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Nutritional and Organoleptic Properties of Jam Produced from a Blend of Apple, Banana and Date

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Abstract – Functional food development and consumption is gaining momentum worldwide. Traditionally, jams were first produced as an effort to preserve fruit during off-season for consumption. This study was aimed at analysing the nutritional and organoleptic properties of jam produced from a blend of apple, banana and dates using natural pectin present in most citrus fruit. Fruit pulp from apple, banana and dates which forms a composite blend in the ratio 30:20:50, 30:45:25 and 40:35:25 for apple, banana and dates for sample X, Y and Z respectively were processed to formulate blends. The blends were analysed.. The result of the proximate analysis shows that blends XandY had highest protein contents (4.33±0.077, 4.33±0.77), sample Z had fatter 2.28±0.237 and fibre contents high in sample Y (1.91±0.325) The result of the micronutrient analysis shows that the sample Y is high in all micronutrients analysed except Calcium (VitaminC, Phosphorus and Calcium, 2034.28±0.058, 0.20±0.006 and 0.23±0.001 respectfully). The result of organoleptic properties analysis revealed that Sample Z was generally accepted than any other samples but nutrients content is not as high as that of sample Y. Meanwhile, significant difference exists between the three samples at ($p<0.05$). In conclusion the jam locally produced from fruits is proof to be very nutritive and high in antimicrobial and antioxidant properties that can scavenge free radicals, thereby improving the antioxidant status of the body.

Keywords: Proximate, Micronutrient, Organoleptic, Jam. Banana, Date

1. Introduction

Fruits are one of the major food groups in the food pyramid. Fruits account for fraction of the world's agricultural output and fruit normally means the fleshy seed-associated structures of a plant that are sweet and edible in the raw state such as apples, oranges, grapes, strawberries, and bananas. Fruits contain a high percentage of water averaging 85%, fats, and protein in very small varying amounts, a fair proportion of carbohydrates present as cellulose, starch in small quantity, and sugar. Pectin substances from intracellular cement layer of fruits. They are palatable and often consumed in large quantities which contribute greatly to nutrient intake (Denton et al., 2000).

Jams are one of the most popular food products because of their low cost, all-year-long availability, and organoleptic properties (Galkowska et al., 2010). Traditionally, jams were first produced as an effort to preserve fruit during the off-season for consumption. In jams manufacturing, the fruits and sugar are mixed in similar proportions. The mixed product is then cooked to produce a delicious substance that possesses sufficient storage capabilities. Using extreme thermal treatment, the mix is concentrated to acquire the necessary final soluble solid content (Igual et al., 2013). The downside to this process is that it imparts unsavoury colour, flavour, and nutritional values to the product.

Functional food development and consumption are gaining momentum worldwide. Currently, there is an awakening awareness on preventive rather than curative health care. And it has been discovered that the consumption of functional foods will serve as a vital instrument for preventive health care. Globally, the consumption of functional foods is being encouraged. In fact, in bakery products developments, there is a new trend of research into the development of flours with health benefits by incorporating fruit pomaces, fibres, and legumes into cereals (Awolu et al., 2016). Therefore, this studied aimed to analyze the nutritional and organoleptic properties of jam produced from a blend of apple, dates, and banana.

2. Materials and Methods

2.1 Materials

Fresh apple, banana and date fruits, citric acid (lime), sodium benzoate, and sugar were purchased from Oje Market, Ede, Osun State.

2.2 Methods

Flowchart for Jam made from a Blend of Apple, Banana and Date fruit.

