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Formulation and Development of Sulphate Free Shampoo

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Abstract: *Sulphate free shampoos are the cosmetic preparations that with the use of traditional ayurvedic herbs are meant for cleansing the hair and scalp just like the regular shampoo. They are used for removal of oils, dandruff, dirt, environmental pollutions etc.*

Shampoo occupies a prominent and very important place among the products available today. Due to the increasing awareness and importance of cleanliness and healthiness of hair, the use of "sulphate free shampoo" is increasing every day. Earlier the use of herbal shampoo was confined to the upper and upper middle classes of urban society, but with increasing awareness the use of herbal shampoo has become well established in even rural households.

Sulphate free shampoos can keep the hair clean, nurtured and meet the need of stronger, softer and shinier hair. They are also perceived as helping to maintain the colour of dyed hair. We offer an array of sulphate alternatives to meet the increasing consumer demand for sulphate-free options.

Keywords: *Sulphate free shampoo, Formulation, Development, Cosmetic, Herbs*

I. INTRODUCTION

Hair is simple in structure, but has important functions in social functioning. Hair is made of a tough protein called keratin. A hair follicle anchors each hair into the skin. The hair bulb forms the base of the hair follicle. In the hair bulb, living cells divide and grow to build the hair shaft. Blood vessels nourish the cells in the hair bulb, and deliver hormones that modify hair growth and structure at different times of life.

Washing the hair and scalp has become a near-universal practice. The method of doing so varies depending on both geographic and economic factors.

Shampoos assumed importance as a product category with the advent of synthetic detergents. These were developed in the 1930s. Became widely used in laundry markets by the mid-1940s and appeared in a shampoo format during the 1950s.

Shampoos are probably the most widely used hair products today; based on synthetic detergents they are relatively insensitive to water hardness.

Thus, allowing for the efficient rinsing since there are no scum residues. In the early days a shampoo could be defined as an effective cleansing agent for hair and scalp but today the shampoo must do much more. It must leave the hair easy to comb, lustrous and controllable whilst being convenient and easy to use.

Sulphates, essentially, are what make shampoos turn into a thick lather in the shower. This ingredient, which is standard for most of the shampoo products, has additionally come under attack for causing frizziness (especially in curly hair) and damaging colored hair. After dying your hair or receiving a chemical treatment (such as a Keratin or Brazilian blowout), Salons will often recommend a sulphate-free shampoo and conditioner to maintain the style.

A. *Herbal Shampoo is used to make out hair Healthy, Shining, Soft Black and Strong*

- 1) AMLA: To make the hair strong and Black.
- 2) REETHA: To cleaning the hair.
- 3) SHIKAKAI: To makes the hair soft.
- 4) BRAHMI: To coolness.
- 5) LEAVES OF NEEM: To make the hair healthy.
- 6) ACID SLURRY: For Cleansing.
- 7) OTHERS LIKE: Perfume and colour.

B. Advantages

- 1) Daily usable shampoo.
- 2) Powerful anti-dandruff agent.
- 3) Prevents hair loss and revitalizes hair roots.
- 4) The gentle cleansing action and perfect pH balance makes hair soft and shiny.
- 5) An effective hair nourisher which acts as a tonic for hair growth.
- 6) Stops split ends.
- 7) Avoids headache.
- 8) A good hair conditioner & acts as a detangler.

C. Requirements of a Shampoo

- 1) To remove sebum (the secretion of the sebaceous glands) and atmospheric pollutants from the hair and scalp.
- 2) To remove the residues of previously applied hair treatments. e.g. polymeric constituents from styling lotions and hair sprays.
- 3) To deliver an optimum level of foam to satisfy the expectation of the user.
- 4) To leave the hair in a satisfactory condition after rinsing so that it can be combed easily both in the wet and dry state.
- 5) To perform as a vehicle for the deposition of beneficial materials onto the hair and scalp.
- 6) To be non-toxic and non-irritating to the hair and the scalp.
- 7) To be non-damaging to the tissues of the eye if inadvertently splashed

D. Classification of Shampoo

Shampoos are usually classified according to function, e.g. antidandruff, Medicated, 2-in-1 Shampoo, Mild baby shampoo, Basic beauty shampoo, Premium conditioning shampoo.

