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Proximate Composition And Sensory Evaluation Of Jam Produced From Pineapple And Pumpkin Pulp Blends

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Abstract

The study was carried out to determine the nutritional content and organoleptic attributes of pineapple and pumpkin fruits blended jam in ratios 100:0, 90:10, 80:20, 70:30, and 60:40 respectively with jam sample made of 100% pineapple was set as a control. The proximate composition revealed 15.61-19.79% moisture content, 2.40-7.55% ash content, 1.00-1.54% protein content, 2.56-3.00% fat content, 3.00-7.90 fibre content and 66.54-70.70% carbohydrate content. However, when pineapple and pumpkin fruits were combined and processed into jam in different formulations, the ash, protein, and fiber content increased while the moisture, fat, and carbohydrate content decreased. The score of sensory evaluation reveals that composite Jam sample made of 80% pineapple and 20% pumpkin pulp was the most preferred by the panelists.

Keywords: Pineapple, Pumpkin pulp, composite jam, nutritional content, sensory evaluation

Introduction

Jam is made from cooked fruit pulp, water, and sugar. It may also contain citric acid and pectin in some cases (Featherstone, 2015). In terms of jam production, Chile, China, the United States, Spain, France, India, Turkey, and Brazil stand out. Brazil produced approximately 30.1 million tons of merchandise in 2017 (ABIA, 2020). In 2016, 4,000 tons of jam were manufactured, with 3.36 billion tons consumed (CBI, 2020). The most commonly utilized fruits for jam production include grape, apricot, blueberry (ABIA, 2020), mango, pineapple (Asema and Parveen, 2018), strawberry, orange (Featherstone, 2015), and pomegranate (Abid et al., 2018). Storage and transportation become an excellent choice for the addition of uncommon ingredients such as pineapple and pumpkin fruits pulp since it is a low-cost product and easy to process.

Ananascomosus (pineapple) is a tropical fruit that can be eaten raw, juiced, or cooked (Nafisah et al., 2020) Pineapple may be turned into confections and consolidated into cooked foods and pastries, and the pulp is yellow to strong yellow, sweet, and succulent. With rich quantities of vitamins, minerals, fiber, flavonoids, and carotenoids, this fruit has an excellent nutritional profile (Ancos, 2017). Pineapple is commonly used to make jams, snacks, canned goods and canalso be eaten fresh, dehydrated or as juices (Lobo and Paull, 2017). The Fruit has a shorter shelf life after harvesting, resulting in nutritional and financial losses. Furthermore, despite having high levels of antioxidants (Silva and Jorge, 2014), dietary fiber (Morais et al, 2015), vitamins, and minerals (Morais et al, 2015). Pineapple adds colour, flavour, and texture to fruits salad and spreads (Othman, 2011). Various researchers have used Pineapple and other fruits for jam and other spreads (Jan and Masih, 2012).

Pumpkins are the fruits of a variety of Cucurbita plants in the Cucurbitaceae family. Cucurbita is a vegetable crop genus that is economically significant (Paris, 2010). Pumpkins are typically grown as a side crop on the boundaries of field crops or sparsely between staple crops like maize or sorghum (Hamisy et al., 2002). They're grown in various parts of the world for their pulp and seeds, which are used to make syrups, jellies, jams, purees, and soup thickeners for human consumption (Provesi et al., 2011; Kim et al., 2012).Proteins in pumpkin pulp have both nutritional and health-protective properties (Jun et al., 2006; Kampuse et al., 2015). Because of its highly desirable flavour, sweetness, and yellow-orange colour, it can be processed into flour and paste and used for wheat fortification and porridge preparation (Nakazibwe et al., 2019). It is also been reported as a natural colorant in pasta and flour mixes (See et al., 2007; Kulaitien et al., 2014).

