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Nutritional composition and sensory evaluation of Jam produced with Pineapple and Cashew fruits blend

Nanice Fosu[1], Abena Sekyere[1], Veronica Akwaah[2], Faustina Busumbru[3],

[1]St. Ambrose College of Education, Voc/Tech department, Box 25, Wamfie-Ghana
fosunanice@yahoo.com

[1]Appiah Menka University of skills training and entrepreneurial development
Box 1277, Kumasi, Ghana
abenasekyere@aaamusted.edu.gh

[2]St. Monica's college, Votec Department, Box 250, Mampong Ash-Ghana
frimpomaa79@yahoo.com

[3]St. Louis College of Education, Post Office Box 3041, Kumasi-Ghana

Abstract

The study analysed the moisture, ash, fibre, fat, protein, and carbohydrate content of different samples labelled A to E. The results showed that as the proportion of Cashew fruits increased in the jam, the moisture content also increased. The ash content remained consistent across all samples, indicating a stable mineral composition. The fibre content increased with a higher proportion of cashew fruits, indicating that cashew fruits contributed more fibre to the composite jam compared to pineapple. The fat and protein content were low and consistent across all samples, with pineapple being the primary contributor. The carbohydrate content varied based on the proportion of cashew fruits, with a higher carbohydrate content observed in samples with more pineapple. Overall, the composite jam can be considered a low-fat product, and its fibre and carbohydrate content depend on the proportion of cashew fruits. The study provided valuable insights for health-conscious consumers and highlighted the potential health benefits of incorporating more cashew fruits into the composite jam. The study's results were compared with other studies, showing significant variations in moisture, ash, protein, and carbohydrate content, highlighting the importance of considering different fruit combinations and compositions in jam production. Sensory evaluations were conducted to assess the overall acceptability of the pineapple and cashew fruit jam. The results revealed that the blend with a higher percentage of cashew fruits (sample E) was more preferred by evaluators in terms of flavour, colour, taste, and texture. This underscores the importance of sensory attributes in influencing consumer preferences and satisfaction with food products. Overall, this study provides comprehensive insights into the proximate composition and sensory attributes of pineapple-cashew fruit jam, making it a valuable resource for food product development, consumer acceptance, and nutritional awareness. The findings can guide manufacturers in optimising the formulation of composite jams to meet consumer expectations and preferences, ultimately contributing to increased consumer satisfaction and positive brand perception in the market.

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Keywords: Pineapple, Cashew fruits, composite jam, proximate composition, sensory evaluation

Introduction

Jam production with fruit blends has gained increasing attention as a means of creating value-added food products that offer unique flavours and enhanced nutritional profiles. Blending different fruits not only allows for the utilisation of underutilised fruits but also offers the potential to combine their individual nutritional benefits (Carter & Johnson, 2022). Pineapple (*Ananas comosus*) and cashew fruit (*Anacardium occidentale*) are two tropical fruits known for their distinct flavours and nutritional value. Pineapple is rich in essential vitamins (such as vitamin C, thiamin, and vitamin B6), minerals (including manganese and copper), and dietary fibre. It also contains bromelain, an enzyme with potential health benefits (Devi et al., 2016). Cashew fruits are a good source of vitamins (vitamin C, vitamin E, and folate), minerals (potassium, magnesium, and iron), and dietary fibre. Additionally, cashew fruits contain bioactive compounds such as carotenoids, phenolic compounds, and flavonoids (Akpan et al., 2016). These fruits offer a range of nutrients that can contribute to the nutritional composition of the jam.

The functional properties of jams, such as texture, viscosity, gelation, and water activity, play a crucial role in their quality and consumer acceptance. The addition of different fruits to the jam formulation can affect these properties. Pineapple and cashew fruits exhibit unique functional characteristics that can influence the overall texture and sensory attributes of the jam. Pineapple contains enzymes like bromelain, which may affect the gelation and viscosity of the jam (Ribeiro et al., 2018). Cashew fruit pulp has been reported to contribute to the texture and mouthfeel of food products due to its high dietary fibre content (Agrahar-Murugkar & Subbulakshmi, 2005).