E. The Action Of Shampoo On The Hair

The original prime purpose of the shampoo is to cleanse the hair. The underlying science has been reported by Lawrence and by Breuer, who recognized three basic components of Hair Soil:

1. Sebum the oily secretion of the sebaceous glands.
2. Protein matter arising from the cell debris of the stratum corneum layers of the scalp and the protein content of sweat.
3. Atmospheric pollutants and residues from other hair-care products.

II. MATERIAL AND EQUIPMENTS

Table 1: Materials required and Suppliers

Sr. No.	Ingredients	Company Supplier
1	De-ionized water	
2	Alkyl Polyglucosides Blend	Spe-chem Industry
3	Glycerine	Godrej Industry
4	Coco-glycoside	Galaxy Surfactant Limited
5	Glyceryl oleate	Galaxy Surfactant Limited
6	Methyl Paraben	Alta Laboratory ltd
7	Propyl Paraben	Alta Laboratory ltd
8	Cetyl hydroxy ethyl cellulose	Praavar Chemtech
9	Guar hydroxy propyl trimonium	Praavar Chemtech
10	Perfume	Emami Blend
11	Reetha Extract	By Extraction Method

A. List of Equipment's

- 1) Soxhlet Apparatus
- 2) Mechanical Stirrer
- 3) Homogenizer
- 4) pH Meter
- 5) Weighing Balance
- 6) Brookfield Viscometer

III. EXPERIMENTAL STUDY

Table 2: Formulation Table

Sr. No.	Ingredients	Quantity for 100%	Use
1	De-ionized water	82.58	Solvent
2	Alkyl Polyglucosides Blend	12.00	Surfactant
3	Glycerine	0.50	Humectants
4	Coco-glycoside	1.30	Surfactant
5	Glyceryl oleate	1.20	Surfactants
6	Methyl Paraben	0.30	Biocide
7	Propyl Paraben	0.20	Biocide
8	Cetyl hydroxy ethyl cellulose	2.50	Thickener
9	Guar hydroxy propyl trimonium	0.30	Conditioning polymer
10	Perfume	q. s.	Distinctive Smell
11	Reetha Extract	2	Cleansing Conditioner

IV. LIST OF EQUIPMENTS USE

Table 3: List of Equipment's

Sr No.	Equipments	Company made
1.	Weighing Balance	Mettler Toledo
2.	Mechanical Stirrer	Agitator type (3-blade) maximum 2000 S. M. Scientific Industry Pvt. Ltd. Mumbai
3.	Digital Temperature Controller (Water bath)	Techno India
4.	pH Meter	WTW Series Inolab 7, 5, 12v/DC, Digital Model 111E-E1 Electronic, India
5.	Brookfield Viscometer DV 11+pro, Voltage 230v Frequency 50/60Hz Power 30 VA	S.M.S. Scientific Industry Pvt. Ltd. Mumbai

V. EXPERIMENTAL STUDY

In any cosmetic preparation it is necessary to have stable formulation before incorporation of active. The effectiveness and stability depends on compatibility of active ingredients.

Various shampoos are available which are sulphate free, mild and gentle hair shampoo. Shampoos are super effective cleansers that will remove pollution from scalp without causing excessive dryness to scalp and maintain the natural moisture to skin.

The cleansing ability shampoo prevents the skin from dirt, dust, excessive sebum.

A. Product Formulation And Development

Table 4: Formulation of shampoo (Base) for 100 %

Sr. No.	Ingredients	F1	F2	F3	F4	F5
1.	De-ionised water	78.58	79.58	80.58	81.58	82.58
2.	Alkyl Polyglucosides	10	10.5	11	11.5	12
3.	Glycerine	0.50	0.50	0.50	0.50	0.50
4.	Coco glucoside	0.80	0.90	1.10	1.20	1.30
5.	Glyceryl oleate	0.40	0.60	0.80	1	1.20
6.	Cetyl hydroxyl ethyl cellulose	0.5	1	1.5	2	2.50
7.	Guar hydroxyl propyl trimonium	0.10	0.15	0.20	0.25	0.30
8.	Propyl Paraben	0.25	0.25	0.25	0.25	0.25
9.	Methyl Paraben	0.25	0.25	0.25	0.25	0.25

B. Procedure

All the apparatus were cleaned and weigh all the ingredients as per the formulation. Weigh de-ionised water as per formulation and then add all sulfate free ingredients. Then conditioning polymer and thickener is added. Mix all the ingredients properly by the stirring. Then glycerine is added. After that Propyl paraben and Methyl paraben are added.

