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Comparative Evaluation of Anti-Acne Gel Containing *Gomphrena Globosa* L Flower Extract with Previously Reported Cream Formulation

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Abstract: Cuti bacterium acnes is a cause of acne. Conventional treatments often lead to side effects and bacterial resistance, necessitating natural alternatives. Acne vulgaris is one of the most common chronic inflammatory disorders of the skin, primarily affecting adolescents and young adults. It's occurring mainly due to excessive sebum production abnormal follicular keratinization, proliferation of Cuti bacterium acnes, and inflammation... Although it is not a life-threatening condition, acne can cause pain, post-inflammatory pigmentation, scarring, and psychological distress.

Acne gel is a topical pharmaceutical preparation developed for the management of acne vulgaris. Gels are preferred for topical acne treatment because they are non-greasy, easily spreadable, rapidly absorbed, and provide good skin contact. The prepared gel can be evaluated for physical appearance, homogeneity, pH, viscosity, spread ability, extrudability, drug content, skin irritation, and stability. The acne gel formulation refers to the prepared gel is evaluated and confirmed for its desired quality, safety, stability, and effectiveness.

Gomphrena globosa L., commonly known as globe amaranth, is a traditional medicinal plant widely used to folk medicine across Asia, Africa, and Latin America. Various plant parts, especially flowers leaves, contain rich classes of phytochemicals including phenolics, flavonoids, betacyanins, saponins, and triterpenoids. Pharmacological studies demonstrate significant antioxidant, anti-inflammatory, anticancer, and analgesic activities.

Keywords: Anti-Acne activity, Formulation And Evaluvation, *Gompherna Globosa* L flower extract, Anti-inflamation, Gel, Cuti bacterium, Flavonoids, Anti-oxidant.

Introduction

Acne vulgaris

Acne vulgaris is the most common chronic inflammatory disorders of the skin, predominantly affecting the pilosebaceous units of the face, chest and back .It is particularly prevalent during adolescence and young adulthood, although it may persist or develop during adulthood. Clinically acne is characterized by a variety of lesions including comedones, papules, pustules, nodules and in severe cases, cysts. Persistent or severe acne may result in post-inflammatory hyperpigmentation, scaring and considerable psychosocial distress, thereby affecting an individual's quality of life. Acne is therefore considered not merely a

cosmetic condition but a chronic inflammatory skin disorder requiring appropriate therapeutic management.



Cutibacterium acnes

Cutibacterium acnes, formerly known as Propionibacterium acnes, is a Gram- positive, anaerobic, lipophilic bacterium that normally forms part of the human skin microbiota. Although its presence alone is not sufficient to cause acne, changes in the follicular environment and specific bacterial phylotypes can contribute to acne- associated inflammation. C. acnes can produce enzymes such as lipases that hydrolyse sebum triglycerides into free fatty acids, which can contribute to follicular irritation and inflammatory processes. The bacterium can also interact with innate immune pathways and promotes the release of inflammatory mediators.

Anti-Acne Gel

An Anti-acne gel is a semisolid topical preparation designed to deliver active ingredients directly to acne-affected skin. Gels are widely preferred for topical application because they are non-greasy, easily spreadable, cosmetically acceptable and convenient to use.

Herbal anti-acne gels contain plant extracts as active ingredients along with suitable gelling agents and other excipients. Commonly used gelling agents include Carbopol, HPMC and other hydrophilic polymers. The formulation is evaluated for parameters such as appearance, homogeneity, pH, viscosity, spread ability, extrudability and stability. Biological evaluation such as antimicrobial or anti-acne activity may also be performed.

In the present study, *Gomphrena globosa* extract is incorporated into a topical gel to investigate its potential as a herbal anti-acne formulation.

Plant profile



Botanical Name-*Gomphrena globosa* L.

Family-Amaranthaceae

Common Name-Globe Amaranth, Globe flower, Bachelor's Button.

Botanical Description

Gomphrena globosa is an annual herb belonging to the family Amaranthaceae. The plant is generally erect and branched, with hairy stems and simple, opposite leaves. The leaves are broadly lanceolate to

along in shape. The plant produces distinctive globular flower heads, usually purple, pink, white or red in colour. The flowers are long-lasting and are commonly cultivated as ornamental plants.

The plant is native to tropical regions of Central and South America and is widely cultivated in tropical and subtropical regions, including India.

Medicinal Activities

Various phytoconstituents have been reported from *Gomphrena globosa*, including flavonoids, phenolic compounds, phenolic acids and betalain pigments. Important, reported compounds include quercetin, kaempferol, ferulic acid and p-coumaric acid. The plant has been reported to possess antioxidant, antibacterial, antifungal, anti-inflammatory and anti-acne activities. These properties are mainly associated with its phenolic and flavonoid constituents.

Gomphrena Globosa L contain diverse secondary metabolites such as flavonoids, phenolic compounds, tannins, alkaloids terpenoids and other phytoconstituents. Several of these components have demon antioxidant, antimicrobial and anti-inflammatory properties, which are relevant to the multifactorial pathogenesis of acne.

Consequently, plant based topical formulations are increasing being investigated as potential alternatives or complementary approaches for acne management. However, the therapeutic potential of a medicinal plant should be established through systematic phytochemical, pharmacological formulation and safety studies rather than by traditional use alone.

