# Qualitative analysis of syrup

A Dissertation Report submitted

for the partial fulfilment of the Degree of Master of Science

By

**Prayag Trivedi**

**Enrolment Number: 210621045**

[M.Sc. Biotechnology]

Under the supervision of

**Zilvi Champanery**

**DEPARTMENT OF BIOTECHNOLOGY**

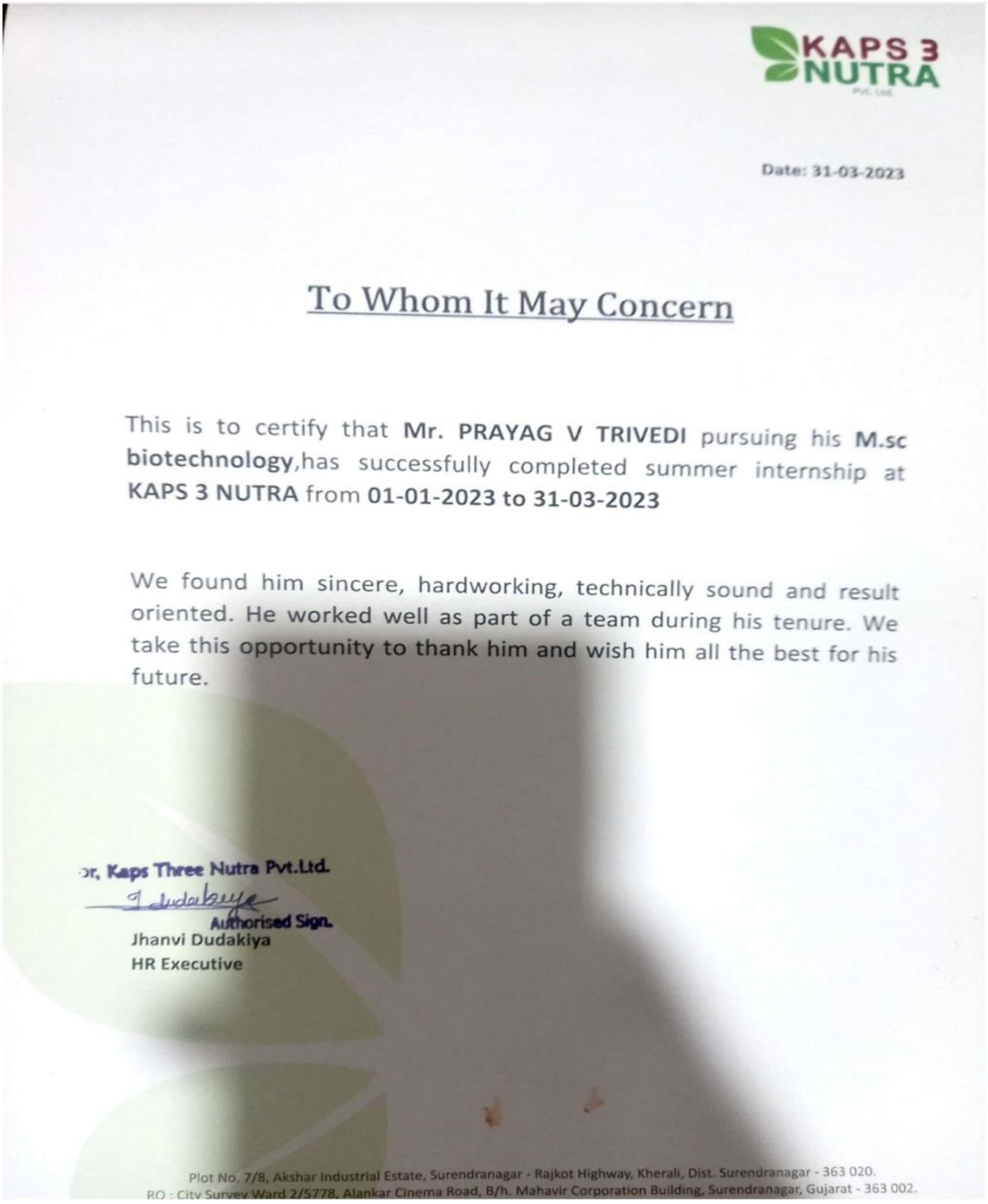
**ATMIYA UNIVERSITY**

**'YOGIDHAM GURUKUL' KALAWAD ROAD**

**RAJKOT (GUJARAT) – 360005**

**2022-2023**

# C E R T I F I C A T E



KAPS 3 NUTRA

Date: 31-03-2023

## To Whom It May Concern

This is to certify that **Mr. PRAYAG V TRIVEDI** pursuing his **M.sc biotechnology**,has successfully completed summer internship at **KAPS 3 NUTRA** from **01-01-2023 to 31-03-2023**

We found him sincere, hardworking, technically sound and result oriented. He worked well as part of a team during his tenure. We take this opportunity to thank him and wish him all the best for his future.

or, Kaps Three Nutra Pvt.Ltd.

