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FORMULATION AND CHARACTERIZATION OF HERBAL ANTI-AGING CREAM ENRICHED WITH CAMPHOR AND SEA BUCKTHORN OIL

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ABSTRACT

Skin aging is a natural biological process influenced by intrinsic and extrinsic factors such as ultraviolet radiation, oxidative stress, environmental pollution, and lifestyle. These factors lead to collagen degradation, reduced skin elasticity, wrinkle formation, and dryness. Herbal anti-aging creams have gained considerable attention because they contain bioactive phytochemicals with antioxidant, anti-inflammatory, and skin-regenerating properties. Sea buckthorn (Hippophae rhamnoides) oil is rich in carotenoids, tocopherols, phytosterols, flavonoids, and essential fatty acids that promote collagen synthesis, improve skin hydration, and reduce oxidative damage. Camphor possesses cooling, antimicrobial, anti-inflammatory, and circulation-enhancing properties that support healthy skin. The present study focuses on the formulation and characterization of a herbal anti-aging cream enriched with camphor and sea buckthorn oil. The prepared cream was characterized for physicochemical properties, pH, viscosity, spreadability, homogeneity, stability, skin irritation, and antioxidant potential. The formulation demonstrated satisfactory stability, acceptable skin compatibility, and promising anti-aging characteristics.

KEYWORDS: Herbal cream, Anti-aging, Sea buckthorn oil, Camphor, Antioxidants, Herbal cosmetics, Skin rejuvenation.

INTRODUCTION

Skin is the largest organ of the human body and acts as the primary protective barrier against physical, chemical, and microbial damage.[1] Skin aging is characterized by wrinkles, fine lines, loss of elasticity, pigmentation, and reduced moisture content resulting from intrinsic aging and environmental factors such as ultraviolet radiation, pollution, smoking, and oxidative stress.[2,3] Reactive oxygen species (ROS) generated during oxidative stress damage collagen, elastin, and cellular proteins, accelerating premature skin aging.[4] Therefore, antioxidants play an important role in protecting the skin from oxidative damage and delaying the aging process.[5] Herbal cosmetics have become increasingly popular because of their safety, efficacy, and lower incidence of adverse effects compared with synthetic products.[6] Medicinal plants contain flavonoids, carotenoids, phenolic acids, vitamins, and essential fatty acids that protect the skin against oxidative stress and improve skin health [7] Sea buckthorn (Hippophae rhamnoides) oil is one of the richest natural sources of vitamins C and E, carotenoids, omega-3, omega-6, omega-7, and omega-9 fatty acids, making it highly beneficial for skin nourishment and regeneration.[8] Camphor, a natural terpenoid, exhibits antimicrobial, cooling, anti-inflammatory, and circulation-enhancing properties that may improve skin texture and overall appearance.[9] The objective of the present study was to formulate and characterize a herbal anti-aging cream enriched with camphor and sea buckthorn oil and evaluate its physicochemical and stability characteristics.[10]

Skin Aging

Skin aging is a progressive biological process involving structural and functional changes in the epidermis and dermis.[11]

Types of Skin Aging

➢ **Intrinsic Aging**

Genetically programmed aging
Reduction in collagen synthesis
Decreased skin elasticity
Fine wrinkle formation.[12]

➢ **Extrinsic Aging**

Ultraviolet radiation
Environmental pollution
Smoking
Stress
Poor nutrition
Free radical generation[13]

➢ **Causes of Skin Aging**

Oxidative stress[14]
UV radiation[14]
Decreased collagen synthesis[15]
Elastin degradation[15]
Reduced skin hydration[16]
Inflammation[16]
Environmental pollutants[17]
Hormonal changes[17]

➢ **Herbal Anti-Aging Cream**

Herbal anti-aging creams are semisolid topical formulations containing natural bioactive ingredients that help reduce wrinkles, improve skin elasticity, increase hydration, and protect the skin from oxidative damage.[18]

These formulations are preferred because they provide antioxidant protection while minimizing irritation commonly associated with synthetic anti-aging agents.[19]

➢ **Mechanism of Anti-Aging Action**

The herbal anti-aging cream acts by:
Neutralizing free radicals through antioxidant activity[20]
Enhancing collagen synthesis
Improving skin hydration
Reducing inflammation
Promoting tissue regeneration
Improving skin elasticity

➢ **Advantages**

✓ Natural and safe ingredients[21]
✓ Rich antioxidant activity[21]
✓ Improves skin hydration[22]
✓ Enhances collagen production[22]
✓ Reduces wrinkle formation[23]
✓ Suitable for long-term use[23]
✓ Minimal adverse effects[24]
✓ Eco-friendly formulation[24]

➢ **Disadvantages**

✓ Shorter shelf life[25]
✓ Batch-to-batch variation of herbal extracts[25]
✓ Higher production cost[26]
✓ Possible allergic reactions in sensitive individuals[26]

Table no. 1: Formulation Composition.

