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FORMULATION AND EVALUATION OF POLYHERBAL LIPSTICK USING SEA BUCKTHORN EXTRACT AND BEETROOT EXTRACT

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ABSTRACT

Lipstick is one of the most widely used cosmetic products for enhancing lip appearance; however, conventional formulations often contain synthetic chemicals, artificial colorants, and trace heavy metals that may lead to adverse effects such as dryness, irritation, and long-term toxicity.[1,2] Increasing consumer awareness has shifted preference toward herbal and natural cosmetic products due to their safety, biocompatibility, and added therapeutic benefits.[3,4] The present study aims to formulate and evaluate a polyherbal lipstick using natural ingredients. The formulation was prepared using a combination of natural waxes (beeswax, carnauba wax), emollients (shea butter, cocoa butter), and oils (castor oil, jojoba oil, and sea buckthorn extract) along with natural and mineral-based colorants such as beetroot extract and red iron oxide. Titanium dioxide and zinc oxide were incorporated to improve opacity and provide photoprotective properties, while vitamin E was used as an antioxidant to enhance stability.[5–8] The prepared formulation was evaluated for various physicochemical parameters including melting point, breaking strength, spreadability, pH, surface characteristics, and stability under different conditions. The results demonstrated that the formulated lipstick exhibited satisfactory physical properties, uniform color distribution, good spreadability, and stability without causing irritation.[9-12] Thus, the developed polyherbal lipstick can be considered a safe, effective, and eco-friendly alternative to conventional synthetic lipsticks, with potential for further development and commercialization.

KEYWORDS: Polyherbal lipstick, Artificial colorants, Biocompatibility, Sea Buckthorn oil.

❖ INTRODUCTION

Cosmetic products are extensively used in daily life for enhancing appearance and maintaining personal hygiene. Among these, lipstick holds a significant position as it improves the aesthetic appeal of the lips and boosts self-confidence. Despite its widespread use, many commercially available lipsticks contain synthetic substances such as artificial dyes, preservatives, and trace levels of heavy metals, which may pose potential health risks including irritation, dryness, and long-term toxicity upon continuous use.[1,2]

With increasing awareness regarding the safety and environmental impact of cosmetic products, there has been a noticeable shift toward the use of herbal and natural ingredients. Herbal cosmetics are derived from plant-based sources and are generally considered safer, biocompatible, and eco-friendly compared to their synthetic counterparts.[3,4] These products not only enhance beauty but also provide additional therapeutic benefits such as moisturization, protection, and nourishment of the skin.[5]

Polyherbal formulations, which involve the combination of multiple natural ingredients, are gaining importance due to their synergistic effects. In the context of lipstick formulation, natural waxes such as beeswax and carnauba wax are used to provide structure, consistency, and stability. Emollients like shea butter and cocoa butter contribute to the smooth texture and moisturizing properties of the product.[6,7] Oils such as castor oil and jojoba oil enhance spreadability, impart gloss, and help maintain hydration of the lips.[8,9]

The use of natural colorants has become increasingly popular as a safer alternative to synthetic dyes. Beetroot extract is commonly used due to its natural red pigment and antioxidant properties; however, its stability may be limited under certain conditions.[10] To improve color durability and intensity, mineral pigments such as red iron oxide are often incorporated into the formulation.[11] Additionally, compounds like titanium dioxide and zinc oxide are included to provide opacity and offer protection against harmful ultraviolet radiation.[12]

Sea buckthorn oil is a valuable herbal ingredient known for its high content of vitamins, essential fatty acids, and antioxidants, which support skin regeneration and healing. Vitamin E (tocopherol) is also widely used in cosmetic formulations due to its antioxidant properties, which help prevent oxidative degradation and enhance the shelf life of the product.[13,14]

The development of a stable and effective lipstick formulation requires careful evaluation of various physicochemical parameters. Tests such as melting point, breaking strength, spreadability, pH, and stability studies are essential to ensure product quality, safety, and user acceptability.[15–17]

Therefore, the present study aims to formulate and evaluate a polyherbal lipstick using natural ingredients, with the objective of developing a safe, effective, and environmentally friendly alternative to conventional synthetic lipsticks.

❖ *AIM AND OBJECTIVES*

2.1 Aim

To formulate and evaluate a polyherbal lipstick using natural ingredients with acceptable physicochemical properties, safety, and stability.

