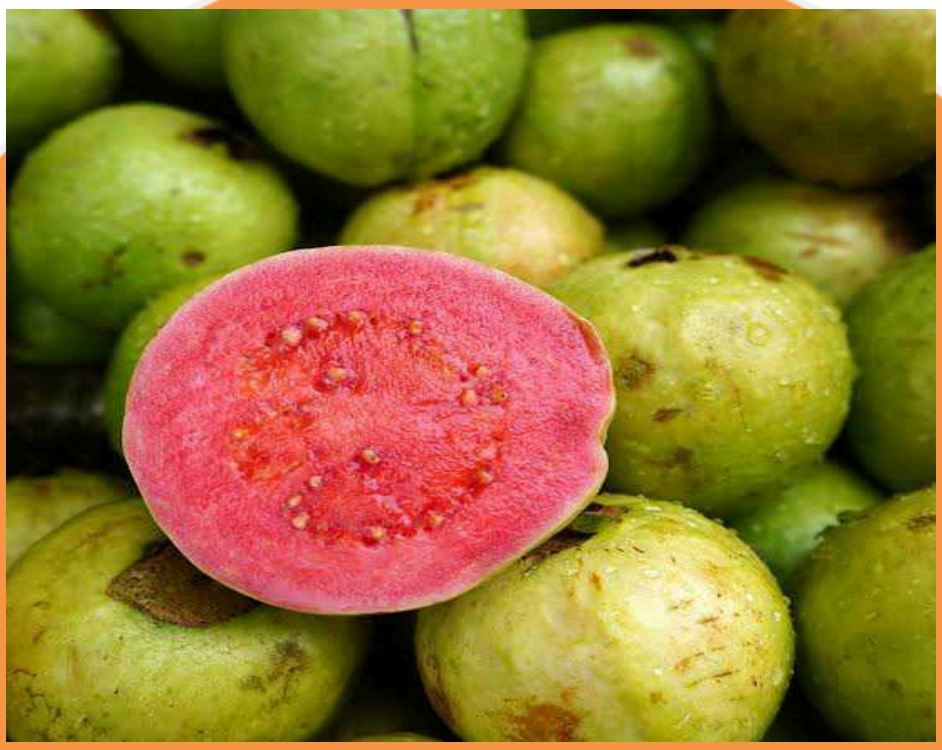

AIM: -

To study the presence of oxalate ions at different stage of ripening of guava plant.

CERTIFICATE

This is to certify that ..... a student of class XII of Jawahar Navodaya Vidyalaya , Roll no. ....., session 2020-2021, has satisfactorily completed the required chemistry project work as per the syllabus of the standard XII in the chemistry laboratory of the school.

DATE: Chemistry teacher

..

P.G.T- Chemistry

Signature of Principal:

Signature of External Examiner:

Acknowledgement

.....

.....

I, here by acknowledge my deep sense of gratitude and indebtedness to Mr . PGT (chemistry) whose immense help genius guidance encouragement , necessary suggestion , initiation , enthusiasm and inspiration made this work a master art and a joint enterprise

PREFACE

Here we have studied the presence of oxalate ions in a guava at its different stages of ripening. We have measured its strength, concentration, amount of ions and we have also come to know that guava is a very organic fruit which is rich in vitamin C, carbohydrates and also hailed as one of the super fruits due to the numerous health benefits.

We can also achieve the knowledge and know about the process of titration, about its prospects and steps and a walk through from the aspects and uses of different chemicals in the methodology of titration.

ACKNOWLEDGEMENT

I hereby acknowledge my deep sense of gratitude and indebtedness to Mr. ……. , P.G.T Chemistry whose immense help, genius gratitude, encouragement, necessary suggestions, initiation, enthusiasm and inspiration made this work a master art and a joint enterprise.

Apart from my efforts , the success of any project depends largely on the encouragement and guidelines of many others. I think this opportunity to express my gratitude to the people who have been instrumental in the successful completion of this project. I would also like to show my great attitude towards my friends for helping me in the completion of this project.

Signature of Student

CONTENTS

Objective:

To study the presence of oxalate ion at different stage of ripening of guava plant.

Introduction:

Guava is a common sweet fruit found in India and many other places around the world. Guava are plants in the myrtle family (Myrtaceae) genus Psidium (meaning “pomegranate” in Latin), which contains about 100 species of tropical shrub. Rich in vitamin C, this fruit is a rich source of oxalate ions whose content varies during the different stages of ripening.

