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Formulation of Herbal Shampoos and Their Comparative Evaluation with Marketed Formulations

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Abstract
All shampoos are basically water and detergent mixtures. The main objective of this study was to eliminate harmful materials from shampoo formulations and substitute them with a safe natural product. Formulators must play an active role in educating the consumers about the potential harmful effects of synthetic detergents and other chemical additives present in shampoo. Shampoos are formulated by taking salts, saponins, plant extract (Ritha, Amala, Harada), glycerine, methyl paraben and EDTA. Formulation was prepared by slight heating and adding the weighed quantity of herbal ingredients. Then the marketed formulation has been evaluated with that of marketed ones. Results shows that it is possible to formulate an herbal shampoo that is better than the synthetic ones.

Keywords
Herbal shampoo glycerine, methyl paraben and EDTA.

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INTRODUCTION
A shampoo may be described as a cosmetic preparation meant for 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 preparation. The added function of shampoo include lubrication, conditioning, body building, prevention of static charge builds up, medication and soon. Finally, the complete shampoo formulation must be medically safe for long term usage. [1-2]
Evaluation of shampoos comprises the quality control tests including visual assessment and physiochemical controls such as pH, density and viscosity. Sodium laurel sulphate based detergents are the most common but the concentration will vary considerably from brand to brand and even within a manufacturer's product range. Cheap shampoos may contain a high detergent concentration while expensive shampoos may contain very little of a cheap detergent. Shampoos for oily hair can have exactly the same detergent at the same concentration as shampoos for dry hair. The difference is more likely to be a reduced amount of oil or conditioning agent in the shampoo for oily hair or the difference may even just be the packaging. [3]

The challenge lies in selecting materials that can be rationally justified as herbal and formulating them into cosmetic whose functionality is comparable with their synthetic counterparts. More particularly, the invention relates to hair cleansing and conditioning compositions that incorporate herbal extracts. Herbal extracts are used for a variety of reasons and are chosen based on their particular properties. Shampoo shave primarily been products aimed at cleansing the hair and scalp. Selected ingredients of shampoo that have been popular with the consumer are currently under attack because of potential risks associated with their use. So to provide quality hair care products with focus on purity, effectiveness and safety with ethical method of manufacturing it was planned to develop an herbal shampoo preparation. [4]

Table: -1 Plants commonly used in herbal shampoo

S.no	Botanical name	Common name	Reported functional uses
1	*Trigonella foenum-graecum*	Fenugreek	Cleaning and softning of hair
2	*Citrus limon*	Lemon	Shampoo for antidandruff property
3	*Urtica olioica*	Nettles	Hair rinses and stimulates growth of hair
4	*Santalum album*	Sandalwood	Antidandruff agent, antimicobial agent
5	*Sapindus indica*	Soap nut	Antidandruff and hair growth regulator
6	*Withania somnifera*	Aswagandha	Improve cerculation of the scalp, structure of antidandruff agent
7	*Azardirecta indica*	Neem	Antimicrobial agent
8	*Ocimum sanctum*	Tulsi	Antimicrobial agent

METHODOLOGY

To formulate a clear shampoo base, definite amount of saponins and salts were added to aqueous solution containing extracts, and juices along with glycerine (1%), methyl paraben (0.05%) and EDTA (0.15%) etc. Formulations were prepared by slightly heating and adding the weighed quantity of herbal ingredients (extracts and juices). [12-14]

Herbal extracts were diluted with distilled water then glycerine, EDTA, xanthum gum and methyl paraben were added with sterring. Juices were mixed on mechanical shake for 20 minutes. Extracts are mixed with slow sterring on a magnetic stirrer. Then jasmine oil was added and mixed with slow steering on a magnetic stirrer. Volume made up to 100 ml with distilled water. [13]

