PJN
ISSN 1680-5194

PAKISTAN JOURNAL OF NUTRITION

ANSInet
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Pakistan Journal of Nutrition 4 (4): 257-261, 2005
ISSN 1680-5194

Nutritional Composition of Garri Sievates Collected from Some Locations in Southern Nigeria

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Abstract: The study was initiated to determine the chemical composition of white and yellow garri sievates collected from ten locations in Southern Nigeria. Parameters measured were proximate (DM, CP, EE, CF, NFE, Ash), Caloric Value, HCN, neutral detergent (NDF) and acid detergent (ADF) fibres, hemicellulose and starch. Others were Ca, P, S, Na, K and Mg. The results indicated zonal variation for some of the measured indices (whether for white or yellow sievates). Also, apart from the EE and HCN constituents of the two types of sievates, all other measurements were not appreciably different. Results revealed a DM of 86.80, CP (1.17%), CF (2.45%), EE (0.76%), Ash (1.2%), NFE (94.44%) and 389.16kcal/100g for the combined samples. However, the EE for the white and yellow sievates were 0.41% and 1.10% respectively, and similarly 1.44 and 0.93 mg/100g for HCN.

Key words: White garri sievates, yellow garri sievates, chemical composition

Introduction

Cassava is a perennial herbaceous shrub which has numerous uses. Although its origin is not from Africa, it has been reported (FAO, 1991) that Africa produced 72.7 million tuber tones of the world's 158.1 million tuber tones. Similarly, Nigeria produced 26 million tuber tones of this figure (i.e. about 17%) of world's total and about 36% of African's total). Among the secondary waste products derived from cassava processing is the garri sievate (Bokanga, 1995; Hahn, 1989; Oke, 1968) which is a by-product obtained from cassava during the production of garri. It is obtained when fried garri is passed through a sieve and it is made up of two types (white or yellow). Our preliminary investigation indicated that these products are mainly waste especially in the rural areas. Consequently, our group decided to cover the zone in order to ascertain the basic composition of the products.

Thus, this investigation was initiated to determine some chemical (as nutritional) composition of the two types of garri sievate found in the zone where our laboratory is situated.

Materials and Methods

White and yellow garri sievates used for this investigation were collected from 10 zonal locations (Auchi, Okada, Ubiaja, Ekpoma, Abudu, Agbor, Ikpoba-Okha, Oredo, Ekosodin and Egba) such that both samples were obtained on each point. It was ensured that in all the locations visited, the same procedures of processing were adopted. The freshly harvested cassava is peeled, washed and grated in a diesel powered mechanical grater. The grated pulp is packed into bags, allowed to undergo the process of fermentation and dehydration (dewatering). The dewatered cassava is left overnight before frying. Prior to frying, the cassava dewatered is sieved by hand through a sieve and the coarse lump left after sieving-out the garri is known as the garri sievate.

Thereafter, samples were sun dried (30 - 35°C) and blended using a grinder. After grinding, each sample was packed in a separate container and subsequently labeled for proper identification.

Chemical analyses of samples were carried out using AOAC (1980) procedures. The variables analyzed were cyanide, calorie, neutral detergent fibre (NDF), Acid detergent fibre (ADF), hemicellulose, Starch and minerals (Ca, P, S, Na, K, Mg). The caloric values were calculated using the formula 4(%CP) + 9(%EE) + 4(%NFE) as reported by Oyenuga (1968).

Results

The proximate composition of the white garri sievates samples from the study in Southern Nigeria are presented in Table 1 and 2, while the mineral constituents are shown in Table 3. Results for that of the Yellow garri samples are represented in Table 4 and 5 (proximate constituents) and mineral components (Table 6).

For the white garri sievates, all parameter measured (except DM, Ash, NFE, Caloric value, NDF and Mg) were significantly ($P<0.05$) affected by location. The values indicated that DM ranged between 85.00% and 87.70%, while the CP were between 0.61 in zone 7 and 1.38 in zones 9, and 3 (1.37%). Those for the CF were between 1.66% (location 10) and 3.64 in zone 9; EE (between 0.26% and 0.61%); and acid detergent fibre (ADF) between 1.84% in zone 1 and 2.43% in zone 10. Others