2.2 Objectives

To develop a polyherbal lipstick using natural waxes, oils, and colorants.
To incorporate herbal ingredients for added therapeutic and moisturizing benefits.
To evaluate the formulated lipstick for physicochemical parameters such as melting point, breaking strength, spreadability, and pH.
To assess the stability of the formulation under different storage conditions.
To ensure the safety and non-irritant nature of the product on application.
To provide a natural and eco-friendly alternative to synthetic lipsticks.

❖ *EXCIPIENT PROFILE*

Table no. 1: List of Material use in Formulation.

SR.NO	Name of Material	Photograph	Synoname	Pharmacological / Functional use
1.	Beeswax		Cera alba, White wax, Yellow wax	Hardening agent, emollient, provides structure and stability
2.	Carnauba wax		Copernicia cerifera wax, Palm wax	Thickening agent, improves hardness and melting point
3.	Sea Butter		Butyrospermum parkii butter	Moisturizer, emollient, prevents lip dryness
4.	Cocoa Butter		Theobroma cacao butter	Skin softener, improves texture and smoothness
5.	Castor oil		Ricinus communis oil	Provides gloss, improves pigment dispersion and spreadability
6.	Jojoba oil		Simmondsia chinensis oil	Moisturizer, improves lip hydration and texture

7.	Sea Buckthorn oil		Hippophae rhamnoides oil	Antioxidant, healing agent, nourishes lips
8.	Beetroot Extract		Beta vulgaris extract	Natural colorant, antioxidant, provides pink-red shade
9.	Red iron Oxide		CI 77491, CI 77492, CI 77499	Mineral pigment, enhances color stability
10.	Titanium dioxide		CI 77891	Opacifying agent, improves brightness and coverage
11.	Zinc Oxide		ZnO	Protective agent, soothing and UV protective property
12.	Vit E		Tocopherol	Antioxidant, prevents oxidation and improves shelf life

❖ *MATERIALS*

All the materials used in the formulation of polyherbal lipstick were of cosmetic or pharmaceutical grade and were selected based on their safety, compatibility, and functional properties in cosmetic formulations.

Natural waxes such as beeswax and carnauba wax were used as the primary structuring agents to provide hardness, stability, and shape to the lipstick. These waxes are widely used in cosmetic formulations due to their excellent binding and film-forming properties.[36]

Emollients including shea butter and cocoa butter were incorporated to impart smooth texture, moisturization, and softness to the lips. These natural butters are known for their skin-conditioning properties and ability to prevent dryness.[27]

Oils such as castor oil, jojoba oil, and sea buckthorn oil were used to enhance spreadability, gloss, and hydration. Castor oil contributes to shine and viscosity, while jojoba oil improves skin compatibility due to its similarity to natural sebum. Sea buckthorn oil is rich in essential fatty acids and antioxidants, providing nourishment and protective effects (Rawlings, 2006; Zeb, 2004).[34,19]

For coloration, beetroot extract was used as a natural pigment due to its non-toxic nature and antioxidant properties. Additionally, red iron oxide was incorporated to enhance color stability and intensity. Mineral pigments are commonly used in cosmetics due to their safety and long-lasting properties (Kulkarni et al., 2011).[31]

Titanium dioxide and zinc oxide (non-nano) were included as opacifying agents and to provide protection against ultraviolet radiation. These ingredients are widely accepted in cosmetic formulations for their safety and protective effects (European Commission, 2009).[29]

Vitamin E (tocopherol) was used as an antioxidant to prevent oxidative degradation of oils and improve the stability and shelf life of the formulation. Flavoring agents such as vanilla, rose, or peppermint oil were added to enhance the sensory appeal and user acceptability of the final product.

The selection of these materials was based on their proven efficacy, safety profile, and widespread use in herbal cosmetic formulations.[35]

❖ EXTRACTION PROCESS

1. Extraction Process of Sea Buckthorn Berry Materials Required

Dried sea buckthorn berries Ethanol / Hydroalcoholic solvent Soxhlet apparatus
Heating mantle Round bottom flask Filter paper thimble Water bath

Procedure

Step 1: Drying and Powdering

Sea buckthorn berries were washed thoroughly and shade dried for 3–5 days. The dried berries were powdered using a mechanical grinder.[20]

Step 2: Filling of Thimble

About 25 g of berry powder was filled into the extraction thimble and placed in the Soxhlet chamber.

