

Formulation of a Lip Balm Using Aloe Vera Oil

Okorie Ogbonna, Ucheokoro Adaeze S.*, Eseyin, John O., Abali Sunday O.

*Department of Pharmaceutics and Pharmaceutical Technology,
University of Port Harcourt, Port Harcourt 500004, Nigeria.

*Corresponding Author: Ucheokoro Adaeze S.,

*Email: adaeze.ucheokoro@uniport.edu.ng

Lead Author: Okorie Ogbonna [Okorie et al.]

DOI: 10.29322/IJSRP.16.04.2026.p17219

<https://dx.doi.org/10.29322/IJSRP.16.04.2026.p17219>

Paper Received Date: 19th March 2026

Paper Acceptance Date: 18th April 2026

Paper Publication Date: 22nd April 2026

ABSTRACT

Background: Lip balms are essential topical formulations designed to moisturize, protect, and repair the lips, particularly due to their susceptibility to dryness and environmental damage. Natural ingredients such as Aloe vera have gained attention for their therapeutic, moisturizing, and healing properties in cosmetic formulations.

Objectives: This study aimed to formulate and evaluate a natural lip balm using Aloe vera oil as the primary active ingredient and to assess its physicochemical and organoleptic properties across different formulation batches.

Methods: Lip balm formulations were prepared using the melting and blending method with key ingredients including beeswax, shea butter, coconut oil, cocoa butter, Aloe vera oil, vitamin E, and flavoring agents. Five batches with varying compositions were produced. Evaluation parameters included organoleptic properties (colour, texture, odour, homogeneity, grittiness), pH, viscosity (Brookfield viscometer), and spreadability. Statistical analysis using ANOVA was conducted to assess batch consistency.

Results: All formulations exhibited desirable organoleptic properties, being smooth, homogeneous, non-gritty, and pleasant in odour, with slight colour variations. The pH ranged from 6.0 to 7.0, indicating skin compatibility. Viscosity values ranged from 1155 to 2160 cP (mean 1705 ± 466.5 cP), reflecting moderate consistency suitable for application. Spreadability ranged from 4.2 to 7.0 g·cm/s (mean 5.87 ± 1.00 g·cm/s), confirming ease of application. Statistical analysis showed no significant differences ($p > 0.05$) among batches, indicating formulation uniformity and reproducibility.

Conclusion: The Aloe vera-based lip balm demonstrated excellent physicochemical stability, skin compatibility, and user-acceptable properties. It represents a safe, effective, and natural alternative to synthetic lip care products, with potential for commercial application in herbal cosmetics.

Keywords: Aloe vera, lip balm, formulation, viscosity, spreadability, natural cosmetics, physicochemical evaluation, herbal product.

INTRODUCTION

A lip balm is a formulation created to moisturize, calm, and shield the lips from damage. It is available in several forms, such as sticks, jars, and tubes, and typically contains a mixture of ingredients that keep the lips soft, smooth, and well-hydrated. Lip balms are particularly useful for preventing and managing dryness, cracking, and chapping, especially during exposure to harsh weather conditions. By forming an occlusive layer over the lips, they help retain moisture and guard against external elements like sunlight, cold, wind, and low humidity. Because of these protective and soothing effects, lip balm is one of the most frequently used cosmetic products by both men and women.^[1,2]

The colorless mucilaginous gel from *Aloe vera* leaves has been extensively used with pharmacological and cosmetic applications. Traditionally, this medicinal plant has been employed to treat skin problems (burns, wounds, and anti-inflammatory processes).^[3]

Aloe vera contains over 200 bioactive constituents, including vitamins, enzymes, minerals, sugars, lignin, saponins, salicylic acids, and amino acids, all contributing to its diverse pharmacological and cosmetic properties.^[4]

Moreover, *Aloe vera* gel not only boosts the total collagen content but also improves collagen quality and cross-linking within healing tissues. The compound acemannan, a mucopolysaccharide made up of acetylated mannose units, is considered the principal active agent responsible for *Aloe vera*'s wound-healing effects. It enhances granulation tissue formation, reduces radiation-induced skin reactions, and activates macrophages to release fibrogenic cytokines. Acemannan may also stabilize growth factors, promoting sustained tissue regeneration.^[4,5]

Consequently, *Aloe vera* has become a vital ingredient in the cosmetic industry, appearing in over 95% of dermatologically beneficial formulations worldwide. The plant's sugars are also used in moisturizing products, while combinations of *Aloe vera* with essential oils create soothing and protective lotions, sunscreens, and anti-aging creams.

