

Formulation And Evaluation of Herbal Cream for Enhanced Wound Healing

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Abstract—The present study was undertaken to formulate and evaluate an herbal wound-healing cream containing extracts of *Acorus calamus* and *Fenugreek* (*Trigonella foenum-graecum*). Wound healing is a complex biological process involving tissue repair and regeneration, and herbal medicines have gained significant attention due to their safety and therapeutic efficacy. *Acorus calamus* possesses antimicrobial and anti-inflammatory properties, while fenugreek exhibits antioxidant, moisturizing, and wound-healing activities. The herbal extracts were prepared by ethanolic maceration and subjected to preliminary phytochemical screening, which confirmed the presence of flavonoids, saponins, lipids, and phenolic compounds. Three cream formulations (F1, F2, and F3) were prepared using the emulsification method with suitable excipients such as stearic acid, cetyl alcohol, liquid paraffin, glycerin, methyl paraben, and triethanolamine. The prepared formulations were evaluated for physical appearance, pH, spreadability, irritancy, washability, homogeneity, phase separation, and viscosity.

Among the formulations, F2 showed the most desirable characteristics with a skin-compatible pH of 5.5, good homogeneity, acceptable viscosity (32,500 CPS), satisfactory spreadability (8.33 g/cm), easy washability, absence of phase separation, and non-irritant behavior. The results indicated that the combination of *Acorus calamus* and fenugreek extracts produced a stable and effective topical formulation with potential wound-healing activity. In conclusion, the developed herbal cream, particularly formulation F2, demonstrated promising physicochemical properties and may serve as a safe and effective wound-healing preparation. Further pharmacological and clinical studies are recommended to establish its therapeutic efficacy and commercial applicability.

Index Terms—*Acorus calamus*, Fenugreek, Herbal Cream, Wound Healing, Phytochemical Screening, Topical Formulation.

I. INTRODUCTION

Burns, traumas, surgeries, and long-term conditions like diabetes are all contributing factors to the growing prevalence of wounds, which continue to be a serious medical concern. The healing process is impacted by infectious bacteria, especially if their biofilm (biological films) has a long-lasting impact. In clinical terms, wounds are categorized as either acute or chronic. (2) Depending on a number of variables, including the patient's internal and external circumstances, the intricate healing process may progress or regress. Hemostasis, inflammation, proliferation, and maturation are phases of wound healing that overlap. (3) "Cosmetic" comes from the Greek word "cosmetic," which meaning "to go embellish. Since then, the term "cosmetics" has been used to refer to any product used to enhance or beautify one's look. In contrast to synthetic goods that are harmful to human health, the phrase "herbal" denotes safety.

The 9 global market labor statistics. for herbal remedies is expanding, according to Creams are described as "viscous liquid or semi-solid emulsions of either the oil-in-water or water-in-oil type" dosage forms and have varying water and oil consistencies.(4) Herbal extracts (*A. calamus*, fenugreek) were combined to provide excipients for the cream compositions.(5) Topical therapies, such as creams with medicinal ingredients, can be used in place of wound coverings to promote healing, lessen inflammatory reactions, and prevent bacterial infections—all of which are frequently linked to serious wound damage.(6)

ACORUS CALAMUS



Calamus Acorus Linn. It is frequently called "Sweet Flag." and (Araceae) family of rhizomatous and tuberous herbs. Calamus Linn. Acorus. Nowadays, Acorus is widely found in southern Siberia, China, of the Araceae India, Indonesia, Japan, Burma, Sri Lanka, southern Canada, southern Russia, northern Asia Minor, and the northern United States. Commercial versions are available both peeled and unpeeled. This perennial herb is frequently found along streambanks and in damp marshes. These consist of mucilage, polyphenolic chemicals, glycosides, flavonoids, saponins, tannins, and volatile oils such as α -asarone and β -asarone (8). The scent of volatile oil is caused by aromatic components, specifically asarone in leaves and as arylaldehyde in roots. Asarone and other phytochemicals that break down bacterial membranes, block enzymes, and stop growth are the primary source of Acorus calamus's antibacterial effect. This speeds up healing and lessens wound infection. The application of A. calamus in topical wound care is supported by increased hydroxyproline content, increased tensile strength, and wound contraction. (5)

