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Physicochemical and Nutritional Value of Red and White Guava Cultivars Grown in Sudan

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ABSTRACT

The aim of this work was to evaluate the physicochemical characteristics and nutritional value of red and white guava fruit (*Psidium guajava*) grown in Sudan Significant differences (P<0.05) was observed between the two varieties in weight (71.68, 59.69 g), diameter (4.50, 3.73 cm) and level of water content (83.01, 81.37 %) for white and red guava fruit , respectively . chemical composition tests were also. carried out for the two varieties .it was observed that the highest level of vitamin C was that of the white one (250.77) mg|100g compared to the red (190.69 mg/100g) however, the highest level of the total and reducing sugar was estimated in red variety (8.88, 8.43 %) ,while the white one was (8.43, 7.05 %) respectively. In general, the two varieties were found rich in potassium (38.23, 37.29 mg/100g), sodium (17.03, 12.67 mg/100g) ,calcium (12,68, 11.82 mg/100g)., magnesium (7.22, 6.17. mg\100g) and iron (3.66 , 1.57 mg\100g) for white and red guava fruits, respectively.

Keywords: *Guava ,Physicochemical characteristics , Nutritional value.*

INTRODUCTION

The guava tree (Psidium guajava L.) which belongs to the family Myrtaceae is considered as one of the most important tropical fruit trees in the world, enriching the diet of hundreds of millions of people with its special characteristic odour and high nutritive value (Morton, 1987; El- Bulk, 1997). In Sudan, guava fruit is considered as one of the most popular and major fruits of the country coming after dates, citrus, mango and banan (Table 1). The most popular guava cultivars are the pear and apple shaped fruit types which may be either with pink or white pulp. Both types are easily grown in any part of the country with high productivity (7.0 tons/feddan) and could be harvested 2-3 times in one year. Table 1. shows the total production and cultivated areas of guava fruits in Sudan during the period of 2006-2010 in comparison with dates, citrus, mango, banana and other fruits as reported by the Horticulture var. Section, Federal Ministry of Agriculture (2011). . The whole fruit is edible, round to pear-shape, from 3 to 10 centimeters (cm) in diamet(up to 12cm in some selected cultivars) (Herbst, 2001). It has a thin delicate rind, pale green to yellow at maturity in some species, pink to red in others, a creamy white or orange flesh with many small hard seeds and a strong characteristic aroma, Guavas are often marketed as "super fruits" being rich in vitamins A and C with seeds that are rich in omega-3, omega-6 polyunsaturated fatty acids and especially dietary fiber. A single apple guava (P. guajava) fruit contains over four times the amount of vitamin C as a single orange (over 200 mg per 100g serving) and also has good levels of the dietary minerals, potassium, magnesium, and generally abroad, low-calorie profile of essential nutrients. However, nutritional value is greatly dependent on species, the strawberry guava (P. littorale cattleianum) notably containing only 30-40mg of vitamin C per 100g serving, a fifth of the vitamin C found in more common varieties.
Vitamin C content in the strawberry guava is still a high percentage (62%) of the dietary reference intake (Healthaliciousness.com, 2008)

MATERIALS AND METHODS

Two varieties white and red which are commonly cultivated and consumed in sudan were obtained from local market in capital Khartoum .only ripe fruits sample were selected . these fruits were cleaned and kept refrigerated prior to further treatment and analysi1.

Physical attributes of guava fruits

The weight (g) and length (cm) of the two varieties of guava fruits (white flesh and red flesh) were determined using stainless Virnier device (Mituroyo, Japan), then, the average were calculated for each fruit. Skin a
apearance, shape and rind colour were also determined.

Chemical attributes

The moisture , ash , protein , and crude fiber content in the raw materials was estimated according to the method of the Association of Official Analytical Chemists (AOAC) 1990, while sugars were determined using the AOAC (1984). The ascorbic acid content was described by pearson (1976) and the minerals content was measured according to AOAC (1980).

RESULTS AND DISCUSSION

Results

4.1 Physical characteristics of guava fruit

Table 1. shows the physical characteristics of white and red local Sudanese guava fruits harvested during season 2008/09. Significant ($P \leq 0.05$) differences were observed with regard to the fruit physical characteristics. The average weight (gm) and diameter (cm) of the two varieties (white and red) were found to be 71.68-59.69 gm and 4.50-3.73 cm, respectively. The skin colour was light yellow to green for the white variety whereas the red one was light yellow to light green. About the shape, it was pear or round in the white variety, whereas the red variety was only round. The white variety has light yellow pulp as well as the red one has light pink pulp. The seeds shows significant ($P \leq 0.05$) differences between the two varieties (22.37 and 18.58 gm/1 kg) for white and red varieties, respectively. Morton (1996) reported that, guava fruit in general is round, ovoid, or pear shaped, 2 to 4 in 5-10 cm long, the skin white, yellowish, light-or dark pink. Number of seeds ranged from 112-535, but some guavas are seedless or nearly so. In the same aspect, Herbst (2001) noticed that, guava fruit is round to pear shape, from 3 to 10 cm in diameter and may be up to 12 cm, whereas weight varied between 55-85 gm in some cultivars.

