International Journal of Medical, Pharmaceutical and Health Sciences (2024);1(4):163-168

International Journal of Medical, Pharmaceutical and Health Sciences

Journal home page: www.ijmphs.com

Review Article

Formulation and Evaluation of Natural Anti Dandruff Shampoo

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Article Info

Article history:
Received: 08/12/2024
Received in revised format: 22/12/2024
Accepted: 24/12/2024
Available online: 30/12/2024

Keywords: Shampoo; Herbal; Shikakai; Reetha; Guar Gum; Curry Patta

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DOI:10.62946/IJMPHS/1.4.163-168

ABSTRACT

The aim of present study was to report an herbal antidandruff shampoo utilizing plants that are well-reported for their cleansing effects on hair. These natural plant components are safer as compared to synthetic chemicals (e.g. silicones and polyquaterniums), used as conditioning agents. Present study utilizes flowers of *hibiscus rosa sinensis*, seeds of *trigonella foenum-graecum* (fenugreek), fresh leaves of *murraya koenigii* (curry patta), fruits of *Acacia concinna* (shikakai), fruits of *sapindus mukorossi* (reetha) and dried seed of *Cyamopsis tetragonoloba* (guar gum). Dried powder forms of all these plants were used. An exhaustive evaluation of prepared formulations was also reported. The evaluation studies ensure the antidandruff potential of reported formulations. Furthermore, study showed good foam foaming, rinsing, and good dirt dispersion activity; yet, extra research are proposed to improve the product's overall quality.

INTRODUCTION

The Anglo-Saxon term "dandruff" (also known as "dandriffe") is a combination of the words "tan," means "tetter," and "drof," means "dirty." The symptoms of dandruff, a chronic scalp ailment, include redness, scaling, and itching. It happens when big clusters of epidermal cells fall off the scalp. A fungus known as *Malassezia restricta* and *Malassezia globosa* is thought to be the source of dandruff, which is the excessive shedding of dead skin cells from the scalp. The yeast Malassezia, formerly known as Pityrosporum, causes infections of the skin and scalp. On the scalp, cell replacement happens gradually and is invisible to the naked eye. Every month, the process of change takes place. A disruption on the scalp known as dandruff will occur if this process speeds up. Overcrowding, inadequate personal cleanliness, and a warm, humid environment are all perfect conditions for Malassezia growth. Males are more likely than females to have dandruff, which affects 5% of the population and often appears after puberty [1,2]. Dandruff can be categorized as either a skin scaling disorder or a sebaceous gland disorder. Once more, dry dandruff can be minor or severe. There are two types of dandruff: dry and oily [3]. Dandruff is frequently caused by abnormal keratinization of the epidermal tissue, excessive lipid secretion, excessive sebum

(skin oil) secretion from your skin, abnormal proliferation of scalp bacteria, dry skin, inadequate or inappropriate hair cleaning, scrubbing, excessive shampoo use, being more sensitive to chemical hair products, eczema, psoriasis in your hair, the excretion of microorganisms that thrive in your skin, and your sensitivity and tolerance to allergies and natural immunity [4,5].

Dandruff can be treated in two ways: with chemical-based anti-dandruff shampoo and treatment, or with an organic alternative that uses herbal dandruff shampoo. Anti-dandruff shampoos come in two varieties: synthetic (chemical) and herbal. The current treatment option for dandruff is synthetic shampoo, which contains tar derivatives, piroctone olamine, zinc pyrithione, salicylic acid, imidazole derivatives, glycolic acid, steroids, sulfur, selenium sulfide, and uncylenic acid derivatives for therapeutic purposes [6]. Similar to conventional shampoos, herbal shampoos use Ayurvedic herbs to cleanse the hair and scalp and are further employed to remove pollutants from the environment, oils, dandruff, and filth, among other things [7].

One kind of cosmetic product that incorporates herbs natural substances derived from plants is herbal shampoo. 'Herbal shampoo' can refer to any hair cleaning product that is prepared from the extracts of ayurvedic herbs and flowers. It can also be described as a thick liquid hair care solution that is used to clean and remove oil and debris from hair. Numerous benefits of the herbal shampoo include lubrication, conditioning, hair development, preventing hair loss, preserving hair color, and treatment. It also serves as a keratolytic agent and has anti-dandruff and cleaning properties [8,9].

The composition of herbal shampoo is intended to remove dandruff and filth while also leaving hair feeling silky and soft. The goal of the current study is to avoid using commercially available synthetic or chemical preparations. The usage of a number of herbal components with antidandruff qualities made the hair shiny and silky while encouraging hair development. Crucially, these preparations are reasonably priced and economical. The composition contains a variety of plants, including hibiscus, tulsi, neem, reetha, bhringraj, and shikakai.

MATERIAL AND METHODS

Herb Collections

The fresh flowers of *hibiscus rosa sinensis*, seeds of *trigonella foenum-graecum* (fenugreek), fresh leaves of *murraya koenigii* (curry patta), fruits of *Acacia concinna* (shikakai), fruits of *sapindus mukorossi* (reetha) and dried seed of *Cyamopsis tetragonoloba* (guar gum) is collected from local market of Sagar, M.P. India in the month of October 2022. All plant parts were authenticate from Deptt. Of Botany, Dr. H.S. Gour University Sagar M.P. India with herbarium file No. Bot./H/173/197131.

