PROJECT REPORT
(BSCC3151)

ON

Production of Shampoo and its Chemical Analysis

Submitted in partial fulfilment of the requirement for the degree of
B.Sc. (Hons) Chemistry

Submitted by

NEHA. M

Admission No.19SBAS1020002

B.Sc. (Hons) Chemistry (VI Semester)

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Division of Chemistry
Department of Basic Sciences
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GALGOTIAS UNIVERSITY
Uttar Pradesh

May2022

GALGOTIAS UNIVERSITY
(Established under Galgotias University Uttar Pradesh Act No. 14 of 2011)

SCHOOL OF BASIC AND APPLIED SCIENCES

CERTIFICATE

This is to certify that **Ms. Neha. M** has carried out her Project work entitled **" Production of shampoo and its chemical analysis "** under my supervision. This work is fit for submission for the completion of project for bachelor Degree in Chemistry.

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Date: 31st May 2022

TO WHOMSOEVER IT MAY CONCERN

This is to certify that Ms Neha.M a 6th semester student of B.Sc (Hons) Chemistry from Galgotias University, Greater Noida has undergone in training from **15/02/2022 to 31/05/2022** as a part of fulfillment of her course, at our factory located at B-44, Phase II, NOIDA(U.P.) in Quality Control and Quality Assurance department.

During her training period she had undertaken a project on "**Production of Shampoo and its chemical Analysis**"**– An HR Perspective."** She was found to be taking keen interest and has put in her efforts to work on the project very sincerely.

The project she has undergone, really helped us in identifying many strengths and areas of improvement in our working environment.

We wish her all the best in her future endeavors.

Oriflame India Pvt Ltd

Authorized Signatory

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CANDIDATE DECLARATION

I hereby declare that the dissertation entitled **Production of shampoo and its chemical analysis** by me in the partial fulfillment for the degree of B.Sc.(Hons) in Chemistry to the Division of Chemistry; Department of Basic Sciences, School of Basic & Applied Sciences, Galgotias University, Greater Noida, Uttar Pradesh, India is my original work. It has not been submitted in part or full to this University of any other Universities for the award of diploma or degree.

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ACKNOWLEDGEMENT

I am extremely grateful to **Dean Dr. AK Jain** for providing me with all the facility that was required to complete my project.

I would like to express my special thanks of gratitude to my guide **Dr. Umar Farooq** for their able guidance and support in completing my project.

I would also like to acknowledge with much appreciation the important role of the staffs in Oriflame, who gave me permission to use the instruments and learn the mechanisms.

I wish to extend my special thanks to **Mrs. Aradhana Dubey** my guide in Oriflame for the project who was so humble and very helpful in completion of my work.

I would like to thank following people for teaching me more than they have to and helping me in finalising my project, **Mr. Bhawtosh** who taught me about the raw materials and its specification. **Mr. Vipul Sharma** who taught me about the testing of the cosmetic products and analysing their reports. **Mr. Uttam Singh** who taught me about the production and filling of the products.

At last thanking each and everyone who were there to clear the queries and helping me to get all the information regarding my review.

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LIST OF ABBREVIATIONS

QC - Quality Control

INCI – International Nomenclature of Cosmetic Industry

CTFA – Cosmetic , Toiletry and Fragrance Association

FTIR – Fourier Transform Infrared spectroscopy

KEY WORDS

Shampoo, Hair , cosmetics, INCI, CTFA, Quality control, Viscosity , Specific Gravity, FTIR, ABBE Refractometer, Infrared radiation, Refractive Index.

ABSTRACT

Hair cosmetics like shampoo, conditioner and other hair products are an important part in today's generation. Because, the increase of the pollution worldwide made people to suffer with a lot of hair problems. Some of them are loss of hair, frizzy and oily look. And some have dandruff issues. To get rid of this, the cosmetic industry introduced the shampoo as their safety tool to protect our hair from getting damaged. In simple words, Shampoos are the cosmetic preparation meant for cleaning the hair and scalp. It removes the oils, dandruff, dirt and protects from environmental pollution.

