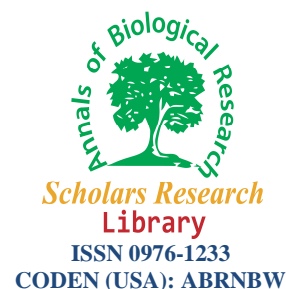




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Physicochemical qualities of commercial samples of fruit juices sold in south eastern states of Nigeria

Onyeneto T. C.¹, Nwachukwu I. N.^{2*} and Nwogwugwu N. U.²

¹Department of Microbiology, Anambra State University of Science and Technology, Uli, Nigeria

²Department of Microbiology, Federal University of Technology, Owerri, Nigeria

ABSTRACT

Comparative studies were carried out to assess the physicochemical qualities associated with commercial samples of fruit juices sold in South Eastern States of Nigeria. One hundred and thirty samples (130) of thirteen (13) different brands of fruit juices were analysed in laboratory for their chemical and physical qualities. The samples were bought from different commercial shops in Aba, Abakiliki, Awka, Enugu, Onitsha, Owerri and Umuahia. They included 'Five alive citrus burst', 'Dansa apple', 'Dansa orange', 'Dansa mango', 'Frutta apple', 'Frutta orange', 'Frutta mango', 'Chivita apple', 'Chivita pineapple', 'Chivita mango', 'Chivita orange', 'Five alive apple splash' and 'Fumman orange juices'. The physicochemical qualities analyzed for included: specific gravity which ranged between 1.0384 and 1.0856g/l; total solids which ranged between 2.30 and 10.09%; pH which ranged between 2.98 and 4.58%; Titratable acidity ranged between 3.91 and 7.15%; sugar content ranged between 10.40 and 13.04%; vitamin C content ranged between 1.69 and 31.25mg/100ml; protein content ranged between 0.168 and 0.519% and colour assessment ranged between 3.13 and 60.0 EBC. Physicochemical qualities contributed to the quality of fruit juices.

INTRODUCTION

Fruit juices are nutritious and offer great taste and health benefits. The Dietary Guidelines for Americans (2005) recommended consumption of several cups per day of fruit juices and vegetables. Fruit juices are therefore well recognized for their nutritive values; minerals and vitamin contents. In many tropical countries, they are common beverages that serve as man's food and are sold in different shops and supermarkets [1]. [2] reported that the quality of fruit juices depend essentially on the species and maturity of the fresh fruit used. The main factors that influence the quality of fruit juices are the acid and sugar ratio, the aroma volatiles, the phenolic components and the ascorbic acid (Vitamin C) content. Thus several physical and chemical determinations (pH, colour, total solids and total titratable acidity) are important for fruit juice characterization and quality [3].

Juices are often consumed for their health benefits for example, juice is rich in vitamin C, while prune juice is associated with digestive health benefits, and cranberry help to prevent or even treat bladder infections [4]. However, the high amount of fructose in fruit juice when not consumed with fiber has been suggested as a contributor to the growing diabetes [4]. Juice therefore has a standard level of purity which is 100% in many countries, and the Food and Drug Administration mandate that a production is labeled a fruit juice if it has 100% purity. The organoleptic quality is the perceptive characteristic which forms the basis of evaluation and preference

by consumers. These changes in the organoleptic quality of foods (colour, odour, texture, juiciness and sliminess) impair consumers' acceptability and its economic properties [5].

The aim of this research was therefore to determine the physicochemical qualities of fruit juices which determine the quality of fruit juice which include: the protein content, colour, vitamin C content, pH, titratable acidity, specific gravity and total solids.