Table 2: Formulations of herbal shampoo

Compounds	Formulation 1 (V1)%w/v	Formulation 2 (V2)%w/v
Ritha (*Sapindus mukorossi)*	10	10
Harada(*Terminalia chebula Retzr*)	5	5
Amala (Emblica officinalis)	25	20
Glycerine	1.5	1.5
EDTA	0.15	0.15
Methyl paraben	0.05	0.05
Jasmine oil	q.s	q.s
Distilled water (q.s to make)	100ml	100ml

PROCESS OF FORMULATING HERBAL SHAMPOO [12-14]

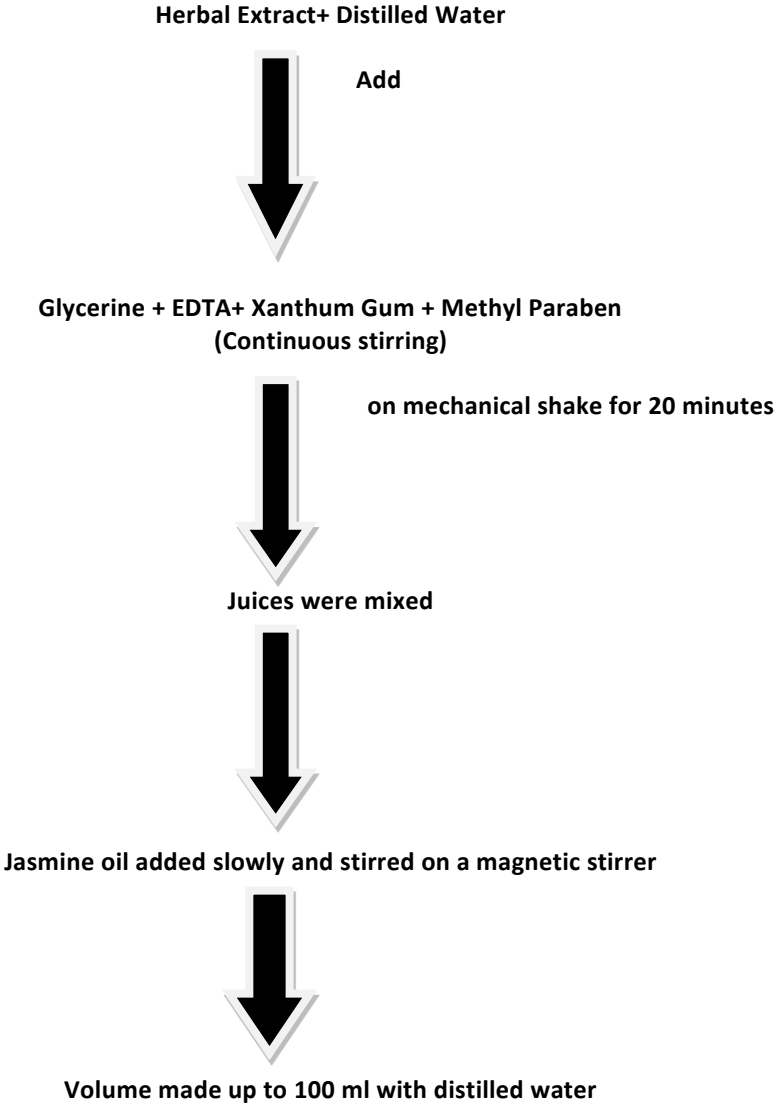

Fig.1: Formulations of herbal shampoo

EVALUTION

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. Following parameters have been evaluated.

