

# Design, Optimization, and Characterization of Herbal Face Pack

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## Abstract

The goal of this project is to develop and test a polyherbal face pack made of herbal substances for cosmetic purposes. Amla (*Emblica officinalis*), masoor daal (*Lens culinaris*), and rose petals were obtained from a local market and dried, powdered, then geometrically blended and analyzed for organoleptic and physico-chemical, general powder characteristics, and chemical assessment. The mixed dry powder has an acceptable flow property, making it ideal for use as a face pack. Four distinct compositions incorporating components such as Amla (*E. officinalis*), masoor daal (*L. culinaris*), and rose petals powder were developed with variable quantities and called F1 to F4. Different metrics such as organoleptic qualities, physicochemical parameters, and stability, as well as an irritancy test and microbiological load, were used to assess all of the created compositions. The powder's particle size ranged from 23.3 to 26.9  $\mu$ m. F2 outperformed all other formulations in terms of physical metrics, skin irritation, and consistency even after stable storage conditions.

**Key words:** Cosmetics, *Emblica officinalis*, Face pack, *Lens culinaris*, Rose petals, Skin

## INTRODUCTION

Cosmetics are over-the-counter items that are aimed to enhance the look of the skin by washing, beautifying, and enhancing attractiveness. Herbs have been utilized for cleansing, rejuvenating, and managing them since ancient times. The skin of the face is the largest portion of the body and reflects an individual's health.<sup>[1,2]</sup> It is made up of components such as amino acids, lipids, and carbs, thus it requires a well-balanced diet to maintain it clean, shiny, and healthy.<sup>[3]</sup> The herbal paste is known as "mukhalepa" in Ayurveda which is used as a face therapeutic. This herbal paste is used to treat acne, pimples, scars, markings, and pigmentation on the face.<sup>[4]</sup>

Cosmetic masks with clay scrubs' appeal can be ascribed to various psychophysiological effects. Several available commercially skin and hair care products contain the mystery and mythology of "moist soil" therapies. These products are commonly classified as therapy cosmetics and come as a result of jellies, viscous liquids, or pastes that are placed to the facial, body, hair, or scalp. The mask's aromas as well as drying time are intended to add toward the mask's or clay scrub's medicinal value. Several modern mask formulations

mix pharmacological activities, physiological skin and hair enhancers, and cleaning ingredients with the curative feeling of the mask composition. Acne therapies, gritty body clay washes, alpha- or beta-hydroxy acid gel or clay masks, hair adjusters, and body stimulants or conditioners are among them.<sup>[5]</sup> They are normally kept on every day for 15–20 minutes to enable all of the moisture to evaporate, and the resultant film compresses and hardens, making it easy to remove. The exciting sensation of a regenerated face is achieved by the administration of a facial mask, while the colloidal and adsorption clays employed in these treatments eliminate oil and dirt out from skin of the face. Whenever the administered face pack is eliminated, the skin waste and grime placed on it are also excluded from the study.

Women can get eliminated of wrinkling, dark bags, blemishes, and acne using the face packs suggested in Ayurveda. Herbal facial packs improve skin's radiance and smoothness. We

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can get the most out of herbal face packs if we use them appropriately for our skin type. These face packs improve skin radiance and are the most effective ayurvedic therapy for increasing impartiality. Face packs are among the most ancient and attractive ways to cleanse the face. Ayurveda describes a variety of facial packs that include feeding, soothing, cleansing, astringent, and antibacterial effects. Face packs may be made at home using common household and kitchen ingredients. Herbal face packs are less expensive and have no adverse effects when it comes to organically achieving fair skin. Herbs have been used for cleansing, beautification, and management since antiquity. Cosmetics are described as items that are used for washing, grooming, enhancing attractiveness, or changing one's look.<sup>[6]</sup> Smooth, vibrant, and silky skin may be achieved with handcrafted natural face packs as well as mask. Mukhalepa is an ayurvedic herbal paste used to cure acne, pimples, scars, markings, and pigmentation on the face. The practice of putting a herbal mixture over one's face is known as "mukhalepana." This treatment is now known as face treatment.<sup>[4]</sup> Face pack is a homogeneous powder that is applied to the facial, and a great natural face pack should provide critical nutrients to the epidermis and permeate the subcutaneous tissues to provide those nutrients. Botanical facial packs are appropriate for a variety of skin conditions. Ayurvedic face packs can help minimize creases, blemishes, acne, and eye bags. They also improve the skin's attractiveness and suppleness.<sup>[7]</sup> Natural face packs do include certain essential vitamins that really are necessary for our skin's wellness and radiance. These compounds are also advantageous to our body in a variety of ways. Homemade facial packs are easier to use it and lesser complex. They assist us in caring for our skin while also demonstrating its value by improving blood circulation inside the face's veins.<sup>[8]</sup> The benefits of the face packs are usually transient, and they must be used 2–3 times each week for a consistent glowing.

