Assessment of Maize (Zea mays) Genotypes for Seed Metrics, Agronomic Performance, Yield and Nutritional Content in the Southern Savanna Agro-ecological Zone of Nigeria (Wukari as Case Study)

D. O. Ibirinde a*, N. M. Iliya a and S. Bitrus a

a Department of Crop Production and Protection, Federal University Wukari, Nigeria.

Authors’ contributions
This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

Article Information
DOI: 10.9734/AJAHR/2022/v9i4/209

Open Peer Review History:
This journal follows the Advanced Open Peer Review policy. Identity of the Reviewers, Editor(s) and additional Reviewers, peer review comments, different versions of the manuscript, comments of the editors, etc are available here: https://www.sdiarticle5.com/review-history/91905

Received 23 July 2022
Accepted 27 September 2022
Published 19 November 2022

ABSTRACT

Maize is ranked as one of the cereal crops with high yield potential globally and may be considered very important for countries like Nigeria, where there is an increasing demand for food to meet the demand of its teeming population. Five varieties of maize (Sammaz 52, M1217, M1155, Oba 98 and Oba super II) obtained seed companies and mostly grown in Wukari were evaluated during the 2020/2021 cropping seasons for yield, agronomic performance, seed metrics and nutritional quality at the Research and Teaching Farm of the Federal University Wukari, Taraba State. Having four replications, the experiment was set up using Randomized complete Block Design (RCBD). Obtained data on agronomic characters, yield and nutrient qualities revealed significant differences among the varieties for days to tasseling, silking, grain yield, nutritional content, number of nodes, ear height (cm), hundred seed weight (g), number of seed rows, seed length at P>0.05. Height at maturity showed significant difference, with Oba98 having the highest (195.25 cm) value. M1217 recorded superiority (24.95g) over the other varieties for 100 seed weight. Laboratory Analysis was conducted to determine the essential amino acid and nutritional content of the five maize varieties. There was a significant variation in the crude protein content of the five varieties with the SAMMAZ52 having the highest value (13.14%). Oba 98 recorded highest essential amino acid such as Methionine (2.39), Lysine (2.33) and Tryptophan (1.43) over the other varieties assessed.
Keywords: Maize genotypes; seed metrics; nutritional qualities; trait performance; yield.

1. INTRODUCTION

Maize belongs to the plant family Gramineae and it was first domesticated about 10,000 years ago, by the natives of southern Mexico [1]. Maize is an important crop worldwide, serving as staple food for human, livestock feed and industrial raw materials [2]. It is widely used as major ingredient in animal feed composition and in the production of ethanol, used as bio-fuel for medical purposes [3]. Maize is ranked as the third mostly produced and consumed cereal globally, after rice and wheat [4-6]. In most developing countries, maize is responsible for about 15% to 56% of human total daily calories requirement, especially in Latin America and Africa (Adetimrin et al. 2008). Globally, maize is grown on an area of about 197 million hectares with about 1.13 billion tons production, Africa produces 7.2% of the world production, producing 10 million tons of maize grown on about 40 million hectares and the largest producer in African is Nigeria with production of 6.5 million tons harvested on 10 million hectares [7,8].

Maize has a variety of uses, although between 90% and 95% of the crop is harvested for grain, while the remaining 5% and 10% is cultivated for silage [9]. Nutritionally, maize [10], is composed of about 80% carbohydrates, 10% protein, 3.5% crude fibre, 2% mineral, iron and vitamin B. Despite the wide-ranged utility of maize to humans and animals, maize has poor protein concentration, because of the low essential amino acids such as lysine and tryptophan. Protein deficiencies can be corrected in animals through the addition of supplements to the feed, thereby increasing the overall cost (Mbuya et al. 2010). Furthermore, it yields are limited by both biotic and abiotic factors as pest and disease, drought, mineral deficiency, weed (Salami et al. 2007), [11]. Identifying genotypes with desirable traits is essential for yield improvement, however there is inadequate information on the agronomic performance for yield improvement and nutritional content of the commonly cultivated maize varieties in study.

