

Formulation and Evaluation of Polyherbal Hair Removal Wax Powder Containing Barium Sulphide

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Abstract: This study focuses on developing and evaluating a natural, herbal-based powder designed to help remove unwanted facial hair while also supporting overall skin health. The formulation includes ingredients such as turmeric, rice flour, sandalwood powder, orange peel powder, manjistha powder, Multani mitti (Fuller's earth), and cocoa powder. These ingredients were carefully chosen because they are traditionally known to improve skin condition and may help reduce facial hair in a gentle way.

During the preparation process, the proportions of each ingredient were adjusted to ensure the powder works effectively while remaining safe for use on the skin. The final product was then examined for its basic physical properties, including color, smell, and texture.

In addition, the powder was tested to see how well it suits the skin and how effective it is in removing hair, based on observations and user feedback. The results showed that the formulation was successful and has good potential as a skincare product.

Keywords: Poly Herbal Wax Powder, Anatomy of Skin, Stages of Hair Growth, Skin-Friendly Wax, Herbal Cosmetics, Skin, Brightening, Exfoliating Agents, Herbal Skin Care, Herbal Formulation Evaluation.

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I. INTRODUCTION

The practice of removing unwanted body hair has been observed across different cultures for centuries and continues to evolve with scientific and technological advancements. Early methods relied primarily on natural substances and manual techniques, whereas recent developments have introduced chemically active formulations and laser-assisted procedures. Among the available options, powdered depilatory preparations are widely recognized for their convenience, economical nature, and minimal discomfort during use.

The action of depilatory powders is based on the disruption of keratin, a fibrous protein that provides structural integrity to hair. By weakening this protein, the hair becomes

easier to detach from the skin surface. In comparison, shaving merely trims the visible portion of hair, while waxing extracts hair from the follicle, often causing pain. Consequently, depilatory powders serve as a practical and less invasive alternative.

Traditional depilatory systems were largely composed of naturally sourced materials. Historical records from regions such as India, China, and Egypt indicate the use of substances like chickpea flour, turmeric, and alkaline compounds to eliminate hair while improving skin texture. These preparations were valued for their combined cleansing and nourishing properties.

Advancements in formulation technology have led to the incorporation of chemical agents, including sodium

hydroxide and calcium thioglycolate, to increase depilatory efficiency. Modern products are available in multiple variants designed to suit different skin types. Some include botanical extracts such as neem, aloe vera, and sandalwood to minimize irritation. However, formulations with higher chemical content may lead to adverse effects such as skin sensitivity, allergic reactions, and potential long-term concerns.

Therefore, the development of a polyherbal depilatory powder represents an effort to integrate traditional herbal knowledge with modern formulation strategies to achieve safe and effective hair removal.

