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Research Paper

Evaluation of the Proximate Composition of two Maize Varieties Planted in Federal Capital Territory (FCT) Abuja, Nigeria

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Chemical analysis of maize grains planted in FCT farm land was carried out. The two maize varieties yellow (Kampam4) and White maize (Rido) were collected from the maize farmland in FCT. Grains samples collected from different farmland were tested for moisture, crude fat, protein and carbohydrate in the laboratory using the AOAC method (1999). The proximate composition results for the two maize varieties showed that the moisture content ranges from (6-15%), crude fat (2-4%), protein (16-30%), ash (2-6%) and carbohydrate (52-77%).The results also showed that there was no significant difference in the proximate composition of the two maize varieties planted in FCT. It was therefore concluded that the two maize varieties are carbohydrate based food and recommended for consumption by all age groups in various forms.

Keyword: Abuja farmland, maize varieties

INTRODUCTION

Cereal grains are major source of nutrients for especially the economically less privileged people of developing countries. Many of these people obtain more than half of both their calorie and protein from cereals (Afzal, 2009). 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 (Ape, 2015). In Nigeria, the most important cereals are sorghum, millet, rice, maize and wheat (Muhammad *et al*., 2013). 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 (Olowalana, 2014). Maize protein which ranges from 6 to 12% is regarded to be inferior because it is low in Lycine and tryptophan. Osipita *et al*.(2012), reported that this poor nutritive value of maize can be improved through better maize breeding, storage, cooking and by a fortification process.

Maize plays an important role in the diet of Nigerians, it serves as a major source of carbohydrate in both human and livestock diet for release of energy needed for normal body metabolism Zea mays is the third most important cereal crop after rice and wheat (Ridhi, 2014). It has the widest distribution and is primarily grown for its grains which is consumed as human food and animal feed. The crop is high yielding, mature early, easy to process, readily digestible, cost less than other cereals and can be grown across a range of agroecologocal zones (Sule *et al*., 2014). In some developed countries, maize is also grown for industrial products such as oil, syrup and starch (Afzal, 2009). The diverse usefulness of maize has led to increase in maize production and reversed the downward spiral of food production in Africa. The world maize output was 301 million tonnes in 1992, but increased to 589 million tons in 2000. The United State of American produces 43%, Asia (25%), Latin America and Caribbean (13%) and Africa (7%) of the production in 2000. 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. The objectives of this study is to compare the proximate content of the two

maize varieties commonly planted in FCT Abuja yellow maize (Kampam4) and white maize (Rido).

MATERIALS AND METHODS

Maize sample collection

Maize sample was collected from 18 sampling station spread across the 6 area council in FCT. Three sampling station from each area council was selected for the study. A total of 114 maize samples of two maize varieties yellow (Kampam4) and white (Rido) that are commonly planted varieties of maize in FCT were collected monthly for the period of 6 month from June to November 2016. About 5 ears of matured maize samples were randomly collected from three different point from each sampling station and kept in an appropriately labelled polythene bag and taken to laboratory for analysis according to the method described by Mathew (2012).

Determination of proximate compositions of maize

Moisture contents, crude protein, fat, ash content and carbohydrate were determined using the Association officials of Analytical Chemists (1999). All the proximate value was determination in triplicate and the average was taken. The proximate values were reported in percentage.

Maize moisture content analysis

The percentage moisture lost due to drying was determined in triplicate at a temperature of 105°C for 3 h. Ten grams weight of the powdered sample was weighed (W1) into pre weighed crucible (Wo) and placed into a hot drying oven at 105°C for 3 h. The crucible was removed, cooled, in a desiccators and weighed. The process of drying, cooling and weighing was repeated until a constant weight (W2) is obtained. The weight loss due to moisture was calculated by:

$$\text{Moisture } (\%) = \frac{W1-W2\_X100}{W1-Wo}$$

Where
Wo=weight of the empty crucible (g).
W1=weight of the powdered sample +empty crucible (g).
W2=weight of dried sample +empty crucible.

Ash content determination

The residue remaining after combustion of the dried sample was determined. 2 g of the powdered sample was weighed (W1) into pre weighed (W1) empty crucibles (Wo) and placed into a lento muffle furnace at 550°C at 5 h. The ash was cooled in desiccators and weighed (W2).The weight of ash was determined by the difference between the powdered weight, pre weighed and the ash in the crucible. Percentage ash was calculated as:

$$\textbf{Ash (g)} = \frac{W2-Wo\ \ X100}{W1-Wo}$$

Where
Wo =weight of empty crucible (g).
W1=weight of crucible + powdered sample (g).
W2=weight of crucible +ash sample (g).

