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## Review Paper

# A Comprehensive Review on Natural Lip Balm

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### ABSTRACT

Lip balm is used to protect, hydrate, and improve the appearance of the lips. Despite being manufactured as a major cosmetic-product, limited studies have been conducted on the safety and efficacy of various formulation with or without active pharmaceutical ingredient. This paper is aimed to provide stepwise approach by reviewing publications, patents, and regulatory guidance issued between 2000 and 2024. Lip balm is formulated by using waxes, oils, colouring agent and flavouring agent. It is administered using local route or novel delivery systems. It may also consist of antioxidants, SPF agents, antimicrobial compounds, and herbal extracts with therapeutic benefit. It is manufactured at a very large scale to cater the widespread demand all over the world specially in winter season. This cosmetic product undergoes standardised in vitro and in vivo testing procedures, quality control and quality assurance to ensure that it gives sustained moisturization and in some cases UV protection and prevent discolouration of lips. This paper provides a comprehensive review and delve into development and regulatory framework, highlighting various research areas smart-release technologies, biodegradable packaging, and evidence-based evaluation of natural actives ingredients

### INTRODUCTION

Lip balm is a commonly used consumer-applied personal care product that plays an important role in soothing and hydrating the lips. Initially developed to protect and moisturize the lips, contemporary lip balms are formulated to manage conditions such as dryness, chapping, and cracking caused by environmental factors including wind, sun exposure, and low temperatures. The skin of

the lips is thinner and softer than that of other body parts, which makes it more susceptible to dryness and damage [1]. To provide protection, retain moisture, and promote healing, lip balms are typically formulated with emollients, humectants, and occlusive agents. Over time, lip balms have evolved from simple wax-based products to advanced formulations containing active ingredients such as vitamins, antioxidants, and herbal extracts. These developments aim to

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enhance product performance while meeting consumer demand for natural and environmentally friendly ingredients [2]. Lip balms are currently available in various forms, including sticks, pots, and tubes, offering convenience and flexibility to users. Despite their widespread use, increasing attention has been directed toward understanding the safety, effectiveness, and environmental impact of lip balm products. This work attempts to provide a comprehensive overview of lip balms, focusing on their composition, mechanism of action, advantages, and limitations. The article has been prepared to offer useful information on lip balm formulation and application, based on recent research findings and current trends, to support informed decisions for effective lip care [3,4].

Modern lifestyles rely heavily on cosmetic products, and the concept of sustainability has gained importance across industries, including cosmetics, to promote a more natural way of living. Natural foods, herbal preparations, and organic products are increasingly preferred for maintaining health, and similar preferences are reflected in personal care choices. As a result, the use of herbal cosmetics has expanded significantly [5]. Natural substances have been used worldwide for medicinal purposes for thousands of years, and many possess pharmacological properties such as antibacterial, anti-inflammatory, and cytostatic activities, which have been recognized in human medicine [6]. The practice of colouring lips to enhance appearance has existed for centuries, leading to a wide range of lip products with different colours and textures. Lipsticks, lip jellies, and lip balms are now available in numerous shades to satisfy consumer preferences. The present work focuses on the detailed investigation of natural lip balms, based on an extensive review of literature addressing natural excipients, formulation approaches, and evaluation methods. Organoleptic properties such as colour, aroma, spreadable, pH, melting point, skin irritation

potential, and product stability are commonly assessed. Product colour can indicate freshness and quality, and natural colorants are generally considered less harmful than synthetic alternatives [7–10].

Public interest in herbal cosmetic formulations continues to grow, supported by the development of new technologies and processes that enable the use of organic raw materials [11]. Organic-certified ingredients and products are obtained through systematic cultivation and careful maintenance of raw materials used in lip balm production. These ingredients are preferably free from harmful chemical pesticides and fertilizers and are stored using natural methods under appropriate conditions [12]. Lips are particularly prone to dryness, chapping, and cracking during extreme weather conditions because they lack oil glands and therefore require additional protection and moisture throughout the day. Dry lips are commonly experienced during winter, and in some individuals, the condition persists into summer. Many synthetic lip balms contain ingredients such as petrolatum, synthetic waxes, parabens, alumina, and artificial fragrances and colours. Since lip balms may be unintentionally ingested, it is essential to thoroughly evaluate formulation components to prevent potential short-term or long-term adverse effects. Lipsticks and lip balms serve distinct purposes, as lipsticks are primarily used for colouring the lips, whereas lip balms are intended to protect and nourish them [11]. Dry lips, also known as chapped lips or cheilitis, can result from behavioural habits, environmental exposure, or underlying medical conditions. Common contributing factors include dry weather, sun exposure, dehydration, frequent lip licking, and certain medications. Preventive and management strategies include adequate hydration, use of lip balms containing sun protection, avoidance of lip biting or licking, and use of humidifiers. Lip skin exhibits higher trans-



