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ORIGINAL RESEARCH

Formulation and Evaluation of Multi-herbal Peel-off Mask

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ABSTRACT

Acne vulgaris is a common inflammatory skin condition, and increasing antibiotic resistance among acne-associated organisms such as Cutibacterium acnes (formerly Propionibacterium acnes) has increased interest in herbal topical products. The present study aimed to prepare three multi-herbal peel-off gel masks (F1–F3) and to evaluate them as a preliminary formulation and physicochemical study. The masks contained extracts of fenugreek (Trigonella foenum-graecum L.), tulsi (Ocimum tenuiflorum L.), rose petals (Rosa spp.) and turmeric (Curcuma longa L.), together with lavender oil, glycerine, methylparaben, propylparaben and polyvinyl alcohol (PVA) as the film-forming agent. The formulations differed in the proportions of the herbal extracts, lavender oil, propylparaben and PVA, and were prepared by a simple stirring method. They were evaluated for physical appearance, pH, spreadability, drying time and preliminary physical stability. All formulations were light yellow, translucent and semisolid. The pH values ranged from 7.0 to 7.67 and the drying times from 10 to 17 min. F1 showed the shortest drying time (10–12 min) and the highest spreadability value (9.8 g·cm/s). Antimicrobial, antioxidant, anti-inflammatory and anti-acne activities were not evaluated. F1 showed the most favourable overall physical characteristics among the three formulations and is a candidate for further biological, dermatological and stability evaluation.

Keywords: Multi-herbal peel-off mask, Fenugreek, Rose petals, Tulsi, Turmeric, Formulation, Physicochemical evaluation

HIGHLIGHTS

- Three herbal peel-off mask formulations (F1–F3) were prepared and compared.
- pH, spreadability, drying time and physical stability were assessed.
- F1 showed the shortest drying time and highest spreadability among F1–F3.
- Anti-acne and other biological activities were not evaluated in this study.
- F1 is a candidate for further biological, safety and stability evaluation.

1. INTRODUCTION

Herbal cosmetics represent a rapidly growing segment of the skincare industry, formulated using naturally derived plant-based ingredients that are reported to offer a range of skin-related benefits, including hydration, nourishment, and antioxidant and anti-inflammatory activity. Consumer preference has shifted toward "natural" and "clean-label" skincare products in recent years; however, natural origin does not by itself establish safety, and herbal ingredients may also cause irritation or sensitisation. Herbal formulations contain bioactive phytoconstituents such as flavonoids, alkaloids, tannins, and essential oils, which have been reported to exhibit antioxidant, antimicrobial, and anti-inflammatory properties in the published literature. Polyherbal face packs and masks have been formulated by combining several botanicals [1,2].

Among the many forms of herbal cosmetics, the peel-off mask has emerged as a popular topical preparation. A peel-off mask is typically applied as a thin, even layer on the face with the fingers or a spatula, then allowed to dry into a flexible, cohesive film. Once dried, this film can be peeled away from the skin in a single motion, leaving behind no sticky residue. On removal, the film may lift away surface dirt, excess sebum, and loosely attached dead skin cells, and the skin may feel smooth and clean afterwards. Peel-off masks may also provide a mild moisturising effect through temporary occlusion of the skin surface.

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One of the dermatological conditions for which herbal peel-off masks are frequently formulated is acne vulgaris, a common, recurrent inflammatory disorder of the pilosebaceous unit. Acne predominantly manifests during adolescence, most commonly in individuals aged 12 to 25, a period marked by heightened sebaceous activity due to hormonal fluctuations. Acne is among the most prevalent skin diseases worldwide [3], and approximately 85% of teenagers and young adults are reported to be affected at some point, underscoring its significant public health and cosmetic burden.[4,5] The pathogenesis of acne is multifactorial, involving increased sebum production, follicular hyperkeratinisation, inflammation and colonisation of the follicle by *Cutibacterium acnes* (formerly *Propionibacterium acnes*) [6,7] and, to a lesser extent, *Staphylococcus epidermidis*[8]. Several studies have reported that both *C. acnes* and *S. epidermidis* have developed resistance to commonly used antibiotics, which limits the long-term efficacy of conventional antimicrobial acne therapies [6,8]. In this context, plant-derived topical preparations, which are used in traditional healing systems such as those practised in Indonesia, continue to be investigated as complementary options; however, their efficacy and resistance profiles must be verified experimentally [5,9].

Within this context, peel-off gel face masks have gained popularity as topical cosmetic preparations. A defining advantage of these formulations is their ability to form an elastic, cohesive film that can be removed easily without damaging the underlying skin. Peel-off masks have been described as cleansing and refreshing products that may support the appearance of the skin [10,11].

