

Formulation of Herbal Hair Wax along with Heat Protecting Action

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Abstract

An essential strategy for improving patient adherence to alopecia and scalp therapies is hair cosmetics. The present piece examines hairstyle beauty products and their modes of action: Hair wax: its application on hair and its protective properties. Medical dermatologists are able to manage scalp and hair follicle disorders more effectively by taking into account the variety of sorts of hair and ethnicities by using their expertise of hair care products, how to use them, and any potential adverse effects. Throughout the dawn of time, organic materials have been extensively used and have repeatedly demonstrated to be harmless and to have minimal adverse consequences. Numerous research indicate how to employ botanical extracts as a hair regeneration and protective factor. Selecting the correct hair wax is crucial to creating your personal look. Allow me to briefly take you around a couple of the top hair wax products for guys and provide advice on what you ought to look towards in a waxy substance.

Keywords: Hair Wax, Hair Care Products, Heat Protectant, Alopecia, Botanical Extracts

Introduction

Hair is a dermal outgrowth that arises out of follicles that contain hair that have a root, shaft, and tip. It is developed from the epidermis. Three distinct phases — the anagen (long growing phase), catagen (short transitional apoptotic phase), and telogen (resting phase) — are associated with the formation of hair.

Structure of Hair

The keratinous thread that emerges from the superficial layer of skin is called hair. Its structure is mainly composed of keratinized, dying cells. Hair follicles are epidermal penetrations of the skin where hair strands begin. The portion of hair that is not attached to the follicle is called the hair shaft, and it is mostly visible at the skin's surface. The remainder of the scalp's hair, called the hair root, is fixed in the shaft and is located beneath the skin's surface. At the scalp bulb, located deep below the dermis, the hair root terminates. The hair matrix is a layer of basal cells that are actively dividing during mitosis. The scalp papilla, whose is composed with tissue that connects and has veins of blood within, is encircled by the hair bulb.

