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ESTMATION OF OXALATE IONS IN SAPOTA, TOMATO, AND GUAVA IN DIFFERENT STAGES OF RIPENING

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ABSTRACT

The work aims to estimate the Oxalate ion in three fruits varies during different stages of ripening. Oxalate is the dianion with the formula C_2H4^{2-}. Many metal ions form insoluble precipitates with oxalate (eg) calcium oxalate, the primary constituent of the most common kind of kidney stones. In the present study the oxalate content was more in riped sapota than in guava and Tomato. This in turn will provide an advice to take medium riped fruits always balancing the taste of the fruit and physiological power of affecting the kidney by Oxalate content.

KEYWORDS: Oxalate ion, Kidneystone, Guava, Tomato, sapota

INTRODUCTION

1.1. Oxalate (IUPAC: Ethanediate)

Oxalate is the dianion with the formula $C_2H_4^{2-}$, also written $(coo)_2^{2-}$ Either name is often used for derivatives, such as salts of oxalic acid, for example sodium oxalate $Na_2C_2O_4$, or dimethyl oxalate $(CH_3)_2C_2O_4$. Oxalate also forms coordination compounds where it is sometimes abbreviated as oxalate.

Many metal ions form insoluble precipitates with oxalate, a prominent example being calcium oxalate, the primary constituent of the most common kind of kidney stones.

Occurance in nature:

Oxalate occurs in many plants, where it is synthesized by the incomplete oxidation of carbohydrate. The root or leaves of Rhubarb and buckwheat are high in oxalic acid. Other edible plants that contain significant concentrations of oxalate include in decreasing order, star fruit (carambola), black pepper, parsely, poppy seed, amaranth, spinach, chard, beets, cocoa, chocolate, most nuts, most berries, fishtail palms, New Zealand spinach (Tetragonia tetragonioides) and beans.

Leaves of tea plants (mellia sinensis) contain among the greatest measured

concentrations of oxalic acid relative to other plants.

Physiological effects:

In the body, oxalic acid combines with divalent metallic cations such as calcium (ca^{2+}) and iron (II) (Fe^{2+}) to form crystals of the corresponding oxalates which are then excreted in urine as minute crystals. These oxalates can form larger kidney stones that can obstruct the kidney tubules. An estimated 80% of kidney stones are formed from calcium oxalate. Those kidney disorders, gout, rheumatoid arthritis, or certain forms of chronic vulvar pain (vulvodynia) are typically advised to avoid foods in oxalic acid.

Oxalic acid can also be produced by the metabolism of ethylene glycol ("anti freeze"), glyoxalic acid or ascorbic acid (vitamin C).

Powdered oxalate is used as a pesticide in bee keeping to combact the bee mite.

Some fungi of the genus Aspergillus produce oxalic acid.

Health risk due to oxalate:

Although unusual consumption of oxalates (for example, the grazing of animals on oxalate containing plants such as Bassia hyssopifolia, or human consumption of wood sorrel) may result in kidney disease or even death due to oxalate poisoning.

MATERIALS AND METHODS

METHODS OF PREPARATION OF SOLUTIONS

Preparation of stock solution (0.05 N $KmnO_4$)

Preparation of oxalate solution

50 g of both sapota, tomato, and guava pulp were weighed separately and ground using mortar and pestle. The crushed pulp was transferred to a beaker and 50 ml of dil. H_2SO_4 was added to it. Then the contents were boiled for 10 minutes, cooled and the extract was filtered through a fine cloth. The residue was discarded and the filtrate was transferred into a 100 ml standard flask, 10 ml of this extract was pipette out into 100 ml standard measuring flask. It was washed repeatedly with distilled water and it was transferred into the same flask and made up to mark. The solution was shaken well for uniform mixing and labeled.

ESTIMATION OF FREE OXALATE IONS IN EXTRACT

Standardization of $KMnO_4$

20 ml of 0.05 N standard ferrous ammonium sulphate solution was pipette out into a clean conical flask. Equal volume of dil. H_2SO_4 was added and titrated the solution against $KMnO_4$ taken in the burette. End point is the appearance of permanent pale pink color. The titrations were repeated to get the concordant value. From the titre value, the strength of $KMnO_4$ is calculated.

