World Journal of Biology Pharmacy and Health Sciences
eISSN: 2582-5542
Cross Ref DOI: 10.30574/wjbphs
Journal homepage: https://wjbphs.com/

(RESEARCH ARTICLE)

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Herbal hair removal solution: Exploring *Murraya koenigii* for safe and natural depilation powder

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World Journal of Biology Pharmacy and Health Sciences, 2025, 22(03), 167-183

Publication history: Received on 28 April 2025; revised on 05 June 2025; accepted on 07 June 2025

Article DOI: https://doi.org/10.30574/wjbphs.2025.22.3.0583

Abstract

The primary API *Murraya koenigii* is the subject of this study, which focuses on the creation and assessment of a natural, safe hair removal powder using natural compounds with skin-benefitting properties. Black salt, neem powder, mentha powder, tulsi powder, rose powder, turmeric, rice flour, sandalwood powder, orange peel powder, liquorice powder, multani mitti (fuller's earth), and barium sulfide are among the other natural components used in hair removal powder. These components were selected due to their reputation for enhancing skin health and reducing the visibility of unwanted body hair. The quantities of each ingredient were carefully adjusted during the formulation process to ensure maximum effectiveness while maintaining skin safety. The powder's physical characteristics, such as its color, texture, smell, and the distribution of its particles, were evaluated. Furthermore, the evaluation and feedback from users were utilized to assess the powder's compatibility with the skin and its efficiency in removing hair. The study's results indicate that a body hair removal powder containing multiple beneficial ingredients was successfully created. The appeal to customers seeking gentler alternatives to hair removal treatments that contain chemicals is heightened by the inclusion of natural substances. Further enhancements could be explored in future research and development to optimize the powder's capabilities and increase its market appeal

Keywords: Polyherbal; Hair removal; Depilatory; *Murraya koenigii*; Barium sulfide

1. Introduction

The human body contains approximately 100,000 to 150,000 hairs, and each one goes through various stages of growth and shedding throughout its life cycle. Hair is primarily composed of proteins. These proteins are part of the stiff, fibrous keratin class. Long chains of amino acids constitute proteins. Keratin proteins are responsible for forming the cytoskeleton of all cells in the epidermis. The amino acid cysteine constitutes the majority of the keratin proteins found in hair fibers. The sulfur atoms in the cysteine molecules are connected by the bonds of substances called disulfides. Breaking these strong disulfide bonds is quite challenging due to their strength. The chemical bonds formed by disulfide groups in keratins are the primary determinant of the lifespan and resilience of hair fibers, as well as their ability to withstand environmental stressors. The three phases of hair growth are anagen, catagen, and telogen. Hair is generated in the hair follicle, which is a cylindrical indentation located in the outermost layer of the skin. Hair is composed of a slender, flexible structure of dead cells. Many of the amino acids that make up hair contain sulfur and cysteine, which is the most prevalent amino acid found in hair.

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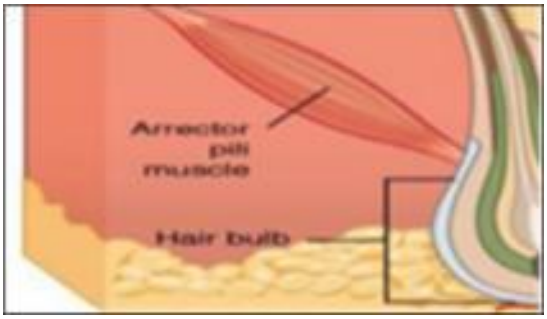

Figure 1 Anatomy of Hair

Hair growth in unwanted areas of the body is a problem that both men and women must deal with. Unwanted hair is believed to affect a person's ability to appear their best, even if it poses no health risks. Unwanted body and facial hair contributes to one's overall aesthetic appeal.