In early years, people used soap to wash their hair. Even though it cleaned the hair, but it had some drawbacks. Like irritation in eyes, giving dull look and reduction in volume. In 1930's, the modern shampoo was invented. Its purpose is not only to clean hair but also we can take bubble bath, use it as diy body scrub and many other options. But its main function is to wash the hair and provide silky and neat look. New improvements are ongoing to develop the characteristics of shampoo in such way that it doesn't make the hair to be unmanageable and to be a good commercial product. Some researchers have been done to replace synthetic ingredients and use natural raw materials. And other than that people nowadays want both the conditioner and shampoo's work to be in one stage as it usually undergoes two steps. So making shampoo as a basic need and wanting to show its significance, this is a review which gives the detail about why shampoo is used and how it is manufactured in the cosmetic industry.

CHAPTER– 1

INTRODUCTION

INTRODUCTION

Cosmetics, simply known as make up, are the products which are used by humans to make over themselves. Cosmetics are mostly used by women than men.

All the cosmetics have some expiring time so they must be renewed. To improve their look or appearance and to look after their bodies, people use cosmetics since ancient times.

Cosmetics include:

Cleanser, Toner, Moisturiser, Concealers, Foundation, Body wash, Shampoo and Conditioner, Body Cream, Lip balm, Deodorant.

Here I will give you information about the hair care product- shampoo, one of a cosmetics used to clean hair. It is necessary to wash our hair because it is exposed in all the climatic conditions, dirt,

etc which makes it to look frizzy, oily in scalp and irritation which finally leads to loss of hair. To overcome this problem, the cosmetic industry in the early 1930s, introduced a synthetic detergent shampoo. And later in the year 1960s a new methodology in shampoo was made that we are currently using.

A shampoo is made to remove the sebum which is build up in the hair. It is manufactured in such a way that it doesn't harm the hair and its scalp.

Dermatologist prescribe hair care products to improve scalp hair density.

Uses of a shampoo

1. Hair and scalp looks healthier.
2. Leads to hair growth.
3. Protects from the environmental pollutants
4. Prevents oily hair

Varieties of shampoo have been introduced because one shampoo cannot solve all the hair problems.

One is made for hair growth and the other is made for treating dandruff, etc.

4.LITERATURE REVIEW

1.DEVELOPMENT AND EVALUATION OF ANTIDANDRUFF SHAMPOO BASED ON NATURAL SOURCES.

Shampoo is a hair care product which is used for the removal of all the dirts and environmental pollutants(1). It is a cosmetic preparation. The main function of the shampoo is to clean the hair and its scalp which secrets the sebum(3).

Most of the people in today's generation are worrying about a main problem – hair dandruff which is caused by Malassezia (Pityrosporum)species. It is a great concern all over the world. It can be controlled by adding the fungiastic ingredient with the manufacturing ingredients in anti – dandruff shampoo.

The main objective of this study is to eliminate harmful ingredient which is synthetic and substitute them with safer ingredients that are natural.

Herbal shampoo was prepared by sida cordifolia leaf extract. Soap nut and shikakai were used as surfactants(5).

Evaluation of organoleptic properties are done. Physiochemical and performance test were performed and compared with synthetically marketed products.

The purpose of this review is to develop a stable anti dandruff shampoo which would be more effective. The preparation is done by excluding all types of synthetic additives. By the results, we can confirm that developing a stable herbal shampoo is commercially possible.

Further longterm studies may be recommended to prove the safety of this formulation to make it suitable as a commercial product.

CHAPTER – 2

MATERIALS AND METHODOLOGIES

MATERIALS AND METHODS

Cosmetic chemists develop new shampoos in a laboratory setting. These researchers start by determining the properties of the shampoo formula. They must choose aesthetic elements like how thick it should be, what colour it should be, and how it should smell. They also take into account performance factors including how well it cleans, how the foam looks, and how unpleasant it will be. Consumer testing is frequently used to help identify what these qualities should be.

A formula is established in the laboratory when the shampoo's characteristics are discovered(i). The first batches are prepared in small beakers with a variety of components. Almost all of the substances that can be used in personal care products are classified by the Cosmetic, Toiletry, and Cosmetic Ingredients classification systems.

MATERIALS:

WATER

Water is the most important ingredient in all shampoos, accounting for 70-80% of the total composition. Shampoos contain deionized water, which has been processed to eliminate different particles and ions. The water might come from underground wells, lakes, or rivers.