MATERIALS AND METHODS

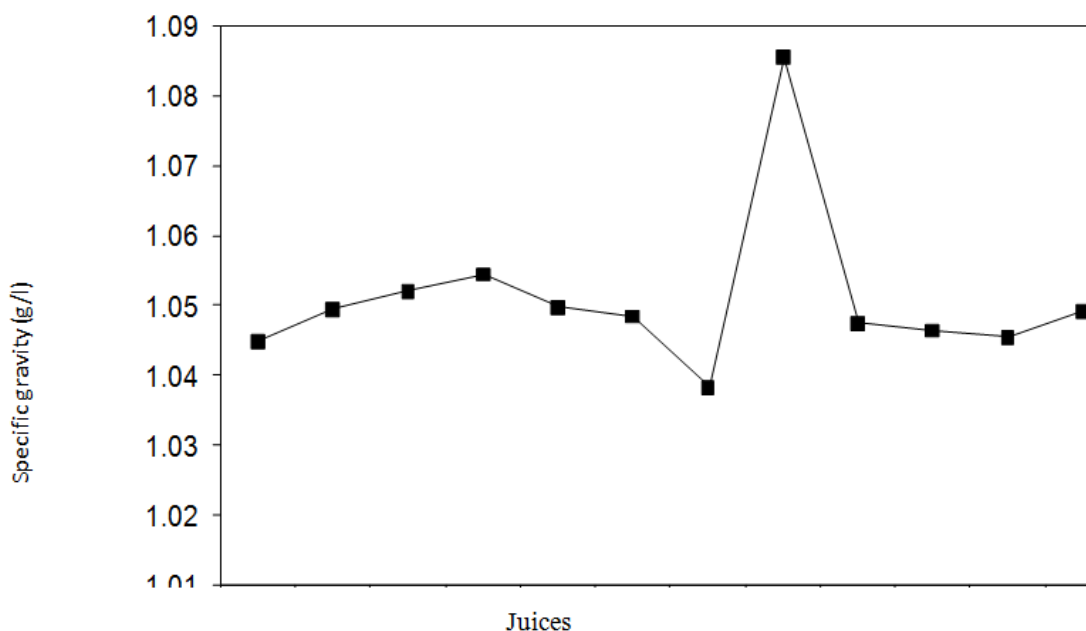


Figure 1: Total solids of the juices. The juice drinks are: Five Alive Citrus Burst (FACB), Dansa Orange (DO), Dansa Apple (DA), Dansa Mango (DM), Frutta Apple (FrA), Frutta Orange (FrO), Frutta Mango (FrM), Chivita Apple (CA), Chivita Pineapple (CP), Chivita Pineapple (CP), Chivita Mango (CM), Chivita Orange (CO), Five Alive Apple Splash (FAAS), Fumman Orange (FuO)

The sample collection areas were from different stores in Enugu, Awka, Onitsha, Owerri, Aba, Abakiliki and Umuahia, all in South Eastern Nigeria.

COLLECTION OF SAMPLES

A total of one hundred and thirty (130) samples of thirteen (13) different brands of processed pasteurized fruit juices were purchased. The samples were Five alive citrus burst, Dansa apple, Dansa orange, Dansa mango, Frutta apple, Frutta orange, Frutta mango, Chivita apple, Chivita pineapple, Chivita mango, Chivita orange, Five alive apple splash and Fumman orange juices. These samples had four to six months to their expiration date and were transported immediately to laboratory for analysis.

Physicochemical Analysis

These physicochemical properties comprise of attributes such as Specific gravity, Total solids, Titratable acidity, sugar, vitamin, protein, Ash, Trace metals and colour contents of these samples (Table 1). A ten man sensory panel was constituted to determine the sensory changes for colour, odour and taste associated with these fruit juices [5]. The specific gravity was determined using the Gravimetric method as described by [6]. The pH value was determined by Lolomal electrode pH meter method [7]. The Total solids, Titratable acidity and Ash values were determined by the method of [8]. The sugar contents were determined using the Anton paar and Refractive index method. The trace metals and contaminants were determined using Atomic Absorption Spectrophotometer (AAS) as described by [9] and [10]. The protein content was determined using the Visual Titration method. The colour

assessment was determined using Harris Colorimeter in EBC (European Brewing Convention) method. The protein content was determined using Kjeldahl method [7].

