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Research Article

Natural Pigment-Based Herbal Lipsticks: Formulation, Physicochemical Evaluation, and Stability Analysis

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ABSTRACT

The rising awareness of the harmful effects of synthetic cosmetics has sparked interest in herbal alternatives. This study focuses on creating and testing herbal lipsticks using natural pigments from Beta vulgaris (beetroot), Hylocereus undatus (dragon fruit), and Theobroma cacao (cocoa powder). The goal was to make a safe, non-toxic, and skin-friendly lipstick using herbal ingredients and to assess their physical, chemical, and stability characteristics. We prepared ten formulations with different concentrations of natural pigments. We also used natural base ingredients like beeswax, castor oil, coconut oil, olive oil, vitamin E, and jasmine oil. We obtained the herbal extracts through straightforward aqueous and mechanical extraction methods. We evaluated the lipsticks based on melting point, pH, color, breaking point, application force, surface flaws, aging stability, skin irritation, and perfume stability. Among all formulations, F-10, which included 3 g of cocoa powder, showed the best features. It had a stable texture, good melting point, excellent spreadability, attractive color, and caused no skin irritation or microbial growth. The results indicated that natural pigments can effectively replace synthetic dyes while maintaining product quality and safety. In conclusion, herbal lipsticks made with natural colorants offer a safer option than synthetic products, with F-10 (cocoa-based) standing out as the best formulation. Further clinical trials are needed to confirm long-term safety and consumer acceptance.

INTRODUCTION

In recent years, more consumers have been choosing natural and herbal cosmetic products because they are worried about the negative effects of synthetic chemicals (1). Cosmetics are substances used to clean, beautify, or change the appearance without impacting the body's structure

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or functions. Among these products, lipsticks are very popular, especially among women, for making the lips look better. Traditional lipsticks often have synthetic dyes, heavy metals, and preservatives that can cause side effects like skin irritation, allergic reactions, dryness, and even long-term health risks. Common chemical additives like parabens, phthalates, and sulfates appear in many commercial lipsticks and have raised serious health concerns. On the other hand, herbal lipsticks are made from natural waxes, oils, and pigments sourced from plants, providing a safer and skin-friendly option. Natural pigments like beetroot (Beta vulgaris) (2), dragon fruit (Hylocereus undatus), and cocoa powder (Theobroma cacao) are becoming popular because they are compatible with the body, have antioxidant properties, and offer vibrant colors. These plant-based colorants not only improve appearance but also help with lip care due to their natural nutrients (3). This study aims to create and assess an herbal lipstick formulation using these natural pigments. The objective is to reduce exposure to synthetic chemicals while keeping the desired physical and cosmetic qualities of standard lipsticks.

MATERIALS AND METHODS

Procurement of samples

All raw materials, including beetroot, dragon fruit, and cocoa powder, were bought fresh from local markets in Vijayapura, Karnataka. Oils, beeswax, and Vitamin E capsules came from local medical and grocery stores. Laboratory glassware, muslin cloth, and Molds were obtained from a supplier of laboratory equipment in Vijayapura.

Extraction Methods

Beetroot Extraction: Beetroot was purchased from local market of Bijapur. Beetroot was washed, Peeled and cut into uniform-sized fine slices and later in a China dish with hot water until the colored extract was visible. Later the extract was separated out with passing it through clean muslin cloth into a beaker a red colored clear pigment was obtained (4).

Figure 1: Beetroot grinding for pigment extraction

Figure 2: Beetroot extract in beaker

Dragon Fruit Extraction: The dragon fruit was purchased from the local market. Fruit was washed, peeled and cut into small pieces later the pieces were grinded into fine solution with the help of mortar and pestle by triturating it in a clockwise direction a fruity pulp was obtained. Later this Pulp was passed through a clean muslin cloth and color was separated it was again passed through if any pulp was found intact in the obtained color pigment extraction (5).

Figure 3: Pouring pulp for filtration process

Figure 4: Extract collected after muslin filtration

METHOD

The preparation was done in a way such that every pigment used was prepared with 3 concentrations such as 1ml/1gm, 2ml/2gm, 3ml/3gm and a plain/colorless lipstick was also prepared the further formulation and preparation is mentioned below.