Table 1: Chemical Composition of White Garri Sievates According to Zones

	Constituent (S)						
Zone	DM (%)	CP (%)	CF (%)	EE (%)	ASH (%)	NFE (%)	CV (Kcal/100g)
1	86.70	1.04^{a}	2.60^{a}	0.38^{a}	1.26	94.72	386.46
2	87.70	1.27^{b}	1.89^{b}	0.48^{b}	1.19	95.17	390.08
3	87.10	1.37^{b}	2.58^{a}	0.61^{c}	1.10	94.34	388.33
4	86.70	1.06^{c}	2.00^{b}	0.38^{a}	0.99	95.57	389.94
5	86.30	0.96^{ac}	2.10^{b}	0.30^{d}	1.00	95.64	389.10
6	86.70	0.63^{d}	2.28^{ab}	0.48^{b}	1.07	95.54	389.00
7	86.50	0.61^{d}	3.41^{c}	0.44^{ab}	0.99	94.55	384.60
8	85.00	0.91^{ac}	2.91^{a}	0.33^{ad}	1.10	94.75	385.61
9	86.30	1.38^{b}	3.64^{c}	0.26^{d}	0.97	93.75	382.86
10	87.20	0.90^{ac}	1.66^{b}	0.39^{a}	1.59	95.46	388.95
X	86.62	1.01	2.51	0.41	1.13	94.95	387.49

^{abcd}Means on the same column with different superscript are significantly (P<0.05) different

Table 2: Cyanide, Fibre Fractions and Starch Composition of White Garri Sievates According to Zones

	Constituent (S)				
Zone	HCN mg/100g	NDF (%)	ADF (%)	Hemicelulose (%)	Starch (%)
1	1.68^{ae}	28.19	1.97^{ab}	27.22^{a}	72.44^{a}
2	1.36^{bce}	28.92	1.90^{ab}	27.02^{a}	73.31^{b}
3	1.59^{abc}	29.04	1.86^{a}	27.18^{a}	72.79^{b}
4	1.15^{c}	30.83	2.01^{b}	28.82^{b}	72.44^{a}
5	1.18^{c}	27.01	1.98^{b}	25.03^{c}	72.09^{a}
6	1.85^{ad}	31.51	2.30^{c}	29.21^{b}	72.44^{a}
7	2.12^{d}	27.57	1.84^{a}	25.73^{c}	72.27^{a}
8	1.54^{c}	29.44	1.89^{ab}	27.55^{a}	70.96^{c}
9	0.84^{f}	28.12	2.01^{b}	26.11^{c}	72.09^{a}
X	1.44	28.97	2.02	26.95	72.37

^{abcd} Means on the same column with different superscript are significantly (P<0.05) different

Table 3: Mineral Composition of White Garri Sievates According to Zone

	Constituent (S)					
ZONE	Ca (%)	P (%)	S (mg/Kg)	Na (%)	K (%)	Mg (%)
1	0.14^{ac}	0.031^{a}	6.72^{a}	0.032^{ac}	0.137^{a}	0.049
2	0.16^{a}	0.027^{b}	6.35^{a}	0.050^{b}	0.097^{b}	0.061
3	0.08^{b}	0.023^{c}	6.72^{a}	0.047^{b}	0.097^{b}	0.061
4	0.10^{bc}	0.021^{c}	8.21^{b}	0.045^{b}	0.063^{c}	0.061
5	0.12^{c}	0.014^{d}	6.35^{a}	0.020^{cd}	0.067^{c}	0.171
6	0.12^{c}	0.024^{c}	6.72^{a}	0.027^{cd}	0.106^{d}	0.134
7	0.24^{d}	0.017^{d}	6.35^{a}	0.023^{cd}	0.079^{b}	0.122
8	0.14^{ac}	0.021^{c}	5.23^{c}	0.047^{b}	0.099^{bd}	0.025
9	0.12^{c}	0.023^{c}	4.48^{d}	0.041^{b}	0.079^{b}	0.085
10	0.14^{ac}	0.022^{c}	7.09^{a}	0.047^{d}	0.133^{ad}	0.073
X	0.14	0.022	6.42	0.039	0.096	0.084

^{abcd} Means on the same column with different superscript are significantly (P<0.05) different

were hemicellulose (25.03 to 29.21%); starch 70.96% in zone 8 and 73.31% in zone 2; Ca (from 0.08 to 0.24%); P (0.04% in zone 3 to 0.031% in zone 9); S (4.48 to 8.21mg/kg); Na (between 0.20 and 0.050%); and K (from 0.63 to 0.137%). The results for the cyanide (mg/100g) were between 0.84 in zone 9 and 2.12 in zone 7. Thus the results for the white garri sievates show that the patterns of variation for the measured parameters were not regular for the zones.

