

Formulation and Evaluation of Lip Balm From Beetroot

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Abstract: *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..*

Keywords: Beetroot extract for cosmetic, natural lip balm formulation, beetroot for lip care, herbal lip balm, beetroot antioxidant properties , lip balm with natural ingredients , beetroot lip balm

I. INTRODUCTION

Many cosmetics contain harmful synthetic (man-made) ingredients, which has caused concern among people. Since lips don't have oil glands, they can easily become dry, so it's important to keep them moisturized and protected throughout the day. Most regular lip balms include harmful substances like petrolatum, synthetic wax, alumina, parabens, hydrogenated oils, and artificial colors or fragrances. These can be toxic. People often lick their lips or accidentally eat some lip balm, which makes the use of safe ingredients even more important for health. Cosmeceuticals are natural ingredients that have both healing and skin-protecting benefits. This study focused on using such safer ingredients with fewer side effects to make a lip balm. Lip balms are meant to protect the lips, not decorate them. They form a thin, oily layer on the lips that keeps in moisture and blocks out dryness. These balms usually don't have color. Beeswax, made by female bees, is often used in lip balms. It keeps lips moisturized, smells good, protects from sun damage, and helps mix the other ingredients together. Vitamin E is an antioxidant that also works as a natural softener. It helps keep lips smooth and youthful by reducing aging signs. Coconut oil goes deep into the skin and its fatty acids help keep lips soft and hydrated[1]. Coconut oil helps reduce redness and pain from dry or sunburned lips because it has anti-inflammatory properties. Honey helps heal wounds because it can kill bacteria and fungi and also has antioxidants. Beetroot has a lot of antioxidants that make the lips soft, smooth, and help the skin stay stretchy and healthy[2]. Beetroot is a rich source of betalains, flavonoids, vitamin C, and polyphenols, which contribute not only to its bright red color but also to its antioxidant, anti-inflammatory, and skin-rejuvenating properties. These compounds help to combat oxidative stress caused by environmental factors such as UV radiation and pollution, which are known to damage skin cells and accelerate aging. The natural colorants found in beetroot, especially betanin, can provide a gentle and appealing pink or reddish tint to the lips, eliminating the need for synthetic dyes that may cause allergic reactions or irritation. Beetroot contains nitrates and iron, which promote blood circulation. Some anecdotal evidence suggests that applying beetroot juice or beetroot-based products topically may temporarily enhance lip color and plumpness by increasing blood flow, giving lips a naturally healthy appearance. As consumers increasingly shift toward natural, organic, and chemical-free skincare products, beetroot lip balm has gained popularity for its ability to provide hydration, protection, and a subtle tint using plant-based ingredients[3]. Betalains are water-soluble nitrogen-containing pigments with high antioxidant potential. These pigments are stable under mildly acidic conditions, making them ideal for cosmetic formulations like



lip balms. With increasing awareness of environmental and health concerns, consumers are leaning toward green beauty. Beetroot lip balm fits perfectly into this movement due to its: Biodegradable and renewable ingredients, Cruelty-free and vegan formulation potential Minimal ecological footprint in farming and extraction. Vitamin C in beetroot helps with collagen production, which is crucial for maintaining lip plumpness and firmness. Iron and Folate help nourish the skin and support circulation, which can enhance lip health and natural color. Saponins and Tannins in beetroot may also contribute to antimicrobial effects, potentially aiding in the prevention of lip infections such as cold sores[4].

INGREDIENTS AND USES:

1. Beetroot extract:-



Figure No: 1 Beetroot extract

Beetroot is a dark red vegetable, rich in vitamins, antioxidants, and natural color. It is often used in natural skincare for its beauty benefits. Gives natural pink/red colour to your lips. Keeps lips soft and smooth. Has vitamins that are good for your skin. Made from a vegetable, so it's safe and natural. It's natural and chemical-free – Safe even for sensitive skin. Brightens dark lips – With regular use, beetroot can help lighten dark or dull lips. Makes lips look healthy – The natural red or pink color gives a fresh, healthy glow[5].

