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FORMULATION, EVALUATION AND COMPARATIVE STUDY OF COST-EFFECTIVE HERBAL SHAMPOO WITH MARKETED SHAMPOO

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ABSTRACT

A shampoo may be described as a cosmetic preparation meant for the washing of hair and scalp, packed in a form convenient for use. Its primary function is of cleansing the hair of accumulated sebum, scalp debris and residues of hair-grooming preparations. The main objective of the work is to formulate and evaluate cost-effective herbal shampoo. Shampoo was prepared by simple mixing process. Ingredient used are Shikakai, Aamla, Reetha. All ingredients were mix together using mortar and pestle. Prepared herbal shampoo was found to be turbid, brown in color, pleasant in odour. Ph was found to be 6.06, Percentage of solid content was found to be 11.75, foaming index was found to be 500. Skin sensitisation and dirt dispersion test were also performed. The present study was carried out with the aim of preparing the herbal shampoo that reduces hair loss during combing, safer than the chemical conditioning agents as well as to strengthen the hair growth. From the result, in the present study, the prepared herbal shampoo formulation was comparable to the market shampoos in many parameters. Our data suggests that, prepared herbal shampoo is recommended as a choice product in cost effective hair care cosmetics.

KEYWORDS: Herbal shampoo, reetha, shikakai, amla, anti-dandruff, dirt-dispersion, foaming index.

INTRODUCTION

A shampoo may be described as a cosmetic preparation meant for the washing of hair and scalp, packed in a form convenient for use. Its primary function is of cleansing the hair of accumulated sebum, scalp debris and residues of hair-grooming preparations. The added functions of shampoo include lubrication, conditioning, bodybuilding, prevention of static charge build up, medication and so on. Finally, the complete shampoo formulation must be medically safe for long-term usage. The English word shampoo is derived from Hindi “champo” which means head massage with some form of hair oil.

Many synthetic shampoos contain harmful chemicals primarily for foaming and cleansing action but their regular use leads to dryness of hair, hair loss, irritation to scalp and eyes.

Nowadays natural products dominate over the synthetic products since it has no side effects. This is one reason that the herbal products are popular among the consumers. Synthetic hair products have chemicals which may give short term growth and shine to hair, but definitely when used for long term damages the hair which may even lead to baldness, premature hair greying and hair loss. Some of the chemicals used in synthetic shampoo includes sodium dodecyl sulphate (SDS), N-nitrosodiethanolamine (NDELA), disodium EDTA, formaldehyde, etc.

Herbal formulations are considered as alternative to synthetic shampoo but formulating cosmetics using completely natural raw material is a difficult to prepare. For the preparation of herbal shampoo, natural material should be milder and safer than the synthetic ones, and at the same time would compete favourably with its foaming, detergency and solid content. Commercially available herbal shampoos are not completely natural but contain herbal extract in synthetic detergent base along with other chemical additives. There are large numbers of medicinal plants which are reported to have beneficial effects on hair.

We, therefore, considered to formulate a pure herbal shampoo using traditionally and commonly used plant material.

The pericarp of Spindus mukorossi, commonly known as Soapnut or reetha, fruits of Phyllanthus emblica commonly known as Amla, and dried pods of Acacia concinna (Shikakai).

AIM AND OBJECTIVES

Aim: The aim of this present study is to prepare and formulate an herbal shampoo and to assess its physiochemical function that emphasis on safety, efficacy, eliminating harmful synthetic ingredient, and substitute with safe natural ingredients.

Objectives

1) Remove oil content from the hair leaving the hair dry and damaged
2) Herbal shampoos aim at delivering essential nutrients to the hair
3) Mild cleansing effect to remove the unwanted oily content.
4) They are basically water-based products containing mainly surfactants.
5) Primary function is of cleansing the hair of accumulated sebum, scalp, debris and residues of hair grooming preparations.
6) The herbal shampoo although better in performance and safer than the synthetic ones will be popular with consumers.

INFORMATION OF PLANT[7]

A) REETHA

- Synonym – Indian soup berry, washnut
- Source- sapindus mukorossi, Family sapindaceae

Use
1. Cleanser or insecticide
2. for treating migraine headache.
3. To remove skin impurities like pimples, eczema.

Fig: 1 Reetha plant.

B) Aamla

- synonym - Indian goose berry.
- source- emblica officinalis family phyllanthecacea

Use
1. Prevent premature greying of hairs and stimulate hair growth.
2. Commonly used as oil or aqueous extract in hair care formulations like hair oil and shampoo.

Fig 3: Aamla plant.

C) Shikakai

- Synonym- bhuriphena
- Source – acacia concinna family mimosacea

It consists of lupeol, spinasterol, lactone natural sugars, hexacosanol, oxalic acid, tartaric acid, citric acid, ascorbic acid, alkaloids and nicotine.
Use: 1. It act as natural hair cleanser, astringent and detangle hairs.
2. It promotes hair growth, strengthen hairs and act as antidandruff agent.

