International Journal of Current Research in Physiology and Pharmacology
Volume 8, Issue 1; 2024
eISSN: 2523-6709 pISSN: 2523-6695
Research Article

Formulation and evaluation of herbal face pack for healthy skincare

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Aim and Background: This research investigates the formulation and assessment of a herbal face pack, integrating historical insights into plant-based skincare remedies. **Methodology:** Comprising ingredients like neem, multani mitti, turmeric, aloe vera, papaya, liquorice, and rose water, the face pack is designed to enhance skin health and radiance. The study meticulously details the preparation process, emphasizing the incorporation of traditional practices within modern skincare approaches. Comprehensive evaluation encompasses organoleptic, physicochemical, rheological, irritancy, and stability analyses. **Result:** The outcomes affirm that the face pack has commendable attributes, including a pleasing fragrance, refined texture, and non-irritating properties. Demonstrating sustained stability, the formulation underscores its potential as a natural and efficacious cosmetic product. This research adeptly integrates age-old wisdom with contemporary scientific scrutiny, underscoring the relevance of exploring traditional skincare practices in a contemporary context. **Conclusion:** The herbal face pack emerges as a promising solution for fostering luminous and resilient skin through the judicious use of natural constituents.

Keywords: herbal skincare, face pack formulation, natural ingredients, skincare research, traditional practices.

Introduction

For centuries, the recognition of plant's efficacy in achieving healthy, radiant, and beautiful skin has been a prevalent understanding [1,2]. Cosmetics, serving as tools to enhance appearance, are widely accessible goods utilized to improve one's look through the processes of cleansing, beautifying, and enhancing attractiveness [3]. The utilization of various herbs for skincare dates back to ancient times, encompassing practices of dealing with skin-related issues, cleansing, and adorning. The face, as the largest exposed area of the body, serves as a visible indicator reflecting an individual's overall health [4]. In historical contexts, women were particularly attentive to their appearance, demonstrating a profound care for their distinct skin types. In contemporary times, using natural remedies, such as plant extracts like neem, aloe vera, orange peel, tulsi, and rose,

persists, especially in rural and mountainous areas [5-7].

Despite the enduring pursuit of beauty, the modern era witnesses the prevalence of common skin issues, including acne, blackheads, pimples, and dark circles, predominantly among the younger population. Ayurveda attributes these skin problems to blood impurity, emphasizing a holistic approach to skincare [8]. Within Ayurveda, the term "mukha lepa" denotes the herbal paste used to address acne, pimples, scars, markings, and pigmentation on the face. The application of this herbal blend, known as "mukha lepana," has evolved into a popular facial cosmetic therapy. Additionally, the concept of a "face pack" involves applying a supple powder to the face. An effective herbal face pack is expected not only to enhance the appearance of skin but also to provide essential nutrients by penetrating the subcutaneous tissues [9,10].

The application process of a face pack entails the use of a smooth powder, applied as pastes or liquids, which dries and strengthens into a film. This film is left on the skin for a specified period, typically ten to twenty-five minutes, allowing the water to evaporate. Post-evaporation, the resulting film contracts, strengthens, and becomes easy to remove. While colloidal and adsorption clays in these preparations effectively remove grime and grease from the face's skin, the warming and narrowing impact caused by the face pack application imparts a stimulating sensation, creating a sense of rejuvenation. However, it's important to note that skin debris is typically left behind after the removal of the applied face pack [11,12].

In light of this historical and contemporary context, the present research article delves into the formulation and evaluation of herbal face packs aimed at promoting glowing skin through the use of natural materials. This underscores an ongoing interest in exploring and harnessing traditional practices for skincare and beauty in the modern era. The pursuit of a healthy and radiant complexion remains deeply ingrained in cultural and scientific endeavors, merging ancient wisdom with contemporary scientific evaluation.

Materials and Methods

Herbal Ingredients Profile

a) Neem

Azadirachta indica, commonly known as neem and belonging to the Meliaceae family, is a tree renowned for its rich chemical composition. Various biologically active substances, including triterpenoids, alkaloids, phenolic compounds, flavonoids, carotenoids, ketone bodies, and steroids, are present in different parts of the neem tree. Azadirachtin, a tetranortriterpene classified as a C-seco Limonoid, stands out as the most biologically active compound, comprising seven isomeric chemicals like meleicin, azadirachtin M, and azadirachtin N [13]. Other significant Limonoids found in neem include Valassin, Salanin, Gedunin, Nimbidin, Nimbolides, and Nimbin. Notably, Azadirachtin, Salannin, Meliantriol, and Nimbin are considered the top four Limonoid compounds. Limonoids, with their insecticidal and pesticidal properties, serve various purposes such as antifeedants, repulsives, growth inhibitors, attractants, chemosterilants, and insecticides. Neem oil extracted from *Azadirachta indica* has demonstrated promising applications, including its effectiveness in treating aging symptoms, post-surgical scalp wounds, and acne, and exhibiting antifungal and antibacterial activities [13,14]. Additionally, neem oil has been recognized for its role in reducing scars, healing wounds, and minimizing warts and moles, highlighting its diverse therapeutic uses. These properties of *Azadirachta indica* underscore its significance as a valuable source of bioactive compounds with applications in skin care, wound healing, and pest management [13,15,16].

