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FORMULATION AND EVALUATION OF POLYHERBAL LIP BALM

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1. ABSTRACT

The present research work focuses on the preparation and evaluation of a polyherbal lip balm using natural ingredients such as cocoa butter, coconut oil, castor oil, honey, aloe vera gel, beetroot extract, pomegranate extract, rose oil, and vitamin E oil. Lips are highly sensitive and are continuously exposed to environmental conditions such as sunlight, pollution, cold air, and dry weather, leading to dryness and cracking. Herbal lip balms provide moisturization, healing, nourishment, and protection without causing harmful side effects.

The prepared formulation was evaluated for different parameters including physical appearance, pH, spreadability, melting point, stability, irritation test, and fragrance stability. The formulation showed excellent smoothness, good spreadability, suitable pH, pleasant odor, and stability under different storage conditions. The natural ingredients used in the formulation possess antioxidant, anti-inflammatory, moisturizing, antimicrobial, and healing properties.

KEYWORDS: Herbal lip balm, polyherbal formulation, natural cosmetics, moisturization, antioxidant activity.

2. AIM AND OBJECTIVE

AIM: This project aims to formulate and evaluate a natural lip balm using polyherbal ingredients that provide effective moisturization, healing, protection, and aesthetic benefits to the lips, with minimal use of synthetic chemicals.

OBJECTIVES

- To formulate a stable, natural lip balm using cocoa butter, coconut oil, castor oil, honey, aloe vera gel, beetroot extract, pomegranate extract, rose oil, and vitamin E oil.
- To explore the synergistic effects of multiple herbal ingredients in enhancing lip hydration, healing, and protection.
- To optimize the formulation process by maintaining suitable temperature conditions to preserve the bioactivity of sensitive natural extracts.
- To provide natural cooler, fragranc, and therapeutic benefits to the lip balm using herbal extracts and essential oils.
- Physical appearance homogeneity.
- pH value
- Sprea dability
- Stability under different storage conditions.
- To compare the advantages of polyherbal-based lip balm with conventional synthetic lip care products in terms of safety, efficacy, and consumer acceptability.

3. INTRODUCTION

Cosmetics are substances used to enhance beauty and improve appearance. Lip care products are among the most commonly used cosmetic products worldwide. Lips are one of the most delicate parts of the human body and are highly prone to dryness because they do not contain sebaceous glands. Environmental conditions such as sunlight, cold weather, wind, and pollution can easily damage the lips. Lip balms are semisolid preparations applied to lips to provide hydration and protection. Conventional lip balms often contain synthetic chemicals, artificial fragrances, petroleum jelly, and preservatives that may produce irritation or allergic reactions in some individuals.

Due to increasing awareness regarding the harmful effects of synthetic chemicals, consumers are now shifting toward herbal and natural cosmetic products. Herbal cosmetics are prepared using plant-based ingredients and are considered safer, eco-friendly, and effective. Polyherbal formulations combine the properties of multiple herbal ingredients to provide synergistic

therapeutic benefits. In this project, different natural ingredients were selected based on their medicinal and cosmetic properties.

Cocoa butter acts as an excellent moisturizer and provides a smooth texture. Coconut oil protects the lips from dryness and microbial infection. Castor oil improves gloss and spreadability. Honey acts as a humectant and healing agent. Aloe vera gel soothes irritated lips and promotes healing. Beetroot extract provides natural color and antioxidants. Pomegranate extract protects against oxidative stress and aging. Rose oil enhances fragrance and provides calming effects, while vitamin E oil acts as a natural antioxidant.

Each ingredient was selected for its dermatological and healing properties:

- Cocoa Butter provides deep moisturization and forms a protective barrier on the lips due to its rich antioxidant and fatty acid content.
- Coconut Oil offers antibacterial and emollient properties, promoting hydration and protecting against infections.
- Castor Oil gives the balm a glossy texture and contributes anti-inflammatory effects through its ricinoleic acid content.
- Honey acts as a humectant, drawing moisture into the lips, and has healing and antimicrobial benefits.
- Aloe Vera Gel is known for its soothing and anti-inflammatory properties, helping to heal dry and damaged lip tissue.
- Beetroot and Pomegranate Extracts provide natural pigmentation and antioxidant protection from environmental damage.
- Rose Oil enhances aroma and offers, antibacterial and anti-inflammatory properties.
- Vitamin E Oil supports skin repair and acts as a stabilizing antioxidant.

4. Review of Literature:

The literature review is an important part of research that provides information regarding previous studies related to herbal lip balm formulations and herbal cosmetic preparations.

Several researchers have worked on herbal cosmetics using natural ingredients such as cocoa butter, aloe vera, coconut oil, honey, beetroot extract, pomegranate extract, and vitamin E.

According to previous studies, herbal lip balms provide better moisturization and healing effects compared to synthetic formulations. Natural oils and butters improve lip softness and prevent moisture loss.

