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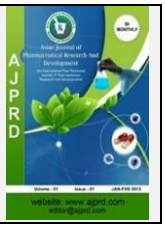

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Research Article

Development and Evaluation of PolyherbalTopical Cream for Wound Healing Applications Using Alum, Turmeric, and Aloe Vera

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A B S T R A C T

Background: Hypertension (HTN) remained a major global health concern and a leading risk factor for cardiovascular morbidity Wound healing is a complex biological process involving hemostasis, inflammation, proliferation, and tissue remodeling. Herbal formulations have gained significant interest due to their safety, effectiveness, and reduced adverse effects compared to synthetic products. The present study aimed to formulate and evaluate a polyherbal wound healing cream containing alum, turmeric, and aloe vera using an oil-in-water emulsion base. Different batches (F1, F2, and F3) were prepared by varying the concentration of excipients such as stearic acid, cetyl alcohol, glycerin, and herbal extracts. The prepared formulations were evaluated for appearance, pH, spreadability, homogeneity, greasiness, phase separation, washability, skin irritation, and stability. The results indicated that all formulations showed acceptable physical characteristics. Batch F3 demonstrated superior properties with good spreadability, light yellow appearance, pleasant odor, no phase separation, and excellent stability. The study concluded that the developed polyherbal cream possesses promising potential for wound care applications.

Keywords: Polyherbal cream, wound healing, aloe vera, turmeric, alum, topical formulation, herbal cream

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INTRODUCTION

Wound healing is a dynamic biological process that restores damaged tissue integrity through a series of overlapping phases including hemostasis, inflammation, proliferation, and remodeling. Proper wound management is essential to prevent infection and promote faster tissue regeneration.

Topical formulations such as creams are widely used in wound care because they provide localized action, improved patient compliance, and ease of application. Creams are semisolid emulsions that may be formulated as oil-in-water (O/W) or water-in-oil (W/O) systems. Oil-in-water creams are generally preferred because they are non-greasy, easily washable, and cosmetically elegant.

Herbal medicines have been increasingly used for wound healing due to their antimicrobial, anti-inflammatory, antioxidant, and tissue regenerative properties.

Alum possesses astringent and antimicrobial activity.
Turmeric contains curcumin, which exhibits anti-inflammatory and antioxidant properties.
Aloe vera promotes tissue regeneration and provides soothing effects.

The present study focuses on combining these three ingredients into a single polyherbal cream formulation for potential wound healing applications.

2. Literature Review

Wound healing involves multiple physiological mechanisms including clot formation, inflammatory cell migration,

collagen synthesis, and tissue remodeling.

Previous studies have reported:

- Aloe vera accelerates wound healing and improves epithelialization.
- Turmeric reduces inflammation and microbial infection.
- Alum helps wound contraction and reduces bleeding.
- Polyherbal formulations often provide synergistic therapeutic benefits.

Based on literature evidence, combining alum, turmeric, and aloe vera may provide improved wound healing activity.

Materials and Methods

Materials

- Stearic acid
- Cetyl alcohol
- Triethanolamine
- Glycerin
- Methyl paraben
- Alum
- Turmeric extract
- Aloe vera extract
- Rose oil
- Distilled water

Preparation of Herbal Extracts

Alum Extract

0.5 g alum was dissolved in distilled water followed by stirring and filtration.

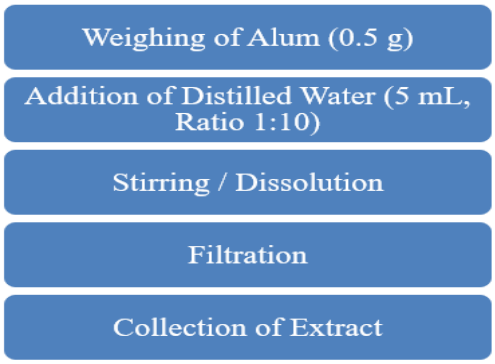

Table: 1 Basic Detail of Alum

Parameter	Details
Common Name	Alum / Potash Alum
Chemical Name	*Potassium Aluminum Sulfate*
Chemical Formula	KAl(SO4)2·12H2O
Molecular Weight	474.39 g/mol
Category	Astringent, Antiseptic
Appearance	Colorless crystalline solid
Taste	Sweetish, astringent
Solubility	Soluble in water, insoluble in alcohol
Melting Point	Decomposes on heating

Turmeric Extract

0.5 g turmeric powder was mixed with glycerin and subjected to maceration followed by filtration.

