Comparative proximate and some Micronutrients content of five local varieties of mango pulp (*Mangiferaindica*) commonly consumed in Wudiltown Kano State

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Abstract: Comparative nutrient composition was carried out on five local varieties of mango pulp commonly consumed in Wudil town Kano state. The moisture content of the pulp range from 79% for Peter mango (Binta sugar)to 84% for Golden nugget(Kayan rago), ash range from 0.05% for Sheri mango (Yar-kamaru)to 0.49% for Julie mango (Mai-simunti); proteins range from 0.3 1% to 1.25% for Normal mango (Tawarri)and Peter mango (Binta sugar).The fat contentof the pulp range from 0.6% for Golden nugget mango (Kayan rago) and Peter mango (Binta sugar)to 1.0% for Normal mango (Tawarri),while carbohydrate content was found to range from 14.06% to 18.74% for Golden nugget mango (kayan rago)and Peter mango(Binta sugar)respectively. The elemental analysis revealed that, among the varieties used, high potassium content was found in the pulp from Sheri mango (Yar kamaru)(62.2±0.01mg/100g). The pulp from Golden nugget (Kayan rago)and Normal mango (Tawarri)were found to contain more magnesium(1.2±0.01 mg/100g) than that from other source used but pulp from Peter mango (Binta sugar)and Julie mango (Mai-sumunti)contain high amount of iron (1.40±0.00 mg/100g) and likewise highestcalcium content was found in the pulp of Julie mango (Mai-sumunti)respectively. Vitamin C content was found to be high in Julie mango (Mai sumunti)(26.4mg/100g) while beta-carotene was high in pulp from Peter mango (Binta sugar). Therefore among these local varieties of mango pulp, Peter mango (Binta sugar)was found to be more nutritious due to the high content of protein and carbohydrate.

Key words: Mango fruits, Pulp,Proximate, Ascorbic Acid, Minerals and β-carotene

1. Introduction

Mangoes are members of genus *Angifera* of the flowering plant family *Anacardiaceae* [1]. The fruit is a fleshy drupe of varying size, color, fiber content, and taste among other features. The shape varies from round, to ovate-oblong and longish with length ranging from 2.5 to 30 cm depending on variety[2]. Apart from the diversemango seedlings varieties known, there are more

than a thousand vegetatively propagated cultivars reported [2]. Depending on the variety, the mature fruit differs in size and color, ranging from yellow, orange, red to green [3].

The fruit is of high nutritional significance and can serve as an energy source (about 64-86 calories per 100g). More than 80% of the fruit is water which depending on its accumulation, determines the size of the fruit [4].Furthermore, it is also nutritionally rich in vitamins, minerals, and other nutrients[5][6]. The fruit contains phytonutrients such as carotenoids (provitamin A, β-carotene and α-carotene) [7], polyphenols and omega-3- and -6 polyunsaturated fatty acids [3]. Vitamins A, C and E comprise 25, 76 and 9% of the Dietary Reference Intake (DRI) in a165 g serving, while vitamins B6 (pyridoxine) and K comprise, 11% and 9% DRI) [3].The pulp alone contains up to about 25 different carotenoids, β-carotene being the most dense and responsible for the yellowish-orange color of most mango varieties [8].Also, thecarotenoids pigments are almost insoluble in water and are not affected by acids or alkalis [9].

Minerals such as sulphur, phosphorus, iron and to a certain extent, calcium are found in many fresh fruits [9].They have only a small amount of protein and are also less in fat, with a few exceptions like avocado or butter fruit (*Perseaamericana*) which contains up to 25per cent fat. Various sugars are found in fruits which vary depending on the fruit. The polysaccharides, cellulose, hemicelluloses and peptic substance are the structural component of fruits. These make fruits important sources of roughage or bulk in the diet. Fruits also contain some free organic acids [9].

The world has witnessed an increase in tropical fruits production, consumption, and trade, possibly due to the increased awareness of their nutritional and therapeutic values [10] asfruits

have been used as natural remedies to health related problems including degenerative diseases associated with aging [11][12].