Authorised Sign.

Jhanvi Dudakiya

HR Executive

Plot No. 7/8, Akshar Industrial Estate, Surendranagar - Rajkot Highway, Kherali, Dist. Surendranagar - 363 020.
RO : City Survey Ward 2/5778, Alankar Cinema Road, B/h. Mahavir Corporation Building, Surendranagar, Gujarat - 363 002.

# D E C L A R A T I O N

I hereby declare that the work incorporated in the present dissertation report entitled "**Qualitative analysis of syrup"** is my own work and is original. This work (in part or in full) has not been submitted to any University for the award of any Degree or a Diploma.

Date: 31$^{St}$ March, 2023 Prayag Trivedi

# ACKNOWLEDGEMENT

I would like to express my sincere gratitude to everyone who has contributed to the completion of my report.

First and foremost, I would like to thank my mentor Mr. <Name> for their invaluable guidance and support throughout my research journey and also thankful to my supervisor <Name>. Their expertise, insight, and encouragement have been instrumental in shaping my ideas and helping me to develop as a researcher.

I would also like to extend my thanks to the employees who have provided me with the necessary resources and intellectual support to carry out my research. Their feedback and comments have helped me to refine my ideas and improve the quality of my work.

I am grateful to my family and friends for their unwavering support and encouragement. Their love and understanding have been a constant source of motivation for me throughout this process.

Finally, I would like to acknowledge the participants who took part in my study. Without their willingness to participate and provide their valuable insights, my research would not have been possible.

In conclusion, I am deeply grateful to everyone who has contributed to the completion of my report. Their support and encouragement have been invaluable, and I am truly thankful for their help in making this achievement possible.

# Qualitative analysis of syrup

## Objective:

Company visit

Physical analysis

Microbiological analysis

Heavy metal analysis

# TABLE OF CONTENTS

**ABSTRACT** ..... **7**
**COMPANY INFORMATION** ..... **8**
**INTRODUCTION** ..... **9**
**COMPNY VISIT** ..... **11**
**PHYSICAL ANALYSIS** ..... **22**
**MICROBIOLOGICAL ANAYSIS** ..... **26**
**HEAVY METAL ANALYSIS** ..... **30**
**ASSAY BY UV SPECTROSCOPY** ..... **33**
**REFERENCE** ..... **34**

# ABSTRACT

The analysis of multivitamin syrup is crucial to ensure that the product meets the specified quality standards and regulatory requirements. This abstract summarizes the methods and results of a typical analysis of multivitamin syrup.

The analysis included physical, chemical, and microbiological tests. Physical tests were performed to assess the appearance, color, and clarity of the syrup. Chemical tests were conducted to determine the levels of vitamins and minerals in the syrup, such as vitamin A, vitamin C, vitamin D, iron, and zinc. Microbiological tests were performed to detect the presence of harmful microorganisms, such as bacteria and fungi.

The results of the analysis showed that the multivitamin syrup met the specified quality standards and regulatory requirements. The syrup had a clear appearance and the specified color. The levels of vitamins and minerals in the syrup were within the specified limits, indicating that the product contained the intended nutritional components. The microbiological tests showed that the syrup was free from harmful microorganisms.

Overall, the analysis demonstrated that the multivitamin syrup was of high quality and safe for consumption. This analysis provides important information for manufacturers, regulatory agencies, and consumers to ensure the safety and efficacy of multivitamin syrup products.

# COMPANY INFORMATION

**KAPS3 NUTRA** is a leading company in the field of nutrition.

**KAPS3 NUTRA** is involved in Manufacturing, Marketing and Exporting Nutraceutical products. Company is dedicated to deliver superior quality using modern techniques of science and infrastructure.

The company has a wide range of nutraceutical products for every generation including supplements for pregnant women and lactating mothers, growing children, geriatrics and critically ill patients covering majority of the diseases.

**KAPS3 NUTRA** Private Limited incorporated with MCA on **04 April 2018.** The **KAPS3 NUTRA Private Limited** is listed in the class of company and classified as **Non Govt. Company**. This company is registered at Registrar Of Companies(ROC), **Ahemdabad.**

The company has 2 directors/key management personal **Piyushkumar Prabhubhai Jesadia** and **Shah Harshit Prashantbhai.**

**KAPS3 NUTRA Private Limited** company's registered office address is **City Survey Ward no.2, City Surveyno. 5778 Alankar Cinema Road, B/H Mahavir Corp.Bldg Surendranagar Gj 363002 In.**

Current status of **KAPS3 Nutra Private Limited** company is **Active.**

# INTRODUCTION

Production means the conversion of raw material into finished products. It is directly affected to the cost of production so production activity operates in economically and effective manner.

