

**STUDENT STUDY PROJECT WORK**  
**DETERMINATION OF VITAMIN C IN VARIOUS FRUITS AND**  
**VEGETABLES**  
**AND**  
**THE ROLE OF VITAMIN C IN COVID- 19**

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### CERTIFICATE

Certified that the student study project work entitled “**DETERMINATION OF VITAMIN C IN VARIOUS FRUITS AND VEGETABLES AND THE ROLE OF VITAMIN C IN COVID- 19**” submitted by **P. Srikanth , P. Laurakesha, K. Praveen, K. Yogi, Ch Sai, J. Rajesh, Hemanth Reddy , D. Naresh, S. Saikrishna, G. Vashishta** is an authentic record of project work carried out at Department Chemistry, Kakatiya Government college, Hanamakonda, under the supervision of **Dr. Ravula Mogili** in the Department of Chemistry, Kakatiya Government College Hanamkonda.

Signature of Supervisor

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## **TITLE OF THE PROJECT**

### **DETERMINATION OF VITAMIN C IN VARIOUS FRUITS AND VEGETABLES AND THE ROLE OF VITAMIN C IN COVID-19**

#### **STATEMENT OF THE PROBLEM**

- The rampage of the deadly corona virus is aggressively increasing day by day on the several corners of the planet.
- The outbreak of corona virus infectious disease-2019 (COVID-19) is globally deemed a significant threat to human life. [1]
- The only way to stay away from the harmful effects of covid-19 is to prepare our body to fight it .
- Strengthening the immune system and keeping our body healthy always is the only option to fight against this disease. [2]
- Lack of information about the recommended daily consumption of vitamin C
- Lack of awareness of strengthening immune system through the available fruits and vegetables.

## **AIM**

DETERMINATION OF VITAMIN C IN VARIOUS FRUITS AND VEGETABLES AND THE ROLE OF VITAMIN C IN COVID-19



## **OBJECTIVES**

- To determine the Vitamin C in fresh fruits.
- To determine the Vitamin C in fresh vegetables.
- To determine the Vitamin C in stored juices

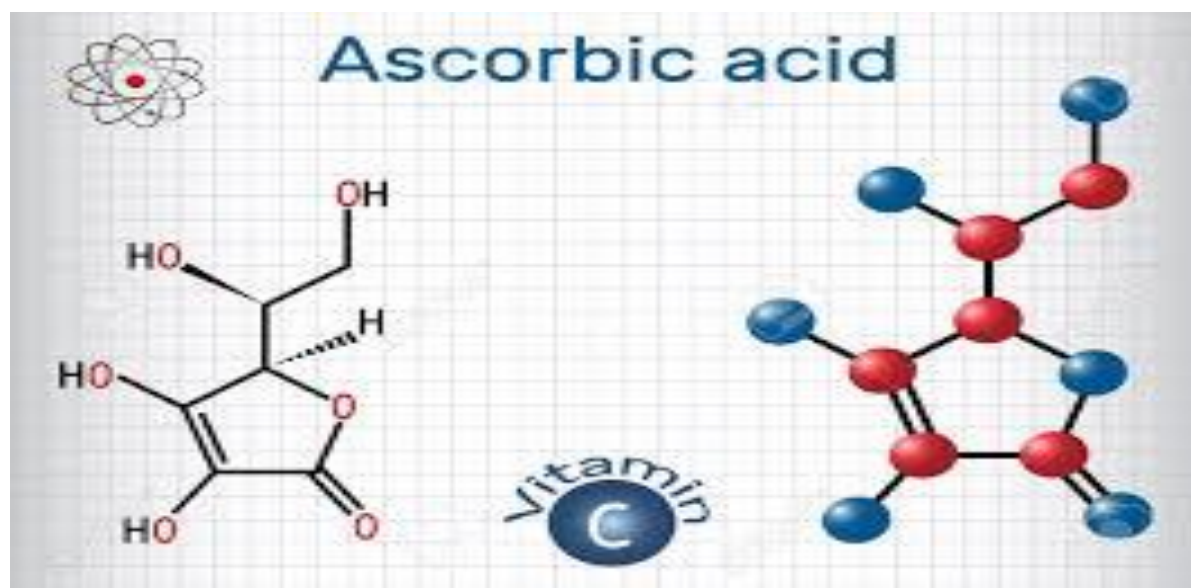
- Role of Vitamin C in Covid 19.

