PHYSICAL, CHEMICAL AND MICROBIOLOGICAL ANALYSIS OF WAFERS

An Industrial Training Report submitted

for the partial fulfillment of the Degree of Master of Science

By

Priyanshi Prajapati

[M.Sc. Microbiology, SemesterIV]

Under the supervision of

Dr. Rachna Joshi
Head Of Department
Balaji Wafers Pvt. Ltd, Rajkot

DEPARTMENT OF MICROBIOLOGY

Shree M & N Virani Science College (autonomous),

Affiliated to Saurastra University, Rajkot

'YOGIDHAM GURUKUL' KALAWAD ROAD

RAJKOT (GUJARAT) – 360005

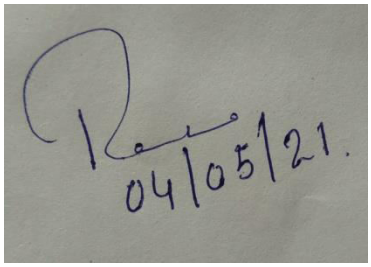
2019-21

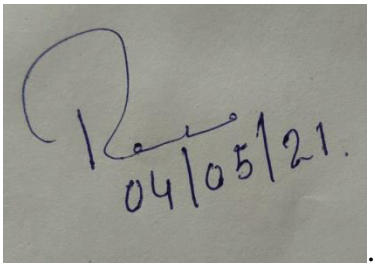
ANNEXURE 1

(On letterhead of the Industry)

C E R T I F I C A T E

This is to certify that this training report entitled "Physical, Chemical and Microbiological Analysis of Wafers" was successfully carried out by Miss Priyanshi Prajapati towards the partial fulfillment of requirements for the degree of Master of Science in Microbiology of Shree M & N Virani Science College (autonomous), Affiliated to Saurastra University, Rajkot. It is an authentic record of her own work, carried out by her under the guidance of Dr. Rachna Joshi for a period of 1 month during the academic year of 2020 – 2021. The content of this report, in full or in parts, has not been submitted for the award of any other degree or certificate in this or any other University





Dr.Rachna Joshi

Dr.Rachna Joshi

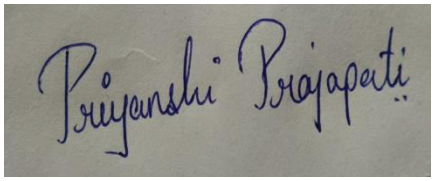
Name & Signature of the Head of the Department

Name & Signature of the supervisor

ANNEXURE 2

D E C L A R A T I O N

I hereby declare that the work incorporated in the present dissertation report entitled **"Physical, Chemical and Microbiological Analysis of Wafers"** 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 (Name and signature of Student)

Acknowledgement

I am pleased to represent this report and its my moral duty to offer my sincere thanks to all those people who helped me in this training

I am thankful to Dr. Rachna Joshi head of department of Balaji Wafers Pvt. Ltd. for helping and guiding me in this training.

My sincere thanks to Principal of Shree M.N. Virani Science College and HOD for encouragement and providing such facilities to explore food industries

- ✓ Index :-
- Introduction
- Products of Balaji Wafers
- Aim and objective
- Methodology
- Results
- Conclusion
- Reference

..

- **Introduction :-**

Balaji Wafers company started in 1976 by Virani Brothers. This business was started from the canteen of a cinema hall in Rajkot.

By their retail success , they were inspired to set a semi-automatic plant instead of preparing wafers by the traditional frying method.

Balaji Wafers is one of the largest potato chips producing companies in India, with a high market shares especially in Gujarat.

Products of Balaji Wafers are potato wafers, banana wafers, simply salted, tomato twist, masala, cream and onion,crunchex etc.

Other the wafers, other products are namkeen farali chevdo, mung dal, chana dal, shing bhujia etc.

Slogan “Wafers Zyaada,Flavours WahWah”.

- ✓ **Introduction to Wafers :-**

Wafers or Crisps are thin slices of potatoes or bananas which are deep fried or baked until it becomes crisp.
Wafers are one of the most popular snack items consumed in whole world.
They are commonly served as a snack, side dish, or appetizer.
They are produced by rapid dehydration of potato slices by direct contact with hot oil.
Its crispiness and special palatability makes it the favourite of people of all the age groups.

✓ **Products of Balaji Wafers :-**

Balaji wafers are known for their wafers. The wafers they make are salted, masala, tomato twist, onion and cream, banana wafers etc.

Other then wafers they make namkeen items like aloo sev, mung dal, chana dal, farali chevdo, etc.

✓ **Aim and Objectives :-**

- To check the quality of raw material
- To check the finished product
- To determine the quality and quantity of the product.

