INTERNATIONAL JOURNAL OF PHARMACEUTICAL SCIENCES
[ISSN: 0975-4725; CODEN(USA): IJPS00]
Journal Homepage: https://www.ijpsjournal.com

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Research Article

Research Article on Formulation and Evaluation of Peel Off Mask Using Fenugreek Seeds

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ARTICLE INFO

Published: 26 April. 2025
Keywords:
Anti-Aging, Peel Off Mask, Anti-Inflammatory, Anti-Oxidant, Fenugreek, Skin Rejuvenation.
DOI:
10.5281/zenodo.15287366

ABSTRACT

This study aims to formulate and evaluate a peel-off facial mask using fenugreek (Trigonella foenum-graecum) as a primary active ingredient. Fenugreek seeds possess potent anti- inflammatory, antibacterial, and antioxidant properties, making them suitable for topical application in skincare products. The mask formulation was evaluated for its physicochemical properties, skin compatibility, efficacy in oil and impurity removal, and user satisfaction. Results suggest that fenugreek-based peel-off masks have significant potential in improving skin texture and reducing acne without causing irritation. . We have made these formulation using PVA, preservative, humectant, fenugreek, SLS, etc. In this study, F1, F2, F3 formulation batches of peel off mask were prepared and evaluated by checking its viscosity, pH, spreadability, color, odor, etc. After doing evaluation of these batches, batch F3 was showing optimum result and safe for skin radiance and rejuvenation. Therefore, these fenugreek-based peel off mask would be a good alternative instead of other peel off gel mask.

INTRODUCTION

Herbal cosmetics are defined as the beauty products which pass desirable physiological activity such as healing, soothing, appearance, enhancing skin glow and conditioning properties because of herbal ingredients. These herbal cosmetics that can repair revitalize and protect skin. One of the most common disorders found among youngsters usually 18-25 years of age is Acne, aging [1]. As we get older, the skin will experience an aging process. It is caused by various factors from within and outside the body. Factors from outside the body, such as exposure to sunlight, can cause skin damage. The process of damaging the skin will appear dull and wrinkled, the skin will age faster, and black spots will appear. Exposure to sunlight from ultra violet rays and it is a components that contributes to various diseases of skin [2]. Peel-off mask have been

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Relevant conflicts of interest/financial disclosures: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

developed especially for cosmetic treatment which is used in beauty salon. Peel-off mask is applied directly on the skin because the formulation is in ready to use form. When it applied on skin and it slowly hardens, moisture collects in the horny layer under the elastic mask film, through which air and water is not allowed to permeate. At the same time,the main active substances and other are able to penetrate well into the skin and intensively supply the substances within a short space of time[3]. Skin is a very sensitive and protective layer of the human body, which is exposed to environmental pollution hence, it is very essential to protect the skin. Therefore, it is necessary to take care of facial skin to overcome the problem associated with it, one of which is taking care of facial skin by using face masks. Peel-off mask is applied as a liquid film that thinly spreads with fingers on the face and peels-off as a thin plasticized film after complete drying without leaving any residues. It can repair, refresh, and tighten facial skin, provides deep pore cleansing and skin debris removal. Peel-off can also provide slight moisturizing action and enhances the occlusive effect, improving blood circulation [4]. UV light is oxidative because it can induce oxidative stress by producing free radicals and reactive oxygen species (ROS). The presence of ROS that accumulates in the skin is believed to be an inducer of cell damage, premature aging, erythema, and skin cancer. Antioxidants can inhibit oxidation or radical reactions caused by oxygen or peroxide so that these free radicals can be suppressed. Currently, the use of synthetic antioxidants used in industry is being avoided due to the health risks and toxicity. Therefore, the use of antioxidants from natural sources can be formulated to prevent oxidation to replace synthetic antioxidants [2]. The use of cosmetics containing antioxidant compounds can prevent premature aging due to free radicals. Various types of skin care cosmetic preparations have been circulating in the market in attractive dosage forms and packaging, including the peel-off gel mask. Peel-off facial masks are unique in that they form a film after the mask is dry and provide several benefits including easy use, improving the appearance of facial skin by providing a skin tightening effect, and cleansing the skin of impurities. Anti-aging are preparations that function to inhibit the process of damage to the skin (degenerative), and to inhibit the appearance of signs of aging on the skin. One type of preparation that can be used in anti-aging products is a peel-off mask preparation[2].

