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Research Article

Formulation and Evaluation of Lip balm Based on Alkanet Root

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ABSTRACT

The current study focuses on the creation and evaluation of a herbal lip balm made with natural substances such as rose oil, beeswax, cocoa butter, vitamin E, alkanet root, and ascorbic acid. Rose oil helps to naturally hydrate and soften the lips. The herbal lip balm, known for its antioxidant properties, is intended to cure cracked lips and prevent hyperpigmentation. The formulation procedure included homogenous mixing, followed by tests on the lip balm's physical stability, pH, melting point, and spreadability. Overall, the study found that a lip balm containing alkanet root powder and ascorbic acid can successfully diminish hyperpigmentation while also hydrating the lips. This method is not only safe and effective, but also aesthetically pleasing. The use of plant-based chemicals reduces allergens and environmental effect by using safe, non-toxic colorants such as alkanet root. These natural components are high in vitamins and antioxidants, which contribute to the lip balm's healing effects. The alkanet root lip balm was deemed good in terms of color, smoothness, and spreadability. Furthermore, the study found that integrating herbal compounds into lip balm compositions produced little side effects.

INTRODUCTION

In modern lifestyles, cosmetics have become indispensable, with an increasing demand for natural and organic products. Herbal cosmetics, available in various formulations, include lip coloring—a traditional method that enhances the appearance of lips and adds refinement to the face. Natural colorants are generally safer than synthetic alternatives[1]. Traditional medicine has employed phytoconstituents for thousands of years. The use of cosmetics, particularly lip balms and other facial products made from natural or plant-based materials, is on the rise globally and is continuously evolving[2]. Alkanna tinctoria, commonly known as alkanet or Ratanjot, is a plant in the Boraginaceae family. Its most notable feature is its roots, which are used to produce a red dye. The deep red color of the root is due to the presence of shikonin, an isomer of alkannin, and their derivatives. The flowers of Alkanna tinctoria

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are a striking blue, while the roots appear dark red with a blackish exterior, revealing a blue-red interior. The dye from the root is soluble in oils, ether, and alcohol but not in water[3]. The natural red pigments in ratanjot roots have numerous applications in textiles, cosmetics, medicine, and cooking. Ratanjot roots contain bioactive compounds with antioxidant and wound-healing properties. To explore these antioxidant qualities further, studies have been conducted to validate the potential uses of A. tinctoria L. roots in food and other industries[4].

Fig no. 1 *Alkanet tinctoria* Roots

The genus Alkanna has been recognized since ancient times for its medicinal and pharmacological properties, along with the chemical composition of its plant parts. The root bark, in particular, is valued for its dyeing compounds[5]. Vitamin C, also known as ascorbic acid, is a water-soluble substance essential for healthy skin. This powerful antioxidant reduces redness and may support wound healing[6]. Beeswax, a natural substance produced by female bees, is commonly used in cosmetics, especially lip balms, due to its emulsifying properties. Vitamin E is another beneficial ingredient, known for its antioxidant qualities that help reduce the signs of aging and keep lips moisturized[7]. Regular lip balms function as lip sealants, creating a protective barrier between the lips and environmental conditions. They prevent moisture loss, allowing the lips to maintain their natural moisture content. As a sealant, once the lip balm wears off, moisture loss can increase due to the exposure between the air and lips[8].

Lip balm

Lip balms are formulations applied to the lips to keep them moisturized and protected from the elements. While the cosmetic literature offers limited insights into this type of formulation, it can be likened to lipstick due to similarities in form. This resemblance extends to organoleptic properties and stability requirements, such as temperature tolerance, pleasant taste, safety, smooth application, adhesion, and ease of removal. Unlike lip gloss, which can be used by both men and women, lip balms primarily consist of fatty acids, such as waxes, oils, and butters, that provide consistency and act as emollients. Common ingredients include coconut oil, beeswax, and cocoa butter, along with additives such as antioxidants to enhance the product[9].

