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PREPARATION OF CREAM SHAMPOO: A COMPARATIVE STUDY WITH MARKETED FORMULATION

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ABSTRACT

The aim of the article is to prepare a synthetic cream shampoo and evaluate its physicochemical properties as a comparative study with marketed formulation. A liquid or cream preparation of soap or detergent to wash the hair is called as shampoo. Now a days the role of shampoo is not only providing the cleaning action but also to provide other benefits like hair growth, hair nourishment, shinny and glossy hairs, dandruff free hairs and many more. Prepared cream shampoo and three marketed formulations were evaluated based on different parameters such as physical appearance, pH, viscosity, surface tension, % solid content, wetting time, foaming capacity, dirt dispersion and were compared. Conclusion is all the shampoo formulations were of good quality and could be used safely and effectively.

KEYWORDS: Cream Shampoo, Synthetic Shampoo, Marketed Formulation, Evaluation, Physicochemical Properties.

INTRODUCTION

Quality control is the process by which products/services are tested and measured to ensure that they meet a standard. Through this process a business can evaluate, maintain and improve product quality. Quality control is essential for any company that manufactures products or provides a service. It helps to improve customer satisfaction by consistently delivering quality products or services. It reduces wastage of resources, increase efficiency and profits for the company.[1]

Benefits of Quality Control.

1. Encourages quality consciousness
2. Satisfaction of consumers
3. Reduction in production cost
4. Most effective utilization of resources
5. Reduction in inspection costs
6. Improved techniques and methods of production[1]

Evaluation is the critical process by which a product or service is examined to measure a range of factors through evidence. The quality control of cosmetics is important to ensure the efficacy and safety of products and its raw materials. Due to the rapid growth that cosmetic industries have exhibit all over the world, efficient, low cost and rapid methods to assay cosmetics quality control are a priority.[1]

Cosmetics are products that are created for application on the body for the purpose of cleansing, beautifying or altering appearance and enhancing attractive features. Cosmetics are substances used to enhance the appearance or odour of the human body. Hair is one of the outer barometers of the inner body. Shampoo is a common method of hair treatment. The composition of various shampoos is associated with hair quality, hair care practice and certain problems such as oily, dandruff and androgenic hair treatment and alopecia.[2]

The evaluation of such formulations is also very important to know their performance, quality and effectiveness. It is also necessary to check whether the products have any sensitivity toxic effects on human body. The work was done keeping the ideas of Bureau of Indian Standards to analyze the cosmetics products.[3]

Need of Shampoo

Sebum is a fatty fluid produced by the skin of our heads. It' s made to protect the hair by coating the entire head with it. This gives the hair a healthy sheen, but too much of it makes the hair look unclean.[4]

Ideal Properties of Shampoo

1. It should remove dirt from scalp.
2. It should be non-toxic and safe.
3. It should give gloss and shine to hairs.

4. It should be economic and eco-friendly.
5. It should provide nutrition to hairs.[5]

Functions of Shampoo

1. It must remove dirt or soil thoroughly and effectively.
2. It should thoroughly clean the hair.
3. It should generate enough foam to please the user.
4. Rinsing with water should easily remove it.
5. It should leave the hair with a lovely scent.
6. It should have no negative side effects or cause skin and eye discomfort.[4]

Cream Shampoo

These shampoos have a paste like consistency and are packed in a collapsible tube. They find great use in hair salons. They are also available in jars with wide mouth. The paste consistency is developed by the addition of alkyl sulfates and Cetyl alcohol is added, which serves as a builder. Cream shampoo is enriched from of liquid shampoo, thicker and pearlescent proposed to express of the more intensive condition they are planned to provide. The content was wet but not completely dissolve. They would apply faster than solids and dissolved speedily.[6]

Example: Redken cream shampoo.

Raw materials for shampoos

Ingredients of present shampoo can be classified under.

1. **Surfactants:** Give cleansing and foaming property.

e.g., Anionic Surfactants: Alkyl benzene sulphonates, Alkyl sulphates.

Non-anionic surfactants: Fatty acid alkanolamides, Polyalkoxylated derivatives.

Amphoteric Surfactants: N-alkyl aminoacids, Betains.

2. **Additives:** Important additives are given below.