The aim of the present work was to prepare three multi-herbal peel-off gel masks (F1–F3) containing fenugreek, tulsi, rose petal and turmeric extracts with a PVA-based film-forming system, and to evaluate their physical and application characteristics as a preliminary formulation and physicochemical study. Antimicrobial, antioxidant, anti-inflammatory and anti-acne activities were not evaluated in this study; the properties attributed to the botanicals below are based on previously published literature and are not findings of the present work.

2. MATERIALS AND METHODS

Fenugreek seeds, basil (tulsi) leaves, turmeric rhizomes and rose petals were collected from Rajnandgaon, Chhattisgarh, India, and were authenticated by the Department of Botany, Govt. Digvijay Autonomous PG College, Rajnandgaon. Some additional ingredients were procured from the local market. The components incorporated into the peel-off mask formulation are listed below (Figure 1; Table 1).

2.1. Fenugreek (Trigonella foenum-graecum L.) extract

The fenugreek extract was prepared in January 2026 at the laboratory of Sanskar City College of Pharmacy, Rajnandgaon. Fenugreek has been reported to show antioxidant and anti-inflammatory activity [12,13]. The extract was obtained from 5 g of fenugreek seed powder in 50 mL of 95% ethanol by Soxhlet extraction for 4–5 days. The extract was filtered through filter paper, and the solvent was evaporated using a water bath. The concentrated extract was collected, with an estimated yield of 0.5 g, and stored in an airtight container at room temperature until further use.

2.2. Tulsi (Ocimum tenuiflorum L.) extract

Tulsi (*Ocimum tenuiflorum* L., also known as *Ocimum sanctum* L.) has been reported to possess antibacterial and antifungal properties and contains several phytoconstituents, including ursolic acid [14,15]. It is traditionally used in herbal cosmetic preparations, including face packs [14]. Fresh tulsi leaves were collected from the local area of Rajnandgaon district, Chhattisgarh, India. The collected leaves were cleaned, dried and powdered. The powdered leaves were subjected to Soxhlet extraction using ethanol for 4–5 days. The resulting extract was filtered through Whatman filter paper, and the solvent was removed using a water bath. The concentrated extract was collected, weighed and stored in an airtight container at room temperature until further use.

2.3. Rose (Rosa spp.) petal extract

Rose petals contain phenolic compounds and have been reported to possess antioxidant and antimicrobial properties [16,17]. They are also widely used in cosmetic preparations for their fragrance [17]. Fresh rose petals were collected from a local nursery in Rajnandgaon district, Chhattisgarh, India. The petals were cleaned and subjected to maceration using double-distilled water for 72 h. The resulting aqueous extract was filtered through Whatman filter paper. The filtrate was concentrated using a water bath, and the recovered extract was collected, weighed and stored in a sterilised, airtight container at room temperature until further use.

2.4. Turmeric (Curcuma longa L.) extract

Turmeric (*Curcuma longa* L.) rhizomes contain curcuminoids, which have been reported to possess antioxidant, anti-inflammatory and antimicrobial properties in experimental studies [18,19]. Turmeric rhizomes were collected from the local area of Rajnandgaon district, Chhattisgarh, India. The rhizomes were cleaned, dried and powdered. The powdered material was subjected to Soxhlet extraction using ethanol for 4–5 days. The resulting extract was filtered through Whatman filter paper, and the solvent was evaporated using a water bath. The concentrated extract was collected, weighed and stored in an airtight container at room temperature until further use.

2.5. Lavender oil

Lavender oil purchased from the local market was added to the formulation in the quantities given in Table 1 (0.2–0.5 mL). Lavender oil has been reported to show antimicrobial and calming effects [20,21], and it was included mainly as a fragrance component.

2.6. Methylparaben and propylparaben

Preservatives (methylparaben and propylparaben) were collected from the laboratory of Sanskar City College of Pharmacy in February 2026. Parabens are widely used antimicrobial preservatives in cosmetic and topical products, generally at concentrations below 1% [22,23]. The quantities used were 0.2–0.5 g per batch (Table 1), equivalent to about 1.0–2.8% w/w (Table 2).

2.7. Glycerine

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Glycerine was added as a humectant [24], at 0.25 mL (4–5 drops) per batch.

Polyvinyl alcohol (PVA; degree of hydrolysis 95%, Sigma-Aldrich) was used as the film-forming agent in all three formulations [10,11].