Due to continuous industrialization ,many competitors entered into the market, the space available to sell the product have squeezed because too many people are selling the same product and that is why it became too obvious that the mass production of goods which is the heart and soul of production concept can no longer work because of too much production, so the focus slightly shifted from Production concept to Customization concept where each and every product is manufactured and delivered according the tastes and preferences of the customer. KAPS3NUTRA produces various types of nutrition products and medicine.

KAP3 Nutra is a leading company in the field of nutrition. KAP3 Nutra manufactures and markets a wide range of specialty nutritional feed supplements for Poultry, Dairy, Aqua and Swine feeds. KAP3 Nutra's manufacturing facilities are ISO 9001, ISO 22000 and GMP certified by DNV-GL. KAP3 Nutra's Analytical Laboratory has ISO 17025 certification of NABL and offers comprehensive in house testing facilities.

Multivitamin syrup is a dietary supplement that provides a combination of vitamins and minerals in liquid form. It is designed to supplement the daily nutritional requirements of individuals who may not be getting enough essential vitamins and minerals from their diet alone. Multivitamin syrup is available in various formulations, which may differ in the types and amounts of vitamins and minerals included.

Multivitamin syrup is commonly used by individuals who have difficulty swallowing pills or tablets, such as young children, the elderly, or individuals with medical conditions that affect swallowing. The liquid form also allows for easier dosage adjustment, as the amount of syrup can be measured more accurately compared to tablets or capsules.

The benefits of multivitamin syrup include improving overall health and wellness, supporting immune function, and reducing the risk of vitamin and mineral deficiencies. It may also help support healthy growth and development in children and adolescents, as well as promote healthy aging in adults.

However, it is important to note that multivitamin syrup is not intended to replace a healthy diet or to treat or prevent any specific medical condition. It should be used in conjunction with a balanced diet and lifestyle, and individuals should consult with their healthcare provider before starting any new supplement regimen, particularly if they have any underlying medical conditions or take any medications.

# COMPNY VISIT


**Our Expertise**

Health Suppliments

Antioxidants

Vitamins

Minerals

Protein Suppliments

Sexual Wellness

- **Mouth Dissolving Tablets**

Mouth Dissolving tablets quickly dissolve in mouth and gives you the quickest result. All tablets are highly effective and good in taste.

- **Bitter less Syrup**

Bitter less syrup category has a pleasant taste. A good taste helps you to cure the disease without experiencing any bitterness.

## OUR WORK AREAS

- **Protein Powder**

Kaps3's Protein Powder contains essential quality protein that keep the body healthy and strong while improving the overall health.

- **Diabetic Nutrition**

Diabetic Nutrition contains all that can help a diabetic person gaining all the ingredients needed for the body to stay healthy and fit.

- **Pediatric Nutrition**

Consuming our Pediatric Nutrition can help your baby to gain utmost nutrition that needs to grow faster and healthier.

- **Cancer Nutrition**

Cancer Nutrition consist of core vitamins and minerals that work on addressing your weakness and fill you with energy

- **Weight Loss**

Weight Loss by Kaps3 contains broad range of products that helps you to lose extra fat from your body and managing proper balance of vitamins.

- **Weight Gain**

Our Weight Gain supplements are rich of all the essential vitamins, minerals, and nutrition that will help you to gain weight and not just the fat.

- **Hepatic Nutrition**

Hepatic Nutrition from Kaps3 is a great source of energy and vital nutrition for your body which you lose while fighting with the disease.

- **Meal Replacement**

Kaps3's Meal Replacement products contains prime nutrition and vitamins and that give you energy that your body might be missing on.

- **Industry Expert**

Our team comprises of experts from the industry who puts in their complete effort to make each of the products superior and effective.

- **Quality Assurance**

Each of our products is quality assured. Every product passes through several quality checks to ensure the high quality of the products.

- **Packaging**

We pay special attention to our packaging work. All products are packed with great care so that they can reach you without any damage.

- **Fastest Delivery**

One thing that we are proud of is our fast delivery service. We ensure the fastest delivery of products using assured logistics service.

# Manufacturing Facilities

### Plant & Machinery

Nutraceutical products is used to improve health, delay the aging process, prevent chronic diseases, increase life expectancy, or support the structure or function of the body. We want to serve our best to the people and so we use the best equipments needed. Plant is designed and constructed as per WHO GMP standard having dedicated areas for each operation.

### Rotary Bottle Washing Machine

- Before the bottles are filled in liquid line, they are properly washed in the machines so that they are bacteria free.
- 64 bottles are washed at a time

KAPS 3 NUTRA

## Automatic Liquid Filling / ROPP / Screw / Machine

- Liquid line is 4 head contain and fully automatic.
- 4 bottles are filled at one time.
- After filling they are even capped, sealed and labeled by the machine.

