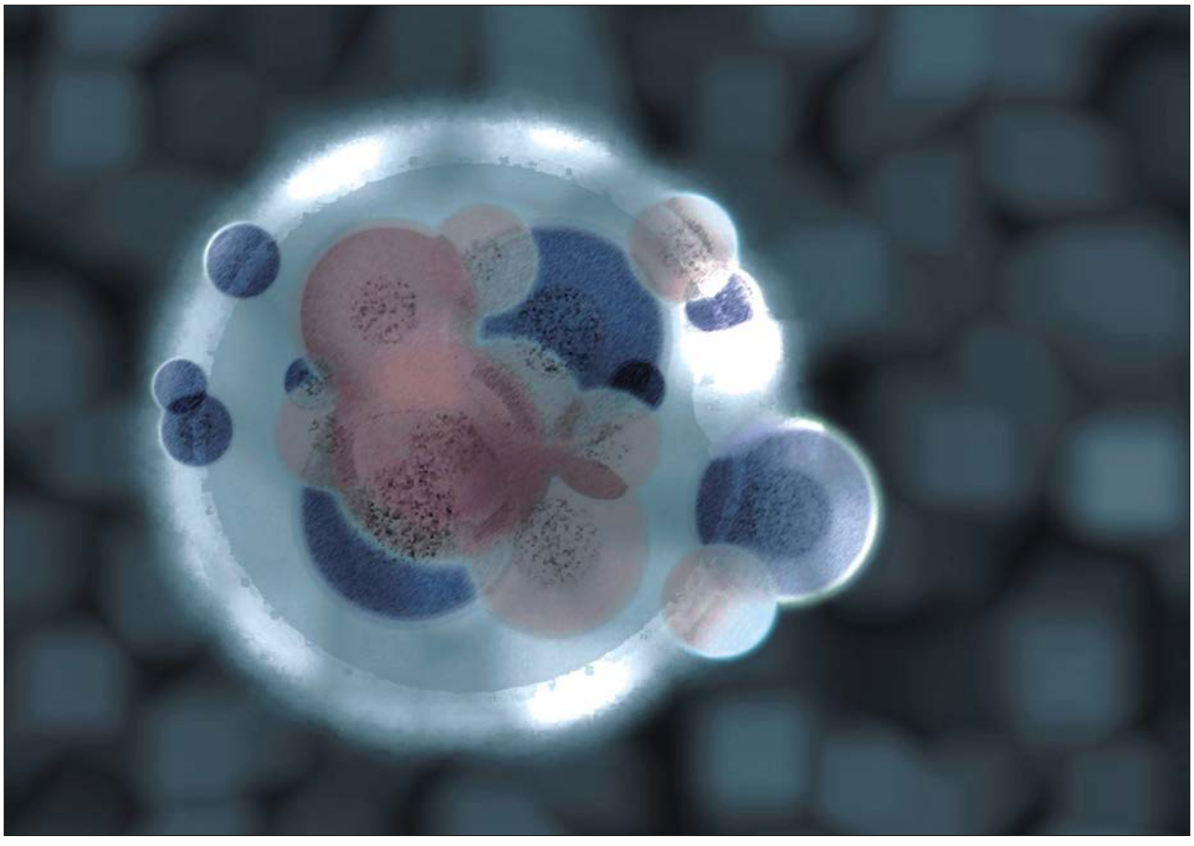

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Production, Chemical and Sensory Properties of Ogi from Different Pearl Millet Varieties

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Abstract: Chemical composition, yield of ogi and by-products was studied using six pearl millet varieties. The six pearl millet varieties used for the ogi production are Ex-Borno, Zango and Gwagwa (Local varieties) and LCIC-9702, GB-8735 and SOSAT-C88 (improved varieties). The proximate chemical composition of the pearl millet grain ranged from 10.09 to 10.95% moisture, 11.34 to 12.97% protein, 3.67 to 4.51% fat, 1.20 to 1.52% ash and 70.15 to 72.52% carbohydrate. While the chemical composition of the ogi products from same millet varieties range from 6.687 to 9.1% moisture 8.60 to 9.27 protein, 3.9 to 6.0% fat, 1.39 to 1.62% ash and 74.46 to 77.42% carbohydrate. Statistically significant differences existed in crude fat and available carbohydrate in both grain and their ogi products. The yield of ogi and by products ranged from 63.78 to 81.22% as ogi 21.00 to 36.17% as bran, 2.35 to 4.21% as soluble, while 99.92 to 107.9 as total dry matter. Statistically significant ($p<0.05$) differences existed within the pearl millet varieties with respect to yield of ogi and by products. There were differences observed in the amino acid profile of all the ogi sample from the different pearl millet varieties. The lysine, valine, methionine and isoleucine contents of the ogi sample were lower than the FAO/WHO recommended daily allowance. While ogi from Zango, LCIC 9702 and SOSAT-C88 had leucine content higher than the FAO/WHO recommended daily allowances.