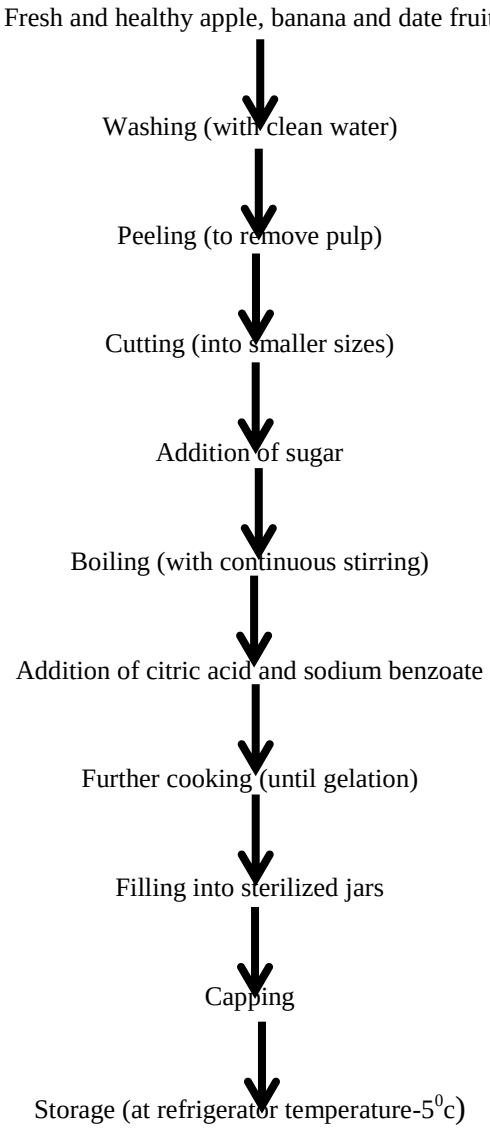

Fig.1: Flowchart for Jam made from a Blend of Apple, Banana and Date Fruit.

Samples were analysed chemically according to the official methods of analysis described by the Association of Official Analytical Chemist (A.O.A.C., 18TH EDITION, 2005). Sensory evaluation was carried out on jam made from a blend of banana, apple and date using a six-point hedonic scale carried out by 20 semi-trained panellist. The results obtained from chemical analysis and sensory evaluation was subjected to SPSS Version 23 for statistical analysis.

3.0 Results of Findings

Table 1 Proximate analysis result

SAMPLE	%C P	%C F	%F	%A	%M	%C	%R S	%N R S	ENERGY (KCAL)
X	4.33	2.27	1.92	0.20	0.26	91.00	0.21	0.25	398.09
	±	±	±	±	±	±	±	±	±
	0.077	0.221	0.319	0.012	0.039	0.641	0.014	0.027	7.014
Y	4.33	2.27	1.91	0.20	0.24	91.00	0.21	0.25	401.82
	±	±	±	±	±	±	±	±	±
	0.077	0.221	0.326	0.012	0.047	0.641	0.014	0.027	0.632
Z	4.34	2.28	2.12	0.20	0.26	90.98	0.21	0.25	401.89
	±	±	±	±	±	±	±	±	±
	0.072	0.237	0.080	0.012	0.039	0.664	0.014	0.027	0.609

Values are mean ± standard deviation (n=3)

Three jam samples = X, Y, Z
X → Jam blend of Apple 30%, Banana 20% and Date 50%
Y → Jam blend of Apple 30%, Banana 45% and Date 25%
Z → Jam blend of Apple 40%, Banana 35% and Date 25%

Table 2 Micronutrient analysis result

Samples	Vitamin C (µg/100g)	%Phosphorus	%Calcium
X	1978.27±0.035	0.19±0.002	0.20±0.003
Y	2034.28±0.058	0.20±0.006	0.21±0.001
Z	2067.46±0.015	0.21±0.001	0.23±0.001

Values are mean ± standard deviation (n=3)
Three jam samples = X, Y, Z
X → Jam blend of Apple 30%, Banana 20% and Date 50%
Y → Jam blend of Apple 30%, Banana 45% and Date 25%
Z → Jam blend of Apple 40%, Banana 35% and Date 25%

Table 3 Sensory evaluation results

Samples	Taste	Flavour	Texture	Colour	Aroma	Acceptability
X	4.80±0.695	4.35±0.587	4.00±1.414	4.30±0.979	4.10±1.165	4.70±0.657
Y	4.50±1.000	4.40±0.751	4.25±1.293	3.80±1.056	4.20±0.894	4.85±0.745
Z	5.00±1.026	4.70±0.732	4.95±1.234	4.70±0.923	4.90±0.911	5.40±0.753

Values are mean ± standard deviation (n=20) at ($p<0.05$)
Three jam samples = X, Y, Z
X → Jam blend of Apple 30%, Banana 20% and Date 50%
Y → Jam blend of Apple 30%, Banana 45% and Date 25%
Z → Jam blend of Apple 40%, Banana 35% and Date 25%

4 Discussion of Findings

The results of proximate analysis (Table 1) show that the protein value of the jam blend samples ranged from 4.33% to 4.34%. Sample Z had the highest protein content (4.34%) than other samples but this result is slightly higher than what was reported on black-plum fruit jam (4.08±0.02%) by (Ajenifujah and Aina, 2011).