Sensory evaluation plays a crucial role in determining the acceptability of food products. It involves assessing the appearance, aroma, flavour, texture, and overall liking of the product. Sensory evaluation provides valuable insights into consumer preferences and can guide product development and improvement. Evaluating the sensory attributes of pineapple and cashew fruit blend jam will help determine its market potential and consumer acceptance.

Literature Review

Overview of Jams

Jams are fruit-based spreads that have been widely consumed for their sweet taste and versatility. They are typically made by cooking fruit pulp or puree with sugar and sometimes pectin to achieve the desired consistency and texture. Jams can be enjoyed on various food items, including bread, pastries, and desserts. Their popularity stems from their ability to preserve the natural flavours, colours, and nutritional content of fruits while creating a convenient and flavorful product (Garca et al., 2019).

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Pineapple (*Ananas comosus*) and cashew fruits (*Anacardium occidentale*) possess distinct nutritional profiles that contribute to their potential as ingredients in the production of jam. Pineapple is rich in essential vitamins such as vitamin C, thiamin, and vitamin B6. It also contains minerals like manganese and copper, as well as dietary fibre. Additionally, pineapple contains bromelain, an enzyme with proteolytic properties that can aid in digestion and has potential health benefits (Devi et al., 2016). Cashew fruits, on the other hand, offer a range of vitamins, including vitamin C, vitamin E, and folate, along with minerals such as potassium, magnesium, and iron. Cashew fruits are also a good source of dietary fibre and contain bioactive compounds such as carotenoids, phenolic compounds, and flavonoids, which contribute to their antioxidant properties (Akpan et al., 2016). The combination of these nutritional components from both fruits holds promise for creating a nutritionally rich jam product.

Functional Properties of Jams

The functional properties of jams, including texture, viscosity, gelation, and water activity, significantly influence their quality and consumer acceptance. Texture is an essential attribute that affects the mouthfeel and overall sensory experience of the jam. Viscosity plays a role in spreadability, while gelation contributes to the firmness and stability of the product. Water activity influences the shelf life and microbial stability of jams (Bentez et al., 2015). When pineapple and cashew fruits are used as ingredients in jam production, their unique functional characteristics can impact the final product. For instance, pineapple contains enzymes like bromelain, which can affect the gelation and viscosity of the jam (Ribeiro et al., 2018). Cashew fruit pulp, with its high dietary fibre content, may contribute to the texture and mouthfeel of the jam (Agrahar-Murugkar & Subbulakshmi, 2005).

Fruit Blending in Food Processing

The concept of fruit blending in food processing has gained attention due to its potential to create novel flavour profiles, enhance nutritional value, and improve product stability. Blending different fruits offers the opportunity to combine their unique characteristics and create a product with a more complex sensory profile. Previous studies have demonstrated the advantages of fruit blending in various food products, such as juices, sauces, and jams. Blending different fruits has been shown to positively impact the nutritional composition, functional properties, and sensory attributes of the final product (Goula et al., 2019; Sogi et al., 2016). By blending pineapple and cashew fruits in jam production, it is expected that the nutritional and functional benefits of both fruits can be synergistically harnessed, leading to a unique and appealing product.

Sensory Evaluation of Jams

Sensory evaluation plays a crucial role in understanding consumer preferences and acceptance of food products. It involves the assessment of sensory attributes such as appearance, aroma, flavour, texture, and overall liking. Evaluating the sensory characteristics of jams allows for an understanding of the sensory profiles and preferences of consumers. Descriptive analysis, hedonic testing, and preference mapping are commonly employed sensory evaluation methods for jams (Lawless & Heymann, 2010). Sensory evaluation studies provide valuable insights into consumer preferences, helping in product development, optimisation, and market success. Several studies have explored the nutritional composition, functional properties, and sensory evaluation of fruit blends in various food products. However, limited research has been

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conducted specifically on jams produced with a blend of pineapple and cashew fruits. By examining related studies, it is possible to identify knowledge gaps and inconsistencies in the existing literature. This paper aims to fill these gaps by investigating the specific aspects of nutritional composition, functional properties, and sensory evaluation in the context of jam produced with a pineapple and cashew fruit blend.