Vaseline:-



Figure No: 2 Vaseline

Vaseline is a petroleum-based product, originally a triple-purified petroleum jelly, known for its healing and moisturizing properties. It's been a staple in many households since its introduction in 1870, particularly for treating dry skin, minor cuts, burns, and chapped lips. Vaseline's main function is to create a protective barrier on the skin, locking in moisture and aiding in the natural healing process. It is semi-solid mixture of hydrocarbons originally discovered in the 19th century. Vaseline is hydrophobic and non-polar, so it doesn't absorb into the skin but instead creates a seal. This seal prevents water from evaporating, keeping lips hydrated longer. Chemically inert, Vaseline doesn't react with other ingredients, making it a stable base for active additives (like beetroot extract or essential oils). It helps evenly distribute pigments or therapeutic agents in a lip balm formulation. Provides a smooth, spreadable texture. Adds viscosity and consistency to lip balm formulations. Physically shields lips from environmental irritants, wind, and pollutants. Adds a desirable gloss and soft feel, improving user experience and aesthetic appeal[6].

Vitamin E:-



Figure No: 3 Vitamin E



Vitamin E complements it by nourishing and protecting the lips while enhancing the effect of the beetroot's natural tint. Vitamin E helps to deeply hydrate and soften lips, preventing dryness and cracking. Vitamin E is commonly used in skincare. It is available as tocopherol or tocopheryl acetate in beauty formulations. It is known for its skin-repairing and protective qualities[7].

Deep Moisturization :- Vitamin E helps lock in moisture, keeping lips hydrated and preventing dryness and flaking.

Antioxidant Action :- Protects lips from oxidative damage caused by sun, pollution, and toxins. This helps maintain soft and healthy lips.

Healing and Repair :- Helps in the regeneration of skin cells. Great for healing cracked, chapped, or peeling lips.

Natural Preservative :- Prevents oils and butters in lip balm from going rancid by slowing oxidation, thereby increasing shelf life.

Sun Protection Support :- Though not a sunscreen itself, Vitamin E boosts the effect of other sun-protective ingredients and reduces sun damage.

Anti-Aging :- Prevents fine lines and wrinkling of lip skin by improving elasticity and promoting collagen production[8]

Rose water:-



Figure No: 4 Rose water

Rose water has been used for thousands of years, dating back to ancient Persia and Egypt. Cleopatra is said to have used rose water in her skincare. It's traditionally made by steam-distilling rose petals, especially from the Damask rose. Components are present in rose water flavonoids, Terpenes, phenyl ethanol, citronellol and geraniol (natural antiseptics)[9].

Toner: Balances skin pH, tightens pores, and removes excess oil.

Moisturizer: Hydrates and revitalizes dry or tired skin.

Acne treatment: Its antibacterial and anti-inflammatory properties help reduce acne and redness.

Anti-aging: Reduces fine lines, puffiness, and under-eye bags.

Makeup remover: Gently removes makeup when combined with oils (like coconut or almond oil).

After-sun care: Soothes sunburns and cools the skin[10].

Almond oil:-



Figure No: 5 Almond oil

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[11]. 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 help restore the skin's natural lipid layer, keeping lips healthy and protected from environmental damage. It protects lip skin cells from oxidative stress and premature aging.



Also promotes skin repair and healing, making it beneficial for cracked or chapped lips. Helps calm minor irritation or inflammation from dryness, cold weather, or sun exposure.

Hypoallergenic Nature:- In theory, almond oil is considered gentle and safe for sensitive skin (including lips), though some people with nut allergies should avoid it.

Solvent for Actives:- Almond oil can act as a carrier oil, helping dissolve and deliver other beneficial ingredients like essential oils, vitamins, or herbal extracts deeper into the lip tissue[12].

Bee wax:-



Figure No: 6 Beeswax

Beeswax is a natural substance made by honeybees. It shows how amazing nature is and how hard bees work. For thousands of years, people have used beeswax in many ways, from ancient times to today. Bees create beeswax to build the honeycomb in their hives. This helps them store honey safely. But beeswax isn't just important for bees—it's also very useful for people. We use it in things like makeup, medicine, art, and crafts. Beeswax is made up of special natural ingredients like fats and oils, which give it strength and helpful qualities. It can heal the skin and make products look and feel better. When we learn about beeswax, we discover a natural gift with a long history and many uses[13].

II. LITERATURE REVIEW

1. Siti Nural Huda Mohammad Azmin, et.al (2020):

In this study the many cosmetics contain harmful synthetic (man-made) ingredients, which has caused concern among people. Since lips don't have oil gland.. Cosmeceuticals are natural ingredients that have both healing and skin-protecting benefits. This study focused on using such safer ingredients with fewer side effects to make a lip balm. Lip balms are meant to protect the lips, not decorate them. They form a thin, oily layer on the lips that keeps in moisture and blocks out dryness. These balms usually don't have color[1].

