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Formulation And Evaluation Of Herbal-Based Facial Pack For Dermatological Benefits

Thamaraikani. S[1], Perumal. P[2], Arun. A[3], Subaranjani. P. G[4], Poovanthen. N[5], Soundhar. M[6], Kishore. M[7]

[1]Assistant Professor, [2]Principal, [3,4,5,6,7]Research Student

Department of Pharmacognosy,

JKK Munirajah Institute of Health Sciences College of Pharmacy, T.N.Palayam, Erode-638506, Tamil Nadu, India.

Abstract: The increasing demand for natural and safe cosmetic formulations has led to the exploration of plant-based ingredients for skincare applications. The present research aims to formulate and evaluate a polyherbal facial pack using a synergistic blend of herbal powders, namely Terminalia arjuna (Arjuna), Fuller's earth (Multani mitti), Citrus sinensis (Orange peel), Azadirachta indica (Neem), Santalum album (Sandalwood), Rosa centifolia (Rose), Aloe barbadensis (Aloe vera), Curcuma longa (Turmeric), Tinospora cordifolia (Giloy), Crocus sativus (Saffron), Sapindus mukorossi (Soap nut), Cinnamomum verum (Cinnamon), Oryza sativa (Rice flour), and Myristica fragrans (Nutmeg). These ingredients are traditionally known for their antimicrobial, anti-inflammatory, exfoliating, cleansing, and rejuvenating properties.

The herbal facial pack was prepared in powder form and evaluated through various parameters including organoleptic and morphological characters, phytochemical screening (for flavonoids and terpenoids), physical flow properties (angle of repose, bulk density, tapped density, Hausner's ratio, and Carr's Index), and physicochemical evaluations (pH, moisture content, ash values, particle size, washability, irritancy, and stability). Microbial load determination was conducted to ensure safety and compliance with cosmetic standards. The results confirmed that the prepared formulation exhibited acceptable physical characteristics, was free from microbial contamination, non-irritant, stable under storage conditions, and easily washable. The study concludes that the formulated herbal facial pack is suitable for oily and combination skin types, with potential benefits in reducing acne, excess sebum, and improving overall skin texture and clarity.

Keywords: Polyherbal formulation, Facial pack, Herbal cosmetics, Phytochemical screening, Skin care, Oily skin, Anti-acne, Natural ingredients, Physicochemical evaluation, Microbial load.

1. INTRODUCTION

The concept of beauty and cosmetics is as ancient as mankind and civilization. Indian herbs and its significance are popular worldwide. An herbal cosmetic has growing demand in the world market and is an invaluable gift of nature. Herbal formulations always have attracted considerable attention because of their good activity and comparatively lesser or nil side effects with synthetic drugs. Herbal cosmetics are defined as the beauty products which possess desirable physiological activity such as healing, smoothing appearance, enhancing and conditioning properties because of herbal ingredient.

Herbal Cosmetic products are used to protect skin against exogenous and endogenous harmful agents and improve the beauty and attractiveness of skin. Herbal Cosmetics are not only developing an attractive external appearance, but towards achieving long life of good health by reducing skin disorders. The herbal ingredients present in skin care products that supports the strength to the skin, integrity of skin and texture, moisturizing, maintaining elasticity of skin by reduction of collagen and photo protection etc.

1.1. HISTORY OF COSMETICS

The use of cosmetics dates back to ancient civilizations, where natural ingredients were used to enhance beauty and care for the skin. Early records from ancient Egypt, Greece, and Rome show that people used herbs, oils, and clays for skincare and makeup. Egyptian women applied malachite and galena for eye makeup, while Greek and Roman societies used olive oil, honey, and herbal extracts for skincare.

In Ayurveda, traditional Indian texts describe various herbal formulations for skin health. Natural ingredients like turmeric, sandalwood, aloe vera, and neem were commonly used to cleanse, nourish, and protect the skin. These herbal formulations were believed to have therapeutic properties, promoting clear and radiant skin.

During the medieval period, herbal cosmetics continued to evolve, with many cultures developing unique skincare routines using local herbs. In Asia, rice water and green tea were valued for their skin-brightening properties, while in the Middle East, rose water and saffron were widely used.