1.1 Anatomy of Skin:

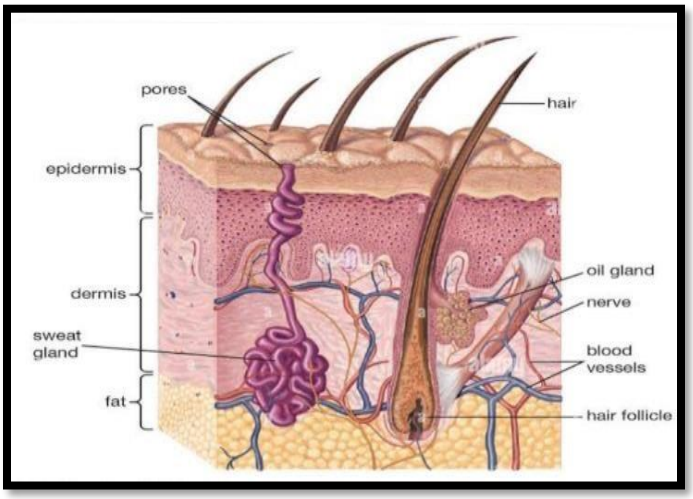


Figure 1: Longitudinal Section Of Skin

Skin, also known as the integumetary system, is the largest organ in our body, covering the entire external surface; measuring up to 2m and weighing approximately 4.5−5kg in an average adult (or about 12−15% of total adult body weight).Skin is the first physical barrier protecting us from the external environment. Skin is made of three layers: the outermost layer the epidermis, the structure below it, the dermis and the structure below the dermis known as the subcutaneous tissue[5].

A. Epidermis: Consists of epithelial cells. Among these cells, both living cells and dead cells can be found. These new cells at the bottom of epidermis divide fast and push the older cells upward. The epidermis does not have any direct source of blood veins to provide nutrition. It takes its nutrients from the diffusion of necessary molecules from a rich vascular network in the underlying dermis. Epidermal cells are connected very strongly by desmosomes.

- **Desmosomes** are in contact with the intracellular keratin filmates. Keratin filmates produce keratin.Keratin cells accumulate and cross lined l cells in the cytosol during their maturation. Afterward when the older cells die, this network of keratin fibroses remains and provides a tough and hard protective layer in epidermis, called protective keratinized layer. This layer is waterproof and airtight. It prevents most substances to enter the body or leave from the body. In diseased skin, particularly burns, epidermis is destroyed causing potential loss of body fluid and an increase in susceptibility to microbial infections, leading to fatal consequences untreated Cell types that exist in the epidermis are

- **Keratinocytes:**These are the main cell types in epidermis (95% of cells).

- **Melanocytes:** These are the pigment producer cells and found in the basal layer of epidermis.

- **Langerhans cells:** These cells are important immunological cells and can be found in the mid dermis as well Merkel cells; these cells are found in the basal layer of epidermis and are one part of amine precursor and decarboxylation system

Epidermis consists of five layers, namely from inside to outside; stratum germinativum (basal layer) stratum spinosum, stratum granulosum, stratum lucidum and stratum corneum. Stratum corneum is the outer most layer of epidermis and has a thickness of 10-20 µm when it is dry and 40 µm when it is hydrated and becomes swollen. Stratum corneum has a structure of “bricks and mortar” arrangement. In this model the keratin rich corneocytes (bricks) are sitting in the intracellular lipid rich matrix Corneocytes (the bricks) create 85 % of stratum corneum and intracellular lipids (15%) are arranged in 15-20 layers. Stratum corneum consists of 70% proteins, 15% lipids and only 15% water. Molecules can basically permeate through skin by two different pathways. The first pathway is called transapendagle route. In this route the molecules should permeate through skin by permeation through sweat glands and across the hair follicles. The number of molecules which can penetrate through this pathway is very limited. The second pathway of penetration through skin is the trans epidermal pathway. In this pathway molecules should pass through stratum corneum as multi-layered barrier. This pathway has two micro pathways; the intracellular micro pathway and the transcellular micro pathway [6].

B. Dermis:

Dermis is positioned under epidermis and is characterized by lots of elastin fibres that provide the stretching ability as well as lots of collagen that provides the strength to the skin. Blood vessels found in dermis provide nutrients for both dermis and epidermis. Dermis also plays a major role in temperature regulation. Nerves present there are responsible for pressure and pain sensations34. Dermis has a thickness of 3-5 mm. In addition to elastin fibres, blood vessels an nerves, an interfibrillar gel of glycosaminoglycan, salt, water, lymphatic cells and sweet glands are parts of dermis.

Cell types found in dermis are:

- Fibroblasts: collagen producing cells
- Macrophages: scavenger cells

❖ **Mast cells:** responsible for immunological reactions and interactions with eosinophils 36-Dermis plays an important role as connection to other skin layers also. Changes in the metabolism in dermis can influence growth integrity of the epidermis, hair follicles and skin glands [7].

C. Hypodermis: The hypodermis is the subcutaneous layer lying below the dermis; it consists largely of fat. It provides the main structural support for the skin, as well as insulating the body from cold and aiding shock absorption. It is interlaced with blood vessels and nerves [8].