Table 1: Formulation Of Plain Lipstick

Sr no	INGREDIENTS	F1
1	Bees wax	10gm
2	Castor oil	5ml
3	Coconut oil	5ml
4	Vitamin E	1ml
5	Jasmine oil	Q. S

Figure 5: F1 Formulation

Table 2: Formulation of lipstick with Beetroot as Pigment

Sr no	INGREDIENTS	F2	F3	F4
1	Bees wax	10gm	10gm	10gm
2	Castor oil	5ml	5ml	5ml
3	Coconut oil	5ml	5ml	5ml
4	Beetroot pigment	1ml	2ml	3ml
5	Vitamin E	1ml	1ml	1ml
6	Jasmine oil	Q. S	Q. S	Q. S

Figure 6: F2 Formulation

Figure 7: F3 Formulation

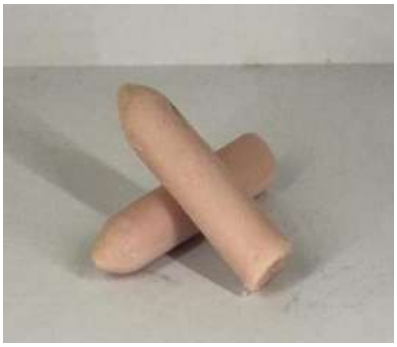

Figure 8: F4 Formulation

Table 3: Formulation of lipstick with Dragon fruit as Pigment

Sr no	INGREDIENTS	F5	F6	F7
1	Bees wax	10gm	10gm	10gm
2	Castor oil	5ml	5ml	5ml
3	Coconut oil	5ml	5ml	5ml
4	Dragon fruit Pigment	1ml	2ml	3ml

5	Vitamin E	1ml	1ml	1ml
6	Jasmine oil	Q. S	Q. S	Q. S

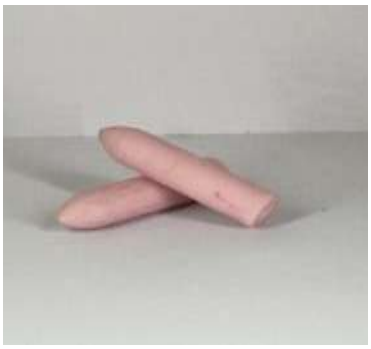

Figure 9: F5 Formulation

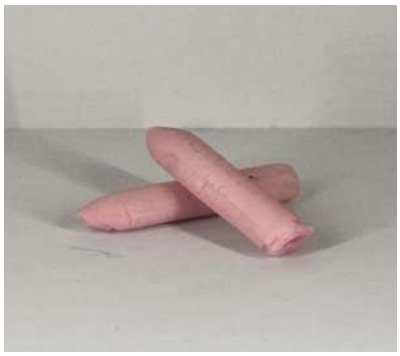

Figure 10: F6 Formulation

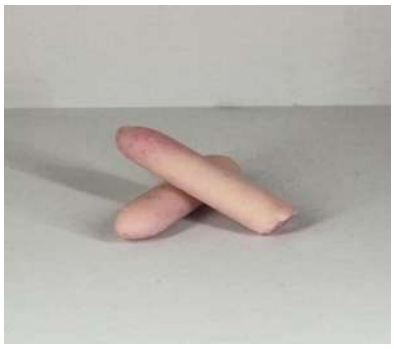

Figure 11: F7 Formulation

Table 4: Formulation of lipstick with Cocoa powder as Pigment

Sr no	INGREDIENTS	F8	F9	F10
1	Bees wax	10gm	10gm	10gm
2	Castor oil	5ml	5ml	5ml
3	Coconut oil	5ml	5ml	5ml
4	Cocoa powder pigment	1gm	2gm	3gm
5	Vitamin E	1ml	1ml	1ml
6	Jasmine oil	Q. S	Q. S	Q. S

Figure 12: F8 Formulation

Figure 13: F9 Formulation

Figure 14: F10 Formulation

EVALUATION PARAMETERS

Melting point: Determination of melting point is important as it is an indication of the limit of safe storage.