Therefore, present research was undertaken to achieve the following objectives;

- Assessment of agronomic traits and comparison of yield performance in selected maize varieties.
- Evaluation of the nutritional contents of selected maize varieties grown in Wukari.

2. MATERIALS AND METHODS

2.1 Experimental Site, Materials and Layout

The Experiment was conducted at the Teaching and Research Farm of Federal University Wukari, Taraba State, Nigeria during the 2016 and 2017 cropping seasons. Wukari is situated in the Guinea Savannah of North-eastern Nigeria, situated at latitude 7.985’N and longitude 9.78’E, characterized by an average rainfall of 1058 mm – 1300 mm per annum, relative humidity of about 15% and annual temperature of between 28°C and 30°C . Wukari has rich agricultural land that is suitable for the cultivation of varieties of crops such as vegetables, cereals and other assorted fruits(https://en.m.wikipedia.org/wiki/wukarifederation) [12].

The genetic materials; Sammaz 52, M1217, M1155, Oba 98 and Oba II (commonly grown in Wukari and environment) were sourced from open market. The field was laid out in a Randomized Complete Block Design (RCBD), covering an area of 21 m × 8 m. Research plot was divided into four blocks, wherein each block contained five treatments made of beds of 3 m × 25 cm planting distance and the distance between each replication was 1 m. The experiment was replicated four times. Five plants were randomly tagged per plot, from which data were collected. Cultural practices such as fertilizer application, thinning, earthen-up and weed control both mechanical and chemical method were properly carried out.

2.2 Data Collection

Data was collected on the following parameters;

Days to emergence (DTE): Number of days from seed sowing to its emergence.
Days to tasseling (DTT): Days between seed sowing and appearance of tassels.
Days to silking (DTS): Days from seed sowing to silk production.
Height at maturity (HM): Plant height at maturity (cm).
Ear height (EH): Distance from ground level to point where ear is borne (cm).
Width of ear leaf (WEL): Width of leaf at the ear node (cm).
Length of ear leaf (LEL): Length of leaf at the ear node (cm).

Ear length (EL): Length of the ear (cm).

Length of ear peduncle (LEP): Measured in cm.

Ear diameter (ED): Ear circumference divided by 2 (cm).

Ear weight (EW): Weight of cob, grain and husk (g).

100 seed weight: Weight of 100 seeds (g).

Seed length (LS): Measured using Vanier caliper (cm).

Width of seed (WS): Using Vanier caliper (cm).

Number of nodes (NN): Comprising all nodes.

Number of tillers (NT): Other stem arising from the root.

Tassel branches (NTB)

Cob length (CL): Measured using a ruler (cm).

Seed coat colour (SCC): Pigmentation of seed coat.

Number of kernel rows.

2.3 Ear Bagging For Controlled Pollination

At the onset of tasseling, there was regular prompt covering of ear shoots, in order to forestall incidences of uncontrolled pollination.

2.4 Tassel Bagging and Pollination

The tassel, being the male reproductive organ in maize (Nielsen, 2010), helps in fertilizing the ovule, resulting in development of kernel. Pollen grains used for pollination were obtained by first bagging the tassel carefully, using a tassel bag, gently shaking the already bagged tassel and then dusting the ear silk with the collected pollen grains. This is done in the absence of wind, to avoid drifting of pollen grains from the target. Dusting was done thrice, to ensure adequate fertilization and grain filling.

2.5 Laboratory Analysis

Conducted, using the Association of Analytical Chemist procedure.

2.6 Moisture Content Determination

Determination of moisture content was achieved by weighing 2g of already ground sample into a previously ignited and weighed silica dish. This was dried in the oven (Genlab MINO/30 UK) for about 24 hours, at 100°C until a constant weight was attained and then cooled in desiccators prior to weighing.

Estimation:

\[
\text{% of moisture} = 100 \times \left( \frac{\text{wt of dish + sample prior to drying} - \text{wt of dish + sample after drying}}{\text{wt of sample taken}} \right)
\]

2.7 Ash Determination

Estimated following the procedure according to AOAC number 932.03 and 984.27 [13].