Despite these nutritional characteristics, there is little or no information on its application in the making of jam or other similar preserves, resulting in low usage and considerable post-harvest losses/waste in Ghana's Upper East Region.Producing and evaluating jam from pineapple and pumpkin composites will thus help to increase the market for both fruit and value-added product, improve the value of underutilized fruits, diversify the use of the fruit by increasing the number of available jam products, promote cultivation, and increase the market for both fruit and value-added product. The purpose of this study was to undertake a proximate Composition and sensory evaluation of Jam produced from pineapple and pumpkin pulp

MATERIALS AND METHODS

Sample collection

Pineapple, pumpkin fruits, sugar, lemon, ginger and other ingredients were purchased from Bolgatanga Market. Shape, size, uniformity, colour, and integrity of the fruit samples were all taken into consideration. Fruits that showed symptoms of damage or disease were thrown out.

Jam Blends Formulation

Five distinct jam samples were made in the following ratios: 100:0, 90:10, 80: 20, 70: 30, and 60:40. JAM Sample T1 (100% pineapple) was used as a control and was made entirely of pineapple, T2(90% pineapple and 10% pumpkin pulp), T3(80% pineapple and 20% pumpkin pulp), T4(70% pineapple and 30% pumpkin pulp) and T5(60% pineapple and 40% pumpkin pulp). For uniformity, the pulps were combined with the help of a Philip’s blender before the preparation of the jam started.

Table 1: Percentages of ingredients used in Jam Formulation

INGREDIENTS	T1	T2	T3	T4	T5
Pineapple (g)	100	90	80	70	60
Pumpkin pulp (g)	0	10	20	30	40
Sugar (g)	100	100	100	100	100
Lemon juice (ml)	5	5	5	5	5
Water (ml)	500	500	500	500	500
Ginger (Grated) (g)	2	2	2	2	2

Keys: T1(100% pineapple), T2(90% pineapple and 10% pumpkin pulp), T3(80% pineapple and 20% pumpkin pulp), T4(70% pineapple and 30% pumpkin pulp) and T5(60% pineapple and 40% pumpkin pulp)

Preparation of Jams

Fruits of the pumpkin and pineapple were washed, skinned, and cut into little cubes. The cubes were cooked separately for 20 minutes to soften it and pureed using blender. The pureed fruits were separately measured and combined based on the recipe. To prepare the jam, the pulp and sugar were mixed according to normal protocols. The Heat was applied to the pulp and sugar mixture. During the process, the soluble solid forms were monitored until 55°C was reached (Sulieman et al., 2013). The citric acid (lemon juice) was added to the jam. The jam was then cooked further until a coating of bubbles formed around the edges of the wooden spoon. The hot jam was then put into sterilized bottles, sealed, labeled for proximate and sensory evaluation.

Proximate Analysis

The determination of moisture, ash, protein, fat, crude fibre and carbohydrate were carried out using AOAC (1990) methods.

Determination of moisture

With minor changes, the moisture content of the sample was determined using the AOAC (1990) technique. 2 g of the samples were weighed on Petri dishes, then placed in an oven, uncovered, and cooked for 3 hours at 130–150°C. The samples were removed from the oven and placed in a desiccator to cool for 15 minutes before being weighed. The operation was repeated until the mass remained consistent. Using the calculation, the weight loss was reported as a % moisture content loss:

$$\text{Moisture content} = \frac{\text{weight loss} \times 100\%}{\text{Weight of sample}}$$

Determination of crude protein

The crude protein content of the samples was assessed using a modified version of the AOAC (1990) technique. In the Kjeldahl digestion technique, approximately 0.8 g of each sample was digested in a fume chamber. After diluting with water and then sodium thiosulphate and sodium hydroxide solutions, the digestion was allowed to cool before being distilled into boric acid containing bromocresor green indicators. After that, 0.1N hydrochloric acid (HCl) solutions were used to titrate the samples. The %age protein content was estimated using the equation after blank titrations were carried out in the same way: Crude protein = Nitrogen × 6.25 (1 mL of 0.1N HCl = 0.0014gN)

