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PRODUCTION AND QUALITY EVALUATION OF FRUIT JUICE FROM BLENDS OF LOCAL APPLE (MALAY ROSE-APPLE) (*SYZYGIUMMALACCENSE*) AND PINEAPPLE (*ANANASCOMOSUS*)

Onwuzuruike U. A, Offia Olua B. I & Nkwocha B. U

Research Scholar, Department of Food Science and Technology, College of Applied Food Sciences and Tourism, MichaelOkpara University of Agriculture, Umudike, Abia, Nigeria

ABSTRACT

Production and evaluation of fruit juice from Malay-rose apple (Syzygiummalassence) and pineapple (Ananascosmosus) juice blends was studied using single strength pineapple juice as the control. The samples were analyzed for vitamins, minerals, microbial, and physiochemical properties. The pineapple juice (control) sample had the highest value of vitamins, followed by blended fruit juice sample and then Malay rose apple. Results of the mineral composition showed that there were significant differences among the samples ($p<0.05$) with pineapple having (12.63mg) calcium, (0.43mg) magnesium, (74.67mg) potassium and (0.05mg) sodium, Malay rose apple had (11.53mg) calcium, (3.11mg) magnesium, (103.33mg) potassium and (1.02mg) sodium. While the fruit juice blend had (20.55mg) calcium, (68.23) magnesium and (87.57mg) potassium. The results showed that the microorganisms in the sample were mainly Saccharomyces cerevisea (yeast), micrococcus spp and lactobacillus (bacteria).

KEYWORDS: *Fruit Juice, Pineapple, Malay Rose-Apple, Proximate, Physicochemical, Microbial*

Article History

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INTRODUCTION

Fruits are the mature ovaries of the plant with their seeds. The edible portion of most fruits is the fleshy part of the pericarp or vessel surrounding the seeds (Potter and Hotchkiss, 2005). Fruits are rich in some micronutrients especially ascorbic acid and the precursor of vitamin A (B-carotene and pro-vitamin A) (Okaka, 1997). Juices are obtained from a single fruit or from different kinds of fruits and vegetables (Tombak, 2000). Whole fruit can be directly squeezed, macerated or crushed so as to produce a considerable amount of pulp or juice or may be extracted by water. (Frazier and Westhoff, 1998).

Malay rose–apple (*Syzygiummalaccense*) has been cultivated since pre-historic times (Merr and Perry, 2007). The edible pulp has a pH of 4.7. Both tender and ripe fruits and the seeds are rich in minerals and vitamins. Ripe fruits are rich in vitamin A, vitamin B complex and vitamin C (FMEWF, 2006). Due to high levels of vitamins, Malay rose apple supplements other staple fruits in times of scarcity in some region (ICUC, 2003). The ripe fruit is eaten raw though many people consider it insipid. Many rose apples are often cooked with acid fruits to the benefit of both. They are sometimes made into sauce or preserves. The slightly unripe fruits are used for making jelly and pickles.

Pineapples have exceptional juiciness and a vibrant tropical flavor that balances the tastes of sweet and tart. Pineapple juice is widely consumed by both adult and children. The juice is a nonalcoholic drink and its demand continues to rise mainly due to increasing consumer's awareness of its health benefits. It has a proximate composition of 81.2-86.2% moisture, 13-19% total soluble solid of which sucrose, glucose, and fructose are the main components, 0.4% fiber and a rich source of vitamin C (Dull, 2000).

Fruit juices are beverages which are commonly consumed for their refreshing attributes, nutritive values, and health benefits. In Nigeria, most of the fruit drinks are imported (Frank *et al.*, 2005). Locally processed fruit drinks are highly needed in order to reduce foreign exchange for importation. A mixture of juices balances out certain nutrients which may not be present in a single fruit or vegetable. Beside adding body and improving the nutritive value, mixtures also compensate for the sourness or bitterness of a particular juice. This study is therefore aimed at evaluating the vitamins and minerals, microbial and physiochemical properties of juice made from local apple (malay rose-apple) and pineapple juice blends.

MATERIALS AND METHODS

Raw Material Collection

Fresh Malay rose apple and pineapple fruits were purchased from Ndi-Oro Market in Ikwuano local government area in Abia State.

