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"Formulation and Evaluation Of Orange Peel Antidandruff Herbal Shampoo"

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ABSTRACT

The current study's primary goal was to create and assess a herbal shampoo with natural and herbal ingredients, with a focus on commercialization. One frequent cosmetic product for hair maintenance is shampoo. In addition to washing the skin and hair on the scalp, it can also be used as a conditioning agent and to make hair look more attractive. The extracts of orange peel, curry leaves, shoe black plant, aloe vera gel, and lemon juice were combined in varying amounts to create the shampoo. Several physiochemical tests were conducted following formulations in order to assess them in accordance with quality standards. tests such as stability studies, conditioning qualities, the Dirt Dispersion Test, visual examination, pH measurement, hair cleaning action, and foaming ability. All of these essential characteristics must be present in a high-quality herbal shampoo that is suitable for daily usage. The four parameters—cost reduction, high yield, formulation reproducibility, and preparation stability—are detailed in the concept or strategy for commercializing this formulation. However, more scientific investigation is needed to confirm its overall quality, with human hair R&D experiments being considered. These qualities are all necessary for a high-quality herbal shampoo that may be used on a daily basis.

Keywords: Herbal shampoo, Orange peel, antidandruff, conditioning, stability, pH, commercialization

Anatomy of Hair:

Structure of Hair:

Columns of keratinized, dead cells are fused together to form a hair. A superficial part of the hair that protrudes from the skin's surface is called the shaft. In cross-section, the shafts of wooly hair are elliptical or kidney-shaped, wavy hair is oval, and straight hair is spherical. The part of the hair that extends deep into the surface and occasionally reaches the dermis and subcutaneous layer is called the root. There are three concentric layers in both the root and the shaft.

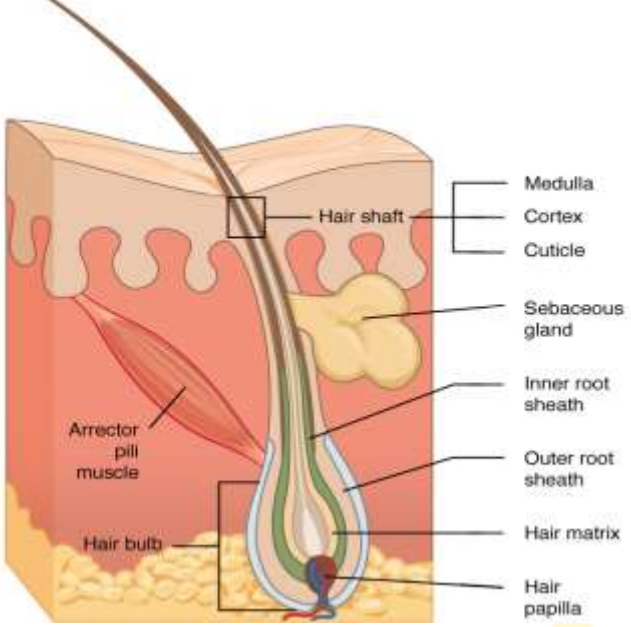

Fig 1 A : Structure of hair

Fig 1 B : Hair follicle

Medulla: It is typically visible in thick hair and is the middle portion of the shaft. It is made up of two or three rows of polyhedral cells with air gaps and pigment granules**.**

Cortex: It makes up the majority of the shaft and is situated on the medulla's periphery. It is made up of long cells, with the air in white hair and pigment granules in dark hair**.**

Cuticle: It is made up of a single layer of thin, flat, highly keratinized cells and is the outermost layer of hair**.**

Physiology of the hair:

The combined actions of several keratinocyte layers within the hair follicle result in the formation of a hair. Hair development is a dynamic, cyclical process in which the length of growth cycles is regulated by a variety of hormones and cytokines. It also depends on the location of hair growth as well as other variables like the age and developmental stage of the individual, dietary habits, and environmental changes like day length. Cytokines, or hormones, are key participants in this cycle because they can tell the follicle to adapt in the right way, putting each hair at a different stage of the growth cycle than the ones next to it.