The plant's antiseptic action is attributed to six bioactive agents lupeol, salicylic acid, urea nitrogen, cinnamic acid, phenols, and sulphur which together inhibit the growth of bacteria, fungi, and viruses.^[4,5]

This study was aimed to develop and evaluate a natural lip balm formulated with Aloe vera oil as the main active ingredient, designed to provide deep moisturization, promote healing, and protect the lips from dryness and cracking. The lips represent a distinct area of the face, consisting of the epidermis, dermis, and a well-vascularized connective tissue. Unlike most areas of the body, the lips lack hair follicles, sweat glands, and sebaceous glands, which play vital roles in maintaining lubrication and moisture. The vermilion border contains a very thin stratum corneum with fewer keratinocyte layers, making the tissue more permeable and sensitive to environmental factors.^[7] This thin structure accounts for the reddish color of the lips, which results from visible capillaries beneath the surface.^[8]

Lip balms are semi-solid topical preparations formulated to hydrate, soothe, and protect the lips. They function by forming a thin occlusive or semi-occlusive film that minimizes water loss and improves smoothness and comfort.^[9]

Conventional lip balms typically consist of waxes such as beeswax or paraffin blended with oils, butters, and emollients that replenish lost moisture and maintain lip softness.^[7] Besides their protective role, lip balms also enhance appearance and serve as a base for cosmetic applications such as lipsticks and glosses.^[10]

Herbal or natural lip balms are gaining popularity because they contain ingredients with therapeutic, antioxidant, and moisturizing effects. Unlike synthetic products, herbal formulations are milder and more environmentally sustainable. Common natural components include *Aloe vera*, coconut oil, shea butter, and beeswax, which provide emollient and healing benefits.^[11]

METHODS

Materials

Table 1: Materials Used in the Formulation of *Aloe vera* Lip Balm

Ingredients	Pharmaceutical Use
Aloe vera oil	Offer moisturizing, soothing, anti-inflammatory, wound-healing, and skin-repairing properties.
Beeswax	Acts as a thickening and structuring agent. It provides consistency, stability, and forms a protective barrier to lock in moisture.
Vitamin E oil	Acts as an antioxidant that protects against free radical damage and enhances product shelf life.
Coconut oil	Serves as an emollient that softens and smoothens the lips while providing moisturizing benefits.
Cocoa butter	Prevents transepidermal water loss (TEWL), improves consistency, and enhances the smoothness of the lip balm.
Shea butter	Improves texture, spreadability, and consistency. It provides an occlusive effect and serves as an emollient.
Colourant	Adds aesthetic appeal and enhances consumer acceptability.
Flavouring agent (pineapple oil)	Provides a pleasant aroma and taste
Clove oil	Offers mild antiseptic and soothing properties.

Formulation of *Aloe vera* Lip Balm

The lip balm formulation was prepared using the **melting and blending method**, involving a series of carefully controlled steps to ensure product uniformity, stability, and performance.

Weighing of Ingredients

The required quantities of the solid ingredients were accurately weighed using an analytical balance (Adventure™ AR 2130, England). Specifically, 27 g of beeswax, 5 g of cocoa butter, and 3.5 g of shea butter were weighed into a clean conical flask.

Melting of the Oil/Wax Phase

A water bath was heated to approximately 75 °C. The weighed beeswax, cocoa butter, and shea butter were placed in a beaker and positioned in the water bath. The mixture was allowed to melt with gentle stirring while maintaining a temperature of 75°C to ensure complete melting without overheating. Once fully melted, 0.5 g of colorant and 26 ml of coconut oil were added to the molten wax-butter mixture and stirred continuously until a homogenous blend was achieved.

Homogenization and Clarification

The molten mixture was stirred continuously using a glass rod for 2–3 minutes to ensure uniform distribution of all components and to achieve a clear, homogenous solution.

Cooling and Addition of Heat-Sensitive Ingredients

The molten mixture was allowed to cool gradually under gentle stirring to prevent crystallization. Once the temperature dropped below 40°C, 26 mL of *Aloe vera* oil, 3 mL of vitamin E oil, 6 mL of clove oil, and 3 mL of pineapple oil (flavouring agent) were added and stirred gently for uniform distribution.

Packaging

While still in the fluid state, the prepared formulation was carefully transferred by pouring into a clean, and appropriate pharmaceutical packaging container for a lip balm formulation. Each container was tapped gently on a flat surface to remove trapped air bubbles and ensure smooth filling.

Solidification and Conditioning

After the packaging and labeling, the formulated lip balm was allowed to cool and solidify naturally at ambient room temperature. Upon complete solidification, the surface of each sample was carefully examined to ensure uniformity and to check for any imperfections such as cracks, air pockets, or surface depressions. This stage ensured that the final product exhibits a smooth texture, consistent structure, and desirable aesthetic qualities.