Humans have struggled with unwanted hair for a long time. Approximately 21% of women suffer with excessive facial hair, particularly on the chin and upper lips, and over 80% of women struggle with excessive hair growth . Thus, hirsutism—the male-patterned development of hair on a woman's body—is one of the current conundrums. Numerous methods have been used for a long time to get rid of unwanted hair, but each one has some drawbacks or adverse effects, which are listed below.

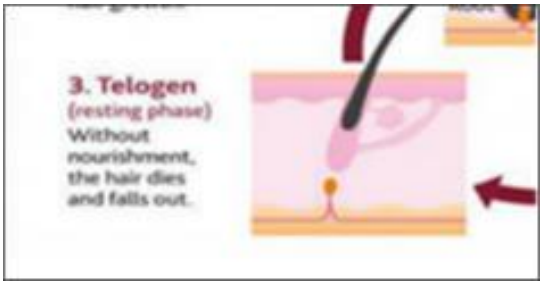

Figure 2 Hair Growth Cycle

Hair Removal Methods and their Consequences:

Table 1 Comparison of Hair Removal Methods and Their Consequences

Sr. No	Hair removing method	Consequences
1	Plucking & waxing	It's painful & time-consuming process. Folliculitis may occur
2	Depilatory creams	Fast regrowth, redness, irritation & darkening of skin are associated with it
3	Shaving	Time consuming & Folliculitis may occur
4	Electrolysis/laser/intense pulse light(IPL)	Sometime painful, expensive, risk of hyper pigmentation, rare cases of hypertrichosis and scarring also reported4
5	Antiandrogen /oral contraceptives	Long term treatment required, menstrual problems can occur as an adverse effect
6	Substitute cream (Eflornithine)	) Indefinite use require & not actually remove hairs but help to stop regrowth

2. Material and Method

The table below lists several ingredients and how they are used to make hair removal powder.

Table 2 Ingredients Used in Herbal Hair Removal Powder and Their Benefits

Sr. No.	Materials	Uses
1	*Murraya koenigii*	Promote hair growth, prevent hair loss
2	Barium Sulphide	Used in hair removal
3	Tulsi powder	Reduce hair loss
4	Orange powder	Add shine and luster to hair
5	Santalum album	Anti-dandruff and hair growth
6	Rice flour powder	Remove dirt oil, reducing breakage
7	Neem power	Clearing dandruff, Treating lice
8	Mentha powder	Reduce hair fall
9	Black salt	Improve hair health
10	Liquorice powder	Promotes shine and softness hair
11	Rose powder	To remove hair painlessly & skin smooth
12	Bentonite clay	Out impurities and excess oil
13	Turmeric	Anti-inflammatory properties

2.1. Plant material

2.1.1. Curry Patta (antioxidants) API

- Biological source: - It is obtained from dried leave powder of the *Murraya koenigii* . Family: - Rutaceae

Physical characteristic:-

- Colour- Dark green or blackish green
- Odour- Aromatic
- Taste- Bitter
- Size- Each leaflet is 0.79–1.57inch long and 0.39–0.79 inch broad.
- Shape-Ovate lanceolate
- Texture- Shiny and smooth

Chemical constituents: *Murraya koenigii* contains a wide variety of organic substances, including sterol, alkaloids, flavonoids, and carbohydrates.

Uses- Curry leaves are high in antioxidants, vitamins (A, B, C, and E), minerals, and other health benefits, such as the ability to improve digestion, promote healthy hair, lower cholesterol, control diabetes, and have anti-inflammatory and antibacterial qualities that help treat acne, minimize blemishes, and promote a healthy, radiant complexion.

Figure 3 *Murraya koenigii* Leaves

Figure 4 *Murraya koenigii* leaves powder

2.1.2. Sandalwood Powder- (Soothes and calms skin)

Biological source: Sandalwood oil is obtained by distillation of sandalwood, Santalum album Linn.

