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FORMULATION AND EVALUATION OF POLYHERBAL DEPILATORY POWDER MASK

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ABSTRACT

Cosmetic products containing herbal ingredients are increasing day-by-day since it is devoid of unwanted effects which is usually causing by chemical products. Unwanted hair growth is one of the primary problem experiencing by women especially teenagers which mainly affects their confidence and happiness in special occasions. This study focuses on the preparation and evaluation of polyherbal depilatory powder mask having skin brightening and moisturizing effect too. The powder consists of a mixture of ingredients such as Yellow orpiment powder, Acalypha indica leaf powder, Moringa leaf powder, Vetiver root powder, Aloe vera powder and gum acacia powder. The yellow orpiment (Hartal) is an ingredient which is mostly preferred in Ayurvedic topical as well as internal preparations and Acalypha indica (Indian nettle) is one of the folklore herbal ingredient having high efficacy in removing hair and to treat various skin disorders. The prepared powder was evaluated for various parameters such as organoleptic, ash value, moisture content, pH, spreadability, rheological parameters and the obtained results are found to be fall within acceptable range.

KEYWORDS: *Polyherbal depilatory, Yellow orpiment (Hartal), Acalypha indica (Indian nettle)*

1. INTRODUCTION

Human skin works as a natural barrier, thermoregulator, and stimuli sensor through the millions of hairs and glands that distribute across the body's surface. Human beings have a variety of different hair kinds. As a coating of thin, downy hairs, the lanugo develops first. It starts appearing in the third or fourth month of foetal life and will be entirely shed either before or soon after delivery. Fine, short, unpigmented hairs known as down hair, or vellus, grow during the first few months of infancy. Except for the palms of the hands, the soles of the feet, the undersides of the fingers and toes, and a few other areas, vellus covers the whole body. Longer, coarser, more highly coloured hair known as terminal hair, which grows in the armpits, genital areas, and, in males, on the face and occasionally on portions of the trunk and limbs, supplements this hair during and after puberty. The eyelashes, eyebrows, and scalp all have different types of hairs that start to grow rather early in childhood. The average total number of hairs is between 100,000 and 150,000 on the scalp, which is where hair is typically densest and longest. The average human hair grows 0.5 inches (13 mm) every month.[1]

Hair removal is a growing business in the cosmetic and personal care market. Both men and women are increasingly preoccupied with the aesthetics of their looks. Many men and women decided to eliminate undesirable body hair for aesthetic, social, cultural, or medical reasons. Hair removal procedures have evolved throughout time, offering both temporary and permanent solutions. Some methods and products can only be used in professional salons and dermatological offices, while others are available for home use.[2] Hair removal products, commonly known as depilatories, are cosmetic preparations that are intended to eliminate hair from specific areas of the skin surface. In general, women tend to be less probable than males to get facial and body hairs, but owing to poor dietary habits and hormonal fluctuations, women are now more likely to develop unsightly body hairs. The removal of hair necessitates careful consideration because it is a tough material that is difficult to dissolve or destroy. Should it be removed, it could result in inflammation as well as redness.[3] These days, hirsutism is an enormous problem that has no recognized etiology in women and adolescent girls. It can be caused by anything from drug-induced hirsutism to hereditary and endocrine disorders. Unwanted excessive hair growth is more likely to be caused by either excessive androgen production or a higher response to circulating androgens. In-vivo chemicals have been used to prevent hair regeneration in a number of trials. Despite being created and tested on mice, aminoethyl pyrazole compounds are less effective than eflornithine[4] However, a lot of research has been done on hair inhibition, but

there aren't many products available to stop or reduce hair regrowth superficially from herbal sources. For this reason, our work is mainly focused on using a combination of Indian nettle and yellow orpiment as active ingredients to remove and inhibit hair regrowth. Furthermore, the substances listed above have a variety of skin-benefitting properties, including antibacterial, antifungal, and brightening properties, and they have been tied to the treatment of a number of dermatological disorders.[3]

