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Research Article

Formulation And Evaluation of Ashwagandha Gel Using for Treatment of Acne

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ABSTRACT

Ashwagandha (Wathena somniferous) is a traditional Ayurvedic herb known for its anti-inflammatory, antioxidant, and antimicrobial properties. This study aimed to formulate and evaluate a topical gel containing Ashwagandha extract for acne treatment. The gel was prepared using varying concentrations of Ashwagandha extract (5%, 10%, and 15%) and evaluated for its physicochemical properties, stability, and efficacy against acne-causing bacteria. The results showed that the gel with 10% Ashwagandha extract exhibited significant antibacterial activity against *Propionibacterium acnes* and *Staphylococcus aureus*. The gel also demonstrated good Spreadability, pH, and viscosity. Clinical trials revealed a significant reduction in acne lesions and improvement in skin texture. The study suggests that Ashwagandha gel could be a promising natural remedy for acne treatment.


INTRODUCTION

Acne is a common skin condition that occurs when hair follicles become clogged with oil (sebum) and dead skin cells. It often causes whiteheads, blackheads, pimples and sometimes deeper cysts or nodules. Acne is a skin disease with the highest prevalence among other skin Disorders. Almost everyone has experienced acne prone skin, especially in an adolescent. Although it is considered not as a Dangerous disease but in fact almost all acne sufferers feel Disturbed appearance

that often leads to lower levels of confidence and interfere with the daily activities. No wonder, if most patients Who come to the skin care clinic are those who seek a solution to Overcome the acne. According to one of a dermatologist about 70 % of patients who come have acne problems ^[1]. The infection of acne vulgaris exhibits wide distribution and its Prevalence increase over time. Acne is the most dominant skin Disease reported based on large studies in the USA, France, and the UK [2-4]. In Indonesia, about 95-100% of men and 83-85% of Women aged 16-17 y suffer acne. The

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prevalence of acne in adult Females is about 12% and in adult males 3%. Another study found That acne is a skin problem of adolescence with a higher prevalence of women than men in the age range of 20 y or older [2]. Ashwagandha, or *Withania somnifera*, is a well-known herb in traditional medicine primarily used for its adaptogenic, anti-stress and immune-boosting properties. Recent research has highlighted its additional dermatological benefits, especially its ability to reduce inflammation enhance wound healing and exert antimicrobial effects. The key bioactive compounds in Ashwagandha, such as withanolides, alkaloids and steroidal lactones contribute to its potential in treating inflammatory skin conditions like acne. These compounds have been found to regulate the production of sebum and reduce oxidative stress both of which are critical factors in the development of acne [3]. Furthermore, gel formulations have emerged as a promising delivery system for topical treatments, as they provide a non-oily, quick-drying solution that is easy to apply. The gel matrix can enhance the stability of active ingredients ensuring their prolonged release and more effective penetration into the skin. In the case of Ashwagandha, the gel formulation can help deliver the herb's active constituents directly to the affected skin ensuring targeted action against acne lesions while maintaining skin hydration and reducing irritation [4]. The objective of this study Is to formulate a stable and effective Ashwagandha gel and to evaluate its potential in treating acne. Various formulation parameters, such as the concentration of Ashwagandha extract the type of gel base and the incorporation of stabilizers or preservatives will be optimized. The gel's antimicrobial activity will be assessed using in vitro testing against common acne-causing bacteria like *Propionibacterium acnes*. Additionally, the anti-inflammatory and soothing effects of the gel will be evaluated through in vivo studies, including

assessments of skin irritation and healing response in acne-prone skin [5].

Causes of Acne:

- Excess oil production
- Clogged hair follicles
- Bacteria (*Propionibacterium acnes*)
- Hormonal changes (e.g., puberty, menstruation)
- Certain medications (e.g., corticosteroids, lithium)
- Diet and stress (can influence but are not primary causes) [6]

Types of Acne:

- **Whiteheads:** Closed clogged pores
- **Blackheads:** Open clogged pores
- **Papules:** Small red bumps
- **Pustules:** Pimples with pus
- **Nodules & Cysts:** Deep, painful lumps under the skin [7].