## MATERIALS AND METHODS

Ingredients for this project were obtained at a local market and pulverized for later use. The following are the specifics of the plant materials investigation. The plant material utilized to make the face pack is described in more detail here.

### Amla (*Emblia officinalis*)

*E. officinalis* [Figure 1], a member of the *Euphorbiaceae* family, is a popular herbaceous remedy used in a range of medicinal formulations for a variety of ailments. It is also known as Amla or Indian gooseberry. The berries are cooling, astringent, and refrigerant. Antibacterial, emmenagogue, anabolic, adaptogenic, antimicrobial, antiviral, antioxidant, ant ageing, cosmetics, and antiemetic properties that are all found in Amla fruits.<sup>[9,10]</sup> Scrounging reactive oxygen species (ROS) through the use of antioxidants was a great factor for the production of photo-protective substances of makeup

involvement. *E. officinalis* has also demonstrated substantial photoprotective effects on the human body by quenching ROS produced by UVB irradiation and therefore avoiding DNA harm inflicted by antioxidant capacity connected to sunblock (antiphoto-aging). *E. officinalis* has a significant anti-hyaluronidase action, implying a rise in hyaluronan, and is particularly useful for preventing early skin ageing, that is, wrinkle development.<sup>[11]</sup>

### Masoor Daal (*Lens culinaris*)

*L. culinaris* [Figure 2] belongs to the *Fabaceae/Leguminosae* family. Lentil had the greatest total antioxidant capability across pulses when assessed by ferric minimizing antioxidant potential and total radical-trapping antioxidant parameter, but it was second to wide beans when tested by trolox similar antioxidant capability [Figure 3].<sup>[12]</sup> Duenas *et al.* validated these observations, indicating that lentils had more antioxidant properties as beans.<sup>[13]</sup>

Red lentils provide a variety of skin-beneficial properties. To begin with, it slows down the ageing process. That because red lentils are high in antioxidants, which aim to minimize

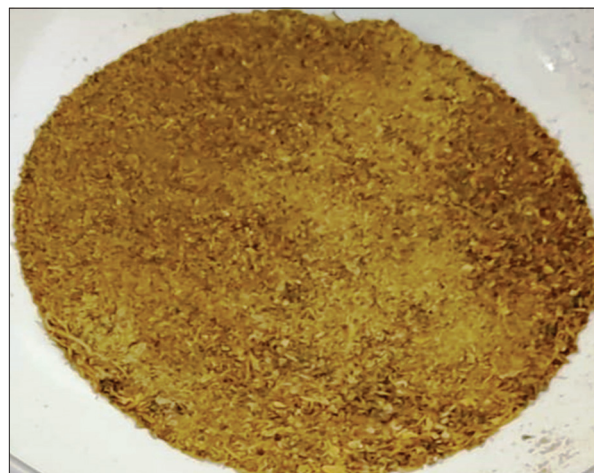


Figure 1: Powder of Amla (*Emblia officinalis*)



Figure 2: Powder of Masoor Daal (*Lens culinaris*)

and decrease damage to cells and tissues, which causes accelerated ageing. A skin lightening pack prepared with red lentils, turmeric, and lemon can assist you brighten your skin rapidly and safely. After a beach trip, a mash of masoor dal and tomato might help you eliminate tan. Furthermore, a daily application of a paste composed of red lentils steeped in milk may be used to eliminate dry spots and hydrate your skin fully from within. It also aids in the restoration of a gorgeous natural shine.<sup>[14]</sup>

### Rose petals powder (*Rosa canina*)

Rose petal powder is high in antibacterial characteristics, as well as Vitamin K, C, and B, which have beneficial benefits. It also has a significant level of antioxidants.

