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FORMULATION AND EVALUATION OF HERBAL UNDER EYE CREAM CONTAINING NELUMBO NUCIFERA AND RUBIA CARDIFOLIA

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KEYWORDS

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Abstract

The current study focuses on creating and assessing a herbal under-eye cream with extracts from Nelumbo nucifera (lotus seed) and Rubia cordifolia (manjistha) for antioxidant and anti-pigmentation properties. Stress, pigmentation, poor blood circulation, and oxidative damage are the main causes of dark circles, a frequent cosmetic issue. The antioxidant, skin-soothing, and melanin-reducing qualities of the herbal extracts led to their selection. Stearic acid, beeswax, coconut oil, glycerin, triethanolamine, rose water, methyl and propyl paraben, and other excipients were used in the emulsification process to make the cream. Herbal extracts were prepared in different formulation batches with different concentrations. A number of characteristics, including appearance, pH, homogeneity, spreadability, washability, viscosity, and stability, were assessed for the prepared creams. The formulated herbal under-eye cream demonstrated excellent consistency and physical properties ideal for topical application. By combining Manjistha and lotus seed extract, the cream provides a powerful synergistic effect that safely reduces dark circles and protects the delicate under-eye skin from oxidative damage. Manjistha targets inflammation and hyperpigmentation through active compounds like purpurin, flavonoids, and phenols that fight free radicals. Concurrently, lotus seed extract calms the skin and blocks excess melanin production. Ultimately, the study confirms that this natural cosmetic blend offers a highly effective, safe, and antioxidant-rich solution for treating dark circles and preventing skin damage

Introduction:

The skin around the eyes is thin and delicate, making it more prone to dark circles, puffiness, pigmentation, and premature aging. Under-eye dark circles are one of the most common cosmetic concerns and may occur due to stress, lack of sleep, aging, dehydration, excessive melanin production, poor blood circulation, and oxidative stress. Nowadays, herbal cosmetics are gaining wide popularity because they are safer, effective, and produce fewer side effects compared to synthetic cosmetic products. Herbal formulations containing natural plant extracts possess antioxidant, anti-inflammatory, and skin-protective properties that help in improving skin health. *Rubia cordifolia* (Manjistha) is an important medicinal plant widely used in Ayurveda for its blood-purifying, antioxidant, and skin-brightening properties. It contains active constituents such as purpurin, flavonoids, and phenolic compounds which help in reducing oxidative stress

and skin pigmentation. *Nelumbo nucifera* (Lotus seed) is also known for its antioxidant and anti-melanogenic activity, which may help in reducing melanin formation and soothing the skin.

MATERIAL AND METHODS

1. Lotus seeds

Fig 1: ***Nelumbo nucifera***

Nelumbo nucifera Gaertn., commonly known as sacred lotus, is an aquatic medicinal plant belonging to the family Nelumbonaceae. The lotus seeds are obtained from the dried seeds of *Nelumbo nucifera* Gaertn. Lotus seeds also contain significant amounts of flavonoids such as quercetin, kaempferol, and catechin, which possess strong antioxidant properties and help in protecting cells from oxidative stress. Lotus seeds contain flavonoids and phenolic compounds that help neutralize free radicals responsible for oxidative stress

2. Manjishta root

Fig 2: ***Rubia cordifolia***

Rubia cordifolia L., commonly known as Manjistha or Indian Madder, is a perennial climbing herb belonging to the family Rubiaceae. Manjistha consists of the dried roots and stolons of *Rubia cordifolia* Linn. The root is particularly rich in anthraquinones such as alizarin, purpurin, munjistin, rubiadin, and xanthopurpurin. Manjistha contains anthraquinones, flavonoids, and phenolic compounds that help neutralize free radicals and reduce oxidative stress, which contributes to under-eye pigmentation and skin aging.

Table No 1 ingredient and their category

Sr.no.	Ingredients	Category
1.	Beeswax	Stiffening agent
2.	Steric acid	Emulsifying agent
3.	Triethanolamine	pH adjuster agent
4.	Propyl paraben	Preservative
5.	Methyl paraben	Preservative
6.	Propylene glycol	Humectant

Collection of drugs

The fresh plant materials of nelumbo nucifera (seed) and Rubia cordfolia were collected from local area from Agriculture farmhouse and authenticated at Department of botany, Radhabai kale Mahila Mahavidyalaya, Ahilyanagar.

Preparation of powder

To remove the contaminants, the mature seeds were gathered and given a complete water wash. The seed dried for a week in the shadow. The dried for a week and then broken into tiny bits and material was then ground into a coarse powder with a blender.