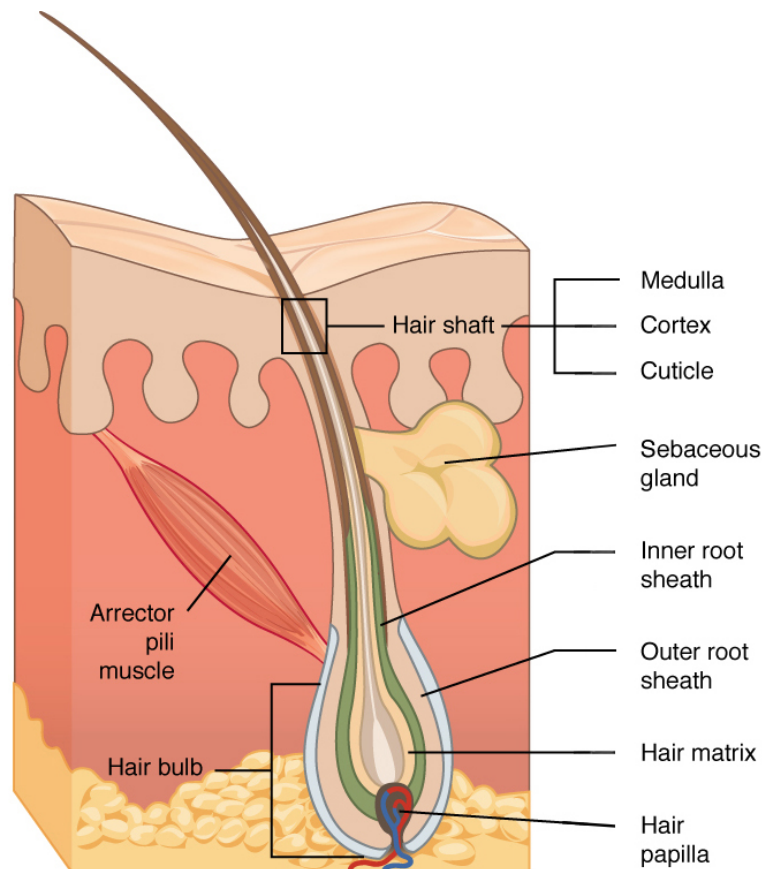


Figure 1: Structure of Hair

After the skin that is dead on the surface sheds, the basal cells of the bulbous portion of the hair divide and push cells outward in the shaft of the hair & roots. This process is similar to how the basal layer of the epidermis generates the several layers of epidermis that come to the surface. The cortex, an inner layer of compressing keratinized cells, encircles the medulla, which is the core portion of the hair. The cuticle, an exterior layer of extremely hard keratinized cells, covers the cortex. Not all hair contains a medullary layer, however such layers are shown in a diagonal its cross-section of the hair follicle.

The Cuticle

Eight or ten layers of flat, overlapping thin cells make up the cuticle; as a result, it is nearly transparent, much like window glass. The cuticle's main function is to shield its inner cortex. Disulphide bonds stabilize and hold in place the cells that comprise the cuticle, which resembles roof tiles.

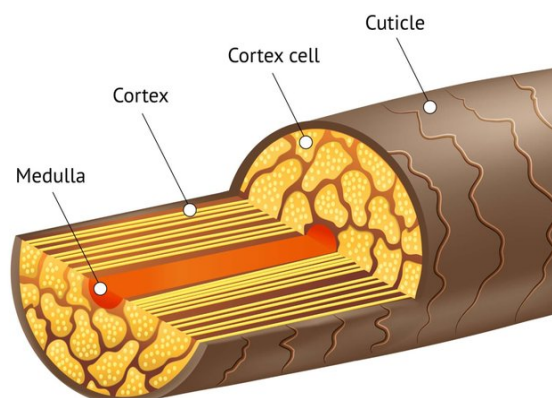


Figure 2: Layers of Hair

The Cortex

Hair is mostly composed of cortex, which accounts for around 75% of its weight. Each hair fiber's center, or cortex, is made up of long, densely packed keratin spindles held in place by disulphide bonds. From the tiniest structure, the proteins that make up keratin their own health, to the most massive and final order, the cerebral cortex itself, these kerato spindles are organized in a hierarchy.

Medulla: The medulla is the center of many, but not all, hair fibres. It's usually found in thicker, finer terminal hair.

Hair Wax

Hair wax is a dense styling product that contains wax and is applied to the hair to help hold it in place. Unlike hair gel, which typically contains alcohol, hair wax doesn't dry out and stays malleable. It's frequently marketed as whip, putty, pomade, shaping gum, and or styling paste. These goods differ greatly in terms of texture, consistency, and intended use, and each producer claims that their product serves a distinct purpose. Traditionally, pomade has been a kind of locks wax that also makes hair shine.

Hair wax has been around for a long time, and the ancient Gauls produced a waxy soap-like material for hair style; it wasn't utilized as a means of sanitation for many years.

Hair wax is a versatile shaping item that has many uses. Wax conditions hairstyle while also enhancing its density, shine, organization, and smoothness. It's an extensive set of benefits for only a single substance. Find out that the greatest a complete package styling product is waxed for hair. Hair style wax is a solid substance with characteristics similar to hair gel. The style goods waxy texture keeps hair from hardening, enabling it to remain supple and bouncy all day. For individuals who want to have light, silky, and flexible hair, this is a major plus. When applied correctly, hair wax's nourishing properties prevent hair without drying out, give damaged hair a shiny new appearance, and lessen hair breakage.