Fig. 3: Shikakai plant.

Preparation of ingredients[2]

- **Reetha Extract**

It is prepared by cold maceration method.
10 gm of Reetha powder in 70% ethyl alcohol (30mL)

- **Amla Extract**

10 gm of Amla powder in 50 ml water and boil.

- **Shikakai Extract**

10 gm of Shikakai powder boiled in 50 ml water.

- **Gelatin Solution**

Boil 50 ml of water and add 1 gm Gelatin powder and again boil for 5 min

Table No. 1: Composition of formulated herbal shampoo.

Ingredients	Quantity
Reetha extract	2.5 gm
Amlaa extract	2.5 gm
shikakai extract	2.5 gm
Lemon juice	1 ml
Methyl paraben	1 gm
Gelatin solution	q.s.
Essential oil	q.s.

Method of preparation

1. Weighing

All required herbal ingredient for shampoo preparation were accurately weighed individually by using digital balance.

2. Mixing

Shampoo was prepared by simple mixing process. All ingredients were mix together using mortar and pestle. After mixing it was filtered. And gelatin solution was added for final volume. Perfume and preservative were finally added.

Table No. 2: Role of Ingredients.

INGREDIENTS	ROLE OF INGREDIENTS
Reetha extract	Foaming agent
Amla extract	To provide nourishment to hair
Shikakai extract	Anti-dandruff
Methyl paraben	preservative
Gelatin solution	base
Citric acid	To adjust pH
Orange oil	perfume

EVALUATION TEST FOR HERBAL SHAMPOO[2]

1. Physical appearance/visual inspection

The formulation prepared was evaluated for the clarity, color, odour and foam producing ability.

2. pH Determination

1% solution of formulation was prepared along with the standard marketed products and pH was determined by digital pH meter. 1% solution of shampoo was prepared by mixing 2ml of shampoo in 200 ml of distilled water in a beaker stirrer the beaker to mix the shampoo with water without shaking the beaker.

3. Determination of percentage of solids

In this test first of all the weight of clean, dry and empty evaporating dish was measured and recoded than approximately 4 gm sample of formulated herbal shampoo was placed in evaporating dish by measuring the weight of evaporating dish the exact initial weight of shampoo was calculated. Dried weight of shampoo was recorded by placing the evaporating dish on hot plate until the shampoo completely evaporated.

4. Foaming Index

Cylinder shake method was used for determining foaming ability. 5 ml of shampoo was taken into measuring cylinder and volume was make upto25 mL and shaken properly for ten times. Then 5 test tubes were taken and stock solution was measured as given in following observation table. And each test tube was adjusted for volume up to 10mL by adding water. then foam in each test was measured in cm and foaming index was calculated.

5. Dirt dispersion test

The dirt dispersion test using Indian ink, two drops of shampoo was added to 10 ml of water containing test tube and one drop of ink was added in test tube. Shake test tube for 10 times. The amount of ink in foam was estimated as None, Light, Moderate or Heavy, indicates the dispersion nature of shampoo.

6. Skin sensitization test

This test is performed on skin of human volunteers and checks whether its irritation on skin or not.

phytochemical test[1]

Phytochemical tests are performed to check the present or absent of flavonoid, carbohydrate, protein, sapponin, terpenoid, tannins, glycosides, alkaloid and resins. The plant sample were purchase from local Markets and then powdered and stored in airtight bottles.

Phytochemical test for Shikakai

Preparation of Extracts: The pods of *Acacia concinna* was allowed to dry and pulverized by using mortar and pestle. Five-gram pulverized material was dissolved in 50 mL of solvent (Alcoholic and aqueous extracts) and kept in an orbital shaker overnight. The obtained extracts were filtered with Whattman No. 42 filter paper (125 mm) and the filtrate was collected and used for experimental analysis.

Table No. 5: Showing presence of phytochemicals in shikakai.

Test	Alcoholic extract	Aqueous extract
Alkaloid	+	+
Flavanoid	+	+
Phytosterols	+	+
Saponins	+	+
Tannin	-	+
Phenolic Compounds	+	+

Phytochemical test for Reetha

Preparation of plant material: the Powder material 10 gram was successfully extracted with ethanol and water and stored in airtight container and kept in refrigerator until use.

Phytochemicals Screening different qualitative chemical test can be performed for establishing profile of ethanol and acquires extract from its chemical composition the

following test were performed on extracts to detect various phytoconstituents present in chemical.

Table no. 3 showing presence of phytochemicals in reetha.