2.8. Polyvinyl alcohol (PVA)



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Figure 1: Ingredients used in the formulations

Table 1: Composition of the multi-herbal peel-off mask formulations (per batch)

S no.	Formulation ingredients	Function	F1	F2	F3
1	Fenugreek extract (mL)	Herbal extract	3	2	1
2	Basil (tulsi) extract (mL)	Herbal extract	1	2	2
3	Rose petal extract (mL)	Herbal extract	3	3	3
4	Turmeric extract (mL)	Herbal extract	1	2	2
5	Lavender oil (mL)	Fragrance	0.5	0.3	0.2
6	Methylparaben (g)	Preservative	0.5	0.5	0.5
7	Propylparaben (g)	Preservative	0.5	0.2	0.5
8	Glycerine (mL)	Humectant	0.25	0.25	0.25
9	PVA (g)	Film-forming agent	1.5	1	0.5
10	Water (mL)	Solvent	8	8	8

The approximate total batch weights were 19.3 g for F1, 19.3 g for F2 and 18.0 g for F3, calculated assuming a density of approximately 1 g/mL.

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Table 2: Approximate percentage composition (% w/w) calculated from Table 1

Ingredient (% w/w, approx.)	F1	F2	F3
Fenugreek extract	15.6	10.4	5.6
Basil (tulsi) extract	5.2	10.4	11.1
Rose petal extract	15.6	15.6	16.7
Turmeric extract	5.2	10.4	11.1
Lavender oil	2.6	1.6	1.1
Methylparaben	2.6	2.6	2.8
Propylparaben	2.6	1.0	2.8
Glycerine (0.25 mL)	1.3	1.3	1.4
PVA	7.8	5.2	2.8
Water	41.6	41.6	44.6
Total (g)	19.3	19.3	18.0

2.9. Preparation method

To prepare the formulation, all required ingredients were accurately weighed. Methylparaben and propylparaben were dissolved in a portion of purified water. Separately, the film-forming agent, polyvinyl alcohol (PVA), was dissolved in purified water under continuous stirring with gentle heating until a clear and homogeneous solution was obtained. The PVA solution was then added to the prepared combined extracts of fenugreek, tulsi, rose petals and turmeric, followed by incorporation of the dissolved paraben solution into the mixture. The required quantity of glycerine was then added to the formulation, after which lavender oil was introduced as a fragrance. The entire formulation was mixed using an electric stirrer for 20 minutes to ensure uniform blending, and the finished product was transferred into properly labelled, airtight containers for storage. The three formulations (F1–F3) differed in the proportions of fenugreek, tulsi and turmeric extracts, lavender oil, propylparaben and PVA (Table 1); the compositions were prepared as three trial batches of a preliminary formulation study. The PVA content ranged from about 2.8% to 7.8% w/w (Table 2), which covers the lower part of the 5–10% range used in earlier peel-off gels [5,25].

2.10. Evaluation parameters

Each parameter was determined in triplicate on each formulation, and values are reported as mean ± SD. No statistical comparison among formulations was performed.

2.11. pH determination

The pH of the prepared formulation was measured using a calibrated digital pH meter. Prior to analysis, the instrument was calibrated using standard buffer solutions of pH 4.0, 7.0, and 9.0 to ensure accurate measurements [9]. The pH was determined at room temperature (25 ± 2 °C) by directly immersing the electrode into the prepared gel sample.

2.12. Spreadability

To evaluate the spreadability of the prepared gels, an appropriate amount of gel was placed between two glass slides measuring 7 cm in length. A weight of 1 g was applied to the upper slide to ensure uniform distribution of the gel. The time required for the upper slide to travel a fixed distance of 4 cm over the lower slide was recorded, and the spreadability of each formulation was assessed from this time [26].

The spreadability (S) was calculated using the formula:

$S = m \times l / t$

Where:

S = Spreadability (g·cm/s)

m = Weight applied (g)

l = Distance travelled by the upper slide (cm)

t = Time taken for slide separation (s)

2.13. Drying time

A thin layer of each formulation was applied and the time required for complete drying was recorded using a stopwatch. The reported optimal drying time for peel-off gel masks generally ranges from 10 to 20 minutes [27].

2.14. Physical evaluation

The prepared formulation was subjected to physical evaluation to assess its colour, appearance, consistency, and texture [2,11]. The colour of the formulation was evaluated against a white background, while consistency was assessed by applying it to the skin and examining its uniformity. Greasiness was determined by spreading the formulation on the skin and noting any oily residue, and the gel's odour was assessed by dispersing a portion in water and evaluating the resulting fragrance. These assessments were qualitative and subjective.

2.15. Preliminary physical stability

The prepared formulations were stored in airtight containers at room temperature (25 °C) for 6 weeks and visually inspected every 24 h for changes in colour, odour, homogeneity, phase separation and consistency. No formal stability protocol (for example, ICH

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Q1A(R2) [28]) was followed; the observations are therefore considered a preliminary assessment of physical stability and not a formal stability study.