1.2 Function and Physiology Of Skin:[9]

'Beauty is skin deep', is a common adage. The health and colour status of the skin not only reflects its health status but skin as an organ also has a number of vital roles in the physiology of the body. Many significant functions of the skin are mentioned below:-

- Protection
- Sensation
- Regulation of Body Temperature
- Excretion
- Immunity
- Blood Reservoir
- Drug Delivery route

1.3 Common Disorder of The Skin:[10]

As we mentioned earlier that cosmetics are basically for beautification and masking, prevention or overcoming common disorder, it is necessary to have knowledge of common disorder of the skin. Common disorder of skin can be classified as follows:

[A] Pigmentary disorder

- Hyperpigmentation
- Hypopigmentation

[B] Disorder of sebaceous and sweat glands

[C] Skin scaling disorder

- Psoriasis
- Dandruff
- Effects of aging on skin

1.4 Aging:[11]

Aging is a lifelong process of growing up and growing old. It begins at conception and ends with death. So, in this sense, we are all aging from the time of birth. In our younger years, aging is called by other names. For example, in our infant years, we call aging "growth and development." In our teenage and young adult years, we refer to aging as "maturation." After age 30, our physical body begins to wear out and our functioning declines. This is called "senescence."

- Aging includes three parts:

A. Growth and development: In our infant years
B. Maturation: In our teenage and young adult years and
C. Senescence: After age 30. So, aging should be explained based on these three parts.

- **Types Of Aging:**

1.Chronological Aging
2.Biological Aging
3.Psychological Aging
4.Social Aging
5.Functional Aging

1.5 Anti-Aging:[12]

Skin aging is characterized by features such rough-textured appearance. This aging process is accompanied with phenotypic changes in cutaneous cells as well as structural and functional changes in extracellular matrix components such as collagens and elastin. Cutaneous aging is induced by both intrinsic and extrinsic factors. Intrinsic aging is an inevitable physiological process that results in thin, dry skin, fine wrinkles, and gradual dermal atrophy, while extrinsic aging is engendered by external environment factors such as air pollution, smoking, poor nutrition, and sun exposure, resulting in coarse wrinkles, loss of elasticity, laxity, and rough-textured appearance. The decrease of moisture content of the skin will lead to the decine of protease activity, causing the skin peeling, so moisture is an essential part of anti-aging. Moisturizing agents currently used in anti-aging cosmetics mainly include: pyrrolidone, sorbitol, glycerol, polyethylene glycol, cholesterol and, hyaluronic acid and other. The photoaging and natural aging together, cause the skin barrier degradation and the formation of wrinkles and pigmentation.

1.6 Peel Off Mask Gel: [13]

Peel-off facial masks gel are known for their unique characteristics inherent to the use of film-forming polymers that, after complete drying, create a very cohesive plastic layer allowing for the manual removal of the product without leaving any residue. In addition, the firming action of these formulations leads to a sensation of clean skin. Moreover, it also provides slight moisturizing action and enhances the effect of the active compounds on the epithelium, especially as a result of the occlusive effect caused by the plastic polymeric layer Peel-off masks work by penetrating deep into your pores and gently removing the dead cells in the outermost layer of your skin, along with any impurities sitting over it. Removing dirt, bacteria, debris, and overall impurity is essential to have balanced, toned, healthier skin. This is where peel-off masks shine.

1.6.1 Types of Facial mask divided into four groups:[4]

1. Peel off: Applied to the skin, allowed to dry for 15 minutes then peeled off as one continuous sheet. They are ideal to provide a purifying and renewing perception as well as action. They effectively remove the very outer layer of old, dead skin cells.

2. Sheet: Sheet masks are the most versatile because they are effective serum formulations with actives added to achieve the product purpose, e.g: • Anti-sebum • Whitening • Anti-aging [14].

3. Charcoal/clay: These types of masks are essential cream cleansers with the charcoal or clay added. This also helps build the viscosity [15].

4. Leave-on: These kinds of masks come in crème-gel or cream forms that are extremely moisturizing. They are applied to the skin, kept on for 15 to 30 minutes (or overnight), and then the remaining product is rubbed in. They are meant to

deliver more moisture and emollience than regular creams, hence they have greater lipid and humectant content[16].



Figure 2: Types Of Peel Off Mask

1.7 What Is The Right Way To Use A Peel-Off Mask [17]

1.Start with clean, dry skin. Ensure that your face is free from makeup, dirt, and oil.
2.Open the peel-off mask tube and squeeze out an adequate amount of product onto your fingertips.
3.Apply the mask evenly to your face, avoiding the eye area.
4.Allow the mask to dry completely. This usually takes around 15-20 minutes.
5.Once the mask is fully dry, gently start peeling it off from the edges. Start from the bottom and peel upward in an upward motion.
6.Rinse off any residue with lukewarm water and pat your skin dry.



