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RESEARCH ARTICLE

Chemical Composition and Sensory Evaluation of Jam from *Cola parchycarpa* and Orange Blends

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ABSTRACT

This study investigates proximate composition, vitamin contents, and sensory evaluation of jam produced from blends of *Cola parchycarpa* and orange. *C. parchycarpa* and orange were formulated in the ratio of 100:0, 50:50, and 0:100 designated as COL, ORA and CO5, respectively. Protein content ranged from 0.76% to 1.01%, fat from 0.56% to 1.65%, fiber from 1.03% to 2.16%, ash from 0.43% to 0.80%, and carbohydrates from 72.53 to 77.52%. Vitamin A and Vitamin C were significantly ($P < 0.05$) high in sample COL. Sample CO5 (50% *C. parchycarpa*: 50% orange) had the highest mean scores in taste (8.30), flavor (7.90), aftertaste (8.30), spreadability (8.40), mouthfeel (8.30), and general acceptability (8.90). Highly nutritional and acceptable jam can be produced from blends of *C. parchycarpa* and orange.

Key words: *Cola parchycarpa*, jam, proximate composition, sensory evaluation

INTRODUCTION

Jams are prepared by combining sugar, lime, and citric of lemon juice with fruit and then heating the mixture till the consistency is obtained.[1] It is also a food made by boiling fruit and sugar to a thick consistency. Jam is used as spread in eating bakery products like bread, biscuits, pie meat among others. Food processing actually holds a means of transforming and diversify some underexploited plant foods such as monkey kola and orange. Monkey kola is a member of the family of Sterculiaceae and genus cola. It is made up of three varieties: Red (*Cola lateritia*), yellow (*Cola parchycarpa*), and white (*Cola lepidota*).[2] The red species are commonly found in Southern Nigeria between the months of June to November.[3] The pod of the yellow variety is roundish, while white variety has more cylindrical shape. Monkey kola is identified by various local names in Southeastern Nigeria ("achicha" or ohirincha in Igbo and "ndiyah" in Efik). Monkey kola can be eaten fresh cooked into pastries or preserved by canning or drying.[1] Nutritionally, Monkey kola is a good source of Vitamin A, high in natural sugar, and excellent sources of iron.[4] It is also rich in protein and Vitamins D, E, and K which are fat soluble.[5] Orange belongs to citrus family, and orange is botanically known as *Citrus sinensis* from Rutaceae family. Oranges are rich in Vitamin C, a powerful natural antioxidant, dietary fiber, and bioactive compound such as carotenoid and flavonoid that prevent cancer and degenerative diseases.[6]

In Nigeria, Monkey kola and orange are mostly consumed fresh and, like most fruits and vegetable, have a very short lifespan probably due to high moisture and its hard coat texture also limits its consumption. There is therefore need to process Monkey kola and orange fruit into a more stable and easier to use form such as jams, jellies, and juice to derive maximum benefit from it.[7,8] Processing of *C. parchycarpa* and orange into jams will reduce spoilage, thereby increase the shelf life and utilization, create variety, and improve nutritional quality of a new develop product. It is against this background and this study seeks to assess chemical and acceptability of jam from *C. parchycarpa* and orange blends.

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MATERIALS AND METHODS

Sources of materials

C. parchycarpa and orange were procured from Eke Ekwulobia in Aguata Local Government Area, Anambra State.

Sample preparation

The mature and undamaged *C. parchycarpa* and orange were sorted, and graded was done based on firmness, size, maturity, color, shape, and free from foreign matter, insect damage and mechanical injury. *C. parchycarpa* and orange were washed using chlorinated water. *C. parchycarpa* was open longitudinally with the sharp kitchen knife to remove the seed, while the oranges were peeled and cut open to remove the seeds. The pulp of *C. parchycarpa* was placed in water containing lime juice (250 ml lemon juice per liter of water) to stop them from browning.

