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PRODUCTION AND SENSORY EVALUATION OF JAM FROM BLENDS OF PINEAPPLE AND AVOCADO ENRICHED WITH HONEY FOR SUSTAINABLE HEALTH

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Abstract

This main objective of this research work was to carry out the production and sensory evaluation of jam made from pineapple and avocado blended with 30%, 40% and 50% proportions of pineapple and enriched with honey for sustainable health. Fruits are rich in nutrients and can promote good health and wellbeing. Fruits are produced abundantly in their season such that if not well preserved, will result to a massive waste. Jam is one of such foods that can be produced for the purpose of reducing food wastage, increasing food value, income generation and product circulation in and out of season. The study sought answers to three research questions. The instrument used for data collection was a nine point hedonic scale which was as subjected to reliability testing. The test yielded a reliability coefficient of 0.718. Two fruits were used for jam production in this study (pineapple and avocado). Avocado is very low in sugar content and pectin. Therefore, to produce a well textured, sweetened and flavoured jam using this fruit, pectin (from blends of pineapple), acid and a sweetener were added. After production, a sensory evaluation was carried out to ascertain the level of acceptability of the organoleptic attributes of taste, flavour, colour and texture of the products. Findings show that, pineapple is the most suitable for jam production as 100% pineapple jam (Sample B) has the best taste, flavour, colour and is more generally accepted than others. Avocado/pineapple jam blends (samples A, C, and D) were not rejected as sample A (avocado/pineapple jam 70:30%) has the best texture and the mean scores for other organoleptic attributes were above average. Based on the findings the researchers concluded that home made pineapple and avocado jam blends have good flavour, taste, colour, texture, acceptability and shelf life and recommend production and consumption of same for sustainable health.

Introduction

Fruits are nutrient-dense foods that promote good health and wellbeing. Consuming fruits is an excellent way to improve overall health and reduce disease risk, as they are rich in essential vitamins, minerals, fiber, and antioxidants (Sissons, 2019). Nigeria has an abundance of fruits, including bananas, mangoes, and pineapples (NBS, 2017). However, fruit consumption in Nigeria and other African countries remains below recommended levels, likely due to lack of awareness about fruit benefits and inadequate postharvest management (James and Zikankuba, 2017). Fruits are highly perishable due to their high

moisture content and nutrient richness. After harvesting, fruits undergo biochemical changes, such as ripening and respiration, which affect their quality, nutritional value, and shelf life.

Fruits are seasonally abundant, but their perishable nature leads to significant waste if not preserved. Food preservation and processing techniques, such as jam production, help minimize waste, increase food variety, and add value to products. This approach generates income and employment, addresses nutritional imbalances, and extends shelf life. Consuming fruity jams offers numerous health benefits, including weight management, energy provision, and reduced risk of cardiovascular diseases, certain cancers, and type 2 diabetes (Maizobo, 2020; Salami, 2017). Additionally, jam consumption may help lower blood pressure, reduce kidney stone risk, and promote digestive health.

Jam is a semi-solid food product made by cooking fruit or vegetable pulp with sugar, pectin, acid, and other ingredients to achieve a suitable consistency. According to Awulachew (2021), jam production utilizes a preservation technique called jellying. This method is an effective and relatively affordable way to preserve fruits and vegetables. A typical jam recipe consists of 45% fruit ingredients and 55% sugar, cooked to a 68% concentration to achieve a balanced quality (Ogunlade and Oluwafemi, 2021). Jam is a versatile spread used on bread, pancakes, pies, and more. To provide consumers with nutritious options, jam should be made available in various fruit and vegetable combinations, using single or multiple ingredients.

Fruits are the primary ingredient in jam production, and their composition determines the quantity of other ingredients needed. Ideal fruits for jam-making are rich in sugar, have balanced acidity, and contain pectin, a nutritive fibrous element. According to Conelley (2013), citrus fruits, cherries, apples, and pineapples are popular choices due to their high pectin and sugar content, balanced acidity, and favorable soluble solid levels. However, other fruits like plums and berries can also be used, offering opportunities for innovation and variety. Awulachew (2021) identified three essential qualities for jam-making fruits: high pectin content, relatively low pH, and high Total Soluble Solids (TSS) content. By exploring new fruit combinations, this study aims to create healthy and acceptable jam options, increasing the range of spreads available to consumers.