Research studies suggest that aloe vera gel possesses anti-inflammatory and wound-healing properties, making it highly useful in lip care formulations. Honey has antimicrobial and humectant properties that maintain hydration and accelerate healing of cracked lips.

Beetroot extract has been studied as a natural coloring agent because of its betalain pigments and antioxidant activity. Pomegranate extract has shown strong antioxidant and anti-aging properties that protect the lips from environmental damage.

Vitamin E oil is widely used in cosmetic products because of its antioxidant and skin-protective effects. Rose oil improves fragrance and provides soothing action.

The combination of multiple herbal ingredients in a single formulation is known as a polyherbal formulation. Polyherbal formulations produce synergistic therapeutic effects and improve overall efficacy.

Previous studies also confirmed that herbal formulations are safer, eco-friendly, and less irritating compared to synthetic cosmetic products.

Based on the literature review, the present study was designed to formulate and evaluate a stable, effective, and cosmetically acceptable polyherbal lip balm.

Several studies have been conducted on herbal cosmetic preparations.

Researchers have reported that cocoa butter and coconut oil improve moisturization and protect lips from dryness. Aloe vera gel is effective in healing cracked lips because of its anti-inflammatory and soothing properties.

Studies on beetroot extract show that it acts as a natural colorant and antioxidant. Pomegranate extract provides anti-aging and antioxidant benefits. Vitamin E oil is widely used in cosmetic formulations because it protects against oxidative damage.

4.1DRUG PROFILE OF INGREDIENTS

Table 4.1: Cocoa Butter.

Cocoa Butter	
Biological Name:	*Theobroma cacao*
Family:	Malvaceae
Part Used:	Seeds (Cocoa beans)
Constituents:	Stearic acid, Oleic acid, Palmitic acid, Polyphenols
Properties:	Emollient, Moisturizing, Antioxidant
Uses in Formulation:	Acts as a base and provides rich moisturization to the lips, preventing dryness and chapping.

Fig 4.1: Cocoa Butter.

Collection and Details: Cocoa butter, derived from the seeds of Theobroma cacao, is a highly stable fat commonly utilized in cosmetics, pharmaceuticals, and food industries.

TABLE 4.2 : HONEY.

Honey	
Biological Name:	Apismellifera
Family:	Apidae
Part Used:	Secretion
Constituents:	Fructose, Glucose, Aminoacids, Vitamins (B-complex, C), Minerals (Calcium, Potassium)
Properties:	Humectant, Antibacterial, Healing
Uses in Formulation:	Retains moisture in lips and promotes the healing of cracked lips.

Fig 4.2 : Honey.

Collection and Details: Honey, a natural secretion produced by bees (*Apis mellifera*) from the nectar of flowers, is one of the oldest known substances used for therapeutic and cosmetic purposes. It possesses a unique combination of sugar molecules, enzymes, amino acids, vitamins, and minerals that make it extremely beneficial for skin and lip care applications.

Honey acts primarily as a natural humectant, meaning it has the remarkable ability to attract and retain moisture from the environment into the skin. This moisture-retention property is critical in lip balm formulations, as it helps prevent the lips from becoming dry, flaky, or cracked, especially in adverse weather conditions. Maintaining lip hydration is essential since the lips lack oil glands and are naturally more vulnerable to dehydration. Chemically, honey is composed of approximately 80% sugars (mainly fructose and glucose), and the rest consists of water, amino acids, vitamins such as B-complex and Vitamin C, including calcium, Potassium, and magnesium.

TABLE 4.3 : CASTOR OIL.

Castor Oil	
Biological Name:	*Ricinus communis*
Family:	Euphorbiaceae
Part Used:	Seeds
Constituents:	Ricinoleic acid, Linoleicacid
Properties:	Emollient, Soothing, Anti-inflammatory
Uses in Formulation:	Provides smooth texture and shine to the lip balm.

Fig4.3: Castor Oil.

Collection and Detailed Profile: Castor oil is a vegetable oil derived from the seeds of the plant Ricinus communis. It has been used for centuries in traditional medicine and cosmetic formulations due to its numerous skin benefits. The oil is primarily composed of ricinoleic acid, a unique fatty acid that accounts for about 85-95% of its composition, along with linoleic acid and other minor constituents.

One of the most significant properties of castor oil is its emollient nature, which means it can soften and smooth the skin. When applied to the lips, castor oil creates a protective barrier that helps prevent moisture loss, keeping the lips hydrated and soft. This moisture-locking

property is particularly beneficial in lip balm formulations, where prolonged hydration is essential to prevent dryness and chapping, especially in harsh or cold climates.

Table No.4.4: Coconut Oil.