The fat content of the jam blends ranges between 2.27% and 2.28%, while Sample X and Y have the lowest fat content (2.27%). This is similar to 2.81±0.03% reported by Ajenifuja and Aina, 2011. The lower fat content might be attributed to the ratio of composition of the fruit pulps. Also, most fruits and their products are low in fat (Sheila, 1978).

Sample Z has a higher fibre content (2.12%) compared to other samples.t The values are higher than the result obtained for fibre by Okudu and Umahi, 2017, which are 0.05% and 0.04% for pawpaw jam and soursop jam respectively. The result shows that the jam is rich in fibre thus exhibiting good elements of a functional food apart from the cherished phytochemicals in them. Dietary fibre increases faecal output, lowers faecal pH, and significantly increases the daily excretion of butyrate of the consumers, which are putative markers of colonic health in humans (Phillips et al., 1995; Cummings et al., 1996).

The ash content of all the samples averagely (0.20%) was lower compared to the ash value reported by Umeh and Nwadialu (2010) for Cola parchycarpa jam which was 0.6%. Ash content indicates minerals composition of food sample. It is very important in many biochemical reactions which aid the physiological functioning of major metabolic processes in the body (Ashaye and Adeleke, 2009).

The moisture content of Sample X and Sample Z (0.26%) was higher than Sample Y (0.24%). The moisture content obtained for the three samples is lower than the values reported by Tanwar et al., (2014) for commercial orange jam (96.3%). The differences and lower moisture content may be due to the heating process involved during heating. High moisture in food is an index of food spoilage; this implies that the low levels of moisture in the samples of jam produced could retard microbial attack (Dewole et al., (2013). Moisture has a great impact on the shelf life of products (Eke-Ejiofor and Owuno, 2013). Processing of jams resulted in water removal and thus the concentration of food nutrients (Saka et al., 2007).

The study recorded higher carbohydrate content and this might be attributed to the high carbohydrate in bananas as reported by (Franz et al., 2001). Carbohydrate is a readily available source of energy, more easily digested and absorbed (Brown, 2011). Muller, (1998) stated that Jam is a good source of energy, which may give average daily energy intake.

The energy content of the samples is 398.09kcal, 401.82kcal, and 401.89kcal for Sample X, Y, and Z respectively. Sample Z recorded the highest energy value (401.89kcal) compared to other samples. The average energy value (400.87kcal) obtained in this study was significantly higher than those reported by Okudu and Ene-Obong, (2015) for Cola lepidota jam which was (80.2kcal), but Whitney and Rolfes, (2014) gave the estimated energy requirement (EER) for children 1-3years as 992kcal per day has been reported in their study.

The result of Vitamin C content of the three samples in table 2 was higher than the RDA for both men and women, which is 700µg for women and 900µg for men. Vitamin C acts as an antioxidant and a promoter of iron absorption in the body (Mahan and Stump, 2008). Vitamin C (ascorbic acid) content of the samples in this study is similar to the results (1800µg) obtained by Fasogbon et al., (2013) for fresh pineapple jam. The application of prolonged heat treatments on fruits, such as in the case of jam, can lead to important losses of the beneficial properties of these citrus fruits (Igual et al., 2011).

The average value (200mg) of Phosphorus and calcium (213mg) content in this study are higher than the values (1.3mg) reported by Tanwar et al., (2014) for guava jam and Awolu et al., (2018) for a blend of banana, pineapple and watermelon jam which was (1.7mg) this may as a result of different types of fruit used but the value is within the range of recommended daily allowance(if you cannot get the value to remove it) Phosphorus is known to be an essential component of phospholipids, bones and teeth, membranes, adenosine triphosphate, and deoxyribonucleic acids. Its deficiency could lead to bone loss, weakness, and loss of appetite (Smolin and Grosvenor, 2010); Moreover, Calcium is said to play a significant role in bone and teeth health and maintenance, nerve transmission, muscle contraction, and blood clotting (Smolin and Grosvenor, 2010; Zimmerman and Snow, 2012).

The result of the sensory evaluation shows no significant difference in the characteristic tested but sample Z acceptability is a little high with a mean score of 5.40±0.753 than other samples, Similar results were also obtained in Lake et al., (2006) findings when performed, sensory evaluation of jam produced from jambolana pulp.

Conclusion

The result shows that the jam blends locally produced are nutrients dense compare with synthetically produced, they are safe for human consumption if prepared under safe, hygienic conditions.

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