FENUGREEK



The Fabaceae family includes the annual plant fenugreek (*Trigonella foenum-graecum*). It is extensively grown in the Mediterranean, India, and North Africa. (9) The most significant and beneficial element of the fenugreek plant for medicinal purposes is its seeds. These seeds are solid, tiny, and have a golden-yellow hue. They look like stones with four faces. (10) Soluble fibers like galactomannan, alkaloids like trigonelline, flavonoids, polyphenols, and steroidal saponins such as diosgenin are abundant in fenugreek seeds and leaves. (11).

Its many pharmacological characteristics, including its anti-inflammatory, antioxidant, antibacterial, antidiabetic, and wound-healing qualities, are caused by these molecules. (12) Fenugreek seeds' mucilage is crucial for preserving a moist wound environment that promotes tissue regeneration and repair. Its traditional use and present therapeutic significance in wound management are supported by these combined activities, which lead to faster and more efficient healing of both acute and chronic wounds. (13)

II. MATERIAL AND METHODS

The plant materials like Acorus calamus and fenugreek powder were procured from a local market Tq Wani, Dist. Yavatmal, Maharashtra. The plant authenticated were by Dr. V.N. CHAVAN Assistant Professor & HOD Of Botany, Art, Commerce, Science College of Malegaon Dist. Yavatmal, Maharashtra.

Table no1: Ingredient and Excipients with their function

NAME	FUNCTION
A. calamus extract	Anti-inflammatory, antimicrobial
Fenugreek extract	Moisturizer, healing agent
Stearic acid	Emulsifier, thickening agent
Cetyl alcohol	Emollient, stabilizer
Liquid paraffin	Lubricant, skin conditioning agent
Glycerin	Humectant, hydrates the skin
Methyl paraben	Preservative to prevent microbial growth
Triethanolamine	Emulsifying agent
Rose oil	fragrance
Distilled water	solvent

Extraction process

1. *A. calamus* dried rhizome was extracted in 1:10 (w/v) ethanol. For three days, it was macerated. Filtration was done after the mixture was filtered via filter paper.

2. Fenugreek seed powder was macerated with ethanol for 3 days. The whole extract solution was filtered, and it was kept at 4° C until use. The obtained extract was kept in an airtight container for further phytochemical studies.

Phytochemical test

Table no 2: Phytochemical test

Tests	Observation
1. Sudan III Test Take extract +add Sudan III stain	Red colour
2. Vanillin Test Extract +add vanillin +conc. H ₂ SO ₄	Violet colour
3. Foam formation test A stable froth (foam) forms when the drug solution is added to water a test tube and thoroughly shaken.	Foam form
4. Shinoda test A few drops of strong hydrochloric acid and a small amount of extract plus magnesium turnings were added.	Pink to reddish

Formulation of cream

The methodology outlines the ingredients, herbal extract preparation, formulation process, and assessment techniques utilized to create the herbal cream with fenugreek and *A. calamus* extract. Standard cosmetic preparation methods were used in the formulation process to create a stable and potent herbal lotion. The herbal cream was prepared by the emulsification method.

Initially, the oil phase was prepared by accurately weighing stearic acid, cetyl alcohol, and liquid paraffin heating them in a water bath in a sterile beaker at approximately 70°C until all ingredients melted completely to form a uniform mixture. Simultaneously, aqueous phase was prepared by heating distilled water and glycerin in another beaker to the same temperature (70°C), followed by the addition of methylparaben as a preservative until it dissolved completely. After that, the heated aqueous phase was gradually mixed with the oil phase while being constantly stirred to obtain a stable cream base. After partial cooling of the cream base, the prepared *Acorus calamus* extract and fenugreek (*Trigonella foenum-graecum*) extract were gradually added with constant stirring to ensure uniform distribution of the herbal ingredients throughout the formulation. Subsequently, a small quantity of rose oil was incorporated as a fragrance enhancer. The final cream was mixed thoroughly until a smooth, homogeneous consistency was achieved. The prepared herbal cream transferred into clean, airtight containers and evaluation.

