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Organoleptic And Mineral Properties Of Chemically Preserved Cashew Apple Juice

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Abstract: ***Cashew apple fruit juice is an energy given fruit drink. This study investigated the organoleptic properties and mineral composition of chemically preserved cashew apple fruit juice. Three samples B, C and D were treated with 0.1g benzoic acid, sodium benzoate and citric acid respectively. Sample A was the untreated cashew apple juice. There was significant ($p < 0.05$) difference in the organoleptic attributes investigated. The mineral composition of both untreated and treated sample of cashew apple juice was studied. Mineral analysis was determined by atomic absorption spectrophotometer. The mineral analyzed were calcium (Ca), magnesium (Mg), sodium (Na), potassium (K), Iron (Fe) and Zinc (Zn). The value (PPM) of the untreated cashew apple juice were 26.00±0.03 for Ca, 21.60±0.01 for Mg, 81.90±0.84 for Na, 193.00±0.02 for K, 15.00±0.01 for Fe and 0.12±0.01 for Zn. Sample B treated with benzoic acid had the highest values for Ca (30.00±0.01), Mg (18.00±0.02), Na(84.90±0.03) and K(236.00±0.10). From the result the use of benzoic acid as a preservative increased the value of calcium, sodium and potassium of the cashew apple juice, while the values of those mineral in sample C and D decreased. However, there was an increase in the value of Fe in the sample C (17.60±0.20), compared to sample A, B and D. Sample D also had an increased value of Zn (0.21±0.01) compare to samples A, B and C. Each chemical had an impact on the mineral composition of the cashew apple juice but benzoic acid had the greatest impact on the mineral composition of the cashew apple juice.***

Keyword: ***Cashew apple fruit juice, Minerals, Sodium benzoate, Citric acid, Benzoic acid***

I. INTRODUCTION

Cashew tree is botanically known as *Anacardium Occidentale*. Cashew tree is generally considered to be native to the Northern Part of South America areas. In Nigeria cashew is grown mostly in the middle belt states (Kwara, Benue and Plateau) and some of the southern state such as Oyo, Edo, Anambra and Imo (Addaquay and Nyamekoye-Boamah, 1998).

Cashew apple belongs to the family Anacardiacea, is a pseudo fruit formed by an enlarged peduncle and the true fruit a kidney shaped (reniform) achene (Costa *et al.*, 2003). Cashew apple fruit juice is very rich in vitamin C (262mg/100ml of juice) and contains five times more vitamin C than orange juice. A glass of cashew apple juice meets an adult individual daily vitamin C (30mg) requirement (Asuncão and Mercandante, 2003; Adou, 2011). Cashew apple has been widely used as a food from the earliest times and is well known for its curative characteristics, it has cholesterol reducing effect for many years particularly in Europe. Cashew apple has been used to treat infant intestinal disorders such as diarrhea and dysentery. It also has health benefits such as cancer prevention and the prevention of bacterium that causes severe gastritis (Kubo *et al*., 1993, Carvallo *et al*., 2006).

The objectives of this study are therefore to produce cashew apple juice and evaluate the effect of preservative chemicals on the organoleptic properties and mineral composition of the cashew apple juice.

II. MATERIALS AND METHODS

SOURCE OF RAW MATERIAL

The cashew apple fruits were harvested from cashew trees at Auchi Polytechnic, Area 2 Compound Auchi, Edo State, Nigeria.

PREPARATION OF CASHEW APPLE JUICE

Fresh, ripened, juicy, good quality cashew apples were sorted and the nuts were separated from the fruits. The fruits were washed in saline to remove foreign materials. Juice was extracted manually, clarified with ig of gelatin and allowed to stand at 4^{o}C. The clarified juice was filtered using clarifying agents was taken as control.

Sample A ⟶ untreated juice (control)
Sample B ⟶ preserved with 0.1g of benzoic acid
Sample C ⟶ preserved with 0.lg of sodium benzoate
Sample D ⟶ preserved with 0.lg of citric acid

PROCESSING OF CASHEW APPLES AND CLARIFICATION TREATMENT

Cashew apple fruits were cleaned with saline to remove dirt or unwanted materials attached to the cashew. The cleaned cashew apple fruits were blended using a blinder and filtered with a muslin cloth. 1g of gelatin was dissolved with warm water and added to the juice and stirred; gelatin is added to the cashew juice to remove tannins and clarify the juice.0.1g benzoic acid, citric acid, sodium benzoate was added into 100ml of cashew juice separately. Untreated juice served as control. 20 ml of each of the treated and untreated juice were dispersed into sterile bottle and labeled A, B, C, and D and was refrigerated before analysis.