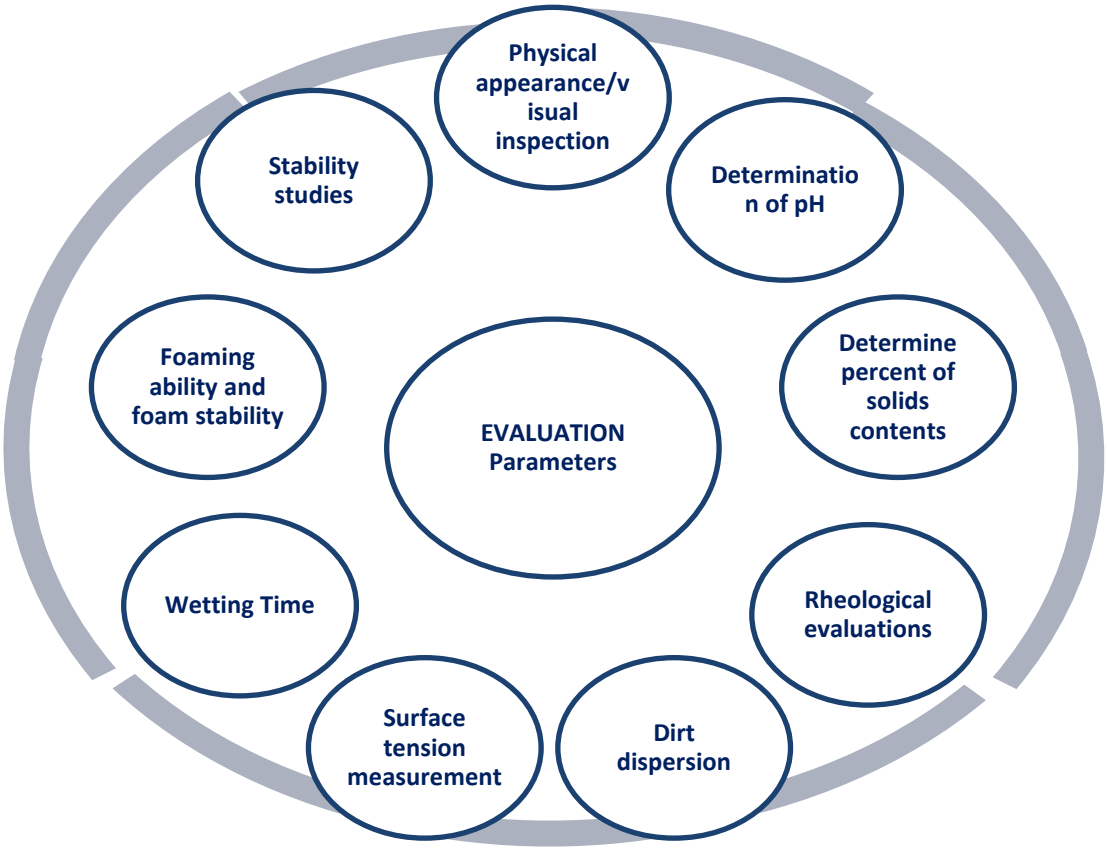

Fig.2. Evaluation parameters for the formulation of shampoo

➢ **Physical appearance/visual inspection**

The formulations prepared were evaluated in terms of their clarity, foam producing ability and fluidity. [5]

➢ **Determination of pH**

The pH of 10% shampoo solution in distilled water was determined at room temperature 25°C. [6]