✓ **Methodology :-**

Analysis of wafers can be done by 3 ways :-

1. Physical Analysis
2. Chemical Analysis
3. Microbiological Analysis

1) Physical Analysis :-

Physical analysis refers to the testing methods used to evaluate the various physical properties of food.
Physical Analysis can be done by 2 ways:-

i. Sensory analysis
ii. Moisture Content

A. Sensory Analysis:-

Sensory Analysis is method to measure the product through :-

1. Smell - aroma

2. Touch - texture
3. Taste - flavor
4. Visual – appearance, color, size, shape
5. Sound – crunch

B. Moisture :-

Moisture analysis is the method used to measure the percentage of water in the sample.

After frying (loss on drying), moisture content is analyzed in moisture meter.

Procedure:-

Take 5gm of crushed wafer and put it on moisture meter.

Note down the reading till the time reaches to 0.05 per minute.

Observation:-

Moisture content of wafer: 1.08 %

Normal range: - 0.90 – 1.25 %

2) Chemical Analysis :-

i. Butyro :-

This test used to analyze the edible oil. It is used to check the purity of food like ghee, sweets, fats and oils.

The device used is Butyro Refractometer or BR meter.

Procedure:-

Take the butyro Refractometer and put a drop of edible oil sample.

Note down the reading.

Observation:-

Oil sample Reading is 46.7.

It is in normal range.

ii. Refractive Index:-

The ratio of velocity of light in vacuum to the velocity of light in the oil or fat. it is called as refractive index.

Instrument used is Butyro Refractometer or BR meter.

Procedure:-

Take the butyro refractometer and put a drop of edible oil sample.

Note down the reading.

Observation:-

Oil sample reading is 1.4620.

It is in normal range.

iii. Total Polar Material (TPM):-

TPM test is used to check the quality of oil.

Procedure:-

Take 20ml of oil sample and put it on hot plate.

When it reaches at 40-45°C , take the sample from hot plate.

Take the TPM Analyzer and put it in oil sample and note down the reading

Observation:-

. Reading is 10.0%

The normal range of TPM is 10.0%

iv. Free Fatty Acid Analysis:-

This test is used to know the fee fat present in oil. It is done by titration method.

Procedure:-

Take 30ml 95% ethanol

Add 4-5 drops of phenophthelin.

Add 0.1N NaOH till color changes to pinkish purple

Add 10gm oil sample and heat it and again add phenophthelin.

Heat it until color changes to colorless.

Titrate with 0.1N NaOH till color change to light pink and note down the reading.

Calculation:-

$$\frac{Burette\ reading\ \times\ 0.1N\ NaOH\ \times\ 28.2}{weight\ of\ sample}$$

$$\frac{0.15 \times 0.1 \times 28.2}{10.1}$$

0.0418 %

Observation:-

Reading is 0.0418%

It is in the normal range

v. Peroixde Values:-

This test determines the value of H_2O_2 that is present in oil.

This test is done by titration method.

Procedure:-

Take 5gm of oil.

Add 12ml chloroform and 18ml acetic acid

Add 0.5ml KI and keep it in dark room for 1 min.

Add 30ml water and add 4-5 drops of 1 % starch indicator

Titrate it with 0.01N Sodium thiosulfate and note down the reading.

Reading is 0.34

Calculation:-

$$PV = \frac{Burette\ Reading \times 0.01N\ KI \times 1000}{weight\ of\ sample}$$

$$= \frac{0.34 \times 0.01 \times 1000}{5}$$

$$= 0.68 \text{ meq/kg}$$

Observation:-

Reading is 0.68 meq/kg

It is in the normal range of PV values

vi. Fat Analysis:-

In fat analysis, total amount of fat is measured. The fresh wafers are tested in fat analysis.

Procedure:-

Take empty beaker and weigh it.

Take crushed wafer and weigh it to 2gm.

Take this sample in thimble and add 100ml petroleum ether.

Put the thimble in the beaker.

Put the beaker on hot plate of the oil analyzer instrument.

Keep it for 1hour at 120°C. After 1hr change the temp at 180°C and close all the valves.

During this process ~20 mins open all valves as ether reaches down again , close the valves. Let all the ether evaporates.

Take the beaker and put it in oven for one and half hour. Then put it in desicator.

Then again weigh the beaker. Note down the reading then calculate the values.

Calculation:-

X = pre weight – post weight

Fat analysis = $\frac{X \times 100}{weight\ of\ sample}$

= 31.45 %

Observation:-

Reading is 31.45%

It is in the normal range.