epidermal water loss and lower stratum corneum water content compared to cheek skin, resulting in increased dryness and roughness. Lip balms are therefore applied to reduce water loss by forming an occlusive barrier. While specific care agents have been shown to improve lip roughness, the effects of occlusion alone, achieved through formulations without targeted care agents, have not been clearly documented. The objective of this study was to evaluate whether a highly occlusive formulation composed of commonly used oils and waxes, rather than specific active care agents, could improve lip dryness and roughness [12–14].

### 1. Anatomy of Lips:

The lips play an essential role in functions such as speech, suction, and sensory perception. Anatomically, they are composed of the epidermis, the orbicularis muscle, superficial fascia, and adjacent musculature, along with mucous membrane and areolar tissue. The margins of the lips are covered by a dry, reddish mucous membrane that is continuous with the skin and contains numerous vascular papillae and tactile corpuscles. Internally, this mucous membrane reflects from the upper and lower lips onto the

gums, forming superior and inferior midline folds known as the labial frenula [15,16]. The areolar tissue, also referred to as the submucous layer, contains the coronary vessels, which encircle the buccal orifice close to the free margin of the lips. These vessels include the superior and inferior coronary arteries, which arise from the facial artery. The superior coronary artery is larger than the inferior and anastomoses with its counterpart on the opposite side, also giving rise to a small branch supplying the nasal septum. Compression of this vessel may occasionally assist in controlling epistaxis [17]. Venous drainage is provided by the coronary vein, also known as the superior labial vein, which originates as a plexus within the orbicularis muscle of the upper lip. This vein runs parallel to the coronary artery and drains into the facial vein just below the alae of the nose. Veins draining the lower lip typically pass to the submental vein and subsequently to the facial vein or, in some cases, to the anterior jugular vein. The inferior coronary vein usually empties into the facial vein slightly below the point where the superior labial vein terminates [18–20].

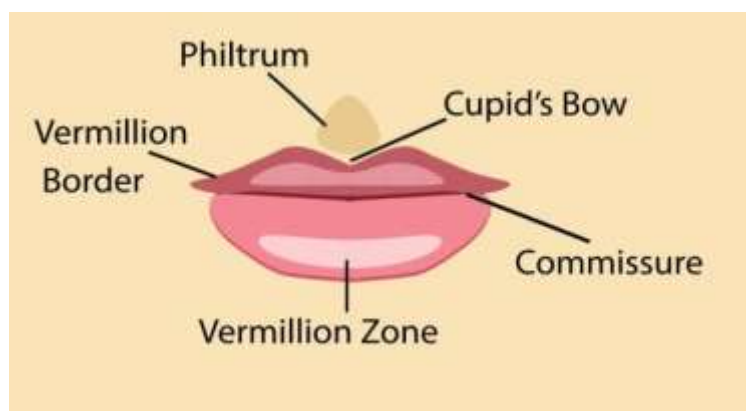


Fig.1 Anatomy of Lip

### 2.1 Lip Disorders:

**i) Swelling:** The lips may enlarge as a result of allergic reactions. Sensitivity to certain foods or beverages, medications, lipsticks, or airborne allergens can contribute to such reactions. In most

cases, lip size returns to normal once the underlying cause is identified and eliminated. However, the exact cause of swelling often remains unknown. Recurrent episodes of swelling may be associated with hereditary angioedema. Lip swelling may also occur due to nonhereditary

conditions such as erythema multiforme, sunburn, exposure to cold and dry weather, or physical trauma.