Coconut Oil	
Biological Name:	*Cocos nucifera*
Family:	Arecaceae
Part Used:	Fruit (Coconutmeat)
Constituents:	Lauricacid, Capricacid, Caprylicacid, Vitamin E
Properties:	Moisturizing, Antimicrobial, Antioxidant
Uses in Formulation:	Moisturizes and softens lips, protects from environmental damage.

Fig 4.4: Cocunat Oil.

Collection and Detailed Profile: Coconut oil is derived from the meat of the coconut fruit, *Cocos nucifera*, and has been used for centuries in various cultures for its medicinal and cosmetic properties. It is composed primarily of medium-chain fatty acids, including lauric acid, capric acid, and caprylic acid, which are known for their antimicrobial and moisturizing properties. Additionally, coconut oil contains vitamin E and polyphenolic compounds, which contribute to its antioxidant and anti-inflammatory effects. The main reason coconut oil is frequently used in lip care products is its exceptional moisturizing ability. The fatty acids present in coconut oil penetrate deep into the skin, providing long-lasting hydration while preventing moisture loss. This makes it an ideal ingredient for lip balms, which need to deliver intense hydration to the lips and protect them from drying out. Coconut oil also serves as a natural barrier on the skin, helping to protect the lips from harsh environmental factors, such as wind and sun exposure. health and appearance of the lips, contributing to a more youthful, smooth, and plump look

Table 4.5 : Aloe Vera Gel.

Aloe vera gel	
Biological Name:	*Aloe vera*
Family:	Asphodelaceae
Part Used:	Leaves (Gel from the inner part of the leaves)
Constituents:	Polysaccharides, Glycoproteins, Aminoacids, Vitamins (A,C,E, B12), Enzymes
Properties:	Soothing, Moisturizing, Anti-inflammatory, Healing
Uses in Formulation:	Soothes and hydrates the lips, promotes healing of cracked and dry lips.

Fig 4.5: Aloe Vera Gel.

Collection and Detailed Profile: Aloe vera, known scientifically as Aloe vera, is a succulent plant that has been revered for its therapeutic properties for thousands of years. The gel, derived from the inner part of the leaves, is commonly used in skincare products due to its natural healing, soothing, and. Aloe vera gel contains a wealth of bioactive compounds, including polysaccharides, glycoproteins, amino acids, enzymes, and a variety of minerals that contribute to its wide array of skin benefits.

Table No 4.6 : Beet Root Extract.

Beet Root Extract	
Biological Name:	*Beta vulgaris*
Family:	Amaranthaceae
Part Used:	Root
Constituents:	Beta lains (beta cyanins and beta xanthins), Folates, Vitamin Carbohydrates, Iron, and Potassium.
Properties:	Antioxidant, Anti-inflammatory, Skin-brightening, Nourishing
Uses in Formulation:	Provides natural colour to the lip balm, improves lip health, and adds nourishment.

Fig 5.6: Beet Root Extact.

Collection and Detailed Profile:

Beetroot extract is derived from the root of *Beta vulgaris*, a plant belonging to the Amaranthaceae family. Known for its deep red colour, beetroot is packed with a variety of bioactive compounds, including betalains (betacyanins and betaxanthins), folates, vitamin C, and minerals such as iron and potassium. These components contribute to the extract's numerous health benefits and make it a valuable ingredient in cosmetics and skincare formulations, including lip care products. One of the most prominent benefits of beetroot extract in lip balm is its antioxidant properties. The betalains, which give beetroot its characteristic red hue, are powerful antioxidants that help neutralize free radicals, which can damage skin cells and accelerate the aging process. By protecting the lips from oxidative stress, beetroot extract helps maintain their youthful appearance, making it a great choice for lip care products that aim to promote healthy, vibrant lips.

Table No.4.7 : Pomegranate.

Pomegranate extract	
Biological Name:	*Punica granatum*
Family:	Lythraceae
Part Used:	Fruit (Peelandseeds)
Constituents:	Punicalagins, Ellagicacid, Anthocyanins, Vitamin C, Flavonoids
Properties:	Antioxidant, Anti-inflammatory, Anti-aging, Hydrating
Uses in Formulation:	Offers antioxidant protection, improves skin hydration, and provides anti-aging benefits to the lips.

Fig 4.7: Pomegranate.

Collection and Detailed Profile:

Pomegranate extract, derived from the fruit of *Punica granatum*, is highly valued in the cosmetic and skincare industry due to its potent antioxidant, anti-inflammatory, and anti-aging properties.

The extract is made from both the peel and seeds of the fruit, which are rich in bioactive compounds, including punicalagins, ellagic acid, anthocyanins, and flavonoids. These constituents contribute to the many skin benefits of pomegranate extract, making it a valuable ingredient in lip balm formulations aimed at promoting healthy, youthful-looking lips.

Table no. 4.8: Rose Oil.

