

Design And Evaluation of Polyherbal Peel – Off Mask and Facewash for Cosmeceutical Applications

Aiswarya C.S¹, Akhila C B², Chithra R.S³, Nandana N B⁴, Rahna V P⁵, Sahadiya Latheef⁶

¹Department of Pharmaceutics, ELIMS College of Pharmacy

^{2,3,4,5,6}B. Pharm students, ELIMS College of Pharmacy

Abstract—The present study focused on the formulation and evaluation of a polyherbal peel-off mask and herbal face wash using extracts of Bougainvillea, Carica papaya leaves, and Citrus maxima peel for cosmeceutical applications. Ethanolic extracts were prepared and screened for phytochemical constituents. The peel-off mask formulations (F1–F3) were evaluated for various parameters, and F3 showed better viscosity, drying time, peel-off characteristics, and antimicrobial activity. Herbal face wash formulations were assessed for physicochemical properties, skin compatibility, and cleansing ability, among which F1 exhibited optimum performance. The study concluded that the developed polyherbal peel-off mask and face wash are safe, effective, and promising natural alternatives for skincare applications.

Index Terms—Polyherbal formulation, Face wash, Peel-off mask, Bougainvillea, Carica papaya leaves, Citrus maxima peel

I. INTRODUCTION

Polyherbal formulations are herbal preparations that involve the combination of two or more herbs to achieve enhanced therapeutic effects. The use of multiple herbs is based on the principle that their active constituents can interact with each other and produce beneficial effects through different mechanisms of action. Such combinations may provide improved efficacy due to synergistic activity compared with individual herbal ingredients. Owing to their traditional importance, potential health benefits, and comparatively lower risk of adverse effects, polyherbal formulations are increasingly being explored and utilized in modern herbal medicine for the management of various diseases.¹

Medicinal plants have been used for centuries as natural sources of therapeutic agents due to the presence of various active constituents. Different plant

parts, including leaves, flowers, and fruit peels, contain phytochemicals such as flavonoids, phenolic compounds, tannins, alkaloids, and essential oils that contribute to their biological activities.² Plants like Bougainvillea glabra, Carica papaya, and Citrus maxima possess significant medicinal potential and are traditionally utilized for their antioxidant, antimicrobial, anti-inflammatory, and healing properties. These natural resources continue to gain importance in the development of pharmaceutical, nutraceutical, and cosmetic products.^{3,4,5}

II. MATERIALS AND METHODS

2.1 COLLECTION OF SELECTED HERBS

Bougainvillea, Papaya leaves, and Pomelo peel was collected from the partly shaded moist tropic regions of Wadakkanjeri – a village in the district of Thrissur, Kerala. The specimens were authenticated by Dr Sheeja T Tharakan, Professor and Research guide, Department of Botany, Vimala college (Autonomous), Thrissur

2.2 EXTRACTION OF SELECTED HERBS

The selected Herbs such as Bougainvillea, Papaya leaves, and Pomelo peel were dried and powdered. The powder was extracted by soaking in ethanol for 3 days with occasional shaking (cold maceration) then filtered and evaporated. Then used for further studies.⁶

2.3 FORMULATION OF PEEL-OFF MASK

SI No	INGREDIENT	QUANTITY		
		F1	F2	F3
1	Bougainvillea	1ml	1ml	1.5ml
2	Papaya leaves	1ml	2ml	2.5ml
3	Pomelo peel	2ml	2ml	3ml
4	HPMC	0.5g	1g	1.5g

5	PVA	8g	8g	8g
6	gelatin	1g	1g	1g
7	glycerine	2ml	2.5ml	3ml
8	propylene glycol	2ml	2ml	2ml
9	Methyl paraben	0.5g	0.5g	0.5g
10	Propyl paraben	0.05g	0.05g	0.05g
11	EDTA	0.02g	0.02g	0.02g
12	Triethanolamine TEA	q. s	q. s	q. s
13	perfume	1-2 drops	1-2 drops	1-2 drops
14	Distilled water	q s 100 ml	q s 100 ml	q s 100 ml