THICKENER

It increases the viscosity without changing the other parameters or properties.

It can be used in any formula which contains a high level of water.

SURFACTANT

Removes dirt and other impurities and it is because of their ability to dissolve the barrier between dirt, oil and water.

HUMECTANT

It moisturizes the hair, because the surfactant used in the preparation of shampoo makes the hair look dry. It is a common moisturizing agent and it is necessary to be added as it is beneficial for all the skin type. Most commonly glycerin is used as a humectant.

CONDITIONING AGENTS

Some of the materials in and as surfactants are added in shampoo which while using leaves harsh effect on hair. So there comes the role of conditioning agents which reduces the irritation and provides moisture to the hair and scalp.

PRESERVATIVES

It helps to preserve the product over time. This is added while manufacturing, because when shampoo is prepared water plays a common role which has a ph and a particular temperature in which bacteria can grow. Thus adding it for the prevention. Raw material like sodium benzoate is mostly used.

MODIFIERS

To change specific qualities, other components are added to shampoo compositions. To make the recipe opaque and give it a pearly appearance, opacifiers are added. To counteract the dulling effects of hard water, materials known as sequestering agents are added. To modify the pH of a shampoo, acids or bases such as citric acid or sodium hydroxide are added to ensure that the detergents clean well.

SPECIAL ADDITIVES

The colour and odour of a shampoo are two important aspects that impact its purchasing. Manufacturers add fragrance oils and FD&C dyes that have been approved and certified by the government to alter these features. Other unique additions can have a similar impact. Botanical extracts, natural oils, proteins, and vitamins are all natural ingredients that give shampoos their unique properties and help them sell. To combat dandruff, ingredients like zinc pyrithione are utilised. Dyes, which can colour hair, are another addition.

INSTRUMENTS USED:

1. FTIR
2. ABBE REFRACTOMETER
3. VISCOMETER
4. WEIGHING BALANCE
5. PH METER

DETAILS OF THE INSTRUMENTS:

1. FTIR

Infrared spectroscopy is an important technique in organic chemistry. It is an easy way to identify the presence of certain functional groups in a molecule. Also, one can use the unique collection of absorption bands to confirm the identity of a pure compound or to detect the presence of specific impurities.

2. ABBE

One of the most fundamental properties of solutions is their refractive index. The refractive index of a substance with reference to air is the ratio of the sine of the angle of incidence to the sine of the angle of refraction of a beam of light passing from air in to the substance. The laboratory refractometer is designed for measuring the refractive index, which is used to indicate the purity of a substance, and hence is a vital property for identification.

3. VISCOMETER

Viscosity is generally defined as the measure of a fluid resistance to flow.

In chemical and cosmetics industry, viscosity testing is a very important parameter in quality control. By measuring the viscosity of products, manufacturers can predict how products will behave once they are in consumer's hand.

Fig.1 VISCOMETER

4. PH METER

pH Meter is a versatile unit, which simplifies pH measurement without compromising on accuracy or reliability.

Fig.2 PH METER

5. WEIGHING BALANCE

Mettler balances are high precision analytical balances, which simplify weighing operations without compromising on accuracy or reliability.

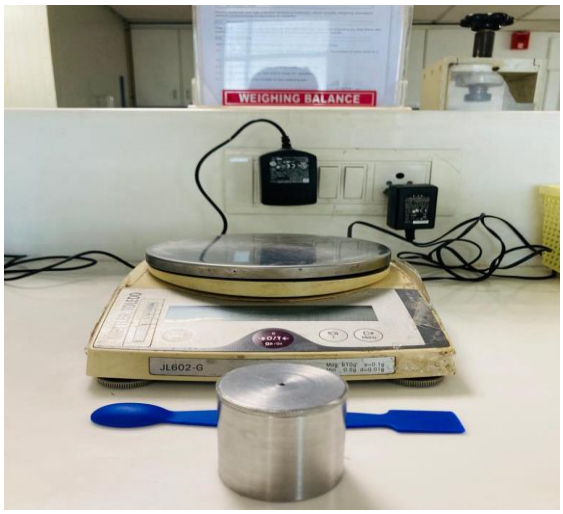

Fig.3 WEIGHING BALANCE

TESTING METHODS:

The Raw materials are imported from various places with a safety measurement comes to the warehouse of the manufacturing company.

