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FORMULATION AND EVALUATION OF A POLYHERBAL LIP BALM

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ABSTRACT: The present study focuses on the formulation and evaluation of a natural lip balm utilizing polyherbal ingredients. The formulation incorporates cocoa butter, coconut oil, castor oil, honey, *aloe vera* gel, beetroot extract, pomegranate extract, rose oil, and vitamin E oil to provide moisturizing, antioxidant, and healing benefits. A total of 80 millilitres of lip balm was prepared following a stepwise method: melting the base ingredients, followed by the addition of humectants and heat-sensitive herbal extracts at controlled temperatures to preserve their bioactive properties. The herbal extracts not only impart therapeutic effects but also act as naturalcolorants and fragrance enhancers. The developed lip balm aims to offer effective lip protection, hydration, and a soothing effect, with minimal use of synthetic additives. Evaluation parameters such as appearance, pH, spreadability, melting point, and stability were assessed to ensure the product's efficacy and consumer acceptability. The study highlights the potential of natural and polyherbal formulations in developing safe, effective, and eco-friendly cosmetic products.

INTRODUCTION: The lips, being a prominent and sensitive part of the face, are constantly exposed to environmental stressors such as dry air, cold temperatures, pollution, and ultraviolet (UV) radiation. Unlike other areas of the skin, the lips lack sebaceous glands and a stratum corneum, making them highly vulnerable to dryness, cracking, and chapping. Therefore, maintaining lip health and appearance requires the regular application of protective, moisturizing, and healing formulations like lip balms. Conventional lip balms often contain petroleum-based ingredients and artificial flavours.

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However, growing awareness about the potential adverse effects of synthetic chemicals such as skin irritation, allergic reactions, and long-term health risks has shifted consumer preference toward natural and herbal alternatives. Herbal lip care products, especially polyherbal formulations, offer a holistic and safe solution by combining the healing benefits of various plant-based ingredients. Herbal ingredients are biocompatible, biodegradable, and rich in vitamins, antioxidants, essential fatty acids, and natural colorants.

They provide multiple benefits, such as hydration, healing, anti-inflammatory, and antioxidant effects, making them ideal for long-term cosmetic use. Polyherbal formulations, which incorporate multiple herbs, are known to enhance therapeutic effectiveness through synergistic interactions. This project aimed to formulate a natural polyherbal lip balm using a blend of butters, oils, plant extracts,

and essential oils. 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 calming, antibacterial, and anti-inflammatory properties.
- ❖ Vitamin E Oil supports skin repair and acts as a stabilizing antioxidant.

The formulation process was carefully controlled to preserve the efficacy of heat-sensitive ingredients. Post-formulation, the product was evaluated for parameters such as appearance, pH, spreadability, melting point, and stability. These evaluations ensure product quality, safety, and consumer satisfaction.

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 colour, fragrance, and therapeutic benefits to the lip balm using herbal extracts and essential oils.
- To evaluate the formulated lip balm for various physicochemical parameters, such as:
- Physical appearance (color, texture, homogeneity)
- pH value
- Spreadability
- Melting point
- 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.

Overview of Cosmetic and Lips:

Introduction to Cosmetics: Cosmetics are substances, either synthetic or natural, applied to the body to beautify, cleanse, or enhance appearance without modifying bodily structures or functions. They encompass skincare products, makeup, hair care items, oral hygiene products, and fragrances. Although cosmetics are commonly utilized to enhance beauty, certain products may contain detrimental chemicals that cause health hazards, including skin irritation or carcinogenic effects. Recognizing these hazards is crucial, as cosmetics significantly influence both the fashion sector and everyday existence [1].

Herbal Cosmetics and Their Growing Significance: Herbal cosmetics have gained popularity due to their excellent dermal compatibility. They are formulated with natural constituents such as herbs and shrubs, providing multiple advantages without adverse effects.

Derived from traditional systems such as Ayurveda, Unani, and Homeopathy, these products offer antioxidant, anti-inflammatory, antiseptic, and antibacterial properties, rendering them highly suitable for skincare applications, including anti-aging treatments, anti-acne solutions, and sunscreen formulations.

In contrast to synthetic cosmetics, which can induce skin disorders or toxic reactions, herbal cosmetics nourish the skin with essential nutrients and minerals. The term" Cosmetic Phytocognosy" examines plant-based constituents utilized in cosmetics, highlighting the scientific exploration of botanical elements in beauty products. Contemporary cosmeceuticals integrate natural elements with technological advancements, delivering safe, hypoallergenic, and dermatologist-approved products. Coined in 1961, cosmeceuticals combine cosmetic and therapeutic advantages, enhancing both skin health and aesthetics. As the demand for natural alternatives continues to rise, herbal cosmetics are redefining personal care by harmonizing nature's resources with innovative science to provide effective and safe beauty solutions [2].