## REVIEW OF LITERATURE

### VITAMIN C

- Vitamin C was discovered in 1912.
- It was the first vitamin to be chemically produced
- The scientific name of vitamin C is Ascorbic acid
- The molecular formula is  $C_6H_8O_6$
- It is a water-soluble vitamin and anti-oxidant compound that is generally obtained from fruits and vegetables.
- It is sold as dietary supplement.
- It is on the World Health Organisations list of Essential medicines.
- Scurvy is a disease resulting from the deficiency of vitamin C

### STRUCTURE OF VITAMIN C



## SOURCES OF VITAMIN C

- It is found in many biological systems , foodstuffs, fresh vegetables and fruits<sup>[3]</sup>
- Ascorbic acid occurs in living tissues, fresh fruits such as citrus fruits, straw-berries, melons, vegetables, dairy products and meat.
- Ascorbic acid is locally available in the fruits like guava, lemons, orange, blue grapes, and apple.

### Primary natural sources of vitamin C

#### Animal products



Liver | Dairy products & Milk

#### Plant products



Citrus Fruits | Tomatoes | Green leafy vegetables

## IMPORTANCE OF VITAMIN C

- Ascorbic acid plays an important role in collagen biosynthesis, iron absorption, immune response and activation. [4]
- Normally Vitamin C can cope up with high dose in the body, as it is a water soluble Vitamin.
- It mainly involves in wound healing and osteogenesis.
- It is necessary for the formation of intercellular substances that bind cells in tissues such as capillaries, bones and teeth. [5]
- It is an important and powerful anti-oxidant in biological system which fights against free-radical induced diseases.
- Vitamin C is a strong anti-oxidant that can boost our blood anti-oxidant level by 30%. It even reduces some cancer related disorders and reduces the risk of chronic heart diseases. [6]
- Vitamin C can improve the brain function.
- Vitamin C helps in reduction of cardio vascular diseases.
- As per the study of NIH (National Library of Medicine) there are limited proven therapies for COVID-19. Vitamin C's antioxidant, anti-inflammatory and immunomodulating effects make it a potential therapeutic candidate, both for the prevention and amelioration of COVID-19 infection, and as an adjunctive therapy in the critical care of COVID-19. [7]
- According to [clinicaltrials.gov](https://clinicaltrials.gov) there are 50 completed or ongoing covid 19 clinical trials including vitamin C as a treatment.



## **ROLE OF VITAMIN C IN COVID -19**

- Vitamin C has lately being of interest to researchers in fights against the covid-19 pandemic, large dose of intravenous Vitamin C are being tried in covid-19 critical patients on ventilators in some of the countries. [8]
- Vitamin C shortened infections caused by respiratory viruses in adults by 8%, and in children by 18%
- Vitamin C is known to prevent the cold diseases, lowers blood pressure and cholesterol levels and enhances the human immune system.
- According to Chennai based nephrologist Dr. Rajan Ravi Chandran, has cautioned for Consumption of Vitamin C which enhances the immune system during the covid 19 pandemic situation.
- United states are planning to include Vitamin C along with Vitamin D, Zinc, and hydroxy chloroquine for covid 19 Prevention. [9]

## **How does Vitamin C work in covid-19 ?**

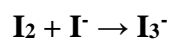
- With COVID-19, we know that the main reason for the extensive lung injury is the excessive free radicals and oxidative stress mounted by the dysfunctional immune system in an effort to kill the virus, but end up harming the patient instead.
- Vitamin C, a water soluble powerful anti-oxidant, can neutralize these free radicals and reduce oxidative damage to the lungs.
- When the balance between oxidants and anti-oxidants is lost, that's when the damage happens and patients progress to severe disease.
- By administering adequate Vitamin C, we can increase the anti-oxidant status of our body.

