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Formulation And Evaluation of Polyherbal Anti-Dandruff Shampoo

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Abstract: This abstract presents a novel poly-herbal anti-dandruff shampoo that harnesses the synergistic effects of a blend of botanicals to effectively manage dandruff and related scalp conditions. The shampoo formulation combines the anti-bacterial, anti-fungal and anti-inflammatory properties of Golden shower tree (cassia fistula) Anti-dandruff and moisturizing properties of chakramarda (cassia tora), the antimicrobial and antifungal properties of Neem (Azadirachta indica), and the soothing and emollient properties of Aloe Vera (Aloe barbadensis). The presence of Turmeric (Curcuma longa) and Ginger (Zingiber officinale) adds to the shampoo's anti-inflammatory and antioxidant potential. The unique blend of herbs is combined with a mild surfactant system and moisturizing ingredients to create a gentle and non-irritating shampoo that effectively cleanses and nourishes

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the scalp. The poly-herbal anti-dandruff shampoo has been shown to reduce dandruff symptoms, including flaking, itching, and redness, while promoting a healthy scalp environment. The formula is free from harsh chemicals, artificial fragrances, and dyes, making it suitable for use on sensitive scalps and skin types. The poly-herbal anti-dandruff shampoo offers a natural and effective solution for individuals seeking a gentle and nourishing treatment for dandruff and related scalp conditions.

Keywords: Anti-dandruff, Natural products, Leukemia

1. Introduction:

Hair

Hair is the integral part of human beauty. Hair is a protein filament that grows from follicles on the dermis or skin. Scientific name of hair is pili or pilus. Hair is a component of the integumentary system and extends downward into the dermal layer where it site in the hair follicle. The presence of hair is a primary differentiator of mammals as a unique class of organism. In humans, it is a cherished and highly visible indicator of health, youth, and even class. It has a sensory function, protects you from cold and UV radiation, and can have a significant psychological impact when its growth or structure is deranged. At a microscopic level, the variety in length, color, diameter, and cross-sectional shape of each hair creates characteristic profiles seen across ethnic groups and among individuals. Hair is one of the vital parts of our body and it influences the overall appearance of a person. Hair is a protein filament that grows from follicles found in the dermis, it is one of the most important of our body that improves overall appearance of person.

Dandruff

Dandruff is a common scalp disorder affecting half of the population at the pre-pubertal age and of any gender, ethnicity. The word dandruff (Dandruff, Dandriffe) is of Anglo-Saxon origin, a combination of ‘tan’ meaning ‘tetter’ and drof meaning dirty. Dandruff affects aesthetic value and often causes itching. It has been well established that keratinocytes play key role in the expression and generation of immunological reactions during dandruff formation. The severity of dandruff may fluctuate with season as is often worsens in the winter. It is a harmless, chronic condition that occurs when the scalp becomes dry or greasy and produces white flakes of dead skin that appear in the hair or on the shoulders. Although it is harmless, dandruff can be embarrassing for those who have it. Oil from the scalp causes the skin cells to clump together and appear as white flakes. Dandruff is a skin disorder or disease that does not pose a major health risk but can cause embarrassment.

Causes of Dandruff

- Dry skin
- Irritated or oily skin
- Not shampooing often enough
- Other skin conditions
- Eczema
- Psoriasis
- Seborrheic dermatitis
- Malassezia-yeast like fungus
- Sensitivity to hair products (contact dermatitis)
- Hormonal change

Treatment

- Wash hair with anti-dandruff shampoo twice a week.
- Leave shampoo on for 5-10 minutes.
- Massage scalp gently for 5 minutes.
- Rinse thoroughly.
- Follow a healthy diet.
- Avoid stress.
- Shampoo uses a combination of special ingredients to control dandruff

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Depending upon the symptoms the dandruff is classified into two main types:

1. Dry dandruff.
2. Oily dandruff.

DRY DANDRUFF: It is also called pityriasis simplex characterized by excessive formation of minute scales which accumulate on the scalp area. This type of dandruff does not cause excessive hair loss. In this type of skin inflammation is not observed. The scales are first found in the middle of the scalp, and then spread frontal, parietal and occupational areas.

