

FORMULATION AND EVALUATION OF HERBAL FACE MIST USING *PORTULACA OLERACEA* FOR INSTANT SKIN HYDRATION

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DOI: <https://doi.org/10.5281/zenodo.21699092>

How to cite this Article: Prof. Swati N. Kakad^{1*}, Prof. Shital K. Datir^{1*}, Dr. Gokul S. Talele², Pallavi S. Kumbharkar³, Sakshi S. Thombare⁴, Priyanka S. Pawar⁵ (2026). Formulation And Evaluation Of Herbal Face Mist Using *Portulaca Oleracea* For Instant Skin Hydration. World Journal of Pharmaceutical and Medical Research, 12(8), 318-324.

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Article Received on 07/07/2026

Article Revised on 28/07/2026

Article Published on 01/08/2026

ABSTRACT

The present study focuses on the formulation and evaluation of an herbal face mist containing *Portulaca oleracea* for instant skin hydration. In the modern era, environmental stress, pollution, and prolonged exposure to sunlight significantly contribute to skin dehydration and dullness. Synthetic moisturisers may cause irritation or allergic reactions in sensitive individuals, thereby increasing the demand for safer, plant-based cosmetic alternatives. *Portulaca oleracea*, commonly known as purslane, is rich in bioactive constituents such as omega-3 fatty acids, flavonoids, vitamins A, C, and E, and polysaccharides, which exhibit potent antioxidant, anti-inflammatory, and moisturising properties. The herbal face mist was formulated using an aqueous extract of *Portulaca oleracea* along with suitable natural humectants and preservatives. The prepared formulation was evaluated for various physicochemical parameters, including pH, viscosity, and clarity, spray pattern, stability, and skin irritation. The optimised formulation demonstrated a skin-compatible pH range (5.5–6.5), uniform spray distribution, acceptable clarity, and good stability under different storage conditions. Preliminary evaluation indicated an immediate, refreshing, and hydrating effect on the skin, with no signs of irritation or adverse reactions. In conclusion, the formulated herbal face mist containing *Portulaca oleracea* can serve as a safe, effective, and natural alternative to synthetic hydrating products, providing instant moisturization and skin revitalisation. Further research may focus on long-term stability studies and clinical evaluation for commercial cosmetic applications.

KEYWORDS: *Portulaca oleracea*, Herbal face mist, Skin hydration, Antioxidant activity, Moisturizing effect, Natural cosmetics, Herbal formulation, Instant refreshment.

INTRODUCTION

Healthy skin requires adequate hydration to maintain barrier integrity, elasticity, softness, and protection against environmental damage.^[1] Skin dehydration may result from ultraviolet radiation, pollution, low humidity, aging, and excessive use of harsh cleansing agents, leading to dryness, irritation, roughness, and premature aging.^[2,3] Face mists are topical liquid formulations designed to deliver immediate hydration and refresh the skin. Herbal face mists are increasingly preferred because they contain naturally derived antioxidants, vitamins, and moisturizing agents that provide hydration

while minimizing irritation associated with synthetic cosmetic ingredients.^[4,5] *Portulaca oleracea* (Purslane) is an edible medicinal herb rich in omega-3 fatty acids, flavonoids, alkaloids, polysaccharides, vitamins A, C, and E, minerals, and phenolic compounds. These phytoconstituents contribute to antioxidant, anti-inflammatory, wound-healing, and moisturizing activities, making *P. oleracea* a promising ingredient for topical skincare formulations.^[6,7] The incorporation of aloe vera juice, glycerin, cucumber extract, green tea extract, panthenol, and rose water further enhances the moisturizing, antioxidant, and soothing properties of the

formulation.^[8,9] The present study was undertaken to formulate and evaluate a herbal face mist containing *Portulaca oleracea* extract for instant skin hydration and improved skin comfort.^[10]

Skin Hydration

Skin hydration refers to the maintenance of adequate water content within the stratum corneum, the outermost layer of the skin. Proper hydration preserves skin elasticity, barrier function, and overall skin appearance.^[11] The natural moisturizing factor (NMF), epidermal lipids, and hyaluronic acid play vital roles in retaining moisture and preventing transepidermal water loss (TEWL).^[12]