## RESEARCH METHODOLOGY

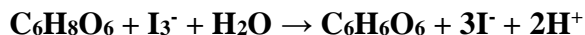
### IODOMETRIC TITRATION

#### PRINCIPLE

- Iodine is relatively insoluble, but this can be improved by complexing the iodine with iodide to form triiodide:



- Triiodide oxidizes vitamin C to form dehydroascorbic acid:



- As long as Vitamin C is present in the solution, the triiodide is converted to the iodide very quickly.
- When all the Vitamin C is oxidized, iodine and triiodide will be present, which react with starch to form a blue-black complex.
- The blue-black color is the endpoint of the titration.

#### APPARATUS

1. Beakers
2. Measuring cylinders
3. Burette
4. Dropper
5. Pipette
6. Blender
7. Burette stand
8. Standard flask
9. Erlenmeyer flask
10. Test tubes
11. Filter paper

## **CHEMICALS REQUIRED**

1. Potassium Iodide
2. Iodine
3. Starch
4. Distilled water
5. Fruits
6. Vegetables

## **PREPARATION OF THE SOLUTIONS**

### **Preparation of 0.005 M Iodine solution**

- 1 gm of Potassium iodide (KI) and 0.65 grams of Iodine (I<sub>2</sub>) were accurately weighed and then slowly dissolved in distilled water.
- The iodine solution was transferred into a 500 ml volumetric flask and the volume was completed up to the mark.
- Finally, the iodine solution was standardized with a solution of ascorbic acid.

### **Sample preparation**

- Vegetables and Fruits are washed with distilled water and wiped with filter paper.
- 100 grams of each sample was cut into small pieces blended together with 50 ml of distilled water using an electric blender and then filtered.
- The filtrate was transferred into 500 ml volumetric flask and the flask was filled up to the mark with distilled water.

## Calculation

This calculation for 100ml Vegetable or Fruit extract from 100gm of Vegetable or Fruit.

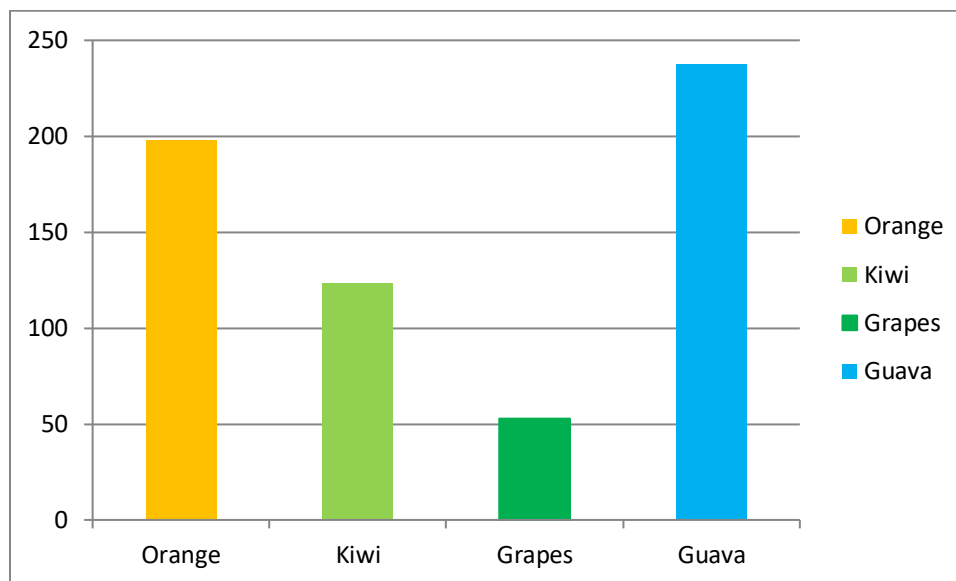
Conc. of ascorbic acid(Vit-C) = Conc. of Iodine solution X Required volume of Iodine(B.R)/20

