

Formulation and Evaluation of Herbal Cold Cream

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ABSTRACT

Herbal cold creams formulated with plant-derived actives are gaining significant attention owing to their minimal adverse effects and multifaceted skin benefits. The present work describes the formulation and comprehensive evaluation of an Aloe vera–based water-in-oil (W/O) cold cream using the fusion method. Three formulations (F1, F2, F3) were prepared by varying beeswax concentration (3, 4, and 5 g per 20 g batch) while keeping Aloe vera gel (3 g), liquid paraffin (8 g), borax (0.16 g), rose water, distilled water, and methylparaben (0.004 g) constant. All formulations were assessed for organoleptic properties, pH, spreadability, viscosity, washability, skin irritation (patch test), moisture content, and 3-month stability. Formulation F2 (4 g beeswax) consistently exhibited the most balanced physicochemical profile — pH 5.83, viscosity 4510 cP, spreadability 58.0 g·cm/sec, moisture content 23.8%, excellent washability, and non-irritant behaviour — and was stable under both room-temperature and accelerated conditions (40°C/75% RH) with no phase separation. These findings confirm the therapeutic and cosmetic potential of Aloe vera cold cream as a safe, effective, and consumer-acceptable herbal moisturizer.

Keywords: Aloe vera, Cold cream, Herbal cosmetics, Water-in-oil emulsion, Beeswax, Formulation, Evaluation, Moisturizer

1. INTRODUCTION

1.1 Skin – The Largest Organ

The skin covers approximately 1.5–2 m² of body surface and serves as the primary barrier between the internal and external environment. Structurally organised into three layers — epidermis, dermis, and hypodermis — the skin performs six major physiological functions: protection, thermoregulation, sensation, excretion, vitamin D synthesis, and selective absorption. Skin dryness (xerosis) is a widespread condition arising from impaired barrier integrity, and is managed through topical emollient preparations.

1.2 Cosmetics and Cold Cream

Under the Drugs and Cosmetics Act, 1940, cosmetics are articles applied externally for cleansing, beautifying, or altering appearance. Cold cream is a semisolid W/O emulsion that provides intense moisturization, skin protection, and a soothing effect. Its classical formulation relies on the borax–beeswax emulsification system, wherein borax reacts with fatty acids of beeswax to generate an in-situ soap emulsifier.

1.3 Why Herbal?

Herbal cold creams incorporate plant-based actives — notably Aloe vera, neem, and turmeric — offering multi-action benefits: moisturization, anti-inflammation, and antimicrobial activity, without synthetic parabens, sulfates, or artificial fragrances. Growing consumer demand for clean-label cosmetics makes herbal formulations commercially viable and scientifically relevant.

1.4 Aloe Vera

Aloe barbadensis Miller (family Liliaceae) is a succulent plant whose inner leaf gel contains over 75 bioactive compounds including polysaccharides (acemannan), vitamins C and E, amino acids, enzymes (bradykinase), and anthraquinones. Its pH of 4.5–5.5

is compatible with normal skin pH. Acemannan promotes fibroblast proliferation and collagen synthesis, accelerating repair and reducing scar formation. Demonstrated efficacy against *Staphylococcus aureus* and *Pseudomonas aeruginosa* further supports its cosmetic and therapeutic utility.

2. MATERIALS & METHODS

2.1 Materials

All ingredients were of pharmaceutical/cosmetic grade. The key materials and their functional roles are summarised below:

Ingredient	Category	Role
Aloe vera gel	Active	Moisturizing, healing
Beeswax	Thickener/Stabilizer	Texture, protective layer
Liquid paraffin	Oil phase.	Prevents moisture loss
Borax	Emulsifier	Stabilises W/O emulsion
Rose water	Humectant	pH balance
Distilled water	Solvent	Aqueous phase vehicle
Methylparaben	Preservative	Antimicrobial, shelf life

2.2 Preparation Method (Fusion Method)

Oil phase: Beeswax and liquid paraffin were melted together on a water bath at 70–75°C until a clear uniform oil phase was obtained.

Aqueous phase: Aloe vera gel, rose water, distilled water, borax, and methylparaben were mixed and heated to the same temperature (70–75°C).

Emulsification: The aqueous phase was slowly added to the oil phase with continuous stirring to form a stable W/O emulsion.

Cooling: The emulsion was cooled gradually with constant stirring to improve droplet size distribution, texture, and stability.

Filling: The finished cream was transferred to clean containers. Yield (%) = (Final weight / Theoretical weight) × 100; a value >95% was targeted.

2.3 In-process Quality Controls

Temperature monitoring (70–75°C), visual inspection for uniformity, pH check during cooling (target 4.5–6.5), texture/grittiness test, microbiological precautions (70% IPA sanitisation), and preliminary spreadability check were all performed before filling.

3. FORMULATION DESIGN

Three formulations (F1, F2, F3) were prepared for 20 g batches, differing only in beeswax concentration to assess its effect on physicochemical properties.

