INTERNATIONAL JOURNAL OF PHARMACEUTICAL AND HEALTHCARE INNOVATION
journal homepage: www.ijphi.com

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Research Article

Formulation and evaluation of lip balm using homogenized ethanolic extract of *Hylocereus costaricensis*

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Article Info

Article history:

Manuscript ID:

IJPHI0613042025
Received: 06- January -2025
Revised :13- January -2025
Accepted: 04- March 2025
Available online: March 2025

Keywords:
Herbal lip balm, Natural ingredients, red dragon fruit extract, *Hylocereus costaricensis*, Lip moisturization, Cosmetic safety

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Abstract

Background and Objective: The cosmetics industry is witnessing a shift towards natural and organic products, with herbal cosmetics gaining popularity. Natural lip balms are sought after for enhancing lip attractiveness and providing essential moisture. This study focuses on formulating and evaluating an herbal lip balm enriched with natural ingredients like beeswax, olive oil, and red dragon fruit extract to cater to the increasing demand for safer lip care products. Materials and Methods: The research involves the preparation of a homogenized ethanolic extract of Hylocereus costaricensis, a red dragon fruit rich in antioxidants and vitamins. Pre-formulation tests were conducted to assess the presence of alkaloids, flavonoids, tannins, saponins, and steroids. The formulation process included melting beeswax, cocoa butter, and olive oil, adding the fruit extract, and incorporating rose oil to create the lip balm. Results and Discussion: The post-formulation evaluation revealed positive results, including a melting point of 65°C, near-neutral pH, good spreadability, optimal viscosity, and no skin irritation. The lip balm demonstrated aging stability and maintained its fragrance, indicating its effectiveness and safety. The study contributes to the development of natural and safer cosmetic products, aligning with the industry's trend toward green alternatives. Conclusion: The formulated herbal lip balm, enriched with beeswax, cocoa butter, olive oil, rose oil, and Hylocereus costaricensis extract, meets quality and safety standards. Its properties ensure effective lip protection, moisturization, and overall lip health, addressing the need for natural and skin-friendly lip care solutions in the cosmetics market.

1. INTRODUCTION

Cosmetics have become an integral part of modern lifestyles, and the trend towards natural and organic products is growing [1]. The cosmetics sector, including the production of herbal cosmetics, is embracing this shift towards green products [2,3]. Natural lip balms, in particular, are popular for their ability to enhance lip attractiveness and provide a glamorous sheen while promoting healthy, moisturized lips. The use of natural ingredients in cosmetics is increasingly popular due to concerns about synthetic excipients in cosmetic products. Lip balm is a product that is frequently used to protect and moisturize lips, especially during colder months when they may become dry, cracked, and painful [5].

S. No.	List of Equipment Used:	Make
1	Digital weighing balance	Essae Teraoka Ltd., Bangalore, India
2	Water bath	Rotek, Vengola, Kerala
3	Digital pH meter	Systronics µ pH system 361
4	Melting point detector	Emerson / Labtronics, LT-115

Traditional lip balms often contain harmful chemical substances that can negatively impact health, prompting a need to explore natural ingredients for creating safer lip care products [6-7]. The beauty industry has responded to these concerns by producing natural cosmetics, including herbal lip balms designed to prevent dryness and shield against environmental hazards [6]. These balms, enriched with ingredients like beeswax, olive oil, and red dragon fruit extract, offer hydration, protection against chapping, and nourishment for the lips. extract.

Beeswax, a natural compound from female bees, acts as an emollient and thickener in lip balms. It provides moisturization, sun protection, and a pleasant aroma. Olive oil, obtained from pressing olive fruits and rich in antioxidants that promote collagen production, is an emollient that softens the skin. Olive oil, obtained from pressing olive fruits and rich in antioxidants that promote collagen production, is an emollient that softens the skin. *Hylocereus costaricensis* also called Red dragon fruit is rich in anthocyanin dyes, which can provide natural color and be used as dyes in food products. Red dragon fruit extract is known for its antioxidant properties, antimicrobial effects, and high vitamin content (E, C, B), making it an ideal ingredient for lip moisturization and skin health. The extraction process will involve the use of ethanol as a solvent to obtain the betalain colorant, which will be used in the preparation of the lip balm [8].

This research aims to formulate and assess a herbal lip balm using natural ingredients such as beeswax, Cocoa butter, Olive oil, Rose oil, and *Hylocereus costaricensis* extract. The evaluation will focus on essential properties like organoleptic characteristics, melting point, spreadability, pH, and perfume stability to ensure the quality and safety of the lip balm, aligning with the industry's shift towards natural and safer cosmetic products.