II. HAIR ANATOMY

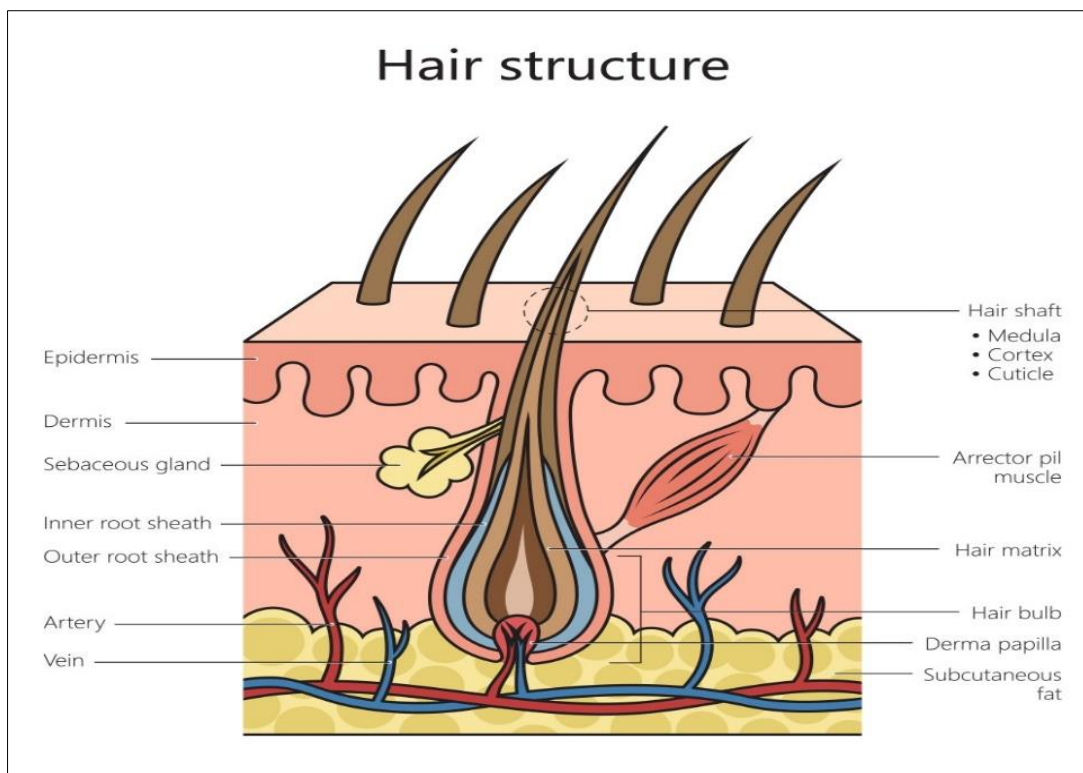


Fig 1 Hair Structure

Human hair is a specialized structure derived from the skin and consists of three key components: the hair shaft, hair follicle, and hair bulb. Each of these parts contributes to the formation, support, and growth of hair.

➤ *Hair Bulb:*

Located at the base of the follicle, the hair bulb is the active growth region of hair. It contains rapidly dividing cells that generate new hair tissue. As these cells multiply, they are pushed upward through the follicle, where they gradually harden due to keratin formation. This process ultimately leads to the development of the hair shaft. The hair bulb is also associated with the sebaceous gland, which releases sebum to maintain hair softness and protection.

➤ *Hair Follicle:*

The hair follicle is a tube-like structure embedded within the skin that encloses and supports the developing hair. It provides an environment for continuous cell division and hair formation. As newly formed cells move upward within the follicle, they undergo keratinization and form the visible hair structure. Attached to the follicle is the sebaceous gland,

which produces an oily secretion that conditions and protects both hair and surrounding skin.

➤ *Hair Shaft:*

The hair shaft is the portion of hair that extends above the skin surface and is composed of dead, fully keratinized cells. It is organized into three distinct layers:

- *Cuticle:*

The outer protective covering made up of overlapping, scale-like cells that shield the inner layers from damage.

- *Cortex:*

The central and thickest layer, consisting of tightly packed keratin-filled cells that provide strength, flexibility, and elasticity to the hair.

- *Medulla:*

The innermost region, composed of loosely arranged cells and air spaces, contributing to the internal structure of the hair.

