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Extraction and Preservation of Cashew Juice Using Sorbic and Benzoic Acids

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Abstract The extraction and preservation of cashew juice using sorbic and benzoic acid was carried to determine a more method for preserving cashew juice under a period of one month. Cashew juice was produced and preserved by five different methods viz – untreated (control) as sample (A_1); pasteurized juice only (A_2); pasteurization and preserved with sorbic acid (B_1); pasteurization and preserved with benzoic acid (B_2) and a combination of sorbic and benzoic acids coupled with pasteurization at 95°C. All the samples were stored in sterilized transparent bottles at 4°C and 28°C for 30 days. Storage stability and the microbial count were determine to obtA1n a suitable method for preserving cashew fruit (Anacardium Occidentale) juice. Sensory evaluation was carried out using 9 point hedonic scale by 20 panelist and statistical analysis on the sensory data was carried out to determine significant differences of the samples at 95% ($P \leq 0.05$) confidence level. The results obtA1ned showed that a combination of sorbic and benzoic acids together with pasteurization was capable of preventing the growth of microorganisms, increase shelf-life, inactive enzymatic actions in the juice and reduce the harsh taste of cashew juice for 30 days of storage.

Keywords: *cashew (Anacardium Occidentale), sorbic acid, benzoic acid, preservation, microbial count*

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1. Introduction

A fruit juice is the unfermented, undiluted extractible fluid content obtA1ned from the expression of fruit. Fruit juices are tasteful food beverages which provide energy and contA1n considerable amount of important vitamins (especially vitamin C) and mineral (Duckworth, 1979). Juices which include single strength and concentrates are important means of utilizing fresh fruits, which provides and important source of nutrients in a convenient and most refreshing form (Duck worth, 1979).

There has been a shift over the past three decades in the forms in which fruits are consumed. The fruits consumed. The fruits consumed in processed forms has increased significantly while the rate of consumptions of various fruits in their unprocessed forms have declined greatly due to the concentration of people at the urban regions than the rural areas. The problems associated with freshly harvested fruits such as deterioration have increased the technologies of making the fruits accessible to people living in the urban areas in their processed forms. The processed fruits juices share was about 43% in 1950 but today, it has increased to more than 70% (Ohler,1988). The increased convenience of processed fruits, their all year round avA1lability and improved uniform quality have been the major factors influencing this shift. In most developing countries of the world, fruits are normally wasted and only small quantities are utilized by industries or consumed due to poor storage facilities, poor transportation system, handling equipment (like in green apples) and poor preservation methods. For example cashew fruits has a high rate of deterioration due to prone attack by insects, rodents and micro organisms such as yeast and mould which makes the fruit unavA1lable to the people in other parts of the country.

Efforts have been made by technologists all over the world to providing methods of processing tropical fruits and vegetable through pre-processing storage techniques, preparative processes, extraction, pasteurization, packaging and preservations using chemical and natural preservatives (Ihekoronye, A.I. and Ngoddy, 1985). Akinwale (2000), analyzed some physico-chemical properties of some tropical fruits and found out that cashew apple juice contA1ned the highest amount of vitamin C with 203.5mg/100ml which is more than 300% higher pasteurization which will inactivate enzymes as well as mellow down the harsh taste of the juice. Also suitable condition for the juice will be determined in order to maintain the shelf-life of the juice.

It is hoped that the end of this study, a high quality cashew juice having good taste, appearance and shelf life stability will be produced. The result of this work will also encourage cashew farmers as this will boost cashew fruit production and motivate processors to go into cashew juice processing.

2. Material and Methods

2.1. Materials Procurement

The Cashew fruits used in this work were obtA1ned from a cashew plantation at Okigwe, Imo State, Nigeria. Other materials include Sorbic acid, benzoic acid and packaging materials. Sterilized bottles were used and sterilized equipment.

The chemicals (Sorbic acid and benzoic acid) were obtA1ned from food science and Technology in FUTO and other equipment like refractor meter, Hydrometer and pH meter.