2. Kole, P. L Jadhav.H.R. et al. (2022):

This introduces the theme or category of studies about to discuss 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 protects lip skin cells from oxidative stress and premature aging. Also promotes skin repair and healing, making it beneficial for cracked or chapped lips. Helps calm minor irritation or inflammation from dryness, cold weather, or sun Exposure[12].

3. Hsinchu ,Taiwan et.al (2023) :

In this study rose water has been used for thousands of years, dating back to ancient Persia and Egypt. Cleopatra is said to have used rose water in her skincare. It's traditionally made by steam-distilling rose petals, especially from the Damask rose. Components are present in rose water flavonoids, Terpenes , phenyl ethanol , citronellol and geraniol (natural antiseptics)[9].

4. Robinson, N. Bryce, et.al (2021– 2023):

This concept introduced:



Toner: Balances skin pH, tightens pores, and removes excess oil.

Moisturizer: Hydrates and revitalizes dry or tired skin.

Acne treatment: Its antibacterial and anti-inflammatory properties help reduce acne and redness.

Anti-aging: Reduces fine lines, puffiness, and under-eye bags.

Makeup remover: Gently removes makeup when combined with oils (like coconut or almond oil).

After-sun care: Soothes sunburns and cools the skin[10].

5. Bharanidharan, D., P. Krishnan, et.al (2023):

In this study the beetroot is a dark red vegetable, rich in vitamins, antioxidants, and natural color. It is often used in natural skincare for its beauty benefits. Gives natural pink/red colour to your lips. Keeps lips soft and smooth. Has vitamins that are good for your skin. Made from a vegetable, so it's safe and natural[5].

6. Haney, Beth.et.al (2024):

While there is substantial research on vaseline is hydrophobic and non-polar, so it doesn't absorb into the skin but instead creates a seal. It helps evenly distribute pigments or therapeutic agents in a lip balm formulation. Provides a smooth, spreadable texture. Adds viscosity and consistency to lip balm formulations. Physically shields lips from environmental irritants, wind, and pollutants. Adds a desirable gloss and soft feel, improving user experience and aesthetic appeal[6].

7. Panin, G., R. Strumia, and F. Ursini. et.al (2024):

In this study about vitamin E complements it by nourishing and protecting the lips while enhancing the effect of the beetroot's natural tint. This helps maintain soft and healthy lips. Vitamin E helps lock in moisture, keeping lips hydrated and preventing dryness and flaking. It is available as tocopherol or tocopheryl acetate in beauty formulations. It is known for its skin-repairing and protective qualities[7].

8. Rahman, Parvejur, and Sagufta Mehnaz et.al (2024):

While there is substantial research on beeswax is a natural substance made by honeybees. For thousands of years, people have used beeswax in many ways, from ancient times to today. But beeswax isn't just important for bees it's also very useful for people. We use it in things like makeup, medicine, art, and crafts. Beeswax is made up of special natural ingredients like fats and oils, which give it strength and helpful qualities. It can heal the skin and make products look and feel better[13].

