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Quality evaluation of juice, and concentrate from Cashew apple (*Anacardium occidental)*

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Abstract
Aims: To produce juice and concentrate from Cashew Apple fruit (*Anacardium occidental)* and chemically evaluate the products, examine the Proximate analysis, physiochemical, mineral and vitamin of the products to evaluate the sensory properties of the products.
Study Design: Matured and ripe fruits were proced into juice and then, concentraate products were analyzed for physciochemical, proximate and micronutrient composions. Shelf life of the products was evaluated. All experiments were replicated three and data subjected to descriptive statistics.
Place and Duration of study: Department of food, Nutrition and Home Sciences, Prince Abubakar Audu University, Anyigba, Kogi State, Nigeria, between 01|01|2022 and 25|08|2023.
Methodology: cashew apple fruits were harvested and processed into fruit juice and then fruit concentrate by evaporation of water. Physiochemical and proximate compositions were determined using stadard methods Mineral and Vitamine C analyses were done by done by suitable Spetroscopy methods while HPLC was used to determine B vitermins. Changes in physiochemical properties were studied to determine shelf life.Data were subjected to stistiscal analyses.
Results: Nean values of of physiochemical parameter **of** juice were pH,4.39, TA, 0.24, SG, 1.352, ^{0}Brix, 10.50, SG of concentrate 1403 and ^{0}Brix of concentrate 45.0 differed significantly (P= 0.5) from that of the juice. Proximate analysis showed a high miosture and protein concentrations (relative to other fruits) in cashew apple fruits juice.Concentrate was significantly (P= 05) lower in moisture but higher in protein content. Fruit juice contained micronutrients*;* Ca, 466.25, Fe 7.856, Mg, 223.25, Na, 26.50, P, 93.38, K, 60.50, Zn 0.55 and Vitamin C 208.60. Concentrations of these substances was signicatiy different (P=, 0.5) higher in the fruit concetrate. Phytochemical analyses in cashew apple fruit juice Were, Sapponni 0.69, Tanin 1.38, Oxilate 0.08, Phytate 0.19.showed lower content in fruit juice but higher in the concentrate, all were significantly different. (p=0.05).
Conclution: Cashew apple fruits juice and concentrate are rich in many macronutrients, espcecially protein, Ca, Fe, K, P, Zn, Vitamin C and phytochemicals such as Sapponi, Tanin, Oxilate and Phyate.

Keywords: Cashew apple, *Anacardium occidental,* evaluation

1. Introduction

The cashew tree (*Anarcardium occidentale* L*)* belongs to the family Anacardiaceae and it is native of South America. It is called Gold Mine of the wasted land since it is requires low inputs for production. It is one of the most important plantation crops earning huge foreign exchange through its kernel and cashew nut shell liquid (Attri, 2009) [10]. The swollen, pedicle of the cashew "pomace" has a high level of ascorbic acid when compared with the fruit, and this has been promoted in Nigeria as a fresh fruit (Akinwale, 2001).

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 increased convenience of processed fruits, their all year round availability 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 cashew apples) and poor preservation methods. For example cashew fruits have a high rate of deterioration due to prone attack by insects, short fresh shelf-life, rodents and microorganisms such as yeast and mould which makes the fruit unavailable to the people in other parts of the country.

Over the years the demand for fruit juice concentrates from different fruits has been in high demand. Fruit Juice concentrates have a lot of advantages over non-concentrated juice due to their effective storage ability and nutritional content. Fruit Juice concentrates are produced by extracting the juice from fresh sound fruits, then evaporating a large proportion of excess water, leaving a highly concentrated version of the fruit juice which can be used as a natural flavouring for a myriad of applications or re-constituted with water to create natural fruit drinks. Conversion of fresh fruits into concentrate has many advantages including substantial reduction of weight and volume and a potential decrease in transportation cost by as much as 85% when compared to its raw counterpart (Ratti, 2001).

1. Kogi state is the highest producer of cashew in Nigeria… give values, which you can find on the internetor ministry.
2. The intrest of most processors is in the nut.while the apple is very rich in vitamins B and C it is very perishabel and cannot be distributed as fresh fruit.
3. As a result, large quantities of the apple are wasted after harvest. Also cause a nuisance in the environment.
4. This study was done to develop methods of utilizing this wasted resource by processing into juice and concentrate, and hence preserve and make it available to consumers both within and outside Nigeria.