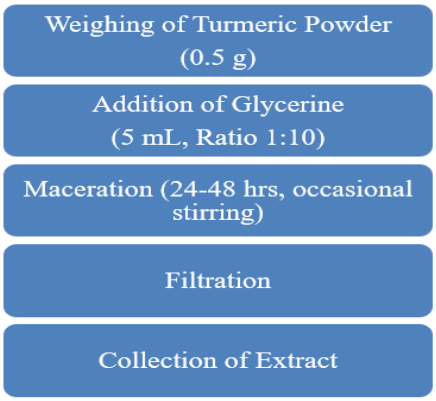

Table 2: Turmeric Basic Detail

Parameter	Details
Common Name	Turmeric
Biological Name	*Curcuma longa*
Family	*Zingiberaceae*
Part Used	Rhizome
Category	Antiseptic, Anti-inflammatory, Antioxidant
Appearance	Yellow to orange powder
Odor	Aromatic
Taste	Bitter, slightly pungent
Solubility	Insoluble in water, soluble in alcohol/ oils

Aloe Vera Extract

Fresh aloe vera gel was collected, washed, filtered, and used in formulation.

Figure 1: Aloe Vera

ALOEVERA BASIC DETAIL

Parameter	Details
Common Name	Aloe Vera
Biological Name	*Aloe barbadensis Miller*
Family	Liliaceae
Part Used	Leaves (Gel)
Category	Moisturizing agent, Anti-inflammatory
Appearance	Colorless to pale yellow gel
Odor	Slight characteristic odor
Taste	Bitter
Solubility	Soluble in water

Formulation of Polyherbal Cream

Preparation of Oil Phase: Stearic acid and cetyl alcohol were melted at 70-75°C.

Preparation of Aqueous Phase: Glycerin, methyl paraben, triethanolamine, and alum were dissolved in water.

Emulsification: The aqueous phase was added to the oil phase with continuous stirring.

Cooling Phase: Turmeric extract, aloe vera extract, and rose oil were added during cooling.

Final Product: Cream was transferred into airtight containers.