## Storage facility

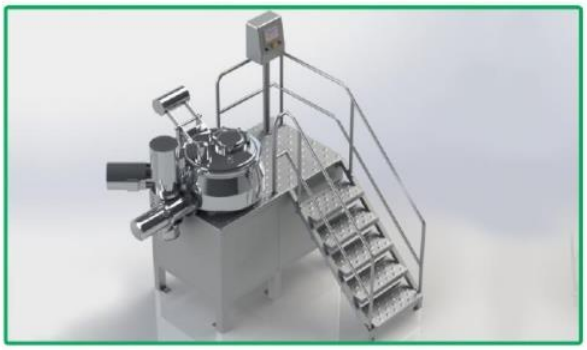
We have enough storage facility to hold huge stock of products. The warehouses are well- furnished and well equipped to sustain quality standard at storage time.


## Inspection Table with Magnifying Domea / Self Adhesive Vertical Labeling Machine / Packing Conveyor Belt.

- After the liquid process, the bottles are inspected as if minor dirt is present.
- Bottles are than being labeled by the machines.
- Lastly, on packing conveyor belt, the final packing is done in the cartons.

## Strip Packaging

- Strip Packaging machines are designed to handle a wide range of products with utmost precision
- The Products from the hopper passes through a stainless steel feeding system and goes to sealing roller cavities where laminated foils, drawn from two rollers, packs and seals the products in a continuous strip to deliver the desired sizes of strip packages.



## Rapid Mixer Granulator

- It is used to mix the ingredients and make the granules before compression.

## Paste Kattle

- It is been used for making granules for tableting formulation. There is anchor type beater been provided for paste mixing with dual speed

## Blister / Alu-Alu Packing

- This machine is used for the packing of tablet and capsules in 1 x 10, 1 x 15 no.
- It is designed for the product to have better protection and prevention of sunshine rays.

## Vibro Shifter

- It eliminates all oversized contamination and offers quality assurance of the finished product.

## Multi Mill

- Multi mill machines is used for wet and dry granulation, pulverisation etc.

## Fluid Bed Dryer

- It helps effective drying, mixing, granualtion, finishing and cooling of powdered substances.

## Rotary Tablet Press

- It compresses powder into tablets of uniform size and weight. A tablet is formed by the combined pressing action of two punches and a die.

## Coating Machine

- Application of coating material is done on a moving bed of tablets and removing rapidly the solvent using a current of hot air.


## Double Cone Blender

- It efficiently mixes dry powders and granules homo-geneously.

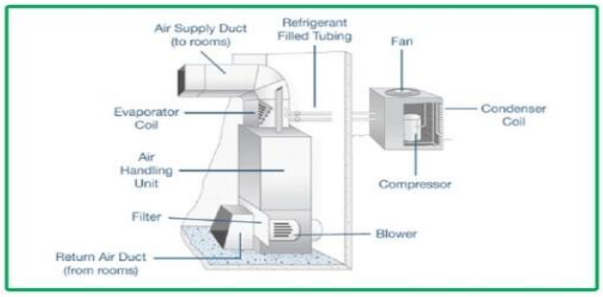
## Powder Packaging Pneumatic Machine

- The machine prepare the packets, fills the powder of 25gm to 100gm and seals it in 3 sides & CENTER.

## Sachet Pneumatic Machine (Servo Drive)

- The machine prepare the packets, fills the sachet of 1 gram to 10 grams and seals it in 3 to 4 sides.

# AIR HANDLING UNIT




An air handling unit regulates and circulate air as part of the heating, ventilation and air conditioning system. The AHU takes in outside air, reconditions (filtered and either heated or cooled) it and supplies it as fresh air to the air conditioned room.

# RO-DM PLANT

## RO PLANT

**Superior functionality**
**High filtration capacity**


## DM PLANT

**Demineralization** is the process of removing mineral salts from water by using the ion exchange process.

# MAIN PRODUCT


## MANUFACTURING PROCESS

As any savvy consumer will understand, a quality product cannot be made without having a quality manufacturing process. They both go hand in glove.

So what makes us good and unique at manufacturing products?

Below are some details that can give you a clear picture of the care that we take at every step of the manufacturing process, just to provide our customers with products that have 100% quality assurance.

The nutraceutical market is changing rapidly in response to the FDA's new Dietary Supplement Current Good Manufacturing Practices (CGMP)

All our nutritional products are manufactured under these strict guidelines of the USFDA

In an effort to maximize return on capital and other resources, we use only audited, GMP-certified contract manufacturing firms, which have invested heavily in state-of-the-art facilities and quality infrastructure to ensure compliance.

