



Proximate Composition, Mineral and Sensory Properties of Pancake Prepared from Wheat/Corn/Walnut Flour Blends

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ABSTRACT

The objectives of this study was to examined the proximate, mineral and sensory properties of pancake prepared from wheat/corn/walnut flour blends for household consumption, and to improve the nutritional content of the food products for the utilization of home-grown crops and reduce importation of wheat flour. Corn and walnut were processed into flour, pancake was prepared from blends of wheat/corn/walnut flours using blend in the ratio 70:20:10, 60:25:15 and 50:30:20 respectively, while hundred percent (100%) wheat flour (WF) was used as control. Samples were subjected to sensory evaluation within 10 mins of production. Proximate analyses were carried out using standard deviation methods. Result showed that proximate composition of the pancake revealed a significant ($p \geq 0.05$) increased in ash (1.15-5.95%), fat (3.70-18.41%), protein (9.13-14.85%), crude fibre (2.60-16.38%) while carbohydrates had significant ($p \geq 0.05$) decreased (47.60-4.96%). Mineral properties showed that magnesium had a significant ($p \geq 0.05$) increased (2.59-3.32%), copper (0.13-0.19%), calcium (0.11-0.14%), zinc (30.91-69.30). The sensory results of the pancake showed that the control was preferred than all other samples. Sample B (70-20-10) was slightly accepted. In conclusion: The findings of the study showed sample D which comprised of 50% wheat, 30%com and 20% walnut flour blends had the most nutrient value while carbohydrate was low. However, sample B was mostly preferred amongst the blend in taste, colour, texture, appearance and aroma.

Keywords: wheat, walnut, corn, pancake, proximate, mineral.

INTRODUCTION

Pancake is a flat, thin, round cake made from a starch-based batter which basically contains flour, eggs, water, sugar and baking powder. Other ingredients may include milk, nutmeg, vanilla flavour, vegetable oil or melted butter [1,2]. They are ready to eat convenience and inexpensive food product that is widely consumed by all ages [3]. It is prepared by pouring the batter-based mixture unto a grease hot pan and is flipped after 2-3 minutes and cooked till both sides turn golden brown [4]. It can be eaten as breakfast in many households as well as an appetiser for lunch or dinner and is acceptable for various age groups. Fillings such as jam; fruit or syrup can be used during service. The main ingredient used in the preparation of pancake is wheat flour which is usually imported into Nigeria and has consistently increased in price. However, flours can be gotten from locally grown cereals, fruits and nuts such as corn, walnut, soybean, tiger nut, beetroot, bambara nut, potato, coconut, almonds, etcetera. These plants can be processed into flour and used as composite with or without wheat flour for supplementation and fortification. Walnut and corn can be used in composite with wheat flour for production of confectioneries and bakery products due to their availability and accessibility and it will also add to the nutritional value of the product especially pancake. Wheat (*T. aestivum*) is cultivated widely for its seed; it is a cereal grain that is a worldwide used as staple food. Several species of wheat are gathered to form the genus *triticum* According to [5]. wheat is typically milled into flour which is used to make a wide variety of food products including pancakes, pasta, biscuits, bread, etcetera. Wheat flour contains gluten, which gives its dough the ability to stretch and is majorly filled with carbohydrate [6]. Wheat is imported into the country while other flour such as corn and walnut flour can be used in composite with wheat flour to improve the nutritional content of food products like pancake and also for the utilization of home-grown crops and reduce importation of wheat flour [7].

