

Project Report
on
QUALITY ANALYSIS OF SKIN CARE PRODUCTS

Submitted in Partial Fulfilment of the Requirement
for the Degree of **B.Sc. (H) Biochemistry**

Submitted by

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Uttar Pradesh
June 2022

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CERTIFICATE

This is to certify that **Ms. Muskan Tyagi** has carried out her project work entitled “**Quality Analysis of Skincare Products**” under my supervision. This work is fit for submission for the award of Bachelor (H) Degree in Biochemistry.

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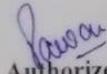
This is to certify that Ms Muskan Tyagi a 6th semester student of B.SC (Hons) Biochemistry from Galgotias University, Greater Noida has undergone in training from **06/01/2022 to 06/05/2022** as a part of fulfillment of her course, at our factory located at B-44, Phase II, NOIDA(U.P.) in Quality Control and Quality Assurance department.

During her training period she had undertaken a project on **“Quality Analysis of Skincare Product”– 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.

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CANDIDATE DECLARATION

I hereby declare that the dissertation entitled “**Quality Analysis of Skin Care Products**” submitted by me in partial fulfillment for the degree of B.Sc. (Hons) Biochemistry to the Division of Life Sciences, Department of Biosciences, School of Basic and Applied Science, Galgotias University, Greater Noida, Uttar Pradesh, India is my original work. It has not been submitted in part or full to this University or any other Universities for the award of degree.

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MUSKAN TYAGI

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LIST OF ABBREVIATIONS

- **AQL** - Acceptable Quality Limit
- **BIS** - Bureau Of Indian Standards
- **cps** - centipoise
- **D & C** - Drug and Cosmetics
- **GMP** - Good Manufacturing Practices
- **ISO** - International Organization for Standardization
- **LOD** - Loss on Drying
- **NPD** - New Product Development
- **OFC** - Over Filled Capacity
- **RM** - Raw Material
- **SG** - Specific Gravity
- **TFM** - Total Fatty Matter
- **UV** - Ultra - violet
- **UTM** - Universal Testing Machine

1. ABSTRACT

Cosmetic products are very popular and are designed to protect, cleanse and change the look of external parts of your body. The key ingredients used in preparation of most cosmetics include : preservatives, water, emulsifier, thickeners, colors, moisturizers and fragrances. Quality of the product plays a very important role for consumer as well as for the company. Quality does not only mean of the goodness of a final/finished product. However, in order to gain the desired quality of product, it is very important that the whole plan, starting from the purchase of the raw materials to the period where the final product reaches to the consumers.

In any company or organization, the quality function involves all departments and all groups of personnel. Basically Quality Control is a tool which allow to maintain the quality of the product at required level.

Following various features are taken into consideration before the launching of any cosmetic product such as : need of consumer, formulation research include: selection of good quality of raw materials and packaging components, to control packaging and manufacturing procedures, development of analysis procedures of finished product, methods for testing and safety studies knowledge is also required.

Quality analysis is an ongoing process. It is a comparison with a standard whether a cosmetic product comply to a given criteria like : operating standards, standards for packaging material, raw material specifications, production line check, etc.

Hence, in this report discuss about raw material used in skin care products and there chemical and packaging testing analysis of these products for quality assurance of these products.

2. INTRODUCTION

2.1 Quality Analysis of Skin Care Products

Cosmetics are products which is designed to protect, cleanse and change the appearance of the external parts of human body. Basically, the key ingredients which are present in most cosmetics include emulsifiers, water, thickeners, moisturizers, fragrances, and colors.

Quality analysis of cosmetics is very important because it ensure the safety and efficacy of products and the raw materials which are used in it. According to D & C Act (1940) and the rule in 1945; Cosmetics mean any article meant to be poured, rubbed, sprayed or sprinkled into or applied to any part of your body for promoting attractiveness, cleansing, beautifying, or improving appearance.

There is a wide variety of cosmetics present which is categorized under different categories such as: skin care, hair care, oral care, decorative cosmetics (lipstick, eyeliner, etc.) and perfumes.

Skin care products shows wide variety of products used in our daily life for example, shower gels, facial scrubs, facial masks, face wash, hand and body creams, foot cream, eye cream, toner, moisturizers, hydrating & anti-ageing creams, etc. We will discuss about each variety further in elaborated manner.



Fig 1. Various types of skin care products

Skin care products are basically used to improve the health and appearance of the skin.

Basically, the main purpose of skin care products or cosmetics include: preserve skin moisture balance, cleaning the skin, protects skin from harmful U.V. radiations, stimulate skin metabolism.

Quality analysis is an ongoing process. It is a comparison with a standard whether a cosmetic product comply to a given criteria. Standard comprise of :

- **Operating Standards** - This give details of storage, filling, manufacturing procedures, and of packaging of the finished products.

- **Formula** - It gives accurate statement of different ingredients which compose the product.

- **Raw Material Specifications** - Provide all details about limits and characteristics of the RM used in making of the product.