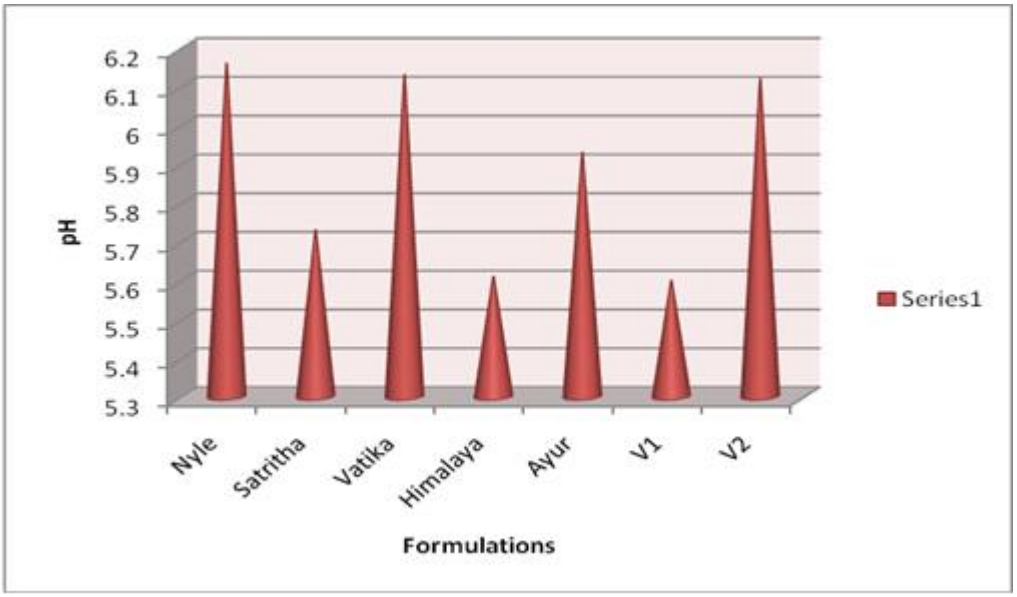

Fig.3: pH of different formulations

➢ **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. [7-10]

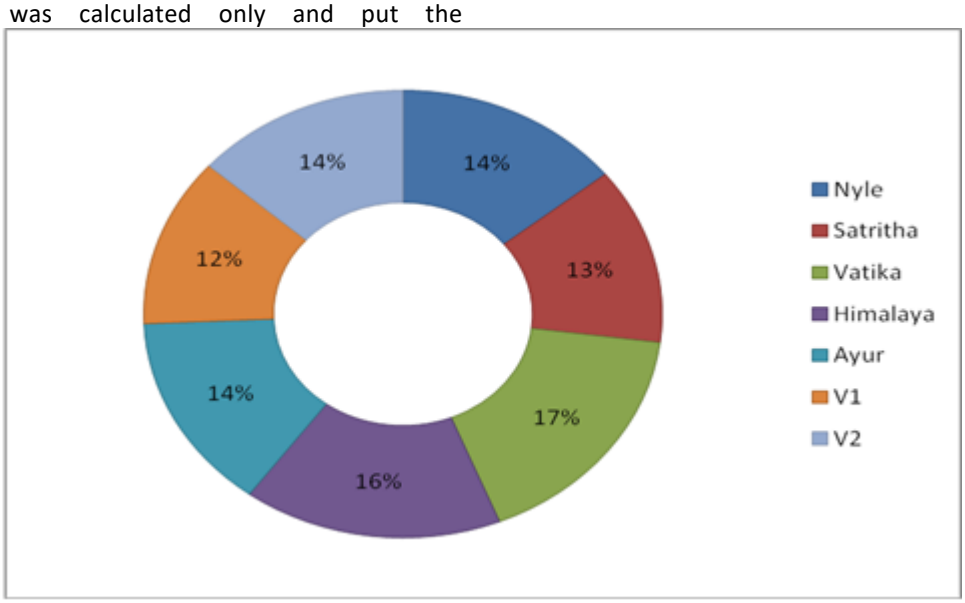

Fig.4: Determination of percentage solid content

➢ **Rheological evaluations**

The viscosity of the shampoos was determined by using Ostwald Viscometer. The viscosity of the shampoos was measured by using spindle T95. The temperature and sample container's size was kept constants during the study. [7-10]