2. Materials and Method

2.1. Raw Materials and Equipments

The fresh ripe Cashew apples (*Anarcardium occidentales)* was plucked and selected from plantation within Dekina Local Government Area in Kogi state, Nigeria.

Table 1: Experimental complete Design

Sample	Juice	Concentrate
Cashew apple	1	1
Hog plum	1	1
Mango fruits	1	1
Sub Total	**3**	**3**

Grand total (6)

They are two samples with six (6) different products.

2.2 Production of Cashew Apple fruits juice

Fresh Cashew apple, was obtained from Kogi State University research farm, stored in a cold chamber (−18 °C) at Food Nutrition and Home Sciences laboratory, Kogi State University, Anyigba. The production of Cashew apple, fruits juice and concentrate is shown in figure 3.1.

2.3. Sorting and Cleaning

The sorting and cleaning of the cashew was manually done with hand and the ripe cashew was selected and weighed. Washing was done manually using tap water (pH 7.00). This was done between two hours to prevent deterioration of the apple (Akuboh, 1995).

(b) Blanching

The blanching was done to remove bacteria load on the epicarp and soften it for crushing. Blanching was done at 75^0C for 10 -15 minutes.

(c) The Juice Extraction

This was done by the use of a squeezer and filter. The apple was cut into pieces and the juice was extracted using a juice extractor (locally fabricated squeezer/press) then sieved through a Muslim cloth.

a. Filtration

The extracted juice are filtered throw muslin cloth.

b. Addition of preservatives

Sodium benzoate, sodium metabisulphide, and citric acid are added to serve as preservative 0.15mg/lt

(d) Homogenisation

The juice was mixed thoroughly using a normal mixer to bring about uniformity of the product. Various liquids that are insoluble with each other was mixed into a single solution. Achieving this requires minimizing the droplet to a small unchanging diameter.

(e) Pasteurization

The product was then pasteurized at exactly 85^0 C to inactivate enzymes there by reducing the bacteria load.

(f) Packaging

Selected packaging materials was used to avoid direct sunlight or oxygen from affecting the flavour. Preferably bottles with closures were used.

(g) Storage: It was stored in the laboratory fridge at a low temperature of 18^0c.

2.4. Cashew apple fruit processing in concentrate

Healthy fresh and ripe Cashew apple fruit were obtained from Anyigba in Dekina local Government Area of Kogi State. The processing of Cashew apple fruit is shown in Fig 3.2.

(a) Sorting and cleaning

Sorting and cleaning was done manually with hand. Firm and ripe mangoes was selected washed and weighed.

(b) Blanching

Blanching was done to remove bacteria load on the epicarp

and soften it for peeling. Blanching was done at 75°C for five minutes.

(c) The juice extraction
Peeling was done manually to remove the outer skin using a sharp knife, it was pulped and blend using a blender to obtain uniformity of the juice.

(d) Pasteurization/ Concentration
The blended Cashew apple fruit juice was pasteurized at 85°C for ten minutes with continuous stirring. Addition of preservative such as sodium benzoate, 0.4mg/1lt citric acid 4,0mg/1lt and sodium meta-bisulphite 0,15mg/1lt.

(e) Storage
The pasteurized juice was filled hot into storage container and kept in a cool dry place.

(f) **Packaging**
Vacuum packaging material (bottle with closure) were used in other to prevent oxygen and sunlight from affecting the flavour.

2.5. Proximate Analysis
Proxinate analysis of the juice and concentrate samples Moisture, Carbohydrates, Protain, Fat, Ash, and Fiber were determined using the standard methods described in AOAC 2010.

2.6. Determination of Phytochemicals (Saponnin, Tannins, Oxalate and Phytates)
Phytochemical of the juice and concentrate samples were determined using the standard methods described in AOAC 2010. Saponnin, this was done using felinsdenis spectrophometer (Person, 1976).
Tannins the tannin content was determined using Folin Denis Reagent as described by (Makkar, *et al.*, 1993). Oxalate. Oxalate was determined titrimetrically by (Falade *et al* 2004) been precipitated as calcium oxalate and titrated against standard potassium permanganate. The oxalate was calculated as sodium oxalate equivalent. Phtytate was determined using the method of (Reddy *et al* 1999).

2.7. Physiochemical Analysis, pH, TSS, Specific Gravity, Total Titratable Acidity (T. T.A).
The pH meter values was detertamine standardized with a standard buffer solution Total Soluble Solids (Brix) The soluble solid of the juice samples was determined using Abbe refractometer. Specific Gravity The specific gravity of the samples produced was determined using (Onwaka 2008). Total Titratable Acidity (T. T.A).Titratable acidity as tartaric acid was determined according to the method of (AOAC 2000).