Figure 1. *Neem powder*

b) Multani Mitti

Multani Mitti, commonly known as Fuller's Earth, proves to be a versatile skincare ingredient with a multitude of benefits. Its transformative effects on the skin include reducing pore size, eliminating blackheads and whiteheads, and fading freckles and sunburns, contributing to a smoother and more even complexion. The natural cleansing properties of Multani Mitti make it effective in detoxifying the skin, removing impurities and excess oil, while simultaneously enhancing blood circulation for a healthier complexion and a radiant glow. With its richness in essential nutrients, Multani Mitti not only combats acne but also diminishes blemishes, resulting in clearer and more evenly toned skin. The presence of magnesium chloride further amplifies its skin-friendly attributes [17,18]. Incorporating Multani Mitti into a skincare routine provides a holistic approach to achieving and maintaining radiant and healthy skin, making it a valued and versatile ingredient in various beauty treatments. Whether addressing specific skin concerns or promoting overall skin well-being, Multani Mitti stands out as a natural and effective solution for those seeking a skincare regimen rooted in beneficial properties [17-19].

Figure 2. *Multani mitti*

c) Turmeric Powder

Turmeric, scientifically identified as *Curcuma longa* and classified under the Zingiberaceae family within the genus Curcuma, plays a pivotal role in skincare preparations due to its diverse and beneficial properties. Recognized for its blood-purifying attributes and antibacterial effects, turmeric actively supports wound healing and addresses skin conditions stemming from blood impurities [20]. Its versatility extends to anti-inflammatory and anti-allergic properties, making it a valuable asset in skincare routines dedicated to soothing and calming the skin. Enriched with phytoconstituents, notably terpenoids, turmeric becomes a potent agent in enhancing skin tone, providing a natural radiance, and contributing to overall skin health [20,21]. Noteworthy for its anti-aging benefits, turmeric effectively reduces the appearance of wrinkles and promotes skin suppleness, aligning with the desire for youthful and vibrant skin. Additionally, turmeric comprehensive skincare benefits encompass addressing pigmentation issues, uneven skin tone, and dullness, making it a versatile solution for achieving a clearer and more even complexion [22]. By integrating turmeric into skincare regimens, individuals can harness its multifaceted properties to promote healthy, radiant skin. Whether utilized for wound healing, anti-inflammatory effects, or anti-aging benefits, turmeric emerges as a natural and effective ingredient, enriching skincare formulations and contributing to the overall well-being of the skin [22,23].

Figure 3. *Turmeric powder*

d) Aloe Vera

Aloe vera, scientifically known as *Aloe barbadensis* and categorized under the Liliaceae family within the genus Aloe, stands out for its remarkable skincare properties. Renowned for its anti-microbial attributes, aloe vera proves to be an exceptional remedy for treating acne and pimples, providing effective and natural solutions for individuals dealing with these common skin issues [24,25]. In addition to its acne-fighting capabilities, aloe vera emerges as a fantastic moisturizer for the skin. Its hydrating properties make it a valuable ingredient for maintaining skin health and preventing dryness. Aloe vera powder, containing a plethora of essential nutrients, further enhances its skincare benefits. Components such as glycerin, sodium palmate, sodium carbonate, sodium palm kemelate, and sorbitol contribute to the richness of aloe vera powder, underscoring its potential to nourish and revitalize the skin [25-27]. Incorporating aloe vera into skincare routines harnesses its natural goodness, offering a holistic approach to skincare and promoting a healthy and rejuvenated complexion [26].