2. MATERIALS AND METHODS

Instruments:

Table 1: Instruments used

Table 2: Chemicals used

Name	Specification	Functions
Beeswax	SD Fine	Hardening agent
Olive oil	Sengee Biochem	Moisturizer
Rose oil	Grasee International	Perfuming agent
Cocoa butter	Sigma-Aldrich	Base
Hylocereus costaricensis	Local Market	Active ingredient and Moisturizer

Preparation of homogenized ethanolic extract of *Hylocereus costaricensis*

Fresh red dragon fruit underwent a thorough washing process to eliminate any surface dirt and dust. Subsequently, the fruit was sliced, and its flesh was blended for 30 seconds in a blender. The blended flesh was then homogenized with ethanol (95% v/v) at a ratio of 1:3. This mixture was left to stand for 15 minutes to facilitate the leaching of betalain from the red dragon fruit juice. Following this, the homogenized fruit juice was strained to eliminate the small black seeds typically present in red dragon fruit. The resulting filtrate was then subjected to evaporation until dryness was achieved [9].

Fig. 1: Preparation of homogenized ethanolic extract of *Hylocereus costaricensis*

Pre-formulation evaluation:

Table 3: Pre-formulation tests [10,11]

FORMULATION	Quantity
Red dragon fruit extract	1 g
Beeswax	2 g
Cocoa butter	3 g
Olive oil	5.5 g
Rose oil	Q. S

Compound	Test Method	Procedure	Observation
Alkaloids	Dragendorff's test	Add Dragendorff's reagent to the test solution.	Orange-brown precipitate obtained
Flavonoids	Shinoda test	Add 5 ml 95% ethanol, conc. HCL, and magnesium turning to the aqueous extract.	The pink color was observed, indicating the presence of flavonoids
Tannins	Lead Acetate test	Add 10% lead acetate in distilled water to the test filtrate.	The presence of precipitate indicates the presence of tannins
	Bromine water test	Add bromine water to the aqueous extract.	Decoloration of bromine water indicates the presence of tannins
Saponin	Foam test	Shake the extract vigorously with water.	Persistent foam formation confirms the presence of saponin
Steroids	Salkowski reaction	Add chloroform and conc. H2SO4 to the aqueous extract.	The chloroform layer turns red, and the acid layer exhibits greenish-yellow fluorescence, indicating steroids

Formulation of herbal lip balm:

Table 4: Ingredients of herbal Lip balm

Melt beeswax and cocoa butter separately in different china dishes at 70°C in a water bath. Similarly, olive oil was also melted at the same temperature in a water bath. The *Hylocereus costaricensis* fruit extract was then added to the oil phase until a homogeneous mixture was achieved. Subsequently, the mixture was cooled to 40°C, and 1-2 drops of rose oil were incorporated. The molten blend was poured into molds and placed in ice water for 5 minutes before being removed from the molds [12,13].

Post formulation evaluation [8]:

Organoleptic Evaluation/Visual assessment

The formulated mixtures underwent evaluation for their color, visual characteristics, and odour.

Melting point

The initial step involved the liquefaction of the lip balm to create a molten formulation. This molten substance was subsequently introduced into capillaries with precision, allowing it to solidify back to its original state through controlled cooling. Following this, the capillary housing the solidified balm was linked to a calibrated thermometer. The amalgamated apparatus was then submerged in a temperature-controlled water bath. The critical temperature at which the lip balm within the capillary underwent complete liquefaction was meticulously documented as its definitive melting point.

Measurement of pH

The pH measurement was conducted using a digital pH meter. A quantity of 1 gm of the formulation was mixed

with 100ml of distilled water, and the pH level was assessed. The readings were recorded three times with the digital pH meter, and the average value was calculated for accuracy.

Test for spreadability

The product was assessed by applying it repeatedly onto a glass slide at room temperature to evaluate the uniformity in forming a protective layer and to observe any fragmentation, deformation, or breakage during application. The assessment criteria included:

G: Good - indicating uniform, flawless application without fragmentation or deformation of the lip balm.

I: Intermediate - suggesting uniform application with minimal fragmentation, appropriate application, and limited deformations of the lip balm.

B: Not uniform - highlighting significant fragmentation, improper application, and intense deformation of the lip balm.

Determination of viscosity

The viscosity of the formulation was analyzed using a Brookfield DV-E viscometer using spindle S-64. The value of viscosity was measured in terms of cps.

Skin sensitivity test

The assessment involved applying the product as a patch on the skin for 30 minutes, followed by observation for any skin reaction. The observed responses were categorized as follows:

N: No reaction

R: Skin redness

Physical appearance	**Observation**
Texture	Smooth
Colour	Purple
Odour	Pleasant

I: Irritation or itching

Aging stability

The formulated lip balm underwent storage in a temperature-controlled oven at 40˚C for 1 hour. Subsequently, the lip balm was assessed for different characteristics including bleeding, surface crystallization, and ease of application.

Perfume stability

The herbal lip balm formulation was stored under standard cool temperature conditions and subsequently assessed for its fragrance after 30 days.

3. RESULT

The following are the results of the Preformulation evaluation.