Determination of ash

With minor adjustments, the AOAC (1990) method was used to determine the ash content of the sample. Approximately 5 g of sample was weighed into previously weighted ash dishes, placed in a muffle furnace, and ignited for 5 hours at 550 10°C. It was weighed to a consistent mass after cooling. The ash (%age) that resulted was computed as follows:

$$\text{Ash content} = \frac{W2-W3}{W2-W1} \times 100$$

Where W1 is the weight of empty crucible; W2 is the weight of crucible + weight of sample before ashing; and W3 is the weight of crucible + weight of sample after ashing

Determination of crude fat

The crude fat content of the samples was determined using a modified version of the AOAC (1990) method. 2 g of the prepared material was weighed into Soxhlet thimbles and placed into an extraction flask of a specific weight. Diethyl ether extraction lasted 5 hours. Evaporation on an electrical bath was used to remove the diethyl ether at the end. The leftover fat in the flask was dried in the oven at 60°C for 30 minutes before being weighed after cooling for 15 minutes. The fat content (%age) was determined as follows:

$$\text{Fat content} = \frac{\text{Weight of fat}}{\text{Weight of sample}} \times 100\%$$

Determination of crude fiber

The crude fiber content of the samples was determined using a modified version of the AOAC (1990) method. One gram (1 g) of the sample was weighed, and 100 mL of trichloroacetic acid was used as a digesting reagent. The solution was heated to a boil and then kept at 50–60°C for around 40 minutes. After removing the flask from the heater and allowing it to cool somewhat, the solution was filtered through Whitman filter paper. The residue was cleaned with methylated spirit and hot water. The filtrate was placed in the muffle furnace and heated to 550°C for 30 minutes before being cooled and weighed. The following formula was used to determine the %age of crude fiber content:

Crude fiber = the loss in weight after incineration × 100

Determination of carbohydrate

The AOAC (1999) method was used to determine the carbohydrate % of the samples, which was computed using the equation: Carbohydrate = 100 – (% Moisture + % Fat + + % Protein + % Crude fiber + % Ash)

Sensory evaluation

A portion of the various jam products (10g) was given to 30 assessors (untrained market women) in white disposable plastic cups with disposable spoons for sensory analysis. The assessors then filled out a sensory ballot sheet, which was used to score the jam's colour, aroma, texture, spreadability, taste, and overall acceptability. Based on the Resurreccion (1998) adjusted criteria, 10 g of spread was provided in a white disposable plate with a piece of Jacob's cracker biscuit for each sample, with 9 representing (liked extremely) and 1 representing (disliked extremely) on a 9-point hedonic scale. 500ml sachet water was provided for mouth rinsing after each tasting.

Statistical Analysis

Every single analysis was done twice. The collected values were subjected to an analysis of variance (ANOVA) using a Microsoft Excel spreadsheet, and the difference in mean significance was determined using the LSD test ($p<0.05$).

Results and Discussion

The proximate composition of jam made from pineapple and pumpkin fruits is shown in Table 2. The moisture content of the five different Jam formulations ranged from 15.61 to 19.79 %, with Sample T1 (100% pineapple) having the highest value (19.79%) and Sample T5 (60% pineapple and 40% pumpkin pulp) having the lowest value (60 % pineapple and 40 % pumpkin pulp) (15.61%). The current study's results are lower than those reported for Roselle jam, which has a moisture level of 33-34% (Ashaye and Adeleke, 2009). The moisture content of the samples differed significantly (p0.05) from one another, and the moisture content of the Jam dropped as the quantity of pumpkin fruits increased. The samples in this investigation were prone to mould growth due to the high moisture content. According to Frazier &Westoff (1978), a food's moisture content is an indication of its water action and is used to determine stability and proneness to microbial infection (Davey, 1989)

The range of ash content was 2.40-7.45%, with sample T5(60% pineapple and 40% pumpkin pulp) having the highest value (7.45%) and control sample T1(100% pineapple) having the lowest (2.40%). This result is within the ranges reported by Eke-Ejiofor & Owuno (2013) for pineapple/jackfruit jam and Kansci, et al. (2003) for mango jam. There were statistically variations in ash amongst the samples ($p<0.05$). It was observed that when the quantities of pumpkin fruits pulp increased it resulted in a corresponding increase in the ash content of the Jam. Because the proportion of ash contents is a reflection of the mineral contents present in the food material, the values obtained were relatively high, indicating excellent mineral content in the jam.

