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Research Article

Formulation and Evaluation of Herbal Lip Tint Using Beta vulgaris Extract

Pooja Ikhar*, Pallavi Gawande, Payal Thakre, Parikshit Darange, Vaibhav Dapurkar

P. R. Patil Institute of Pharmacy, Talegaon (S.P.), Wardha, India

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ABSTRACT

One of the cosmetic item that is frequently used is lip tint . Due to rising awareness regarding safety and sustainability, herbal cosmetics prepared using natural ingredients are gaining global importance. These research work is based on formulation and evaluation of herbal lip tint by using natural ingredient Beta vulgaris (Beetroot). Beta vulgaris (commonly known as beetroot) is a natural source of red violet pigments called betalains, particularly betacyanin. These pigments are water soluble and responsible for the characteristic deep red color of beetroot. This formulation applied on the lips to prevent drying, give tint of color to the lips and protect against adverse factors of the environment. The evalution of lip tint is carried out by various parameters like texture, spreadability, colour, pH, stability, fragrance as well as its effectiveness in terms of hydration. The stability test are conducted to ensure that the quality of product maintain over time under various environmental condition. The further scope of herbal lip tint is highly promising, because of rising the global demand of herbal and natural beauty product. The adverse effect of synthetic lip tint or lip balm is removed by herbal lip tint. Moreover, there is great potential for innovation in this space, from customized tints to eco-friendly packaging and multipurpose applications.

INTRODUCTION

Lips - The lips are soft, movable structures forming the opening of the mouth. Lips and skin have different structural characteristics . The Skin of the lips have small no. of melanin cells. This makes blood vessels under the skin of the lips more visible, providing the lips a beautiful shade of pink. Lips are covered by thin skin (no sweat glands) . [4]

Problems related to lips – Lips disorder affect the structure, colour or health of lips.

***Corresponding Author:** Pooja Ikhar
Address: *P. R. Patil Institute of Pharmacy, Talegaon (S.P.), Wardha, India*
Email : ikharpooja11@gmail.com

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1. Dry and Chapped lips – Caused by dehydration, cold weather or excessive licking.

2. Pigementation – Due to sun exposure, smoking, caffeine or hormonal changes.

3. Lip Cracks – Due to extreme dryness or vitamin deficiency.

4. Swelling- Hereditary angioedema is a disorder that can result in repeated episodes of swelling [2]

5. Inflammatory response: The corners of the lips may become uncomfortable, scorching, red, cracked, and scaly when the lips become inflamed (cheilitis). A diet low in vitamin B2 may be the cause of cheilitis.

6. Discoloration – Hyperpigmentation, Freckles, Systemic condition.

7. Sun Damage – Lips can get sunburned due to UV exposure. [5]



Dry lips



discolorated lips

The Various products are available in the market to avoid various types of lips problems, such as –

- Lipsticks
- Lip balm
- Lip gloss
- Lip Cream
- Synthetic Lip tin

All above the products are synthetic in nature that have various side effects or limitations. In the above-mentioned cosmeceuticals various synthetic colours and ingredients are used for good apperance and for cosmetic purpose. The above-mentioned cosmeceuticals give good appearance but not any kind of therapeutic effect. Due to the presence of hazardous synthetic excipients in cosmetics, there has been a great public concern regarding the use of organic sources. Lips do not have any oil glands; thus, it is important to provide extra moisture and protection throughout the day. [6] Additionally, these synthetic substances can negatively impact the environment and contribute to pollution. As a result, consumers are becoming more cautious in their selection of cosmetic products[7]. With increasing awareness of environmental and health concerns, consumers are leaning toward green beauty. [8]

Herbal lip tints are an innovative category of cosmetic formulations that aim to deliver both color and care. Unlike conventional lipsticks that may contain parabens, heavy metals, artificial fragrances, and synthetic dyes herbal lip tints utilize natural plant-based colorants, oils, waxes, and antioxidants, offering a healthier alternative. [1] One of the plants that has the potential to be developed as a lip balm is the beetroot tuber plant. [10] In the formulation of herbal lip tint beetroot