Labeling and Storage

Once solidified, each batch of the lip balm container was properly labeled with essential information including the product name, date of manufacture, and a concise list of ingredients. The labeled samples were then stored in a cool, dry environment, away from direct sunlight and excessive heat. This storage condition was maintained to preserve the product's stability, prevent melting, and reduce the risk of rancidity or degradation of sensitive components such as oils and vitamins.

RESULTS AND DISCUSSION

The organoleptic properties of the aloe vera lip balms were evaluated to ensure its physical characteristics align with consumer expectations. These properties, including color, texture, and smell, they play a critical role in determining user acceptance and satisfaction. The visual, tactile, and olfactory attributes of the aloe vera lip balms were carefully observed and recorded, as summarized in Table.

Table 2: Table showing the aloe vera lip balm formula in various batches

Ingredients	Concentration (w/w%)				
	Batch A	Batch B	Batch C	Batch D	Batch E
Beeswax	25 g	30 g	25 g	20 g	4 g
Aloe vera oil	20 ml	25 ml	30 ml	35 ml	8 ml
Coconut oil	15 ml	15 ml	15 ml	10 ml	10 ml
Vitamin E oil	5 ml	5 ml	5 ml	5 ml	5 ml
Clove oil	10 ml	10 ml	7.5 ml	7.5 ml	2ml
Cocoa butter	10 g	5 g	5 g	5 g	1 g
Shea butter	4 g	4 g	2.5 g	2.5 g	0.5 g
Pineapple oil	10 ml	5 ml	5 ml	0	0
Vanilla oil	0	0	0	2 ml	2 ml
Colorant	1 g	1 g	0.1 g	0.2 g	0.2 g
Total	100	100	100	100	100

Table 3: Organoleptic properties of the Formulated Aloe vera lip balm

Observation					
Physical Parameter	Batch A	Batch B	Batch C	Batch D	Batch E
Colour	pale pink	Red	Pink	Cream	Cream
Texture	smooth	Smooth	Smooth	Smooth	smooth
Smell	Pleasant	Pleasant	Pleasant	Pleasant	Pleasant
Homogeneity	Homogenous	Homogenous	Homogenous	Homogenous	Homogenous
Grittiness	non-gritty	non-gritty	non-gritty	non-gritty	non-gritty

Physicochemical Properties

The physical and chemical properties of the aloe vera lip balms were evaluated to ensure its functionality, stability, and suitability for different skin types. Parameters such as pH, viscosity, and spreadability were analyzed across multiple batches to maintain consistency and reliability in the formulation. These analyses are critical for understanding the product's performance and potential consumer acceptance.

Viscosity Measurements

Viscosity is a critical factor in determining the spreadability and overall consistency of skincare products like a lip balm. It plays a vital role in ensuring that the product applies smoothly to the lips and maintains its stability during use. The viscosity of the formulated aloe vera lip balm was measured using Brookfield viscometer for each batch to assess how the consistency influenced its usability.

The viscosity values ranged between 1155 cP and 2160 cP, with a mean of 1705 ± 466.5 cP which shows moderate consistency.

Higher viscosity observed in some batches (especially batch 1 and 3) may be attributed to the proportion of beeswax and shea butter, which act as thickening agents. Lower values (batch 4 and 5) could result from slightly higher oil content, improving spreadability but slightly reducing firmness.

An ideal lip balm should possess moderate viscosity to ensure easy application without being too greasy or hard, as supported by Patel et al. (2019), who reported that appropriate viscosity enhances product stability and user comfort.

Spreadability Tests

Spreadability plays a very important role in assessing how effectively the formulated lip balm can be applied to the skin. It measures how easily the mask spreads over the skin's surface, contributing to its ease of use during application. In this project, the spreadability of the lip balm was tested across different batches, and the results are summarized in Table 4.3.

The spreadability of the lip balm ranged from 4.2 to 7.0 g·cm/s, with a mean of 5.87 ± 1.00 g·cm/s. Good spreadability is essential for a smooth and uniform application on the lips. Batches with higher spreadability (Batch 1 and 3) contained slightly more coconut oil and Aloe vera oil, which act as emollients and reduce drag during application. According to,^[12] formulations with higher oil content and balanced wax concentration exhibit better spreadability and user satisfaction.

This research centered on the formulation and assessment of a natural lip balm prepared with Aloe vera oil as the primary active ingredient, combined with beeswax, shea butter, coconut oil, pineapple oil, and a food-grade dye. The main purpose was to produce a safe and effective herbal alternative to synthetic lip balms that often contain artificial colorants and fragrances known to cause lip irritation and dryness. Five batches of the lip balm were produced with similar base ingredients but slight variations in proportions to evaluate their stability and performance. Each batch was examined for pH, viscosity, and spreadability, as well as organoleptic characteristics including color, texture, fragrance, homogeneity, and grittiness.