- **Anatomy of lips**

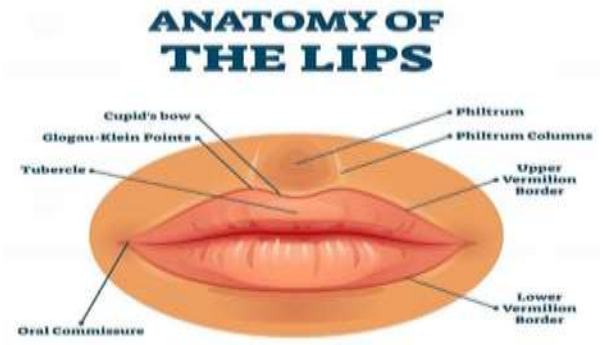

Fig no.2 Anatomy of lips

Speaking, sucking, and understanding are all done with the lips. It is composed of the epidermis, superficial fascia, orbicularis muscle, and adjacent muscles (areolar and mucous tissue membrane). The margins of the lips are covered with a dry, red mucous membrane that is continuous with the skin and has many vascular papillae and touch corpuscles. Internally, the superioris and inferioris folds occur along the centre line as the mucous

membrane from the upper and lower lip is reflected onto the gums[10].

1. **Lips:-**

The structures around the mouth. Their superior border in the middle matches the inferior margin of the nose base. The oral commissures are where the upper and lower lips meet, and their lateral borders line up with the alar sulci. The inferior border of the lip in the middle is known as the dentilabial sulcus. According to anatomy, the upper lip includes the philtrum and its pillars. Four zones make up the lip's surface: the oral mucosa, vermilion border, hairy skin, and vermilion. The normal lip shape varies depending on age and race.

2. **Vermilion:** The specialized stratified squamous epithelium covering the red portion of the lips is continuous with the gingivolabial groove's oral mucosa. Intriguingly, the lips are another name for the vermilion itself.

3. **Vermilion Border:**

The rim of paler skin that demarcates the vermilion from the surrounding skin.

4. **Cupid's Bow:**

The curve of the upper lip's vermilion border. In a frontal view, this line resembles an archer's bow, curving medially and superiorly from the commissures to the paramedian peaks at the bases of the philtrum's pillars (crista philtrae), with an inferior convexity between those peaks. The philtrum is a vertical groove in the middle of the top lip that is surrounded by these lateral pillars (ridges).

5. **Oral Commissure:**

The point at which the upper and lower lips' lateral vermilions unite. The cheilion is an anthropological landmark found at this location.

6. **Labial Fissure:**

The oral vestibule is a slit-like area located between the lips[11].

- **Disorders of lips:-**

1. **Soreness of lips:-**

A raised region or sore with rough edges on the lip might be a sign of skin cancer. Various sores may appear as a result of various medical diseases, such as oral herpes simplex virus infection or syphilis. Others, such Keratoacanthoma, have no recognized etiology.

Fig no.3 Soreness of lips

2. **Sun damage**:-

Sun damage can make the lip, especially the lower lip, hard and dry. This sort of damage can be prevented by coating the lips with lip balm that contains vitamin C.

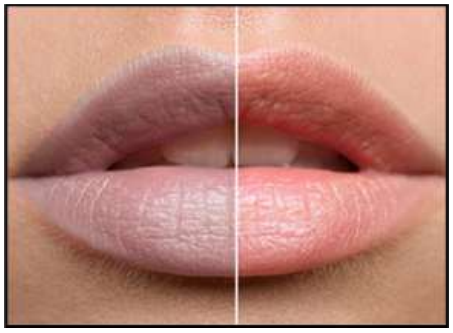

Fig no.4 Sun damaged lips

3. Discolouration:-

Freckles and uneven brownish areas around the lips can linger for years. Kawasaki illness, a condition of unclear origin that often affects infants and children, can cause dryness and cracking of the lips, as well as reddening of the mouth lining.

Fig no.5 Discoloration of lips

4. Swelling:-

An allergic response might cause swelling in the lips. The response might be due to sensitivity to specific meals, beverages, medicines, lipstick, or airborne irritants. When a reason is discovered and eliminated, the lips often return to normal.

