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Research Paper

Formulation and Evaluation of an Herbal face toner containing *Nelumbo nucifera* and *Daucus carota* Extract

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ABSTRACT

The increasing demand for natural cosmetic products has encouraged the development of herbal formulations with minimal side effects. The present study focuses on the formulation and evaluation of a herbal face toner incorporating lotus (*Nelumbo nucifera*) extract and carrot (*Daucus carota*) extract. The extracts were prepared using Soxhlet extraction and percolation techniques. Three different toner formulations were prepared using varying concentrations of herbal extracts along with glycerine, rose water, sodium benzoate, vitamin E, and fragrance. The prepared formulations were evaluated for physicochemical parameters including pH, viscosity, surface tension, homogeneity, spreadability, skin irritation, and phytochemical screening. The optimized formulation showed a skin-compatible pH (4.5–5.0), good stability, non-irritating nature, and satisfactory organoleptic properties. Phytochemical analysis confirmed the presence of flavonoids, tannins, alkaloids, and saponins. These bioactive compounds contribute to antioxidant and skin-conditioning properties. The results suggest that the herbal toner containing lotus and carrot extracts can be a safe, effective, and eco-friendly alternative to synthetic toners.

INTRODUCTION

Skin is the largest organ of the human body and plays an important role in protection against environmental damage, pathogens, and chemical exposure. It consists of three main layers: the epidermis, dermis, and subcutaneous tissue.

Maintaining healthy skin requires proper cleansing, hydration, and protection. Face toners are liquid cosmetic formulations applied after cleansing to remove residual impurities, balance skin pH, tighten pores, and prepare the skin for moisturizers and serums. Conventional toners

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often contain alcohol and synthetic chemicals that may cause dryness and irritation.

Recently, herbal cosmetic products have gained popularity due to their safety, effectiveness, and minimal side effects. Natural plant extracts rich in antioxidants and bioactive compounds can provide multiple dermatological benefits. Lotus (*Nelumbo nucifera*) is widely used in traditional medicine and cosmetics due to its antioxidant, anti-inflammatory, and skin-soothing properties. It contains flavonoids, tannins, alkaloids, and phenolic compounds which contribute to anti-aging and skin brightening effects.

Carrot (*Daucus carota*) is rich in beta-carotene, vitamin A, vitamin C, and antioxidants that promote skin regeneration, improve complexion, and protect against UV damage. Therefore, this study aimed to formulate and evaluate a herbal face toner combining lotus and carrot extracts to provide antioxidant, moisturizing, and skin-conditioning benefits.

2. MATERIALS AND METHODS

Materials

All materials used in the formulation of the herbal face toner were of analytical or cosmetic grade and were used without further purification. The principal herbal ingredients used in this study included lotus flower petals from *Nelumbo nucifera* and carrot roots from *Daucus carota*. These plants were selected due to their well-documented dermatological and antioxidant properties that support skin hydration, anti-aging activity, and protection against oxidative stress.

Fresh lotus flowers were collected and the petals were separated carefully. Carrot roots were obtained from a local agricultural source and washed thoroughly before processing. Both plant materials were processed into extracts that served as the primary bioactive components in the 4toner formulation.

Additional formulation ingredients included glycerine as a humectant to enhance skin hydration, rose water obtained from *Rosa damascena* as a soothing base and natural fragrance, sodium benzoate as a preservative to prevent microbial contamination, vitamin E as an antioxidant stabilizer, citric acid solution for pH adjustment, and a cosmetic-grade fragrance agent to improve sensory characteristics.

All aqueous solutions were prepared using distilled water, and all glassware and equipment used during formulation were cleaned and sterilized prior to use to ensure product safety and avoid contamination.

Preparation of Plant Extracts

Preparation of Carrot Extract

The carrot extract was prepared using a modified percolation extraction method to obtain phytochemicals such as beta-carotene, vitamins, and antioxidant compounds. Fresh carrots were initially washed thoroughly under running water to remove soil and impurities. The outer peel was removed manually using a sterile peeler, and the carrots were cut into thin slices of approximately 2–3 mm thickness to facilitate drying and extraction efficiency.