Herbal Face Mist

A herbal face mist is a water-based cosmetic formulation containing herbal extracts, hydrating agents, botanical hydrosols, and antioxidants that provide instant hydration, cooling, and skin rejuvenation.^[13] Unlike conventional facial sprays, herbal formulations deliver additional biological activities such as antioxidant protection, anti-inflammatory effects, and skin soothing without excessive synthetic chemicals.^[14]

Types of Face Mist

➤ Hydrating Face Mist

Contains humectants such as glycerin and aloe vera to improve skin moisture levels.^[15]

➤ Antioxidant Face Mist

Prepared using botanical extracts rich in polyphenols and flavonoids to protect the skin against oxidative stress.^[15]

➤ Calming Face Mist

Contains soothing ingredients such as lavender hydrosol, chamomile, and cucumber extract to reduce redness and irritation.^[16]

➤ Brightening Face Mist

Formulated with vitamin C-rich botanical extracts to improve skin radiance.^[16]

➤ Anti-Aging Face Mist

Contains antioxidants, peptides, and botanical extracts that reduce oxidative damage and improve skin elasticity.^[17]

Advantages

- Provides instant skin hydration^[18]
- Refreshes and cools the skin^[18]

- Rich in natural antioxidants^[19]
- Reduces oxidative stress^[19]
- Helps maintain skin barrier function^[20]
- Improves skin softness and elasticity^[20]
- Suitable for frequent application^[21]
- Free from harsh synthetic chemicals^[21]
- Eco-friendly and biodegradable^[22]
- Enhances overall skin appearance^[22]

Disadvantages

- Limited shelf life due to herbal ingredients^[23]
- Possibility of microbial contamination if preservation is inadequate^[24]
- Batch-to-batch variation in phytochemical composition^[24]
- Natural color changes during storage^[25]
- Stability depends on storage conditions^[25]
- Potential allergic reactions in sensitive individuals^[26]

Plant Profile of *Portulaca oleracea*

Scientific Classification

- Scientific name: *Portulaca oleracea* L.
- Common name: Purslane
- Family: Portulacaceae
- Kingdom: Plantae
- Order: Caryophyllales
- Genus: *Portulaca*
- Species: *oleracea*

Portulaca oleracea is a succulent medicinal herb widely distributed throughout tropical and subtropical regions. It is rich in omega-3 fatty acids, flavonoids, alkaloids, polysaccharides, phenolic compounds, vitamins (A, C and E), glutathione, β -carotene, potassium, calcium and magnesium, which contribute to its antioxidant, anti-inflammatory and skin-protective activities.^[27-30]

Pharmacological Activities

- Antioxidant^[31]
- Anti-inflammatory^[32]
- Moisturizing
- Wound healing
- Antimicrobial
- Skin barrier protection
- Anti-aging activity^[33]

Formulation Composition

Table no.1: Formulation Composition.

Sr. No.	Ingredients	F1 (gm)	F2 (gm)	F3 (gm)	Function / Purpose
1.	<i>Portulaca oleracea</i> extract	0.5	1.0	1.5	Skin soothing, antioxidant, hydration
2.	Aloe vera juice	5.0	5.0	5.0	Moisturizing, soothing, anti-inflammatory
3.	Glycerin	2.0	2.0	2.0	Humectant, retains moisture
4.	Rose water	5.0	5.0	5.0	Skin toning, refreshing agent
5.	Cucumber extract	1.0	1.0	1.0	Cooling effect, hydration, soothing
6.	Panthenol	0.5	0.5	0.5	Moisturizing, improves skin barrier function
7.	Green tea extract	0.2	0.2	0.2	Antioxidant, anti-aging, skin protection
8.	Lavender hydrosol	5.0	5.0	5.0	Soothing, calming effect
9.	Natural preservative	0.2	0.2	0.2	Prevents microbial

					growth, increases shelf life
10.	Citric acid	q.s.	q.s.	q.s.	pH adjuster
11.	Distilled water	q.s. to 100 gm	q.s. to 100 gm	q.s. to 100 gm	Vehicle / solvent base