With the advancement of chemistry in the 19th and 20th centuries, synthetic ingredients became more common in cosmetics, leading to mass production. However, concerns about synthetic chemicals and their effects on the skin and environment have led to a resurgence in the use of herbal and natural cosmetics.

1.2. POLYHERBAL BASED FACIAL PACK FORMULATIONS

Today, polyherbal formulations, which combine multiple plant extracts, have gained popularity due to their potential synergistic effects. Among various herbal skincare formulations, facial packs hold a unique position as they offer multiple benefits such as exfoliation, detoxification, sebum control, acne reduction, and enhancement of skin glow.

A facial pack works by forming a thin layer over the skin, allowing the absorption of active ingredients while removing dirt, dead skin cells, and excess oil upon removal. Herbal facial packs, in particular, provide therapeutic benefits due to the presence of bioactive phytoconstituents such as flavonoids, alkaloids, terpenoids, tannins, and essential oils, which are known for their antioxidant, antimicrobial, anti-inflammatory, and rejuvenating properties.

The current study focuses on the formulation of a polyherbal facial pack using a blend of well-known herbal ingredients including Terminalia arjuna, Multani mitti, Citrus sinensis peel, Azadirachta indica, Santalum album, Rosa centifolia, Aloe barbadensis, Curcuma longa, Tinospora cordifolia, Crocus sativus, Sapindus mukorossi, Cinnamomum verum, Oryza sativa, and Myristica fragrans. These ingredients have been traditionally used in Ayurvedic and Unani medicine for various skin conditions such as acne, pigmentation, excessive oiliness, and dullness.

This research emphasizes not only the formulation and standardization of the herbal facial pack but also its comprehensive evaluation through organoleptic, phytochemical, physicochemical, and microbial parameters. The goal is to develop a safe, stable, and effective natural skincare product suitable for regular use, especially targeting oily and acne-prone skin types.

1.3. SKIN TYPE SUITABILITY

Oily and Combination Skin:

The formulated facial pack is most suitable for oily and combination skin types, as it contains Multani mitti, neem, turmeric, orange peel, and soap nut, which help in controlling sebum, tightening pores, reducing acne, and exfoliating dead cells.

- **Dry Skin:**

Users with dry skin may experience excessive dryness due to the sebum-absorbing and deep-cleansing properties of certain ingredients. However, it can be used with added milk, honey or aloe vera gel to balance the drying effect. Application should be limited to once a week, followed by a moisturizer.

- **Sensitive Skin:**

A patch test is strongly recommended, as ingredients like turmeric, cinnamon or nutmeg may cause irritation in hypersensitive skin types.

2. METHOD AND PREPARATION OF POLYHERBAL BASED FACIAL PACK POWDER

The polyherbal face pack was prepared following a systematic procedure to ensure uniformity, quality, and effectiveness. The key steps involved in the formulation are:

2.1. Drying

All selected ingredients were collected and dried to remove moisture and enhance shelf life.

2.2. Size Reduction

The dried ingredients were individually ground using a hand-driven mixer to obtain a fine powder.

2.3. Weighing

Each powdered ingredient was accurately weighed as per the formulation requirements.

2.4. Mixing

The weighed ingredients were thoroughly blended using a mixer to form a homogeneous fine powder.

2.5. Sieving

The mixed powder was passed through sieve No. 80 to achieve a uniform particle size for smooth application.

2.6. Packing and Labelling

The sieved fine powder was packed in airtight containers to protect it from moisture and contamination, then labelled suitably for identification and storage.

FORMULATION FORMULA FOR INGREDIENTS USED IN POLY HERBAL FACIAL PACK POWDER

S.NO	INGREDIENTS	QUANTITY (in gm)
1	Nut Meg	2.0 g
2	Arjuna	1.0 g
3	Multani Mitti	2.0 g
4	Orange Peel Powder	3.0 g
5	Sandal Wood	1.0 g
6	Rose Powder	3.0 g
7	Aleo Vera	2.0 g
8	Turmeric Powder	1.0 g
9	Giloy Powder	1.0 g
10	Saffron	1.5 g
11	Soap Nuts	2.0 g
12	Cinnamon Powder	0.5 g
13	Rice Flour	0.5 g
14	Milk Powder	1.0 g
15	Neem Powder	1.0 g

Table 1: Formulation Of Ingredients

3.0. METHODS OF APPLICATION:

The facial pack should be applied on a wet face. For oily skin, add curd, tomato juice, potato juice, or lemon juice. For dry skin, add raw milk, rose water, or normal water to form a paste with an optimum thickness. Apply the paste evenly on the face using a brush and leave it on for 15-25 minutes until it dries completely. To remove the pack, use a wet sponge or wash your face with lukewarm water.

