

<https://doi.org/10.33472/AFJBS.6.Si3.2024.5609-5619>



African Journal of Biological Sciences

Journal homepage: <http://www.afjbs.com>



Research Paper

Open Access

Synergistic Benefits of Herbal Ingredients: Formulating and Evaluating a Face Pack with *Santalum album*, *Citrus reticulata*, Calcium Bentonite, *Aloe Barbadensis* and *Curcuma longa*

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Article Info

Volume 6, Issue Si3, August 2024

Received: 26 June 2024

Accepted: 19 July 2024

Published: 08 August 2024

doi: [10.33472/AFJBS.6.Si3.2024.5609-5619](https://doi.org/10.33472/AFJBS.6.Si3.2024.5609-5619)

ABSTRACT:

This work aims to formulate and evaluate a herbal face pack for cosmetic purposes using herbal ingredients such as Multani mitti, turmeric, aloe vera, sandalwood, and orange peel powder. The ingredients were obtained from the local market and passed through a sieve number 100. The ingredients were then properly mixed and three formulations (F1, F2, and F3) were prepared separately. Evaluations of its physio-chemical properties, organoleptic properties, irritancy test, rheological properties, and other tests are mentioned below the evaluation. The formulation's passable flow feature made it acceptable for a face pack and didn't cause any irritation to the skin. Particle size aids in removing debris from skin pores and preserving the skin's suppleness. As a result, the herbal face packs (F1, F2, and F3) created in this study have good morphological, rheological, physicochemical, and other qualities. F3 emerged as the most balanced formulation, with high spread ability, a fast-drying time, and acceptable physicochemical properties. We have found that good properties of the face packs for application.

Keywords: Formulation, face pack, herbal ingredient, natural, glowing, cosmetics.

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1. INTRODUCTION

There is a global trend these days toward adopting natural lifestyles and using herbal goods. For a healthy lifestyle, people are choosing more and more natural foods, herbal remedies, and natural healing techniques. Additionally, there is a huge need for cosmetics. The fact that herbal products have less negative effects and health hazards is a major factor in this development. Furthermore, there has been an increase in the usage of herbal medications and herbal cosmetics due to consumers' increased awareness of health and quality of life. Formulations including medicinal or bioactive components are referred to as herbal cosmetics. Cosmetics are readily available goods that are intended to improve the way skin looks by washing, beautifying, and enhancing attractiveness. Historically, a variety of plants have been utilized for maintaining, improving, and cleaning the skin. Particularly the skin of the face serves as a vital sign of one's general health. The technological method of creating herbal cosmetics is intricate and delicate because it must maintain the bioactivity of the botanical elements through prolonged processing and guarantee their efficacy when applied topically. Maintaining product quality requires producers to test their facilities in a methodical manner. These days, it's typical for young people and those with dark circles, acne, blackheads, and pimples to look for treatments. An herbal paste that targets blackheads, pimples, and acne is applied to the face to address these problems. For facial treatment, a face pack—a finely powdered powder—is also used. These mixtures are applied as a paste to the face, where they create a film that tightens, fortifies, and cleanses the skin. The best results from herbal face packs—like increased brightness and fairness—come from customized applications based on individual skin types. The recipe for a herbal face pack that will naturally lighten, brighten, and whiten skin for both men and women is presented in this article. A herbal paste called "**mukha Lepa**" is applied as a face treatment in Ayurveda. There are natural skin-lightening characteristics in this face pack. Vitamins that are vital for skin health and shine are added to natural component facial packs. These components have demonstrated numerous benefits for the skin. Natural facial packs are user-friendly, enhancing blood circulation in facial veins and revitalizing the skin. An effective herbal face pack should provide vital nutrients to the skin, available in a free-flowing powder form for external application. It should deeply penetrate subcutaneous tissues to deliver necessary nutrients. Different skin types have specific requirements for facial packs. Herbal face packs are increasingly popular due to their numerous advantages over chemical-based alternatives. They are non-toxic, non-allergenic, and non-Habit-forming, offering natural solutions with extended shelf lives and no added preservatives. They can be easily prepared and stored for extended periods. The current research article focuses on formulating and assessing an herbal face pack aimed at enhancing skin radiance, utilizing natural ingredients such as Multani mitti, turmeric, sandalwood, orange peel, and aloe vera.