Figure 3: Peel Off Face Mask

1.8 Ideal Properties:[18]

- It should be nontoxic and non-irritant.
- They should be physically and chemically inert.
- They should have compatible with skin pH.

- After applying it should be peel off within 15 min.
- They should be non-sensitizing.

1.9 Advantage of Peel Off Gel Mask [19,20]

- It repairs and rejuvenate skin tone, gives a health hydrated glow to the skin.
- It also helps to tone the skin and treat the wrinkles.
- Significantly improved skin profile is rapidly achieved.
- Suitable for all types of skin.
- It beneficial to remove blackheads, dead skin.



Figure 4: Advantages Of Peel Off Mask

1.10 Do or Don't Peel Off Mask:



Figure 5: Do Or Don't of Peel Off Mask

2. Literature Review:

1. **Yogesh yewale, *et.al* (2024) :**This research article presents the formulation and evaluation of a novel herbal peel-off mask designed to rejuvenate and enhance skin health. The formulation integrates a blend of natural ingredients including Fenugreek, charcoal, orange peel powder, and coconut oil, along with additives such as Carbopol, polyvinyl alcohol, glycerine, methyl paraben, propyl paraben, rose water, and triethanolamine. The study begins with the meticulous selection of each ingredient for its individual therapeutic properties and compatibility within the formulation. Subsequently, various formulations are prepared and evaluated for their physical characteristics, such as consistency, spread ability, and homogeneity[21].
2. **Suraj Rajage, *et.al* (2024):**This study focuses on the formulation and evaluation of a novel herbal peel-off face mask using bean fruit powder and avarmpoo flower extract. The aim is to harness the potential synergistic effects of these natural ingredients in providing skin benefits, such as antiacne, moisturizing, smoothening, removal of dead skin, and removal of dirt[14].
3. **Sadhana B.Mahajan, *et.al* (2024):**Fenugreek is known for its anti-aging properties and is used to reduce blemishes and dark circles. Neem is known for its anti-fungal characteristics and aid in the lightning of acne scars. Saffron is used for skin brightening and skin moisturizing. Turmeric is used as an anti-inflammatory and antioxidant. In this research, multiple herbs are used for the formulation of peel-off mask. The extract of fenugreek, neem, turmeric and saffron were used and evaluation parameter has been performed to meet the requirements of ideal peel-off mask formulation[22].
4. **Shreya Lokhande, *et.al* (2024):** According to this investigation, the formulation exhibits good spreadability and is very stable at room temperature, which helps to ensure patient comfort when using the peel-off mask. All skin types can use the peel-off mask with good compatibility, as it does not cause irritation or allergies. On human skin, the peel-off masks demonstrated good peel-off qualities with no itchiness or irritation and no residue. The study on herbal peel off mask verified that they eliminate dead skin cells, pigmentation, excess facial hair,give skin a glow,unclog pores,and replenish moisture and hydration. The adsorption capacity of this peel-off mask is its key feature. Both organic and inorganic pollutants are eliminated, along with a wide range of other particles and contaminations [20].
5. **Prakash Nathaniel Kumar Sarella, *et.al* (2023):** Emulgels represent an exciting new class of delivery vehicles, and this review explores their potential and future prospects. Despite their promise, emulgels have not been extensively reviewed in the literature. This article aims to provide a comprehensive overview of emulgels, focusing on their formulation, characterization, and applications[23].
6. **S.priyanka, *et.al* (2023):**In this article, we have formulated activated charcoal peel off mask and also evaluated it by using different test methods. The formulation showed amazing results after its application. The use of these face masks include cleansing, moisturizing and nourishing facial skin. This peel-off masks have the advantage of being practical because of their peeling off property and it lift like an elastic membrane[24].
7. **M.Krishna Pillai, *et.al* (2023):**In our research, herbal ingredients such as Neem, Turmeric, Green tea, Rose petal, Cabbage, Manjishta were used due to their Anti-acne properties. The peel-off mask can be used as the remedy to treat facial skin related problems

such as acne, dark skin, wrinkles etc. Most of the peel-off masks are prepared by polymers which can form thin layer on skin. They are available in gel form. Dead skin can be removed by applying peel-off mask. In present study we found that the formulation was much more stable at room temperature and had good flow properties. This formulation shows compatibility with all types of skin and shows no irritation effect[25].