Method of Preparation

The herbal face mist was prepared by the cold mixing method, which is suitable for heat-sensitive herbal extracts and hydrosols.^[34]

- The required quantity of *Portulaca oleracea* extract (0.5 g, 1.0 g, and 1.5 g for F1, F2, and F3, respectively) was accurately weighed and dissolved in a small quantity of distilled water under continuous stirring.^[35]
- Aloe vera juice, glycerin, rose water, cucumber extract, panthenol, green tea extract, and lavender hydrosol were measured accurately and mixed together in a clean beaker with continuous stirring until a clear, homogeneous solution was obtained.^[36]
- The previously prepared *Portulaca oleracea* extract solution was gradually added to the above mixture with gentle stirring to ensure uniform distribution of the active constituents.^[37]
- A suitable natural preservative was incorporated into the formulation to prevent microbial contamination and enhance product stability.^[38]
- The pH of the formulation was adjusted to 5.5–6.0 using citric acid, which is compatible with the physiological pH of the skin.^[39]
- Finally, distilled water was added q.s. to 100 mL, and the formulation was stirred for 10–15 minutes until a uniform solution was obtained.^[40]
- The prepared face mist was filtered through muslin cloth or Whatman No. 1 filter paper to remove any undissolved particles and then filled into sterile spray bottles. The bottles were stored at room temperature ($25 \pm 2^\circ\text{C}$) away from direct sunlight until further evaluation.^[41]

Evaluation of Herbal Face Mist

1. Organoleptic Evaluation^[42]

The formulation was examined visually for appearance, colour, odour, clarity, and homogeneity.

2. pH Determination^[43]

The pH was measured using a calibrated digital pH meter at room temperature. The acceptable pH range for facial skin was 5.5–6.5.



Figure no.1: pH Determination.

3. Spray Pattern Test^[44]

The face mist was sprayed onto white paper from a fixed distance (15–20 cm), and the spray pattern was observed for uniformity, droplet size, and coverage.

4. Sprayability Test^[45]

The spray nozzle was evaluated for ease of spraying, clogging, and uniform mist formation.

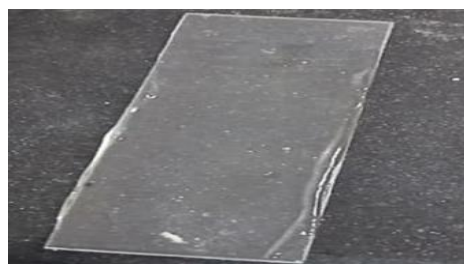


Figure no.2: Sprayability Test.

5. Viscosity^[46]

Viscosity was determined using a **Brookfield Viscometer** at $25 \pm 2^\circ\text{C}$ to ensure proper flow and sprayability.

6. Specific Gravity^[47]

Specific gravity was determined using a pycnometer and compared with distilled water.

7. Skin Hydration Test^[48]

Skin hydration was assessed using a skin moisture analyzer before application and 30 minutes after application. The percentage increase in skin hydration was calculated.

8. Drying Time^[49]

The time required for the face mist to dry completely after spraying onto the skin was recorded using a stopwatch.

9. Skin Irritation Test^[50]

The formulation was applied to the forearm of healthy volunteers and observed for **24 hours** for redness, itching, burning, or irritation after obtaining informed consent.



Figure no.3: Skin Irritation Test.

10. Stability Study^[51]

The formulation was stored at.

- Room temperature ($25 \pm 2^\circ\text{C}$)
- Refrigerated condition ($4 \pm 2^\circ\text{C}$)
- Accelerated condition ($40 \pm 2^\circ\text{C}$, $75 \pm 5\%$ RH) for **3 months** and periodically evaluated for changes in colour, odour, pH, clarity, and phase separation.

11. Microbial Limit Test^[52]

The formulation was evaluated for microbial contamination using standard microbiological methods to ensure product safety.

RESULT AND CONCLUSION

Formulation and Evaluation Parameters of Herbal Face Mist were performed as follows.

1. Organoleptic Characteristics

Table No. 2: Result of Organoleptic Properties.

