

Development and evaluation of herbal hair mask for treatment of dandruff and fungal infection

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ABSTRACT

Dandruff and fungal infections of the scalp are common hair and scalp conditions affecting millions worldwide. This study aimed to develop and evaluate the efficacy of a novel herbal hair mask for the treatment of antidandruff and antifungal properties. A blend of potent herbal extracts known for their antimicrobial and anti-inflammatory properties was formulated into a hair mask. The formulation

Hair care categories are well growing and consumers are always keen to try better and better alternatives in everyday life. There are different segments in category shelves for different usages. Now these are segmenting further in organic, natural origin. The best thing of the herbal cosmetics is that it is purely made by the herbs and shrubs. The natural content in the herbs does not have any side effects on the human body; instead, it enriches the body with nutrients and other useful minerals. Common formulations of herbal hair care are, Hair Shampoos, Hair Conditioners, 2 in 1 Hair Shampoo and conditioner, Hair Masks. Herbal anti-dandruff hair mask helps you smoothen the irritating, oily and flaky scalp by controlling dandruff, thus giving you a itch-free healthy scalp and nourished hairs. Dandruff is a major problem of hair, which cannot be fully cured with the aid of chemicals. This chemical causes split ends and weakens the hair. Hairs are the delicate part of the body. So, accordingly to take care of them, we made the formulation of hair mask. This research aims to create an herbal hair mask. Hair masks are treatments that you apply to your hair for a certain amount of time before rinsing them out. They add moisture and nutrients to your hair that help hydrate dry strands, increase shine, prevent frizz, hair loss, and damage. The purpose of using a hair mask is to remove dirt and dandruff, strengthen and darken the hairs. The formulation of a hair mask that is completely free of chemicals. It only contains natural ingredients which do not harm your hairs.

KEYWORDS - Hair, Herbal hair mask, Anti Dandruff, anti fungal,

INTRODUCTION

Hair plays a crucial role in our overall health, serving as an indicator of our well-being. Using a hair mask can effectively moisturize our hair, particularly benefiting those with dry or damaged hair. Hair masks can also enhance the strength of our hair. Homemade hair masks have no drawbacks and offer numerous benefits, as they can be made from readily available ingredients. This product is particularly essential for individuals with thin or damaged hair. Healthy hair contributes to a more attractive appearance. While there are various types of masks available in the market, many of them contain harmful chemicals. To avoid these, it is advisable to create a chemical-free hair mask at home, which is simple to make. The rapidly advancing world has consumed people's time with busy schedules and obligations, causing them to neglect their own well-being. This has resulted in very limited time for self-care. One common skin condition that arises from improper hair care is dandruff. Dandruff is a skin condition that causes flaking on the scalp. It is typically caused by bacterial species such as *Staphylococcus aureus*, *Propionibacterium*, and fungal species like *Candida* and *Malassezia*. The exact causes of dandruff are generally unknown, but dry scalp is believed to be one of the contributing factors. Additionally, dandruff tends to worsen during the winter season [1]. Despite the availability of various treatment options, dandruff has persisted as a problem for centuries [2]. It is not only defined by its clinical presentation, pathophysiology, and

etiological spectrum, but also by its impact on society. The presence of scaly scalp can give an unhygienic and untidy appearance, leading to self-consciousness and embarrassment for the sufferer. Dandruff can significantly affect self-esteem and confidence [3].

Hair plays a crucial role in enhancing the well-being of individuals and serves as a protective barrier for the scalp against harmful solar radiation and physical abrasions. It is essential to focus on the creation of effective hair care products to address and shield the hair fiber from daily external aggressors. The primary objective of hair care formulations is to enhance the overall quality of the hair fiber, including its texture, strength, and manageability. Additionally, these formulations aim to enhance sensory aspects such as shine, reduce frizz, and promote the formation of a protective hair film.