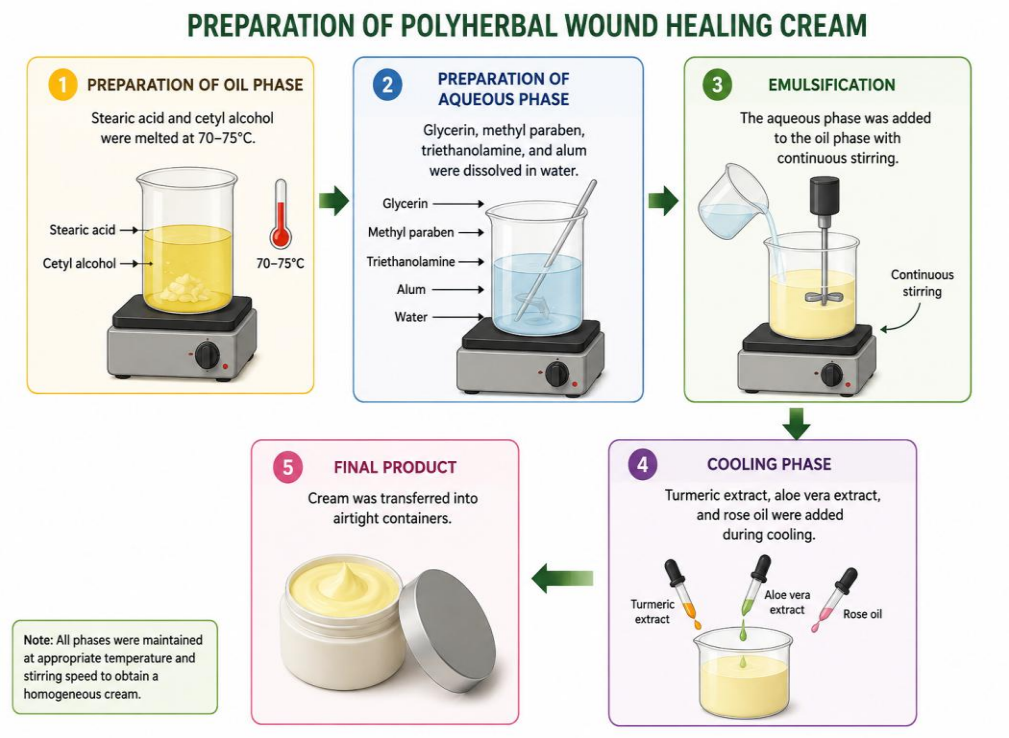

Figure 2: Formulation of Polyherbal Cream

Table 1: Formulation of Polyherbal Cream

Ingredients	Property	F1 (g)	F2 (g)	F3 (g)
Stearic Acid	Emulsifier	5.5	6.0	6.0
Cetyl Alcohol	Stiffener	3.0	2.5	3.5
Triethanolamine	Neutralizer	1.5	1.5	1.5
Glycerin	Humectant	5.0	4.0	6.0
Methyl Paraben	Preservative	0.1	0.1	0.1
Alum	Astringent	0.5	0.5	0.5
Turmeric Extract	Healing agent	2.0	1.5	2.5
Aloe Vera Extract	Soothing agent	7.0	6.0	8.0
Rose Oil	Fragrance	q.s.	q.s.	q.s.
Distilled Water	Vehicle	q.s. to 50 g	q.s. to 50 g	q.s. to 50 g

Figure 2: Formulation F1, F2 & F3 batches of Polyherbal Cream

Evaluation Parameters

The prepared creams were evaluated for:

- Appearance
- pH
- Spreadability
- Greasiness
- Homogeneity
- Phase separation
- Skin irritation
- Stability
- Washability
- After feel (emolliency)

Appearance

The prepared cream formulations were visually inspected for color, texture, consistency, and uniformity. The formulations were checked for the presence of lumps, grittiness, and phase separation.**Observation:** Smooth, uniform, lump-free cream.

pH Determination

Approximately 1 g of cream was dispersed in 10 mL of distilled water and allowed to stand for 2 hours. The pH of the formulation was measured using pH paper/pH meter.

Observation: pH should be compatible with skin (5-7).

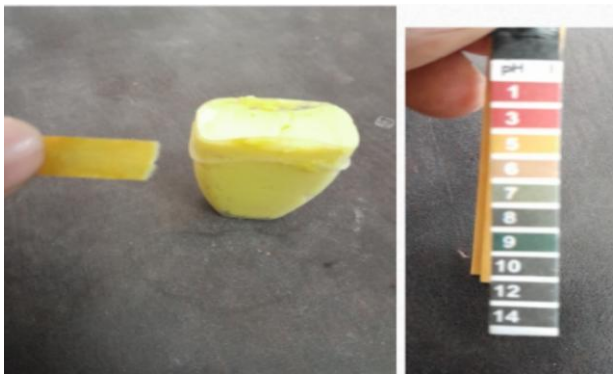

Figure 3: pH paper testing

Spreadability

Spreadability was determined by placing a small amount of cream between two glass slides and applying a specific weight on the upper slide. The time required for the upper slide to move was recorded.

Formula:

$$S = \frac{M \times L}{T}$$

Where:

- S = Spreadability
- M = Weight tied to upper slide
- L = Length moved by slide
- T = Time taken

Observation: Good spreadability indicates easy application.

Greasiness Test

A small quantity of cream was applied on the skin surface and observed for oily residue after application.

Observation: Non-greasy formulation preferred.