Rose Oil	
Biological Name:	*Rosa damascene*
Family:	Rosaceae
Part Used:	Petals
Constituents:	Citronellol, Geraniol, Nerol, Phenyl ethyl alcohol, Flavonoids
Properties:	Antioxidant, Anti-inflammatory, Moisturizing, Skin rejuvenating, Soothing
Uses in Formulation:	Provides fragrance, moisturizes, and helps in skin healing and soothing, enhancing the appearance of lips.

Fig no. 4.8: Rose Oil.

Detailed Profile: Rose oil, derived from the petals of *Rosa damascene*, is a highly prized essential oil that has been used in traditional and modern skincare for its multitude of beneficial properties. Rose oil is well-known for its sweet, floral fragrance, making it a popular addition in cosmetics and personal care products. Beyond its pleasing scent, rose oil offers numerous benefits for the skin, particularly for lip care, where it contributes to hydration, healing, and the overall health of the lips.

Table no. 4.9: Vitamin E.

Vitamin E	
Biological Name:	Alpha-Tocopherol
Family:	None (Vitamin)
Part Used:	Synthetic or natural Vitamin E (usually derived from vegetable oils or wheat germ)
Constituents:	Alpha-Tocopherol, Gamma-Tocopherol, Tocotrienols
Properties:	Antioxidant, Moisturizing, Anti-aging, Skin Healing, UV Protection
Uses in Formulation:	Provides antioxidant protection, moisturizes, promotes skin healing, and reduces signs of aging in lip balms.

Fig no.4.9: Vitamin E.

Detailed Profile: Alpha-Tocopherol, or vitamin E, is a fat-soluble vitamin essential for skin health and is found in many cosmetic products, including lip balms. Vitamin E protects the skin from free radical-induced oxidative stress, which can cause premature aging and dermatological issues. Alpha- Tocopherol is the main Vitamin E component in cosmetics, but Gamma-Tocopherol These chemicals are found in wheat germ, sunflower, and safflower oils.

Ideal Properties:

Softening: The lip balm must efficiently moisturize and soften the lips, guaranteeing they remain smooth and pliable.

Longevity: It must provide enduring wear, preserving its efficacy and coverage without necessitating frequent reapplication.

Gentle Formula: The formulation must be gentle, appropriate for all skin types, and devoid of any components that could induce irritation or allergic responses. The adhesive film must attach securely to the lips, creating a protective, smooth, and noncrackly covering while eschewing any sticky or tacky sensation.

Healing: Contains herbs known for their healing properties, like aloe vera or calendula, to soothe and repair damaged lips.

4.2 EXTRACTION OF INGREDIENTS AND PHYTOCHEMICAL TESTS USING SOXHLET APPARATUS:

Fig 4.10: Soxhelt Apparatus

1. Extraction of Cocoa Butter Using Soxhlet Apparatus

Principle

Soxhlet extraction is used for continuous extraction of fats and oils from solid materials using an organic solvent. The solvent repeatedly passes through the sample and dissolves the cocoa butter present in cocoa beans.

Procedure

1. Dry the cocoa beans properly and grind them into coarse powder.
2. Weigh about 20–25 g of cocoa powder.
3. Fill the powder into a thimble and place it inside the Soxhlet extractor.
4. Add petroleum ether or hexane into the round bottom flask.
5. Assemble the Soxhlet apparatus with condenser.

6. Heat the apparatus using a heating mantle.
7. The solvent evaporates, condenses, and continuously extracts cocoa butter from the powder.
8. Continue extraction for about 4–6 hours.
9. After extraction, remove the solvent by evaporation.
10. Collect the yellowish cocoa butter and store in an airtight container.

Observation Table 4.10:

Parameter	Observation
Colour of extract	Pale yellow
Odour	Characteristic chocolate odour
Consistency	Semi-solid fatty mass
Extraction completion	Fatty extract collected successfully
Percentage yield	45–55%

Appearance of Extract

- Color: Pale yellow to cream
- Odor: Characteristic chocolate smell
- Nature: Oily and semi-solid

Table 4.11: Phytochemical Tests of Cocoa Butter.

Test	Observation
Physical appearance	Pale yellow semi-solid fat
Solubility	Soluble in organic solvents
Odour	Characteristic chocolate odour

2. Extraction of Beetroot Using Soxhlet Apparatus

Principle

Soxhlet extraction is a continuous extraction technique used to separate phytochemicals The solvent repeatedly passes through the beetroot powder and extracts its active constituents.

Procedure

1. Wash fresh beetroot properly.
2. Cut into small pieces and dry completely.
3. Grind into coarse powder.
4. Fill the powder in filter paper or thimble.
5. Place the thimble inside Soxhlet apparatus.

6. Add ethanol into round bottom flask.
7. Connect the apparatus with condenser.
8. Heat gently for continuous extraction.
9. Allow extraction for 4–6 hours.
10. Solvent repeatedly extracts the phytochemicals.
11. Evaporate the solvent after extraction.
12. Collect the dark red beetroot extract.