III. AIM AND OBJECTIVE :

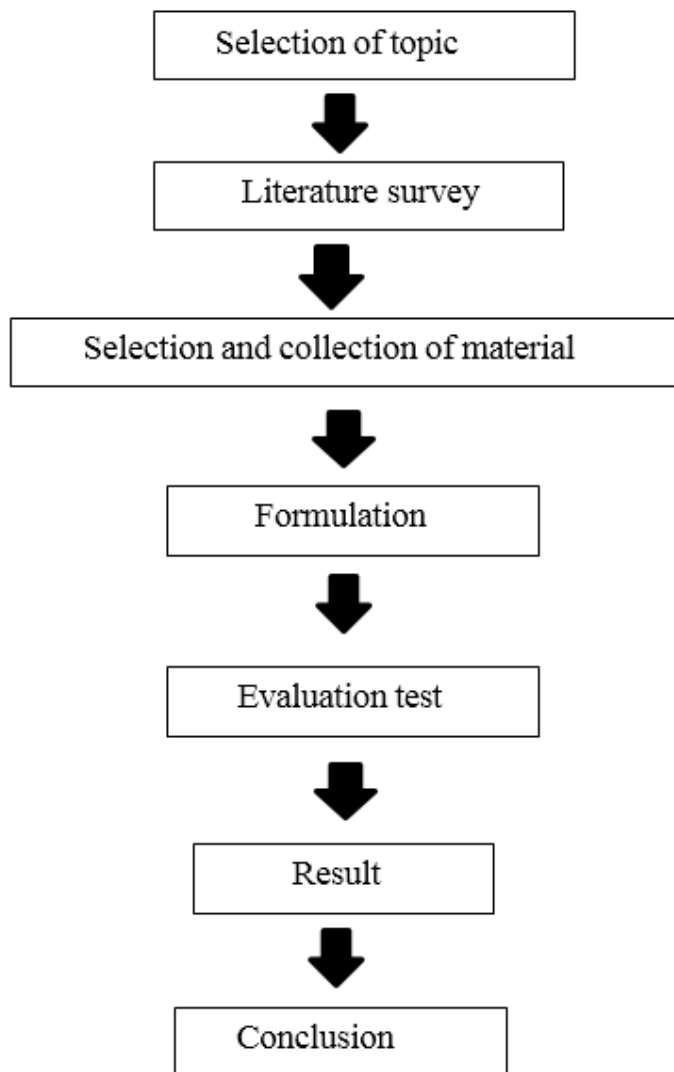
Aim: Formulation and evaluation of lip balm from beetroot

Objective:

1. To extract and utilize natural pigments from beetroot (Beta vulgaris L.)
2. To formulate a lip balm using beetroot extract in combination with natural base ingredients such as beeswax & coconut oil.
3. To evaluate the physical properties of the formulated lip balm, including texture, spreadability, melting point, and pH, ensuring product stability, irritation of skin.
4. To assess the moisturizing and tinting effects of the beetroot lip balm on lips.
5. To conduct stability studies of the lip balm under various environmental conditions, analyzing changes in color, odor, and pH over time.
6. To ensure the safety and skin compatibility of the lip balm.



IV. PLAN OF WORK



PLANT AND EXCIPIENTS PROFILE :

1) Beetroot:-



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 acids , minerals[14] .

2) Beeswax:-



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[15]

V. MATERIAL AND METHODOLOGY

Material:

Collection of material: Beetroot juice for natural colour and antioxidants, vaseline for seal prevents water from evaporating and keeping lips hydrated longer, beeswax to give structure and firmness to the balm , coconut oil for moisturizing and nourishing lips , vitamin E for preservation and skin benefits and lip balm container to store the final product[16,17].

Table No: 1 Formulation table of lip balm

Sr no.	Ingredients	Uses	Quantity
1	Beetroot extract	Pigment	62 ml
2	Vaseline	Sun protection	7.5 gm
3	Vitamin E	Anti-oxidant	0.30 gm
4	Rose water	As cool agent and fragrance	2.5 ml
5	Almond oil	Moisturize	6 ml
6	Bee wax	Natural emulsifier	1.2 gm

METHODOLOGY:

Procedure:

Step 1: Take Fresh beetroot wash clean, peeled, and chopped. Juice was extracted using a blender and filtered.

Step 2: Boil the beetroot juice for 20 min on low heat and let it simmer until it reduces to a thick, concentrated liquid. put it aside to cool.

Step 3: set up a double boiler method and add the Vaseline , bee wax , and almond oil . And after stir continuously until all ingredients and melt completely and combine it.

Step 4: Remove the melted Almond oil , bee wax and Vaseline mixture from heat. Quickly stir in the reduced beetroot extract. Add vitamin E and Rose water. mix well for an even blend .

Step 5: Immediately pour the mixture into the small lip balm container. Let them keep in freezer for 30 min to solidify and after take it out and keep at room temperature. And once set , cover with lids and label[18].



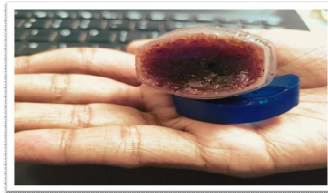


Figure no:7 Product photo

HOW TO APPLY LIP BALM FOR THE BEST PROTECTION:-

Step One: Open the container:

If the balm is in a tube, twist it up just a little about half a centimeter. If it's in a small jar or pot, scoop out a small amount about the size of a pea using your finger.

Step two: Put balm on your bottom lip. Gently rub the balm along the outside of your bottom lip.