- **Standards for Packaging Material** - Packaging plays a very crucial role because the final look and somehow market value of the product totally depends on good packaging, if packaging of product is eye-catching so the market value of the product increases by more purchasing.
It covers all components which go around the product include : size, shape, color and all other aesthetics and acceptance criteria and limit also.

- **Standards for the Finished Product** - It covers all the characteristics which are important for proper safety, for good performance and durability of the product.

- **Methods for Testing** - It covers all test procedures for the components and quality control is basically divided into:
Raw Material and Packaging Material Quality Control , Quality Control of finished products and Production Line Quality Control.

Raw Material Quality Control : The raw materials used in cosmetics are varied in nature. BIS has done admirable work in mending specifications for various raw material used in cosmetics. The test normally involves; Physical Parameters - color, odour, density, viscosity, etc. and Chemical Parameters - like impurities present or any ingredient, etc.

Packaging Material Quality Control : Packaging of cosmetics has special importance because it enhance aesthetics. Main purpose of quality analysis of packaging is to weed out imperfect packaging.

Finished Product Quality Control : It includes testing of chemical and physical parameters such as; shade matching, viscosity, specific gravity, stability tests (mainly done for emulsion products)

Microbiological testing is also done on finished products its main aim to ensure that all the finished products are free from any kind of harmful pathogenic bacteria or any other bacteria are within the limit.

Production Line Quality Control : Its main aim to assure good quality of outgoing products .

Procedure include drawing of random samples from the On (Production) Line at different intervals and these samples are checked and if the product quality is found less the standard. Entire production is taken for 100% rechecking.

2.2 Packaging Requirements for Cosmetic Products:

Product packaging is an important part of consumer experience and ensure that safe and high-qualitative products are delivered to the consumer. Today, product packaging has a high environmental footprint, both during production and disposal.

Product packaging is also the key to success for the product because good packaging lets consumer find any kind of information they need to know about the product like expiration dates, direction for use or if there is any other sensitive information and good packaging also enhance aesthetics.

Requirements for packaging testing in cosmetic products is also plays an important role which follows **Incoming material inspection plan** which we will discuss further in detail.

3. REVIEW OF LITERATURE

According to a pharmaceutical journal by Niha Naveed, on average men used 6 skin care products while women used 12 in comparison to men. Additionally, in relation to ethnic and skin care products, according to U.S. Census Bureau, people classified in larger ethnic according to (Oresajo and Pillai, 2007) groups such as: American, African, Hispanics, and Asians spends more on daily use personal care products.

Increasing demand of cosmetic also focusing on the way of packaging of the cosmetic products, nowadays, industry focusing on sustainable packaging because packaging is on of the important factor influencing the consumer behavior (Alcayde Wnadosell, 2021).

Advances in sciences and technology along with the development of modern chemistry have made this dream easy (Draelos, 2000). Exposure to ultraviolet B radiations produces ‘oxidative and inflammatory skin damage’ and augments jeopardy of skin ‘carcinogenesis’. (Coulter et al., 2003).

As a general result, the exposure to pictures of good-looking and even slightly above-average-looking females lowered the self-image of exposed women and increased dissatisfaction with their own appearance (Pollay, 1986; Myers and Biocca, 1992; Martin and Gentry, 1997; Hawkins et al., 2004).

According to this review literature it tells us about the cosmetic products , its utility, use of personal care on human skin and the packaging of the cosmetic product to make it more aesthetic and increasing their marketing.

3.1 SKIN CARE PRODUCTS

The products which are used for personal well-being are as follows :

- **ANTI-AGEING CREAM** – Anti-ageing cream targets on various signs of ageing. It helps in reducing wrinkles, fine lines and works to brighten, replenish, and hydrate the skin. It also provide protection against premature ageing and pollution to your skin.

KEY INGREDIENTS - Redcurrant, Linseed oil, Sea buckthorn, Silver birch.

Firming Active : help in reducing collagen and elastin degradation. Increase the synthesis of key proteins which restores firmness of skin.

Anti-pollution active : act as protective shield over the skin which protect from pollution.



Fig 2. Anti-ageing Cream

ALL INGREDIENTS :

Butlene Glycol, Glycerin, Glycofilm - They all are work as *humectants* in the formulation of cream. Humectants act as common moisturizing agent which is used in many cosmetic products. It has the ability to retain moisture and also preserving all the product properties.

Phenoxyethanol, Imdazolidinyl Urea - These two act as *preservative*. Phenoxyethanol is most commonly used preservative in cosmetic products. Preservatives are substances that have the ability to decrease or prevent the microbial growth in cosmetics during storage or at the time of consumer use. They also helps in prolong the shelf-life of products.

Pemulentr, Xanthum Gum - Used as *thickener*.

Thickener provides more appealing consistency to cream. Also helps in enhancing the viscosity and volume of cosmetic products.

Dimethicone, Lexgard, Simugel - Act as *emollient*.

Emollients are refatting agents, which provide fat to the skin as it needs by reducing evaporation they provide proper moisture to the skin.