2.8. Micronutrient Analyses
2.9. Mineral analysis
Mineral elements (Zn, Mg, Ca, Na, Fe, and K) were determined using Thermo Fisher Scientific (iCE 3000) Atomic Absorption Spectrophotoscopy (AAS), with the appropriate hollow cathode lamp and wave length of each of the metals. Atomic Absorption Spectrophotometer standard solutions were purchased from Merck. Appropriate quality assurance procedures and precaution were carried out to ensure reliability of the result.
The dry ashing method was used for sample preparation. All glass wares were washed with demineralised water and 1% Nitric acid. Portions of 25 mL of fruit juice and concentrate were appropriately homogenized before samples were taken directly into crucible and evaporated completely by placing on water bath at 100°C. The thick mass was charred on hot plate & kept in muffle furnace (450 °C) till it became complete ash. The crucible with ash was put in dessicator for cooling. The ash was dissolved in 2 mL Nitric acid & demineralised water & finally made up to 30 mL.

2.10. Ascorbic acid content
The ascorbic acid (AA) content was determined according to a method of Rahman *et al.* [13]. The mixture containing hog plum juice and concentrate were treated with 1 mL of 2, 4-dinitrophenyl hydrazine at 37ºC for 3 h, and the resulting solution was further treated with H_2SO_4 acid (1.0 mol.dm^{-3}) to produce red color complex. Absorbance was measured at 521nm using a spectrophotometer (UV–VIS spectrophotometer, UV–VIS Spectronic). AA content was calculated and expressed as milligram per 100 mL of juice (mg/100 mL) using a calibration curve of standard ascorbic acid.

2.11. Determination of B vitamins
Ten grams of each sample were extracted and analyzed using the HPLC (Shimadzu Corporation, Japan) and the conditions described by Zohora *et al.* [14] for the estimation of B-vitamins. All chemicals and reagents were of recommended analytical grade. Standard solutions of thiamine hydrochloride for vitamin B1 (thiamine), riboflavin for vitamin B2 (riboflavin) and niacin for B3 (nicotinamide) were also prepared and used as described by these authors.

2.12. Shelf life Studies
The products were packaged in glass bottles with screw caps, pasteurized at 85ºC/5 seconds and stored at ambient conditions (25–30°C and 60–85% RH). Samples were analyzed for their physicochemical properties, Titratable acidity, ºBx, Specific gravity and pH over a period of six months using methodologies described earlier.

2.13. Statistical Analyses
All experiments were replicated three times and simple descriptive statistics and t test for difference of means were used to validate data. All data analyses were done at the 95% confidence level. Results are expressed as Means + Standard Deviation.

2.14. Sensory Evaluation
The samples were prepared and evaluated by twenty (20) semi-trained panelist randomly selected from students of Kogi State University Anyigba. The samples were cashew apple, Hog plum and mango fruits were evaluate for quality characterizatics such as aroma, texture, taste, consistency and general acceptability The 20 Panellist evaluated the sample independently for Flavour, colour, texture, taste and consistency. Each sensory attribute was rated on a 9- point Hedonic scale (1 dislike to (Iwe, 2007).

3. Result and Discussion
3.1. Cashew apple fruit juice and Concentrate
Cashew apple fruits juice has yellow colour with sensentional aroma, the condentrate is brownisedcolour, which has been

discribed by Owolarafe *et al*. (2021)

3.2. Proximate analysis of Cashew apple fruit juice and Concentrate

The result obtained for the proximate analysis of cashew apples fruit juice and the concentrate shows that there was significant ($p<0.05$) difference in the carbohydrate content in all the two samples with mean values ranging from 7.38 % - 9.98 %. The value obtained in this study were lower compared to 14.0% reported for Abdulraman (2009).

Cashew apple juice has the lowest mean value of 7.38 % % this may be due to enveromental conditions or differences and mode of processing.

The moisture content of two samples range from 87.79% to 91.45 %. The moisture content was significantly ($p>0.05$) different with the cashew apple juice had the highest, 91.45%. The result was significantly higher, when compared with the report by Cower and Agyente, (2009).

The protein content of the two sample ranges from 0.54 to 1.12. It show significantly $p<0.05$ difference, cashew apple juice (0.54) was the lowest. The result of the protein content of the two samples compare favourabilly with reported by Cower and Agyente, (2009). In accordance to report by Okon (1983) [13], the protein content of mango fruits concetrates support and contribute to daily protein need of 0.89% for adults as recommended by the USDA National nutrition database for standard reference, proteins also plays a part in the organoseptic properties of foods in addition to being a source of amino acid.