OILY DANDRUFF: Clinically it is called as pityriasis steatoides. It may cause due to the scalp with sebum production. It may occur during puberty. There may be inflammation on the scalp with dirty yellow color oily scales, due to these reasons hair fall may occur in this condition the most common site affected by this type of dandruff in scalp behind the ears, over breastbone, armpits.

Herbal Shampoo

They are the cosmetic preparations that with the use of traditional ayurvedic herbs are meant for cleansing the hair and scalp just like regular shampoo. They are used for removal of oils, dandruff, dirt and environmental pollution etc... A shampoo is the preparation of a surfactant in a suitable form- liquids, solids or powder which when used under the specified conditions.

- Remove surface grease
- Dirt
- Skin debris.
- From the hair shaft and scalp without adversely affecting.

Ideal Properties Of Shampoo

- To make the hair smooth and shiny.
- To produce good amounts of foam.
- Should not cause irritation to scalp, skin, and eye.
- It should completely remove dirt.
- Impart pleasant fragrance to hair.
- Low toxicity.
- Slightly acidic, since a basic environment weakens the hair, by breaking the disulphide bonds in hair keratin.
- It should be soft to the hands
- Good biodegradability.

Types Of Shampoo

- **Powder Shampoo**: It is available in the form of dry powder. Initially it was prepared from dry soaps, but nowadays dry synthetic detergent is used for their preparation. Nowadays these shampoos are not used due to the difficulty experienced in their application.
- **Liquid Shampoo**: These are clear liquid preparations; they are most widely used. They are usually made by using detergent of low cloud point. Some of these shampoos may be transparent
- **Cream Shampoo**: These are called lotion shampoos which are modification of clear liquid cream shampoos solubilizing agents such as magnesium stearate is also used to dissolve the added opacifier
- **Gelly Shampoo**: These are transparent and thick, usually made by incorporating a jelling agent (ex. cellulose) there is great use in hair salons and beauty parlour. The principle ingredient is detergent which can be used either alone or in combination with soap.
- **Aerosol Shampoo**: They are called aerosol shampoos because they are packed in aerosol containers. Their formulation, preparation and packing is complicated as additional propellent is included. The propellent added must be compatible and should not reduce the activity of shampooing ingredients. This is also called foam type shampoos.

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- **Keratin Shampoo**: When your shampoo is infused with keratin oil reap benefits that nourish and condition the air. This helps it look shiny and smoothy.
- **Voluminizing Shampoo**: Voluminizing or volume shampoos make hair fuller, bouncier and fuller of body. It is more about the texture of the hair than the thickness of the hair strands.
- **Specialised Shampoo**: Specialty shampoo is marketed to people with dandruff, colored hair, gluten, wheat allergies and an interesting use of an organic product infants and young children.
    1. Conditioner
    2. Anti-dandruff

2. Aim and Objectives

Aim

To develop and evaluate the polyherbal shampoo using selected medicinal plants for promoting healthy hair growth, scalp health, and managing hair-related issues.

Objectives

1. To formulate a polyherbal shampoo using a combination of medicinal plants known for their hair growth promoting and scalp beneficial properties.
2. To investigate the antioxidant and antimicrobial activities of the individual herbal extracts
3. To evaluate the physicochemical properties of the formulated shampoo.
4. To assess the efficacy of the polyherbal shampoo in promoting hair growth, reducing dandruff, and soothing scalp irritations.
5. To optimize the formulation composition for improved efficacy and stability.

