Advances in Bioresearch
Adv. Biores., Vol4 (4) December 2013: 74-78
©2013 Society of Education, India
Print ISSN 0976-4585; Online ISSN 2277-1573
Journal's URL:http://www.soeagra.com/abr/abr.htm
CODEN: ABRDC3

ORIGINAL ARTICLE

Effect of Different Preservation Methods on the Quality Attributes of Some Tropical Fruit Juices

[1].MAKANJUOLA, Olakunle Moses, [1]ADEPEGBA, Adetokunto Olawola, [1]AJAYI,Adebola and [2]MAKANJUOLA, John Olanrewaju
1.Department of Food Technology, Federal Polytechnic. P.M.B, Ilaro,Ogun State,Nigeria
2.Zanzid Nigeria Ltd 1B,Eric Moore Close, Off Eric Moore Road, Lagos state ,Nigeria.
Corresponding Author; Makanjuola, Olakunle Moses , Department of food Technology , Federal Polytechnic , P.M.B, 50 , Ilaro , Ogun State , Nigeria .
E –mail ; Kunle.makanjuola@yahoo.com

ABSTRACT
Effect of different preservation methods on some quality attributes of juices produced from four tropical fruits , namely water melon , mango , cashew and apple were evaluated immediately after production[day 0] and 28 days after storage . Juices were preserved at room temperature , refrigeration temperature , freezing temperature and addition of 0.5% sodium benzoate . The pH for all the juice samples ranged from 3.01-4.91 , indicating that they are slightly acidic irrespective of the preservation methods adopted . The vitamin C content varied between 30mg/100ml and 52mg/100ml, suggesting that the juice samples are rich in this vitamin, though all the juice samples showed the decreased trends of vitamin C from day zero to day 28 , . The total soluble solids [TSS]were low for all the juice samples , probably due to the fruit variety , the degree of maturity and ripeness . The total titratable acidity [TTA] were also low , ranging from 0.08%-0.27% , though it was found to increase as the storage period increased in all the juice samples . Juice samples preserved using refrigeration method were highly accepted while juice subjected to room temperature were least preferred in terms of color , flavor , taste and over all acceptability .
Keywords: Quality attributes, Tropical fruit Juices , preservation methods

Received 20/09/2013 Accepted 20/11/2013

INTRODUCTION

Fruits has been described as the succulent or fleshy covering of nuts; are pulpy in character, often juicy and since they develop from flowers of plant, they consists of the ripened seed or seed, with some edible tissues attached[1].Juice is the liquid that is naturally contained in fruit and vegetables tissues .It is commonly consumed as a beverage or used as an ingredient or flavouring in foods[2].Fruit juices are some of these non-alcoholic beverages which have been consumed in one form or another for many years[3]

Juice is prepared by mechanically squeezing or macerating fruit without the application of heat or solvent. Processing methods used for fruits depend on the type of fruit desired end product. The operations involved may include washing , peeling , slicing , pulping , filteration , syruping , pasteurization or sterilization , dehydration , canning and fermentation , among others[4].In Nigeria , substantial quantities of fruit juices are commercially produced and marketed , while some are imported [5]

Fruit juices are actually known for the ability to raise serum antioxidant capacity and even off set the anti oxidant stress and inflammation normally caused by high-fat and high-sugar meals. Fruit juice in moderate amounts can help children and adults meet daily recommendations for fruit consumption, nutrient intake and calories [2]. Food preservation is the process of treating and handling food to stop or slow spoilage [loss of quality, edibility or nutritional values] and thus allow for longer storage. Preservation of juices involves preventing the growth of bacteria, yeast, fungi and other micro organisms [2].However, this study was carried out to ascertain the effect of different preservation methods on some quality attributes of selected tropical fruit juices produced locally.

MATERIALS AND METHODS

Source of material: Ripe water melon ,mango, cashew and apple fruits were purchased from sayedero market in Yewa South Local government area of Ogun State, Nigeria

Production of Fruit Juices

Water Melon Juice

The water melon fruits were thoroughly washed in tap water, peeled manually, seed removed and cut into small pieces. The fruit were blended in an electric food processor to produce pulps which were further sieved using clean cheese cloth, pasteurized at 65^0C for 15 minutes, cooled to room temperature and packaged in sterilized pet bottles.