The composition for the yellow garri sievates obtained in

Table 4: Chemical Composition of Yellow Garri Sievates According to Zones

	Constituent (S)						
Zone	DM (%)	CP (%)	CF (%)	EE (%)	ASH (%)	NFE (%)	CV (Kcal/100g)
1	86.70^{a}	1.14^{a}	1.80^{a}	0.94^{a}	1.47^{a}	94.61^{a}	391.46
2	87.20^{a}	1.15^{a}	1.98^{ab}	1.21^{b}	1.21^{bc}	94.45^{a}	393.29
3	86.90^{a}	1.24^{a}	2.25^{b}	1.02^{ab}	1.31^{b}	94.18^{a}	390.86
4	86.60^{a}	1.23^{a}	2.43^{b}	0.93^{a}	1.12^{cd}	94.92^{a}	390.45
5	87.50^{b}	2.78^{b}	2.27^{b}	2.03^{c}	1.28^{bc}	91.64^{b}	395.95
6	87.90^{b}	1.27^{a}	2.16^{ab}	0.97^{ab}	1.06^{d}	94.54^{a}	391.97
7	86.80^{a}	1.14^{a}	3.05^{ab}	1.00^{ab}	1.41^{a}	93.40^{ab}	387.16
8	86.00^{a}	1.01^{a}	2.04^{ab}	1.06^{ab}	1.06^{d}	94.83^{a}	392.90
9	87.10^{a}	1.20^{a}	2.07^{ab}	1.01^{ab}	1.26^{bc}	94.46^{a}	391.73
10	87.00^{a}	1.06^{a}	3.74^{d}	0.79^{a}	1.61^{e}	92.80^{ab}	382.55
X	86.97	1.32	2.38	1.10	1.28	93.92	390.83

^{abcd} Means on the same column with different superscript are significantly (P<0.05) different

Table 5: Cyanide, Fibre Fractions and Starch Composition of Yellow Garri Sievates According to Zones

	Constituent (S)				
Zone	HCN (mg/100g)	NDF(%)	ADF (%)	Hemicellulose (%)	Starch (%)
1	0.77^{a}	27.03^{a}	2.43^{a}	24.60	72.44^{a}
2	0.63^{a}	26.56^{a}	2.03^{b}	24.53	72.87^{b}
3	0.79^{a}	26.98^{a}	2.53^{ac}	24.45	72.61^{b}
4	0.71^{a}	28.76^{ab}	2.64^{c}	26.12	72.35^{a}
5	0.61^{a}	30.76^{b}	2.32^{ad}	28.44	73.13^{c}
6	0.86^{b}	27.48^{a}	2.15^{bd}	25.33	73.48^{d}
7	0.81^{ab}	26.43^{a}	2.15^{bd}	24.28	72.53^{c}
8	1.55^{cd}	38.56^{c}	1.93^{b}	36.63	71.83^{a}
9	9.79^{a}	28.65^{ab}	1.85^{b}	26.80	72.79^{ab}
10	1.73^{d}	29.81^{ab}	2.35^{ad}	27.46	72.70^{ab}
X	0.93	29.10	2.24	26.86	72.67

^{abcd} Means on the same column with different superscript are significantly (P<0.05) different.

Table 6: Mineral Composition of Yellow Garri Sievates According to Zones

	Constituent (S)					
Zone	Ca(%)	P(%)	S(Kg/Kg)	Na(%)	K(%)	Mg(%)
1	0.12^{a}	0.021^{ab}	8.96^{a}	0.047^{a}	0.101^{ab}	0.134^{a}
2	0.10^{a}	0.025^{a}	6.72^{b}	0.047^{a}	0.088^{b}	0.037^{b}
3	0.24^{b}	0.022^{ab}	8.21^{a}	0.047^{a}	0.092^{b}	0.073^{c}
4	0.12^{a}	0.019^{b}	6.72^{b}	0.045^{a}	0.070^{b}	0.061^{c}
5	0.22^{b}	0.040^{c}	7.09^{b}	0.029^{b}	0.128^{c}	0.049^{b}
6	0.14^{a}	0.023^{a}	5.60^{d}	0.027^{b}	0.133^{c}	0.037^{b}
7	0.12^{a}	0.022^{ab}	7.47^{ab}	0.066^{c}	0.097^{b}	0.195^{ad}
8	0.14^{a}	0.023^{a}	3.73^{e}	0.059^{c}	0.099^{b}	0.049^{b}
9	0.10^{a}	0.023^{a}	5.97^{d}	0.066^{c}	0.067^{d}	0.061^{c}
10	0.16^{ab}	0.026^{a}	6.72^{b}	0.063^{c}	0.099^{b}	0.024^{b}
X	0.15	0.024	6.72	0.050	0.097	0.072