Family: Santalaceae

Physical characteristic:-

- Colour- Pale yellow
- Odour- Aromatic or characteristic
- Taste- Unpleasent
- Solubility-Freely soluble in alcohol and slightly soluble in water
- Texture- Soft and silky feel
- Chemical constituents: Two to five percent of sandalwood's volatile oil is made up of 90 to 97 percent sesquiterpene alcohols, or "santalols," of which 95 percent are two isomers. Aldehyde santalol, α- and B-santalol, sesquiterpene alcohol, santene, and santenone.
- Uses: Inflammatory skin disorders are lessened with the use of chandan powder. also aids in reducing skin irritation and acne, possesses cooling qualities. Sandalwood's antibacterial and antimicrobial properties may prove beneficial. It helps lessen the irritation, redness, and itching that scabies causes.

Figure 5 Sandal Wood

Figure 6 Sandalwood powder

2.1.3. Rice flour (A gantle exfoliant)

- Biological source: Rice is the seed of the grass species Oryza sativa (Asian rice).
- Family: Poaceae/ Gramineae

Physical characteristic

- Colour- White or slightly off-white
- Odour- Very mild or almost odourless
- Taste- Slightly sweet or neutral
- Size- Vary small, fine granules.
- Shape-Fine, powdery particles
- Texture- Soft and smooth
- Solubility- Insoluble in cold water but soluble in hot water
- Chemical constituents: Rice flour has a moisture content of 8.5% to 13% and is mostly made up of starch (amylose and amylopectin), although it also contains protein, fat, fiber, and ash.
- Uses: For millennia, people from many cultures have used rice flour as a natural and affordable way to decrease facial hair.Compounds in rice flour help weaken hair follicles, slow down hair growth over time, and lower sebum levels. A tried-and-true ingredient, rice flour helps to make skin bright and smooth.eliminates pollutants and sun tan from the skin. Have anti-oxidant qualities.

Figure 7 Rice flour

Figure 8 Rice flour powder

2.1.4. Orange Peel Powder: (antioxidants or natural exfoliant)

- Biological source: Orange peel is the fresh or dried outer part of the pericarp of Citrus aurantium Linn,
- Family: Rutaceae

Morphology

- Colour- Bright orange to yellow-orange color.
- Odour- Strong and citrusy aroma
- Taste- Slightly bitter with a hint of sweetness
- Size- Fine powder.
- Shape- Clump together.
- Texture- Soft and smooth
- Solubility- It is not highly soluble in water but can be infused into liquids and will impart flavor and color.
- Chemical constituents: The orange peel contains 23% sugar, 22% cellulose, 25% pectins and 11% hemicellulose.
- Uses: Exfoliation, acne therapy, skin whitening, anti-aging effects, oil management, and calming qualities are just a few of the skincare advantages that orange peel powder provides. Packed with vitamin C and antioxidants, it promotes a glowing complexion, lightens dark spots, and improves skin tone when added to homemade face masks or scrubs.

Figure 9 Orange Peel

Figure 10 Orange peel powder

2.1.5. Turmeric (Traditional medicines system)

- Biological source: Curcumin is the active ingredient of the dietary spice turmeric and is extracted from the rhizomes of Curcuma longa.
- Family: Zingiberaceae

Morphology:

- Colour- Bright yellow to deep orange.
- Odour- Earthy, aromatic
- Taste- Bitter, slightly pungent, warm
- Size- As a powder its fine, whole dried rhizomes are about 2-5 cm log
- Shape- Powder is fine and rhizomes are cylindrical or irregular
- Texture- Soft and smooth, rhizomes are hard and rough
- Solubility- Soluble in water, alcohol and oils
- Chemical constituents: The most prominent curcuminoids found in turmeric are curcumin, demethoxycurcumin, and bisdemethoxycurcumin. Turmeric's vivid yellow hue and several biological properties are attributed to these polyphenolic chemicals.
- Uses: Turmeric may aid in blood purification and nourishment, which could result in skin that is healthy and radiant. Because of its antibacterial, anti-inflammatory, antiseptic, and antioxidant qualities, it may help treat skin conditions including eczema and acne. Additionally, it might prevent premature aging. Additionally, sunscreens and cosmetics contain turmeric.