So from here small amount of each raw material comes to the quality laboratory for testing. All the samples get tested by either FTIR or ABBE. The FTIR instrument is to check the Infrared Radiation and the ABBE Refractometer is to check the Refractive Index.

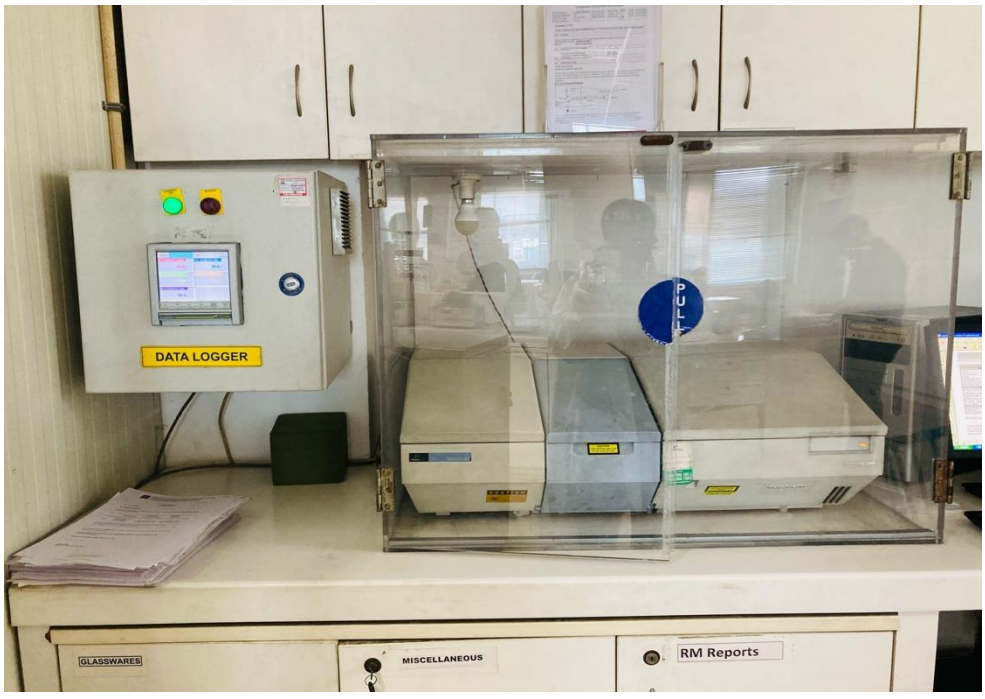

Fig.1 FTIR INSTRUMENT

The details of the test and standard result will be already uploaded in the computer system, from there we will be able to know that which raw material should be tested in FTIR or ABBE.

In IR, the samples are pellet pressed then subjected to the IR and then the result comes in the form of

graph. The system will automatically show whether the raw material can be passed or not.

Fig.2 PELLET PRESS

Similarly for RI, the sample is placed in the glass prism after proper cleaning and by adjusting the knob to make the point to be in the centre the result will be shown in numerical. And the final results are checked with the standard results which are uploaded on the system.

Fig.2 ABBE RFRACTOMETER

When finally the materials are tested, these are sent to the process area for the manufacturing process.

THE MANUFACTURING PROCESS

This process is of two steps:

1. A batch of shampoo is produced in large vessel.
2. The batches are filled in separate bottles and then they get packed.