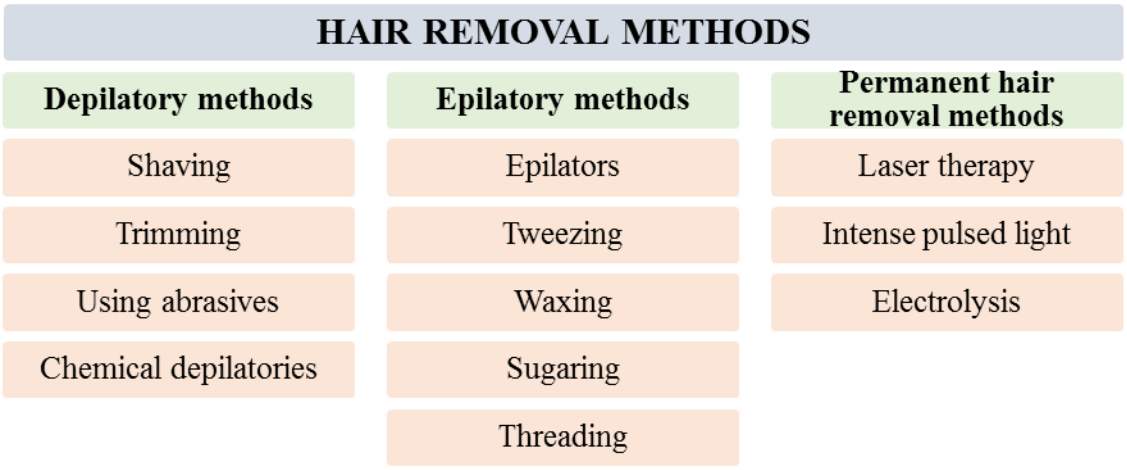

Fig No 1: Different methods for hair removal available.

BENEFITS OF HERBAL DEPILATORY POWDER

- **Skin friendly:** Natural components are gentler on the skin than synthetic depilatories, resulting in fewer reactions and irritation.
- **Gradual regrowth:** With repeated use, the hair becomes thinner and sparser.
- **Cost-effective:** Compared to salon waxes, home waxing using herbal powder is more cost effective over time.
- **Skin nourishment:** The herbs and natural ingredients not only remove hair, but also nourish and moisturize the skin, reducing the risk of skin irritation, rashes, and burns.

2. MATERIALS AND METHODS

Materials: Yellow Orpiment Powder, Indian nettle powder, Moringa leaf powder, Vetiver root powder, Aloe vera powder, Dried acacia exudate powder.

Requirements: Mortar and pestle, Sieves (#120 and #60 size), Funnel, China dish, Digital weighing balance, Blender.

1. Yellow orpiment

Yellow orpiment stones were purchased from the online market. It is thoroughly crushed into fine powder by using a mortar and pestle. Further it is kept in air tight containers.

Synonym: Hartal, Ponnatharam

Characteristics

Colour: lemon-yellow to golden- or brownish-yellow

Shape: Granular or powdery, and, rarely, as prismatic crystals

Odour: Characteristic smell of Arsenic

Hartal is a stone helpful in the removal of hair on consistent use and it acts as good exfoliating agent with skin brightening activity.

Fig No.2: Yellow orpiment stone.

2. Indian nettle leaves

Indian nettle (Acalypha indica) leaves were collected from the surrounding locality, it is thoroughly washed using water, dried the leaves under shade for about 2 days and powdered well using a blender. The powder obtained is kept in an air tight container.

Synonym: Indian copperleaf, Indian mercury, Kuppaimeni

Family: Euphorbiaceae

Description: The leaves are simple and arranged spirally, 0.02-12.00 cm long petiole, blade broadly ovate to ovate-lanceolate, base cuneate, apex acute, margins toothed, more hairy along the midrib, 5-veined at base and with 4-5 pairs of lateral veins. Indian nettle leaves is mostly known for their hair removal property as a folklore and it possess various properties such as anti-fungal, anti-bacterial, which helps in treating skin disorders such as psoriasis, eczema and rashes.[6]

Fig No.3: Indian nettle leaf.

3. Moringa leaves

The moringa (Moringa oleifera) leaves were collected from the surrounding locality as it is abundantly found in almost all areas. It is washed with water, dried under shade for 2 days and powdered well by using blender. Keep the powder in an air tight container.