Key words: Local, improved pearl millet cultivars, ogi

INTRODUCTION

Ogi a cereal based fermented thin porridge is mainly produced from sorghum, corn and millet[1,2]. Ogi is a popular traditional weaning food and also consumed by the old as breakfast cereal. Many workers Adegoke *et al.*[3]. Bamigo and Muller[4] have evaluated the production and physicochemical properties of ogi from maize and sorghum). Similar detailed information is lacking for pearl millet based ogi. Consumer acceptance of pearl millet ogi is very important. It is therefore necessary to consider cultivars acceptance in relation to the quality of the product made from it.

As reported by Akingbala *et al.*[5] acceptance of new cultivars is often limited because they do not have desirable food quality for use in traditional foods. Consistent supply of good quality grain. Until a source of good quality pearl millet the major constraint in the development of millet foods is the lack of can be produced, millet based products will continue to be inferior. Breeding grains that have superior quality traits will certainly give rise to processed ogi that can be successfully and competitively be marketed. The yield of ogi from new cultivars, its chemical composition and sensory properties are additional factors to consider for the release of a cultivar for increased farmers cultivation.

Therefore this study, compared the yield, chemical and sensory qualities of ogi from local and improved cultivars.

MATERIALS AND METHODS

The six pearl millet varieties used in this was study are Ex-Borno, Zango, Gwagwa (local) and SOSAT- C88, GB-8735 and LCIC9702 (improved varieties) were obtained from Lake Chad Research Institutes Maiduguri, Borno State, Nigeria, immediately after harvest. They have the mandate for millet varietal improvement. Grain samples were cleaned and stored at 0°C until required.

The moisture, crude protein (N×6.25), crude fat and ash contents of pearl millet samples and ogi were determined using relevant AOAC[6] methods. Carbohydrate was determined by difference. The titratable acidity and pH of the grain samples and the ogi were

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determined according to Nkama *et al.*[7] methods. Soluble solids in steep liquor and wash water were determined gravimetrically Akingbala *et al.*[5] by drying a 5 mL aliquot in an air oven set at 130°C for 2 h and weighing the residue.

Ogi preparation: Ogi was produced by the laboratory method as described by Akingbala *et al.*[5]. as follows: About 100 g of each pearl millet sample was washed and steeped in 200 mL of distilled water for 3 days. The steeped grain was then ground in a waring blender with 200 mL of distilled water. The slurry was then sieved through cheesecloth, using 600 mL of water as extraction solvent. The extract was allowed to settle for about 18 h and the top water decanted. The ogi sample was dried in the sun on white cardboard sheets placed on wooden platforms.

Ogi recovery: Ogi recovery was determined by drying the ogi in air oven set at 60°C to a constant weight. A weighed sub-sample of the ogi was then dried at 130°C in an oven for 2 h and the residual moisture content determined[5]. the ogi recovery is the total weight of ogi divided by 100 g of pearl millet on dry weight bases.

Amino acid determination: Dried ogi sample (4 g) from each pearl millet variety was defatted using soxhlet apparatus with chloroform: m ethanol (1:1v/v) as extraction solvent AOAC[6] for 6 h. About 30-50 mg of the defatted ogi was hydrolyzed at 110°C for 24 h with 6 NHCl. The ampendes, was then broken, filtered and evaporated to dryness at 40°C under vacuum in a rotary evaporator (CADTEEH SODETEC, 6, 19, 300.60, 203, France). The residue was then dissolved in 5 mL acetate buffer (pH 2.0) and stored in plastic specimen bottle at 0°C until required. The amino acid from each ogi sample was then determined in a Technician Sequential Mutter sample (TSM) amino acid analyzer. The amino acid content of each ogi sample was then determined by using the area under the curve of the chromatogram peak as described by Spackman[8].