C. Incorporation of active

In formulation the incorporation of active has been done. The desired properties and desire characteristics are checked by varying the concentration various ingredients. Optimization of the shampoo was show in the chapter Evaluation and results.

Table 5: Incorporation of actives

Sr. No	Ingredients	Quantity in %
1.	De-ionised water	82.58
2.	Alkyl Polyglucosides	12
3.	Glycerine	0.50
4.	Coco glucoside	1.30
5.	Glyceryl oleate	1.20
6.	Cetyl hydroxyl ethyl cellulose	2.50
7.	Guar hydroxyl propyl trimonium	0.30
8.	Propyl Paraben	0.25
9.	Methyl paraben	0.25
10.	Reetha Extract	2.00
11.	Colour	q. s.
12.	Perfume	q. s.

D. Packaging

The sulphate free shampoo should be pack in a suitable container in order to use conveniently and provide facility to use for consumers.

VI. EVALUATIONS

The evaluation of product was carried out in the following steps in order to ensure that the product is safe, stable, well preserved and free from microbial growth.

A. In-Vitro Evaluation of shampoo

1) Determination of physical parameters

- Appearance:* Visually appearance of the formulation was observed.
- Color:* Colour of the formulations also checked visually.
- Consistency:* Consistency was also checked whether it is satisfactory or poor or viscous.
- Tacky feel:* When shampoo taken on palm for application then checked whether it feels tacky or not.

2) Determination of Ph: Shampoos are used for topical applications, so their pH should be similar to that of with the skin. The skin has acidic mantel and the pH of the shampoo as per the standards should be in the range of 7.0-9.0

a) Apparatus- pH meter, Beaker

- Procedure-* 200 g sample was taken in a 250ml beaker and dipped the pH rod in a sample and note the readings. pH was measured at 25°C.

3) Determination of Viscosity

- Principle:* The resistance to movement of spindle is measured and expressed in term of viscosity in seconds. The resistance being directly linked with viscosity can be expressed directly in terms of viscosity by previous.

b) Apparatus: Brookfield Viscometer

- Procedure:* The viscosity of the prepared formulations was determined using Brookfield viscometer RV series model. The selected formulations were poured into the sample adaptor of the viscometer and viscosity was measured at 25°C.

The measurements were carried out using spindle number 5 at the speed of 10 rpm and the viscosity was measured at 5 min after the rotation of the spindle.

4) Determination of foaming power

- Principle:* The mechanism of foam development and stability the part of surfactants play in these processes are complicated and even today not completely understood. In any case, an important part is played by the reduction of surface tension and the formation of liquid crystal of the surfactant molecule in the foam bubble well. The formation of liquid surface layer of surfactant molecule is essential hence only substances capable of foaming such films will be good foam produces.

b) Apparatus: Beaker, Measuring cylinder

- Procedure:* Firstly 5ml of shampoo taken in a beaker and then 45ml of water was added in it. Stir it well before solubilizing the shampoo in water, then this solution was transferred in 250 ml measuring cylinder and inverted for 2 sec and again reverted to its normal position to get one shake, Such 12 shakes were given to the shampoo solution.

After 12 shakes, the cylinder was kept aside for 60 sec. and reading were taken, by measuring the volume of foam and water together and volume of water alone.

Formula- Foaming power- $F1 - F2$

Where, F1- Foam + water & F2- water (in ml)

5) Determination of Water Content

- Principle:* Water is removed by distilling the material with toluene and the volume of water thus isolated is noted.

b) Reagents: Toluene – treated with excess of water and distilled

- Procedure:* Accurately about 10gms of the material was weighted and it was transfer in to the flask. About 200ml of toluene and a few pieces of dry pumice stone was added. The apparatus was connected and the receiving end of the tap was filled with toluene poured through the top of the condenser. The flask was heated gently for 15min and when the toluene begins to boil it was reflux at a rate of 2 drops / sec. until most of the water had passed over. The rate to about 4 drops / sec. was increased when all the water had apparently distilled over, the inside of the condenser tube was rinsed with toluene while brushing down the tube with the tube brush attached to a copper wire and saturated with toluene. The distillation was continued for 5mins. Then the source of heat was removed and the receiving tube was allowed to cool to room temperature. Any droplets of water were adhering to the wall of the receiving tube, and then it was scrub down with a brush consisting of a rubber band wrapped around a copper wire and wetted with toluene. The water in the toluene had separated, and then volume of water was read.

i) Calculation

$$\text{Water \% by mass} = \frac{V \times d \times 100}{M}$$

Where,

V = Volume of water in ml at room temperature collected in the receiving tube
d = Density of water of room temperature
M = Mass in gm of material taken for the test.