8. **Pooja Birade, *et.al* (2023):**Peel-off masks have gained widespread popularity and preference due to their convenient application. The gel-based variant is particularly favored for its painless and moisturizing sensation during use. A peel-off mask is a type of application gently applied to the facial skin surface and peeled off after a few minutes, serving as a remedy for various facial skin issues such as wrinkles, aging, acne, and aiding in unclogging pores blocked by dust. The choice of a gel-based formulation enhances ease of use and ensures better drug release. Peel-off gel masks formulated with natural ingredients like green tea, fenugreek, lemon powder, and honey are known for their effective, stable, and safe properties. These masks are designed to address skin concerns and are available in a gel form. The removal of dead skin is facilitated by the application of peel-off masks. The current study focuses on the development and evaluation of a topical peel-off gel mask containing a blend of herbal powders (fenugreek, green tea, lemon, and honey) along with chemical reagents like polymers (polyvinyl alcohol)[26].
9. **Gagan K.S, *et.al* (2023):**The present study I found that the formulation was much stable in room temperature and showing good spreadability which people makes comfortable during application. This peel off mask good compatibility with all type of skin and showing no irritation or allergies.This peel off mask show a good peel off property on human skin without any irritation and itching and without leaving any residue.The study of herbal peel off mask confirmed that it can removed dead cells ,pigmentation ,provide glow to skin,clean the pores.And also provide moisturize and hydrate the skin.The preparation ws found to be stable,and it is compatible with all type skin and show good spreadability,the preparation helps in removing dirt from skin surface and protect skin surface and protect from external environment[27].
10. **Tina Raju, *et.al* (2022)** :The aim of this research work was to design formulate and optimization peel off face mask for the treatment of Rosacea. Among the 4 different types of rosacea, this research work aims to develop a user-friendly symptomatic treatment for the types which affect the facial skin. The peel off mask was formulated using 4%, 6%, 8%, 10% and 12% polyvinyl alcohol (PVA) as a gelling agent and the main ingredient was chamomile oil. Evaluation of peel off mask included physical characteristics (organoleptic properties, homogeneity, viscosity, spread ability, film drying time), chemical characteristics (pH value), stability and antimicrobial activity. The variation in PVA affects the pH value, viscosity and film drying time significantly. Stability test showed that all peel off mask show no significant changes at room temperature with and without exposure to sunlight and at low temperature. Variation in the concentration of PVA in the formula affected the physical, chemical characteristic and antimicrobial activity of the chamomile oil peel off gel face mask significantly. The preparation using 10% PVA was found to be the best formula with optimal results and better antimicrobial action[28].

11. **Siti Nuurul Huda Mohammad Azmin, *et.al* (2022):** Formulated and evaluated condition for peel off face mask gel from banana peels and mulberry extract ,The optimum conditions for the formulation were found at 15% polyvinyl alcohol and 0% of carbomer, as the tested properties (drying time, colour, pH and elasticity) were at the best values. The properties of optimum formulation verified that it matches with the commercial peel-off face mask. This research proves that agricultural waste such as banana peels can be utilized to be an advantageous cosmetic product with good properties performance. However, the study's extension should be conducted on the stability, microbial and sensory evaluations of the formulated peel-off mask to ensure that it is equivalent to the existing commercial product[29].
12. **Miss.Telange-Patil P.V, *et.al* (2021):**The objective of this work is to formulate and evaluate a herbal face pack for acne and dull skin from herbal ingredients: orange peel, sandalwood, multani mitti, aloe Vera, turmeric were collected from local market. The ingredient have been reported in this research paper having good anti-inflammatory , anti-oxidants and anti-microbial activity. Herbal face masks are used to stimulate blood circulation, rejuvenates them muscle and help to maintain the elasticity of the skin and removes dirt from skin pores. Thus in the present work, we found good properties for the face mask[30].
13. **Syamsuri syakari, *et.al* (2021):**The goal of this study is to see how different concentrations of PVA and HPMC as film-forming and gelling agents affect the quality of peel-off gel masks made from ethanol extract of yarrow (Achillea millefolium) as an antiaging ingredient[31].
14. **Yenni Pushpita tanjumg,*et.al.*(2021):**The aim of these study was to obtain peel off gel facial mask preparation from arabica coffee fruit peel extract that meets the requirement and to determine the antioxidant activity of arabica coffee fruit peel extract and peel off gel mask preparation[32].
15. **P.K.Mane (2021):**Formulated and evaluated the topical peel-off gel mask containing a single herbal powdered drug i.e., Fenugreek and other chemical reagents such as polymers, e.g. polyvinyl alcohol (PVA), Carbopol and Sodium . Also, other chemicals like triethanolamine, talcum powder and preservatives are used in the gel formulation. Three formulation batches i.e. F1, F2 and F3 were prepared and evaluated for various parameters like colour, odour, consistency, washability, pH and spread ability. Further, the peel-off gel masks for each batch were also prepared by drying them and evaluated for their peeling time. Amongst all the formulations studied, batch F2 was found optimum for all the parameters. Therefore, this peel-off gel mask would be a good alternative to the synthetic anti-acne gels[1].
16. **I.Zarwinda, *et.al* (2021):** This research aims to evaluate and assess the efficacy of peel off mask as an anti-acne of ethanol extract from bimbli leaves(Averrhoa bimbli L.) These method used was an experiment, evaluating the extract through the inhibition test of Staphylococcus epidermidis bacteria with the paper disk diffusion method. The leaves of bilimbi (Averrhoa bilimbi L.) can be formulated in the form of a peel-off mask by using various extract concentrations. All preparations for the peel-off mask of the ethanol extract of bilimbi leaves FI (7%), FII (9%), and FIII (11%) with each weight of 100 grams, are light brown to dark brown while the blank (F0) is clear, homogeneous, and not