(*Beta vulgaris)* is use as natural colourant. Beetroot is often also known as the root of a plant with a root shape similar to a bulb. The dye (pigment) found in red beets is betalain, which is the most abundant content in Beetroot. The content of betacyanin (purple pigment) and betaxanthin (yellow pigment) is a natural dye that forms a purplish dark red color. In addition, there is a content of Betalain, which is a group of antioxidants, vitamins and minerals such as vitamins B, calcium, phosphorus, nutrients and iron. [9] Beetroot lip tint fits perfectly due to its: Biodegradable and renewable ingredients. Vitamin C in beetroots helps with collagen production, which is crucial for maintaining with plupness and firmness. Iron and follate helps to nourish the skin and support circulation, which can enhance lip health and natural colour. [8]

Beetroot consists of the fleshy taproot of *Beta vulgaris*, belonging to the family Chenopodiaceae (now often classified under Amaranthaceae). Beetroot contains several important phytochemicals like Betalains as major pigments i.e. Betacyanin (red pigment) and Betaxanthin (yellow pigment), Vitamin C, Vitamin B9, Minerals, Carbohydrates and other constituents like polyphenol, flavonoids and nitrates. Beetroot is use as natural colourant in lip tint and cosmetics. It act as an anti- oxidant, it is use for skin glow and hydration .



Lip tint

Review of Literature :

1. **Kumodini Bansod et al. (2025):**

Developed and evaluated a herbal lip tint using natural ingredients such as glycerin, vitamin E, beeswax, strawberry and beetroot powders, along with oils like castor, tea tree, and coconut oil. The formulation was designed to provide moisturizing, protective, and coloring effects, making it a multifunctional cosmeceutical product.The study assessed various physicochemical parameters including texture, spreadability, and melting point, along with performance aspects like hydration, healing of dry lips, and user acceptability. Stability testing confirmed that the formulation maintained its quality under different environmental conditions.

The authors highlighted that herbal lip tints have strong future potential due to increasing consumer preference for natural, safe, and sustainable cosmetic products. Growing awareness about harmful effects of synthetic ingredients and the trend toward minimalistic beauty further support the demand for plant-based formulations. Additionally, opportunities exist for innovation in areas such as personalized products, eco-friendly packaging, and multifunctional applications

2. **Nitika Kumari ,Padma youdol(2024):**

One cosmetics item that is frequently used is lip balm. A waxy material called lip balm is applied to the lips to maintain moisture. The purpose of the lip balm is to shield the lips from outside factors, like the winter cold, and to avoid chapped and dry lips. Lip balm shields lips from irritation and illness. It also lessens the discomfort that comes with chapped lips. The lip balm's components aid to treat cracked lips and moisturize the lips. Lip balm isn't gender-specific like lipstick. The majority of them are waxy in texture. Lip balm is a type of moisturizer that is used to protect the lips

from environmental factors and prevent them from drying out. The adverse effects of lip balm are lessened when herbal substances are used.

3. **Nakshtra Wagdhare and Pawan Mali (2025)**

It described cosmetic science as a multidisciplinary field that integrates chemistry, biology, dermatology, and consumer behavior to enhance human aesthetics. The field has evolved significantly from traditional beauty practices to a modern, technology-driven discipline. The authors highlighted that major advancements in the 20th century led to the development of sophisticated formulations containing emulsifiers, preservatives, and synthetic colorants. In recent years, cosmetic science has expanded its focus beyond appearance to include skin health, safety, and ethical considerations. Ingredients such as hyaluronic acid and retinoids are extensively studied for their therapeutic and cosmetic benefits. Furthermore, the study emphasized the growing importance of regulatory standards, sustainability, and consumer awareness in shaping the cosmetic industry. Emerging technologies like nanotechnology and artificial intelligence are playing a crucial role in advancing formulation strategies and product innovation, reflecting the continuous evolution of cosmetic science.