Conditioning Agents: Improve feel and lustre of the hair

e.g., Lanolin, Mineral Oil, Egg Derivatives, Herbal extracts

Viscosity Modifiers: Modify Viscosity

e.g., Electrolytes, Natural gums, Cellulose derivatives

Opacifying and Clarifying Agents: Give pearlscent effect.

e.g., Milky emulsions of vinyl polymers and latexes, ethanol

Sequestering Agents: Prevent deposition of calcium and magnesium salts of soaps on hair.

e.g., EDTA salts and polyphosphates.

Preservatives: Prevent microbial growth.

e.g., Formaldehyde, Esters of parahydroxy benzoic acid.

Perfumes: Give fragrance.

e.g., Herbal, fruity or floral fragrances.[7]

Difference between Herbal formulation and Synthetic formulation[8]

Herbal formulations	Synthetic formulations
Pure and organic ingredients.	Contains one active principle in high concentration.
Free from side effects	It is simple with single ingredients
No surfactants e.g SLS	Contains surfactants
No synthetic additives	Contains Synthetic additives
No animal testing	
Earth and skin friendly	
No petroleum-based ingredients	

Literature Review

Kumar et al., 2010: Shampooing is the most common form of hair treatment. Shampoos are primarily been 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. We have evaluated and compared the herbal shampoo, which was formulated in previous study, with two marketed shampoos. The findings of this investigation reveal that synthetic preservatives have sometimes been the cause of adverse effects among consumers.

Krunali et al., 2013: Shampoo is a hair care product used for the removal of oils, dirt, skin particles, dandruff, environmental pollutants and other contaminant particles that gradually build up in hair. The goal is to remove the unwanted build-up without stripping out so much sebum as to make hair unmanageable. Five different formulations of various brands are evaluated.

Deeksha et al., 2014: Background shampoos are getting more attention by the consumers as compared to soaps. Shampooing is an art by which sebum or grease produced by sebaceous gland are rinsed off from hairs making them dirt/oil free. Aim of the present study was to evaluate synthetic and natural shampoo with their cleansing action, wetting time, % solid content and dirt dispersion.

Golhandi D et al., 2015: This study is focus to formulate a completely natural shampoo and its comparative evaluation with marketed products. The extract of are used to eliminate harmful synthetic ingredient from anti-dandruff shampoo formulation and substitute them with a safe natural ingredient. Formulated herbal shampoo shows good physical properties like pH, percentage of solids, foam formulation, viscosity and dirt dispersion. The anti-fungal property also found within the range of satisfaction.

Jacob et al., 2015: Shampoo is a hair care product packed in a convenient way for use function of shampoo to wash hair and scalp. The major function of shampoo is to clean the hair, removal of oils, dirt, scalp debris and accumulated sebum. The major objective of the present study was to formulate herbal shampoo powder by means of eliminating harmful synthetic ingredients and substitute them with herbal ingredients. Our formulated herbal shampoo powder was consist of fenugreek, hibiscus, henna, lemon, vettiver, neeliamari, velvet flower, ashwagandha shikkakai, karisilaankanni, tulsi, amla, brahmi and rose petals in appropriate ratio. The following evaluation test were carried out – pH test, solid content test, dirt test, foaming capacity, wetting time and surface characterization analysis using scanning electron microscopy.

Fale SK et al., 2020: Today' s shampoo formulations are beyond the stage of pure cleaning of the hair. Additional benefits like conditioning, smoothing, good health of hair and above all, its safety benefits are expected. A more radical approach in popularizing herbal shampoo would change the consumers expectation emphasizing safety and efficacy. Thus, this study aims to investigate and compare quality of marketed herbal and synthetic shampoos formulations. The selected shampoos were evaluated for their physicochemical properties including pH, solid content, rheological measurements, dirt dispersion level, foaming ability and stability, wetting time and surface tension.

Dhayanithi S et al., 2021: The aim of the article is to formulate a pure herbal shampoo and to evaluate its physicochemical properties. The shampoo is enriched with herbal extracts

without any synthetic additives. The herbal extracts used in formulation are Sapindus mukorossi (reetha), Glycyrrhiza glabra(liquorice), Azadirachta indica (neem), Nardostachys jatamansi (jatamansi), Ocimum tenuiflorum(tulsi), Lavendula angustifolia (lavender oil), Musa acuminate (banana root). Small amount of Marigold was added as a preservative and citric acid as pH adjuster.

Hadalage et al., 2022: A liquid or cream preparation of soap or detergent to wash the hair is called as shampoo. The main objective of this study was to eliminate harmful synthetic ingredient from herbal shampoo formulation and substitute them with a safe natural ingredient. 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.