Synonym: Drumstick tree, Horseradish tree

Family: Moringaceae

Description: The leaves of moringa are vibrant green when young, and turn darker and yellow in the fall.It posses a smooth, thick, and firm texture. Moringa leaves provides hydartion effect to skin as well as it helps in reducing signs of aging.

Fig No.4: Moringa leaf.

4. Vetiver roots

The roots of vetiver were purchased from the market and washed with water to remove the dust particles adhered to it and dried it well. Then it was thoroughly powdered and stored in an air tight container.

Synonym: Vetiveria zizanioides, Chrysopogan zizanioides, Khus, Cuscus grass

Family: Poaceae

Description: Vetiver is a miraculous grass native to India. The roots have aromatic properties and grow 20-30 cm deep in medium textured marginal soils under cultivation. These roots produce cooling sensation and hydration effect when incorporated in various topical formulations.

Fig No.5: Vetiver roots.

5. Aloe vera

The leaves of aloe vera were collected from surrounding areas, washed it and cut into thin slices. These slices are placed under sunlight for about 5 days until it becomes dry and powdered it.

Synonym: Aloe perryi Baker, Aloe barbadensis Mil, Aloe ferox Miller

Family: Liliaceae

Description: It is an evergreen perennial growing to 0.8 m-1 m at a slow rate. They are xerophytic in nature and posses a cactus like appearance. It posses thick, fleshy, spear-like leaves that can grow up to 36 inches long. The leaves are normally green or gray, and sometimes have white spots and sharp spines along the edges. Aloe vera also has yellow, tube-like flowers that grow in clusters on a stem. Aloe vera have various actions such as moisturizing, soothing effect when used in pharmaceutical preparations.

Fig No.6: Aloe vera.

6. Acacia gum

Synonym: Indian gum, Egyptian thorn, Acacia gomifera[10]

Family: Leguminosae

Description: Acacia gums are unique hydrocolloids as they are water soluble. They are commonly employed in the cosmetic industries to change the rheological qualities of products. Acacia gums serve numerous purposes, including stabilization, film formation, thickening, flocculation, suspension, and emulsification in pharmaceutical formulations.

Fig No 7: Gum acacia.

3. METHODOLOGY

I. COLLECTION OF HERBS

The raw materials such as yellow orpiment were purchased from the online market and remaining others from the surrounding locality.

II. PREPARATION OF POLYHERBAL DEPILATORY POWDER MASK

- **Grinding of raw materials**

The stones of yellow orpiment were powdered well by using mortar and pestle. The remaining herbal ingredients are washed well, dried and powdered well by using a blender.

- **Sieving of powders**

The powder obtained by grinding are sieved by hand sieving**.** The powders except vetiver root powder are placed individually on the mesh of the smallest aperture sieve number 120 and tapped at sides whereas vetiver powder is sieved by using mesh of sieve size 60. Paper sheet is kept at the bottom to collect the fine powder after sieving.

- **Weighing of powders**

All the powders are gathered and placed conveniently near the digital balance. Each powder ingredients were weighed individually in the digital balance.

- **Mixing of powders**

The accurately weighed amount of powdered materials are placed one by one into a clean china dish and mixed it well by using a spatula for ensuring the homogeneity.

- **Storage**

The prepared polyherbal powder mask is transferred to a suitable air-tight container.

III. FORMULATIONS OF POLYHERBAL DEPILATORY POWDER MASK

Three batches of polyherbal depilatory powder mask (F1, F2, F3) were prepared and used for further evaluation.

Table No 1: Formulation of polyherbal depilatory powder mask.

Sl No	INGREDIENTS	F1	F2	F3
1	Yellow orpiment powder	6 g	6 g	6 g
2	Indian nettle leaves powder	8 g	8 g	8 g
3	Moringa leaves powder	3.5 g	3.5 g	3.5 g
4	Vetiver roots powder	2 g	3.5 g	4 g
5	Aloe vera powder	2.5 g	1.5 g	1 g
6	Gum acacia powder	3 g	2.5 g	2.5 g

Procedure for using the prepared powder mask

- The required amount of prepared polyherbal depilatory powder is mixed with sufficient amount of rose water or tap water to make it to a paste form.
- Before applying the paste, ensure that the area that you decided to apply the mask is cleaned well and free from any makeup, dirt or oil.
- The paste is applied to the required site by using hands or by brush.
- Leave the paste to the skin for about 20-30 minutes until it becomes dry.
- Scrub out the dried powder mask in circular motion with little amount of water.
- Wash the area after scrubbing, with water thoroughly.