Sr.	Ingredient	F1	F2	F3
1	Aloe vera gel	3 g	3 g	3 g
2	Beeswax	3 g	4 g	5 g
3	Liquid paraffin	8 g	8 g	8 g
4	Borax	0.16 g	0.16 g	0.16 g
5	Rose water	5.64 g	4.64 g	5 g
6	Distilled water	q.s.	q.s.	q.s.
7	Methylparaben	0.004 g	0.004 g	0.004 g

Table 1: Formulation Parameters (per 20 g batch)

4. EVALUATION PARAMETERS

4.1 Organoleptic / Physical Evaluation

Colour, odour, appearance, texture, phase separation (24 h rest), and grittiness were assessed by visual inspection and touch. All three formulations showed pale white to white colour, pleasant rose fragrance, smooth glossy appearance, non-gritty homogeneous texture, and no phase separation.

4.2 pH Determination

1 g of cream dissolved in 10 mL distilled water; pH measured in triplicate using a calibrated digital pH meter.

Formulation	R1	R2	R3	Mean pH	Verdict
F1	6.0	5.9	6.0	5.97	Acceptable
F2	5.8	5.9	5.8	5.83	Acceptable
F3	5.6	5.7	5.6	5.63	Acceptable

Table 2: pH Values (acceptable range: 4.5–6.5)

4.3 Spreadability

0.5 g cream placed between two glass slides; 100 g weight applied for 1 min. $S = M \times L / T$ (g·cm/sec).

Formulation	Spread (cm)	S (g·cm/sec)	Inference
F1	6.4	64.0	Good

Formulation	Spread (cm)	S (g·cm/sec)	Inference
F2	5.8	58.0	Good
F3	5.2	52.0	Satisfactory

Table 3: Spreadability (standard: >40 g·cm/sec)

4.4 Viscosity

Measured using Ostwald Viscometer at 25°C ± 2°C; values in centipoise (cP).

Formulation	Beeswax	Mean Visc. (cP)	Inference
F1	3 g	3810	Low – easy to apply
F2	4 g	4510	Moderate – ideal
F3	5 g	5360	High – firm texture

Table 4: Viscosity (standard range: 3000–6000 cP)

4.5 Washability & After-Feel

0.5 g cream applied on back of hand; washed after 5 minutes with plain water.

Form.	Washability	After-Feel	Inference
F1	Easily washable	Slightly greasy	moisturisedGood
F2	Washable	Non-greasy	Very Good
F3	more waterFirm	smooth post-wash.	Good

Table 5: Washability and After-Feel

4.6 Skin Irritation (Patch Test)

Applied to a 2×2 cm area on inner forearm of healthy volunteers; observed at 24 h and 48 h for erythema, oedema, and itching. All three formulations showed complete absence of redness, swelling, and itching — classified as Non-irritant. Safe for all skin types including sensitive skin.

4.7 Moisture Content

Formulation	Initial (g)	Final (g)	Moisture (%)
F1	1.000	0.748	25.2%
F2	1.000	0.762	23.8%
F3	1.000	0.778	22.2%

Table 6: Moisture Content (acceptable: <30%)

4.8 Stability Studies

Conducted as per ICH Q1A(R2) guidelines under three conditions for 3 months: Room Temperature (25°C/60% RH), Accelerated (40°C/75% RH), and Refrigerated (5°C). F2 was selected as lead. Parameters assessed at 0, 1, 2, and 3 months included appearance, colour, odour, pH, viscosity, spreadability, and phase separation.

F2 Stability Summary: pH changed marginally from 5.97 → 5.90 (RT) and viscosity from 4510 → 4455 cP (RT). Under accelerated conditions (40°C), slight yellowing and viscosity drop to 4320 cP were noted; however, no phase separation occurred. Shelf life: ≥3 months at room temperature.

5. COMPREHENSIVE RESULTS

Parameter	F1	F2	F3	Standard
Colour	Pale white	Pale white	White	Uniform
pH	5.97	5.83	5.63	4.5–6.5
Spreadability	64.0	58.0	52.0	>40
Viscosity (cP)	3810	4510	5360	3000–6000
Washability	Good	Good.	Good	washable
Skin Irritation	None	None	None	Non-irritant
Phase Sep.	Absent	Absent	Absent	Absent
Moisture (%)	25.2	23.8	22.2	<30%
Emulsion type	W/O	W/O	W/O	W/O confirmed
Stability (3M)	Stable	Stable	Stable	No sig. change

Table 7: Comprehensive Evaluation Summary

Optimal formulation: F2 – 4 g beeswax

F2 demonstrated the most balanced profile — ideal pH (5.83), moderate viscosity (4510 cP), excellent washability (non-greasy after-feel), and highest stability under accelerated conditions.

6. SUMMARY & CONCLUSION

The present work successfully formulated and evaluated three Aloe vera–based herbal cold creams (F1, F2, F3) using the W/O fusion method. All formulations met standard physicochemical requirements, confirmed non-irritant status through patch testing, and maintained stability over 3 months at room temperature.

Key conclusions:

- Aloe vera is an effective herbal active imparting moisturizing, soothing, anti-inflammatory, and antimicrobial properties to the formulation.
- Beeswax concentration directly governs viscosity and inversely affects spreadability; 4 g per 20 g (F2) provides the optimal balance.
- The borax–beeswax emulsification system produced robust W/O emulsions stable under accelerated conditions with no phase separation.
- Formulation F2 is recommended as the lead candidate for scale-up, further clinical evaluation, and eventual commercialisation.
- Further research on long-term stability (>6 months), clinical efficacy trials, and standardisation of herbal extraction will enhance the commercial and therapeutic value of this formulation.

7. REFERENCES

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