The values obtained for crude fat in this study ranged from 0.40 % to 0.66 % the analysis showed that there was significantly ($p<0.05$) difference among two samples with the cashew apple juice with a value of 0.40%, the value obtained in thus study was higher compared to the reported value of 0.30 % for mango fruit. Cower and Agyente, (2009). The value obtained in this study was compared favourably, to cashew fruits juice 0.30% reported by Cower and Agyente, (2009).

The result of the ash content of three samples ranges from 0.20 % to 0..38 % with cashew apple 0.20% had the lowest. The results obtained from this study was lower compared to the reported value of 2.8% by (Akinhenmi *et al*. 2008).

The crude fiber content of the two samples ranges from 0.03 % to 0.08 % was significantly $p<0.05$ different cashew apple juice 0.03% and the concentrate is 0.08 % value obtained in this report was lower compared to the reported value of 3.2% (Akinhanmi *et al*, 2008) [5].

Table 2: Proximate analysis in (%) of Cashew apple juice and Concentrate

Composition %	Cashew apple juice	Concentrate
Carbohydrate	$7.38^{c}\pm 0.04$	$9.98^{c}\pm 0.16$
Moisture	$91.45^{a}\pm 0.07$	$87.79^{a}\pm 0.06$
Protein	$0.54^{c}+0.090.$	$1.12^{c}\pm 0.04$
Fat	$0.40^{a}\pm 0.03$	$0.66^{a}\pm 0.03$
Ash	$0.20^{b}\pm 0.00$	$0.38^{b}\pm x0.04$
Fiber	$0.03^{b}\pm 0.0$	$0.08^{a}\pm 0.0$

Values are means $\pm$ standard deviation of three replication. Means with the same superscript in columns are not significantly different ($P \leq 0.05$).

3.2. Physiochemical Properies of Cashew Apple Fruits Juice and concentrate

The result of the physio-chemical properties for cashew apple fruits juice and concentrate are presented in Table 3.2 The titrable acidity, the result ranges from 0.24mg/g to 0.53mg/g showed significant ($p<0.05$) difference with cashew apple fruit concentrate has the highest mean value of 0.53mg/g, while cashew apple juice has the lowest mean value of 0.24 mg/g

There was also significant (<0.05) difference in the Brix level with cashew apple juice had 10.50 $Brix^{0}$ and the concentrate had 45.03 $Brix^{0}$ that shows that the removal of water during concentration had significant role in the physiochemical Properies of Cashew Apple Fruits Juice and concentrate.

The specific gravity of the cashew apple juice sample ranges from 1353.0 to 1403.0 with significant ($P<0.05$) difference cashew apple juice had the lowest mean value of 1352.0.

In terms of the p^{H} there was significance ($p<0.05$) difference, Cashew apple fruit juice ranges from 3.05 to 4.39 the juide shows higher level of acidity.

Table 3: Physiochemical properties of Cashew apple fruit juice and concentrate

Compositioon	Cashew Apple juice	Concentrate
Titrate Acidity mg/g	$0.24^{a}\pm 0.52$	0.53 ± 1.80
Brix $^{(0)}$	$10.50^{b}\pm 0.0$	45.03 ± 0.06
Specific Gravity	$1352^{c}.0 \pm 2.00$	1403.0 ± 0.06
p^{H}	$4.39^{b}\pm 0.0$	3.05 ± 0.40

Values are means $\pm$SD of 3 replications with the same superscript column are not significantly different ($p>0.05$) values.

3.3: Photochemical Composition from Cashew Apple Fruits Juice and concentrate

The result of the saponin in Cashew apple fruit juice and the concetrate ranges from 0.69mg/100g to 0.90 mg/100g. Cashew apple concetrate had highest shown in Table 3.3 there was significant different $p<0.05$ in the two samples. The resuil was higher, when compairing with 0.23% obtained in bitter leaf (Apena *et al.*, 2004) however merck index (1976) reported that seponins are practically non-toxic to man when taken orally saponins have a number of advantage, the most intresting, is that it can lower plasma cholesterol concetrations (Adenji. *et al*., 2007) Saponins have the ability to reduce the cholesterol levels in man and animal. However high saponin levels has been associated with gastroentritis manifested by diarrhea and dysenterry (Adebayo *et al*. 2015) [1].