Benefits of Applying Face Pack:

1. Nourishes the skin.
2. Because of the herbal elements in it, it helps lessen marks, scars, acne, and pimples.
3. Dead skin cells are usually removed with face packs.
4. The skin is calmed and relaxed after using these face masks.
5. They aid in rapidly regaining the skin's former radiance and luster.
6. Regular application of natural face masks improves complexion, texture, and radiance of the skin.
7. The wise use of face packs can help mitigate the negative impacts of extreme weather and pollutants.

Precautions to be Taken While Applying Face Pack:

1. Select the face pack based on the type of skin you have. Before using the face pack, speak with a skin specialist or natural therapist.
2. Do not keep the face pack on your face for longer than **15 to 20** minutes. If you keep it on for too long, you could get enlarged pores, wrinkles, and sagging skin.
3. Refrain from giving your face a rough scrub because this might cause dark stains and pimples. Avoid putting heat on your face while the face pack is on.
4. Use the face pack once every seven days. The dry face pack should not be peeled off or scratched since this could harm the skin underneath.
5. Mist your face with water and then take off the desiccated face pack. Once the mask has been taken off, gently glide an ice cube over your facial skin. This aids in closing open pores and firming the skin.
6. Avoid applying the face pack near the "**eye area**" as the skin surrounding the eyes is extremely delicate. The removal process of the face pack could potentially harm the skin around the eyes.

2. MATERIALS AND METHODS**Materials:**

Multani mitti (Calcium bentonite): Multani mitti powder, which we use to prepare face packs, has many benefits for the skin: it minimizes pore size, gets rid of blackheads and whiteheads, lightens freckles, soothes sunburns, cleanses the skin, improves blood circulation, evens out complexion, lessens acne and blemishes, and leaves skin with a radiant glow. Among the healthy nutrients it provides is magnesium chloride.

Orange peel (Citrus sinensis): We employ Beta-carotene, which is abundant in orange peel powder, is converted into Vitamin A, a potent antioxidant that softens, smoothes, and moisturizes skin. It is especially helpful for revitalizing the complexion and hydrating greasy skin. Orange peels are also a great source of vitamin C, which helps to maintain healthy, glowing, elastic, and smooth skin. Orange peel powder can be used to effectively treat acne, pimples, blemishes, and other skin disorders when added to your usual face packs or masks. Oranges include Vitamin C, which helps to prevent free radical damage and promotes healthy, radiant, and youthful skin.

Aloe vera (Aloe barbadensis miller): We make powder from wild, organic aloe vera leaves. contains a multitude of enzymes, minerals, lignin, salicylic acids, saponins, and vital amino acids that greatly improve skin health. It is also rich in vitamins **A, B12, C, and E**. Aloe vera is very good for the skin because of its biochemical qualities, which include anti-inflammatory, antibacterial, antioxidant, moisturizing, nourishing, cooling, and cell-regenerative actions.

Turmeric (Curuma longa): This medication contains turmeric because of its blood-purifying qualities and its antibacterial effect, which can help with wound healing. Turmeric powder is a powerful anti-inflammatory and anti-allergic substance that successfully heals skin disorders brought on by blood impurities. Turmeric's phytoconstituents, including terpenoids, contribute to a lighter skin tone. Turmeric also increases skin suppleness and prevents wrinkles and other indications of aging. It also takes care of uneven skin tone and discoloration.

Sandalwood (Santalum album): Anti-aging and anti-tanning effects are found in sandalwood. It is good for the skin in many ways; it tones the skin, acts as an emollient, has antimicrobial qualities, and has cooling and tightening effects. Sandalwood also offers healing and calming qualities that improve the health of the skin.

Methods of Preparation:

Three distinct formulations (**marked as F1 through F3**) were produced using different

proportions of each component. **Table 1** listed the concentration of each element. Sieve #100 was used to grind the ingredients into a fine powder after they were precisely weighed. The serial dilution method was then used to blend the materials geometrically so that there would be consistent mixing. After being made, the face pack was tagged, put in a self-sealing polyethylene bag, and utilized for additional testing.

Table 1: Formulation of Face Pack

Sr.no	Name of Ingredients	Scientific Name	Quantity of sample for 100g		
			F1(g)	F2(g)	F3(g)
1	Multani mitti	Calcium Bentonite	23	23	23
2	Orange peel	Citrus sinensis	20	40	30
3	Aloe vera	Aloe barbadensis miller	15	15	15
4	Turmeric	Curcuma longa	2	2	2
5	Sandalwood	Santalum album	40	20	30

Evaluation of facepack :

Evaluation

The prepared face pack was assessed based on the following criteria to guarantee its superiority:

Morphological Evaluation:

The color, smell, texture, consistency, and other organoleptic properties of the prepared face pack were assessed. Touch and sense were used to visually assess texture, color, and smell.