PH: The pH of formulated herbal lipstick was determined using pH meter.

Color: Lip colors are products that apply color, texture, and/or shine to the lips using a brush or other applicator. Lip color product safety is

established by the selection of ingredients that are safe and suitable for this intended use and purpose.

Breaking point: Breaking point was done to determine the strength of lipstick.

Force of application: It is test for comparative measurement of the force to be applied for application.

Surface anomalies: This was studied for the surface defects, such as no formation of crystals on surfaces, no contamination by molds, fungi etc.

Aging stability: The product was stored in 40ºC for 1 hr. Various parameters such as bleeding, crystallization of on surface and ease of application were observed.

Skin irritation test: It is carried out by applying the product on the skin for 10 minutes.

Perfume stability: The formulation herbal lipstick was tested after 30 days, to record fragrance.

RESULTS AND DISCUSSION

A total of ten lipstick formulations (F1-F10) were made using natural pigments like beetroot, dragon fruit, and cocoa powder in different amounts. Each formulation was tested for melting point, pH, colour, breaking point, force of application, surface issues, aging stability, skin irritation, and perfume stability. The results showed that all formulations had acceptable pH values (4.5-6.5), which are good for lip application. The melting points ranged from 60°C to 70°C, indicating good thermal stability. Among all, F10, which contained 3 g of cocoa powder, had the best qualities for smooth texture, rich natural colour, even application, and toughness against breaking. None of the formulations caused skin irritation in the volunteers who were tested, and there were no signs of microbial growth or surface issues during the stability tests. The perfume stability remained good after 30 days. The cocoa powder added a nice fragrance and rich natural colour, while also improving product consistency and user enjoyment (6). Therefore, the results suggest that the cocoa-based formulation (F10) is the best choice, making it a promising option for a safe, natural, and effective herbal lipstick (7).

Table 5: TABLE OF RESULTS

Sr. No.	Evaluation parameters	F-1	F-2	F-3	F-4	F-5	F-6	F-7	F-8	F-9	F-10
1	Melting Point	54±1°C	50±1°C	50±1°C	52±1°C	60±1°C	62±1°C	63±1°C	59±1°C	60±1°C	61±1°C
2	pH parameter	6.5±0.2	6.7±0.2	6.8±0.2	6.7±0.3	6.3±0.4	6.2±0.4	6.4±0.4	6.1±0.2	6.1±0.2	6.2±0.3
3	Colour	Pale Yellow	Pale Yellow	Salmon Pink	Salmon Pink	Pale Yellow	Baby Pink	Coral Pink	Chocolate	Brown	Dark Brown
4	Breaking Point	23	28	27	28	28	28	27	30	29	32
5	Force of application	Hard	Hard	Hard	Hard	Hard	Hard	Hard	Hard	Hard	Hard
6	Surface of anomalies	No Defect	No to little Defect	Little Defect	No Defect	No Defect	No to little Defect	Little Defect	No Defect	No Defect	No Defect
7	Aging stability	Smooth	Smooth	Smooth	Smooth	Smooth	Smooth	Smooth	Smooth	Smooth	Smooth
8	Skin irritation test	no	no	no	no	no	no	no	no	no	no
9	Perfume stability	+++	+++	++	++	+	++	+++		+	++

CONCLUSION

The study created and tested herbal lipsticks using natural pigments from beetroot, dragon fruit, and cocoa powder. All the formulations showed good physical and chemical properties, such as the right pH, melting point, texture, and stability. Among them, Formulation F10, which contained 3 g of cocoa powder, performed the best in terms of colour, texture, spreadability, and user acceptance (8). These findings indicate that natural colorants can be safe and effective alternatives to synthetic dyes in cosmetics. The herbal ingredients used are non-toxic, friendly to skin, and do not contain harmful chemicals like parabens and sulfates (9). There were no reports of skin irritation or microbial contamination during the evaluation. Therefore, F10 is a promising option for developing commercial herbal lipsticks. However, more clinical trials and consumer studies are needed to confirm its long-term safety and effectiveness (10).

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