Preparation of extraction

The extraction was carried out by the maceration method. About 40 g of powdered material was placed in a closed container and extracted using ethanol for 72 hours with occasional shaking. The extract was filtered through Whatman filter paper and concentrated on a water bath to obtain a semisolid extract.

Phytochemical Screening:

1. Dragendorff's Test:

A small quantity of extract was treated with Dragendorff's reagent. The formation of an orange precipitate indicated the presence of alkaloids.

2. Shinoda Test:

The extract was treated with magnesium turnings and concentrated hydrochloric acid. Development of a reddish-pink color confirmed the presence of flavonoids.

3. Ferric chloride test:

The extract was treated with ferric chloride solution. Appearance of a greenish-black color confirmed tannins.

4. Foam test:

The extract was shaken vigorously with distilled water. Formation of stable foam indicated the presence of saponins.

5. Borntrager's Test:

Add 2 ml of dilute hydrochloric acid (HCl) to the extract and boil gently for a few minutes. Cool the solution and filter it Transfer the filtrate to a test tube and add an equal volume of chloroform. Shake well and allow the layers to Separate the chloroform layer and add a few drops of dilute ammonia solution. Formation of reddish-pink color indicated presence of Antraquinone.

Preparation of under eye cream

1. All oil-soluble ingredients were mixed to prepare the oil phase.
2. The aqueous phase was prepared separately in another beaker.
3. The oil phase was slowly added to the aqueous phase dropwise with continuous stirring.
4. The mixture was stirred thoroughly to achieve proper emulsification and obtain a smooth, stable oil-in-water cream.
5. The prepared cream was allowed to cool to room temperature.
6. The cream was then transferred into an airtight container for storage.

Formulation Table

Table No: 2 Formulation table

Sr. No.	Ingredients	Batch F1	Batch F2	Batch F3	Batch F4
1.	Lotus seed extract	0.2g	0.3 g	0.4 g	**0.5 g**
2.	Manjistha extract	0.2 g	0.3 g	0.4 g	**0.5 g**
3.	Stearic acid	1.2 g	1.2 g	1.2 g	**1.2 g**
4.	Beeswax	0.4 g	0.4 g	0.4 g	**0.4 g**
5.	Lavender oil	2.0 ml	1.0 ml	1.0 ml	**1.0 ml**
6.	Propylene glycol	0.6 g	0.6 g	0.6 g	**0.6 g**
7.	Methyl paraben	0.02 g	0.02 g	0.02 g	**0.02 g**
8.	Propyl paraben	0.01 g	0.01 g	0.01 g	**0.01 g**
9.	TEA	0.15 g	0.15 g	0.15 g	**0.15 g**
10.	Coconut oil	2.0 ml	2.0 ml	2.0 ml	**2.0 ml**
11.	Water	q.s to 10	q.s to 10	q.s to 10	**q s to 10**

Evaluation parameter

1) Physical Evaluation

A. Colour and Appearance

The color of the under-eye cream was assessed by visual observation and was observed to be dark brown.

B. Odour

The odor of the formulation was evaluated by applying a small quantity to the hand and observing its characteristic scent.

C. Consistency

The cream was observed to possess a smooth texture with a semi-liquid consistency during visual inspection.

D. Homogeneity

The extract was evenly dispersed within the formulation, indicating good homogeneity. The preparation appeared free from visible particles and possessed a smooth, consistent texture, demonstrating uniformity of the product.

2) Washability

A small quantity of the formulation was applied to the hand and rinsed with tap water to evaluate its ease of removal and washability

3) Phase separation

The prepared formulation was stored in a tightly closed container, protected from direct sunlight, at room temperature. After 24 hours of storage, the formulation was examined for phase separation. No evidence of phase separation was observed, indicating good physical stability of the product.

4) Irritancy

The cream was applied to the designated skin area, and the

application time was recorded. The treated site was then monitored for 24 hours for any signs of erythema, edema, or irritation. The results indicated that the formulation caused no visible erythema, edema, or skin irritation.

5) Stability Test:

The stability study was performed under varying temperature conditions rather than at constant temperature and humidity. The formulation was exposed to alternating cycles of room temperature and freezing temperature on a daily basis to assess its resistance to temperature-induced changes

6) pH

The pH of the formulation was evaluated using pH paper. As healthy skin generally exhibits an acidic pH, the acceptable pH range for skin serum formulations is 4.1–6.7. The prepared formulation showed a pH value of 5, which falls within the desired range and is considered compatible with the skin.

7) Antipigmentation activity

The anti-pigmentation activity of the formulated herbal under-eye creams (F1–F5) containing Lotus Seed and Manjistha extracts was evaluated by the Tyrosinase Inhibition Assay using L-DOPA as substrate and Kojic Acid as the standard. The assay was performed in phosphate buffer (pH 6.8) and incubated at 25 ± 2°C for 30 minutes.