6) *Determination of Microbial Examination:* Microbial growth may occur in cosmetics and Personal care product like shampoo, lotion, and gel many more are intended to be used as skin care preparation, hence they come in contact with skin directly. Hence it is very important that the cosmetics product, must to free from microbial contamination, so that it will ensure safety product to the client. The cosmetics product must be safe and adequate preserved.

a) *Apparatus:* Test tube, Petri dish, colony counter, autoclaves.

b) *Media and Buffer:* Soybean casein digest agar medium- Dissolved in 40 g of soybean casein digest Agar in 1000 ml of distilled water. Boil if necessary in order to have a uniform. Close the flask with the metal cap and autoclave at 122°C for 20 minute. After autoclaving store it in a cool place can be used with 3 weeks. Stock solution pH 7.2 phosphate buffer- Dissolve 34 g of potassium phosphate in about 500 ml of water content in a 1000 ml volumetric flask. Adjust the pH to 7.2 by addition of NaOH (4%) add water to make up volume and mix. Sterilize at 122°C for 20 minute, store under refrigeration. Dilute phosphate buffer solution pH 7.2- Dilute 1 ml of flask solution with distilled water in the ratio of 1:800 fill 50 ml each in conical flask with cotton and sterilize at 122°C for 20 minute.

c) *Procedure:* Melt sufficient number of soybean casein digest agar medium in test tubes in a hot water bath and transfer while hot into constant temperature water bath maintain at $48 \pm 2^\circ\text{C}$. Weigh hand transfer aseptically 1 gm of the sample to conical flask containing sterile 50 ml of dilute phosphate buffer pH 7.2 shake well pipette out 1 ml portion into three sterile dishes. Pour melted and cooled soybean casein digest agar medium over it and rotate the plates to mix thoroughly. Include the plate at 32°C for 72 hours in an inverted position.

Determine the average no. of colonies on soybean casein digest agar medium plates and multiply by 30, the dilution factor. This will be the no. of micro-organisms per gram of the sample

7) *Determination Of Thermal Stability:* In any rational design and evaluation of dosage form for drug, product the stability of the active component must be major criterion in determining their acceptance or rejection. Stability of a drug can be defined as the ability of particular formulation, in a specific container, to remain within its physical, chemical, therapeutic and toxicological specification. Optimized formulation was selected and kept for stability studies. Formulation were packed in a suitable container and sealed tightly and studies were carried out for 30days. The international conference on Harmonization (ICH) guidelines titled “stability testing of new drug substances and products” describes the stability test requirements for drug registration application in the European Union, Japan and the united state of America.

Stability data for shampoo

Stability condition	:	Physical stability
No. of days	:	30 days

B. In- Vivo Evaluation of shampoo

1) *Photographic Evaluation:* Photographic evaluation is carried to see the effect of the product visually .In case of determination of cleansing activity. Photographic evaluation was adopted. In this method the photograph of the skin before and after rinsing of skin were taken out and effect of product was determined.

2) *Determination of Exfoliation:* In that volunteer was selected. Photograph of nose was taken before application of product, and then product was applied on nose, rinse with water. After rinsing photograph difference was observed.

VII. RESULT AND DISCUSSION

A. In- Vitro Evaluation of shampoo.

1) Determination of Physical Parameter

Table 6: Determination of physical parameters

Sr. No.	Physical Parameters	F1	F2	F3	F4	F5
1.	Color	Yellow	Yellow	Yellow	Yellow	Yellow
2.	Viscosity	Spreadable	Spreadable	Spreadable	Spreadable	Spreadable
3.	Spread ability	Good	Good	Good	Good	Good
4.	Feel	Very good	Very good	Very good	Very good	Very good
5.	Appearance	Opaque	Opaque	Opaque	Opaque	Opaque

Table 7: Determination of physical parameters

Sr. No.	Ingredients	Formulation				
		F1	F2	F3	F4	F5
1.	Color	+++	+++	+++	+++	+++
2.	Viscosity	+++	+++	+++	+++	+++
3.	Spread ability	++	++	++	++	+++
4.	Feel	++	++	++	++	+++
5.	Appearance	++	++	++	++	+++

Abbreviation

“+” = Poor

“++” = Good

“+++” = Satisfactory

From the above formulation F3, F4& F5 has required property and hence these were selected as a base formulation and these were further subjected In vitro analysis.