Anatomical Structure of the Lips: The lips consist of five primary anatomically distinct zones: the vermilion/white roll, subvermilion, peristomal, philtral column, and commissural regions. The lower lip vermilion is divided into medial and lateral zones, while the upper lip vermilion/white roll is further categorized into lateral, apical cupid's bow, and centralphiltral zones. The subvermilion and peristomal areas are also divided into medial and lateral subdivisions. The lips are delineated into four distinct regions: oral mucosa, hairy skin, vermilion rim, and vermilion. The vermilion, known for its characteristic red colour, is covered by specialized stratified squamous epithelium. The cupid's bow defines the upper lip, while the cinnabar border separates the vermilion from the adjacent lighter facial skin.

Functional and Structural Composition of the Lips: The upper and lower lips, known as the labium superius oris and labium inferius oris, respectively, are composed of mucosa, vermilion, and cutaneous surfaces. The lower lip extends from the lateral commissures to the labiomental crease, while the upper lip spans from the nasolabial folds to the base of the nose. The lips converge at the commissure, where numerous muscles responsible for various lip movements are anchored.

The lips are densely populated with sensitive nerve endings and feature a transitional reddish skin area called the vermilion border. In neonates, the inner surfaces of the lips are denser and enveloped by a moist mucous membrane; sebaceous glands and papillae facilitate suction. The orbicular is oris muscle, along with adjacent facial muscles, provides structural support and enables a variety of lip movements essential for functions such as speech, suction, and facial expression. Structurally, the lips are composed of skin, superficial fascia, muscles, areolar tissue, and a mucous membrane. The superior and inferior midline folds, or labial frenula, form as extensions of the inner mucous membrane connecting the lips to the gums. These elements highlight the critical role of the lips in both aesthetic appearance and physiological functions, illustrating their intricate anatomy and versatility [3].

Disorders of Lips:

Allergic Reactions: Lip swelling can occur due to allergic reactions triggered by sensitivity to foods, beverages, medications, cosmetics, or airborne irritants. Typically, the swelling reduces once the underlying cause is identified and eliminated, though in some cases, the cause may remain unknown. Hereditary angioedema is a genetic condition that is characterized by recurrent episodes of lip swelling.

Sun-Related Damage: Prolonged sun exposure can cause the lips, especially the lower lip, to become dry and hard. Visible damage often appears as red spots or a white film, increasing the risk of cancer. Preventive measures include wearing a wide-brimmed hat and using lip balms with sunscreen to protect against harmful ultraviolet rays.

Inflammation and Other Conditions: Cheilitis, a condition causing painful, irritated, fissured, or scaly lip corners, may result from a deficiency of vitamin B2. Melanotic macules, which appear as freckles or brownish spots around the lips, are generally harmless.

However, numerous small brownish-black spots can indicate "Peutz-Jeghers syndrome", a hereditary disorder.

Additionally, Kawasaki disease a condition affecting children under eight manifests through dry, glossy lips, erythema of the oral mucosa, and other symptoms.

Lesions and Health Concerns: Lip lesions or ulcers with well-defined borders might signify skin cancer. Other sores could indicate conditions like syphilis or oral herpes simplex virus infection. Certain issues, such as keratoacanthoma, lack a known cause. Maintaining lip health is essential for the early detection and treatment of potential underlying medical concerns [4].

MATERIALS AND METHODS

Drug Profile of Ingredients Used:

TABLE 1: COCOA BUTTER

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

FIG. 1: COCOA BUTTER

Detailed Profile: Cocoa butter, derived from the seeds of Theobroma cacao, is a highly stable fat commonly utilized in cosmetics, pharmaceuticals, and food industries. It is extracted by fermenting, drying, roasting, and pressing cocoa beans. It is renowned for its rich emollient properties, making it a favoured ingredient in lip care products. Cocoa butter is rich in saturated and monounsaturated fats, predominantly stearic acid, oleic acid, and palmitic acid. It also contains minor compounds like phytosterols and antioxidants such as polyphenols. These components collectively contribute to cocoa butter's moisturizing, healing, and protective actions on the skin. One of the most remarkable features of cocoa butter is its ability to create a barrier that slows down the loss of moisture, maintaining skin hydration over extended periods. This barrier-forming property is particularly advantageous for lip balms, as lips are prone to dehydration due to constant exposure to environmental elements such as wind, cold temperatures, and sun.