Mango Juice

Ripened mango fruits were thoroughly washed, peeled manually with stainless steel knife, seed removed and edible portion were cut into thin slices, blended in a kenwood food processor, sieved through a double folded cheese cloth, then pasteurized for 15 minutes at 65^0C, allowed to cool to room temperature and packaged in sterilized pet bottles

Cashew Juice.

Ripe cashew fruits were sorted out , thoroughly washed with clean portable water and boiled in a pressure cooker at 100^0C for 5 minutes to allow easy extraction .The boiled cashew fruits were then peeled and the edible portion blended using ken wood processor and sieved through a double folded cheese cloth, pasteurized and packaged in sterilized pet better.

Apple Juice.

The apple fruits were thoroughly washed in tap water, peeled manually with stainless steel knife, seed removed and cut into small pieces .The fruits were blended in an electric food processor to produce pulp which were further sieved using clean cheese cloth to produce juice, pasteurized at 65^0C for 15 minutes, cooled to room temperature and then packaged in sterilized pet bottles.

Storage Conditions

The juice samples produced were stored under different storage conditions such as room temperature, refrigeration temperature, freezing temperature and addition of sodium benzoate. Analysis were carried out on day zero (production day) and 28 days after storage.

Analytical Procedure

Quality attributes of the fruit juice were determined using standard assays performed in triplicates. The pH was determined using standard pH meter, Expandable Ion Analyser EA 920. The meter was standardized using buffers 7 and 4 before obtaining readings . Vitamin C was determined using the 2,6-dichloroindophenol titration method [AOAC,1995][6] . Total soluble solids [TSS] were determined using AOAC [1995] [6] method while the Total titratable acidity [TTA] was carried out by titrating 10ml of each sample with 0.1NNaOH to the phenolphthalein end point[6] . The refractive index was determined using Abbey 60 refractometer as described by Pearson [7]

Sensory Evaluation

The water melon, mango , cashew and apple juice samples were subjected to sensory evaluation ratings. The juices were evaluated for taste, color, flavor, and overall acceptability on a 9point Hedonic scale[9=like extremely and 1 dislike extremely] using twenty judges randomly selected from staff and students of the Federal Polytechnic, Ilaro.The evaluation was carried out under full illumination where juice samples were presented in randomized order in transparent glasses cups coded with alphabets. Bottled water was provided for the judges to rinse their mouth as they evaluated the juice samples.

Statistical Analysis

Data collected were analyzed by Analysis of variance[ANOVA] as described by Gomez[8] . The least significant difference [LSD] test was used to identify the means that differ significantly at $P \leq 0.05$.

RESULTS AND DISCUSSION

TABLE 1: Quality Assessment of Fruit Juice at Room Temperature (27%)

DAY 0

SAMPLE	PH	VIT.C Mg/100ml	TSS (%)	REFRACTIVE INDEX(%)	TTA (%)
WAT	3.11±0.02	46.60.±0.03	7.0±0.03	3.51±0.01	0.09±0.03
MAN	4.00±0.03	52.81±0.02	8.5±0.01	3.53±0.03	0.18±0.03
CAS	4.71±0.03	48.22±0.02	6.4±0.06	3.61±0.05	0.22±0.02
APP	3.14±0.05	51.20±0.03	7.7±0.02	3.61±0.02	0.20±0.01

Values were means of triplicate determinations

TABLE 2: Quality Assessment of Fruit Juice at Room Temperature (27%)

DAY 28

SAMPLE	PH	VIT.C Mg/100ml	TSS (%)	REFRACTIVE INDEX(%)	TTA (%)
WAT	3.65±0.03	30.12±0.01	6.8±0.06	3.60±0.06	0.24±0.04
MAN	4.12±0.04	42.90±0.04	8.0±0.03	3.53±0.04	0.23±0.06
CAS	4.81±0.03	40.53±0.02	5.8±0.01	3.61±0.04	0.29±0.02
APP	3.66±0.07	42.36±0.03	7.1±0.02	3.64±0.05	0.27±0.04