Jadhav et al., 2023: Nowadays peoples are interested in hair preparation and conditioning preparation such shampoos are product that removes surface grace and dirt from the hair shaft and scalp. The herbal cream shampoo prepared formulation was evaluated for its physiochemical properties. Some physiochemical properties such as pH foam ability and foam stability and the percent solid content viscosity microbial test was evaluated.

AIM AND OBJECTIVES

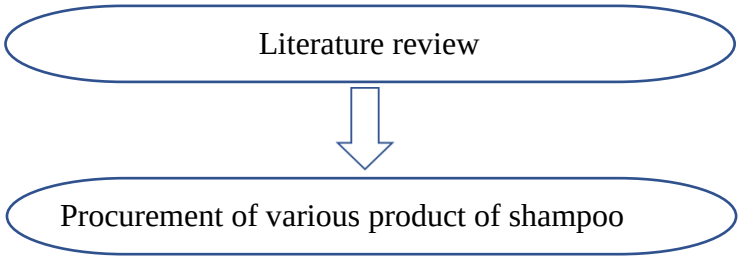
Aim

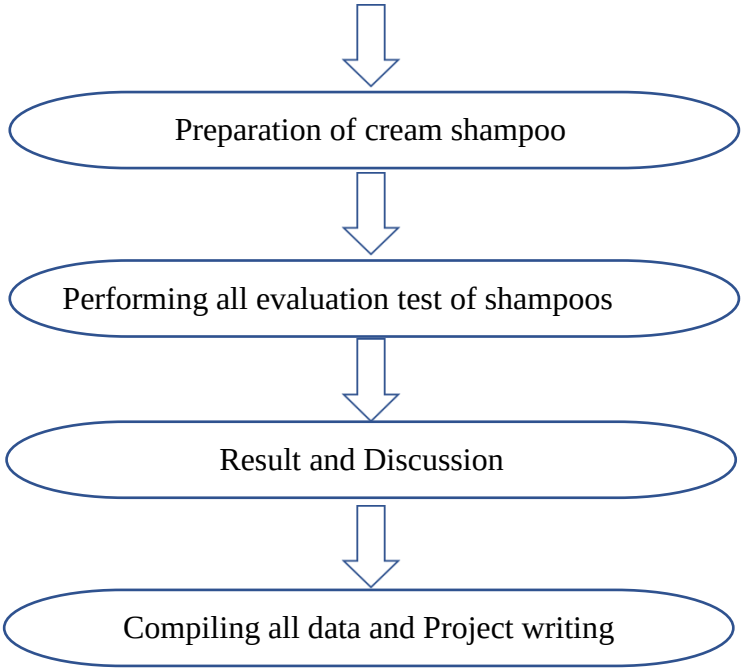
The aim of the article is to prepare a synthetic cream shampoo and evaluate its physicochemical properties as a comparative study with marketed formulation.

Objectives

- To formulate a cream shampoo and its comparative evaluation with marketed formulation.
- To check quality and standard of shampoo.
- To evaluate physicochemical properties of shampoo.

Plan of Work





MATERIALS AND METHODS

Materials

Various marketed shampoos were collected from local market of Karad, India.

Brand Name	Manufacturing company	Strength
Kesh Kanti Natural Hair Cleanser (**F1**)	Patanjali Ayurved Ltd. Haridwar India.	25 ml
Dove (**F2**)	Hindustan Unilever Ltd. (Hul), India.	25 ml
Redken (**F3**)	Redken is an American hair care brand owned by L' Oréal Group	25 ml

Reagents

1. Water
2. Ink
3. Sodium Lauryl Sulphate (SLS)
4. Cetostearyl alcohol

Apparatus and instruments handled: All equipment used were of borosilicate glass

1. Beaker
2. Tripod stand
3. Glass rod
4. Test tubes
5. Test tube stand

6. Test tube holder
7. Evaporating dish
8. Canvas paper
9. pH paper
10. Weighing machine
11. Hotplate
12. Gravity bottle
13. Stalagmometer
14. Oswald Viscometer
15. Stop watch
16. Mortar and pestle

Methods

Formula for Preparation of Cream Shampoo (F4): All required material collected and weighed according to formula given below: For 25 ml.