Moreover, the antioxidant content in cocoa butter, especially polyphenols, provides anti- aging benefits by neutralizing free radicals, thereby protecting the lips from premature aging signs like dryness, wrinkling, and pigmentation. The smooth and semi-solid consistency of cocoa butter at room temperature offers excellent spreadability and adds a creamy texture to lip balm formulations, enhancing the user experience. In addition, cocoa butter has a mild, pleasant cocoa fragrance, which naturally enhances the sensory appeal of cosmetic products. Its hypoallergenic nature ensures it is well-tolerated even by sensitive skin types, reducing the likelihood of allergic reactions or irritations. In this formulation, cocoa butter serves as one of the main base components, providing the structural framework of the lip balm. It ensures that the product maintains its semi-solid consistency, enabling easy application while delivering superior moisturization. The soothing effect of cocoa butter aids in healing cracked or chapped lips, making it indispensable for any effective lip care product [5, 6].

TABLE 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.

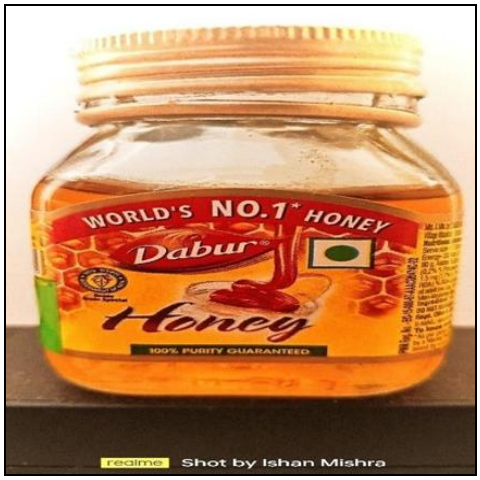

FIG. 2: HONEY

Detailed Profile: 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 oilglands 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, and essential minerals including calcium, potassium, and magnesium. These nutrients work synergistically to nourish the delicate skin of the lips, promoting cell regeneration and enhancing overall lip health. Furthermore, honey possesses potent antibacterial and antimicrobial properties. It has been used for centuries in wound healing due to its ability to inhibit bacterial growth and create a protective barrier against infections. In lip balm formulations, this antibacterial action helps in preventing infections in cracked lips and promotes faster healing. Honey also contains natural antioxidants, which assist in combating oxidative stress caused by environmental factors such as UV radiation and pollution. By neutralizing free radicals, honey helps prevent the early aging of the lips, preserving their softness, elasticity, and youthful appearance.

The application of honey also imparts a subtle natural sweetness and fragrance to the lip balm, enhancing the sensory experience without the need for artificial flavours or sweeteners. Its soothing and anti-inflammatory effects further calm irritated or inflamed lips, making it particularly beneficial for individuals with sensitive skin. In the context of natural lip balm formulation, honey is added during the cooling phase to preserve its bioactive components. The incorporation of honey not only enhances the therapeutic value of the lip balm but also aligns with consumer preference for natural, chemical-free, and effective skincare products. Thus, honey's multifunctional role as a humectant, antibacterial agent, antioxidant, and healing promoter makes it an indispensable ingredient in natural polyherbal lip balm preparations [7, 8].

TABLE 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.

FIG. 3: CASTOR OIL

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.

The high concentration of ricinoleic acid in castor oil also contributes to its anti-inflammatory and soothing effects. It can help reduce irritation and inflammation, which is especially useful for individuals with sensitive skin or those suffering from cracked lips. Its calming effect on the skin supports the healing process and promotes faster recovery from dryness or damage. Additionally, castor oil possesses mild antimicrobial properties that help prevent bacterial infections on the lips. This is particularly important for individuals with cracked lips, as open wounds or cuts can make the lips more susceptible to infection. By preventing infection and promoting healing, castor oil enhances the overall efficacy of lip balms formulated for therapeutic purposes.

Castor oil also provides a glossy, smooth finish to lip balms, which improves the product's aesthetic appeal. The oil's viscous consistency allows it to adhere to the skin, providing lasting protection and shine. As a result, it plays an essential role in enhancing the sensory experience of the lip balm, ensuring smooth application and a non greasy feel while still delivering intense moisture. Beyond its benefits for the skin, castor oil is also an excellent choice for improving the overall texture and consistency of cosmetic formulations.

In lip balm, it contributes to a rich, creamy texture that ensures easy and comfortable application without being too sticky or heavy. The inclusion of castor oil in lip balm formulations aligns with the growing trend toward using natural ingredients in cosmetic products. Its plant-based origin and skin-friendly properties make it a preferred choice for consumers looking for safe, effective, and non-toxic alternatives to synthetic chemicals in their beauty routines.

In summary, castor oil's ability to soften, moisturize, and protect the skin, combined with its anti-inflammatory and antimicrobial properties, makes it a vital ingredient in lip balms. Its smooth texture and long-lasting effects help keep the lips hydrated and healthy, making it an indispensable component in any lip care formulation [9].

TABLE 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: COCONUT OIL

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.