Protein content ranged from 1.00 to 1.54 %, with jam sample T5 (60 % pineapple and 40 % pumpkin pulp) having the highest (1.54 %) and jam sample T1 (100 % pineapple) having the lowest (1.00 %). This study's protein content is higher than Eke- Eke-Ejiofor&Owuno's (2013) findings for jackfruit (0.19g/100g) and pineapple (0.46g/100g) jam. Between the control and composite jam samples, there was a significant difference ($p<0.05$). Watt et al. (1963) observed protein content in jackfruit jam, pineapple jam, and raw jackfruit to be 1.3 %, 0.46 %, 0.19 %, and 1.12%, respectively, in jackfruit jam, pineapple jam, and raw

jackfruit. According to nutritional labeling, the most common ingredients in jam are fruits, sugar, pectin, and citric acid. The jam has low protein content because none of the ingredients used are high in protein (MohdNaeem et al., 2015). When compared to fresh fruits, most processed goods, such as jams, have lower nutritional content due to the heat generated during processing (Jawaheer et al., 2003).
The crude fat content of the jam samples ranged from 2.56% to 3.00%, with the highest fat content (3.00%) in the control sample (100 % pineapple) and the lowest fat content in jam sample T5 (60 % pineapple and 40 % pumpkin pulp) (2.56 %). The data collected differed significantly from that of Ajenifujah-Solebo and Aina (2011), who calculated 3.8-10.03%. This could be related to the fruit pulps' content ratio. There was a significant difference ($p<0.05$) between sample A (100 % pineapple) and the jam combinations.. Fat is a key source of energy as well as a source of essential fatty acids. Many foods' fat content has an impact on their overall physical characteristics (Muhammad et al., 2009). Haque et al. (2009) found that the fat content of several fruits ranged from 0.0084% to 1.27%.

The fiber level of the various jams ranged from 3.00 % to 7.95 %, with the lowest fiber content of 3.00 % in the control sample (100 % pineapple) and the greatest fiber content of 7.90 % in sample T5(60% pineapple and 40% pumpkin pulp). It was discovered that increasing the pumpkin fruit in the jam resulted in an increased in the fibre content. However, there was a significant difference ($p<0.05$) between all the jam produced. This figure is higher than the 3.06% revealed by Singh et al. (1991). Diabetics are typically prescribed fiber-rich diets to reduce the glycemic reaction to food and, as a result, the requirement for insulin (Guillon and Champ, 2000). To avoid insulin resistance syndrome and to reduce the occurrence of other metabolic disorders such as obesity and cardiovascular disease, people should consume a variety of fiber sources (Guillon and Champ, 2000).

The carbohydrate content ranged from 66.54 to 70.70%, with Sample T1(100% pineapple)containing the most (70.70%) and Sample T5(60% pineapple and 40% pumpkin pulp)containing the least (66.54%). Carbohydrate content decreased as the amount of pumpkin fruit in the sample increased, and there was a significant difference ($p<0.05$) between all the jam. Carbohydrates give quick energy for physical activity and help to regulate nerve tissue transmission. As a result, pineapple jam would be a rich source of both carbohydrate and energy.

Table 2: Proximate composition of pineapple and pumpkin pulp Jam

Sample	**Moisture**(g/100g)	**Ash**(g/100g)	**Protein**(g/100g)	**Fat**(g/100 g)	**Fibre**(g/100 g)	**CHO**(g/100g)
T1	19.79^{a}	2.40^{e}	1.00^{e}	3.00^{a}	3.00^{e}	70.70^{a}
T2	18.74^{b}	3.69^{d}	1.11^{d}	2.89^{b}	4.23^{d}	69.66^{b}
T3	17.69^{c}	4.97^{c}	1.22^{c}	2.78^{c}	4.45^{c}	68.62^{c}
T4	16.65^{d}	6.24^{b}	1.33^{b}	2.67^{d}	6.68^{b}	67.58^{d}
T5	15.61^{e}	7.55^{a}	1.54^{a}	2.56^{e}	7.90^{a}	66.54^{e}