Materials and Methods

The study utilised ripe pineapples (*Ananas comosus*) obtained from a local market. Pineapples were selected based on their uniformity, absence of physical damage, and overall quality. The pineapples were carefully washed, peeled, and cored before further processing. Also, Fresh cashew fruits (*Anacardium occidentale*) were sourced from a local farm. Cashew fruits at optimal ripeness were chosen based on visual inspection, considering factors such as colour, firmness, and absence of spoilage. The cashew fruits were thoroughly washed to remove any surface contaminants and prepared for further processing. Commercial white granulated sugar was used as the sweetening agent in the jam production. High-quality refined sugar was selected to ensure consistency in the formulation. Pectin, a natural gelling agent, was added to enhance the texture and gel formation of the jam. A commercial pectin product suitable for fruit-based applications was used. Clean and sterilised glass jars with airtight lids were used for packaging the jam. The jars were selected to ensure proper sealing and to maintain the quality and freshness of the jam.

Sample formulation

Five different pineapple and cashew fruit jam samples were produced and coded as A, B, C, D, and E in a varied proportion: 100:0, 80:20, 60:40, 40:60, and 40:60. One hundred percent pineapple jam was used as a control.

Jam Production

The jam production process involved several key steps, including fruit preparation, cooking, and packaging, as outlined below: The procedure adopted by Smith & Johnson (2022) was used.

Fruit Preparation

1. Fresh pineapples and cashew fruits were washed thoroughly to remove any surface impurities.
2. Pineapples were peeled, cored, and cut into small pieces.
3. Cashew fruits were carefully removed from their shells, discarding the outer skin and retaining the juicy fruit pulp.

Blending and Cooking

1. The prepared pineapple pieces and cashew fruit pulp were blended together using a food processor or blender until a smooth and homogeneous mixture was obtained.
2. The blended fruit mixture was then transferred to a cooking pot.

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3. Sugar was added to the fruit blend at a predetermined ratio, considering the desired sweetness and preserving properties of the jam.
4. If necessary, a suitable amount of commercial pectin was added to the mixture to enhance the gel formation and texture of the jam.
5. The fruit blend, sugar, and pectin were thoroughly mixed to ensure uniform distribution.

Cooking and Thickening

1. The cooking pot containing the fruit blend mixture was placed over heat and cooked at a controlled temperature.
2. The mixture was continuously stirred to prevent burning and promote even heat distribution.
3. The cooking process continued until the mixture reached the desired consistency, often determined by visual observation or by measuring the jam's viscosity.
4. The cooking time varied depending on the desired thickness and texture of the jam, typically ranging from 30 to 60 minutes.

Packaging

1. Sterilised glass jars with airtight lids were used for packaging the jam.
2. The hot jam was carefully poured into the sterilised jars, leaving a suitable headspace to allow for expansion during cooling.
3. The filled jars were then sealed tightly with the lids.
4. To ensure further sterilisation and prolong shelf life, the filled jars were subjected to a sterilisation process, such as placing them in a boiling water bath or using a steriliser, following established guidelines. Bottle jam samples were subjected to proximate composition, functional properties, and sensory evaluation analyses.

Table 1: Formulation of ingredients for Jam preparation

INGREDIENTS	A	B	C	D	E
Fresh Pineapple (g)	100	80	60	40	20
Cashew fruits (g)	0	20	40	60	80
Sugar (g)	100	100	100	100	100
Pectin (g)	10	10	10	10	10

Keys A (100% Pineapple), B (80% pineapple and 20% Cashew fruits), C (60% pineapple and 40% Cashew fruits), D (40% pineapple and 60% Cashew fruits), E(20% pineapple and 80% Cashew fruits).

Proximate Analysis: The proximate analysis was performed to determine the moisture, ash, protein, fat, crude fibre, and carbohydrate content of the jam produced with the pineapple and cashew fruit blend. The methods recommended by the Association of Official Analytical Chemists (AOAC, 2000) were followed for each component analysis. The specific procedures are described below:

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Moisture Content: The moisture content of the jam was determined using the AOAC (2000) method. Approximately 5 grammes of the jam sample were weighed into a pre-weighed moisture dish and placed in an oven set at a specific temperature (typically 105–110 °C). The sample was dried until a constant weight was achieved. The moisture content was calculated using the formula: Moisture (%) = (Initial weight - Final weight) / Initial weight x 100)

Ash Content: The ash content, which represents the inorganic mineral content, was determined using the AOAC (2000) method. About 2–3 grammes of the jam sample were incinerated in a muffle furnace at a high temperature (typically 550–600 °C) until complete combustion occurred. The remaining ash was weighed and expressed as a percentage of the original sample weight.

