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Evaluation of ascorbic acid (vitamin c), zinc, and copper contents (an antidote to covid-19 and other viral infections) in fruits commonly consumed in Ikere Ekiti, Ekiti State, Nigeria

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Abstract

The Vitamin C, Zinc and Copper content of some fruits namely pineapple, tangerine, grape, lime, orange and watermelon available in Ikere Ekiti, Ekiti State market which are normally consumed by the people for refreshment, nutritional and therapeutic purposes were collected for chemical analysis. The Vitamin C content of the fresh fruit juices were determined by volumetric method. Vitamin C content for the fruits were as follows: Pineapple (4.54), Tangerine (2.80), Grape (10.13), Lime (11.18), Orange (7.50), and Watermelon (12.40) all in mg/100g. Copper and Zinc were analyzed using a Unicam 969 Atomic Absorption Spectrophotometer – Solar in the flame mode. The result for the Zinc values were as follows: Pineapple (1.57), Tangerine (0.70), Grape (0.20), Lime (2.38), Orange (0.80), and Watermelon (0.20). While that of Copper content were are as follows: Pineapple (0.87), Tangerine (0.05), Grape (0.06), Lime (0.31), Orange (0.29), and Watermelon (0.05) all in mg/100g.

The Vitamin C content, Zinc and Copper values for the fruits compared well with the WHO daily recommended nutritional intake in some of the fruits, while others can only serve as supplements along with other sources of Vitamin C, Zinc and Copper.

In general, Watermelon has the highest value of Vitamin C, while Tangerine has the lowest. Lime has the highest Zinc value while Watermelon and Grape has the lowest. The highest value for Copper was recorded in Pineapple, while the lowest was found in Watermelon and Tangerine.

Keywords: Vitamin C; Zinc; Copper; Fruits; Viral Infections; Ikere Ekiti

1. Introduction

Viral infections are illnesses you get from virus (a small germ that uses your sex to reproduce e.g. catarrh, and covid-19. The availability of fruits could serve as cheap source of vitamins and minerals which could be useful in the achievement of sustainable development growth which is good health (Goal 1) (Ojo O.I. *et al.* 2020). The alarming increase of the diseases and economic crisis calls for continuous research into medicinal plants (fruits that contain reasonable amounts of vitamins and minerals for curative measure)

The various types of fruit available in Ikere Ekiti markets, which are orange, tangerine, grape, lime, pineapple and watermelon, are commonly consumed by people in Ikere Ekiti for their refreshment, nutritional and therapeutic purposes. However, most consumers do not know the advantages of one type of fruits over another in terms of ascorbic acid content, minerals and antioxidant properties.

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Fruits are good source of vitamins, minerals and antioxidant recognized for their role in preventing Vitamin A and Vitamin C deficiencies. People who incorporate fruits as part of a healthy eating pattern have a reduced risk of some chronic diseases and viral infections.

Vitamins are organic compounds that people needs in small quantities. Each has a different role in maintaining health and bodily function as medically reviewed and updated by Alexandra Perez, 2023. They are also referred to as micro nutrient and they are chemically unrelated just as their actions are different. The B Vitamins and Vitamin C are water soluble while Vitamin A, D, E and K are fat soluble.

There are multiple evidences from in vitro studies, animal experiments and clinical trials showed that vitamin C might have an antiviral effect (Michael *et al.*, 2020). In another in vitro study, a nutrient mixture, including vitamin C, had a dose-dependent suppression effect on production of influenza viral nucleoproteins and neuraminidase activity (Jariwalla *et al.*, 2007).

Vitamin C could have a role in improving the function of innate immunity and enhancing cellular and humoral immune response. Evidence showed that the inadequate intake of micronutrients, including vitamin C, decreases resistance to infection and increases disease complications (Anis *et al.*, 2020). Vitamin C improves epithelial barrier integrity, which is the first line of defense against external pathogens (Anitra *et al.*, 2017). Multiple evidences reveal that vitamin C has a potent antioxidant effect. It acts directly as a scavenger of oxygen-free radicals. It also helps to restore other cellular and antioxidants such as tetrahydrobiopterin and vitamin E (Niki *et al.*, 1991). In addition, vitamin C potentiates the antioxidant effect of polyphenols, such as flavonoids (Robert and Jacob; 1995).

Zinc and Copper are trace minerals essential for important biochemical functions and necessary for maintaining health throughout life, they support daily immune, mood and energy function. Zinc is a key player in supporting essential function throughout your body from immunity to mood, while Copper is vital for functions like making energy and blood cells. Copper and Zinc work together and separately to control and support metabolism. Both minerals help to activate the enzyme Copper-zinc superoxide dismutase also called CuZnSOD. This enzymes serves as an antioxidant, which means it protect your cells from harmful reactive specie; a group of chemicals that forms as a natural by-product of your cell metabolism. Since our cells produce new reactive oxygen species regularly, they rely on antioxidant to continually neutralize the compound and prevent cell damage. In a nutshell, getting enough Copper and Zinc helps ensure that you can effectively clear away reactive oxygen species so that your cells can continue to function properly.