The sliced carrot material was then dried in a hot air oven maintained at a temperature of 50–55 °C until the pieces became brittle and free of moisture. Drying was performed to prevent microbial growth and to enhance extraction efficiency by reducing water content. The dried carrot slices were subsequently ground using a mechanical grinder to obtain a coarse powder with a particle size of approximately 20–40 mesh. The powdered material was stored in an airtight container until further extraction.

For extraction, the powdered carrot material was subjected to an imbibition process. The powder was transferred to a beaker and moistened with



sufficient 70% ethanol until the material was completely wetted. The mixture was allowed to stand for 2–4 hours to allow the plant cells to swell and facilitate solvent penetration.

Following imbibition, the moistened powder was packed into a percolator. A layer of cotton or filter paper was placed at the bottom of the percolator to prevent clogging and ensure uniform solvent flow. The carrot powder was added gradually and packed gently without compression to allow proper solvent circulation.

The solvent (70% ethanol) was slowly poured into the percolator until it covered the plant material by approximately 3–4 cm. The percolator was closed and allowed to stand for 24 hours to allow maceration and solvent penetration.

Percolation was then initiated by opening the stopcock, allowing the solvent to flow at a controlled rate of 1–3 drops per second. The extract (percolate) was collected in a clean amber glass container. Fresh solvent was added as necessary to maintain the solvent level above the plant bed.

Percolation was continued until the extract became nearly colorless, indicating complete extraction of active constituents. The collected extract was concentrated using a rotary evaporator at 40–45 °C to remove excess ethanol and obtain a semi-concentrated carrot extract. The final extract was stored in an amber-colored bottle at refrigerated conditions until use in formulation.

Preparation of Lotus Extract

The lotus extract was prepared using a Soxhlet extraction method, which is widely used for efficient extraction of phytochemicals from plant materials. Fresh lotus flowers were collected and the petals were separated carefully from the floral structure. The petals were washed with distilled water to remove dust and impurities and then shade-dried at room temperature for 3–5 days until complete moisture removal.

The dried petals were ground using a grinder to obtain a coarse powder. Approximately 20 g of lotus petal powder was accurately weighed for extraction. The powdered material was placed into a filter paper thimble, which was inserted into the main chamber of the Soxhlet extractor. A round-bottom flask containing 200 mL of 95% ethanol was attached to the Soxhlet apparatus.

The extraction setup consisted of a heating mantle, round-bottom flask, Soxhlet extractor, and condenser. The solvent was heated until it began to boil and evaporate. The ethanol vapor traveled upward into the condenser, where it condensed and dripped onto the plant material contained in the extraction chamber. The extraction chamber gradually filled with solvent containing dissolved phytochemicals. Once the solvent reached the siphon level, it returned to the flask, carrying extracted compounds with it.

This extraction cycle was repeated for 8–10 cycles, typically lasting 4–6 hours, to ensure complete extraction of bioactive compounds such as flavonoids, alkaloids, and phenolic compounds from the lotus petals. After completion of the extraction process, the apparatus was allowed to cool and was carefully dismantled. The solvent containing the lotus extract was then concentrated using a rotary evaporator or water bath maintained below 40 °C to prevent degradation of thermolabile compounds. The concentrated lotus extract was collected as a semi-solid viscous mass and transferred into an amber glass container. The extract was stored at 4 °C until use in the formulation process.

Formulation of Herbal Face Toner

The herbal face toner was prepared using a simple aqueous formulation method to ensure homogeneity and stability of the final product. Initially, a clean and dry 20 mL beaker was taken, and the required quantity of lotus extract was added. The measured amount of glycerine was



then incorporated into the beaker and stirred continuously using a glass rod until uniform mixing was achieved. Subsequently, sodium benzoate was added as a preservative to prevent microbial contamination during storage. The carrot extract was then added slowly to the mixture with continuous stirring to ensure proper dispersion of active compounds.

