acne. Seborrhea, comedones, inflammatory lesions, and the presence of Propionibacterium acnes, Staphylococcus epidermis, and Staphylococcus aureus in the follicular canal and sebum production are the hallmarks of acne vulgaris, a skin condition affecting the pilosebaceous gland. 95% of males and 83% of girls are affected by this nearly universal sickness that affects people of all colors [2]. Two of the most well-known herbal plants are turmeric and neem, which have centuries-old traditional medical uses and a wealth of bioactive components. Turmeric is a member of the Zingiberaceae family and is well-known for its active ingredient Curcumin has many biological characteristics, including antioxidant and antibacterial qualities. Neem is indigenous to the Indian subcontinent and a few African nations. It is a member of the Meliaceae family. Because of its many active phytoconstituents, including nimbidin, nimbin,

salannin, margolone, and azadirachtin, neem is a versatile tree with exceptional antibacterial, antifungal, antioxidant, anti-inflammatory, and insecticidal properties. It is reasonable to expect that a combination of neem and turmeric would have a synergistic impact based on their reported pharmacological characteristics [3]. High concentrations of azadirachtin, one of the most studied and utilized active ingredients in neem, are found in the seeds of the neem tree [4]. Skin infections can be effectively treated by aloe vera's antibacterial, anti-inflammatory, and antioxidant properties [5]. Neem's leaf extract, seed oil, and bark are used medicinally in traditional medicine to treat intestinal helminthiasis, leprosy, respiratory conditions, and constipation. Additionally, neem has antipyretic, anti-inflammatory, antimycotic, antibacterial, immunomodulatory, cardiovascular, anti-hyperglycaemic, and cognitive properties. All parts of the neem plant are used to cure skin ulcers, blood morbidity, burning feelings, and itching [6]. The primary naturally occurring polyphenol in *Curcuma longa* (turmeric) rhizome and other *Curcuma* species [7]. Because of its antioxidant, anti-inflammatory [8], antimutagenic, antibacterial [9], wound-healing, and anticancer qualities, curcuma longa has long been utilized as a medicinal herb in Asian nations [10]. Aloe vera is a perennial succulent plant that is a member of the Liliaceae family. This plant has been referred to as "the healing plant." Since ancient times, aloe vera has been utilized in traditional medicine. Its immunomodulatory and growth-promoting properties have been shown for millennia. Aloe vera is a plant that has fewer toxicity and adverse effects while being more effective and potent against a variety of skin conditions [11].

The objective of this study is to formulate and evaluate an herbal anti-acne gel containing Aloe vera, Neem, and Turmeric for its physicochemical properties, stability, and antimicrobial efficacy against acne-causing microorganisms.

II. PLANT PROFILE

1. Neem:

Synonyms: Nira, Nimb, Vespa, Limba, Nimba.

Biological source: Neem consists of the fresh or dried leaves and seed oil of *Azadirachta Indica* belonging to family Meliaceae.



Fig 1: - *Azadirachta Indica*

Chemical Constituents: Nimbin, 6-desacetylnimbinene, Nimbiene, Nimbandiol, nimbolide, Quercetin, Ascorbic acid, nhexacosanol, amino acid, Nimbin & Nimbidinin.

Geographical source: It is found in India, Pakistan, Sri Lanka, Malaya, Indonesia, Japan, Tropical region of Australia and Africa. In India, it is found in Uttar Pradesh, Maharashtra, Tamil Nadu, Rajasthan, and M.P.

Uses:

- Poultice, applied to boils.
- In worm, jaundice
- Ulceration of cowpox
- Antiviral and anti-fungal

Pharmacological uses: Anti-ulcer, antifertility, antifungal, antiviral, anti-pyretic. [12]

2. Turmeric: -

Synonyms: -Saffron Indian; haldi (Hindi); *Curcuma*; *Rhizoma cur-cumae*.