Method of Preparation of Anti-dandruff Shampoo

A straightforward mixing procedure was used to create the shampoo. 100 g of *each plant* material was washed under running water to remove foreign substances, homogenized and boiled in hot water for 4 hrs. separately. The obtained aqueous extracts were filtered and concentrated to obtain semi solid mass. The % yield of each extract was calculated for *hibiscus rosa sinensis* (9.8%), *trigonella foenum-graecum* (8.5%), *murraya koenigii* (10.11%), *Acacia concinna* (11.2%), *sapindus mukorossi* (8.8%) and *Cyamopsis tetragonoloba* (11% w/w).

The necessary amounts of herbal extract, as listed in formulation table no. 1, were added to create the herbal antidandruff shampoo. The shampoo mixture, which is displayed in Table 1, was created by combining the plant extracts in various ratios. Glycerine was combined with herbal extracts and shaken for 20 minutes. Finally, an appropriate amount of 1% citric acid solution was added to the solution to correct its pH. A straightforward mixing procedure was used to create the herbal anti-dandruff shampoo. Guar gum is utilized as a thickening ingredient, while reetha is employed as a surfactant in the shampoo [10].

Table 1: Compositions of Polyherbal Antidandruff Shampoo

S. No.	Name of Ingredients	F1	F2	F3	F4	F5
1.	*Hibiscus Rosa Sinensis*	25	30	38	25	20
2.	*Trigonella Foenum-Graecum*	15	8	6	18	10
3.	*Acacia Concinna*	1	1.5	2.5	1.5	1
4.	*Murraya Koenigii*	04	3.5	4.5	5.5	7
5.	*Sapindus Mukorossi*	10	5	5	5	10
6.	Vitamin E	10	12	10	10	10
7.	Glycerin	5	5	15	5	12
8.	*Cyamopsis Tetragonoloba*	10	15	10	10	10
9.	Water	q.s	q.s	q.s	q.s	q.s

Evaluation Parameters

The quality control process for evaluating the prepared formulations includes visual assessment and physicochemical tests. Specific tests for shampoo formulations include determining moisture content, dry residue, salt content, surface tension, and detergency tests [11].

Physical Appearance and Organoleptic Evaluation

The evaluation of formulations involves assessing macroscopic characteristics such as color, odor, taste, texture, and appearance using sensory organs like the eyes and nose. This helps determine clarity, foam producing ability, fluidity, and overall quality.

Cleansing Action

For cleansing action of prepared herbal shampoo, 05 grams of wool yarn were soaked in oil and put in a flask with 200 milliliters of water and one milliliter of room-temperature shampoo. For four minutes, the flask was shaken at a rate of fifty shakes per minute. Samples were extracted, dried, and weighed after the solution was discarded and determined percentage of detergency power (DP) as [12]:

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

Where C = Weight of sebum in the control sample, T = Weight of sebum in the test sample

Determination of pH

The pH of a 10% shampoo solution in distilled water was determined at room temperature (25°C).

Viscosity measurement

Ostwald's viscometer was used to estimate the produced shampoo's viscosity at room temperature.

Determine Percent of Solids Contents

A dry, clean evaporating dish should be weighed. Weigh the dish with the shampoo after adding 4 grams of shampoo to it. Subtract the weight of the empty dish from the weight of the dish with shampoo to determine the precise weight of the shampoo. Put the shampoo-filled evaporating dish on a hot plate and let the liquid evaporate. To ascertain the weight of the solids, weigh the dish containing the residual solids (dry shampoo) [13].

Surface Tension Measurements

Was done out with a 10% shampoo dilution in distilled water at room temperature using stalagmometer.

Dirt Dispersion

Two drops of shampoo were added to 10 mL of distilled water taken in a large test tube. To this solution, one drop of India ink was added and the test tube was stoppered and shaken ten times. The amount of ink in the foam was indicated by the rubric such as None, Light, Moderate or HeavyThe dirt dispersion of prepared shampoo was determined using India ink in a test tube [14].

Foaming Ability and Foam Stability

Foaming ability was assessed using the cylinder shake method. A 250 ml graduated cylinder was then filled with 50 ml of the

1% shampoo solution, and shook ten times. Following a minute of shaking, the total quantities of the foam contents were noted. The foam volume was measured. As soon as the foam was shaken, its volume was measured every minute for four minutes [15].

Patch Test

This involves applying a little amount of moistened formulation to the hand's surface, and results have shown that the formulation causes itching and irritation.

RESULTS AND DISCUSSION

In the present study, formulated a polyherbal shampoo by using plant extracts.

