

ORIGINAL ARTICLE

## A Comparative Study On The Ascorbic Acid Content Of Several Fruits

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**ABSTRACT:**

The aim of this study is to compare the ascorbic acid content in several fruits which are collected from the local market of Virudhunagar. Ascorbic acid content was determined for eleven fruits such as (Watermelon (*Citrullus lanatus*), Strawberry (*Fragaria ananassa*), Kiwi (*Actinidia deliciosa*), Lemon (*Citrus limon*), Gooseberry(*Phyllanthus emblica*), Gauva (*Psidium guajava*), Pomegranate(*Punica granatum*), Orange(*Citrus aurantium var. sinensis*), Grape (*Citrus paradisi*), Pineapple (*Ananas comosus*) and sapota (*Manilkara zapota* ). Determination of ascorbic acid was carried out by dye titration (Volumetric) method. After comparison between the results obtained in different fruits of our study, the fruit juice of Amala, Guava, and Kiwi show maximum content of vitamin C and Lemon, Orange, and Strawberry with a minimum content of vitamin C. In our projects, Vitamin C is very high in very low-cost fruits like Gooseberry, lemon, Guava, Sapato, grapes, watermelon, etc. So, it is easy to buy people and protect themselves from scurvy. Finally, we concluded that we have to eat fruits fresh and raw to get more Vitamin C.

**INTRODUCTION:**

Ascorbic Acid could be a natural vitamin (Vitamin C). Ascorbic acid remains a potent reducing and antioxidant agent that functions against bacterial infections, in detoxifying reactions, and in the formation of collagen in fibrous tissue, teeth, bones, connective tissue, skin, and capillaries. It is an essential nutrient in many multicellular organisms, esp., in humans. It is found in citrus and other fruits, and in vegetables, vitamin C cannot be produced or stored by humans and it must be obtained through diet. It has a role as a coenzyme, a flour treatment agent, a food antioxidant, a plant metabolite, a cofactor, and a skin-lightening agent.<sup>[1]</sup> Vitamin C works as an antioxidant to protect your cells against free radicals, which may play a role in heart disease, cancer and other diseases.<sup>[2]</sup> Vitamin C is a water-soluble vitamin that can be found in fresh vegetables and fruits, namely, citrus. Ascorbic acid plays an important role in collagen biosynthesis, iron absorption, and immune response activation and is involved in wound healing and osteogenesis.<sup>[3]</sup> It also acts as a powerful antioxidant that fights against free-radical induced diseases.<sup>[4-8]</sup> Deficiency of Vitamin C causes Scurvy's well-known connective tissue feebleness and capillary brittleness. Nevertheless, an ascorbic acid surplus can lead to gastric irritation and the metabolic product of vitamin C (oxalic acid) can cause renal problems. In some cases, too many quantities of ascorbic acid may result in the inhibition of natural processes occurring in food and can contribute to taste fading.<sup>[9]</sup> Ascorbic acid is a labile substance because it is easily degraded by enzymes and atmospheric oxygen. Its oxidation is often enhanced by excessive heat, light, and heavy metal cations that are why the ascorbic acid content of foodstuffs and beverages represents a relevant indicator of quality that has to be carefully monitored, regarding its variation during manufacturing and storage.<sup>[10]</sup> Vitamin C supplements are available alone and together with other vitamins. Vitamin C tablets may cause side effects are diarrhea, nausea, heartburn, fatigue, flushing, headache, difficulty falling asleep or staying asleep, and gas. Taking vitamin C orally

(in tablet form) or injecting it as a dose prevents and treats Scurvy. Vitamin C helps to treat anemia in people undergoing dialysis. It prevents irregular heartbeat after and before heart surgery. Taking vitamin C by mouth might reduce LDL cholesterol in people with high cholesterol. It also prevents lower systolic blood pressure. People most in danger of ascorbic acid deficiency are those with a limited variety of food in their diet, or who have intestinal malabsorption problems from cancer or a renal disorder. Ascorbic acid is also used to prevent and treat scurvy (a disease that causes fatigue, gum swelling, joint pain, and poor wound healing from a scarcity of vitamin C). This paper was to investigate the amount of ascorbic acid present in the different fruits using the classical (conventional) method by volumetric methods-titration with an oxidant solution of dichlorophenol indophenol (DCPIP), taking into account that the reported data in the literature regarding the determination of ascorbic acid by this method in this fruits are very scarce.