Biological source: -Turmeric is the dried rhizome of *Curcuma longa* Linn. (syn. *C. domestica* Valetton), belonging to family Zingiberaceae.



Fig 2: - *Curcuma longa*

Chemical constituents: -yellow-pigmented curcuminoids (approx. 5%, mainly curcumin) and 6% essential oils (turmerones, zingiberene).

Geographical source: - Turmeric is mainly tropical regions, especially India, along with countries like China, Indonesia, Bangladesh, and Sri Lanka, where it is cultivated extensively.

Uses: -

- Anti-inflammatory action.
- Antioxidant properties.
- Antimicrobial activity.
- Treating skin problems (acne, wounds).
- Improving digestion.
- Boosting immunity.
- Natural food coloring and flavoring agent.
- Used in traditional medicine (Ayurveda).

Pharmacological uses: -Anti-inflammatory, antioxidant, antimicrobial, hepatoprotective, anticancer, and immunomodulatory pharmacological activities.

3. Aloe vera:

Synonyms: -Aloe barbadensis, Aloe indica, Aloe vulgaris, and Indian aloe.

Biological source: - Aloe vera is the dried latex and fresh gel obtained from the leaves of Aloe barbadensis, belonging to the family Liliaceae.



Fig 3: - Aloe barbadense

Chemical constituents: -anthraquinones (like aloin), polysaccharides (acemannan), vitamins, enzymes, amino acids, sugars, sterols, and minerals.

Uses: -

- Soothes and heals burns, cuts, and wounds.
- Acts as a natural moisturizer for skin.
- Helps in treatment of acne and reduces inflammation.

- Promotes wound healing and skin regeneration.
- Used in hair care to reduce dandruff and condition hair.
- Aids digestion and relieves constipation (latex part).
- Boosts immunity due to antioxidant properties.
- Helps in reducing skin irritation and sunburn.
- Used in cosmetic and pharmaceutical formulations.
- May help in controlling blood sugar levels.

Pharmacological uses: -Aloe vera is used as a wound-healing, anti-inflammatory, antimicrobial, and laxative agent in various formulations.

III. MATERIALS REQUIRED

Ingredients	Quantity required	Properties
1. Aloe vera (Aloe barbadensis) extract	5ml	Soothing, anti-inflammatory, wound healing.
2. Neem (Azadirachta Indica) extract	2ml	Strong antibacterial activity.
3. Turmeric (Curcuma longa) extract	1ml	Anti-inflammatory, antioxidant.
4. Carbopol 934	1g	Gelling agent.
5. Glycerin	3ml	Humectant.
6. Triethanolamine	q.s	pH adjustment.
7. Methyl paraben	0.2g	Preservative.
8. Distilled water	Upto 100 ml	Vehicle.



Fig 4: - Materials Required

IV. PREPARATION OF EXTRACTS

1.Extraction of aloe barbadensis: - Aloe vera leaves can be used to extract fresh gel. On a sanitized tray, evenly spread the gel in a thin layer. Use the following to dry the gel:

40–50°C in a hot air oven. Until a firm, brittle mass is achieved, keep drying. The dried substance should be ground into a fine powder. For consistent particle size, pass through a sieve. Keep out of direct sunlight and moisture by storing in an airtight container [20].



Fig 5: - Extraction of aloe barbadense

2.Extraction of Curcuma longa: - Put some powdered turmeric in a container. Add enough ethanol. Shake occasionally for 24 to 72 hours. Use filter paper or muslin cloth to filter. To acquire extract, evaporate the solvent [21].