2.8 Oil Content Determination

Estimated following the procedure of Hilleord, Denmark, using Tecator Soxtec (model 2043 [20430001]. 1.5 g of sample mixed with 2.3 g anhydrous sulfate was weighed and put into thimble, then covered with cotton, meanwhile 40ml of petroleum ether (40-600 C Bpt) was added to a pre-weighed cup. The thimble and cup were both attached to the extractor. Using ethanol, the sample extraction was done for 30 min. and rinsed for 1½ hr. Thereafter, the solvent was evaporated from the cup to the condensing column. Extracted fat in the cup was then placed in an oven at 105°C for 1 hr., allowed to cool down and weighed.

Estimation of Oil (%):

\[
\text{% oil} = \left( \frac{\text{Initial weight of cup – final weight of cup}}{\text{Weight of sample}} \right) \times 100
\]

2.9 Crude Protein (CP)

Estimated by adopting the Micro Kjeldahl Method, as described by Pearson (1976). 10 ml volume of H₂SO₄ was added to 3g of sample and digested with a Kjeldahl digestor (Model Bauchi 430) for 1½ hr. This was followed by adding 40ml distilled water, using the Kjeldahl distillation unit (Model unit B-316), containing 40% concentrated NaOH and Millipore water. Liberated ammonia was collected in 20 ml boric acid with bromocresol green and methyl red indicators and titrated against 0.04 N H₂SO₄. A control (blank without sample) was also prepared. Percent protein was estimated as:

\[
\text{Crude protein (%)} = \left( \frac{\text{Sample titer – blank titer}}{14 \times \text{Sample weight}} \right) \times 6.25
\]

Where; 14 is the molecular weight of nitrogen and 6.25 is the nitrogen factor.

2.10 Crude Fiber (Cf)

1g of sample (defatted) was measured into a weighed crucible and attached to the extraction
unit of Kjeldahl extractor (D-40599; Behr labour-
technik GmbH, Dusseldorf, Germany). 150 ml of
hot 1.25% H₂SO₄ was added and digested for 30
mins. The acid was drained off and sample was
washed using hot distilled water for 1½. The
crucible was removed and oven dried overnight
at 105°C, allowed to cool down, weighed, and
incinerated at 550°C in a muffle furnace (MF-1-
02; PCSIR Labs, Lahore, Pakistan) overnight
and reweighed after cooling. Extractible fiber (%)  
was estimated as:

\[
\text{% crude fibre} = \text{(weight of digested sample - weight of ashed sample)} / \text{Weight of sample} \times 100
\]

2.11 Carbohydrate

Determined by difference, which is, addition of all
the percentage of moisture, oil, ash, crude protein, and crude fiber, subtracted from 100%. This
gave the quantum of nitrogen-free extract (carbohydrate). Mathematically, it is expressed as;

\[
\text{% Carbohydrate} = 100 - (\text{% Moisture} + \text{% Fat} + \text{% Ash} + \text{% Crude fibre} + \text{% Crude protein})
\]

2.12 Data Analysis

Analysis of Variance (ANOVA) for obtained date
was conducted using SPSS software (21st edition
and separation of means was done using
Duncan Multiple Range Test (DMRT).

3. RESULTS AND DISCUSSION

3.1 Agronomic Traits of Maize Genotypes

A highly significant genotype effect obtained for
the agronomic parameters is an indicator of
variability which allows for the identification of
local varieties that exhibited agronomic
characteristics that are desirable (Table 1). This
alludes to the earlier report by Ngwuta et al.
(2001), that, local maize cultivars can serve as
sources of hybrid maize development. Assessed
morphometric traits (ear length, ear weight, ear
diameter, number of tassel branches, tassel
branches and length of ear peduncle) of maize
varieties recorded no significant difference in
their values [14-16]. According to Parvez [17],
ear weight, ear diameter and ear length are
important characters that influence yield
efficiency in maize, while tassel branches, length
and weight are important tassel characters that
affects yield efficiency, as they determine the
abundance or otherwise of pollen grain produced
by the maize plant. Findings of the research
agrees with the initial assertions of Gue et al.
[18]; Ibirinde et al. [19], that tassel traits affect
grain yield either physiologically; by competing
for photosynthesis, or physically by shading
effect. Thus, an ideal male parent for maize
breeding programme should have numerous
tassels that are capable of producing large
amount of pollen grains, whereas an ideal female
should partition more towards big ear and hence
should possess small tassel [20-22].

