Production And Evaluation Of Mixed Single Strength Juice From Local Fruits Lemon, Pineapple, Grape, Pawpaw And Water Melon

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Abstract: Three samples of single strength juice were prepared from five local fruits. The fruit used included watermelon, pawpaw, grape, lemon and pineapple. The fruit juices samples (A, B, and C have different combination/percentages to these fruits. After blending, the juices were bottled pasteurized and kept at ambient temperature. At interval of one week, samples were withdrew and tested for chemical changes as well as consumer acceptability. Total titratable acidity of the juices increased with storage time. Panel of judges preferred fresh ones indicating that the means of storage explored in this research was not very adequate to retain features of the freshly prepared juices however the use of mixed fruit in preparing single strength juice is a viable option.

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1.0 Introduction

Single strength fruit juice is the unfermented, undiluted, extractable fruit content resulting from expression of fruit (Naggy, 1998). Single strength fruit juice is said to be a natural juice in the sense that the juice extracted is not mixed or adulterate with any food substance such as colour, sugar and other additive. Fruit juice can be defined as fruits "extract" juice extracted from juice after undergoing different unit operation during extraction. The demand for fruits is largely based on their nutrient values, flavor, aroma and colour. Fruit juice are valuable chiefly for their vitamins, minerals, carbohydrate content, amino acid, flavor compound and probably other still unidentified constitute (Tresleer and Joslyn, 1997). Other valuable compound such as acid, alcohols, esters, aldehyde, ketone, phenols and especially terpenes (the essential oil used as flavoring essence) are also obtained for fruit processing (Vickery and Vickery, 1996). According to Brisk (1994), the essential role of vitamins, mineral and other nutrient found in fruit especially vitamin A may help in providing our eye sight light under condition of poor lightening in dark which is a disease called Exophthalmia cause by hardening of the eyes which may result to permanent blindness. Fruit juice which is rich in vitamins such as B Thiamin, B_2 Riboflavin and ascorbic acid helps in preventing diseases such as Beriberi, a disorder of the nerves and muscle, vitamin C (Ascorbic Acid) for the formation of teeth, bone and prevention of scurvy while minerals such as Iron in the prevention of anemia, calcium (Ca) and phosphorus contribute to the body structure, necessary, for bone and teeth formation. Single strength juice could be produced from one particular fruit, or a mixture or combination of two or more fruit without any further adulteration. During mixing, the different fruit are blended together to form a uniform mixture. Since a lot of fruits are imported from foreign countries, not withstanding of the abundant fruit in our country Nigeria, it will be useful opportunity to utilize these abundant fruits by processing the juice so as to avoid wastage. In Nigeria, substantial quantities of fruits are produced in a particular season of the year of which many fail to reach the market due to spoilage from mechanical damage and overspend (Adumola and Matanmi, 2002).

Unlike in advanced countries where many homes have canning facilities, over 99% of Nigerian homes do not have, as a result, many fruits that are not utilized by the few canning industries deteriorates if not consumed immediately or shelf life of the fruits extended for a few weeks by refrigeration and again many Nigerian homes cannot afford refrigerator. In all these therefore, it will be a better approach to produce indigenous single strength mixed fruit juice from different fruits such as pineapple, cucumber, watermelon, grape fruit and lemon blended together at different rates to achieve similar organoleptic properties in terms of colour, flavor, taste, aroma and mouth feel with longer shelf life at different interval of storage.

The objective of this paper is to produce single strength juice from a blend of indigenous fruit such as pineapple, pawpaw and watermelon and examine their organoleptic properties in terms of flavor, color aroma and mouth feel.

2.0 Materials and Methods

The experiment was conducted in the department of Food Science and Technology Laboratory of Federal University of Technology, Owerri.

2.1 Materials

Materials used were Cooker, Strainer, Bowl, Packaging Material (Coca Cola Bottle 35cll), Knife, Extruder and Thermometer.

Reagents used were from Food Science and technology Laboratory at Federal University of Technology Owerri.