Preparation of Jam

A modified method as described by Adepoju *et al*.[9] was used to prepare the jam. *C. parchycarpa* was grated manually using kitchen grate, and the blender was used to blend and homogenize the pulp. 500 g of the pulp of *C. parchycarpa* was added to 500 g of sugar and 250 ml of water. 20 ml of lemon juice and a pinch of salt were also added to enhance gel formation and improve color and flavor of the jam. The mixture was left at room temperature for 45 min and then cooked slowly with occasional stirring for 20 min. The cooked jam was poured into a sterilized bottle and allowed to cool at room temperature (29–32^{o}C). The same step was taken in the preparation of orange jam, as well as the combination of monkey cola and orange jam.

Chemical analysis

This chemical analysis was determined.

Proximate composition analysis

The moisture, protein, fat, ash, and crude fiber contents of the jam samples were carried out according to the methods of AOAC,[10] and this was determined in triplicates. The carbohydrate was determined by difference.

Determination of vitamin contents

Vitamin A was determined by the method of the Association of Vitamin Chemists Kirk and Sawyer.[11] Vitamin C was determined by titrimetric method of AOAC.[10]

Sensory evaluation

A 10-member panels was trained to conduct sensory evaluation on the following samples (100% C. parchycarpa jam, 50% C. cola parchycarpa : 50% orange jam and 100% orange jam) using a 9-point Hedonic scale (where 9 = extremely like and 1 = dislike extremely). The samples were scored for color, flavor, taste, mouthfeel, and overall acceptability.

Statistical analysis

Data obtained from chemical analysis and sensory evaluation were subjected to the analysis of variance using the Statistical Package for the Social Sciences Version 17.0 Duncan's multiple range test was used to compare the treatment mean. Statistical significance was accepted at $P < 0.05$.

RESULTS AND DISCUSSIONS

The proximate composition of jam produced from blends of *C. parchycarpa* and orange pulp is shown in Table 1. The moisture contents of jam sample ranged from 18.60 to 23.34%. Sample ORA (100% orange) had the highest values (23.34%), while sample COL (100% *C. parchycarpa*) had

Table 1: Proximate composition of jam samples

Samples	Moisture contents	Protein	Fat	Fiber	Ash	Carbohydrates
COL	18.60^{b}±0.10	0.76^{b}±0.01	1.65^{a}±0.01	1.03^{c}±0.01	0.44^{b}±0.01	77.52^{a}±0.01
ORA	23.34^{a}±1.00	0.76^{b}±0.01	0.62^{b}±0.10	1.96^{b}±0.01	0.80^{a}±0.10	72.53^{b}±1.00
CO5	22.00±1.00	1.01^{a}±0.01	0.56^{b}±0.10	2.16^{a}±0.10	0.43^{b}±0.00	73.00^{b}±1.00

Mean followed by the same column with the different superscripts is significantly different (P<0.05). COL: 100% *Cola parchycarpa*, ORA: 100% orange, CO5: 50% *Cola parchycarpa*: 50% orange

the lowest values (18.60%). The value of moisture content recorded in this study was very low when compared to the values (90.8% and 96.3%) recorded by Umeh and Nwadialu[12] for orange and *C. parchycarpa* jams, respectively. According to Fellow,[13] moisture content of food can be used as an indicator of its shelf life. The low moisture obtained in the study shows that the jam would have longer shelf life.

There were significantly ($P < 0.05$) differences in protein contents among the jam samples. Sample CO5 had the highest value (1.01%) of protein contents while samples if COL (100% *C. parchycarpa*) and ORA (100% orange) had the lowest values (0.76%). The value of protein in this was similar to the values (0.46%) reported by Eke-Ejiofor and Owuno[14] in pineapple jam. Fat contents ranged from 0.56% to 1.65%. Fat contents were significantly($P < 0.05$) higher in sample COL than other jam samples. The value of fat contents in this study was higher than the value (0.40%) recorded by Umeh and Nwadialu[12] for *C. parchycarpa*. Sample CO5 had the highest values (2.16%), followed by sample ORA (1.96), and sample COL had the lowest value (1.03) of fiber contents. The value obtained in this study was higher than the value (0.36) reported by Okudu and Ene-Obong[15] in *C. parchycarpa*. Wardlaw and Kessel[16] reported that Monkey kola had high in fiber contents and should be encouraged in the diet to prevent colon cancer. There was a significant ($P < 0.05$) difference in ash contents among the jam samples. The ash contents ranged from 0.43 to 0.80%. The carbohydrate values were significantly ($P < 0.05$) higher in sample COL than samples of ORA and CO5. The reasons for nutrients differences may be partly attributed to the differences in their moisture contents.