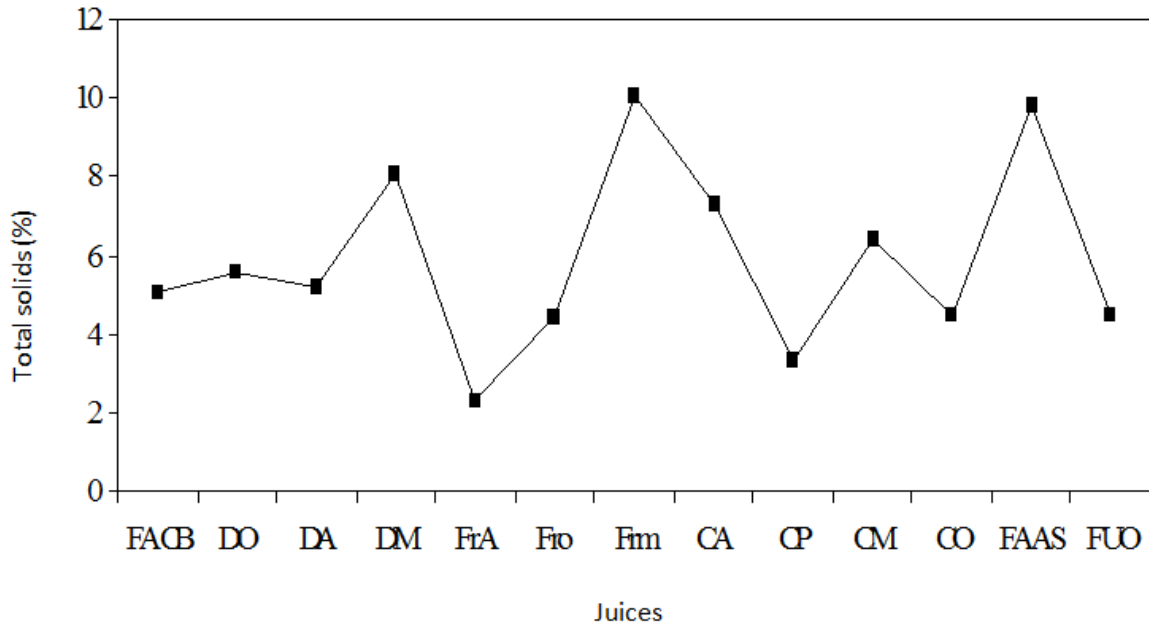


Figure 2: pH of the juices. The juice drinks are: Five Alive Citrus Burst (FACB), Dansa Orange (DO), Dansa Apple (DA), Dansa Mango (DM), Frutta Apple (FrA), Frutta Orange (FrO), Frutta Mango (FrM), Chivita Apple (CA), Chivita Pineapple (CP), Chivita Pineapple (CP), Chivita Mango (CM), Chivita Orange (CO), Five Alive Apple Splash (FAAS), Fumman Orange (FuO)

RESULTS

From the organoleptic/sensory tests, most of the juices were light yellow to deep yellow, light sweet to heavy sweet and good fruit flavor to high fruit aroma. The specific gravity values ranged between 1.0384 and 1.0856g/l. The Chivita apple had the highest value of 1.0856g/l, while Frutta mango recorded the lowest value of 1.0384g/l. the result are represented in Figure 1.

The total solids of the fruit juices ranged between 2.3% and 10.09%. Frutta mango had the highest value of 10.09%, while Frutta apple recorded the least value of 2.3%. These results are presented in Figure 2.

The pH values of the fruit juices ranged between 3.28 and 3.80. The highest pH value of 3.80 was recorded by Five alive apple splash while Frutta recorded the lowest pH value of 3.28

The Titratable acidity of the fruit juices ranged between 3.91% and 7.15% Frutta orange had the highest value of 7.15%, while the lowest value are presented in Figure 4.