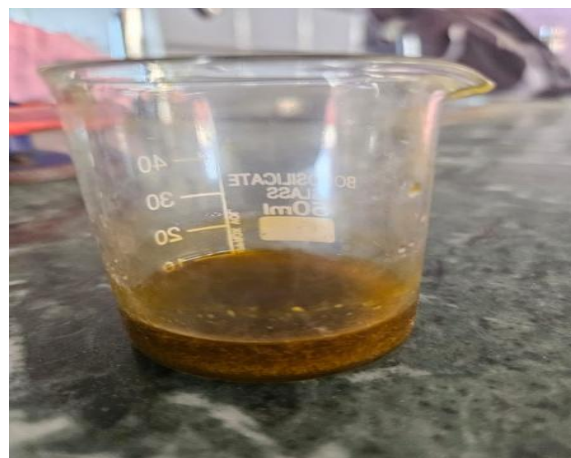


Fig 6: - Extraction of Curcuma longa

3.Extraction of Azadirachta Indica: -The collected plant material (leaves) was properly cleaned with water, chopped into small pieces, boiled for one hour in distilled water (1 g of plant material in 10 mL of water), and then filtered. A rotating vacuum evaporator was used to concentrate the filtrates before they were lyophilized. The yield of water extract was 4.0%. Until it was needed again, the extract was kept in a freezer at -80 °C [21].

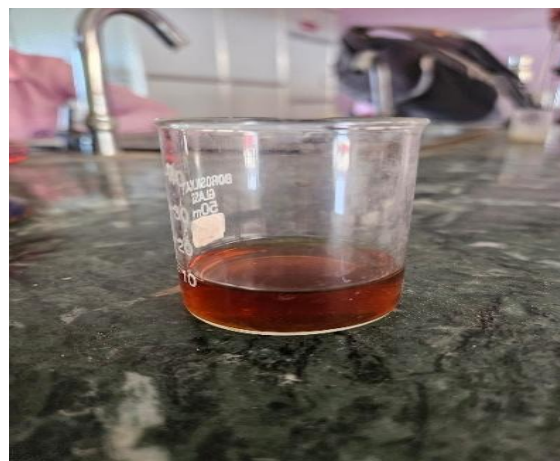


Fig 7: - Extraction of Azadirachta Indica

V. PROCEDURE

1. Preparation of Gel Base
 - Disperse Carbopol 934 in distilled water.
 - Allow it to swell for 30–60 minutes.
2. Addition of Humectant
 - Add glycerin slowly with continuous stirring.
3. Incorporation of Herbal Extracts
 - Add Aloe vera gel, Neem extract, and Turmeric extract.
 - Mix thoroughly to obtain uniform dispersion.
4. Addition of Preservative
 - Add methyl paraben and mix well.
5. pH Adjustment
 - Add triethanolamine dropwise until gel forms and pH reaches ~6–7.
6. Final Mixing
 - Stir continuously to remove air bubbles and obtain smooth gel [22].

VI. EVALUATION PARAMETER

1. Physical Appearance

- Colour – yellowish brown
- Odor –Slightly pungent
- Homogeneity – Uniform
- Texture – Smooth

2. pH Determination

- 6.32 was the pH of the above formulation found by using pH meter.



Fig 9 :-Determination of Ph

3. Viscosity

- The gel exhibited a semi-solid consistency with adequate viscosity, ensuring easy spread ability and good retention on the skin [23].

4. Spread ability

- Easy of application on skin



Fig 10 :-Spreadability

5. Washability

- Ease of removal with water
- Should wash off easily without residue

6. Antimicrobial activity

The antimicrobial activity of the formulated herbal anti-acne gel was evaluated by the agar well diffusion method against acne-causing microorganisms such as *Propionibacterium acnes* and *Staphylococcus aureus*, and the formulation showed a clear zone of inhibition indicating significant antibacterial activity [24].



Fig 10 :-Antimicrobial test

VII. CONCLUSION

The formulated herbal anti-acne gel containing Aloe vera, neem, and turmeric showed satisfactory physicochemical properties, good stability, effective spreadability and washability, and significant antimicrobial activity against acne-causing microorganisms, indicating that it is a safe and effective topical preparation for the management of acne [25].

VIII. RESULT

The prepared herbal gel showed satisfactory physicochemical properties, good stability, and effective antimicrobial activity, making it suitable for topical anti-acne use.



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