It works by forming a protective layer over the skin that helps shield it from these elements while locking in moisture. This protective barrier is particularly useful for individuals who are frequently exposed to extreme weather conditions that can cause their lips to become chapped or cracked. In addition to its moisturizing and protective properties, coconut oil has mild antimicrobial activity, which helps to prevent the growth of harmful bacteria on the skin. This is particularly beneficial for lip balms, as cracked or chapped lips can sometimes become vulnerable to bacterial infections. Coconut oil's ability to act as a natural antimicrobial agent promotes faster healing and reduces the risk of infection in damaged skin. The presence of antioxidants, including vitamin E, in coconut oil also makes it beneficial for combating oxidative stress caused by free radicals. Free radicals are molecules that can cause damage to skin cells, leading to premature aging and skin degradation. By neutralizing these free radicals, coconut oil helps to maintain the health and appearance of the lips, contributing to a more youthful, smooth, and plump look.

Furthermore, coconut oil has soothing and anti inflammatory properties that help reduce irritation and inflammation, making it ideal for individuals with sensitive lips. Whether caused by environmental factors, allergies, or other irritants, the soothing properties of coconut oil can provide relief to irritated or inflamed lips, calming redness and discomfort. Coconut oil is also highly valued for its light, pleasant fragrance, which adds to the sensory appeal of lip care products without the need for artificial fragrances. Its natural, tropical aroma is gentle and refreshing, enhancing the overall user experience. In summary, coconut oil's ability to moisturize, protect, and soothe the skin makes it an essential ingredient in lip balm formulations. Its combination of antimicrobial, antioxidant, and anti-inflammatory properties ensures that lips remain hydrated, protected, and healthy. Whether used to heal cracked lips, prevent dryness, or provide long-lasting moisture, coconut oil is an indispensable component in any effective lip care product [10].

TABLE 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. 5: *ALOE VERA* GEL

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 moisturizing properties. *Aloe vera* gel contains a wealth of bioactive compounds, including polysaccharides, glycoproteins, amino acids, enzymes, and a variety of vitamins and minerals that contribute to its wide array of skin benefits. One of the most notable properties of *Aloe vera* gel is its ability to provide intense hydration and moisture. The gel contains a high amount of water, which makes it an excellent humectant, drawing moisture from the air and locking it into the skin. This makes *Aloe vera* gel an ideal ingredient in lip balm formulations, where maintaining moisture and preventing dryness is a top priority. When applied to the lips, *Aloe vera* gel helps to keep them soft, smooth, and hydrated, reducing the likelihood of cracking or chapping. *Aloe vera* also has powerful soothing and anti-inflammatory properties, which are beneficial for calming irritated or inflamed skin. For individuals with sensitive or damaged lips, *Aloe vera* gel can help reduce redness, swelling, and discomfort caused by sunburn, windburn, or environmental stressors. The cooling effect of *Aloe vera* gel provides immediate relief to painful or irritated lips, promoting a more comfortable lip care experience.

The healing properties of *Aloe vera* gel are also well-documented. It stimulates cell regeneration and accelerates wound healing, making it an excellent choice for repairing cracked or damaged lips. The polysaccharides and glycoproteins in *Aloe vera* gel help to stimulate the production of collagen, which is essential for skin repair and regeneration. This makes *Aloe vera* particularly effective in promoting the healing of cuts, cracks, or abrasions on the lips, ensuring that the skin recovers quickly and without scarring.

In addition to its moisturizing and healing benefits, *Aloe vera* gel is rich in vitamins A, C, E, and B12, all of which contribute to skin health and protection. Vitamin E, in particular, acts as a potent antioxidant that helps to neutralize free radicals, protecting the lips from premature aging and oxidative damage caused by environmental factors such as UV rays and pollution. *Aloe vera* gel's light, non-greasy texture allows for easy application, providing a smooth and refreshing sensation without feeling heavy or sticky. It also enhances the overall feel of the lip balm, giving it a pleasant, soothing quality that makes it ideal for use throughout the day.

As a natural ingredient, *Aloe vera* gel is well-suited for individuals with sensitive skin, as it is less likely to cause irritation or allergic reactions compared to synthetic additives. It is also suitable for all skin types, including dry, oily, or combination skin, making it a versatile and inclusive ingredient in lip care products. In conclusion, *Aloe vera* gel is a highly effective and beneficial ingredient in lip balm formulations due to its moisturizing, soothing, anti-inflammatory, and healing properties. It helps to keep the lips hydrated, calm irritation, and promote the healing of damaged or cracked lips, making it an essential component in any lip care product aimed at providing long-lasting comfort and protection [11, 12, 13].

