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"FORMULATION AND EVALUATION OF HERBAL HYDROGEL FOR THE TREATMENT OF ACNE"

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Abstract-Aim: *The present study aimed to develop and evaluate an herbal hydrogel formulation for the management of acne vulgaris.* ***Objectives:*** *The objectives of this research were to identify herbal ingredients possessing anti-acne properties, to prepare a stable herbal hydrogel using a suitable gelling agent, and to assess the formulation for its physicochemical characteristics, antimicrobial efficacy, and potential for skin irritation.*

Conclusion: *In this study, a herbal hydrogel formulation for acne treatment was successfully developed and evaluated. The formulated hydrogel showed desirable physicochemical properties, appropriate pH for skin application, good spread ability, and satisfactory stability. The formulation exhibited notable antibacterial activity against acne-associated microorganisms and was found to be non-irritant to the skin, confirming its suitability for topical use. Overall, the findings suggest that the developed herbal hydrogel is a safe, effective, and promising alternative to conventional synthetic anti-acne products.*

Keywords: **Herbal hydrogel; Acne vulgaris; Herbal formulation; Antimicrobial activity; Topical drug delivery**

Introduction

Acne vulgaris is a widespread chronic inflammatory condition affecting the pilosebaceous units of the skin and is most commonly observed during adolescence and early adulthood, although it may continue into later life. Clinically, acne presents as come dones, papules, pustules, nodules, and, in severe cases, cystic lesions that may result in permanent scarring. The development of acne is complex and involves multiple contributing factors, including increased sebum secretion, abnormal follicular keratinization, proliferation of *Cut ibacterium acnes*, and associated inflammatory processes. While not a life-threatening disorder, acne can have a profound negative effect on an individual's psychological well-being, often leading to emotional distress, diminished self-confidence, and social anxiety.

Current acne management strategies primarily rely on topical and systemic treatments such as antibiotics, retinoids, benzoyl peroxide, and hormonal therapies. Although these conventional therapies are effective, their long-term use is frequently limited by undesirable side effects including skin dryness, irritation, erythema, photosensitivity, and the increasing concern of antimicrobial resistance. These drawbacks have driven the search for safer and more sustainable treatment alternatives.

Herbal medicines have gained considerable attention due to their broad spectrum of pharmacological activities, including antimicrobial, anti-inflammatory, antioxidant, and wound-healing effects, which are beneficial in acne treatment. In recent years, hydrogels have been widely explored as topical drug delivery systems because of their high water content, biocompatibility, non-greasy nature, and ability to provide controlled drug release while maintaining skin hydration. Incorporating herbal extracts into hydrogel systems can further enhance therapeutic effectiveness, improve patient acceptability, and reduce adverse reactions.

The present study aims to formulate and evaluate a herbal hydrogel for acne treatment by integrating selected herbal ingredients with a suitable hydrogel base. The formulation is assessed through various physicochemical and biological evaluation parameters to determine its stability, safety, and therapeutic potential, thereby highlighting its suitability as an alternative approach to conventional anti-acne therapies.

Plant profile:

1. Green tea.

Figure No: 01 Green tea.

BOTANICAL NAME: Camellia sinensis (L.) Kuntze

FAMILY: Theaceae

SYNONYMS: Green Tea, Cha, Chai, Thea

VERNACULAR NAME:

Tamil; pachchaitheyilai

Hindi; hari chai

Telugu; akupacchati

Malayalam; paccha Chaya

2. Tea tree.

Figure No: 02 Tea tree

BOTANICAL NAME: Melaleuca alternifolia

FAMILY: Myrtaceae

SYNONYM: Melaleuca oil

Vernacular name;

Tamil; ti tri ennai

Hindi; ti tree oil

Telegu; ti tri ayi

Malayalam; ti tri oyil

Materials and methods:

Materials: Green tea extract, Carbopol 940, Propylene glycol, Glycerine, Methyl paraben, Triethanolamine, Distilled water, Tea tree oil.

Equipments: Magnetic stirrer with hot plate, Viscosimeter, Ph meter, thermometer, Mechanical stirrer, Weighting balance, Glassware (beaker, cylinder), Franz diffusion cell.

METHOD OF PREPARATION:

Step 1: Preparation of Gel Base (Carbopol 940 Hydration)

Step 2: Preparation of Preservative and Humectant Solution

Step 3: Incorporation of Herbal Actives

Step 4: Neutralization and pH Adjustment

Step 5: Final Weight Adjustment

Step 6: Filling and Packaging

Figure No: 03 METHOD OF PREPARATION

EXCIPIENTS

- Excipients are pharmacologically inert substances that are intentionally added to a pharmaceutical dosage form along with the active ingredient. They play a crucial role in the formulation by improving the physical, chemical and aesthetic properties of the dosage form. In topical preparations such as hydrogels, excipients help in gel formation, stability, spread ability, preservation and patient acceptability without affecting the therapeutic activity of the drug.