Both extrinsic (color and size) and intrinsic (nutritional value, sweetness, acidity and shelf-life) factors determines the quality of fruits [13]. Other factor influencing quality is proper fruit harvesting time which is determined by cultivar, location, weather, and purpose and ease of harvest. In mangoes and oranges, for example, both the sugar and acid levels changes as fruit ripen on the tree (sugars increase and acid decreases). This ratio of sugar to acid determines the taste and acceptability of the fruit [14].

This work aimsto determine the proximate, Beta carotene and some nutrient contents of five local varieties of mango pulp Golden nugget mango *(Kayan rago)*, Sheri mango *(Yar kamaru)*, Peter mango *(Binta sugar)*, Normal mango *(Tawari)*and Julie mango (*Mai suminti))*commonly consumed in Wudil town.

2.0 Material and methods

2.1 Study Area

This study was carried out on five local varieties of mango fruits commonlypurchase and consumed in Wudil town, Kano State Nigeria. The town is one of the prominent local Governments in the state and is located in the North – East region of Nigeria at Coordinates: 11° 49' 0" North, 8° 51' 0" East. The market is situated in the center of the town close to the river side. The market operates every Friday of the week from 8.00 am to 7.00pm and local

farmer supplied different type of commodities to the market. Local varieties of mango are among the common commodities that can be found and purchase during its season.

2.2 Sample collection

The five local varieties of mango fruits used as sample (100g each) in this research were purchased from local market in Wudil town on July; 2011. The fruits were transported to laboratory in a sterile polyethene bags and stored in refrigerator prior to processing in duplicate. The samples were leveled A for Golden nugget (*Kayan rago),* B for Sheri mango(*Yar kamaru),* **C**for Peter mango (*Binta suga),* D for Normal mango(*Tawarri)*and E for Julie mango (*Mai sumunti)*respectively.

2.3 Methods

The moisture, proteins, *fat* and ash contents of the pulp were determined using AOAC (2000) methods while the total carbohydrate contents were determined by difference (100 - % (Moisture +Ash +Proteins+ Fat).

The vitamin C content of the pulp was determined by titration using 2,6- dichlorophenol solution as described by AOAC(l995) as reported by Benderitter*et al.* [15] and the Beta carotene content was quantified spectrophotometrically using method adopted from IVACG [16].

The potassium, magnesium, iron and calcium content of the pulp were determined using methods adopted by AOAC [17].

3.0 Results and Discussion

3.1 Results

The proximate analysis revealed that, the moisture content ranges from 79 to 84% for *Binta suga* and Golden nugget mango(*Kayan Rogo);* Ash content ranges from 0.05 to 0.49% for Sheri mango (*Yar kamaru)*and*Mai Sumunti;*protein content of the pulp was found to be from 0.31 to *1.25%* for Normal mango (*Tawarri)*and *Binta sugar,* fats from 0.6 to 1.0% for both *Kayan rogo* and *Binta suga* and *Tawarri* while carbohydrate content was found to be from 14.06 to 18.74% for *Kayan rago* and *Binta suga* Varieties as depicted on table 1.0 respectively.

The elemental analysis revealed that, potassium contents ranges from 20.8 to 62.2mg/100g for *Mai Summunti* and *Yar kamaru;* magnesium from 0.6 to 1.20mg/100g for *Binta suga* and *Mai sumunti* and *Kayan rago* and *Tawarri;* Iron from 0.6 to 1.4mg/100g for *Kayan rago* and *Binta suga*and *Mai Summunti* and calcium from 1.4 to 9.4mg/100g for *Yar kamaru* and *Mai sumunti* as Shown on Table 2.0 respectively.

Vitamin C and beta-carotene content of the mango pulps were shown on Table 3. It was found that shows that among the varieties, pulps from *Mai sumunti* contain the highest vitamin C content (26.4mg/100g) while*Binta suga* contain the highest amount of beta carotene (0.08mg/100g) respectively.