Jam production requires a precise combination of ingredients, including fruits, citric acid, pectin, and sugar. (Food Research Lab, 2022). Citric acid plays a crucial role in establishing a network between sugar and pectin, enabling jam formation. In commercial jam production, citric or tartaric acid is used to control pH levels, enhance flavor and taste, and prolong shelf life. Natural colors and flavors can also be added, in accordance with FDA recommendations.

This study explores the use of honey as a healthier alternative to sugar in jam production. Honey, a viscous liquid produced by bees from plant nectars, has been used as a sweetener in food and medicine for centuries. Research by Eteraf-Oskouei and Najafi (2013) reveals that honey possesses antimicrobial properties, inhibiting the growth of various bacteria, fungi,

and viruses. Additionally, honey boasts antioxidant powers and plays a significant role in managing numerous diseases. Composed primarily of fructose and glucose, honey also contains fruit oligosaccharides, amino acids, vitamins, minerals, and enzymes. These properties make honey a suitable and healthy sweetener for jam preparation, particularly when combined with the fruits examined in this study.

Pineapple (*Ananas comosus*), a tropical plant native to South America and widely cultivated in Nigeria, is utilized to produce nutrient-dense and healthy jams. This fruit has been linked to a reduced risk of lifestyle-related health conditions. Pineapple is an excellent source of dietary fiber, vitamins, and minerals, particularly manganese and vitamin C (Ackom & Tano-Debrah, 2012). It also contains bromelain, a digestive enzyme with potential therapeutic applications. Studies have demonstrated that pineapple can be used to prepare fruit jams rich in taste, flavor, texture, and overall acceptability. For instance, Nafisah et al. (2020) found that a jam blend of pineapple, apple, and watermelon showed significant differences in color, aroma, taste, and overall acceptability. Similarly, Rana et al. (2021) discovered that a pineapple-coconut jam blend in a 3:1 ratio yielded the best sensory results. These findings indicate that pineapple is a suitable fruit for preparing high-quality jams that can be consumed by all, without compromising nutritional value.

Avocado (*Persea americana*), a nutrient-rich berry fruit commonly found in Nigeria, is explored as a potential ingredient for jam production. Avocados are considered a "powerhouse" of beneficial ingredients (Govindji, 2007), rich in fiber, antioxidants (lutein, zeaxanthin, and vitamin E), and healthy fats. These nutrients contribute to various health benefits, including reduced blood sugar, weight loss, and lower disease risk. Avocados can be used to make spreads like fruit jams, which can be consumed with sandwiches, crackers, and bread. The high levels of mono- and polyunsaturated fatty acids in avocados may promote cardiovascular health and increase the bioavailability of fat-soluble phytochemicals (Dreher & Davenport, 2013). This study aims to produce avocado jam blended with pineapple and evaluate its organoleptic characteristics, comparing them to other fruit jams.

The decision to use avocado fruit blended with pineapple and enriched with honey for jam production in this study is due to the nutritional qualities of these fruits which can help to achieve sustainable health. Sustainable health is featured among the 17 Sustainable Development Goals (SDGs) established by the United Nations in 2015. The goal is to ensure healthy living and promote well-being for all at all ages. A vision for an environmentally and nutritionally sustainable health system that improves, maintains and restores health (World Health Organization, WHO, 2017). The SDGs were compartmentalized into four by Arubayi (2021) of which Health and Wellbeing (Goal 3) is the second category and identified Home Economics (Food and Nutrition) is one of the major pillars needed for actualizing sustainable health. It then follows that healthy nutrition and food choices go a long way in sustaining

health and wellbeing; and becomes imperative to increase the healthy food options available to consumers.