Our FDA cGMPs certified facilities has a comprehensive system of process controls documenting each stage of the manufacturing process to help minimize and detect problems like contamination early in the manufacturing process. The process controls is essential to ensure that nutraceuticals are manufactured, packaged, held, and labeled in a consistent and reproducible manner.

We establish best practices for instrument and analytical procedure validation, as well as implementing a robust quality system.

- **Laboratory Controls –**

Demonstrating the specifications of the supplements can be verified and accurately tested for authenticity.

- **Manufacturing Operations –**

Having a system in place to thoroughly keep records of batches manufactured.

- **Packaging and Labeling –**

Proven ability to characterize contents of packaging and demonstrate that it lines up with specifications.

- **Holding and Distribution –**

Managing the supply chain by developing a process for retaining samples and handling products. Also, making sure that products are identifiable and are not mislabeled.

- **Handling of Returns and Salvage –**

Instilling a process to oversee the proper handling of defects and deviations that are not aligned with regulations.

- **Product Complaint –**

Instituting quality control to oversee how products are handled and mitigated. Formal Procedures and Training Documentation – Implementing a process to maintain documentation of everything from complaints to formula deviations.

- **Quality Control –**

Implementing a department to oversee all procedures are in line with FDA and CGMP regulations and extensive analytical testing is in place.

# PHYSICAL ANALYSIS

There are several physical analysis methods that can be used to evaluate a multivitamin syrup sample. Here are a few examples:

Appearance and color: The appearance and color of the syrup can be evaluated visually. The syrup should be clear and free from any particles or sediment, and the color should be consistent with the product specifications.

- Density: The density of the syrup can be measured using a density meter. The density should be consistent with the product specifications.
- pH: The pH of the syrup can be measured using a pH meter. The pH should be consistent with the product specifications.
- Viscosity: The viscosity of the syrup can be measured using a viscometer. The viscosity should be consistent with the product specifications.
- Moisture content: The moisture content of the syrup can be determined using a moisture analyzer. The moisture content should be consistent with the product specifications.
- Total solids: The total solids content of the syrup can be determined using a refractometer or other methods. The total solids content should be consistent with the product specifications.
- Particle size distribution: The particle size distribution of any suspended particles in the syrup can be analyzed using techniques such as laser diffraction or microscopy. The particle size distribution should be consistent with the product specifications.

By performing these physical analysis methods, manufacturers can ensure that their multivitamin syrup product meets certain quality standards and specifications.

Different method of physical analysis are used for product and give result of our product:

## VISUAL INSPECTION

Visual inspection of a syrup sample is an important quality control measure that can be used to evaluate the appearance, clarity, and color of the syrup. Here are some of the key factors that can be evaluated during visual inspection:

- Appearance: The syrup should be free from any foreign matter, sediment, or other visible impurities. The container should be clean and free from any damage or defects.
- Clarity: The syrup should be clear and free from any cloudiness or haziness. If the syrup contains any suspended particles, they should be evenly distributed throughout the sample.
- Color: The color of the syrup should be consistent with the product specifications. Any variations in color could indicate a problem with the manufacturing process or the quality of the ingredients.
- Container integrity: The container should be tightly sealed and free from any leaks or damage that could compromise the quality or safety of the syrup.
- Labeling: The label on the container should be clear, accurate, and legible. It should include all required information, such as the product name, ingredients, dosage instructions, and any warning or cautionary statements.

By conducting a thorough visual inspection of the syrup sample, manufacturers can identify any potential quality issues or defects and take corrective actions to ensure that their product meets the required quality and safety standards.

## SMELL INSPECTION

Smell inspection of a syrup sample is an important quality control measure that can be used to evaluate the odor and aroma of the syrup. Here are some key factors that can be evaluated during smell inspection:

- Odor: The syrup should have a characteristic and pleasant odor that is consistent with the type of syrup and its ingredients. Any unusual or off-odor could indicate a problem with the manufacturing process or the quality of the ingredients.
- Aroma: The syrup should have a pleasant and appealing aroma that is consistent with the type of syrup and its ingredients. The aroma should not be overpowering or unpleasant.
- Contamination: The syrup should not have any signs of contamination or spoilage, such as a sour or rancid smell, moldy or musty odors, or any other off-odors that could indicate bacterial growth or other quality issues.

- Consistency: The odor and aroma of the syrup should be consistent from batch to batch. Any variations in odor or aroma could indicate a problem with the manufacturing process or the quality of the ingredients.

By conducting a thorough smell inspection of the syrup sample, manufacturers can identify any potential quality issues or defects and take corrective actions to ensure that their product meets the required quality and safety standards. It is also important to note that smell inspection should be conducted by trained personnel, who are familiar with the characteristic odor and aroma of the syrup, to ensure accurate evaluation.