The consumption of fruits are beneficial and the health effects of fruits are ascribed in part to minerals, phytochemicals and ascorbic acid, a natural antioxidant, which may inhibit the development of major clinical conditions including cardiovascular diseases, stress, scurvy and cancer (Monika and Susanne 2006).

In this view, the present study was to comparatively evaluate the content of ascorbic acid, Zinc and Copper content in some local fruits commonly consumed by people in Ikere city, Ekiti state.

2. Materials and Methods

Samples for the study were purchased in local market in Ikere city, Ekiti state. All the samples were thoroughly cleaned using deionized water to remove adhering contaminants. For the analysis of vitamin C in the samples, determination was done on the same day of purchase to counteract the instability of vitamin C.

Vitamin C was determined by using the procedure as outlined by Food Analysis Laboratory Manual, Chapter 7 Vitamin C Determination by Indophenol Method (Suzanne *et al.*, 2017).

Determination of vitamin C in fruits was done by extracting the juice using juice extractor and 2ml of the muslin-filtered juice was used in titration for the determination of vitamin C.

Different samples of the commonly available fruits (Table 1) were purchased from central markets of Ikere city, Ekiti state. Samples were analyzed as purchased in the fresh forms. The pretreatment of the samples were done by crushing with a porcelain mortar and pestle or by blending to give a homogenized paste.

20mL HNO₃ was added to 10.0g of the sample portion, and allowed to stand for 15min. The mixture was heated until the liquid reduced to 5mL. After cooling, 20mL HNO₃, 10mL H₂SO₄ and 8mL H₂O₂ were added and the contents were evaporated to 5mL. After cooling, to eliminate acid, 10mL deionized H₂O was added and the mixture was boiled for 10min (this was repeated twice). After cooling the digest was filtered into 25mL volumetric flask and made up to mark

with deionized H₂O. The digestion solutions were subsequently analyzed for Cu and Zn using a Unicam 969 Atomic Absorption Spectrophotometer – Solar in the flame mode.

3. Results

Table 1 Copper and Zinc contents (mg/100g) of the Fruits

Sample	Cu	Zn
Pineapple	0.87	1.57
Tangerine	0.05	0.70
Grape	0.06	0.20
Lime	0.31	2.38
Orange	0.29	0.80
Watermelon	0.05	0.20

Table 2 Physicochemical Analysis and Ascorbic Acid (Vitamin C) Contents of the Fruits

Sample	pH	Total Solids %	Ascorbic acid (Vitamin C) mg/100g
Pineapple	5.73	6.02	4.54
Tangerine	5.96	11.10	2.80
Grape	5.68	4.60	10.13
Lime	4.94	7.70	11.18
Orange	5.79	7.80	7.50
Watermelon	5.98	8.12	12.40

4. Discussion

Vitamin C content for the fruits were as follows: Pineapple (4.54), Tangerine (2.80), Grape (10.13), Lime (11.18), Orange (7.50), and Watermelon (12.40) all in mg/100g. The result of Copper and Zinc analyzed using a Unicam 969 Atomic Absorption Spectrophotometer – Solar in the flame mode were as follows: Pineapple (1.57), Tangerine (0.70), Grape (0.20), Lime (2.38), Orange (0.80), and Watermelon (0.20). While that of Copper content were are as follows: Pineapple (0.87), Tangerine (0.05), Grape (0.06), Lime (0.31), Orange (0.29), and Watermelon (0.05) all in mg/100g.

In general, Watermelon has the highest value of Vitamin C, while Tangerine has the lowest. Lime has the highest Zinc value while Watermelon and Grape has the lowest. The highest value for Copper was recorded in Pineapple, while the lowest was found in Watermelon and Tangerine. The values for Vitamin C, Zinc and Copper in this research work compares well the previous work done by researchers in same fruits.

5. Conclusion

The Vitamin C content, Zinc and Copper values for the fruits compared well with the WHO daily recommended nutritional intake in some of the fruits, while others can only serve as supplements along with other sources of Vitamin C, Zinc and Copper.

5.1. Contribution to Knowledge

The presence of Vitamin C content in a considerable level in the selected fruits shows high medicinal value which could be used as a cheap alternative antioxidant also as antiviral agents to cure and control some human disease like scurvy, hyperthyroidism, anemia, bleeding gums, skin diseases. In addition, the results obtained from vitamin C, Zinc and Copper contents in the selected fruits also compared favourably with World Health Organization (WHO) daily intake

limit and findings of other researchers from other parts of the world of which we could also make them serve as food supplements.

Recommendation

I hereby recommend daily consumption of water melon or oranges for the maintenance of daily dietary intake of vitamin C which help in the prevention of scurvy which is the deficiency disease state of vitamin C and management of viral diseases like Covid-19 and others.

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