Figure 4. *Aloe Vera powder*

e) Papaya

Belonging to the Kingdom Plantae, Order Brassicales, Family Caricaceae, Genus Carica, and species *C. papaya*, the papaya plant is scientifically named *Carica papaya*. Commonly known as papaya, it is also referred to as pawpaw or papaw. This tropical fruit not only holds culinary significance but also offers a range of benefits for skincare and health. Papaya is renowned for its role in exfoliation, aiding in the removal of dead skin cells and promoting a smoother complexion. Additionally, it is recognized for its potential in preventing hair loss, making it a valuable ingredient in hair care routines. The fruit's properties extend to treating sore and cracked heels, contributing to overall foot health. Moreover, papaya is known for its skin-lightening effects, offering a natural solution for individuals seeking to enhance and brighten their skin tone. Incorporating papaya into skincare and beauty regimens showcases its versatility and effectiveness in addressing various concerns. Whether used in facial masks, hair treatments, or foot care products, papaya stands out as a natural and beneficial ingredient, aligning with the desire for holistic and nourishing solutions for skin and hair health [28].

Figure 5. *Papaya powder*

e) Liquorice

The botanical name for liquorice is Glycyrrhiza glabra Linn, and it belongs to the family Leguminosae under the genus Glycyrrhiza. A key component of Glycyrrhiza glabra is glycyrrhizin, also known as glycyrrhizic acid, which is a terpenoid saponin. This compound is found in the form of potassium and calcium salts in glycyrrhizinic acid, serving as the primary constituent of liquorice. Glycyrrhizinic acid further breaks down into glycyrrhetinic acid, also known as glyrrhetic acid, exhibiting a triterpenoid structure. In addition to glycyrrhizin, another noteworthy chemical component found in liquorice is flavonoids. These flavonoids contribute to the anti-gastric impact of liquorice, making them beneficial for the treatment of peptic ulcers. The multifaceted chemical composition of Glycyrrhiza glabra underscores its medicinal properties, making it a valuable ingredient with applications in traditional medicine and various therapeutic formulations [29-30].

Figure 6. *Liquorice powder*

f) Rose water

Rose water is a floral water derived from the distillation of rose petals, primarily from the Damask rose (*Rosa damascena*) or other species of roses. This fragrant liquid has been used for centuries for its versatile benefits in skincare, culinary arts, and aromatherapy. In skincare, rose water is renowned for its mild astringent properties, making it a popular natural toner for the skin. It helps balance the skin's pH, tighten pores, and remove residual impurities. The soothing and anti-inflammatory properties of rose water also make it a gentle solution for calming irritated skin and reducing redness. Beyond skincare, rose water is a culinary ingredient, adding a delicate floral flavor to various dishes and beverages. It has been used in Middle Eastern and South Asian cuisines for its unique aroma and taste. In aromatherapy, the pleasant scent of rose water is believed to have mood-enhancing properties, promoting relaxation, and reducing stress. Many people use rose water as a natural fragrance or as a component in various beauty products [31-32].

Figure 7. *Rose water*

Method of Preparation

Formulation of Herbal Face Pack

All the required herbal powders for the face pack preparation were weighed separately by using digital balance as mentioned in Table 1. The powders are now mixed thoroughly. prepared a mixture of herbal powders triturated to obtain uniform drug powder of face pack. The mixture was passed through sieve no #44. The prepared face pack powder was packed into a self-sealable polyethylene bag, labeled, and used for further studies [33].

Sl. No.	Ingredients (In powder form)	Quantity 10g
1	Neem	1g
2	Multani mitti	2g
3	Turmeric powder	3g
4	Aloe vera	2g
5	Papaya	1g
6	Liquorice	1g
7	Rose water	Q.S

Table 1. ***Ingredients for Herbal Face Pack***

Figure 8. *Formulated face pack*

The procedure of face pack application

Figure 9. *Face pack*

Method of Evaluation

Organoleptic Evaluation: The organoleptic parameters include its appearance, color, odor, texture, grittiness, and washability, which were measured manually for its physical properties [34,35].

Physicochemical Evaluation: Physicochemical parameters were determined, including the determination of moisture content, extractive values, pH, and ash values [36,37].

1. **Determination of moisture content**: Moisture content is important for the plant drugs because lack of drying may lead to possible enzymatic deterioration of the active principles.
   • Moisture content was by loss on drying (LOD). Weigh precisely 3gms of the powder drug take in a weighed petri dish and position it in a hot air oven at 100-108ºC. It was weighed until constant weight was obtained.[38].
2. **Determination of pH**: It is the measurement of acidity or alkalinity of the product measured on a scale of 0-14. pH of the formulated face pack in rose water was found [38].
3. **Determination of Ash values**: The residue remaining after complete incineration is the ash content of the product. Ash value is a principle to justice for the identity or purity of the drug. A high ash value is skimpy of contamination, substitution, adulteration, or carelessness in the preparation of the product [39]. Ash values can be determined by as follows:

Total Ash value: Total ash value is useful for sensing low-grade, fatigued products and also useful for detecting additional sandy, earthy matter with drug. About 2-4gm of the prepared sample was placed in an earlier ignited and tared crucible. The material was spread squarely on the crucible and ignited by gradually cumulative heat until it was white i.e. free from carbon. It was then cooled in a desiccator and weighed. The percentage total ash was calculated concerning the air-dried sample [39].