2.2. Material Preparations

The cashew fruits (apples with nuts) on arrival within the same day there where harvested, in the laboratory were thoroughly washed with distilled water before the nuts were carefully detached from the apples. The apples were then rewashed to remove any form of dirt that were found between the nuts and the apples. The muslin filter wrapped in an aluminum foil was sterilized at a temperature of 121°C and pressure of 16psi for 20mins in an autoclave. The apples were sorted to remove the unwholesome ones and were rewashed using distilled water, allowed to drA1ned and then reweighed.

2.3. Production of Juice From Cashew Apple

A modified extraction method was used in the extraction fo the cashew juice.

Approximately, 2500g of thoroughly washed cashew apples were crushed using a grater and the juice was extracted using a mechanical screw press (Duchscher crub press model NG, 1 usine de Wedker).

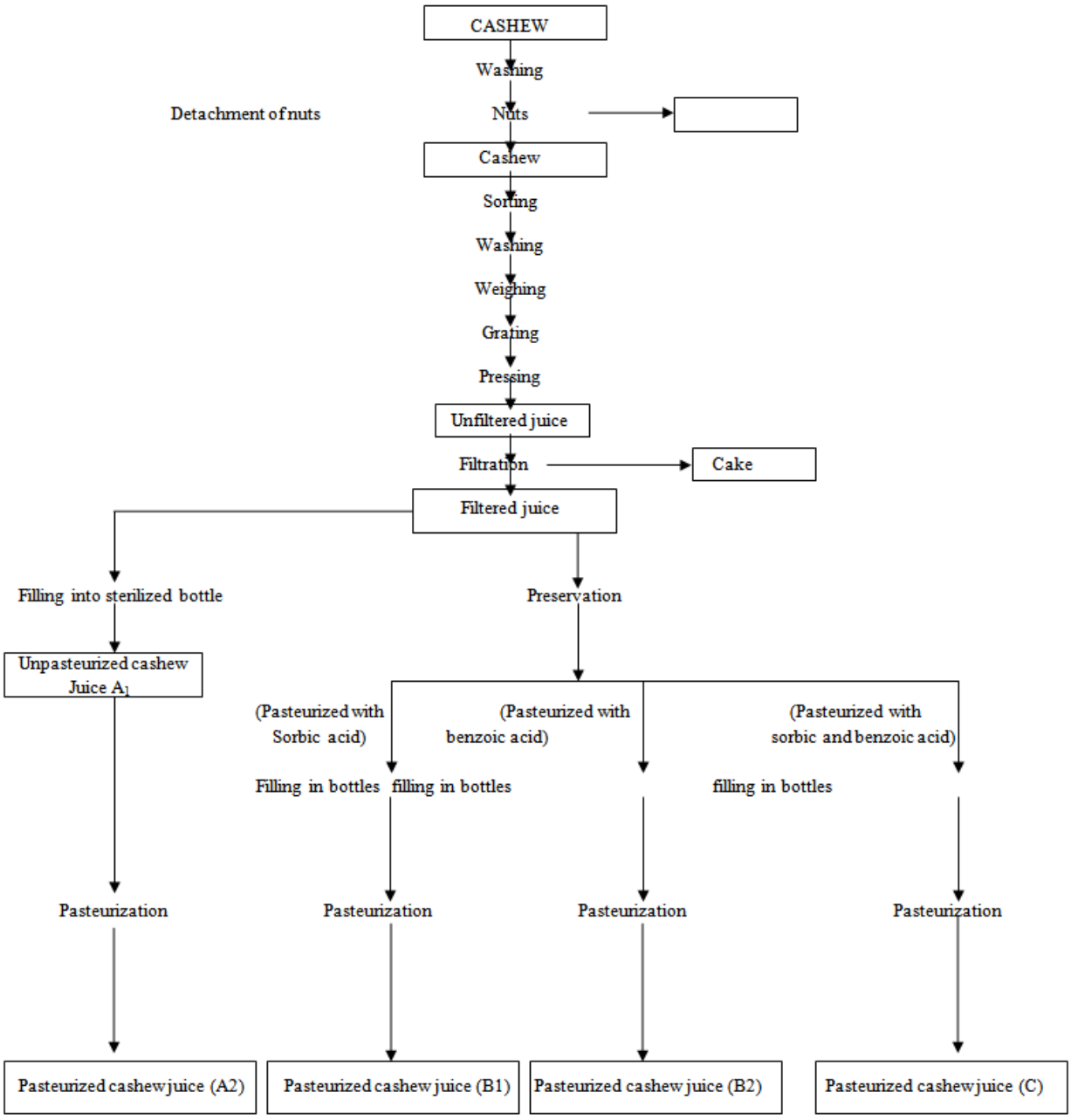

Figure 1. The production flow diagram of cashew juice processing, using different preservation methods

