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Formulation and Evaluation of Lipsticks using Celosia Cristata Extract: A Natural Approach to Cosmetic Development

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ABSTRACT

The increased desire for natural and herbal cosmetics has led experts to study plant-derived components to create safe and effective formulations. This study examines the phytochemical characterization, formulation, and assessment of herbal lipstick using *Celosia cristata* flower extract as a natural colour and functional component. Qualitative phytochemical testing found flavonoids, alkaloids, tannins, and saponins in the extract. They limit bacterial growth and are antioxidants. Five different formulations of herbal lipstick were prepared using the melt and pour method and evaluated for various physicochemical parameters, including texture, spreadability, melting point, and stability. Among these, Formulation 1 exhibited superior characteristics, demonstrating optimal colour stability, smooth texture, and enhanced user acceptability compared to the other formulations. The results suggest that Celosia cristata flower extract is a promising natural alternative to synthetic dyes in lipsticks, offering both aesthetic and functional benefits. Further studies, including extended stability analysis and in vivo assessments, are recommended to optimize the formulation for commercial application.

Keywords: *Celosia cristata, Herbal lipstick, Phytochemical analysis, Natural cosmetics, formulation evaluation*.

1. INTRODUCTION

When it comes to cosmetic items, lipsticks are among the most often used cosmetics, enhancing aesthetics while also providing protection and nourishment to the lips. However, concerns regarding the safety of synthetic ingredients, such as artificial colorants, heavy metals, and preservatives, have led to a growing interest in herbal and natural formulations1. The increasing consumer preference for eco-friendly, non-toxic, and sustainable beauty products has driven research into plant-based alternatives with bioactive properties2. *Celosia cristata*, commonly known as cockscomb, is a flowering plant belonging to the Amaranthaceae family. It has been traditionally used in herbal medicine due to its antioxidant, anti-inflammatory, and antimicrobial properties3. The vibrant pigments present in Celosia cristata, primarily betalains and flavonoids, make it a promising natural alternative to synthetic dyes in cosmetics4. Additionally, its bioactive compounds may provide functional benefits such as UV protection and lip hydration, making it a potential candidate for herbal lipstick formulation5. Herbaceous plants exist. It is common in Africa, South America, India, and some Asian regions. Plants can grow to two to five feet. This plant has simple, alternately oriented, sagittate or arrow-like leaves. Pinnate and border venation are found on the leaf. They can grow to two to four inches and are greenish-purple or red. Red is the most popular flower color. *Celosia cristata* produces reddish or purple pigments in tissue culture. Cyanidin, an anthocyanin, was found. Figure 1 shows Celosia cristata blossoms. The present study aims to develop and evaluate herbal lipsticks incorporating Celosia cristata extract as a natural colorant and bioactive ingredient. The formulated lipsticks were assessed for physicochemical parameters, stability, and antimicrobial properties to determine their efficacy and safety. This research aligns with the global trend toward green cosmetics and offers a novel approach to formulating safer, plant-based lip care products.

Fig.1. *Celosia cristata* flower

2. MATERIALS AND METHODS:

Collection of plant and authentication of plant material:

The plants (flower) of *celosia cristata* were collected using handpicking method from medicinal garden of Surya School of pharmacy, Vikiravandi, Villupuram district, Tamilnadu. The herb was recognized and authenticated by siddha central research institute, Chennai.

Preparation of Extract

Before the blooms of *Celosia cristata* were harvested, they were very carefully washed with tap water to remove any dust or other surface pollutants that might have been present. For a period of ten to fifteen days, the blossoms were dried in the shade at room temperature in order to preserve their bioactive components. The dried flowers were carefully mashed with a laboratory blender and filtered through an 85-mesh screen to achieve a constant particle size. A total of 5 kg of powdered material was subjected to maceration extraction using aqueous and ethanol solvents for 72 hours at room temperature. After the extraction period, the extract was filtered using muslin cloth, and the solvent was evaporated using a rotary evaporator to obtain the crude extract. The crude extract was further utilized for qualitative phytochemical analysis and incorporated into lipstick formulation as a natural bioactive ingredient8,9,10.

