Physicochemical and Sensory Evaluation of Fruit Drink Produced from Desert Date (*Balanites aegyptiaca*) in Kano Metropolis

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Abstract
Desert dates (Balanites aegyptiaca) were processed into formulated drinks. Two varieties of Desert dates were obtained from Rimi market Kano, Nigeria. They were selected, sorted, rinsed and then boiled in portable water for 10 -15 minutes; then allowed to soak for 1 – 3 hours. It was sieved to remove strands, seed and other particles. The purpose of this study is to develop acceptable flavoured drinks from Desert dates and thereby increase the utilization of this under-utilized fruits. The physical, chemical attributes and sensory evaluation were conducted on the products to assess the highest preference. Values for pH ranged from 4.57 to 4.64 and the total titratable acidity (TTA) from (0.87 – 1.40) % but, Total soluble solids (25 - 24) ^{o}Brix and Vitamin C content ranged from 5.38 – 7.69 mg/100 ml while specific gravity ranged from (1.056 – 1.062) g/cm^{3}. The sensory results showed that there no significant differences ($p < 0.05$) between the samples in terms of attributes of taste, appearance, mouth feel and overall acceptability and not in the attribute of aroma. Generally, the fruit drink had good consumer preference with the sample B being the most preferred.

Keywords: *Desert date, attributes, physicochemical, sensory, evaluation*

Introduction

Desert date (*Balanites aegyptiaca*) is widely distributed in the arid zone of Nigeria. It is also found in other African countries of Senegal and Sudan, as well as in India (Chothani and Vaghasiya, 2011, Ndoye *et al.*, 2004, Pandey, 2005). The tree is remarkable because it is available during the dry season, when foliage is difficult to obtain and is found in many kinds of habitat, as it grows in a variety of soil types (Chothani & Vaghasiya, 2011).

Balanites aegyptiaca (L.) Del, Balanites "Lalob, Hegleeg" in Arabic, which belongs to the Zygophyllaceae, is oneof the most common wild plant species to dry land of Africa and South Asia (Deshmukh and Bhuyar, 2009; AlAshaal *et al.*, 2010; Shalaby *et al.*, 2012). The

plant is known to be a potential of medicinal value and used in herbal medicine. The leaves are edible and effective for sleeping sickness (Sheded *et al.*, 2006), and diabetes (Morsy *et al.*, 2010). The outer rind of the fruit is used in the treatment the skin diseases, hypoglycemic agent. The roots and bark are used as antimalaria; for treatment of *Candida* infection; and promising for treatment of HIV/AIDSpatients (AlAshaal *et al.*, 2010; Cook *et al.*, 1998).

The oil and fruit extracts of balanites were reported to have vast biological activities as anticancer, antihelmenthic (Al Ashaal *et al.*, 2010; Shalaby *et al.*, 2012), useful botanical insecticides (Patil, Salunkhea, Gavit, and Maheshwari, 2010), antifungal (Chapagain *et al.*, 2007), larvicidal (Wiesman and Chapagain, 2006; Chapagain *et al.*, 2008), and molluscicidal activities (Treyvaud, *et al.*, 2000).

Fruits constitute an important part of a balanced diet as they are natural source of food nutrients namely protein, carbohydrate, minerals and dietary fiber, needed by man and animals. With the global focus on increased food production and emphasis on provision of nutritive food for the worlds teeming population, it is very important to consider our locally available fruits and to determine their nutrient composition for the purpose of increasing the production of such fruits (Ossi and Ndukwe, 2008 and Bhandari and Kawabata 2006)

Consumption of wild edible plants was practiced for ages. Nabel *et al*, 2006 explained that there has been renewed interest in the world wide consumption of wild food plants. Despite the increased reliance by agricultural societies on conventional crop plants, the tradition of eating wild plants has not completely disappeared; their nutritional role and health benefit have been reported in many studies (Pardo-de-Santayana *et al.*, 2007).Wild food plants are used as a source of food energy, sources of vitamins and minerals. They are important as dietary supplements, providing trace element, vitamins and minerals (Gillman,2008, Debela *et al.*,2011).

Presently, a variety of soft drinks are being produced in the country e.g. sweetened carbonated soft drinks and beverages containing fruit juice and soda water. Among these, the share of fruit juice based beverages is presently quite small compared to synthetic carbonated drinks. Gradually, there is a distinct shift towards fruit juice based beverages for obvious advantages of the higher nutritional, medicinal and calorific values over the synthetic aerated beverages (Svans, 2008). It has been reported that fruits and nuts form an integral part of the African diet and are consumed as relishes and snacks. Fruits are used in the production of beverages (Anon, 2007).

Material and Method

Sample collection

Two varieties of *Balanitis aegyptiaca* (Desert date) fruit, sugar and flavour were obtained from Rimi market of Nassarawa local government Area of Kano state, Nigeria.

Preparation of desert date fruit drink

About 160 g of desert date fruits were sorted for wholesomeness, washed in clean water to remove contaminants reduced microbial load. They were peeled, rinsed, boiled for 10-15 minutes and allowed to soak for 1-3 hours in 2 l of water. The extracted juice was sieved to remove the seeds, strands and other particles and was poured into a clean pot and 200g of sugar and 28ml of flavor were added to obtain desert date fruit drink. The formulated drinks were pasteurized for 85°C for 15 minutes, and drink were filled into bottles and kept in refrigeration for analyses.

