

Extraction and Formulation of Lip Tint from Natural Dye Extracted from *Celosia Cristata Linn* Flower

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ABSTRACT

The escalating utilisation of synthetic dyes across diverse industries, including textiles, cosmeceuticals, food, and pharmaceuticals, is projected to witness a notable 6.5 % surge by 2027, notwithstanding the well-documented drawbacks associated with their usage. Synthetic dyes have been linked to adverse effects such as skin irritation, necrosis, genotoxicity, and hyperactivity in children. Acknowledging the imperative need to transition towards safer alternatives, this study investigates the extraction and formulation of a lip tint employing a dye derived from *Celosia cristata Linn* as a natural substitute for synthetic dyes. The aqueous extraction of *Celosia cristata Linn* flower unveiled the presence of various phytochemical constituents, including flavonoids, tannins, phenols, steroids, terpenoids, quinones, cellulose, starch, and saponins. Particularly noteworthy is the betalain constituent in the flower extract, which imparts the dye with nutraceutical, antioxidant, and anti-inflammatory properties. The formulated lip tint underwent a comprehensive evaluation encompassing dye stability, spreadability, melting point, skin irritation, surface anomalies, homogeneity, perfume stability, pH, short-term stability, and colorant yield. The study concludes that the lip tint formulated from *Celosia cristata Linn* dye represents a viable and safe alternative for various cosmeceutical applications, providing a natural solution to the adverse effects associated with synthetic dyes.

Keywords: Lip tint; Natural dye; *Celosia cristata*; Betalain; Antioxidant; Terpenoids

1. INTRODUCTION

The term “cosmetic” denotes a product designed to augment an individual’s aesthetic appeal. The global market size for beauty care products reached \$299.77 billion in 2022 and is anticipated to expand from \$313.22 billion in 2023 to \$417.24 billion by 2030¹. In modern society, herbal medicines and products are valued as “natural and safe remedies” with minimal side effects and high therapeutic potential, often preferred over allopathic drugs known for more significant side effects. Herbal products serve diverse roles, including dietary, cosmetic, and medicinal uses. Today, herbal cosmetics are recognised as safe for the skin, supporting both health and beauty. The Significance of Dyes in Cosmetics: Dyes assume a crucial role in the field of cosmeceuticals, serving as coloring agents chemically produced to bestow vibrant hues to products. Despite the prevalence of synthetic dyes in cosmeceuticals, their usage is accompanied by consequential effects on human health. The diverse

regulatory standards across international markets necessitate stringent scientific oversight to govern their application. Ensuring the safety of synthetic dyes in cosmetics intended for human use is imperative².



Figure 1. *Celosia cristata linn* flower.

Natural Pigments: Derived from botanical sources such as flowers, plants, and seeds, natural pigments represent dyes extracted from organic materials. Notable advantages of natural dyes in comparison to synthetic

counterparts include diminished chemical pollution, decreased likelihood of allergenic reactions, non-toxicity, biodegradability, and historical richness across diverse cultures. The incorporation of natural dyes not only aligns with traditional dyeing methods and cultural heritage but also ensures their safety for human utilisation³.

Celosia cristata Linn, as shown in Fig. 1 is commonly known as *Cockscomb* or *laal murgaa* and is a member of the *Amaranthaceae* family. Classified as a non-woody plant, it attains a height ranging from 5 to 2 feet. Characterised by alternate, simple, and saggitate leaves, this plant bears distinctive fan-shaped, velvety, and convoluted flowers, resembling the structure of the brain, hence earning the name “cock’s comb.” Indigenous to Southern China, it is prevalent in tropical and subtropical regions globally⁴.



Figure 2. *Celosia cristata* linn plant.