Protein Content: The protein content of the jam was determined using the AOAC (2000) method. The sample was digested using appropriate reagents, such as acid and alkali solutions, to break down proteins into their constituent amino acids. The resulting solution was then titrated, and the protein content was calculated based on the nitrogen content using the appropriate conversion factor (typically 6.25 for most foods).

Fat Content: The fat content of the jam was determined using the AOAC (2000) method. The sample was subjected to solvent extraction, typically using a non-polar solvent such as petroleum ether or hexane, to remove the lipid fraction. The solvent was evaporated, and the remaining fat was weighed and expressed as a percentage of the original sample weight.

Crude Fibre Content: The crude fibre content of the jam was determined using the AOAC (2000) method. The sample was subjected to acid and alkali digestion to remove the non-fibrous components. The remaining fibre fraction was then filtered, washed, dried, and weighed. The crude fibre content was expressed as a percentage of the original sample weight.

Carbohydrate Content: The carbohydrate content of the jam was calculated by difference. It was determined by subtracting the sum of the moisture, protein, fat, ash, and crude fibre content from 100%. This method provides an estimation of the carbohydrate content, representing the remaining components in the sample.

Sensory Evaluation

Sensory evaluation plays a crucial role in understanding and assessing the sensory attributes, consumer acceptance, and overall quality of the jam. It involves the systematic and subjective assessment of the appearance, aroma, flavour, texture, and overall sensory experience of the product by trained panellists or potential consumers (Lawless & Heymann, 2010). One hundred and fifty (150) Panellists for the sensory evaluation were recruited based on specific criteria, including their sensory acuity, experience, and ability to discriminate and describe sensory attributes accurately. Trained panellists with expertise in evaluating fruit products were selected to ensure consistency and reliability in the sensory assessments. Prior to the evaluation, the panellists underwent training sessions to familiarise themselves with the sensory evaluation techniques, vocabulary, and scoring scales (Stone et al., 2012). Hedonic tests involved consumer

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panellists who evaluated the overall liking or preference for the jam. They used rating scales, such as a 9-point hedonic scale, to indicate their degree of liking or preference for various attributes as well as the overall product. The sensory evaluation sessions were conducted in controlled environments to minimise external factors that could influence sensory perception. The evaluation area was well-lit and free from strong odours or distractions that could affect panellists' concentration and sensory acuity. Each panellist was provided with individual sensory evaluation booths or isolated spaces to prevent communication or bias between panellists.

Data Collection and Analysis

Data collection during the sensory evaluation involved recording the panellists' responses and observations. This could include written descriptions, scores on rating scales, or the selection of attributes in preference mapping techniques. The data obtained were compiled and analysed using Analysis of Variance (ANOVA).

Analysis and Discussion

Proximate composition of Pineapple and Cashew fruits composite Jam

Table 2 presents the proximate composition of the pineapple and Cashew fruit composite Jam. The table includes information about the moisture, ash, fibre, fat, protein, and carbohydrate content of different samples labelled as A, B, C, D, and E. Moisture content refers to the amount of water present in the samples. The values range from 23.45% (sample A) to 26.18% (sample D). As the proportion of Cashew fruits increases in the composite jam, the moisture content tends to increase. Moisture content ranged from 23.45-26.18%. Sample D, which consisted of 40% pineapple and 60% cashew fruits, had the highest moisture content with a value of 26.18%. This suggests that the combination of pineapple and cashew fruits resulted in a higher moisture content compared to the other samples. Sample C, which contained 60% pineapple and 40% cashew fruits, had the second-highest moisture content at 25.27%. Although it had a slightly lower moisture content than Sample D, it still had a higher moisture content than the remaining samples. Sample A, consisting of 100% pineapple, had the lowest moisture content among the samples, with a value of 23.45%. This indicates that the presence of cashew fruits in the other samples contributed to a higher moisture content compared to pineapple alone. These findings were compared to a study conducted by Muresan et al. (2014) on the quality of jam derived from banana and ginger with a moisture content of 74%. In contrast, Chacko and Estherlydia (2014) found that jams made from local fruit peels had a moisture content ranging from 39.1% to 62.6%. The results differed significantly (p 0.05) from Salam et al.'s (2020) research on jam production and acceptability from pineapple, watermelon, and apple blends, which reported moisture content percentages between 63.46% and 65.21%.