*Figure 1 https://www.futurelearn.com/info/courses/creating-the-amazing-engineering-the-future/0/steps/65282*

## TASTE INSPECTION

Taste inspection of a multivitamin syrup sample is an important quality control measure that can be used to evaluate the taste, flavor, and overall palatability of the syrup. Here are some key factors that can be evaluated during taste inspection:

- Taste: The syrup should have a pleasant and characteristic taste that is consistent with the type of syrup and its ingredients. The taste should not be overly sweet or bitter, and should not have any off-flavors or aftertastes.
- Flavor: The syrup should have a pleasant and appealing flavor that is consistent with the type of syrup and its ingredients. The flavor should not be overpowering or unpleasant.

- Consistency: The taste and flavor of the syrup should be consistent from batch to batch. Any variations in taste or flavor could indicate a problem with the manufacturing process or the quality of the ingredients.
- Mouthfeel: The syrup should have a smooth and consistent mouthfeel, with no gritty or unpleasant sensations.
- Aftertaste: The syrup should not leave any unpleasant aftertaste or lingering sensation in the mouth.

By conducting a thorough taste inspection of the multivitamin syrup sample, manufacturers can identify any potential quality issues or defects and take corrective actions to ensure that their product meets the required quality and safety standards. It is also important to note that taste inspection should be conducted by trained personnel, who are familiar with the characteristic taste and flavor of the syrup, to ensure accurate evaluation.

RESULT OF PHYSICAL ANALYSIS OF PRODUCT:

**Name of Product: Diastase P 100 ml syrup**
**Batch No. : K3S2494C**
**Mfg. Date: AUG 2022**
**Exp Date: JAN 2024**

**Date of Sampling: 26/08/2022**
**Date of Testing: 26/08/2022**
**Report Date: 26/08/2022**
**A.R.No: 125/FP**

| PARAMETER | SPECIFICATION | METHOD | RESULT |
|---|---|---|---|
| Physical Appearance | Yellow coloured liquid | Visual Inspection | Yellow liquid |
| Colour | Yellow colour | Visual Inspection | Yellow |
| Odour | Pineapple smell | Smell Inspection | Pineapple |
| Taste | Pineapple taste | Taste Inspection | Pineapple |

# MICROBIOLOGICAL ANAYSIS

Microbiological analysis of a multivitamin syrup sample is an important quality control measure that can be used to evaluate the presence and levels of microorganisms in the syrup. Here are some key factors that can be evaluated during microbiological analysis:

1. Total viable count: The total viable count (TVC) is a measure of the total number of viable microorganisms, including bacteria and fungi, in the syrup. The TVC should be within the acceptable limits specified by the regulatory authorities.
2. Yeast and mold count: The yeast and mold count is a measure of the number of viable yeast and mold colonies present in the syrup. The count should be within the acceptable limits specified by the regulatory authorities.
3. Pathogenic microorganisms: Pathogenic microorganisms, such as Salmonella, Escherichia coli (E. coli), Staphylococcus aureus, and Pseudomonas aeruginosa, should not be present in the syrup. These microorganisms can cause foodborne illnesses and pose a serious risk to public health.
4. Preservative efficacy: The efficacy of preservatives used in the syrup should be evaluated to ensure that they are effective in controlling the growth of microorganisms.

By conducting a thorough microbiological analysis of the multivitamin syrup sample, manufacturers can identify any potential microbial contamination or growth issues and take corrective actions to ensure that their product meets the required quality and safety standards. It is also important to note that microbiological analysis should be conducted by trained personnel using appropriate testing methods and equipment to ensure accurate results.

## 1. TOTAL VIABLE COUNT (TVC)

TVC is a microbiological analysis method used to determine the number of viable microorganisms, including bacteria and fungi, present in a multivitamin syrup sample. This test is an important quality control measure to evaluate the safety and shelf life of the product.

The TVC test involves diluting a sample of the syrup in a sterile diluent and then spreading the diluted sample on a solid culture medium. The culture plates are then incubated at a specific temperature and for a specific period of time to allow the microorganisms to grow. After

incubation, the colonies that have grown on the plates are counted and the results are reported as colony-forming units (CFUs) per milliliter (ml) of the original sample.

The acceptable limits for TVC vary depending on the regulatory requirements and the type of product. In general, the lower the TVC, the better the quality of the product. However, it is important to note that some microorganisms are beneficial and may be intentionally added to the product, such as probiotics.

If the TVC of the multivitamin syrup sample exceeds the acceptable limits, it may indicate microbial contamination, poor storage conditions, or inadequate preservation. In such cases, corrective actions should be taken to identify the source of contamination and prevent further growth of microorganisms in the product.