Sample Preparation

The fruits were sorted to remove the damaged and rotten ones, and were properly washed and their skins were manually removed. The juices were extracted using an electric blender and were poured into different clean airtight plastic containers. The extracted Malay rose and pineapple juices were blended together to obtain juice blend, pasteurize (85^0C for 5mins), cooled and packaged in an airtight plastic container prior to analyses.

Table 1: Codes Representing Each Sample

Sample Codes	Sample Name
100	malay-rose apple juice
200	pineapple juice
300	malay-rose/pineapple juice

Sample Analyses

Vitamin Determination

The vitamin A content was determined using the method described by James, (1995). Okwu and Josiah (2006) were used in determining the thiamine content while the vitamin C content was determined by AOAC (1990).

Mineral Determination

The mineral content of the samples was determined by the dry ash extraction method (James, 1995). A measured weight of the entire sample was incinerated in a muffle furnace until all the organic constituents were burnt leaving the minerals as ash. The ash was then dissolved in a minimal volume of dilute hydrogen chloride solution; the extract was made up to known volume prior to determination of calcium, magnesium, potassium, and sodium. The calcium and magnesium content was determined by the method was described by Pearson (1976) while AOAC (1990) method was used for analyzing the potassium and sodium in the sample.

Physicochemical Analysis

The pH was determined by the pH meter method (AOAC, 2005). The gravimetric method of Bradly (2003) was used to determine the total solids, while the specific gravity and total titratable acidity were determined by the method described by (James, 1995) and the method of AOAC (2005).

Microbial Analysis

The microbiological assessment of the sample was carried out using the pour plate method described by Ezeama (2007) and the ICMSF (1978).

Preparation of Media

Tryptone soy agar(for the total viable count) and Sabouraud dextrose agar (for fungi identification)were weighed and prepared according to manufacturer's instructions. About 32g of tryptones soy agar and sabouraud dextrose agar powder were weighed out into a conical flask and dissolved in 1 liter of de-ionized distilled water and properly mixed (homogenized by carefully shaking). The mouth of the conical flask is plugged with non-absorbent cotton wool and covered with aluminum foil tightly and sterilized by autoclaving at 121^0Cfor 15 minutes.

Serial Dilution Techniques

1 gram of the sample was weighed out using chemical balance. The 1g was added to 10ml of distilled water to solubilized and the mixture properly homogenized. A set of test tubes were arranged on test tubes rack containing 9ml of distilled water in each. 1ml of the stock sample solution was transferred to the first test tube to make 10^{-2} dilution. The sequence was continued in a similar manner until 10^{-6}dilution strength, that is 10^{-1},10^{-2}, 10^{-3}, 10^{-4}, 10^{-5}, 10^{-6}. Approximately 1ml portion was taken and inoculated into plates of both tryptone soy agar and sabour and dextrose agar.

Inoculation Procedures

The pour plate techniques described by Ezeama (2007)was applied. The aliquot (1.0ml) of the sample was introduced to each sterile petri dish and pour 10 to 15ml of the liquefied medium at 44^0Cto 46^0Cinto each of the plates and mixed by rotating the plates first in one direction and then in the opposite direction. The agars were allowed to solidify in a level surface. Then incubated aerobically and anaerobically at 35-37^0Cfor 18-48hours for bacteria or anaerobically at 2.8± 2.0^0Cfor 4-5 days for fungi. A plate was selected with 25-250 colonies and averages the count to obtain the colony count. The counts were recorded as CFG/g of the food sample.

Isolation and Identification of Microorganisms

The methods described by Fawole and Oso (1988), was used in carrying out the isolation. Following a 48 hours plate culture of the sample, the culture was examined for the presence of different colonies. Discrete colonies seen were carefully and aseptically transferred to sterile agar plate (tryptone soy agar, macconkey agar, and sabouraud dextrose agar) using streaking method. The plates were inoculated for 24-48 hours at 35-37^0C.

Fungi Isolates

Identification and characteristic of fungi isolates from each sample was based on the colony features and microscope examination. The colony was examined based on mycelia, nature of mycelia and spores, mounts of each fungus isolated was made on lactophenol cotton blue and examined microscopically using the 10x and 40x objective lens

with the condenser iris diaphgram closes sufficiently to give good contrast (Cheesbrough, 2000).

Statistical Analysis

All experimental data were expressed as mean ± SD (standard deviation). After checking the pre-requisite (a normality check, followed by Levene's test for homogeneity of variance), one-way analysis of variance (ANOVA) was used to analyze the data using the SPSS software (version 16, IBM, USA) to determine the significant difference among the experimental data, while the Duncan Multiple Range Test (DMRT) method was used to compare the means of experimental data at 95 % confidence interval when a significant difference was observed from the One-way ANOVA.