The ash content, which represents the inorganic residue left after complete combustion of the sample, is relatively consistent across all the samples of the pineapple and cashew fruit composite jam. The values range from 0.57% to 0.58%. The consistency in ash content across the samples indicates that the composition of the ash residue in the jam is similar, regardless of the proportion of cashew fruits; this suggests that the ash content is not greatly influenced by the variation in fruit proportions. The ash content primarily represents the mineral content of the

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samples, including elements such as calcium, potassium, magnesium, and phosphorus. These minerals are naturally occurring and are often associated with fruit composition. The minor variation in ash content observed in the samples could be attributed to slight differences in the mineral composition between the pineapple and cashew fruits used in the composite jam. However, since the differences are minimal and within a narrow range, it suggests that the mineral content remains relatively stable across the samples. The ash content is typically of less importance for nutritional purposes compared to other macronutrients and micronutrients. However, it can be an indicator of the overall mineral composition and the presence of essential minerals in the food product. In summary, the ash content in the pineapple and cashew fruit composite jam samples is relatively consistent, with values ranging from 0.57% to 0.58%. This suggests that the mineral composition, represented by the ash content, remains stable across the samples, regardless of the variation in fruit proportions. Dandago (2009) concurred with this observation, stating that certain minerals present in raw materials may not be retained in prepared foods due to their leaching into the water during processing, resulting in a notable reduction. Additionally, these results were higher than the results obtained from the preparation of dietetic jam using Umbu Caja fruit (0.20-0.30%) as reported by Mamede et al. (2013).

The fibre content in the samples of pineapple and cashew fruit composite jam is an important aspect to consider. The results show that the fibre content ranges from 0.12% in sample A to 0.47% in sample D. This data suggests that the proportion of cashew fruits has a notable effect on the fibre content of the composite jam. As the proportion of cashew fruits increases, the fibre content tends to increase as well. This implies that cashew fruits contribute more fibre to the composite jam compared to pineapple. Dietary fibre is a crucial component of a healthy diet as it aids in digestion, helps regulate blood sugar levels, and promotes satiety. Increasing the fibre content of food products can have positive effects on overall health and well-being. The variation in fibre content observed across the samples may be attributed to the differing fibre content of pineapple and cashew fruits. Cashew fruits tend to have a higher fibre content than pineapple, which could explain the increase in fibre as the proportion of cashew fruits increases. It is important to note that the fibre content observed in the composite jam samples, although showing a trend, is still relatively low. Depending on an individual's dietary requirements, additional sources of dietary fibre may need to be considered in their overall diet to meet recommended intake levels. In conclusion, the fibre content in the pineapple and cashew fruit composite jam samples varies with the proportion of cashew fruits. As the proportion of cashew fruits increases, the fibre content tends to increase, highlighting the potential health benefits of incorporating more cashew fruits into the composite jam.

The fat content of the samples, as mentioned in the results, is relatively low and consistent among all the composite jam samples. The fat content ranges from 0.08% in sample A to 0.30% in sample D, with samples B and E having fat contents of 0.15% each and sample C having a fat content of 0.23%. These results indicate that the pineapple and cashew fruit composite jam is a low-fat product. The fat content in all the samples is within a narrow range, suggesting that the variation in the proportion of cashew fruits does not have a substantial impact on the fat content. It is important to note that fat is a macronutrient that provides energy, aids in nutrient absorption, and supports various physiological functions in the body. While the fat content in the composite jam samples is low, this may be desirable for individuals who are following a low-fat diet or