2.2 Method

About 30 quantities of the following fruits were purchased from Ekeonunwa market in Owerri Imo State (Pawpaw, water melon, grape fruit, lemon and pineapple).

2.3 Processing of Individual Fruits

About 2.5kg of pawpaw was weighed in a weighing balance, peeled and washed. The peeled pawpaw was reweighed and sliced into pieces, the sliced pawpaw was strained and juice was extracted from it. The extract was weighed and recorded in millimeters.

About 3kg of Pineapple was weighed in a weighing balance, peeled, washed and weighed. The peeled Pineapples were bisected and sliced into small pulp and was strained to extract juice. The extract was weighed and recorded in millimeters. About 3kg of Watermelon was weighed, peeled and washed. The weight of the peeled watermelon was recorded. It was further bisected into four equal parts and sliced into pieces. The sliced pieces of watermelon were strained and the extract watermelon juice was weighed and the weight was recorded. About 2kg each of Lemon and Grape fruit were weighed and peeled washed and further sliced and juice were extracted using an extruder. The juice extracted from each fruits were weighed and recorded in centiliters.

2.3.1. Blending of Individual Fruits

Blending of the extracted juice was done on the 35cl coca cola bottled samples A, B, C,

- Single strength juice from sample A was produce by blending.

SAMPLE A
50% pawpaw juice
10% Lemon
10% Grape
10% Pineapple
20% Watermelon

to produce 100% blended single strength mixed fruit juice.

Single strength Mixed fruit juice sample B was produced by blending these percentage of fruits.

SAMPLE B
50% watermelon
10% Lemon
10% Grape
15% Pineapple
15% pawpaw

to produce 100% blended single strength mixed fruit juice.

Single strength Mixed fruit juice sample C was produced by blending these percentage of fruits.

SAMPLE C
50% pineapple
10% Lemon
10% Grape
10% Pineapple
15% water melon

to give 100% mixed fruits single strength juice.

2.4 Chemical Analysis

The Ash content and moisture content of each of the juice sample were analyzed, while the lactic acid, Ascorbic acid and Total Titratable Acidity (TTA). Total Soluble Solid (TSS) of each of the juice samples were also tested for on a 7 day interval for two weeks of storage.

2.4.1 Determination of Ash Content

The Ash content was determined by using the AOAC (1990) Method. Milliliters of the sample was accurately weighed into a petty dish of known mass and ignited at about 525^0C and heated in carbolic muffle furnace until the ash was force of carbon (8hrs).

The random was cooled in a dessicator and then weighed. The percentage of ash was calculated as followed.

$$\%\text{of Ash} = \frac{\text{Mass of residue x 100}}{\text{Mass of sample 1}}$$

2.4.2 Determination of Total Titratable Acidity

10milliliter of the sample was suspended in 20 milliliter of distilled water in a 100ml flask with 1 ml of 1% phenolphthalein. The mixture was titrated to eh end part of phenolphthalein (faint pink colour) using O.I.N sodium hydroxide.

Using the obtained titration value and a known formula, the amount of titratable acid in g/100g sample was calculated. The obtained acid value could be expressed as lactic by multiplying with a factor of 0.007. About 20 Milliliter of 5% metaphosphone acid was diluted from 20% stock and titrated with the dye solution to a faint pink colour that persist for 15 seconds. The dye was standardized with standard Ascorbic acid (AOAC 1996).

$$\frac{2}{T_1} \times \frac{T}{1} \times \frac{100}{W}$$

When T = Titer value of sample
T_1 = Titer value of standard Ascorbic acid
W = Mass of sample used

2.5 Sensory Analysis

Panel of 15 members was drawn from the school environment and test was conducted on the flavor, colour taste and feel of the juice using a nine point hedonic scale.

9 - Like extremely.
8 - Like very much.
7 - Like moderately.
6 - Like much.
5 - Neither Like nor dislike.
4 - Dislike moderately.
3 - Dislike much.
2 - Dislike very much.
1 - Dislike extremely.

2.5.1 Step in Processing of Fruit Juice

Before the fruit juices were produced, they passed through the following processing steps as shown in figure 1 below.