Fat contents determination

The fat content was determined using Soxhlet extract following the method of (AOAC, 1999). Two grams of the powdered sample was weighed (Wo) into a porous thimble and covered with a clean white cotton wool. About 200 cm^3 of Petroleum ether was poured into 250cm^3 extraction flask, which would have been previously dried in the oven at 105°C and weighed (W2). The porous thimble was placed into the soxhlet and the rest of the apparatus was assembled. Extraction was done for 5 h. The thimble was removed carefully and the extraction flask placed in a water bath so as to evaporate the petroleum ether and then dried in an oven at a temperature of 105°C to completely free the solvent and moisture. The percentage crude fat was calculated as:

$$\text{Crude fat } (\%) = \frac{W1-W2}{Wo} \times 100$$

Where
Wo=weight of sample (g).
W1=weight of flask + oil (g).
W2=weight of flask (g).

Crude protein determination

The crude protein of the sample was determined using the AOAC (1999). One gram of each sample was weighed into a digestion flask. Ten grams of potassium sulphate, 0.7g mercuric oxide and 20cm^3 concentrated sulphuric acids was added to the sample in the digestion flask. The flask was heated gently at an inclined angle until frothing subsides and then boiled until the solution becomes clear. This continued for half an hour. When the frothing is in excess, a small amount of paraffin wax was added. On cooling 90ml of distilled water was added and mixed. A small piece of pumice was added to prevent bumping. A bout 80ml of 2M sodium hydroxide solution

Table 1. Comparative percentage mean proximate composition of yellow maize (Kampam4) and white maize (Rido) planted in FCT farmland.

Location/maize variety	% Moisture	% ASH	% FAT	% CRUDE PROTEIN	% CARBOHYDRATE
Nyanya Rido	9.5	4.77	3.16	16.1	66.52
Gwarinpa kampam 4	8	5.73	3.35	20.79	61.98
Garki kampam4	10.5	3.35	3.23	12.43	70.49
Kubwa kampam 4	7.42	2.55	2.52	10.52	77.66
Bwari Rido	15.22	3.87	2.56	22.28	65.35
M/pape kampam 4	6.9	4.37	1.75	11.01	75.84
Zuba kampam 4	8.78	4.73	1.35	21.7	63.765
Tunganmaje Rido	7.51	2.18	4.11	22.33	62.87
G/Lada kampam 4	9.78	2.81	1.72	19.93	60.17
Gaupe Rido	6.24	5.9	4.74	30.47	52.47
Kuje kampam 4	6.52	2.7	3.79	30.95	55.96
Robochi kampam 4	5.96	3.9	1.11	30.12	59.06
Sheda Rido	10.44	4.23	2.25	19.44	62.76
Yangoje kampam 4	8.02	1.6	4.15	22.07	64.36
Kwali kampam 4	7.55	3.2	2.04	23.35	63.86
Yaba kampam 4	6.66	2.72	1.41	23.62	60.53
P/Basa kampam 4	8.65	6.13	2.72	21.61	61.35
Abaji Rido	8.44	3.22	3.27	20.99	62.99

was added while tilting the flask so that two layers are formed. The condenser unit was rapidly connected, heated and the distilled ammonia collected in 50ml boric acid methyl red indicator. Fifty millilitres of the distillate was collected and titrated against 0.1M hydrochloric acid solution. The percentage nitrogen content was calculated thus: % N = (Volume of acid x Molarity of standard acid) x 0.014 x 100 Weight of sample (g) . % Crude protein content = nitrogen content x 6.25.

Total carbohydrate

The total carbohydrate was determined by differential method as described by (AOAC 1999) This was achieved by subtracting the total protein, lipid, moisture and ash content from 100 thus: % carbohydrate (100 – (% moisture + % ash+ % fat + % protein).

RESULTS AND DISCUSSION

Table 1 shows the moisture content in both Rido and Kampam4 maize ranges from 8% to 16%. The ash content ranges from 4% to 8%. Fats content ranges from 3 % to 5%. Crude protein ranges from 15% to 30%.Carbohydrates range from 60% to 90%. This confirms that maize is carbohydrate base food. According to study by Olowalana, (2014) the major chemical constituent of the maize kernel is carbohydrate which accounts for 72-73% while protein ranges from 6 to 12%. Studies by Sule *et al*. (2014) also revealed that maize is a carbohydrate based crop irrespective of the variety with percentage carbohydrate ranging between 78% to 85%, protein was 12.68%, ash was 2.95% with low moisture content of 8.6% (Table 1). An independent t test to determine the difference between the mean computed confidence test of maize variety proximate analysis of (Kampam 4 and Rido) of the levene's test result F (0.2458), P (0.135), indicated that the variance of Kampam4 and Rido proximate analysis are said to be approximately equal .The t-test result were not significant t (0.230) p (0.821) ,d (0.198),indicating there is no significant difference between proximate content of kampam4 and Rido at 95% confidence interval difference between 1.507 to 1.632.

Conclusion

The t-test result was not significant between the proximate content of Kampam4 and Rido. Therefore it can be concluded that there is no significant difference between the proximate composition of yellow maize and that of white maize planted in FCT. Both the yellow maize (Kampam4) and white maize (Rido) are carbohydrate based food.

Recommendations

(i) Base on the finding of this study, maize both yellow and white planted in FCT Abuja is recommended for consumption to the inhabitant of FCT as source of carbohydrate.
(ii) Maize both yellow and white are also recommended to be planted in FCT farmlands.

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