Ingredients	Role	Quantity
Sodium Lauryl Sulphate	Cleaning and foaming agent	9.5 gm
Cetostearyl alcohol	Thickening agent	1.7 gm
Water	Vehicles	13.8 ml
Perfume, Preservatives	Gives smell and preservation	q.s.

Wax or glyceryl stearate is used as base.[5]

Preparation of cream shampoo: Procedure

- Initially a 1/3 solution of detergent and water was heated to about 80°C.
- The wax was heated separately in a container at 80^0 C which facilitates the melting of the wax.
- Both the solution was kept at 80°C and mixed. Uniform mixing was achieved by constant and gentle stirring. Remaining SLS was added
- The solution was allowed to cool about 40 to 45°C
- Finally, under warm conditions mixture was transferred to suitable container.[6]

Evaluation Test for Shampoos

Physical appearance: The samples were evaluated in terms of their clarity, color, Odour and texture.[3]

Determination of pH: pH of your 10% shampoo solution. Dip one strip of pH paper in the solution and compare the color of the strip to key. pH meter can also be used after calibration. Most shampoos were neutral or slightly acidic. Acidic solutions cause the cuticle (outer layer) of the hair to shrink and lay flatter on the shaft of the hair. Basic solutions cause the cuticle to swell and open up. Acidic solutions make the hair seem smoother. Basic solutions make hair seem frizzier.[9]

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 were 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.[9]

If a shampoo has too many solids it will be hard to work into the hair or too hard to wash out. A good shampoo will be between 20% – 30% solids.[10]

Dirt Dispersion: To a large test tube containing 10 ml of distilled water, two drops of shampoo were added. One drop of ink was added in the test tube, fitted with a stop cork and shake for ten times. The amount of ink in the foam was estimated as none, light, moderate or heavy.[11]

Shampoos that cause the ink to concentrate in the foam are considered poor quality. The dirt should stay in the water portion. Dirt that stays in the foam will be difficult to rinse away. It will redeposit on the hair.[10]

Wetting time: The canvas was cut into discs having an average weight of 0.44 g. The disc was floated on the surface of shampoo solution of 1% w/v and the stopwatch started. The time required for the Disc to begin to sink was measured acutely and noted as the wetting time.[12]

Surface tension measurement: Measurements were carried out with a 10% shampoo dilution in distilled water at room temperature Stalagmometer was used for determining surface tension of shampoo using purified water.[13]

Rheological evaluation (Viscosity): Viscosity of 10% shampoo Solution was measured by using an Ostwald viscometer as per formula. The viscosity which gives great fluidity, which makes formulation easy to apply and easy to spread on hair.[11]

Determination of Foaming Index: Place 5 test tubes in the test tube stand. Then add the stock solution i.e., the prepared shampoo in each test tube by increase in volume means 1 ml in first test tube, 2 ml in second test tube and so on. Then make up the volume of each test tube up to 10 ml using distilled water. Then shake each test tube to produce enough amount of foam. Then measure the produced foam using ruling scale and then Calculate the foaming index.[14]

Foaming ability and Foaming stability: Foam production has little to do with cleansing activity of shampoos, it is key importance to the consumer and is therefore an important criterion in evaluating shampoo. The Shampoo showed good foaming properties.[14]

Ease of distribution: Ease of distribution was performed by applying 5ml of the Formulation over the wet hair and the time taken to complete the distribution was measured.[12]

Ease of rinsing: The time taken to remove the detergent was performed by applying 5 ml of the shampoo and time taken for complete removal of frothing from wash water was determined.[12]

Ease of combing (Wet): Ease of combing was performed by passing a comb through the wet hair and checking whether the comb glides smoothly.[12]

Speed of Drying: The speed of drying was performed by applying 5ml of the shampoo in hair and dried after washing. The drying of hair was performed by using a table fan with constant speed and distance from the subject.[12]

Ease of Combing (Dry): Ease of combing was performed by passing a comb through the dry hair and checking whether the comb glides smoothly.[12]

Nature of hair after wash: Nature of hair after wash was done by applying a small quantity of the shampoo on hair and then washed.[12]

List of the formulae used for calculation:

1) Determination of % Solid contents:

% solid content = (B – A)/ 4 x 100

Where, A is Weight of empty petri plate.

B is Weight of plate after evaporation.

2) Surface Tension Measurement:

$$R^2 = \frac{(W_3 - W_1)n_1}{(W_2 - W_1)n_2} \times R_1$$

Where, W1 is the weight of empty beaker.