Acid insoluble Ash value: Used to determine the earthy matter. To the crucible containing total

ash, 25ml of HCl was added and bound with a watch glass. Boiled gently for 5min. The watch glass was wetted with 5ml hot water and added to the crucible. The insoluble matter was collected on an ashless filter paper and washed with hot water until it was neutral. The filter paper containing the insoluble matter was moved to the original crucible, dried on a hot plate, and ignited to persistent weight. Allowed to cool in a desiccator for 30min and weighed. Percentage acid insoluble ash was calculated in reference to air-dried sample [39].

Water soluble ash value: It is the alteration in weight between total ash and residue after treatment of total ash with water. It is used to differentiate either the material is exhausted by water or not. To the crucible containing total ash, 25ml water was added and boiled for 5min. The insoluble matter was collected on an ashless filter paper. Washed with hot water and blasted in a crucible for 15min at a temperature not incomparable 450ºC. Cooled and weighed. Percentage water soluble ash was calculated in reference to air dried sample [39].

Rheological Evaluation

It gives an overall idea about the visco elastic flow behaviour of the product. Physical parameters like angle of repose, tapped density, bulk density, Hausner's ratio and Carr's index were observed and calculated for the formulation [40].

a) Angle of repose: The angle of repose or critical angle of repose, of a granular material is the sharpest angle of descent or dip relative to the horizontal plane to which a material can be stacked without stumping. It is important for the plan of processing, storage and conveying systems of particulate materials. It is also useful to quantify the flow properties of powder because it influences cohesion among the different particles. The fixed funnel cone method employs the calculation of height (H) above a paper that is placed on a horizontal surface. The formulated pack was carefully poured through the funnel till the peak of the conical heap just touched the tip of the funnel. Here 'R' denotes the radius of the conical heap. The equation for calculating angle of repose(a) is, a=tan−1(1/HR) [40,41].
b) Tapped Density: The tapped density is an improved bulk density attained after mechanically tapping a graduated measuring cylinder containing powder sample. The tap density of a powder can be used to expect both flow properties and its compressibility. The volume of packaging can be determined in a graduated cylinder. 25gms of weighed formulation powder was taken and slowly added to the cylinder with the help of a funnel. The initial volume was observed firstly and the sample was then tapped until no extra volume reduction occurred. The value obtained after tapping was noted. The equation for calculating the tapped density is, Tapped density= Weight of (g)/Tapped volume (ml) [41,42].
c) Bulk Density: The bulk density value contains the volume of all the pores within the powder sample. The term bulk density refers to method cast-off to indicate a packaging of particles or granules. 25gms of weighed powder was taken and gradually poured into the graduated cylinder. The volume engaged by the powder was noted. The formula for calculating bulk density is, D = M/V Where, D = bulk density, M = mass of particles, and V = total volume occupied by them [41-42].
d) Hausner's Ratio: Hausner's ratio is connected to interparticle friction and as such can be used to predict the powder flow properties. The equation for measuring the Hausner's ratio is, Hausner's ratio = tapped desity/bulk density [40,42].
e) Carr's Index: Carr's index is an additional indirect method of measuring the powder flow from bulk density. It is directly related to the relative flow rate cohesiveness and particle size. It is a simple, fast, and famous method of presiding powder flow characters. The equation for measuring it is % compressibility = (tapped densit−bulk density)/ (tapped) x 100% [42].
f) Particle size: Particle size is a parameter, which affect numerous properties like spreadability, grittiness, etc. Particle size was determined by microscopy method according to the standard procedure [40,42].

Results

Following evaluation parameters were performed to ensure dominance of prepared face pack.

Organoleptic evaluation

Herbal face pack was evaluated for organoleptic parameters displayed in the Table 2. The colour of prepared formulation was brown. The odour of prepared formulation was pleasant and good acceptable which is necessary to cosmetic formulations.

Sl. No.	Parameter	Observation
1	Colour	Brown
2	Odour	Pleasant
3	Appearance	Smooth, fine
4	Texture	Fine
5	Smoothness	Smooth

Table 2. ***Organoleptic Evaluation***

Herbal face pack was evaluated for powder property. showed in **Table 3**. Rheological findings defensible the flow properties of herbal face pack. It was found to be free flowing and non- sticky in nature.