Sensory evaluation: The quality of ogi from each cultivar was evaluated by a panel composed of Nigerians from different groups in the University of Maiduguri, Nigeria on the basis of color, taste, texture, consistency and overall acceptability. A nine point hedonic scale was used where 9 was liked extremely and 1 disliked extremely[9]. Data from each parameter was reported as a mean of 30 observations. A 10% (dry weight basis) paste of each ogi was cooked and 5% sugar added.

Statistical analysis: Analysis of Variance (ANOVA) was used to determine the differences within the cultivars and Duncan Multiple Range test was use to separate the means[10].

RESULTS AND DISCUSSION

There was no significant difference in moisture, protein and ash contents of the pearl millet varieties used in the ogi production. Fat and carbohydrate differed significantly (Table 1). Hadimani *et al.*[11] and Nkama *et al.*[7], have reported similar variations in proximate composition. The factors that affect the proximate composition of pearl millet include agronomical and genotype.

The proximate composition of the ogi from the different pearl millet varieties indicates there were no significant differences in the protein and ash contents of the ogi samples, but crude fat, carbohydrate and moisture content differed significantly ($p<0.05$) (Table 2). The average total loss of protein during ogi preparation as a result of fermentation, grinding and sieving were about 13.7, 19.3, 25.6, 29.7, 29.0 and 31.8%, respectively for Ex-Borno, SOSAT C88, Gwagwa, GB 8735, Zango and LCIC 9702, respectively. Nkama *et al.*[7] reported similar results for the recovery of protein 8.4-9.6% for some pearl millet cultivars. The overall mean loss for protein was 24.85%. the ash content recorded in study was higher than that reported by Nkama *et al.*[7] (3.97-5.66), Akigbala *et al.*[5] for sorghum ogi.

There were significant variations ($p<0.05$) in the yield of ogi from the different pearl millet varieties (Table 3). SOSAT-C88 had the lowest yield (63.78%) of ogi and Gwagwa gave the highest yield (81.22%). A higher yield of ogi was obtained in study compared to the yield obtained by Nkama *et al.*[7] of 57.99-59.84%. Akingbala *et al.*[5] reported a mean yield of ogi 68.4-79.0% for seven different sorghum cultivars. This result compares well with Akingbala *et al.*[5] results. The solubles and bran accounted for means of 3.44-27.10%, respectively.

The amino acid profile of ogi from the six pearl millet varieties is presented in Table 4 along with Food Agricultural Organization and World Health Organization recommended daily allowances for essential amino acid for comparative purposes. There were differences in the amino acid profiles of all the ogi samples from the different pearl millet cultivars. The lysine, threonine, alamine, valine, methionine and isoleucine contents of the ogi samples were lower than the (FAO/WHO) recommended daily allowances (Table 4). Ogi from Zango, LCIC-9702 and SOSAT-C88 had leucine contents higher than the (FAO/WHO) recommended daily allowances. Also Gwagwa, Zango, Ex -Borno, LCIC 9702 and SOSAT C88 had tryptophan contents higher than the FAO/WHO

Table 1: Chemical composition of pearl millet (Grain) varieties used in ogi production

	Chemical composition (%)				
Varieties	Moisture	Protein	Crude fat	Ash	Carbohydrate
Ex-ORNO	10.74±0.51	10.73±1.01	4.22±0.28[a]	1.53±0.15	72.78±1.56[a]
SOSAT-88	11.09±0.55	11.34±0.95	3.67±0.31[b]	1.20±0.11	72.52±1.60[b]
GWAGWA	10.89±0.45	12.51±1.20	4.51±0.25[c]	1.52±0.16	72.11±1.70[b]
GB-8735	10.09±0.50	12.24±1.01	4.13±0.30[a]	1.43±0.14	71.23±1.58[c]
ZANGO	10.92±0.43	12.85±1.12	4.50±0.29[c]	1.36±0.13	70.36±1.61[d]
LCIC-9702	10.64±0.47	12.97±1.13	4.8±0.26d	1.44±0.17	70.15±1.55d
LSD (5%)	NS	NS	0.35	NS	1.23