Table 4.12: Phytochemical Tests of Beetroot Extract.

Phytochemical	Test	Expected Result
Flavonoids	Alkaline reagent test	Yellow colour formation
Phenolic compounds	Ferric chloride test	Bluish-green colour
Carbohydrates	Molisch's test	Violet ring formation
Betalains	Visual observation	Red-purple colour

Table 4.13: Observation Table.

Parameter	Observation
Colour of extract	Dark reddish-purple
Odour	Characteristic odour
Consistency	Semi-solid viscous extract
Solvent used	Ethanol
Extraction completion	Solvent became light coloured after repeated cycles.
Percentage yield	12–15%

Beetroot extract was successfully obtained using Soxhlet apparatus and showed positive phytochemical tests for flavonoids, phenols, carbohydrates, and glycosides.

3. Extraction of Aloe Vera Using Soxhlet Apparatus:

Principle

Soxhlet extraction is used for continuous extraction of active constituents from plant. The solvent repeatedly passes through the dried aloe vera powder and extracts phytochemicals efficiently.

Procedure:

1. Collect fresh aloe vera leaves.
2. Collect the gel and dry it completely.
3. Grind the dried material into powder form.
4. Place the thimble inside Soxhlet apparatus.
5. Add ethanol into round bottom flask.

6. Connect the condenser and heat gently.
7. Allow extraction for 4–6 hours.
8. Evaporate the solvent after extraction.
9. Collect the concentrated aloe vera extract.

Table 4.14: Phytochemical Tests of Aloe Vera Extract.

Phytochemical	Test	Expected Result
Carbohydrates	Molisch's test	Violet ring
Saponins	Foam test	Persistent foam
Glycosides	Borntrager's test	Pink colour
Flavonoids	Alkaline reagent test	Yellow colour

Table 4.15: Observation.

Parameter	Observation
Colour of extract	Light green to yellowish-green
Odour	Characteristic mild odour
Consistency	Semi-solid viscous extract
Solvent used	Ethanol
Appearance	Smooth and homogeneous
Extraction completion	Solvent became lighter after repeated extraction cycles
Percentage yield	8–14%

Aloe vera extract was successfully obtained using Soxhlet apparatus and showed positive phytochemical tests for flavonoids, saponins, phenols, and carbohydrates.

4. EXTRACTION OF POMEGRANATE:

Principle

The Soxhlet apparatus works on the principle of continuous hot solvent extraction. The solvent evaporates, condenses, and repeatedly passes through the powdered drug, extracting phytochemicals efficiently.

Procedure for Extraction

1. Collect fresh pomegranate peels and dry them under shade.
2. Grind the dried peels into coarse powder.
3. Place the powder in a thimble made of filter paper.
4. Fill the round bottom flask with ethanol.
5. Heat the solvent using a heating mantle.
6. The solvent evaporates and condenses into the extraction chamber.
7. Continue extraction for 4–6 hours until the solvent becomes colorless.

8. Collect the extract and evaporate excess solvent.
9. Store the concentrated extract in an airtight container.

Table 4.16: Phytochemical Tests of Pomegranate Extract.

Phytochemical	Test	Expected Result
Tannins	Ferric chloride test	Blue-black colour
Flavonoids	Shinoda test	Pink/red colour
Phenolics	Ferric chloride test	Greenish-black colour
Glycosides	Keller-Killiani test	Brown ring formation

Table 4.17: Observation Table.

Parameter	Observation
Colour of extract	Dark reddish-brown
Odour	Fruity characteristic odour
Consistency	Thick extract
Percentage yield	10–14%

5. METHODOLOGY

The herbal extracts were prepared using Soxhlet apparatus with ethanol as solvent at 60–70°C for 5–6 hours. The obtained extracts were concentrated and incorporated into the lip balm base containing cocoa butter, coconut oil, castor oil, and shea butter. The ingredients were heated and mixed with continuous stirring for 10–15 minutes to obtain a uniform formulation. The prepared lip balm was poured into suitable containers and allowed to cool at room temperature (25°C). Stability studies were carried out at room temperature, and accelerated temperature condition.

Table 5.1: Formulation Table for Polyherbal Lip Balm.