Pire and Rivas (1987) cited that, the fertilization of fruit trees and the conditions during growth can affect the physicochemical characteristics of the fruit such as the out appearance with emphasis on size, shape and rind colour

Composition profile of guava fruit

Table 2. shows chemical composition profile of guava fruit (white and red). Significant ($P \leq 0.05$) differences were observed between the two varieties in water content, sugars and level of ascorbic acid, whereas ash, protein and fiber showed insignificant differences. The water percentage was 83.01 and 81.37% for white and red varieties, respectively. The results indicated that the red variety contain the less amount of water. Morton (1987) found that water level in guava fruit ranging between 77-86%. Khan (1989) reported that the moisture content of some mango varieties produced in Pakistan ranged between 77.6-82.2%.

The values of ascorbic acid were 250.77 and 190.69 mg/100 gm for white and red pulp varieties, respectively, which indicated that the white pulp variety is richer in vitamin C. Bose. (1999), and Jain, (2011) indicated that guava fruit is an excellent source of ascorbic acid (260 mg/100 gm) especially the white pulp variety.

Total sugars were 8.43 and 8.88% for white and red pulp guava fruit, respectively, whereas the reducing sugars were 7.05 and 8.44% for the two varieties mentioned above. Nevertheless, Morton (1987) found that the total carbohydrates in guava fruit range between 9.5-10%. Moreover, Noor, (2011) reported 10.19, 10.71 and 11.95% for total and 3.45, 2.96 and 3.14% for reducing sugars of three mango cultivars.

As in Table 5 the ash, protein and fiber values were (0.58, 0.53%), (7.00, 6.80%) and (3.50, 2.91%), respectively for white and red variety. Morton (1987) found that the ash, protein and fiber of guava fruit range between 0.43-0.70% ash, 2.80-5.50% fiber and the protein range 0.90-1.00%. The values obtained in this study are not greatly differing from values obtained by Morton in ash and fiber whereas the values of protein were higher compared to Morton (1987).

Selvaraj. (1999) reported that, there are some factors that affect the composition profile of the fruits such as stage of maturation, ripening and condition during growth in addition to the fertilizertion process.

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Minerals content of guava fruit

Table 6. shows the minerals content of white and red guava fruits. The white guava fruit was significantly (P≤0.05) higher in Ca, Mg, Fe, Na and K compared to the red guava. Both varieties were found to be rich in K content (382.30 and 372.95 mg/100 gm for the white and red guava, respectively. The values obtained in the study are much higher compared to the values, reported by Morton (1987) calcium (9.10-17.00 mg), iron (0.30-0.70mg), whereas Bose *et al*. (1999) found that minerals like phosphorous.

and calcium ranged between 23.00-27.0 and 14.00-30.00 gm in guava fruit, respectively.

Minerals content such as phosphorous, potassium, calcium, magnesium, sodium and iron content were affected by growth, environmental conditions and maturation (Selvaraj *et al*., 1999; West, 1988).

Table 1. Physical characteristics of guava fruits

Physical property	Guava samples		$Lsd_{0.05}$	SE±
	White flesh	Red flesh		
Weight (gm)	71.68±12.88^{a}	59.69±5.73^{b}	10.5236**	2.9541
Diameter (cm)	4.50±0.52^{a}	3.73±0.63^{b}	0.6784*	0.0755
Seed (gm)	22.37±0.52^{a} (gm/kg)	18.58±0.52^{b} (gm/kg)	2.5231*	0.0198
Skin appearance	Light yellow Green	Light yellow Light green		
Shape	Pear-round	Round		
Rind colour	White	Pink		

Mean±S.D value(s) bearing same superscript letter(s) within each row are insignificantly (P≤0.05) different.* = significant at P≤0.05, ** = highly significant at P≤0.01

Table 2. Composition profile of guava fruit

Constituent (%)	Guava fruit		$Lsd_{0.05}$	SE±
	White pulp	Red pulp		
Water content	83.01±0.28^{a}	81.37±0.22^{b}	1.6423*	0.5467
Ash	0.58±0.01^{a}	0.53±0.01^{a}	0.0694 ^{NS}	0.0085
Protein	7.00±0.00^{a}	6.80±0.00^{a}	0.3682^{NS}	0.0179
Fiber	3.50±0.01^{a}	2.91±0.03^{a}	0.6425 ^{NS}	0.0234
Total sugars	8.43±0.02^{b}	8.88±0.04^{a}	0.4692*	0.0257
Reducing sugars	7.05±0.01^{b}	8.44±0.02^{a}	1.2958*	0.0371
Non-reducing sugars	1.38±0.01^{a}	0.44±0.00^{b}	0.9309*	0.0569
Ascorbic acid (mg/100 g)	250.77±2.05^{a}	190.69±1.21^{b}	48.56*	13.72

Mean±S.D value(s) bearing same superscript letter(s) within each row are insignificantly (P≤0.05) different. NS= not significant; * = significant at P≤0.05

Table 3. Minerals content of guava fruits (mg/100g)

Mineral	Guava samples		$Lsd_{0.05}$	SE±
	White	Red		
Potassium (K)	382.30±5.00^{a}	372.95±5.00^{b}	0.0086*	0.0137
Sodium (Na)	170.35±4.00^{a}	126.75±4.00^{b}	0.0035**	0.0023
Calcium (Ca)	126.80±4.00^{a}	118.20±4.00^{b}	0.0080*	0.0055
Magnesium (Mg)	72.25±2.00^{a}	61.70±2.00^{b}	0.00101*	0.0008
Iron (Fe)	3.36±1.00^{a}	1.57±1.00^{b}	0.0152*	0.0018

Mean±S.D value(s) bearing same superscript letter(s) within each row are insignificantly (P≤0.05) different. * = significant at P≤0.05, ** = highly significant at P≤0.01

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