The juice obtA1ned was filtered using the sterilize muslin cloth both the juice and the cake were weighed and the weights were recorded. A pure juice sample was obtained which weighed approximately, 1900g. Different

samples were made out of this juice which the first sample was aseptically obtA1ned and stored in a sterilized bottle, stored without preservatives and pasteurization. Another sample was made which only mild heat treatment was applied to it before storage while other samples were made with addition of sorbic acids and Benzoic acid respectively and also pasteurized. A combination of both sorbic and benzoic acid at 0.1% based on the total weight of the juice in equal ratio was also so use to obtA1n another sample.

The preservatives were first dissolved with a little portion of juice before adding to the remA1ning juice and thoroughly homogenized. The juices were immediately filled in sterilized bottles (autoclaved). Corked and pasteurized at a temperature of 95°C for 7mins, cooled and stored at different temperatures (room temperature and frozen temperature of 40°C and 28°C for the respective samples.

The production flow diagram of the cashew juice processing is shown in Figure 1.

3. Analysis on the Cashew Juice

3.1. Determination of pH of the Cashew Juice

The pH of the cashew juice was determined by using a standard pH meter (PHYWE, range 0-14). The pH of 7 after which the bulb was dipped in another buffer solution and the reading on the scale was adjusted. The process was repeated with another known pH (Tap water) to standardized the pH meter. Each time, the bulb was dipped into another solution it was thoroughly rinsed with distilled water after the calibration of the pH meter, the bulb was dipped into the juice samples and the pH reading of the juice was repeated 3 times and the average were recorded.

3.2. Determination of the Cashew Juice Colour

This was done using spectrophotometer method. The absorbance values of the juice was determined at 450nm and 600nm wave length using a spectrophotometer. Before the analysis, the juice was diluted with distilled water and was used as blank.

The measurement was made by inserting the coveter (glass tube) contA1ning the samples into the light path of the spectrophotometer which measured the intensity of light at various wave lengths transmitted by the solution.

The intensity of light were determined by the electric detector, which converted radiant energy to electric energy. The diluted juice samples which had the absorbance value at 450nm was used as a standard and the other filled with the juice were inserted into the instrument and knob was switched off before taking the reading of the absorbance on the electronic scale.

3.3. Determination of the Specific Gravity of the Juice

The specific gravity of the juice samples were measured by the use of hydrometer. The hydrometer was dropped into the juice sample when it was cooled at 20°C after extraction in a measuring cylinder and was allowed to float. The readings were taken directly from the hydrometer scale by reading the upper meniscus.

3.4. Determination of Total Soluble Solids (Brix Level) of the Cashew Juicie

Soluble solid content was measured as percentage sugar by the use of a refractometer. The sample was poured on the sample holder and covered. The readings was taken directly from the scale when viewed from the eye-piece after adjusting the knob until there was a clear demarcation between yellow and light by a red light which the red line was at the centre of the cross. The analysis was carried out for the respective samples and recorded.

3.5. Determination of Titratable Acidity of the Fruit Juice.

This was measured by using 0.1N NaOH solution and phenolphthalein indicator. The juice sample (25ml) was diluted to about 25ml with distilled water. One hundred milliliter solution of the sample was titrated with 0.1N NaOH per 100ml of original solution. This values were then converted to percentage titratable acidity using a standard formular.

3.6. Determination of the Microbial Counts of the Fruit Juice

The number of micro organisms present in the fruit juice were determined using the pour plate count method. The pipettes and plates were sterilized by autoclaving at 121°C before use and hygienically stored. The agar (potatoe dextrose) was prepared according to the instructions on the bottle. The sample were serially dilute the 5^{th} dilution, then agar was allowed to cool to 15°C. 0.1ml of each of the dilution were poured in the plates and then nutrient agar was poured on the inoculated samples. The plates were covered immediately and gently shaken, then placed at 37°C for 24-48hrs. the microbial growth on each of various sample plates were countedand recorded. This was repeated at one week interval for (4) weeks.