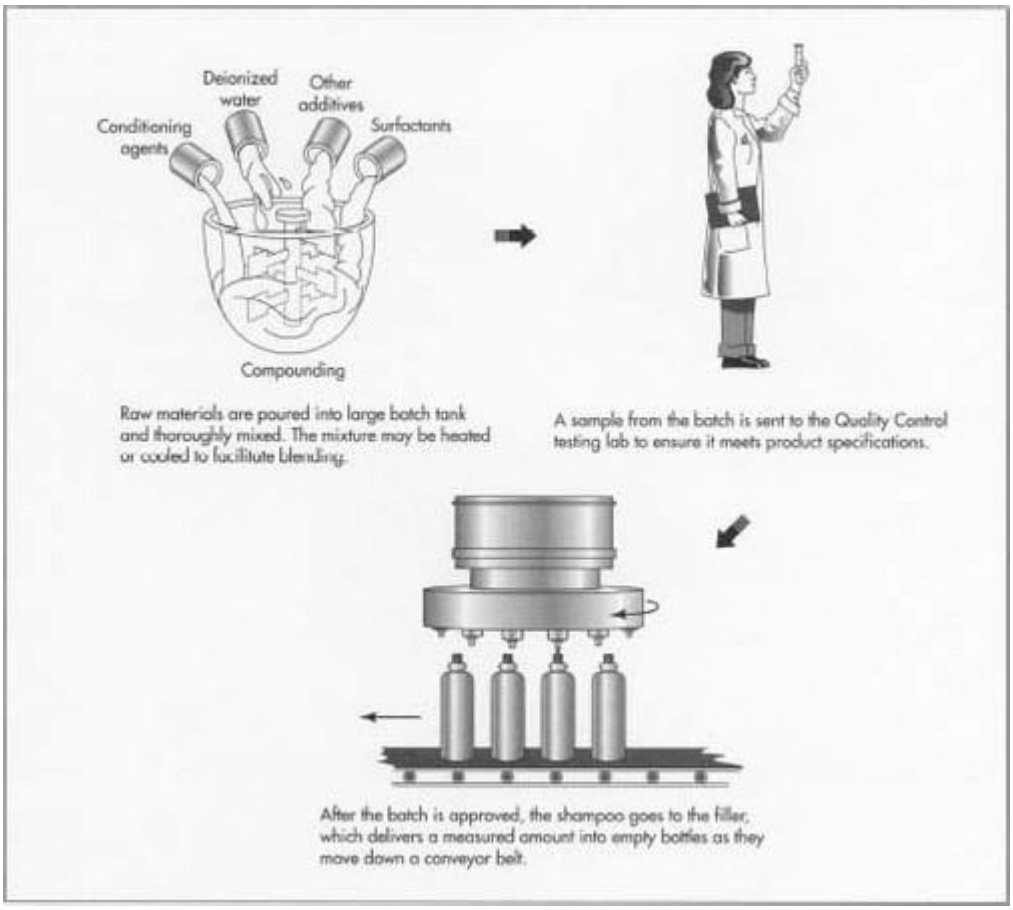

Fig.4 COMPOUNDING

COMPOUNDING

1. A batch of shampoo is made in the vessel which are placed in the process area. The workers here follows the MI (Manufacturing Instructions) given to them to make batches of 600 kg or more or may be less. So for them the raw materials are delivered through lift and the workers take them to the processing area via hand truck. The raw materials given to them will be in drum or in some plastic bags. Then they are added in the vessel as per the MO (Manufacturing Order). The Manufacturing Order gives the information that which raw material should be added first (phase wise) and at what quantity. The MI has the information about the temperature, vessel and the stirring speed.
2. The raw material which needed to be heated or cooled are done in separate vessel and therefore for water it is directly pumped into the vessel. Here hot water is used for making shampoos.