Standardization of free oxalate ions in the extract

Previously cleaned and rinsed burette was filled with the standard potassium permanganate solution. 10ml of the extract

containing oxalate ion was pipette out into a clean conical flask. An equal volume of dilute sulphuric acid was added. The contents of the flask were heated to 70^0C and titrated against potassium permanganate taken in the burette. The appearance of permanent pale pink color indicates the end point. From the titre value strength and the amount of oxalate ions present in the whole of the solution was calculated.

The above experiment was repeated by taking 50 gram of the sapota, tomato, and guava at different stages of ripening (l e. after raw and ripe) each time, making 100 ml of the solution as explained above and titrating against the same normality of $KMnO_4$ solution.

RESULTS AND DISCUSSION

In this project, three types of fruits (Sapota, Tomato, and Guava) were taken to estimate the oxalate ions and how it amount varies during different stages of ripening. The three fruits are the rich source of oxalate. From the titre value, it should be noted that the increase in oxalate content was more in sapota than in guava and tomato.

CALCULATION

Weight of sapota taken =50 gm

Volume of sapota extract taken for titration = 10ml

Extract from sapota	Burette reading		Volume of $KMnO_4$ (ml)	Concordant value
	Initial	Final		
Raw Fruit	0	5.2	5.2	5.2
Ripe Fruit	0	7.2	7.2	7.2

Normality of the $KMnO_4$ solution used for titration = 0.1923 N

For raw sapota fruit

Amount of oxalate ions in 1000 g raw sapota extract

$$= N_{oxalate} \text{ X } 44 \text{ X } \frac{100}{1000} \text{ X } \frac{1000}{50} \text{ g/litre}$$

= 0.0529 x 44 x2

= 4.6552 g/litre

For fresh sapota fruit:

Amount of oxalate ions in 1000g of fresh sapota fruit

$$= N_{oxalate} \text{ X } 44 \text{ X } \frac{100}{1000} \text{ X } \frac{1000}{50} \text{ g/litre}$$

= 0.0733x 44 x2

= 6.4504 g/litre

Amount of oxalate ions in tomato fruits:

Volume of tomato extract taken for titration=10 ml

Weight of tomato fruit taken = 50g

Normality of the $KMnO_4$ solution used for titration = 0.1923 N

Extract from tomato	Burette reading		Volume of KMnO4 (ml)	Concordant value
	Initial	Final		
Raw fruit	0	2	2	2
Fresh fruit	0	3	3	3

For raw tomato fruit:

Amount of oxalate ions in 1000 g raw tomato extract

$$= N_{oxalate} \text{ X } 44 \text{ X } \frac{100}{1000} \text{ X } \frac{1000}{50} \text{ } g/litre$$

= 0.02038 x 44 x2

=1.7934 *g/litre*

For fresh tomato fruit

Amount of oxalate ions in 1000g fresh tomato extract

$$= N_{oxalate} \text{ X } 44 \text{ X } \frac{100}{1000} \text{ X } \frac{1000}{50} \text{ } g/litre$$

= 0.03057 x 44 x2

=2.6901

Amount of oxalate ions in guava fruit:

Volume of guava extract taken for titration =10 ml

Weight of guava fruit taken = 50g

Normality of the $KMno_4$ solution for titration = 0.1923 N

Extract from guava	Burette reading		Volume of $KMnO_4$ (ml)	Concordant vale
	Initial	Final		
Raw Fruit	0	4.7	4.7	4.7
Ripe Fruit	0	5.3	5.3	5.3

For Raw guava fruit:

Amount of oxalate ions in 1000g raw guava extract

$$= N_{oxalate} \times 44 \times \frac{100}{1000} \times \frac{1000}{50} \; g/litre$$

$$= 0.0478 \times 44 \times 2$$

$$= 4.2064 \; g/litre$$

For Fresh guava fruit:

Amount of oxalate ions in 1000g fresh guava extract

$$= N_{oxalate} \times 44 \times \frac{100}{1000} \times \frac{1000}{50} \; g/litre$$

$$= 0.1019 \times 44 \times 2$$

$$= 8.9672$$

CONCLUSION

It should be concluded that the increase in oxalate content was more in sapota than in guava and tomato. The presence of oxalate is injurious to health. The oxalate present in the riped fruits. But we should bear in mind the physiological power of oxalate in affecting the kidney based on the above facts, generally speaking and it is also advisable to take medium riped fruits (sapota, tomato, and guava) always balancing the taste of the fruit and physiological power of affecting the kidney by oxalate content.

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