Total count = Initial dilution x subsequent x Amount of plated = Dilution Factor.

3.7. Sensory Evaluation

Sensory evaluation is unique source of product information concerned with measuring the response of people to products in terms of appearance, aroma, taste, texture and after and after taste without benefit of label, pricing or other imagery (Iwe 2002).

The sensory evaluation was carried out by 20 panelists composed of 10 male and 10 females selected within the university, rating samples on 9 – point hedonic scale. This was a comparison test between the un-pasteurized and pasteurized cashew juice. Cashew juice preserved with sorbic acid compare toe cashew juice preserved with benzoic acid and finally comparing juice preserved with both sorbic acid and benzoic acid at the ration and other respective samples. The evaluation was based on quality parameters such as taste, flavor, mouth-feel, colour, and overall acceptance. The panelists were requested to compare the samples by observation and testing, indicating their feelings. The means of the scores by the

judges were tested by analysis of variance for significant differences between their respective juice samples.

4. Results and Discussion

4.1. pH Value of Cashew Juice Stored at Different Temperature

the pH value of the various samples of the juice were shown in Table 1. The pH values of freshly juice treated with the preservatives (sorbic acid, benzoic acid and the combination) were the same and they have lowered pH than the pH (4.10) then samples contA1ning preservatives were slightly more acidic than the samples contA1ning no preservatives. Also, during storage (for 30 days) the pH of unpasteurized samples increased as result of microbial activities in the juice. The high pH of the control sample was an indication of fermentation which shows the effect of microbial activities in the juice. The high pH for the control sample was an indication of fermentation which shows the effect of microbial activities in the juice and sourness of the juice due to high pH. Sample A_2 (juice preserved by pasteurization only) had an increase in pH both at ambient temperature and refrigeration temperature (4°C). This increase was from 4.10 to 4.38, which shows the preservative effect of pasteurization and chilling effect on the juice. Pasteurization destroyed most of the enzymes and microorganism in the juice and the chilling effect made the environment to be unfavorable for the activities of these enzymes during the 30 days storage.

The pH of sample A_2 (pasteurized only) stored at 28°C increased to 5.20. this might be because Uof microbial actions in the juice during storage. The pH of the pasteurized sample were not as high as that of the untreated (Sample A1) stored under the same temperature over the same period. This shows the differences between the effect of pasteurized juice and unpasteurized juice. The samples which were preserved using sorbic and benzoic acid, B1 and B2 respectively did not show much increase in pH when stored for 30days at low temperature (4°C) B1 slightly increased from 4.00 to 4.10 at 4°C and to 4.13 at 28°C. Sample C is a combination of both preservatives (sorbic and benzoic acids) showed no change in pH during the period of storage at 4°C and 28°C. The pH of sample remA1ned unchanged for the period of storage both at 4°C and 28°C. But sample pH of B1 and B_2 were not affected during the cold storage but slightly increased at 28°C.

Table 1. MEAN pH OF CASHEW JUICE SAMPLES STORED AT DIFFERENT TEMPERATURE

Sample (s)	fresh juice (28°C)	Cashew juice stored for 30 days	
		(4°C)	(28°C)
Untreated juice-control (A_1)	4.10	4.50	6.40
Pasteurized juice only (A_2)	4.10	4.38	5.20
Juice preserved with Sorbic acid + pasteurization (B_2)	4.00	4.10	4.13
Juice preserved with Benzoic acid + pasteurization (B_2)	4.00	4.00	4.10
Juice preserved by Sorbic acid + benzoic acid + pasteurization C)	4.00	4.00	4.00