4. PROCEDURE FOR FACIAL PACK APPLICATION:

1. Take the required amount of facial pack powder in a bowl and add rose water to mix.
2. Blend well and apply evenly over the facial skin, covering acne and blemish spots.
3. Let the pack dry completely for about 10-20 minutes.
4. Finally, rinse the face with cold water.

5. METHODS OF EVALUATION:

EVALUATION STUDIES FOR FORMULATED POLY HERBAL BASED FACIAL PACK:

Prepared formulations of poly herbal facial pack were evaluated the following parameters.

5.1. Organoleptic Evaluation

The organoleptic parameters of the prepared face pack, including its nature, colour, odour, texture and consistency, were manually evaluated to assess its physical properties. Sensory evaluations were conducted using touch and sight for texture and colour, while the sense of smell was used to assess the odour. These parameters were carefully examined to ensure the product's overall quality and sensory appeal.

5.2. Morphological Evaluation:

Poly herbal face packs were assessed for the morpho-logical characteristics listed in table below. The formulation was a light-yellow colour. It is desirable for cosmetic formulations that the created formulations have a pleasant and agreeable smell. The texture and smoothness met the criteria for cosmetic compositions.

6. PHYTOCHEMICAL SCREENING

6.1. Flavonoid Detection: The Shinoda test helps detect flavonoids. A small amount of the sample is mixed with alcohol, magnesium turnings, and a few drops of hydrochloric acid. If flavonoids are present, the mixture will change to a pink, red, or magenta colour, indicating their presence.

6.2. Lead Acetate Test: In the Lead Acetate test, a few drops of lead acetate solution are added to the sample. If flavonoids are present, a brown or yellow precipitate will form.

6.3. Terpenoid Detection: To detect terpenoids, the sample is mixed with chloroform and concentrated sulfuric acid. If terpenoids are present, the solution will turn reddish-brown or purple.

6.4. Salkowski Test: In the Salkowski test, the sample is mixed with chloroform and concentrated sulfuric acid. If terpenoids are present, the solution will turn reddish-brown or purple.

7. Physical Evaluation

The particle size was tested by microscopy method. The flow property of the dried powder of combined form was evaluated by performing Angle of Repose by funnel method, bulk density and tapped density by Tapping Method, Hausner ratio and Carr's Index.

7.1. Angle of Repose – Measured using the funnel method.

The angle of repose is the maximum angle between the surface of a pile of powder and the horizontal plane. In the funnel method, dried powder is placed in a funnel set 2 cm above a horizontal surface. The powder is allowed to flow and form a heap, and the height and radius of the resulting pile are measured. The angle of repose (θ) can be calculated using the formula:

$$\textbf{Angle of Repose}(\theta) = \tan^{-1}(h/r)$$

Where:

- θ is the angle of repose,
- h is the height of the heap,
- r is the radius of the base of the heap.

7.2. Bulk Density – Measured as mass/volume of powder.

Bulk density is defined as the ratio of the mass of a powder to its bulk volume. To measure this, a specific amount of dried powder is placed in a 50 ml measuring cylinder, filled up to the 50 ml mark. The cylinder is then dropped onto a hard surface from a height of 1 inch, at intervals of 2 seconds. The volume of the powder is recorded after each drop, and the powder's mass is measured. This process is repeated to obtain average values. The bulk density is then calculated using the following formula:

$$\text{Bulk Density} = \frac{\text{Mass of the poly herbal face pack}}{\text{Volume of the poly herbal face pack}}$$

7.3. Tapped Density – Obtained after tapping powder mechanically.

Tapped density refers to the increased bulk density achieved by mechanically tapping a container filled with a powder sample. After noting the initial volume or mass of the powder, the measuring cylinder or vessel is tapped mechanically for 1 minute. Volume or mass readings are taken at intervals until there is minimal further change in volume or mass. The tapped density is then expressed in grams per cubic centimetre (g/cm^3).