The main aim of this research is to develop a natural, eco-friendly, and safe herbal hair mask in powder form, which offers greater convenience in application by simply adding water before use. The selection of specific herbs for the herbal hair mask may vary based on the desired benefits.[15]

Physiology of hair

The physiology of hair involves a perpetual cyclic process where mature follicles undergo a growth cycle. Comprising of growth (anagen), regression (catagen), rest (telogen), and shedding (exogen) phases. The duration of each phase varies depending on the hair's location, individual nutritional and hormonal status, and age. Physiology of Hair. Hair growth cycle: Hair development is a continuous cyclic process and all mature follicles go through a Growth cycle consisting of growth (anagen), regression (catagen), rest (telogen) and shedding (exogen) phases. The duration of the phase's changes based on the location of the hair and also personal nutritional and hormonal status and age.



Fig.1 Hair growth cycle

Based on symptoms, dandruff can be classified into two types: dry (common) and oily. Dry dandruff, also known as Pityriasis simplex, is characterized by the excessive formation of small scales in white, grayish, or ashen colors, which accumulate on the scalp. Initially, these scales are localized in the middle of the scalp and then spread to the parietal, frontal, and occipital areas. This type of dandruff does not typically cause excessive hair loss. The other type, oily dandruff or Pityriasis steatoides, occurs on the scalp with varying levels of sebum production. It is accompanied by inflammation of varying intensity and the appearance of oily scales in a dirty yellow color, which can form lesions. Hair loss is common, and it may even worsen androgenetic alopecia [4].

DANDRUFF : A SCALP ISSUE

Definition

What is Dandruff?

Dandruff is one of the most common scalp conditions. Corneocytes are responsible for causing the formation of flakes, which are snow white to yellowish in color. The flakes tend to stick together due to the firm adhesion of the corneocytes. As a result, they cause itching and discomfort on the scalp.

What is the most common time of year for dandruff?

According to research, dandruff is most common between puberty and mid-life. The sebaceous glands are very active during this time.[19]

Symptoms

The main symptoms of dandruff are an itchy scalp and flakiness.[5] Red and greasy patches of skin and a tingling feeling on the skin are also symptoms.[6]

Benefits of Herbal Anti-Dandruff Hair Mask

1. Stimulate hair growth.
2. Cleansing.
3. Remove dandruff.
4. Reduce hair fall.
5. Prevent premature graying.
6. Decrease baldness.
7. Keep against going gray too soon.
8. Calm the irritated, greasy, and flaky scalp.

MATERIALS AND METHODS

Materials

The different parts of the plants were selected for the study having hair care property which is already proven. Following are the ingredients which we have used in the formulation of hair pack.

- Flax seed
- Corn starch
- Hibiscus
- Amla powder
- Curry leaves
- Bhringraj oil
- Olive oil
- Castor oil
- Multani powder

1) flax seed

Biological source : *Linum usitatissimum* Linn Family : Linaceae

Flaxseed, abundant in fatty acids and antioxidants, assists in eliminating pollutants and dead skin cells from the scalp. Employing flax seed gel as a moisturizer for your hair and scalp aids in the advancement of new hair growth and fortifying existing hair. Topical products, such as oils, creams, ointments, pastes, and gels, are available, with gels gaining popularity due to their enhanced stability and capacity for controlled release compared to other semisolid preparations.[7]. Flaxseed gel helps hair grow faster and longer by providing nourishment to the hair follicles,” explains Celeste Arnold, senior stylist and owner of Celeste Arnold Hair and Makeup. “The presence of vitamin E in flaxseed provides nutrition to the scalp and reduces free radical damage.



Fig 2. Flax seed

2) corn starch

Biological Source : Corn starch, maize starch, or cornflour (British English) is the starch derived from corn (maize) grain. The starch is obtained from the endosperm of the kernel.

Family : Poaceae

Corn starch serves as food, feed, and a raw material for industrial use. Starch makes up most of the biomass of the corn hybrid and is the most important and main yield component in corn breeding programs. Starch is composed of two polymers, branched amylopectin and linear amylose, which normally constitute about 75% and 25% of the corn starch.



Fig 3. Corn starch

3) Hibiscus

Biological Source : Hibiscus rosa-sinensis Family : Malvaceae

Chemical Constituents: The phytochemical analysis showed that Hibiscus rosa-sinensis contained tannins, Anthraquinones, quinines, phenols, flavanoides, alkaloids, terpenoids, saponins, cardiac glycosides, protein, free amino Acids, carbohydrates, reducing sugars, mucilage, essential oils and steroids.[10].