- Herbal hair wax with heat defense is a fantastic product that combines the benefits of natural ingredients with the ability to protect your hair from heat damage. It's a great option for those who love styling their hair with heat tools like straighteners or curling irons.
- Unlike regular hair wax, which focuses solely on styling, herbal hair wax with heat defense takes it a step further by providing a protective barrier against the high temperatures generated by styling tools. This helps minimize the potential damage caused by heat, such as dryness, brittleness, and split ends.
- What makes herbal hair wax with heat defense special is its use of natural ingredients. These can include nourishing oils like coconut oil, argan oil, or shea butter, which moisturize and condition your hair, keeping it healthy and vibrant. It may also contain herbal extracts such as aloe vera, chamomile, or green tea, which have soothing and rejuvenating properties for your hair and scalp.
- By using herbal hair wax with heat defense, you can style your hair with confidence, knowing that it's being protected from the potential harm of heat styling. It's a wonderful option for anyone who wants to maintain healthy, luscious locks while still achieving their desired hairstyles.

Herbal hair wax with heat defense is to provide a natural and effective solution for protecting hair from the damaging effects of heat styling.

Regular hair wax focuses on styling, but herbal hair wax with heat defense goes beyond that by incorporating ingredients that create a protective barrier against heat.

This helps to minimize the potential damage caused by high temperatures, such as dryness, brittleness, and split ends.

By formulating it with herbal extracts and nourishing oils, it not only protects your hair but also provides additional benefits like moisturization and rejuvenation. It's a great way to keep your hair healthy and beautiful while still achieving the styles.

Herbal hair wax brings a fresh and exciting twist to traditional hair styling products. What makes it truly special is its use of natural ingredients. Instead of relying on synthetic chemicals, herbal hair wax harnesses the power of plants and botanical extracts to provide nourishment and care for your hair.

The novelty of herbal hair wax lies in its ability to offer both styling and hair care benefits. It not only helps you achieve your desired hairstyle, but it also provides additional benefits such as moisturization, protection, and even promoting hair growth. This makes it a versatile and holistic solution for your hair needs.

By using herbal hair wax, you can enjoy the best of both worlds - a product that not only styles your hair but also supports its overall health and vitality. So, if you're looking for a natural and effective way to style and care for your hair, herbal hair wax is a fantastic choice. It's a novel approach to hair care that can help you achieve the look you want while keeping your hair healthy and beautiful.

Many hair waxes are present in market but we make herbal hair wax with heat defence property by the use of herbal material like coconut oil etc.

Ingredients

Many common constituents in professional hair wax formulations are listed below.

Bees Wax

Over history, wax from bees has served as a fundamental ingredient in numerous hair products. Cera alba, a different designation for beeswax, is a naturally wax that honey bees naturally generate. It is believed to help maintain hair and may even enhance its health. Does beeswax benefit hair healthily? The latest discoveries in contemporary medical science and research will be examined below, along with other relevant concerns regarding how to use wax from bees for hairstyle.

In addition to their long history of important contributions to human society, bees are currently gaining popularity in the beauty, health, and cosmetics sectors. The wax from bee has been a common component in cosmetic goods for generations, mostly because of the advantages it has for human hair, which are discussed and illustrated here.

Since the good also contained other substances, such as cannabis sativa, it is impossible to determine that just the wax alone produced the growth, even though the beeswax shown an ability to speed through the applicants' hair-growing process. It's likely that a significant boost of growth in hair was achieved by beeswax in combination with a few additional natural elements.

Biological Source: Beeswax is a natural wax produced in the bee hive of honey bees *Apis mellifera*.

Family: Apidae

Uses: Beeswax plays an important role in herbal hair wax as it provides hold and texture to the hair. It also helps to seal in moisture and protect the hair from heat styling. It also act as base for hair wax.

In addition, wax promotes quicker healing of wounds due to its antibacterial and anti-inflammatory properties. Beeswax, which is high in vitamin A, encourages cell regeneration and improves the general health of cells. These benefits work in concert to bolster beeswax's ability to soothe irritated scalps, which may also directly affect the health and growth of hair.

Your hair strands may be harmed by overloading products containing dangerous ingredients. Because beeswax is organic, it is free of any toxins that might harm hair. It is also compounds safe, which makes it a great choice for nourishing hair.