Sr.no	Ingredient	Quantity. (%)	Primary Function
1.	Camphor	1.5%	Anti-inflammatory, antimicrobial, circulatory enhancement
2.	Sea Buckthorn Oil	3.0%	Antioxidant, anti-aging, skin nourishment, moisturization
3.	Stearic Acid	12.0%	Forms soap emulsifier with TEA; gives consistency
4.	Cetyl Alcohol	3.0%	Stabilizes emulsion, improves texture, emolliency
5.	Glycerine	5.0%	Attracts and retains moisture, improves skin hydration
6.	Triethanolamine	1.5%	pH control, emulsification promotion
7.	Parabens	0.02%	Broad-spectrum antimicrobial preservation
8.	Lavender Oil	1.0%	Pleasant sensory character, mild antimicrobial
9.	Distilled Water	q.s. to 100%	queous vehicle, primary dispersion medium

Method of Preparation

The cream was prepared by the hot emulsification technique. Stearic acid and cetyl alcohol were melted together to form the oil phase, while glycerin, preservatives, and distilled water were heated separately to prepare the aqueous phase. Both phases were maintained at approximately 70–75°C.

The heated aqueous phase was slowly incorporated into the oil phase under continuous stirring to obtain a stable oil-in-water emulsion. After partial cooling, triethanolamine was added to adjust the pH and improve emulsion stability. When the temperature reached approximately 40°C, camphor dissolved in ethanol, sea buckthorn oil, and lavender oil were incorporated with continuous stirring until a smooth and homogeneous cream was obtained. The finished product was packed in airtight containers for evaluation.

Table no. 2: Formulation table.

Sr.No	Ingredients	Formula 1 (F1)	Formula 2(F2)	Formula 3 (F3)
1.	Sea Buckthorn Oil	2.0 ml	3.0 ml	4.0 ml

2.	Camphor	0.2 g	0.2 g	0.2 g
3.	Stearic Acid	1.6 g	1.4 g	1.2 g
4.	Cetyl Alcohol	0.6 g	0.6 g	0.6 g
5.	Glycerine	1.0 ml	1.0 ml	1.0 ml
6.	Triethanolamine	q.s.	q.s.	q.s.
7.	Parabens (Methyl/Propyl)	0.02 g	0.02 g	0.02 g
8.	Lavender Oil	q.s.	q.s.	q.s.
9.	q.s. to 20 ml	q.s. to 20 ml	q.s. to 20 ml	q.s. to 20 ml

Characterization (Evaluation) of Herbal Anti-Aging Cream

The prepared herbal anti-aging cream was evaluated using standard physicochemical and stability parameters.

1 Organoleptic Evaluation

The cream was visually examined for color, odor, appearance, texture, and homogeneity.[31]

2. pH Determination

The pH of the cream was determined using a calibrated digital pH meter.[32]

3. Spreadability

Spread ability was measured by placing the cream between two glass slides under a specified weight.[33]

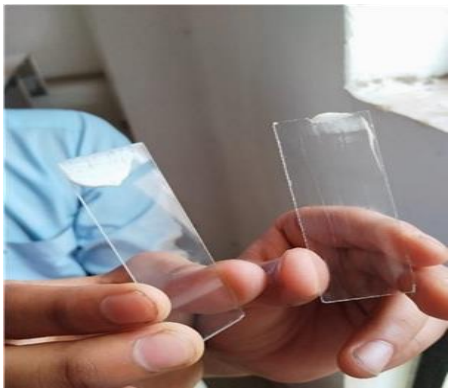

Fig. 1: Spreadability Testing.

4. Viscosity

Viscosity was measured using a Brookfield Viscometer at room temperature.[34]

Fig 2: Viscosity Measurement by using Brookfeild.