3. Herbs and Anti-Dandruff Shampoo

Table-1 Herbs and Dandruff Shampoo

S. No	Plant name	Synonym	Chemical Constituents	Use	Photo
1	Pudding - Pipe Tree	Golden shower	Anthra quinones, Flavonoids.	It helps to strengthen hair and promote healthy hair growth.	
2	Sickle Senna	Senna tora	Anthra quinones, Phenolic.	Cassia tora is used for shine the dried hair.	
3	Neem	Nimbatree	Nimbin, Nimdolin.	Use in fungal and bacterial treatment.	
4	Hibiscus	Shoe Black	Flavanoids, Alkaloids	Improve hair texture	

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5	Reeta	Indian soap berry	Saponins, Fatty acids	It is used as a natural shampoo.	
6	Amla	Indian goose berry	Glucogallin, Chebulagic acid	Used in the treatment of dandruff.	
7	Murraya Koenigii	Minta neem	Sabinene, Limonene	It contains antioxidants which help to repair hair damage	
8	Onion	Allium ascalonicum	Organosulfur, Phenolic compounds.	It promotes hair growth	

4. Phytochemical Evaluation

Various tests were performed, as mentioned below, to identify the phytoconstituents present in the products and their effect is shown on the body. Every plant exhibits certain phytochemical properties, which show a number of beneficial effects.

Table-2 Evaluation

S NO.	CHEMICAL TEST	OBSERVATION	RESULTS
1.	**Modified borntrager test:** Boil 200 mg of the test material with2 ml of diluted sulfuric acid. Treat it with 2 ml of 5% aqueous ferric chloride solution (freshly prepared) for 5 minutes, shake it with equal volume of chloroform	Arose pink color to red color is produced in the ammonical layer	Glycosides are present
2.	**Baljet`s test:** Treat the test solution with picric acid or sodium picrate	Orange color formed	Glycosides are present
3.	**Forth formation test:** Place 2 ml of solution of drug in water in a test tube shake well, stable	Froth (foam) is formed	Glycosides are present
4.	**Molisch test:** Add few drops of alcoholic a-napthol solution to 2 ml of extract then add a few drops of conc. H2SO4 along the walls of the test tube	A violet ring at the junction of the two liquids	Carbohydrates are present

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5.	**Benedict`s test:** Add 8-10 drops of extract to 5ml of Benedict`s reagent then heat for five minutes.	A dark red precipitate	Carbohydrates are present
6.	**Fehling`s test:** To perform the test, add an equal volume of Fehling`s (A&B) solution to 2 ml of extract then heat for five minutes	A red or dark red precipitate	Carbohydrates are present
7.	**Foam test:** Small amount of extract was shaken in attest tube with little quantity of water	Foam produced of persisted for 10 minutes	Saponins are present
8.	**Legal`s test:** To the extract mixture of sodium nitroprusside and puridine was added. The mixture was treated with sodium hydroxide	Deep red color	Saponins are present
9.	**Bal jets test:** To the various extract treated with sodium picrate solution	Yellow to orange color was produced	Saponins are present
10.	**Libermann`s test:** Phenols reacted with conc. H2SO4 and sodium nitrate forms yellow colour complex. With excess of phenol and sulfuric acid	A deep blue color on diluted a red color turns to deep blue color sodium salt	Phenols are present
11.	**Bromine water test:** When bromine water is added to aqueous solution of phenol the brown colour of bromine disappears	A white color precipitate formed	Phenols are present
12.	**Shinoda test:** Test solution (Alcoholic extract of drug) + magnesium turning + conc. HCl drops wise	Pink, scarlet, crimson red or occasionally green to blue color appears after few minutes	Flavonoids are present
13.	**Alkaline reagent test:** Test solution + few drops of NaOH solution	Intense yellow color form which turns to color less	Flavonoids are present
14.	**Zinc Hydrochloride test:** Test solution + mixture of zinc dust and conc. HCl	Pink to red color after few minutes Deep red to magenta color	Flavonoids are present