Figure 11 Turmeric root

Figure 12 Turmeric Powder

2.1.6. Multani Mitti (Exfoliation and cleansing)

- Biological source: Its type of clay, not a plant and also known as 'Bentonite clay'. It is primarily composed of hydrated aluminum silicates with varying amounts of other mineral such as kaolinite and montmorillonite.

Morphology:

- Colour- Light brown, yellowish, pale, off-white
- Odour- Odourless
- Taste- Earthy or bland
- Size- Commercially available in powdered form and raw clay chunks can vary in size
- Shape- Powdered is amorphous and irregular in crude form
- Texture- Soft and smooth, and fine powdered
- Solubility- Insoluble in water and organic solvents but it swells and form a paste when mixed with water
- Chemical constituents: The main constituents of multani mitti are hydrated aluminum silicates. Its absorbing qualities also come from the presence of calcium bentonite and magnesium chloride. It also includes water, silica, alumina, iron oxide, magnesium oxide, and lime.
- Uses: It may have anti-inflammatory, anti-acne, astringent, and skin-brightening properties in addition to exfoliating, cleaning, cooling, and smoothing the skin.

Figure 13 Multani Mitti Stone

Figure 14 Multani Mitti Powder

2.1.7. Barium sulphide (hair removal)

One chemical ingredient found in depilatory lotions for hair removal is barium sulfide. It functions by dissolving hair proteins, which facilitates their removal. But for certain people, it can result in allergic reactions and skin irritation. It is important to use goods containing barium sulfide with caution.

Figure 15 Barium Sulphide Powder

2.1.8. Tulsi leave (Skin tone improve)

- Biological source: Tulsi consists of fresh and dried leaves of Ocimum sanctum Linn. Family: Labiatae.

Morphology:

- Colour- Green or purplish-green
- Odour- Strong, aromatic and slightly spicy
- Taste- Pungent, slightly bitter
- Size- About 2-4 cm long
- Shape- Oval with a pointed tip and slightly toothed edges
- Texture- Soft or slightly hairy
- Solubility- Insoluble in water but tulsi extract or oil is soluble in alcohol or oil based solvent
- Chemical constituents: Bright, yellow, and pleasant volatile oil (0.1 to 0.9%) is found in tulsi leaves. It has about 70% eugenol, 3% carvacrol, and 20% eugenol-methyl-ether. Alkaloids, glycosides, saponin, tannins, a

significant amount of vitamin C, and trace amounts of maleic, citric, and tartaric acids are also said to be present in the plant.

- Uses: The oil has insecticidal and antibacterial properties. The leaves have diaphoretic, spasmolytic, fragrant, and stimulating properties. In addition to being used as an antiperiodic, the juice is a component of several remedies for skin conditions and earaches. Tulsi leaves reduce pigmentation and improve skin tone.

Figure 16 Tulsi leaves

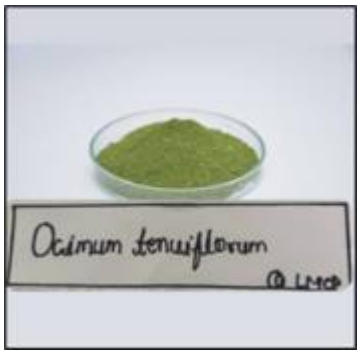

Figure 17 Tulsi leaves powder

2.1.9. Neem leaves (prevent infection and soothe skin)

- Biological Source: Neem consist of the dried leave, seed, bark and oil extracted from Azadirachta Indica
- Family: Meliaceae

Morphology

- Colour- Bright green, dark green
- Odour- Characteristic and pungent
- Taste- Vary bitter
- Size- 3-8 cm long,1-2 cm wide
- Shape- Lanceolate with serrated
- Texture- Smooth surface
- Solubility- Insoluble in water but leaf extract soluble in alcohol and organic solvent
- Chemical constituents: The most prominent of the several chemical compounds found in neem are limonoids, such as azadirachtin. Alkaloids, saponins, flavonoids, tannins, and other vitamins and minerals are additional important constituents.
- Uses: To calm the skin, stop infections, and maybe stop hair growth, neem can be used to hair removal powder. Neem is a useful component of hair removal solutions because of its inherent ability to cleanse and purify the skin.