The scalp is the main area affected by the common skin condition seborrheic dermatitis. It causes skin irritation, scaly patches, and persistent dandruff. This condition is preventable and can be improved with beeswax. Researchers who looked at the effects of beeswax on psoriasis, eczema, and dandruff discovered that after two weeks, nominees who used a honey solution containing beeswax showed improvement.

By using beeswax-based products, hair extensions retain their inherent moisture levels without causing any oily residue. Beeswax hair products can be used as a final tool in the final stage of hair styling, creating a subtle shine and preventing frizz. People with dry hair can also use beeswax products to seal split ends.

We can use bees wax as base for making hair wax Beeswax hair products are best suited for textured hair, such as afro, curly, and curled hair due to their natural weight..The use of beeswax is advisable for creating dreadlocks, as it retains its shape and helps prevent breakage.

The most effective method to apply bees wax on hair to secure in normal dampness. But remember that applying beeswax to the scalp is not a good idea as it can clog the pores. Rather, make sure that you only utilise wax on the tips of your hair.

Take a tiny bit of bee wax. It will be easier to apply to the hair if you rub it between your palms and allow the heat from your hands to melt it. Avoid using beeswax on your hair without completing this step first.

Fingertip-massage the beeswax into your hair. For better hold, concentrate on getting it to the ends of the strands. Until there is no more wax on your fingers, continue rubbing the wax into your hair. Once

you've used enough wax, use a brush or comb to gently style your hair. To more evenly distribute the beeswax throughout your hair, it is advised to use a hair brush.

Extraction

Melting in hot water (typically in a filter bag). To float on top of the boiling water, the melted wax passes through the bag's fabric. The wax solidifies and becomes removable when the water cools. Melting using an extractor for solar wax. Here, the wax is exposed to the sun behind a glass cover. When the wax melts, it flows into a container for collection. Once the jar is taken out of the extractor, the wax solidifies once again. This method has the excellent benefit of using free sunshine, but it is also very simple for wax to burn in the tropics. Melting by a steam heat source while the wax is suspended in a filtering bag using the distillation method of wax extraction. A container positioned beneath the bag receives the melted liquid wax that has passed through the bag.

Hot Water Extraction

Make sure the crushed combs are clean of both honey and dirt. Using up the remaining wax. Place them into a polypropylene bag or appropriate fabric and secure with twine. Fill a large, old cooking pot or large metal container with plenty of heated water. Because it's a dirty operation, old, insignificant utensils are required. Lower the honey comb sack deeply into the boiling water.

It is best to merely slightly heat the water. It must not come to a boil as this may mix dirt with the wax and cause discoloration. Press the bag repeatedly until the wax has completely melted. Using a rolling motion, extract the final droplets of wax from the bag between two sticks. Be careful — the bag will get heated. After removing the pot from the water, let it cool. When the water cools, the wax on its surface will solidify.

Solar Water Extractor

Make sure the crushed combs are clean of both honey and dirt. Fill the extractor with the smashed combs. Finding a light filter, such as an old nylon stocking or light bag, will aid in maintaining the extractor's cleanliness. Avoid letting the wax become too hot and burning by angling the extractor so that it faces the sun. The wax will run through a filet and into a collecting container as a result of the sun's heat. After the wax melts, take it out of the extractor and allow it to cool and solidify.

Distillation Method

Make sure the crushed combs are clean of both honey and dirt. Place them inside a polypropylene bag or appropriate fabric and fasten it with a cord. Hang the bag from the container's top. Underneath the bag holding the wax, on the water's surface, is a suitable container. The wax that is trapped in the container melts when the water underneath boils. As the water evaporates, it needs to be replenished.