Generally, height at maturity is determined by the
growth attained during vegetative growing phase
of plants. Velci et al. [24] posited that, plant
height and ear insertion allowed plant center of
gravity to maintain balance, thereby reducing
lodging/stem breaking and favouring nutrient
transport, which enhances plant yield. Highest
record for plant height was in OBA98 (195.25
cm) and lowest in M1217 (184.67 cm). This is in
concord with the finding of Duncan and Hesketh
(1968), who observed the variation in height at
maturity of different genotypes in maize ranging
from 120 cm to 300 cm. Number of nodes in any
plant represents the total leaves produced by it
and its photosynthetic potentials to manufacture
food [25].

Length of seed and width of seed for the five
varieties under investigation showed no
significant difference. Meanwhile, there were
significant differences in the values recorded for
number of rows, weight of cob without husk and
hundred seed weight. The highest value for 100
seed weight was found in M1217 (24.95 g), while
the lowest was recorded by OBA SUPER 11
(20.43 g).This is in agreement with Jha et al.
[26], who observed that, variations in 100 seed
weight of maize ranged from 10.8 g to 25.7 g.
3.2 Mean of Yield Related Traits

Yield related traits for maize genotypes being assessed (Table 4) revealed a relatively high value for coefficient of variation for number of nodes (12.10%), number of tassel branches (23.66%) and height at maturity (10.53%). This is an indication that the variability that existed in the maize genotypes can be exploited in maize breeding programmes.

Other seed metrics (seed width and seed thickness) showed no significant difference in their values. As observed by Teng et al. [27], cultivars characterized by long, wide and weighty seeds produced taller plants, with larger leaf area and maximum grain filling. This indicated that, grain length and width can be used to predict vigorous seedling growth between varieties [28-30]. Long grain was found to be better indicator of leaf area while grain width can be used for germination percentage, hence improving crop stand and yield (Ibirinde et al. 2022).

Values obtained for hundred seed weight (HSW) across the different treatments were significantly different and ranged from 0.22g to 0.19g. The highest value (0.22g) was recorded by OBA98, while the least (0.19 g) was recorded in SAMMAZ52. This suggests that, there is higher concentration of endosperm which contributed to higher seed weight, resulting from frequent dusting of pollen grain and the yield potential of OBA98.

Table 1. Descriptive statistic of vegetative characters

<table>
<thead>
<tr>
<th>Genotype/trait</th>
<th>DE (cm)</th>
<th>DT (cm)</th>
<th>DS (cm)</th>
<th>DD (cm)</th>
<th>NTB</th>
<th>NN</th>
<th>HM (cm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SAMMAZ52</td>
<td>99.75</td>
<td>11.15</td>
<td>3.70</td>
<td>3.15</td>
<td>76.95</td>
<td>10.48</td>
<td>11.53</td>
</tr>
<tr>
<td>OBA98</td>
<td>104.15</td>
<td>11.75</td>
<td>3.88</td>
<td>3.45</td>
<td>93.30</td>
<td>11.15</td>
<td>14.17</td>
</tr>
<tr>
<td>MM1155</td>
<td>103.70</td>
<td>12.00</td>
<td>3.88</td>
<td>4.05</td>
<td>95.74</td>
<td>11.26</td>
<td>15.06</td>
</tr>
<tr>
<td>M1217</td>
<td>96.95</td>
<td>11.45</td>
<td>4.06</td>
<td>3.95</td>
<td>96.30</td>
<td>10.83</td>
<td>13.67</td>
</tr>
<tr>
<td>OBA SUPER11</td>
<td>96.53</td>
<td>11.83</td>
<td>3.93</td>
<td>3.22</td>
<td>94.83</td>
<td>11.08</td>
<td>15.01</td>
</tr>
<tr>
<td>Grand mean</td>
<td>100.22</td>
<td>11.63</td>
<td>3.89</td>
<td>3.57</td>
<td>91.31</td>
<td>10.95</td>
<td>13.85</td>
</tr>
<tr>
<td>SD</td>
<td>16.04</td>
<td>2.33</td>
<td>0.46</td>
<td>1.48</td>
<td>39.85</td>
<td>2.17</td>
<td>5.23</td>
</tr>
</tbody>
</table>