The Organoleptic properties of prepared shampoos were shown in Table 2, which showed that the formulated shampoos were light brown in colours with mint odour. The texture of shampoos was clear with clear viscous liquids. The cleansing action of prepared shampoos were reported in Table 3, indicating % cleansing values in the range of ~33%. The results indicates that a combination of natural surfactants, like reetha, in optimized concentrations can produce sufficient foam for shampoo and exhibit good detergency ability. Additionally, the developed formulation demonstrates cleansing action, suggesting that natural surfactants could serve as effective replacements for harsh synthetic detergents in shampoo formulations.

It has been demonstrated that the pH of prepared herbal shampoos plays a significant role in improving the characteristics of hair, reducing eye irritation, and preserving the ecological balance of the scalp. followers of the current herbal shampoo promotion trend. One strategy to reduce hair damage is to adjust pH. Mild acidity causes the scales to tighten and prevent swelling, which results in shine. As can be seen from the table below, all of the shampoos were acid balanced and fell between 6.0 to 6.45, which is close to the pH of the scalp (Table 4).

Table 2: Organoleptic properties of prepared shampoos.

S. No.	Organoleptic Parameter	F1	F2	F3	F4	F5
1.	Color	Light Brown	Light Brown	Light Brown	Light Brown	Light Brown
2.	Odor	Mint	Mint	Mint	Mint	Mint
3.	Texture	Clear	Clear	Clear	Clear	Clear
4.	Appearance	Viscous Clear Liquid	Viscous Clear Liquid	Viscous Clear Liquid	Viscous Clear Liquid	Viscous Clear Liquid

Table 3: % Cleansing of prepared herbal shampoos.

S. No.	Formulation	Cleansing %
1.	F1	33.10
2.	F2	33.16
3.	F3	32.89
4.	F4	32.60
5.	F5	33.0

Table 4: pH Value of prepared herbal shampoos.

S.No.	Formulation	pH
1.	F1	6.45
2.	F2	6.30
3.	F3	6.09
4.	F4	6.00
5.	F5	6.12

Viscosity Evaluation

The prepared shampoo had a viscosity between 1.00 and 1.40 poise, which provides excellent fluidity and enables the formulation easy to distribute and apply to hair. Since the shampoo was made entirely of natural herbs and had a pH of 1.00 to 1.40, it did not cause any skin irritation when applied (Table 5).

Table 5: Viscosity of prepared herbal shampoos.

S. No.	Formulation	Viscosity
1.	F1	1.12
2.	F2	1.25
3.	F3	1.00
4.	F4	1.40
5.	F5	1.35

The results of % of solid content was mentioned in Table 6 (Figure 1). The % of solid content was highest in formulation F4 and least in formulation F3.

Figure 1: Photograph of % Solid content determination.

Table 6: Percent of Solids Contents of herbal shampoos.

S. No.	Formulation	% Of Solid content
1.	F1	5.12%
2.	F2	6.12%
3.	F3	3.75 %
4.	F4	8.25%
5.	F5	9.5%

The significant characteristic of herbal shampoos is the decrease in the surface tension of pure water to roughly 40 dynes/cm. It is among the primary deterrent mechanisms. The herbal shampoos' good detergent effect is demonstrated by the decrease in water's surface tension from 72.8 dynes/cm to 30 dynes/cm (Table 7).

Table 7: Surface tension of prepared herbal shampoos.

S. No.	Formulation	Surface Tension (dynes/cm)
1.	F1	30.1 ± 3.8
2.	F2	32.7 ± 3.4
3.	F3	33.1 ± 2.0
4.	F4	32.5 ± 2.3
5.	F5	34.1 ± 2.8

The dirt detergency activity of prepared herbal shampoos was light to moderate (Table 7).

Table 8: Dirt detergency of prepared herbal shampoos.

S. No.	Formulation	Observation
1.	F1	Light
2.	F2	Moderate
3.	F3	Light
4.	F4	Light
5.	F5	Moderate

Foam production is an important criterion in evaluating shampoo, however has little cleansing activity of shampoos. Table 9 represents, that the prepared herbal shampoos showed good foaming properties.

The patch test showed no swelling, no redness and no irritations from prepared herbal shampoos.

Table 9: Foam forming ability of prepared shampoos.

S. No.	Shampoo quantity in ml for foam forming	Height of foam (cm)				
		F1	F2	F3	F4	F5
1.	1ml	2	3.3	4	3.8	3.2
2.	2ml	1.9	2.8	3	4.1	3.0
3.	3ml	2.6	3.4	2.8	3.1	2.8
4.	4ml	2	3.1	3.2	3.2	3
5.	5ml	3.9	4.8	3.1	4.0	3

Table 10: The patch test results of prepared herbal shampoos.

S. No.	Observation	F1	F2	F3	F4	F5
1.	Swelling	No	No	No	No	No
2.	Redness	No	No	No	No	No
3.	Irritation	No	No	No	No	No

CONCLUSION

In the present study we have reported herbal antidandruff shampoo. Different herbs were used for the preparation of shampoos. Total five formulations were reported with different % of herbs. The formed shampoos showed improved antidandruff activities during evaluation. The formed shampoos are comparable to marketed products and furthermore, more studies are required to get the best formulation.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

ACKNOWLEDGEMENTS

None.

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