### Materials and methods:

Eleven varieties of fruits (Watermelon (*Citrullus lanatus*), Strawberry (*Fragaria ananassa*), Kiwi (*Actinidia deliciosa*), Lemon (*Citrus limon*), Gooseberry (*Phyllanthus emblica*), Guava (*Psidium guajava*), Pomegranate (*Punica granatum*), Orange (*Citrus aurantium var. sinensis*), Grape (*Citrus paradisi*), Pineapple (*Ananas comosus*) and sapota (*Manilkara zapota*) were collected from a local fruit stall, Virudhunagar and were squeezed to extract the juice and then filtered through Muslin cloth.

### Estimation of Ascorbic Acid by volumetric method:

#### Principle

Ascorbic acid reduces the 2, 6-dichlorophenol indophenol dye to a colorless leuco-base. The ascorbic acid gets oxidized to dehydroascorbic acid. Though the dye is a blue coloured compound, the endpoint is the appearance of pink colour. The dye is pink colour in an acidic medium. Oxalic acid is used as the titrating medium.

#### Materials

1. Oxalic Acid (4%)
2. Dye Solution: 42mg of sodium bicarbonate was weighed and dissolved in a small volume of distilled water. 52mg 2,6-dichlorophenol indophenol was dissolved into it and made up to 200ml with distilled water.
3. Stock Standard Solution: 100mg of ascorbic acid was dissolved in 100ml of 4% oxalic acid solution in a standard flask (1mg/ml).
4. Working Standard: 10ml of stock solution was diluted to 100ml with 4% oxalic acid. The concentration of the working standard is 100ug/ml

#### Methodology

5ml of the working standard solution was pipetted out into 100ml of the conical flask. Then 10 ml of 4% oxalic acid was added to it and titrated against the dye ( $V_1$ ml). The appearance of pink color which persists for a few minutes is an endpoint. The consumption of

dye is equivalent to the amount of ascorbic acid. The sample (5g sample) was extracted in 4% oxalic acid and made up to a known volume (100ml) and centrifuge. 5ml of this supernatant was pipetted out in a conical flask and 10ml of 4% oxalic acid was added to it. The solution and dye were titrated ( $V_2$  ml).

### Calculations

$$\text{Amount of ascorbic acid mg/100ml sample} = \frac{0.5\text{mg} \times V_2\text{ml} \times 100\text{ml} \times 100}{V_1\text{ml} \times 5\text{ml} \times \text{Wt. of the sample}}$$

### Results and discussion:

Vitamin C plays a key role in bodybuilding development and in ailment prevention. The various functions of vitamin C include the antioxidant activity, formation of protein, tendon ligaments, and blood vessels for curing injuries and forming scar tissue for restoring and protecting cartilage, bone, and teeth and helping in the absorption of iron. To determine the amount of vitamin C in several fruits using the titrimetric method, we have chosen 11 different fruits. The fruits such as watermelon, Strawberry, Kiwi, Lemon, Sapota, Gooseberry, Guava, Pomegranate, Orange, Grape, and Pineapple. The amount of vitamin C present in order as Gooseberry > Kiwi > Orange > Lemon > Sapota > > Guava > Papaya > Grape > Pineapple > watermelon > Strawberry.

**Table 1: Quantity of fruit juice in each fruits according to their weights**

Name of the Fruit	Weight (g)	Juice (ml)	Juice (ml)/g
Orange	161.8	60	0.37
Grape	40.0	12	0.3
Pomegranate	150.2	40	0.27
Pineapple	140.0	35	0.25
Gooseberry	30.8	23	0.75
Guava	154.7	60	0.39
Watermelon	156.5	73	0.47
Strawberry	11.5	5	0.43
Kiwi	79.4	44	0.55
Lemon	35.7	23	0.64
Sapota	45.3	27	0.60