W2 is the weight of beaker with distilled water

W3 is the weight of beaker with shampoo solution

n1 is the no. of drops of distilled water

n2 is the no. of drops of shampoo solution.

R1 is the surface tension of distilled water at room temperature.

R2 is the surface tension of shampoo solution.

3) Determination of Foaming Index

Foam index = 1000/A

Where, A= Volume of decoction having exact 1cm of height.

4) Rheological Evaluation:

$$\eta = \frac{\eta_1 \times \rho_2 t_2}{\rho_1 \times t_1}$$

η_1 = Absolute viscosity of water
t_1 = Time of flow of water
ρ_1 = Density of water
η_2 = Absolute viscosity of liquid
t_2 = Time of flow of liquid
ρ_2 = Density of liquid

5) Determination of Density

Density = mass ÷ volume

RESULTS AND DISCUSSION

❖ **Results of** 1) Physical Appearance

2) Determination of pH

Table 1: Evaluation of formulation for Physical appearance and Ph.

Sr. No.	Formulation		Colour	Odour	Clarity	pH
1)	Gel Shampoo	F1	Light brown	Good	Opaque	5
		F2	White	Good	Milky opaque	5
2)	Cream Shampoo	F3	White	Characteristics	Milky	6
		F4	White	Characteristics	Milky	6

Acceptance Criteria: pH should be neutral or slightly acidic.

❖ **Results of** 3) Determine % of Solid Contents

4) Dirt Dispersion

5) Wetting Time

Table 2: Evaluation of formulation for % Solid contents, Dirt dispersion, Wetting time.

Sr. No.	Formulation		% Solid Contents	Dirt dispersion	Wetting time
1)	Gel Shampoo	F1	13.5 %	Moderate	3 sec
		F2	15.5 %	Light foam	5 sec
2)	Cream Shampoo	F3	59.2 %	Light foam	48 sec
		F4	61.6 %	Light foam	50 sec

Acceptance Criteria

% Solid Contents: Gel Shampoo – Between 10 to 20 %

Cream Shampoo – Between 55 to 65 %.

Dirt Dispersion: The amount of ink in the foam was estimated as None, Light Moderate or heavy.

Wetting Time: Gel Shampoo – Between 3 to 10 sec.

Cream Shampoo – Between 40 to 60 sec.

❖ **Results of** 6) Surface Tension Measurement

7) Rheological Evaluation

8) Determination of Foaming Index

Table 3: Evaluation of formulation for Surface Tension Measurement, Rheological Evaluation (Viscosity) and foaming index.

Sr. No.	Formulation		S. T. Measurement	Rheological Evaluation	Foaming Index
1)	Gel Shampoo	F1	26.12 dyne/cm	0.824 cp	200
		F2	27.14 dyne/cm	0.852 cp	250
2)	Cream Shampoo	F3	39.3 dyne/cm	1089 cp	200
		F4	40.1 dyne/cm	1236 cp	250

Acceptance Criteria

1) **Surface Tension Measurement:** 25 to 40 dyne /cm
2) **Rheological Evaluation:** Gel type Shampoo – 0.8 to 1 cp

Cream Shampoo – 1000 to 2000 cp

❖ **Results of** 9) Determination of Foaming Ability and Foaming Stability.

Table 4: Evaluation of formulation for foaming ability and foaming stability.

No. of stock solution containing 1ml of stock solution	Height of foam in cm			
	F1	F2	F3	F4
	Gel Shampoo		Cream Shampoo	
1 ml	0.2	0.4	0.6	0.7
2 ml	0.3	0.5	0.7	0.7
3 ml	0.6	0.7	0.8	0.8
4 ml	0.8	1	0.8	1
5 ml	1	1.2	0.9	1.3

❖ **Results of other remaining evaluation parameters**

10) Ease of distribution

11) Ease of rinsing

12) Ease of combing (wet)

13) Speed of drying

14) Speed of combing (dry)

15) Nature of hair after hair wash

Table 5: Other remaining evaluation parameters.