Fig no.6 Swelling of lips

5. Exfoliative Cheilitis:-

Exfoliative cheilitis is a wide term that relates to a variety of chronic diseases. It is marked by persistent scale and vermilion irritation, with the lower lip being more severely affected than the upper lip (chronic chapped lips). Patients may complain of dryness, itching, or tingling. Exfoliative lip findings can be produced by a number of inflammatory dermatoses, including as atopic dermatitis (AD), psoriasis, and a persistent irritating or allergic reaction to cosmetics[12].

Fig no.7 Exfoliative Cheilitis

➢ Ideal Properties of lipbalm:-

Natural ingredients include plant extracts, essential oils, and natural emollients.

- Moisturizing: Provides deep hydration to the lips, preventing dryness and chapping.
- therapeutic: Contains herbs with therapeutic properties, such as ascorbic acid and vitamin E, which soothe and heal damaged lips.
- Sun Protection: SPF protects lips from harmful UV rays.
- Non-toxic: devoid of harsh chemicals, parabens, and synthetic fragrances.
- Long-Lasting: Provides long-term hydration without the need to reapply regularly.
- Gentle: Suitable for sensitive skin without inflammation.
- Sustainable: Made with eco-friendly procedures and packaging materials.
- No animal testing: cruelty-free.
- Appealing aroma: A nice aroma derived from natural ingredients or essential oils.

A. Plant Profile

1. Alkanna tinctoria(Ratanjot powder):-

Alkanet (also known as Ratanjot) is a plant from the Boraginaceae family. Its most notable feature is its roots, which are used as a red dye. The rich red hue achieved is due to the presence of

shikonin, its isomer alkannin, and their derivative. Alkanna tinctoria has a vivid blue bloom. The plant has a dark red root that seems blackish from the outside but is blue-red on the interior with a white core. The root is a dye that is soluble in alcohol, ether, and oils, but insoluble in water

Biological source:- Obtained from the dried roots of *Alkanna tinctoria*

Synonym:- Anchusa tuberculata

Family:-Boraginaceae

Chemical Composition:-

- 5,8-dihydroxy-1, 4-naphthoquinone (naphthazarin) constituents
- High content of naphthoquinones in their roots, along with secondary metabolites such as flavonoids and phenolic acid derivatives.
- Antioxidant property

Uses:-

a. Much useful as the colours in food
b. Used in cosmeceutical preparation

Fig No.8 Alkanet Root

2. Coconut oil:-

Biological source:-Oil expressed from the dried solid part of endosperm of coconut, ***Cocos nucifera***

Synonym:- Coconut oil, coconut butter, copra oil

Family:-Palmae

Chemical constituents:-It consist of the mixture of triglycerides of saturated fatty acids. The oil contains about 95% of saturated fatty acids. It shows presence of caprylic acid, capric acid, and myristic acid[13].

Uses:-

a. It is useful as non-aqueous medium for the oral administration of some medicaments.
b. Fractioned coconut oil is used as the basis for preparation of oral suspension of drugs unstable in aqueous media.

Fig no. 9 Coconut oil

MATERIAL AND METHOD:-

1. **Selection of material:-**

Alkanna tinctoria (Ratanjot powder), ascorbic acid, and other herbal ingredients were utilized to make lip balm.

2. **Material collection:**

The formulation's ingredients, including Alkanna tinctoria (Ratanjot powder), were sourced from multiple Nagpur sites. Ascorbic acid was obtained from the college lab, as were all other components such as beeswax, coconut oil, and rose essential oil, as well as vitamin capsules purchased from the local market.

3. **Materials:-**

Beeswax, cocoa butter, coconut oil, ascorbic acid, vitamin E capsules, alkanet root powder, and rose oil. Rose oil and coconut oil were obtained from the store. All additional substances, such as beeswax and cocoa butter, came from a research lab.

Ascorbic Acid:- Ascorbic acid, often known as vitamin C, is a water-soluble molecule necessary for maintaining healthy skin. Vitamin C is an excellent antioxidant that reduces redness and may help with wound healing[6] .