On the basis of In vitro analysis formulation F was found to have most desirable results.

Table 8: Characteristics of shampoo with variations in actives

Sr No.	Ingredients	Formulation				
		Fw1	Fw2	Fw3	Fw4	Fw5
1.	Appearance	+++	+++	+++	+++	+++
2.	Color	+++	+++	+++	+++	+++
3.	Viscosity	++	++	++	++	+++
4.	pH	++	++	++	++	+++
5.	Foam height	++	++	+++	++	+++
6.	Feel	+++	+++	++	+++	+++

From the above formulation Fw3& Fw4 has required property and hence these were selected as a base formulation and these were further subjected In vitro analysis.

Table 9: Physical characteristics of Shampoo with active

Sr. No.	Ingredients	Formulation				
		Fwa1	Fwa2	Fwa3	Fwa4	Fwa5
1.	Appearance	+++	+++	++	+++	+++
2.	Color	+++	+++	+++	+++	+++
3.	Viscosity	++	++	++	++	+++
4.	pH	++	++	+++	+	+++
5.	Foam height	++	++	++	++	+++
6.	Feel	+++	++	+++	+++	+++

From the above formulation Fwa3 and Fwa4 have required property and hence these were selected as a base formulation and these were further subjected In vitro analysis. On the basis of In vitro analysis shampoo formulation and optimization of formulation Fwa5 was found to have most desirable results and desirable characteristics and hence it was selected.

Table 10: Characteristics of shampoo with base

Sr. No.	Ingredients	Formulation				
		Fwb1	Fwb2	Fwb3	Fwb4	Fwb5
1.	Appearance	+++	+++	++	+++	+++
2.	Color	+++	+++	+++	+++	+++
3.	Viscosity	++	++	++	++	+++
4.	pH	++	++	+++	+	+++
5.	Foam height	++	++	++	++	+++
6.	Feel	++	++	+++	++	+++

From the above formulation Fwb4 and Fwb3 have required property and hence these were selected as a base formulation and these were further subjected In vitro analysis.

On the basis of In vitro analysis shampoo formulation and optimization of formulation Fwb5 was found to have most desirable results and desirable characteristics and hence it was selected. Formulation Fwb5 was selected for the evaluation.

2) *Determination of Accelerated stability Studies:* The sample of Shampoo was kept at 8-100C, 25°C, 450C. The changes in physical appearance colour, feel etc were studied.

Table 11: Determination of accelerated stability study at room temperature

Sr. No.	Parameters	25° C				
		Fwb1	Fwb2	Fwb3	Fwb4	Fwb5
1.	Color	NC	NC	NC	NC	NC
2.	Consistency	NC	NC	NC	NC	NC
3.	Spread ability	NC	NC	NC	NC	NC
4.	Appearance	NC	NC	NC	NC	NC
5.	Feel on application	G	G	G	G	VG

Table 12: Determination of accelerated stability study at 45°C

Sr. No.	Parameters	45° C				
		Fwb1	Fwb2	Fwb3	Fwb4	Fwb5
1.	Color	NC	NC	NC	NC	NC
2.	Consistency	NC	NC	NC	NC	NC
3.	Spread ability	SC	NC	NC	NC	NC
4.	Appearance	NC	SC	NC	NC	NC
5.	Feel on application	G	G	G	G	VG

Table 13: Determination of accelerated stability study at 8-100°C

Sr. No.	Parameters	8-100°C				
		Fwb1	Fwb2	Fwb3	Fwb4	Fwb5
1.	Color	NC	NC	NC	NC	NC
2.	Consistency	NC	NC	NC	NC	NC
3.	Spread ability	SC	NC	NC	NC	NC
4.	Appearance	NC	SC	NC	NC	NC
5.	Feel on application	G	G	G	G	VG

NC –No Change, G –Good, SC – Slight Change, VG – Very Good

Result: From above observations formulations Fwb3 was selected because it has satisfactory physical parameters.