irritating. The recipe for the peel-off mask for bilimbi leaf ethanol extract (FI, FII, and FIII) is useful as an anti-acne remedy.[33] Formulated and evaluated peel off mask from the ethanolic extract of bilmbi leaves as antiacne treatment].

17. **Izzet Turker, *et.al* (2021):** In this study, phenolic compounds were extracted from fenugreek seeds using different extraction techniques and the effect of the different extraction times, seed to solvent ratios and solvent types on TPC, TFL and antioxidant activity were investigated. Soxhlet extraction and maceration extraction gave similar results in terms of TPC, TFL and antioxidant activity values when only 100% ethanol was used as solvent. On the other hand, when distilled water used as solvent, all values were significantly enhanced [34].
18. **Arif Budiman, *et.al* (2017):** The aims of this research are to develop and test a peel-off mask gel prepared from black mulberries (Morus nigra) extracts, which has antibacterial activity against Staphylococcus epidermidis and Propionibacterium acnes. The present study reveals that the nanoparticles from extracts of thorns of Bombax ceiba can be prepared by synthesis at higher temperature, which shows better anti-oxidant activity and antibacterial activity than the simple extracts[35].

3. Objective:

Objectives: -

- To investigate the efficacy peel off mask in improving skin texture and appearance.
- To formulate the peel off mask by using fenugreek seeds.
- To evaluate the formulated peel off mask.

4. : MATERIAL AND METHODS

4.1 Plan Of Work:

- Literature survey
- Selection of ingredients (plants, excipients, solvents and containers)
- Preparation of powder from fenugreek seeds
- Formulation of peel off mask
- Evaluation of peel off mask for various parameters-
  - Organoleptic properties
  - Viscosity
  - Irritation test
  - Stability test
  - Spreadability
  - Peeling time
  - PH test
- Compilation of observed data to Project Report Book.
- Publication of study in the journals.

4.2 Ingredients Table:

Table 1: Ingredient Table:

Ingredients	Category
Fenugreek powder	Anti-aging
Sandalwood	Soothing & Aromatic
Polyvinyl Alcohol	Film former
Propylene Glycol	Plasticizer & Humectant
Glycerin	Moisturizer
Sodium lauryl Sulphate	Surfectant
Methyl Paraben	Preservatives
Propyl Paraben	Preservatives
Disodium EDTA	Antioxidant & Chelating Agent
Triethanolamine	pH Adjuster
Orange Oil	Fragrance
Water	Base

4.3 Drug Profile:

1. Fenugreek: [36]

- Synonym: Trigonella foenum graecum
- Biological source.: Native to southern Europe and Asia, is an annual herb with white flowers and hard, yellowish brown and angular seeds,

known from ancient times, for nutritional value beside of it medicinal effects. Fenugreek seeds are rich source of gum, fiber, alkaloid, flavonoids, saponin and volatile content

- Family: Leguminosae



Figure 6: Fenugreek Seed

2. Sandalwood: [30]

- Synonym: sandal, Indian sandalwood oil
- Biological source: Sandalwood consists of the heartwood of the stems and roots of Santalum album Linn.
- Family: Santalaceae



Figure No 7: Sandalwood Powder

➢ **Other Excipients:**

1. **Polyvinyl Alcohol:** [37]

PVA full form is polyvinyl alcohol. Polyvinyl alcohol is a man-made or synthetic polymer. PVA polymer molecule contains vinyl and alcohol groups. It is a very useful polymer due to its adhesive properties. PVA is water soluble, crystalline and flammable in nature. Presence of alcohol group in it makes it flammable.



Figure 8: Polyvinyl Alcohol

Physical Properties of PVA:

PVA shows high tensile strength and flexibility. It is soluble in water and has no odour. PVA molecular weight or polyvinyl molecular weight ranges between 26,00030,000. Its melting point is 185°C. It is insoluble in organic solvents but slightly soluble in ethanol. Chemical Properties of PVA Polyvinyl alcohol can react with butyraldehyde and formaldehyde. It is atactic type material and resistant to oil and grease.

2. Propylene Glycol:

Act as plasticizer. Maintain elasticity of formulation.