Qualitative Phytochemical Screening of *Celosia cristata* Flower Extract

Qualitative phytochemical study was performed on *Celosia cristata* flower extract to identify bioactive components. Carbohydrates, alkaloids, flavonoids, tannins, saponins, glycosides, terpenoids, and steroids are all components of the plant, and proteins were present. Standard phytochemical tests were performed using established methods.[11,12].

1. Alkaloids (Wagner's Test)

In order to determine whether or not the extract included alkaloids, Wagner's reagent, which consists of iodine in potassium iodide solution, was utilized. It was possible to successfully verify the presence of alkaloids using a precipitate that was reddish-brown in color.

2. Flavonoids (Alkaline Reagent Test)

Flavonoids were identified by adding 10% sodium hydroxide solution to the extract. The appearance of a yellow coloration, which disappeared upon acidification, confirmed the presence of flavonoids.

3. Tannins & Phenolic (Ferric Chloride Test)

Tannins and phenolics were found after determined by mixing the extract with 1% ferric chloride ($FeCl_3$) solution. A blue-black or greenish coloration confirmed their presence.

4. Saponins (Foam Test)

To detect saponins, mix the extract with distilled water. Saponins worked when they formed a foam that lasted at least 10 minutes.

5. Glycosides (Keller-Killiani Test)

The extract included cardiac glycosides after exposure to glacial acetic acid, ferric chloride, and high sulfuric acid. Seeing a reddish-brown ring at the interface confirmed their existence.

6. Terpenoids (Salkowski Test)

In order to determine the presence of terpenoids, the extract was combined with chloroform and sulfuric acid that had been thoroughly concentrated. Terpenoids were characterized by a bottom layer that was a distinct reddish-brown color.

7. Steroids (Liebermann-Burchard Test)

Steroids were detected by adding acetic anhydride and concentrated sulphuric acid to the extract. The appearance of a green or bluish-green coloration confirmed their presence.

8. Carbohydrates (Benedict's test)

The presence of carbohydrates was determined by heating the extract with Benedict's reagent. A It was because of the presence of reducing carbs that the brick-red precipitate was observed.

9. Proteins (Biuret Test)

Proteins were detected by treating the extract with 1% copper sulphate and 10% sodium hydroxide solution. The development of a violet color confirmed the presence of proteins.

Formulation of lipstick

Herbal lipsticks were made using standard cosmetics composition methods. The formulation melted beeswax and carnauba wax in a beaker at 70 degrees *Celsius* in a water bath. Both waxes' melting points were arranged in descending order. A 70-degree Celsius water bath melted white soft paraffin and castor oil in a separate beaker. Both compounds' melting temperatures decreased in succession. The colored pigment was progressively mixed into the oil phase until smooth to create a uniform combination. Next, it was absorbed into the wax phase at the same temperature. Vanilla was added once the liquid cooled to 40 degrees Celsius. The molten amalgam was cast in lipstick molds. After reaching the correct consistency, It was placed in the lipstick container after being retrieved from the Molds.[13,14]

Table. 1: Formulation of lipstick

Ingredients	**F1**	**F2**	**F3**	**F4**	**F5**
Castor oil	12ml	-	1ml	-	5ml
Beeswax	6g	7g	2g	17g	10g
Cetyl alcohol	1g	1g	-	-	-
Petroleum jelly	1g	1g	-	-	-
Coconut oil	-	12ml	1.5ml	7ml	5ml
Liquid paraffin	-	-	-	15ml	-
Lemon juice	-	-	2ml	0.5ml	-
Sample	3ml	3ml	3ml	3ml	3ml
Rose essence	q.s	q.s	q.s	-	q.s
Vanilla essence	-	-	q.s	q.s	-

Evaluation of Herbal Lipstick

The formulated herbal lipstick was evaluated for various physicochemical properties to ensure its quality, stability, and efficacy. The following parameters were assessed [24,25].

1. Organoleptic Evaluation

The lipstick was visually examined for its color, texture, surface smoothness, and appearance. Any presence of surface defects such as cracks or uneven color distribution was noted. The fragrance was also evaluated by sensory perception[15].

2. Melting Point Determination

A capillary tube featured a small bit of lipstick that was placed inside of it. For the purpose of determining the temperature at which the lipstick melts, the tube was inserted into a melting point device. In order to ensure accuracy, the experiment was carried out three times.