Divided into three distinct phases

1) Anagen or growth phase
2) Catagen or transitional phase
3) Telogen or resting phase

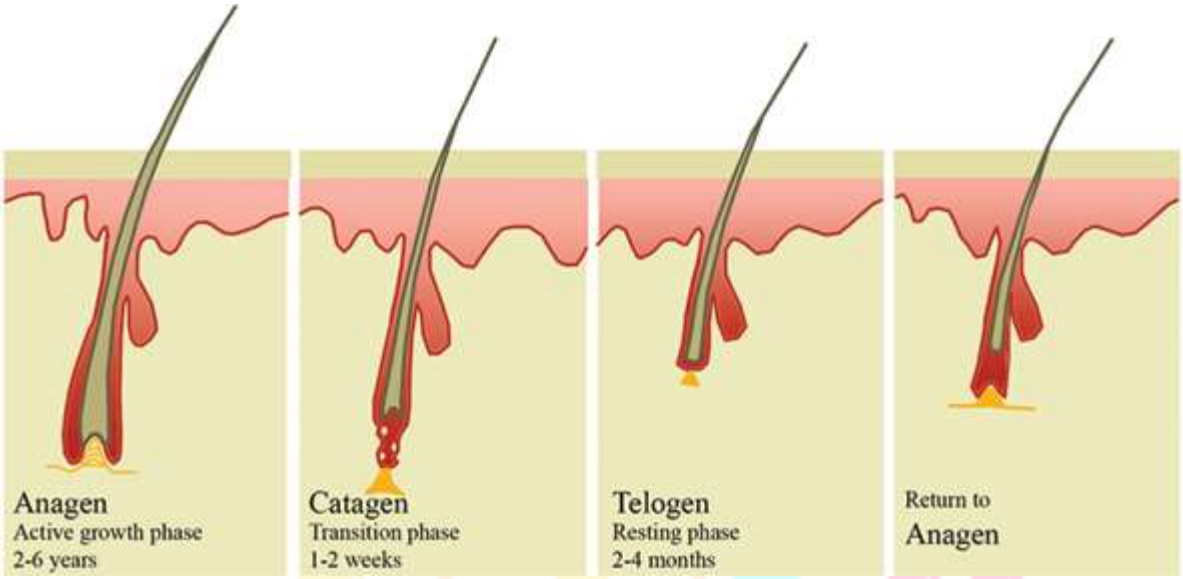

Fig 2 : Stages of Hair growth

The hair follicle grows to its distinctive onion shape during the anagen phase, which is an active growth phase, and a hair fiber is created. There are six stages to it (I–VI). Hair progenitor cells multiply during anagen I–V (proanagen), encircle the developing dermal papilla, grow downward into the skin, and start differentiating into the hair shaft and IRS. The newly formed hair shaft then starts to develop, and melanocytes in the hair matrix exhibit pigment-producing activity. Full restoration of the hair fiber-producing unit occurs during anagen VI (metanagen), which is marked by the formation of the epithelial hair bulb surrounding the dermal papilla, deep within the subcutaneous tissue, and the new hair shaft emerges from the skin's surface.

Hair Problems:

1) Dandruff (Fig 3) : Dandruff is the term for the scaly particles that stick to the hair's root and can be brought on by an unhealthy diet, a dry scalp, an infection, too much sebum, or product sensitivity. Hair loss may result from this benign, non-inflammatory skin disorder that affects the scalp. Naturally, because apple cider vinegar has anti-inflammatory and antibacterial qualities, it's a rapid treatment for dandruff. Adding omega-3 fatty acids, coconut oil, and tea tree oil also significantly reduces dandruff.
2) Hair loss : Hair loss occurs due to numerous factors such as stress, hormone imbalance, and utilizing the improper products. Protein-rich foods, gentle shampoos, hot oil massages, drinking plenty of water, and regular exercise can all help prevent this condition.
3) Dry hair (Fig 4) : Dry hair is caused by a lack of protein, but it can also be caused by other underlying conditions like menopause, birth control pills, pregnancy, hormonal imbalances, anemia, and hyperthyroidism. Foods high in omega 3 and omega 6 fatty acids can restore the luster of hair.
4) Oily scalp : Overwashing is the main cause of an oily scalp, while there are other factors as well, such as hormone fluctuations, bad diet, and heredity. Lactic acid is one ingredient that helps control oil production.
5) Hair colour damage : Frequent coloring treatments may eventually harm the hair. Additionally, the dye's ingredients may result in split ends, dandruff, breakage, and dryness. shampoos with medication. The hair can be treated with further care, conditioning, and nourishment.
6) Split ends : Hair tends to dry out and split over time when oil from the scalp doesn't get to the ends, and heat exacerbates the condition. Split ends can be prevented by lightly oiling the ends.