Walnuts (*Tetracarpidium conophorum*) is an underutilized homegrown nut that is rich in omega 3&6 fatty acids which are essential fatty acids required in the body. These fatty acids may help in the reduction of the risk of a heart disease or failure. Walnut flour can be used to improve the dietary fiber in pancake as it contains about 12% fiber [6,8]. And it can be used in fortification of the flour as an addition to wheat and corn flour for the production of pancake for all age groups. Corn (*zea mays*) is also known as maize. It is a staple cereal for food which is a whole cereal used in preparation of nutritious foods. [9], stated that corn flour is a gluten free flour that has a unique profile of nutrients such as proteins, carbohydrates, minerals and vitamins and a higher anti-oxidant ability compared to wheat, oat and rice. [10], the flour can be used in making gluten free bakery products and confectioneries which are healthier for consumption as compared to products made with only wheat flour. Due to the low-density lipoproteins (LDL) contained in corn, it can help reduce bad cholesterol levels in the blood vessels, this will help improve the nutritional content of pancakes made with wheat, corn and walnut composite flour. It will also help guarantee that the pancake of composite flour can be consumed by all age groups. Corn flour is available all year, easily accessible, processed into flour, and affordable in Nigeria while walnut flour can be used to improve the nutrient composition of the flour. [11] The use of composite flour is recently common to reduce the importation of wheat flour into country and this will encourage the utilization of home-grown legumes, cereals, roots, grains, etcetera. in the production of flour products especially walnut which has been underutilized for ages [12].

MATERIALS AND METHODS

Walnuts (*Tetracarpidium conophorum*) and corn grains (*Zea mays*) were purchased from Fruit Garden in D/line, Port-Harcourt, Rivers state. Other ingredients such as wheat flour, milk, sugar, vanilla flavour, vegetable oil, baking powder, etc. were purchased from Mile 3 Market in Diobu, Port-Harcourt, Rivers State. All reagents used were obtained from the Department of Food Science and Technology, Rivers State University, Port-Harcourt, Rivers state and were of analytical grade.

Processing of Sample Materials (Processing of Walnut and Corn)

Walnut (*Tetracarpidium conophorum*) was washed very well to clean off any contaminants on the shell. The shells were cracked and removed using the hand. After which, the nuts were reduced/sliced into smaller sizes with the aid of a sharp kitchen knife. They were then blanched in hot water for about 3 minutes and then passed through cold running water to cool off to retain the colour and to prevent reaction of enzymes. The blanched nuts were dried in a hot air oven at 60°C for 24 hours to remove moisture. It was milled into flour using a blender and then passed through a sieve. The flour was stored in an airtight container under room temperature of 37°C until it was used for the pancake production.

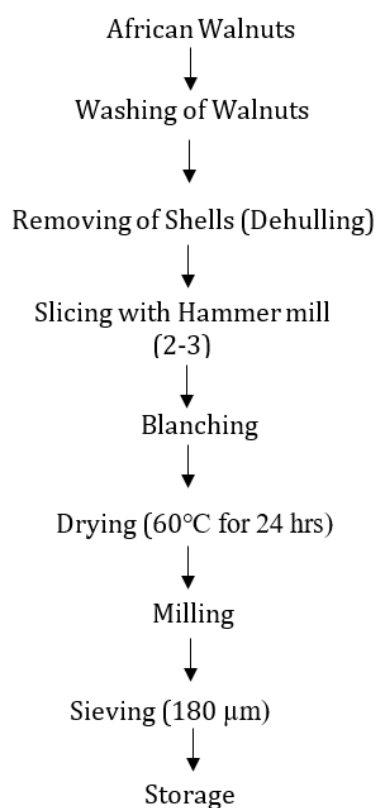


Figure 1: Flowchart of walnut flour

Source: [8]

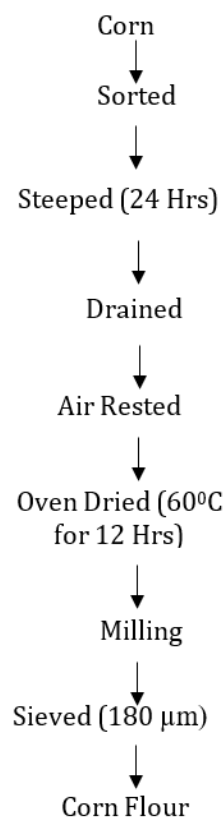


Figure 2: Flowchart of corn flour

Source: [13]

Corn Flour

The corn grains (*Zea mays*) were thoroughly selected and blown to remove debris and stones that might be in it. The cleaned grains are then milled into flour using a dry blender. The milled

corn was passed through a sieve and then stored in an airtight container at room temperature of 37°C until it was needed for production.