3) Microbiological Analysis:-

Firstly, autoclave all the media and apparatus for 1 hour at 121°C

a) Total Aerobic Count:-

Media:- Plate Count Agar

Pre enrichment media :- Buffer Peptone Water (BPW)

Dilution tubes :- 0.1 %peptone solution

Stock solution :- 25gm wafer(crushed) + 225ml BPW

Procedure:

Take 1ml from stock solution and add it in 9ml peptone water tube mix well and again take 1ml from it and dilute it upto 10^{-4}

Pour the agar in plates and by pour plate technique add sample in plates.

Keep the plates in incubation for 48 hrs at 37°C

.

After 48 hrs observe the plates and observe the plate.

Observation:-

No. of colonies in 10^{-2} plate : 107 colonies

No. of colonies in 10^{-3} plate : 45 colonies

No. of colonies in 10^{-4} plate : 4 colony

Calculation:-

CFU = $\frac{\varepsilon c}{N1 + (N2 \times 0.1)d}$

Where, εc = total no. of colonies

N1 = no. of dilution plate of that dilution

N2 = no. of second dilution

D = first dilution/ minimum dilution

∴ CFU = $\frac{107 + 45 + 4}{1 + (1 \times 0.1) \times 10 - 2}$

CFU = 141.818 $\times 10^2$ cfu/gm

b) Yeast and Molds:-

Media :- Chloroamphenicol Yeast Glucose Agar

Pre enrichment media :- Buffer Peptone Water (BPW)

Dilution tubes :- 0.1 %peptone solution

Stock solution :- 25gm wafer(crushed) + 225ml BPW

Procedure :-

Take 1ml from stock solution and add it in 9ml peptone water tube mix well and again take 1ml from it and dilute it upto 10^{-4}

Pour the agar in plates and by pour plate technique add sample in plates.

Keep the plates in incubation for 78 hrs at 25°C .

After 78 hrs observe the plates and observe the plate

Observation :

No. of colonies = 20 colonies

c) Coliforms :-

Media :- Violet Red Bile Agar

Pre enrichment media :- Buffer Peptone Water (BPW)

Dilution tubes :- 0.1 %peptone solution

Stock solution :- 25gm wafer(crushed) + 225ml BPW

Procedure :-

Take 1ml from stock solution and add it in 9ml peptone water tube mix well and again take 1ml from it and dilute it upto 10^{-4}

Pour the agar in plates and by pour plate technique add sample in plates

Keep the plates in incubation for 48 hrs at 37°C .

After 48 hrs observe the plates and observe the plate.

Observation:-

No. of colonies = 38 colonies

d) <u>E. coli :-</u>

Media :- Eosin Methylene Blue

Pre enrichment media :- Buffer Peptone Water (BPW)

Dilution tubes :- 0.1 %peptone solution

Stock solution :- 25gm wafer(crushed) + 225ml BPW

Procedure :-

Take 1ml from stock solution and add it in 9ml peptone water tube mix well and again take 1ml from it and dilute it upto 10^{-4}

By pour platr method, pour the eosin Methylene blue in plates. Keep the plates in incubation for 24 hrs at 37°C.

After 24 hrs, take the plates and streak the sample in plates.

Keep the plates in incubation for 24 hrs.

Observe the green metallic shine colored colony. If colored colony seen then do biochemical confirmative test.

Indole test :- take the tryptophan broth and inoculate the colony. Keep the broth in incubation for 24 hrs at 37°C.

After 24 hrs, add Kovac's reagent in it. By the adding of reagent it shows the pink colored ring.

Presence of pink ring indicates that E. coli is present in sample.

e) Salmonella :-

Media :- Xylose Lysine Deoxycholate (XLD)

Pre enrichment media :- Buffer Peptone Water (BPW)

Dilution tubes :- 0.1 %peptone solution
Stock solution :- 25gm wafer(crushed) + 225ml BPW

Procedure :-

Take 1ml from stock solution and add it in 9ml peptone water tube mix well and again take 1ml from it and dilute it upto 10^{-4}

By pour plate method, pour the XLD in plates. Keep the plates in incubation for 24 hrs at 37°C.

Take 0.1ml sample and inoculate it in RV (rappapor vssalian) media and incubate it for 24 hrs at 42°C.

Take loopful sample from RV media and streak it on XLD plates. Keep the plates in- cubation for 24 hrs at 37°C.

Observe the red colony with black color in center. If there is no red colony then salmonella is absent.

If red colored colony appears then conformative test has to be done.

Take TSI slant, and pick the red colony from XLD plate and streak it in slant.

Incubate the slant for 24 hrs at 37°C

After 24 hrs observe the slant and write observation.

Observation :-

Slant color = red color

Changes to = yellow color

Then production of SO_2 occurs and in result of that bubbles will appear.