The *Celosia cristata* Linn as shown in Fig. 2 plant harbors a diverse array of bioactive compounds, with Betalain emerging as the predominant component in the flower extract responsible for its coloration. Analysis of the flower extract reveals the presence of certain vitamins, namely Thiamine (Vitamin B1), Folic acid (Vitamin B9), Cyanocobalamin (Vitamin B12), and Biotin (Vitamin B7), albeit in relatively lower concentrations. Noteworthy is the heightened presence of Vitamin E (α -tocopherol), a pivotal factor contributing to the antioxidant properties inherent in the dye, as indicated by research findings⁵.

A herbal lip tint, made from natural ingredients and free of synthetic additives, offers multiple benefits. It enhances the natural color and health of the lips while protecting against cold sores, chapping, and dryness. Additionally, it helps moisturise and repair damaged lip cells, promoting overall lip wellness⁵.

The dye extraction process involved maceration, wherein the flowers underwent a 48-hour period of shade drying, followed by maceration with diverse solvents for an interval of 8-10 hours. Subsequently, the resulting extract underwent filtration, and the filtrate underwent a drying process in a hot air oven at a temperature of 40 °C for approximately 24 hours⁶.

2. MATERIALS AND METHODS

MATERIALS

Methanol, NaOH, Methylparaben, Alcohol (1 %), Ethanol, Distilled water, Distilled water, Coconut Oil, Kaolin clay, Candelilla wax, Castor Oil, Rose oil/rose essence, Soya been wax, Hager’s reagent (saturated picric acid solution), Chloroform, Con. Sulphuric acid, Acetic anhydride, Ferric chloride, Con. Hydrochloric acid, Diethyl ether, Con. Ammonia, Glacial acetic acid, Mayers reagent, Fehling’s solution, sodium citrate, Sodium carbonate, Copper sulfate pentahydrate^{7,8}.

METHODS

2.1 Drying of Flowers

The native strain of *Celosia cristata* Linn underwent a meticulous cleaning process, wherein the flowers, excluding the seeds, were meticulously arranged in inverted bundles. These bundles were then subjected to shade drying under a roof for a duration of 48 hours to effectively preserve the bioactive constituents.

2.2 Maceration

The floral material underwent a maceration process involving 1000 mL of methanol. The mixture was intermittently agitated at 25 ± 2 °C for a duration of 2 days and subsequently filtered using Whatman filter paper. Maceration was employed as a method to preserve the bioactive constituents⁹⁻¹¹. This maceration process of *Celosia cristata* Linn was carried out and mentioned stepwise in Fig. 3.

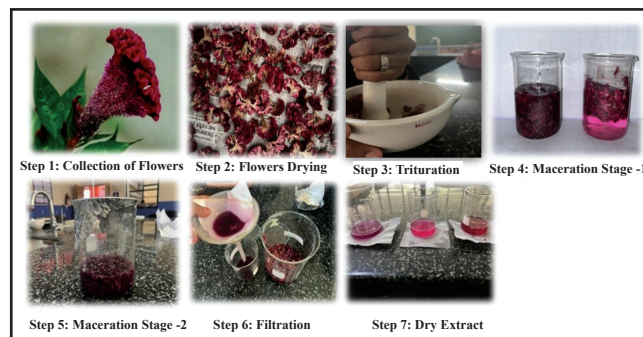


Figure 3. Extraction procedure of natural dye from *Celosia cristata* linn flower.

2.2.1 Phytochemical Tests

The phytochemical test of *Celosia cristata* linn was carried out and the list of results mentioned in Table 1.

2.2.2 Formulation of Lip Tint Using the Extracted Dye from *Celosia cristata* Linn:

- Precisely measure the designated quantities of waxes, oils, and clays as specified in the ingredient list.
- Combine the measured waxes, oils, and clays in a container, and subject the mixture to heating using a water bath and a heating mantle.
- Introduce the extracted dye into the liquefied ingredients. Given the oil-based nature of the formulation and the polar characteristic of the dye, it necessitates conversion into a powdered form before incorporation.

The dye is transformed into a powder by placing it in petri plates and subsequently subjecting it to a hot air oven, maintaining a temperature not exceeding 40 °C for a duration of 48 hours. The powdered dye is accurately weighed and added to the formulation, ensuring thorough stirring for uniform dispersion within the formulation.