Flour Formulation

Four blends designated as WCW1, WCW2, WCW3 and WCW4 were prepared by mixing wheat flour, walnut flour and corn flour using an electric blender to achieve a uniform blend in the ratio 70:20:10, 60:25:15 and 50:30:20 respectively, while hundred percent (100%) wheat flour (WF) was used as control.

Table 1: Formation of Flour Blends

Sample	Wheat	Corn	African Walnut
A (Control)	100	-	-
B	70	20	10
C	60	25	15
D	50	30	20

25% corn and 15% walnut, D=50% wheat, 30% corn and 20% walnut flour blends

Pancake Recipe and Preparation

Ingredients	Quantity
Flour	250g
Sugar	50g
Baking Powder	3g
Eggs	2
Milk	30ml
Salt	5g
Nutmeg	5g
Vanilla Flour	5g

Source: [4]

The pancake recipe set used is shown in the table below. The preparation was described by [4] with some modifications. The eggs were cracked into a large stainless steel mixing bowl and mixed together lightly using a whisk, milk and vanilla flavour was added and mixed lightly again. In another bowl, the flour, sugar and baking powder were added and mixed together, poured into the wet ingredients and then mixed together using a wooden spatula till a smooth consistency was achieved. A non-stick pan was greased with oil, placed on a low heat and allowed to get hot, the pancake batter was scooped using a deep spoon and then poured into the hot greased pan. The pancake was cooked on both sides for at least 3 minutes each.

Proximate Analysis

Proximate composition of the samples was determined using the Association of Official Analytical Chemist [15] methods for moisture, ash, protein, fibre, fat. From the total dry weight of the samples. Total carbohydrates were calculated by difference of moisture, ash, protein, crude fibre from 100% while mineral composition was determined using the [16].

Sensory Evaluation

Pancake samples were subjected to sensory evaluation within 1 hour of production. These attributes namely appearance, taste, colour, flavour, aroma, texture and overall acceptability

were assessed on pancake samples respectively using a nine (9) point hedonic scale from (9 like extremely to 1 dislike extremely). Twenty (20) trained panellist from the Department of Home Science and Management who were regular consumers of pancake. Instructions were given to them to rinse their mouths with water after each sample was eaten.

Statistical Analysis

All data obtained were analysed in duplicate and subjected to the analysis of variance (ANOVAN) using statistical package for Social Science (SPSS) version 23.0. significant difference was defined at level of ($p \geq 0.05$) while sample means were separated using the Duncan multiple range test (DMRT)

RESULTS AND DISCUSSION

Moisture content ranged from 33.80% to 41.55% with the lowest recorded in sample B while the highest was in sample D. There were significant differences between the ($P < 0.05$) samples. This result was lower than the results recorded by [[17] in proximate composition consumer acceptability of pancakes made with wheat and soya bean flour blends (46.18-59.12%) using cocoyam and soybean flour but higher than that of [19] in the production of biscuits. It was also lower than the results (10.55-12.16%) gotten by [1] in wheat/soyabean pancake. The significant differences ($P < 0.05$) in the result could be due to the ability of the composite flour to absorb water during preparation and addition of other ingredients for the production of the pancake. However, the result was higher than the result recorded by [20] in the formulation of complementary foods using soybean, walnut and ginger, this may be due to the addition of other ingredients in the pancake to make it palatable. Ash content ranged from 1.30% to 5.95% with the lowest recorded in sample B (70% wheat, 20% corn and 10% walnut flour) and the highest recorded in sample C (60% wheat, 25% corn and 15% walnut flour). This was not in line 1.56-3.44 % with [25] in addition of orange -fleshed sweet potato and iron -rich beans improves sensory, nutritional and physical properties but reduced microbial shelf life of cassava- based pancake. There were significant differences ($P < 0.05$) among samples. This result (1.07-3.02%) was higher than that of [21] in quality attributes of pancakes from peeled and unpeeled sweet potato flours with cassava. Ash is the inorganic substance remaining after the water and organic substances have been charred and it provides a measure for total amount of minerals in food. The increasing ash content of the samples shows that there was increase in the mineral content of the pancake which will improve the nutrient composition of the pancake and benefit the body. The values are comparable with that of [22] for biscuits made from wheat and Africa walnut flour.