### Optimization of formulation using 2<sup>2</sup> factorial designs

The influence of two independent variables was investigated using a 2<sup>2</sup> factorial design focus on the model of experiments approach. The values of the two components, the quantity of *E. officinalis* (X1) and the quantity of *L. culinaris* (X2), were appropriately entered. As output responses, drying time after application (Y1) and the nature of face after wash (Y2) were used. Two criteria were assessed in this study, each at two levels. All feasible permutations (F1-F4) were tested in the experiments. Throughout the trial, all other composition and cognitive factors were held constant. Table 1 displays factorial combinations based on 2<sup>2</sup> different factorial designs [Table 2].

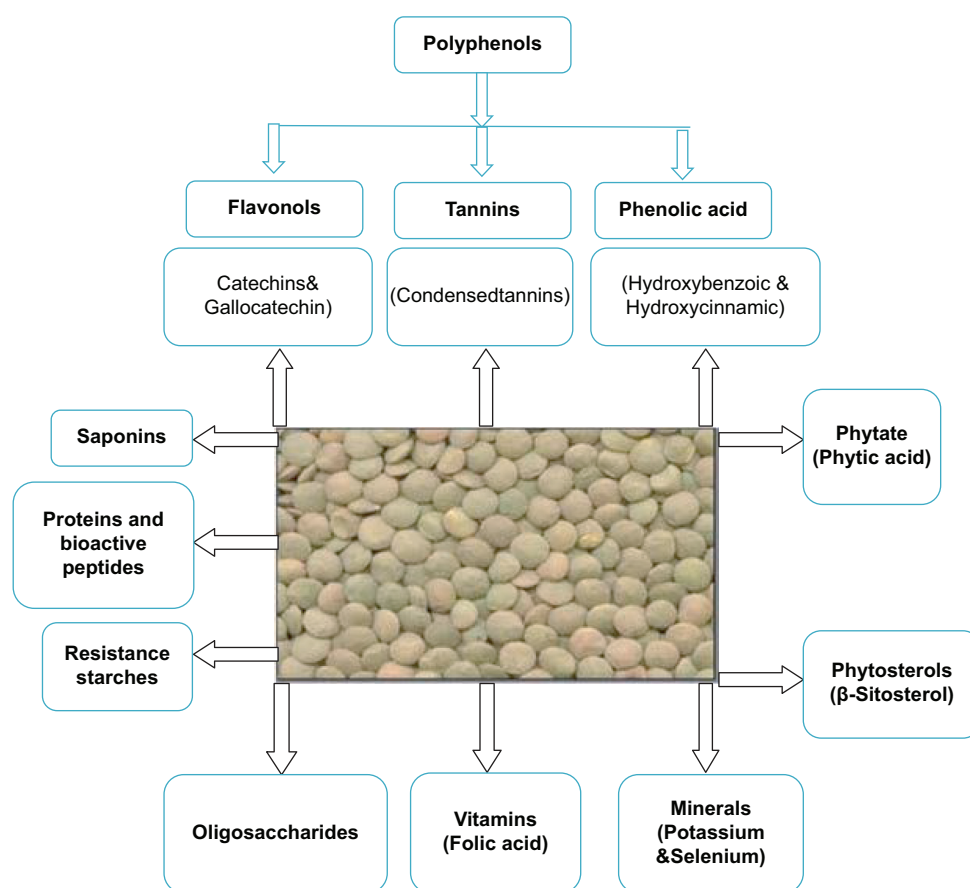


Figure 3: Bioactive phytochemicals and essential nutrients of lentil seeds

Table 1: General powder characters

Parameters	Observation			
	F1	F2	F3	F4
Angle of repose	17°±1	16.5°±1	17.5°±1	17°±1
Bulk density	0.429±0.09 g/cc	0.431±0.08 g/cc	0.430±0.09 g/cc	0.433±0.08 g/cc
Tapped density	0.420±0.07 g/cc	0.422±0.08 g/cc	0.418±0.08 g/cc	0.419±0.08 g/cc
Grittiness	When combined with water, no gritty particles were observed	When combined with water, no gritty particles were observed	When combined with water, no gritty particles were observed	When combined with water, no gritty particles were observed