4. **Pawar et al. (2025):**

Many lip-care products used daily, like lipsticks and lip balms, contain harmful chemicals such as heavy metals and preservatives. These substances are not just bad for your skin they can also enter your body through the pores on your lips or when you accidentally swallow small amounts while eating or drinking. While these products are mainly used to make the lips look more attractive, they should also help in keeping the lips healthy and protected. Unfortunately, most of the commercial lip products on the market rely on artificial chemicals, colors, and synthetic flavors. Over time, these chemicals can cause skin irritation, dryness, darkening of the lips, or even allergic reactions. That's why natural and organic lip balms are becoming more popular. These are made using safe, plant- based ingredients that not only enhance the appearance of your lips but also keep them soft, smooth, and hydrated.

5. **Payal Solanke et al.(2025):**

The primary focus of this study is the creation and assessment of a natural lip balm that uses beetroot juice as its primary ingredient. Beetroot, renowned for its vibrant colour and potential health advantages, is a promising ingredient in cosmetics because of its natural pigments and moisturising properties. The first step in the research process is creating a lip product formulation that includes beetroot juice and other natural components. The formulation of the lip balm is then assessed in terms of its physical, chemical, and sensory properties. By examining a number of factors, such as colour, pH, texture, scent, and moisturising effectiveness, the product's overall quality and consumer appeal are evaluated. Additionally, stability tests are performed to guarantee the lip balm's longevity and shelf life under various storage circumstances. In addition to offering insights into the possible advantages of using beetroot juice in lip care products, the study's findings hope to support the rising demand for sustainable and natural cosmetics. In the end, the study aims to provide a competitive substitute for traditional lip balms, encouraging environmentally responsible and health- conscious cosmetics.

Aim :- Formulation and Evaluation of Herbal Lip Tint Using *Beta vulgaris* Extract .

Objective :- To formulate a stable lip tint using natural ingredients . To formulate a natural lip tint having suitable fragrance not affecting its natural properties. To replace the synthetic dyes with the natural, safe and non – toxic alternative. Also to evaluate the prepared lip tint for pH, spreadibility, and stability.

MATERIAL AND METHODS

The ingredient used in herbal lip tint are as follows-

Sr. no.	Ingredient	Instrument	Apparatus
1	Beetroot (*Beta vulgaris*)	Weighing balance	Beaker
2	Coconut Oil	pH meter	Stirrer
3	Castor Oil		Water bath
4	Beeswax		Tripod stand
5	Almond Oil		Burner
6	Vanilline		Measuring cylinder
7	Methyl Paraben		Conical Flask
8	Vitamin E		
9	Ethanol		
10	Distilled Water		

Beetroot –

Beetroot powder is a multifunctional, natural ingredient in herbal lip tint. Beetroot is a dark red vegetable, rich in vitamins, antioxidants, and natural color. It is often used in natural skincare for its beauty benefits. It provide a beautiful tint and its inclusion enhances both the aesthetic and therapeutic value of the product. [8, 11]

Nomenclature:

- **Common Name:** Beetroot, Garden Beet, sugar Beet, Red Beet
- **Botanical Name:** Beta vulgaris subsp. Vulgaris
- **Family:** Chenopodiaceae
- **Origin:** Europe and Africa
- **Plant Type:** Biennial (grown as an annual for roots)
- **Chemical constituents :** Amino acid, minerals [8]



***Beta vulgaris* extract**

Coconut Oil *(Cocos nucifera)* -

Coconut oil (Cocos nucifera), derived from the meat of mature coconuts, has emerged as a versatile and highly valued natural product with a wide array of applications. Renowned for its distinct aroma, creamy texture, and myriad health benefits, coconut oil has been utilized for centuries across various cultures for culinary, medicinal, and cosmetic purposes.[6]

Function:

- Used as a moisturizer and emollient in the formulation
- Prevents lip dryness
- Provides a smooth and hydrating texture.