Sr. No.	Character	Observation
1	Nature	Mist
2	Colour	Light greenish/transparent
3	Appearance	Clear, homogeneous
4	Odour	Pleasant herbal fragrance

OBSERVATION

- All formulations (F1, F2, and F3) were clear, homogeneous, and light greenish.
- Herbal fragrance from Rose water, Lavender hydrosol, and Portulaca extract enhanced consumer acceptability.

2. Determination of pH

Table No. 3: Result of pH.

Sr. No.	Formulation	pH Value
1	F1	5.2
2	F2	5.3
3	F3	5.4

OBSERVATION / DISCUSSION=

- pH of all formulations was within skin-friendly range (4.5–5.5).
- Minor differences due to varying concentrations of Portulaca extract.

3. Spreadability

Table No. 4: Result of Spreadability.

Sr. No.	Formulation	Spreadability (cm)
1	F1	8.5
2	F2	8.8
3	F3	9.0

OBSERVATION / DISCUSSION

- All formulations spread easily on skin ensuring uniform hydration.
- F3 showed slightly higher spreadability due to higher glycerin and extract content.

4. Skin Hydration / Moisturization

Table No. 07: Result of Skin Hydration.

Sr. No.	Formulation	0 min	15 min	30 min	60 min
1	F1	32	38	40	41
2	F2	33	42	44	45
3	F3	34	47	50	52

OBSERVATION / DISCUSSION

- F3 showed maximum hydration due to higher concentration of Portulaca, Aloe, and cucumber extracts.
- Hydration observed within 15 minutes, confirming instant effect.

5. Determination Skin Irritancy Test

Table No. 8: Result of Skin Irritancy.

Sr. No.	Formulation	Irritancy
1	F1	No
2	F2	No
3	F3	No

Observation: No redness, itching, or irritation observed; formulations safe for topical use.

6. Determination of Stability

Table No. 9: Result of Stability.

Sr. No.	Parameter	Formulation batches		
		F1	F2	F3
1.	Stability	passed	failed	passed

OBSERVATION

F1 and F3 stable at room temperature, 4°C, and 40°C. F2 failed; requires optimization for better stability.

7. Determination of Transparency

Table No. 10: Result of Transparency.

Sr. No.	Parameter	Formulation batches		
		F1	F2	F3
1.	Transparency	Transparent	Transparent	Transparent

OBSERVATION

All formulations were clear and transparent, indicating good solubility and formulation quality.

CONCLUSION

The present study successfully formulated and evaluated a *Portulaca oleracea*-based Herbal Face Mist for skin hydration and soothing effects. Three trial formulations (F1, F2, and F3) were prepared and systematically assessed for physicochemical properties, safety, stability, and moisturizing efficacy.

All formulations showed satisfactory organoleptic characteristics, being clear, homogeneous, light greenish, and possessing a pleasant herbal fragrance. The pH values (5.2–5.4) were within the skincompatible range (4.5–5.5), confirming suitability for topical application without irritation.

Spreadability studies demonstrated good and uniform application properties, while transparency tests

confirmed proper formulation and compatibility of ingredients. Skin irritancy testing revealed no redness, itching, or adverse reactions, indicating that the formulations are safe for sensitive skin. Skin hydration studies showed a significant increase in moisture content, with F3 exhibiting the highest hydration effect. This enhanced performance may be attributed to the higher concentration of *Portulaca oleracea* extract along with Aloe vera, cucumber extract, glycerin, and panthenol, which act synergistically as humectants and soothing agents.

Stability studies conducted at different temperatures confirmed that all formulations remained physically and chemically stable without significant changes in colour, pH, clarity, or fragrance over the study period.

Among the three batches, F3 was identified as the optimized formulation due to superior hydration, excellent spreadability, stability, and user acceptability.

Overall, the study demonstrates that a *Portulaca oleracea*-based herbal face mist can be developed as a safe, effective, stable, and natural cosmetic product for daily skincare. It provides instant hydration, soothing action, and antioxidant benefits, highlighting the potential of herbal ingredients in modern cosmetic preparations.

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