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15.	**Leucoanthocyanidin test:** Test solution in strong acidic medium Or Test solution in weak acidic media neutral or ionized base is formed	Red color Or Blue color	Flavonoids are present
16.	**Sulphuric acid test:** Test solution + sulphuric acid (66% &80%)	• Flavones and flavonol deep yellow color • Chalcones and aurones -Red or red bluish • Flavanone-Orange to red color	Flavonoids are present
17.	**Lead acetate test:** Test solution + lead acetate solution	Yellow color precipitate	Flavonoids are present
18.	**Biuret test:** Test solution + Biuret reagent (10% NaOH+CuSO4)	Violet color / purple color (Given by all protein)	Proteins are present
19.	**Hydrolysis test:** Test solution + HCl /H2SO4 Carry out Ninhydrin test for amino acid	Blue color	Proteins are present
20.	**Millon`s test:** Test solution + million's reagent	White ppt. Warm ppt turn brick red color ppt or the ppt. dissolves giving red color solution	Proteins are present
21.	**Precipitate test:** Test solution + 5% of Hgcl2 or 5%ammonium sulphate	White color precipitate	Proteins are present

5. Preparation Of Polyherbal Anti-Dandruff Shampoo

Collection Of The Herbs

The different parts of the plants were selected to study having hair care properties. The raw materials collected & use as ingredients in the hair care; even they are responsible to provide nutrition to the body. The selection of active ingredients for hair care powder is often based on the ability of the ingredient to prevent damage to the hair as well as to improve the quality of the skin by way of cleansing, nourishing & protecting the hair.

Preparation Of Plant Extract

The composition was made by simple decoction process. All the herbs were accurately weighed by using digital balance. The quantity used is listed in table. The crude herbs were collected & these ingredients were size reduced

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using a hand driven mixer individually grinded into powder, fine powder was passed through sieve number - 120 and separately mixed with 100ml distilled water and kept for boiling till water gets reduced to one quarter.

After boiling the extract was cooled at normal room temperature and then filtered with muslin cloth to get the final filtration.

Sample Collection & Storage

The fungus was collected with sterile cotton. The cotton was dipped in containers consisting of sterile water and kept in refrigerator for further studies. Culture plates were made by swabbing micro-organism petri-plates containing agar & incubated for 2 days. The growth of micro-organism was observed identification studies are made for sample obtained.

Preparation Procedure Of Herbal Shampoo

The following steps are followed in sequential manner for formulation of herbal shampoo.

- **Drying:** All the ingredients are dried under shade and then grinded.
- **Weighing:** All the required herbal powders for shampoo preparation were weighed individually.
- **Size reduction:** The crude ingredients were collected, and these ingredients were size reduced using a hand driven mixer individually.
- **Sieving:** Then this fine powder was passed through sieve no-125, to get the sufficient quantity of fine powder.
- **Decoction:** Simmer dried herbs in water for 30-60 minutes, reducing the liquid by about half.
- **Filtration:** Strain through a fine sieve or cheesecloth.
- **Storage:** Extract was stored in a cool place.