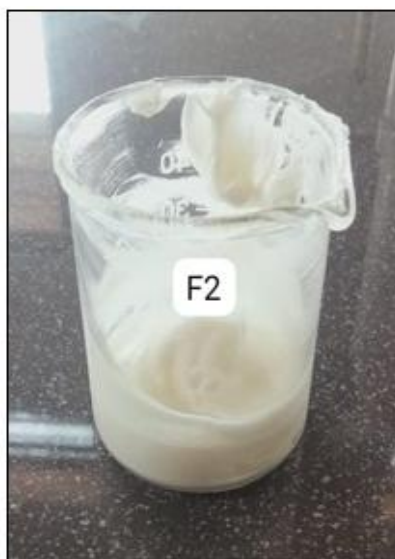
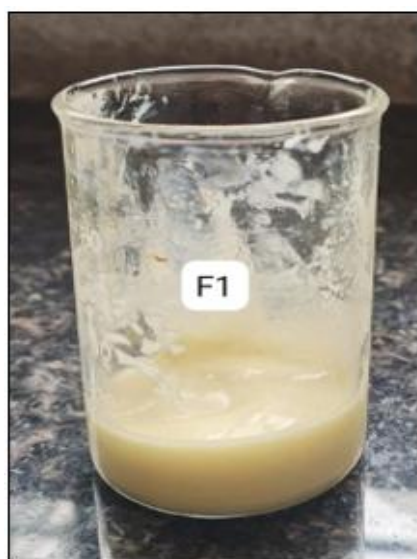


Table no3: Formulation of cream

Sr.no	Drugs	F1	F2	F3
1	Acorus calamus extract	0.7g	0.2g	0.3g
2	Fenugreek extract	1.0g	0.5g	0.8g
3	Steric acid	1.2g	0.5g	0.8g
4	Cetyl alcohol	0.5g	0.6g	1.0g
5	Liquid paraffin	1.0g	1.0g	1.5g
6	Methyl paraben	0.5g	0.5g	0.7g
7	Glycerin	0.02g	0.02g	0.02g
8	Triethanolamine	0.2g	0.2g	0.2g
9	Distilled water	q.s	q.s	q.s
10	Solvent	q.s	q.s	q.s

Evaluation of cream

1. Physcial evaluation

The prepared herbal cream formulation was evaluated on the basis of key physical characteristics, including color, odor, consistency, and overall formulation state.

2.pH determination

A calibrated digital pH meter was used to measure the produced formulations pH.

3.Spreadability test

Spreadability was determined by calculating the separation's duration of two glass slides 22 under a defined load containing the cream sample. A lower separation time indicates better spreadability and improved semisolid consistency.

The following formula is used to determine the spreadability: $S = M \times L / T$

M = Weighted to upper silde

L = Length of glass silde

T = Time taken for slide separation

4.Irritancy test

A small area (1 cm²) was marked on the dorsal surface of the left hand. The formulation was applied on the marked region, and the site was observed over a specified period to check for any signs of irritation.

5. Washability test

A small amount of cream was applied, and then tap water was used to clean the hand. All formulations were found to be readily removable, indicating satisfactory washability.

6.Phase separation

To check for phase separation, the made cream was kept at room temperature in a well-sealed container shielded from the sun for a whole day.

7. Homogeneity Evaluation

Homogeneity of the formulations was assessed through visual inspection and tactile evaluation to ensure uniform texture and consistency.

8. Viscosity Measurement

The viscosity of the prepared formulations was determined using a Brookfield viscometer.