Mechanism of Action:

With its unique composition rich in medium-chain fatty acids and antioxidants, coconut oil has garnered attention not only in traditional medicine

but also in modern scientific research.[6] The fatty acids in coconut oil penetrate the skin and help maintain hydration,preventing the lips from becoming dry or cracked.[1]



Cocos nusifera



Ricinous communis

Castor Oil (*Ricinus Communis*) –

Castor oil (Ricinus Communis) is a vegetable oil obtained from the seeds of the castor bean plant. It is rich in ricinoleic acid, which gives it its emollient properties.[1] It is especially valued in herbal and natural cosmetic products for being plant-based, skin-friendly, and effective at dispersing pigments.

Whether used alone or with other oils, castor oil plays a vital role in enhancing both the function and aesthetic of lip tint products.

Use:

1. Provides Shine

2. Acts as a Natural Emollient

3. Carrier Oil for Pigments and Actives

4. Enhances Texture

5. Natural and Skin-Friendly [11]

Beeswax -

Bees create beeswax to build the honeycomb in their hives. Beeswax is made up of special ingredients like fats and oils, which give it strength and helpful qualities. [8] It is incredibly moisturising, has a lovely scent, and may shield the lips against UV rays that harm them act as a natural emulsifier. The anti-bacterial property in beeswax helps to lessen the discomfort of the inflammation that follows an infection. [12] It gives solid cosmetics structure by thickening them up and maintaining their solid state for seamless application. [2]

Nomenclature :

Botanical Name: Ceropegia ampliata

Common Names: Beeswax plant, Bushman's pipe, Horny wonder

Plant Family: Apocynaceae

Origin: South Africa, Namibia

Plant Type: Perennial succulent vine



Beeswax

Almond Oil -

Almond oil is a natural oil obtained from the seeds of the almond tree, scientifically known as Prunus dulcis. Almond oil goes deep into the skin and helps keep the lips soft and smooth because of its healthy fats. It also helps reduce pain and dryness caused by chapped or sunburned lips. It also has antioxidants that protect the lips from wrinkles and damage. As an emollient, it smooths and softens the skin by filling gaps between skin cells. Almond oil contains oleic acid and linoleic acid, essential fatty acids that restore the skins natural lipid layer, keeping lips healthy and protected from environmental damage. It protects lip skin cells from oxidative stress and premature aging. [8]



Almond oil

Vanilline (Vanilla planifolia) –

Vanilla essence is derived from the beans of the vanilla orchid, which contains vanillin, a compound with antioxidant properties.

- Function: Adds fragrance and enhances the sensory appeal of the lip tint.
- Properties: Provides a pleasant, sweet fragrance while offering mild antioxidant effects.
- Mechanism of Action: Vanillin protects the product from oxidative damage and masks any herbal odors, making the lip tint more appealing to consumers [1]



Vanila planifolia

Vitamin E –

Vitamin E nourish and protects the lips while enhancing the effect of the beetroot's natural tint. It is available as tocopherol or tocopheryl acetate in beauty formulations, known for its skin protective qualities[8] · Vitamin E can help to close up the painful cracks in the skin that are caused by dryness and cold weather and can seal up cracks and keep the skin of your lips soft, supple [13] · It slows down the ageing process, keeping the lips' delicate, young texture.

Utilising vitamin E on dry lips speeds up the appearance of newly formed cells because it encourages cell repair and cycle. [12]



Vitamin E

Formulation – The formulation of the herbal lip tint was designed to combine natural colorants, emollients, and therapeutic agents to provide a tinted, moisturizing, and protective effect on the lips. The ingredients were selected based on their safety, functionality, and compatibility [1]

Sr. No.	Ingredients	Quantities		
		F1	F2	F3
1	Beetroot Extract	1ml	1ml	1.2ml
2	Coconut Oil	2.2ml	2.2ml	-
3	Castor Oil	4.6ml	3.12ml	3.64ml
4	Almond Oil	-	-	2.08ml
5	Vanilline	q.s.	q.s	q.s
6	Beeswax	2g	1.5g	0.3g
7	Vitamin E	0.11ml	0.22ml	0.22ml
8	Methyl Paraben	0.2g	0.1g	0.2g
9	Glycerin	-	0.16ml	0.8ml

Method of Preparation –

Preparation of Beetroot Extract (Coloring Agent) :