Value were means of triplicate determinations

TABLE 3: Quality Assessment of Fruit Juice at Refrigeration Temperature (5^0C)

DAY 0

SAMPLE	PH	VIT.C Mg/100ml	TSS (%)	REFRACTIVE INDEX(%)	TTA (%)
WAT	3.09±0.02	49.52±0.03	7.0±0.05	3.53±0.03	0.08±0.02
MAN	4.16±0.03	52.84±0.04	8.4±0.03	3.48±0.05	0.16±0.02
CAS	4.77±0.03	47.28±0.03	6.4±0.05	3.58±0.03	0.22±0.06
APP	3.12±0.05	50.18±0.04	7.5±0.05	3.42±0.03	0.20±0.04

Values were means of triplicate determination

TABLE 4: Quality Assessment of Fruit Juice at Refrigeration Temperature (5%)

DAY 28

SAMPLE	PH	VIT.C Mg/100ml	TSS (%)	REFRACTIVE INDEX(%)	TTA (%)
WAT	3.72±0.05	45.21±0.02	6.7±0.04	3.65±0.01	0.19±0.02
MAN	4.00±0.03	49.97±0.04	8.4±0.03	3.61±0.06	0.19±0.03
CAS	4.89±0.09	42.08±0.03	6.7±0.04	3.68±0.02	0.26±0.01
APP	3.47±0.03	47.29±0.01	7.6±0.06	3.67±0.03	0.22±0.01

Values were means of triplicate determination

TABLE 5: Quality Assessment of Fruit Juice at Freezing Temperature (-16%)

DAY 0

SAMPLE	PH	VIT.C Mg/100ml	TSS (%)	REFRACTIVE INDEX(%)	TTA (%)
WAT	3.01±0.06	46.62±0.05	7.2±0.03	3.49±0.03	0.08±0.05
MAN	4.06±0.02	52.83±0.04	8.8±0.04	3.47±0.02	0.16±0.01
CAS	4.61±0.03	48.22±0.02	6.5±0.04	3.52±0.06	0.24±0.02
APP	3.74±0.04	51.20±0.02	7.6±0.05	3.44±0.07	0.22±0.04

Values were means of triplicate determination

TABLE 6: Quality Assessment of Fruit Juice at Freezing Temperature (-16%)

DAY 28

SAMPLE	PH	VIT.C Mg/100g	TSS (%)	REFRACTIVE INDEX(%)	TTA (%)
WAT	3.40±0.06	40.61±0.05	7.0±0.02	3.55±0.03	0.21±0.01
MAN	4.22±0.03	47.51±0.05	8.5±0.04	3.50±0.03	0.20±0.02
CAS	4.90±0.04	43.21±0.05	6.2±0.03	3.62±0.05	0.24±0.06
APP	3.24±0.02	42.29±0.04	7.4±0.03	3.45±0.03	0.26±0.02

Values were means of triplicate determination

TABLE 7: Quality Assessment of Fruit Juice Preserved with Sodium Benzoate (5%)

DAY 0

SAMPLE	PH	VIT.C Mg/100ml	TSS (%)	REFRACTIVE INDEX(%)	TTA (%)
WAT	3.13±0.02	46.70±0.05	7.1±0.03	3.50±0.04	0.09±0.03
MAN	4.00±0.03	52.34±0.06	8.4±0.02	3.48±0.02	0.17±0.01
CAS	4.21±0.03	47.20±0.01	6.3±0.03	3.58±0.03	0.22±0.02
APP	3.10±0.06	50.20±0.03	7.6±0.04	3.42±0.01	0.20±0.01

Values were means of triplicate determination

TABLE 8: Quality Assessment of Fruit Juice Preserved with Sodium Benzoate (5%)