Balanitis aegyptiacea
↓
De-barking

↓
Rinsing
↓
Soaking 1-3hrs
↓
De seed
↓
Filtration
↓
Additives (sugar/flavor)
↓
Fruit drink

Figure1: flow chart for *Balanites aegyticea* drink

Results

The Physiochemical characteristics of *Balanites aegytica* formulated drink is shown in table 1 and mean sensory evaluation is presented in table 2 while table 3 reveals the percentage score of the sensory analysis.

Table 1: Physiochemical Parameters of Sample A and B

SAMPLE	A	B
Vitamin C Mg/100ml	7.69±0.10	5.38±0.17
Brix (^{0}Brix)	25±1.60	24±1.73
TTA (%)	1.40±0.84	0.87 0.86
pH	4.64±0.32	4.57±0.63
S.G	1.0516±1.14	1.0622±1.14
Sweetness Index	17.85	27.59
Astringency Index	0.056	0.036

Mean ± Standard Deviation of Triplicate read

Table 2: Comparative Sensory Evaluation of Sample A and B

Sample	**A**	**B**
Colour	1.75^a±1.41	1.70^a±1.37
Flavour	1.60^a±1.22	1.80^a±1.44
Taste	2.30^a±1.89	1.85^a ± 1.51
G.ACCP.	1.95^a±1.58	2.10^a ± 1.84

Mean ± Standard Deviation of Triplicate reading

Table 3: Percentage Score on Comparative Sensory Evaluation of Samples A and B

Sample	**A**	**B**

Hedonic scale		
Colour	85	85
Flavor	85	75
Taste	60	80
G. Acceptability	70	75

Discussion

The soluble solids content is one of the most important quality parameters in processing. 55% soluble solids content were sugars, glucose, and fructose and their amount and proportion has an influence on the organoleptic qualities of fruits. The TSS of sample A (25^{o}Brix) was slightly higher than sample B (24^{o}Brix).

The acidity of the drinks (i.e. sample A and sample B) was 1.40% and 0.87% respectively. Acids present in food not only improve its palatability but also influences their nutritive value. The acid influenced the flavor, brightness of colour, stability, consistency and keeping quality of the product (Adedeji e*t al.*, 2006).

The pH values of the formulated drinks were 4.64 and 4.57 which is within the range of 3 to 5 for fruits and vegetables juices (Adubofuor *et al.*, 2010; Harris *et al.*,1991) and were however similar to those reported for papaya and aloe vera juice (Borghani, *et al.*, 2012). The optimum pH for the growth of most microorganisms is in the range of 6.6 to 7.5 (Bor and Jasper, 1988). The pH value of 3 to 4 may give juice a good potential of inhibiting the growth of pathogenic bacteria (Jay, 2000; Hatcher *et al.* 1992).

The vitamin C levels of the formulated drink were lower than all the fruits but, similar result was reported by Fadavi *et al.*, (2006). The vitamin C levels reported for carrots, tomatoes, and oranges were 9.3mg/100g, 19.1mg/100g, and 53.2mg/100g, respectively (Pamplona-Roger, 2003).The presence of vitamin C in a drink is desirable, as the vitamin is vital in Iron absorption as well as formation of intercellular protein collagen (Ogbanna *et al.*, 2013).

Table 2 shows the result of the mean score of the sensory evaluation of the formulated drink. The result showed that the average score for colour of sample A was 1.75 which was slightly higher than sample B (1.70).From statistical analysis conducted, though there was slight variation in the colour of the samples, there was no significant differences($P \leq 0.05$), meaning that the sample colour were both liked moderately. Colour is usually an indication of flavor concentration because usually, a lighter colour will indicate a milder flavor (Amri and Ladjama, 2013).

The average score for taste of sample A was 2.30, there was a slight difference in sample B which recorded 1.85.The panelist liked the taste of the samples very much. The taste of the drink may be attributed by the amount of sugar contained in the fruit pulp. Sweetness rating may also depend on the type of the fruit and may also vary during storage (Ashaye *et al.*, 2005).

The sweetness index and astringency of the drinks were 17:24 and 0.025:0.036 respectively. The ratio of sugars to acids and vice versa gives an accurate prediction of tartness and sweetness of acid foods which influences organoleptic perception(Wardy *et al.*, 2009).Foods with sweetness index greater than 19 are regarded as sweet and less acid by taste(Wardy *et al.*, 2009).

Table 3 shows the percentage score on comparative sensory evaluation of the samples (i.e sample A and sample B) used in this research work.

The colour is important to the consumers. Out of the 20 panelists, 45% liked extremely, 40% like much so 95% indicated their acceptance is sample A.

The flavor of a drink is also important to the consumer. The panelists were asked to compare the flavors of samples A and sample B. 85% of panelist accepted the flavor of sample A while 75% accepted sample B.

Thus, there was slight preference for the flavor of sample A. This was confirmed by the mean values (Table 2) which were significantly different at 5% level.

The taste of a drink is also an important feature for consumers. Out of the 20 panelists, 55% accepted sample A while 80% accepted sample B. Although both samples were accepted, there is high preference for the taste of sample B and this is shown by mean values in (Table 2) which showed significant difference at 5% level.

The general acceptability of the drink is also very important to the consumers as sample A had 70% general acceptability while sample B had 75% general acceptability.

All the sensory attributes scored were however not significantly different ($P \leq 0.05$) with the exception of the taste which showed significant differences between the samples.

CONCLUSION

Two varieties of *Balanites aegyticae* formulated drink were produced and the physiochemical parameters were quite similar except, both samples were generally acceptable, with slight preference for sample B. There was no significant difference in term of all sensory attribute with exception of taste.

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