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MEYCAUAYAN NATIONAL HIGH SCHOOL
Camalig, City of Meycauayan, Bulacan

**Cases in Phases: A Study in Vitamin C Content in
Different Stage of Ripeness**

A Research Presented to

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In Partial Fulfillment

of the Requirement for the Subject

Practical Research 2

Science, Technology, Engineering, and Mathematics (Darwin)

By

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INTRODUCTION

Rationale

About 61 million years ago, humans, along with other mammals, have lost the ability to produce ascorbic acid, although this evolution benefits humans back then. It poses harm to humans as vitamin C is commonly used in treating modern day illnesses. This study will focus on the sources of vitamin c for human consumption, fruits, and the stages of ripeness it is best to be consumed for efficient vitamin C intake and extraction.

Vitamin C has many important uses in the medical field making it an essential vitamin for humans. According to Taraj, Hasa, & Muca (2021), almost half of consumers increase the use of products with vitamin c to reduce the risks of being affected by seasonal viruses. According to Gonzales, Miranda-Massari, & Olalde (2023), vitamin c can be helpful in improving mitochondrial activity by reducing excessive ROS production, additionally, it reduces inflammation in some places such as the skeletal muscle. According to Xu et al. (2023), vitamin c is associated in reducing covid-19 mortality, as well as reducing death by sepsis. Kashiouris et al. (2020) emphasized on this by stating that, vitamin c deficiency is common amongst septic patients. These studies prove the importance of Vitamin C for human health.

A fruits Vitamin content changes as it ripens, this is found in other studies conducted in the past. According to Koffi et al. (2020), ripening significantly affects the quality and contents within Carica Papaya L. According to Moradinezhad et al. (2016), ascorbic acid in the Ziziphus Jujuba Mill. decreases from white to mature age, but significantly increases in the fully matured age. According to Phillips et al. (2021), there is a big jump in terms of sugar content of bananas from unripe to ripe and small to none from ripe to overripe, this suggests that researchers recognize the ripeness and level of maturity of a fruit. Valsikova-Frey, Komar, & Rehus (2017) concluded that Vitamin C gradually increases in the nine fruits that they have tested. These studies suggest that Vitamins, specifically Vitamin C contents of fruit changes as it ripens.

The importance of vitamin C in the human body urges the researchers to find the best ripening stage to consume Muntingia calabura linn. This study will benefit poeple who have nutrition concerns and needs, because if they have knowledge of the amount of nutrients present in each ripening stage, then they can maximize the extraction of the nutrients needed.

Statement of the Research Problem

This study aims to measure the vitamin C in different stages of ripeness of *Muntingia calabura* linn. This study also aims to determine the stage of ripeness of *Muntingia calabura* linn that has the most vitamin C content.

These statements will help in answering the research problem:

1. How much vitamin C are there in *Muntingia calabura* linn?
2. Does the amount of vitamin C change when *Muntingia calabura* linn?
3. How much of a change in the amount of vitamin C occurs when *Muntingia calabura* linn ripens?

Significance of the Study

This study will measure the amount of vitamin C in each stage of ripeness of *Muntingia calabura* linn (Aratiles). This study will improve the knowledge on the vitamin C content of *Muntingia calabura* linn in each of the stages of ripeness.

- **Future Researcher**

By conducting this research, this study will help the Future Researchers investigate the nutritional content of tropical fruit, especially in insufficiently utilized types like *Muntingia calabura* linn. By providing a foundation of information regarding to its vitamin C content, future studies can delve deeper into other nutritional aspects. This will serve as a related study for those who want to tackle the same study.

- **Nutritionist**

This study will help Nutritionist who aim knowing how much Vitamin C content in different fruits will allow them to offer more diverse options for their clients or patients. In areas where access to other fruits high in vitamin C may be restricted. Locally available options such as *Muntingia calabura* linn could be promoted as alternatives.

- **Parents**

Delving into this study will help the parents to be more informed about nutritional benefits of fruits that are readily accessible in their areas. This study might convince the parents to add the *Muntingia calabura* linn on their family's diet as an affordable, easily accessible, and nutritious option.

Scope and Delimitation

This study will only assess the fruit of *Muntingia calabura* linn and not its leaves or flowers. This study will only measure vitamin C of *Muntingia calabura* linn and not any other vitamins or minerals. This study also covers the different stages of ripeness of *Muntingia calabura* linn, the researchers will measure the vitamin C of unripe, ripe, and overripe *Muntingia calabura* linn. In this study, the researchers will be experimenting to determine the amount of vitamin C in *Muntingia calabura* linn but will be only using Betadine Test, this is done to be precise with the results as supposed to having multiple methods with varying accuracy.

METHODOLOGY

Research Design

This study utilized an Experimental Research Design, this design fits the goals of the researchers in proving the significance of ripeness to the amount of vitamin C *Muntingia calabura* linn (*M. calabura* linn) contains. In this study the researchers will conduct experiments to formulate findings. This research design is in line with the researcher's goal because by conducting experiments the researchers will be able to get results that are appropriate for what the study wants to prove.

Population and Sample (Subject/Materials)

This study will use Betadine Test in gathering the data. This test determines whether Vitamin C is present within *M. calabura* linn. The equipment/materials required for this test are the following:

1. Medicine Dropper
2. Medicine Cup
3. Glass Cup
4. Bowl
5. Spoon

Data Collection (Experimentation)

Betadine Test is an experiment used to find presence of Vitamin C. This experiment works by reducing the Iodine present in Povidone Iodine. Iodine is an oxidizing agent while vitamin C is a reducing agent, when vitamin C reacts with Iodine it reduces the Iodine into Iodide ions, this is a colorless solution hence turning the reddish brown Povidone Iodine into a colorless liquid. In this study, the researchers will extract juices from *M. calabura linn* and mix it with water, Povidone Iodine will then be dropped to the solution and the researchers will gather data by how much Povidone Iodine is dropped in the solution.

