

# Formulation and Evaluation of Polyherbal Mask for Anti-Melasma

## Mr. Guruprasad Narvekar<sup>1</sup>, Mr. Rajyogi Parulekar<sup>2</sup>, Ms. Vaibhavi Salave<sup>3</sup>, Mr. Dattaprasad Shelke<sup>4</sup>, Ms. Mrudula Pawar<sup>5</sup> Ms. Shreyesi Kadam<sup>6</sup>

<sup>1,2,3,4,5</sup> Final Year B Pharmacy, <sup>6</sup>, Assistant Professor Vijayrao Naik College of Pharmacy, Shirval, Kankavli

#### Abstract

Melasma is a common skin disorder characterized by hyperpigmentation, resulting in patches of discoloration on the skin. Melasma affects millions of people worldwide, particularly women, and is often triggered by hormonal changes, sun exposure, and genetic predisposition. Current treatments have limitations, and natural ingredients have gained attention for their potential therapeutic benefits. The present study aims to develop and evaluate an anti-melasma peel-off mask formulation using a combination of herbal extracts with the following activities: Ziziphus jujuba shows Antioxidant, Anti-inflammatory, Skin brightening activity. Soybean: Antioxidant , Anti-inflammatory ,Skin moisturizing and hydrating activity. Portulaca oleracea: Antioxidant ,Anti-inflammatory, Skin soothing and calming activity. Evaluation of peel of mask included physical parameters, pH, Spreadability test, Homogeneity, Drying time, Irritation test,Washability test .

Keywords: Anti-inflammatory, Anti- Melasma, Peel of mask.

#### 1. Introduction

#### 1.1 Role of melanin on human body

Skin is the biggest organ of our body, consist of three primary layers the epidermis, dermis and subcutaneous fat layer. Under its surface, it also has a large number of glands, hair follicles, blood vessels, nerves, and nerve endings. Neural crest cells are the embryological source of melanocytes, which give the epidermal layer the colour it has.[1]

These melanocytes are distributed throughout the basal layer of the epidermis and produce melanin, the primary determinant of skin colour.[2] The excessive buildup or irregular distribution of melanin in the skin is the cause of pigmentation disorders. These disorders are brought on by melanin, a natural pigment that gives our skin, hair, and eyes their colour. Melanin synthesis, distribution, and metabolism are all in balance under normal conditions. "However, this equilibrium may be disrupted by certain illnesses or pathological conditions, which can lead to irregular melanin deposition and hyperpigmentation disorders.[3]

#### 1.2 Melasma:

Melasma, also called chloasma or "the mask of pregnancy," is a common skin condition that causes dark patches on the skin. These patches can be light to dark brown and usually show up



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symmetrically on the face, though they can sometimes have unusual shapes. It often happens to pregnant women but can affect anyone It usually occurs on the forehead, cheeks, nose, and the area above the upper lip, and it can sometimes affect the neck, neckline, and forearms. Melasma may be categorized by both location and depth of involvement.[4]

#### 1.2.1 The most common types of melasma based on where it appears on the face are:

(1) centrofacial, which affects the centre of the face.

- (2) malar, which affects the cheeks.
- (3) mandibular, which affects the jawline.

#### 1.2.2 Melasma can also be grouped into four categories based on how deeply it affects the skin:

- (1) epidermal, which is on the surface.
- (2) dermal, which is deeper in the skin.
- (3) mixed, which includes both layers.
- (4) indeterminate, which is unclear.

This is assessed by exposing a long-wave ultraviolet light source (Wood's lamp) on the skin. This is checked by shining a long-wave ultraviolet light, known as a Wood's lamp, on the skin.[5]

#### 1.2.3 Mechanism of action of Melasma:

Melanin biosynthesis in melanocytes begins with phenylalanine converting to L-tyrosine, which is then oxidized by tyrosinase to L-dopa and dopaquinone. Dopaquinone forms dopachrome, which is converted to 5,6-dihydroxyindole or its carboxylic acid form with help from tyrosinase-related proteins.(6,7,8) These are further processed into melanin inside melanosomes. Mature melanosomes transfer melanin to keratinocytes, where it accumulates around the nucleus, resulting in skin pigmentation.[9,10,11]

