

FORMULATION AND EVALUATION OF HERBAL LIQUID SHAMPOO

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ABSTRACT

A liquid or cream preparation of soap or detergent to wash the hair is called as shampoo. Shampoos are the products which removes surface grease, dust from the hair shaft and scalp. Shampooing is the most common form of hair treatment. Shampoos are primarily being products aimed at cleansing the hair and scalp. In the present scenario, it seems improbable that herbal shampoo, although better in performance and safer than the synthetic ones, will be popular with the consumers. A more radical approach in popularizing herbal shampoo would be to change the consumer expectations from a shampoo, with emphasis on safety and efficacy. The main objective of this study was

to eliminate harmful synthetic ingredient from herbal shampoo formulation and substitute them with a safe natural ingredient.

KEYWORDS: Herbal shampoo, evaluation, formulation, radical approach, physico-chemical approach.

INTRODUCTION

A liquid or cream preparation of soap or detergent to wash the hair is called as shampoo. Shampoo is a hair care product, typically in the form of a viscous liquid that is used for cleansing hair. The goal of using shampoo is to remove the unwanted build-up in between the hair without stripping out so much sebum as to make hair unmanageable Shampooing is the most common form of hair treatment. Shampoos are primarily being products aimed at cleansing the hair and scalp. In the present scenario, it seems improbable that herbal shampoo, although better in performance and safer than the synthetic ones, will be popular with the consumers. A more radical approach in popularizing herbal shampoo would be to

change the consumer expectations from a shampoo, with emphasis on safety and efficacy. The word shampoo in English is derived from Hindustani champoo. Shampoos are typically composed of 10 to 30 ingredients.

Ideal Properties of shampoo

1. To make the hair smooth and shiny.
2. Produce good amount of foam.
3. Should not cause irritant to scalp, skin and eye.
4. Should completely, effectively remove dirt.
5. Impart pleasant fragrance to hair.

Functions of Shampoo

1. It should effectively and completely remove dirt or soil.
2. It should effectively wash the hair.
3. It should produce a good amount of foam to satisfy the user.
4. It should be readily removed by rinsing with water.
5. It should impart a pleasant fragrance to the hair.
6. It should not have any side effects or causes irritation to the skin and eye.

Classification of Shampoo

1. Based on Appearance.
 - Powder shampoo
 - Liquid shampoo or lotion shampoo
 - Gel shampoo or Solid shampoo
 - Cream shampoo
 - Oil shampoo
 - Miscellaneous anti dandruff shampoo or medicated shampoo
2. Based on Use or Function.
 - Conditioning shampoo
 - Antidandruff shampoo
 - Therapeutic shampoo
 - Baby shampoo
 - Balancing shampoo

- Clarifying shampoo

3. Based on origin:

- Herbal shampoo
- Egg shampoo

Evaluation of shampoos comprises the quality control tests including visual assessment and physicochemical controls such as pH, density and viscosity.

MATERIALS AND METHODS

Preparation of Herbal Liquid Shampoo

All plant material like ritha fruits, fenugreek seeds, amla and shikakai were collected from Ayurveda store.

Table No. 01: Formula of prepared shampoo.

Sr. No.	Name of Plant	Part Used	Quantity	Purpose / Uses
01	Fenugreek seeds	Seeds	07.50gm	Promotes hair growth
02	Ritha	Fruits	21.00gm	Detergent
03	Amla	Fruits	64.00 gm	Help enhance hair texture and increase hair growth
04	Shikakai	Beans	64.00gm	Shine to hair and soft & smooth hair after wash
05	Distilled Water	-	750 ml	For soaking
06	Methyl paraben	-		Preservative

Accurately weigh all ingredients and soak it for overnight. next morning (all ingredient becomes puffy and filled with water after soaking overnight) boil the ingredients in the same water on medium flame then cool the mixture and filter. Methyl paraben was added for preservation and Developed shampoo was stored in a suitable container and used for further evaluations.

Evaluation of Prepared Herbal Liquid Shampoo

To evaluate the prepared formulations, quality control tests including visual assessment and physicochemical controls such as pH, density and viscosity were performed. Also, to assure the quality of products, specific tests for shampoo formulations including the determination of dry residue and moisture content, total surfactant activity, salt content, surface tension, thermal and mechanical stability and detergency tests were carried out.

- 1) **Physical appearance/visual inspection:** The formulations prepared were evaluated in terms of their clarity, foam producing ability and fluidity.