Step 3: Solvent Addition

Approximately 250 ml ethanol was added to the round bottom flask.

Step 4: Soxhlet Extraction

The extraction was performed at 65–70°C for approximately 5–6 hours. Continuous cycles of solvent evaporation and condensation ensured efficient extraction of active constituents (Upadhyay et al., 2010).[23]

Step 5: Filtration and Concentration

The extract obtained was filtered and concentrated using a water bath at low temperature to remove excess solvent.

Step 6: Storage

The final semi-solid extract was stored in an airtight amber-colored bottle at refrigerated temperature.

2. Extraction Process of Beetroot

Materials Required

Dried beetroot powder

Ethanol (95%) / Hydroalcoholic solvent Soxhlet apparatus

Round bottom flask Heating mantle Whatman filter paper Rotary evaporator / Water bath

Procedure

Step 1: Preparation of Sample

Fresh beetroot was washed, peeled, sliced, and shade dried for 5–7 days. The dried material was powdered using a grinder and passed through sieve no. 40.[35]

Step 2: Loading of Sample

Approximately 20–25 g of beetroot powder was packed in a thimble made from filter paper and placed inside the Soxhlet extractor.

Step 3: Addition of Solvent

About 200–250 ml ethanol was added into the round bottom flask connected to the Soxhlet apparatus.

Step 4: Extraction Process

The apparatus was heated using a heating mantle at 60–70°C. The solvent evaporated, condensed in the condenser, and continuously extracted the phytoconstituents from beetroot powder.

Step 5: Duration of Extraction

Extraction was continued for approximately 4–6 hours or until the solvent in the siphon tube became colorless.

Step 6: Concentration of Extract

The collected extract was concentrated using a water bath or rotary evaporator at 40–45°C to obtain a thick reddish extract.

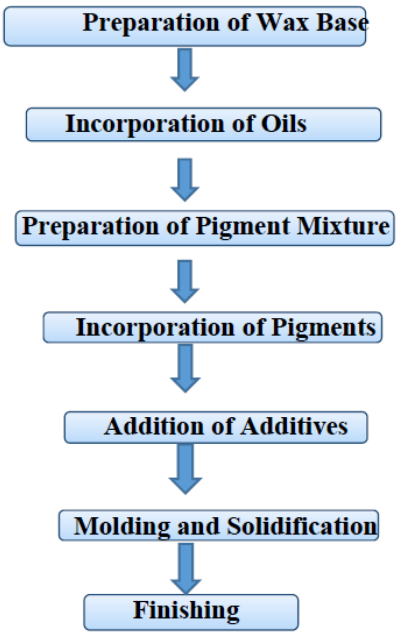
Step 7: Storage

The concentrated extract was stored in an amber-colored airtight container under refrigerated conditions until further use.

❖ ***METHOD OF PREPARATION***

The polyherbal lipstick was prepared by the fusion method, which is a widely used technique in cosmetic

formulation for preparing lipsticks due to its simplicity and ability to produce a uniform and stable product.[1,2]



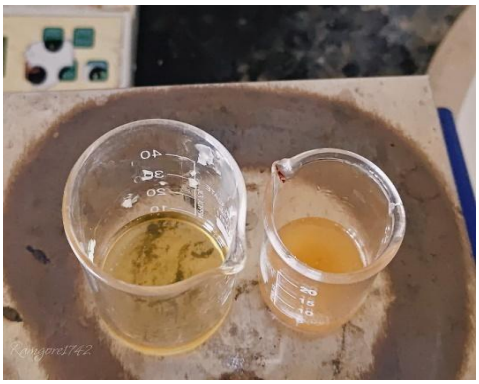
❖ ***PROCEDURE***

1. Preparation of Wax Base

Accurately weighed quantities of beeswax and carnauba wax were taken in a clean container. Shea butter and cocoa butter were added, and the mixture was melted using a water bath at a temperature of approximately 70–75°C to obtain a homogeneous molten base. The use of controlled heating ensures proper melting and prevents degradation of ingredients.[6]

2. Incorporation of Oils

After complete melting of the waxes and butters, castor oil, jojoba oil, and sea buckthorn oil were gradually added with continuous stirring to achieve uniform mixing and consistency. Oils play an important role in improving spreadability and texture of the formulation et al.,[8,9]



