Physiochemical properties and Sensory evaluation of pineapple and water melon juice blends

ABSTRACT:

Pineapple and Watermelon juice were produced from harvested fruits and formulated into various blends such as (A= A= 100ml P: 0ml WM; B= 80ml P:20ml WM; C= 60ml P:40ml WM; D=40ml P:60ml WM; E=20ml P:80ml WM; F=0: 100ml WM). The formulated blends were pasteurized, bottled and evaluated for moisture content, protein ,crude fibre, ether extract and total carbohydrate values respectively. The physico chemical properties of total brix and vitamin C content of the blends, and the degree of product acceptability determined by using a hedonic scale ranking of preference.

The results obtained revealed that the moisture content values of the blends ranged from 94.68 – 96.3%, Ash 0.50 – 1.03%, protein 0.04 – 0.38%, ether extract 0.05 – 0.17%, and total carbohydrate 2.81 – 3.94% respectively. The results further revealed that the samples containing pineapple juice only were significantly higher than all other formulated blends in vitamin C 2.37mg/100g, total sugar brix 11.00 and total titratable acidity 5.11%. Increasing the concentration of the water melon juice in the blends led to a reduction in vitamin C, total sugar brix and titratable acidity level in the juices.

KEYWORDS: Pineapple, Watermelon, Fruit juice, total brix, Titratable acidity.

INTRODUCTION:

Fruit juice is reported to be an excellent health-promoting beverage that is rich in antioxidant substances, such as phenolic compounds and vitamin C (Gardner *et al.,* 2016). For instance, consumption of fruit juice is associated with several health benefits, including increased antioxidant capacity, improved endothelial function, reduced low-density lipoprotein oxidation, and improved cardiovascular and neurocognitive function (Wu *et al*., 2015). Fruit is an important source of phytochemicals.

Pineapple is a vital source of sugars, organic acids, essential minerals, vitamins and fiber for human nutrition. Its fruits are also rich in health promoting antioxidants such as ascorbic acid, flavonoids and carotenoid compounds (Liu and Fan, 2016). The chemical composition of pineapple (sugars, organic acids, minerals, fiber, aromatic compounds, vitamins, amino acids, flavonoids, carotenoids, etc.) depends greatly on the variety. Fresh fruit has small but substantial amounts of vitamin A, and flavonoid pigments such as ß -carotene, xanthin, lutein and ß-cryptoxanthin (Loeillet *et al.,* 2011). Pineapple is now considered to be the third most important fruit crop in world production after banana and citrus (Malézieux*et al*., 2013).

Fresh fruit and vegetables (FFV) are a major source of essential vitamins and minerals, such as vitamin A, vitamin C and potassium, needed for human wellbeing. They are, however, perishable living products that require coordinated activity by growers, storage operators, processors and retailers to maintain quality and reduce food loss and waste (Lipinski *et al.,* 2013), hence processing of fruits and vegetables is pertinent in preserving perishable products and income generation. Processing of fruit will lead to increased income by the farmer and enhance the shelf life of fruit products. This present study seeks to process fruits into juices for the purpose preservation and income generation.

MATERIALS AND METHOD.

Source of Materials: The pineapple and Watermelon fruits were harvested from the teaching and Research farm of the Department of Crop and Soil, University of Port Harcourt, Nigeria

Location of Study:

List 1 :Experimental design:

Sample	A	B	C	D	E	F
Pineapple (ml)	100	80	60	40	20	-
Water melon (ml)	0	20	40	60	80	100

v/v ratios

Processing of Pineapple juice

The pineapple would be washed with slow running tap water. The pineapple sample would be peeled using a knife and washed in a bowl. The washed sample would be delivered into a solution of Sodium hydroxide (40 g/l). The citric acid solution would be blanched (60 g/l) at 95ºC for 5min. It would be cooled in iced water to inactivate their endogenous enzymes and soften their respective tissues. At the end, the pineapple would be sliced and grounded with addition of distilled water 1:1 (v/w). The sample mixture would be filtered on cheese cloth under vacuum to get fresh juices from the pineapple sample. The pineapple peeled juice would be extracted using juice blender. More so, pineapple juice would be blended following the method and procedure as described by Awsi and Dorcus (2012).