**ii) Sun damage:** Prolonged sun exposure can cause the lips, particularly the lower lip, to become dry and hardened. The presence of red patches or a white, filmy appearance may indicate damage that increases the risk of cancer development. Preventive measures include wearing a wide-brimmed hat to shield the face from harmful ultraviolet radiation and applying lip balms containing sunscreen.

**iii) Inflammation:** Inflammation of the lips, known as cheilitis, may lead to discomfort, irritation, redness, cracking, and scaling, especially at the corners of the mouth. Nutritional deficiencies, particularly a lack of vitamin B2, have been associated with the development of cheilitis.

**iv) Discoloration:** Discoloration of the lips may appear as melanotic macules or freckles, which are irregularly shaped brownish patches that can persist for many years and are generally benign. However, the presence of numerous small, widely distributed brownish-black patches may indicate a genetic condition associated with the formation of polyps in the stomach and intestines. Kawasaki disease, an illness of unknown origin that primarily affects infants and children under eight years of age, may also cause lip dryness, cracking, and redness of the oral mucosa.

**v) Sores:** Lip sores may present as raised lesions or sharply defined ulcers and can be indicative of serious conditions such as skin cancer. Various types of sores may be associated with disorders including syphilis and oral herpes simplex virus infection, while others, such as keratoacanthoma, have no clearly identified cause [21].



**Fig.2 Common Lip Disorders**

## 2. Lip Balm:

Lip balm is a wax-like preparation applied to the lips to moisturize and to manage conditions such as cold sores, stomatitis, angular cheilitis, and dry or chapped lips. It is commonly used several times a day to relieve irritation, dryness, and lip lesions. Typical ingredients include beeswax or carnauba wax, camphor, alcohol, lanolin, paraffin, and petrolatum. Lip balm may be applied directly using a lipstick-style tube or by fingertip

application. Its primary function is to prevent lip dryness and protect the lips from harmful environmental factors. At present, numerous chemical-based lip balms are commercially available from brands such as The Body Shop, Nivea, and Himalaya. Although limited information is available in cosmetic literature specifically addressing lip balm formulations, comparisons with lipstick formulations are considered appropriate due to similarities in application and functional requirements. These

include temperature stability, pleasant taste, safety, smooth application, adequate adhesion, and ease of intentional removal. Lip balm is designed for use by both men and women and should not be equated with lip gloss [22–24]. During formulation, careful balance of key ingredients such as butters, oils, waxes, and other excipients is essential. While many individuals invest considerable effort in maintaining healthy skin through regular facials, daily cleansing, and anti-aging products, lip care is often neglected. The use of natural lip balms represents a simple and effective approach to maintaining healthy lips. Given the frequent application of lip balms, it is important for health authorities to closely examine their ingredients. Certain pigments used to impart colour to lip balms may pose health risks if ingested by humans [25,26].

### 3.1 Types of Lip Balms and their benefits:

Not all lip balms are formulated in the same manner, as each type is designed with specific ingredients and benefits to address particular lip-related concerns. The most commonly used types of lip balms are described below.

- i. **Tinted lip balm:** Tinted lip balm is widely regarded as a daily essential, particularly for women, as it provides subtle colour and shine while maintaining lip nourishment. This type of lip balm is suitable for routine use and complements a natural, makeup-free appearance. Most tinted lip balms contain natural oils and butters that help keep the lips soft while imparting a light tint. However, selecting an appropriate shade can be challenging. In such cases, colour-changing lip balms offer a practical solution by adapting to the wearer's lip chemistry and providing a personalized tint.
- ii. **Moisturizing lip balm:** Moisturising lip balms are especially beneficial for individuals with dry lips. These formulations are designed to

maintain an optimal balance between hydration and greasiness. They are enriched with moisturizing agents such as glycerine, hyaluronic acid, and natural oils that prevent moisture loss. By forming a protective barrier, moisturising lip balms help keep the lips soft, smooth, and supple throughout the day.

**SPF lip balm:** Similar to other areas of the skin, the lips are vulnerable to ultraviolet radiation and tanning. Therefore, the use of lip balms containing sun protection factor is essential during outdoor exposure. SPF lip balms include UV-filtering agents that help protect the lips from sunburn, pigmentation, and premature aging.