Protein content ranged from 9.13% to 14.85% with the lowest value recorded in sample A (100% wheat flour) and the highest value in sample D (50% wheat, 30% corn and 20% walnut flour). There was significant difference ($P < 0.05$) across all samples. The result (11.73-12.84%) was in line with [23] in quality attributes of pancakes from peeled and unpeeled sweet potato flours with cassava starch (9.06-10.34) than that of [24] in proximate composition of cassava-based pancakes for college students. The increasing trend of protein in the result was due do the high protein content in walnut as reported by [8]. The results showed that walnut is higher in protein than wheat flour. Protein contains amino acids, which serve as the building blocks in the body. It is important for growth, maintenance and protection of the body. The fat content increased due to the increased in walnut flour. Fat makes food palatable and enhance flavour

and texture of food. However, the result was higher than that of [4] for pancake made with soybean and cocoyam flour due to the choice of flour used in production of the pancake. Crude fiber had values ranging from 2.60% to 16.38% with the lowest found in sample A (100% wheat flour) and the highest in sample D (50% wheat, 30% corn and 20% walnut flour). The results are higher than the results (1.05-1.88%) recorded by [23] (3.75-6.01%). There was significant difference ($P<0.05$) across all samples. The crude fiber content increased with the addition of walnut and corn flour. This may be due to the high fiber content in the both flours compared to that of the only wheat pancake. The result (1.66-4.16%) was higher than that of [25] in quality assessment of pancakes produced from wheat/tigernut composite flour. Carbohydrate content had values ranging from 4.96% to 47.6% with the lowest value found in sample D (50% wheat, 30% corn and 20% walnut flour) and the highest value found in sample A (100% wheat). There was significant difference ($P<0.05$) across all samples. There was a decreasing trend in the result as walnut and corn flour increased. This is due to the little carbohydrate found in walnuts and this makes it good for people who are trying to watch their diet or reduce their weight.

Table 1: Proximate Composition of Pancake

Sample	Moisture	Ash	Fat	Protein	Crude Fibre	Carbohydrates
A	35.66 ^c ±0.02	1.30 ^c ±0.14	3.70 ^d ±0.14	9.13 ^d ±0.00	2.60 ^d ±0.00	47.60 ^a ±0.02
B	33.80 ^d ±0.07	1.15 ^c ±0.21	7.36 ^c ±0.04	10.00 ^c ±0.00	7.58 ^c ±0.00	40.11 ^b ±0.25
C	41.10 ^b ±0.07	5.95 ^a ±0.07	12.60 ^b ±0.00	10.91 ^b ±0.04	10.69 ^b ±0.16	18.74 ^c ±0.26
D	41.55 ^a ±0.00	3.60 ^b ±0.28	18.41 ^a ±0.01	14.85 ^a ±0.04	16.38 ^a ±0.02	4.96 ^d ±0.11

Means with different superscript in the same column are significant different ($p\geq 0.05$)

Key: A= 100% wheat flour, B= 70% wheat, 20% corn and 10% walnut flour blends, C=60% wheat, 25% corn and 15% walnut, D=50% wheat, 30% corn and 20% walnut flour blends

Mineral Composition of Pancake Samples

Magnesium content of the pancake samples ranged from 2.59-3.32% with the lowest value found in sample A (100% wheat flour) while sample D had the highest value. There was significant difference ($P<0.05$) across all samples. There was an increasing trend found as the corn and walnut flours increased. It was lower than that of This may be due to the processing of the walnut and corn. Copper content had values ranging from 0.13- 0.31% with the lowest value recorded in sample B and C while the highest value was recorded in sample D. There were significant differences ($P<0.05$) across all samples. Calcium content ranged from 0.11-0.14% with the lowest value recorded in sample B while the highest value was recorded in sample C. There was significant difference ($P<0.05$) across all samples. Deedam et al., (2020) stated that walnut flour is rich in calcium but it was not so abundant in the pancake. The calcium content was more abundant in sample C which consisted of 60% wheat, 25% corn and 15% walnut flour. Calcium is essential for building of strong bones and teeth in the body. Zinc content had values ranging from 34.19% to 69.3% with the highest value found in sample D while sample A had the least value.