4. EVALUATION OF POLYHERBAL DEPILATORY POWDER MASK

1. ORGANOLEPTIC EVALUATION

The prepared formulations were evaluated for its colour against a white background, odour by taking smell and texture by mixing the powder with rose water.

2. PHYSICO-CHEMICAL EVALUATION

i. Ash value[7]

The inorganic residues found in herbal medications, such as phosphates, carbonates, and silicates, are typically represented by the ash values.

Empty silica crucible was weighed(W1). About 3 g (W) of the air-dried polyherbal powder was added to the previously weighed crucible. The sample was ignited gradually in an electric muffle furnace, increasing the heat to 450°C until grey ash results. Then the crucible was cooled in a desiccator and reweighed. Repeat the process of heating for 30 minutes, cooling and weighing until the difference between two successive weighing is less than 1 mg. Record the lowest weight after incineration (W2).

Total ash (%) = 100 × (W2-W1)/W

where, W1= Weight in g, of empty crucible

W2= Weight in g, of crucible with ash

W3= Weight in g, of test sample

ii. Moisture content[7]

Clean and dry the porcelain dish and then weigh it (W1). About 4 g of polyherbal powder was placed in the previously weighed porcelain dish and again weighed (W2). Put the dish in an electric oven with the temperature set to about 110±5°C for 6 hours. After drying, remove the dish from the oven with tongs and cool it inside a desiccator and reweigh it. Continue the drying process until two consecutive weighing are found to be constant. Record the final constant weight as W3.

Moisture content (%) = 100× (W2-W3 / W3-W1)

where, W1= weight of empty porcelain dish

W2= weight of the dish with wet sample

W3= weight of dish with dry sample

iii. Determination of pH

pH, short for "potential of hydrogen," is a measure of the acidity or alkalinity of a solution. 1 gm of the powder is mixed with sufficient amount of water to form a paste and the pH is determined by using a digital pH meter.

iv. Spreadability

Spreadability test measures how quickly a product spreads when applied to the skin. The spreadability test was carried out by placing 500 mg of the polyherbal powder mask (powder mixed with rose water) in between two glass slides. The upper glass slide is loaded with 20 g of weight with a time span of 1 min. The diameter of the spread was measured after 1 min by parallel plate method.

$$S = d^2 \pi/4$$

where, S = spreadability

d = diameter of the sample spread (mm)

3. RHEOLOGICAL PARAMETERS

Rheological parameters of powder are properties that describe how a powder behaves as a bulk assembly, including its flowability, stability and mechanical behavior.

i. Angle of repose

Funnel method: A funnel was placed above the graph paper on a horizontal surface secured with its tip at a given height (h). Through the funnel, powder was poured until the tip of the funnel was just touched by the apex of the conical pile. The radius (r) formed on the base by the leap of the conical pile was measured.

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

where, h= Height of the cone

r= radius of the cone base

ii. Bulk density

It is the ratio of mass of the powder to bulk volume. It was measured by pouring measured amount of powder in measuring cylinder and measuring the volume occupied by the powder.

iii. Tapped density

It is the ratio of mass of the powder to the tapped volume. Initially the sample was tapped for 50 times, then the volume was noted. Then it was again tapped for 50 times, for examining that the two consecutive measurement of volume remains constant or not. If it is found to be constant, record it as tapped volume.

iv. Hausner's ratio[9]

It is the measure of how easily a powder or granular material flows.

Hausner's ratio = Tapped density / Bulk density

v. Carr's index[9]

It is a measure of a powder's compressibility and flowability.

Carr's index = (Tapped density – bulk density/ Tapped density) × 100

4. STABILITY STUDY

The stability of the polyherbal depilatory powder mask was studied by storing at room temperature for a period of 1 month and evaluated the parameters such as color, odor, texture and pH.

