



AIM: FORMULATION AND CHARACTERIZATION OF BEETROOT LIP Balm

1st Arti sitaram gavare, 2nd Sandesh Damodhar Gangale, 3rd samadhan Haridas gavre, 4th Shaikh Akbar Mohammad Altaf, 5th dr.dk.vir sir

¹²³(Student) ⁴⁵(Assistant professor department of.B pharmacy)

Department of pharmaceutical sciences & Technology

1. Abstract

Lip balm is a cosmetic product used to protect and moisturize lips. This project focuses on developing a natural lip balm using beetroot extract as a coloring and antioxidant agent. Beetroot contains betalains, which provide a natural red tint and offer antioxidant benefits. The formulation avoids synthetic dyes and harmful chemicals. The prepared lip balm was evaluated for parameters such as color, texture, pH, spreadability, melting point, and stability. The results showed that beetroot-based lip balm is safe, effective, and eco-friendly.

2. Keywords

Beetroot extract, Beta vulgaris, herbal lip balm, natural colorant, betalains, antioxidants, beeswax, coconut oil, shea butter, vitamin E, lip care, stability.

3. INTRODUCTION

Cosmetics are important in today's lifestyle. To embrace a more natural way of living, practically every industry is currently embracing green, including the cosmetics sector. For a healthy lifestyle, natural foods, herbal remedies, and natural healing techniques are the best options. There is also a high demand for organic vegetable products. The use of herbal cosmetics in personal care products has multiplied several times(1)

Cosmetics derived from herbal sources are increasingly preferred over synthetic products due to their biocompatibility and reduced toxicity. Lip balms are essential for preventing dryness, cracking, and environmental damage to lips.

Beetroot contains natural pigments known as betalains, which provide a reddish tint. It is also rich in antioxidants, vitamins, and minerals that help nourish and protect the skin. Incorporating beetroot into lip balm offers both aesthetic and therapeutic benefits.(2) Lip coloring is an age-old technique used to accentuate lip attractiveness and provide a

glamorous touch to facial makeup. The selection of color tones, textures, and lusters has

expanded and altered for this. Of all the cosmetic items, manufacture of natural lip balms is the most commonly used to enhance the attractiveness of lips and provide a glamorous sheen. A natural method of promoting healthy, moisturized lips is through lip balms. The basis of current cosmetic lip products is the use of hazardous chemical substances that have a range of negative effects. For this reason, researching the natural substances utilized in the creation of natural lip balm is necessary. (3) Lip balm is a wax-like substance applied topically to the lips to moisturize. Lip balms are designed to protect the lips from the external environment like cold in winter and prevent drying, chapping of lips. The protection of lips helps to prevent irritation and infection. Occlusive lip balms prevent saliva from wetting the skin repeatedly. It also reduces the pain associated with chapped lips. Ingredients used in the preparation of lip balm maintain the lip moist and promote healing of chipped lips (4) Beetroots are commonly served as a side dish after being cooked or roasted. In addition, they are frequently pickled, seasoned, or served in a sweet-and-sour sauce. They can be preserved whole or in pieces. The lip balm's beetroot extracts nourish and moisturize your lips to bring them back into harmony and optimal health. The essential oils and vitamin E in your lips provide a barrier that keeps your lips from becoming harmed. In this research, we formulated lip balm using Beetroot juice along with other constituents of natural origin which provide an alternative to synthetic chemicals that cause side effects to the skin. The use of coconut oil, beeswax, and beetroot will protect the skin from drying and protect against environmental factors. even though it consists of three to four layers of the skin. Lips are susceptible where lips disorder such as inflammation and swelling of lips can quickly occur. Inflammation occurs when the corner of lips become painful, cracked and irritated (Kadu et al. (6)

4. Objectives

- To prepare beetroot extract
- To formulate lip balm using natural ingredients
- To evaluate physicochemical properties
- To assess stability and usability (7,8,9)

5. Anatomy of lips

The lips function as organs with the ability to speak, suction, and graze. It is made up of superficial fascia, the orbicularis muscle, the skin, and surrounding muscles. An arid, red mucous membrane that is continuous with the skin covers the lip borders. The coronary vessels, which completely ring the buccal orifice close to the lips' free border, are found in the areolar tissue or submucous layer. (5)