Table 1: Formulation of Peel-off mask

PREPARATION OF PEEL OFF MASK

Take distilled water in a beaker. Heat to 80 °C in a water bath. Slowly add 8 g PVA with gentle stirring until it completely dissolves (clear solution). In another beaker, take 10 ml warm water ($\approx$ 60 °C). Sprinkle required quantity of HPMC on the surface and allow it to hydrate for 30–45 minutes. Stir gently until a smooth gel form. Mix the cooled PVA solution and HPMC gel together slowly. Add Glycerine, Propylene glycol, and EDTA. Dissolve Methyl & Propyl parabens in a small amount of propylene glycol and add to the main mix. Take required quantity of gelatin in 10ml of water and allow it to hydrate. Mix with the gel. Add Bougainvillea, Papaya leaf, and Pomelo peel extracts slowly with gentle stirring. Add Triethanolamine (TEA) dropwise to adjust the pH. Add perfume (1–2 drops) or essential oil if desired. Add distilled water q.s. to 100 mL and mix slowly.⁷

2.4 PHYSIOCHEMICAL EVALUATION OF HERBAL PEEL OFF MASK

The evaluation of peel off mask for their various properties involves several parameters.

2.4.1 Organoleptic properties

Visually inspecting the product, For its,

Colour: Examine the appearance of colour.

Odour: We sniffed the formulation to determine its odour.

Consistency: It being decided by hand.

Greasiness: Greasiness of formulation evaluated by applying the formulation onto the skin.

2.4.2 pH

Using a digital pH metre, the pH of this polyherbal peel-off mask was discovered.

2.4.3 Irritancy test

To screen for irritant reactions, such as swelling, itching, and redness on the skin, a formulation was applied to the hand and left on for 15 minutes.⁷

2.4.4 Spreadability test

Put a butter paper with the 1 gram formulation on it, then place a watch glass on top of it. The sample was then compressed to a consistent thickness for two minutes using a five-gram weight on a watch glass, and its spreadability was measured.⁸

2.4.5 Peel off test

The skin of the back of the hands was covered with a 4x4mm formulation film. Give it a good fifteen to twenty minutes to dry.

Peel off the dry layer from the skin's surface after 15 to 20 minutes. Peel removed with ease and without any issues was noted.⁸

2.4.6 Folding endurance

Onto the skin was put the formulation film. A section of the film (3 by 3 cm) was cut and folded in the same spot until it broke after drying.

A film's folding endurance is determined by how many times it can be folded without breaking.⁹

2.4.7 Washability

The formulations were administered onto the skin, and subsequently, washing with water were meticulously examined.¹⁰

2.4.8 Drying Time Test

The film drying time test was conducted by observing the time required for the preparation to dry completely, starting from the application of the peel-off gel mask on the skin until a dry layer was formed. Measurements of drying time: Ideally, the peel-off gel mask should dry within 15 to 30 minutes.⁹

2.4.9 Homogeneity test

It is evaluated by visual inspection to detect the presence of lumps, grittiness or phase separation.

2.4.10 Viscosity:

Viscosity was measured by using Brookfield Viscometer using spindle number 64.

2.4.11 Antimicrobial assay of peel-off mask

Well diffusion method:

Here we used Muller-Hinton agar media and Streak plate method to isolate the strain. Sterilize the inoculating loop by heating it in a flame until red hot, then allow it to cool. Dip the cooled, sterilized loop

into the microbial sample. Gently streak the loop back and forth across a small section of the agar surface. The antimicrobial study was done by well diffusion method. Then by using borer make wells on the petri plate. Then add the prepared peel-off mask into the well. Incubate all the Petri dish for 24 hrs. Zone of inhibition then observed, which is suggested by the clear area around the well.¹¹

2.5 FORMULATION OF HERBAL FACEWASH

Sl.No	INGREDIENTS	QUANTITY		
		F1	F2	F3
1	Bougainvillea	2ml	1ml	1ml
2	Papaya leaves	2ml	2ml	1ml
3	Pomelo peel	2ml	2ml	2ml
4	Carbopol	1.5g	2g	2.5g
5	glycerine	4ml	3ml	2ml
6	Propylene glycol	2ml	2ml	2ml
7	Sodium lauryl sulphate	0.4g	0.4g	0.3g
8	Methyl paraben	0.5g	0.5g	0.5g
9	Propyl paraben	0.05g	0.05g	0.05g
10	EDTA	0.02g	0.02g	0.02g
11	Triethanolamine TEA	q. s	q. s	q. s
12	Perfume	1-2 drops	1-2 drops	1-2 drops
13	Distilled water	q s 100 ml	q s 100 ml	q s 100 ml

