

Sugar, Vitamin C, and Mineral Contents in Indigenous and Foreign Fruit Juices Marketed in Nigeria

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ABSTRACT

The Sugar, Vitamin C and Mineral contents in some indigenous and foreign fruit juices marketed in Nigeria were investigated. Some indigenous fruit juices, namely Chivita pineapple, Funman orange, Delight orange and Tampico orange, while foreign fruit juices, such as Pure Heaven, Five Alive, Don Simon and Just Juice, were used. Total Acidity, pH, Sugar, Mineral, Vitamin C contents and organoleptic attributes were evaluated in these indigenous and foreign fruit juices.

Results of the study show that there were no significant ($p < 0.01$) differences in the total acidity, pH and sugar contents in the indigenous and foreign fruit juices. The

concentration of Vitamin C and minerals (K^+ , Na^+ , Ca^{2+} , and Mg^{2+}) in the foreign fruit juices were significantly ($p < 0.01$) higher than in the indigenous fruit juices. Chivita pineapple was best preferred and closely followed by Just Juice, while Don Simon was least preferred.

Data of the study indicate that both indigenous and foreign fruit juices are good sources of energy, Vitamin C, minerals and water. They are found nutritionally adequate and acceptable for human consumption.

Key Words: Sugar, Vitamin C, Minerals, Indigenous and Foreign Fruit Juices.

INTRODUCTION

Fruits are good sources of minerals and vitamins A and C. Nearly two-thirds of the vitamin C in our diets come from fruits, especially citrus fruits such as oranges, grape fruits and lemon. (Pubols 1960, Ockerman 1991, Attaway *et al* 1977). Fruit juice covers servings of concentrated fruit juice drinks, diets of which are unblended lemonade, grape drink, limeade and orange drink, with more than six combinations listed of two or more kinds of citrus juices in the blends. (Charley *et al* 1950, Herman 1984, Freeland-Graves and Peckham 1996). Some of the fruits that are commonly used in the manufacture of fruit juices are orange, pineapple, mango and black currant. (Attaway *et al* 1977).

Sugar has numerous functions, which makes it important ingredient in fruit juices namely, sweetness, texture, preservation, fermentation, appearance, freezing point and antioxidant activity. (Davis, 1995, Desor and Beuchamp, 1987). Therefore, sugars in food have multifunctional roles that go beyond the perception

of sweetener. They contribute in many ways to a safe and varied food supply (Hartel 1993, Ockerman, 1991). Vitamin C is an important antioxidant and helps protect against cancers, heart disease and stress. It is part of the cellular chemistry that provides energy, essential for sperm production, for making collagen, involved in the building and health of cartilage, joints, skin and blood vessels (Lehninger, 1981, Champe and Harvey, 1994).

As important as vitamins are, they can do nothing for you without minerals. Vitamins cannot be assimilated without the use of minerals. Many carbohydrates are excellent scavengers for metal ions, for example, calcium, phosphorus, magnesium, potassium, sodium and so on. Minerals are constituents of the bone, teeth, soft tissue, muscle, blood and nerve cells. They are vital for overall mental and physical well-being. Minerals act as catalysts for many biological reactions within the body, including muscle contraction, neurotransmission, the production of hormones, digestion and the utilization of nutrients

in foods. (Champe and Harvey, 1994).

In Nigeria, several fruit juices are commercially produced and marketed, while some are imported. The most important requirement for fruit juices is that it must be refreshing as well as pleasing in tastes and odours (Hui, 1979). The taste factors perceived by the tongues are sweet, sour, bitter and salty. (Ebuehi *et al* 2002, 2003, Attaway *et al* 1977, Ockerman, 1991, Larmond, 1977)

Standards specify those ingredients that must be present, usually at a minimum level, in order to be classified in certain categories such as fruit juice drinks, sugar content, and so on. However, regulations are most concerned with additives, contaminants and prescribed maximum levels (US FDA, 1984, Ebuehi and Disu, 2000). The indigenous fruit juices used for the study were Chivita pineapple, Funman pineapple, Delight orange and Tampico citrus juice.

Chivita pineapple juice was manufactured by Chi Ltd., Lagos, Nigeria, Funman pineapple juice was manufactured by Funman Agricultural Products Nig. Ltd., Ibadan, Nigeria. Delight Orange juice was manufactured by UAC Foods, Lagos, Nigeria, while FAN Milk Nig. Plc., Ibadan, Nigeria, manufactured the Tampico citrus drink.

The Five Alive juice drinks were packed under authority of the Coca-Cola Company, by Refreshment Spectrum Limited, London. The Just Juice Company Ltd., Norfolk, United Kingdom, manufactured the Just Juice. The Pure Heaven Juice was produced by Sun Oil Limited, London, while the Don Simon Juice was produced by J. Garcia Carrion, Juilla (Murcia). Nigerians popularly consume these indigenous and foreign fruit juices across all ages. Despite the scanty Nutrition information present on the labels of these fruit juices, it is worthwhile to ascertain and verify the nutritive composition and the general acceptability of these fruit juices.