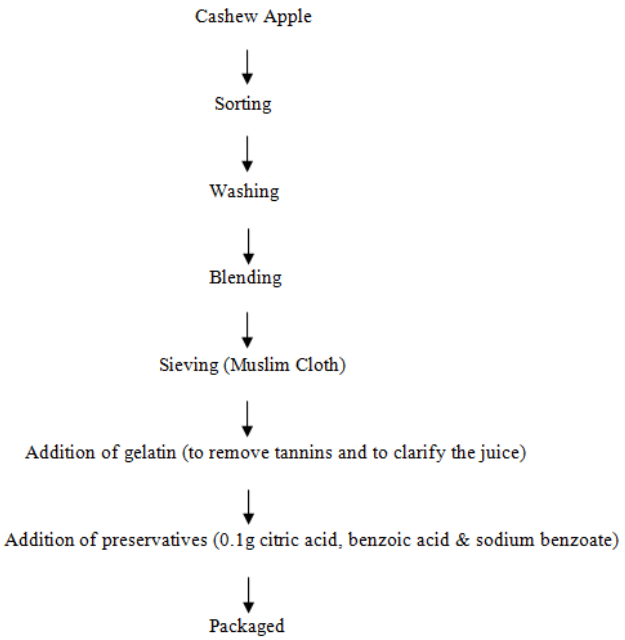

Figure 1: Flow chart of cashew apple juice processing

EVALUATION OF SENSORY ATTRIBUTES

Organoleptic evaluation of the cashew apple juice samples were analyzed by 10 untrained panelists based on colour, flavour, taste, sedimentation, and overall acceptability. Sensory tests were performed in individual booth under white light. Samples per taster were served on a 5-point hedonic scale, varying from dislike extremely (score 1) to like extremely (score 5), based on Stone and Sidel method of organoleptic evaluation.

METHOD FOR MINERAL ANALYSIS OF CASHEW APPLE JUICE

Mineral analysis which include calcium, magnesium, sodium, potassium, iron and zinc were determined. Sodium and potassium were determined by flame photometry using maizing flame photometer (Maizing U.K. Model 405). Calcium, magnesium, iron and zinc were determined by the AOAC atomic absorption spectrometric method (AOAC, 1990).

III. STATISTICAL ANALYSIS

Data obtained from the organoleptic properties and mineral composition of chemically preserved and unpreserved cashew apple juice was analyzed using GENSTAT 8.1statistical package.

IV. RESULTS AND DISCUSSION

Results of the sensory evaluation of chemically preserved and unpreserved cashew apple juice is presented in the table 1 below.

Values with different superscript letters in the same column are significantly (P<0.05) different.

Samples	Taste	Aroma	Colour	Sedimentation	General Acceptability
A	4.40 ± 0.1^{c}	4.10 ± 0.1^{c}	4.40 ± 0.1^{a}	3.90 ± 0.7^{c}	4.40 ± 0.5^{b}
B	4.40 ± 0.8^{c}	4.40 ± 0.7^{a}	4.30 ± 0.9^{b}	4.10 ± 0.7^{b}	4.20 ± 0.6^{c}
C	4.50 ± 0.5^{b}	4.10 ± 0.7^{c}	4.30 ± 0.9^{b}	4.20 ± 0.8^{a}	4.40 ± 0.5^{b}
D	4.70 ± 0.7^{a}	4.20 ± 0.8^{b}	4.40 ± 0.1^{a}	3.90 ± 0.9^{c}	4.80 ± 0.6^{a}

Table 1: Organoleptic evaluation of chemically preserved and unpreserved cashew apple juice

TASTE

This is how the cashew apple juice feed on the palate. There is significant (P<0.05) difference among the samples. Sample D preserved with citric acid had the highest value of 4.70 while sample A unpreserved and B preserved with benzoic acid had the same values 4.40 which showed that sample D is more preferable in taste by the panelists.

AROMA

This is the pleasant smell of the cashew apple juice to the olfactory lobe. There is significant (P<0.05) difference in the

four samples. Sample B had the highest value (4.40) while Samples A and C had the same values (4.10).

COLOUR

This is the appearance of the cashew apple juice. There is significant (P<0.05) difference in the samples. Sample A which is the untreated and sample D preserved with citric acid had the same values 4.40 while samples B and C had the same values 4.30.

SEDIMENTATION

This is the tendency for particles in suspension to settle out of the fluid. There is significant (P<0.05) difference in both treated and untreated samples in terms of sedimentation. Sample C had the highest value (4.20) while Samples A and D had the same value (3.90).