The reported antioxidant, antibacterial and anti-inflammatory properties of *Gomphrena globosa* indicate its potential for investigation in tropical herbal formulations. Therefore the present studies aim to formulate and evaluate an anti-acne gel containing *Gomphrena globosa* extract.

Methodology and Formulation

Standardization of plant material

Fresh flowers of *gomphrena globosa* were collected, authenticated and washed thoroughly. The flowers were shade-dried powdered and stored in an airtight container. The powdered material was evaluated for organoleptic, physiochemical and preliminary phytochemical parameters.

Extraction and Characterization

The powdered flowers were extracted using a suitable hydroalcoholic solvent .The extract was filtered, concentrated and stored for further studies ,The percentage yield, colour, odour, consistency, solubility and pH of the extract were determined .Preliminary phytochemical screening was performed to identify major phytoconstituents.

Material and Procedure

Carbopol 934 was dispersed in purified water and allowed to swell. The required quantity of *Gomphrena globosa* flower extract was dissolved in propylene glycol and added slowly to the hydrated Carbopol dispersion with continuous stirring. Glycerin and the required preservatives were then incorporated and mixed uniformly. Triethanolamine was added dropwise to adjust the pH and obtain the desired gel consistency. The prepared gel was allowed to stand to remove entrapped air and was finally transferred into a suitable container for further evaluation.

Ingredients	Characterstics
<i>Gomphrena globosa</i> extract	Active ingredient
Carbopol 940	Gelling agent
Glycerin	Moisturizing agent
Propyl paraben	Preservatives
Disodium EDTA	Chelating agent
NaOH	Neutralizing agent
Distilled water	Solvent/vehicle

Formulation

Ingredient	F1	F2	F3
Gomphrena globosa extract	2.5g	5g	7.5g
carbopol	0.8g	1.0g	1.2g
Propylene glycol	5.0g	5.0g	5.0g
Glycerine	3.0g	3.0g	3.0g
Propyl paraben	0.02g	0.02g	0.02g
Disodium EDTA	0.05g	0.05g	0.05g
NaOH	Qs	Qs	Qs
Distilled water	Qs	Qs	Qs

Evaluation Tests

Organoleptic test

The evaluation was systematically conducted by a clearly visual and sensory of the *Gomphrena Globosa* L extract gel, importantly focusing on the key organoleptic parameters such as colour and aroma.

pH Determination

The sample was measured by an electronic portable pH meter. The pH meter was calibrated with phosphate buffer of known pH. At a constant, temperature pH was observed in the electrical property of the solution. This change was read by the electrode and the accuracy in the middle pH ranges.

Spread ability

The spread ability was expressed in terms of time in seconds taken by two slide to slip off from the gel, placed between the slides, under certain load. Lesser the time taken for separation of the two slides better the spread ability. Two set of glass slides of standard dimension were taken .then the one slide of suitable dimension was taken and the gel formulation was placed on that slide. Then the other slide was placed on the top of the formulation. Then the weight or certain load was placed on the upper slide so that the gel between the two slides was pressed uniformly to form a thin layer. Then the weight was removed and excess of formulation adhering to the slides to was scrapped off. The upper slide was allowed to slip off freely by the force of weight tied to it. The time taken by the upper slide to slip off was noted.

$$\text{Spreadability} = m \times l/t$$

Where,

M = standard weight is tied to or placed over the upper slide

L = length of a glass slide

T = time taken in seconds

Antibacterial activity Assay

The antibacterial inhibition zone of the *Gomphrena Globosa* L gel was evaluated using the well diffusion method. A 0,2 ml bacterial suspension of *C.acnes* was inoculated into a petri dish containing 20ml of sterile, molten mueller hinton agar (MHA) that had not yet solidified. The dish was swirled gently to ensure a homogeneous mixture of the bacteria and the medium before being allowed solidify. Wells was

filled with 50µl of the respective samples. the plates were there incubated at 37° C for 24hrs under the anaerobic conditions .the bacterial activity was determined by measuring the diameter of the clear inhibition zones formed around each well.

Viscosity test

Viscosity is the resistance of a gel to flow. It is commonly measurable using a Brookfield viscometer, where the force required to rotate a spindle in the gel is measured and expressed in centipoise (Cp). Transfer the prepared gel into a clean Dry beaker. Remove any air bubbles present in the gel. Maintain the sample at 25±1°C. Select a suitable spindle and the attach it to the Brookfield viscometer. Immerse the spindle into the gel without touching the bottom or sides of the beaker. Operater the viscometer at the selected speed, such as 10rpm. Allow the reading to stabilize. Record the viscosity in cP.

Homogeneity test

Perfomed by applying 1g of gel onto glass plate. The formulation is considered homogeneous if the it shows no visible signs of clumping particles or unmixed components.

Conclusion

In conclusion, acne is a common skin disorder that affects many people worldwide. Various treatment option are available, but some may cause side effects with long-term use. Natural products containing bioactive compounds have gained attention as alternative therapies for acne management. *Gomphrena globosa* flavonoids, phenolic compounds, and anti-oxidant constituents that may help reduce acne – causing bacteria and the skin inflammation based on the reviewed literatures, *Gomphrena globosa* shows potential as a natural anti-acne agent. However, further studies and clinical evaluations are required to confirm its safety, efficacy, and suitability for pharmaceutical formulations therfore, *Gomphrena globosa* can be considered a promising candidate for the development of anti-acne topical preparations in the future.

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