After thorough mixing of the extracts, the required quantity of vitamin E was added to enhance antioxidant activity and improve skin protection properties. Rose water was then incorporated as the aqueous base of the formulation. The mixture was stirred continuously to obtain a clear and homogeneous solution.

The pH of the formulation was measured using a calibrated pH meter. If necessary, the pH was adjusted by adding a small quantity of citric acid solution dropwise until the formulation reached a pH range compatible with skin (approximately 4.5–5.5). The prepared toner solution was filtered through filter paper to remove any suspended particles or impurities. The final formulation was transferred into sterilized containers and properly labelled for further evaluation and analysis.

Three formulations were prepared with different concentrations of extracts.

Formulation Composition

Ingredient	F1	F2	F3
Lotus extract	2 ml	2.5 ml	3 ml
Carrot extract	0.6 ml	0.8 ml	1 ml
Glycerine	0.3 ml	0.3 ml	0.3 ml
Rose water	5.2 ml	5.2 ml	5.2 ml
Sodium benzoate	0.1 ml	0.1 ml	0.1 ml
Vitamin E	0.05 ml	0.05 ml	0.05 ml
Fragrance	0.01 ml	0.1 ml	0.1 ml
Citric acid	q.s	q.s	q.s

Evaluation of Herbal Face Toner

The prepared toner formulation was evaluated for various physicochemical and dermatological

parameters to assess its suitability for cosmetic use.

Organoleptic Evaluation

Organoleptic properties such as colour, odour, clarity, and texture were assessed visually to ensure consumer acceptability and uniformity of the formulation.

Homogeneity Test

Homogeneity of the formulation was evaluated by visual inspection to ensure the absence of visible particles, lumps, or phase separation.

pH Determination

The pH of the toner was determined using a calibrated digital pH meter. Approximately 25 mL of the formulation was taken in a beaker, and the pH electrode was immersed into the sample until a stable reading was obtained.

Viscosity Measurement

The viscosity of the toner formulation was determined using an Ostwald viscometer. The flow time of the formulation was compared with that of distilled water to calculate viscosity values in centipoise.

Surface Tension

Surface tension was measured using a stalagmometer to determine the spreading ability of the toner formulation on the skin surface.

Skin Irritation Test

A small quantity of the toner was applied on the dorsal side of the hand and observed for any signs of redness, itching, or irritation. The absence of such symptoms indicated that the formulation was safe for topical application.

Spreadability

The toner was sprayed onto the skin surface and spread gently using cotton. The ability of the formulation to spread uniformly was recorded.

Antimicrobial Activity

Antimicrobial activity was evaluated using agar plate inoculation. The formulated toner was applied to an agar plate containing microbial culture and incubated at 37 °C for 24 hours. The



absence or reduction of microbial growth indicated antimicrobial effectiveness.

Stability Studies

The formulation was subjected to stability testing under different conditions, including light exposure and storage for 30 days, to observe any changes in color, odor, or physical properties..

RESULTS AND DISCUSSION

This study focused on the formulation and evaluation of a herbal face toner containing lotus extract (*Nelumbo nucifera*) and carrot extract (*Daucus carota*). Three different formulations (F1, F2, and F3) were prepared by varying the concentrations of the active herbal extracts while keeping other ingredients constant. The prepared formulations were subjected to various evaluation parameters including organoleptic characteristics, phytochemical screening, pH determination, antioxidant activity, and physical stability tests. The results obtained from these evaluations are discussed below.

3.1 Organoleptic Evaluation

Organoleptic evaluation is an important parameter for cosmetic formulations because it determines consumer acceptability and aesthetic quality. The prepared toner formulations were evaluated for colour, sensitivity, grittiness, and sedimentation through visual inspection.

Table 1: Organoleptic Properties of Herbal Face Toner

Formulation	Color	Sensitivity	Grittiness
F1	Colourless	Absent	Smooth
F2	Colourless	Absent	Smooth
F3	Colourless	Absent	Smooth

All the formulations were clear, colourless liquids without visible particles, indicating that the extraction process and filtration produced a uniform preparation. The absence of grittiness suggests that the toner contains finely dispersed plant extracts without undissolved particles.