Coco butter:- Cocoa butter (CB) is a byproduct of the cocoa bean processing industry made from mature beans of the Theobroma cacao plant. It is an essential ingredient in chocolate and other confectionery items. It is valued for its peculiar physicochemical properties, which are induced by its odd fatty acid composition. The major triacylglycerols (TAG) identified in CB are symmetrical and include relatively little highly unsaturated fatty acids[14].

Vitamin E:- Vitamin E is the most essential lipid-soluble component of the cell's antioxidant defense system, and it can only be obtained from diet. Its antioxidant activity enables it to serve a number of important roles in the body[15].

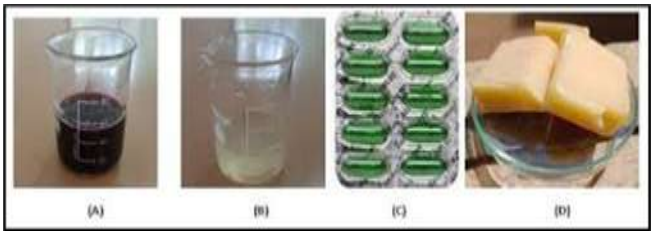

Fig no. 10 Materials of lipbalm

Method of preparation of lipbalm:-

Preparation of herbal lipbalm:-

1. The herbal lipbalm was prepared by fusion and simple mixing method.
2. Components were heated at 70 ºC in a beaker.
3. In which the beeswax and coco butter were melted in porcelain dish on water bath with the addition of infused coconut oil of alkanet root powder.
4. The ascorbic acid is added along with vitamin E capsules with the continuous stirring.
5. For the fragrance essential rose oil is added in the mixture along with some rose essence.
6. The mixture is added to the container before it started solidifying[16].

Formulation table:-

Ingredients	Use	Quantity
Beeswax	Thickening agent, provides glossiness	8%
Cocobutter	Shows Emolliant property	10%
Coconut oil	Emulsifier and has binding property	5%
Ascorbic acid	An Antioxidant, provides brightening effect	0.5%
Alkanet root powder	To give colour pigment	11%
Vitamin E capsule	Act as a preservative	1.5%
Rose oil	Provides fragrance	2%

Evaluation of Lipbalm :-

1) Organoleptic properties:-Organoleptic is defined as being perceivable by the sense, such as smell, appearance, taste. Organoleptic properties are sensory experience of the distinctive attributes or quality of a thing.

a. **Color:-** The Color of the formulation was checked manually
b. **Odour:-** fragrance was checked
c. **Appearance:-** Texture and appearance are checked

2) Test for Spreadability:-

For doing spreadability lipbalm was spread on a glass slide on an area of 1.5 inches. It was spread

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

G - Good: uniform, no fragmentation; perfect application, without deformation of the lip balm.
I - Intermediate: uniform; leaves few fragments; appropriate application; little deformation of the lip balm.
B - Bad: not uniform; leaves many fragments; difficult or inappropriate application, intense deformation of the lip balm[1].

3) Melting point:-

For melting point, the sample of lip balm was taken in a glass capillary whose one end was sealed by flame. The capillary containing drug was dipped in liquid paraffin inside the melting point apparatus which was equipped with magnetic stirring facility. Melting was determined visually and melting point was reported[17].

4) pH determination:-

The pH of lipbalm of was determined by using pH paper. The lipbalm pH was checked by adding some amount of lipbalm in to check the pH.

5)Skinirritability:-
The skin irritability test was done simply by appl ying the product to the skin and letting it on skin for 10 min[2].

6) Antioxidant activity:-

- About 100 µg/ml of stock solution was prepared. From stock solution 10µg,20µg,30µg,40µg,50µg/ml solutions were prepared.
- About 0.3ml solution was removed and 2.7ml of 1mM DPPH was added. The mixture was shaken vigorously and left to stand for 2hrs in the dark.(dpph paper)
- Absorbance was noted at 517nm.
- Methanol was taken as blank.
- Ascorbic acid was taken as standard.(10µg)
- The percent radical scavenging activity is calculated by the formulae:

$$\%RSA = \frac{\text{Abs Control-Abs Test}}{\text{Abs control}} \times 100$$

RESULT

1] Organoleptic properties:-

- **Color:-** Slightly red
- **Odour**:- Aromatic Fragrance
- **Appearance:-** Smooth appearance

2] Spreadability :- Smoothly spreads on a glass slide with no fragments. To calculate spreadability formula is given as:-

S= M×L÷T

Where,
m = mass of lip balm applied between the slides.(1g)
l = length of spread by the glass slide. (3.5cm)
t = time taken to spread.(28sec)
The range of spreadability was found to be 0.12g.cm/sec

3] pH determination:- pH was found to be slightly acidic at the range of 5-6.