## 2. YEAST AND MOLD COUNT

Yeast and mold count is a microbiological analysis method used to determine the number of viable yeast and mold colonies present in a multivitamin syrup sample. This test is an important quality control measure to evaluate the safety and shelf life of the product.

The yeast and mold count test involves diluting a sample of the syrup in a sterile diluent and then spreading the diluted sample on a solid culture medium specific for yeast and mold. The culture plates are then incubated at a specific temperature and for a specific period of time to allow the yeast and mold colonies to grow. After incubation, the colonies that have grown on the plates are counted and the results are reported as CFUs per ml of the original sample.

The acceptable limits for yeast and mold count vary depending on the regulatory requirements and the type of product. In general, the lower the yeast and mold count, the better the quality of the product. However, it is important to note that some microorganisms are beneficial and may be intentionally added to the product, such as certain strains of yeast.

If the yeast and mold count of the multivitamin syrup sample exceeds the acceptable limits, it may indicate microbial contamination, poor storage conditions, or inadequate preservation. In such cases, corrective actions should be taken to identify the source of contamination and prevent further growth of yeast and mold in the product.

It is important to note that the method used for yeast and mold count may vary depending on the specific requirements of the product and the regulatory authorities. The most commonly used methods include spread plate method, pour plate method, and membrane filtration method.

## 3. PATHOGENIC MICROORGANISM

Pathogenic microorganisms analysis is a microbiological testing method used to determine the presence or absence of harmful microorganisms such as Salmonella, Escherichia coli (E. coli), Staphylococcus aureus, and Pseudomonas aeruginosa in a multivitamin syrup sample. This test is an important quality control measure to ensure the safety of the product.

The analysis of pathogenic microorganisms in syrup samples involves the use of specific testing methods that are capable of detecting these microorganisms. These methods may include culturing techniques, PCR (polymerase chain reaction), or ELISA (enzyme-linked immunosorbent assay) tests.

The acceptable limits for pathogenic microorganisms in multivitamin syrup samples are very low, and in most cases, the absence of these microorganisms is required for the product to be considered safe. Any detection of pathogenic microorganisms in a syrup sample indicates contamination, and corrective actions must be taken to identify the source of contamination and prevent further growth of these microorganisms in the product.

It is important to note that the specific testing method used for pathogenic microorganisms analysis may vary depending on the regulatory requirements and the type of product. It is also crucial to ensure that the testing is carried out by trained personnel in a properly equipped laboratory to ensure the accuracy and reliability of the results.

RESULTS OF MICROBIOLOGICAL ANALYSIS OF SYRUP SAMPLE:

| | | | |
|---|---|---|---|
| Total aerobic plate count | $\leq 1x10^4$ CFU/g | Growth visible colony &colour change method | 28 cfu/g. |
| Yeast & Molds | $\leq 1x10^2$ CFU/g | Growth visible colony &colour change method | 07 cfu/g. |
| *E. Coli* | Negative | Growth visible colony &colour change method | Absent per g. |
| *Coliform* | $\leq 1x10^2$ CFU/g | Growth visible colony colour change method | 04cfu/g. |
| *Salmonella spp* | Negative | Growth visible colony &colour change method | Absent per g |
| *Staphylococcus aureus* | Negative | Growth visible colony &colour change method | Absent per g |

# HEAVY METAL ANALYSIS

Heavy metal analysis in syrup involves testing for the presence and levels of various heavy metals in a syrup sample. Heavy metals such as lead, cadmium, arsenic, mercury, and chromium can be harmful to human health if ingested in high amounts. These metals can contaminate syrup during processing, packaging, or storage.

To conduct a heavy metal analysis in syrup, a sample of the syrup is taken and tested in a laboratory using specialized equipment. The most common method used is atomic absorption spectroscopy (AAS), which involves vaporizing the sample and analyzing the absorption of light by the metal atoms.

Before conducting the analysis, the laboratory will prepare the sample by removing any impurities or particles that may interfere with the results. The sample is then acidified to dissolve any metals that may be present in solid form. The acidified sample is then analyzed using AAS, and the results are compared to established safety limits.

If the levels of heavy metals in the syrup are found to be above the safety limits, the product may be considered unsafe for consumption and may need to be recalled or discarded. Regular monitoring of heavy metal levels in syrup can help ensure the safety of the product and prevent potential health risks to consumers.

Also for heavy metal analysis other than AAS method there are also chemical method present. In chemical method by preparing different stock solution using different test analysis of heavy metals occur.

The presence of heavy metals in syrup can be toxic to human health if consumed in high amounts. Heavy metals such as lead, cadmium, arsenic, mercury, and chromium are known to be harmful to the body, and prolonged exposure to these metals can lead to serious health problems.