Homogeneity

The cream was tested by visual inspection and touch to determine uniform distribution of ingredients.

Observation: No coarse particles and uniform texture.

Phase Separation Test

The prepared cream was stored in a closed container at room temperature and observed periodically for separation of oil and aqueous phases.

Observation: No phase separation indicates stable emulsion.

Skin Irritation Test

A small amount of cream was applied on a small area of skin and observed for 24 hours for redness, itching, swelling, or irritation.

Observation: No irritation should be observed.

Stability Study

The cream formulations were stored at different temperatures such as:

- Room temperature
- Refrigerated temperature
- Elevated temperature

They were evaluated periodically for changes in:

- Color
- Odor
- Texture
- Phase separation

Observation: No significant changes indicate stable formulation.

Washability Test

A small quantity of cream was applied on skin and washed with tap water to determine ease of removal.

Observation: Cream should be easily washable.

After Feel (Emolliency)

The cream was applied on the skin and evaluated for smoothness, softness, and residual feel after application.

Observation: Should provide smooth and pleasant after-feel.

RESULTS AND DISCUSSION

All formulations showed satisfactory characteristics.

Table 2: Evaluation Results of Polyherbal Cream

Parameter	F1	F2	F3
Appearance	Semi-solid	Semi-solid	Semi-solid
pH	6	6	6
Spreadability	Acceptable	Good	Good
Color	Dark yellow	White	Light yellow
Odor	Pleasant	Pleasant	Pleasant
Phase Separation	No	No	No
Stability	Stable	Stable	Stable

Table 3: Detailed Evaluation Results of Polyherbal Cream

Sr. No.	Evaluation Parameter	Procedure	Observation/Result
1	Appearance, Color and Texture	The cream was visually examined for uniformity, colour, texture, and consistency. It was checked for lumps and grittiness.	The cream was yellow in colour with smooth semi-solid texture. No lumps were observed.
2	pH Determination	A small quantity of cream was applied on pH paper and colour change was compared with standard pH scale.	pH was found to be approximately **5.5**, suitable for skin application and non-irritant.
3	Spreadability	The cream was placed between two glass slides and ease of spreading was observed.	The cream showed good spreadability and spread easily on skin.
4	Greasiness	The cream was applied on skin and observed for oily residue.	The cream was found to be non-greasy and easily absorbable.
5	Phase Separation	The cream was observed over time for separation of oil and water phases.	No phase separation was observed. The formulation remained stable.
6	Homogeneity	The formulation was visually checked for uniform distribution of ingredients.	The cream was homogeneous with uniform consistency.
7	Skin Irritation Test	The cream was applied on skin and observed for redness, itching, or irritation.	No irritation or redness was observed. Safe for topical application.
8	Stability Test	The cream was stored at different temperatures and observed for physical changes over time.	No significant changes were observed. Formulation remained stable.
9	Washability	The cream was applied on skin and washed with water.	The cream was easily washable and left no residue.
10	After Feel (Emolliency)	The feel of skin after cream application was evaluated.	The cream provided smooth, soft, and pleasant after-feel.

DISCUSSION

Batch F1: Lower preservative content and reduced triethanolamine affected formulation performance.

Batch F2: Increased stearic acid and cetyl alcohol caused excessive thickness.

Batch F3: F3 demonstrated optimum consistency, spreadability, stability, and overall appearance. Therefore, F3 was considered the optimized formulation.

The combination of alum, turmeric, and aloe vera may contribute to wound healing through antimicrobial, anti-inflammatory, and moisturizing actions.

CONCLUSION

The polyherbal wound healing cream containing alum, turmeric, and aloe vera was successfully formulated using an oil-in-water emulsion system. All formulations showed acceptable physical characteristics. Among all batches, F3 demonstrated superior performance and was selected as the optimized formulation. The developed formulation may serve as a promising topical preparation for wound care applications.

Future Scope

- In vivo wound healing studies
- Antimicrobial studies
- Stability studies
- Clinical evaluation
- Commercial scale-up

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Conflict of Interest

The authors declare no conflict of interest.

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