Ethylhexyl Salicylate, Octorylene, Butyl Methoxydibenzoylmethane - Act as *UV Filter*. UV filter absorb or block the UV rays from the sun and protect the skin from harmful radiations.

Linseed oil - used as *essential oil* , rich in vit. E having soothing and calming properties.

- **HONEY SUGAR SCRUB**

The milk contain lactic acid which is also known as alpha- hydroxyl acid, which naturally helps in removing the dead skin.

Sugar helps in polishing the skin act as natural exfoliant. Honey clears away dirt and oil by opening the pores.



Fig 3. Honey Sugar Scrub

KEY INGREDIENTS : Organically sourced extracts of milk and honey.

ALL INGREDIENTS :

Glycerine - Act as *Humectant*.

Sodium Laureth Sulphate, Cocamidopropyl Betaine - Used as *surfactant*

Surfactants are compatible with both oil and water.

Hydrated Silica - Act as thickener or functional powder.

Sodium Hydroxide - Act as *pH adjuster*.

Organic Honey, Pure Cane - Act as *emollient*.

Benzophenone - It acts as *UV filter*.

Methyl Paraben - It is used as a *preservative*, which having the tendency to prevent from microbial contamination. Keeps the cosmetic fresh and safe.

- **FACE WASH**

Helps in removing impurities, reduce appearance of pores and help in balancing skin hydration level.



Fig 4. Face Wash

INGREDIENTS :

Citric Acid - Used to adjust the pH, means act as *pH adjuster* and helping to reduce potential irritations.

Salicylic Acid, Phenoxyethanol - Used as *preservative*.

Sodium Chloride - Used as *thickener*.

Glycerine - Act as *humectant* which helps in preventing moisture loss from the skin.

Cocamidopropyl Betaine - Used as *surfactant*, for removing oil and dirt from the skin.

Sine Adipe Lac - Also known as nonfat dry milk, it is used as *antistatic agent* and conditioning the skin.

- **BODY CREAM WITH HONEY**

It nourishes and provide smoothness to the skin by hydrating the skin full day.

Basically, a cream is semi – solid emulsion of either water-in-oil or oil-in-water type .

Creams can be classified on different basis like : acc. To their function, acc. to their characteristic properties or acc. the emulsion type.



Fig 5. Honey Body Cream

KEY INGREDIENTS : Organically source extracts of milk and honey .

ALL INGREDIENTS :

Glycerine, Butelene Glycol, Light Liquid Paraffin - Act as *humectants*.

Imidazolidinyl Urea, Propyl Paraben - Act as *preservative*.

Stearic Acid, Dimethicone, Organic Honey, Capric Triglyceride - Act as *emollient* .

Stearyl Alcohol, Cetearth, Cetyl Alcohol - Act as *emulsifier* .

Quinoline Yellow - Used as *colour liquid* .

Sodium Hydroxide - Act as *pH adjuster*.

Disodium EDTA - Act as chelating agent and maintain integrity of cosmetic products.

4. AIM AND OBJECTIVES

The current study was designed with the following aims and objectives:

- a. To determine the quality of the skin care product by chemical analysis by:**
- Testing bulk for standard odour, colour, and appearance.
 - To determine the viscosity, SG and pH of the bulk sample.
 - To determine the tests applied for the emulsion cosmetics (creams) such as :
 - Total fatty matter , loss on drying
 - Determination of thermal stability for analyzing the bulk functionality .
- b. Packaging testing requirements in cosmetic products include :**
- Foiling Testing is done to check the proper foil seal strength of the products.
 - Performing vacuum leakage test to determine any kind of leakage mostly in cap or pump products.
 - Torque test is done to make sure the opening or closing of products.

5. MATERIAL AND METHODS

5.1 Chemical Analysis of Skin Care Products:

For chemical analysis, a range of instruments are used such as: Brookfield Digital Viscometer, Pycnometer, pH meter, Weighing Balance, Glassware, Oven, etc.



Fig 6. Chemical Analysis of different skin care products

CHEMICAL ANALYSIS OF BULK SAMPLES

Chemical analysis of bulk samples are being done by following methods:-

Method for Testing Bulk For Standard Color

Procedure :

- Place a sample in a 200-ml clear glass beaker.
- Place the standard bulk in its own tarson next to the sample. Bulk standard should be less than 1 year old.
- Place the sample & the standard side by side for an initial color comparison.
- Surfactant product such as shampoos and shower gels are often aerated when first sampled.
- It may be necessary to compare the sample with the standard after 24 hrs.
- Ensure that there is ample lighting so that the samples are viewed under similar light conditions.
- The colors of the products are required to comply with the standard to avoid color variation in any batch of the same product.

Method For Testing Bulk For Standard Odour

Procedure :

- A batch must always be compared with the old one which is less than 1 year old, or in case when that product has not been manufactured within that period, the last batch manufactured of that particular product must be used as the standard.
- Before the batch is compared to a standard, wash hands to remove all residues, which may interfere with the batch to be tested.
- A small quantity of the standard should be rubbed in to the back of the left hand & a similar quantity of the batch under test should be rubbed into the back of the other hand.
- The odour must be compared immediately and then after 4-5 min., this is more likely to indicate if the fragrance level is correct in the batch.