Lead, for example, can cause damage to the nervous system, kidneys, and reproductive system. Cadmium can cause kidney damage, while arsenic can lead to skin lesions, cancer, and cardiovascular disease. Mercury can damage the nervous system and cause developmental problems in fetuses and young children, while chromium can cause lung cancer and respiratory problems.

The severity of the health effects depends on the amount and duration of exposure to the heavy metals. Children and pregnant women are particularly vulnerable to the harmful effects of heavy metals, and even low levels of exposure can have long-term health consequences.

To prevent toxicity from heavy metals in syrup, it is important to monitor and control the levels of these metals in the product. Regulatory agencies have established safety limits for heavy metals in food products, including syrup, and manufacturers are required to comply with these limits to ensure the safety of their products. Additionally, consumers can minimize their exposure to heavy metals by consuming a varied diet and avoiding products that are known to contain high levels of these metals.

## PREPARATION AND METHOD FOR HEAVY METAL ANALYSIS

- **Lead Nitrate Stock Solution** :Dissolve 159.8 mg of lead nitrate in 100 mL of water to which has been added 1 mL of nitric acid, then dilute with water to 1000 ml. Prepare and store this solution in glass containers free from soluble lead salts.
- **Standard Lead Solution** : On the day of use, dilute 10.0 mL of Lead Nitrate Stock Solution with water to 100.0 ml. Each mL of Standard Lead Solution contains the equivalent of 10 µg of lead. A comparison solution prepared on the basis of 100 µL of Standard Lead Solution per g of substance being tested contains the equivalent of 1 part of lead per million parts of substance being tested.
- **pH 3.5 Acetate Buffer** : Dissolve 25.0 g of ammonium acetate in 25 mL of water, and add 38.0 mL of 6 N hydrochloric acid. Adjust, if necessary, with 6 N ammonium hydroxide or 6 N hydrochloric acid to a pH of 3.5, dilute with water to 100 ml ,and mix.
- **Standard Preparation** : Into a 50-mL colour -comparison tube pipet 2 mL of Standard Lead Solution (20 µg of Pb), and dilute with water to25 ml. Adjust with 1 N acetic acid or 6 N ammonium hydroxide to a pH between 3.0 and 4.0, using short-range pH indicator paper as external indicator, dilute with water to 40 mL, and mix.
- **Test preparation** : transfer accurately weighed test sample into 50 ml of Nessler's cylinder. Dissolve in and dilute to 25 ml with water .Adjust the pH of this solution with 1N Acetic

acid or 6M Ammonia solution to a pH between 3.0 & 4.0 using shortrange pH indicator paper as external indicator. Dilute with water to 40 ml and mix.

RESULT OF HEAVY METHOD ANALYSIS BY CHEMICAL METHOD:

| Heavy Metals | | | |
|---|---|---|---|
| Lead (Pb) | < 10 ppm | Heavy Metal test | 0.0001ppm |
| Arsenic(As) | < 0.3 ppm | Arsenic kit test | Not Present |
| Mercury(Hg) | < 0.5 ppm | Heavy Metal test | Not Present |
| Cadmium(Cd) | < 0.3 ppm | Heavy Metal test | Not Present |

# ASSAY BY UV SPECTROSCOPY

UV (ultraviolet) spectroscopy is a commonly used method for the assay of syrups. Here are the general steps for performing a UV assay of syrup:

- **Preparation of sample:** Take a representative sample of the syrup and dilute it with a suitable solvent, such as water or methanol. The dilution factor should be such that the absorbance falls within the linear range of the instrument.
- **Calibration of instrument**: Set the spectrophotometer to the desired wavelength (usually 210 nm, 230 nm, or 280 nm). Prepare a standard solution of the active ingredient in the same solvent used for sample preparation. Measure the absorbance of the standard solution at the selected wavelength and use it to prepare a calibration curve.
- **Measurement of sample**: Measure the absorbance of the sample at the selected wavelength using the same solvent blank used for the standard solution. Record the absorbance and calculate the concentration of the active ingredient in the sample using the calibration curve.
- **Validation:** Validate the method by checking for accuracy, precision, linearity, range, and specificity. The method should be validated according to the appropriate regulatory guidelines.

Note: The exact method may vary depending on the specific syrup and the instrument used. It is recommended to consult the relevant pharmacopoeia or standard operating procedure for specific guidance on the UV assay of syrups.

RESULT OF SYRUM SAMPLE:

| Assay | | | |
|---|---|---|---|
| Diastase (1:1200) (50 mg) | Not Less than 90% | UV method | 51 mg |
| Pepsin (1:3000) (10 mg) | Not Less than 90% | UV method | 12 mg |

# REFERENCE


1. *COA OF DIASTASE P 200 ML[1]*. (n.d.).
2. https://www.futurelearn.com/info/courses/creating-the-amazing-engineering-the-future/0/steps/65282