The objectives of the study are to ascertain the Sugar, Vitamin C, Mineral Contents and organoleptic attributes of the imported and locally manufactured fruit juices in Nigeria. The information unraveled from the study, will be very useful to both the consumers and producers, and will serve as a veritable tool in the product

development, quality control/assurance and promotional strategies of these fruit juices.

MATERIALS AND METHODS

Selected Popular Indigenous and Foreign Fruit Juices

The popular and locally manufactured fruit juices in Nigeria used for the study, are Chivita Pineapple, Funman Pineapple, Delight Orange and Tampico Orange. These fruit juices were purchased directly from designated accredited depots located at Ikeja, Lagos State, Nigeria. These fruit juices were manufactured in 2004 and to expire in 2005. They were certified and approved for human consumption by the National Agency for Food, Drug, Administration and Control (NAFDAC). The imported fruit juices, used for the study were Five Alive, Just Juice, Pure Heaven and Don Simon Juice. These foreign fruit juices were purchased from a reputable supermarket in Lagos, Nigeria and were to expire in a year's time.

Analysis of Nutritive Composition of Fruit Juices

Total acidity, pH, percentage sugar, minerals (namely K^+ , Na^+ , Ca^{2+} and Mg^{2+} ions) and Vitamin C contents in these fruit juices were determined by the methods of the Association of Analytical Chemists (AOAC, 1984). The concentration of the minerals in these juices was determined using the Atomic Absorption Spectrophotometer (AAS Model 305B). The base line of the instrument was set to zero with distilled water and then calibrated with the standards and the Boehringer Commercial Control Samples as per manufacturer's instruction.

Organoleptic Attributes

The organoleptic attributes of these indigenous and foreign fruit juices were determined by the method of Larmond (1977). Coded samples of the fruit juices were given to 20 untrained taste panelists in a special room prepared for this purpose. They were instructed to taste the fruit juices and to rinse their mouth after each sample taste. They were requested to express their feelings about the samples by scoring the following attributes: - Colour, Taste, Flavour, Texture (mouthful) and overall Acceptability of the fruit juices, using a 5-point Hedonic scale (1; dislike extremely, 2;

dislike, 3; neither like nor dislike, 4; like and 5; like extremely).

Statistical Analysis

Differences between means were assessed by student's *t* - test, while the levels of significance of the data were calculated by analysis of variance according to Snedecor and Cochran (1969).

RESULTS AND DISCUSSION

Results of sugar, vitamin C and mineral contents in indigenous and foreign fruit juices marketed in Nigeria are presented in Table 1. The total acidity, pH, Sugar and Mineral levels of the indigenous fruit juices, namely Chivita pineapple, Funman pineapple, Delight orange and Tampico orange were not significantly ($p < 0.01$) different. However, the sugar and Vitamin C contents in the Chivita pineapple were significantly ($p < 0.01$) higher as compared to other indigenous fruit juices. The nutritive composition of the foreign fruit juices, namely Pure Heaven, Five Alive, Don Simon and Just Juice were not significantly ($p < 0.01$) different from each other, except in the Vitamin C content. The vitamin content in Just Juice and Don Simon or in Pure Heaven and Five Alive, were not significantly ($p < 0.01$) different. However, the Vitamin C content in Don Simon and Just Juice were significantly ($p < 0.01$) higher than in the Pure Heaven and Five Alive. Table 2 shows the comparison of the Sugar, Vitamin C and Mineral contents in indigenous and foreign fruit juices. This was computed from the mean values of the respective indigenous fruit juices and those of the foreign fruit juices. These results show that there were no significant ($p < 0.01$) differences in the total acidity, pH and sugar contents of both the indigenous and foreign fruit juices. However, remarkable significant ($p < 0.01$) differences were noticed in concentration of these minerals (K^+ , Na^+ , Ca^{2+} and Mg^{2+}) and Vitamin C in the foreign fruit juices, which were higher as compared to the indigenous fruit juices.

The organoleptic evaluation of the indigenous and foreign fruit juices is presented in Table 3. The percentage mean score of the appearance, odour, taste, texture and general acceptability of these indigenous fruit juices were between 8.25%

and 17.31%, while those of the foreign fruit juice were between 7.16% and 17.02%. The highest percentage mean score (17.31%) in the organoleptic evaluation was obtained for Chivita pineapple, one of the indigenous fruit juice, which was closely followed by Just Juice with 17.02%, one of the foreign fruit juice. The lowest percentage mean score of 7.16% was obtained for the Don Simon juice, one of the foreign fruit juice. Data of the study clearly indicate that Chivita pineapple is the most preferred fruit juice, followed closely by Just Juice and lastly Don Simon Juice. The sugar content in the Chivita juice was undoubtedly the highest, and may probably be responsible for its overall acceptance by consumers, preferring it above all other fruit juices studied.