TABLE 6: BEETROOT EXTRACT

Beet Root Extract	
Biological Name:	*Beta vulgaris*
Family:	Amaranthaceae
Part Used:	Root
Constituents:	Beta lains (beta cyanins and beta xanthins), Folates, Vitamin C, 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. 6: BEET ROOT EXTRACT

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.

Beetroot extract also has anti-inflammatory properties, which are beneficial for calming irritation or inflammation. For lips that are cracked, chapped, or otherwise irritated, beetroot extract can help soothe the skin and reduce redness or swelling, promoting quicker healing. The anti-inflammatory compounds in beetroot extract also help reduce the risk of further irritation from environmental factors such as sun exposure or harsh weather conditions. In addition to its healing and protective properties, beetroot extract is rich in vitamins and minerals that nourish and condition the skin. Vitamin C, a potent antioxidant, helps in the production of collagen, which is essential for maintaining the structure and elasticity of the skin. The presence of folates, iron, and potassium further contributes to the nourishment and overall health of the lips, ensuring that they remain supple and hydrated. The extract also adds a natural tint to the lip balm, providing a soft, healthy color without the need for artificial dyes or pigments.

This makes it a popular choice in natural cosmetics, where consumers are increasingly seeking products with clean, plant-based ingredients. The natural color imparted by beetroot extract can enhance the aesthetic appeal of lip balms, making them more appealing to consumers who prefer organic and natural beauty products. Moreover, beetroot extract has mild exfoliating properties, which help remove dead skin cells from the surface of the lips.

This gentle exfoliation can result in smoother, softer lips, and its inclusion in a lip balm formulation helps to enhance the overall texture of the lips, making them feel refreshed and rejuvenated. Beetroot extract is also known for its ability to hydrate and moisturize the skin, which is essential in preventing the lips from becoming dry or cracked. When used regularly, it helps maintain the softness and suppleness of the lips, ensuring that they remain healthy and nourished.

In conclusion, beetroot extract offers multiple benefits for lip balm formulations, including antioxidant protection, anti-inflammatory effects, nourishment, and natural colour. Its ability to hydrate, soothe, and enhance the appearance of the lips makes it an ideal ingredient in lip care products that aim to improve lip health and provide a natural, vibrant look [14, 15].

TABLE 7: POMEGRANATE EXTRACT

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. 7: POMEGRANATE EXTRACT

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.

The antioxidant properties of pomegranate extract are one of its most significant benefits. Punicalagins, which are the primary antioxidants in pomegranate, are highly effective at neutralizing free radicals. Free radicals, generated by environmental stressors like UV rays, pollution, and harsh weather, contribute to skin aging and damage. By protecting the lips from oxidative stress, pomegranate extract helps maintain the lips' natural smoothness and elasticity, preventing premature aging and the development of fine lines and wrinkles. In addition to its antioxidant activity, pomegranate extract has powerful anti-inflammatory properties. The flavonoids and ellagic acid present in the extract work to reduce inflammation, which can be particularly beneficial for lips that are chapped, cracked, or irritated. These compounds help to soothe and calm the skin, promoting faster healing and reducing the risk of infection or further irritation. For individuals who suffer from sensitive lips or environmental irritants, pomegranate extract offers gentle relief and protection.

Pomegranate extract is highly regarded for its anti-aging benefits, primarily due to ellagic acid, which helps prevent collagen and elastin breakdown, keeping lips plump and youthful. It also provides deep hydration, working alongside coconut oil and aloe vera to maintain moisture levels and prevent dryness. Rich in antioxidants, pomegranate extract protects the lips from environmental damage while soothing and nourishing them. Additionally, it contains anthocyanins, responsible for its vibrant red hue, offering a natural tint to lip balms while enhancing aesthetic appeal.

As consumers seek natural and plant-based skincare, pomegranate extract has become a multifunctional ingredient that promotes lip health by hydrating, protecting, and rejuvenating. Its ability to preserve collagen, provide moisture, and deliver antioxidant benefits makes it an ideal choice for lip balms designed to combat aging and enhance lip softness. The natural pigment and protective qualities of pomegranate extract make it a valuable addition to cosmetics that enhance lip colour while maintaining health.

In conclusion, pomegranate extract offers a wide range of benefits for lip care, including antioxidant protection, anti-inflammatory effects, anti-aging properties, and hydration. Its ability to nourish and protect the delicate skin of the lips makes it an essential ingredient in lip balm formulations designed to maintain youthful, healthy, and beautiful lips [16, 17].

TABLE 8: ROSE OIL

	Rose Oil
Biological Name:	*Rosa damascene*
Family:	Rosaceae
Part Used:	Petals
Constituents:	Citronellol, Geraniol, Nerol, Phenylethylalcohol, 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. 8: ROSE OIL

Detailed Profile: Rose oil, derived from the petals of *Rosa damascena*, 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.