GENERAL ACCEPTABILITY

This is the final judgment by the judges' considered to be within the realm of what is appropriate. There is significant different among the samples (P<0.05). Sample D treated with citric acid had the highest value (4.80). Samples A and C had the same values while Sample B had the least value (4.20).

Cashew apple juice treated with benzoic acid, sodium benzoate and citric acid respectively were analyzed for their mineral composition. The values of the untreated cashew apple juice sample A were Ca (26.00±0.03), Mg (21.60±0.01), Na (81.90±0.84), K (193.00±0.02), Fe (15.00±0.01) and Zn (0.12±0.01). Sample B treated with benzoic acid had the highest value for Ca (30.00±0.01), while Sample D treated with citric acid had the least value (10.10±0.01). For Mg, Sample A had the highest value (21.60±0.01) while Sample D had the least value (13.20±0.01). Sample B had the highest value for Na (84.90±0.03) while Sample D had the least value (76.60±0.01). Sample B had the highest value for K (236.00±0.10) compared to samples D (216.00±0.10), sample A (193.00±0.02) and sample C (190.00±0.03). However, there was an increase in the value of Fe in sample C (17.60±0.20) compared to sample A (15.00±0.01), B (0.59±0.01) and D (0.53±0.10). Sample C also had an increased value of Zn (0.34±0.02) compared to samples A (0.12±0.01), B (0.09±0.01), and D (0.21±0.01) as shown in table 2 below.

The value of potassium in all the samples was the highest this is in accordance with the result of Eisele and Drake. (2005); Adou. (2011).

Minerals belong to the family of micro nutrients. The increased consumption of fruits will improve mineral content of the body system and reduced the risk of cardiovascular disease and cancer (Ismail *et al*., 2011). Potassium (K) is used to maintain the balance of electrolytes in the body and can help to prevent bone demineralization by preventing calcium loss in urine (He and MacGregor, 2001). Potassium lowers blood pressure, is used for muscular contraction. It is used to maintain automatic heart and muscular activity in general (Jacotot and Parco, 2000). The accepted daily intake (ADI) permitted for an adult is 470 ppm/day (Institute of medicine, 2005).

Magnesium (Mg) is important in the stability of the nervous system in muscular contraction as an activator of alkaline-phosphate and as an alternative of calcium (Ca) in the body (Cowan, 2002). Epidemiological studies also showed that magnesium could reduce sudden death (Garzon and Eisenbery, 1998).

Sodium, (Na) regulates blood pressure and osmotic imbalance in the body. It stabilizes the extracellular and nervous hormonal stimulation. Consuming a litre of cashew apple juice will meet the accepted daily intake of potassium, magnesium and sodium by the body system (Adou, 2011).

Parameter	A	B	C	D
Calcium (ppm)	26.60 ± 0.03^{b}	30.00 ± 0.01^{a}	14.00 ± 0.10^{c}	10.10 ± 0.01^{d}
Magnesium (ppm)	21.60 ± 0.01^{a}	18.00 ± 0.02^{b}	16.80 ± 0.08^{c}	13.20 ± 0.01^{d}
Sodium (ppm)	81.90 ± 0.84^{b}	84.90 ± 0.03^{a}	80.60 ± 0.04^{c}	76.60 ± 0.01^{d}
Potassium (ppm)	1193.00 ± 0.02^{c}	236.00 ± 0.10^{a}	190.00 ± 0.03^{d}	216.00 ± 0.10^{b}
Iron (ppm)	15.00 ± 0.01^{b}	0.59 ± 0.01^{c}	17.60 ± 0.20^{a}	0.53 ± 0.10^{c}
Zinc (ppm)	0.12 ± 0.01^{c}	0.09 ± 0.01^{d}	0.34 ± 0.02^{a}	0.21 ± 0.01^{b}

Values with different superscript letters in the same row are significantly different (P<0.5).

Table 2: Mineral composition of chemically preserved cashew apple juice

V. CONCLUSION

Results confirmed that combination of clarification and chemical preservation is suitable for preservation of cashew apple juice up to 24 hours under refrigeration. This method was efficient in decreasing astringency and in retaining nutrient quality of the juice.

The juice was also acceptable in terms of sensory attributes. The method described is simple, rapid, inexpensive and convenient for industrial use in the processing and preservation of cashew apple juice.

The utilization of the preserved juice should be encouraged as health drink and could be recommended to people with vitamin C deficiency because of its high vitamin C content.

Above all, preservation of cashew apple juice is important because of the seasonality of its production which makes it abundantly available during its season and scarce during off season.

The quality of juice may be improved by fine homogenization, proper capping, proper pasteurization and using sterilized bottles.

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