III. STAGES OF HAIR GROWTH

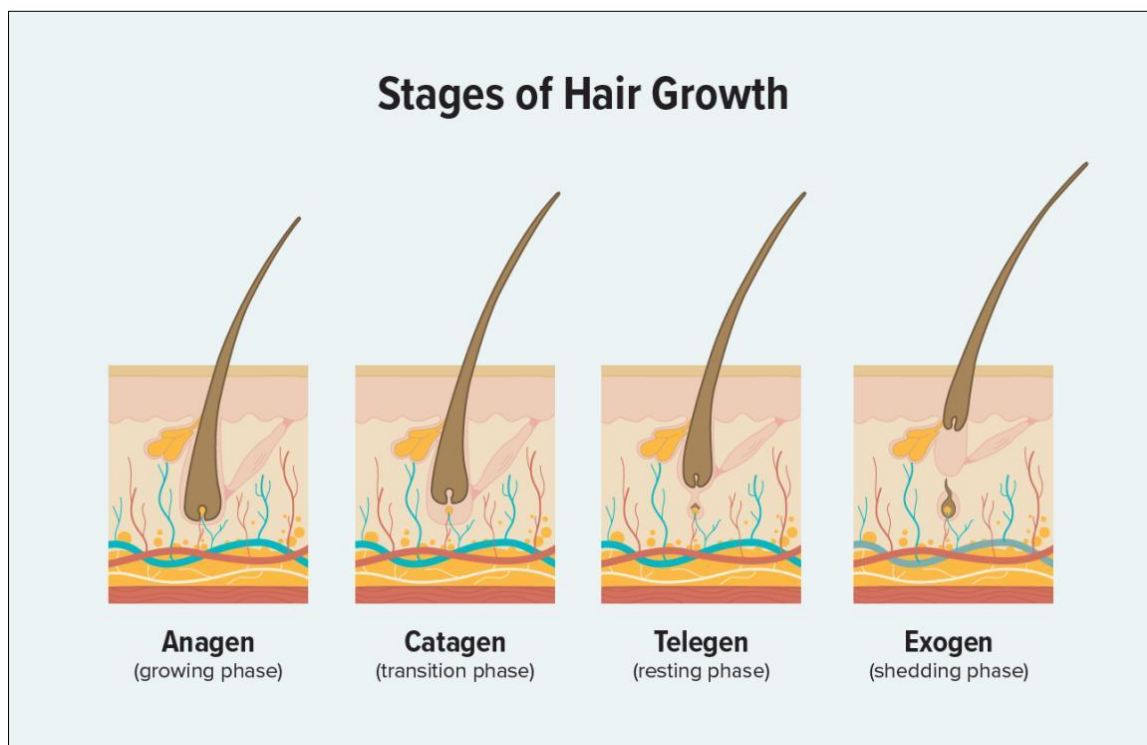


Fig 2 Stages of Hair Growth

➤ *Anagen Phase*

The anagen phase is the active growth stage of hair, during which hair follicles continuously produce new hair. It is the longest phase, lasting about 2–8 years for scalp hair, while shorter for other body hairs.

➤ *Catagen Phase (Transition Phase – Short)*

The catagen phase follows the growth stage and lasts for about 2 weeks. During this period, hair follicle activity declines, the follicle reduces in size, and hair growth stops. The hair detaches from its base but remains temporarily within the follicle. Around 1–3% of scalp hair is in this phase at any given time.

➤ *Telegen Phase (Resting Phase – Short)*

The telogen phase is a resting stage that continues for approximately 2–3 months. Hair growth does not occur

during this period, but the hair remains anchored in the follicle. About 9% of scalp hair exists in this phase. Meanwhile, new hair begins to develop in preparation for the next growth cycle. In some classifications, the shedding of hair is considered a separate stage known as the exogen phase.

➤ *Exogen Phase*

Exogen phase represents the stage during which mature hair is released from the follicle. It is considered an extension of the telogen phase and may continue for several months. Hair shedding occurs naturally, often during activities such as washing or brushing, with a normal loss of about 50–100 hairs per day. At the same time, new hair begins to grow within the follicle, replacing the shed strands.

IV. MATERIALS AND METHODS

➤ *Plant Materials*

Table 1 Plant Materials

Sr.no	Ingredients	Quantity	Use
1	Turmeric Powder	3g	Hair removal and Antiseptic agent
2	Rice Flour	4g	Reduces sebum level
3	Multani Mitti	3g	Anti-acne
4	Sandal Wood Powder	2g	Anti-microbial
5	Orange Peel Powder	1.5g	Skin brightning
6	Bariumsulphide Powder	3g	Hair removal agent
7	Neem Powder	1g	Reduce blemishes
8	Cocoa Powder	2g	Antioxidant

- *Turmeric*



Fig 3 Turmeric

- ✓ Family: Zingiberaceae
- ✓ Biological Source: Turmeric is obtained from the rhizomes of *Curcuma longa*, with curcumin as its principal active constituent.
- ✓ Genus: *Curcuma*
- ✓ Species: *Curcuma longa* L.

Turmeric is widely recognized for its potential role in improving skin health. It may assist in detoxification and nourishment of the blood, thereby promoting a healthy and radiant complexion. Due to its antimicrobial and antiseptic properties, it is considered beneficial in managing skin conditions such as acne and eczema. Additionally, it may contribute to delaying signs of premature aging. Turmeric is commonly incorporated into cosmetic and sunscreen formulations; however, further scientific investigation is required to fully establish its dermatological effects.

- *Rice Flour*



Fig 4 Rice Flour

- ✓ Family: Poaceae (Gramineae)
- ✓ Biological Source: Rice flour is derived from the seeds of *Oryza sativa* (Asian rice).
- ✓ Genus: *Oryza*

- ✓ Species: *Oryza sativa*

Rice flour has been traditionally used as a natural and economical remedy for reducing unwanted facial hair. It contains bioactive components that may gradually weaken hair follicles, potentially slowing hair growth with regular application. Additionally, it helps in reducing excess sebum production, contributing to improved skin texture.

- *Multani Mitti (Fuller's Earth)*



Fig 5 Multani Mitti (Fuller's Earth)

Multani mitti is known for its beneficial effects on the skin, including anti-acne and anti-inflammatory activities. It also exhibits astringent properties and is commonly used to enhance skin brightness and clarity.