1. Cleaning: Wash fresh beetroot thoroughly to remove dirt and impurities.

2. Peeling and Cutting : Peel the beetroot and cut it into small pieces.

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

4. Weighing : Weigh the required quantity of beetroot paste.

5. Addition of Ethanol : Add Ethanol and Water in the ratio of 70:30

6. Maceration : Transfer into a closed container, Keep for 24–48 hours and Shake occasionally (every few hours)

- This helps dissolve betalain pigments

7. Filtration: Filter using muslin cloth or filter paper, Collect the reddish extract

8. Concentration (Optional but Recommended) : Evaporate excess ethanol,Keep on water bath (below 50°C) OR allow to evaporate at room temperature to obtain thick concentrated pigment (Betalain extract)

- You will get a more concentrated extract

9. Storage : Store in amber-colored bottle, Keep in cool place (preferably refrigerator)



grinding of beetroot



weighing



Maceration



Filtration



Storage of extract

Preparation of Natural Lip Tint:

Step 1: Melting the Base: Take beeswax in a beaker. Melt it using a 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: Vanilline / Lavender oil / Olive Oil / Rosemary Oil .

Step 5: Homogenization/ Mix the entire formulation until:

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

Step 6: Molding/ Pour the warm mixture into: Lip tint containers.

Step 7: Cooling: Allow it to cool at room temperature. The mixture solidifies into a semi-solid, smooth lip tint.



F1



F2



F3

Storage:

- Store lip tint at room temperature.
- Avoid high heat and direct sunlight (betalain pigment may fade).
- This method yields a smooth, spreadable, semi-solid lip tint [5]

EVALUATION PARAMETER –

➢ **Physical Appearance** –

1. Colour : Usually a deep reddish-pink or maroon shade due to the natural pigment (betalain) found in beetroot.The tint can vary based on how much beetroot extract or powder is used.
2. Texture : Smooth and creamy, sometimes slightly waxy depending on the base [8]

➢ **pH Measurment -**

The pH measurement is performed to ensure the product is safe and non-irritating for lips. For this 1g of lip tint is diluted with 10 ml distilled water, the pH was then measured using pH meter. [11] The result show that the lip tint had pH close to neutral.



Fig. Ph of F1



fig.Ph of F2



Fig. Ph of F3

➢ **Stability Study-**

Prepared lip tint was placed for accelerated stability studies at room temperature (25 °c), at accelerated temperature (40°c) and at refrigerated temperature (4°c) for 30 days .After 30 days it was again characterized for organoleptic properties, melting point, spreadability and pH [8]

➢ **Skin Irritation Test –**

To accomplish this, apply the product as a patch to the skin, wait 30 minutes, and look for any signs of:

- No reaction
- Irritation
- Redness [2]

➢ **Melting point –**

Take a capillary tube,

• fill it with the test sample at one end, and then seal the other end

• The capillary tube should be placed in a melting point device

• Turn the knob on the heater. Check the test sample's melting point. [3]

➢ **Spreadability-**

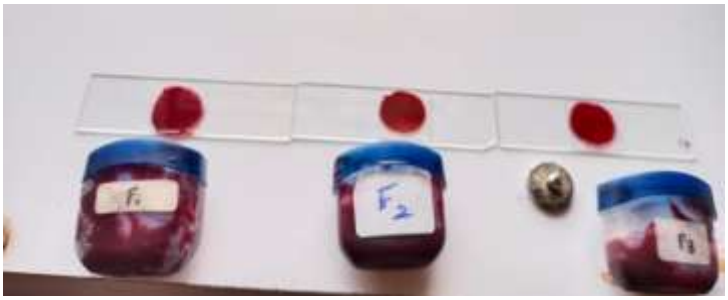
Spreadability is assessed with the aid of a slide. The lip tint is placed on a slide and then another slide is placed on it, load is applied. Regarding the homogeneity of the layer creation, visual observations were made

The following standards have been determined for this examination:

G: Good: uniform

I - Leaves few stops; moderate uniformity

B - bad: uneven



spreaability of F1, F2, F3



Spredability of F1, F2, F3

➢ **Washability-**

The ease of removal of the lip tint was tested by applying it to the skin and attempting to remove it with plain water.A good lip tint should be semi-permanent but removable with mild cleansing .