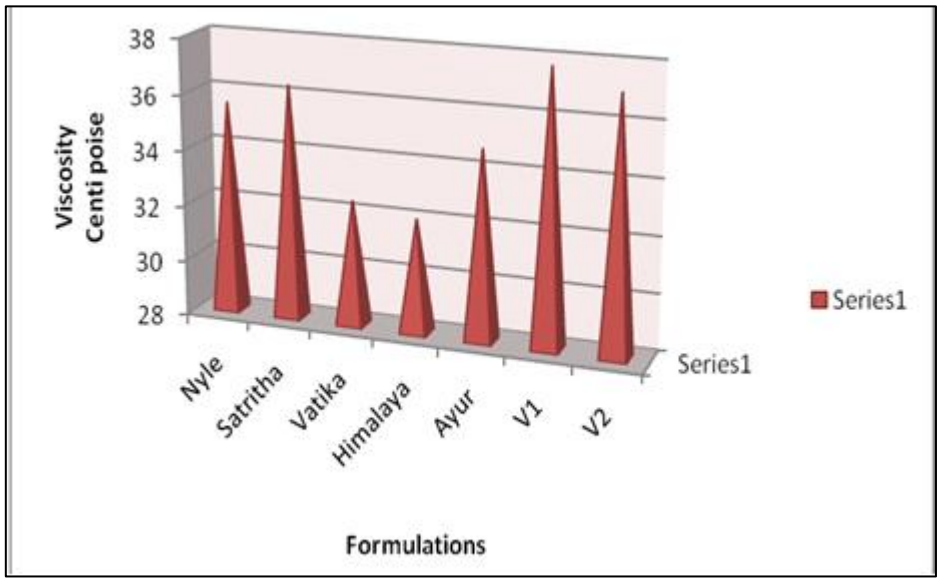

Fig.5: Determination of Viscosity

➢ **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 closed and shakes it ten times. The amount of ink in the foam was estimated as None, Light, Moderate, or Heavy. [7-10]

➢ **Surface tension measurement**

Measurements were carried out with a 10% shampoo dilution in distilled water at room temperature. Thoroughly clean the stalagmometer using chronic acid and purified water. Because surface tension is highly affected with grease or other lubricants5, 6. The data calculated by following equation given bellow: [14-16]

$$R_3 = (W_3\text{-}W_1)\, n_1 \times R_1/(W_2\text{-}W_1)\, n_2$$

Where $W_1$is weight of empty beaker.
W_2 is weight of beaker with distilled water.
W_3 is Weight of beaker with shampoo solution.
n_1 is no. of drops of distilled water.
n_2 is no. of drops of shampoo solution.
R_1 is surface tension of distilled water at room temperature surface tension of shampoo solution.

- **Wetting Time**

The canvas was cut into 1-inch diameter discs having an average weight of 0.44 gm. The disc was floated on the surface of shampoo solution 1% w/v and the stopwatch started. The time required for the disc to begin to sink was measured accurately and noted as wetting time(sec). [7-10]

- **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 [11-13]

- **Stability studies**

The thermal stability of formulations was studied by placing in glass tubes and they were placed in a humidity chamber at 45°Cand 75% relative humidity. Their appearance and physical stability were inspected for a period of 3 months at interval of one month. [11-13,16]

RESULTS

Table 3: Results of Physical Appearance, pH and Solids

S.No.	Formulation	Physical Appearance	Foam producing ability
1	NYLE	Light orange, transparent	Good foaming
2	SATRITHA	Light brown, turbid	Good foaming
3	VATIKA	Light green, turbid	Good foaming
4	HIMALYA	Whitish, Transparent	Good foaming
5	AYUR	Pinkish, Transparent	Good foaming
6	V1	Brown, Turbid	Good foaming
7	V2	Brown, Turbid	Good foaming

****V1&V2= Formulations prepared in lab**

Table 4- Results of Evaluation of formulations

S.no	Formulation	pH	Solid contents%	Surface tension (Dyne c.m-1)	Viscosity Centi poise	Wetting Time (sec)
1	Nyle	6.16	22.61	35.6	67.73	145
2	Satritha	5.73	20.22	36.4	68.32	178
3	Vatika	6.13	26.75	32.5	65.06	178
4	Himalaya	5.61	25.67	32.1	66.33	185
5	Ayur	5.93	22.51	34.8	67.13	208
6	V1	5.60	19.32	37.8	68.21	187
7	V2	6.12	21.36	37.1	67.23	178