The vegetables which have high vitamin c in broccoli (81mg), pineapple chunks (78.9 mg), and potato (72.7mg) in a cup of raw. But fruits in a cup of raw like guava have 377mg and orange juices have 124mg.<sup>[12]</sup> Vitamin C is very high in Broccoli, Bell peppers, etc., but nowadays it is very costly in the markets. In our projects, Vitamin C is very high in very low-cost fruits like lemon, Guava, Gooseberry, grapes, watermelon etc. So, it is easy to buy people and protect themselves from scurvy. The amount of juice in one fruit or one piece was calculated and tabulated in Table 1 and Figure 1. The weight of one fruit size is 11.5g, 30.8g, 35.7g, 45.3 g, 79.4g, 150.2g, 154.7g and 161.8g of strawberry, Gooseberry, lemon, sapota, kiwi, pomegranate, Guava, and Orange respectively. A piece of fruit weight is Pineapple (140g), Watermelon (156.5g), and Grapes approximately 8 fruits (40g). We squeezed or crushed the fruits to get the juices. A juice ranges from 0.25-0.75ml from 1 gram of each fruits. The amount of ascorbic acid present in the several fruits was tabulated in table 2. Vitamin C content was found maximum in amala (200mg/100g) and minimum in grapes (6mg/100g). After comparison between the results obtained in different fruits, the fruit juice of Amala, Guava, Kiwi, Lemon, Orange show a maximum content of vitamin C and Strawberry, grapes, pomegranate with a minimum content of vitamin C. Our results merely coincide with Khude Varsha Sanjay, 2020.<sup>[13]</sup> Only Compare with citrus fruits, orange has more vitamin C than Lemon. These results match with Nishanta Shrestha *et al.*, 2016.<sup>[14]</sup> When comparing the results between fresh, frozen, and cooked materials, the fresh juice will have the maximum content of vitamin C. Gilani *et al.*, 2017,<sup>[15]</sup> showed that the storage of fruits and vegetables in refrigerator increases their phenolic acids but decreases the total phenolics, Anthocyanins and vitamin C with subsequent loss of their antioxidant capacity. Nour *et al.* 2010 reported that the average ascorbic acid was the highest in lemon juice followed by sweet orange juice and grapefruit.<sup>[16]</sup> But in the current investigated results, among the citrus fruits the average ascorbic acid was found to be highest in orange juice followed by, sweet orange, lemon, and grapefruit. This difference might be the intention that the ascorbic acid content of fruits is certainly not stable but differs with some influences are position of the tree, climatic/environmental conditions, ripening stage, species and variety of the fruits as well as temperature.<sup>[17]</sup> The ascorbic acid content of freshly prepared lemon juice is 48.61 mg/100 ml.<sup>[18]</sup> On the other hand, there are significant disparities between the ascorbic acid values found in the current study and those found in numerous other studies for specific fruit juice samples. This could be due to changes in fruit varieties and maturation stage. Different techniques of measuring and squeezing processes may also affect the ascorbic acid content of fruit juices. The amount of ascorbic acid could even vary between the different fruit samples of the same species may be due to different factors including climate, temperature, amount of nitrogen fertilizers used in growing the plant and various physical conditions such as light can also affect the concentration of ascorbic acid in fruits.<sup>[19-21]</sup>