Table 2. Descriptive statistic of reproductive traits

<table>
<thead>
<tr>
<th>Genotype/trait</th>
<th>EH(cm)</th>
<th>EL(cm)</th>
<th>ED(cm)</th>
<th>EW(cm)</th>
<th>CL(cm)</th>
<th>CW(g)</th>
<th>AI(°)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SAMMAZ52</td>
<td>99.75</td>
<td>11.15</td>
<td>3.70</td>
<td>3.15</td>
<td>76.95</td>
<td>10.48</td>
<td>11.53</td>
</tr>
<tr>
<td>OBA98</td>
<td>104.15</td>
<td>11.75</td>
<td>3.88</td>
<td>3.45</td>
<td>93.30</td>
<td>11.15</td>
<td>14.17</td>
</tr>
<tr>
<td>MM1155</td>
<td>103.70</td>
<td>12.00</td>
<td>3.88</td>
<td>4.05</td>
<td>95.74</td>
<td>11.26</td>
<td>15.06</td>
</tr>
<tr>
<td>M1217</td>
<td>96.95</td>
<td>11.45</td>
<td>4.06</td>
<td>3.95</td>
<td>96.30</td>
<td>10.83</td>
<td>13.67</td>
</tr>
<tr>
<td>OBA SUPER11</td>
<td>96.53</td>
<td>11.83</td>
<td>3.93</td>
<td>3.22</td>
<td>94.83</td>
<td>11.08</td>
<td>15.01</td>
</tr>
<tr>
<td>Grand mean</td>
<td>100.22</td>
<td>11.63</td>
<td>3.89</td>
<td>3.57</td>
<td>91.31</td>
<td>10.95</td>
<td>13.85</td>
</tr>
<tr>
<td>SD</td>
<td>16.04</td>
<td>2.33</td>
<td>0.46</td>
<td>1.48</td>
<td>39.85</td>
<td>2.17</td>
<td>5.23</td>
</tr>
</tbody>
</table>

Table 3. Descriptive statistics of seed metrics and yield traits

<table>
<thead>
<tr>
<th>Genotype/trait</th>
<th>NR</th>
<th>WWH (g)</th>
<th>LS (cm)</th>
<th>WS (g)</th>
<th>W100 (g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SAMMAZ52</td>
<td>12.70</td>
<td>85.00</td>
<td>0.27</td>
<td>0.19</td>
<td>22.95</td>
</tr>
<tr>
<td>OBA98</td>
<td>13.35</td>
<td>104.75</td>
<td>0.33</td>
<td>0.22</td>
<td>22.77</td>
</tr>
<tr>
<td>MM1155</td>
<td>12.73</td>
<td>106.63</td>
<td>0.28</td>
<td>0.21</td>
<td>23.67</td>
</tr>
<tr>
<td>M1217</td>
<td>13.50</td>
<td>108.90</td>
<td>0.30</td>
<td>0.21</td>
<td>24.95</td>
</tr>
<tr>
<td>OBA SUPER11</td>
<td>13.44</td>
<td>107.00</td>
<td>0.31</td>
<td>0.21</td>
<td>20.43</td>
</tr>
<tr>
<td>Grand mean</td>
<td>13.14</td>
<td>102.32</td>
<td>0.30</td>
<td>0.21</td>
<td>23.00</td>
</tr>
<tr>
<td>SD</td>
<td>1.95</td>
<td>43.26</td>
<td>0.07</td>
<td>0.05</td>
<td>1.89</td>
</tr>
</tbody>
</table>

Table is ranked in rows, where DE= Days to Emergence, DT= Days to Tasseling, DS= Days to Silking, DD= Days to Dusting, NTB= Numbers of Tassel Branches, NN= Numbers of Nodes and HM= Height at Maturity. P>0.05