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prefer a lower fat intake. The consistency in fat content across the samples suggests that the main contributor to the fat content is likely the pineapple, as the proportion of cashew fruits does not seem to have a significant influence. It is worth mentioning that dietary recommendations vary for fat intake, and individuals may have different preferences and requirements based on their health goals and dietary needs. If individuals are specifically looking for a higher fat content in their diet, they might need to consider incorporating other sources of healthy fats into their overall meal plan. In summary, the fat content of the pineapple and cashew fruit composite jam samples is relatively low and consistent. These results indicate that the composite jam can be considered a low-fat product. Tarwar et al. (2014) noted a fat content of 0.09% in guava jam. When comparing this value with the fat content observed in our study for pineapple and cashew fruit blend jam, it indicates that the fat content in the produced jam is very low, making it a suitable choice for health-conscious individuals.

The protein content of the samples, as indicated in the results, is relatively low and consistent across the different samples. The protein content ranges from 0.22% in sample A to 0.27% in sample D, with samples B and E having protein contents of 0.24% and sample C having a protein content of 0.25%. These results suggest that the protein content in the composite jam samples is similar and does not vary significantly. The values provided are relatively low, indicating that the pineapple and cashew fruits used to prepare the composite jam contribute only a small amount of protein.

It is important to note that protein is a vital macronutrient that plays a crucial role in various biological processes and is essential for the growth, repair, and maintenance of body tissues. While the protein content in the composite jam samples is relatively low, it is not uncommon for fruits to have lower protein levels compared to other food sources such as meat, dairy products, or legumes, which are typically recognised as higher protein sources. Therefore, if individuals are specifically seeking to consume higher protein content, they might need to consider incorporating other protein-rich food sources into their diet alongside the composite jam. Overall, the protein content of the pineapple and cashew fruit composite jam samples is relatively low and consistent, reflecting the nature of these fruits as not being particularly high in protein. The outcome revealed that the blended samples had a notably high protein content, which differed significantly (p 0.05) from the protein content reported by Salam et al., 2020, which ranged from 0.97% to 0.99%.

The result regarding the carbohydrate (CHO) content in the samples is interesting. The table shows that the carbohydrate content ranges from 69.65% in sample D to 75.89% in sample A. This indicates that the carbohydrate content is highest in the sample with 100% pineapple (sample A) and lowest in the sample with the highest proportion of cashew fruits (sample D). The trend observed in the results suggests that as the proportion of cashew fruits increases in the composite jam, the carbohydrate content tends to decrease. This indicates that cashew fruits have a lower carbohydrate content compared to pineapple. The decrease in carbohydrate content with an increase in cashew fruit proportion could be due to the relatively lower carbohydrate content of cashew fruits compared to pineapple. It is worth noting that other factors, such as the specific composition and characteristics of the fruits, could also influence the carbohydrate content. However, based on the provided information, the trend indicates that pineapple contributes more

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carbohydrates to the composite jam compared to cashew fruits. Understanding the carbohydrate content is important for dietary considerations, as carbohydrates are a major source of energy in the human diet. Different individuals may have specific dietary requirements or preferences regarding carbohydrate intake, and these results can provide insights into the composition of the pineapple and cashew fruit composite jam for individuals interested in monitoring or adjusting their carbohydrate intake. The carbohydrate content of the fruit jam samples closely matched the results of Aina et al. (2015) and Homi (2006) for pineapple and guava jams, respectively, with values of 58.6% and a range of 63.73% to 70.98%.

Table 2: Proximate composition of Pineapple and Cashew fruits composite Jam

Samples	**Moisture** (%)	**Ash** (%)	**Fibre** (%)	**Fat** (%)	**Protein** (%)	**CHO** (%)
A	23.45	0.58	0.12	0.08	0.22	75.89
B	24.23	0.57	0.24	0.15	0.24	73.81
C	25.27	0.57	0.35	0.23	0.25	71.72
D	26.18	0.57	0.47	0.30	0.27	69.65
E	24.36	0.57	0.24	0.15	0.24	73.81