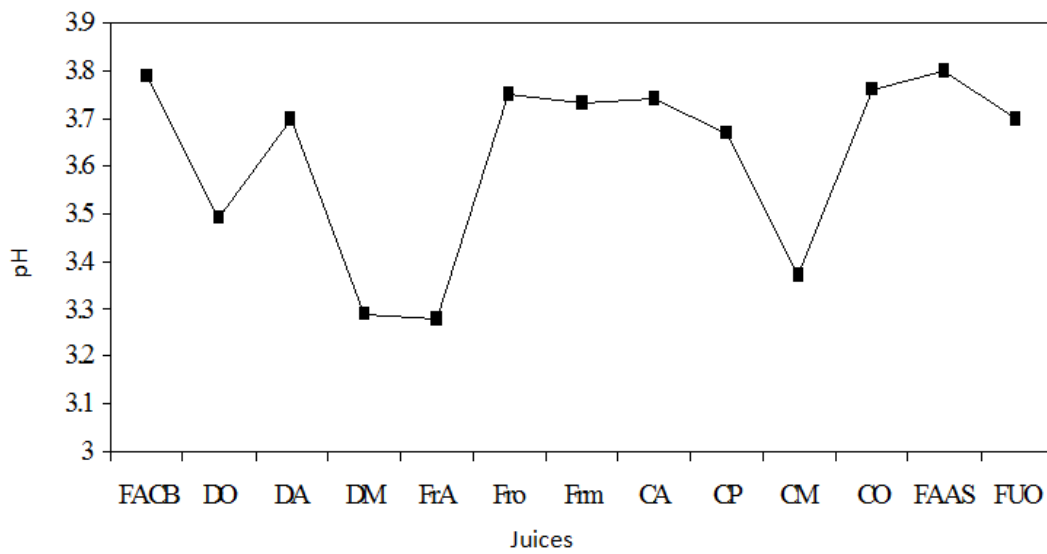


Figure 3: Specific Gravity of the juices. The juice drinks are: Five Alive Citrus Burst (FACB), Dansa Orange (DO), Dansa Apple (DA), Dansa Mango (DM), Frutta Apple (FrA), Frutta Orange (FrO), Frutta Mango (FrM), Chivita Apple (CA), Chivita Pineapple (CP), Chivita Pineapple (CP), Chivita Mango (CM), Chivita Orange (CO), Five Alive Apple Splash (FAAS), Fumman Orange (FuO)

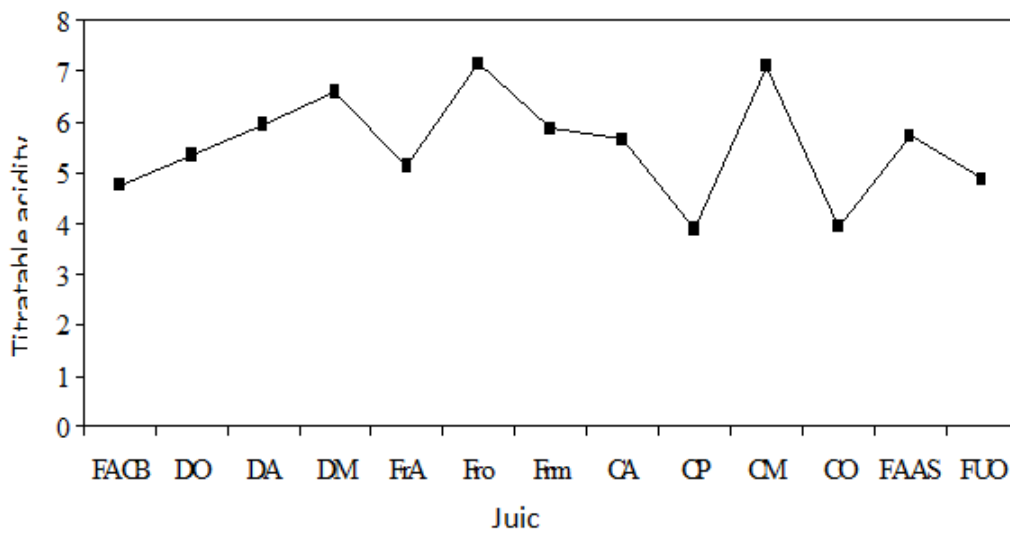


Figure 4: Titratable acidity of the juices. The juice drinks are: Five Alive Citrus Burst (FACB), Dansa Orange (DO), Dansa Apple (DA), Dansa Mango (DM), Frutta Apple (FrA), Frutta Orange (FrO), Frutta Mango (FrM), Chivita Apple (CA), Chivita Pineapple (CP), Chivita Pineapple (CP), Chivita Mango (CM), Chivita Orange (CO), Five Alive Apple Splash (FAAS), Fumman Orange (FuO)