Values represent means and standard deviation replicate readings for various parameters. Values in the same column with different superscripts are significantly different ($p>0.05$). Keys: T1(100% pineapple), T2(90% pineapple and 10% pumpkin pulp), T3(80% pineapple and 20% pumpkin pulp), T4(70% pineapple and 30% pumpkin pulp) and T5(60% pineappleand 40% pumpkin pulp)

Sensory attributes of the composite jam

The sensory evaluation results of pineapple and pumpkin jam samples are shown in Table 3. One of the determinants of a consumer's product decision is sensory evaluation. The colour of the jams ranged from 8.50-8.99% with control jam T1 (100% pineappel) having the lowest score (8.50%) and T5(60% pineapple and 40% pumpkin pulp)jam having the highest (8.99%). The carotenoid pigment in the raw squash fruit is responsible for the high color values of the jam. One of the most essential quality characteristics in jams is colour. One of the most essential quality factors for pumpkin fruits is their yellow colour, which has a considerable impact on consumer approval of jams (Igual, 2014). The results for pumpkin composite jam are comparable to those published by Samaha (2002). The aroma of jam ranged from 8.60 - 8.70% with sample T3(80% pineapple and 20% pumpkin pulp)receiving the highest rating (8.70%) and sample T1(100% pineapple) receiving the lowest (8.60%). The taste ranged from 7.80-8.86% with sample T3(80% pineapple and 20% pumpkin pulp)receiving the highest rating and sample T5(60% pineapple and 40% pumpkin pulp) receiving the lowest. Texture ratings varied from 7.80 to 8.86% with Sample T3 (80% pineapple, 20% pumpkin pulp) receiving the highest rating and Sample T5 (60 percent pineapple, 40% pumpkin pulp) receiving the lowest. The ultimate evaluation of a product is heavily influenced by its texture. Even if a product tastes nice, poor texture might make it unacceptably unpalatable to the user. The degree of fruit freshness, the sweetener, and the gelling agent all have an impact on this parameter. The overall acceptance ranged from 7.51-8.63%. Jam sample T3(80% pineapple and 20% pumpkin pulp) recorded high ratings for acceptance followed by T2(90% pineapple and 10% pumpkin pulp) and the least was sample T5(60% pineapple and 40% pumpkin pulp). It was observed that there were significant difference between all the composite jam samples and the control. Jam sample made of 80% pineapple and 20% pumpkin pulp was the most prefered by the evaluators.

Table 3: Sensory attributes of the composite jam

Sample	Colour	Aroma	Spreadability	Taste	Overall Acceptability
T1	8.50^{e}	8.60^{e}	8.67^{c}	8.26^{c}	8.60^{b}
T2	8.65^{d}	8.69^{d}	8.74^{b}	8.32^{b}	8.63^{b}
T3	8.87^{c}	8.74^{c}	8.86^{a}	8.37^{a}	8.68^{a}
T4	8.94^{b}	8.79^{b}	7.88^{d}	7.50^{d}	7.50^{d}
T5	8.99^{a}	9.86^{a}	7.80^{e}	6.40^{e}	7.41^{e}

Values represent means and standard deviation replicate readings for various parameters. Values in the same column with different superscripts are significantly different (p>0.05). Keys: T1(100% pineapple), T2(90% pineapple and 10% pumpkin pulp), T3(80% pineapple and 20% pumpkin pulp), T4(70% pineapple and 30% pumpkin pulp) and T5(60% pineapple and 40% pumpkin pulp)

Conclusion

The study has proven that using pineapple and pumpkin fruits to prepare composite jam is possible and that the ash, protein, and fiber content in the jam produced increased as the proportion of the pumpkin fruit increased. The study concludes that producing an acceptable jam from indigenous fruits would reduce post-harvest as well as waste disposal challenges. Production of jam from underutilized fruits with different ratios of ingredients was made with sample T3(80% pineapple and 20% pumpkin pulp) being the most preferred by the panelists.

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