Ingredients	F1 (g)	F2 (g)	F3 (g)	F4 (g)	F5 (g)	F6 (g)	F7 (g)	F8 (g)	F9 (g)
Cocoa Butter	2.0	2.2	2.4	2.6	2.8	3.0	3.2	3.4	3.5
Coconut Oil	1.5	1.5	1.5	1.4	1.4	1.3	1.3	1.2	1.2
Castor Oil	1.0	1.0	1.1	1.1	1.2	1.2	1.3	1.3	1.4
Shea Butter	1.0	1.0	1.1	1.1	1.2	1.2	1.3	1.3	1.4
Honey	0.3	0.3	0.4	0.4	0.5	0.5	0.5	0.5	0.5
Aloe Vera Gel	0.3	0.3	0.4	0.4	0.5	0.5	0.5	0.5	0.5
Beetroot Extract	0.1	0.1	0.15	0.15	0.2	0.2	0.25	0.25	0.3
Pomegranate Extract	0.1	0.1	0.15	0.15	0.2	0.2	0.25	0.25	0.3
Vitamin E Oil	0.05	0.05	0.08	0.08	0.1	0.1	0.1	0.1	0.1
Rose Oil	0.02	0.02	0.03	0.03	0.04	0.04	0.05	0.05	0.05

Formulation Development:

The formulation of the natural polyherbal lip balm was carried out through a carefully designed stepwise process to ensure maximum retention of the herbal ingredients' beneficial properties.

Special attention was given to temperature control, homogenization, and the order of mixing different categories of materials (base ingredients, humectants, herbal extracts, essential oils, and antioxidants). The overall goal was to achieve a smooth, stable, aesthetically pleasing, and therapeutically effective lip balm.

Preparation of Base Ingredientsl:

The foundation of any lip balm lies in the base, which primarily consists of oils and butters that provide emollience and create a protective barrier over the lips.

Cocoa butter, coconut oil, and castor oil were selected as base ingredients for their excellent and skin compatibility.

- The required quantities of cocoa butter, coconut oil, and castor oil were accurately weighed using a digital weighing balance.
- These ingredients were transferred into a clean, dry beaker resistant to heat.
- The beaker was placed in a water bath maintained at 60–70°C, ensuring a gentle and uniform heating process. Direct flame heating was avoided to prevent degradation of oils and butters.
- As the ingredients started to melt, the mixture was stirred continuously with a glass rod to ensure uniform blending. A homogeneous liquid phase indicated the complete melting of the base components. This phase is crucial as it ensures that the final lip balm will be free from granules or uneven textures.

Fig 5.1 Prepration of Base ingredient

Addition of Humacants:

Ingredients were thoroughly mixed and melted, the beaker was removed from the water bath. The mixture was allowed to cool slightly, bringing the temperature down to around 45°C. This temperature range is critical because certain bioactive ingredients like honey and aloe vera gel may lose their beneficial properties if exposed to excessive heat.

- Freshly measured honey was added slowly into the slightly cooled oil phase, followed by aloe vera gel.Continuous stirring was maintained during this addition to ensure proper dispersion the hydrophilic components within the lipophili base.
- Honey acts as a humectant by drawing moisture to the lips, while aloe vera gel provides soothing, anti-inflammatory effects.
- Homogeneity at this stage ensures a uniform texture in the final product without any phase separation.

Incorporation of Herbal Extracts: Upon further cooling of the mixture to approximately 35–40°C, heat-sensitive herbal extracts were incorporated carefully:

- Beetroot extract was added first to impart a natural pink tint and antioxidant benefits.
- Pomegranate extract is followed, adding natural pigmentation and offering additional antioxidant protection against environmental damage. These extracts were pre-prepared and filtered to ensure smooth dispersion in the lip balm. Stirring was continued to achieve a uniform distribution of colour and bioactive components. Care was taken to avoid vigorous stirring, which might introduce air bubbles.

Addition of Essential Oils and Antioxidants: At a further reduced temperature (around 30–35°C), rose oil and vitamin E oil were added:

Rose oil was added to enhance fragrance and provide mild antiseptic and antiinflammatory benefits.

Vitamin E oil was incorporated as a powerful antioxidant to improve the shelf life of the product and offer additional skin-repairing properties. Temperature addition ensures that the volatile essential oils retain their fregnance and thereputic evaporating.

Molding and Setting: Immediately after the complete incorporation of all ingredients, the still- liquid lip balm was carefully poured into pre- sterilized lip balm molds or small containers. Sterilization of containers was performed beforehand using either dry heat or alcohol-based methods to prevent microbial contamination. The containers were left

undisturbed at room temperature to allow the lip balm to solidify naturally. Rapid cooling (e.g., using a refrigerator) was avoided initially to prevent the formation of cracks or uneven surfaces.

Table 5.2: INGREDIENTS AND QUANTITIES USED IN THE POLYHERBAL LIP BALM FORMULATION.

Sr. No.	Ingredients	Purpose	Quantity for 10 g
1	Cocoa Butter	Emollient and moisturizer	3.0 g
2	Coconut Oil	Moisturizer and softening agent	2.0 g
3	Castor Oil	Gloss enhancer and emollient	1.5 g
4	Honey	Humectant and healing agent	0.5 g
5	Aloe Vera Gel	Soothing and moisturizing agent	0.5 g
6	Beetroot Extract	Natural colorant and antioxidant	0.4 g
7	Pomegranate Extract	Antioxidant and nourishing agent	0.4 g
8	Rose Oil	Fragrance agent	0.05 g
9	Vitamin E Oil	Antioxidant and stabilizer	0.1 g

Evaluation Parameters

The prepared lip balm was evaluated for physical appearance, color, odor, texture, homogeneity, pH, spreadability, melting point, stability, irritation test, hardness, washability, moisturizing property, antioxidant activity, and fragrance stability.