Coconut Oil

A persistent scalp condition that recurs frequently, dandruff affects most people worldwide. A recent metagenomic analysis of the Indian scalp microbiome revealed the critical function that bacterial commensals play in supplying the scalp with vital vitamins and amino acids. In many parts of the world, people frequently apply coconut oil and its formulations to their scalps to keep them healthy. Therefore, the purpose of this study was to investigate the relationship between the physiological characteristics of the scalp and the impact that topical administration of coconut oil had on the bacterial and fungal scalp

microbiome at both the taxonomic and functional levels. A 16-week time-course study was conducted on a cohort of 140 Indian women, 70 with dandruff and 70 without, with the treatment period lasting 12 weeks and the relapse phase lasting 4 weeks. The study produced approximately 900 samples. Following the treatment phase, dandruff parameters showed a negative correlation with an increase in the number of *Cutibacterium acnes* and *Malassezia globosa* in the dandruff scalp. Functional analysis revealed a decline in the fungal pathogenic pathways and an enrichment of beneficial scalp-related bacterial pathways, such as biotin metabolism. The study offers fresh perspectives on how coconut oil affects scalp microbiota modulation and scalp health maintenance.

Biological Source: *Cocos nucifera* (L.) (Arecaceae) is commonly called the “coconut tree”.

Uses: It is used to relieve dandruff, restore luster to dry and damaged hair, tame frizz, and protect hair against styling damage.

It is safe to use on most hair types. Coconut oil in herbal hair wax with heat protection helps to moisturize and nourish the hair. It also adds shine and helps to reduce frizz.

Its moisturizing and nourishing properties, coconut oil also helps to strengthen the hair and prevent breakage. It forms a protective barrier on the hair shaft, reducing damage from heat styling tools. Plus, it adds a delightful tropical scent to the hair wax.

It May Assist in Dividing Tip Repairing: The phrase "split ends" originates from the fact that you may detect the ends of your hair breaking off and splitting when it becomes extremely dry and brittle. Both healing and preventing ends from splitting in hair are possible with the use of coconut oil.

It Has the Power to Smooth and Shine Hair: The main fatty acid found in coconut oil, lauric acid, gives hair a glossy, silky feel. In addition, coconut oil has additional vitamins and fatty acids that make hair feel and look healthy and remove sebum accumulation.

It May Aid in the Battle Against Dandruff: Apart from providing moisture and nourishment to hair, coconut oil also helps minimize the visibility of dandruff. According to a 2018 study published in the *International Journal of Molecular Sciences*, coconut oil can aid in skin barrier restoration and possesses antibacterial, anti-inflammatory, and antioxidant properties. A 2021 study published in *Scientific Reports* reveals that coconut oil can help treat dandruff by boosting your skin's "good" bacteria, calming inflammation, and even combating dermatitis. There are many factors that can cause dandruff, including dry scalp, dermatitis, fungus, and more.

It bolsters the Cuticle: Because coconut oil softens, hydrates, and strengthens brittle, broken hair strands, it is excellent for the general health of your hair. Additionally, it fortifies the cuticle of the hair, keeping it more resilient to environmental pollutants and maintaining a better appearance and feel. "As a result, this reduces environmental and heat damage until you wash it out, all because a cuticle that's well saturated with moisture is more resilient to all the external impacts", Davis explains.

That Controls Frizz: Frizz may also be eliminated using a hair mask or serum containing coconut oil. According to Davis, "Ultimately, the cuticle-smoothing benefits of coconut oil make it an effective anti-frizz remedy." When applied to hair on a very humid day, coconut oil helps prevent frizz.

Since vitamin E helps protect hair from oxidative damage caused by radicals that are free, coconut oil is a good choice. Furthermore, it helps protect hair from external stressors including contamination and UV radiation. After putting coconut oil for hair on your locks, let it in overnight. In the morning, wash and condition your hair as usual.

The ingredients in coconut oil for hair may aid in the development of new hair growth follicles. Less hair fall and fuller-looking hair are the outcomes of this. Additionally, it can help postpone the development of graying.

What are the Hair Applications for Coconut Oil?