Step Three: Put balm on your top lip. Gently rub the balm along the outside of your top lip.

Step Four: Rub your lips together. Press your lips together and rub them. This helps spread the balm all over[19].

HOW TO USE[20]:



Wash your lips before apply and apply a lip balm thin layer on lips.



Massage evenly for absorption and Make sure that the application is not too thick.



Leave on during the day, under makeup, or overnight for best results.

EVALUATION PARAMETERS :

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 (like beeswax, shea butter, or cocoa butter).

Easily spreadable on the lips[24].

pH Measurement:

The pH of the lip balm was tested to check if it could cause any side effects. For this, 1 gram of the lip balm was mixed with 100 ml of water. The pH was then measured using a pH meter. The result showed that the lip balm had a pH close to neutral[25].





Figure No: 8 pH meter

Melting point:

A small amount of lip balm was placed in a thin glass tube that was sealed at one end using a flame. This tube was then placed in liquid paraffin inside a melting point apparatus. The temperature at which the lip balm melted was measured and recorded as its melting point[26].



Figure No: 9 Heating mantle

Stability study:

Prepared lip balm was placed for accelerated stability studies at room temperature (25.0 \pm 3.00C), refrigeration (4 \pm 2.00C) for 30 days .After 30 days it was again characterized for organoleptic properties, melting point, spreadability and pH[27].

Skin irritation test:

It is carried out by applying lip balm on the skin for 10 min.



Figure no: 10 Irritation Test

Test of spread ability:

The spread ability test was done by applying the lip balm several times on a glass slide to see if it spread evenly and to check if it broke, changed shape, or got damaged during use. The lip balm showed good results it spread evenly, didn't break or change shape, and applied perfectly at room temperature[28].

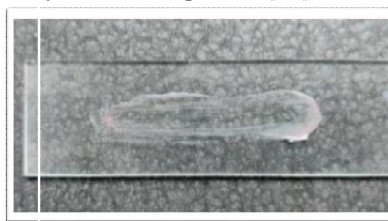


Figure No: 11 Spread ability Test



Skin sensitivity:

It was carried out by applying the product in the form of a patch on the skin for 30 min and observe the reaction as-N - No reaction , R-Redness of the skin ,I- Itching, swelling , inflammation[29]

RESULT:

Physical appearance :

1. colour: Usually a deep reddish-pink or due to the natural pigment.
2. Texture: Smooth, creamy and easily spreadable on the lips.

PH Measurement:

pH of lip balm was near to neutral pH i.e. 7.00 , this would not cause any irritation to lips.

Melting point:

Melting point of lip balm was found to be in the range of 680C- 690C, which matches the appropriate melting point of between 650-750C.

Stability study:

Stability of drug can be defined as the time from date of manufacture and the packaging of the formulation, until ,its chemical or biological activity is not less than a pre-determined level of labelled potency and its physical characteristics have not changed appreciably. Stability studies were carried out for 1 month /30 days at room temperature (25.0+/- 3.00C) , refrigeration (4+/- 2.00C) and oven temperature (40.0 +/-2.00C). It was observed that prepared lip balm shows I - Intermediate uniform ; leaves few fragments; appropriate application ; little deformation of the lip balm at room temperature (25.0+/- 3.00 C) and refrigeration (4+/-2.00 C) and little deformation at oven temperature (40.0+/- 2.00 C).

Test of spread ability:

The spread ability test was done by applying the lip balm several times on a glass slide to see if it spread evenly and to check if it broke, changed shape, or got damaged during use. The lip balm showed good results it spread evenly, didn't break or change shape, and applied perfectly at room temperature.

VI. CONCLUSION

In conclusion, making lip balm from beetroot is a great step forward in natural skincare. By carefully using beetroot extract and mixing it with other natural ingredients, a lip balm has been created that keeps lips healthy and beautiful. Beetroot is rich in antioxidants, which protect lips from damage caused by the environment. The balm also helps keep lips soft and smooth by preventing dryness and chapping. Another bonus is that beetroot gives a natural tint to the lips, adding color without using artificial dyes. This makes the lip balm not only helpful but also attractive. Since more people now want skincare products that are natural and eco-friendly, using beetroot fits this trend well. In the future, more work can be done to improve the feel and performance of the lip balm. Also, testing can help prove how well it works. Overall, beetroot lip balm is a smart and natural way to care for your lips, combining nature and science for beautiful, healthy results.

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