Use-

- Stimulates hair growth
- Conditions hair
- Prevents baldness
- Treats dandruff and itchy scalp
- Prevents premature greying



Fig 4. Hibiscus

4. Amla

Biological Source : Emblica officinalis Gaertn Family : Euphorbiaceae

Common name : Indian gooseberry

Chemical composition : gallic acid, ellagic acid, different tannins, minerals, vitamins, amino acids, fixed oils, and flavonoids like rutin and quercetin.

Amla powder, which is derived from gooseberry, is widely used and serves as a crucial ingredient in hair tonics that promote the growth cycle of hair and improve its color. It not only strengthens and nourishes the hair roots, but also enhances their shine and variety. When applied to the roots, Amla oil stimulates further hair growth and improves its diversity. It is particularly renowned for its effectiveness in reducing hair thinning and loss, thanks to its antioxidant properties primarily derived from its tannin content. Additionally, it possesses calming and antibacterial characteristics that can help prevent dandruff.[11,12].



Fig.5 Amla

5) Curry leaves

Biological Source : *Murraya koenigii* Family : Rutaceae

Chemical composition : crystalline glycosides, Carbazole, alkaloids, resin and koenigin. Girinimbin, koenimbine, koenigine, koenidine, koenine, coumarine, mahanimbicine, iso-mahanimbin, bicyclomahanimbicine [13].

Benefits

- Boosts Hair Growth
- Conditions Hair
- Strengthens Hair
- Reduces Hair Loss
- Repairs Damage
- Tackles Frizz & Dryness
- Treats Dandruff
- Prevents Premature Greying
- Makes Hair Shiny
- Fights Infections



Fig.6 Curry leaves

6) Bhringraj oil

Family – Asteraceae and

(Bhringraj) contains wide range of diverse phytochemical

constituents which include coumestans, alkaloids, flavonoids, glycosides, polyacetylenes, and triterpenoids, phenolic acids, saponins, sterol, sesquiterpene lactones, proteins, amino acids, carbohydrates, and many more [16,17].



Fig.7 Bhringraj

7) Castor oil

Castor oil comes from the castor bean, which is rich in ricinoleic.

Chronic Idiopathic Constipation (CIC) is a condition approved by the Food and Drug Administration (FDA) that may benefit from the use of castor oil as an over-the-counter laxative. This type of laxative can be



Fig 8.Castor

beneficial for constipation and for medical procedures. However, the use of this type of laxative has decreased over time as research has developed better laxatives with fewer side effects.[18]

Ingredients table

Sr.no.	Ingredients	F1	F2	F3	F4	F5
1	Flax seed	15g	15g	15g	15g	15g
2	Corn starch	15g	15g	15g	15g	15g
3	Hibiscus powder	5g	5g	5g	5g	5g
4	Amla powder	5g	5g	5g	5g	5g
5	Curry leaves	5g	5g	5g	5g	5g
6	Bhringraj oil	5ml	6ml	4ml	4.5ml	5ml
7	Olive oil	5ml	5ml	6.5ml	5.5ml	5.6ml
8	Castor oil	5ml	4ml	5.5ml	5ml	5.4ml

9	Multani powder	5g	5g	5g	5g	5g
10	Sodium benzoate	2g	2g	2g	2g	2g
11	Water	q.s.	q.s.	q.s.	q.s.	q.s.

Table 1: Ingredients Table

Method of preparation

Weighing of ingredients:

All the required ingredients for hair mask preparation were accurately weighed individually by using digital balance

Mixing of ingredients:

- Added the flaxseeds to the water.
 - Boiled this water for around 10 minutes and keep stirring to avoid the flaxseeds from sticking to the base of the utensil.
- Turned the stove off when you achieve a gel-like texture, neither too dense nor too thin
- Let the gel cooled down for about an hour while it thickens.
- Put the muslin cloth in a glass measuring cup, then empty the gel into it
 - Now, squeezed the gel from the muslin cloth into the measuring cup in order to strain it.
- Added the Corn Starch to luke warm water.
 - Stirred well until smooth and completely dissolved. Put the rest of the water onto the stove top and bring to boil.
 - In a boiling water, added the corn starch mixture and stir continuously. Keep stirring the liquid will change their consistency after few minutes and start to become more viscous, but won't get the thickness as required, because it happens only after cooling.
- Stirred until it changes from a milky white into a vasaline like color and texture.
 - After that dried out the hibiscus flowers and curry leaves in hot air oven and cooled it at room temperature, make the fine powder of the ingredients with the help of mortar and pestle.
 - Mixed the above ingredients and made a paste of it, then added amla powder & Multani powder in it and mixed it well.
 - Added the bhringraj oil, castor oil and olive oil in the above paste and made the uniform paste.
- Finally added Sodium benzoate as a preservative.