Guavas have a prounounced and typical fragrance, similar to lemon rind but less is strength. Guavas are also rich in manganese which helps the body to absorb other key nutrients from the fruit that we eat. Guavas contain folate, a mineral which helps promote fertility. The Potassium in guavas help normalize blood pressure as well. Since it contains about 80% of water it helps keep our skin hydrated.

Now, what is oxalate? It is a carboxylic acid, primarily found in plants and animals. It is not an essential molecule and is excreted out from the body, unchanged. Our body either produces oxalate on its own or convert other molecules like vitamin C to oxalate. External sources like food also contribute to the accumulation of oxalate in our body. The oxalate present in the body is excreted in the form of urine as waste. Too much of oxalate in our urine result in the medical condition called hyperoxaluria, commonly referred to as a kidney stones. Diet is looked preventive measure in addition to medication to treat kidney stones.

Applications:

As one Guava has a high content of vitamin C, one guava fruit contains 4 times more vitamin C than an average size of orange and 10 times more vitamin A than a lemon.

It also contains vitamin B2, E and K, fiber, calcium, copper, folate, iron, manganese, phosphorous and potassium. With all the nutrition that it provides, guava hardly contains any fats. Moreover, it is one of the least chemically treated and sprayed fruit.

Some of the wider applications, guava is related to health. They are:

1. **IMMUNITY BOOSTER :**
   Vitamin C presence in guava helps improve immunity and protects us against common infections and pathogens.

2. **LOWER RISK OF CANCER :**

   Lycopine, quercetin, vitamin C and other polyphenols act as potent antioxidants which neutralize free radicals generated in the body, preventing the growth of cancer cells.

3. **DIABETES-FRIENDLY :**
   Due to rich fiber content and low glycaemic index, guavas prevent the development of diabetes. While the low glycaemic index inhibits a sudden spike in sugar levels, the fiber content ensures the sugar levels are well regulated.
4. **HEART HEALTHY :**
   Guavas improve the sodium and potassium balanced of the body there by regulating blood pressure in patients with hypertension. Guavas also help lower the levels of triglycerides and bad cholesterol (LDL), which contribute to the development of heart diseases.

5. **ANTI-AGEING PROPERTIES :**
   Guavas are rich in vitamin A, vitamin C and anti oxidants like carotene and lycopene which help protect the skin from wrinkles. A guava a day, keeps fine lines away.
6. **GOOD FOR OUR BRAIN :**
   Guava contains vitamin B3 and vitamin B6, also known as niacin and pyridoxine respectively, which help in improving blood circulation to the brain, stimulating cognitive function and relaxing the nerves.

Thus there are several aspect in which guava is helpful in maintain our physical and mental health.

THEORY

Oxalate ions are extracted from the fruit by boiling pulp with dilute H_2SO_4. The oxalate ions are estimated volumetrically, by titrating the solution with potassium permanganate ($KMnO_4$) solution.

Sl.no	Constituents	% amount
1	Water	75.10%
2	Protein	1.50%
3	Fats	0.20%
4	Calcium	0.01%
5	Phosphorous	0.04%
6	Vitamin C	0.03%
7	Organic matter	14.50%

A reagent, called the titrant, of a known concentration (a standard solution) and volume is used to react with a solution of the analyte or titrand, whose concentration is not known.

$[5e^- + 8H^+ + MnO_4 \longrightarrow Mn^{2+} + 4\ H_2O]\ \times 2$

$[\ C_2O_4^{2-} \longrightarrow 2CO_2 + 2e^-\ ]\ \times 5$

$16H^+ + 2MnO_4^- + 5C_2O_4^{2-} \longrightarrow 10\ CO_2 + Mn^{2+} + 8\ H_2O$

Using a calibrated burette or chemistry pipetting syringe to add the titrant, it is possible to determine the exact amount that has been consumed when the end point is reached. The end point is that point at which the titration is complete, as determined by an indicator. This is ideally the same volume as the equivalence point.

The volume added titrant at which the number of moles of titrant is equal to the number of moles of analyte, or some multiple thereof (as the polyprotic acid). In the classic strong acid – strong base titration, the end point of the titration is that point at which the pH of the reactant is just about equal to 7, an often when the solution takes on a persisting solid colour as is the pink of phenolphthalein indicator.

