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The Vitamin C (Ascorbic Acid) Contents of Some Tropical Fruits

FIDELIS FRU NJI¹, FUNMI D. ONAJOBI²

¹University of Bonn, Institute of Animal Nutrition, Germany; email: ffid@itz.uni-bonn.de

²OAU Ile-Ife, Department of Biochemistry, Nigeria

Abstract

The ascorbic acid contents of 27 different tropical fruits typical to West Africa were analysed using 2, 6-dichlorophenol indophenol (DCPIP) as dye. The results revealed that in 100 g edible portions of most of the nuts there was less than 1 mg ascorbic acid. The citrus fruits contained per 100g edible portions, amounts ranging from about 24 mg in lime to about 41mg in lemon, while guava stood out with an exceptional content of about 300 mg. The concentration of vitamin C obtained in some of the fruits examined in this study, varied substantially from studies done in other parts of the world.

Introduction

Fruits are very useful to man, due to their nutritive value, which essentially rotates around their vitamin content. One of such vitamins is vitamin C (ascorbic acid). Vitamin C is a water-soluble vitamin that is very unstable in air. In man, Vitamin C is important in the utilisation of amino acids, vital in the maintenance of collagen, enhances the absorption of iron, synthesis of steroid hormones, conversion of cholesterol to bile acids furthermore, it is an antioxidant and helps to neutralise pollutants that may invade the body. It has been reported to prevent some degenerative diseases, and helps in enhancing the immune system (Sauberlich, 1994; Frei, 1998; Douglas *et al*, 2000). Because of its enormous uses Vitamin C, has over the years been processed and sold as food or vitamin supplements in various forms. With present reign of ethical feeding, natural food products and a return to natural sources, almost every one is turning to the natural sources of vitamins. Vitamin C is very instable and would loose some of its activity when exposed to heat, moisture or agitation (Sidibe *et al.*, 1996). Because of its instability it is highly recommendable that it be acquired from fresh and natural sources, which are mainly plants. Fruits have been reported to be the best source of vitamin C. If people have to consume and acquire this essential vitamin from fruits, a detailed documentation of the contents in the various fruits is necessary, so as to serve as a guide to the consumers.

In West Africa there are many fruits, with very little or no information available on their vitamin C contents. Most of the values used are estimates from values determined in other locations, most especially in the developed world. Here, the ascorbic acid contents of some fruits, common in West Africa, were determined.

Materials and Methods

27 different West African tropical fresh fruits were acquired around Ibadan Nigeria. 5 sample fruits of each species were used (Table 1). With tangerine, lime, orange, lemon and pineapple, the juice was manually and gently squeezed out into beakers. With the nuts, samples were gently finely crushed diluted and centrifuged (1500 rpm) and the supernatant used for the determination.

For coconut water, the nut was cracked opened and the water poured out into a beaker. Samples of the rest of the fruits were gently homogenised and diluted accordingly. An assay was made out of each and samples pulled out of each for titration. 4 titre replicates were recorded per assay. The ascorbic acid content was determined by use of the 2, 6- dichlorophenol-indophenol (DCPIP) titrimetric redox reaction method as described by the Association of Vitamin Chemists (1951). DCPIP is a blue dye that changes to permanent pale pink colour when reduced by ascorbic acid. The determination is thus based on colorimetric change caused by oxidation of ascorbic acid.

Results and discussion

Table1. The ascorbic acid content (mg / 100g edible portion)

Common name	Scientific name	mg vitamin C / 100 grams
Almond nuts	<i>Terminalia catapa</i>	0.38
Garden eggplant	<i>Solanum anomalum</i>	0.50
Coconut pulp	<i>Cocos nucifera</i>	0.66
Walnut	<i>Tetracarpidium conophorum</i>	0.82
Almond fruit	<i>Terminalia catapa</i>	1.20
Banana-Omini (round)	<i>Musa sapientum</i>	1.99
Coconut water	<i>Cocos nucifera</i>	2.48
Tomato	<i>Lycopersicon esculentum</i>	4.21
Avocado	<i>Persia americana</i>	4.47
Banana (long)	<i>Musa sapientum</i>	4.63
Apple (jambo)	<i>Eugenia jambo</i>	7.29
Water melon	<i>Citrullus vulgaris</i>	10.43
Spondias (Iyeye)	<i>Spondias mombin</i>	15.70
Pineapple	<i>Ananas comosus</i>	19.25
Cocoa pulp	<i>Theobroma cacao</i>	22.53
Lime	<i>Citrus aurantifolia</i>	23.52
Bread fruit	<i>Artocarpus communis</i>	26.15
Juju plump	<i>Spondia purperia</i>	27.83
Mango-onishu	<i>Mangifera sp</i>	28.98
Mango-olomi	<i>Citrus reticulater</i>	30.48
Tangerine	<i>Citrus reticulater</i>	32.00
Mango-sheri	<i>Mangifera sp.</i>	33.29
Grape	<i>Citrus paradisi</i>	38.69
Orange	<i>Citrus sinensis</i>	40.73
Lemon	<i>Citrus limon</i>	40.88
Pawpaw	<i>Carica papaya</i>	68.90
Guava	<i>Psidium guajava</i>	300.27.

The results revealed the nuts to be very poor in ascorbic acid content, while most fruits contained higher amounts. The citrus and fleshy fruits were generally seen to be rich in ascorbic acid. The

Natural Food Hub (2001) published content values that were similar to those reported here, although some differed significantly. In orange for example, they reported a value of 53 mg contrary to the 41 mg / 100g edible portion found in this work. They reported a content of 183 mg in guava, while in this study guava was found to contain up to 300 mg. Rensburg & Preez (1985) reported up to 267 mg/100g, an amount much higher than those reported by Natural Food Hub, but less than what was found in this study. The differences in values however may be attributed to the different regions in the world in which the fruits were grown, the seasons in which they were grown (Nakatoh, 1985), the type of fertilisation they received (Kotoky & Bhattacharyya, 1996), and also to the maturity stage at which harvesting was done (Egbekun & Otiri, 1999). Considering the recommended daily intake (RDI) of 65 -75 mg vitamin C (Levine *et al.*, 1999) and considering the average amount of fruits one consumes in a day (say an orange or a slice of pawpaw, about 200g), it is actually possible to know which of these fruits are good sources of Vitamin C. Based on these assumptions, we have classified these fruits into 4 groups:

- Poor Source:** (These provide less than half of the RDI) - Almond nuts, garden eggplant, coconut pulp, walnut, almond fruit, banana (round), coconut water, tomato, avocado, banana (long) apple (jambo) and watermelon.
- Fair Source:** (These provide more than half but not up to the RDI) - spondias (Iyeye), pineapple, cocoa pulp, lime, breadfruit and juju plumb.
- Good Source:** (These provide approximately the RDI) – mangoes, tangerine, grapefruit, orange and lemon.
- Very good Source:** (These provide much more than the RDI) – pawpaw and guava

In fact guava should be in a class of its own for its content is exceptionally high.

Conclusion

Although the ascorbic acid content of these fruits varied very remarkably, from traces in the nuts to 300mg/100g of the edible portion of guava, most commonly consumed fruits in West Africa are seen to be rich in vitamin C.

Keywords: Ascorbic acid, DCPIP; titrimetric, tropical fruits, vitamin C

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