Fig 3: Dandruff

Fig 4 : Dry scalp

INTRODUCTION

Shampoo is a cosmetic hair care product used to clean the hair and scalp. It typically appears as a viscous liquid. It is a surfactant preparation in a suitable liquid or powder form that, when used as directed, will remove skin debris, oil, and grease from the hair shaft and scalp without harming the user. Shampooing serves to condition and beautify hair, eliminate accumulated debris, and restore the hair's healthy appearance without removing sebum. It also works as an adjunct in the treatment of various scalp disorders. In the past, shampoos were created from a variety of herbs and their extracts; however, the majority of shampoos on the market now are formulated using surfactants. Although the surfactants are included for their cleaning properties, long-term use can lead to negative side effects such eye irritation, dry hair, and hair loss. One of the cosmetics that people use every day is shampoo, and the shampoo business probably holds the largest market share among hair care products. Many synthetic shampoos, both medicated and nonmedicated, are now on the market; however, herbal shampoos have become more and more popular recently due to their natural origin, safety, growing customer demand, affordability, and lack of side effects. Although it is difficult to develop cosmetics using only natural raw materials, the herbal shampoo was created utilizing herbal ingredients as an alternative to synthetic formulation. Making a herbal shampoo with just one natural component that is safer and milder than synthetic ones is really challenging. Therefore, we attempted to develop a basic plan for the production of herbal shampoo in order to provide effective hair care. Herbal components used in the current investigation include Orange peel(*Citrus sinensis*), Shoe black plant, curry leaves, aloe vera gel, lemon juice, rose water, etc. in different proportions and evaluated for its physicochemical properties. The active ingredient in this herbal shampoo mixture is what makes it unique, Orange peel(*Citrus sinensis* Antioxidants, including vitamin C, are abundant in orange peel. Dandruff can be made worse by free radical damage, which these antioxidants shield your scalp against Around the world, people frequently experience dry scalps, which are typically accompanied with dandruff. Its antibacterial qualities, which successfully lessen scalp infections and dandruff. . Due to its inherent abrasiveness, dried and powdered orange peel can be used to exfoliate your scalp, removing dead skin cells and preventing them from flaking off as dandruff. Orange peel's essential oils help hydrate your scalp and prevent it from drying out, which is a common cause of dandruff.

Function and Description of Ingredients:

1) Orange peel extract:

Common Name: Orange

Biological Name: Citrus sinensis

Family: Rutaceae

Parts Used: Peel
Class: Dicotyledons

Function: Antioxidants, including vitamin C, are abundant in orange peel. Dandruff can be made worse by free radical damage, which these antioxidants shield your scalp against. Your scalp can remain healthy and disease-free thanks to orange peel's inherent antibacterial qualities. Citric acid from the peel also aids in removing more oil, which eliminates dandruff. Due to its inherent abrasiveness, dried and powdered orange peel can be used to exfoliate your scalp, removing dead skin cells and preventing them from flaking off as dandruff. Orange peel's essential oils help hydrate your scalp and prevent it from drying out, which is a common cause of dandruff.

Fig 5 : Orange peel

2) Shoe black plant
Common Name: Hibiscus flower
Biological Name: Hibiscus rosa sinensis L.
Family: Malvaceae.
Parts Used: Flower
Class: Magnoliopsida

Function: Hair follicles are nourished, softened, and made easier to manage with hibiscus. You can use conditioners with hibiscus as the main component to get the nourishing effects of hibiscus on your hair. Vitamins, antioxidants, and amino acids included in hibiscus help nourish the scalp and stimulate hair follicles, which in turn promotes hair development. Rich in vitamins and antioxidants, hibiscus profoundly nourishes the scalp, fostering a favourable environment for hair growth

Fig 6 : Hibiscus flower

3) Curry leaves:

Common Name: Sweet Neem leaves
Biological Name: Murrayakoenigii
Family: Rutaceae
Parts Used: Leaves
Class: Dicotyledons

Function: Curry leaves aid with dandruff management. Its antifungal qualities aid in lowering itching and dandruff, giving you healthy hair and a clean scalp. Curry leaves reduce dandruff, encourage hair growth, and hydrate your scalp. Rich in cell reinforcements, curry leaves assist to prevent hair loss, premature graying, and dandruff by saturating the scalp and removing dead hair follicles.