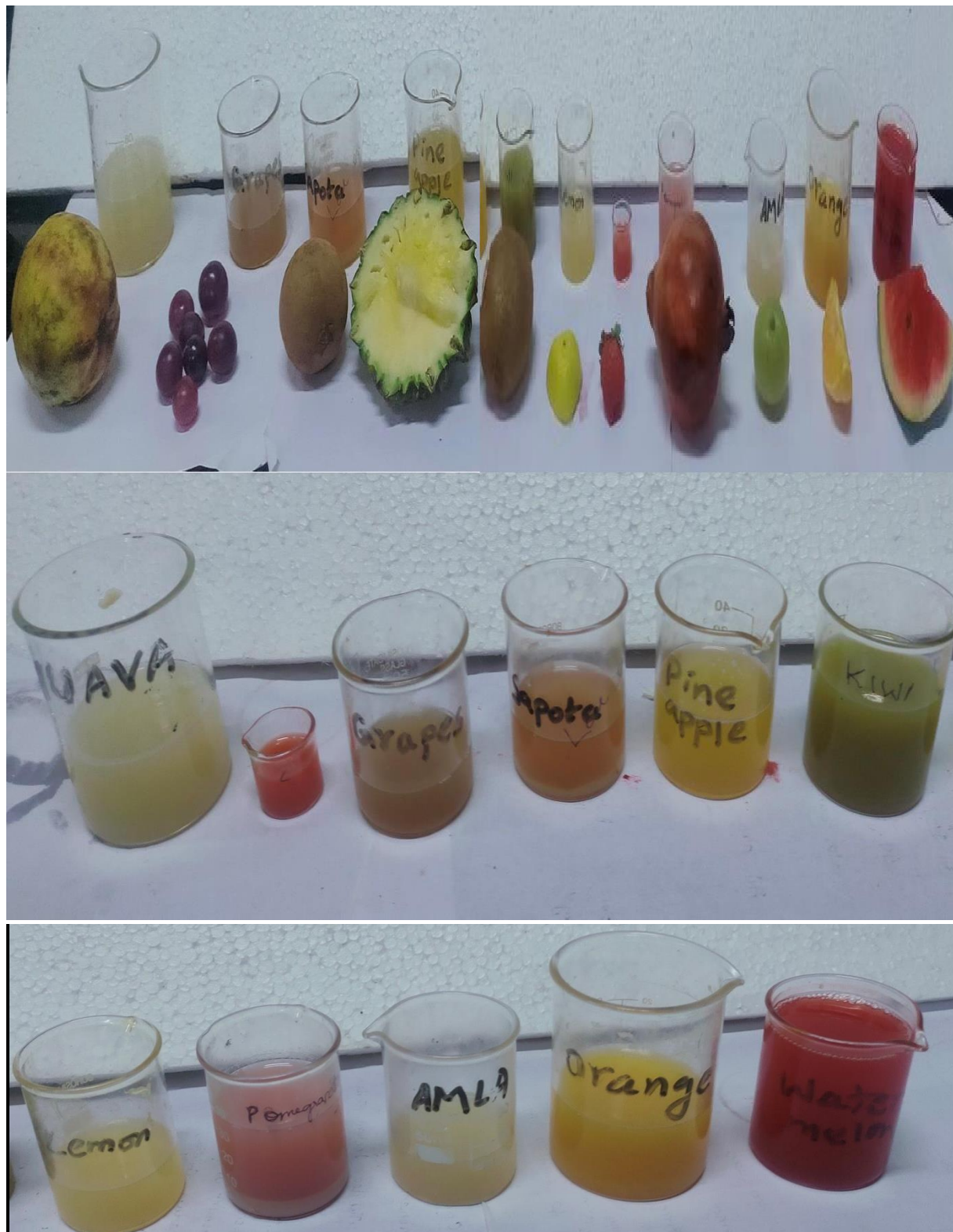


Figure 1: Several fruits and its juices used for the determination of ascorbic acid content

**Table 2: Determination of ascorbic acid content in each fruits used in this study.**

Name of the Fruit	Amount of ascorbic acid in mg /100g
Orange	60
Grape	6
Pomegranate	10.2
Pineapple	40.2
Gooseberry	200
Guava	80
Watermelon	8.1
Strawberry	7
Kiwi	100
Lemon	53
Sapota	20

The amount of ascorbic acid content in fruit juices can also be influenced by the variety and time interval of storage. Therefore, it is essential that fruit juices be stored at cool temperatures in order for their ascorbic acid contents not to decrease. Vitamin C present in fruit juices can improve immunity, prevent iron deficiency, and improve skin and blood pressure issues. It is good for heart health and also protects against gout. It is also helpful in weight loss. Intake of vitamin c rich fruits cures deficient symptoms such as survey, connective tissue weakness and capillary fragility.

### CONCLUSIONS:

The concentration of ascorbic acid varies from one fruit to another fruit. Adults 19-64 aged people required 40mg of vitamin C per day. All of the vitamin C we require should be included in our everyday diets. The amount of ascorbic acid in several fruits used in this study ranges between 6-200mg/100g. The highest value for ascorbic acid was obtained for natural juice made by squeezing fruit. Provisions of enough amounts of vitamin c to prevent scurvy in populations that are not currently deficient but it may be deficient depend on the some degree of food commodities. The provision of sufficient amounts of vitamin c for other purposes such as the maintenance of saturated tissue levels of ascorbic acid and enhancement of immune responses was considered. This project concluded that assigning a priority to the addition of vitamin C in emergency feeding situations is based on these values. So it's concluded that we have to eat fruits fresh and raw to get more Vitamin C.

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