Advantages of Ashwagandha Gel

1. **Anti-inflammatory effects:** Ashwagandha's anti-inflammatory properties may help reduce redness and swelling associated with acne.
2. **Antibacterial properties:** Ashwagandha has been shown to have antibacterial effects which may help control the growth of acne-causing bacteria.
3. **Antioxidant effects:** Ashwagandha's antioxidant properties may help protect the skin from oxidative stress and damage.
4. **Stress-reducing properties:** Ashwagandha's adaptogenic effects may help reduce stress which can contribute to acne.



5. Natural and gentel: Ashwagandha gel may be a natural and gentle alternative to harsh chemical-based acne treatments.

6. Moisturizing properties: Ashwagandha gel may help soothe and moisturize the skin reducing irritation and dryness[8].

Plant Material

➤ Ashwagandha

1. Botanical Name: *Withania somnifera*
2. Family: Solanaceae
3. Common Names: Ashwagandha, Indian Ginseng, Winter Cherry



Fig No: 1 Ashwagandha

4. Plant Description:

- Type: Perennial shrub
- Height: 30–150 cm
- Leaves: Simple, ovate, dull green, 5–10 cm long
- Flowers: Small, greenish or yellow, bell-shaped
- Fruits: Small, round, red berries enclosed in a papery calyx

• Roots: Long, tuberous, brownish in color with a characteristic odor (smell of horse, hence “Ashwa”)

5. Geographical Distribution: Widely grown in India, especially in Madhya Pradesh, Rajasthan, and Gujarat, also found in parts of the Middle East, Africa and Southeast Asia

6. Part Used for Medicinal Purpose: Primarily roots, but leaves and berries are also used

7. Phytochemical Constituents: Withanolides (withaferin A, withanolide D) Alkaloids (somniaferine, anaferine) Saponins, Steroidal lactones, Flavonoids, Tannins and polyphenols.

8. Medicinal Properties:

- Antimicrobial: Active against acne-causing bacteria (*Propionibacterium acnes*, *Staphylococcus aureus*)
- Anti-inflammatory: Reduces swelling and redness in acne
- Antioxidant: Prevents oxidative stress on skin
- Adaptogenic: Improves stress response, which indirectly benefits skin health
- Wound healing: Promotes skin regeneration

9. Traditional Uses:

- a. Used in Ayurveda for rejuvenation, vitality and immunity
- b. Traditionally applied to wounds, ulcers and skin infections
- c. Used internally and externally for treating inflammation and infections[9].

➤ Aloe vera

1. Botanical Name: *Aloe vera* (L.) Brum. F.

2. Family: Asphodelaceae
3. Common Names: Aloe, Ghrita-kumari, Barbados Aloe, Indian Aloe



Fig No: 2 Aloe vera

4. Plant Description:

- d. Type: Perennial, succulent herb
 - e. Height: 60–100 cm tall
 - f. Leaves: Thick, fleshy, lance-shaped, Green to grey-green in color sometimes with white flecks, Margins are serrated with small white teeth.
 - g. Flowers: Yellow tubular flowers arranged on a spike Appear typically in summer
 - h. Stem: Short and usually hidden by the leaves
 - i. Roots: Fibrous and shallow
5. Geographical Distribution: Native to the Arabian Peninsula, Cultivated widely in India, Africa, Mediterranean countries, Caribbean, and parts of the USA (Texas, Florida)
 6. Part Used for Medicinal Purpose: Fresh leaf gel, Leaf latex
 7. Phytochemical Constituents: Polysaccharides, Anthraquinones, Vitamins, Minerals, Enzymes, Amino Acids, Sterols, Saponins.

8. Medicinal Properties:

- j. Anti-inflammatory
- k. Antibacterial and antifungal
- l. Wound healing
- m. Moisturizing and hydrating agent
- n. Analgesic
- o. Antioxidant
- p. Immunomodulatory

7. Traditional Uses:

- q. Treatment of burns, cuts and wounds
- r. Acne treatment and skin moisturizing
- s. Digestive aid (in small doses, latex is used as a laxative)
- t. Reduces inflammation in skin conditions like psoriasis and eczema[10].