Table 1:The proximate composition of some local verities of mango pulp

Sample	Moisture (%)	Ash (%)	Protein (%)	Fats (%)	T. Carbohydrate %
Golden nugget	84 ± 0.0	0.34±0.0	0.94±0.0	0.60±0.0	14.06±0.01
Sheri mango	82 ± 0.0	0.05±0.0	0.63±0.0	0.8±0.0	16.06±0.00
Peter mango	79 ± 1.4	0.43±0.0	1.25±0.0	0.6±0.0	18.74±0.33
Normal mango	80 ± 0.0	0.43±0.0	0.31±0.00	1.0±0.0	18.26±0.00
Julie mango	80 ± 0.0	0.49±0.01	0.63±0.00	0.8±0.0	18.09±0.00

All results are mean of duplicate ± standard deviation.P-values for all parameters were < 0.05

Table 2:Some elemental analyses of five local varieties of mango pulp

Sample	K (mg/100g)	Mg (mg/100g)	Fe (mg/100g)	Ca (mg/100g)
Golden nugget	27.6± 0.00	1.20 ± 0.01	0.6 + 0.00	2.2 ± 0.00
Sheri mango	62.2±0.01	0.6 ± 0.00	0.8 + 0.00	1.4 ± 0.00
Peter mango	41.4± 0.00	0.6 ± 0.00	1.4 + 0.00	2.2 ± 0.00
Normal mango	62.0± 0.00	1.2 ± 0.01	1.2 + 0.00	7.2 ± 0.00
Julie mango	20.8± 0.00	0.6 ± 0.01	1.4 + 0.00	9.4±0.00

All results are mean of duplicate ± standard deviation;P-values for all parameters were < 0.05

Table 3: Vitamin C and β-carotene content of five local varieties of mango pulp

Sample	Vitamin C (mg/100g)	β-carotene (mg/100g)
Golden nugget	23.60± 0.50	0.026± 0.00
Sheri mango	25.00±0.50	0.028± 0.00
Peter mango	22.16± 0.48	0.080± 0.00
Normal mango	21.18± 1.50	0.040 ± 0.00
Julie mango	26.40± 0.50	0.26 ± 0.00

All results are mean of duplicate ± standard deviation;P-values for all parameters were < 0.05

3.2 Discussion

The proximate composition of *kayan rago* (A), *Yar kamaru* (B), *Binta suga*(C), *Twarri*(D) and *Mai sumunti* (E) varieties of Mango pulp commonly consumed in Kano weredetermined. The percentage moisture, ash, fat, proteins and carbohydrate contents were determined usingAOAC [17].

Moisture content determination is one of the most important analyses performed on food product because it determines the quality of that product. The higher the moisture content of a products the more it is susceptible to spoilage by microbial action [18]. From the result of this work, it is clear that *Binta Suga* (C) variety contains the least moisture content (79%), followed by *Tawarri* (D) and *Mai sumunti* (E) (80%), *Yar kamaru* (B) (82%) and *Kayan rago* (A) (84%) respectively. Therefore, products formed from *Binta suga* will have more shelf life and stability than those from other varieties. This result is inline with the work of Robert and Bradley [18]; which reported that, moisture content of water melons, oranges, apples, and grapes to be 92.6, 86.0, 84.4 and 81.6% respectively.

Ash content of food stuff refers to the inorganic residues remaining after ignition or complete oxidation of organic matter which reflects the mineral content in the food [19]. The results of this work shows that, the ash content of *Kayan rago, Yar kamaru, Binta suga, Tawarri* and *Mai suminti* were found to be 0.34, *0.05,* 0.43, and 0.49% respectively. This clearly shows that *Mai suminti* variety tend to contain more mineral content (0.49%) followed by *Binta suga* and *Tawarri* with 0.43% then *kayan rago* (0.34%). While *Yar kamaru* variety contains the least mineral content (0.05%).This result is inline with work reported by Habers[19] that, the ash content of cherries, apple and tomatoes was 0.3, *0.5* and 0.6% respectively.

Protein refers to organic compound with complex structural organization consisting of amino acid linked into a chain called peptide bond. The nutritive value of food is determined by its protein content. The result of this work revealed that *Binta suga* variety was found to contain more protein content (1.25%) which is followed by *kayan rago* (0.94%) than *Yar kamaru* and *Mai sumunti* (0.63%) and *Tawarri* (0.31%) respectively. This result did not tally with report of Ibiyemi *et al.* [20] that, the protein contents of Mango pulp ranged between 3.99 and 4.96%. This difference may be due variation in sample sources.