3. RESULTS AND DISCUSSION

3.1. Physical characteristics

All formulations were light-yellow, glossy and translucent semisolids with an acceptable consistency and uniformity. They were homogeneous and non-greasy (Table 3). The light-yellow colour is consistent with the presence of turmeric, a pigmented botanical, although this was not tested. Because colour, odour and consistency were judged subjectively, these observations are descriptive.

Table 3: Physical evaluation

Formulation code	Colour	Odour	Consistency
F1	Light yellow	Mild, characteristic	Semi-solid
F2	Light yellow	Mild, characteristic	Semi-solid
F3	Light yellow	Mild, characteristic	Semi-solid

3.2. pH

The measured pH values were 7.0 (F1), 7.4 (F2) and 7.67 (F3), that is, neutral to slightly alkaline (Table 4). The surface of healthy skin is generally acidic, with a mean pH below about 5 [29,30], so the measured values are higher than the usual skin-surface pH and compatibility with normal skin physiology cannot be concluded from these data. Published peel-off gel masks have generally been reported with mildly acidic to slightly acidic pH values, for example 5.3–6.0 for a kenikir extract mask [31], 5.89 for an optimised red rice extract mask [32] and 6.4 for a water hyacinth leaf extract mask [33]. The pH of F1–F3 is therefore higher than these values. A peel-off mask remains on the skin only briefly before removal, so any effect of this pH may be limited, but this was not tested. Adjusting the pH of future batches toward the mildly acidic range of normal skin (about pH 4–6 [30]) and evaluating skin tolerance would be appropriate.

3.3. Drying time and spreadability

The drying time was 10–12 min for F1, 14–15 min for F2 and 16–17 min for F3, which lies within the 10–20 min range cited for peel-off gel masks [27]. Drying times reported for other herbal peel-off gels are similar or longer, for example below 21 min [31], 14.7 min [32] and 27.5 min [33], so the formulations prepared here dried relatively quickly. The spreadability values were 9.8 ± 0.4 (F1), 8.1 ± 0.3 (F2) and 7.6 ± 0.4 (F3) g·cm/s, so F1 showed the highest value. Earlier studies usually express spreadability as the spreading diameter in cm (for example 5.19 cm [32] and 5.9 cm [33]) and not as $S = m \times l / t$, so a direct numerical comparison is not possible; the same parameters have, however, been used to characterise PVA-based peel-off masks [5,11,26,34]. Budiman et al. obtained the best physical properties with 7% PVA (with 2.5% HPMC) [5], and F1, which had the highest PVA content (about 7.8% w/w), also showed the shortest drying time and highest spreadability here. This agreement should not be read as proof that PVA content was responsible, because the quantities of fenugreek, tulsi, turmeric, lavender oil, PVA and propylparaben all differed among F1–F3 (Table 1). F1 can only be described as showing the most favourable overall physical characteristics among the three formulations tested. As no statistical comparison was made, the differences among the formulations should be regarded as indicative only.

Table 4: Evaluation parameters data

Parameters	F1	F2	F3
pH	7.0 ± 0.5	7.4 ± 0.4	7.67 ± 0.3
Spreadability (g·cm/s; n = 3)	9.8 ± 0.4	8.1 ± 0.3	7.6 ± 0.4
Drying time (min)	10–12	14–15	16–17
Preliminary physical stability	No visible change	No visible change	No visible change

All values are expressed as mean ± SD of replicate determinations (n = 3), wherever applicable. Drying time is expressed as a range.

3.4. Preliminary physical stability

No phase separation, discolouration or change in consistency was observed at room temperature over 6 weeks. This indicates preliminary physical stability only and does not replace formal stability testing [28,35].

3.5. STUDY LIMITATIONS

This investigation was limited to preliminary physicochemical characteristics of three trial batches. Several ingredients were varied simultaneously, no statistical comparison was made, and the sensory observations were subjective. Film integrity and peelability, safety and skin irritation, antimicrobial, antioxidant, anti-inflammatory and anti-acne activities, microbiological quality, formal stability and clinical effectiveness were not evaluated.

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4. CONCLUSION

In this preliminary formulation study, three multi-herbal peel-off gel masks (F1–F3) containing fenugreek, tulsi, rose petal and turmeric extracts with a PVA film-forming base were prepared and evaluated for physical characteristics. All formulations were light-yellow, semisolid and homogeneous, with pH values of 7.0–7.67 and drying times of 10–17 min. F1 showed the shortest drying time (10–12 min) and the highest spreadability value (9.8 g·cm/s), and therefore showed the most favourable overall physical characteristics among the three formulations. No conclusions can be drawn on safety or on antimicrobial, antioxidant, anti-inflammatory or anti-acne efficacy because these were not evaluated. F1 represents a candidate for further pH optimisation, biological and dermatological safety evaluation, and formal stability studies.

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