- *Sandalwood Powder*



Fig 6 Sandalwood Powder

- ✓ Family: Santalaceae
- ✓ Biological Source: Sandalwood oil is obtained through the distillation of *Santalum album* Linn.
- ✓ Genus: *Santalum*
- ✓ Species: *Santalum album* Linn.

Sandalwood is valued for its antimicrobial, antiseptic, and anti-inflammatory properties. These characteristics make it useful in alleviating skin irritation, redness, and itching.

associated with certain dermatological conditions, including scabies.

- *Orange Peel Powder*



Fig 7 Orange Peel Powder

- ✓ Family: Rutaceae
- ✓ Biological Source: Orange peel is obtained from the dried or fresh outer pericarp of *Citrus aurantium* Linn.
- ✓ Genus: *Citrus*
- ✓ Species: *Citrus sinensis*

Orange peel powder is widely used in skincare due to its exfoliating and rejuvenating properties. It is rich in vitamin C and antioxidants, which help improve skin tone, reduce pigmentation, and provide a natural glow. It also aids in controlling excess oil, managing acne, and offering mild anti-aging benefits when used in topical applications.

- *Cocoa Powder*



Fig 8 Cocoa Powder

- ✓ Family: Malvaceae
- ✓ Biological Source: Cocoa powder is obtained from the processed seeds of *Theobroma cacao*.
- ✓ Genus: *Theobroma*
- ✓ Species: *Theobroma cacao*

Cocoa powder is known for its high antioxidant content, especially flavonoids, which contribute to maintaining healthy skin. These compounds help enhance blood circulation, improve moisture retention, and offer protection against environmental stressors such as ultraviolet radiation.

Additionally, the presence of essential nutrients supports the reduction of inflammation, minimizes visible signs of aging, and promotes overall skin vitality.

- *Barium Sulphide*



Fig 9 Barium Sulphide

Barium sulphide is an inorganic compound frequently incorporated into depilatory preparations. Its primary function involves the breakdown of keratin within the hair structure, which weakens the hair and facilitates its removal. However, due to its strong chemical nature, it may lead to skin irritation or allergic responses in sensitive individuals, and therefore its use must be carefully controlled.

- *Neem*



Fig 10 Neem

- ✓ Family: Meliaceae
- ✓ Biological Source: Neem is obtained from different parts (leaves, bark, seeds) of *Azadirachta indica*, which contains bioactive constituents such as azadirachtin and nimbin.
- ✓ Genus: *Azadirachta*
- ✓ Species: *Azadirachta indica*

Neem is widely used in dermatological preparations due to its broad spectrum of biological activities. It exhibits strong antibacterial and antifungal properties, which help in

controlling microorganisms responsible for acne and other skin infections. Its anti-inflammatory action aids in reducing

redness, swelling, and irritation associated with skin disorders.

V. METHOD OF PREPARATION

➤ Preparation of Hair Removal Powder

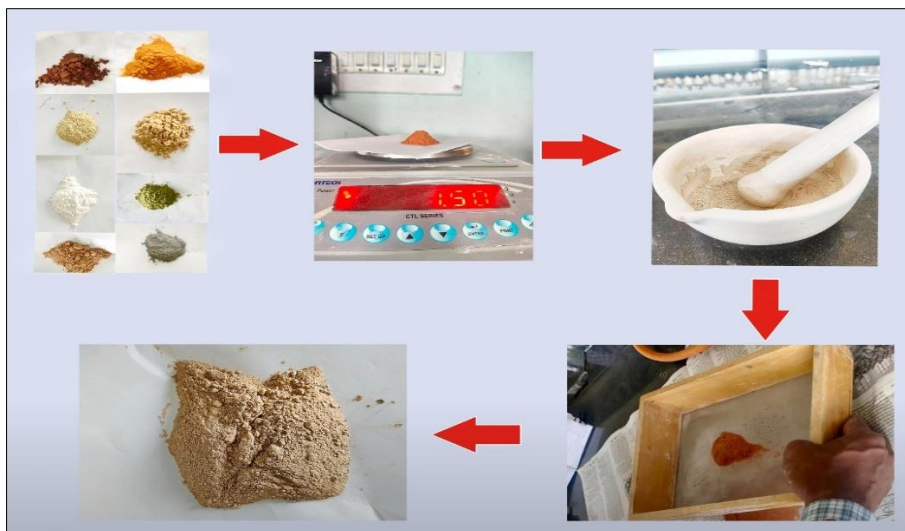


Fig 11 Preparation of Hair Removal Powder

- The formulation process began by accurately weighing all the ingredients in accordance with the proportions.
- Each raw material individually triturated using a mortar and pestle until a fine powder was obtained, ensuring proper particle breakdown.
- The powdered materials were subsequently sieved to obtain a uniform particle size and to remove any coarse or aggregated particles.
- After sieving, all the ingredients were carefully mixed together to achieve a consistent and homogeneous blend.
- Finally, the finished powder formulation was transferred into a clean, dry, airtight container and stored appropriately to protect it from moisture and maintain its stability.