7.4. Hausner's Ratio & Carr's Index – Indicators of powder flowability.

The Hausner ratio is a measure of the flowability of a powder. It is calculated as the ratio of the tapped density to the bulk density of the powder. A higher Hausner ratio indicates poor flowability, while a lower ratio suggests better flowability. It is expressed as:

$$\text{Hausner Ratio} = \frac{\text{Tapped Density}}{\text{Bulk Density}}$$

7.5. Carr's Index (Compressibility Index):

Carr's Index is another measure of the flowability and compressibility of a powder. It is calculated using the bulk and tapped densities and provides insight into the powder's ability to compact under pressure. The formula for Carr's Index is

$$\text{Carr's Index} = \frac{\text{Tapped Density} - \text{Bulk Density}}{\text{Tapped Density}} \times 100$$

Both the Hausner ratio and Carr's Index are used to assess the powder's characteristics and its suitability for processing and handling.

8. PHYSICOCHEMICAL EVALUATION:

8.1. pH Determination:

Measured using a calibrated digital pH meter. The pH of a 10% poly herbal face pack solution in distilled water was measured at room temperature (25°C) using a calibrated digital pH meter.

8.2. Moisture Content:

Moisture content determination for the poly herbal facial pack was carried out by weighing 10 g of the powder in a tare evaporating dish and placing it in a hot air oven set at 105°C. The drying process was repeated until a constant weight loss was observed after every 30-minute interval. The moisture content for each sample was then calculated.

8.3. Ash Content:

Evaluated using an incinerator to determine inorganic residues. To determine the ash content of the poly herbal facial pack, a small amount of the powder (about 5-10 g) is placed in a crucible and heated in a furnace at 500-600°C until all organic material is burned away, leaving only the ash. The amount of ash is then calculated as a percentage of the original weight of the sample.

8.4. Irritancy Test

Marked a 1 sq. cm area on the left dorsal hand surface. A definite amount of the face pack was applied. The area was observed for erythema, edema, and irritation at regular intervals for 24 hours. To test for irritation, a small amount of the poly herbal face pack is applied to the skin (usually on the forearm or behind the ear). The area is then observed for any redness, swelling, or irritation over 24-48 hours. If no irritation occurs, the product is considered safe for use.

8.5. Washability Test

Applied the formulation on the skin and checked ease of removal using 1L of water.

8.6. Particle size

Particle size is a parameter which affect various properties like spread ability, grittiness, etc. Particle size was determined by sieving method by using LP. Standard sieves by mechanical shaking for 10 min.

9. Stability Studies

Stability studies check how the poly herbal face pack holds up over time. The product is stored under different conditions (like varying temperatures and humidity) and tested regularly for changes in colour, texture, pH, and effectiveness. This helps ensure the product remains safe and effective throughout its shelf life. The formulated facial pack was stored under different temperature conditions: Room temperature - 35°C & 40°C, Stability was assessed over a one-month period for: Colour, Odor, pH, Consistency, Texture

10. Determination of Microbial Load

The herbal facial pack was tested for microbial contamination. To test for microbial load, a sample of the poly herbal facial pack is placed on special agar plates that encourage the growth of bacteria and fungi. After incubating for 24-48 hours, the number of colonies is counted. If the number of microbes is within the safe limits, the product is considered safe to use. The antibacterial activity was tested against Escherichia coli and Staphylococcus aureus.

RESULT AND DISCUSSION

Prepared formulations of poly herbal facial pack powder were evaluated the following parameters.

5.1. Organoleptic Evaluation:

Herbal facial pack was evaluated for organoleptic parameters showed in the **Table 2.**

The colour of formulation was Brown.

The odour of prepared formulations was pleasant and good acceptable which is desirable to cosmetic formulations.

Texture and smoothness were acceptable as per requirement of cosmetic formulations.