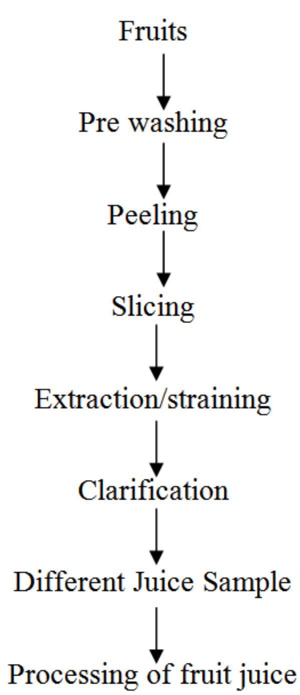

Fig 1 Flow chart for Processing of Fruit Juice

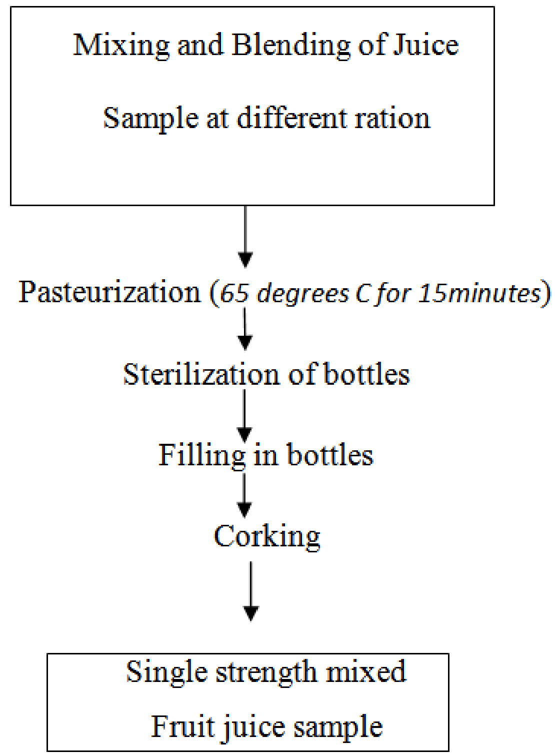

Fig 2 flow chart for the production of single strength fruit juice

2.6 Experimental Design

Three samples of single strength fruit juice were produced from blending of fruit sample of watermelon, grape fruit, pawpaw, lemon and pineapple. The three samples are:

Sample A = 50% pawpaw juice, 10% lemon, 10% pineapple 10% grape and 20% water melon juice.

Sample B= 50% water melon, 10% lemon, 10% grape and 15% pineapple and 15% pawpaw.

Sample C 50% pineapple, 10% lemon, 10% grape, 10% pawpaw and 20% of water melon.

The samples were pasteurized, and both chemical and sensory analyses were tested. Each of the samples were preserved for 2 weeks and tested for tactic acid, Ascorbic acid, Ash, Moisture, Total Soluble Solid (TSS) and Total Titratable Acidity (TTA) at interval of 7 days to know each of the individual sample shelf life and storage ability.

3.0 Results and Discussion

3.1 Chemical Analysis of Single Strength Juice

3.1.1. Total Titratable Acidity

Total titratable acidity of the sample increases during the 7 days of storage. On the 14th day of storage, it further increased gradually from 0.57% to 0.58%. The result of the total titratable acidity of the three samples is shown in Table1. At the 7th and 14th

day of storage, statistical analysis showed that there was no significant difference between the total titratable acidity of the three samples. The rise in the percentage acidity of the sample was probably due to the combination of the different fruit juices and this increases the acidity of the mixed fruit juices (Morgan, 1998).