Phytochemical test	Ethanol extract	Aqueous extract
Alkaloid test		
Mayer s test	+	-
Wagner s test	+	-
Dragendorff s	+	-
Carbohydrate		
Molisch's test	-	-
Saponin test	+	-
Amino acids		
Millon's test	+	-
Phytosterols	+	-
Test for Sterols		
Libermann and Buchards test	+	+
Phenolic compounds& Tannins		
Ferric chloride	+	+
Lead acetate	+	+
Alkaline reagent test	+	+
Flavonoids	+	+
Tannins	+	+

Phytochemical test for Aamla[5]

These tests are used to detect the presence of various organic functional groups, which is the indicative of type of phytochemicals present in the plant. These tests indicate the presence different class of constituents present in the extract.

Table no. 4: Showing presence of phytochemicals in Amala.

Test	Alcoholic extract	Aqueous extract
Alkaloid	+	-
Coumarin	+	-
Flavanoid	-	+
Carbohydrate/glycoside	+	+
Steroid	+	-
Phenol	+	+
Carboxylic acid	+	-
Tannin	+	+
Terpenoid	-	+
Resins	-	+
Saponins	-	+
Amino acids	+	-

Comparative study of herbal shampoo with marketed shampoo.[2,4]

Table No. 6 comparison of formulated and marketed shampoo.

Physicochemical evaluation of formulated and marketed shampoo		
Parameter	**Herbal shampoo**	**Marketed shampoo**
Colour	Brown	white
Appearance	Turbid	Milky opaque
Odour	Good	Good
pH(10% solution)	6.06	6.12
% Solid contents	11.75	25
Foam volume (mL)	500	123
Foam type	Small airy	Small dense

RESULTS

Evaluation of herbal shampoo

Physical appearance/visual inspection

A shampoo like any other cosmetic preparation should have good appealing physical appearance. The formulated and marketed shampoos were evaluated for physical characteristics such as color, odour and transparency . Our prepared shampoo was turbid, brown in colour and had good odour. No significant difference was observed in terms of odour, transparency and foaming characteristics between commercial and formulated shampoo except for color.

- Colour- brown
- Odour- pleasant
- Appearance- turbid

% Of solid contents

Good shampoos usually have 20% -30% solid content as it is easy to be applied and rinse out from the hair. If it doesn't have enough solid it will be too watery and wash away quickly, similarly too many solids will be hard to work into the hair or too hard to wash out. The percent solid contents of all the tested shampoo were found within the range of 21%-25% and are expected to wash out easily.

Fig No. 4 : Solid content of shampoo.

Weight of Petri dish =56.62
Weight of sample = 4.11 ml
Total weight of Petri dish (A) = sample + weight of petri dish

= 4.11 +56.62

(A) = 60.70 gm
Weight of Petri dish after evaporation of sample (B) = 57.09 gm
Total solid content in sample is = (A) – (B)

= 60.70 – 57.09

Therefore, of solid content = A – B / 4 × 100

= 0.47 / 4 × 100

= 11.75

The total solid content of shampoo is **11.75 %**

Foaming ability and foaming stability

Foaming or lathering is very important to the consumer and therefore, it is considered as an important parameter in evaluation of shampoo. Herbal Essences and formulated shampoo produced the foam volume above 100 mL The foams generated by formulated shampoo were small, compact, uniform, denser and stable similar to commercial samples. All tested shampoo had the same foam volume for 5 min showing that their foam has good stability. The higher foaming property of formulated shampoo may be due to the combination of soap nut, Shikakai and Ziziphus

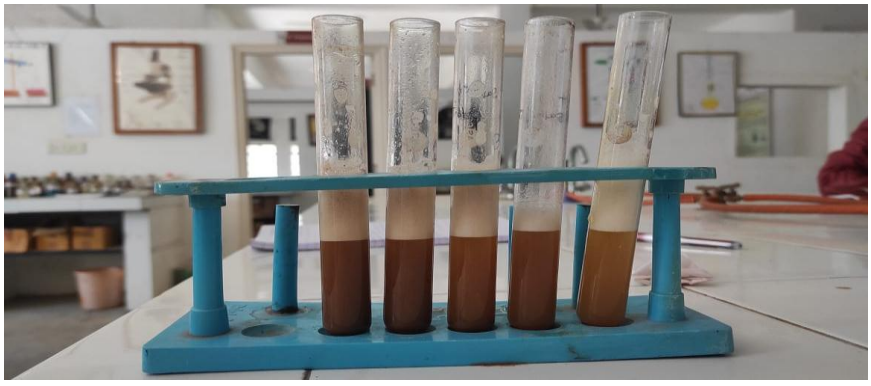

Fig No 5: Foaming test.

Table No. 7: Foaming test.