There was significant difference ($P<0.05$) across all samples. [8] stated that walnut is a rich source of zinc. This was higher than that of [23] and [20]. The result complies with their statement. Zinc was found to be the most abundant mineral found in the pancake samples. Zinc content increased as walnut flour increased in the sample.

Table 2: Mineral Composition (mg/100g) of Pancake made from Wheat/Corn/Walnut Flour blends.

Sample	Magnesium	Copper	Calcium	Zinc
A	2.59 ^c ±0.01	0.19 ^b ±0.01	0.12 ^b ±0.00	34.19 ^b ±0.04
B	3.17 ^b ±0.01	0.13 ^c ±0.01	0.11 ^b ±0.00	30.91 ^d ±0.00
C	3.23 ^b ±0.00	0.13 ^c ±0.00	0.14 ^a ±0.03	32.35 ^c ±0.07
D	3.32 ^a ±0.03	0.31 ^a ±0.28	0.12 ^b ±0.01	69.30 ^a ±0.02

Means with different superscript in the same column are significant different (p≥0.05)

Key: A= 100% wheat flour, B= 70% wheat, 20% corn and 10% walnut flour blends, C=60% wheat, 25% corn and 15% walnut, D=50% wheat, 30% corn and 20% walnut flour blends.

Sensory Attributes of Pancake

There was a general decrease observed in the sensory scores of the pancake as walnut and corn flour ratio increased. The mean scores for taste ranged from 4.38 to 7.57 with sample A (100% wheat flour) being the most preferred while sample D (50% wheat, 30% corn and 20% walnut flour) being the least preferred sample this result is higher than 1.98-4.85 [25] in addition of orange -fleshed sweet potato and iron -rich beans improves sensory, nutritional and physical properties but reduced microbial shelf life of cassava- based pancake There was a significant difference (p>0.05) in taste across all samples. The mean scores for colour ranged from 5.81 to 6.52 with sample D being the least preferred while sample A was the most preferred sample. There was no significant difference for colour across all samples. The mean scores for flavour ranged from 5.24 to 7.00 with sample C being the least preferred sample and sample A was the most preferred sample in appearance. There was a significant difference (p>0.05) in appearance across all samples. The mean scores for aroma ranged from 5.10 to 7.05 with sample A being the most preferred sample while C was the least preferred sample in aroma. There was no significant difference in aroma across all samples. The mean score for texture ranged from 5.52 to 7.43 with sample A being the most preferred in texture while sample D was the least preferred in texture. There was no significant decrease in texture across all sample

Table 3: Sensory Evaluation of Pancake made from Wheat/Corn/Walnut Flour.

Sample	Taste	Colour	Flavour	Aroma	Texture	Overall Acceptability
A	7.57 ^a ±1.74	6.52 ^a ±1.21	7.00 ^a ±1.48	7.05 ^a ±1.12	7.43 ^a ±1.21	6.95 ^a ±1.44
B	5.67 ^b ±1.77	6.38 ^c ±1.24	5.86 ^b ±1.68	5.67 ^{ab} ±1.46	6.67 ^b ±1.46	5.83 ^b ±1.00
C	4.57 ^b ±1.91	6.28 ^c ±1.45	5.24 ^b ±1.90	5.10 ^b ±1.87	6.05 ^b ±1.86	5.47 ^b ±1.80
D	4.38 ^b ±2.09	5.81 ^b ±2.23	5.33 ^b ±2.42	5.14 ^b ±2.40	5.52 ^c ±1.91	5.10 ^b ±1.14

Means with different superscript in the same column are significant different (p≥0.05)

Key: A= 100% wheat flour, B= 70% wheat, 20% corn and 10% walnut flour blends, C=60% wheat, 25% corn and 15% walnut, D=50% wheat, 30% corn and 20% walnut flour blends

CONCLUSION

The study showed the proximate composition, mineral content and sensory properties of pancake samples made from wheat/walnut/corn flour blends in different ratios. The study revealed that sample D that comprised of 50% wheat, 30%com and 20% walnut flour blends had the most nutrient value while carbohydrate was low. It was also the least preferred in the sensory analysis. However, sample B was most preferred by the assessors amongst the blend ratios in taste, colour, texture, appearance and aroma.

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