- You may use coconut oil on your hair as a daily treatment, an overnight treatment, or a deep conditioning therapy.
- To treat your hair and scalp, just massage a tiny quantity of coconut oil into your scalp and run it through your hair every day. You may also combine a few drops of essential oils with coconut oil for further benefits.
- Use coconut oil as a deep conditioner on your hair and scalp, letting it sit for at least half an hour before washing it away.
- If you want to give your hair an overnight treatment, apply coconut oil to it before bed and leave it in. In the morning, wash and condition your hair as usual.

Jasmine Oil:

According to Hill, the white blossom bloom of the jasmine plant is the source of jasmine oil, an emollient for the scalp and hair. "The flower is believed to be indigenous to Iran, but is also known to thrive in the tropical climates." Since jasmine oil is pricey, it is not frequently the oil of choice when creating hair and scalp care products, which makes it extremely rare to obtain high-quality oil in hair products.

Usually, the essential oils of jasmine are included in your items. "Adding essential jasmine oil to shampoos, scalp rinses, and other hair care products is the most common way this powerful ingredient is incorporated into products", Hill explains. It is created in the same method and offers the same advantages without the high cost associated with utilizing pure jasmine oil. "Many also use jasmine essential oils in massage because it is recognized to help improve mood", says Friese. Since jasmine essential oils are not governed by the FDA, Graf suggests making sure they are of the highest caliber before including them into your regimen.

Biological Source: Jasmine oil is an essential oil derived from the white flowers of the common jasmine plant, also known as *Jasminum officinale*.

Uses: Its lovely scent and nourishing properties, jasmine oil can also help to soothe the scalp and reduce inflammation. It has antimicrobial properties that can assist in maintaining a healthy scalp environment.

Furthermore, jasmine oil is known for its calming and relaxing effects, which can create a pleasant hair care experience. So, not only will your hair look great, but it will also smell amazing and feel refreshed with the inclusion of jasmine oil.

It reinforces the hair's lengths and roots while supplying hydration to increase suppleness, which is why hair care items use it. It reduces cracking, gives hair a glossy, thicker appearance.

Due to its easy penetration into hair follicles and ability to increase hair suppleness, it is utilized on hair. This nourishing oil helps control frizzy, unmanageable hair. It is also effective as a detangler.

Antiviral and Antimicrobial

Because of its antibacterial and antiviral qualities, jasmine oil is beneficial for treating a variety of scalp issues, such as dermatitis or psoriasis, as well as sensitive scalps, irritation, and redness. Treatment for dandruff and other scalp diseases might also benefit from its antibacterial properties.

Promotes Cell Replacement

It relieves dry scalps and aids in sealing hair cuticles since it contains anti-infective ingredients. By doing this, you might be able to stop hair breakage and promote hair growth.

Keeps Your Hair and Scalp Hydrated and Protected

Your hair and scalp will be moisturized and hydrated with jasmine oil, which will promote hair development. Applying jasmine oil on your hair as part of your regimen keeps the strands hydrated and prevents breakage.

Brings Silk to Your Hair

Because of the qualities of jasmine oil, your skin will retain moisture longer, which will nourish your scalp.

Gives Your Hair Strength and Length

Oil helps hair grow longer and fuller by strengthening its tensile strength.

Manages Infections of the Scalp: Jasmine oil's antibacterial qualities aid in the treatment of scalp infections and remove chemical buildup from hair.

Battles Hair Lice

Because of the purifying qualities of jasmine oil, hair lice can be eliminated, encouraging the growth of healthy hair.

How to Apply

In order to strengthen hair and get rid of the factors that contribute to hair loss, you may also immediately apply jasmine oil to your scalp and hair before shampooing.

Butter from Shea

Shea is a sustainable butter mainly produced in Ghana. It is soft and the unrefined version has an ivory colour and a typical shea scent (which can be very nutty and not to everyone's liking. Use the refined version if you don't like the natural scent).