Table 1: Total Titratable Acidity of Single Strength Juice during Storage

DAY	A	B	C
0	0.034[a]	0.035 [a]	0.043 [a]
7	0.193[b]	0.176 [b]	0.207 [b]
14	0.202 [b]	0.193 [b]	0.204 [b]
Mean	0.143±0.077	0.133±0.073	0.151±0.076

KEY
A = 50% pawpaw Juice 10% lemon, 10%Grape, 10% pineapple and 20% water melon
B = 50% pineapple, 10% lemon, 10%grape, 15% pineapple and 15% pawpaw
C = 50% pineapple, 10% lemon, 10% grape, 15% Pawpaw and 15% water melon

3.1.2 Total Soluble Solids

The total soluble solids of the three samples were determined. On zero (0) day of storage, sample A was 13.9%, B was 14.9% and C was 15.0%. On the 7th day of storage, the total soluble solids of the three samples show a decrease of 44.6% to 31.48% that is from the first day to 7th day of storage. The results of the total soluble solids are shown in (Table 2). Statistical analysis showed that from the zero (0) day and 7th day of storage, results were significantly different. Probably the difference could be as a result of the break up other soluble solids in the mixed fruit juices (Tressler and Joslyn, 1997).

As the storage continues from the 7th day, a drastic decrease was observed in the Total soluble solids of the three samples. Statistically, a significant difference ($p \geq 0.5$) existed in the average total soluble solids of the three samples. At the end of the 14th day, the total soluble solids (TSS) of the sample further decreased showing that the juices were losing in soluble solids (Potter, 2000) thereby increasing in total dissolved solids (TDS). Storage led to hydrolysis of TSS and improved TDS (Osuji and Okafor, 2013)

Table 2: Total Soluble Solids of Single Strength Juice during 14 Days of Storage.

DAY	A	B	C
0	13.9[a]	14.9[a]	15.8[a]
7	11.15[b]	10.73[b]	9.60[b]
14	9.34[c]	8.63[c]	8.33
Mean	11.46[a]	11.42a	11.24a
SD±	1.77	2.58	3.26

KEY: A = 50% pawpaw Juice 10% lemon, 10%Grape, 10% pineapple, 20% water melon;
B = 50% water melon,10% lemon; 10% graps, 15% pineapple, 15% pawpaw;
C = 50% pineapple, 10% lemon; 10% grape, 15% pawpaw, 15% water melon

3.1.3 **Ascorbic Acid Content of Single Strength Juice**

The ascorbic acid content of the three samples on the 0 day of storage water 5.9, 5.1 and 3.9 respectively (table 3). The changes observed on the 7th day of storage was that ascorbic acid of the three samples increased gradually to 7.7, 6.9 and 5.8. And on further storage of 14 days, it further increased up to 9.6, 8.9 and 8.5 was observed. The increase was likely affected positively because of the released or hydrolyzed TSS that took place during storage (Osuji and Okafor 2013; Snedcor, 2001) Summary of the results of the changes in Ascorbic acid of these three samples is fully shown in table 3. Hydrolysis of the TSS by the inherent enzymes present in the different fruits may have led to the increase in ascorbic acid content (Osuji and Okafor, 2013).

Table 3: Changes in Ascorbic Acid Content of Single Strength Juice During Storage.

DAY	A	B	C
0	5.9^a	5.1^a	3.9^a
7	7.7^a	6.9^a	5.8^a
14	9.6^c	8.9^c	8.5c
Mean	7.7^a	6.7b	6.1^c
SD±	1.77	1.55	1.88

KEY: A = 50% pawpaw, 10% lemon 10% grap; 10% pine apple, 20% water melon;
B = 50% water melon, 10% lemon;10% grape, 15% pineapple, 15%pawpaw;
C = 50% pineapple, 10% lemon, 10%grape;15% pawpaw, 15%water melon

3.1.4 Ash Content of Single Strength Juice

The ash content of the three samples A, B and C on the first day of storage were 98.5%, 98.7% and 97.3% respectively. On the 7th day, there was a reduction in the ash content to 82.1%, 82.0% and 79.8% respectively. On further storage of 14 days, the three samples exhibit a percentage decrease in ash content of 67.9, 69.1 and 66.0. See table 4 for the summary of the changes in percentage (%) ash content of the three samples on their respective days of storage. The reduction in ash content as storage progresses is as a result of the breakdown or degradation of the fibrous part of the juices. Hydrolysis by the inherent enzymes present in the different fruits may have led to the decrease in ash content (Osuji and Okafor, 2013).

