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Quality Evaluation of Gurasa: A traditional Snack Produced from Wheat, Acha and Moringa Leave Composite Flour

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Abstract

Gurasa is a delicacy that was introduced to Kano by settlers from the Kingdom of Saudi Arabia, who settled around the ancient Dala hills, and widely consumed in northern Nigeria. In this research, composite 'Gurasa' were produced from wheat and Acha flour blends mixed in the ratio of 90:10, 80:20, 70:30 and 60:40 of wheat to Acha with 10g of Moringa leave powder running through each sample for fortification. Control for the study was produced from 100% wheat flour. The samples were subjected to different methods of quality evaluation. Functional properties of the flours were determined by different standard methods. Proximate analysis was carried out according to AOAC (2005) method. Also, standard methods were used for minerals determination. The products were presented for sensory evaluation by administering 9-point hedonic scale questionnaire, 10 judges indicate their preference for color, taste, aroma, texture and overall acceptability. Data obtained were analyzed statistically by ANOVA. The results of analysis of functional properties showed that foaming Capacity of samples 6.30 % of 100% wheat flour to 7.80% of 60:40 wheat and Acha flour. Also, water Absorption capacity and gelatinization temperature increased with proportional increase in Acha flour. Then proximate analysis revealed that protein content was 12.68 %, 16.22%, 19.65%, 23.00% and 25.70 for 100% wheat gurasa, 90:10, 80:20, 70:30 and 60:40 wheat and Acha respectively. Fat content also increased with increased Acha flour. Mineral composition showed that addition of Acha flour increased the mineral content. Sensory evaluation showed that the taste, aroma and texture of 100% wheat flour gurasa was preferred ($P \leq 0.05$). However, an acceptable gurasa can be produced from the composite flours of wheat and Acha.

Keywords: Gurasa; Fortification; Wheat; Acha and Moringa leave.

Introduction

Gurasa is a delicacy that was introduced to Kano by settlers from the Kingdom of Saudi Arabia, who settled around the ancient Dala hills. It is flat bread made from flour, yeast, baking powder and egg. It can be made with wheat flour or a combination of the two. It is similar to making bread; however, the dough for gurasa is lighter than that of bread. Gurasa can either be fried or baked using a locally made oval earthenware pot known as tanderu. When fried, it becomes circular while the edges become brownish. It becomes tough if exposed to air or kept for more than three days after production. The word, gurasa means bread in Hausa Language. It is so popular a snack in Kano that the state is known as the land of gurasa. It can be consumed, in

contrast to regular consumption pattern. Like, "You can eat Gurasa with tea, if you like with vegetable soup, it can also be eaten with pepper soup, even with suya meat, you will realise that every Suya seller sells Gurasa. Some Gurasa can be eaten with fried egg.

Wheat is a cereal grain used for many purposes but mainly for foods. It is used for making flour for different kinds of bread, for biscuits, cookies, cakes, breakfast cereal, pasta, noodles, and for fermentation to make beer, some other alcoholic beverages, and for making of biofuel. Wheat is also used as a livestock feed, and its straw is used as a construction material. Wheat is an important source of carbohydrates. Globally, it is the leading source of vegetable

protein in human food, having a protein content of about 13%, which is relatively high compared to other major cereals but relatively low in protein quality for supplying essential amino acids. When eaten as the whole grain, wheat is a source of multiple nutrients and dietary fiber. Acha (*Digitaria exilis*) is also referred to as findi or fundi in some areas of Africa, such as the Gambia, with English common names white fonio, fonio millet, and hungry rice or acha rice. The grains are very small and have the potential to improve nutrition, boost food security, foster rural development and support sustainable use of the land. Despite its valuable characteristics and widespread cultivation, fonio has generally received limited attention research and development, which is also why the species is sometimes referred to as an underutilized crop. Fonio has continued to be important locally because it is both nutritious and one of the world's fastest growing cereals, reaching maturity in as little as six to eight weeks. It is a crop that can be relied on in semi-arid areas with poor soils, where rains are brief and unreliable. The grains are used in porridge and couscous, for bread, and for beer.