Rheological Evaluation:

It required assessing the qualities of the powder. Numerous physical parameters, including Hauser's ratio, bulk density, tapped density, and angle of repose, were used to assess the sample.

A) Angle of repose: After allowing the required amount of material to drop from the funnel, which was positioned at a height of 6 cm, the heap's height and radius were noted for use in subsequent computations. The following formula can be used to find the angle of repose (θ):

$$\{ \text{Angle of repose } (\theta) = \tan^{-1} \left(\frac{h}{r} \right) \}$$

θ - Angle of repose,

h - Height of the heap.

r - Radius of the base.

Table no.2: Angle of Repose

Angle of Repose	Nature of Flow
<25	Excellent
25-30	Good
30-40	Passable
>40	Very poor

A) Bulk Density: Bulk density is calculated as the ratio of the mass of a powder to its bulk volume. Determined by transferring 25 gm of accurately weighed amount of powder sample to the graduated cylinder.

$$\text{Bulk Density} = \frac{\text{Mass of sample}}{\text{Volume of sample}}$$

B) Tapped Density: To measure a known amount of powder sample (10 gm), it is put into a graduated cylinder. Once the sample's initial volume was recorded in the measuring cylinder, it was placed on a tap density measuring apparatus and tapped repeatedly for ten to

fifteen minutes. The tapped density can be obtained by calculating the mass of powder divided by the tapped volume using the following formula.

$$\text{Tapped Density} = \frac{\text{Mass of Sample}}{\text{Tapped volume of sample}}$$

C) **Housner's ratio:** The Hausner's ratio can be used to assess a powder's flowability. It is essentially the ratio of the powder's bulk density to its tapped density

$$\text{Housner's ratio} = \frac{\text{Tapped density}}{\text{Bulk density}}$$

Table No.3: Housner's Ratio

Flow Character	Hausner Ratio
Excellent	1.00 - 1.11
Good	1.12 - 1.18
Fair	1.19 - 1.25
Passable	1.26 - 1.34
Poor	1.35 - 1.45
Very poor	1.46 - 1.59
Very, very poor	>1.60

D) **Carr's index:** Also known as Percent Compressibility: is a measurement of the powder flow characteristic. It is proportional to the relative flow rate of cohesiveness and particle size⁶. The following calculation is used to calculate the % compressibility index:

$$\text{Carr's index} = \frac{\text{Tapped density} - \text{Bulk density}}{\text{Tapped density}} \times 100$$

Table No.4: Carr's index

Flow Character	Carr's index	Hausner Ratio
Excellent	< 10	1.00 - 1.11
Good	11-15	1.12 - 1.18
Fair	16-20	1.19 - 1.25
Passable	21-25	1.26 - 1.34
Poor	26-31	1.35 - 1.45
Very poor	32-37	1.46 - 1.59
Very, very poor	>38	>1.60

E) **Particle size:** Particle size was determined using a conventional microscopic approach. Particle size analysis is an essential metric that has a direct impact on the spread ability, grittiness, and other qualities of powder.

Physicochemical Evaluation:

The physicochemical examination covered characteristics such as moisture content, pH, and ash Values.

A) **pH :** The pH of the mixture was measured using a digital pH meter. Initially, the pH meter was calibrated using an appropriate buffer solution at different pH levels. The product was

diluted to **10% (w/v)** in distill water, and the pH was measured right away, without the need for further dilutions.

B) Moisture content: For products made from plants, moisture content and loss on drying (LOD) are important factors. Insufficient drying of these materials may lead to the enzymatic breakdown of active components. The preparation's moisture content was ascertained using the LOD technique. A carefully weighed three grams of material were added to a pre-weighted petri dish (W1). W2 represented the weight of the sample-containing petri dish. A hot air oven set between 100 and 108 0C was used to bake the Petri dish until the sample's target weight was achieved.

C) Total Ash value: The term "**ash value**" refers to the residue that is left over after the powdered sample has completely burned. It is employed to ascertain a drug's identity or purity. In general, adulteration, contamination, or substitution during product manufacturing are indicated by an abnormally high ash value. Total ash value is helpful in identifying an overabundance of sandy, earthy material with medication as well as low-quality, tired items. Two to four grams of powdered material were added to a crucible that had previously been tarred and burned. After the substance had been evenly distributed throughout the crucible, the heat was gradually increased until a white, carbon-free powder was created. After cooling in a desiccator, the sample's weight was determined.