3. Breaking Strength Test

A lipstick sample was placed horizontally on a flat surface, and increasing weights were applied at one end until the lipstick broke. Lipstick broke at the weight it stopped working.[17].

4. Hardness Test

The hardness of the lipstick was tested using a texture analyzer or penetrometer. The lipstick was pressed against a probe, and the force required to penetrate the lipstick was measured [18.]

5. pH Determination

Distilled water was used to dissolve a small bit of lipstick, which was then filtered after the process was completed. A digital pH meter was utilized in order to determine the pH degree of the filtrate. The pH range that achieves the best results for lipstick is between [4.5] and [6.5].

6. Spreadability Test

A small quantity of lipstick was applied to a glass slide, and another slide was placed over it. A weight was placed on top for a fixed time, and the diameter of the spread lipstick was measured. Higher spreadability ensures better application on lips [20.]

7. Stability Study

The formulated lipstick was subjected to stability testing under different temperature conditions (4°C, 25°C, and 45°C) for a period of four weeks. The samples were evaluated for any color change, texture variation, or phase separation [21.]

8. Smudging Test

The lipstick was applied to a glass surface and left undisturbed for 30 minutes. The surface was lightly rubbed with a tissue to check for smudging. Lesser smudging indicates better adherence [22.]

9. Perfume Retention Test

The lipstick was stored in closed containers for 24 hours, and the fragrance intensity was assessed at different intervals (1 hr, 12 hr, and 24 hr) [23.]

3. RESULT AND DISCUSSION

The consequence of phytochemical analysis, formulation, and evaluation of lipstick incorporating *Celosia cristata* flower extract.

Table. 2: Phytochemical analysis of *Celosia cristata* flower extract

Phytochemical Compound	Aqueous Extract	Ethanolic Extract
Alkaloids	Present	Present
Flavonoids	Present	Present
Tannins	Present	Absent
Saponins	Present	Present
Glycosides	Present	Present
Terpenoids	Absent	Present
Steroids	Absent	Present
Carbohydrates	Present	Absent
Proteins	Present	Present

The formulated herbal lipstick showed desirable properties in terms of color stability, texture, and spreadability. Evaluation tests indicated good acceptance, with the lipstick maintaining its integrity under various conditions, suggesting its potential as a safe and effective cosmetic product.

Fig. 2: Formulation 1

Fig. 3: Formulation 2

Fig. 4: Formulation 3

Fig. 5: Formulation 4

Fig. 6: Formulation 5

Table. 3: Evaluation of formulated Lipsticks

S.No	Evaluation Parameters	F1	F2	F3	F4	F5
1.	Color	Reddish pink	White	Light pink	Marbled pink	Marbled pink
2.	Texture	Smooth	Smooth	Smooth	Smooth	Smooth
3.	pH	6.4	6.3	6.4	6.6	6.3
4.	Melting point	55-60	59-61	60-61	50-60	59-61
5.	Breaking point	70±0	80±0	100±0	80±0	120±0
6.	Microbial test	No growth	No growth	No growth	No growth	No growth
7.	Skin irritation test	No	No	No	No	No
8.	Spreadability	Easily	Easily	Intermediate	Easily	Intermediate
9.	Surface anomalies	No	No	No	No	No
10.	Force of application	Good	Easy	Good	Easy	Good
11.	Perfume stability	+++	+++	+++	+++	+++
12.	Aging stability	Smooth	Smooth	Smooth	Smooth	Smooth

4. CONCLUSION

This study examined herbal lipstick phytochemical composition, formulation, and evaluation using *Celosia cristata* flower extract. The extract's phytochemical makeup contains bioactive components such flavonoids, alkaloids, tannins, and saponins, which improve its functional characteristics.Five different formulations of herbal lipstick were developed and evaluated based on various physicochemical parameters, including texture, spreadability, melting point, and stability. Among these, Formulation 1 demonstrated the most desirable characteristics, exhibiting superior color stability, smooth texture, and enhanced user acceptability compared to the other formulations. The results suggest that Celosia cristata flower extract can serve as a promising natural colorant with additional therapeutic benefits.

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CONFLICT OF INTERESTS

We have No conflict interest.

AUTHOR CONTRIBUTIONS

Equal contribution for all authors.

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