Amount of Ascorbic acid = Conc. of ascorbic acid(Vit-C) X Molecular weight (176)

## OBSERVATIONS

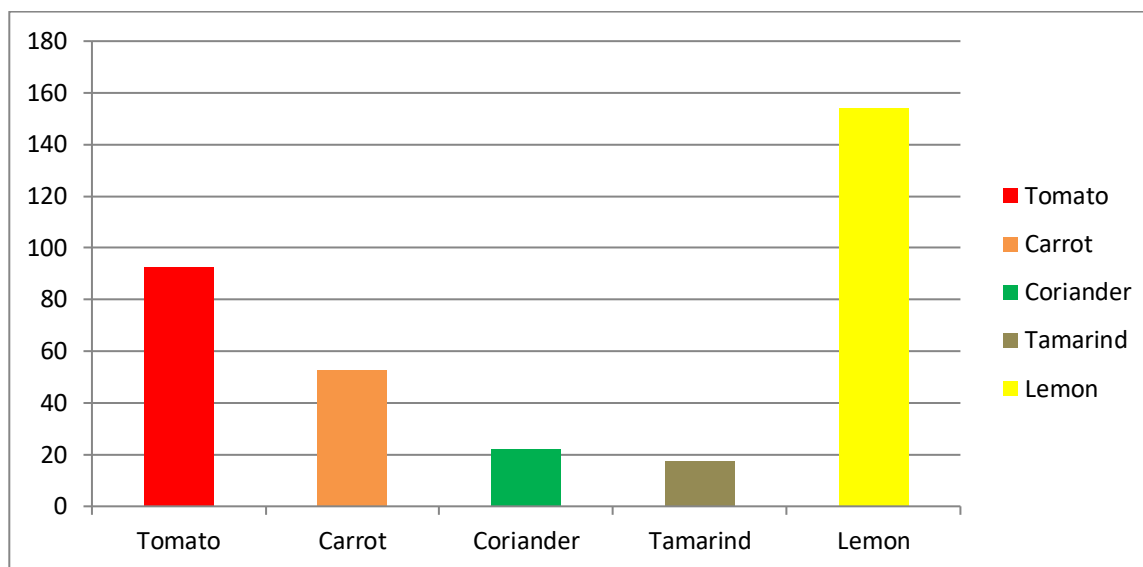
### VITAMIN C IN FRUITS

S.No	NAME OF THE SAMPLE	VOLUME OF THE SAMPLE(ml)	BURETTE READING (ml)		VOLUME OF THE IODINE SOLUTION(ml)	WEIGHT (mg)
			INITIAL	FINAL		
1	Orange	20	0	4.5	4.5	198
2	Kiwi	20	0	2.8	2.8	123.2
3	Grapes	20	0	1.2	1.2	52.8
4	Guava	20	0	5.4	5.4	237.6



## VITAMIN C IN VEGETABLES

S.No	NAME OF THE SAMPLE	VOLUME OF THE SAMPLE (ml)	BURETTE READING (ml)		VOLUME OF THE IODINE SOLUTION (ml)	WEIGHT (mg)
			INITIAL	FINAL		
1	Tomato	20	0	2.1	2.1	92.4
2	Carrot	20	0	1.2	1.2	52.8
3	Coriander	20	0	0.5	0.5	22
4	Tamarind	20	0	0.4	0.4	17.6
5	lemon	20	0	3.5	3.5	154



## **ANALYSIS OF DATA**

- For Analysis of fruit Guava is found to be richest in vitamin C content of 237.6 mg
- Green grapes is found to be lowest in vitamin C content that is 52.8 mg
- For Analysis of vegetable lemon is found to be richest in vitamin C content of 154 mg
- Tamarind is found to be lowest in vitamin C content that is 17.6 mg

## **CONCLUSION**

- Volumetric titration method was applied for determination of vitamin C in various fruits and vegetables.
- Results shown that a considerable variation in vitamin C in these fruits and vegetables were observed.
- Guava is found to be the richest source of vitamin C in fruits.
- Green pepper (grown in sunlight) is found to be the richest source of Vitamin C in vegetables.
- Green pepper (grown in shade) is found to have lowest vitamin C content.
- These findings may serve as the good guide on selection of a particular fruit or vegetable for the daily requirement of vitamin C.