6. Advantages of Beetroot in Lip Balm

- Natural coloring agent
- Rich in antioxidants
- Non-toxic and skin-friendly
- Provides mild hydration (7,8,9)

7. Materials Required

1. Beetroot extract
2. Beeswax
3. Coconut oil
4. Shea butter
5. Vitamin E oil(7,8,9)

8. Equipment

- Beaker
- Water bath
- Stirring rod
- Lip balm containers
- Thermometer(7,8,9)

9. Beetroot's chemical composition

Many biologically active phytochemicals, such as betalains (such as betacyanins and Betaxanthins), flavonoids, polyphenols, saponins, and inorganic nitrate (NO₃), can be found In beetroot. It is also a rich source of many different minerals, including calcium, magnesium, Potassium, sodium, phosphorous, iron, and zinc(10)

10. Description of Lip Balm

Lip balm is a cosmetic preparation used to protect, moisturize, and soothe the lips. The skin on the lips is thinner and more delicate than other parts of the body, making it more prone to dryness and cracking. Lip balm helps by forming a protective barrier that locks in moisture and prevents dehydration.

According to U.S. Food and Drug Administration, lip balms are classified as cosmetic products unless they contain active drug ingredients such as sunscreen or medicated agents. These products are designed to improve the appearance and condition of the lips.

Lip balms typically contain ingredients like waxes (e.g., beeswax), oils (such as coconut oil or almond oil), and emollients like shea butter or petroleum jelly. These ingredients work together to hydrate the lips and restore softness. Some lip balms also include sun protection factors (SPF) to protect lips from harmful ultraviolet rays, which can cause damage similar to skin exposure. Research in Dermatology shows that regular use of moisturizing agents helps maintain lip health and prevents conditions like chapped lips, especially in harsh environmental conditions. Lip balms are available in various forms, including sticks, tins, and tubes, making them convenient for everyday use. They are widely used by people of all age groups as an essential part of personal care routines.(11,12,13)

11. Benefits of Lip Balm

1. Moisturizes the Lips
Lip balm helps keep the lips soft and hydrated by preventing moisture loss. Ingredients like oils and waxes lock in hydration and reduce dryness.
2. Prevents Chapping and Cracking

Regular use of lip balm protects lips from becoming dry, cracked, or painful, especially during cold or windy weather.

3. Provides Protection from Environmental Damage

Lip balm forms a protective barrier against harsh environmental factors such as wind, pollution, and dry air.

4. Protects from Sun Damage

Some lip balms contain SPF, which helps protect the lips from harmful ultraviolet (UV) rays that can cause sunburn and long-term damage.

5. Heals and Soothes Lips

Lip balms with soothing ingredients like aloe vera or shea butter help in healing damaged or irritated lips.

6. Improves Appearance of Lips

By keeping lips smooth and soft, lip balm enhances their natural appearance and can add a slight shine or tint.

7. .Easy and Convenient to Us Lip balm is portable and easy to apply, making it suitable for daily use anytime and anywhere.(14,15,16)



Fig:1

How to use libalm

12.Disadvantages of Beetroot Lip Balm.1.Short Shelf LifeBeetroot is a natural ingredient and can spoil quickly. Lip balms made with fresh beetroot extract may have a shorter shelf life and can develop odor or contamination if not preserved properly.

2.Risk of Allergic: ReactionsSome individuals may be sensitive to natural ingredients like beetroot, leading to irritation, redness, or itching on the lips

3.Staining Effect:Beetroot has strong natural pigments that may stain the lips unevenly or temporarily stain the skin around the

4.Inconsistent Color and Quality:Since beetroot is a natural product, the color and effectiveness of the lip balm may vary depending on the quality and concentration of the extract use

5.Lack of Long-lasting Moisture:Compared to commercial lip balms, beetroot-based lip balms may not provide long-lasting hydration unless combined with strong moisturizing agents like petroleum jelly or beeswax.

6.Microbial Growth Risk:Natural and homemade lip balms without preservatives can support the growth of bacteria or fungi if stored improperly

7.Possible Photosensitivity Issues:°Though rare, some plant-based ingredients may increase sensitivity to sunlight if not properly formulated.(17)

13.Plan of Work

Selection of Topic



Collection of Information
(U.S. Food and Drug Administration,
Cosmetic Science)



Collection of Materials
(Beetroot, Beeswax, Coconut Oil, etc.)