- 2) **Determination of pH:** mix 01gm of shampoo with 09ml of water and determine the pH using pH meter at 27°C.
- 3) **Determine percent of solids contents:** A clean dry evaporating dish was weighed and added 4 grams of shampoo to the evaporating dish. The dish and shampoo was weighed. The exact weight of the shampoo was calculated only and put the evaporating dish with shampoo was placed on the hot plate until the liquid portion was evaporated. The weight of the shampoo only (solids) after drying was calculated.
- 4) **Rheological or Viscosity evaluations:** The viscosity of the shampoos was determined by using Brookfield viscometer. 10ml of shampoo is taken in a beaker and spindle is dipped in it for about 5min. and then reading is taken.
- 5) **Dirt dispersion:** Two drops of shampoo were added in a large test tube contain 10 ml of distilled water. 1 drop of India ink was added; the test tube was stoppered and shakes it ten times. The amount of ink in the foam was estimated as None, Light, Moderate, or Heavy.
- 6) **Cleaning action:** 5 grams of wool yarn were placed in grease, after that it was placed in 200 ml. of water containing 1 gram of shampoo in a flask. Temperature of water was maintained at 35°C. The flask was shake for 4 minutes at the rate of 50 times a minute. The solution was removed and 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.
- 7) **Detergency ability:** The Thompson method was used to evaluate the detergency ability of the samples. Briefly, a crumple of hair was washed with a 5% sodium lauryl sulfate (SLS) solution, then dried and divided into 3g weight groups. The samples were suspended in a hexane solution containing 10% artificial sebum and the mixture was shaken for 15 minutes at room temperature. Then samples were removed, the solvent was evaporated at room temperature and their sebum content determined. In the next step, each sample was divided into two equal parts, one washed with 0.1 ml of the 10% test shampoo and the other considered as the negative control. After drying, the resided sebum on samples was extracted with 20 ml n-hexane and re-weighed. Finally, the percentage of detergency power was calculated 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 3, 4.

- 8) **Foaming ability and foam stability:** Cylinder shake method was used for determining foaming ability. 50ml of the 1% shampoo solution was put into a 250 ml graduated cylinder and covered the cylinder with hand and shaken for 10 times. The total volumes of the foam contents after 1-minute shaking were recorded. The foam volume was calculated only. Immediately after shaking the volume of foam at 1 minute intervals for 4 minutes were recorded.
- 9) **Stability studies:** The thermal stability of formulations was studied by placing in glass tubes and they were placed in a humidity chamber at 45°C and 75% relative humidity. Their appearance and physical stability were inspected for a period of 3 months at interval of one month.

RESULT AND DISCUSSION

Evaluation of Herbal Liquid Shampoo

- 1) **Physical appearance/visual inspection:** The results of visual inspection of series of formulations are listed in table no. 02.

Table No. 02: Evaluation of Formulation for physical appearance.

Sr. No.	Formulation	Physical appearance
01	A1	Dark brown, amla like smell
02	A2	Dark brown, amla like smell
03	A3	Dark brown, amla like smell

2) Determination of pH

The pH of shampoos has been shown to be important for improving and enhancing the qualities of hair, minimizing irritation to the eyes and stabilizing the ecological balance of the scalp. The current trend to promote shampoos follower. pH is one of the ways to minimize damage to the hair. Mild acidity prevents swelling and promotes tightening of the scales, there by inducing shine. As seen from table no. 03 all the shampoos were acid balanced and were ranged 5.5 to 5.9, which is near to the skin pH.

Table No. 03: Determination of pH.

Sr. No.	Formulation	pH
01	A1	5.63
02	A2	5.01
03	A3	5.72

3) Determine percent of solids contents

If the shampoo has too many solids it will be hard to work into the hair or too hard to wash out. The result of percent of solids contents is tabulated in table no. 04, and was found between 22-29%. As a result, they were easy to wash out.

Table No. 04: Determine percent of solids contents.

Sr. No.	Formulation	Solid Contents
01	A1	21.11
02	A2	22.61
03	A3	28.43

4) Rheological or Viscosity evaluations

The results of rheological evaluation showed that the viscosity of the samples changes gradually with the increase in rpm, therefore the shampoo formulations were time dependent. Secondly as the data showed the viscosity decreases with increase in rpm, so the shampoo formulations were shear thinning or pseudo plastic in nature. These formulations showed pseudo plastic behavior which is a desirable attribute in shampoos formulation. At low rpm the herbal shampoos showed high viscosity and increase in the shear rate the viscosity of the shampoos drops, this is a favorable property which eases the spreading of the shampoos on hair. The results obtained from the rheological studies were fitted into different flow behaviors, using the linear or non-linear regression. Table no 05. shows the goodness of fitting indices for Newtonian, plastic and pseudo plastic flow behaviors.