Procedure for hair mask application

- Take a required quantity of herbal hair mask in a bowl.
- Apply the paste on scalp to the ends using fingers, gentle massage (Don't rub or Scratch).
- Keep for 30 minutes then wash hair with diluted shampoo.

EVALUATION TEST

The hair mask formulations underwent evaluation tests based on the following criteria:

1. Organoleptic properties

- Color

- odour
- Texture

2. Physicochemical Properties

- pH: The pH of a 10% hair mask solution in distilled water was measured at room temperature(25°C) using a digital pH Meter.
- Washability: The ease and extent of washing off the formulations from the skin were manually assessed.
- Hair Condition After Washing: The condition of the hair post-wash was evaluated by gathering feedback from volunteers.

3. Eye and Skin Irritation Tests

Synthetic surfactants often cause eyelid inflammation and corneal irritation. However, the herbal hair mask formulation contains naturally sourced ingredients, resulting in no harmful effects on the skin and eyes. Tests for eye and skin irritation confirmed the safety of the herbal hair mask.

4. Patch Test 5. Spreadability

2 drop of mixture was placed between 2 glass slides. 500g of weight was placed on the slides. The weight was placed for specific period of time for 5 minutes. The hair gel spreads in a circular way its diameter was measured from different points.

Spreadability was calculated by using formula. [14] $S = M.L/T$

Where, S= Spreadability, M=weight on the slide, L=Diameter of the formed circle (cm), T=time (sec)

RESULT AND DISCUSSION

All the observation data for evaluation of Hair Mask presented as following table :

Table 2: Result of evaluation of hair mask

Sr.no.	Test	F1	F2	F3	F4	F5
1	Colure	Brown	Brown	Brown	Brown	Brown
2	Nature	Semi solid paste	Semi solid paste	Semi solid paste	Semi solid paste	Semi solid paste
3	Odour	Pleasant	Pleasant	Pleasant	Pleasant	Pleasant
4	Texture	Smooth	Smooth	Smooth	Smooth	Smooth
5	pH	5.7	5.3	5.6	5.9	5.4
6	Washability	Easilywash	Easilywash	Easilywash	Easilywash	Easilywash
7	Nature of hair afterwash	Silky and smooth	Silky and smooth	Silky and smooth	Silky and smooth	Silky and smooth
8	Eye and skin irritation	Absent	Absent	Absent	Absent	Absent
9.	Swelling	Negative	Negative	Negative	Negative	Negative
10.	Redness	Negative	Negative	Negative	Negative	Negative

The evaluation parameter results from the recent study show that **formulation 5** exhibited a notably reduced level of dandruff. The investigation findings concluded that the herbal hair mask formulation possesses all the sought-after characteristics of an ideal herbal hair mask, proving to be safe, highly efficient, and economically feasible.

CONCLUSION

This study looks at a variety of plant-based drugs that have been shown to be effective in hair care. Herbal-based cosmetics are becoming increasingly popular due to their non-toxic nature. This hair mask helps to nourish the skin on the scalp, and removes excess oil. Oily scalp and poor hygiene can lead to dandruff in the hair. If used regularly, this mask can lead to healthy and dandruff-free hair. Natural remedies are becoming more widely used around the world due to their safety and fewer side effects than chemical-based products. Herbal formulations are easy to make at home with available ingredients. This study aims to create a herbal anti-dandruff hair mask with the rich qualities of plants that are easily available and can be used for hair care. The study also ensures that the mask will last for a long time.

This study shows that the prepared formulation of herbal anti-dandruff hair mask is safe and use as the cosmetic.

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