Total 4: Ash Content of Single Strength Juice During Storage

DAY	A	B	C
0	98.5^a	98.7^a	97.0^a
7	82.0^b	81.1^b	79.8^b
14	67.9^c	69.1^c	66.0^c
Mean	82.8^a	8.3^a	80.9^c
SD±	12.5	12.2	12.7

KEY:
A = 50% pawpaw, 10% lemon 10% grape; 10% pine apple, 20% water melon;
B = 50% water melon, 10% lemon 10% grape; 15% pineapple, 15%pawpaw;
C = 50% pineapple, 10% lemon, 10%grape;15% pawpaw, 15% water melon

3.1.5 Sensory Evaluations of Single Strength Juice

The average rating of the three samples by the panelists at the first day of storage on colour were almost all the same with the reference sample. The rating was almost within the range of like very much, and like moderately. The sensory scores on taste or mouth feel were at the range of like very much and like moderately. On flavor, the rating/scores were at the range of neither like nor dislike and like moderately. All the three samples were well and highly accepted by the scores of panelists, even up to 14th day of storage. The summary table for the sensory evaluations is discussed below on table 5. Statistical analysis of the samples shows that there was no significant difference among the sample colour and mount feel.

3.1.5.1 Colour

On the 1st day of storage sample A was ranked the highest in colour, which shows that watermelon as a fruit juices started to deteriorate of which the average panelist rating were low. Statistical analysis shows that there was no significant colour difference among the three samples of mixed fruit juice on storage,

3.1.5.2 Flavour

At the 1st day of the experiment, statistical analysis of the average scores given by the panel of judges to the sample flavour showed that there was no significant different between sample A and C while sample B has more flavour more than other samples. Sample B was significantly different ($P \geq 0.5$). On the 7th and the 14th day of storage, the flavour of the mixed fruit juices slightly changed and panelists scored on them were low. The samples were scored low when compared to the freshly prepared, but the trained panelist generally accepted both the freshly prepared and stored single strength juice samples. The overall acceptability of the samples up to 14 days of storage is very essential.

3.1.5.3 Mouth Feel

At the first day of experiment, statistical analysis of the average scores given by the panel of the judge to the samples taste showed that there was significant difference among the samples. Sample C comprising more percent of pineapple was ranked the highest meaning that pineapple fruit contains more sugar content than other fruits. At the 7th day of storage, statistical analysis showed that there was no significant difference in taste. On the 14th day of storage, the panelists ranking of the samples proved that pineapple still retains more taste than the other two samples. The mouth feel of sample C was still accepted by the panel of judges.

Table 5: Mean of Sensory Score of Mixed Single Strength Juice as affected by Storage

		Colour	Flavour	Mouth feel
Week 0	A	7.7^{a}	6.3^{a}	6.5^{b}
	B	6.7^{a}	6.7^{ab}	6.2^{b}
	C	6.3^{a}	6.3^{a}	7.3^{a}
Week 1	A	3.9^{b}	2.6^{b}	3.9^{c}
	B	3.7^{bc}	2.5^{bc}	3.2^{cd}
	C	3.9^{b}	2.6^{b}	4.1^{c}
Week 2	A	1.8^{d}	1.8^{c}	2.1^{e}
	B	1.7^{d}	1.6^{c}	2.2^{e}
	C	2.0^{c}	1.5^{c}	2.5^{e}
	LSD	4.2	1.5	2.7

4.0 Conclusion and Recommendation

Production of mixed single strength juice using Nigerian local fruits proved viable. The blended juices were all accepted by the consumers. The mixed single strength juice having higher percentage (50%) of pineapple juice was rated higher than other blends. The nutritional composition of the juice improved during storage. It is a means of preservation and will lead to all year round availability of these fruits. Healthy advantages of consumers abound especially for those that are allergic to excess fiber. This paper recommends large scale or industrial scale production of a mixture of different tropical fruit juices.

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