Keys: A (100% Pineapple), B (80% pineapple and 20% Cashew fruits), C (60% pineapple and 40% Cashew fruits), D (40% pineapple and 60% Cashew fruits), E(20% pineapple and 80% Cashew fruits). Values are mean ± standard deviations (SD) of two determinations Values with same superscript within a column are not significantly different ($P > 0.05$)

Sensory attributes of pineapple-cashew fruits jam

Table 3 presents the sensory evaluation of the composite jam produced with a pineapple and cashew fruit blend. The attributes evaluated include flavour acceptance, colour acceptance, taste acceptance, texture acceptance, and overall acceptance. The samples were labelled as A, B, C, D, and E. Sensory evaluations are commonly conducted to assess the flavour characteristics of food products. The sensory result indicates that different blends of pineapple and cashew fruits were evaluated, and the flavour scores varied among the samples.

The flavour scores for the different samples ranged from 7.34 to 7.65. E, which contained 20% pineapple and 80% cashew fruits, received the highest mean score of 7.65. On the other hand, sample A, consisting of 100% pineapple, received the lowest mean score of 7.42. The statement also suggests that there was a significant difference between the 100% pineapple jam and the blends. This implies that the sensory evaluation results showed a noticeable distinction between the flavour of the 100% pineapple jam and the samples containing a blend of pineapple and cashew fruits. The results provided indicate the colour evaluation of different jam samples. The colour scores for the various samples ranged from 8.10 to 8.36. Sample E, which contained 20% pineapple and 80% cashew fruits, received the highest score of 8.36 for colour. On the other hand, sample A, consisting of 100% pineapple, had the lowest score of 8.10. The flavour of the jam was more accepted as the proportion of cashew fruits increased in the blends.

Colour is an important sensory attribute in food evaluation as it contributes to the overall perception and acceptability of a product. Different factors can influence the colour of food, such

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as the presence of pigments, processing methods, and ingredient composition. In the case of the jam samples you mentioned, it seems that the blends incorporating cashew fruits (Sample E) resulted in a higher colour score compared to the 100% pineapple sample (Sample A). This suggests that the addition of cashew fruits may have contributed to a more visually appealing colour in the jam.

The result indicates the taste scores of different jam samples, ranging from 8.20 to 8.42. Sample E, which contained 20% pineapple and 80% cashew fruits, received the highest taste score of 8.42, while the 100% pineapple jam sample had the lowest mean score of 8.20. This result highlights the importance of taste in food, particularly in the context of evaluating jam samples. Taste plays a crucial role in determining the palatability and enjoyment of a food product. It encompasses various sensory perceptions, including sweet, sour, salty, bitter, and umami flavours. In this specific case, the taste scores indicate that the jam sample with a blend of pineapple and cashew fruits (sample E) was perceived to have a more favourable taste compared to the 100% pineapple jam (sample A), which received the lowest taste score. The higher taste score for sample E suggests that the inclusion of cashew fruits in the blend contributed to a more desirable and enjoyable taste experience. The finding underscores the significance of taste as a primary sensory attribute that influences consumer preferences and acceptance of food products. Taste can significantly impact overall satisfaction and the likelihood of repeat consumption. By understanding and addressing taste preferences, food manufacturers can develop products that align with consumer expectations and achieve higher levels of consumer satisfaction.

The texture finding indicates the texture scores of different jam samples, ranging from 8.27 to 8.54. Sample E, which contained 20% pineapple and 80% cashew fruits, received the highest texture score of 8.54, while the 100% pineapple jam (sample A) had the lowest mean score of 8.27. Texture plays a vital role in the sensory experience and overall enjoyment of food. It refers to the tactile properties perceived when consuming a food product, including attributes such as smoothness, creaminess, crunchiness, chewiness, and viscosity. Texture not only adds variety and complexity to the eating experience but also contributes to the overall perception of quality. The texture scores indicate that the sample with a blend of pineapple and cashew fruits (sample E) was perceived to have a more desirable texture compared to the 100% pineapple jam (sample A), which received the lowest texture score. The higher texture score for sample E suggests that the addition of cashew fruits in the blend enhanced the textural properties of the jam, potentially adding elements such as creaminess, richness, or improved mouthfeel. The finding highlights the importance of texture in food, as it can greatly influence consumer preferences and acceptance. Texture contributes to the overall sensory experience and can evoke specific sensory expectations and associations with certain food products. For instance, a creamy texture may be expected in certain dairy-based products, while a crisp and crunchy texture may be preferred in some snack foods. Understanding and optimising texture in food development and production are essential for achieving consumer satisfaction and market success. By carefully controlling and balancing textural attributes, food manufacturers can create products that align with consumer expectations, differentiate themselves in the market, and provide enjoyable eating experiences.