4.2. Total Soluble Solid of Cashew Juice (Brix Level)

Total soluble solids of cashew juice samples stored at different temperatures for 30 days were shown in Table 2. Sample A_1 and A_2 (untreated juice and pasteurization juice) greatly decreased in their brix level, from 13% to 2.1 for A_1 and 2.50 for A_2 respectively. This decrease could be attributed to the fermentation process due to actions of yeast and moulds in the juice. The reduction in brix level shows that micro organisms have used up the sugar in their activities contA1ning in the samples. Samples B1, B_2 and C had slight decrease in their total soluble solid content which was due to the inhibitory effect of sorbic and benzoic acids on the microorganisms that would have caused fermentation/spoilage of the juice. Pasteurization effect and low temperature storage of sample A_2 (pasteurized only) did not have a positive effect on the sample during storage. The brix level decrease from 13.10 to 5.8^o brix and 2^o 1^o brix when stored at low temperature respectively.

Pasteurization of the juice with sorbic acid and benzoic acids mA1ntA1ned the percentage sugar of the juice when stored for 30 days.

Table 2. TOTAL SOLUBLE SOLIDS (^{O}BRIX LEVEL) OF THE CASHEW OF STORAGE

Sample (s)	fresh juice (28°C)	Cashew juice stored for 30 days	
		(4°C)	(28°C)
Untreated juice-control (A_1)	13.1^o	4.2^o	2.1^o
Pasteurized juice only (A_2)	13.1^o	5.0^o	2.5^o
Juice preserved with Sorbic acid + pasteurization (B_2)	13.0^o	11.4^o	12.0^o
Juice preserved with Benzoic acid +pasteurization (B_2)	13.0^o	11.8^o	12.2^o
Juice preserved by Sorbic acid + benzoic acid + pasteurization C)	13.0^o	4.00^o	12.0^o

There was some differences in Brix levels of samples stored in low temperature compared to room temperature. Sample B1 (treated with sorbic acid and pasteurization) and B_2 (treated with benzoic acid + pasteurization) showed an increase when stored in room temperature (B1increased from 11.4^o to 12^o, B_2 increased from 11.8 to12.2^o) while low temperature storage reduced the percentage sugar in samples B1 and B_2 and C (11.4^o , 11.8^o and 11.9^o) compared to ambient temperature. The samples preserved with combination of both preservatives

had just a slight difference in brix level between low temperature and room temperature storage. This could be attributed to the combine effect of both preservative to inactivate the action of enzymes as well as mellow down the harshness of the juice.

4.3. Colour of the Cashew Samples

The colour of the juice on samples A_1 (pure juice, untreated) and A_2 (juice preserved by pasteurization only) became darker on daily bases during storage. Within the first two weeks of storage, the samples became very dark due to the action of non-enzymic browning reaction in the juice during storage.

For sample A_1 (pure juice, untreated) there were action of both enzymic browning and sample A_2 (pasteurized juice) darkening was suspected to be caused by Millard reaction. The reactions which takes place between amino acids and reducing sugars present in the juice decreasing the alpha-amino nitrogen content followed by undesirable colour, odour and flavor changes (Pribella and Betusowa, 1978). The amber-brown colour developed during processing of pear juice has been ascribed to poly phenol oxidize activity (Luh, 1980). Preservation of the juice by pasteurization only did not impact any preservative significance in colour of sample A_2 (pasteurized only) but sample A_1 which is the control, completely deteriorated due to Millard reactions and enzymatic activities.

The colour of sample B1 (preserved with sorbic acid + pasteurization), B_2 (preserved with benzoic acid + pasteurization only) and C (preserved with sorbic acid + benzoic acid + pasteurization) when tested by spectrophometric test for absorbance gave 0.18 for the 1st day. When stored for 30 days, sample B1, B2 and C recorded and absorbance value of 0.15, 0.15 and 0.16 respectively when stored under low temperature. Sample B_1, B_2 and C increased in the absorbance values when stored in room temperature compared to low temperature storage and recorded 0.40, 0.39 and 0.41 respectively. The appearance of samples B_1, B_2 and C did not record much changes but they mA1ntA1ned a shiny yellow colour during storage. This mA1ntenance of colour could be attributed to the pasteurization and the preservative effects on the juice samples which inactivated enzyme browning in the juice.