Fig 7 : Curry leaves

4) Aloe Vera Gel:

Common Name: Gwar Patha or Ghrit Kumari
Biological Name; Aloe barbadensis miller
Family: Asphodelaceae (Liliaceae)
Parts Used: Leaves
Class: Liliopsida

Function: There is much more to aloe vera than just a cooling component. Experts advise utilizing aloe vera shampoo for a number of reasons in order to address various hair problems. Proteolytic acid, which it contains, improves follicle health and restores damaged scalp skin. In addition, it nourishes your hair and fights dandruff and hair loss. The following is a list of all the advantages aloe vera has for hair.

Figure 8: Aloe Vera

5)Reetha:

Common Name: Soapnut
Biological Name: Sapindus mukorossi
Family: Sapindaceae
Parts Used: Fruit

Function: Reetha, commonly known as soapnuts, is also known as "Soap nut tree" in India and Arishtak in Ayurveda. It is widely used as a hair cleaner and is well known for its traditional medical applications. It is a shampoo that prevents hair loss and contains natural antifungal and antibacterial properties that may help prevent dandruff. It can be applied daily to feed the scalp and encourage the growth of new hair. The natural cleansing properties of Reetha's saponins efficiently eliminate oil, debris, and contaminants from the scalp and hair. This keeps the scalp clear of accumulation and healthy.

Figure 9: Reetha

Functions of other ingredients:

Table 1:Other Ingredients

Ingredients	**Functions**
Sodium Lauryl Sulphate (SLS)	It is used as a surfactant and as a foaming agent.
Sodium Chloride	It is used as thickener.
Lemon juice	It is used as a preservative.
Xanthan gum	It is used to increase viscosity
Rose oil	It is used for fragrance.

MATERIALS AND METHODOLOGY

1) **Collection of Herbs:** The required herbs are collected from market and some of them are collected from the area of college.

2) **Extraction Of Herbs :**

Extraction of orange peel powder: 30gm of powdered material dissolves in the 200ml of ethanol in Soxhlet apparatus. Ethanol is used as solvent to the round bottom flask. Heat the solvent using the heating mantle for 180-210min at 78°C. Once the solvent starts boiling, the vapour will pass through the condenser. The condensed solvent will drip into the Soxhlet apparatus and extract the desired compound will then drip back into the RBF. Repeat the extraction process for several minutes. After the extraction process,collect the extract from RBF and cool at room temperature

Fig 10 : : Extraction of orange peel powder using soxhlet apparatus

Decoction of curry leaves: Weigh 20 gm of curry leaves then first wash with the distilled water then washed curry leaves add in 100 ml of distilled water then put on a water bath for 30 min. After 30 min filter the solution we get filtered solution of curry leaves.

Fig 11: Decoction of curry leaves on water bath

Extraction of aloe vera: Clean the leaves of aloe vera. Slice of split the aloe vera leaves,then extract the pulp that resembles gel.Put the pulp in the blender and blend for minimum of one min.

All the herbal extracts were used in required quantity for the formulation of herbal shampoo. All herbal ingredients are mentioned in the **Table no-2**

Table 2: Herbal Ingredients

Plant	**Parts**	**Quantity**
Orange peel extract	Peel	10%
Shoe black plant	Flower	5%
Reetha	Fruit	5%
Curry Leaves	Leaves	5%
Aloe Vera	Leaves	5%

Table 3: Composition of Herbal Shampoo for (20ml)

Herbal Extract	12ml
SLS (Sodium Lauryl Sulphate)	1ml
NaCl	0.5ml
Xanthan Gum	1ml
Lemon Juice	1ml
Rose Water	q.s
Water	q.s

Formulation of Herbal Shampoo:

- Weighed all the ingredients according to the formula.
- Take a beaker add orange peel extract, hibiscus powder extract, curry leaves extract and aloe vera gel in given amount mix well with the help of magnetic stirrer.
- Add xanthan gum and sodium chloride in beaker.
- Then add reetha powdered solution into the firstly prepared solution.
- Add lemon juice and rose water it works as Preservatives and perfume.
- Mix well the above solution using magnetic stirrer for several mins.
- Store the solution in the container and label it.

Evaluation OF Herbal Shampoo:

To evaluate the prepared formulations following quality control tests including visual assessment and physicochemical controls such as pH, foam volume, foam stability, stability of shampoo, cleansing, dirt dispersion test was performed using standard protocols.