Table is ranked in column, where NR= Number of Rows, WWH= Weight without husk, LS= Length of Seed, WS= Weight of Seed, W100 = Weight of 100 Seed. Superscript a, ab, b and c denote DMRT range, where “a” is the highest and “c” is the least. P>0.05
Table 4. Mean squares and coefficient of variation of vegetative characters

<table>
<thead>
<tr>
<th>Traits</th>
<th>Mean (±)</th>
<th>Mean Square</th>
<th>CV (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>DE</td>
<td>4.00 ±0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>DT</td>
<td>52.44±2.54</td>
<td>6.45</td>
<td>4.84</td>
</tr>
<tr>
<td>DS</td>
<td>57.47 ±2.86</td>
<td>8.18</td>
<td>4.98</td>
</tr>
<tr>
<td>DD</td>
<td>60.50 ±2.86</td>
<td>8.19</td>
<td>4.73</td>
</tr>
<tr>
<td>NTB</td>
<td>15.64 ±3.70</td>
<td>13.70</td>
<td>23.66</td>
</tr>
<tr>
<td>NN</td>
<td>13.30 ±1.61</td>
<td>2.59</td>
<td>12.10</td>
</tr>
<tr>
<td>HM</td>
<td>183.84 ±19.89</td>
<td>395.73</td>
<td>10.53</td>
</tr>
</tbody>
</table>

Table is ranked in column, where DE= Days to Emergence, DT=Days to Tasseling, DS= Days to Silking, DD=Days to Dusting, NTB=Numbers of Tassel Branches, NN=Numbers of Nodes and HM=Height at Maturity, CV= Coefficient of variation. P>0.05

Table 5. Mean squares and coefficient of variation of reproductive characters of maize genotypes

<table>
<thead>
<tr>
<th>Traits</th>
<th>Mean (g)</th>
<th>Mean Square</th>
<th>CV (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>EH</td>
<td>100.22±16.04</td>
<td>257.51</td>
<td>16.00</td>
</tr>
<tr>
<td>EL</td>
<td>11.6±2.33</td>
<td>5.45</td>
<td>20.03</td>
</tr>
<tr>
<td>ED</td>
<td>3.89±0.46</td>
<td>0.21</td>
<td>11.83</td>
</tr>
<tr>
<td>PL</td>
<td>3.57±1.48</td>
<td>12.19</td>
<td>41.45</td>
</tr>
<tr>
<td>EW</td>
<td>91.31±39.85</td>
<td>1587.92</td>
<td>43.64</td>
</tr>
<tr>
<td>CL</td>
<td>10.95±2.17</td>
<td>4.72</td>
<td>19.82</td>
</tr>
<tr>
<td>CW</td>
<td>13.85±5.23</td>
<td>27.40</td>
<td>37.76</td>
</tr>
<tr>
<td>AI</td>
<td>36.85±14.52</td>
<td>201.84</td>
<td>38.53</td>
</tr>
</tbody>
</table>

Table is ranked in column, where HM=Height at Maturity, EH= Ear Height, EL= Ear length, AI= Angle of Insertion, ED= Ear Diameter, PL= Peduncle Length, EW= Ear Width, CL= Cob length, CW= Cob weight. P>0.05

Table 6. Mean squares and coefficient of variation on statistics of seed metrics and yield traits of maize genotypes

<table>
<thead>
<tr>
<th>Traits</th>
<th>Mean (±)</th>
<th>Mean Square</th>
<th>CV (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>NR</td>
<td>13.14±1.95</td>
<td>3.81</td>
<td>14.84</td>
</tr>
<tr>
<td>WWH (g)</td>
<td>102.32±43.26</td>
<td>1871.64</td>
<td>42.28</td>
</tr>
<tr>
<td>LS (Cm)</td>
<td>0.30±0.07</td>
<td>0.00</td>
<td>23.33</td>
</tr>
<tr>
<td>WS (g)</td>
<td>0.21±0.05</td>
<td>0.00</td>
<td>23.80</td>
</tr>
<tr>
<td>W100 (g)</td>
<td>23.00±1.89</td>
<td>3.56</td>
<td>8.22</td>
</tr>
</tbody>
</table>