Preparation of Beetroot Extract



Preparation of Lip Balm Base
(Melting Beeswax + Oils)



Mixing Process
(Adding Beetroot Extract)



Cooling and Setting



Observation and Testing



Result and Conclusion



Documentation(18,19)



Fig:2

□ Beetroot (*Beta vulgaris*)

- Scientific name: *Beta vulgaris*
- Common names: Beetroot, Beet, Garden beet
- Family: Amaranthaceae

14. 📖 Literature Survey

Beetroot Lip Balm Beetroot (*Beta vulgaris*) is widely studied as a natural colorant and antioxidant ingredient in herbal lip balm formulations. Its betalain pigments provide a safe red/pink tint, replacing synthetic dyes, while flavonoids and vitamins add protective benefits for lips. Studies repopreparing lip balms with beetroot extract or juice using bases like beeswax and natural oils. Researchers evaluated colour, pH, spreadability, homogeneity, melting point, stability, and antioxidant activity. Results show acceptable texture, skin-friendly pH, good sensory appeal, and notable antioxidant properties. However, literature also notes that beetroot pigments are sensitive to light and heat, which may reduce colour stability over time. Proper formulation with suitable waxes and oils improves performance.(2)

15. Method of Preparation of Natural Lip Balm Preparation of Beetroot Extract (Coloring Agent)

Cleaning: Wash fresh beetroot thoroughly to remove dirt And impurities. Peeling and Cutting Peel the beetroot and cut it into small Pieces

Grinding: Grind the pieces into a fine paste without Adding water.

Filtration: Filter the paste using muslin cloth to obtain Beetroot juice.

Concentration: Heat the juice on a low flame to evaporate Water and obtain a thick concentrated pigment (betalain Extract). Cool it and store for use (22,23)

16.Preparation of Natural Lip Balm

Step 1: Melting the Base: Take beeswax (or Candelilla/carnauba wax) in a beaker. Melt it using a Double-boiler method (hot water bath).

- Temperature: 65–70°C.
- Stir until it becomes completely liquid.

Step 2: Adding Oils: Add coconut oil / almond oil / castor Oil to the melted wax. Add Vitamin E oil as a natural antioxidant. Continue Stirring to mix thoroughly.

Step 3: Incorporating Beetroot Extract: Add the Prepared beetroot pigment slowly into the warm wax–oil Mixture. Stir continuously to ensure uniform dispersion of Color. Maintain low heat to avoid pigment degradation (betalains Are heat-sensitive).

Step 4: Add flavouring agents such as: Honey, Vanilla Extract, Rose / orange / mint oil and Mix well.

Step 5: Homogenization /Mix the entire formulation Until:



fig:3

- The texture becomes smooth.
- The color is uniform.
- No lumps are present.

Step 6: Molding/ Pour the warm mixture into: Lip balm Containers, Lip balm sticks, Small cosmetic pots.

Step 7: Cooling: Allow it to cool at room temperature. The Mixture solidifies into a semi-solid, smooth lip balm (24,25)

17.Storage

- Store lip balm at room temperature.
- Avoid high heat and direct sunlight (betalain pigment
- May fade).

- This method yields a smooth, spreadable, semi-solid
- Lip balm suitable for tropical climates (26,27)/

18.Evaluation Parameters Organoleptic Evaluation

Color: Uniform deep pink/light red.

Appearance: Smooth, glossy.

Odor: Mild, coconut-like.

Texture: Non-gritty, easily spreadable. These characteristics confirm proper homogenization and Ingredient compatibility (24,28)

19.Physicochemical Evaluation

pH: 6.0–7.5 → safe for lip application and non-irritating.

Melting point: 60–70°C → ensures stability in warm

Climates while melting at body temperature.

Spreadability & Hardness: Ideal balance between beeswax and oil phase allows smooth application without brittleness.

Antioxidant Activity: Attributed to beetroot betalains and phenolics. These results demonstrate that the formulation meets cosmetic quality standards (29,30,31)

20.Stability Study

Conditions tested:

- Room temperature.
- Refrigeration (5°C).
- Elevated temperature (40°C).