It is therefore suggestive that the preferred acceptance of the Chivita juice to the other juices could be due to the nutritive composition. From the present study, the Vitamin C content in the foreign fruit juices was significantly ($p < 0.01$) higher than in the indigenous fruit juices. This finding may not be unconnected with the difficulty in the storage of vitamin C, a strong reducing agent, readily losing hydrogen atom to become dehydroascorbic acid and finally hydrolyzed losing its vitamin activity, to diketogulonic acid (Lehninger, 1981). One could infer that the fruit juices imported into the country contained a more stable Vitamin C ingredient as compared to the Vitamin C in the locally produced fruit juices in Nigeria. It could be suggested that certain stabilizers be developed and incorporated in the fruit juices to fortify some of its nutrients. A similar explanation could be adduced to justify while the minerals in the foreign fruit juices were significantly higher than in the locally produced fruit juices.

Fruit juice is food consisting of fermentable but unfermented juice which is obtained from fruit by mechanical processes and has the characteristics colours, aroma and flavour of juice from which it is obtained. (Clarke, 1997). The principal ingredients in fruit juices are sugar and water. Both indigenous and foreign fruit juices are good sources of energy, vitamin C, minerals and

water. These fruit juices are nutritionally adequate and acceptable for human consumption.

CONCLUSION

Data of the present study on the nutritive composition of the indigenous and foreign fruit juices indicate that total acidity, pH and sugar content do not differ, and except in the vitamin C and mineral levels, which were higher in the foreign fruit juices.

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Table 1: Sugar, Vitamin C and Mineral Contents of Indigenous and Foreign Fruit Juices

Nutritive Composition	Indigenous fruit juices					Foreign fruit juices				
	Chivita Pineapple	Funman Pineapple	Delight Orange	Tampico Orange	Pure Heaven	Five Alive	Don Simon	Just Juice		
% Total Acidity (as acetic acid)	0.090±0.002	0.12±0.006	0.14±0.02	0.12±0.004	0.11 ± 0.02	0.10 ± 0.04	0.14 ± 0.06	0.09 ± 0.005		
pH	6.00±0.04	5.90±0.05	5.70±0.04	5.7±0.003	6.05 ± 0.04	6.02 ± 0.03	6.02 ± 0.05	6.00 ± 0.04		
% Sugar	12.75±1.61	10.12±1.46	10.65±0.07	11.28±1.42	11.20 ± 0.14	12.56 ± 0.76	12.35 ± 0.69	12.45 ± 0.81		
% K ⁺	0.008±0.00002	0.0004±0.00001	0.003±0.00001	0.0003±0.00001	0.014 ± 0.003	0.016 ± 0.002	0.009 ± 0.0002	0.018 ± 0.003		
% Na ⁺	0.005±0.0001	0.003±0.00002	0.002±0.00001	0.002±0.00001	0.008 ± 0.0002	0.006 ± 0.0001	0.005 ± 0.0002	0.041 ± 0.003		
% Ca ²⁺	0.004±0.0001	0.003±0.00001	0.002±0.00002	0.002±0.00001	0.006 ± 0.0001	0.007 ± 0.0003	0.003 ± 0.0004	0.006 ± 0.0004		
% Mg ²⁺	0.003±0.0002	0.003±0.00001	0.001±0.00001	0.002±0.00001	0.005 ± 0.0002	0.005 ± 0.0002	0.004 ± 0.0002	0.003 ± 0.0005		
Vitamin C (mg/100ml)	11.06±1.84	9.74±1.52	9.61±1.28	9.74±1.06	12.10 ± 0.34	12.50 ± 0.62	31.40 ± 0.53	30.85 ± 0.74		

Table 2: Comparison of Sugar, Vitamin C and Mineral Contents in Indigenous and Foreign Fruit Juices

Nutritive Composition	Indigenous Fruit Juice	Foreign Fruit Juice
Total acidity (as acetic acid)	0.12 ± 0.005	0.11 ± 0.006
pH	5.83 ± 0.004	6.02 ± 0.005
% Sugar	11.20 ± 0.96	12.14 ± 0.75
% K ⁺	0.003 ± 0.00004 ^a	0.014 ± 0.003 ^b
% Na ⁺	0.003 ± 0.0005 ^a	0.015 ± 0.004 ^b
% Ca ²⁺	0.003 ± 0.0002 ^a	0.006 ± 0.0001 ^b
% Mg ²⁺	0.002 ± 0.0001 ^a	0.004 ± 0.0001 ^b
Vitamin C (mg/100ml)	10.04 ± 0.63 ^a	21.71 ± 1.48 ^b

¹Data expressed as Mean ± S.D of Chivita, Funman, Delight and Tampico Fruit Juices (Indigenous)

¹Data expressed as Mean ± S.D of Pure Heaven, Five Alive, Don Simon and Just Juice(Foreign)

Values carrying difference superscripts horizontally are significantly different

Table 3: Organoleptic Evaluation of the Indigenous and Foreign Fruit Juices

Fruit Juice	% Score	Position
Chivita Pineapple	17.31	1 st
Just Juice	17.02	2 nd
Five Alive	15.88	3 rd
Pure Heaven	13.45	4 th
Tampico Orange	11.48	5 th
Delight Orange	9.45	6 th
Funman Pineapple	8.25	7 th
Don Simon	7.16	8 th

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