DAY 28

SAMPLE	PH	VIT.C Mg/100ml	TSS (%)	REFRACTIVE INDEX (%)	TTA (%)
WAT	3.48±0.04	44.30±0.03	7.1±0.04	3.66±0.06	0.22±0.04
MAN	4.02±0.02	49.02±0.02	8.8±0.02	3.32±0.04	0.18±0.03
CAS	4.91±0.03	44.31±0.03	6.2±0.03	3.56±0.03	0.27±0.02
APP	3.94±0.02	49.00±0.03	7.6±0.03	3.69±0.05	0.23±0.02

Values were means of triplicate determination

TABLE 9: Sensory Evaluation Ratings of Juice Samples

PRESERVATION METHODS	TASTE	COLOUR	FLAVOUR	OVERAL ACCEPTABILITY
ROOM TEMPERATURE (27^0C)	4.47±0.01	3.25±0.01	3.14±0.01	3.11±0.00
REFRIGERATED (5^0C)	8.67±0.03	9.33±0.03	8.77±0.03	8.99±0.20
FREEZING (-16^0C)	7.23±0.04	5.11±0.02	6.15±0.02	6.22±0.01
5% SODIUM BENZOATE	5.17±0.02	6.16±0.02	4.52±0.02	4.67±0.02

DISCUSSION

The results of quality attributes for the fruit samples subjected to different preservation methods are as shown in the tables 1-8 respectively. The pH for all the samples , irrespective of preservation methods and types of fruit juices ranged from 3.01 to 4.91 . The pH for the samples , an indication of high acidity may confer longer keeping quality on all the juices as reported in the previous work [9] . However , the pH levels of the juice samples indicated that they are slightly acidic[10]. Also the observed lend of pH could be as a result of storage temperature [preservation methods] and type of fruits used for the production of the juices. It is also possible to have biochemical reaction taking place during storage periods together with microloial action in the juices [5] . pH is determinant of juice quality and the stabilization of juice color is mainly due to pH effect [5] . Products with low pH will have their shelflives increased [11] as observed in a previous work.

Fruits as a food class are valuable chiefly for their vitamin and mineral contents [1] and almost all fruits contain physiologically significant amount of vitamin c and some are very rich [4] . As shown in the tables, the vitamin C [Ascorbic acid] ranged from 30mg/100ml to 52mg/100ml for all the samples , irrespective of the fruit type , preservation methods and length of storage . It was observed that there was gradual decrease in level of vitamin C contents at the end of 28 days of storage. For example, the vitamin C contents of water melon on day 0 was 46.60mg/100ml and decreased to 30.12mg/100ml on day 28, even when stored at room temperature. These trend where exhibited by other juice samples. The decrease in value of vitamin C observed in the samples with storage time could be as a result of oxidation reaction taking place during storage and this agreed with a previous work [5]. Also, the variation in the loss of vitamin C after 28 days of storage observed from different juice samples could be attributed to the different type of fruits used and the quality of vitamin C initially present in the fruit as confirmed by a previous work [5] . Furthermore, it was observed that the preservation method to which the juice samples were subjected to played a crucial role as far as the vitamin C contents are concerned at the end of the storage period. For example, vitamin C losses were low at freezing temperature storage, refrigeration temperature storage and chemical preservation storage [addition of Sodium benzoate] when compared with losses from room temperature storage . Low temperature can slow down the rate of degradation of vitamin C generally while the great [high] losses seen in juice samples stored at room temperature may be as result of oxidation reaction by residual oxygen , followed by decomposition which may have been accelerated due to storage temperature [12]

The loss in total soluble solids for all the juice samples irrespective juice type, preservation method and duration of storage was low. However as fruit mature on the tree, their concentration of juice solids which are mostly sugar changes. [13] . Also the degree of maturity, ripeness and variety tends to affect the total soluble solids [TSS] of the fruit juices [13].

The total titratable acidity of all the juice samples were low, ranging from 0.08% to 0.27% and was also found to increase as the storage period prolongs . The relatively high level of vitamin C in some of these juices may be due to the acidity since ascorbic acid occur more in acidic medium as observed in a similar work [9,14]. The refractive index of all the samples also increased on day 28 after storage irrespective of the juice samples and preservation methods .