Miscellaneous Tests:

A) Shinoda Test: Ninety-five percent ethanol was used to dissolve the extract test solution. Three to five drops of concentrated HCl were added to the liquid after a tiny piece of magnesium foil was inserted. The presence of flavonoids was suggested by the deep cherry red color.

B) Grittiness Test:

Visual Inspection: Spread a small amount of face pack on a glass slide. Check for visible particles.

- Tactile Test: Rub a small amount between fingers. Assess smoothness.
- Microscope: Examine a thin layer on a glass slide to identify particles.
- Dilution Test: Dilute with water and repeat the tactile test.
- Sensory Evaluation: Apply on skin, check for smooth application and feel.
- Magnifying Glass: Inspect the sample closely for any granules.

C) Irritancy Test:

On the left hand dorsal surface, a predetermined area measuring 1 square centimeter was covered with the prepared face pack, and the application time was noted. After that, for up to 24 hours, the skin was examined at regular intervals to look for erythema, edema, and irritation.

D) Washability:

In this capacity of formulation is accessed to be rinsed off. After applying the face pack to the skin, the ease and extent of washing with regular tap water were personally assessed.

E) Spread ability Test:

To do a spreadability test on a face pack, first prepare a tiny amount of the product, usually approximately 1 gram, and place it in the center of a clean glass slide or flat surface. Using a spatula, spread the face pack in a circular motion to see how well it distributes. To determine the spreadability, measure the circumference of the spread face pack with a ruler. Optionally, note the time it takes to reach a specific diameter for a more complete assessment. Document the measurements and observations, taking note of the simplicity and uniformity with which they were dispersed. A face pack with good spreadability should disseminate smoothly and evenly without taking too much effort

F) Dry Time Test:

To determine the drying time of a face pack, first apply a particular amount of the product (e.g., 1 gram) evenly to a clean glass slide or a predetermined region of the skin. Use a spatula to

create a consistent layer. Start a timer and check the face pack at regular intervals, gently touching the surface to ensure it is dry. The face pack is considered dry when it no longer feels tacky or moist and has a consistent dry texture throughout the application area. Record the overall drying time and take note of any variables that may have an impact on it, such as room temperature, humidity, or application thickness. Repeat the test to ensure consistency, and if testing on the skin, keep an eye out for any reactions. This test helps consumers calculate how long they need to wait for the face pack to completely dry.

3. RESULT AND CONCLUSIONS

We had all of the face pack formulations ready, which were -**F1, F2, and F3**. Face Pack adhered to every test requirement. Because natural medicines have fewer negative effects than synthetic ones, they are more widely accepted. As is well known, there is a growing global market for herbal formulations. Our endeavor is to create a herbal face pack with elements like aloe vera, sandalwood, turmeric powder, orange peel powder, and multani mitti. Following formulation, we carry out several assessment tests, including morphological, rheological, physicochemical, and other tests. After analysis, we discovered that the face pack has good qualities.

Table 5: Morphological Evaluation Data

Sr.no	Parameter	F1	F2	F3
1	Nature	Powder	Powder	Powder
2	Color	Slight Yellow	Slight Yellow	Slight Yellow
3	Oduor	Slightly Aromatic	Slightly Aromatic	Slightly Aromatic
4	Texture	Fine	Fine	Fine
5	Smoothness	Smooth	Smooth	Smooth

Table 6: Rheological Evaluation Data

Sr.no	Parameter	F1	F2	F3
1	Angle of repose	37°	34°	36°
2	Bulk density	0.39 g/ml ³	0.39 g/ml ³	0.39 g/ml ³
3	Tapped density	0.60 g/ml ³	0.62 g/ml ³	0.68 g/ml ³
4	Hausner Ratio	1.53	1.58	1.74
5	Carr's index	35	37	42
6	Particle size	<0.149mm	<0.149mm	<0.149mm

Table 7: Physicochemical Evaluation Data

Sr.no	Parameter	F1	F2	F3
1	pH	6.3	5.1	5.5
2	Moisture Content	12 %	6.3 %	5.6 %
3	Total Ash Value	8.33 %	3.31 %	8.18 %

Table 8: Miscellaneous Evaluation Data

Sr.no	Parameter	F1	F2	F3
1.	Grittiness Test	Negative	Negative	Negative
2.	Shinoda Test	Positive (Red color)	Positive (Red color)	Positive (Red color)
3. (a)	Irritancy Test	Negative	Negative	Negative
(b)	Erythema	Negative	Negative	Negative
(c)	Edema	Negative	Negative	Negative