No sedimentation was observed in any of the formulations, which indicates good physical stability and proper solubility of ingredients in the aqueous base.

Furthermore, none of the formulations showed signs of skin sensitivity, suggesting that the ingredients used in the formulation were non-irritant and suitable for topical application.

3.2 Phytochemical Screening

Phytochemical analysis was carried out to detect the presence of bioactive compounds in the herbal extracts used in the toner formulation. The tests performed included identification of alkaloids, flavonoids, saponins, and tannins.

Table 2: Phytochemical Screening Results

Phytochemical Test	Method Used	Observation	Result
Alkaloids	Dragendorff's Test	Orange-brown precipitate	Positive
Alkaloids	Mayer's Test	Cream precipitate	Positive
Alkaloids	Wagner's Test	Reddish brown precipitate	Positive
Flavonoids	Alkaline Reagent Test	Yellow colour formation	Positive
Flavonoids	Shinoda Test	Pink colour formation	Positive
Saponins	Liebermann-Burchard Test	Colour change observed	Positive
Saponins	Foam Test	No stable foam	Negative



Tannins	Ferric Chloride Test	Greenish-black colour	Positive
Tannins	Lead Acetate Test	White precipitate	Positive

The phytochemical screening results confirmed the presence of alkaloids, flavonoids, tannins, and saponins in the herbal extracts used in the toner. Flavonoids and tannins are known to possess antioxidant, antimicrobial, and anti-inflammatory properties, which are beneficial for skin health. The presence of these compounds supports the therapeutic potential of the toner formulation.

Carrot extract is particularly rich in beta-carotene, vitamin A, and phenolic compounds, which contribute to skin nourishment and protection against oxidative stress. Similarly, lotus extract contains polyphenols and flavonoids, which help in soothing irritated skin and reducing inflammation. Thus, the phytochemical analysis confirmed that the prepared herbal toner contains bioactive phytoconstituents responsible for its cosmetic and therapeutic effects.

3.3 pH Determination

The pH of cosmetic formulations is an important parameter because it determines skin compatibility and safety. The pH of the prepared formulations was measured using a calibrated pH meter.

Table 3: pH of Herbal Face Toner Formulations

Formulation	pH
F1	4.0
F2	5.0
F3	4.5

Graph 1: pH Comparison of Toner Formulations

The pH values of all formulations ranged between 4.0 and 5.0, which falls within the normal pH range of human skin (4.5–5.5).

Maintaining an appropriate pH is essential because it helps:

- Preserve the skin's natural acid mantle
- Prevent microbial growth

- Maintain skin hydration
- Avoid irritation or dryness

Among the three formulations, Formulation 3 (pH 4.5) was closest to the natural skin pH and therefore considered the most suitable for skin application.

3.4 Antioxidant Activity

Antioxidant activity plays a crucial role in skincare formulations because antioxidants help in neutralizing free radicals that cause premature aging, skin dullness, and oxidative damage.

Table 4: Antioxidant Activity of Formulations

Formulation	Antioxidant Activity
Formulation 1	Moderate
Formulation 2	High
Formulation 3	Very High

The antioxidant activity observed in the toner formulations can be attributed to the combined effect of lotus extract and carrot extract. Carrot extract contains beta-carotene and vitamin A, which are powerful antioxidants that protect skin from UV-induced damage. Lotus extract contains polyphenols and flavonoids, which have strong free radical scavenging properties.

Formulation 3 exhibited the highest antioxidant activity, which can be attributed to its higher concentration of both lotus and carrot extracts.

3.5 Skin Compatibility and Performance Evaluation

The toner formulations were also evaluated for skin irritation, spreadability, stickiness, and skin conditioning effects.