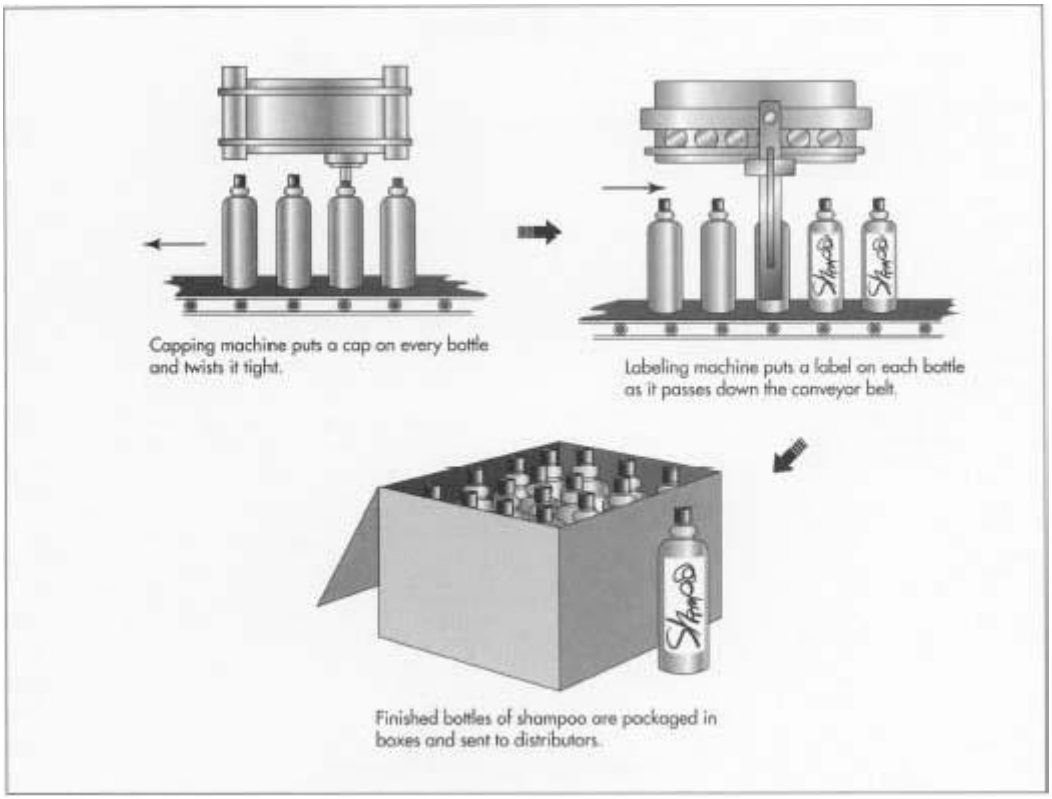

Fig.5 FILLING

QUALITY CONTROL CHECK.

3. After adding all the ingredients, the shampoo is finally made and in small container, the batch of shampoo is taken for the testing in the quality lab. In the quality lab, the physical parameters of the batch is checked. The physical parameters: Color, odour and appearance. Other main parameters: Viscosity, pH and Specific gravity. If the result doesn't come in range, specifications can be made. If there is a minor issue with pH, acid or a base can be added to manage and if it is with viscosity salt can be added.
4. When the test results are in the range, then the batch is approved by QC and allowed to be filled in bottle. There are some things that should be noted before the batches are filled in the bottles.
    - Firstly, the area must be clean.
    - Then there must not be any items regarding the previous batch that have been made
    - And while the batches get started to fill, their weights must be checked simultaneously.

FILLING

5. The empty bottles are placed in a hopper at the starting point. It works in a format which keeps the bottle upright and properly oriented and then it moves them to the filling carousel.
6. The filling carousel is made of series of piston which is calibrated to give the exact amount of shampoo to be filled in bottles.
7. Next the bottles move to the capping machine where there is an another hopper filled with the caps. The bottles are moved and the caps are put on twisted tight.
8. When the cap is fitted, the bottles are moved to labelling section. The machine automatically sticks the label at a correct position. They stuck it as the bottles pass by.
9. From this labelling area, the bottles will move to the boxing area, where the bottles are filled in the carton boxes and are kept in pallets which will be moved in trucks to the distributors.

QUALITY CONTROL

The work of the Quality Control is to check whether the product meets the specifications or not.

They also do check the line where the products are filled in the bottles. They check whether the place is neat, labels are correctly placed, the cap is tighten or not. They also take batches in small amount for the microbial analysis. Microbial analysis is done for every product to check the bacteria contamination.

For a product, firstly microbial analysis is done, secondly the chemical tests are done.

Additionally, the packaging and transporting area is also checked.

CHAPTER – 3

RESULT AND DISCUSSION

RESULT AND DISCUSSION

As mentioned above, Manufacturing Instruction is the information or literally the details to produce or process any product. In this, the name of the vessel will be given, and their particular temperature in which they will be produced.

In Manufacturing Order, the details of the raw materials will be given that how much percentage it should be added in which phase at which temperature.

As per the given instructions, the work will start in the mentioned time. Mostly a shampoo takes 3 hrs to be produced. And when it is done, it is taken to the quality laboratory to be checked.