Moringa oleifera is native to India where it is utilized in a number of preparations. Moringa leaves and seed pods are often eaten for their nutritious value and the roots made into a pungent condiment. The leaf is used extensively in Ayurveda and is typically steeped as moringa tea. It is a tree that has been used for thousands of years in India for everything from food, to building materials, and also for its beneficial properties. This 'wonder tree' truly is wondrous in that each part of the tree is useful. The roots, stems, leaves, seed pods, resin and flowers are considered to be healing herbs in Ayurvedic (traditional Indian healing system) and Unani (traditional Middle Eastern healing system) folk medicine. In modern times, the leaves and seed pods are utilized extensively due to their nutrient content and modern studies are investigating their vast potential. Gurasa generally provides insufficient amounts of certain key nutrient, particularly iron, zinc and calcium to meet the recommended nutrient uptake for human, hence this study seeks to produce gurasa from wheat, acha and moringa leave powder and evaluate its nutritional content.

Materials and Methods

Sample Collection

Wheat flour, Acha (Hungary Rice) flour, moringa leaves, yeast, salt and water were purchased from Kasuwan Barci market Kaduna. The equipment and reagents used were obtained from the workshop and quality control laboratories of the department of food technology, Kaduna Polytechnic. All reagents used were of analytical grade.

Sample Preparation

Production of Acha Flour

The Acha grains were cleaned by winnowing over a tray and sorted by hand picking of unwanted particles. The grains were then washed with tap water. This was followed by draining of excess water and then drying in a tray dryer at 60°C for 6 hours. The dried grains were then milled to fine flour (400µm particle size) in a hammer mill. Figure 1 shows the flow Diagram for the production of Acha Flour

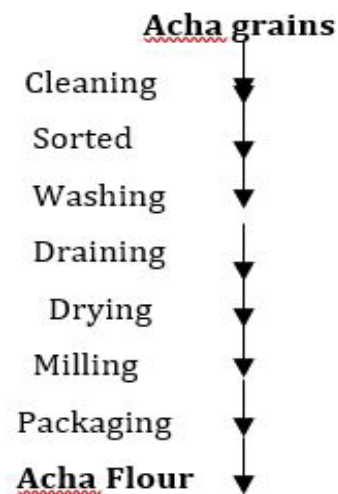


Figure 1: Flow Diagram for the production of Acha Flour

Production of Moringa Leave Flour

Fresh Moringa leaves collected from the Moringa Tree plant and were washed with tap water. This was drained and dried in an Oven tray dryer at 50°C for 3 hours and then milled into fine powder (120µm particle size) using a dry mill blender. Figure 2 shows the flow chart for the production of Moringa leaves powder.

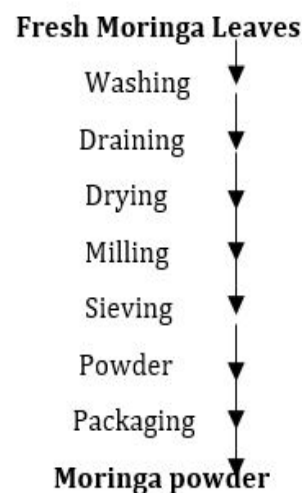


Figure 2: Flow chart for the production of Moringa leaves powder.

Production of Gurasa

The wheat, acha and moringa flour were sieved, weighed and mixed evenly. All the remaining dry ingredients were weighed at appropriate amount and added to the mixture. 350mls of tap water was added to the mixture for the 1st fermentation for 20 minutes at 27°C. The mixture was allowed to ferment for the 2nd time for 40 minutes of 27°C. The baking pan/tray was greased with vegetable oil. The fermented mixture was placed and arranged on the baking pan. It was allowed to proof and baked in the oven at 170°C for 10 minutes. When baking was completed, it was allowed to cool at room temperature for 10-15 minutes. The Gurasa was then packaged using a cellophane wrapper.

Analytical Methods

The proximate composition, functional properties and mineral elements to determine how much of major or macro components were determined according to standard methods as described by AOAC (2012) with some little modification. The carbohydrates were determined by difference using the formula: % carbohydrate = 100 - (% protein + % ash + % crude fiber + % crude fat + % moisture) [1].