Table 5: Skin Performance Evaluation

Parameter	Observation
Skin Irritation	No irritation observed
Stickiness	Non-sticky
Spreadability	Easily spreadable
Skin Conditioning	Smooth and hydrated skin
Removal	Easily washable

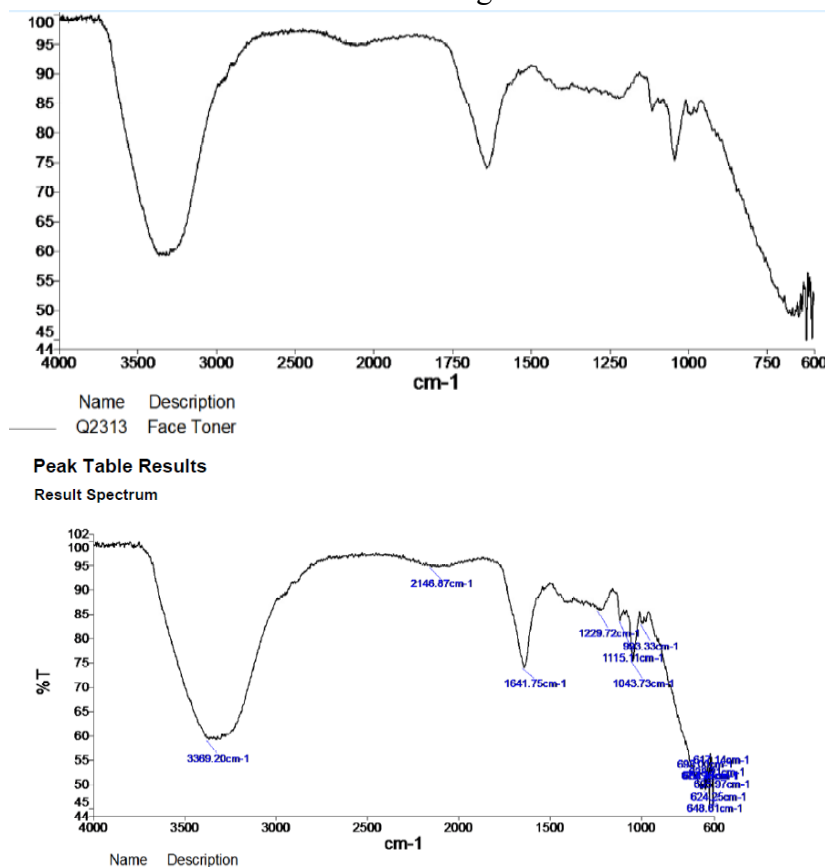
The skin irritation test indicated that the toner was safe for topical application and did not cause redness or itching. The formulation was non-sticky and easily spreadable, which improves consumer acceptability. After application, the skin appeared smooth, hydrated, and refreshed, which confirms

the moisturizing effect of glycerine and rose water in the formulation.

3.6 FTIR analysis of herbal face toner

FTIR Spectrum

The Fourier Transform Infrared (FTIR) spectroscopy analysis was carried out to identify the functional groups present in the formulated herbal face toner containing lotus extract (*Nelumbo nucifera*) and carrot extract (*Daucus carota*). FTIR analysis helps confirm the presence of bioactive compounds and compatibility of ingredients in the formulation.



The spectrum was recorded using a PerkinElmer Spectrum Two FTIR spectrometer within the range of 4000–600 cm^{-1} using a MIRacle ZnSe ATR accessory with 4 cm^{-1} resolution and 5 scans. The FTIR spectrum exhibited several characteristic peaks corresponding to various functional groups derived from plant

phytochemicals such as flavonoids, phenolics, tannins, and carbohydrates.

FTIR Peak Interpretation

Peak No	Wavenumber (cm ⁻¹)	Transmittance (%)	Functional Group	Possible Compound Source
1	3369	59.25	O–H stretching	Phenols, alcohols
2	2146	94.82	C≡C stretching	Alkynes / organic compounds
3	1641	74.13	C=C stretching	Aromatic compounds
4	1229	86.02	C–O stretching	Phenols, ethers
5	1115	83.87	C–O–C stretching	Alcohols / carbohydrates
6	1043	75.49	C–O stretching	Polysaccharides
7	993	83.20	C–H bending	Alkenes
8	698	51.34	C–H bending	Aromatic compounds
9	672	49.06	Aromatic bending	Phenolic structures
10	664	49.04	Aromatic ring vibration	Flavonoids
11	648	48.84	C–H bending	Aromatic compounds
12	638	49.79	Ring deformation	Aromatic compounds
13	624	44.89	C–H bending	Organic compounds
14	617	52.31	Aromatic vibration	Phenolic compounds
15	605	45.10	Aromatic ring bending	Plant phytochemicals