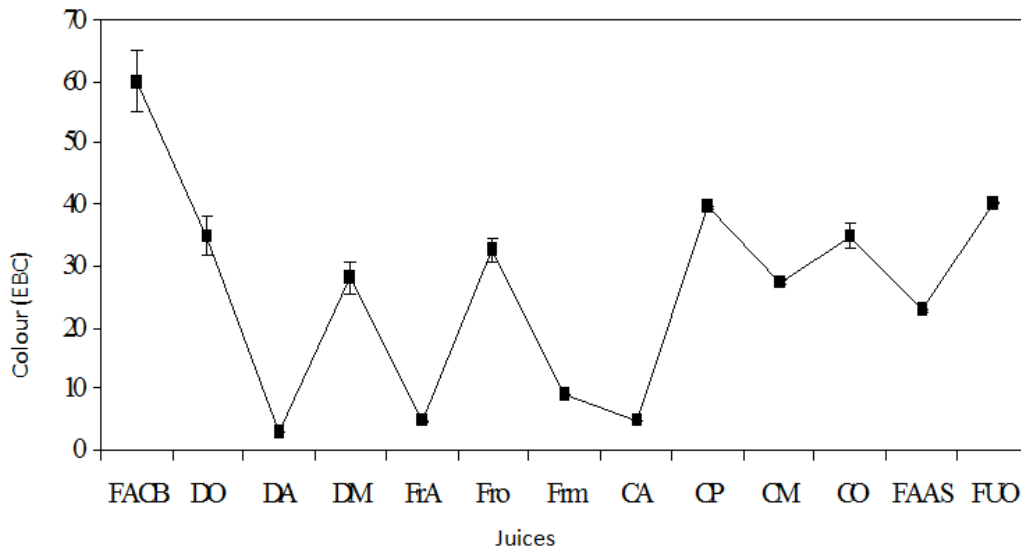


Figure 5: Colour assessment of the juices. The juice drinks are: Five Alive Citrus Burst (FACB), Dansa Orange (DO), Dansa Apple (DA), Dansa Mango (DM), Frutta Apple (FrA), Frutta Orange (FrO), Frutta Mango (FrM), Chivita Apple (CA), Chivita Pineapple (CP), Chivita Pineapple (CP), Chivita Mango (CM), Chivita Orange (CO), Five Alive Apple Splash (FAAS), Fumman Orange (FuO)

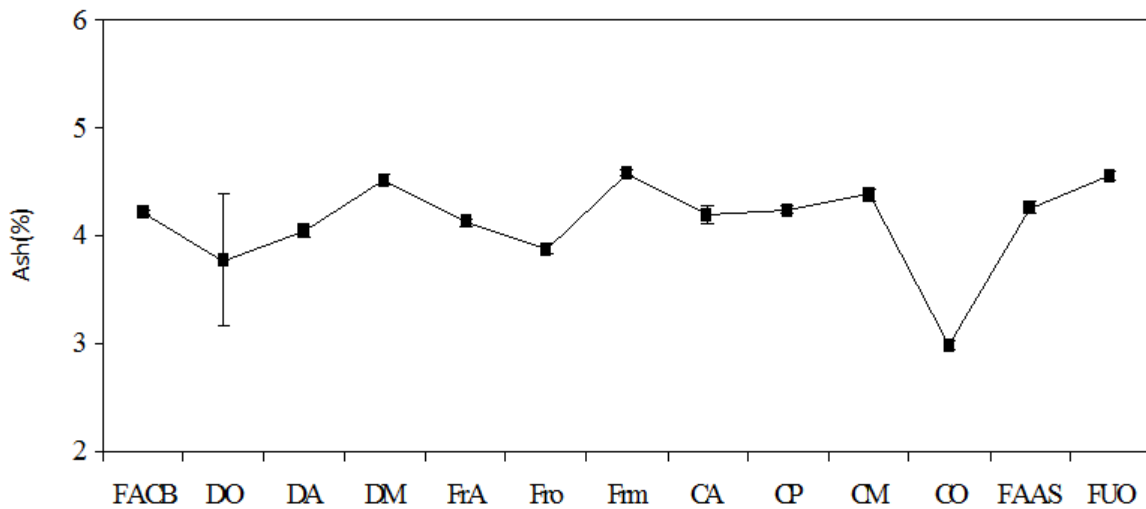


Figure 6: Ash content of the juices. The juice drinks are: Five Alive Citrus Burst (FACB), Dansa Orange (DO), Dansa Apple (DA), Dansa Mango (DM), Frutta Apple (FrA), Frutta Orange (FrO), Frutta Mango (FrM), Chivita Apple (CA), Chivita Pineapple (CP), Chivita Pineapple (CP), Chivita Mango (CM), Chivita Orange (CO), Five Alive Apple Splash (FAAS), Fumman Orange (FuO)

The Colour Assessment of the fruit juices ranged between 3.13 EBC and 60.0 EBC. The highest value of 60.0 EBC was recorded by Five alive citrus burst, while Dansa apple had the lowest colour value of 3.13 EBC. The results are presented in Figure 5.