Determination of Viscosity of the Bulk Sample

Viscosity denotes opposition to float.

Viscosity always varies with different temperature, and pressure it is usually expressed as centipoises in standard.

Apparatus Used:

- Brookfield digital viscometer
- Spindles (as specified)
- S spindle (S1–S5) – Used for low viscosity products like: shampoo, toner, shower gels, etc.
- T bar spindle (TA – TF) – Used for emulsion products like: cream, lotions, etc.

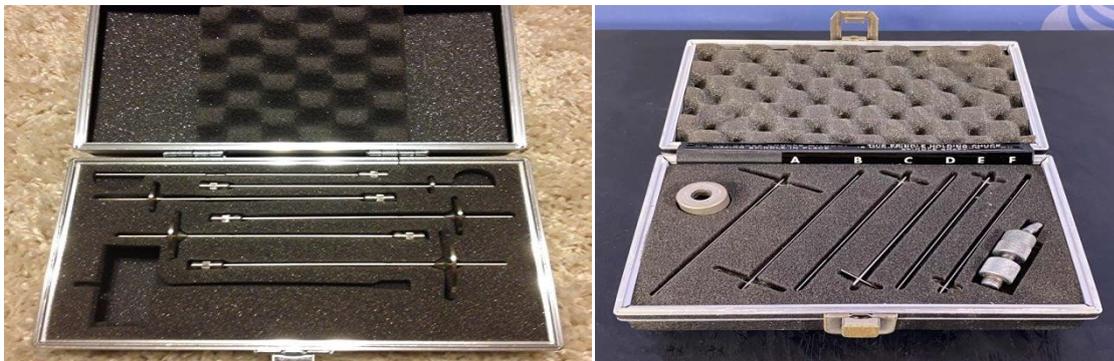


Fig. 7: Brookfield Viscometer for viscosity analysis

Procedure:

- First we take a bulk sample, whose temp. is maintained.
- Then set the spindle and speed according to the given standard and place the bulk under the viscometer.
- Choose whether S or T spindle based on the product, in which only with T-spindle motor is switched on.
- Then the viscosity comes after 1 minute automatically the result is shown.

Significance : Viscosity is resistance to flow of a fluid hence it should be calculated to access the flow ability of the product.

Applicable Test For : Creams, lotions, surfactant products, gels, etc.

Determination of Specific Gravity of the Bulk Sample

Specific gravity also known as relative density and SG is properly defined as the ratio of the density of a substance (liquid or a solid) compared to the density of water.

Appratus used in finding specific gravity : Pycnometer, Weighing Balance, Spatula.

Procedure :

- For finding specific gravity of bulk sample first take the thoroughly wash and dry pycnometer.
- Regulate the temperature of the sample to 20 degree and fill the pycnometer with it.
- From the filled weight of pycnometer remove the tare weight of pycnometer.
- Determine the SG of the sample by dividing the weight of the sample (in gm) which fills the pycnometer at the required temperature by means of the capacity of the pycnometer when 4 degree Celsius water is filled in it.

Fig. 8: Pycnometer along with weighing balance



Significance: The test is done to determine the weight in grams per ml (or c.c.) of a sample.

Applicable Test for: Gels, Creams, Lotion, Shampoo, Toner, Hair oils etc.

Determination of pH of the Bulk Samples

Apparatus Used :-

- pH meter.
- Demineralised or process water.
- pH Buffers pH 7.0 and 4.0



Fig. 9: Working of pH Meter

Procedure :

- Calibrate the pH meter with a known pH buffer solutions of pH 7.0 & pH 4.0 before checking the pH of the sample to be tested. Wash of the electrode with process water then wipe it for proper drying.
- Place the electrode in the sample directly. The bulk must be at the temperature as directed by the bulk product specification.
- Switch the instrument to pH mode & note the reading when the display has stabilized.

Significance: Acidity or alkalinity of a sample is determined by its pH. The product's pH should comply with the range given in bulk specification. The pH of our skin is on acidic side, the various products should be maintained in a range safe and effective for use.

Applicable Test For: Gels, Creams, Lotions, Surfactant products, Tonners, etc.

Total Fatty Matter Determination (TFM)

TFM is defined as the total amount of fatty matter, mostly fatty acids that can be segregate form the sample after splitting with mineral acid, mostly HCl.

This test is usually done for emulsion based products.

PRINCIPLE OF THE METHOD : The fatty matter is extracted out with ether and the emulsion is broken with dil. mineral acid.

The commonly used reagents in this method are: dil. HCl, ether, methyl orange (use as an indicator) and sodium sulphate.



Fig. 10: Determination of Total Fatty Matter

Procedure :

- Firstly, weight correctly 2 g of the bulk sample into a conical flask
- About 25 ml dil. HCl is added then, in shape a reflux condenser.
- Boil until the solution is perfectly clean.
- Pour the content of the flask in to a three hundred ml isolating funnel and allow it to cool to 20 degree centigrade.