III. RESULT

1.Physical evaluation

The physical attributes of the prepared herbal cream formulations, including color, odor, consistency, and general formulation condition, were evaluated.

Table no 4: Physical characteristics evaluation

Appearance	F1	F2	F3
Colour	Pale yellow	White	White
Odor	Oily smell	Aromatic	Pungent
Consistency	Smooth	Smooth	Smooth
State	Semisolid	Semisolid	Semisolid

2.pH measurement

A digital pH meter was used to determine each formulation's pH.



Table no 5: pH measurement

Sr no	Formulation	pH
1	F1	6.8
2	F2	5.50
3	F3	5.6

3. Spreadability Test

Spreadability of the formulations was determined and recorded in g/cm.

Table no 6: Spreadability test

Sr no	Formulation	Spreadability
1	F1	10.0
2	F2	8.33
3	F3	8.45

4. Irritancy Test

The formulations were applied to check skin irritation potential.

Table no 7: Irritancy test

Sr no	Formulation	Irritancy Test
1	F1	Irritant
2	F2	Non irritant
3	F3	Non irritant

5. Washability test

All prepared formulations were evaluated for ease of removal from skin.

Table no 8: Washability test

Sr no	Formulation	Washability test
1	F1	Washable
2	F2	Easily washable
3	F3	Easily washable

6. phase separation

Formulation was observed for any signs of phase separation.

Table no 9: phase separation test

Sr no	Formulation	phase separation
1	F1	Separate
2	F2	Not separate
3	F3	Not separate

7. Homogeneity Evaluation

Each formulation was checked for uniformity and consistency

Table no10: Homogeneity test

Sr no	Formulation	Homogeneity Evaluation
1	F1	Non homogeneous
2	F2	Homogeneous
3	F3	Homogeneous

8. Viscosity Test

Viscosity of formulations was recorded using appropriate instrumentation

Table no11: Viscosity test

Sr no	Formulation	Viscosity Test
1	F1	38,500cps
2	F2	32,500cps
3	F3	34,200cps

IV. DISCUSSION

The herbal wound healing cream containing Acorus calamus and Fenugreek extracts was successfully formulated and evaluated. Phytochemical tests confirmed the presence of bioactive compounds responsible for antimicrobial, anti-inflammatory, and wound healing activities. Among the three formulations, F2 showed the best overall performance with a skin-friendly pH (5.5), good spreadability, non-irritant nature, good homogeneity, no phase separation, and acceptable viscosity. In contrast, F1 showed irritation, phase separation, and poor homogeneity. The results indicate that the combination of Acorus calamus and Fenugreek extracts in F2 produced a stable and effective herbal cream with potential wound healing benefits.

V. CONCLUSION

The current study effectively developed and assessed an herbal wound-healing cream that contained extracts from Fenugreek (*Trigonella foenum-graecum*) and Acorus calamus. Important bioactive components like flavonoids, saponins, lipids, and phenolic compounds—which are known to have antibacterial, anti-inflammatory, and wound-healing qualities—were found through phytochemical screening. A number of physicochemical parameters, such as pH, spreadability, irritancy, washability, homogeneity, phase separation, and viscosity, were assessed for the

produced formulations (F1, F2, and F3) Among the three formulations, F2 showed the best overall performance with a skin-friendly pH (5.5), non-irritant nature, good homogeneity, absence of phase separation, acceptable viscosity, and satisfactory spreadability. Although F3 also exhibited favorable characteristics, F2 demonstrated better stability and suitability for topical application. In contrast, F1 showed phase separation, non-homogeneity, and skin irritation, making it less suitable. Therefore, the study concludes that the herbal cream formulated with *Acorus calamus* and Fenugreek extracts, particularly formulation F2, is a stable, safe, and promising topical preparation for wound healing applications. Further studies, including antimicrobial activity, wound-healing efficacy, stability studies, and clinical evaluation, are recommended to confirm its therapeutic potential and commercial applicability.

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