Figure 18 Neem leaves

Figure 19 Neem leaves powder

2.1.10. Mint powder (antioxidant properties)

- Biological Source: It is consist of dried mint leaves from Mentha piperita.
- Family: Lamiaceae

Morphology:

- Colour- Bright green, dark green
- Odour- Srong, aromatic, like menthol
- Taste- Pungent, cooling, slightly sweet
- Size- 2-5 cm length
- Shape- Ovate toothed edges
- Texture- Soft, Slightly fuzzy
- Solubility- Insoluble in water but essential oils is soluble in alcohol.
- Chemical constituents: Menthone, menthol, 1, 8-cineole, and menthyl acetate make up the majority of peppermint essential oil's chemical makeup. The content of these chemicals varies throughout mint kinds, impacting its flavor, fragrance, and other characteristics.
- Uses: For skin health, it can be utilized Because of its antioxidant qualities, mint is a useful ally in skincare, calming irritations and shielding the skin from oxidative stress. They can help with digestion, relieve a number of illnesses, and refresh breath. They enhance the taste and aroma of food, beverages, and sweets in the kitchen. Mint can be taken as a supplement, added to tea, or utilized in aromatherapy.

Figure 20 Mint leaves

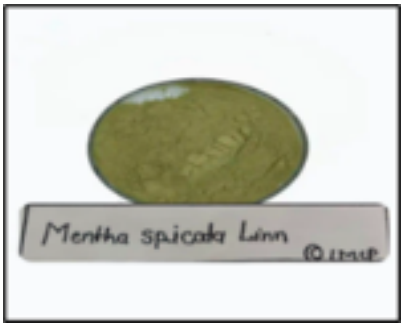

Figure 21 Mint leaves powder

2.1.11. Black salt (exfoliate dead skin)

Also known as kala namak or Himalayan black salt can be used in hair care to address dandruff, prevent hair fall, and promote healthy hair development due to its mineral content and natural purifying capabilities. Black salt can be used to exfoliate dead skin, improve skin tone, and even lighten skin. In addition to its possible health benefits, such as helping to regulate blood glucose, black salt is also said to help with cracked heels.

Figure 22 Black salt stone powder

Figure 23 Black salt stone powder

2.1.12. Liquorice powder (Reduce hyperpigmentation)

- Biological Source: Liquorice is consisting of dried roots and stolons of the plant Glycyrrhiza glabra.
- Family:Fabaceae Morphology:
- Colour- Typically black or dark brown
- Odour- Sweet, slightly earthy
- Taste- Sweet, slightly bitter
- Size- Varies small pieces, rope, coins
- Shape- Cylindrical coin shaped
- Texture- Flexible, slightly sticky when fresh
- Solubility- Insoluble in water but extract is partially soluble and used in syrup and drinks.
- Chemical constituents: Among the many chemical components found in licorice, glycyrrhizin is the most abundant and is well-known for both its sweet flavor and its numerous therapeutic uses. Glycyrrhetinic acid, other flavonoids, and saponins are other important components.

- Uses: The power of liquorice to lighten skin and lessen hyperpigmentation is well-known. To reduce the possibility of skin darkening following hair removal, particularly in darker skin tones, licorice can be added to hair removal powder. Maintaining good skin requires balancing the pH level of the skin, which licorice can help with.