## **SUGGESTIONS**

- Supplementation of vitamin C has been suggested as part of the supportive management of covid-19.
- Vitamin C reduce infections caused by respiratory viruses which indicates that the vitamin C can also influence viral infections in humans.
- Vitamin C shortened infections caused by respiratory viruses in adults by 8%, and in children by 18%
- Vitamin C is known to prevent the cold diseases, lowers blood pressure and cholesterol levels and enhances the human immune system.
- As Vitamin C is water soluble, it is not stored in the body and requires daily intake.
- So fresh fruits and vegetables are rich in vitamin C and are often preferred choice for better bio-availability.
- In some people oxalate may get deposited in the kidneys, so the daily intake of vitamin C is suggested.
- Many diseases can be prevented with the amount of about 100 mg of vitamin C taken per day. [10]
- 90 milligrams (mg) for males.
- 75 mg for females.
- 85 mg for pregnant women.
- 120 mg for breastfeeding women.
- An additional 35 mg for people who smoke.[11]
- 18 grams for cancer patients. [12]

## GALLERY







## REFERENCES

1. Harri Hemilä ,b Gropper SS, Smith JL, Grodd JL (2005). Front. Med., 18 January 2021 | <https://doi.org/10.3389/fmed.2020.559811> .
2. Yizhou Ye, Jing Li, Zhongxiang Yuan , \*Adrian V. Hernandez, PLoS One. 2013; 8(2): e56803. doi: 10.1371/journal.pone.0056803
3. Levine M, Dhariwal KR, Wang Y, Park JB. Am J Clin Nut 1995;62:S1347S-56. DOI: 10.1016/j.clinbiochem.2005.11.011
4. Dioha IJ, Olugbemi O, Onuegbu TU, Shahru Z. Int J Biol Chem Sci 2011;5(5):2180-84.
5. Parkin J., Cohen B. An overview of the immune system. Lancet. 2001;357:1777–1789. doi: 10.1016/S0140-6736(00)04904-7.
6. Jing Zhang Xin Rao Yiming Li , Yuan Zhu Fang Liu Guangling Guo , Guoshi Luo , Zhongji Meng , Daniel De Backer , Hui Xiang , Zhiyong Peng Ann Intensive Care. 2021 Jan 9;11(1):5. doi: 10.1186/s13613-020-00792-3
7. Anitra C Carr , Juliet M Pullar<sup>2</sup>, Stephanie M Bozonet <sup>3</sup>, Margreet C M Vissers Nutrients. 2016 Jun 3;8(6):341. doi: 10.3390/nu8060341.
8. Muhammad I, Ashiru S, Ibrahim D. I, Kanoma AI, Sani I, Garba S. Int J Agric Forestry and Fisheries 2014;2(3):60-5.
9. Weber P, Bendich A, Schalch W. Int J Vitam Nutr Res 1996;66:19-30.
10. Guo-Chong Chen 1, Da-Bing Lu, Zhi Pang, Qing-Fang Liu " J Am Heart Assoc 2013 Nov 27;2(6):e000329.doi: 10.1161/JAHA.113.000329.
11. EFSA Panel on Dietetic Products, Nutrition and Allergies (2015). DOI:<https://doi.org/10.2903/j.efsa.2015.4298>
12. Fenech M, Amaya I, Valpuesta V, Botella MA. Front Plant Sci 2019;9:2006. Elhefian et al., 2019.