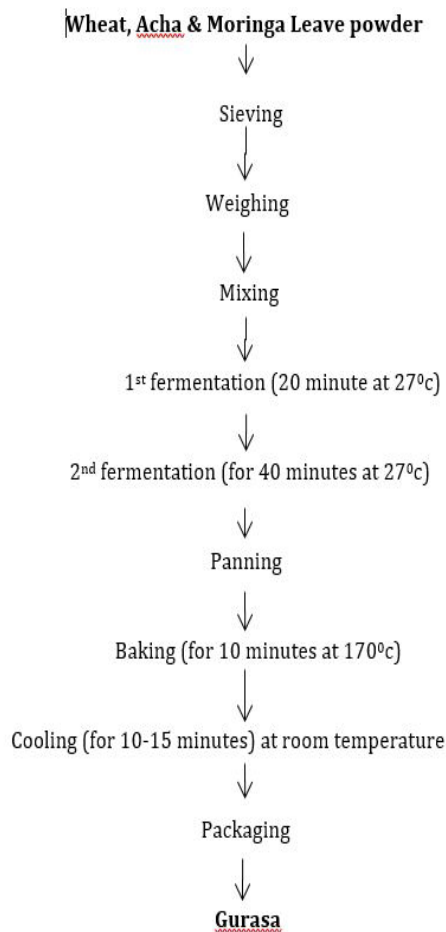


Table 1: Functional Properties of Gurasa' Produced from Wheat-acha-moringa Flour Blends.

Functional Properties	A	B	C	D	E
Bulk Density (g/ml)	0.72	0.75	0.8	0.84	0.87
Water Absorption Capacity (%)	2.44	2.6	2.7	2.78	2.86
Swelling Capacity (g/ml)	5.7	6.1	6.33	6.71	7.22
Gelatinization Temperature (°C)	67.25	67.46	73.03	78.4	80.62
Foaming Capacity (g/ml)	6.1	6.42	7	7.45	7.83

Sample A=100%wheat flour, B= 90:10:10g wheat, acha & moringa leave powder, C= 80:20:10g wheat, acha & moringa leave flour, D= 70:30:10g wheat, acha & moringa leave powder, E=60:40: 10g wheat,acha & moringa leave flours.

Table 2: Proximate composition of composite 'Gurasa' produced from wheat-acha-moringa leave flour Blends.

% Composition	A	B	C	D	E
Moisture	6.96	7.37	7.55	8.15	9.33
Protein	12.68	16.22	19.65	23	25.7
Crude Fat	4	4.25	4.72	5.6	6.22
Crude Fibre	1.85	2.6	3	3.6	4.1
Ash	2.1	3	3.42	3.8	4.33
Carbohydrates	72.41	66.56	61.66	55.85	50.32

Sample A=100%wheat flour, B= 90:10:10g wheat, acha & moringa leave powder, C= 80:20:10g wheat, acha & moringa leave flour, D= 70:30:10g wheat, acha & moringa leave powder, E=60:40: 10g wheat,acha & moringa leave flours.

Table3: Mineral composition (mg/100g) of Gurasa produced from wheat-acha-moringa leave flour Blends.

Minerals content	A	B	C	D	E
calcium	28.22	32.01	35.34	41.12	44
Phosphorous	134.31	140.55	172	181.2	188.65
Iron	4.8	5.6	7	8.4	9.32
Sodium	16.22	16.41	16.7	17	17.28
Potassium	136.72	145.33	160.15	173	180.51

Sample A=100%wheat flour, B= 90:10:10g wheat, acha & moringa leave powder, C= 80:20:10g wheat, acha & moringa leave flour, D= 70:30:10g wheat, acha & moringa leave powder, E=60:40: 10g wheat,acha & moringa leave flours

Table 4: Sensory Evaluation of composite 'Gurasa' produced from wheat-acha-moringa leave flours.

Sensory parameters	A	B	C	D	E
color	7.3	7.25	7.13	7.05	6.7
taste	7.65	6.88	6.61	6.35	6.1
Aroma	7.45	6.83	6.95	7.15	7.38
texture	7.8	7.51	7.1	6.85	6.51
Overall acceptability	7.88	7.3	7.12	6.92	6.7

Sensory Evaluation

The 'gurasa' samples were presented to 10 judges who were familiar with 'gurasa' bread to indicate their preference for the samples on the basis of colour, taste, aroma, texture and overall acceptability using a 9-point hedonic scale. Data obtained were analysed statistically by analyses of variance ($p \leq 0.05$). Means that differ significantly were determined by Least Significant Difference [2].