Evaluation of Lip Balm: A systematic evaluation of the prepared polyherbal lip balm is essential to ensure its safety, efficacy, and stability.

Various parameters such as physical appearance, pH, spreadability, melting point, stability, irritation potential, hardness, stickiness, and fragrance stability were evaluated. Each parameter plays a crucial role in determining the overall quality and performance of the lip balm.

1. Physical Appearance:

Purpose: To assess the external features such as colour, texture, homogeneity, and surface

Materials: Clean white background, normal lighting conditions, magnifying lens (if required).

Method: The lip balm was visually inspected for colour, uniformity, smoothness, and absence of phase separation, grittiness, or particle presence. The texture was evaluated by touching the balm to feel its smoothness and consistency.

2.pH Determination:

Purpose: To confirm that the lip balm has a skin- friendly pH to avoid any irritation to the sensitive skin of the lips.

Materials: Distilled water, pH meter or pH paper, beakers, glass rods.

Method: A small amount of lip balm (about 1 g) was dispersed in 10–20 mL of distilled water. After allowing it to stand, the pH of the dispersion was measured using a calibrated pH meter.

Result: The pH falls within the range of 6.0 to 6.5, which matches the natural pH of lips and ensures the product is mild and non-irritating.

3. Spreadability:

Purpose: To determine the ease with which the lip balm spreads over the lips, ensuring effortless application.

Materials: Glass slides, standard weights, and a measuring scale.

Method: A fixed amount of balm was sandwiched between two glass slides, and a known weight was applied. After a specific time, the diameter of the spread area was measured.

Result: A good spread ability is indicated by a wide, even film formation without fragmentation or resistance. The balm should glide smoothly without leaving clumps.

4.Melting Point Determination:

Purpose

To determine the melting point of the prepared polyherbal lip balm formulation. The melting point helps to check the stability and suitability of the lip balm for application and storage.

Method: Small quantity of lip balm was filled into a capillary tube. capillary tube was attached near the thermometer bulb.A beaker containing liquid paraffin was heated slowly. The capillary tube and thermometer were immersed in the beaker. Temperature was observed carefully during heating.

Result: The prepared polyherbal lip balm showed melting point between 58–61°C, indicating good stability and suitability for topical application.

5.Stability Testing:

Purpose: To determine the stability of the lip balm under different storage conditions over time.25°C (room temperature), and 40°C (accelerated stability), airtight containers.

Method: Samples of the lip balm were stored at different temperatures. Observations regarding changes in colour, odour, texture, pH, and spreadability were recorded at intervals of 7, 15, 30, 60, and 90 days.

Result: A stable lip balm shows no significant changes in physical appearance, fragrance, pH, or consistency over time. Minor changes at elevated temperatures are acceptable but should not affect performance.

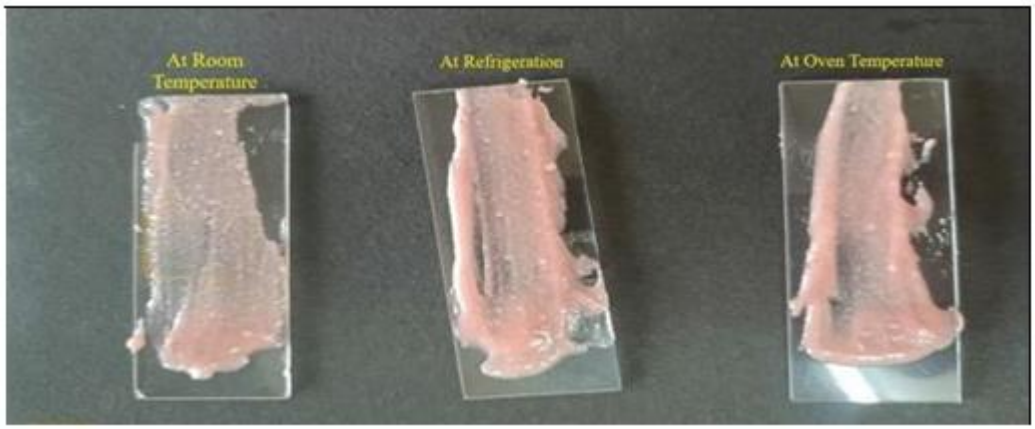

FIG. 5.2: SPREADABILITY TEST.

6. Irritation (Patch) Test:

Purpose: To check the potential of the lip balm to cause irritation on the skin.