Processing of Water Melon juice

The watermelon would be washed with slow running tap water. The watermelon sample would be peeled using a knife and washed in a bowl. The washed watermelon sample would be delivered into a solution of Sodium hydroxide (40 g/l). The citric acid solution would be blanched (60 g/l) at 95ºC for 5min. It would be cooled in iced water to inactivate their endogenous enzymes and soften their respective tissues. At the end, the watermelon would be sliced and grounded with addition of distilled water 1:1 (v/w). The sample mixture would be filtered on cheese cloth under vacuum to get fresh juices from the watermelon sample. The pineapple peeled juice would be extracted using juice blender. More so, watermelon juice would be blended following the method and procedure as described by Awsi and .Dorcus (2012).

Determination of Moisture Content

Moisture content of the plant sample was determined using the AOAC official methods 920.39 (A), 2006. In this method, 1.0 g of the sample was weighed and transferred into a 250 ml silica dish and placed in the oven at 105^0C. The sample was cooled in the dessicator at room

temperature. The content with the container are then weighed and later placed back in the oven for another twenty four (24) hours in order to ensure complete drying. The cooling process was repeated in the dessicator before taking the final weight.

Calculation

Moisture content was calculated using the formula:

$$\text{Moisture content (\%)} = 100 \frac{(B-A)-(C-A)}{(B-A)}$$

Where:

A= weight of clean, dry scale pan (g)

B= weight of scale pan + wet sample (g)

C= weight of scale pan + dry sample (g)

Determination of Protein Content

The crude protein content of the plant sample was determined using the AOAC official methods (2006.) The total nitrogen content of the sample was determined by using the Kjeldahl procedure. In this procedure and method, 10.0 g of the sample was weighed into a 250 ml conical flask containing 20 ml 0f 1.25 % of tetraoxosulphate ($H_2SO_{4\ aq}$). The mixture was allowed to boil gently for thirty (30) minutes and the volume was maintained by gradually balancing the content with the pipette. The mixture was filtered with the bucker funnel and rinsed with hot deionized while the material was scrapped back into the flask with spatula. However, the filtrate was added to 20 ml of 1.25 % hot sodium hydroxide (NaOH) and was allowed to boil gently for thirty minutes using cooling pipette filter to maintain a constant volume. The mixture was filtered through the Bruckner funnel. The residue was washed through with distilled water which was rinsed with 10.0 % hydrochloric acid (HCl). After a proper rinsing, the mixture was dried in the oven at 105^0C.

Calculation

The nitrogen content of the sample was calculated using the formula:

$$\text{Nitrogen in sample (\%)} = 100\ [\underline{A \times B\ 0.014}]$$
$$C$$

crude protein (%) = nitrogen in sample x 6.25

Where:

A= chlorohydric acid used in titration (ml)

B= normality of standard acid

C= weight of sample (g)

Determination of Total Carbohydrate (Onyeike et.al, 2003).

Total carbohydrate was calculated by the difference method as described by onyeike et. al, (2003).This was obtained by summing the values of % moisture, ash, crude protein and crude fat, and subtracting the sum from 100.

Determination of fat content.

Total fat was determined using the AOAC (2006) method of determination using the soxhlet extraction method. Two (2g) gram of sample was weigh into the thimble and covered with cotton wool and transferred to the soxhlet extractor, with 150 ml of hexane measured into the extractor unit

Determination of Total ash

The ash content was determined using the AOAC (2006). 10.0 g of the sample was weighed into a petri dish and transferred into a muffle furnace. The sample in the furnace was heated at 550 ^{0}C for four (4) hours and allowed to cooled in the desiccator. This process was repeated until a constant weight was obtained.