FTIR Spectrum Interpretation

1. Broad Peak at 3369 cm⁻¹

The broad absorption band observed at 3369 cm⁻¹ corresponds to O–H stretching vibrations, which are characteristic of phenolic compounds and alcohol groups. These functional groups are commonly present in plant-derived phytochemicals such as flavonoids and polyphenols found in lotus and carrot extracts. These compounds contribute to antioxidant and anti-inflammatory properties of the toner.

2. Peak at 2146 cm⁻¹

The absorption peak at 2146 cm⁻¹ indicates C≡C stretching vibration, which may arise from organic compounds containing unsaturated bonds present in plant extracts.

3. Peak at 1641 cm⁻¹

The peak observed at 1641 cm⁻¹ corresponds to C=C stretching vibrations of aromatic rings. This indicates the presence of aromatic compounds such as flavonoids and phenolic acids, which are known for their antioxidant and skin protective activities.

4. Peaks between 1229–1043 cm⁻¹

The peaks at 1229 cm⁻¹, 1115 cm⁻¹, and 1043 cm⁻¹ represent C–O and C–O–C stretching vibrations, which are associated with alcohols, esters, and carbohydrate structures. These functional groups are typical of polysaccharides, glycosides, and phenolic compounds present in herbal extracts. These compounds contribute to moisturizing and skin-conditioning properties of the toner.

5. Peak at 993 cm⁻¹



The band at 993 cm^{-1} indicates C–H bending vibrations of alkenes, suggesting the presence of unsaturated organic molecules.

6. Peaks in the region $698\text{--}605\text{ cm}^{-1}$

Several peaks in this region correspond to aromatic ring bending vibrations. These are characteristic of phenolic and flavonoid compounds widely present in plant extracts.

These compounds contribute to:

- Antioxidant activity
- Anti-aging properties
- Skin protection

Significance of FTIR Analysis

The FTIR spectrum confirmed the presence of important functional groups such as hydroxyl, aromatic, and ether groups in the herbal face toner formulation.

These functional groups indicate the presence of bioactive phytochemicals, including:

- Flavonoids
- Phenolic compounds
- Tannins
- Glycosides

These compounds are responsible for the antioxidant, anti-inflammatory, and moisturizing properties of the toner.

The absence of unexpected peaks indicates good compatibility between formulation ingredients without chemical degradation.

The FTIR analysis confirmed the presence of key functional groups associated with plant-derived phytochemicals in the formulated herbal toner. The identified peaks correspond to phenolic, aromatic, and carbohydrate structures, which contribute to the cosmetic and dermatological benefits of the product. Thus, the FTIR results support the successful incorporation of lotus and carrot extracts into the formulation and confirm the chemical stability and compatibility of the toner ingredients.

RESULTS AND DISCUSSION

The prepared herbal toner formulations were clear, smooth, and free from sedimentation. All formulations exhibited acceptable organoleptic properties.

The pH values ranged from 4.0 to 5.0, which is compatible with the natural skin pH. Phytochemical screening confirmed the presence of bioactive compounds such as flavonoids, tannins, alkaloids, and saponins. These compounds are responsible for antioxidant, anti-inflammatory, and antimicrobial activities. Among the three formulations, Formulation 3 showed better antioxidant properties and appropriate pH, making it the optimized formulation.

DISCUSSION

The results obtained from various evaluation tests confirm that the prepared herbal toner formulations possess good physicochemical stability and desirable cosmetic properties. The presence of bioactive phytochemicals such as flavonoids, tannins, and alkaloids indicates that the formulation has potential antioxidant and skin-protective effects. Among the three formulations tested, Formulation 3 showed the most desirable characteristics, including:

- Optimal pH (4.5)
- Highest antioxidant activity
- Good organoleptic properties
- Excellent skin compatibility

Therefore, Formulation 3 was selected as the optimized formulation.