Rose oil contains various bioactive compounds, including citronellol, geraniol, nerol, and phenylethyl alcohol, which are responsible for its therapeutic effects. These compounds contribute to rose oil's powerful antioxidant and anti-inflammatory properties, making it an excellent choice for soothing and rejuvenating the skin. One of the key benefits of rose oil is its ability to deeply hydrate and moisturize the skin. The oil is rich in essential fatty acids, which help to lock in moisture and prevent the skin from becoming dry or chapped. In lip balms, rose oil helps to keep the lips soft, smooth, and nourished, making it particularly beneficial during colder months when the lips are more prone to drying out.

The moisturizing properties of rose oil also contribute to the elasticity of the lips, helping to maintain their plump and youthful appearance.

The antioxidant qualities of rose oil go beyond hydrating. Rose oil antioxidants, including flavonoids, neutralize free radicals and protect skin from oxidative stress. Free radicals damage collagen and elastin fibres, causing wrinkles, fine lines, and skin suppleness. Rose oil protects the lips from oxidative damage, preventing premature aging and keeping them looking young.

Rose oil is calming and anti-inflammatory. It soothes sensitive skin, making it suitable for lip balms that treat cracked, painful, or chapped lips. Rose oil's anti-inflammatory ingredients minimize redness, swelling, and irritation, speeding healing and relieving sunburn and windburn. Rose oil also rejuvenates skin cells. This softens and smoothes lips. In lip balms, rose oil adds aroma.

The product's beautiful flowery scent makes it more delightful to apply. Rose oil fragrance reduces tension and promotes relaxation. This makes it a great complement to lip balms that care for the lips and relax the mind. In conclusion, rose oil is a versatile and beneficial ingredient in lip balm formulations due to its antioxidant, anti inflammatory, moisturizing, and rejuvenating properties.

It helps to hydrate, soothe, and protect the lips while enhancing their appearance and promoting healing. The addition of rose oil in lip care products ensures that the lips remain soft, smooth, and youthful, while also offering a fragrant, calming experience [18].

TABLE 9: VITAMIN-E-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. 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 and Tocotrienols boost its antioxidant properties. These chemicals are found in wheat germ, sunflower, and safflower oils. Vitamin E in its synthetic form is used in skincare formulations because it is more stable and absorbs better. Vitamin E's antioxidant properties make it a great lip balm ingredient. Free radicals, produced by pollution, UV radiation, and stress, are the main cause of skin aging and damage. Free radical neutralization by vitamin E protects skin and lips from oxidative stress. The lips need this protection to prevent fine lines, wrinkles, and other signs of ageing. Vitamin E is known for its antioxidant and moisturizing properties. Emollients help lips stay hydrated. Vitamin E keeps lips soft, smooth, and nourished by preventing chapping and flakiness. Vitamin E has legendary skin-rejuvenating and therapeutic properties. It restores damaged skin, making it ideal for chapped or fissured lips. The vitamin improves blood circulation and skin cell regeneration to speed up healing. It is ideal for lip balms that rejuvenate and protect lips from environmental damage. Vitamin E provides moderate UV protection in lip care formulations. Vitamin E can absorb some UV rays and reduce sun damage, but it cannot replace sunscreen. This preventive function prevents sunburn and premature lip aging from UV radiation. This matters because lip skin is delicate and more susceptible to UV damage. Vitamin E reduces skin inflammation. Vitamin E's anti-inflammatory properties reduce redness, swelling, and discomfort, speeding lip healing and preventing further irritation. Furthermore, Vitamin E smooths and softens the lips, making them feel plumper and more youthful. Regular use of Vitamin E in lip balm can help maintain the lips' suppleness and prevent them from becoming rough or dry, contributing to a healthier and more radiant smile. The inclusion of Vitamin E in lip care products ensures that the lips remain healthy, soft, and youthful, providing long-lasting protection and care [19].

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 [20].

Advantage of Lip Balms: Lip balms provide protection, hydration, and healing, thereby maintaining the health and appearance of the lips.

Ultraviolet Protection: Sunblock lip balms effectively shield the lips from harmful UV radiation, preventing sun damage and promoting long-term lip health.

Global Compatibility: These products are versatile and accessible to everyone, as they are designed for all genders.

Remedy for Lip Damage: Lip balm formulations alleviate lips damaged by cold sores, chapping, and dryness, improving skin condition.

Comfort and Protection: Optimal lip balms ensure effortless application, preventing dryness or friction. They create a uniform protective barrier across the lips that safeguards them from external factors like UV radiation, desiccation, and pollution.

Rejuvenation and Restoration: Lip balms promote healthy, supple lips by rejuvenating and revitalizing them, alleviating issues caused by colds, flu, or allergies.