Viscometer

5. Homogeneity

The formulation was examined visually for uniform distribution of ingredients and absence of lumps.[34]

6. Skin Irritation Test

The cream was applied to the forearm of healthy volunteers and observed for redness, itching, swelling, or irritation for 24 hours.[36]

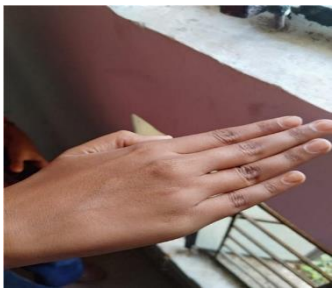

Fig 3: Skin Irritation Test.

7. Stability Study

The formulation was stored at.

4 ± 2°C

Room temperature (25 ± 2°C)

40 ± 2°C / 75 ± 5% RH

for three months according to ICH stability guidelines.[37]

The cream remained physically and chemically stable throughout the accelerated stability study.[39]

RESULTS AND DISCUSSION

Table No. 3: RESULTS AND DISCUSSION.

Sr.No	Parameter	Observation	Inference
1.	Physical Evaluation		
	Color	Light cream to pale orangeyellow	Consistent with sea buckthorn carotenoids; aesthetically acceptable
	Odor	Camphor-lavender blend; pleasant aromatic note	Characteristic of ingredients; no off-notes; consumer-acceptable
	Texture	Smooth, fine-grained, non-gritty, homogeneous	Excellent dispersion of all components; consumer-acceptable
	Consistency	Semi-solid, soft but maintains shape	Appropriate for topical cream application
	Homogeneity	Uniform; no visible phase separation	Stable emulsion system achieved; effective formulation process
	Skin After feel	Non-sticky; rapid absorption; no greasiness	Excellent consumer acceptability; balanced oil-water ratio
2.	pH	6.20 ± 0.02	Within acceptable skin pH range (5.0–7.0)
3.	Spreadability	32.17 cm²	Excellent spreadability and easy application
4.	Viscosity	18,000–22,000 cP (at 10 rpm)	Appropriate viscosity with pseudoplastic behavior
5.	Stability Study	No phase separation or significant changes after 8 weeks	Physically stable formulation
6.	Skin Irritation Test	Grade 0 (No erythema, edema, or irritation)	Safe for topical application

The present study successfully accomplished its primary objective of developing and characterizing a stable, safe, and pharmacologically rational herbal anti-aging cream incorporating camphor (from Cinnamomum camphora) and sea buckthorn oil (from Hippophae rhamnoides) as the principal bioactive constituents.

The formulation was developed through a systematic, evidence-based approach encompassing comprehensive literature review, ingredient selection and characterization, optimized emulsification processing, and comprehensive physicochemical, stability, and safety evaluation. All critical quality attributes of the formulated cream were found to satisfy established acceptance criteria.

- Physical Appearance: Smooth, homogeneous, pale orange semi-solid cream with pleasant camphorlavender fragrance and aesthetically acceptable coloration — fully acceptable.
- pH: 6.20 ± 0.02 at 25°C — within the specified skin-compatible range of 5.0–7.0.
- Spreadability: Mean spread area of 32.17 cm² under standardized conditions — indicating excellent consumer-relevant spreading characteristics.
- Viscosity: 18,000–22,000 cP at 10 rpm (25°C) with pseudoplastic (shear-thinning) rheological behavior — ideal for topical application.
- Stability: No phase separation or significant physicochemical deterioration at ambient conditions over eight weeks; marginal, reversible softening at accelerated conditions with no phase separation — indicating acceptable physical stability.
- Skin Irritation: Grade 0 (no irritation) in all test subjects — confirming safety and tolerability for topical use.

The pharmacological synergism between camphor and sea buckthorn oil provides a compelling scientific basis for the anti-aging claims of this formulation. Camphor's anti-inflammatory, antimicrobial, and microcirculationenhancing activities complement sea buckthorn oil's antioxidant protection, skin barrier restoration, moisturization, epidermal cell regeneration promotion, and collagen synthesis support. Together, these mechanisms address the principal pathogenic pathways of skin aging, offering comprehensive and multitargeted anti-aging activity within a single cosmeceutical formulation. The developed herbal anti-aging cream stands as an effective, safe, stable, and scientifically substantiated cosmeceutical product. Its natural ingredient composition aligns with the contemporary global trend toward plant-derived, clean-label skincare and offers excellent biocompatibility and consumer acceptabilityonclusion.

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