Parameters	F1	F2	F3	F4
	Gel Shampoo		Cream Shampoo	
Ease of distribution	***	***	***	***
Ease of rinsing	**	**	**	**
Ease of combing (wet)	**	**	**	**

Speed of drying	9 min	11 min	10 min	11 min
Speed of combing (dry)	***	***	***	***
Nature of hair after wash	Soft and manageable	Soft and manageable	Soft and manageable	Soft and manageable

******* Best

** Better

*Good

DISCUSSION

All the required quantity of shampoo where checked which showed positive and acceptable results. The pH of shampoo is good which helps in improving the hair texture and maintains the pH of scalp. The evaluation parameters like visual inspection, pH determination, viscosity determination, Surface tension measurement etc. are carried out and the results were good. The formulated shampoo showed good rheological properties.

CONCLUSION

The aim of present study is to prepare cream shampoo and assess its physicochemical function on quality and standard. Several tests were performed to evaluate and compare the physicochemical properties of both prepared and marketed shampoos. Our prepared shampoo showed significant result with that of marketed shampoo. The present study showed that all the marketed formulations of good quality as indicated by results.

REFERENCES

1. https://www.yourarticlelibrary.com/production-management/12-importance-or-benefits-of-quality-control-production-management/26173. (15 April 2023)
2. Dipesh R Karnavat, Pratiksha S.Bhadane, Ritu M. Khairnar, Shweta S.Gavit Formulation and Evaluation of Herbal Antidandruff Shampoo Research Journal of Pharmacognosy and Phytochemistry, 2022; 3-6.
3. Fale SK, Mishra RR, Sahu RA and Maliye AN Assessment and comparison of herbal and Synthetic shampoos Journal of Pharmacognosy and Phytochemistry, 2020; 3152-3155.
4. Manali V. Gharat, Rutuja V. Dalavi, Amit A. Dound, Aniket R. Chikane, Prof. Kajal A. Walunj A Research Article on Formulation and Evaluation of Herbal Shampoo International Journal of Advanced Research in Science, 2022; 217-222.
5. Saili P. Rajput, Rupesh B. Khalse, Sadhana P. Rajput and Dr. Ganesh Tapadiya Formulation of Herbal Shampoo and it' s evaluation World Journal of Pharmacy and Pharmaceutical Sciences, 2022; 1997-2001.

6. Jadhav Shweta Rajendra, Ubale Amol Tanaji, Ziya Khalil Khan, Aoughade Jyoti Vikas, Pawar Neha Vijay Formulation and Evaluation of Herbal Cream Shampoo of Curry Leaves International Journal of Pharmacy and Pharmaceutical Research, 2023; 436-454.
7. Sharma P.P. Cosmetics Formulation, Manufacturing and Quality Control, 4th Edition, March, 1998; 325-333.
8. Mr. Aman Maula Hadalage, Miss. Dhanashri Ananda Kamble, Mr. Ganesh Kiran Kamble, Mr. Ganesh Vijay Kamble, Miss. Dhanashree Rajendra Kumbhar, Ms. Pradnya Patil " Development and Evaluation of Herbal Shampoo" Journal of Emerging Technologies and Innovative Research, 2022; 116-132.
9. Ashok Kumar and Rakesh Roshan Mali Evaluation of Prepared Shampoo Formulations and to Compare Formulated Shampoo with Marketed Shampoos International Journal of Pharmaceutical Sciences Review and Research, 2010; 120-126.
10. Thakkar Krunali, Patel Dhara, D.B Meshram, Patel Mitesh Evaluation of Standards of some Selected Shampoo Preparation World Journal of Pharmacy and Pharmaceutical Sciences, 2013; 3622-3630.
11. Deeksha, Rishabha Malviya and Pramod Kumar Sharma Evaluation of Marketed Shampoo (Synthetic and Natural) for Their Hair Cleansing, Dirt Dispersion, Wetting Time, Solid Content and Foaming Capacity Properties Global Journal Pharmacology, 2014; 490-493.
12. Rhea Jacob, Sakthivel, K. M., Kannan, N. and Guruvayoorappan C Formulation of Cost-Effective Herbal Shampoo Powder: A Comparative Study with Marketed Shampoo International Journal of Current Research, 2015; 12645-12649
13. Golhani D, Pandey V, Shukla A, Shukla R Formulation and Comparative Evaluation of Herbal Shampoo with Marketed Products Mintage journal of Pharmaceutical & Medical Science, 2015; 3-6.
14. Dhayanithi S, Enjamamul Hoque, Pallavi N, Dr. Kavitha PN and Dr. Saraswathi Formulation And evaluation of herbal shampoo National Journal of Pharmaceutical Sciences, 2021; 88-93.