Table 3. THE COLOUR OF CASHEW JUICE SAMPLES UNDER 30 DAYS OF STORAGE

Sample (s)	fresh juice (28°C)	Cashew juice stored for 30 days	
		(4°C)	(28°C)
Untreated juice-control (A_1)	0.18	0.91	0.96
Pasteurized juice only (A_2)	0.18	0.72	0.78
Juice preserved with Sorbic acid + pasteurization (B_2)	0.18	0.15	0.40
Juice preserved with Benzoic acid +pasteurization (B_2)	0.18	0.15	0.39
Juice preserved by Sorbic acid + benzoic acid + pasteurization C)	0.18	0.16	0.41

4.4. Specific Gravity of Cashew Juice Samples Stored for 30 Days.

The specific gravity for fresh juice samples (A_1, A_2, B_1, B_2 and C) was 1.045. When the samples stored for 30 days, A_1 (pure) juice, (untreated) decreased from 1.045 to 0.076 at 4°C and 0.030 at 28°C. The specific gravity for A_2 was 0.80 at 4°C and 0.035 at 28°C, sample B1 (preserved with sorbic acid + pasteurization only) had a constant specific gravity for both 4°C and 28°C respectively. The samples B1 and B_2 had almost the same specific gravity through B_2 decreased from 1.04 to 1.30 when stored at low temperature. Sample C had a stable specific gravity when stored at low temperature for 30 days. The specific gravity remA1ned unchanged at 1.020 for both 4°C and 28°C. The changes that occurred in the specific gravities of the juice samples during storage could be attributed to the disintegration of fruit particles which settled at the bottom of the contA1ner, this was observed that the specific gravities of the stored juice sample under low temperature (28°C) in sample. This might be due to the fact that low temperatures improve the shelf life of food products.

Table 4. SPECIFIC GRAVITY OF CASHEW JUICE SAMPLE STORED AT DIFFFERENT TEMPERATURES

Sample (s)	fresh juice (28°C)	Cashew juice stored for 30 days	
		(4°C)	(28°C)
Untreated juice-control (A_1)	1.045	0.076	0.030
Pasteurized juice only (A_2)	1.045	0.080	0.035
Juice preserved with Sorbic acid + pasteurization (B_2)	1.040	1.020	1.020
Juice preserved with Benzoic acid +pasteurization (B_2)	1.040	1.030	1.040
Juice preserved by Sorbic acid + benzoic acid + pasteurization C)	1.40	1.020	1.020

4.5. Sensory Characteristics of Cashew Juices.

4.5.1. Colour

The result presented in Table 5, and appendices 2a and 2b showed that sample A_1 (Untreated juice, control), A_2 (pasteurized juice only), sample B1 (juice preserved with sorbic acid + pasteurization), sample B_2 (juice preserved with benzoic acid + pasteurization) and sample C (juice preserved with sorbic acid and benzoic acid + pasteurization) were significantly similar at $P>0.05$. Sample A_1, A_2, B1, B_2 and C had a mean score of 708^9, 7.4^a, $7..3^{a9}$, 7.2^9 and 7065^a< 1.0242 (LSD) colour ranking at 5% confidence level.

4.5.2. Taste

Results showed in Table 5, Appendices 3a and 3b showed that sample A_1 (untreated juice control) was not significantly different from A_2 (juice preserved by pasteurization) and not significantly different from B_1 (juice preserved by sorbic acid and pasteurization only), sample B_2 (juice preserved by benzoic acid only) and C (juice preserved by sorbic acid + benzoic acid + pasteurization). The five sample were not significantly different from each other when evaluated. Ftab>Fcal(2.53>0.4080) at 5% confidence level.

Table 5. MEAN SCORES OF SENSORY ATTRIBUTES OF CASHEW JUICE SAMPLES PRESERVED FOR 30 DAYS

ATTRIBUTES	A_1	A_2	B1	B_2	C	LSD
COLOUR	7.8^a	7.4^a	7.3^a	7.2^a	7.6^a	1.0242
TASTE	7.35^a	7.0^a	6.9^a	6.7^a	7.45^a	
FLAVOUR	7.75^a	6.25^c	7.25^a	7.35^a	7.65^b	0.4933
MOUTHFEEL	6.75^a	6.1^a	7.5^a	6.0^c	7.0^a	0.56
GENERAL ACCEPTABILITY	$7.0b^c$	6.6^{bc}	7.2^b	6.4^c	7.8^a	0.6189

KEY
A, b, c, d, e; Means on the same row with similar superscripts are not significantly different at 5% confidence level.
A_1 Untreated juice, control
A_2 Pasteurized juice only
B_1 Juice preserved with sorbic acid + pasteurization
B_2 Juice preserved with benzoic acid + pasteurization
C Juice preserved with sorbic + benzoic + pasteurization.