Table 2: Chemical composition of ogi from different pearl millet varieties

	Chemical composition (%)				
Varieties	Protein	Crude fat	Crude ash	Moisture	Carbohydrate
EX-ORNO	9.26±0.40	5.05±0.33[a]	1.58±0.25	6.68±0.43[a]	77.42±0.35[a]
SOSAT-C88	9.15±0.91	4.97±0.28[b]	1.53±0.10	7.68±0.55[b]	77.10±1.17[a]
GWAGWA	9.27±0.57	4.24±0.25[c]	1.38±0.18	8.78±0.59[c]	76.93±0.12[b]
GB-8735	8.60±0.36	4.18±0.16[c]	1.60±0.25	8.47±0.58[d]	77.17±0.93[a]
ZANGO	9.12±0.40	3.90±0.40[d]	1.62±0.16	9.31±0.35[e]	76.05±0.74[c]
LCIC-9702	8.85±0.42	6.00±0.12[e]	1.49±0.14	9.08±0.15[f]	74.46±0.51[d]
LSD(5%)	NS	0.45	NS	0.84	1.30

Table 3: Percentage yield of ogi, bran, water soluble and total dry matter

Varieties	Yield of ogi (%)	Yield of bran (%)	Water soluble (%)	Total dry matter (%)
GB-8735	68.41±1.39[a]	27.60±1.39[a]	4.21±0.14[a]	99.92±1.20[a]
EX-BORNO	70.47±0.96[b]	28.06±0.96[b]	2.47±0.24[b]	101.00±1.54[b]
SOSAT-C 88	63.78±0.29[c]	36.17±0.29[c]	2.35±0.40[c]	102.40±0.46[c]
LCIC-9702	75.20±0.59[d]	20.95±0.58[d]	4.11±0.40[d]	100.40±0.54[b]
ZANGO	75.65±0.35[d]	28.70±2.18[e]	3.88±0.24[e]	107.90±1.96[d]
GWAGWA	81.22±0.25[e]	21.00±0.12[f]	3.62±0.49[f]	105.90±0.72[e]
LSD (5%)	1.27	1.87	0.68	1.98

Values are means of triplicate determination, Values with different superscript vertically along a column are statistically significant ($p<0.05$).

Table 4: Amino acid profile of ogi sample produced from six pearl millet varieties

Amino acids (Mg/g)	Gwagwa	Zango	GB-8735	Ex-Bomo	LCIC-9702	SOSAT-C88	FAO/WHO
Lysine	2.88	2.66	2.12	2.51	2.78	2.75	4.2
Histidine	1.69	2.07	1.45	1.96	2.04	2.08	-
Arginine	2.79	2.79	2.57	2.98	33.22	3.11	-
Aspartate	3.34	4.14	3.02	3.82	4.20	3.90	-
Threonine	2.35	2.12	0.90	2.58	1.85	2.02	2.8
Serine	1.03	1.08	9.05	1.01	0.98	1.11	-
Glutamate	8.51	10.9	0.85	11.10	10.59	10.43	-
Proline	0.95	1.00	1.63	0.78	1.23	1.11	-
Glycine	1.52	1.95	2.70	1.84	2.19	2.00	-
Alanine	2.61	2.83	0.44	2.94	2.94	2.90	-
Cysteine	0.48	0.63	0.44	0.49	0.85	0.69	2.0
Valine	1.78	2.19	1.77	1.99	1.81	2.23	4.2
Methionine	0.91	1.20	0.82	1.00	1.04	1.16	2.2
Isoleucine	2.00	2.02	1.85	2.25	2.31	2.31	4.2
Leucine	4.18	5.59	4.04	3.08	6.12	6.23	4.8
Tryptophan	1.80	2.11	1.20	1.94	2.04	2.39	1.4
Phenylala-nine	2.25	3.19	1.77	2.93	3.46	3.13	2.8