## Methods of preparation

F1 through F4 was four separate compositions with differing concentrations of all components. Table 2 shows the quantity of each element. Using sieve #120, the exact amount of components were measured and crushed into a powder form. Then, for homogeneous mixing, all of the constituents were geometrically combined using the serial dilution technique. The prepared face pack was then sealed in a self-sealing polyethylene bag, tagged, and utilized for further research [Table 3].<sup>[15]</sup>

## Face pack application procedure

Prepared face pack powder was placed into a petridis and rose water was added for blend preparation. That after prepared face pack was applied onto the face. Acne and blemishes should also be covered. Allow for thorough drying for 20–25 min before washing with cold water.

## Characterization of prepared formulations

### Organoleptic character

The face pack was made and tested for the organoleptic characteristics listed in Table 3. The flow property variable indicated that the system was free flowing. The composition had a faint golden hue to it. The developed compositions have a pleasant odor, which is ideal for cosmetic formulations. The texture and smoothness of the compositions were satisfactory, which is important in cosmetic formulations.

**Table 2: Optimization of formulation using 22 factorial designs**

Factor	Level used	
	Level -1 (Low)	Level 1 (High)
Independent variables		
$X_1$ = <i>Emblica officinalis</i> concentration	15	20
$X_2$ = <i>Lens culinaris</i> concentration	15	20
Dependent variables		
$Y_1$ =Drying time after application		
$Y_2$ =Nature of face after wash		

## Evaluation of physicochemical properties

Microscopy was used to determine the particle size. The Angle of Repose by funnel technique, bulk density, and tapped density by tapping procedure was used to measure the flow characteristics of the dried powder in mixed form.<sup>[16]</sup> The ash content was determined using an incinerator, the pH was determined using a pH meter, and the loss on drying was calculated.<sup>[17-19]</sup>

### Irritancy test

On the dorsal side of the skin of the Wistar rat a 1 sq.cm area was cleaned for the face pack application. A certain amount of formulated face packs was applied to the designated region and the time was recorded. Irritation, erythema, and edema were assessed and reported at periodic intervals up to 24 h.<sup>[20]</sup>

### Drying time after application

The drying time should be between 5 and 20 min. Drying masks for oily skin are often applied for a shorter period of time, whereas moisturizing and antiaging masks are used for longer periods of time, sometimes overnight. Applied face pack was washed with normal water.

### Statistical optimization

Herbal face pack was statistically optimized by comparing numerous statistical measures offered by Design-Expert Software, Version 11. The applicable design's quantitative data were summarized. The level of relevance of the evaluated *E. officinalis* ( $X_1$ ) and the quantity of *L. culinaris* ( $X_2$ ) was determined using an analysis of variance (ANOVA) test. The ANOVA overview of model analysis is shown in Table 4.

### Stability studies

For composition F2, stability testing was carried out by keeping the produced composition at various temperatures for 1 month. Physical criteria such as color, odor, pH, consistency, and feel were examined in packed glass vials of composition held at different temperatures, namely, room temperature, 35°C and 40°C.<sup>[21]</sup>

**Table 3: Composition of face pack**

Formulation code	Components per 50 g		
	<i>Emblica officinalis</i> concentration ( $X_1$ )	<i>Lens culinaris</i> concentration ( $X_2$ )	Rose petals powder
F1	15 (-1)	15 (-1)	20
F2	15 (-1)	20 (1)	15
F3	20 (1)	15 (-1)	15
F4	20 (1)	20 (1)	10

**Table 4:** Summary of statistical parameters

Responses	Sum of squares	df	Mean square	F-Value	P-value	Model significance
Y1	146.50	2	73.25	293.00	0.0413	Significant
Y2	0.5313	2	0.2656	425.00	0.0343	Significant

**Table 5:** Organoleptic properties

Parameters	Observation			
	F1	F2	F3	F4
Appearance	Powder (Free Flowing)	Powder (Free Flowing)	Powder (Free Flowing)	Powder (Free Flowing)
Color	Slight yellowish	Slight yellowish	Slight yellowish	Slight yellowish
Odor	Pleasant	Pleasant	Pleasant	Pleasant
Texture	Fine	Fine	Fine	Fine
Smoothness	Smooth	Smooth	Smooth	Smooth