3) Determination of pH

Table 14: pH of Shampoo with Base

Sr. No.	Days	F1	F2	F3	F4	F5
1.	Initial	6.2	6.2	6.3	6.3	6.3
2.	1st Week	6.3	6.2	6.1	6.1	6.1
3.	2nd Week	6.2	6.4	6.3	6.3	6.3
4.	3rd Week	6.3	6.2	6.2	6.2	6.1
5.	4th Week	6.1	6.1	6.2	6.1	6.4

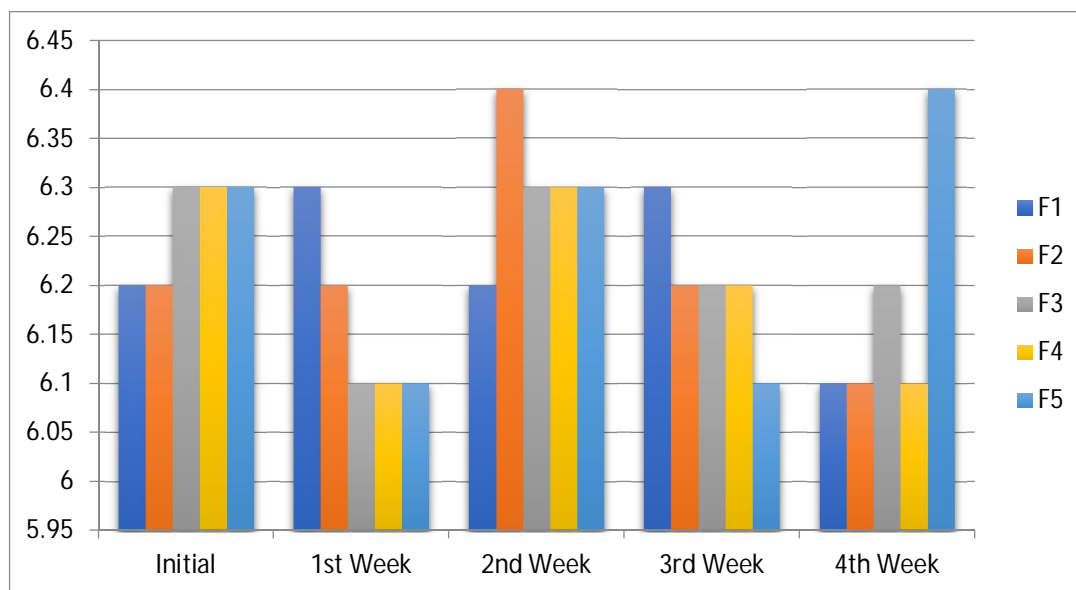


Figure 1: Graphical representation showing pH of shampoo with Base

Table 15: pH of Shampoo base containing actives

Sr. No.	Days	Fwb1	Fwb2	Fwb3	Fwb4	Fwb5
1.	Initial	6.77	6.79	6.77	6.78	6.74
2.	1st Week	6.79	6.79	6.70	6.85	6.76
3.	2nd Week	6.78	6.83	6.73	6.78	6.79
4.	3rd Week	6.74	6.86	6.85	6.81	6.71
5.	4th Week	6.78	6.86	6.84	6.79	6.72

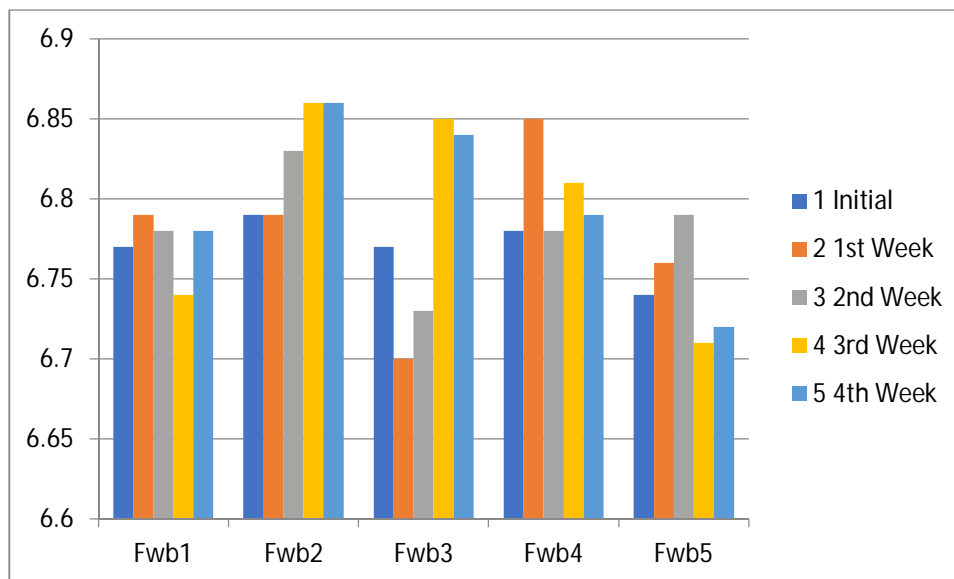


Figure 2: Graphical representation showing pH of shampoo with Actives.