WHO= World Heath Organization, FAO = -Food and Agriculture Organization

Table 5: Sensory evaluation data of the six-ogi samples

Varieties	Colour	Odour	Taste	Texture	Overall acceptability
Commercial ogi	5.65±1.70	5.68±1.31	6.11±1.58	6.41±1.90	6.35±1.58
Gwagwa	7.00±1.62	6.20±1.45	6.07±1.78	5.50±2.15	6.29±1.60
GB-8735	5.83±1.97	5.97±1.97	6.23±2.03	5.60±1.89	6.28±1.81
Zango	6.83±1.68	5.60±1.71	5.83±1.93	7.14±0.38	6.43±1.40
SOSAT-C88	6.70±1.54	5.73±2.21	6.30±1.69	5.87±1.76	6.43±1.60
Ex-Boruo	6.63±1.52	5.53±2.36	6.17±1.95	7.07±0.98	6.82±1.49
LCIC-9702	7.03±1.40	6.62±1.59	6.83±1.67	6.79±0.76	6.93±1.69
LSD (5%)	NS	NS	NS	NS	NS

recommended daily allowances. Phenylalamine was higher in Zango, LCIC-9702 and SOSAT-C88. All the from the six pearl millet varieties had high contents of the amino acid glutamate. The differences in the essential amino acid content among the ogis from the different pearl millet cultivars could be as a result of varietal differences. Protein content and composition are known to vary due to agronomical conditions (water availability, soil fertility, temperature and environmental conditions drying grain development and genotype. All the six pearl millet cultivars were grown under similar agronomical conditions. Variations appear essentially to be due to varietal differences.

Since lysine and some other amino acids were low in ogi, it is therefore essential that ogi be supplemented with milk or grain legume flour to increase the lysine and possibly other essential amino acids as ogi is used for weaning food. Ogi supplemented with soybean flour has been reported, although the universal acceptance of this mixture is still low.

There were no significant differences in the acceptability of the ogi from the six different varieties (Table 5). The lack of significant differences among the ogi samples suggests that an acceptable ogi can be produced from all the cultivars. In a previous report by Nkama *et al.*[7], the overall acceptability of ogi from Zango, SOSAT-C88 and Ex-Borno were similar.

In conclusion the ogi from the pearl millet Gwagwa, a local variety, gave the highest ogi yield. The differences observed in the chemical composition and sensory qualities within the pearl millet varieties reported in this study may be attributed to the varietal effect, since some are improved while others are local varieties.

REFERENCES

1. Adeyemi, I.A. and S. Umar, 1994. Effect of corn variety on ogi quality. J. Food Sci., 52: 3222-324.
2. Adeyeye, A. and K. Ajewole, 1992. Chemical composition and fatty acid profiles in Nigerian. Food Chem., 44: 41-44.
3. Adegoke, G.O., E.J. Otutumu and A.O. Akanji, 1994. Influence of grain quality, heat and processing time on the reduction of Aflatoxin B_1 levels in Tuwo and Ogi., 2 cereal based products. Plant Foods for Human Nutrition, 45: 113-117.
4. Bamigo, E.O.I and H.G. Muller, 1972. Manufacture of ogi (a Nigerian fermented cereal porridge) comparative evaluation of corn. Sorghum and millet. Cum. Inst. Food Sci. Technol. J., S: 217-21.
5. Akingbala, J.O., L.W. Rooney and J.M. Faubion, 1981. A laboratory procedure for the preparation of ogi a Nigerian fermented food. J. Food Sci., 46: 1523.
6. AOAC, 1984. Association of Official Analytical Chemist 14th Ed. Washington D.C., pp: 249-252.
7. Nkama, I., S. Dappiya, S. Modu and W. Ndahi, 2000. Physical, chemical, Rheological and sensory properties of Akama from different pearl millet cultures. J. Arid Agric., 10: 145-149.
8. Spackman, D.H., W.H. Stein and S. Moore, 1958. Automatic recording apparatus for use in the chromatography of amino acids. Anal. Chem., 30: 1171-1207.
9. Williams, A.A., 1982. Scoring methods in the scoring analysis of foods and beverages at long Ashton Research Station. Food Technol., 17: 163-175.
10. Gomez, M.I.H.G., A.B. Obilana, D.F. Martin, M. Madzavamuse and E.S. Monyo, 1997. Manual of Laboratory Procedures for Quality Evaluation of Sorghum and Millet ICRISAT, Patancheru, 502324, Andhra Pradesh, India.
11. Hadimani, N.A., S.Z. Ali and N.G. Malleshi, 1995. Physicochemical composition and processing characteristics of pearl millet varieties. J. Food Sci. Technol., 32: 193-198.