The synergistic combination of lotus extract and carrot extract contributes to enhanced skin hydration, antioxidant protection, and improved skin texture. These findings suggest that the formulated herbal toner can serve as a safe and effective natural cosmetic product for daily skincare use.



CONCLUSION

The present study successfully demonstrated the formulation and evaluation of a herbal face toner containing lotus extract (*Nelumbo nucifera*) and carrot extract (*Daucus carota*), aimed at developing a natural, safe, and effective cosmetic product for daily skincare application. Increasing consumer awareness regarding the adverse effects associated with synthetic cosmetic ingredients has accelerated the demand for plant-based skincare formulations. In this context, the development of a herbal toner utilizing bioactive plant extracts offers a promising alternative with improved dermatological compatibility.

Three formulations (F1, F2, and F3) were developed by varying the concentration of lotus and carrot extracts while maintaining other excipients such as glycerine, rose water, sodium benzoate, fragrance, and vitamin E. The toner formulations were prepared using a simple aqueous-based cosmetic preparation technique and were subjected to extensive physicochemical evaluation, phytochemical screening, and functional performance testing.

The organoleptic evaluation revealed that all three formulations were colourless, smooth, and free from sedimentation, indicating good formulation uniformity and acceptable cosmetic characteristics. The absence of grittiness and sediment formation suggested that the ingredients were properly solubilized and dispersed within the aqueous base.

The pH analysis showed values within the range of 4.0–5.0, which is considered compatible with the natural pH of human skin. Maintaining an appropriate pH is essential to preserve the skin barrier, prevent microbial colonization, and minimize irritation. The optimized formulation (F3) exhibited a pH of approximately 4.5, making it particularly suitable for topical dermatological application.

Phytochemical screening confirmed the presence of several important bioactive constituents including alkaloids, flavonoids, tannins, and saponins. These phytoconstituents are widely recognized for their therapeutic and cosmetic benefits. Flavonoids and phenolic compounds contribute significantly to antioxidant activity, helping to neutralize free radicals that cause premature skin aging. Tannins provide astringent properties, which help tighten skin pores and improve skin tone. Alkaloids and saponins may contribute to antimicrobial and cleansing activities, supporting the toner's ability to maintain skin hygiene.

The evaluation tests also demonstrated that the toner formulation exhibited good spreadability, non-stickiness, and easy washability, which are important attributes for consumer acceptability. Additionally, the skin irritation test confirmed that the formulation was non-irritant and safe for topical use, indicating good dermal compatibility. The observed cosmetic performance can be attributed to the synergistic effects of the selected herbal ingredients. Lotus extract contains polyphenols, flavonoids, and other phytochemicals that exhibit anti-inflammatory, antioxidant, and skin-soothing properties. These compounds help reduce irritation, improve skin hydration, and enhance overall skin appearance. Carrot extract is rich in β -carotene, vitamins A, C, and E, which promote skin regeneration, provide photoprotection, and contribute to skin brightening. Together, these extracts provide a multifunctional cosmetic effect including skin toning, hydration, antioxidant protection, and pore tightening.

Among the developed formulations, Formulation F3 showed superior performance compared with F1 and F2. The optimized concentration of lotus and carrot extracts in F3 provided improved antioxidant potential and better physicochemical stability. Therefore, F3 was identified as the most



suitable formulation for further cosmetic development and potential commercialization.

Overall, the study confirms that the herbal face toner formulated using lotus and carrot extracts is stable, effective, and safe for cosmetic application. The formulation provides several skincare benefits including hydration, pore tightening, antioxidant protection, and skin rejuvenation without causing irritation or adverse effects.

Furthermore, the developed herbal toner represents a promising natural alternative to conventional synthetic toners, aligning with the current global trend toward herbal, eco-friendly, and dermatologically safe cosmetic products.

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