RESULTS AND DISCUSSIONS

Vitamin Composition

Table 2 showed the results of vitamin content of the samples. From the result obtained, sample 200 (pineapple juice) had the highest vitamin Acontent(58.03IU) which was significantly different at ($p<0.05$) from the rest of the samples. The result obtained from sample 100(Malay-rose apple) were lower compared to the value(3.10IU) reported by Merr andPerry (2007), while that of sample 200 (pineapple) juice compared favorably with the value (50IU) reported by Ihekoronye and Ngoddy (1985), signifying that sample 200(pineapple juice) is a good source of vitamin A. The thiamine content of the juice samples was significantly different at ($p<0.05$) from each other with sample 100(Malay rose apple) having the highest thiamine content(14.80mcg) while Sample 300 (blended juice sample) had the least thiamine content (6.32mcg).The difference could be attributed to the nutrition composition of the raw materials. The result obtained from sample 100 (malay-rose)juice compared favourbaly with the values (15.39mcg) reported by Merr and Perry (2007). The improved thiamin content of malay rose apple indicates that the sample would be beneficial in food digestion and other metabolic processes in the body. The vitamin C content of the samples ranged from 2.52 – 31.22mg. Sample 200 (pineapple juice) had the highest vitamin C(36.87mg) content, followed by sample 300(blended fruit juice) (31.22mg). Sample 100(Malay rose apple) juice had the least value (2.52mg). The vitamin C content obtained for sample 100 (Malay-rose) juice is lower than the value (6.5mg) reported by (Merr and Perry, 2007). Ascorbic acid is an important nutrient, which is not only a natural antioxidant, thus the increased vitamin C content recorded for pineapple juice and blended juice samples is a good indication that the samples contain good antioxidant properties.

Table 2: Vitamin Content of Malay Rose Apple –Pineapple Fruit Juice Blend Samples

Samples	Vitamin A (IU)	Thiamine (mcg)	Vitamin C (mg)
100	2.91^{c}±0.01	14.80^{a}±0.00	2.52^{c}±0.01
200	58.03^{a}±0.06	10.67^{b}±0.06	36.87^{a}±0.06
300	4.22^{b}±0.02	6.32^{c}±0.00	31.22^{b}±0.01

Values are means ±standard deviation of vitamins contentdetermination.a – c = means with different superscripts within each column are significantly different ($p<0.05$).Sample 100 = malay-rose apple juice. Sample 200 = pineapple juice. Sample 300 = malay-rose apple/pineapple juice.

Mineral Composition

The results of the mineral content of the samples are presented in Table 3. From the result, there was a significant difference among the samples in their mineral content. Sample 300 (blended fruit juice sample) had the highest calcium content (14.53mg) while sample 100 (Malay rose apple) had the least value (11.53mg). Also, Sample 300(blended fruit juice) (5.23mg) had the highest magnesium content which was significantly different ($p<0.05$)from sample 100 (Malay

rose apple) (3.11mg)and 200 (pineapple)(0.43mg). The improved calcium and magnesium content recorded in the blended juice sample is an indication of improved nutritional value derived from the combination of two or more raw materials to obtain an improved end product.

Table 3: Mineral Composition of Malay Rose Apple-Pineapple and Blended Juice Sample

Sample	Calcium (mg)	Magnesium (mg)	Potassium (mg)	Sodium (mg)
100.00	11.53^{c}±0.01	3.11^{a}±0.01	103.33^{b}±0.58	1.02^{a}±0.01
200.00	12.63^{b}±0.12	0.43^{c}±0.01	174.67^{a}1.15	0.05^{b}±0.01
300.00	14.53^{a}±0.12	5.23^{a}±0.06	101.57^{c}±0.06	0.03^{c}±0.00

Values are means ± standard deviation of mineral content determination. a – c = means with different superscripts within each column are significantly different ($p<0.05$). Sample 100 =Malay–rose apple. Sample 200 = pineapple. Sample 300 = blended sample.