^{abcd} Means on the same column with different superscript are significantly (P<0.05) different

this investigation in the zones did not follow a consistent pattern. The statistical analysis of data indicated that apart from the caloric values and hemicellulose, all other indices measured were significantly (P<0.05) influenced by zones. The results also show that for the DM results were not (except for zones 5 and 6) significantly different. Compositions were CP (between 1.01 and 2.78%); CF (from 1.80 to 3.74%); EE (between 0.79% in zone 8 and 2.03% in zone 5); Ash (from 1.06 to 1.47%) and NFE (from 91.64% in zone 5 to 94.92% in zone 4). In addition,

Table 7: Mean Chemical Composition of White and Yellow Garri Sievates used for the Investigation

Type of Sievate	Composition (S)						
	DM (%)	CP (%)	CF (%)	EE (%)	ASH (%)	NFE (%)	CV (Kcal/100g
White	86.62	1.10	2.51	0.41	1.13	94.95	387.49
Yellow	86.97	1.32	2.38	1.10	1.28	13.92	390.83
Mean	86.80	1.17	2.45	0.76	1.21	94.44	389.16
	HCN (Mg/100g)	NDF (%)	ADF(%)	Hemicellulose (%)			Starch (%)
White	1.44	28.97	2.02	26.95			72.37
Yellow	0.93	29.10	2.24	26.86			72.67
Mean	1.19	29.04	2.13	26.91			72.52
	Ca (%)	P (%)	S (Mg/Kg)	Na (%)	K (%)	Mg (%)	
White	0.14	0.022	6.42	0.039	0.096	0.084	
Yellow	0.15	0.024	6.72	0.050	0.097	0.072	
Mean	0.145	0.023	6.57	0.044	0.0965	0.078	

those for the neutral detergent fibre (NDF) and acid detergent fibre (ADF) were (between 26.43 and 38.56%), and (between 1.85 and 2.64%) respectively, and starch, 71.83 in zone 8 and 73.48% in zone 6.

The cyanide content of the yellow sievates were found to be between 0.61 mg/100g in zone 5 and 1.73 mg/100g in zone 10 while those for the minerals were less than 0.3% in samples measured in each of the zones for Ca, P, Na, K and Mg.

Results of the comparative representation for the overall mean compositions for white and yellow garri sievates are represented in Table 7. The values show that apart from the ether extract and cyanide, all others were not appreciably different. Those for the crude fat (EE) showed 0.41% for the white and 1.10% for the yellow sievates, while the cyanide compositions (mg/100g) were 1.44 and 0.93 respectively.

Discussion

The results emanating from this study show that there were comparable results from each zone. However, the variations which existed in the chemical composition within and between locations could be attributable to factors such as type of cultivars, method of cultivation and management practices, age of harvesting, type and length of fermentation. Others could also include method of processing, cultural practice, climatic and soil factors (Jackson *et al.*, 1992).

Although there is no values to compare the results obtained from our yellow and white garri sievates with, they are however comparable (Ngodigha, 1993) to that of cassava sievates (which is the by-product obtained from sieving fermented cassava after dewatering before frying). In comparison, the garri sievates is the product obtained after sieving fried garri.

The cyanide concentration of the sievates were between 0.84 and 2.12 mg/100g for the white garri and, from 0.61 to 1.73 mg/100g for the yellow type. These are in accordance with 1.90 mg/100g for garri as reported by Oke (1968, 1973), and also by Hahn (1983) who found the HCN concentration in 202 garri samples to be between 0.00 and 3.20mg/100g (with a mean of 0.6mg/100g). Thus, the HCN content of garri sievates (white and yellow) from the ten zones (Table 2, 5 and 7) are far below the estimated lethal dose of 40-60mg/kg (4-6mg/100g) as reported by Bokanga (1995; 1994); Tewe and Maner (1981), Osuntokun (1970) and Hunt (1923). However, the differences between HCN content of white and yellow garri sievates beside other factors might be due to the presence of palm oil in the latter. As it has been stated (Mahungu *et al.*, 1987; Hahn, 1983; Oke, 1973; Oyenuga, 1968) that rate of hydrolysis of the cyanide glucosides in cassava to produce the poisonous HCN is greatly reduced with palm oil. Also, the oil treatment may have contributed to the higher crude fat in yellow garri sievates in comparison with that of the white sievates. Since the other measurened parameters were not appreciably different.

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