Tyrosinase genes and related proteins play a key role in pigmentation disorders, influenced by both external and internal factors. Though few studies directly link genetics to melasma, about 279 genes are associated with its development. Ethnicity and family history are also important risk factors. Hormonal influences, especially increased estrogen and progesterone receptors in the skin, suggest that pregnancy and oral contraceptives may trigger melasma. Male hormones have minimal impact, while UV radiation is a major cause of increased melanin in men, leading to pigmentation. (12,13)

#### 1.3 Medicinal herbs used in anti-melasma activity:

Herbal formulations are cheaper, more effective, less likely to cause side effects, and better for the environment than synthetic ones. People have used plant extracts and parts, such as leaves, fruits, flowers, stems, bark, buds, and roots, for cosmetic and medicinal purposes since ancient times.[14]

As a result, they have become an important subject in pharmacological and cosmetic research and are becoming more and more popular with consumers.[15] Tyrosinase inhibitors, antioxidants, and multi-pathway therapeutic agents are the three categories of natural medicinal compounds that are appropriate for treating skin pigmentation based on variations in their pharmacological actions.[16,17]

#### 1.4 Peel off mask:

Peel-off masks are becoming a popular part of many beauty treatments. These masks are usually applied to the skin as a gel or liquid and are allowed to dry. Once dry, the mask removes dirt and dead skin cells when it is pulled off. Using peel-off masks has many benefits. Adding them to your regular



skin care routine helps keep your skin looking clear, healthy, and youthful. The benefits of peel-off masks and how they help achieve healthy skin.

Face masks nourish the skin, reduce acne and blackheads depending on their herbal ingredients, remove dead skin cells, provide a soothing and relaxing effect, and help restore the skin's lost shine and glow in a short time.

#### **Benefit:**

- 1. Exfoliates Dead Skin Cells: Reveals fresh skin and improves product absorption.
- 2. Unclogs Pores: Reduces blackheads, oil buildup, and acne.
- 3. Deep Cleansing: Draws out toxins and impurities.
- 4. Improves Texture: Smoothens and softens skin.
- 5. Boosts Radiance: Enhances glow, reduces dullness, and evens skin tone. [18]

#### 2. PLANT AND EXCIPIENTS PROFILE

1:Soybean :



Fig. No.1: Soybean oil

- Synonym: Glycinemax, Soya bean, Soy pea, Chinese bean
- Biological source : Glycine max .
- Family: Fabaceae/Leguminosae
- Chemical Constituents: Proteins (35-40%): Glycinin, Fatty acids (20-30%): Linoleic, Oleic, Palmitic Isoflavones (0.1-0.3%): Genistein, Daidzein Carbohydrates (20-30%): Starch, Raffinose
- Solubility:

Water: Partially soluble

Organic solvents (ethanol, acetone): soluble

Oil: Soluble

• Uses: Skin care.

Haircare.[19]



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#### 2:Ziziphus jujuba :



#### Fig. No.2: Ziziphus jujuba

- Synonym: Ziziphus sativa, Ziziphus vulgarism, Rhamnus jujuba.
- **Biological Source:** Ziziphus jujuba is a deciduous shrub or small tree Belonging to the family Rhamnaceae.
- **Chemical Constituent:** Alkaloids (jujube, ziziphin), Flavonoids (quercetin, kaempferol), Saponins(jujubelike), Terpenoids(α-tocopherol), Vitamin (C, B1, B2)
- Solubility: Water: Partially soluble, Ethanol: Soluble, Chloroform: Partially soluble, Ether: Insoluble
- **Properties:** Antioxidant, Anti-inflammatory, Antibacterial, Antiviral.
- Uses: Skincare products (anti-aging, antioxidant).

Anti-inflammatory studies.

Skin conditions.[20]

#### **3:Portulaca oleraceae:**



#### Fig. No.3 : Portulaca Oleraceae

- Synonym: Portulaca sativa, Portulaca purpurea, Portulaca linifolia
- **Biological Source :** Portulaca oleracea is an annual succulent herb Belonging to the family Portulacaceae
- Chemical Constituent: Flavonoids (kaempferol, quercetin), Terpenoids(α-tocopherol), Alkaloids(portulacine), Glycosides(oleanolic acid), Vitamins(A,C,E), Minerals(calcium, magnesium, potassium)
- Solubility :Soluble in water, ethanol and partially soluble in chloroform and insoluble in ether.
- **Properties :** Antioxidant, Anti-inflammatory, Anti-bacterial, Anti-viral.
- Uses : Skin condition. Wound healing. Skin product.[21]



#### 1.Polyvinyl alcohol :



Fig. No.4: Polyvinyl Alcohol

- **Chemical Name:** PVA is a synthetic polymer made from the polymerization of vinyl acetate, followed by hydrolysis
- **Properties:**Water Solubility: PVA is soluble in water, making it suitable for various aqueous formulations.
- Uses: Film Former: Used in peel-off masks, coatings, and drug delivery systems.