**Medicated lip balm:** Medicated lip balms are specifically formulated to treat severe dryness and lip damage. They are effective in healing chapped, cracked, or irritated lips and often contain ingredients such as beeswax, camphor, or menthol to reduce discomfort, burning sensations, and inflammation. These formulations are particularly useful during winter months, when extreme dryness of the lips is common, and are recommended for individuals experiencing pronounced lip irritation.

**Organic lip balm:** Organic lip balms are prepared using natural ingredients such as shea butter, coconut oil, and essential oils. They do not contain parabens, synthetic chemicals, or artificial fragrances, making them suitable for individuals with sensitive skin. These formulations are gentle on the lips and provide deep nourishment while supporting overall lip health.

### 3.2 How to choose lip balm:

1. **Skin type:** A lip balm should be selected according to individual skin type, particularly in cases of dry or sensitive lips.



2. Ingredients: The formulation should contain ingredients that address specific needs, such as moisturizing or soothing properties.

3. SPF: Lip balms containing sun protection factor should be considered to provide additional protection against ultraviolet radiation.

4. Brand and reviews: It is advisable to evaluate reputable brands and consult user reviews to identify products that have demonstrated effectiveness and user satisfaction.

### 3.3 Advantages of natural lip balm:

a. Lip balms contribute to the maintenance of the natural health and appearance of the lips.  
 b. Lip balms containing sun-blocking agents have been shown to protect the lips from harmful ultraviolet radiation.

c. These products are suitable for use by both men and women, as they are not gender-specific.

d. Lip balm formulations help protect the lips from dryness, chapping, and the development of cold sore.

e. The product should form a uniform protective layer over the lips to shield the labial mucosa from external factors such as ultraviolet radiation, dryness, and environmental pollution.

f. It should not cause friction or dryness upon contact with the skin and should aid in rejuvenating, revitalizing, and healing lip conditions associated with allergies, colds, and influenza.

g. The use of natural lip cosmetic products supports improved skin health and enhances overall facial aesthetics.

### 3.4 Disadvantages of natural lip balm:

a) The use of poor-quality lip balms may cause considerable damage to the lips, as such products can contribute to increased dryness.

b) Another disadvantage associated with lip balm use is the potential for habitual or addictive application.

c) Homemade lip balms often require frequent reapplication because they tend to have lower adhesion and persistence on the lips compared to commercially manufactured products.

d) Some manufacturers formulate lip balms primarily for cosmetic appeal, neglecting the softness and health benefits of the lip skin. Prolonged use of such products may gradually impair the natural colour, smoothness, and luster of the lips.

e) The development of naturally derived colours and flavours presents challenges, particularly with respect to formulation complexity and product stability.

f) Certain natural oils, although preferred for their origin, may be less moisturizing and present disadvantages such as reduced spreadability, increased greasiness, and a higher potential for comedogenicity [25, 28–31].

### 3. Formulation strategies in Lip Balm:

Various studies explored different formulation approaches for natural lip balm. The list common materials used as key formulation ingredients for natural lip balm given in the Table no.1 as described below:

**Table No.1: List of Natural Ingredients**

Base	Oils	Colouring Agent	Flavouring Agent
Cocca butter	Coconut oil	Beet root	Strawberry
Bees Wax	Olive oil	Pomegranate	Honey
Shea Wax	Almond Oil	Marigold	Orange
Shea butter	Vitamin E oil	Tomato	Saffron/Kesar
White bees wax	Peanut Oil	Jabulani	Raspberry
Yellow bees wax	Tea tree oil	Watermelon	Vanilla
Carnauba wax	Glycerine	Honey	Mango



Candelilla wax	Castor oil	Saffron	Rose oil
Mango butter	Jojoba oil	Turmeric	Sandalwood
Avocado butter	Corn oil	Capsicum	Jasmine
Olive wax	Arachis oil	Cherry	Cherry
Jojoba wax	Lemon oil	Orange	Apple
Olive butter	Avocado oil	Strawberry	Lemon
Sweet Almond butter	Sesame oil	Mango	Apricot
Sweet almond wax	Sunflower oil	Carrot	Rosemary
Raspberry butter	Grape seed oil	Lemon	Pineapple