Calculation

The ash content was calculated using the formula:

$$\text{Ash content (\%)} = \frac{A-B}{C} \times 100$$

Where:

A= weight of petri dish with sample (g)

B= weight of petri dish with ash (g)

C= weight of sample

Determination of Total Titratable acidity (TTA).

Total titratable acidity was carried out in accordance with the method described by Ferrati et. al, (2005), using 5g of concentrated fruit juice which was homogenized with 20ml of distilled water and filtered with whatman filter paper No. 1. Phenolphthalein was added to the 20ml of the filtrate as indicator and titrated against 0.05M NaOH. Titratable acidity was calculated using the equation:

$$TA = \frac{M\ NaOH\ \ X\ NaOH\ \ X\ 0.09\ X10}{Juice\ \ Sample}$$

Determination of Total soluble solid (brix).

A previously cleaned hand held refractometer was dropped into the blended juices and the prism closed. Values of total soluble solids (brix) was read off the scale of the refractometer.

Determination of Vitamin C.

The Vitamin C content of the samples were determined by the titration method using the standard indophenol solution as described by Wabaliand Onyibe(2021). A fifty- milliliter volume

of the juice was measured into a volumetric containing 25ml of 20% metaphosphoric acid and made up with distilled water to a 100ml mark. Then 10ml of prepared sample was pipetted into a small flask and 2.5ml of acetone added to it and titrated against indophenol solution until a faint pink color persists for 15sec. The Vitamin C content calculated as mg/100ml of sample.

Statistical Analysis

Results were expressed as mean values and standard deviation of three (3) determinations. Data were analyzed using a one-way analyses of variance (ANOVA) using Statistical Package for Social Science (SPSS) version 20.0 software 2011 to test the level of significance at 5% probability Duncan New Multiple Range Test was used to separate the means where significant differences existed according the method of Wahua(1999].

RESULTS:

The results of physicochemical properties of the prepared fruit juice are shown in Table 1. The results revealed that the vitamin C content of the blends ranged from0.28 – 2.37mg/100ml, with sample A containing only pineapple juice being significantly ($p \leq 0.05$) higher than other samples. The result further revealed that the vitamin C content of the various blends reduced as the volume of pineapple in the blends reduced.

Total brix which represent the percentage of sucrose in pure solution showed values ranging from 6.00 – 11.00 with sample A being significantly higher than other blends. The results also revealed that that sample F containing water melon juice had the least value of 6.00. Further the results indicated aconsistent reduction in the value of sugar brix with a reduction in the volume of pineapple juice in the blends.Thetotal titratable acidity of the juice blends ranged from 1.26 –

5.11% with sample A being significantly higher than all other blends. The results further revealed that all the blends were significantly different from each other and the values for acidity decreased as the concentration of pineapple juice in the blends decreased. This implies that pineapple juice contributed majorly to the titratable acidity of the blends

TABLE 1: Physiochemical Properties of Fruit juice blends.

Sample	Vit C mg/100ml	Sugar (Brix)	TTA(%)
A	2.37 ± 0.26[a]	11.00±0.00 [a]	5.11±0.28 [a]
B	0.44±0.04[c]	10.00±0.00 [b]	4.17±0.04 [b]
C	1.20±0.16 [b]	9.00±0.00[C]	3.61±0.11[c]
D	1.34±0.30 [b]	8.00±0.01[d]	2.98±0.04[d]
E	0.48±0.16 [c]	7.01±0.00[e]	2.59±0.07[d]
F	0.28±0.04 [c]	6.00±0.00[f]	1.26±0.00[e]
LSD	**0.647**	**0.017**	**0.438**

Values are mean±Sem. Values with same superscripts are not significantly different at p≤ 0.05 level

A= 100ml P: 0ml WM; B= 80ml P:20ml WM; C= 60ml P:40ml WM; D=40ml P:60ml WM; E=20ml P:80ml WM; F=0: 100ml WM.