Table 2: Formulation of facewash

PREPARATION OF FACEWASH

Take 50ml of distilled water in a beaker. Add Carbopol 940 slowly with constant stirring. Allow it to soak for 1-2 hrs. Stir gently a uniform base is formed. In another beaker, dissolve SLS in 10 ml distilled water. Stir gently until completely clear. Add this solution to Carbopol gel slowly with gentle stirring. Add glycerine and propylene glycol to the mixture. Add EDTA and stir well. Dissolve methyl paraben and propyl paraben in a small amount of propylene glycol. Add this solution into gel with stirring. Add the extracts one by one. Stir slowly. Add triethanolamine dropwise to adjust the pH. Add one or 2 drops of

perfume and make up the volume with distilled water.^{12,15}

2.6 PHYSIOCHEMICAL EVALUATION OF HERBAL FACEWASH

2.6.1 Organoleptic properties: Several factors have been assessed for the creation of the face wash.

Colour: Examine the appearance of colour

Odour: formulation was sniffed to determine the odour

Consistency: It being decided by hand.

Greasiness: It is decided by sensing it.

2.6.2 pH: A calibrated digital pH meter determines the pH of the formulation's 1% aqueous solution at a steady temperature.

2.6.3 Washability: After applying the mixture to the skin, we examine the ease and extent of washing with water.¹³

2.6.4 Grittiness: We test the formulation for gritty particles by applying it to the skin.

2.6.5 Spreadability: Put a butter paper with the 1 gram formulation on it, then place a watch glass on top of it. The sample was then compressed to a consistent thickness for two minutes using a five-gram weight on a watch glass, and its diameter was measured.¹⁴

2.6.6 Irritancy test for skin: A tiny quantity of the created formulation was applied to the left hand's dorsal side for ten minutes. Ten minutes later, agitation and Allergy responses were evaluated.

2.6.7 Viscosity measurement: Viscosity was evaluated using Brookfield viscometer.

2.6.8 Foamability: Small amount of prepared herbal facewash was applied over a hand. It produces foam when mixed with water.^{14,15}

2.6.9 Antimicrobial assay of herbal facewash

Well diffusion method:

Here we used Muller-Hinton agar media and Streak plate method to isolate the strain. Sterilize the inoculating loop by heating it in a flame until red hot, then allow it to cool. Dip the cooled, sterilized loop into the microbial sample. Gently streak the loop back and forth across a small section of the agar surface. The antimicrobial study was done by well diffusion method. Then by using borer make wells on the petri plate. Then add the prepared facewash into the well. Incubate all the Petri dish for 24 hrs. Zone of inhibition then observed, which is suggested by the clear area around the well.¹¹

III. RESULTS AND DISCUSSIONS

3.1 COLLECTION OF SELECTED HERBS

Bougainvillea, Papaya leaves, and Pomelo peel was collected from the partly shaded moist region then dried and powdered in the blender



Figure 1: Dried Bougainvillea, papaya leaf and pomelo peel powder

3.2 EXTRACTION OF SELECTED HERBS

Sl. No	INGREDIENTS	EXTRACT	METHOD OF EXTRACTION	PHYSICAL NATURE	YIELD % W/W
1	Bougainvillea	Ethanol	Cold maceration	Solid	3.62 %
2	Papaya leaves	Ethanol	Cold maceration	Solid	5.2 %
3	Pomelo peel	Ethanol	Cold maceration	solid	3.68 %

Table 3: Extractive yield of herbs

3.3 PREPARATION OF PEEL-OFF MASK

Here we prepared 3 formulations of Peel-off mask by altering the number of excipients.



Figure 4: Prepared Peel-off mask



Figure 2: Ethanolic extracts Figure 3: Dried Extracts herbs

3.4 PHYSIOCHEMICAL EVALUATION OF HERBAL PEEL OFF MASK

3.4.1 Organoleptic properties

Formulations	Colour	Odour	Consistency	Greasiness
F1	Basil green	pleasant	Moderately viscous	Slight
F2	Basil green	pleasant	Viscous	Non-greasy
F3	Basil green	pleasant	Smooth, uniform and optimum viscosity	Non-greasy

Table 4: Organoleptic properties

3.4.2 pH

The pH of all formulations was found to be 5.5-6.5 which is suitable for topical application and compatible with normal skin pH. Among the formulation, F3 showed an optimum pH., indicating better skin compatibility and reduced irritation.

3.4.3 Irritancy test

All the formulation was found to be non-irritant and no signs of erythema, itching, or swelling were observed. F3 showed excellent skin tolerance, confirming its safety for topical use.



Figure 5: Irritancy test

3.4.4 Spreadability test

The spreadability of the peel-off mask was considered high by having a low spread of time. The therapeutic efficacy of peel-off mask depends on their spread. F3 showed better and uniform spreadability, which facilitates easy application on the skin.