The sensory evaluation ratings for the juice samples are presented in table 9.The judges responses showed that the juice samples differs significantly in terms of taste, color, flavor and over all acceptability[$P \leq 0.05$] . Juice samples refrigerated were rated best in term of taste, color, flavor and acceptability , closely followed by juice samples subjected to freezing storage . However it observed that juices preserved with sodium benzoate also ranked better in terms of color when compared with juices kept under freezing storage . This might due to thawing process to which frozen juices were subjected to, since ice crystals formed during storage made the color to be lighter. Samples kept under room temperature were ranked least in all the sensory qualities tested for in the samples and this might probably due to series of biochemical reaction that might taking place during ordinary room temperature storage .

CONCLUSION

It could be concluded that refrigeration method is best suited for the preservation of fruit juices, even for long term storage. Quality attributes of juices such as PH, vitamin C, total soluble solid [TSS], refractive index and total titratable acids [TTA] of various juices kept under refrigeration were not adversely affected by this storage method, hence vitamin C which is an important component of nutrition that help to protect against cancers, heart diseases and stress becomes available to the body when consumed due to its anti oxidant nature.

REFERENCES

1. Ihekoronye ,A.I and Ngoddy ,P.O (1985) . Integrated Food Science and Technology for the Tropics. Macmillan Publishers, London. Pp 293-298
2. Frazier , W.C and Westhof , D.C (1986).Food Microbiology. 3rdEdition. McGraw-Hill Publishing Company Ltd, New York. Pp 17-22, 152-162.
3. Anderson ,C and Blackmore ,D (1991).Modern Food Service. Buttermorth, Heinemman Publishers Ltd. Linacre House, Jordan Hill. Pp 167
4. Enwere , N.J (1998) . Food of Plant Origin. Afro-Orbis Publications Ltd . Nsukka, Nigeria. Pp 154 .
5. Okorie ,O , Enwere , N.J and Udensi , E.A [2009] . Effect of ambient storage condition on the PH and vitamin C content of selected Tetra-Pak packaged fruit juices marketed in Nigeria. Nigeria Food Journal . Vol 27, 2: 4-9
6. AOAC (1995). Official Method of Analysis. Association of Official Analytical Chemists .Washington , D.C
7. Pearson, D (1976). The Chemical Analysis of Food. Church Livingstone Publishers, London . 6th Edition
8. Gomez , K and Gomez , A (1984) . Statistical Procedure for Agricultural Research . 2nd Edition . John Wiley and Sons, New York . Pp 139- 153.
9. Nzeagwu, O.C and Undugwu , A.N (2009) . Nutrient Composition, Physical and Sensory properties of fruit juices produced from velvet tamarind *[delium guineese wild]*, pineapple and pawpaw . *Nigeria Food Journal*. Vol 27, 2: 168-174.
10. Akubor , P.I and Ogbadu, R.I (2005) . Effect of processing methods on the quality and acceptability of melon drink . *Plant Food Human Nutrition* Pp 89.
11. Demir ,N , Acar , J and Bahceci , S.K [2004] . Effect of Storage on quality of carrot juices produced with Lacto Fermentation and acidification . *Journal of European Food Research and Technology* . vol 218 , 5:465-468 .
12. Burdule , H.S , koca, N and Karadeniz , F(2006) . Degradation of vitamin C in citrus juice concentrates during storage. *Journal Food Eng*. 74: 211-216.
13. Potter, N,N (1978). Food Science . 3rd Edition. Avi Publishing Company . Inc. Westport, Connecticut . Pp 557-562
14. Okegbile , E.O and Taiwo , E.A (1990) . Nutritional potential of Velvet tamarind [Dalium guinese wild]. *Nigeria Food Journal* 8: 115-121.

Citation of This Article

MAKANJUOLA, Olakunle Moses, ADEPEGBA, Adetokunto Olawola, AJAYI,Adebola and MAKANJUOLA, John Olanrewaju. Effect of Different Preservation Methods on the Quality Attributes of Some Tropical Fruit Juices. Adv. Biores. Vol 4[4] December 2013: 74-78