**Base:**

Waxes constitute an important class of materials widely used in cosmetics and personal care products. They are employed across numerous industries and applications. Although waxes are most commonly associated with candle production, they also play a significant role as thickeners and emulsifying agents in the food, cosmetic, and pharmaceutical sectors. From a chemical perspective, waxes are complex mixtures of fatty acids, hydrocarbons, and esters. In comparison to fats, waxes are harder, less greasy, and more brittle. They provide effective protection against microbial growth, oxidation, and moisture. Waxes are generally classified into four categories. Animal waxes include beeswax, lanolin, and spermaceti. Plant-derived waxes include carnauba, candelilla, ozokerite, paraffin, microcrystalline wax, and ceresin. Synthetic waxes include polyethylene and carbowax. Among these, beeswax, carnauba wax, and candelilla wax are the most commonly used in cosmetic applications. Chemically, waxes consist primarily of esters formed from fatty acids and fatty alcohols; therefore, substances such as jojoba oil are classified as waxes rather than oils. Waxes typically possess high melting points, ranging from approximately 50 to 100 degrees Celsius. Beeswax is the most frequently used wax in cosmetic formulations due to its effectiveness as a thickening agent and emollient. Carnauba wax and candelilla wax are two other natural waxes commonly incorporated into cosmetic products.

Both are harder than beeswax and have higher melting points, which enhances product stability and makes them particularly suitable for dry formulations such as lip balms. Cocoa butter, although classified as a natural fat rather than a wax, is derived from cocoa beans and imparts a creamy texture to lip balm formulations. It contains antioxidants that nourish and moisturize the lips and support the healing of dry and chapped lips. White beeswax is another important ingredient used in lip balm formulations and has a melting point of approximately 62 to 64 degrees Celsius. It effectively binds high-melting-point waxes and oils and is typically incorporated at concentrations ranging from 3 to 10 percent of the total formulation. Beeswax also facilitates the production of moulded products due to its contraction upon cooling. However, higher concentrations may cause the balm to crumble during use and result in a dull appearance. Candelilla wax, with a melting point of approximately 65 to 69 degrees Celsius, is commonly used at concentrations of 5 to 10 percent. A combination of beeswax and candelilla wax is particularly effective for lip balm formulations. When candelilla wax is used in slightly higher proportions than beeswax, the product exhibits a smooth and glossy appearance. In contrast, carnauba wax is used in very small quantities, as it significantly increases the melting point and hardness of the formulation while imparting an attractive sheen to the final product.

### **Oils:**

Fats and oils differ in their physical state, with fats generally remaining solid at room temperature. Chemically, both fats and oils are triglycerides, which are esters formed from glycerol and fatty acids. The stability and functional properties of an oil are largely influenced by the degree of saturation of its fatty acid components. Oils rich in saturated fatty acids, such as lauric, myristic, palmitic, and stearic acids, include coconut oil, cottonseed oil, and palm oil. In contrast, oils such as canola oil, olive oil, corn oil, almond oil, safflower oil, castor oil, and avocado oil contain higher proportions of unsaturated fatty acids, including oleic, arachidonic, and linoleic acids. Saturated oils are generally more stable and less susceptible to rancidity, whereas unsaturated oils tend to be lighter, less greasy, more readily absorbed by the skin, and are often considered more cosmetically valuable. Natural butters, such as shea butter, avocado butter, and cocoa butter, are classified as fats rather than true butters. These materials function as effective thickeners and emollients and, depending on their composition, may also offer additional benefits. For example, shea and avocado butter possess antioxidant and soothing properties due to the presence of phenolic compounds. In lip balm formulations, oils must be carefully combined with waxes to form an appropriate film on the lip surface. An ideal formulation produces a thin, uniform coating with good coverage and easy spreadable. Oils such as olive oil and sunflower oil contribute to a glossy appearance of the lips.