Numerous fatty acids, including behenic acid, palmitic acid, oleic acid, stearic acid, linoleic acid, and alfa-linolenic acid (ALA), may be found in unrefined shea butter. Because of its distinct fatty acid composition and high non-saponifiable content, butter functions as a very potent emollient. With its ability to enhance suppleness and repair capabilities, it is especially helpful for extremely dry skin and hair types. Because it gives the hair back its luster and beauty, it is a great product to use to style and care for dry, damaged, brittle, frizzy, and split-end hair. Shea butter has long been used to improve Afro-style hair as well as damaged hair since it feeds the hair fibers.

Biological Source: *Vitellaria paradoxa*, formerly known as *Butyrospermum parkii*, is the shea tree, from which shea butter is an edible extract. The deciduous shea trees, which are native to Africa, reach a height of around 15 meters and bear fruit that contains oil-rich seeds after 10 to 15 years of growth.

Uses

- It increases saturation.
- It aids in frizz reduction.
- It lessens itching.
- Guards against UV damage to your hair and scalp.

Manufacture Method

First Phase: Fill a beaker with all of the first phase materials. This must be your largest beaker with a wide mouth if you want to produce a whipped version (or at least big enough to accommodate your electrical whipping gear). Place this beaker in an approximately 85–90°C water bath. Our component with the greatest melting point, bees wax, ranges from 79 to 85°C. we can also add shea butter .

Second Phase : add coconut oil and jasmine oil in separate beakers and heat it.

Combine Phase First and Second : The beaker should be taken out of the water bath once the first phase has fully melted. This may get a little complicated since our blend contains bees wax, which can harden quickly and prematurely. The secret is to constantly stir. You may start to slack down a bit and mix in the second phase once the blend drops below 52°C.

Mix and Allow to Cool Down: Stirring continuously throughout this cooling phase will provide a trace. This is the preferred and advised way (instead of the so-called "shock cooling" method) since it guarantees a consistent cooling down of all your ingredients to prevent graininess.

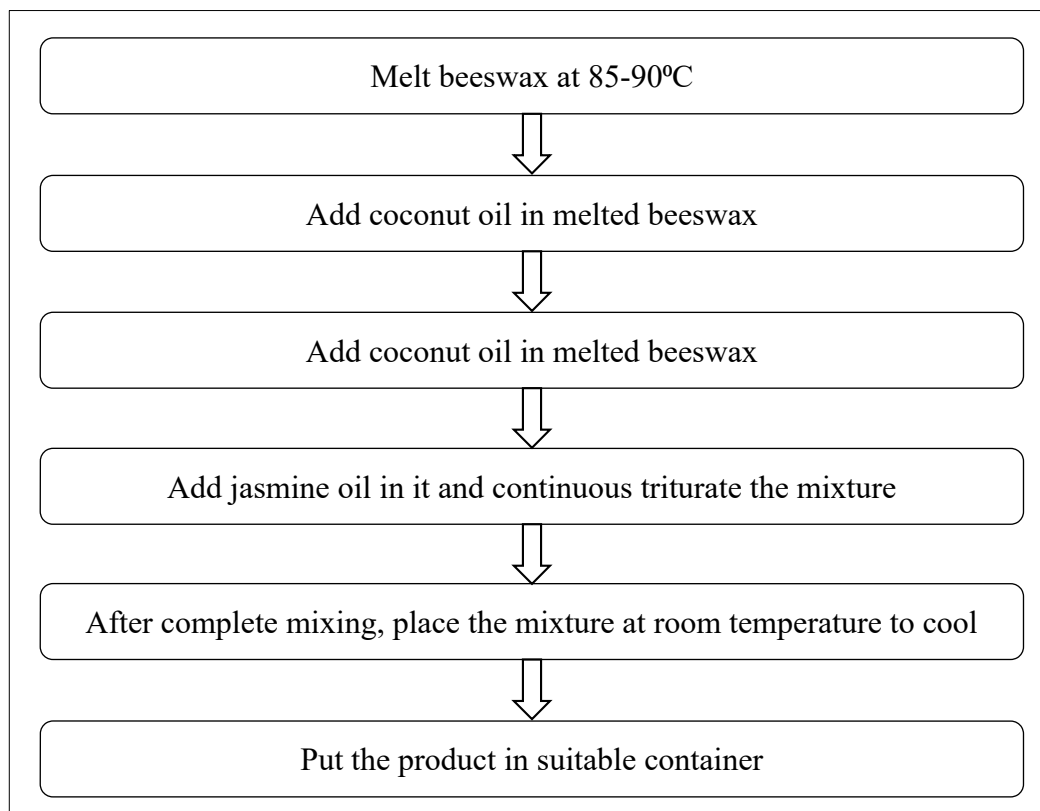
Available Products: You now have an option: fill your jars with hair wax right away if you choose a more firm formula. If you want a fluffy texture, you can also choose to whip it using an electric whisk.