The result of tanin in the two samples ranges from 1.39 to 1.43 mg/100g. There are level of significance $p<0.05$ difference in all the two samples, Tanin are known for their therapetive purpose and as precursors for the synthasis of useful drugs Tannin, help to prevent cellular oxidative damage including lipid peroxidation. (Sofowora 1993). The presence of tannins as reported by (Dharmanda 2001) and (Hayashi *et al.*, 1993) that it have anti-inflammatory effect that helps to control all indication of gastritis, esophagitis, enteritis and irritating bowel disorder. It has been reported by (Bressani *et al.*, 1983) that tannins forms exhibit their toxicity effect by forming protein complexes through multiple

hydrogen binding between their hydroxyl group and carboxyl groups of protein peptide bonds of proteolytic enzymes in the gastrointestinal tract.

The oxilate content of the Cashew apple juice and the concentrate ranges from 0.08 mg/100g, to 0.10 mg/100g cashew apple juice had the lowest content. There were significantly difference p>0.05 The recorded oxalate levels were also less than the safe levels of oxalate (4.9 mg/100g) (Siddharuji *et-al*, 2001), Oxalates form complexes with calcium, magnesium and iron leading to the formation of oxalate stones. It has also been known to inhibit potassium and sodium.

The phytate content of the two sample ranges from 0.19 to 0.28 mg/100g.. There was level of significant difference p>0.05, cashew apple 0.19 had the lowest. Phytic acid also forms insoluble salts with essential minerals like calcium, iron, magnesium and zinc in food, rendering them unavailable for absorption in the blood stream (Tunder *et al* 2002).

Table 4: Photochemical Composition mg/100g from Cashew apple Fruits juice and Concentrate

Composition	Cashew apple Fruits juice	Cconcentrate
Saponin	0.69^{b}±0.01	0.90^{b} ± 0.02
Tannin	1.39^{b}±0.00	1.43^{b}± 0.01
Oxalate	0.08^{b}±0.01	0.10^{b}± 0.00
Phytate	0.19^{b}±0.01	0.28^{b}± 0.02

Values are means ± standard deviation of three replication Means with the same superscript in columns are not significant different (p≤0.05).

3.4. Mineral Composition of Cashew apple Fruit Juice and concentrate

The calcium content of cashew apple fruits juice and concetrate ranges from 466.3 mg/100 mL to 903.75 mg/100g The result of calcium content of cashew apple fruits juice and concetrate, are shows in Table 3.4: Cashew apple concentrate had the highest value, This result compare favourable with cashew juice 43.00 mg/100 mL reported by Lower and Aggente (2009).There was significant p>0.05 differnce.

The iron content ranges from 7.85 to 11.0 mg/100 ml. Cashew apple juice had the lowest mean value of 7.85 mg/100ml.

The magnesium content of cashew apple fruit juice and concentrate ranges 223.3 mg/ to 361.00 mg/100g shows that there was a significant p>0.05 difference. Cashew apple concentrate had the highest.

Sodium content ranges from 26.5 to 59.25 mg/100mL.While cashew apple juice 26.56mg/100mL had the lowest

The phosphorus content ranges from 93.38 to 56.38 mg/100Ml. Cashew apple juice had 93.38 mg/100mL with the lowest mean value.

Potassium (K) content ranges from 60.50 to 118.25 mg/100mL. Cashew apple juice 60.50 mg / 100mL had the lowest means value. v

Zink content ranges from 0.59 to 1.0.21 mg/100mL Hog plum 8.88 mg/100mL had the highest cashew apple 0.59 mg/100mL had the lowest mean value.

Table 5: Mineral Composition mg/100ml of Cashew apple fruits juice and Concentrate

Composition Mineral mg/100mL	Cashew apple fruits juice	Concentrate
Ca	466^{a}.25	903^{a} .75
Fe	7^{c}.856	11^{a}.33
Mg	^{223a}.25	361^{a}.00
Na	26 ^{c} .50	59^{a}.25
P	93^{c}.38	56^{a}.38
K	60^{c}.50	118^{a}.25
Zn	0.59^{c}	1.0^{a}.21

Value are means ± standard deviation of three replication: Means with the same superscript with column are not significantly (p>0.05) difference.