Thickening Agent: Helps to increase the viscosity of formulations.[22]

#### 2.Methyl paraben:



Fig. No.4: Methyl Paraben

- Synonym: Methyl hydroxy Benzoate
- Biological Source: Occurs naturally in several fruits, partially in blueberries
- Family: Alky esters
- Solubility: Soluble in Water, Benzene, Ethanol, ether, acetone
- **Properties:** Odourless, slight burning taste almost odourless.
- Uses: Cosmetic, Fungal growth avoid.[23]



#### **3.Propyl paraben:**



Fig No.5 propyl Paraben

- Synonym: Nipazol
- Source: many plants and some insects
- Chemical constituent: Benzoate easter, propyl easter, 4-Hydrobenzoic acid,
- Solubility: Soluble in Water
- **Properties:** Odourless, tasteless, Colourless, Crystal.
- Uses: Drug and Cosmetics.[24]

#### 4.Propylene glycol :



Fig No 6 Propylene glycol

- Synonym: 1,2-propanediol
- Source: Small amounts found in some foods (e.g., honey, maple syrup)
- Chemical constituents: Carbon (C): 39.98%, Hydrogen (H): 10.57, Oxygen(O): 49.45%
- Solubility: Soluble in water
- Properties: Colourless, odourless liquid
- Uses: Drugs and cosmetics.[25]



### 5.Triethanolamine:



Fig No 7: Triethanolamine

- Synonym: Trolamine, Trihydroxytriethylamine
- Source: It can be obtained from coconut oil to a process of hydrolysis and amination .
- Chemical constituents:Nitrogen (N): 9.4% ,Carbon (C): 48.3% ,Hydrogen (H): 10.1% ,Oxygen (O): 32.2%
- Solubility: Soluble in water, ethanol, and glycerin
- Properties:Odor: Characteristic amine smell
- Uses: pH adjuster: TEA helps maintain a stable pH in formulations.

Wetting agent: TEA reduces surface tension, making it easier to spread and penetrate surfaces.[26]

#### 3. Extraction procedure:

• Extraction of ziziphus jujuba

*Z. jujuba* fruit were extracted with methanol/water (80:20) using soxhlet apparatus with Methanol 80% for 4h at 80 °C. The extracts were evaporated in vacuum. The dried extracts were stored at 4 °C for experimental studies.[27]



Fig No 8:Soxhlet apparatus

#### • Extraction of portulaca oleracea

**Drying of the Purslane Leaves:** The purslane leaves were removed from the plant and dry in a ventilated stove at  $60^{\circ}$ C for 24 h. Comparing the weight of the leaves before and after drying, it was possible to calculate the percentage of moisture contained.



**Extraction by Hot Maceration :** Approximately 8 g of dried leaves of purslane weigh. They were resuspending in 550 mL of distilled water, brought to a temperature of  $70^{\circ}$ C and kept under stirring for 15 min. Finally, the extract was cooled down at room temperature, filtered and collected in a container. The extract is kept at  $20^{\circ}$ C before the analyses.[28]



Fig No 9 : Hot Maceration

4. Formulation table of herbal peel of mas	4.	Formulation	table o	of herbal	peel of mask	:
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Sr. No.	Ingredient	Batches			
		F1	F2	F3	
1.	Soyabean oil	5gm	5gm	5gm	
2.	Jujuba powder	3gm	3gm	3gm	
3.	Portulaca oleracea powder	2gm	2gm	2gm	
4.	Polyvinyl alcohol	5gm	7.5gm	10gm	
5.	Propyl paraben	0.02gm	0.02gm	0.02gm	
6.	Methyl paraben	0.2gm	0.2gm	0,2gm	
7.	Propylene glycol	5ml	5ml	5ml	
8.	Triethanolamine	2ml	2ml	2ml	
9.	Isopropyl alcohol	3ml	3ml	3ml	
10.	Lemon oil	1ml	1ml	1ml	
11.	Water	Upto50ml	Upto50ml	Upto50ml	