Figure 9: Propylene Glycol

3. Glycerin: [38]

It is a simple triol compound. It is humectant,a type of moisturizing agent that pulls water into outer layer of skin from deeper levels of your skin and the air.



Figure 10: Glycerin

4. Methyl Paraben:

It is used as a preservative in the formulation.



Figure 11: Methyl Paraben

5. Propyl Paraben:

It is also used as a preservative in the formulation.



Figure 12: Propyl Paraben

6. Disodium EDTA : [39]

(chemical formula - $C_{10}H_{16}N_2Na_2O_8$) is a chelating agent, used to sequester and decrease the reactivity of metal ions that may be present in a product. This white, water-soluble solid is widely used to bind to metal ions like iron and calcium ions and prevent the deterioration of cosmetics and personal care products. Disodium EDTA thus enhances stability of cosmetics.



Figure 13: Disodium EDTA

7. Triethanolamine: [37]

It acts as an alkali in the formulation. It is also used to raise the pH of certain mixtures, as well as acts as an emulsifier.



Figure 14: Triethanolamine

4.4 Method of Preparation: -

Experimental Procedure:[20]

- Dissolving 10gram of Polyvinyl Alcohol (PVA) in 100ml of hot water up to 80–90 degree celsius and stir until a clear gel is form. Let it cool slightly.
- In a separate beaker, dissolve Methyl Paraben, Propyl Paraben and Disodium EDTA in small amount of warm water .
- Mix Glycerin, Propylene glycol and SLS, then add this to the PVA solution.
- Add Dissolved Preservatives , sandalwood and fenugreek Extract by simple boiling method.
- Mix thoroughly, let cool, and store in a suitable



Figure 15: Filteration Of fenugreek Extract



Figure 16: Formulation Of Peel Off Mask

4.5 Formulation of Peel Off Mask:

Table 2: Formulation Of Peel Off Mask

Ingredients	F1	F2	F3
Fenugreek	1gm	1gm	1gm
Sandalwood	0.5gm	0.5gm	0.5gm

Polyvinyl alcohol	8gm	7gm	10gm
Propylene glycol	2ml	2ml	2ml
Glycerin	5ml	5ml	5ml
Sodium lauryl sulphate	0.25gm	0.25gm	0.25gm
Methyl paraben	0.1gm	0.1gm	0.1gm
Propyl paraben	0.025gm	0.025gm	0.025gm
Disodium EDTA	0.05gm	0.05gm	0.05gm
Triethanolamine	Q.S.	Q.S.	Q.S.
Orange Oil	Q.S.	Q.S.	Q.S.
water	100ml	100 ml	100 ml

4.6 Evaluation of Peel Off Gel:

1] Organoleptic properties:[27]

We have done visual inspection of product and observed that it was: -

a) Colour: - yellowish
b) Odour: -scanted
c)State: -semi solid
d)Consistency: -smooth and thick

2] pH:[40]

Skin's natural pH is slightly acidic, around 4.5 to 5.5. A peel-off gel slightly above skin's natural pH (but still under 7) is effective at removing impurities and gentle enough to avoid irritation, dryness, or disruption of the skin barrier.

3] Spreadability Test: [41]

- **Test Method: Parallel Plate Method**
- **Equipment Needed:**
  - Two glass slides or acrylic plates
  - Standardized weight (usually 500g)
  - Ruler or caliper
  - Stopwatch (optional)
- **Procedure:**

1. Place a **measured amount** (usually 1 gram) of the peel-off gel at the center of one glass slide.
2. Place the **second glass slide** over the gel.
3. Put a **500g weight** on top for a **fixed time** (e.g., 1 minute).
4. Remove the weight and measure the **diameter** (or area) of the gel spread.
5. Repeat for consistency (usually 3 times)

Spreadability: -M*L/T

Where,

- **M** = weight applied (g)
- **L** = length moved by the slide (cm)
- **T** = time taken (s)

4] Drying Time: [35]

- **Why**: Impacts user convenience and efficacy.
- **Ideal**: 15–30 minutes depending on layer thickness.
- **Test**: Time from application to complete dry film formation.

5] Folding endurance: [4]

The formulation film was applied onto the skin .After drying, a portion of film (3*3cm)was cut and folded it at the Small place until it was broken. Folding endurance can be defined as the value of number of times the film can be folded without folding.

6] Skin Compatibility & Irritation Test: [4]

- To ensure safety and prevent adverse reactions.
- No redness, burning, or itching.
- Human patch test or in vitro testing (for R&D).