**Table 6:** Physicochemical evaluation

Parameters	Observation			
	F1	F2	F3	F4
Particle size ( $\mu\text{m}$ )	25.4 $\pm$ 1.10	23.3 $\pm$ 1.85	26.9 $\pm$ 1.70	24.0 $\pm$ 1.17
Ash content	90 $\pm$ 0.522	89 $\pm$ 0.790	94 $\pm$ 0.600	93 $\pm$ 0.532
pH	6.90 $\pm$ 0.13	6.87 $\pm$ 0.10	7.00 $\pm$ 0.10	6.80 $\pm$ 0.17
Loss on drying	2.33	2.8	3.0	2.67

## RESULTS AND DISCUSSION

### Physical parameters

The various face pack formulations were made and analyzed for the physical criteria listed in Table 5. The flow property variable indicated that the system was free flowing. Due to differences in the composition of the components, the colors of the formulations differed. Formulations F1, F2, and F4 were yellowish yellow, whereas Formulation F3 was greenish-yellow. The developed compositions have a pleasant odor, which is ideal for cosmetic preparations. The particle size of the compositions ranged from 23.3  $\mu\text{m}$  to 26.9  $\mu\text{m}$ . All compositions had pH values that were close to neutral, ranging from 6 to 7. The loss on drying and ash content was both within acceptable limits [Table 6].

### Irritancy test

Table 7 shows the results of the irritancy test. Throughout irritancy tests, the composition demonstrated no irritation, redness, edema, or inflammation. This product is suitable for use on the skin.

### Stability studies

The pH of the composition was stored at 40°C changed somewhat, while no variations were seen at ambient temperature or at 35°C, according to the stability experiments. After 1 month of stability testing at 40°C, the formulation's scent altered

**Table 7:** Irritancy test

Parameters	Formulations				Observation
	F1	F2	F3	F4	
Irritant	0	0	0	0	0=No Irritation
Erythema	0	0	0	0	0=No Irritation
Edema	0	0	0	0	0=No Irritation

**Table 8:** Parameters of stability studies of formulation F2

Parameters	Observations (Formulations F2)		
	Room temperature	35 $\pm$ 0.5°C	40 $\pm$ 0.5°C
Color	No change	No change	No change
Odor	No change	No change	No change
pH	6.80 $\pm$ 0.13	6.79 $\pm$ 0.14	6.80 $\pm$ 0.17
Texture	Fine	Fine	Fine
Smoothness	Smooth	Smooth	Smooth

somewhat, but there was no change in color or odor under the other parameters of stability shown in the Table 8.

### Statistical analysis

Herbal face pack was statistically optimized by comparing numerous statistical measures offered by Design-Expert

Software, Version 11. The applicable design's quantitative data were summarized. The level of relevance of the evaluated independent variables on the quantity of *E. officinalis* (X1) and the quantity of *L. culinaris* (X2) was determined using an ANOVA test.<sup>[22-25]</sup> The ANOVA overview of model analysis is shown in Table 4.

## CONCLUSION

People nowadays require a remedy for a variety of skin disorders that are free of adverse effects. Herbal components made it possible to create cosmetics that had no negative side effects. Herbal face packs are said to be a long-lasting and effective technique to improve skin's look. As a result, the present study is an excellent attempt to construct a herbal face pack using naturally accessible substances such as amla (*E. officinalis*), masoor daal (*L. culinaris*), and rose petal powder. The created formulation was said to be physicochemically stable and to have the properties of a conventional cosmeceutical skincare formulation.

## DECLARATIONS

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### Ethics approval

Not applicable.

### Consent for publication

Not applicable.

### Availability of data and materials

The datasets of research were collected from experiments and analysis of variables during the present study. These datasets are available from the corresponding author on reasonable request.

### Authors' contributions

SJ designed and optimizes the study and developed the methodology. SJ performed the experiments, collection of data, and interpretation data. SJ wrote the manuscript. NS contributed to manuscript revision and provided supervision. All authors read and approved the final manuscript.

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