The result of vitamin contents of jam produced from blends of *C. parchycarpa* and orange is shown in Table 2. There were significant ($P < 0.05$) differences in provitamin A contents of the jam. Sample COL (100% *C. parchycarpa*) had the highest value (563.33 mg/100 g), while sample ORA (100% orange) had the lowest value of vitamin A. The differences in vitamin A might be due to different type of fruit used in the production of jam. According to Jill,[4] Monkey kola is a good source of Vitamin A. Apart from being precursor of Vitamin A, β-carotene as a member of the carotenoids also acts as antioxidants that protect the cells of the body against free radicals by neutralizing them before they cause oxidative damage.[17]

The Vitamin C of jam samples varied from 120 to 420 mg/100 g. Vitamin C was significantly ($P < 0.05$) higher in sample COL than other samples. Vitamin C is an important antioxidant and helps protect against cancers, heart disease, and stress, it is part of the cellular chemistry that provides energy, and it is essential for sperm production and for making the collagen protein involved in the building and health of cartilage, joints, skin, and blood vessels.[18]

Table 3 shows the sensory evaluation of jam produced from blends of *C. parchycarpa* and orange. The result of sensory evaluation showed that sample CO5 had the highest mean scores in taste, flavor, aftertaste, spreadability, mouthfeel, and general acceptability, while sample COL had the lowest mean scores in taste, flavor, aftertaste, spreadability, mouthfeel, and general acceptability. There was a significant ($P < 0.05$) difference in all the sensory attributes. Sample CO5 (50% *C. parchycarpa*: 50% orange jam) had highest mean score in taste, flavour, aftertaste, spreadability, mouthfeel and general acceptability.

Table 2: Vitamin contents of jam samples

Samples	Vitamin A mg/100 g	Vitamin C mg/100 g
COL	$563.53^{a}\pm10.00$	$420^{a}\pm10.00$
ORA	$237.00^{b}\pm1.00$	$120^{c}\pm10.00$
CO5	$553.33^{a}\pm10.00$	$320^{b}\pm10.00$

Mean followed by the same column with the different superscripts is significantly different ($P<0.05$). COL: 100% *Cola parchycarpa*, ORA: 100% orange, CO5: 50% *Cola parchycarpa*: 50% orange

CONCLUSION

An acceptable jam was produced from blends of *C. parchycarpa* and orange. Sample CO5 (50%

Table 3: Sensory evaluation of jam samples

Sample	Taste	Flavor	Aftertaste	Spreadability	Mouthfeel	Color	General acceptability
COL	$7.10^{c}\pm0.10$	$7.00^{a}\pm1.00$	$6.90^{c}\pm0.10$	$5.50^{b}\pm0.10$	$6.80^{c}\pm0.10$	$5.90^{c}\pm0.10$	$7.20^{c}\pm0.10$
ORA	$7.90^{b}\pm0.10$	$7.60^{b}\pm0.10$	$7.60^{b}\pm0.10$	$8.00^{a}\pm0.10$	$7.80^{b}\pm0.10$	$8.80^{a}\pm0.10$	$8.30^{b}\pm0.10$
CO5	$8.30^{a}\pm0.10$	$7.90^{a}\pm0.10$	$8.30^{a}\pm0.10$	$8.40^{a}\pm0.10$	$8.30^{a}\pm1.00$	$7.60^{b}\pm0.10$	$8.90^{a}\pm0.10$

Mean followed by the same column with the different superscripts is significantly different ($P<0.05$). COL: 100% *Cola parchycarpa*, ORA: 100% orange, CO5: 50% *Cola parchycarpa*: 50% orange

C. parchycarpa:50% orange) was significantly ($P < 0.05$) high in protein and fiber. Sample COL (100% *C. parchycarpa*) had the highest values in fat, Vitamin A, and Vitamin C. Sample CO5 was most accepted by panelists in terms of taste, flavor, aftertaste, spreadability, mouthfeel, and general acceptability.

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