***V1&V2= Formulations prepared in lab**

Table 5- Results of Foam Stability

Time(minutes)	Foam Volume(ml)						
	Nyle	Satriha	Vatika	Himalya	AYUR	V1	V2
1	68	53	58	75	66	78	82
2	62	51	52	68	66	71	78
3	58	45	49	65	65	69	72
4	52	43	45	63	63	66	71
5	52	40	42	61	62	62	69

****V1&V2= Formulations prepared in lab**

Table-6: Results of Stability Studies

S.NO	PARAMETERS	Formulations	1 month	2 months
1	Physical appearance	Nyle	Clear	Clear
		Satritha	Clear	Clear
		Vatika	Clear	Clear
		Himalya	Clear	Clear
		Ayur	Clear	Clear
		V1	Clear	Clear
		V2	Clear	Clear
2	pH	Nyle	6.16	6.14
		Satritha	5.73	5.70
		Vatika	6.13	6.16
		Himalya	5.61	5.60
		Ayur	5.93	5.91
		V1	5.60	5.59
		V2	6.12	6.14
3	Solid Contents	Nyle	22.61	22.64
		Satritha	20.2	20.24
		Vatika	26.75	26.80
		Himalya	26.67	26.68
		Ayur	22.50	22.53
		V1	19.32	19.67

		V2	21.36	21.37
		Nyle	35.6	35.8
		Satritha	36.4	36.1
		Vatika	32.5	33.1
4	Surface Tension	Himalya	32.1	32.23
		Ayur	34.8	34.83
		V1	37.8	37.91
		V2	37.1	37.23
		Nyle	52	50
		Satritha	40	42
		Vatika	42	45
5	Foming Stability	Himalya	61	62
		Ayur	62	61
		V1	62	62
		V2	69	68

****V1&V2= Formulations prepared in lab**

DISCUSSIONS

The results of visual inspection of series of formulations are listed in table 3. As can be seen, all formulations had the good characteristics with respect to foaming.

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 4, all the shampoos were acid balanced and were ranged 5.5 to 5.9, which is near to the skin pH.

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 3, and was found between 20-29%. As a result, they were easy to wash out.

These formulations showed pseudo plastic behaviour 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 favourable property which eases the spreading of the shampoos on hair. The results obtained from the rheological studies were fitted into different flow behaviours, using the linear or non-linear regression. Table 3 shows the goodness of fitting indices for Newtonian, plastic and pseudo plastic flow behaviours. 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 shampoos showed similar results. These results indicate that no dirt would stays in the foam; so prepared and marketed formulations are satisfactory.

It has been mentioned that a proper shampoo should be able to decrease the surface tension of pure water

to about40 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 35.37dynes/ cm by the herbal shampoos is an indication of their good detergent action. The results are shown in table 4.

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 shampoos showed similar foaming characteristics in distilled water. All five shampoos showed comparable foaming properties. The foam stability of herbal shampoos is listed in table 5. 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.

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 6.

CONCLUSION

As seen the results, it is possible to formulate a completely herbal shampoo that is better than the synthetic ones. The commercial herbal shampoo may contain excessive detergents, which can strip the hair of up to 80% of the oil and thus damage the hair. Using a mild detergent in our shampoo we have insured that this does not happen.

The formulated shampoos of pH were adjusted to 5.5, to retain the acidic mantle of scalp. Synthetic preservatives have sometimes been the cause of adverse effects among consumers. We have used the physic-chemical approach to preservation and by formulating a self-preserving shampoo, have avoided this risk posed by chemical preservatives. However, the aesthetic attributes, such as lather and clarity, of the laboratory shampoo are not comparable with the marketed shampoos. 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. Amore radical approach in popularizing herbal shampoo would be to change the consumer expectations from a shampoo, with emphasis on safety and efficacy. Formulators must play an active role in educating the consumers about the potential harmful effects of synthetic detergents and other chemical additives present in shampoos. There is a strong need to change the consumer perception of a good shampoo and thus lies with the formulators.

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