Observation: In comparative stability study the pH of Clear shampoo was found to be in between 6.8 to 6.7. It was near about to same initial pH of shampoo.

4) Determination of Viscosity

Table 16: Viscosity of Shampoo base

Sr. No.	Days	F1	F2	F3	F4	F5
1.	Initial	8300	8150	8600	9000	9000
2.	1st Week	8950	8900	9000	8900	8980
3.	2nd Week	9000	9000	8800	9000	9000
4.	3rd Week	8250	8700	8050	8700	8700
5.	4th Week	8350	8200	8850	8650	8500

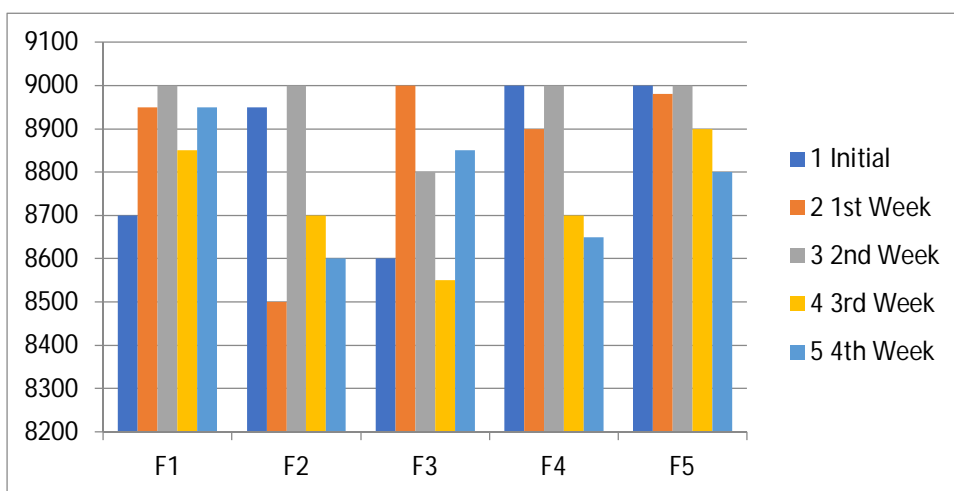


Figure 3: Graphical representation showing Viscosity of shampoo with base

a) *Observation:* In comparative stability study the viscosity of Clear shampoo was found to be in between 900-8400 cps at spin no. 5 and 10 RPM.

Table 17: Foaming power of Shampoo with actives

Sr. No.	Days	Fwb1	Fwb2	Fwb3	Fwb4	Fwb5
1.	Initial	690	697	699	691	698
2.	1st Week	698	698	698	696	692
3.	2nd Week	694	694	694	698	699
4.	3rd Week	693	699	692	694	697
5.	4th Week	695	697	695	698	700