4.	Washability Test	Negative	Negative	Negative
5.	Spreadability Test	1.5 cm	1.8 cm	2 cm
6.	Dry Time Test	13 min 18 sec	14 min 46 sec	13 in 51 sec

Future Safety and Efficacy Testing of Formulation:

To ensure the comprehensive safety and efficacy of the herbal face pack formulations, additional testing is recommended. These tests can provide further insights into the formulations' stability, microbiological safety, and long-term effects on the skin. The following tests could be conducted in the future:

1. Microbiological Testing:

Total Viable Count (TVC) Assess the total number of viable microorganisms in the face pack to ensure it is within acceptable limits. **And Pathogen Testing:** Specifically test for harmful bacteria, fungi, and yeast, such as *Staphylococcus aureus*, *Pseudomonas aeruginosa*, and *Candida albicans*, to ensure the product is free from pathogens.

2. Stability Testing

- **Accelerated Stability Testing** Store the formulations at elevated temperatures (e.g., $40^{\circ}\text{C} \pm 2^{\circ}\text{C}$ with $75\% \pm 5\%$ relative humidity) to simulate long-term storage conditions and assess physical, chemical, and microbiological stability over time.
- **Long-term Stability Testing** Store the formulations under normal conditions (e.g., $25^{\circ}\text{C} \pm 2^{\circ}\text{C}$ with $60\% \pm 5\%$ relative humidity) for extended periods to observe any changes in color, odor, pH, and consistency.

Skin Sensitivity and allergen city Testing Patch Test for this apply a small amount of the face pack to the skin of volunteers to monitor for any delayed allergic reactions or sensitization over 48 to 72 hours. **And repeat Insult patch Test (RIPT)** repeatedly apply the face pack to the skin of volunteers over several weeks to evaluate the potential for skin irritation or sensitization with prolonged use.

3. Clinical Efficacy Testing

In Vivo Testing Conduct clinical trials with human volunteers to evaluate the efficacy of the face pack in improving skin conditions, such as acne, hyperpigmentation, and skin radiance. Use standardized scales and imaging techniques to assess changes in skin condition. **And User Satisfaction Survey** Collect feedback from volunteers on the product's texture, ease of use, efficacy, and overall satisfaction to gather real-world data on the face pack's performance.

4. Dermatological Testing

Dermatological Safety Testing Have dermatologists supervise and evaluate the use of the face pack on volunteers with different skin types to ensure it is safe for all skin types, including sensitive skin. **Comedogenicity Test** Assess whether the face pack clogs pores and causes comedones (blackheads and whiteheads), which is crucial for products intended for acne-prone skin.

5. Phototoxicity and Photosensitivity Testing

Phototoxicity Test Expose the skin treated with the face pack to UV light to evaluate any adverse reactions, such as redness or swelling, which could indicate phototoxic effects. **Photosensitivity Test** Monitor the skin's reaction to sunlight exposure after applying the face pack to ensure it does not increase sensitivity to UV radiation.

Biocompatibility Testing **Cytotoxicity Test** Evaluate the face pack's effect on cultured skin cells to ensure it is not cytotoxic and does not harm skin cells. **Histopathological Analysis** Examine skin tissue samples under a microscope after face pack application to assess any microscopic changes or damage to the skin structure.

6. Antioxidant Activity:

In Vitro Antioxidant Assays Conduct assays such as DPPH (2,2-diphenyl-1-picrylhydrazyl) or **FRAP** (Ferric Reducing Antioxidant Power) to quantify the antioxidant activity of the face

pack ingredients, which can help in combating free radicals and reducing skin aging.

7. Water Activity

Water Activity Measurement Measure the water activity (aw) of the face pack to predict its shelf life and microbial stability. Lower water activity typically indicates a lower risk of microbial growth.

8. Consumer Acceptance Testing

Sensory Evaluation Conduct a sensory panel test where a group of trained individuals evaluates the face pack based on parameters such as texture, fragrance, ease of application, and overall feel on the skin.

4. CONCLUSION

The herbal face packs (**F1, F2, and F3**) developed in this study have good morphological, rheological, physicochemical, and other qualities. F3 emerged as the most balanced formulation, with high spread ability, a fast-drying time, and acceptable physicochemical properties. The face packs are safe to apply to the skin, free of irritants, and include necessary nutrients for skin health. Overall, the formulations show potential for commercial usage as natural, effective cosmetic treatments for improving skin radiance and resolving common skin concerns.

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