3. Preparation of Pigment Mixture

Beetroot extract and red iron oxide were triturated with a small quantity of castor oil to form a smooth paste. Titanium dioxide and zinc oxide were added and mixed thoroughly to avoid agglomeration and ensure uniform dispersion of pigments.[11]

4. Incorporation of Pigments

The pigment mixture was slowly added to the molten base with continuous stirring to ensure uniform color distribution. Proper dispersion of pigments is essential for achieving consistent shade and smooth texture.[5]

5. Addition of Additives

Vitamin E was added as an antioxidant to prevent oxidative degradation of oils, and flavoring agents were incorporated to improve the sensory properties of the formulation (Bansal et al., 2013).[14]

6. Molding and Solidification

The final molten mixture was poured into pre-lubricated molds and allowed to cool at room temperature. Further cooling was done under refrigeration to ensure proper solidification and shape formation.[2]

7. Finishing

After complete solidification, the lipstick was removed from the molds, surface defects were corrected, and the product was transferred into suitable containers for storage and evaluation.

Precautions

Overheating should be avoided to prevent degradation of herbal ingredients Uniform mixing must be ensured for consistent color

Air entrapment should be minimized during pouring

Hygienic conditions should be maintained throughout the process

❖ ***FORMULATION TABLE***

Table no. 2: Preparation Formula.

Sr.no	Ingredients	F1 (10g)	F2(20g)	F3(20g)	F4(20g)
1	Beeswax	1.5 g	2 g	2.5 g	2 g
2	Carnauba wax	0.5 g	1 g	1.5 g	1 g
3	Shea Butter	2.5 g	2 g	1.5 g	2 g
4	Cocoa Butter	3.5 g	3 g	2.5 g	3 g
5	Castor oil	5 ml	4 ml	3 ml	4 ml
6	Jojoba oil	1.5 ml	1 ml	1 ml	1 ml
7	Sea buckthorn extract	0.5 ml	1 ml	1.5 ml	1 ml
8	Beetroot extract	0.5 g	1 g	1.5 g	1 g
9	Red Iron oxide	0.3 g	0.5 g	0.7 g	0.5 g
10	Titanium dioxide	0.1 g	0.2 g	0.3 g	0.2 g
11	Zinc oxide	0.1 g	0.2 g	0.3 g	0.2 g
12	Vitamin E	0.2 ml	0.3 ml	0.3 ml	0.3 ml
13	Flavor	q.s	q.s	q.s	q.s

❖ **COMPARISON WITH MARKETED FORMULATIONS**

The formulated polyherbal lipstick was compared with commonly available marketed herbal lipsticks to evaluate its performance in terms of composition, physicochemical properties, safety, stability, and cost-effectiveness. Marketed lipsticks, although labeled as herbal or natural, often contain a combination of natural ingredients along with synthetic stabilizers, preservatives, and additives to enhance shelf life and performance.[1,2]

Parameter	Your Polyherbal Lipstick	Marketed Lipstick Formulation
Composition	Natural waxes, oils, and herbal extracts	Combination of natural and synthetic ingredients
Colorants	Beetroot extract and iron oxide	Synthetic dyes and mineral pigments
Chemical Contain	Free from synthetic chemicals	May contain preservative and additive
Moisturizing Property	High due to natural emollient	Moderate to high
Safety	High safety and minimal irritation	Generally safe but may cause sensitivity
Stability	Moderate stability,	High stability
Shelf life	Shorter	Longer
Cost	Economical	Higher
Environmental Impact	Eco Friendly and Biodegradable	Moderate environ impact

❖ ***EVALUATION PARAMETERS***

The prepared polyherbal lipstick was evaluated for various physicochemical parameters to ensure its quality, stability, safety, and consumer acceptability.

1. Melting Point Determination

The melting point of the lipstick was determined using the capillary tube method. A small sample of lipstick was placed in a capillary tube and heated gradually. The temperature at which the sample started to melt was recorded.