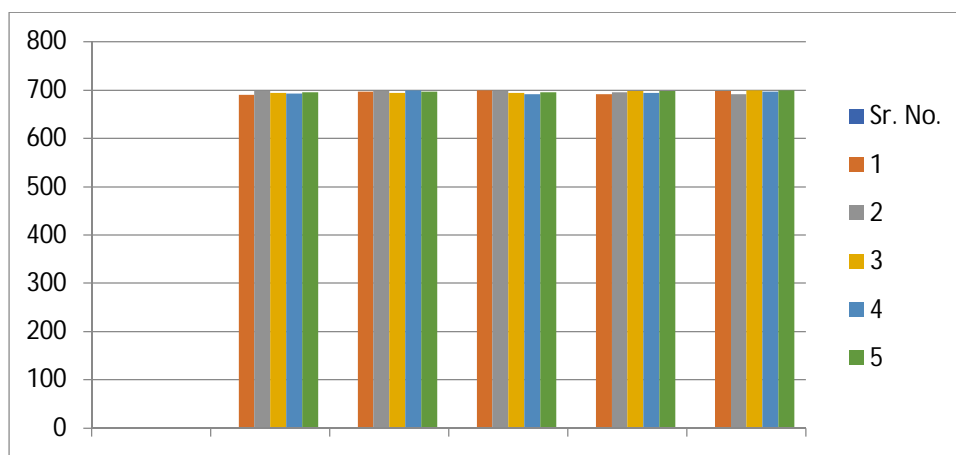


Figure 4: Graphical representation showing foaming power of shampoo

b) *Observation:* In comparative stability study the foam height of Clear shampoo was found to be in between 690-700 ml

5) *Determination of Moisture Content of final Shampoo*

Table 18: Moisture content of Final Shampoo

Sr. No.	Days	Fwb1	Fwb2	Fwb3	Fwb4	Fwb5
1.	Initial	79.65	80.76	79.25	80.15	79.35
2.	1st Week	80.77	80.54	80.88	79.75	80.75
3.	2nd Week	79.87	79.45	79.34	80.76	79.24
4.	3rd Week	80.65	80.87	80.54	79.35	79.55
5.	4th Week	80.22	80.89.	79.57	80.86	79.34

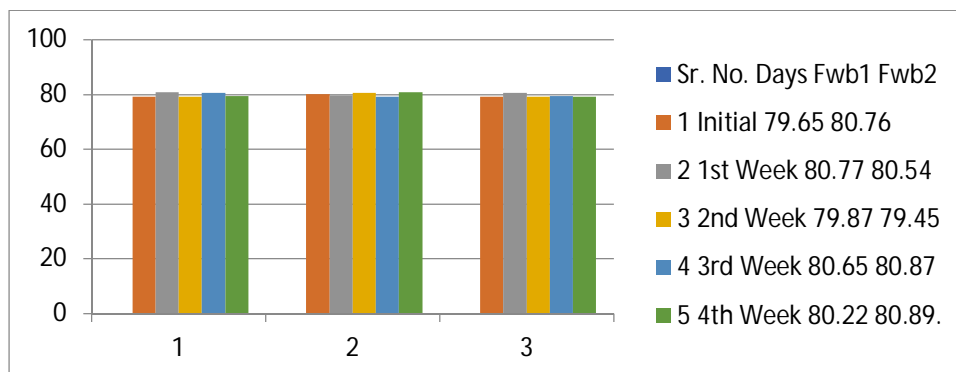


Figure 5: Graphical representation Moisture content of shampoo

a) *Observation:* In comparative stability study the moisture content of Clear shampoo was found to be in between 79-80 % at 105° C.

6) Determination of Thermal stability

Table 19: Determination of Thermal stability

Sr. No.	Parameters	Week	Result
1.	Thermal stability	1st week	Passed
2.	Thermal stability	2nd week	Passed
3.	Thermal stability	3rd week	Passed
4.	Thermal stability	4th week	Passed
5.	Thermal stability	5th week	Passed

B. In- Vivo Evaluation of shampoo.

1) Photographic Evaluation: The formulated product is compare with the marketed product.

Sr. No.	Parameters	Sr. No.	Parameters
1.	Appearance	5.	After wash Irritation
2.	Quick foam generate	6.	After wash Dryness
3.	Foaming Power	7.	After 1hour dryness
4.	On Application Irritation	8.	Fragrance

VIII. CONCLUSION

The sulphate free shampoo using Reetha improves manageability of product and provides the necessary nutrients required for the hair. As the Reetha extract contains Vitamins A, D, E and K found in this fruit are known to impart shine to your hair and make it smooth. Soap nuts also exhibit insecticidal properties that help in killing lice on the scalp. Efficacy testing was done using the extract which provides slight smoothness to the hair. The product was found to have a good market potential and can be considered for launching under the company.

The appropriate market for this product will be the upper middle class and working women. Hence forth this product works on hair by providing a very thin layer on the hair shaft which also prevents the direct damages of the hair due to hair shampoo or any other styling product and also helps on easy washing.

It was observed that peoples look more for hair loss control property as well as good hair growth and cleanser and give conditioning property. Hence, as a future consideration to incorporate additives and herbal extracts this works on anti-hair fall property and enhance hair growth with lesser cost so that it not only for premium market people as well as for mass category can be considered.

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