- Incorporate rose essence into the formulation to impart fragrance.
- Transfer the formulated mixture into molds for further processing.

The *Celosia cristata* linn of Herbal Lip Tint was formulated and the trial data was given in Table 2. The prepared formulation of lip tint is shown in Fig. 4.

Table 1. Phytochemical tests

S. No.	Phytoconstituents	Test	Results/ Inference
1.	Alkaloids	Mayers test	-
2.	Tannins	ferric chloride test	+
3.	Flavonoids	Con. sulphuric acid test	+
4.	Phenols	lead acetate test	+
5.	Steroids	Liebermann Burchard's test	+
6.	Terpenoids	Salkowski test	+
7.	Quinones	Conc HCl test	+
8.	Cellulose	Iodine solution with H ₂ SO ₄ test	+
9.	Starch	Iodine solution test	+
10.	Saponins	Foam test	+
11.	Gums and Mucilage	swelling test	-

Table 2. Formulation of herbal lip tint

S. No.	Ingredients	Uses	F - 1	F - 2	F - 3	F - 4
1.	Bees wax	Moisturizer	—	5g	5g	5g
2.	Coconut oil	Lubricant	2ml	—	2ml	2ml
3.	Castor oil	Humectant	—	2ml	—	—
4.	Alovera gel	Wound healing	qs	qs	—	qs
5.	Rose essence	Anti-inflammatory	qs	qs	qs	qs
6.	Dye	Antioxidant	1.5g	1.5g	1.5g	1.5g
7.	Kaolin clay	Adhesive agent	2g	2g	2g	2g
8.	Candelilla wax	Moisturizer	5g	—	—	—

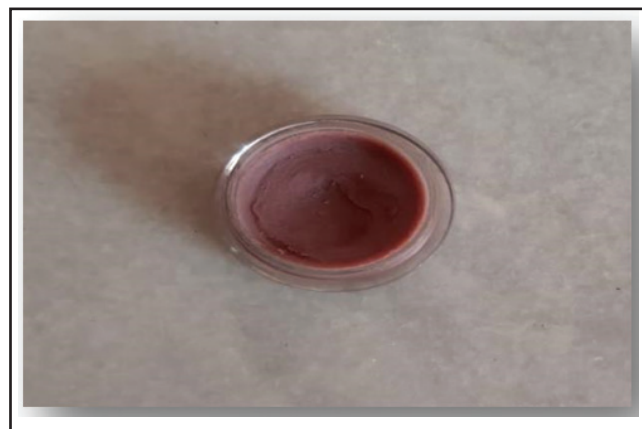


Figure 4. Lip tint from natural dye extracted from *Celosia cristata* linn flower.

3. RESULTS AND DISCUSSION

Upon examination of the aforementioned table, it becomes evident that the flower possesses a substantial quantity of phytoconstituents, yielding commendable therapeutic effects and presenting a preferable alternative to synthetic dyes. The diverse array of phytoconstituents in herbal lip tint manifests a spectrum of advantages¹². Betalain, as a natural colorant, imparts vivid tones, while flavonoids and tannins confer antioxidant attributes, thereby shielding the lips from free radical damage. Essential oils, rich in terpenes, contribute aromatic and therapeutic qualities, such as the calming essence of lavender or the invigorating aroma of peppermint. Furthermore, the presence of polyphenols imparts anti-inflammatory and soothing characteristics, rendering herbal lip tints not only visually appealing but also nurturing and health-conscious¹³.

The formulation and assessment of the herbal lip tint involved the utilisation of natural components, including the natural dye extracted from *Celosia cristata* Linn flowers, coconut oil, aloe vera gel, rose essence, kaolin clay, and Beeswax.

4. EVALUATION PARAMETERS FOR LIP TINT

4.1 Dye Stability

The extracted dye was subjected to a stability assessment within a controlled environment, specifically a stability chamber, for a duration of 15 days. During this period, the variation in color intensity was monitored under conditions of 45 °C temperature and 65 % RH¹⁴. Stability data is shown in Table 3.