Castor oil is widely used in lip balm formulations because of its multiple functional benefits, although alternative oils and solvents are sometimes employed. Refined castor oil is colourless, odourless, and has a pleasant appearance, making it an effective plasticizing agent. While castor oil is less prone to rancidification than other vegetable oils such as

olive or almond oil, the inclusion of an antioxidant is recommended to enhance stability. Jojoba oil is valued for its skin-softening properties and its ability to prevent lip dryness. Wolfberry seed oil is recognized for its skin-repairing and moisturizing effects, while rosehip oil is effective in maintaining the skin's natural moisture balance. Vitamin E is a well-known antioxidant commonly incorporated into lip balm bases to improve product stability and support skin health. Essential oils are also included to impart functional and sensory benefits. Peppermint essential oil provides a revitalizing and refreshing effect, cinnamon essential oil serves as a potent antioxidant, lavender essential oil offers soothing and nourishing properties, and grapefruit essential oil is light and refreshing, making it suitable for dry lips. Almond oil, characterized by its pale-yellow colour and distinctive aroma, is also frequently used in lip balm formulations.

### **Colouring Agent:**

Colourants, also referred to as colouring agents, are primarily used to impart an appealing and distinctive appearance to cosmetic products. The use of colour in cosmetics dates back to ancient times. Consumer preference for cosmetic products is largely influenced by three sensory perceptions: sight, touch, and smell, making colour a critical component of cosmetic formulations. In lip products, colour can be imparted through two principal approaches. The first involves staining the lip surface using a dye solution capable of penetrating the outer layers of the lip skin. The second approach involves coating the lips with a coloured film that conceals surface irregularities and provides a smooth appearance. Soluble dyes are typically used for staining, whereas insoluble dyes and pigments are used to form a superficial coloured layer. Modern lip balm formulations often combine both approaches to achieve an enhanced visual effect. The colourants used in



cosmetic products should be selected from those approved under the Drugs and Cosmetics Act. Natural colourants are preferred due to their safety profile and minimal physiological effects. Ideally, a colourant should be a well-defined chemical substance to ensure consistent colouring strength and facilitate reliable assay and quality control. It should possess sufficient tinctorial strength to achieve the desired colour intensity at low concentrations. Stability is another essential requirement, as colourants must remain unaffected by light exposure, high temperatures, hydrolysis, or microbial activity during storage. Additionally, colourants should not interfere with pH, oxidation or reduction reactions, or analytical tests and assays. Colouring agents that are oil-soluble, spirit-soluble, or water-soluble are all considered suitable for cosmetic applications, provided they are compatible with other formulation ingredients and any active substances present. Compatibility is among the most important characteristics of a colouring agent. Furthermore, colourants should be readily available, cost-effective, and free from unpleasant taste or odour. Common examples of natural colourants used in cosmetics include turmeric, saffron, and beetroot.

#### **Flavouring Agent:**

Flavours or flavouring agents are commonly incorporated into lip balm formulations to mask undesirable tastes and enhance the overall sensory experience. The concept of flavour encompasses not only taste but also touch, smell, sight, and sound, representing a combination of physiochemical and physiological processes that influence the perception of a substance. Advances in flavour technology have led to the development of numerous artificial or imitation flavours, though creating a flavour that is both acceptable and appealing remains more of an art than a science. The selection of flavouring agents depends on the taste profile of the base formulation and the need

to mask or balance other components. Lip balm flavours must be safe, non-irritating, and capable of covering any unpleasant odours arising from the fatty or waxy base. In most formulations, flavouring agents are incorporated at concentrations ranging from 2 to 4 percent of the total composition. The chosen flavour should be consistent, harmonize with other formulation ingredients, and not be so overpowering that it interferes with additional flavours used in combination. Fruit-flavoured lip balms are particularly popular, with common choices including apricot, strawberry, raspberry, cherry, and honey. In addition to its flavouring properties, honey can also act as a natural preservative in cosmetic formulations [26, 27, 32–36].

#### **CONCLUSION**

Natural lip balms have gained considerable popularity due to their ability to soothe, moisturize, and promote the healing of the lips. These formulations typically contain plant-based oils, butters, and waxes, which provide nourishment while posing a lower risk of irritation or adverse effects compared to synthetic ingredients. Despite these benefits, natural lip balms face challenges such as limited shelf life, formulation instability, and the potential for allergenic reactions. Future research should aim to enhance the functional properties of natural lip balms while ensuring sustainability, safety, and efficacy. Given the growing consumer preference for natural and organic personal care products, natural lip balms are expected to continue playing a significant role in comprehensive lip and skin care routines influencing both product development and market trends.

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