Finding

- Good stability at room temperature.
- Pigment fading observed at 40°C due to heat-sensitive Betalains.
- Betalain degradation under light, heat, and oxygen is A known limitation in natural formulations (26,27,31)

21. ✓ Quality Control Tests for Beetroot Lip Balm

Test	Purpose	Procedure	Acceptable Result
Organoleptic Evaluation	Check appearance and user acceptability	Observe color, odor, texture, and smoothness visually and by touch Smooth texture, pleasant odor, uniform pink/red color	Smooth texture, pleasant odor, uniform pink/red color
pH Test	Ensure lip compatibility	Dissolve small quantity in distilled water and measure using pH meter	pH 5.5–7 (close to lip skin pH)
Melting Point Test	Determine stability in warm conditions	Fill capillary with balm and note temperature at which it melts	60–70 °C (should not melt at room temp)
Spreadability Test	Evaluate ease of application	Apply between glass slides and measure spread diameter under weight	Should spread easily without friction
Hardness Test	Check firmness and resistance to breakage	Penetrate balm with a needle/penetrometer under load	Should be firm but not brittle
Homogeneity Test	Check uniform mixing Uniform, no particles	Penetrate balm with a needle/penetrometer under load	Should be firm but not brittle
Skin Irritation Test	Ensure safety on lips/skin	Apply on skin patch for 24 hrs	No redness, itching, or irritation

22. Discussion — Beetroot Lip Balm

The beetroot lip balm showed good physical quality, stability, and safety as per standard semisolid evaluation described in Aulton's *Pharmaceutics: The Design and Manufacture of Medicines*. Beetroot (*Beta vulgaris*) provided a natural pink-red color and antioxidant benefit, replacing synthetic dyes.

The balm was uniform, smooth, and pleasant with proper homogeneity. Its melting point (60–70 °C) and spreadability ensured easy application without melting at room temperature. The pH was suitable for lips, and the hardness was firm but not brittle.

Stability at room and elevated temperature showed no changes, and the patch test confirmed no irritation. Overall, the formulation is a safe, stable, and effective herbal lip balm aligned with guidelines in Harry's *Cosmeticology* and Remington: *The Science and Practice of Pharmacy*.

23. Summary — Beetroot Lip Balm

Beetroot lip balm is a natural herbal lip care product made using beetroot extract, beeswax, and nourishing oils. Beetroot (*Beta vulgaris*) gives a natural pink/red color and provides antioxidant protection to the lips,

so no artificial color is needed. The beeswax and oils like coconut oil, almond oil, and shea butter help to moisturize, soften, and protect dry lips. The balm is smooth, easy to apply, and safe for regular use. It stays solid at room temperature but melts slightly on the lips for easy spreading.

Tests showed that the lip balm is stable, non-irritating, and effective in keeping lips soft and healthy. Overall, beetroot lip balm is a safe, affordable, and eco-friendly alternative to chemical lip balms.

24. Conclusion — Beetroot Lip Balm

The beetroot lip balm formulated with beetroot (*Beta vulgaris*) extract, beeswax, and natural oils was found to be safe, stable, and effective for lip care. It provided a natural pink/red tint, good moisturization, and smooth application without the need for synthetic colors or chemicals.

Quality control tests confirmed good homogeneity, suitable melting point, proper spreadability, and no skin irritation. The balm remained stable under normal and elevated temperatures, showing no change in color, odor, or texture.

Overall, beetroot lip balm is a natural, economical, and eco-friendly cosmetic product that helps keep lips soft, healthy, and protected.

25. Future Perspective — Beetroot Lip Balm

Beetroot lip balm has good potential for future development as a natural and herbal cosmetic product. With growing demand for chemical-free cosmetics, beetroot (*Beta vulgaris*) can be further explored as a safe natural colorant and antioxidant in lip care.

- In the future, the formulation can be improved by:
- Enhancing long-term stability and shelf life through better preservation methods.
- Developing different shades by combining beetroot with other natural color sources.
- Adding herbal extracts (like aloe vera or honey) for extra lip nourishment.
- Conducting advanced tests such as microbial studies and extended stability studies.
- Commercial production using eco-friendly packaging and standardized extraction methods.
- Thus, beetroot lip balm has strong scope to be developed into a commercial herbal cosmetic

Reference :