Following production, sensory evaluation was conducted to assess the nutritional composition and acceptability of the jam products' organoleptic attributes, including taste, flavor, color, and texture/consistency. Sensory evaluation, as defined by Stonel (2018), is a scientific method that measures and interprets human responses to products through sensory perception. A control sample was used as a benchmark to compare the new products, a standard practice in sensory evaluation. This method has proven valuable in new product development and was applied in this study to evaluate the jam products. In addition to sensory qualities, the overall acceptability of the food products was assessed. According to Murray and Baxter (2003), the acceptability of food is influenced by its intrinsic properties, including taste, flavor, texture, appearance, and aftertaste. A product's acceptability is largely determined by its ability to attract consumers through color and flavor, possess a pleasant texture, and excite the taste buds during and after consumption.

The study also evaluated the shelf life of the jam products. Shelf life refers to the period during which a food product maintains its quality, safety, and sensory attributes (Sousa Gallagher, Mahajan, and Yan, 2012).Factors that influence a product's shelf life: include formulation, processing, packaging, and storage conditions. Since fruits are highly perishable, jam production serves as a preservation method. To determine the shelf life of the jam products, the researchers recorded production dates, stored the products under proper conditions, and regularly monitored them for signs of deterioration.

Objectives of the Study

The main purpose of this study was to carry out the production and sensory evaluation of jam made from blends of pineapple and avocado, enriched with honey for sustainable health. Specifically, the objectives of the study sought to ascertain the mean differences in the organoleptic qualities (taste, flavour, colour and texture) general acceptability and shelf life of the products.

Research Questions

The study was guided by the following questions:

1. What is the mean (x) difference in qualities (flavour, colour , taste, texture) ratings of jam produced with avocado blended with 30%, 40% and 50% proportions of pineapple and enriched with honey and that of 100% pineapple jam?
2. What is the mean (x) difference in the general acceptability rating of jam produced with avocado blended with 30%, 40% and 50% proportions of pineapple and enriched with honey and that of 100% pineapple jam?
3. What is the shelf life of jam produced with avocado blended with 30%, 40% and 50% proportions of pineapple and enriched with honey and that of 100% pineapple jam?

Research Methodology

Research Design

The study adopted an Experimental Research Design.

Population and Sample for the Study

The whole population of eighteen (18) Vocational Education lecturers in Delta State University, Abraka were involved in the study as panelists. Thus, there was no sampling. The sample size therefore consisted of a total of 18 panelists or judges.

Instrument for Data Collection

The instrument that was used for the study was a 9-point Hedonic Scale Questionnaire. The 9-point Hedonic Scale Questionnaire was rated from Dislike Extremely to Like Extremely. These ratings were used by the judges to rate the flavour, taste, colour, texture/consistency and overall acceptability of each of the samples presented to them.

Materials and Methods

The materials that were used for this study included avocado and pineapple fruits, sugar, honey, and citric acid from lime. Equipment includes pots, gas cooker, spoons, plates, knives, blender, chopping board, weighing scale, measuring spoons, hair net, apron, and hand gloves.

Method of Preparation of Samples

Ripened pineapple and avocado fruits were purchased, selected, and washed under running water. All the unwanted parts (peels, core, seeds) were removed; The flesh was further made into puree and kept aside.The puree prepared from each fruit (avocado and pineapple) were measured according to the various proportions needed in each sample, The pulp for each sample was 200g, which was shared in various proportions. Pulps samples containing 30% (60g), 40% (80g), and 50% (100g) proportions of pineapple were prepared, with an addition of 70% (140g), 60% (120g), and 50% (100g) of avocado, pulps. The 100% (200g) pineapple pulp was used as control. A total of four (4) different samples were prepared. These samples were simmered with low heat and stirred to bring out the pectin. Caramelized sugar was added to the control sample, and honey to the treatment samples; and boiled rapidly. Furthermore, lime was added to both the control and treatment samples to give the final product of avocado and pineapple jam.. The jam were packaged into sterilized containers, labeled, pasteurized and cooled for storage.

Sensory Evaluation

The sensory evaluation was performed using a 9-point standardized hedonic scale of: Like Extremely (LE) = 9, Like Very Much (LVM) = 8, Like Moderately (LM) = 7, Like Slightly (LS) = 6, Neither Like nor Dislike (NLD) = 5, Dislike Slightly (DS) = 4, Dislike Moderately (DM) = 3, Dislike Very Much (DVM) = 2, and Dislike Extremely (DE) = 1. The sensory attributes, which include colour, taste, flavour, texture/consistency, and overall acceptance were

evaluated. In doing this, various jam samples were presented to the 18 panelists used in the study, and they were asked to evaluate the samples using the hedonic scale.