Materials: Healthy volunteers, occlusive patches, observation chart.

Method: A small amount of lip balm was applied to the forearm of volunteers and covered with an occlusive patch for 24 hours. The application site was observed for redness, swelling, or itching after 24, 48, and 72 hours.

Result: The lip balm should not cause any visible irritation. Mild and transient redness may occur but should resolve quickly without treatment.

7. Fragrance Stability Observation:

Purpose: To ensure that the fragrance of the lip balm remains pleasant and does not degrade over time.

Materials: Storage samples from the stability study.

Method: At each stability testing interval, the fragrance of the lip balm was evaluated by direct smelling and compared to the original sample.

Result: The fragrance should remain fresh and pleasant throughout the storage period. Any development of off-odors would indicate fragrance instability or oxidation of ingredients

Table 5.3: Evaulation Parameter Test.

Ba	pH	Melting Point (°C)	Spreadability (g·cm/sec)	Surface Anomalies	Washability	Stability
F1	5.4 ± 0.10	58 ± 1	14.2 ± 0.2	Absent	Good	Stable
F2	5.6 ± 0.11	60 ± 1	15.1 ± 0.3	Absent	Good	Stable
F3	5.8 ± 0.09	61 ± 1	16.0 ± 0.2	Absent	Excellent	Stable
F4	5.5 ± 0.10	59 ± 1	14.8 ± 0.3	Absent	Good	Stable
F5	5.7 ± 0.12	60 ± 1	15.6 ± 0.2	Slight	Good	Moderately Stable
F6	6.0 ± 0.10	62 ± 1	16.4 ± 0.3	Absent	Excellent	Stable
F7	5.6 ± 0.11	59 ± 1	15.0 ± 0.2	Absent	Good	Stable
F8	5.9 ± 0.08	61 ± 1	16.1 ± 0.3	Absent	Excellent	Stable
F9	6.1 ± 0.09	63 ± 1	16.7 ± 0.2	Absent	Excellent	Highly Stable

6. RESULT

The prepared polyherbal lip balm was found to be smooth, stable, and easy to apply on lips. The formulation showed good color, pleasant odor, and uniform consistency. The pH was suitable for lip application and no irritation or side effects were observed during the patch test. The Polyherbal lip balm was prepared using natural ingredients like cocoa butter, coconut oil, castor oil, honey, aloe vera gel, beetroot extract, pomegranate extract, rose oil, and vitamin E oil. The prepared lip balm showed good colour, smooth texture, pleasant smell, and good spreadability.

The pH of the formulation was found to be suitable for lips and no irritation was observed during the skin irritation test. The lip balm also showed good moisturizing property and remained stable during stability studies. The reddish-pink colour obtained was due to the presence of beetroot and pomegranate extracts.

TABLE 6.1: EVALUATION PARAMETERS AND EXPECTED VALUES FOR THE POLYHERBAL LIP BALM.

Parameter	Instrument Used	Method/Observation	Expected Values
Physical Appearance	Visual Inspection	Observation of colour, texture, smoothness, and homogeneity	Smooth texture, uniform colour, glossy appearance
pH	pH Meter	pH measured after dispersing sample in distilled water	5.5 – 6.5
Spreadability	Glass Slide Method	Ease of spreading under applied weight	Good spreadability without fragmentation
Viscosity	Brookfield Viscometer	Measurement of flow resistance	20–50 cps
Skin Compatibility	Patch Test	Observation for irritation/redness	No irritation or redness
Moisturization	Sensory Evaluation	Observation of lip hydration and softness	Good moisturizing effect
Stability	Stability Chamber	Storage at different temperatures	No phase separation or colour change
Melting Point	Melting Point Apparatus	Temperature at which balm starts melting	50–65°C
Fragrance Stability	Sensory Evaluation	Observation of fragrance during storage	Pleasant and stable fragrance

7. CONCLUSION

The present study concluded that the polyherbal lip balm was successfully formulated by using natural ingredients such as cocoa butter, coconut oil, castor oil, honey, aloe vera gel, beetroot extract, pomegranate extract, rose oil, and vitamin E oil. The prepared formulations showed good appearance, smooth texture, pleasant smell, good spreadability, and satisfactory stability.

The evaluation tests indicated that the lip balm had suitable pH, good moisturizing property, and no skin irritation. The natural extracts provided colour and antioxidant properties to the formulation. Stability studies showed that the formulation remained stable under different storage conditions.

In conclusion, the polyherbal lip balm formulation not only meets the necessary cosmetic standards but also promises a valuable contribution to the herbal cosmetic industry. With continued research and development, it holds the potential to expand into various cosmetic applications, benefiting a wider audience seeking natural and effective skincare solutions. This study highlights the importance of utilizing natural ingredients, combining ancient wisdom with modern scientific methods, to create safe, effective, and sustainable cosmetic products.

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