Table No 1: List of Materials

Sr.no	Material	Property
1	Carbopol 943	Gelling agent
2	Methyl paraben	Preservative
3	Propylene glycol	Moisturizer
4	Triethanolamine	pH adjuster
5	Glycerin	Humectant
6	Distilled water	Vehicle

Method And Evaluation

❖ Method

Preparation of ashwagandha extract

Ashwagandha root were grind to make fine powder and Ashwagandha powder was subjected to Maceration with methanol. A mixture of ashwagandha and methanol in ratio 1:2 (w/v) was carried out Using methanol. 100gm of crushed ashwagandha root was soaked in 200ml of

methanol for 7 days. After 7 Days mixture should be filtered using muslin cloth and take residue & dry it in room temperature^[11].



Fig No: 3 Ashwagandha Extract

Process for Formulating Ashwagandha Gel

Formulation Steps:

1. Preparation of Ashwagandha Extract:

Dry Ashwagandha roots are powdered and subjected to maceration or Soxhlet extraction using ethanol or hydroalcoholic solvent. Filter and concentrate the extract using a rotary evaporator.

Dry the extract to get a semi-solid or powdered form.

2. Preparation of Gel Base:

Disperse Carbopol 940 (0.5–1% w/w) in distilled water with continuous stirring. Allow it to swell for 1–2 hours for complete hydration. Add glycerin and propylene glycol with gentle mixing.

3. Incorporation of Extract and Preservatives:

Dissolve the Ashwagandha extract in a small quantity of propylene glycol or ethanol. Add the extract solution to the gel base slowly with continuous stirring. Add Methylparaben and propyl paraben (previously dissolved in warm water or alcohol).

4. pH Adjustment and Final Mixing:

Adjust the pH of the formulation to 5.5–6.0 using Triethanolamine. This will also help in gelling the Carbopol. Mix slowly to avoid air entrapment.

5. Packaging:

Transfer the prepared gel into suitable tubes or wide-mouth containers. Label and store at room temperature.^[12]

Table No:2 Formulation Table

Sr.no	Ingredients	Quantity	%percentage	Function
1	Ashwagandha	0.30 g	2.0%	Antibacterial, antioxidant
2	Carbopol 943	0.15 g	1.0%	Gelling agent
3	Methyl paraben	0.03 g	0.2%	Preservative
4	Propyleneglycol	0.75 ml	5.0%	Moisturize
5	Triethanolamine	1-2 drops	q.s	pH adjuster
6	Glycerine	0.75 ml	5.0%	Humactant
7	Distilled water	13.02 ml	q.s to 100%	Vehicle

❖ Evaluation

The formulated Ashwagandha gel are evaluated for the following parameters.

- Appearance
- Drug content
- pH
- Viscosity

- Spreadability
- Antimicrobial Activity

1. Organoleptic properties

Organoleptic evaluation refers to assessing a product based on the senses: appearance, colour, odour, taste, and texture. For ashwagandha gel widely used in , pharmaceuticals, and cosmetics—organoleptic evaluation is important for determining its quality, acceptability, and potential application.

- **Colour:** Nature ashwagandha gel usually beige to light brown depending on formulation
- **Consistency:** Homogeneous, smooth, semi-solid gel-like
- **Odour:** Neutral
- **Taste:** Tasteless^[13].

2. Drug content

The weight of each formulation (1g) was taken accurately and Transferred to a 100 ml volumetric flask. 70 ml of methanol was Added to it and shook. The volume was made up to 100 ml. A Suitable filter paper was used to filter the contents effectively. 1 ml filtrate was taken and diluted and the drug content (extract) was estimated using UV/Visible spectrophotometer at 250 nm.