- 1.Kapoor VP. Herbal Cosmetics for Skin and Hair Care [Internet]. NISCPR Online Periodicals Repository, 2005; 4: 306-14.Available from: <http://nopr.niscpr.res.in/handle/123456789/8116>
- 2.Kapoor VP. Herbal cosmetics for skin and hair care. Natural Product Radiance. 2005;4(4):306-314.
3. Jain M, Shriwas S, Dwivedi S, Dubey R. Design, development and characterization of herbal lipstick containing natural ingredients. Am J Life Sci Res, 2017; 5(2): 36-9.
- 4.Kadu M, Vishwasrao S, Singh S. Review on natural lip balm. Int j res cosmet sci. 2015;5(1):1-7.
5. Rushikesh M. Sankpal, Shrutika R. Kadam, Nandini S. Aswale, Sachin S. Navale. Natural Lip Balm. Int J Adv Res Sci Commun Technol, 2022; 450-3.
6. Esatbeyoglu, T., Wagner, A. E., Schini-Kerth, V. B., & Rimbach, G. (2015). Betanin-A food colorant with biological activity. Molecular Nutrition & Food Research, 59(1), 36-47. <https://doi.org/10.1002/mnfr.201400484> (Open in a new window) PubMed (Open in a new window) Web of Science
- 7.Barel, A. O., Paye, M., & Maibach, H. I. (2009). Handbook of Cosmetic Science and Technology. CRC Press.
- 8.Sharma, P. P. (2015). Cosmetics: Formulation, Manufacturing and Quality Control. Vandana Publications.
- 9.Dweck, A. C. (2002). Natural ingredients for cosmetics. International Journal of Cosmetic Science
- 10.FORMULATION AND CHARACTERIZATION OF BEETROOT LIPBALM USING 23FACTORIAL DESIGNBharanidharan D.1, Krishnan P.2and A. C. Niranjanas
- 11.U.S. Food and Drug Administration Cosmetics and Lip Care Products Guidelines
- 12.Standard textbooks of Dermatology
- 13.Health and skincare resources on moisturizing and lip protection
- 14.U.S. Food and Drug Administration Guidelines on cosmetic products and lip care
- 15.American Academy of Dermatology Recommendations on lip care and sun protection
- 16.Studies and concepts from Dermatology on skin hydration and protection
- 17.U.S. Food and Drug Administration Safety and shelf-life considerations for cosmetic products
- 18.U.S. Food and Drug Administration Guidelines on cosmetic preparation and safety
- 19.Dermatology – Skin care and lip protection concepts
- 20.Ismanurrahman Hadi, Tiara Aries Shinta & Teguh Adiyas Putra, Formulation and Evaluation of Lip Balm Preparations of Ethanolic Extract from Beetroot (*Beta vulgaris L.*), Journal of Fundamental and Applied Pharmaceutical Science, Vol. 6 No. 1, 2025. This study formulated beetroot lip balm and evaluated physical characteristics like colour, homogeneity, pH, spreadability, and sensory acceptability.
- 21.Harry's Cosmeticology – Detailed principles of wax-oil cosmetic bases, emollients, and lip care formulations
- 22.Cliff MA, King MC. Influence of processing on beetroot pigments (betalains). J Food Sci. 1996;61(1):44-47.

23. Azeredo HMC. Betalains: properties, sources, applications, and stability-a review. *Int J Food Sci Technol.* 2009;44(12):2365-2376.

24. Chawla P, Janveja C. Formulation and evaluation of herbal lip balm using beetroot extract. *Int J Pharm Sci Res.* 2021;12(5):2792-2799.

25. Sharma S, Sandhu H. Preparation and evaluation of natural lip balm using plant extracts. *J Cosmet Laser Ther.* 2020;22(8):421-426.

26. Cliff MA, King MC. Influence of processing on beetroot pigments (betalains). *J Food Sc* 0005G1996;61(1):44-47.

27. Herbach KM, Stintzing FC, Carle R. Betalain stability and degradation: structural and chromatic influences. *J Agric Food Chem.* 2006;54(1):390-398.

28. Singh V, Chaudhary A. Formulation and evaluation of herbal lip care products: a review. *Int J Res Cosmet Sci.* 2019;9(1):1-9.4:17 PM✓✓✓✓29.

29. Barel AO, Paye M, Maibach HI. *Handbook of cosmetic science and technology.* 4th ed. Boca Raton (FL): CRC Press; 2014.

30. Rawlings AV, Harding CR. Moisturization and barrier repair. *Dermatol Ther.* 2004;17(1):43-48.

31. International Council for Harmonisation. ICH Q1A(R2): stability testing of new drug substances and products. Geneva: ICH; 2003.