REQUIREMENTS :

1. Apparatus

- 100 ml measuring flask
- Pestle or mortar
- Beaker
- Burette
- Funnel
- Weighing Machine
- Filter Paper

2. Chemicals

- Dilute Sulphuric acid (H_2SO_4)
- (N/10) $KMnO_4$ solution

3. Guava fruit at different stage of ripening.

Chemical Equations

Molecular Equation

$$2KMnO_4 + 3H_2SO_4 \longrightarrow K_2SO_4 + 2MnSO_4 + 3H_2O + 5[O]$$

$$[HOOC\text{-}COOH.2H_2O + [O] \xrightarrow[60^\circ\text{-}70^\circ]{} 2CO_2 + 3H_2O\ ] \times 5$$

$$2KMnO_4 + 3H_2SO_4 + 5HOOC\text{-}COOH.2H_2O \longrightarrow K_2SO_4 + 2Mn_2SO_4 + 18H_2O + 10CO_2$$

.

Ionic Equation

$$[MnO_4^- + 8H^+ + 5e^- \longrightarrow Mn^{2+} + 4H_2O\ ] \times 2$$

$$[C_2O_4^{2-} \longrightarrow 2CO_2 + 2e^-\ ] \times 5$$

$$2MnO_4^- + 16H^+ + 5C_2O_4^{2-} \longrightarrow 2Mn^{2+} + 8H_2O + 10CO_2$$

Procedure:

1) Weigh 50gof fresh guava and crush it to a fine pulp using pestle and mortar.
2) Transfer the crushed pulp to a beaker and add some 50 ml dilute H_2SO_4 to it.
3) Boil the content for about 10 minutes. Cool it and filter the contant in a 100 ml measuring flask.
4) Made up the volume 100 ml by adding ample amount of distilled water.
5) Take 20 ml of solution from the flask and add 20 ml dilute sulphuric acid to it.
6) Heated the mixture to about 60˚C and titrated it against (N/10) $KMnO_4$ solution taken in a burette till the end point had an appearance of pink colour.
7) Repeat the above experiment with 50 gm of raw, semi-ripened (or 1 day old) and ripened (or 2-3 days old) guava fruits

Precautions

1) There should be no parallax while taking measurement.
2) Spillage of chemicals should be checked.
3) Avoid the use of burette having a rubber tap as $KMnO_4$ attracts rubber.
4) In order to get some idea about the temperature of the solution touch the flask with the back side of your hand. When it becomes unbearable to touch, the required temperature is reached.

5) Add about an equal volume of dilute H_2SO_4 to the guava extract to be titrated (say a full test tube) before adding $KMnO_4$ solution.

6) Read the upper meniscus while taking burette reading with $KMnO_4$ solution.

7) In case, on addition of $KMnO_4$ a brown precipitate appears, this shows that either H_2SO_4 has not been added in insufficient amount. In such case, throw away the solution and titrate again.

Observation

1) Weight of guava fruit for each time was 50g.
2) Volume of guava extract taken from each titration was 20 ml.
3) Normality of $KMnO_4$ solution was (1/10)
4) End point: colour changes to pink.

Raw	150	18	132	136.06
Semi-ripened	150	13	137	136.06
Ripened	150	10.8	139.2	136.06

Calculations

❖ For raw guava :

$N_1V_1 = N_2V_2$

⇨ $N_1 \times 10 = (1/10) \times 132$

⇨ 1/10 × normality of oxalate

= (x/100)

= strength in fresh

Guava extract = normality × Eq. mass of oxalate ion

= 1.32/100 × 44g / litre of diluted extract

= 0.581 gL^{-1}

❖ **For semi ripened guava (1 day old)**

Strength of oxalate in one day old guava extract

= (1.37/100) × 44g / litre of diluted extract

= 0.603 gL^{-1}

❖ **For ripened guava**

Strength of oxalate in guava extract

= (1.39/100) × 44g / litre of diluted extract

= 0.612 g L^{-1}

Result

1) **The normality of oxalate ions of :**
   - Fresh guava solution is = 1.32 ml
   - Semi ripened guava solution is = 1.37 ml
   - Ripened guava solution is = 1.39 ml
2) **The strength of oxalate ions of :**

- Fresh guava is = 0.58 ml
- Semi ripened guava is = 0.60 ml
- Ripened guava is = 0.61 ml

Conclusion :

The content of oxalate ions in guava was found to be 59.67 % which is close to the literate value of 60 %. It was also noticed that the content of oxalate ions grows with ripening of guava.

We also conclude that guava is an essential fruit plant which is rich in vitamins specially vitamin C, carbohydrates and since presence of 80 % of water in it, it keeps us hydrated.

BIBLIOGRAPHY:

i. www.google.com
ii. www.quora.com
iii. www.wikipedia.com
iv. Practical chemistry by Laxmi Publications