The effectiveness of the product remains unaffected by the operation. The primary variations include hue, look, sensation, spreading through hair, and how it feels on your fingertips. That's what you want. It

is really easy to produce two variants from the same batch, especially in the early going, so you may try both and determine which you like better.

Seal in Jars: Once filled, place the jars in the refrigerator for the whole night with the top off.

Closures and Markings: Take your jars out of the refrigerator and allow them to come to room temperature before sealing the lids. Give your jars labels.



Evaluation and Results

Physical Characteristics: Phase separation, color, odor, and rheological parameter changes were among the physical characteristics of the wax formulation that were assessed. As with other cosmetics, customers tend to perceive hair wax attractiveness primarily via their eyes, therefore looking well is vital. White was the hue of the prepared wax. The smell is nice. The wax had no extraneous objects in it and was smooth.

Homogeneity: Following the wax's setting in the container, developed wax was visually inspected to ensure uniformity. Its look, aggregate content, and flocculates were all examined. There were no agglomerates in the produced hair wax, which was homogeneous and smooth.

pH: Using a digital pH meter, the pH of the wax mixture was found. 100 milliliters of distilled water were used to dissolve one gram of wax. The pH was then measured three times, and the average was determined. Products' pH balances are crucial because they have an impact on surfaces and skin when they are being utilized.

Our designed wax had a pH of 6.06; the mean pH of female hair was 6.784 ± 0.16 , while the mean pH of male hair was 5.604 ± 0.93 .

Ability to Wash: After applying the ready-made hair wax mixture to the skin, the degree and simplicity of water washing are regularly assessed. After applying the prepared herbal hair wax, a water wash was performed. Washing removed all traces of wax.

Extrudability: Collapsible tubes are filled with the ready-made hair wax mixture. Extrudability of the formulation was verified before the material was squeezed out of the tube.

Spreadability: Two glass slides were sandwiched with the weighed amount of wax (2g). The slides were loaded with 500g of weight. For five minutes, the weight was applied for the predetermined amount of time. The spread circle's diameter was then measured at various locations after the weight was removed. A formula was used to determine spreadability.

$$S = M \times L \div T$$

Where, S = Spreadability, M = Weight placed on the slide, L = diameter of circle in cm, T = time in seconds.

Spreadability is crucial for customer acceptance and aids in consistent use. The prepared wax was found to have a spreadability of 13.33 cm/sec.

Skin Irritation Test: Skin was treated with the herbal hair wax mixture, and any rashes, redness, or irritation was noted. For four to five minutes, the hand was exposed to sunlight after the prepared herbal hair wax was applied. It turned out to be non-irritating and skin-compatible.

Stability Study: The capacity of a certain formulation, in a specific container, to maintain its physical, chemical, therapeutic, and toxicological requirements has been termed as the stability of medicine. In order to establish recommended storage conditions, re-test intervals, and shelf lives, stability testing is used to provide evidence on how the quality of a drug substance or drug product varies with time under the influence of various environmental factors, such as humidity and light. For 30 days, the formulation in this study was kept at room temperature ($25\text{--}30^\circ\text{C}$), and any changes in its physical properties and assessment metrics were tracked.

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