VI. METHOD OF APPLICATION

➤ Process of Application

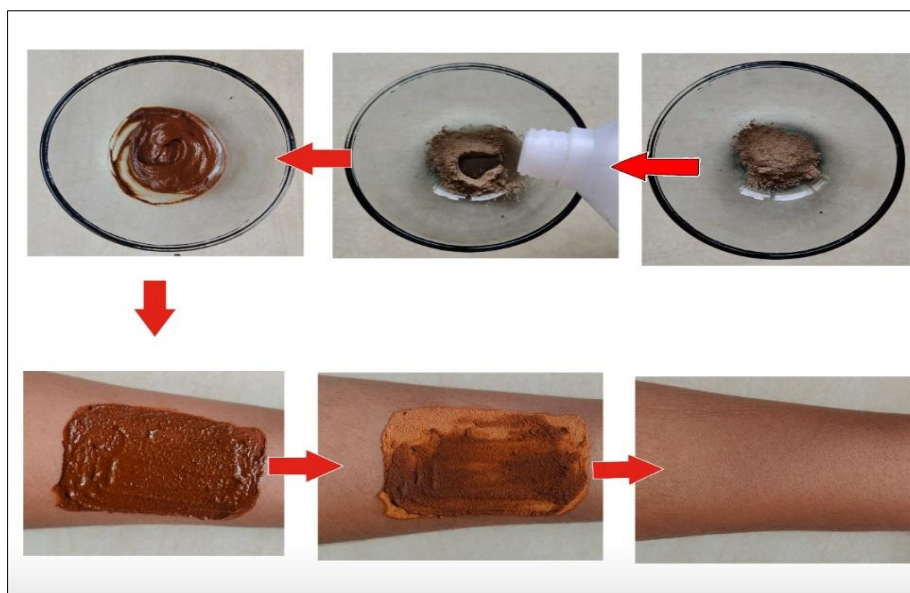


Fig 12 Process of Application

- Take the needed quantity of powder.
- Combine it with rose water, milk, or yoghurt to make a smooth, consistent paste.
- Spread the paste evenly over the targeted area and leave it to dry for 10–15 minutes.
- After it dries, gently remove it by rubbing or peeling it off against the direction of hair growth.
- Wash the area with lukewarm water and apply a moisturizer to keep the skin hydrated.

VII. EVALUATION OF HERBAL WAX POWDER

➤ Organoleptic Evaluation



Fig 13 Organoleptic Evaluation

- Odour: Pleasant aromatic smell
- Colour: Greyish-brown
- Texture: Smooth and finely powdered
- Appearance: Powder form
- Washability: Can be washed off easily

➤ Rheological Parameters

• Bulk Density

A quantity of 10 g of the powder was transferred into a 100 ml measuring cylinder. The bulk density was then determined using formula.



Fig 14 Bulk Density

✓ *Result:* 0.47g/ml

• Tapped Density

10 g of the powder sample was placed into a measuring cylinder. The cylinder was tapped continuously until no further change in volume was noticed. The tapped density was calculated using the formula.