Statistical analysis

The data generated were analyzed using analysis of variance (ANOVA), and means were separated using Duncan's Multiple Range Test (DMRT) at 5% level of probability. The statistical package for social scientist (SPSS) software, version 20.0 was used for the analysis.

Results and Discussion

Functional Properties of Gurasa Produced from Wheat-acha-moringa Flour Blends

The result of functional properties which affect the end use of any food and how such food behaves during preparation for consumption is presented in Table 1. The results revealed that the bulk density of the flour for production of composite 'gurasa' increased proportionally with increase in concentration of Acha in the mixture. The bulk density increased from 0.72 g/ml to 0.87 g/ml. Chandra et al., (2015) reported that there was an increase in bulk density from 0.80 to 0.88 g/ml of composite flour with 5% green gram flour respectively. The bulk density of mixtures of cassava and maize, cassava and rice, 100% cassava and 100% wheat flours did not differ significantly [3-15]. Similarly, the water absorption capacity of the samples increased from 2.44 to 2.86 % as the quantity of Acha increases from 10 to 40. The temperature at which gelatinization of starch take place is known as the gelation temperature. This research revealed that the gelatinization temperature of 100% wheat flour was 68.25 oC. The temperature increased with proportional increase in acha flour in the mixture. This finding was also in agreement with Chandra et al., (2015), where gelatinization temperature of composite flour increased from 65.34 to 77.20 oC in a

sample containing 5% green gram flour. However, there was a decrease in swelling power with increase in concentration of acha flour in the mixture [16-28]

Proximate Composition of Gurasa Produced from Wheat-acha-moringa Leave Flour Blends

Table 2 Shows the results of proximate analyses of composite 'gurasa' produced from wheat-acha flours blend. The result showed that the percent protein content of the samples were 12.68 %, 16.22 %, 19.65 %, 23.00 % and 25.70 % of 100% wheat 'gurasa', 90;10 of wheat and acha flours, 80;20 of wheat and acha flours, 70;30 of wheat and acha flours respectively. This showed that the protein content increased with increase in the acha flour in the mixture [29-35]. 'Gurasa' made from 70;30 mixture of wheat and acha flours contain higher than 50:50 water melon seed and cassava composite flour for production of cookies (Ubbor and Akobundu, 2009). Also, the fat content of yam-soybean, composite 'gurasa' increased with increase in the amount of wheat flour in the mixture. Ash residue, generally considered as a measure of the minerals content of the original food also increased with increase in the amount of acha in the composite 'gurasa' [36-42].

Mineral Composition (mg/100g) of Gurasa' Produced from Wheat-acha-moringa Leave Flour Blends

The minerals content of 'gurasa' produced from wheat-acha flours blend is presented in Table 3. It was revealed that calcium content were 28.22, 32.01, 35.34, 41.12 and 44.00 in 100% wheat flour, 90:10 wheat and Acha, 80:20 wheat and Acha flour and 70:30 wheat and Acha flours respectively. Increase in phosphorus content also follow similar pattern. Sharp rise in these minerals as a result of increase in wheat flour concentration can be attributed to high mineral content of Acha (IITA, 2016c). Calcium is required for healthy bone formation (Bolarinwa et al, 2015). There were little changes in sodium content as a result of presence of Acha in the products. Mngohol et al., (2022) reported similar trend with increase in sodium content from 15.66 mg/100g to 22 mg/100g in mumu, a traditional food produced from sorghum. (Mngohol et al., 2022).

Sensory Evaluation of Gurasa Produced from Wheat-acha-moringa Leave Flour Blends

The result of sensory evaluation, which measures human responses to the composition of the food is presented in Table 4. The results showed that the preferences for taste, aroma and texture decreased with increase in amount of Acha flour in the sample [43-48]. However, all the products were accepted by the judges. There was no significant difference in colour among these samples

Conclusion

Incorporating Acha and moringa leaf powder into wheat 'gurasu' yield product with higher nutrient content. Increase in nutrients is proportional to the amount of Acha added. Composite flours of wheat and Acha produced 'gurasu' with higher levels protein, fat, calcium, phosphorus and iron. Also, addition of Acha and moringa for the production of 'gurasu' increased the functional properties of the mixture. Even though, the taste, aroma and texture of 'gurasu' produced from 100% wheat flour was preferred, but product with acceptable sensory qualities can also be obtained from a composite of wheat, Acha and Moringa.

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