4] Melting point:- The melting point of lipbalm was seen at range of 60-65ºC.

5] Skin irritation:- No irritation was seen after applying lip balm

6] DPPH Scavenging Activity:-

Calculation of % Radical scavenging activity Absorbance Measurement data:-

Concentration of test(µg/ml)	Absorbance of test	%RSA
10	0.850	15.0%
20	0.720	28.0%
40	0.560	44.0%
60	0.380	62.0%
80	0.250	75.0%
Concentration of standard(µg/ml)	**Absorbance of standard**	**%RSA**
10	0.32	30%

Absorbance control (methanol +DPPH) is 1.00 Abs

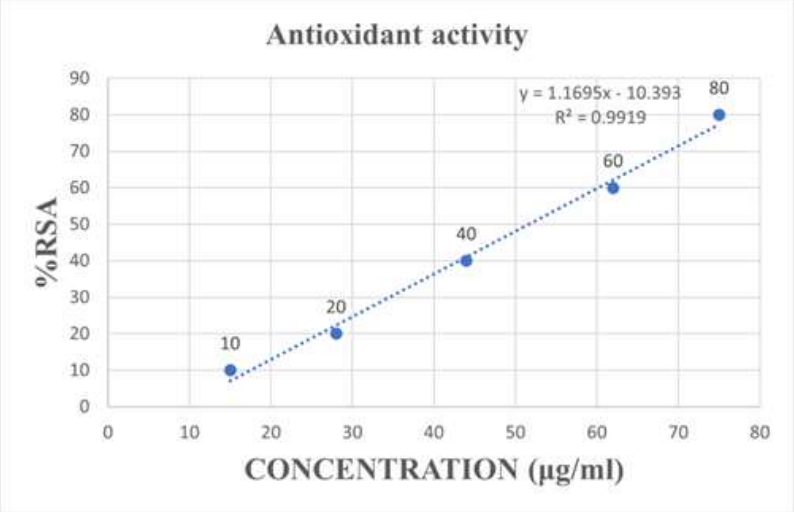

Fig no.15 Graph for antioxidant activity of lipbalm

DISCUSSION

Since conventional lip balms often contain dangerous ingredients like petroleum, artificial waxes, alumina, parabens, hydrogenated oils, artificial fragrances, and coloring, the formulation's main objective was to incorporate as many natural ingredients as possible while maintaining the lip balm's inherent qualities. Compared to synthetic colors, alkanet root powder provides a natural color that is also less harmful. The developed lip balm was examined for stability, pH, spreadability, and melting point. It was discovered that the pH ranged from 5 to 6, and the melting point was between 60 and 65°C. The results of the spreadability test were G-Good: perfect application, no lipbalm deformation, consistent, no fragmentation.

CONCLUSION

Herbal preparations were used to make lip balm for the current investigation. Compared to synthetic coloring chemicals, which might have negative side effects, the herbal formulation is preferable. The pigmenting and antioxidant properties of alkanet root powder led to its selection. Alkanet root was combined with

additional substances to get the desired red color in the herbal lip balm. All formulations were determined to have a suitable pH, ranging from 6 to 5. The resulting lip balm has outstanding qualities including smoothness, gloss, and spreadability. It was found that the herbal lip balm that was developed was less harmful and had no negative effects. When kept at room temperature, the product remains stable. Incorporating natural pigments into cosmetic formulas is therefore a step toward healthier cosmetics, which will increase consumer acceptability. Alkanet root and other plant-based colorants are safe and non-toxic, lowering the risk of allergies and environmental harm. These organic components contribute to the lip balm's general nourishing qualities because they are rich in vitamins and antioxidants.

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