- **Other analysis :-**
  - **Water analysis :-**

Water is analyzed for the quality of it. It measures the hardness, TDS etc of water.

a. Total Dissolved Solids (TDS)

Total Dissolved Solids (TDS) is the term used to describe the inorganic salts and trace amount of organic matter present in water.

Requirements :-

Sample water

TDS meter

Procedure :-

Take 200ml sample water

Dip the TDS rod in the sample water

Let the TDS meter set for few seconds and then note down the reading.

b. Hardness :-

Hardness is describe as high amount of naturally containing dissolved calcium and magnesium.

Requirements :-

Sample water

Buffer

EBT

EDTA

Procedure :-

Take 50ml sample + 1ml buffer + EBT(Erichrome Black T) indicator

Titrate it with EDTA untill steel blue color appears.

Note down the reading.

- **Milk Analysis :-**

Milk should be analyzed to know the fat content , thick or thin , as it meets the standard quality or not ,etc.

I. Fat % :-

In fat % analysis, it determines the level of fat in milk.

Method used is Gerber method

Requirements :-

Milk sample

Sulphuric acid

Amyl alcohol

Gerber tube

Procedure :-

Take 90 % 10ml H_2SO_4 and 10.75ml milk.

Add 1-2ml isoamyl alcohol

Mix until it turns black.

Then centrifuge it for 5 minutes.

After centrifuge, yellow color fat is observed in top.

- **Food adulterants :-**
  Adulterants are the substances that are added to foods so that the quality and composition of food gets affected.

1. **Determination of Sudan dye:-**

   1gm chili powder + 2ml hexane.

   Let the solution settle down.

   Take the upper portion in another tube and add aceto to nitrate.

   If bottom part gets red colored it means Sudan dye is present.

2. **Determination of Metanil Color** :-

   Take 3ml alcohol and add besan in it

   Add 2-3 drops of HCl.

   If pink color appears , it means metanil color is added.

3. **Determination of Artificial Color :-**

Take water and sprinkle the chili powder and turmeric powder in it.

Wait for few seconds.

If solution becomes reddish pink then color is added in chili powder and solution becomes yellow then color is added in turmeric powder.

✓ **Results and discussion:-**

- **PHYSICAL ANALYSIS :-**

1) **Moisture of wafer** :-

Sample :- 1.08 %

Normal range :- 0.90 – 1.25 %

- **CHEMICAL ANALYSIS** :-

1)**Butyro reading** :- 46.7

It is in normal range.

2)**Refractive Index** :- 1.4620

It is in normal range.

3)**TPM**:-10.0%

It is in normal range

4) **FFA analysis** :- 0.0418%

It is in normal range.

5) **Peroxide value** :- 0.68 meq/kg

It is in range.

6)**Fat analysis** :- 31.45 %

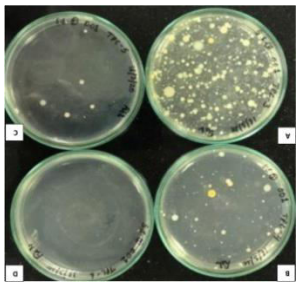
It is in range.

- **MICROBIOLOGICAL ANALYSIS :-**

1) Total Aerobic Count :-

141.818×10^2 cfu/gm

2) Yeast and Molds :-

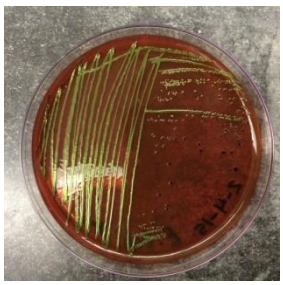


20 olonies were present which are in normal range.

3)Coliforms :

38 colonies were present which is the normal range of Coliforms.

4)<u>E.coli</u> :-



E.coli were absent in the sample.

5) Salmonella :-

Salmonella were absent in the sample.

WATER ANALYSIS :-

1) TDS :- 52
   Normal range : 50 – 150
2) Hardness :- 30

MILK ANALYSIS:-

1) FAT % :- 5.4
2) LR :-22

3)FOOD ADULTERANT :-

1) Determination of sudan dye :- Absent
2) Determination of Metanil color :- Absent
3) Determination of Artificial color :- Absent

✓ Conclusion

- The wafers which are one of the most favorite snacks has to passes through many tests. The tests are physical, chemical and microbiological.
- During this training, many tests are done to check the quality of wafers.
- During this training, we learnt that minute to minute details of product are necessary. Details like collection of samples to packaging of the final product .
- Every step is important and performed thoroughly.
- At the end, it was nice experience and learnt many things for this training.

- ✓ Reference:-

All the test protocols and procedure are the standard operating procedure of Balaji Wafers Pvt. Ltd.

All the photos are original test result that are performed under the guide Dr. Rachna Joshi.