Sl. No.	Parameter	Observation
1	Bulk density	0.45g/ml
2	Tapped density	0.58g/ml
3	Angle of repose	31^0
4	Hausner’s ratio	1.28
5	Carr’s index	22.41%
6	Particle size	22.66

Table 3. ***Rheological Evaluation***

Observation: Rheological findings defensible the flow properties of the face pack as it was found to be free flowing and nonsticky in nature. The results proved that the formulation was constant in all aspects.

Physiochemical evaluation

Herbal face pack was evaluated for physiochemical parameters showed in Table 4. The pH of the formulation was found to be 6. The moisture content was inside limit.

Sl.No.	Parameter	Observation
1	pH	6.51
2	Total ash value	2.13%
3	Acid insoluble ash value	0.95%
4	Water soluble ash value	1.86%

Table 4. ***Physiochemical evaluation***

Observation: Moisture content value obviously indicated that the formulation was hygroscopic in nature. Extractive values and ash values were found within the restrictions. pH was found neutral to suit the requirements of all skin types.

Irritancy test

The prepared herbal face was subjected for irritancy test and the results are displayed in Table 5. The herbal face pack formulation doesn't display any sigh of irritation, redness and puffiness during irritancy studies.

Sl. No	Parameter	Observation
1	Irritation	Nil
2	Redness	Nil
3	Swelling	Nil
4	Photo irritation	No irritation, No swelling, No redness

Table 5. ***Irritancy test***

Observation: Irritancy test displayed negative results for irritancy, redness, swelling and photo irritancy, as the herbals in their natural form without accumulation of chemicals were found to be well-matched with the skin proteins.

Stability studies

The prepared herbal face pack was exposed for stability studies and the results are displayed in Table 6. No change in colour, odour, texture, smoothness and pH was observed.

Sl. No	Parameter	Room temperature	40 ^{0}
1	Colour	No change	No change
2	Odour	No change	No change
3	Texture	Fine	Fine
4	Smoothness	Smooth	Smooth
5	pH	6.51	6.51

Table 6. ***Stability testing***

Observation: Stability tests accomplished at different temperatures over a period of one month discovered the inert nature of the face pack in the terms of color, odor, appearance, texture and pH.

Discussion

The use of herbal face packs is well-documented for their multifaceted benefits in skincare. These products are designed to stimulate blood circulation, rejuvenate muscles, maintain skin elasticity, and effectively eliminate impurities from skin pores [3]. Additionally, they are known to provide nourishment to the skin, reduce acne, pimples, wrinkles, and dark circles, ultimately enhancing the smoothness and glow of the skin [44-45].

One of the distinctive advantages of herbal cosmetics, including face packs, is their non-toxic nature, which mitigates allergic reactions and is attributed to the proven efficacy of natural ingredients. This characteristic makes them a preferred choice for individuals seeking skincare solutions with reduced potential for adverse reactions [46,47].

The formulation and evaluation of herbal face packs are tailored to address specific skincare objectives, encompassing the enhancement of blood circulation, skin rejuvenation, elasticity maintenance, and thorough pore cleansing [48,49]. Furthermore, these products are customized to cater to individualized skincare needs, incorporating moisturizing, cleansing, toning, and rejuvenating properties, with specialized formulations targeting diverse skin types and age groups[50].

The evaluation process for herbal face packs involves meticulous examinations encompassing organoleptic, rheological, physiochemical, irritancy, and stability parameters. The outcomes of such evaluations have consistently revealed commendable properties, including the absence of skin irritation and sustained consistency even under conditions of stability storage.

This research significantly contributes to the domain of natural and effective cosmetic preparations by underscoring the importance of utilizing readily available ingredients to yield products endowed with commendable properties. The corroborated efficacy of the prepared herbal face pack positions it as a reliable and user-friendly cosmetic solution suitable for a diverse array of skin types. The positive attributes identified in this study hold promise for advancing skincare practices, fostering skin health, and augmenting overall aesthetic appearance.

Conclusion

The well-evaluated herbal face pack, blending natural ingredients seamlessly, exhibits pleasing attributes like a delightful scent and smooth texture. With consistent flow, non-stickiness, and sustained stability, it emerges as a reliable cosmetic choice. This study highlights the value of incorporating traditional herbal wisdom for modern skincare, offering an effective solution for radiant and resilient skin.

Acknowledgment: I would like to thank the Staff and Management of Srinivas College of Pharmacy for their Support.

Conflict of Interest: None.

Ethical Statement: Not applicable.

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