S.NO	Parameter	Observation
1	Colour	Brown colour
2	Odour	Pleasant
3	Appearance	Smooth, fine
4	Texture	Fine
5	Smoothness	Smooth
6	Nature	Soft and fresh

Table 2: Organoleptic evaluation

6. Phytochemical Evaluation

The herbal facial pack was evaluated for phytochemical parameters, as shown in **Table 3.**

The evaluation confirmed the presence of key phytoconstituents such as **flavonoids** and **terpenoids**, which are known for their skin-nourishing properties.

S.No	Phytoconstituents	Observation
1	**FLAVONOIDS**	
a.	Shinoda Test	+
b.	Lead Acetate Test	+
2	**TERPENOIDS**	
a.	Salkowski Test	+

Table 3: Phytochemical evaluation

7. Physical Evaluation

The poly herbal based facial pack was evaluated for various physical parameters, as shown in **Table 4.** The observed parameters included bulk density, tapped density, angle of repose, Hausner's ratio, and Carr's index, which are essential for assessing the flow properties of the formulation. Rheological findings justified the flow (powder) properties of the herbal face pack. It was found to be a free-flowing and non-sticky in nature.

S.No	Parameter	Observation
1	Tapped density	1.326 gm/ml
2	Bulk density	1.09 gm/ml
3	Angle of repose	32.53º
4	Hausner's ratio	1.323
5	Carr's index	23.86 %

Table 4: Physical evaluation

8. Physicochemical Evaluation

The Poly Herbal based facial pack was evaluated for physicochemical parameters showed in the **Table 5.**

The pH of formulation was found close to neutral. The ash content and moisture content were within limit. It was determined how easily a formulation could be wiped off.

The particle size of formulations was found in the range of 25-30 µm.

S.No	Parameter	Observation
1	Particle size	25-30 µm
2	pH	6.4
3	Moisture content	1.8%w/w
4	Ash content	2.7%
5	Washability	55 seconds

Table 5: Physicochemical Evaluation

9. Irritancy test:

The results of the irritancy test are shown in **Table 6**. The formulation showed an absence of irritation, redness, and swelling during the study, indicating that it is safe for skin application.

S.No	Parameter	Observation
1	Edema (Swelling)	No
2	Erythema (Redness)	No
3	Irritation	No

Table 6: Irritancy test

9. Stability Studies:

The results of the stability study are shown in **Table 7**. No changes were observed in colour, odour, texture or smoothness under the specified stability conditions, except for a slight change in pH at 35°C and 40°C.

S.No	Parameter	Observation		
		Room Temp	**35ºC**	**40ºC**
1	Colour	No change	No change	No change
2	Odour	No change	No change	No change
3	pH	6.65±0.17	6.65±0.11	6.72±0.21
4	Texture	Fine	Fine	Fine
5	Smoothness	Smooth	Smooth	Smooth

Table 7: Stability Studies

10. Determination of Microbial Load

The prepared formulation was evaluated for Total Viable Count (TVC) and the presence of pathogens such as *E. coli* (Gram-negative) and *Staphylococcus aureus* (Gram-positive). **(Table 8)**

S.No	Microbial Parameter	Observation
1	Total Viable Count	872 CFU/g
2	*E. coli* (Gram-negative)	Absent
3	*Staphylococcus aureus* (Gram-positive)	Absent

Table 8: Determination of Microbial Load

11. CONCLUSION:

The present study aimed to develop a poly herbal based facial pack powder as an effective, natural alternative to chemical-based facial products.

The facial pack was formulated with medicinal plant powders traditionally known for their cleansing, rejuvenating, and soothing properties for the skin.

By using natural ingredients like Nutmeg, Arjuna, Multani Mitti, Orange Peel Powder, Neem Powder, Sandalwood, Rose Powder, Aloe Vera Powder, Turmeric Powder, Giloy Powder, Saffron, Soap Nuts, Cinnamon Powder, Rice Flour, the product offers a safer and more skin-friendly option compared to synthetic additives that may irritate or damage the skin.

The primary goal of this formulation was to create a stable and effective face pack without the use of synthetic chemicals commonly found in commercial products.

The evaluation results indicate that the developed poly herbal based face pacal is of high quality, showing good flow properties, minimal irritancy, and satisfactory performance in terms of moisture content, ash content, washability and particle size.

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