- Rinse the conical flask with 50 ml of ethyl ether in part of 10 ml.
- Pour the ether rinsing in to the separating funnel. Shake the isolating funnel properly and depart until the layers separate.
- Separate out the aqueous section and shake it out with 50 ml part of ether two times, integrate all the ether extracts and wash them with water until free of acid (when tested with methyl orange indicator sol.)
- Filter the ether extract via a filter paper containing sodium sulphate in to a conical flask.
- Wash the sodium sulphate at the paper with ether and combine the washing with filter out.
- Distil off the ether and dry the sample last within the flask at a temp. of $60 + 2$ degree centigrade to steady mass.

TFM Calculation :

T.F.M., % by mass = $100 * M1/M2$

Where , M1 = mass in g of the residue, and

M2 = mass in g of the material taken for the test.

Significance : T.F.M. is determined to calculate the total fatty material present in the product.

Applicable test for: This test is applicable for creams.

Determination of Loss on drying

It is the loss of weight expressed as percentage w/w resulting from water and volatile matter of any kind that can be driven off under stated conditions.

In this sample is heated until no more weight is lost. A commonly used method for determination of moisture content. The equipment used for the testing are : Weighing balance, glass wares, oven.



Fig. 11: Weighing of sample to determine Loss on drying

Procedure :

- Weigh a petri plate, that has been dried under the same conditions to be employed in the determination.
- Take 2.5 gm of sample and accurately weigh the Petri plate along with the sample.
- Then, make sure the sample is evenly or smoothly distribute in the Petri.
- Place the loaded Petri in the oven at 105 degree for 3 hrs; remove the lid of Petri and leave it also in the oven.
- After drying is completed, open the oven, close the Petri promptly and allow it to cool to room temperature in desiccators before weighing.
- Weigh the sample dried Petri.

Calculation

$$\text{LOD (\%)} = \frac{\text{M2} - \text{M3} * 100}{\text{M2} - \text{M1}}$$

Where,

M1 = Wt of whole Petri (gm)

M2 = Wt of Sample + weight of whole Petri (gm)

M3 = Wt of dried sample + weight of whole Petri (gm)

Significance : To know the moisture content present in cream.

Applicable Test For : Creams, etc.

Determination of Thermal Stability

It is done to ensure that the cosmetic product maintain its intended chemical and physical quality as well as functionality.

Apparatus required for test are : a humidity chamber of 25 degree Celsius, a 30 ml capacity of glass bottle with proper closure.

Procedure:

- Put the cream into the glass bottle with the help of spatula and tap the bottle to settle down the bottom.
- Fill the bottle up to two – third and tighten the cap.
- Keep the filled bottle erect inside the chamber for 24 hrs.
- The product shall be taken to have passed the test if, on removal from the chamber, the following indications of instability are not shown :
- Oil and any other kind of phase separation is not shown.
- Change in odour or color.
- Formation of crystal growth or granules.
- Dryness due to water evaporation.

5.2 PACKAGING TESTING REQUIREMENTS IN COSMETIC PRODUCTS :

Packaging plays a very important role in cosmetics because it acts as protectant to finish product and also enhance aesthetics . The main objective of packaging material / product quality control is to expel defective packaging.

The defects could be classified into:

- **Critical defects include:** Cracked glass bottle or jar / cracked bottle neck which leads to total spoilage.
Fails to fulfill mandatory regulations and / or affects the safety of consumers / end users.
- **Major defects include:** defect that leads to product failure and reduction of product's sale ability or usability to a large extent.
- **Minor defects include:** These defects are minor in nature which affect aesthetics attract but not functionality.

For ex. : Bubbles in glass bottle, scratches on case, improper printing, etc.

Statistical techniques, are used for sampling and elucidate the results. Therefore, on the basis of sampling plan, samples are drawn and inspected.

Table: 1. INCOMING MATERIAL INSPECTION PLAN

Lot Size	Sample size code letters	INSPECTION	DOUBLE SAMPLING	
		SINGLE SAMPLING		
		Sample Size	1 st	2 nd
2 to 8	A	2		
9 to 15	B	3	2	2
16 to 25	C	5	3	3
26 to 50	D	8	5	5
51 to 90	E	13	8	8
91 to 150	F	20	13	13
151 to 280	G	32	20	20
281 to 500	H	50	32	32
501 to 1200	J	80	50	50
1201 to 3200	K	125	80	80
3201 to 10000	L	200	125	125
10001 to 35000	M	315	200	200
35001 to 150000	N	500	315	315
150001 to 500000	P	800	500	500
500001 over	Q	1250	800	800

NOTE : For Labels - 30 labels to be checked.

For first 3 supplies sampling plan is always double sampling to check and get more clarity in physical defects, if we found any issue in running component then we will do double sampling for 5 supplies to get more clarity on the defects and check more samples one get more clarity.

For 3 supplies of NPD, the rule is conduct to do double sampling, because these required more focus than existing ones.

