Nutrient Composition and Weight Evaluation of some Newly Developed Maize Varieties in Nigeria.

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Abstract

The weight and chemical composition of improved white and improved yellow dent maize was compared with some local floury maize varieties. The average protein content was 10.8%, 11.1% and 10.5% in improved white dent, improved yellow dent and local floury respectively. The major carbohydrate in all the varieties was starch with local floury having a slightly higher level of sugar. Improved yellow dent was significantly ($P<0.05$) higher in Ca and Fe than other varieties. However, Wy-1 an improved yellow dent variety was particularly low in Fe. There was no significant ($P> 0.05$) change in the average weight of all varieties. The average weight ranged between 28.2 in improved white dent to 29.8 in improved yellow dent. The yellow dent variety will be particularly useful in improving level of micronutrient intake.

Keywords:- Nutrient composition, white dent, yellow dent, local floury maize varieties.

Introduction

Cereal grains are major source of nutrients for especially the economically less priviledged people of developing countries. Many of these people obtain more than half of both their calorie and protein from cereals (Berg, 1973). There is a wide difference in the type and productivity of cereals among countries. Wheat is an important food item in developed countries and the consumption increases as a nation develops. Rice is an essential food for a large segment of the orient world while inhabitants of some poorer countries depend primarily on maize, barley, sorghum or millet for their staple food (Obatolu, 1998).

In Nigeria, the most important cereals are sorghum, millet, rice, maize and wheat (Wudiri, 1999). Of all these cereals, maize remains the most popularly grown and consumed in all-ecological zones of the country.

The major chemical constituent of the maize kernel is carbohydrate which accounts for 72-73% of the Kernel (Wilson, 1987). Maize protein which ranges from 6 to 12% is regarded to be inferior because it is low in Lycine and tryptophan. FAO, (1983) reported that this poor nutritive value of maize can be improved through better maize breeding, storage, cooking and by a fortification process.

Recently, different maize varieties have been developed. It is therefore necessary to assess the improvement of these new developed maize varieties over the existing local varieties. This study was aimed at comparing the chemical and physical characteristic of newly developed Nigerian maize varieties with existing local varieties.

Materials and Method

Two newly developed maize varieties (White floury and Yellow flint) and local varieties were obtained from Institute of Agricultural Research and Training, Ibadan, Seed store.

Proximate Analysis

The method of A.O.A.C. (1990) with slight modification was used to determine protein, ether extract and crude fibre of the maize sample.

Protein was determined by digestion of sample with H_2SO_4 and H_2O_2 mixture on a block digester (Technicon Industrial Auto-analyzer (Technicon Instrument Corp. 1993)) Fat was determined as ether extract using Soxhlet extraction with diethyl ether.

Crude fibre was determined as organic residue that remained after successive digestion with 0.255N H_2SO_4 and 0.313N.

Available carbohydrate was determined using the method of Southgate (1969). Samples were initially extracted with 90% ethyl alcohol, followed by acid hydrolysis of sugar (free residue). Total sugar in the alcohol extract was estimated by the Dubiss Phenol Suphuric acid method. The sugar in the acid hydrolysate was estimated by the anthrone method and multiplied with a factor of 0.90% to obtain percentage of starch.

Results and Discussion

Table 1 shows the proximate analysis of the maize varieties. The mean protein content was 10.8%, 11.1% and 10.5% respectively for the Improved white dent (IWD), Improved yellow flint dent (IYFID) and (Local floury) LF. Th protein content (11.7%) WY-i, IYFID variety was significantly higher ($p<0.05$) than other varieties. The mean protein

Table 1. Proximate analysis of maize varieties on dry matter basis (g/100g)

			Available CHO			
Varieties	**Protein**	**Fat**	**Starch**	**Total Sugar**	**Crude Fibre**	**Total Ash**
IWD MSB-W[α]	10.9	4.6	64.2	5.4	2.1	1..2
TZSR-W[α]	9.7	5.0	60.3	4.0	2.0	1.1
W-composite[α]	11.2	4.3	64.0	4.2	2.1	1.2
TZB[α]	11.2	3.7	63.5	4.1	1.7	1.3
Mean	10.8	4.4	63.0	4.4	2.0	1.3
IYF/D 096E96[β]	10.5	4.9	60.8	4.8	1.8	1.2
Y-Composite[β]	10.9	4.2	63.1	4.1	1.6	1.4
NSI[β]	11.4	4.8	62.2	4.1	2.1	1.2
WY-1[β]	11.7	4.5	63.0	4.2	1.8	1.3
Mean	11.1	4.6	62.3	4.3	1.8	1.3
Bendel white*	9.7	5.0	60.3	5.0	1.6	1.1
Akure white*	10.8	3.0	62.0	5.0	1.6	1.2
Ikom white*	11.0	4.6	64.3	5.2	1.8	1.3
NLC*	10.4	4.7	61.2	5.0	2.9	1.0
Mean	10.5	4.7	61.9	5.0	1.9	1.2
SE±	0.29	0.82	0.88	0.87	0.2	0.1
LSD (5%)	0.88	NS	2.6	2.6	NS	0.2