This test indicates the thermal stability and suitability of the lipstick under different climatic conditions.[30]

2. Breaking Point Test

The breaking point was determined by placing the lipstick horizontally and applying increasing weight at a specific distance from the edge until it broke. The weight

required to break the lipstick indicates its mechanical strength.
This test ensures that the lipstick can withstand normal pressure during application.[38]

3. Spreadability Test
Spreadability was evaluated by applying the lipstick on a glass slide or skin surface and observing the ease of application and uniformity of the film formed.
Good spreadability indicates smooth application and user comfort.[28]

4. Surface Anomalies
The lipstick surface was visually inspected for defects such as air bubbles, cracks, fungal growth, or crystallization.
A smooth and uniform surface indicates good formulation quality.[32]

5. pH Determination
The pH of the lipstick was determined by dispersing a small quantity of the sample in distilled water and measuring using a pH meter.
The pH should be compatible with skin to avoid irritation.[18]

6. Skin Irritation Test
The formulated lipstick was applied on a small area of skin (such as the forearm) and observed for any signs of irritation, redness, or itching for a specified period.
This test ensures the safety of the formulation for topical application.[22]

7. Stability Studies
The lipstick was stored at different temperature conditions (room temperature, elevated temperature, and refrigerated conditions) for a specific period. The formulation was evaluated periodically for changes in color, texture, odor, and physical appearance.
Stability studies help determine the shelf life and robustness of the product.[40]

8. Aging Stability Test
The lipstick was kept at elevated temperatures (40–45°C) for a fixed duration and observed for any changes in consistency, melting behavior, or color.
This test helps predict long-term stability.[39]

9. Perfume Stability Test
The stability of the added flavoring agent was evaluated by checking any change in odor during storage under different conditions.
Stable fragrance indicates good formulation compatibility.

10. Color Uniformity Test
The lipstick was applied on a surface to check for uniform color distribution. Uniformity indicates proper mixing of pigments and overall formulation quality.[37]

❖ DISCUSSION

The comparison indicates that the formulated polyherbal lipstick offers significant advantages in terms of safety and natural composition. The use of plant-based waxes, oils, and herbal extracts enhances compatibility with the skin and reduces the risk of adverse effects (Gediya et al., 2011; Kapoor, 2005).[5,33]

Natural colorants such as beetroot extract contribute to the herbal nature of the formulation; however, their stability is relatively lower compared to synthetic dyes used in commercial products (Patil et al., 2022).[16] The inclusion of mineral pigments such as iron oxide improves color consistency and durability (Verma et al., 2021).[15]

Marketed lipstick formulations exhibit superior stability and longer shelf life due to the presence of preservatives and advanced manufacturing processes. Stability is a crucial factor influencing product quality and consumer acceptance.[29] However, the use of synthetic additives may increase the risk of irritation in sensitive individuals.

The formulated lipstick utilizes vitamin E as a natural antioxidant, which helps prevent oxidative degradation and enhances the stability of the formulation without the need for synthetic preservatives (Bansal et al., 2013).[21]

Additionally, the presence of sea buckthorn oil provides antioxidant and skin-nourishing properties, improving the therapeutic value of the product.[19]

❖ CONCLUSION

The present study successfully formulated and evaluated a polyherbal lipstick using natural waxes, oils, herbal extracts, and mineral pigments. The prepared formulations exhibited satisfactory physicochemical properties such as good spreadability, acceptable melting point, smooth texture, and stability. Among all formulations, F2 showed the best overall performance with optimum hardness, uniform color distribution, and good application properties.

The incorporation of natural ingredients like beetroot extract, sea buckthorn oil, shea butter, and cocoa butter provided moisturizing, antioxidant, and nourishing effects, making the formulation safer and more skin-friendly compared to synthetic lipsticks. The stability and skin irritation studies confirmed that the developed lipstick was stable and non-irritant.

Therefore, the formulated polyherbal lipstick can be considered a safe, effective, eco-friendly, and promising alternative to conventional synthetic lipsticks with potential for future cosmetic applications and commercialization.

❖ RESULT

The polyherbal lipstick formulations were successfully prepared and evaluated using natural waxes, oils, herbal

extracts, and mineral pigments. All formulations showed good appearance, smooth texture, satisfactory spreadability, and acceptable stability. Among all batches, formulation F2 exhibited the best physicochemical properties, including optimum hardness, uniform color distribution, good melting point, and non-irritant nature. Stability studies indicated no significant changes in color, odor, or texture during storage. Therefore, the developed polyherbal lipstick was found to be safe, stable, eco-friendly, and suitable as a natural alternative to synthetic lipsticks.

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