4.5.3. Flavour

The scores given by the panel of judges on flavour shown in Table 5, appendices 4a and 4b showed that sample A_1 (pure juice, untreated) was significantly different from sample A_2 (pasteurized juice only) and also significantly different from B_1 (juice preserved with sorbic acid + pasteurization) but not significantly different from sample B2. Sample A_2 was significantly different from B_1 and significantly different from B_2 but not different from C. sample C (juice preserved with sorbic and benzoic acids + paste2 but significantly different from A2.

4.5.4. Mouth Feel

Table 5, appendices 1a and 1b showed results obtained from panelists the differences in the mouth feel of different samples. Sample A_1 (untreated juice, control) was similar to sample A_2, B_1 and sample C but different from sample B_2. Sample B2 (juice preserved with benzoic acid + preservation was significantly different from sample A_1, A_2, B_1 and C.

4.5.5. General Acceptability

On general acceptability, results presented in Table 6, Appendices 5a and 5b showed there was no significant difference between sample A_1 (pure juice untreated) and sample A_2 (juice preserved by pasteurization only). Sample A_1 and B_2 were also not significantly different fromsample C (juice preserved with sorbic acid + benzoic acid + pasteurization). Sample C was significantly different from sample A_1, A_2, B_1 and B_2 (juice preserved by benzoic acid + pasteurization) was significantly different from sample B1 (juice preserved with sorbic + pasteurization only).

Table 6. TOTAL MICROBIAL COUNTS IN CASHEW FRUIT JUICE SAMPLE WITH 30 DAYS OF STORAGE

Sample (s)	Week 1	Week 2	Week 3	Week 4
Untreated juice-control (A_1)	NG	0.23	0.57	0.71
Pasteurized juice only (A_2)	NG	0.1	0.30	0.41
Juice preserved with Sorbic acid + pasteurization (B_2)	NG	NG	0.11	0.11
Juice preserved with Benzoic acid +pasteurization (B_2)	NG	NG	0.10	0.11
Juice preserved by Sorbic acid + benzoic acid + pasteurization C)	NG	NG	0.10	0.10

KEY
NG NO GROWTH.

4.6. Total Microbial Counts in the Cashew Juice Sample

The total microbial counts in the cashew juice samples showed significant differences. Preservation by pasteurization, use of chemical preservatives and low temperature preservation has proven yet another point from the results obtained. Sample A_1 (control) showed a high level of deterioration because of the ability of yeast and moulds to grow at low temperature. Yeasts were major spoilage agents in chilled citrus juice and concentrates (Murdock and Hatchr, 1975).

During studies on thermal destruction of endogenous microbial populations in reconstituted orange juice, found that microbial population in reconstituted orange juice, found that microbial population in reconstituted orange juice sample incubated for 24 hours at 30°C were on predominantly yeast (Weihe et al; 1984) preservation of sample A_2 (juice preserved by pasteurization only) by pasteurization helped to control the growth of yeast and bacteria by inactivating them. From the result, the total count obtA1ned was 0.1×10^3 (cfu/ml) for sample A_2 compared to A_1 which had 0.23×10^3 (cfu/ml) during the second week of storage. There was no growth in sample B_1, B_2 and C in the second week. Within the 3rd week of storage of the sample, there was a sharp increase in the growth of microorganisms. Sample A_1 increased from 0.23×10^3 (cfu/ml) to 0.57×10^3 (cfu/ml) to the 37 x103 rd week while sample A_2 increased from 0.1×10^3 (cfu/ml) to 0.30×10^3 (cfu/ml). this differences between A_1 and A_2

were as a result of pasteurization effect on A_2 compared to A_1 (unpasteurized).