SKIP LOT TESTING - It reduce the testing pattern of sampling formula for existing components. We continue get the 5 supply of any component, if all are OK so we skip the 6th one supply and after that again follow the same pattern and skip the next supply. Eventually, it helps in lower the men power work but get the COA of that lot. **Important**, thing in this is we can skip the sampling but not COA.

SINGLE SAMPLING is done for regular running products, after double sampling.

5.3 INCOMING MATERIAL CHECKS

1. Checks during Sampling Plan :

- To verify dust and dirt particles.
- To verify packaging component deformation.
- To verify transit damages.

2. Testing requirements as per components :

COMPONENT CATEGORY : TUBES

REQUIRED TESTS :

- Color - Checked by shade cards and artwork also checked .
- Dimensions - check by vernier caliper.
- Scotch Tape Test - used to check coding on the product
- Scuff Resistance - It is used to measure the rub resistance of labels and other packaging material.



Table :12 Tube

COMPONENT CATEGORY : MOLDED COMPONENTS (BOTTLES / JARS)

REQUIRED TESTS :

- Dimensions - checked with the help of vernier caliper.
- Vacuum Leakage - mostly check in case of low viscous products.
- Weight
- OFC - This is required to know the exact vol. of liquid, the bottle can hold if the content were filled to the very top.
- Color checked through shade cards.
- Torque.
- Fitment with closure.



Fig. 13: Bottle and Jars

COMPONENT CATEGORY : LABELS

REQUIRED TESTS :

- Winding Direction - it refers to the direction that the label are oriented on the roll.
- Color - check through shade cards, and shade cards also acts as decision support system for packaging designers.
- Artwork and Scuff Test.



Table : 14 Label for Packaging tests

COMPONENT CATEGORY : CAPS / PUMP

REQUIRED TESTS :

- Dimensions
- Fitment with Container
- Weight
- Color
- Product / Organic Coating Resistance
- Torque
- Vacuum Leakage



Fig. 15: Cap & Pump

COMPONENT CATEGORY : GLASS CONTAINERS

REQUIRED TESTS :

- Dimensions
- Weight
- OFC
- Fitment test
- Vacuum Leakage Test
- Scotch Tape Test



Fig. 16: Glass Containers

COMPONENT CATEGORY : UNIT CARTONS

REQUIRED TESTS :

- Dimensions
- Artwork
- Color
- Moisture Content - Standard value for moisture test is 7 – 9 %, this test is important because too low moisture content of carton makes its surface hard and it easily break due to hardness on the other hand too high moisture content also create problem.
- Scuff Resistance



Fig. 17: Unit Carton

5.4 Testing requirements during finish goods inspection :

(Online Production Checks)

- **Torque Test** - It is done to make sure the seal or opening – closing strength of the caps of bottle.

This testing procedure helps in measuring the quality of lids and bottle caps easily and accurately.

Torque Testing Machine is considered as the best quality control equipment which is used in production as well as laboratories and its principle is based on the rotational force. This procedure is followed before the packaging process is initiated or start.

- **Scotch Tape Test** - This test is basically done on coding area of the product which contains information like: batch number, expiry date, manufacturing date, and price of product.

A scotch tape is applied on the coding area of product and leave it for few seconds and then remove it to check whether coding is removed or not.

- **Physical Damages Check (Aesthetics)** - At the time of finish good inspection, to check physical damages in products is very important to make sure the product meet the mandatory specifications needed by the costumer before their dispatch to the costumer.

For checking the quality of the product, normally carried out inspections which may affect their final appearance so it is necessary to check : internal and surface defects, to check physical appearance like (dullness, rusting, color, brightness, proper coding, leakage, proper information mentioned as per specification, artwork, etc.

- **Weight (Fill volume of the product)** - During finish goods inspection the weight of 10 samples check on production line whether the vol. of the filled sample is complies within the range or not by comparing the weight through standard weight given of the product.



Fig. 18: Checking weight during finish good inspection

- **Vacuum Leakage (Pump & Cap Products)** - The vacuum leakage test of products is done through vacuum oven.

This instrument is used to check the leakage testing in packaging components.

The purpose of the test is to evaluate the feasibility of sealing qualities of lug & screw type closures to ensure product safety over its shelf-life. It is done mostly in cases of low viscous products.

For testing place the sample inside the oven with proper closing the cap. Once oven vacuum reached 625mm Hg, closed the vacuum knob. Then, allow to hold the specified vacuum for 10 – 15 minutes. Release the vacuum through pressure valve to zero reading. At last evaluate the sample for leakage if any.



Fig. 19: Vacuum Oven for leakage testing

3. **Goods Product AQL Checks** : During finish goods inspection performing AQL is very important, because it is highly flexible, it allows you to customize your quality tolerance for your product, according to the formula of under root $n + 1$. The Acceptable Quality Limit tells you about how many defective samples / components are considered acceptable during random sampling quality inspections .