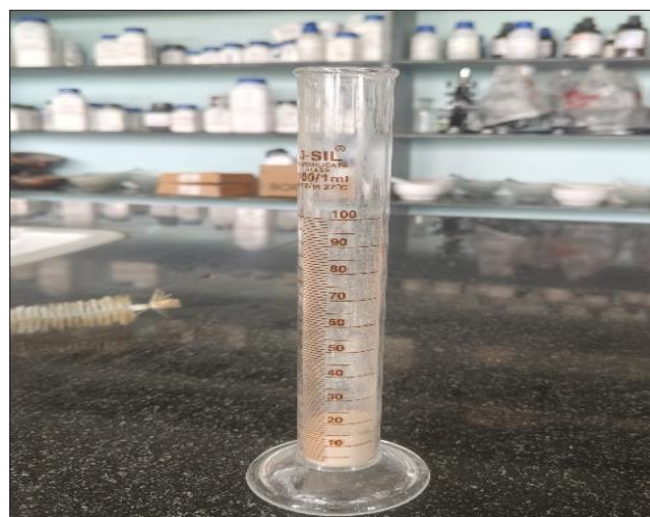


Fig 15 Tapped Density

✓ *Result:* 0.60g/ml

• Angle of Repose

A clean and dry funnel with a diameter of about 20–30 mm was selected. The funnel was fixed onto a burette stand, and a suitable surface was positioned below it. The height of the funnel was maintained at approximately 2 cm from the surface. A graph paper was placed under the funnel to help trace the outline of the powder pile. About 10 g of the powder sample was allowed to flow slowly through the funnel onto the surface, forming a conical heap. The process was continued until a stable heap was obtained. The base of the heap was carefully marked by drawing a circle around it using a pencil. The height (h) of the pile and the radius (r) of its base were measured using a ruler. The angle of repose was then calculated using the formula.



Fig 16 Angle of Repose

✓ *Result:* 30.96 degree

- *Carr's Index (Compressibility Index)*

It represents the relationship between tapped density and bulk density, expressed as a percentage.

Hausner's Ratio It is defined as the ratio of tapped density to bulk density.

✓ *Result:* 21.66%

- *Hausner's Ratio*

It is a ratio of tapped density and bulk density time 100

✓ *Result:* 1.27

➤ *Safety and Skin Sensitivity Test*

- *Patch Test*



Fig 17 Patch Test

✓ *Result:* No signs of redness, irritation, or allergic response were observed.

- *pH Test*

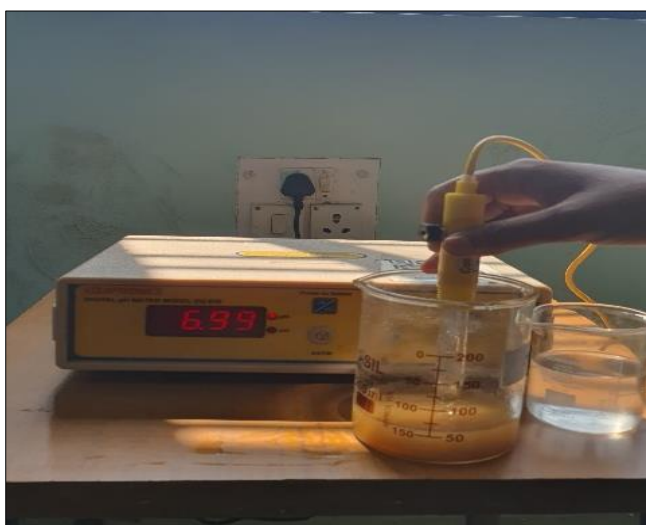


Fig 18 pH Test

✓ *Result:* 6.99

- *Washability*

✓ *Result:* The formulation can be easily washed off using water.

- *Ash Value:*



Fig 19 Ash Value

✓ *Result:* 59%

- *Stain Test:*

✓ *Result:* No stain observes

VIII. CONCLUSION

Hair removal powder is widely used as a simple, cost-effective, and efficient technique for temporary elimination of unwanted hair. The formulation contains several active and supportive components that collectively assist in smooth hair removal while also helping to protect and maintain the condition of the skin. A major functional ingredient, barium sulfide, serves as a depilatory compound that breaks down the keratin present in hair strands, allowing the hair to be removed easily from the skin surface without causing significant pain or discomfort. The performance and safety of hair removal powder differ from person to person due to variations in skin sensitivity, hair type, duration of exposure, and possible allergic responses to particular ingredients. In some cases, improper use may result in side effects such as itching, redness, dryness, irritation, or a burning sensation. Therefore, conducting a patch test before full application is very important to identify any adverse reaction in advance. Careful adherence to the recommended usage instructions is also necessary to reduce the chances of skin damage or discomfort.

Hair removal powder provides several benefits, including painless application, quick results, ease of use, affordability, and the convenience of home application without professional support. Herbal-based preparations may further improve user acceptance because of their skin-friendly nature and reduced chemical harshness.

Overall, hair removal powder can be considered a practical and effective option for temporary hair removal. When prepared with suitable ingredients and applied correctly according to safety guidelines, it can deliver efficient hair removal along with supportive skin-care benefits, making it a preferred alternative for many users.

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