Fats are esters of fatty acid with glycerol [21]. From the result of this work it was found that, mango pulp from *Tawarri* has high fat content (1.0%) than *Yar kamaru* and *Mai sumunti* (0.8%) while *Kayan rago* and *Binta suga* were found to have the least value (0.6%) respectively. This result is in line with work of Umar and Birnin-Yauri[22] whom reported the fat content of cashew apple to be 0.5%.

The carbohydrate content of any food product determines its energy producing substances e.g. sugar and starch found in food [23]. Carbohydrate content analysis in this work shows that *Binta suga*contains highest amount of carbohydrates (18.74%) followed by *Tawarri* (18.26%) then Mai *sumunti* (18.09%), *Yar kamaru* (16.06%) and least from *Kayan rago* (14.06%). This result is not consistent with that reported by Jermiah, [24] and Adam *et al.*[25] reported that, *Terminalia catappa* fruits containsof 38.32% carbohydrate while *Colocynthiscitrullus*has 11.89% carbohydrates; but in line with reported value by Morton [26]for Mango pulp to range between 16.2-17.8grespectively.

The results of the mineral composition of *Mangiferaindica* pulp are presented in the Table 3. There are a lot of variations in the mineral content of *Mangiferaindica*pulp reported to date. The values of sodium were not detected for all the samples. From this results, it is clear that, the *Yar kamaru* contains large amount of potassium than that of Tawarri followed by that obtained from *Binta sugar, Kayan rago* and least from *Mai sumunti* of 62.2, 62.0, 41.4, 27.6 and 20.8mg/100g respectively; therefore these result was found not in line with work reported by Reuter *et al.* [27] that, citrus fruit contains 17.0mg/100g potassium. The level of magnesium content of all the samples shows that *Kayan rago* and *Tawarri* has the highest level than *Yar kamaru, Binta suga* and *Mai sumunti* of 1.2 and 0.6mg respectively This results are not comparable with the findings of Adewole and Olowookere, [28] and Reuter *et al.* [27] who observed that, *Taminalia catappa* pulp contains 10.0 and l04mg/100mg respectively.

The iron content of five local varieties of mango pulp was 1.4mg/100mg in Binta sugar and 0.6mg/100g in Kayan rago is comparable with 1.9mg/100g *Kayan rago* and 0.2mg/b0g reported by AdewoleandOlowookere [28], and Reuter *et al.*[27].

The calcium content for *Mai sumunti, Tawarri, Binta suga,* and Yar kamaru were found to be

9.4, 7.2, 2.2 and 1.4mg/100g respectively. The result is consistent with that reported by Reuter *et al.*,[27].

The vitamin C (Ascorbic acid) and beta-carotene content of the five local varieties of mango pulp as depicted on Table 3. This showed that, the Vitamin C content of the pulp from Mai sumunti to be 26.4mg/100g which is highest among that from other varieties analyzed. This is followed by *Yar kamaru* followed by *Kayan rago Binta suga* and *Tawarri*, with contents of 25.0, 23.6, 22.16 and 21.18mg/100g, respectively. This result is not inline with that of unripe papaya, just ripe papaya and overripe papaya fruit of 107.5, 158, 75and 115.omg/100g as reported by Umoh[29]. Also the vitamin C content obtained in cashew apple is almost twice that obtained in this work of 45.33mg/100g as reported by Umar and Birnin- Yauri, [22].

The β-carotene content of the five local varieties of mango pulp used in this work, revealed a greater beta- carotene content in than that from *Tawarri* followed by that of *Yar kamaru* and less in *Kayan rago* and *Binta suga Mai sumunti* **(** 0.04, 0.028 and 0.026mg/100g) respectively. This result is similar to thatreported by Umoh [29], that,ripe papaya and overripe papaya fruits contains 0.42, 0.71 and 0.7mg/g of carotene.

4.0 Conclusion

From our observation, it is clear that all mango pulp varieties analysed were of high nutritional value and quality. However, the *Binta suga* exhibited the highest nutritional value with respect to higher protein and carbohydrate content. Furthermore, having the lowest moisture content, gives it a longer shelf-life when processed. Thus thiswork serves has revealed the nutritional profile of the pulp ofsomelocal varieties of mango sold in Wudil Town.

Competing Interests

I (author) herebyhave declared that, no competing interests exist.

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