. The proximate composition of the various juice blends is shown in Table 2. The results showed that all samples contained high amounts of moisture ranging from 94.68 – 96.31% and ash content values were between 0.50 – 1.03% with sample A being higher than other samples. Similarly, there were low values for protein and fat ranging from 0.04 – 0.38% and 0.05 – 0.17% respectively. The carbohydrate values were between 2.81 and 3.94% with sample B being the highest and sample F the least.

Table 2 Proximate composition of various blends of fruit juices

Samples	Moisture (%)	Ash (%)	Protein (%)	Fat (%)	Carbohydrate (%)
A	96.31±1.01[a]	1.03±0.20[a]	0.38±0.22[a]	0.17±0.01[a]	3.41±0.15[b]
B	94.71±1.21[a]	0.50±0.10[b]	0.04±0.00[b]	0.08±0.10[b]	3.94±1.02[a]
C	96.14±0.19[a]	0.57±0.08[b]	0.29±0.10[c]	0.16±0.02[a]	3.03±0.29[d]
D	95.22±2.98[a]	0.60±0.11[c]	0.16±0.03[c]	0.05±0.00[c]	3.17±0.26[c]
E	94.68±1.19[a]	0.61±0.12[c]	0.08±0.00[c]	0.05±0.00[c]	3.01±0.11[d]
F	95.84±1.23[a]	0.62±0.10[c]	0.20±0.40[c]	0.05±0.00[c]	2.81±1.23[e]

Values are mean ± Sem. Values with same superscripts are not significantly different at p≤ 0.05 level

A= 100ml P: 0ml WM; B= 80ml P:20ml WM; C= 60ml P:40ml WM; D=40ml P:60ml WM; E=20ml P:80ml WM; F=0: 100ml WM

Results of sensory evaluation of prepared juice blends are shown in fig 1. Sensory color acceptability scores ranged from 5.60 – 8.80 with sample F containing water melon juice being significantly higher than all other samples with a value of 8.80, followed by sample A with values of 8.40 respectively. The preference scores for taste indicated that sample F was most preferred with a value of 8.00, followed by sample E having a value of 6.80, while sample A had the least value of 4.40. The results revealed that the degree of taste acceptability decreased with an increase in the concentration of pineapple juice in the blends.