Sample B_1, B_2 and C showed a minimal growth in the 3rd week. Sample B1 had the total count of $0.1x10^3$ (cfu/ml). there was no significant differences in sample B_1, B_2 and C. the minimal growth development of microorganism was as a result of the inhibitory effects of the chemical preservatives in the juice samples. Within the 4th week of storage, the total count in sample A1 further increased from $0.57x10^3$ (cfu/ml) while sample A_2 increased from 0.30 to $0.41x10^3$ (cfu/ml). samples B_1 and C remA1ned unchanged while sample B_2 increased from 0.10 to $0.13x10^3$ (cfu/ml).

The situation in sample B_1 and C could be attributed to the selective inhibitory effect of sorbic acids on yeast and mould when found in food (Ihekoronye and Ngoddy, 1985).

5. Conclusion and Recommendation

5.1. Conclusion

Base on the results obtA1ned from the investigations on extraction and preservations of cashew juice using sorbic and benzoic acid, it may be concluded the sorbic acid and benzoic acid are good preservatives for cashew fruit juice. From the date obtA1ns on shelf-life stability, it showed that the colour, pH, specific gravity, total soluble solid (Brix level) and titratable acidity of the cashew juice was stable during storage when preserved with sorbic acid and benzoic acid. Pasteurization at 95°C for 7min of the juice inactivated the enzymes present in the juicy which causes browning. Sorbic and benzoic acids by its inhibitory ability on yeast and mould presented microbial growth in the juice during storage and also mellow the harshness yeastic taste of the cashew juice.

In the case of sensory evaluation, sample C (juice preserved with sorbic acid + benzoic acid + pasteurization) with ranking of 7.8^a on its general acceptability of the panelists was “very much like” due to good colour, taste, flavor and mouth feel, which made it to be significantly different from other sample. Sample A_1 (untreated juice, control) and sample A_2 (pasteurized juice only) deteriorated rapidly, showing a high microbial count within 30days of storage while sample B_1, (preserved with sorbic acid + pasteurization), B_2 (juice preserved with benzoic acid + pasteurization) and C (juice preserved with sorbic + benzoic acid + pasteurization) recorded a low microbial count within 30 days of storage.

5.2. Recommendations

The use of a combination of sorbic and benzoic acids with pasteurization in the preservation of cashew fruit (*Anacardium Occidentale*) juice is recommended.

For further research, recommendation of cashew processing with other fruits to make blends of juices due to its high ascorbic acid content.

References

[1] Akinwale (2000). Cashew apple juice: its use in fortifying the nutritional quality of some tropical fruits. Eur. Food Res. Technol., 211: 205-207.

[2] Duckworth, R.B. (1979) Fruit juice in “Fruit and vegetable” Duckworth, R.B (editor) pergamen Press New York.

[3] Ihekoronye, A.I and Ngoddy, P.O. (1985) Integrated Food Science and Technology for the Tropics. Macmillan Publishers Ltd; London PP293-300.

[4] Iwe M.O (2002). Handbook of sensory methods and analysis. PROJOINT Communications Services Ltd, Enugu. pp. 70-72.

[5] Luh, B. S. Nectar, pulpy juices and fruit juice blends in fruit and vegetable processing technology. In *Fruit and Vegetable JuiceProcessing Technology*, 3rd ed.; Nelson, P. E., Tressler, D. K., Eds.; AVI: Westport, CT, 1980; pp 471-476.

[6] Murdock, D. I. and W. S. Hatcher. (1975). Survey of Midwest grapeconcentrate plant for heat resistant mold. Unpublished lab. data. 8.

[7] Ohler, J.G. (1988) Cashew, communication 71, Department of Agricultural research, Koninkiljk Institute Voor de tropen, Amsteradam.

[8] Pribella, A., and Betusowa, M. (1978), *Frllchtsaft-lndllstrie*, 9(1), 15.

[9] WeiheE., Reinecke M. and Forssrnann W.G. (1984). Distribution of vasoactive intestinal polypeptide-like irnrnunoreactivity in the rnarnrnalian heart. lnterrelation with neurotensin- and substance P-like irnrnunoreactive nerves. Cell Tissue Res. 236, 527-540.