5. RESULT AND DISCUSSION: -

The prepared peel-off mask formulations (F1, F2, and F3) were evaluated based on various parameters such as pH, washability, spreadability, skin irritation, peeling time, stability, tensile

strength, and film-forming ability. The results are tabulated in Table 4 and discussed below:

1. **pH:** The pH values of F1, F2, and F3 were 4, 5.9, and 6 respectively. F1 had a slightly acidic pH, which may be closer to the skin's natural pH but could cause irritation in sensitive individuals. F3, with close to neutral pH, is expected to be more skin-friendly and less irritating, making it more suitable for all skin types.
2. **Washability:** All three formulations were found to be washable, indicating that none of the formulations left a residue or required excessive effort for removal.
3. **Spreadability:** F2 exhibited the highest spreadability (7 cm), followed by F1 and F3 (both 6 cm). Good spreadability ensures even application and enhances user experience. F2 thus has a slight advantage in terms of ease of application.
4. **Skin Irritation:** Skin irritation was observed with F1 but not with F2 and F3. The irritation seen with F1 may be attributed to its lower pH or component concentration. This makes F2 and F3 more suitable for sensitive skin.

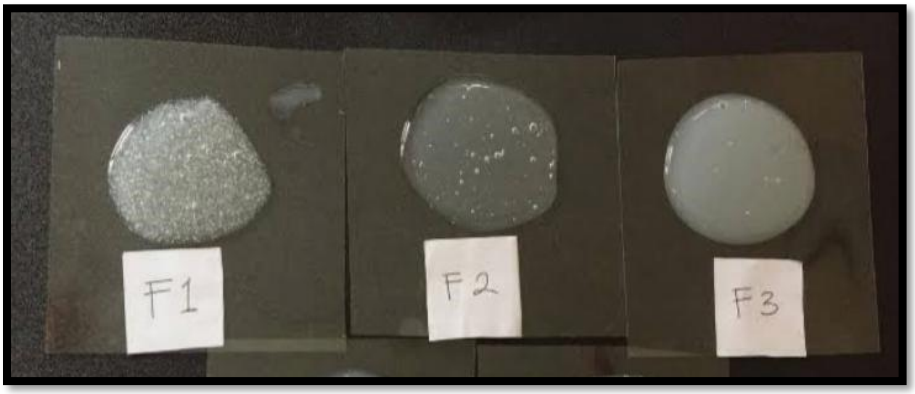


Figure 17: - Evaluation Test

5.Peeling Time: The time required for the mask to peel off was 17 minutes for F1, 16 minutes for F2, and 15 minutes for F3. F3 demonstrated the quickest drying time, which could enhance user compliance, especially for time-conscious consumers.

6.Stability: F1 was only partially stable, F2 was moderately stable, and F3 was highly stable. Stability is a critical factor for product shelf-life and effectiveness, indicating that F3 is the most reliable in this regard.

7.Tensile Strength: Tensile strength was moderate for F1 and F2, and good for F3. This suggests that F3 forms a stronger and more elastic film, which aids in uniform peeling without breakage.

8. Film-Forming Ability:F1 showed mild film-forming ability, while F2 and F3 showed good and very good film-forming properties respectively. A good film is essential for the mask's effectiveness in removing dirt and impurities from the skin.



Figure 18: - Strength Of Peeling

Table 3: Evaluation Parameters for Peel Off Gel

Parameter	Colour	Odour	Consistentancy	Washability
F1	Yellowish	Orange	Semi solid	Good
F2	Yellowish	Orange	Semi solid	Good
F3	Yellowish	Orange	Semi solid	Good

Table 4: Evaluation Parameter Data

Parameter	Observation	Observation	Observation
Formulation	**F1**	**F2**	**F3**
pH	4	5.9	6
Washability	Washable	Washable	Washable
Spreadability	6 cm	7 cm	6 cm
Skin irritation	Yes	No	No
Peeling time	17 min	16 min	15 min
Stability	Partially stable	Moderate stable	Highly stable
Tensile strength	Moderate	Moderate	Good
Film forming ability	Mild	Good	Very Good

6. SUMMARY AND CONCLUSION:

Topical peel-off gel formulation was prepared by using Fenugreek powder as the main drug, which was already known for its Anti-aging, Anti-acne, Anti- inflammatory activity and also having the property to treat oily skin and other skin related problems. There are 3 batches of topical peel-off gel formulation were prepared. Among all batches F1, F2 and F3, batch F3 can be considered the optimal formulation for peel off mask, balancing efficacy, safety, and user satisfaction. Thus, this fenugreek-based peel-off gel formulation could be the safe and efficacious remedy for treating this skin related disorders and could be the safe alternative for other peel off gel mask .

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HOW TO CITE: Nandini Band, Nikhil Samarth*, Mohit Sonare, Mahesh Gadge, Research Article on Formulation and Evaluation of Peel Off Mask Using Fenugreek Seeds, Int. J. of Pharm. Sci., 2025, Vol 3, Issue 4, 3236-3255 https://doi.org/10.5281/zenodo.15287366