The ash content of the fruit juices ranged between 2.98% and 4.58%. Frutta mango had the highest value of 4.58%, while Chivita orange recorded the lowest value of 2.98%. The results are presented in Figure 6.

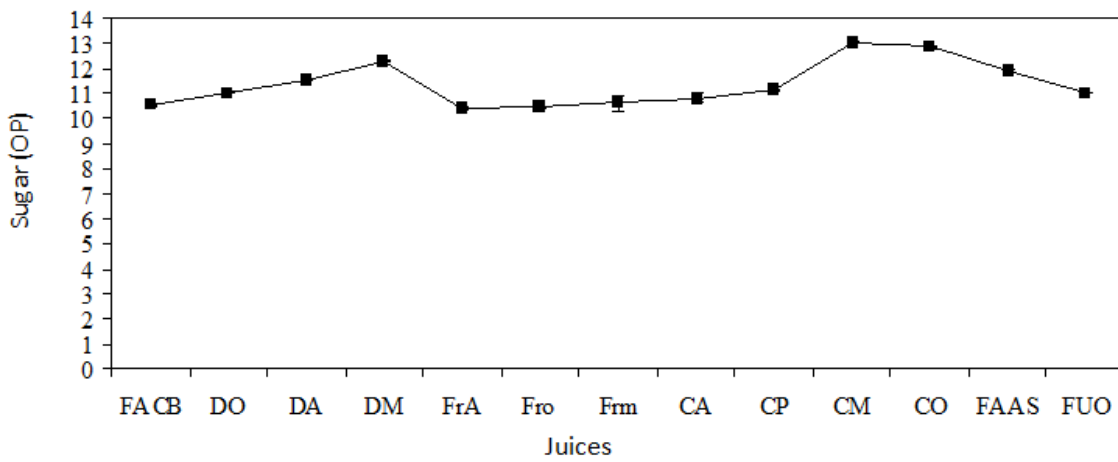


Figure 7: Sugar content of the juices. The juice drinks are: Five Alive Citrus Burst (FACB), Dansa Orange (DO), Dansa Apple (DA), Dansa Mango (DM), Frutta Apple (FrA), Frutta Orange (FrO), Frutta Mango (FrM), Chivita Apple (CA), Chivita Pineapple (CP), Chivita Pineapple (CP), Chivita Mango (CM), Chivita Orange (CO), Five Alive Apple Splash (FAAS), Fumman Orange (FuO)