Table No. 05: Viscosity of herbal shampoo.

Sr. No.	Formulation	Viscosity
01	A1	1.17
02	A2	1.21
03	A3	1.20

5) Dirt dispersion

Shampoo that cause the ink to concentrate in the foam is considered poor quality, the dirt should stay in water. Dirt that stays in the foam will be difficult to rinse away. It will redeposit on the hair. All three shampoos showed similar results. These results indicate that no dirt would stays in the foam; so prepared formulations are satisfactory.

6) Cleaning Action

Cleaning action was tested on wool yarn in grease. Although cleaning or soil/sebum removal is the primary aim of a shampoo, experimental detergency evaluation has been difficult to

standardize, as there is no real agreement on a standard soil, a reproducible soiling process or the amount of soil a shampoo should ideally remove¹¹. As seen from the results, there is a significant difference in the amount of sebum removed by the different shampoos. The results of detergency studies showed that the final formulation has significantly similar detergency ability, when compared with the marketed formulations and it was found in between 18-33%. The results are presented in table no. 06.

Table No. 06: Cleaning action of herbal shampoo.

Sr. No.	Formulation	Cleaning (%)
01	A1	31.16
02	A2	30.01
03	A3	31.20

7) **Surface tension:** measurement It has been mentioned that a proper shampoo should be able to decrease the surface tension of pure water to about 40 dynes/cm¹². Surface tension reduction is one of the mechanisms implicated in detergency. The reduction in surface tension of water from 72.8 dynes/cm to 34.70 dynes/cm by the herbal shampoos is an indication of their good detergent action. The results are shown in table no. 07.

Table No. 07: Surface tension(dynes/cm) of herbal shampoo.

Sr. No.	Formulation	Surfacetension (dynes/cm)
01	A1	32.06
02	A2	31.21
03	A3	31.31

8) **Detergency ability:** Although cleaning or soil/sebum removal is the primary aim of a shampoo, experimental detergency evaluation has been difficult to standardize, as there is no real agreement on a standard soil, a reproducible soiling process or the amount of soil a shampoo should ideally remove. As seen from the results, there is a significant difference in the amount of sebum removed by the different shampoos. The results are presented in table no. 08.

Table No. 08: Detergency ability of herbal shampoo.

Sr. No.	Formulation	Detergency (%)
01	A1	65.53
02	A2	64.09
03	A3	63.21

9) **Foaming ability and foam stability:** Although foam generation has little to do with the cleansing ability of shampoos, it is of paramount importance to the consumer and is therefore an important. Criterion in evaluating shampoos. All the three shampoos showed similar foaming characteristics in distilled water. All three shampoos showed comparable foaming properties. The foam stability of herbal shampoos is listed in table no. 09. A point to be noted here is that there does not seem to be any direct correlation between detergency and foaming, which only confirms the fact that a shampoo that foams well need not clean well. The final formulation produced stable foams there was little bet change in foam volume.

Table No. 09: Foam stability of herbal shampoo.

Sr. No.	Formulation	Foam volume (ml)
01	A1	168
02	A2	166
03	A3	164

10) **Stability Study:** Stability and acceptability of organoleptic properties (odor and color) of formulations during the storage period indicated that they are chemically and physically stable. The stability of herbal formulation is listed in table no. 10.

Table No. 10: Stability study of herbal shampoo.

Sr. No.	Parameters	01 month	02 month	03 month
01	Physical appearance/visual inspection	Clear	Clear	Clear
02	pH	5.21	5.23	5.31
03	Solids contents (%)	21.41	23.15	24.63
04	Surface tension measurement (dy. /cm)	32.77	31.69	34.70
05	Rheological evaluations (cps)	1.21	1.24	1.27
06	Detergency ability (%)	64.21	66.21	53.77
07	Foaming ability and foam stability (ml)	168	178	168

SUMMARY AND CONCLUSION

The herbal shampoo preparation was formulated based upon traditional knowledge and emphasis was to formulate a stable and functionally effective. The formulated shampoos were not only safer than the chemical conditioning agents, but also greatly reduce the hair loss during combing as well as strengthen the hair growth. The pH of the shampoos was adjusted to 5.5, to retain the acidic mantle of scalp.

It was found to be harmless, more effective and economical.

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