Fig. 20: Pallet

4. **Performing Foil Opening Test** : This test is performed to check for seal strength. It is basically a tensile test performed by a Universal Testing Machine (UTM). In this test, a section of the package seal is gripped between jaws and pulled apart at a controlled rate. The energy or force required to separate the sealed surface gives an indication of the seal strength. Tensile tests are used as a quality assurance tool for assessing the inherent sealing qualities of flexible packaging films.

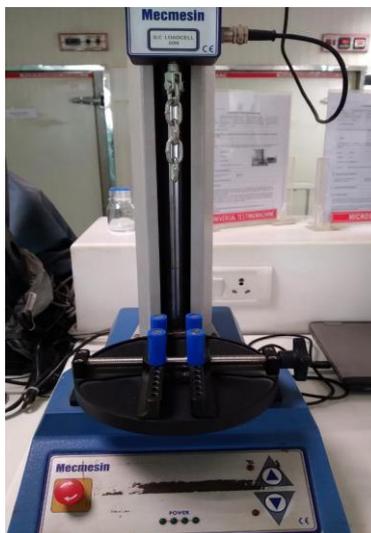


Fig. 21: Universal Testing Machine for foil sealing test

6. RESULTS AND DISCUSSION

6.1 Testing bulk for color and odour

The colors of the products are required to comply with the standard to avoid color variation in any batch of the same product. The organoleptic test method should be sufficient. This test is applicable for creams, lotions, surfactant products, gels, etc.

All the samples of creams, scrub, etc. were observed to contain desired color as per standard.



Fig. 22: Colour Testing

Testing a bulk product for odour is done to ensure that a batch of any product complies with the standard odour. This test is applicable for creams, lotions, surfactant products, gels, etc.

Fig. 23: Odour Testing



The odour of a batch may not be as standard for three reasons :

Incorrect level of essential oils added to the batch.

In the case of products which are fragrance free, it is important that these products are checked for their characteristic odour, i.e. waxy base odour etc.

6.2 Product Name : Anti – ageing cream

Results of chemical analysis are given in table 2. As the product is cream so in this T-splindle is used, both products are same only there batches are different , 1st one is of Feb 2022 and the 2nd one is of April.

Table : 2 Chemical Analysis of Anti – ageing Cream

SI. No.	Date	Viscosity (cps) 150000- 220000	Specific Gravity (0.98 – 1.02)	pH (5.5- 6.5)	Color & App. (White Emulsion)	Odour (Floral)
1.	12/02/22	214000 cps	1.012	5.81	Complies	Complies
2.	20/04/22	187000 cps	1.017	5.96	Complies	Complies

In this we check the physical appearance of the product like odour and colour as stated they both are complies in each batch. The viscosity of both the batches are under range if the viscosity doesn't comes under range we check the temp. Then, maintain it to 25 degree temp. same goes with the specific gravity we maintain the temp. at 20 degree for SG in this both batches SG comes under range.

We have to make sure that while checking viscosity or SG no air bubbles are present in the sample.

And sometimes if the temp. is maintained but result doesn't come under range then we resample the bulk and sometimes there is problem in the RM present in the sample and sometimes milling time also cause problem, we have to make sure that the same problem doesn't cause any hindrance again.

As for the pH also the temp. should be maintained in this both products comes under range. Before taking pH of product one should calibrate the pH properly.

For cream the TFM test is applied to determine the fatty matter present in the cream, in this the min. range of TFM is 5.

6.3 Product Name : Sugar Scrub with honey

As given in table 3 , we can see the viscosity of the batches are within range, as shown the range is between 70000 – 130000. The first batch viscosity is 71297 cps and the second batch viscosity is 73333 cps. So, both batches viscosity comes within range. Same goes with the specific gravity the range is between 1.00 - 1.07. The first batch SG is 1.007 and the second batch SG is 1.012 which is within the range.

The PH is between 5 - 6, our first batch shows pH reading of 5.62 and second batch shows reading 5.75 which means both comes within the range.

Table no: 3 Chemical analysis of Sugar Scrub

SI. NO.	Date	Viscosity (cps) 70000 – 130000	Specific Gravity 1.00 – 1.07	pH 5 – 6	Color & App. (Golden Scrub Areated Gel)	Odour (Sweet)
1.	03/05/22	71297 cps	1.007	5.62	Complies	Complies
2.	15/04/22	73333 cps	1.012	5.75	Complies	Complies

The color and the appearance of the product is golden scrub aereated gel and as shown both batches are complies, and the odour is sweet and both the batches are complies.

6.4 Product Name : Face Wash

As given in table 4, the viscosity of the batches are within range, as shown the range is between 4500 – 13000. The first batch viscosity is 4967 cps and the second batch viscosity is 4789 cps. So, both batches viscosity comes within range.

Table : 4 Chemical analysis of Face Wash

Sl. NO.	Date	Viscosity (cps) 4500 - 13000	Specific Gravity 1.0– 1.04	pH (5.0 - 6.0)	Color & App. (Yellow-Orange Clear Surfactant Gel)	Odour (Vanilla)
1.	08/04/22	4967 cps	1.025	5.71	Complies	Complies
2.	12/02/22	4789 cps	1.020	5.89	Complies	Complies

As the range of specific gravity is between 1.0 - 1.04. The first batch SG is 1.025 and the second batch SG is 1.020 which is within the range.