Method of Data Collection

Copies of the hedonic scale were administered with the help of two (2) research assistants who have been briefed on how to the administer questionnaires. Eighteen (18) copies of the hedonic scale questionnaire were administered to the 18 panelists for sensory evaluation, and collected thereafter. The data realized from the questionnaire was subjected to descriptive statistical analysis.

Method of Data Analysis

Mean and standard deviation was used to analyze data pertaining the research questions. Any item between 5 – 9 is "like". Any item less than 5.00 is dislike.

Presentation of Results

Research Questions 1:

Table 1: Mean (x) and Standard Deviation (SD) of Sensory Evaluation (taste , flavour, colour, texture and general acceptability) of all the Jam Samples

	Samples and Proportions			
Parameter	**A**	B	C	D
	140g:60g	**200g**	**120g:80g**	**100g:100g**
Flavour	6.07;2.12	7.60;0.99	5.67;1.92	5.93;1.87
Colour	5.67;1.80	7.73;1.03	5.40;2.56	5.67;1.76
Texture	7.07;1.03	6.93;1.83	6.40;1.81	6.40;1.60
Taste	6.53;1.77	7.93;0.88	5.60;1.92	5.67;2.02

Key: A = Avocado/Pineapple 70:30%; B = Pineapple = 100%; C= Avocado/Pineapple 60:40%; D = Avocado/Pineapple 50:50%.
Source: Field Work (2024)

Table 1 shows the mean (x) and standard deviation values of the sensory evaluation of all the jam samples. From the Table, Sample B (Pineapple 100%) with a mean (x) score of 7.60 has the best flavour, Sample B (Pineapple 100%) with a mean (x) score of 7.73 has the best colour, Sample A (Avocado/Pineapple 70:30%) with a mean (x) score of 7.07 has the best texture, Sample B (Pineapple 100%) with a mean (x) score of 7.93 has the best taste.

Research Question 2:

What is the mean (x) difference in the general acceptability rating of jam produced with avocado blended with 30%, 40% and 50% proportions of pineapple and enriched with honey and that of 100% pineapple jam?

Table 2: Mean (x) and Standard Deviation (SD) of the General Acceptability of Jam Produced with Avocado Blended with 30%, 40% and 50% Proportions of Pineapple and Enriched with Honey and that of 100% Pineapple Jam (n = 15)

Samples	Mean (x)	SD
A	6.27	1.83
B	7.33	1.23
C	5.73	2.25
D	5.87	1.96

Key: A = Avocado/Pineapple 70:30%; B = Pineapple = 100%;; C= Avocado/Pineapple 60:40%;; D = Avocado/Pineapple 50:50%.
Source: Field Work (2024)

Table 6 shows the mean (x) scores and standard deviations of the general acceptability of jam produced with avocado blended with 30%, 40% and 50% proportions of pineapple and enriched with honey and that of 100% pineapple jam. The table revealed that all the jams were generally acceptable to the panelists. However, Sample B (Pineapple 100%) has the highest mean (x) score of 7.33, showing that it is more generally accepted than others, followed by avocado /pineapple jam (A) with mean (x) score of 6.27.

Research Question 3:

What is the shelf life of jam produced with avocado blended with 30%, 40% and 50% proportions of pineapple and enriched with honey and that of 100% pineapple jam?

Table 6: Shelf Life of Jam Produced with Avocado, Mango and Pawpaw Blended with 30%, 40% and 50% Proportions of Pineapple and Enriched with Honey and that of 100% Pineapple Jam

Samples	Duration	Reactions
Avocado Jam (AEH)	Production Date: 11th March, 2024.	Products maintained good condition till 13th June, 2024.
	Signs of Deterioration Date: 23rd June, 2024	Greyish spots were noticed on 23rd June, 2024.
	Complete Decomposition Date: 1st July, 2024	The spots became darker and spread faster within 8 days of appearance.
	Shelf Life: 104 days	Containers were opened, and mould with spores have started growing on the products giving out pungent smell. The texture was not affected at this point.
		Further growth of the fungi finally decomposed the products and by 1st July, 2024, the products had changed, and became lighter.
Pineapple Jam (D)	Production Date: 11th March, 2024.	At the time of writing this report (22/10/2024), product is yet to show any sign of deterioration. All sensory qualities

are still intact.