Table 5: Phytochemical screening of the extract

TEST	**RESULTS**
Alkaloids	Present
Flavonoids	Present
Tannins	Present
Saponins	Present
Steroids	Absent

Fig. 2: Phytochemical screening of the extract

Formulation of Herbal lip balm:

Fig. 3: Formulated herbal lip balm.

Post formulation evaluation

Organoleptic evaluation:

Table 6: Organoleptic evaluation

Melting point

By using the melting point apparatus melting was determined and the melting point was found to be 65°C.

Measurement of pH

The pH of lip balm was near to neutral pH i.e., 6.76. this would not cause any irritation to the lips.

Test of spreadability

The evaluation of the prepared lip balm for its spreadability revealed a positive outcome, characterized by a uniform application without fragmentation, ensuring a flawless and undistorted application experience.

Fig. 4: Spreadability of Lip balm

Determination of viscosity

The viscosity of the formulation was identified using a Brookfield DV-E viscometer at a temperature of 25^0 C using spindle S-64 at rpm 0.3. The value of viscosity was measured in terms of cps. The viscosity of the formulation was found optimum ie., 334 ± 0.54.

Skin sensitivity test

It was carried out by applying the product in the form of a patch on the skin for 30 minutes and a reaction was observed. The result showed no skin irritation when applied to the skin.

Aging stability

Lip balm was stored in a temperature-controlled oven at 40˚C for an hour. The formulated lip balm was tested for bleeding, crystallization on the surface, and ease of application. The prepared lip balm revealed no signs of bleeding or crystallization and was easy to apply.

Perfume stability

The perfume stability of the formulation was performed to determine parameters like aroma, and fragrance. The formulation did not show any bad aroma or fragrance.

4. DISCUSSION

Lip balms have seen a surge in popularity as an essential product in modern lifestyles, particularly during colder months when lips are susceptible to dryness and cracking [6,13]. This increased use of lip balms is driven by the necessity for lip protection and moisturization, leading to a growing demand for safer and more natural alternatives [14-16]. Consumers are increasingly turning to natural and organic lip care products to address concerns about the potential health risks associated with traditional lip balms containing harmful chemical substances. The beauty industry's response to these concerns through the production of natural cosmetics, including herbal lip balms, highlights a shift towards safer and environmentally friendly options [17-19].

This study addresses these concerns by focusing on creating an herbal lip balm enriched with ingredients known for their hydrating and protective properties, aligning with the growing trend toward natural and organic cosmetic products. The research on formulating and evaluating an herbal lip balm using natural ingredients like beeswax, cocoa butter, olive oil, rose oil, and *Hylocereus costaricensis* extract is a significant contribution to the cosmetics industry. The formulation of this herbal lip balm incorporates key natural ingredients like beeswax, olive oil, and red dragon fruit extract, each chosen for their specific benefits in lip care. Beeswax acts as an emollient and thickener, providing moisturization and sun protection, while olive oil, rich in antioxidants, promotes collagen production and softens the skin. The inclusion of *Hylocereus costaricensis* extract, known for its antioxidant properties and high vitamin content, enhances the lip balm's moisturizing and skin-nourishing capabilities. By utilizing these natural ingredients and following a meticulous preparation process, the study aims to create an herbal lip balm that not only protects and moisturizes the lips but also promotes overall lip health.

The post-formulation evaluation of the herbal lip balm involves a comprehensive assessment of essential properties like organoleptic characteristics, melting point, spreadability, pH, viscosity, skin sensitivity, aging stability, and perfume stability. These evaluations ensure that the lip balm meets quality and safety standards, providing consumers with a reliable and effective product. The results of the evaluation, including the melting point at 65°C, near-neutral pH,

good spreadability, optimal viscosity, and positive skin sensitivity and aging stability tests, demonstrate the efficacy and safety of the formulated herbal lip balm. This research contributes to the development of natural and safer cosmetic products, catering to the increasing demand for high-quality and skin-friendly lip care solutions.

3. CONCLUSION

The study aimed to formulate and evaluate an herbal lip balm using natural ingredients such as beeswax, cocoa butter, olive oil, rose oil, and *Hylocereus costaricensis* extract. The evaluation focused on essential properties like organoleptic characteristics, melting point, spreadability, pH, and perfume stability to ensure the quality and safety of the lip balm. The results showed that the lip balm had a melting point of 65°C, near-neutral pH, good spreadability, optimal viscosity, and no skin irritation when applied to the skin. The lip balm also demonstrated stability under aging conditions and maintained its fragrance after storage. These findings indicate that the herbal lip balm formulation is effective and safe, aligning with the trend toward natural and safer cosmetic products.

ACKNOWLEDGMENT

We would like to thank the staff and management of Srinivas College of Pharmacy for their support.

Ethical approval
NA
Informed consent
Not Applicable.
Funding
No funding was received for conducting this study.
Conflict of interest
The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper. The authors declare no conflict of interest among themselves. The authors alone are responsible for the content and writing of this article.
Financial interests
The authors declare they have no financial interests

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