Data Analysis

In processing the data gathered in the experimentation the researchers will use ANOVA or Analysis of Variance method. This method of analyzing the data is good for looking for differences between groups which is exactly what this study aims to do. By using ANOVA, the researchers will be able to determine whether the ripeness of *M. calabura linn* affects the amount of vitamin C it contains.

Ethical Considerations

In conducting this study, the researchers will make sure to follow the ethical standards of research project. With this in mind, the researchers will not begin experimentation unless permitted by their research instructor to begin the experiment. The researchers will also not use the science laboratory and its equipment and materials unless permitted by the laboratory coordinator.

To ensure safety, the researchers will make sure to wear Personal Protective Equipment (PPE) such as gloves, goggles, and lab coats when coming into contact with possibly harmful chemicals if there are some. The researchers will also study the experiment thoroughly before conducting them to avoid misstep during the procedure, this will make sure that the researchers will not in any way be harmed because of the experiment.

This study will use fruits, specifically *Muntingia calabura linn* (*M. calabura linn*) for experimentation. To reduce environmental harm, the researchers will make sure to pick just the right amount of *M. calabura linn* and not disrupt the balance of the local ecosystem. The waste produced in this experiment will also be handled carefully and will not be disposed of in the environment. Aside from these things, the researchers will take the extra step in cleaning the site in which the experiment took place, this is done to reduce risks of environmental contamination if there is any.

RESULTS

After conducting the experiment, the researchers found vitamin c in Muntingia Calabura Linn, both unripe, ripe and overripe. The researchers also observed difference in the amount of Vitamin C present in each stage of ripeness. These results are present in table 1

Table 1. The amount of Vitamin C each stage of ripeness of Muntingia calabura linn contains

	Rough Test	Test 1	Test 2	Test 3	Mean
Unripe	4600 mg	4200 mg	4360 mg	4300 mg	4286.67 mg
Ripe	8400 mg	8120 mg	8060 mg	8140 mg	8106.67 mg
Overripe	8600 mg	8380 mg	8360 mg	8320 mg	8353.33 mg

The highest record of vitamin C (8380 mg per 100g) was found in the first test of overripe M. calabura linn, while the lowest (4200 mg per 100g) was found in the first test of unripe fruit. The most vitamin C content was seen in overripe fruit (8353.33 mg per 100g) while ripe fruit (8106.67 mg per 100g) is not far behind. The least amount of vitamin C was found in unripe Muntingia Calabura Linn (4286.67 mg per 100g). These results establish and supports the facts that there is Vitamin C present in Muntingia Calabura Linn and indicates that the amount of Vitamin C in Muntingia Calabura Linn increases as it ripens.

These results are then analyzed using ANOVA or Analysis of Variance. Though this analysis the researchers will be able to make conclusions on whether fruit ripeness plays a significant role in the amount of vitamin C present in M. calabura linn. The table below helps determine the F ratio of the analysis, this ratio will help in identifying whether ripeness has a significant effect on the amount of vitamin C present in M. calabura linn.

Table 2. Analysis of Variance table

Source	SS	df	MS	F
Between Treatments	31,191,021.6	2	15,595,510.8	5,085.4
Within Treatments	18,400.4	6	3,066.73	
Total	31,209,422	8		

It is stated in table 2 that the ratio of variance (F ratio) is 5,085.4, which in comparison to the F ratio that you can see in available F-tables is bigger. Using these values, the researchers identify that ripeness has a significant effect in the amount of vitamin C present in M. calabura linn.

DISCUSSION

Conclusion

In summary the researchers found vitamin C in *M. calabura* linn and are able to determine that the ripeness of *M. calabura* linn is significant in terms of its vitamin C content. However, the results in this study are different from other studies conducted in the past. In a study conducted by Tamilselvi (2020), a sample of *Muntingia calabura* linn contained 171.36 mg/100g of vitamin C. Another study that had a different outcome of vitamin C content was conducted by Muslimin et al. (2019), where *Muntingia calabura* linn only had 0.11% of vitamin C per 100g or about 110 mg of vitamin C per 100g.

Recommendation

To better improve the outcomes of future studies, the researchers have thought of some recommendations. These recommendations are based on the experiences of the researchers in conducting this study Recommendations:

- Using Better equipment for experimentation (e.g. Burette, Beakers, Flask, etc.)
- Testing it through different methods, The researchers who conducted this study used a betadine test instead of standard titration tests.
- Check the quality of the fruits. The subject in this study is a fruit that was handpicked in the local area, having to use high-quality fruits in the recreation of the study would be a better choice.
- Try different fruits aside from This study's species and family line.
- Take notice of the storing of Subjects as it is biodegradable and might produce Unrealistic results when used.

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APPENDICES





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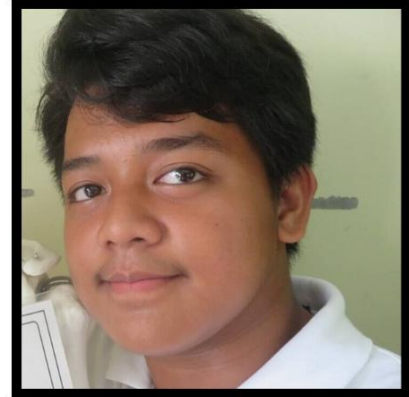
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