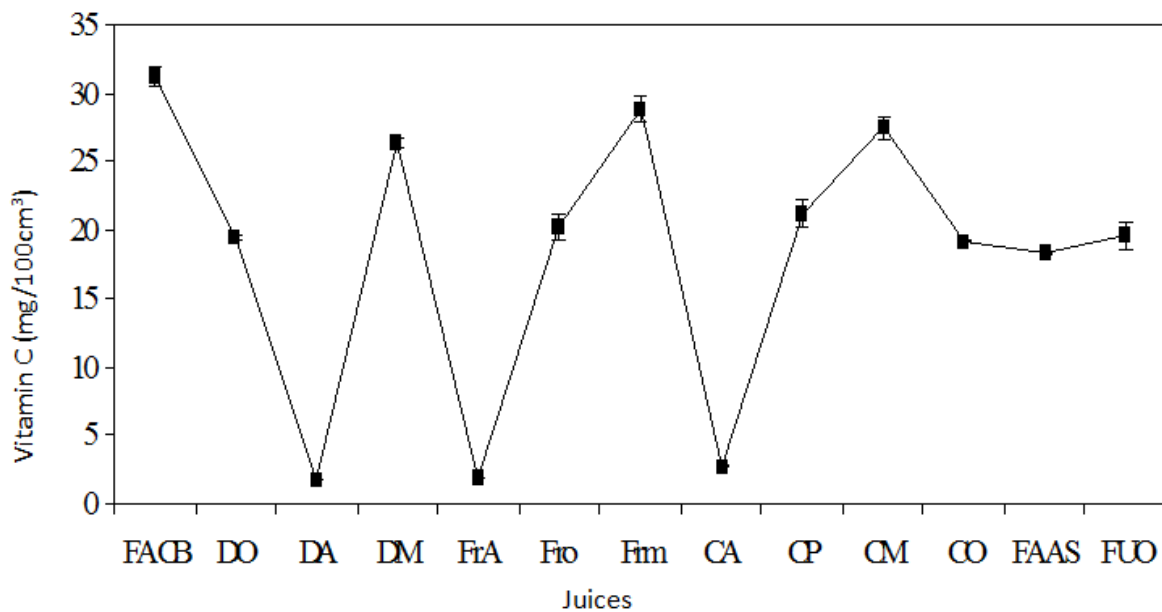


Figure 8: Vitamin C content of the juices. The juice drinks are: Five Alive Citrus Burst (FACB), Dansa Orange (DO), Dansa Apple (DA), Dansa Mango (DM), Frutta Apple (FrA), Frutta Orange (FrO), Frutta Mango (FrM), Chivita Apple (CA), Chivita Pineapple (CP), Chivita Pineapple (CP), Chivita Mango (CM), Chivita Orange (CO), Five Alive Apple Splash (FAAS), Fumman Orange (FuO)

The sugar content of the fruit juices ranged between 10.40^{OP} and 13.04^{OP}. The highest sugar content of 13.04^{OP} was recorded by Chivita mango, while the lowest value of 10.40^{OP} came from Frutta apple. The results are presented in Figure 7

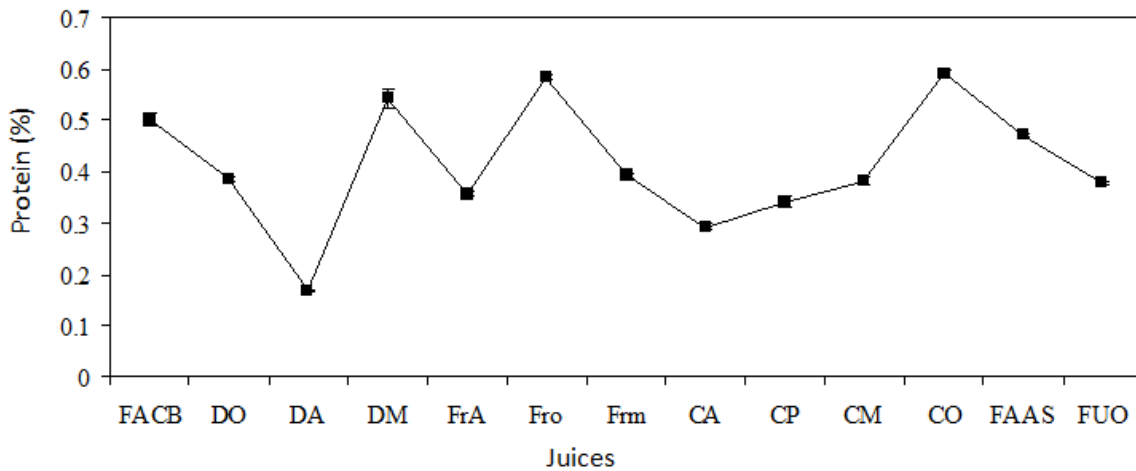


Figure 9: Protein content of the juices. The juice drinks are: Five Alive Citrus Burst (FACB), Dansa Orange (DO), Dansa Apple (DA), Dansa Mango (DM), Frutta Apple (FrA), Frutta Orange (FrO), Frutta Mango (FrM), Chivita Apple (CA), Chivita Pineapple (CP), Chivita Pineapple (CP), Chivita Mango (CM), Chivita Orange (CO), Five Alive Apple Splash (FAAS), Fumman Orange (FuO)

The Vitamin C content of the fruit juices ranged between 1.69mg/100ml and 31.25mg/100ml. Five alive citrus burst recorded the highest value of 31.25mg/100ml, while Dansa apple had the lowest value of 1.69mg/100ml. the results are presented in Figure 8.