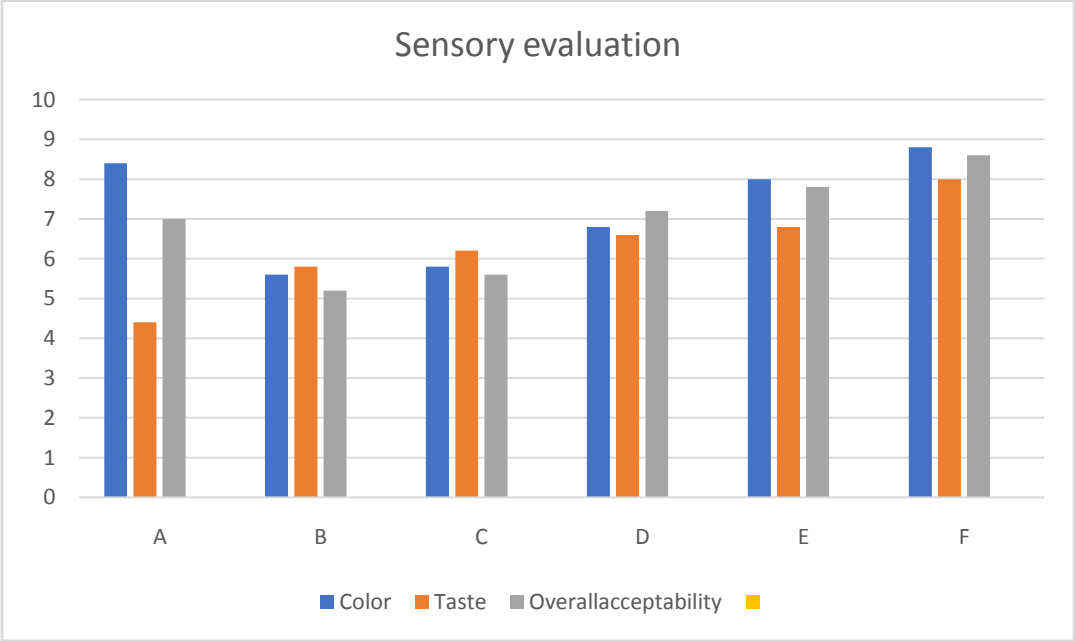

Fig 1: Showing Sensory evaluation

Values aremean ± Sem. Values with same superscripts are not significantly different at p≤ 0.05 levelA= 100ml P: 0ml WM; B= 80ml P:20ml WM; C= 60ml P:40ml WM; D=40ml P:60ml WM; E=20ml P:80ml WM; F=0: 100ml WM

Sensory evaluation: Hedonic scale ranking scores 1 -9.1= Disliked extremely, 9= Liked extremely

DISCUSSION: The vitamin C content of the blended juices ranged from 0.28 – 2.37mg/100ml, with sample A containing pineapple juice showing a significant(p≤ 0.05) higher than other sample. Reduction in the concentration of pineapple juice led to a decrease in the value of vitamin C in the blends. Similar decrease in Vitamin C content of pineapple blend have been reported on blends of ginger, watermelon and pineapple(Taiwo et.al, 2022). This result obtained in this research agrees with the findings of Kayode et. al, (2022), who reported increasing values of vitamin C of fruit juice blends with an increase in the concentration of pineapple juice. Vitamin C is involved in protein metabolism, collagen synthesis and acts as a physiological anti-oxidant in the body. An increased value of vitamin C implies that there is the potential of

improved absorption of non-heme iron and this could play an important role in immune function (Yi and Schellhorn, 2007).

Similar range of values have been reported by Ejimofor et.al, (2023) for sweet orange, water melon and pineapple juices with moisture content 92 -95%, fat0.15 – 0.47, carbohydrate 1.23 – 2.6%. The higher difference in carbohydrate could be attributed to difference in blending ratio and the fruits used. However, the range of values obtained in this report seem to agree with those reported by Banigo et.al, (2015)

The total titratable acidity (TTA) measures the ionic strength of a solution and this determines the rate of chemical reaction.The total titratable acidity ranged from 1.26% for water melon juice to 5.11% for pineapple juice. There was significant reduction in the value of total titratable acidity of the blends with increase in the concentration of water melon juice. The result obtained (5.11%) appears to be slightly higher than those reported by Samreen et.al, (2020) with values of 4.24 – 4.26% for pineapple juice. However, it would appear that varietal difference could be responsible for the difference in values obtained in this research.

Total brix value for pineapple juice with a value of 11.0 showed a significantly ($p \leq 0.05$) higher than other samples. An increase in total brix content is an indication that the juice blend contained a high sugar to acid ratio. Values for total brix decreased with an increase in the concentration of water melon juice in the blends showing the contributory effect of pineapple juice in the sugar to acid ratio.The total brix is the sugar content of an aqueous solution. One degree brix is 1g of sucrose in 100g of solution and this represents the strength of the solution as percentage by weight (Akande and Ojekemi, 2013). The sensory color acceptability scores revealed that pineapple and water melon juices were separately preferred by the panelist, with values of 8.4 and 8.8 respectively. Overall acceptability scores showed that water melon juice

(sample F) only was most preferred. Similar overall acceptability scores have been reported by Emelike and Ebere (2015).

Conclusion: Pineapple and water melon juice blends were produced and analysed for physio chemical properties. The results indicated that there was a reduction in vitamin C content, total sugar brix and titratable acidity of the various juice blends as the concentration of the water melon increased in the blends. Similarly, ash and carbohydrate content of pineapple juice (sample A) were significantly higher than other samples.

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