Enhancing Natural Aesthetics: Natural lip cosmetics combine aesthetics with care by improving lip skin quality, enhancing facial attractiveness [21].

Disadvantage of Lip Balm:

Inferior Ingredients: Lip balms composed of substandard components may damage the lips, potentially leading to dryness rather than delivering hydration.

Lip Balm Dependency: Regular application may result in a habitual dependence on lip balm, occasionally termed "lip balm addiction."

Reduced Durability: Homemade lip balms typically have a shorter duration of effectiveness compared to commercially manufactured alternatives, necessitating more frequent reapplication.

Emphasis on Aesthetics over Health: Certain brands prioritize visual appeal over lip care, resulting in products that may gradually reduce the natural colour, smoothness, and luster of the lips.

Challenges with Natural Ingredients: Naturally sourced colours and flavours are more difficult to procure and may provide stability challenges in formulations.

Disadvantages of Natural Oils: Some natural oils may be excessively greasy, comedogenic (pore-clogging), and possess reduced spreadability, hence impacting usability [4].

Comparison of Herbal and Synthetic Lip Balms:

Synthetic Lip Balm Ingredients: These lip balms commonly contain petroleum-based components such as mineral oil and petrolatum, along with chemically manufactured emollients. These substances provide an initial glossy appearance and extend shelf life.

Potential Risks of Synthetic Lip Balms: While synthetic ingredients enhance durability, they may cause irritation or allergic reactions in individuals with sensitivities. Additionally, they offer only short-term moisturization without nourishing the lips at a cellular level.

Herbal Lip Balm Benefits: Herbal lip balms, particularly those formulated with natural extracts like pomegranate and beetroot, enhance the lips' appearance while providing medicinal benefits.

Advantages of Pomegranate Extract: Pomegranate boasts strong anti-inflammatory properties and promotes collagen production, leading to better barrier function and sustained hydration.

Effects of Beetroot Extract: Beetroot is rich in vitamins and antioxidants, naturally enhancing lip color while offering nourishment.

Health-Friendly Composition of Herbal Lip Balms: These formulations avoid synthetic components and preservatives that may harm the body, making them safer for regular use.

Sustainable Beauty Trend: The rising preference for environmentally responsible beauty products reflects a shift toward herbal alternatives that support both personal care and sustainability.

Holistic Lip Care: By addressing both immediate hydration and long-term lip health, herbal lip balms offer a compelling alternative to conventional synthetic options [22].

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 moisturizing properties 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. 10: PREPARATION OF BASE INGREDIENTS

Addition of Humectants: Once the base 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 of the hydrophilic components within the lipophilic 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 the 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 fragrance and therapeutic potency without 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.

After complete solidification, the lip balm samples were labelled appropriately and stored in a cool, dry place for further evaluation and testing [23, 24, 25].

TABLE 10: INGREDIENTS AND QUANTITIES USED IN THE POLYHERBAL LIP BALM FORMULATION

Sr. no.	Ingredient	Quantity (for 80ml)	Purpose	Manufacturers
1	Cocoa Butter	25ml	Base, moisturization, solidifier	Genuine Chemical Co., Mumbai
2	Coconut Oil	15ml	Moisturizer, antimicrobial base	Marico Ltd.
3	Castor Oil	10ml	Emollient, gloss enhancer	Gautam Pvt. Ltd
4	Honey	5ml	Humectant, healing agent	Dabur India Ltd.
5	Aloe Vera Gel	15ml	Soothing, healing, and hydratingagent	Lab Scale
6	Beetroot Extract	3ml	Natural colorant, antioxidant	Lab Scale
7	omegranate Extract	3ml	Antioxidant, skin rejuvenator	Lab Scale
8	Rose Oil	2ml	Fragrance, a soothing agent	Essential Extracts
9	Vitamin E Oil	2ml	Antioxidant protects the lip skin.	Procter & Gamble Health Ltd.

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.

Physical Appearance:

Purpose: To assess the external features such as colour, texture, homogeneity, and surface uniformity of the lip balm, ensuring it is cosmetically acceptable.

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.

RESULT: The lip balm should display a smooth, glossy, and even surface with uniform colour

throughout. It should not show signs of crystallization, oil separation, or any lumps.

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.

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.