1) **Physical Appearance/ Visual Inspection:** The formulation was tested for clarity, color, odor, foaming ability, and fluidity. Based on the physical and visual appearance the test was carried out.

2) **Determination of pH:** A shampoo solution was constituted in distilled water and the pH of the solution was measured by using a calibrated pH meter.

3) **Foaming Ability & Foaming Stability:** The herbal shampoo solution's capacity to foam was assessed using the cylinder shake method. After adding the sample of herbal shampoo solution, the cylinder was gradually shaken by hand for ten minutes. Following a brief period of shaking, the volume of foam was measured every minute for approximately five minutes. This indicates that the foam produced by the shampoo is stable and has higher foam properties, which could be attributed to the presence of a foaming agent.

4) **Stability Study:** The Stability of the formulation was carried out by keeping the formulation at 25 to 30° C (at room temperature) for 2-3 weeks. This was concerned for testing the good stability in terms of chemical and physical stability.

5) **Skin Irritation Test:** This test was performed by applying the shampoo on skin for 5 minutes after that it was washed and tested for irritation, inflammation or redness on the skin.

6) **Conditioning Attributes:** The conditioning effect of the shampoo on the hair was evaluated after the hair had been washed with the shampoo. The conditioning properties include all desirable benefits impaired to the hair such as increased mass to the hair improve lusture softness and silkiness.

7) **Dirt dispersion test :** About 1% of shampoo solution taken in a Test tube and 1 drop of India ink is added. The test Tube is stoppered and shaken for about 10 mins The amount of ink present in the foam is indicated as None, light, moderate, or heavy

RESULTS AND DISCUSSION

1) Physical Appearance/ Visual Inspection: The prepared formulations are evaluated in terms of color, clarity, color etc.

Fig 13 : Visual assessment

2) pH Result: The shampoo formulation's pH was 4.5, falling between the 4 to 6 range that is advised for shampoo. The formulation has an acid-balanced pH that is almost skin-friendly. Shampoo pH is crucial for preserving the ecological balance of the scalp, lessening eye discomfort, and improving hair qualities. Gentle acidity promotes tightness of the scalp and lessens edoema, giving the appearance of a shiny scalp.

Fig 14 : Ph determination test

3) Foaming Ability & Foaming Stability: The shampoos' capacity to clean has little to do with the formulation's ability to produce foam. Additionally, customer satisfaction is taken into account. The foam created by the finished formulation is depicted in the figure below.

Fig 15 : Foaming ability test

Fig 16 : Skin irritation test

4) Stability study : The created polyherbal shampoo has good stability and is both chemically and physically stable at 25 to 30° C, according to the results of a two-week stability study. The final formulation's stability during the storage period indicated that they are both physically and chemically stable.

5) Skin irritation test : Skin irritation tests are used to assess the potential of chemicals or substances to cause irritation when applied to the skin

6) Conditioning Attributes: When using herbal shampoo to wash artificial hair, the results include the removal of oil and debris, leaving the hair feeling cleaner and glossier while also providing nourishment and conditioning.

7) Dirt dispersion test : About 1% of shampoo solution taken in a Test tube and 1 drop of India ink is added. The test Tube is stoppered and shaken for about 10 mins The amount of ink present in the foam is indicated as None, light, moderate, or heavy.

Fig 17 : Dirt dispersion test

RESULTS

Table no 4: Results

Sr. No	Parameters	Results
1	Physical appearance	Shiny Orange
2	pH	4.5
3	Foaming ability and stability	Good foam capacity
4	Stability study	Good
5	Skin irritation test	Nil
6	Conditioning attributes	Safe
7	Dirt dispersion test	Light

CONCLUSION

The study's primary goal was to create a herbal shampoo that would work well. by staying away from completely synthetic ingredients, which are typically used in shampoo to a significant degree. Herbal ingredients that are extremely safe and effective for use were used to make this shampoo. Orange peel (Citrus sinensis), the active component, has phytoconstituents that have nourishing, conditioning, and antioxidant qualities. Compared to the use of synthetic conditioning agents, the use of natural conditioning agents helps to reduce hair loss. Later, the herbal shampoo's formulation was assessed for a number of factors, including filth dispersion, pH, and visual examination. The formulation provides good results, is effective for usage, and aids in conditioning and nourishing hair, according to the evaluation results of different formulations. The formulation's commercial strategy is based on cost reduction, repeatability, stability, and high yield production.

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