The Protein content of the fruit juices ranged between 0.168% and 0.591%. Chivita orange had the highest value of 0.591, while Dansa apple recorded the lowest value of 0.168%. The results are presented in Figure 9.

The fruit juice content of the fruit juices ranged between 82.5% and 95.0%. Chivita pineapple had the highest value of 95.0%, while Dansa mango, Frutta mango and Chivita mango, each had the lowest value of 82.5%. The results are presented in Figure 10.

However there are significant differences between all the values presented.

DISCUSSION

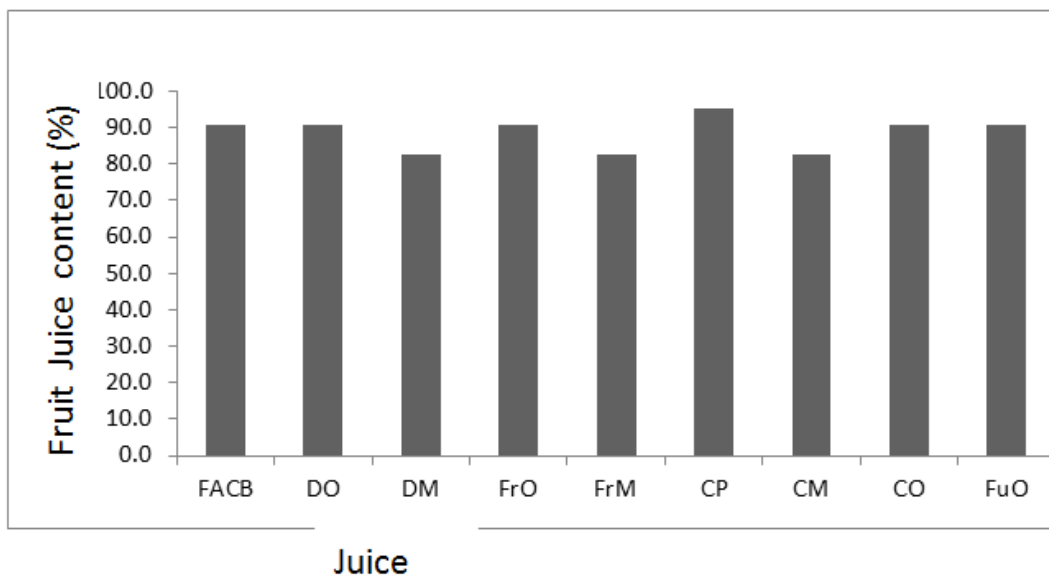


Figure 10: Fruit Juice content of the juices. The juice drinks are: Five Alive Citrus Burst (FACB), Dansa Orange (DO), Dansa Mango (DM), Frutta Orange (FrO), Frutta Mango (FrM), Chivita Pineapple (CP), Chivita Mango (CM), Chivita Orange (CO), Fumman Orange (FuO)

The organoleptic and sensory tests depicted acceptance of these fruit juices based on their colour and odour (aroma). [11] reported that growth rate of microorganisms are reduced in acidic medium, but increased in basic medium. Citrus and other juices are a good option for gaining vitamin C, for a glass of either orange or lemon juice would provide a level in excess of the Current Recommended Daily Allowance (UK-RDA) of 40mg [12]. Strawberry and Guava juices are readily available as the citrus juice. However, the consumption of the more popular mango juice will provide close to the UK-RDA [13]

Citrus juices are also useful sources of dietary calcium, while the potassium-sodium balance in the body may well be enhanced by consuming Avacado or Banana juice [13]. Also besides the chemical alterations, vitamin loss caused by temperature increase and/or oxidation, reduce product acceptance [14]. Colouring and flavouring indicate fruits ripeness to produce quality fruit juice [15]. The specific gravity, Ash and protein contents of the fruit juices are all important in fruit juice quality and stability [3; 4].

In conclusion, it is important that regular monitoring of the fruit juice qualities for human consumption must be introduced to avoid any future disease out-break.

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