Source: Field Work (2024)

Table 3 revealed the shelf life of jam produced with avocado blended with 30%, 40% and 50% proportions of pineapple and enriched with honey and that of 100% pineapple jam. From the table, it was revealed that all the jams produced have long shelf life, which means that they can be kept and used for a long period of time. The pure pineapple jam (Sample B) is still intact at the time of compiling this report. Only the samples from avocado grew fungi and finally decomposed by 1st June, 2024. This therefore means that pineapple jam have longer shelf life than avocado jam.

Findings of the Study

1. The study demonstrated that organoleptically acceptable jam can be produced by blending avocado and pineapple.
2. The study revealed that pineapple jam has the best has the best taste, flavor and colour; and is more generally accepted.
3. The study revealed that avocado/pineapple jam blend (70:30%) has the best texture.
4. The study demonstrated that home made pineapple and avocado jam can be stored for a period of time as they have reasonable shelf life

Discussion of Findings

Table 1 revealed a summary of mean and standard deviation values on the organoleptic/sensory qualities of the jam samples. It is shown that Sample A (avocado/pineapple, 70:30%) has the best texture. This finding corresponds with that of Gamble, et al (2010) who identified avocado pulp to have a creamy and buttery consistency and consequently maintains a high levels of fatty acids. Sample B, (Pineapple 100%) has the best flavor, taste, colour and is more generally accepted. This buttressed the opinions of Othman (2011) opined that pineapple supplies arrays of colour, flavour and texture for pleasurable eating. Similarly, Rana, et al. (2021) also found out that when the sensory properties of colour, taste, flavor, texture and overall acceptability of jam samples were tested, sample with pineapple and coconut in the ratio 3:1 showed the best result than others. These findings therefore indicated that pineapple is good for the preparation of fruit jams that can be consumed by all. The study has demonstrated from the results that blending avocado and pineapple can produce jam with acceptable organoleptic qualities as food acceptance or rejection is solely determined by how well it meets the demands and expectations of the consumer (Sousa- Gallagher, et al, 2011)

This study has gone further to demonstrate that home made pineapple and avocado jam can be stored in appropriate conditions for a period of time as they have a reasonable shelf life. This supports the statement of Doughari, et al., (2007), Shelf life represents the period of time through which food products remain safe to eat and retains its essential sensory properties and complies with the label's nutritional declarations. From a theoretical point of

view, Nicoli (2012), defined shelf life as a finite length of time after production (in some cases after maturation or aging), during which the food product retains a required level of quality under well-defined storage conditions.

Conclusion

This study concludes that blending avocado and pineapple produces organoleptically acceptable jam. The combination addresses avocado's deficiencies in pectin and fructose. While pure pineapple jam excels in taste, flavor, and color, the 70:30% avocado-pineapple blend has the best texture. All jam samples demonstrated reasonable shelf life. Overall, homemade avocado-pineapple jam blends offer excellent flavour, taste, colour, texture, acceptability, and shelf life.

Recommendations

Based on the findings and conclusion, the following recommendations are made:

1. Large-scale commercial production of avocado and pineapple jam is encouraged, given their excellent sensory properties.
2. Consumption of these jam products should be promoted, as both avocados and pineapples are nutrient-rich foods that support growth, prevent diseases, boost immunity, and promote overall sustainable health.

REFERENCES

Ackom, N.B. & Tano-Debrah, K. (2012). Processing pineapple pulp into dietary fibre supplement. *African Journal of Food, Agriculture, Nutrition and Development, 12*(6).

Arubayi, D. (2021). Home Economics and the actualization of Sustainable Development Goals Vision 2030: Home Economics and the actualization of sustainable development. *Nigeria Journal of Home Economics*, *9*(5), 1-10.

Awulachew, M.T. (2021). Fruit jam production. *International Journal of Food Science and Nutritional Diet, 10*(4), 532-553.