Sr.No	Number of test tubes containing ml of stock solution	Height of foam in cm
1.	1 mL	0.5 cm
2.	2 mL	1.5 cm
3.	3 mL	3.8 cm
4.	4 mL	3.7 cm
5.	5 mL	3 cm

Foaming index = 1000/A
Where A = Volume of decoction having exact 1 cm height
Therefore, foaming Index = 1000/2
= 500
Foaming index of shampoo is **500**

Dirt dispersion
It is an important criterion for evaluation of cleansing action of shampoo. Shampoos that cause the ink to concentrate in the foam are considered of poor quality because ink or dirt that stays in foam is difficult to rinse away and gets re-deposited on the hair. Therefore, the dirt should stay in the water portion for achieving better cleansing action. All shampoo concentrated the ink in the water portion, ensuring their satisfactory cleaning ability and actual effectiveness.

FigNo.6: Dirt dispersion.

Most shampoos are formulated as either neutral or slightly alkaline to minimize the damage to hair. The pH of shampoo also helps in minimizing irritation to the eyes, enhances the qualities of hair and maintain the ecological balance of the scalp. The pH of tested commercial shampoos was found within the preferred range (between 7 and 5). The acid balanced values were observed with commercial shampoos (Dove: 6.12,) but the pH of formulated herbal shampoo was found to be near 6.06 in Ph meter.

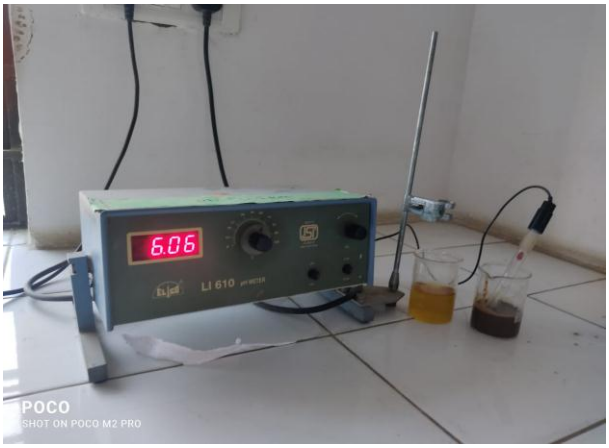

Fig No. 7 : PH meter.

Skin sensitization test
This test is performed on skin of human volunteers and checks whether its irritation on skin or not. The formulated herbal shampoo is non-irritant in nature.

DISCUSSION
A shampoo like any other cosmetic preparation should have good appealing physical appearance. The formulated and marketed shampoos were evaluated for physical characteristics such as color, odour and transparency.

Good shampoos usually have 20% - 30% solid content as it is easy to be applied and rinse out from the hair. The percent solid contents of all the tested shampoo were found within the range of 21% - 25% and are expected to wash out easily.

All tested shampoo had the same foam volume for 5 min showing that their foam has good stability. The higher foaming property of formulated shampoo may be due to the combination of soap nut, Shikakai and Ziziphus.

Foaming or lathering is very important to the consumer and therefore, it is considered as an important parameter in evaluation of shampoo. Herbal Essences and formulated shampoo produced the foam volume above 100 mL The foams generated by formulated shampoo were small, compact, uniform, denser and stable similar to commercial samples.

All shampoo concentrated the ink in the water portion, ensuring their satisfactory cleaning ability and actual effectiveness.

The pH of tested commercial shampoos was found within the preferred range (between 7 and 5). The acid balanced values were observed with commercial shampoos (Dove: 6.12,) but the pH of formulated herbal shampoo was found to be near 6.06 in Ph meter.

CONCLUSIONS
The formulated shampoos were not only safer than the synthetic shampoo, but also greatly reduce the hair loss

during combing as well as strengthen the hair growth. The present study was carried out with the aim of preparing the herbal shampoo that reduces hair loss during combing, safer than the chemical conditioning agents as well as to strengthen the hair growth.

Herbal shampoo was formulated with the aqueous extract of medicinal plants that are commonly used for cleansing hair traditionally Use of conditioning agents (synthetic) reduces the protein or hair loss. To provide the effective conditioning effects, the present study involves the use of shikakai, amla, and other plant extracts instead of synthetic 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. The awareness and need for cosmetics with herbs are on the rise, as it is strongly believed that these products are safe and free from side effects. But when compared to the chemical-based shampoos, herbal shampoos are more effective in terms of safety and ease of manufacturing and in the economic point of view they are cheap. From the result, in the present study, the prepared herbal shampoo formulation was comparable to the market shampoos in many parameters. Our data suggests that, prepared herbal shampoo is recommended as a choice product in cost effective hair care cosmetics.

Abbreviation
gm- gram
ml- millilitre
cm- centimetre
mg= microgram
conc.- concentration
N- normal
mm- millimetre
HCL- hydrochloric acid
NaCl- sodium chloride
$FeCl_3$- ferric chloride

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