The formulations exhibited varying degrees of tyrosinase inhibitory activity. Among all formulations, F4 showed the highest percentage inhibition, indicating superior anti-pigmentation potential. The activity increased with the concentration of herbal extracts present in the formulation. Kojic Acid exhibited the highest inhibition and was used as the reference standard.

RESULT

Table no 3: Identification test for *Nelumbo nucifera*

Sr.no.	Test	Observation	Inference
1	Alkaloid test	reddish-brown precipitate	Alkaloid was present
2	Flavonoid test	Yellowish precipitate	Flavonoid was present
3	Saponin test	Foam formation	Saponin was present
4	Tannin test	Greenish black color	Tannin was present

Table no 4: Identification test for Rubia Cardifolia

Sr.no	Test	Observation	Inference
1	Anthraquinone test	Reddish colour	Anthraquinone was present
2	Flavonoid test	Yellowish precipitate	Flavonoid was present
3	Saponin test	Foam formation	Saponin was present
4	Tannin test	Greenish black color	Tannin was present

Table No 5: Physical Evaluation

Formulation	Colour	Consistency	Odour
F1	Dark Brown	Poor	Characteristic
F2	Dark Brown	Poor	Characteristic
F3	Light Brown	Moderate	Characteristic
F4	**Dark Brown**	**Good**	**Characteristic**

Table No 6: Homogeneity Test

Formulation	Observation
F1	Good Homogeneity
F2	Good Homogeneity
F3	Good Homogeneity
F4	**Good Homogeneity**

Table no.7: Washability Test

Formulation	Observation
F1	Easily Washable
F2	Easily Washable
F3	Easily Washable
F4	**Easily Washable**

Table no.8: Phase Separation Test

Formulation	Observation
F1	No Phase Separation
F2	No Phase Separation
F3	No Phase Separation
F4	**No Phase Separation**

Table no 9: Irritancy test

Formulation	Observation
F1	No Irritation observed
F2	No Irritation observed
F3	No Irritation observed
F4	**No Irritation observed**

Table No 10: stability Test

Formulation	Observation
F1	Slight softening observed
F2	Slight softening observed
F3	No change
F4	**No change**

Table no.11: Measurement of pH

Formulation	pH
F1	4.5
F2	5.5
F3	7.9
F4	**6.4**

Table No 12: Anti-Pigmentation Activity in terms of Tyrosinase Inhibition (%)

Sample ID	Conc. Of Stock solution	Tyrosinase Inhibition Assay % Tyrosinase Inhibition
F4	**Formulation (10 µg/ml)**	**82± 0.28**
Standard solution	Kojic Acid (10 µg/ml)	90± 0.25
Control Solution	Blank Cream	0

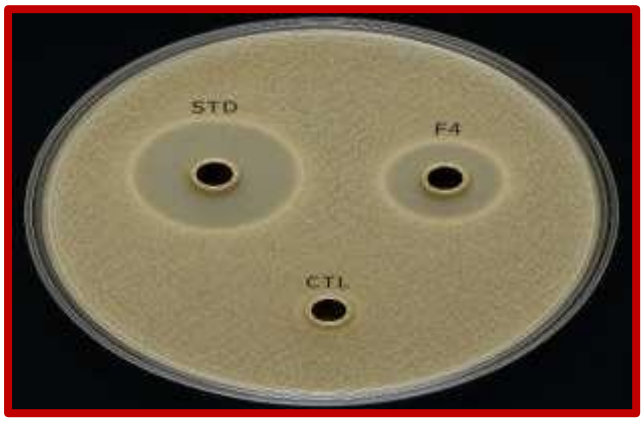

Fig no 3: Zone of inhibition

CONCLUSION

The present research work successfully focused on the formulation and evaluation of a herbal under-eye cream containing natural plant extracts such as *Nelumbo nucifera* (Lotus seed) and *Rubia cordifolia* (Manjistha). The developed formulation was prepared with the objective of providing a safe, effective, and stable herbal cosmetic preparation for the management of dark circles.

The prepared cream exhibited satisfactory physicochemical properties, including appropriate pH, good homogeneity, smooth texture, acceptable spreadability, easy washability, and desirable viscosity, indicating its suitability for topical application on the delicate under-eye area. Stability studies revealed that the formulation remained physically stable without any significant changes in appearance, color, odor, or consistency during the study period.

The incorporation of Lotus seed and Manjistha extracts contributed valuable antioxidant and anti-pigmentation properties to the formulation. The antioxidant constituents help neutralize free radicals and reduce oxidative stress, while the bioactive compounds present in Manjistha and Lotus seed may assist in reducing melanin accumulation and improving skin tone.

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