- In the present study, various excipients were selected to formulate a stable and effective Green Tea and Tea Tree Oil based herbal hydrogel for the treatment of acne**.**

- **CARBOPOL 940:**
- **GLYCERIN:**
- **METHYL PARABEN:**
- **PROPYL PARABEN:**
- **DISTILLED WATER:**
- **TRIETHANOLAMINE [TEA]**

EVALUATION PROCEDURE:

1. PHYSICAL EVALUATION;

THE FORMULATION HERBAL HYDROGEL WAS EVALUATED BY USING FOLLOWING PHYSICAL PARAMETERS

Figure No: 04 PHYSICAL EVALUATIONS

2. PH TEST;

Figure NO: 05 PH TEST

3. VISCOSITY TEST:

Testing the viscosity of a herbal antiseptic cream is for determining its texture, spread ability and overall formulation quality.

BROOKFIELD VISCOMETER:

Figure NO: 06 BROOK FIELD VISCOMETER

4. SPREADIBILITY:

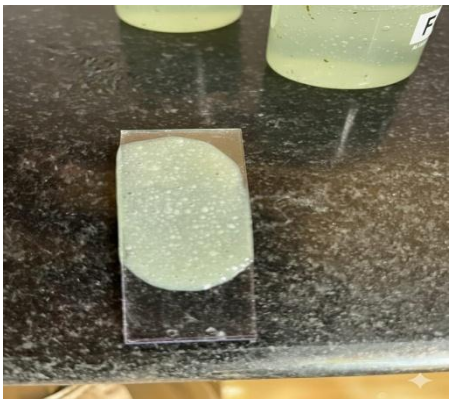

Figure No: 07 SPREAD IBILITY

5. STABILITY TEST

Stability study was carried out for optimized formulation according to ICH guidelines at 40 ℃/75% RH for 1 month.

7. HOMOGENEIY:

Tested via visual appearance and touch to ensure no coarse particles are present.

8.WASHABILITY:

Determined by applying a small amount of the gel to the skin and observing if it washes off easily with tap water.

9.PHASE SEPARATION:

Monitored over a period of storage at normal temperature to ensure the gel components do not separate into distinct layers

REPORT & DISCUSSION:

TABLE: NO: 01 REPORT F FORMULATION OF HERBAL HYDROGEL

S.NO	EVALUATION TEST	F1	F2	F3	F4	F5
1.	Physical appearance	Colour: Pale green Odour: Characteristic herbal Texture: Smooth	Colour: Pale green Odour: Pleasant herbal Texture: Smooth	Colour: Pale green Odour: Mild herbal Texture: Smooth and glossy	Colour: Pale green Odour: Characteristic herbal Texture: Slightly thick and smooth	Colour: Pale green Odour: Pleasant herbal Texture: Smooth and thick
2.	pH determination	5.6	5.8	6.0	6.3	6.6
3.	Viscosity	18,500	20,200	22,800	25,800	27,400
4.	Spreadability	22.5	21.0	19.8	17.6	15.2
5.	Stability	Not stable	Not stable	Stable	Not stable	Not stable
6.	Irritation test	No irritation	No irritation	No irritation	No irritation	No irritation
7.	Homogeneity	Touch good	Touch good	Touch good	Touch good	Touch good
8.	Washability	Easily washable	Easily washable	Easily washable	Moderately washable	Moderately washable
9.	Phase separation	No phase separation	No phase separation	No phase separation	No phase separation	No phase separation

Conclusion

The present investigation successfully involved the development and evaluation of a herbal hydrogel formulation intended for the management of acne. The formulation was prepared using selected herbal constituents recognized for their antimicrobial, anti-inflammatory, and antioxidant activities. The developed hydrogel demonstrated satisfactory physicochemical properties, including uniform consistency, skin-friendly pH, appropriate viscosity, good spread ability, and formulation stability.

The evaluation results confirmed that the herbal hydrogel exhibited significant antimicrobial activity against acne-associated microorganisms, along with good skin compatibility and ease of topical application. The exclusion of synthetic chemical agents reduced the likelihood of adverse reactions, thereby enhancing the safety profile of the formulation when compared to conventional anti-acne products.

In conclusion, the formulated herbal hydrogel represents a safe, effective, and promising topical delivery system for acne treatment. This study highlights the potential of herbal-based formulations as an alternative or supportive therapeutic option in acne management. However, further clinical investigations and extended stability studies are necessary to validate its long-term efficacy and suitability for large-scale production.

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