#### 5. Preparation of peel off mask :

PVA is added to distilled water at 80°C. 0.2 g of methyl paraben and 0.02 g of propyl paraben are incorporated and heated until dissolution. A specific amount of jujuba powder, Portulaca oleracea powder, and soybean oil are then added, and the mixture is subjected to vigorous stirring. After cooling, a 5% propylene glycol solution is added, maintaining the pH at 6 Triethanolamine (1 to 2 ml) is added, and 3%



isopropyl alcohol is incorporated with continuous stirring. Finally, a sufficient quantity of lemon oil is added to the preparation as a perfumery agent.(28)



Fig No 10 : Herbal peel of mask

#### 6. Evaluation tests for Peel off mask :

**1. Physical Evaluation of Peel off mask** -Evaluation of the peel-off mask will involve checking physical parameters such as colour, odour, and consistency manually by applying it on the human skin.

**2. Homogeneity-** The homogeneity test will be carried out to determine the uniformity of particles and the even distribution of particles in the preparation. The formulation will be tested for its appearance and the presence of any aggregates by applying it on glass or a transparent material and inspecting it visually.

3. pH - The pH value of the topical peel-off mask will be determined by using pH meter.

**4. Drying time** - The drying time test will be performed by applying the mask evenly on the back of the hand. The time required for the preparation to dry will be measured using a stopwatch.

**5. Irritation test** - The irritation test will be investigated by applying the formulated peel-off gel mask on the skin of the hand. The mask will be applied to the back of the hand, and the skin will be observed for 15 minutes to check for irritation reactions such as swelling, itching, or redness.

**6**. **Spreadability test** - A total of 1 gm of peel-off preparation will be placed between two glass slides, and a 100 gm weight will be placed on the glass slide for 1 minutes to compress the sample to a uniform thickness. Its diameter will then be measured.

 $S{=}M \times L \backslash T$ 

Where,

S = Spreadability L = Lengt

L = Length of the glass slide

M = Weight tied to the upper slide T = Time taken in seconds

7. Washability test - The formulation will be applied on the skin, and then the ease and extent of washing with water will be checked manually.

**8**. **Physical stability testing of formulation -** Stability testing will be done at room temperature and cold temperature. Visual testing will be performed at each temperature, and the physical appearance will be noted.[29]



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#### 7. Result

Sr No	Parameter	Observation		
		F1	F2	F3
1	Colour	Yellowish appearance	Yellowish appearance	Yellowish appearance
2	Odour	Pleasant	Pleasant	Pleasant
3	Consistency	Semisolid	Semisolid	Semisolid
4	Irritation test	No Irritation	No Irritation	No Irritation
5	Spreadability Test	7cm/s	8.3cm/s	10.3cm/s
6	Washability Test	Easily	Easily	Easily
7	Homogeneity	Homogeneous	Homogeneous	Homogeneous
8	Peeling Time	25-30 min	30-35 min	20-25 min
9	Status of peel of film	Easy to peel	Easy to peel	Easy to peel

8. pH



Fig No 11: pH

Sr.No.	Formulation	рН
1	F1	6.46
2	F2	6.44
3	F3	6.43

#### 9. Stability Study

The stability studies of the formulated peel of mask batches (F1,F2,F3) over 30 days at room temperature revealed consistent observations. All batches maintained a yellowish colour and pleasant odour throughout the study period.



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Sr.No	Parameter	Time (days)	Observation		
			F1	F2	F3
1	Colour	0	Yellowish	Yellowish	Yellowish
		15	Yellowish	Yellowish	Yellowish
		30	Yellowish	Yellowish	Yellowish
2	Odour	0	Pleasant	Pleasant	Pleasant
		15	Pleasant	Pleasant	Pleasant
		30	Pleasant	Pleasant	Pleasant
3	Texture	0	Semisolid	Semisolid	Semisolid
		15	Semisolid	Semisolid	Semisolid
		30	Semisolid	Semisolid	Semisolid

#### **10. Conclusion:**

The developed peel-off mask formulation, incorporating herbal extracts from *Ziziphus jujuba*, soybean, and *Portulaca oleracea*, demonstrated promising potential in managing melasma. These ingredients contributed antioxidant, anti-inflammatory, skin-brightening, moisturizing, and soothing properties, aligning with the therapeutic needs for melasma treatment. The formulation was evaluated through various parameters, including physical characteristics, pH, spreadability, homogeneity, drying time, irritation, and washability, and showed favorable results. Overall, the herbal-based peel-off mask presents a natural, safe, and effective alternative for melasma care with minimal side effects.

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