The findings indicated that all batches-maintained pH values between 6.0 and 7.0, which aligns well with the natural pH of the lips, showing the formulation's skin compatibility. Viscosity values ranged from 1155 to 2160 cP, signifying a medium consistency that allows smooth and easy application. Spreadability values varied between 4.2 and 7.0 gm./s, confirming that the balm can be evenly distributed on the lips without excessive effort. The organoleptic evaluation revealed that all formulations were smooth, pleasant in odor, non-gritty, and homogeneous, although there were slight color differences due to the amount of dye used. Statistical analysis using ANOVA showed no significant difference ($p > 0.05$) among the batches, demonstrating uniformity and reproducibility across formulations.

The formulated Aloe vera lip balm displayed excellent physical and sensory properties, indicating a stable and well-balanced product. The balm's spreadability, pH, and viscosity were all within acceptable ranges for topical application, ensuring comfort and safety. The inclusion of Aloe vera oil as a soothing and moisturizing agent, along with pineapple oil as a natural fragrance and food dye as a safe colorant,

resulted in an effective and appealing product. Hence, the results suggest that the Aloe vera oil-based lip balm exhibited desirable aesthetic and functional qualities, making it a promising natural and skin-friendly substitute for conventional synthetic lip care products. Moreover, the study confirms that Aloe vera oil-based lip balm can serve as a cost-effective, natural, and non-toxic alternative to synthetic lip balms, catering to the growing consumer demand for herbal and eco-friendly cosmetics.

CONCLUSION

This study successfully formulated and evaluated a natural lip balm using Aloe vera oil as the primary active ingredient, demonstrating its effectiveness as a safe and functional cosmetic product. The formulation exhibited desirable physicochemical and organoleptic properties, including appropriate pH (6.0–7.0), moderate viscosity, good spreadability, smooth texture, homogeneity, and pleasant odour, all of which are essential for user acceptability and product performance.

The research showed that variations in ingredient composition across batches did not significantly affect overall quality, indicating good formulation reproducibility and stability. The inclusion of Aloe vera oil contributed to the moisturizing, soothing, and protective properties of the lip balm, while other components such as beeswax, shea butter, and coconut oil enhanced consistency, spreadability, and occlusive effects. Hence, the formulated lip balm meets standard requirements for topical lip care and offers a natural, cost-effective, and skin-friendly alternative to synthetic products.

REFERENCES

1. Allen, L. V. (Ed.). (2021). *Remington: The Science and Practice of Pharmacy* (23rd ed.). Pharmaceutical Press.
2. Bologna, J. L., Schaffer, J. V., & Cerroni, L. (2018). *Dermatology* (4th ed.). Elsevier.
3. Sevilla-Sánchez, D., & Tuset-Creus, M. (2020). Pharmaceutical care in hospitalized patients: Management of the COVID-19 pandemic crisis. *Farmacia Hospitalaria*, 44(7), 28–31.
4. Hamman, J. H. (2008). Composition and applications of Aloe vera in skin preparations. *Molecules*, 13(8), 1599–1616.
5. Choudhary, S., et al. (2014). Polysaccharides of Aloe vera and their role in skin hydration. *Journal of Ethnopharmacology*, 153(1), 140–146.
6. Eshun, K., & He, Q. (2004). Aloe vera: A valuable ingredient for skincare and cosmetics. *Critical Reviews in Food Science and Nutrition*, 44(2), 91–96.
7. Patel, P., Mehta, P., & Desai, T. (2019). Formulation and evaluation of natural lip care product using plant-based ingredients. *Research Journal of Topical and Cosmetic Sciences*, 10(2), 85–90.
8. Surber, C., & Knie, U. (2018). *Metamorphosis of vehicles: Mechanisms and opportunities*. *Current Problems in Dermatology*, 54, 152–165.
9. Kumar, R., Singh, A., & Sharma, M. (2020). Development and evaluation of herbal lip balm containing natural oils. *Journal of Pharmacognosy and Phytochemistry*, 9(4), 1200–1205.

10. Sharma, N., Gupta, S., & Sahu, P. (2021). Optimization and evaluation of herbal-based lip balm using Aloe vera and natural oils. *International Journal of Applied Pharmaceutics*, 13(1), 75–81.
11. Akinola, I., Akinyosoye, G., Solarin, A., & Adekunle, M. (2022). Steroid-induced diabetes mellitus in children: A case series from Nigeria. *African Journal of Endocrinology and Metabolism*, 12(1), 53.
12. Sharma, M., Sheeba, F. R., Yadav, R. P., Patel, A. K., & Kumar, Y. (2021). Mucoadhesive polymers for buccal drug delivery system: An overview. *Asian Journal of Pharmaceutical Research and Development*, 9(2), 57–64.