5. ANTIMICROBIAL STUDY

The antimicrobial activity of the polyherbal powder is evaluated by agar well diffusion method. Staphylococcus aureus was used for the study. The bacterial inoculum is transferred into freshly prepared agar nutrient media and stirred properly so that a uniform distribution of the culture can be ensured. The media was poured into sterilized petri dishes, and the media was allowed to cool to solidify. Then, with the help of a sterile cork borer, well of 6 mm diameter were created in the petri dishes, to which the depilatory powder mixed with water (paste form) was added. The agar plates were kept upside down and was incubated for 24 hours at 37°C. After 24 hours of incubation, the diameter of zone of inhibition was measured in mm using a ruler.

6. RESULTS AND DISCUSSION

1. ORGANOLEPTIC EVALUATION

The formulated polyherbal depilatory powder was examined for color, odor and texture. The results were listed in Table no:2.

Table No 2: Organoleptic Evaluation.

Parameter	F1	F2	F3
Color	Dark mustard yellow	Light mustard yellow	Light mustard yellow
Odor	Pungent herby	Pungent herby	Pungent herby
Texture	Smooth	Smooth	Smooth

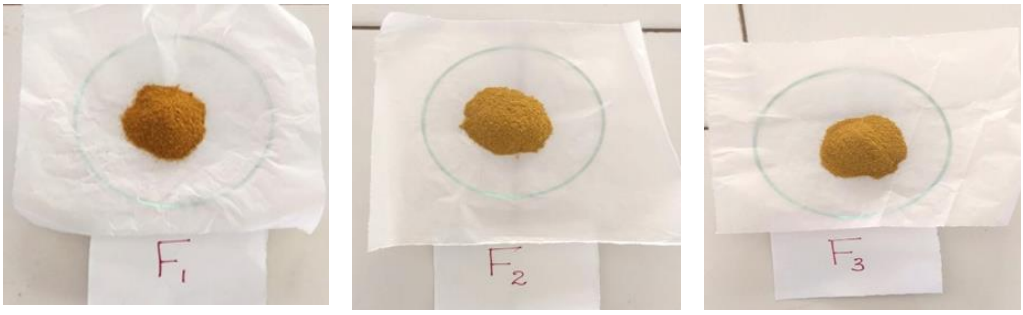

Fig No 8: Organoleptic evaluation.

2. PHYSICO-CHEMICAL EVALUATION

i. Ash value

The ash value obtained for the three formulations were presented in Table no: 3.

Fig No 9: Ash value determination.

ii. Moisture content

The values of moisture content present in prepared formulations were depicted in Table no:3.

Fig No.10: Moisture content determination.

iii. Determination of pH

The pH value obtained for the depilatory powder mask by using digital pH meter was found to be suitable for the nature of skin, which is given in the Table no:3.

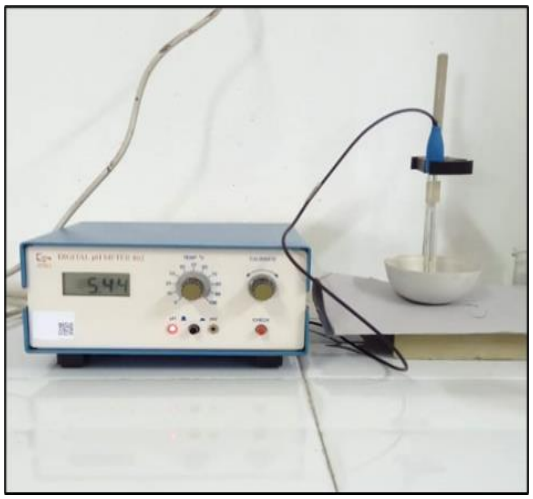

Fig No. 11: pH determination.

iv. Spreadability

The extent of area to which the formulations get readily spreads on application to skin is determined by placing the product in between two glass slides and the values obtained are given in Table no:3.

Fig No. 12: Spreadability.

Table No.3: Physico-chemical evaluation.

Parameters	F1	F2	F3
Ash value	11.20 %	10.56 %	7.40%
Moisture content	11.29 %	9.60 %	8.80%
pH	5.44	5.73	5.82
Spreadability	6.35 cm^2	9.49 cm^2	11.30 cm^2

3. RHEOLOGICAL PARAMETERS

i. Angle of repose

The angle of repose of three formulations were determined by using funnel method and the values obtained are given in Table no:4.