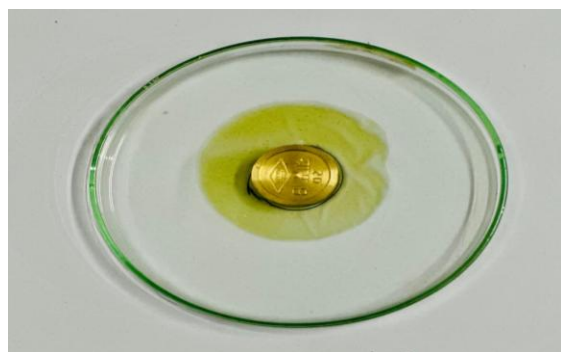


Figure 6: Spreadability test

3.4.5 Peel off test

After drying, the film was peeled off gently. F3 formed a smooth, uniform film and was peeled off

easily without causing pain or residue, indicating good peel-off characteristics.



Figure 7: Peel-off test

3.4.6 Folding endurance

The formulation film was applied onto the skin. After drying, a portion of film (3x3cm) was cut and folded it at the same place until it was broken. Folding endurance can be defined as the value of number of times the film can be folded without breaking. F3 showed higher folding endurance, suggesting better film strength and elasticity compared to other formulations.

3.4.7 Washability

Washability was evaluated by applying the formulation to the skin and washing it with plain water. All formulations were easily washable. F3 was removed completely without leaving sticky or greasy residue, indicating good washability. In F1 there is slight residue and mild stickiness were observed after washing. F2 formulation was easily washable but there is presence of mild stickiness.

3.4.8 Drying Time Test

Formulation	Drying time (Min)	Observation
F1	28-30	Formed film slowly
F2	22-25	Uniform film formation
F3	18-20	Smooth, uniform film

Table 5: Drying time test

Ideally, a peel-off mask should dry within 15-20 minutes. The F3 dried within the acceptable time range.

3.4.9 Homogeneity test

All formulation was found to be homogeneous and free from visible particles or aggregates. Among them,

F3 showed excellent homogeneity, with no phase separation or gritty particles observed.

3.4.10 Viscosity:

The viscosity analysis of formulation F3, carried out using a Brookfield viscometer with spindle 64, demonstrated a shear-thinning (pseudoplastic) flow behaviour. The viscosity of F3 decreased with an increase in rotational speed. This means the formulation becomes thinner when stirred or applied and becomes thicker again when left undisturbed. This behaviour helps in easy spreading on skin while maintaining good consistency in the container.

3.4.11 Antimicrobial assay of peel-off mask

From all the 3 formulation F3 shows good characteristics and F3 selected for further study. The F3 formulation showed effective antimicrobial activity against the tested microorganisms. A zone of inhibition of 4 mm was observed against *Staphylococcus aureus*, indicating moderate antibacterial action. Against *Escherichia coli*, a 2 mm zone of inhibition was recorded, showing mild activity. Overall, F3 was more effective against Gram-positive bacteria than Gram-negative bacteria.

Microorganism	Zone of inhibition
<i>S. aureus</i>	4mm
<i>E. coli</i>	2mm

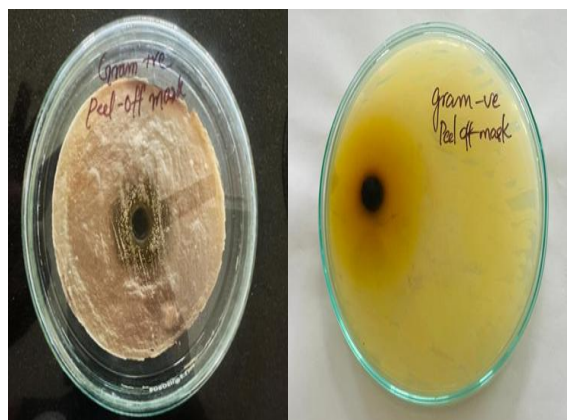


Figure 8: Antimicrobial activity of peel-off mask

3.5 PREPARATION OF FACEWASH



Figure 9: Prepared Facewash

3.6 PHYSIOCHEMICAL EVALUATION OF HERBAL FACEWASH

3.6.1 Organoleptic properties: Several factors have been assessed for the creation of the face wash.

Formulations	Colour	Odour	Consistency	Greasiness
F1	Dark Green	pleasant	Smooth, semisolid	Non-greasy
F2	Green	pleasant	Thick, semisolid	Slightly greasy
F3	Green	pleasant	Thick, semisolid	Slightly greasy

Table 6: Organoleptic properties of facewash

3.6.2 pH pH of all formulation was found to be within the acceptable range for topical application

F1-6

F2-5.8

F3-5.6

This confirms that all formulation was skin friendly and non-irritant

3.6.3 Washability:

F1 shows good washability compared to other formulation (F2 and F3)

3.6.4 Grittiness:

All formulation was free from gritty particles

3.6.5 Spreadability

Compared to other formulation F1 shows better spreadability, that allowing easy application to the skin.