[α]Improved white dent
[β]Improved yellow flint/dent
*Local floury varieties

Table 2. Mineral composition of maize grains (mg/100g)

Varieties	**Ca**	**Mg**	**K**	**P**	**Mn**	**Zn.**	**Fe**
IWD MSB-W[α]	43.6	0.12	0.45	0.20	6.0	2.7	29.3
TZSR-W[α]	50.3	0.13	0.48	0.16	39.5	1.8	25.9
W-composite[α]	62.0	0.11	0.45	0.21	42.0	1.5	36.0
TZB[α]	76.0	0.11	0.39	0.24	22.6	5.0	26.0
Mean	58.0	0.12	0.45	0.20	27.5	2.8	29.3
IYF/D 096E96[β]	65.4	0.14	0.48	0.20	22.5	6.0	67.0
Y-Composite[β]	70.0	0.14	0.44	0.18	19.5	5.4	61.0
NSI[β]	78.0	0.12	0.41	0.11	37.5	5.0	66.0
WY-1[β]	80.0	0.10	0.49	0.20	21.8	4.7	24.9
Mean	73.3	0.13	0.45	0.20	25.3	5.3	54.9
Bendel white*	40.5	0.11	0.39	0.20	33.0	3.6	34.5
Akure white*	71.0	0.11	0.47	0.19	12.0	6.6	52.5
Ikom white*	76.0	0.12	0.39	0.18	18.8	4.8	57.2
NLC*	75.0	0.12	0.37	0.20	24.0	4.4	52.8
Mean	67.1	0.11	0.41	0.19	21.5	4.9	49.3
SE±	5.34	0.01	0.02	0.01	6.1	0.99	6.7
LSD (5%)	14.1	NS	0.01	NS	NS	NS	27.0

[α]Improved white dent
[β]Improved yellow flint/dent
*Local floury varieties

content of the yellow variety was significantly higher than the mean value for the improved white and local floury varieties. There was no significant difference in the fat content of different maize varieties. The mean starch value of the maize varieties ranged from 61.9% in LF to 63.0% in IWD. Sugar content was highest in LF (5.0). This high sugar level of the local variety might be responsible for consumer preference for local variety. Starch has been reported to be the major carbohydrate in maize (Wilson, 1987). The value observed for maize starch in the present study was however lower than the range of 71-73% reported by Wilson (1987). This might be as a result of improved level of protein in the newly-bred variety. The value of total sugar observed in the present study was higher than average value (1.4%) observed by Watson (1987). There was no significant ($P>0.05$) difference in the crude fibre and total ash content of all tested varieties. The crude fibre value observed

Table 3. Weight of 100 kernels of maize variety (gm)

IWD[α]	27.9
MSRB-W[α]	25.0
White composite[α]	29.8
TZB[α]	30.0
Mean	28.2
IYF/D 096E96[β]	31.3
Yellow Composite[β]	25.5
NSI[β]	30.0
WY-1[β]	32.3
Mean	29.8
Bendel white*	27.5
Akure white*	31.0
Ikom white*	30.0
NLC*	27.3
Mean	28.9
SE±	1.3
LSD (5%)	3.9

[α]Improved white dent
[β]Improved yellow flint/dent
*Local floury varieties

in the present study was lower than the average value of 9.5% reported by Watson (1987).

Table 2 shows the mineral composition of the maize varieties. The mean calcium content of IYF/D (73.3mg/100g) was significantly ($P<0.05$) higher than mean value observed for IWD (58.0mg) (100g). All IYF/D varieties studied were high in calcium while some varieties like MSRB-W (43.6mg/100g), and TZSR-W (50.3mg/100g) under IWD (improved white varieties were particularly low in calcium. Similarly Bendel white of the local variety (LF) was very low in calcium. The mean value of 67.1mg/100g observed for LF was lower than mean value for IYFID. The mean iron content of IYF/D (54.9mg/100g) was higher than that observed for IWD and LF. All IWD varieties were particularly low in Fe when compared with other varieties. However, WY-1 one of the IYF/D was significantly ($P<0.05$) low in calcium when compared with other maize varieties in the same group. The improved yellow variety composition appears to have a better mineral composition. The use of such variety that is particularly rich in iron and calcium will be useful in reducing prevalence of iron deficiency and assist in bone development in children respectively. There was no significant difference in the P, Mn and Zn content of all varieties. The mean value of the LF varieties was significantly ($P<0.05$) lower than those observed for the improved varieties (IWD and IYF/D).

The weight of 100 kernels of the maize variety is shown in **Table 3**. There was no significant ($P>0.05$) difference in the weight of all the maize varieties.

Conclusion

The use of the improved yellow maize variety compared to the white maize variety in the diet will be of value in reducing incidences of nutrient deficiency of particularly the low-income communities of the developing countries.

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