Table 3. Stability results of extracted dye

S. No.	The solvent used for extraction	Inference
1.	NaOH	Degraded within 2 days
2.	Methanol	Stable color
3.	Ethanol	Stable color
4.	Distilled water	Stable color

4.2 Spreadability of Herbal Lip Tint

To evaluate the spreadability of the herbal lip tint, a 1 g sample was placed between two glass plates, with a 200 g weight applied on top. After allowing 5 minutes, the spread diameter was recorded, showing effective spreadability. When used on both lips and cheeks, the formulation displayed a smooth and even texture without streaks or granules, affirming its suitability for dual application¹⁵.

4.3 Melting Point

The determination of the melting point was conducted utilising the capillary tube method, with the procedure iterated thrice to obtain and compile the melting point values¹⁶.

4.4 Perfume Stability

The herbal lip tint formulation underwent a 30-day fragrance stability test, revealing that the fragrance endured throughout the observation period¹⁷.

4.5 pH Parameter

The determination of the pH of the resultant formulation was conducted employing a pH meter, yielding a measured pH value of 6.3 ± 0.3 ¹⁸.

4.6 Short-Term Stability

The assessment spanned a duration of 30 days under the specified temperature and humidity conditions. At five-day intervals, the subsequent parameters were subjected to testing¹⁹.

4.6.1 Stability Results

Parameter: Temperature is $45^\circ\text{C} \pm 3.0^\circ\text{C}$ and Humidity is 65 % RH

Appearance: Good

Fragrance: Fair

Spread ability: Fair

4.7 Colorant Yield

Initial weight of dried flowers - 50g

Weight of dye obtained - 25g

% yield = $25/50 \times 100 = 50\%$

Thus the % yield was 50 %

It was noted that there was a notable enhancement ($p \leq 0.05$) in the yield of the colorant when the extraction temperature escalated from 20 to 40°C . The heightened yield correlates with an augmented antioxidant potential, as a greater presence of the betalain pigment corresponds to an increased antioxidant effect.

4.8 Surface Parameter

Surface parameters were assessed to discern any imperfections on the surface of the formulated lip tint through visual observation in Table 4.

Table 4. Surface parameter of formulated lip tint

S. No.	Para-meters	Standard values	F-1	F-2	F-3	F-4
1.	Spread-ability	Excellent	Poor	Fair	Good	Excellent
2.	Melting point	50°C	53°C	56°C	58°C	55°C
3.	Surface Anomalies	No	No	No	No	No
4.	pH	6.3 ± 0.3	6.1	6.4	6.1	6.3
5.	Skin Irritation	No	No	No	No	No

5. CONCLUSION

In the contemporary cosmetic industry, there exists a substantial demand for cosmetic products among the youth demographic. The lip tint, derived from the natural dye extracted through the maceration process of *Celosia cristata* Linn flowers, has been determined to be safe for application and exhibits diverse therapeutic properties, including antioxidant and anti-inflammatory attributes. Through systematic trials utilising a standard formulation, Formulation 4 demonstrated superior spread ability, prolonged consistency, and enhanced moisturising capabilities. The phytochemical analysis of the extracted dye identified the presence of phenols, steroids, terpenoids, cellulose, starch, and saponins. The formulated lip tint, incorporating the natural dye from *Celosia cristata* Linn, underwent comprehensive evaluation across various parameters. The dye exhibited stability in methanol and ethanol, ensuring its robustness in different solvent environments. The lip tint displayed even spread ability over the skin surface, and its melting point was determined to be within the range of 55°C to 60°C . Notably, the lip tint demonstrated a lack of skin-irritating properties, registering a pH of 6.3 ± 0.3 . Furthermore, the colorant yield of the dye was measured at 50 %. Collectively, these findings affirm that the lip tint formulated with the natural dye from *Celosia cristata* Linn is stable under diverse conditions, presenting promising applications in the realm of cosmeceuticals.

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