Code

Ca - Calcium Fe - Iron Mg - Magnisium Na - Sodium P - Phosphorus

K - Potasium Zn - zink

3.5. Vitamin Composition from Cashew Apple Fruits Juice and concentrate Mg/g

The Vitamin Composition of Cashew apple, Hog plum and Mango fruit juice shown in Table 4.10: Vitamin C ranges from 57.79 mg/g to 208.60 mg/g. Cashew apple juice had the highest, there was significant (p<0.05) difference among the three samples. Mango fruit juice 66.62 mg/g shows higher, but Hog plum juice had the lowest. This report was comparable with report of Vitamin C in pawpaw (*Carica papaya*) 12 mg/g, Orange 43 mg/g, cashew Olayiwale, *et al.*, 2013).

The vitamin B1 ranges from 0.22 mg/g to 0.53mg/g. Cashew apple juice had the highest value of 056 mg/g. While Hog plum has the lowest mean value of 0.22 mg/g while mango fruits was significantly higher.

The vitamin B2 content ranges from 0.03 mg/g to 0.49 mg/g. There was significant difference in all the three sample. Cashew apple juice had the highest mean value of 0.49 mg/g. Mango fruits juice had the lowest mean value of 0.03 mg/g, but was significantly higher in Hog plum 0.39 mg/g.

The vitamin B3 shows significantly difference in the three samples. It was higher in cashew apple 0.73 mg/g but lowest in mango fruits 0.02 mg/g but significantly higher in Hog plum 0.36 mg/g.

Table 6: Vitamin composition from Cashew apple, fruit juice and congentrate Mg/g

Composition	Cashew apple fruit juice	Conentrate
C	208.60^{a}± 0.03	263.6^{a}±0.02
B1	0.53^{a}±0.03	0.53^{c}±0.02
B2	0.49^{a}±0.04	0.77^{a}±0.04
B3	0.73^{a}±0.04	0.91^{a}±0.03

Values are means ± standard deviation of three replication; Means with the same super script with column are not significantly different (p > 0.05).

Code C - Vitamin c Ascorbic acidB1- Vitami b1 Riboflavin B2 -Vitami b2 ThiaminB3 - Vitami b3 Niacin

3.6. Vitamin Composition from Cashew Apple Fruits Juice and concentrate

The result of the vitamin composition of Cashew Apple Fruits Juice and concentrate are shown in Table 3.6. The vitamin C content ranges from 166.02 to 263.6mg/g. There was significant p>0.05 difference in the three sample. Cashew apple Concentrate 263.6mg/g had the highest mean value, Hog plum 221.5mg/g was significant Higher while mango fruit 166.02 juice had the lowest mean value. The vitamin B1 ranges from 0.53 to 0.77mg/g, mango fruits concentrate 0.77mg/g. had the highest while cashew apple concentrate 0.53mg/g had the lowest mean value, Hog plum concentrate 0.65 show significant higher.

The vitamin B2 content ranges from 0.40 to 0.77 mg/g. Cashew apple concentrate shows to be the highest mean value content 0.77 mg/g, Hog plum was 0.73mg/g significantly higher. Mango fruit concentrate has the lowest mean value of 0.40 mg/g.

Vitamin B3 content ranges from 0.66 to 0.91mg/g. There was significant difference among the three samples. Cashew fruits concentrate 0.91 had the highest mean value, Hog plum concentrate 0.83 shows significant higher while mango fruits concentrate had the lowest mean value of 0.66 mg/g.

Code C - Vitamin c B1- Vitami b1 B2 -Vitami b2 B3 - Vitami b3 C - Vitamin C Ascorbic acidB1 – Vitamin B1 Riboflavin B2 – Vitamin B2 ThiaminB3 – Vitamin B3 Niacen.

4. Conclusion

Findings from the study shown that the production of Fruit juice and concentrate and products from cashew apple, fruits was possible, in relative to many popular fruit juices, are rich in many macronutrients especially protein. The protein contect of cashew apple fruits juice and concetrates support, that it can contribute to daily protein need of 0.89% for adult. Cashew apple fruits juice and concetrates were also found to contain high concentrations of Ca, Fe, K, Zn, VitaminC and micronutrinets. Processing of fruit juice into concetrate increased the concentration of most nutruints, reduced moisture and enabled extension of shelf life of the product for up to six months. In the sensory property, Cashew apple concentrate was most preferred, and in the overall acceptability as the best product. Findings from the study will contribute towards the effort to make fruits and vegetables that provide healthy benefits to their consumers available to Nigerians, particularly those living in rural areas, duing all seasons of the year. It will also help in promoting & enhancing the utilization, availability and thereby extending the shelf-life of the products above 24hours which can help in making exportation of the product easier.

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