Connelly, A. (2013). The science and magic of jam production. Retrieved on 24th March, 2023 from *https://www.theguardian.com/science/blog/2013/oct /03/science-magic-jam-making*

Doughari, J.H., Elmahmood, A.M. & Manzara, S. (2007). Studies on the antibacterial activity of root extracts of *Carica papaya*. *African Journal of Microbiology Research*, 37-41.

Dreher, M. & Davenport, A.J. (2013). Hass avocado composition and potential health effects. Critical Reviews in Food Science and Nutrition, 53, 738-750.

Eteraf-Oskouei, T. & Najafi, M. (2013). Traditional and modern uses of natural honey in human diseases: A review. *Iranian Journal of Basic Medical Sciences, 16*(6), 731-742.

Food Research Lab (2022). Mixed fruit jam production. Retrieved on 3rdFebruary, 2023 from *https://www.foodresearchlab.com/blog/new-product-development/mixed-fruit-jam-production/*

Gamble, J., Harker, F.R., White, S.R.A.J., Bava, C., Beresford, M. & Woolf, A. (2010). The impact of dry matter, ripeness and internal defects on consumer perceptions of

avocado quality and intentions to purchase. *Postharvest Biology and Technology, 57*(1), 35–43.

Govindji, A. (2007). How fruity is your smoothie. *The British Dietetic Association, 44*(6).

Sousa-Gallagher, M. J., Mahajan, P. V. (2011) Stability and Shelf Life of Fruit and Vegetables' In: Kilcast & Subramaniam (Eds.). Food and Beverage Stability and Shelf-Life. Chapter 22, pp 641-656, Cambridge, UK: Woodhead Publishing Ltd.

James, A. & Zikankuba, V. (2017). Postharvest management of fruits and : A pvegetableotential for reducing poverty, hidden hunger and malnutrition in sub-Sahara Africa. *Cogent Food & Agriculture, 3*(1), 1312052.

Maizobo (2020). Health benefits of jam. Retrieved on 12th February, 2023 from *https://maizobo.com/2020/11/04/health-benefits-of-jam/?v=4874ed2a3309*

Nafisah, S., Konadu, L. & Kafui, S.E. (2020). Production and acceptability of jam produced from pineapple, watermelon and apple blends. *EAS Journal of Nutrition and Food Sciences, 2*(6), 321-325.

National Bureau of Statistics (NBS) (2017). *Annual Agriculture sample survey 2016/17*, United Republic of Tanzania, 88.

Ogunlade, A.O. & Oluwafemi, G.I. (2021). Production and evaluation of jam produced from plum and African Star apple blends. *Food Research, 5*(4), 93 – 98.

Orsini, R.A. (2006). Bromelain. Plastic surgery educational foundation technology assessment committee. *Plastic Reconstruction Surgery, 118*(7), 1640-1644.

Othman, O.C. (2011). Physicochemical characteristics and levels of inorganic elements off-vine ripened pineapple (Ananas comosus L.) fruits of Dar es Salaam, Tanzania KIST. *Journal of Science and Technology, 1*(1), 23 – 30.

Rana, M.S., Yeasmin, F., Khan, M.J. & Riad, M.H. (2021). Evaluation of quality characteristics and storage stability of mixed fruit jam. *Food Research, 5*(1), 225 – 231.

Salami, M. (2017). The amazing health benefits of fruit jam, jelly and preserves. Retrieved on 14th March, 2023 from *http://anjomanfood.com/the-amazing-health-benefits-of-fruit-jam-jelly-preserves/*

Sissons, B. (2019). Benefits of fruit consumption. Retrieved on 15th February, 2023 from *https://www.medicalnewstoday.com/articles/324431*

Stone, H. & Sidel, J.L. (2004). *Sensory evaluation practices*. San Diego: Academic Press.

WHO (2017). Environmentally sustainable health systems: A strategic document. Retrieved on 12th March, 2023 from *https://www.who.int/publications/i/item/ WHO-EURO-2017-2241-41996-57723*

WHO (2003). Diet, nutrition, and the prevention of chronic diseases: Report of a Joint WHO/FAO Expert Consultation, WHO Technical Report Series No. 916. World Health Organization, Geneva, Switzerland.