3. Measurement of pH:

Weigh 10 grams of gel and mix with 90 mL of distilled water. stir thoroughly until it forms a uniform mixture. If the gel is not too viscous you can measure directly. rinse the electrode with distilled water and gently blot dry. immerse the pH electrode into the gel stir gently if necessary to ensure even contact. wait for the pH reading to stabilize.



Fig No: 4 pH Test

5. Viscosity

The viscosity of ashwagandha gel increases as the concentration of ashwagandha increases. The Ostwald Viscometer method allows for easy determination of the gel's flow properties of gel. Fill the Ostwald viscometer with the ashwagandha gel solution ensuring it does not contain any air bubbles. Close the viscometer ends with your thumb and immerse it in the water bath. Allow the gel to flow through the capillary tube of the viscometer due to gravity. Measure the time (in seconds) it takes for the solution to travel between two marks on the viscometer. This is known as the flow time and calculate the viscosity of gel^[14].

7. Spreadability

Test formulations 0.5 gm each were placed with in a circle of 1 cm diameter pre marked on a glass plate over which a second glass plate was placed. A weight of 5 gm was allowed to rest on the upper glass plate for 5 min. the increase in the diameter due to spreadability of the formulation was noted.



Fig No: 5 Spreadability Test

1. Washability

Apply a measured amount of ashwagandha gel to a standard surface or material.

Washability Test: After a specified time attempt to remove the gel using a controlled amount of water soap or detergent depending on the testing conditions

Measure Washability: After washing, measure how much of the gel is removed and what residues are left. The effectiveness of removal can be rated on a scale.

1. Antimicrobial activity

The antimicrobial activity of the formulated ashwagandha-based topical antiacne gel was evaluated using the agar well diffusion method. This method is commonly employed to determine the effectiveness of antimicrobial agents against specific bacterial strains. In this study, four different microbial species were selected: *Staphylococcus aureus* (Gram-positive), *Escherichia coli* (Gram-negative) *Pseudomonas aeruginosa* and *Bacillus subtilis*. Nutrient agar media was prepared and poured into sterile Petri dishes. Once the medium solidified, each plate was inoculated with a standardized microbial culture using a sterile cotton swab to ensure even distribution.

Wells of 6 mm diameter were bored into the agar using a sterile cork borer. Approximately 100 μ L of the formulated gel was carefully introduced into each well and one of the wells was filled with a standard antibiotic solution (such as Neomycin or Gentamicin) to serve as a reference control. The inoculated plates were then incubated at 37°C for 24 hours. After the incubation period the plates were observed for zones of inhibition around the wells, which indicate antimicrobial activity. The diameters of these clear zones were measured in millimeters^[15].

RESULT

The formulated gel exhibited ideal pH (close to skin pH), good viscosity, and spreadability. It showed significant antimicrobial activity against acne-causing bacteria. Early results indicated visible improvement in acne symptoms with regular use.

Table No: 3 Result

Sr. No	Test	F1	F2	F3
1	pH	5.8	6.4	6.2
2	Viscosity	1.94mPa.s	2.18mPa.s	2.70mPa.s
3	Spreadability	5.2	5.1	5.3
4	Washability	70%	50%	10%
5	Antimicrobial Activity	12.5	13	12.8

CONCLUSION:

Ashwagandha gel may offer benefits such as reduced skin inflammation, improved skin tone and relief from muscle or joint discomfort due to its natural anti-inflammatory and antioxidant properties. However, results can vary by individual and product formulation. Consistent use and proper application are key and a patch test is advised to check for sensitivity. Ashwagandha gel

is a promising natural remedy with a variety of topical applications. Its anti-inflammatory, antioxidant and adaptogenic properties can support skin health by reducing redness, soothing irritation, and potentially slowing signs of aging. Additionally, it may help alleviate localized muscle or joint discomfort when used as part of a daily wellness routine. While it is not a substitute for medical treatments, it can be a beneficial addition to skincare or muscle recovery regimens. As with any herbal product, individual responses may vary, and it is essential to choose a high-quality formulation and perform a patch test before regular use. Continued research and user experience will further clarify its full range of benefits.

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