➢ **Microbial limit test-**

The test is important to ensure the product is safe and free from harmful microorganism. Microbial limit test is used to estimate the number of viable microoragnism and also detect the presence of specific pathogens.

Purpose:

- Prevent infection (especially on cracked lips).
- Ensure product safety during storage.
- Check effectivness of preservative.



Microbial limit test

Sr. No.	Evaluation Parameter	Obervation		
		F1	F2	F3
1	Physical Appearance			
	• Texture	Smooth, slightly waxy	smooth	Smooth
	• Colour	Reddish pink	Reddish pink	Reddish pink
2	pH Measurement	5.95	6.12	6.21
3	Stability Study	stable	Stable	Stable
4	Skin Irritation	No reaction	No reaction	No reaction
5	Melting Point	60-65 °c	50-60 °c	45-55 °c
6	Spreadability	Good (1.8 dia.)	Good (1.9 dia.)	Good (1.8 dia.)
7	Washibility	Easily washable	Easily washable	Easily washable
8	Microbial limit test	Pass	Pass	Pass

RESULT :

The goal of the formulation of this lip tint was to utilize a natural coloring agent in place of synthetic dyes, which may be associated with possible adverse effects. The study focused on the formulation and evaluation of a herbal lip tint using extract of Beta vulgaris as a natural color source. The results shows that this extract is a safe

and effective alternative, providing a rich pink tint while ensuring lip safety and care.

The developed lip tint shows desirable cosmetic characteristics, including a smooth texture, pleasant aroma, good spreadability, and an attractive color. The use of Beta vulgaris extract successfully eliminated the need for artificial coloring agents while still achieving an appealing tint.

Further evaluation parameters included stability testing, pH determination, microbial contamination analysis, skin irritation test, and spreadability testing. The formulation remained stable under both room temperature and refrigerated conditions. The pH of the lip tint was found to be 6.12, which is suitable for cosmetic applications. Additionally, the product showed excellent spreadability, uniform application, and no noticeable changes in consistency over time.

Microbial and skin irritation studies confirmed that the formulation is safe for use, indicating that the herbal lip tint is both effective and beneficial for lip care.

SUMMARY AND CONCLUSION :

Making lip tint from beetroot is a great step forward in natural skincare. This project was carried out to develop a herbal lip tint prepared using naturally derived ingredients, with beetroot (*Beta vulgaris*) extract serving as the primary coloring component. Various excipients such as waxes, oils, and antioxidants were incorporated to enhance the product's functional and aesthetic properties. The prepared formulation was subjected to multiple evaluation tests including physical appearance, pH, spreadability, stability, melting behavior, and skin compatibility. The findings confirmed that the formulation was stable, safe for use, and suitable as a cosmetic product. The prepared lip tint provide dual action such as Cosmetic and therapeutic.

Appropriate natural ingredients were carefully selected to ensure safety and effectiveness. Beetroot extract containing natural pigments was prepared using a suitable extraction method. The formulation was developed by blending waxes, oils, and the extract under controlled conditions. Different combinations were tested to achieve the desired consistency, color, and texture. The final product was evaluated using standard parameters such as pH, spreadability, and stability. Based on the evaluation results, the formulation was found to meet the intended objectives. The developed herbal lip tint offers a safer alternative to conventional products that often contain synthetic chemicals. It not only enhances the appearance of the lips but also provides nourishment and protection. Due to its natural composition, the formulation is environmentally friendly and suitable for regular use.

There is considerable scope for further improvement and innovation in herbal lip tint formulations. Future work may focus on enhancing product stability, developing new shades using different plant-based pigments, and improving overall performance. Additionally, the use of sustainable packaging and customization based on consumer needs can be explored. With increasing awareness and demand for natural cosmetics, such formulations are expected to gain wider acceptance in the market.

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CONFLICT OF INTEREST:

The authors declare no conflict of interest.

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