The result showed that blended juice would be² beneficial to bone structure development (Calvo*et al.*,2004). The potassium content of sample 200(pineapple) (174.6mg) and 100(Malay rose apple) (103.33mg)were highest compared to sample 300(blended juice) (101.57mg). Although all the samples were significantly different($p<0.05$) from each other.The sodium content of sample 100 (1.02mg) was significantly different ($p<0.05$) from sample 200 (0.05mg) and sample 300 (blended juice sample) (0.03mg). The result implies that samples are poor sources of sodium. Taylor *et al.*(2011) noted that fruits and vegetables are generally poor sources of sodium.

Physicochemical Composition of Blended Juice Sample

Table 4 showed the results of physiochemical composition of blended-fruit juice sample. The pH of the sample is (5.42), which is low but does not conform to the standard description for acid foods (pH 3.20 -4.60) (James, 1995). The lower the pH value, the higher the titratable acidity. The pH of the juice blend does not favor the growth of spoilage organisms such as yeast(Ezeama, 2007). Low pH and high titratable acidity give the yeast a competitive advantage in the natural environment(juice) because the acidity of the juice inhibits the growth of other microorganisms (Lewis and Young, 1995). However, the result obtained in this study is higher than the values reported by Nwachukwu and Aniedu (2013) (2.7 – 4.4), which could be attributed to the pH of the raw materials used.

The specific gravity(1.38%) of blended juice sample compared closely with the value (1.54%) reported by (ICUMSA, 2009). The soluble solids content (9.15%) ad total solid content(1.28%) of the samples vary substantially from the standard value of total soluble solid content in concentrated and diluted natural tropical fruit juice (5.25%) and (16.0%) respectively Parker (2011). Retention or a minimum increase in the total soluble solids content of juice during storage is desirable for the preservation of good juice quality.

Table 4: Physiochemical Composition of the Product (Juice Blend)

Sample	pH	Specific Gravity (%)	Total Solid (%)	Soluble Solids (%)	TTA (%)
300	5.42	1.38	1.28	9.15	4.87

Sample 300=Blended Sample

Microbial Composition

The results of microbial determination are presented in Table 5 and Table 6. The microbial count took 7 days after 2 days' incubation period (0-12th) day. The results showed that the microorganisms in the sample were mainly *Saccharomyces cerevisae* (yeast), micrococcus spp and lactobacillus (bacteria). It was observed that there was no fungal and bacteria growth on the zero days of incubation. On the second day (2nd) bacteria was not observed while fungal growth began with an insignificant load of 1.3x10^2 cfu/ml till the 4th day. Bacteria growth began to occur from the 4th day on the juice sample and increased progressively to the seventh (6th) day. Bacterial (5.4x10^2 cfu/ml) and fungal (2.6x10^2 cfu/ml) growth were highest on the 8th day but diminished on the tenth (10th) day and twelfth (12th) day. Fungi are common environmental contamination, they are the major causes of spoilage of fruits and vegetable (ICMSF, 1998).

Table 5: Microbial Load of Blended Juice Sample

Days	Bacteria Load	Dilution Factor	Organismisolated
0	0	0	-
2nd	0	0	-
4th	3.2	10^2	Micrococcus spp
6th	3.8	10^2	Micrococcus spp
8th	5.4	10^2	Micrococcusspp and lactobacillus spp
10th	4.4	10^2	Micrococcus spp and lactobacillus spp
12	4	10^2	Micrococcus spp and lactobacillus spp

Table 6: Fungal Load of Blended Juice Sample

Days	Microbial Count	Dilution Factor	Organism Isolated
0	0	-	-
2nd	1.3	10^2	*Saccharomyces cerevisea*
4th	1.3	10^2	*Saccharomyces*
6th	2.2	10^2	*Sacchararomyce*
8th	2.6	10^2	*Saccharomycecerevisea*
10th	1.8	10^2	*Saccharomycecerevisea*
12th	1.2	10^2	*Saccharomycecerevisea*

CONCLUSIONS

The vitamin A content of single strength pineapple juice signifies its importance to poor sighted individuals. The improved thiamin content of malay rose apple indicates that the sample would be beneficial in food digestion and other metabolic processes in the body. While the increased vitamin C content recorded for pineapple juice and blended juice samples is a good indication that the samples contain good antioxidant properties. The blended fruit juice sample with a pH value (5.42) indicates that the juicewill not favor the growth of yeast, thus extending the shelf life of the juice sample. From the microbial analysis, the microorganisms in the blended fruit juice sample were mainly *saccharomycescerevisea*(yeast), *micrococuccus*spp and lactobacillus (bacteria).

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