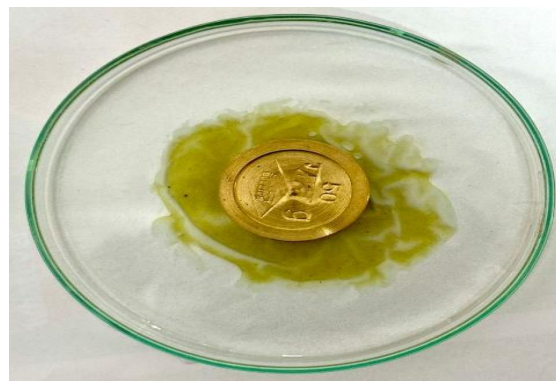


Figure 10: Spreadability

3.6.6 Irritancy test for skin:

No signs of redness, itching, or irritation were observed in any formulation after application



Figure 11: Irritancy test

3.6.7 Viscosity measurement:

The viscosity analysis showed that the viscosity of the sample decreased with an increase in RPM, indicating non-Newtonian behaviour. At low rpm (1–1.5 rpm), the sample exhibited high viscosity values (17400–16400 cP), while at higher rpm (4 rpm), the viscosity reduced to 11900 Cp. This behaviour indicates that the formulation exhibits pseudoplastic flow, which is desirable for topical formulations.

3.6.8 Clarity test

The F1 formulation was found to be clear, transparent and free from foreign particle. The F2 and F3 formulation were slightly turbid



Figure 12: Clarity test

3.6.9Foamability:

F1 produced adequate and stable foam with good lather. Other Formulation produced moderate foam



Figure 13: Foamability

3.6.10 Antimicrobial assay of herbal facewash

Out of 3 formulation the F1 shows good characteristics the F1 formulation were selected for further studies. The antimicrobial assay of the F1 formulation showed a zone of inhibition of 3 mm against *Staphylococcus aureus*, indicating moderate antibacterial activity. A 2 mm zone of inhibition was observed against *Escherichia coli*, showing mild activity. The formulation was more effective against Gram-positive bacteria than Gram-negative bacteria

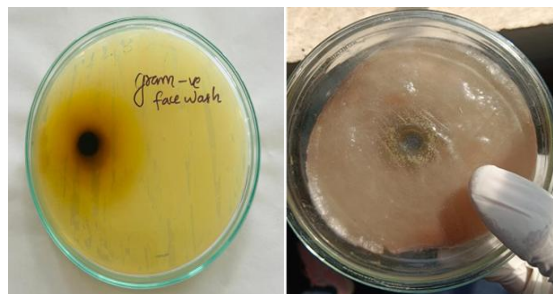


Figure 14: Antimicrobial assay of facewash

Microorganism	Zone of inhibition
<i>S. aureus</i>	3mm
<i>E. coli</i>	2mm

Table 7: Antimicrobial activity of facewash

IV. DISCUSSION

The present work involved the formulation and assessment of a polyherbal peel-off mask and herbal face wash prepared from *Bougainvillea*, *Carica papaya* leaf, and *Citrus maxima* peel extracts. The phytochemical investigation confirmed the presence of various plant constituents that may contribute to the beneficial effects of the formulations. The prepared products exhibited satisfactory appearance, pH, viscosity, spreadability, and skin compatibility. The optimized peel-off mask (F3) and face wash (F1) showed improved formulation characteristics along with antimicrobial activity, indicating their potential for topical cosmetic applications.

V. CONCLUSION

The study successfully developed herbal-based peel-off mask and face wash formulations using naturally derived extracts. The evaluated formulations showed desirable physical properties, good user acceptability,

and promising biological activity. The results indicate that combining different plant extracts may enhance the overall effectiveness of cosmetic preparations. These formulations have potential as natural skincare products; however, further research involving extended stability testing, safety studies, and clinical evaluation is required to validate their long-term use and effectiveness.

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