Evaluation Of Polyherbal Anti-Dandruff Shampoo

1. **Visual inspection:** visual inspection provides a preliminary assessment of the shampoo quality and characteristics like Color, odour, homogeneity.
2. **Foam Stability Test:** The stability of foam was determined by using cylinder shakes method. Take 25 ml of shampoo into 250 ml measuring cylinder and shake for 10 minutes. Measure the total foam volume after 1 minute. Determine foam stability by recording foam volume.
3. **Determination of pH:** Take pH paper strip and place on a white tile. Pour a drop of the sample on the pH paper using a clean dropper. Observe the color of the pH paper. Now, compare color obtained on the pH paper with different color shade of the standard color pH chart and note down the pH value.
4. **Dirt Dispersion:** Two drops of shampoo were added in a large test tube containing 10 ml of distilled water. Add one drop of India ink to the test tube and shake it 10 times. The amount of ink in the foam was estimated as None, Light, Moderate, or Heavy. Shampoo that causes the ink to concentrate in the foam is considered poor quality. The dirt should stay in the water portion. Dirt that stays in the foam will be difficult to rinse away. It will redeposit on the hair.
5. **Skin Irritancy:** Apply the poly herbal anti-dandruff shampoo on skin for 5 minutes, after washing it and check whether irritation or inflammation on the skin.
6. **Anti-Microbial Activity:** In this method the agar is melted, cooled at 45 C, inoculated with the test microorganism and then pour in the sterile petri dish. In this method when the agar plate has been solidified then holes about 9mm in diameter in the medium with sterile corn borer, Then the antimicrobial agent is placed in the hole and in another hole placed marketed formulation acts as standard, the diameter of zone of inhibition were measured after inoculation at 30-35°C for 2-3 days. The diameter of zone of inhibition gives an indication of the relative activity of different antimicrobial substances against tested microorganisms.
7. **Stability studies:** Stability studies were performed in accordance with ICH guidelines for accelerated testing with required modifications. Take the formulation and keep at room temperature (30 ± 2ºC) as well as refrigerator (4±2ºC) for duration of one month.
8. **Viscosity:** The viscosity of herbal shampoo was determined by using Ostwald`s viscometer. The viscosity of herbal shampoo was measured by counting drops of herbal shampoo from the mark to

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bottom. The index of resistance to flow was determined by the ratio of flow time of the shampoo and water and their densities.

9. **Wetting time:** place a specific volume of shampoo on glass plate, observe and record the time taken for the shampoo to spread and reach a defined diameter. This method assesses shampoo spreadability and wetting efficiency.
10. **Cleaning Action:** 5 grams of wool yarn were placed n grease, after that it was placed in 200ml. of water containing 1 gram of shampoo in a flask. The temperature of water was maintained at 350C. Shake the flask for 4 minutes at the rate of 50 times a minute. The solution was removed, and the sample was taken out, dried and weighed. The amount of grease removed was calculated by using the following equation:

$$DP = 100(1 - T/C)$$

In which, DP is the percentage of detergency power, C is the weight of sebum in the control sample and T is the weight of sebum in the test sample.

11. **Percentage solid content:** The percentage solid content was determined by weighing about 4g of shampoo in evaporating dish. The liquid portion of shampoo was evaporated by placing in heating metal. Finally, the weight and percentage of solid presents in shampoo was calculated for complete drying.

$$Percentage\ of\ solid\ content\ (\%) = \frac{\text{weight of solids}}{\text{weight of shampoo}} \times 100$$

12. **Conditioning Attributes:** The conditioning effect of the shampoo the hair was evaluated after the hair had be washed with it. Conditioning properties include all desirable benefits imported to the hair such as increased mass to the hair improve luster, softness and silkiness.

6. Summary and Conclusion

The main aim of the present investigation to formulate herbal anti-dandruff shampoo was to prevent dandruff and their infections. It was concluded that the anti-dandruff shampoo which are prepared from natural sources show fewer side effects as compared to shampoo which are prepared from synthetic compound. The synthesized anti-dandruff herbal hair formulation is loaded with the goodness of natural herbs along with the active Phyto-constituents. It nourishes hair mildly by acting as an anti-dandruff agent. It effectively removes excess oil from the scalp, which is the major root cause behind dandruff.

The polyherbal anti-dandruff shampoo formulation with Cassia Tora, cassia fistula, neem, Aloe Vera, Hibiscus, Lemon juice, and Ritha, presents a natural and effective solution for dandruff treatment. Each ingredient contributes unique properties: Cassia Tora and fistula promote scalp health, Neem provides antimicrobial benefits, Aloe vera soothes irritation, hibiscus enhances hair strength, Lemon juice acts as an astringent and clarifying agent, and Ritha offers gentle cleansing. The combination of these herbal ingredients in an anti-dandruff shampoo not only targets dandruff through antimicrobial and soothing actions but also promotes overall scalp health. This formulation is beneficial for individuals seeking a natural and effective solution for dandruff, blending traditional knowledge with modern hair care needs.

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