Figure 24 Liquorice roots

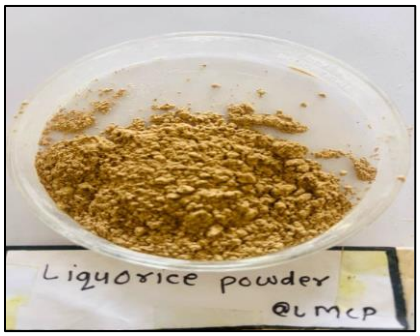

Figure 25 Liquorice roots powder

2.1.13. Rose petals (soothing properties)

- Biological Source: Petals of the rosa species, especially Rosa damasscena. Family: Rosaceae

Morphology:

- Colour- Red pink, white or yellow
- Odour- Pleasant and sweet
- Taste- Slightly sweet to bitter
- Size- 1-6 cm in length depending on the species and variety
- Shape- Ovate to obovate
- Texture- Soft, velvety
- Solubility- Insoluble in water but soluble components can dissolve in alcohol.
- Chemical constituents: Essential oils, flavonoids, phenols, hydroxycinnamic acids, tannins, terpenes, aldehydes, alcohols, vitamin C, fatty acids, minerals, and other phytochemicals are among the many chemical components that are abundant in rose petals.
- Uses: To make perfumes and other smells, rose water and essential oil are utilized. Toners, cleansers, and lotions are just a few of the skincare products that contain essential oils and rose extracts. Rose helps with skin issues including acne and redness because of its antibacterial and anti-inflammatory qualities.

Figure 26 Rose petals

Figure 27 Rose petal powder

3. Preparation of hair removal powder

Firstly, weigh all the ingredients in specified amount and take mortar pestle and washed properly. Then add firstly 5gm of *Murraya koenigii* powder into mortar pestle, add 20gm of barium sulphide

- Add 2 gram of Tulsi powder and continue mixing
- Take 2 gram of orange powder in mortal pestle
- And add 2 gram of neem powder
- Add 4 gram of Santalum album powder
- Add 2 gram of rice flour powder in mortar pestle and then continue(properly) mixing
- After that add 2 grams of Mentha powder
- And take equal quantity of liquorice powder
- Add 1 gram of black salt in mortar pestle and continue(properly) mixing
- Then after add 2 grams of rose powder
- Add 3 gram of bentonite clay mixed properly it well until a homogeneous is obtain

3.1. Evaluation of hair remover powder Organoleptic evaluation

Table 3 Physical Characteristics of the Herbal Hair Removal Powder

Appearance	**Powder form**
Colour	Dark Brownish
Odour	Pleasant, hard smell
Texture	Powder
Consistency	Excellent & Smooth

3.2. pH determination

The pH of hair removal powder was found to be (7.1) this would not cause any irritation.

Figure 28 pH meter Test

3.3. Spreadability test

Prepared hair removal powder, initially has shown Good, Uniform, No Fragmentation & Perfect Application, Without Any Deformation at Room Temperature.

Figure 29 Spreadability test

Table 4 Skin irritation test

Test (T)	Time (Minute)	Results
T1	15 min	No irritation
T2	30 min	No irritation
T3	45 min	No irritation
T4	60 min	No irritation

Figure 30 Irritancy test of hair remover powder

3.4. Washability test

After putting the product on the skin, the amount and ease of washing it off were evaluated by hand.

4. Conclusion

Hair removal powder contains various ingredients barium sulphide, *Murraya koenigii*, mentha powder, tulsi powder, etc. With different pharmacological properties to potentially provide multiple benefits for the skin. A depilatory agent barium sulfide, which means it can dissolve hair at the surface of the skin, facilitating hair removal however, the efficacy and safety of such product depend on various factors, including individual skin type, sensitivity, and potential allergies, irritation to any of the ingredients. It is crucial to conduct a patch test before using the product extensively and to adhere to the recommended usage instructions to minimize the risk of adverse reactions caused by the herbal substances and plants commonly encountered in daily life. Certain plants possess natural compounds known as phytoconstituents, which may have medicinal and hair removal properties. All the formulations were assessed for their physical and chemical properties as well as their therapeutic effects. Based on the findings, it can be concluded that the hair removal powder is made by combining chemical ingredients and herbs.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest.

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