Fig No. 13: Angle of repose.

Table No. 4: Rheological parameters evaluation.

Parameters	F1	F2	F3
Angle of repose	36.8°	35.6°	33.6°
Bulk density	0.33 g/ml	0.29 g/ml	0.27 g/ml
Tapped density	0.41 g/ml	0.34 g/ml	0.31 g/ml
Hausner's ratio	1.24	1.17	1.14
Carr's index	19.5	14.70	12.9

4. STABILITY STUDY

The product was found to be stable after storing it at room temperature for 1 month period..

Table No.5: Results of stability study.

Parameters	F1	F2	F3
Color	No change	No change	No change
Odor	No change	No change	No change
Texture	No change	No change	No change
pH	5.48	5.76	5.83

5. ANTIMICROBIAL STUDY

The zone of inhibition formed in each agar plates is measured by using ruler (in mm) and given in Table no.6.

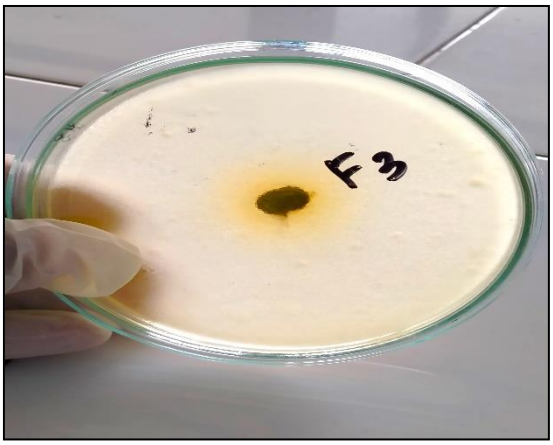

Fig No. 14: Antimicrobial study.

Table No.6: Result of antimicrobial study.

Formulation	Zone of Inhibition (mm)
F1	**14**
F2	**15**
F3	**16**

In this study, we are developing a polyherbal depilatory powder mask with the primary goal of removing undesirable body hairs without creating the harsh consequences that are likely to occur when using chemical depilatory products. The key ingredients in this hair removal recipe are yellow orpiment and Indian nettle (Acalypha indica). Other herbal components such as Moringa oleifera leaves, Vetiveria zizanioides roots and Aloe vera powder are used to provide diverse qualities when combined with acacia as an excipient. The yellow orpiment removes hair while also brightening the skin. Moringa oleifera leaf powder is used to provide moisture to the skin, vetiver root powder for a cooling sensation, Aloe vera powder for

soothing, hydrating and cooling the skin and Acacia as a stabilizer and film forming agent, which prevents the loss of moisture from the skin.

Based on the evaluation results of three formulations (F1, F2, and F3), we can conclude that they have a nearly identical physical appearance and a smooth texture. When assessing the ash value and moisture content, F1 has greater values on both parameters than the standard range, which may influence the product's stability and activity while in storage. As a result, by adjusting the amount of Aloe vera powder and Acacia, we created F3, which has an appropriate ash value and moisture content. The pH measurement shows that F1, F2, and F3 are appropriate for the type of skin and shows a good spreadability.

The flow property measures, such as angle of repose, Hausner's ratio, and Carr's index, reveal that F3 has better flowability than F2 and F1. The pH of the preparations will not change significantly after one month of storage at room temperature. However, since this formulation lacks highly reactive chemical components that aid in removal of hair from the skin, it must be use continuously for a specified amount of time.

F3 has been shown to be the most effective formulation after taking into account the results of all evaluation parameters.

7. CONCLUSION

Natural cosmetic products are more generally accepted since they are regarded to be safer and have fewer side effects than synthetic products. The demand for herbal formulations is increasing worldwide, and this is an excellent attempt to formulate a depilatory powder mask with powders of yellow orpiment, Indian nettle, dried Acacia exudates, Vetiver root, Moringa leaf, and Aloe vera. This study showed that F3 polyherbal depilatory powder formulation was better than F1 and F2 formulations, which exhibits suitable moisture content and ash value, good spreadability, better flow properties and the pH suited to the nature of skin.

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