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The overall acceptability finding pertains to the scores given to different jam samples, which ranged from 8.30 to 8.48. Sample E, consisting of 20% pineapple and 80% cashew fruits, received the highest overall acceptability score of 8.48, while the 100% pineapple jam (sample A) had the lowest mean score of 8.30. Overall acceptability is a crucial measure in food evaluation as it represents the comprehensive satisfaction and preference of consumers regarding a food product. It takes into account various sensory attributes, such as flavour, colour, taste, and texture, as well as other factors like aroma and appearance. By considering all these elements together, the overall acceptability score provides an aggregate assessment of how well a product is liked or accepted by consumers. In the case of the jam samples, the higher overall acceptability score for sample E (a pineapple-cashew blend) compared to sample A (100% pineapple) indicates that the blend was more preferred and accepted by the evaluators. This suggests that the inclusion of cashew fruits in the blend enhanced the sensory experience, resulting in a more enjoyable and satisfying jam.

The finding highlights the importance of overall acceptability in food, as it directly influences consumer satisfaction, repeat purchase intent, and brand loyalty. A higher overall acceptability score indicates that a product has successfully met or exceeded consumer expectations across multiple sensory attributes. This can result in increased consumer preference, positive word-of-mouth, and a competitive advantage in the market. Understanding the factors that contribute to overall acceptability is crucial for product development, quality control, and marketing strategies. By aligning sensory attributes and optimising the product formulation to enhance overall acceptability, food manufacturers can create products that resonate with consumer preferences and drive success in the marketplace. The overall acceptance finding suggests that the blends with a higher percentage of cashew fruits were more preferred by evaluators.

Table 3: Sensory attributes of pineapple-cashew fruits jam

Samples	Flavour	Colour	Taste	Texture	Overall Acceptance
A	7.24^{e}	8.10^{e}	8.20^{e}	8.27^{e}	8.30^{ed}
B	7.29^{d}	8.19^{d}	8.25^{cd}	8.34^{d}	8.34^{d}
C	7.38^{c}	8.25^{c}	8.29^{c}	8.39^{c}	8.38^{c}
D	7.52^{b}	8.31^{b}	8.36^{b}	8.46^{b}	8.43^{b}
E	7.65^{a}	8.36^{a}	8.42^{a}	8.54^{a}	8.48^{a}

Conclusion

The analysis of the pineapple and cashew fruit composite jam samples revealed interesting trends in their nutritional composition. The moisture content increased as the proportion of cashew fruits in the jam increased, with Sample D having the highest moisture content and Sample A having the lowest. The ash content remained consistent across all samples, indicating a stable mineral composition. The fibre content showed a clear relationship with the proportion of cashew fruits, increasing as the cashew fruit content increased. The fat and protein content were low and consistent across all samples, with pineapple being the primary contributor. The carbohydrate content varied based on the proportion of cashew fruits, with higher carbohydrate

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content in samples with more pineapple. Overall, the composite jam offered a nutritionally balanced product with varying proportions of key macronutrients, making it a versatile option for health-conscious consumers. The sensory evaluation results indicated that the blend of pineapple and cashew fruits was well received by evaluators, showing higher scores in various sensory attributes compared to the 100% pineapple jam. The addition of cashew fruits to the blend enhanced the sensory experience, resulting in higher scores for flavour, colour, taste, texture, and overall acceptability. These findings have significant implications for product development and consumer acceptance, as understanding sensory preferences can lead to products that align with consumer expectations and satisfaction. Further research and testing with a larger and more diverse group of evaluators may provide additional insights for continuous product improvement. Overall, the composite jam has the potential for success in the competitive market thanks to its favourable nutritional composition and sensory attributes.

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