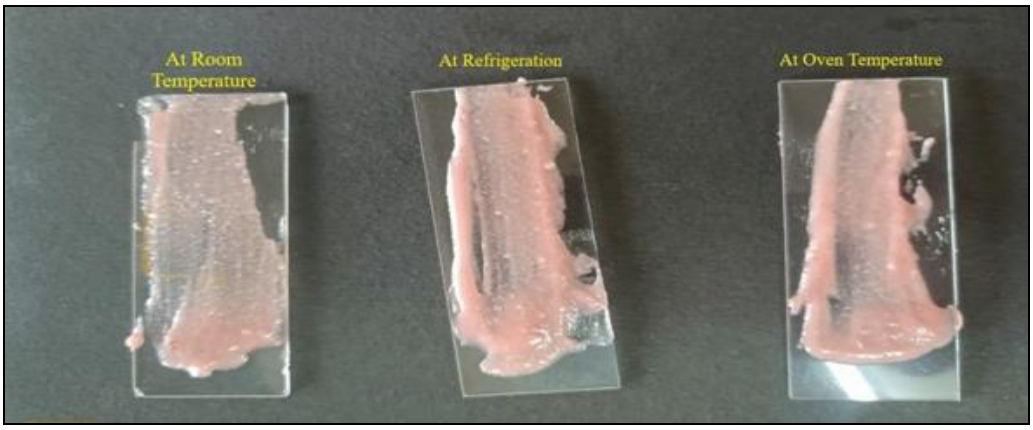

FIG. 11: SPREADABILITY TEST

Melting Point Determination:
Purpose: To ensure that the lip balm remains solid at room temperature but melts upon application to the lips.
Materials: Melting point apparatus, capillary tubes.

Method: The lip balm was filled into a capillary tube and placed in a melting point apparatus. The temperature at which the balm started to melt was recorded.

Result: The lip balm should have a melting point between 60°C and 70°C, allowing it to remain stable under normal storage conditions but soften easily on contact with the skin.

Stability Testing:
Purpose: To determine the stability of the lip balm under different storage conditions over time.

Materials: Incubators are set at 4°C (refrigeration), 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.

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.

Stickiness and Hardness Testing:
Purpose: To determine if the lip balm is of appropriate firmness and if it leaves an undesirable sticky feeling after application.

Materials: Texture analyzer (optional), finger pressure method.

Method: The hardness was tested by applying finger pressure to the balm and noting the resistance. Stickiness was assessed by rubbing the balm between two fingers and observing the tackiness.

Result: The balm should be firm enough to retain its shape but soft enough for easy application. It should not feel excessively sticky on the lips or fingers.

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.

RESULT:

TABLE 11: EVALUATION PARAMETERS AND EXPECTED VALUES FOR THE POLYHERBAL LIP BALM

Parameter	Instrument Used	Reading/Method	Expected Values
Physical Appearance	Visual Inspection	Observation of colour, texture, and consistency	Smooth texture, uniformcolour, pleasant consistency
pH	pH Meter	Measurement of pH by dissolving a sample in distilled water	pH:6.0-6.5 (Ideal Range)
Spread ability	Penetrrometer or Texture Analyzer	The force required to spread the lip bam over a fixed surface.	Good spread ability with minimal effort to apply.
Viscosity	Brookfield Viscometer	Measurement of flow resistance at different shear rates	Viscosity:20-50 cps (centipoise)
Skin Compatibility	Skin Patch Test	Observation of skin reactionaftera24-48 hour patch test on the skin	No irritation or redness observed.
Moisturization	Moisture Content Analyzer (Karl Fischer)	Measurement of water content in the lip balm.	Moisture content: 0.5% - 5%
Stability	Stability Chamber/Room Temperature Monitoring	Observation under different temperature and humidity conditions for several weeks	No visible changes (phase separation, discoloration, etc.)
Melting Point	Melting Point Apparatus	The temperature at which the lipbalms tarts to melt	Melting Point: 35°C - 45°C

CONCLUSION: The formulation and analysis of a polyherbal lip balm with ingredients like cocoa butter, honey, castor oil, coconut oil, aloe vera gel, beetroot extract, pomegranate extract, rose oil, and vitamin E have demonstrated positive outcomes both in terms of preparation and evaluation. The successful blending of these natural ingredients not only aligns with the growing demand for organic and safe cosmetic products but also offers numerous benefits such as moisturization, nourishment, and protection for the lips. Through rigorous testing and evaluations, it was found that the lip balm exhibited smooth texture, ideal consistency, and good spreadability. The product also showed excellent skin compatibility with no signs of irritation or adverse reactions, which is

crucial for ensuring safety in cosmetic formulations. The stability testing confirmed the product's ability to retain its quality over time, further solidifying its potential for commercial use. In terms of therapeutic properties, the polyherbal lip balm displayed the beneficial characteristics of its key ingredients, such as antioxidants from beetroot and pomegranate, anti-inflammatory benefits from aloe vera, and moisturizing effects from natural oils. The use of herbal and natural extracts provides a unique advantage over synthetic alternatives, offering a safer, more holistic approach to lip care. Moreover, the lip balm's formulation demonstrated a balanced pH level, maintaining optimal conditions for skin health. The product also met the required microbial safety standards, ensuring its hygiene and safety for consumer use.

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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