The PH is between 5.0 – 6.0 , our first batch shows pH reading of 5.71 and second batch shows reading 5.89 which means both comes within the range.

The color and the appearance of the product is yellow – orange clear surfactant gel and as shown both batches are complies. The odour is like vanilla fragrance and both the batches are complies.

6.5 Product Name : Body Cream

As given in table 5, the viscosity of the batches are within range, as shown the range is between 30000 – 60000. The first batch viscosity is 53333 cps and the second batch viscosity is 45000 cps. So, both batches viscosity comes within range.

Table 5. Chemical analysis of body cream

SI. NO.	Date	Viscosity (cps) 30000- 60000	Specific Gravity 0.98-1.02	pH (5.5- 6.5)	Thermal Stability
1.	08/04/22	53333 cps	0.989	5.94	Complies
2.	16/03/22	45000 cps	0.101	5.45	Complies

Same goes with the specific gravity the range is between 0.98 - 1.02. The first batch SG is 0.989 and the second batch SG is 0.101 which is within the range.

The pH is between 5.5 – 6.5 , our first batch shows pH reading of 5.94 and second batch shows reading 5.45 which means both comes within the range.

The standard range for TFM is min. 5 % . So, according to oriflame standards both batches TFM % comes within the range.

For total residue the standard range is min. 10 % So, according to oriflame standards both batch residue percentage comes within the range.

Thermal Stability of both batches complies as per specifications.

The color and appearance of the product is pale – yellow viscous cream as per specification both batches shown complies. The odour of both batches is fresh and sweet which is complies acc. to standard specification.

6.6 UTM Test Readings : Required for package products to check the foil sealing.

Product Name : Gold Body Cream

A/c to Oriflame company the standard range for UTM is between 6 – 16 N .So, the readings of the product comes within the range. If the UTM test reading come below the given standard range that means the sealing of foil is not proper and may create hindrance at the time of opening or removing the foil from the sample.

Table : 6 Checking foil strength of gold body cream

SAMPLE	RESULT
Sample 1	7.26 N
Sample 2	6.75 N
Sample 3	6.12 N
Sample 4	8.53 N
Sample 5	7.69 N
Sample 6	8.52 N
Sample 7	8.30 N
Sample 8	6.99 N
Sample 9	8.71 N
Sample 10	6.80 N

6.7 Product Name : Under Eye Cream

As given in table 7, by testing the sealing strength of foil of anti-ageing cream through universal testing machine, the readings comes within the range of all the samples i.e., between 6 - 16 N.

Table : 7 Checking foil strength of under eye cream

SAMPLE	RESULT
Sample 1	9.65 N
Sample 2	8.15 N
Sample 3	6.95 N
Sample 4	7.56 N
Sample 5	10.50 N
Sample 6	8.42 N
Sample 7	7.45 N
Sample 8	7.68 N
Sample 9	9.20 N
Sample 10	8.50 N

6.8 Product name : Anti-ageing cream

As given in table 8, by testing foil strength of anti-ageing cream through universal testing machine all the results comes within the standard range.

As the standard range for UTM is given by Oriflame between 6-16 N.

If it is not comes under range it means the sealing of foil on the product is not as good as it requires , after that the product goes for again sealing on production line.

Table : 8 Checking foil strength of anti-ageing cream

SAMPLE	RESULT
Sample 1	9.23 N
Sample 2	7.15 N
Sample 3	6.85 N
Sample 4	8.26 N
Sample 5	9.50 N
Sample 6	10.42 N
Sample 7	6.92 N
Sample 8	8.75 N
Sample 9	9.45 N
Sample 10	9.20 N

7. CONCLUSION

The wide range of substances are used for the production of cosmetics , then the finished goods are used by consumer on their body, which have the ability for several type of unfavorable response on human skin such responses like: skin irritation and inflammation, allergic reactions, eye irritancy, etc. and getting good quality finished goods also required better packaging techniques.

So, to avoid these kind of problems cosmetic industries do their best with the help of complete quality analysis of cosmetic products and final product packaging tests.

So, to attain such high quality product manufacturer have to do a great job by assuring the quality in all aspects (from choosing raw material to the in-process production line) of these products.

This report tells us about the whole process of chemical analysis and packaging test requirements for different type of cosmetic (skin care) products like : body cream, face wash, eye cream, scrub, shower gel, etc. As ISO 22716 Good Manufacturing Practices (GMP) for cosmetics for turned into brought to provide suggestions for storage, manufacturing, manipulate, and distribution of cosmetics products.

In this report all tests (chemical and packaging) for the quality analysis of skin care products are mentioned with there result for the easiness of the reader to understand the report.

Lastly, as we all know the cosmetic industry is growing rapidly and the awareness of consumers regarding purchasing is also increases with the enforcement of the law (consumer protection act) it is important for the cosmetic industries to ensure the safety, stability, quality and the harmful adverse effect of the products.

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