1. **Eleo oil infused shampoo.**

Description:

The eleo oil infused shampoo is manufactured by the combination of powerful oils. The purpose of this luxurious shampoo is to nourish deeply and clean the scalp gently additionally offers good fragrance.

Uses:

Basically, a oil's work is to prevent the dryness of the hair . Similarly, this shampoo works in that way. Prevents the hair from getting dry, maintains its moisture and nourishes from top to bottom.

The chemical result of the oil infused shampoo:

Test Name	Specifications	Result
Colour	Pale Yellow	Complies
Odour	Floral	Complies
Appearance	As Standard	Complies
Ph	4-5	4.81
Specific Gravity	1.01-1.04	1.017
Initial Viscosity	7000-15000	NA
Final Viscosity	7000-15000	11183cps

To verify the result, there will be always a standard specification. According to it the results are in proper range. First the basic parameters should be checked , if any defect the bulk cannot be passed. Colour, odour and appearance are the basic parameters. Next comes the important parameter SG, ph and viscosity. As per the standard specification the product is in range and can be exported.

2. **Repair Nourishing Shampoo**

Description:

A shampoo that gently cleanses the over – processed and damaged hair. Makes the hair soft and healthy. It contains a phytonutrient complex which strengths the hair fibre. It is dermatologically tested.

Uses:

Help to strengthen the fibre and can be used daily.

The chemical result of Repair Nourishing shampoo:

Test Name	**Specifications**	**Result**
Colour	White	Complies
Odour	Floral	Complies
Appearance	Pearlised Gel	Complies
Ph	4.5-5.2	4.85
Specific Gravity	1.01-1.04	1.021
Initial viscosity	7000-15000	NA
Final viscosity	7000-15000	7817cps

As per standard specification, the results are in range. So there will be no harm or any defect.

3. **Two in one shampoo - Avocado oil and chamomile:**

Description:

In a single step, this creamy 2 in 1 shampoo with natural Avocado Oil and Chamomile softly washes and conditions hair. Hair feels nourished and has a shinier appearance. It is a silicone-free and biodegradable product.

Uses:

Cleans and conditions at the same time.

The chemical result of Avocado oil and chamomile shampoo:

Test Name	**Specifications**	**Result**
Colour	Yellow	Complies
Odour	Sweet	Complies
Appearance	Yellow pearlised Gel	Complies
Ph	4.5-5.2	4.93
Specific Gravity	1.025-1.045	1.031
Initial viscosity	7000-12000	NA
Final viscosity	7000-12000	10567cps

As per standard specification, results are in range so this will also be in good behavior when it is in the hands of consumer.

CONCLUSION

Hair that is shiny, silky, and has clean-cut ends is thought to be healthy.Everybody likes to maintain their hair and want it to be perfect but hair doesn't look in the way which we expected it to look. As it is exposed to every possible pollutant which leads only in hair loss and various other problems. So to maintain their texture and volume we need to take care of hair and provide it with nourishment and conditioning. That's why in recent years, the consumer's demand of product for hair care is increased. Everyone wants the product to be less synthetic and more natural. Different type of cosmetics are produced by the scientists day by day as per the needs. So in the fulfilment of expected needs, shampoo comes finally to the consumer.

From the above given details of the manufacturing process three shampoos according to the demands have been produced.

1. Eleo oil infused shampoo

2. Repair nourishing shampoo

3. Two in one shampoo

Their specifications are in range for to work as good as expected.

In conclusion, this review has the objective or motive to say that shampoo is necessary for hair because it too needs to be healthy as we are.

THE FUTURE PERSPECTIVE

Consumer product corporations will continue to manufacture new types of shampoos. These new formulas will be driven by ever-changing consumer desires and developing chemical technology. Currently, consumers like multi-functional shampoos, such as 2-in-I shampoos, which provide cleansing and conditioning in one step, or shampoos that aid in styling. New shampoos will likely provide improved conditioning, styling, and coloring while cleaning the hair.

Shampoo technology will also improve as new ingredients are developed by raw material suppliers. Some important advances are being made in the development of compounds such as polymers, silicones, and surfactants. These materials will be less irritating, less expensive, more environmentally friendly, and also provide greater functionality and performance.

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