Table is ranked in column, where NR= Number of Rows, WWH= Weight without husk, LS= Length of Seed, WS= Width of Seed, W100= Weight of 100 Seed. P>0.05

Table 7. Proximate composition of maize genotypes

<table>
<thead>
<tr>
<th>Genotypes/Parameters</th>
<th>Protein (%)</th>
<th>Fat (%)</th>
<th>Ash (%)</th>
<th>Crude fibre (%)</th>
<th>Moisture (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SAMMAZ52</td>
<td>13.14a</td>
<td>2.00</td>
<td>1.12</td>
<td>2.55</td>
<td>7.00</td>
</tr>
<tr>
<td>MM1155</td>
<td>10.75a</td>
<td>2.55</td>
<td>1.14</td>
<td>2.00</td>
<td>6.98</td>
</tr>
<tr>
<td>OBA SUPER 11</td>
<td>10.94a</td>
<td>2.33</td>
<td>1.15</td>
<td>2.00</td>
<td>7.10</td>
</tr>
<tr>
<td>OBA98</td>
<td>10.95a</td>
<td>2.35</td>
<td>1.15</td>
<td>2.00</td>
<td>6.86</td>
</tr>
<tr>
<td>M1217</td>
<td>10.86a</td>
<td>2.36</td>
<td>1.17</td>
<td>2.00</td>
<td>6.76</td>
</tr>
</tbody>
</table>

Table is ranked in column, where CP=Crude protein, CF= Crude fiber, Ash= Ash content M= Moisture content. Superscript a, and b denote DMRT range, where “a” is the highest and “b” is the least. P>0.05

Table 8. Values of amino acid profile of maize genotypes

<table>
<thead>
<tr>
<th>Genotype/Parameters</th>
<th>Lys</th>
<th>Met</th>
<th>Trp</th>
<th>Val</th>
<th>Arg</th>
</tr>
</thead>
<tbody>
<tr>
<td>SAMMAZ52</td>
<td>0.88</td>
<td>0.90</td>
<td>0.68</td>
<td>0.69</td>
<td>0.73</td>
</tr>
<tr>
<td>MM1155</td>
<td>1.86</td>
<td>1.88</td>
<td>0.99</td>
<td>1.12</td>
<td>1.23</td>
</tr>
<tr>
<td>OBA SUPER 11</td>
<td>0.39</td>
<td>0.43</td>
<td>0.72</td>
<td>0.76</td>
<td>0.83</td>
</tr>
<tr>
<td>OBA98</td>
<td>2.33</td>
<td>2.39</td>
<td>1.43</td>
<td>1.58</td>
<td>1.81</td>
</tr>
<tr>
<td>M1217</td>
<td>0.53</td>
<td>0.65</td>
<td>0.55</td>
<td>0.62</td>
<td>0.65</td>
</tr>
</tbody>
</table>

Lys = Lysine, Met = Methionine, Trp = Tryptophan, Val = Valine, Arg = Arginine. P>0.05
3.3 Amino Acids Contents

Results in Table (8) for amino acids content showed high variations between the maize genotypes, the total content of amino acids in maize samples ranged from (0.1% in M1217 to 2.48% in OBA98). Methionine also showed high values ranged from 2.39 % (OBA SUPER 11) to 2.39% (OBA98); Valine showed value in maize ranged from 0.62% (M1217) to 1.58 % (OBA98); Arginine showed value in maize ranged from 0.65% (M1217) to 1.81% (OBA98); Typtophan showed value in maize ranged from 0.65% (M1217) to 1.43% (OBA98). These data disagree with those obtained by Lošák et al. [31] who studied the effect of nitrogen fertilization on essential and non-essential amino acids on maize grain.

4. CONCLUSION

The M1217 variety evaluated in the study had superior performance for grain yield, specifically the hundred (100) seed weight. Nutritional qualities of SAMMAZ2 (13.14), as observed in the study showed superiority over OBA98 (10.95), OBA SUPER 11 (10.94), M1217 (10.86) and MM1155 (10.75), particularly in crude protein content. In terms of height at maturity OBA98 has the highest height value (195.25), followed by MM1155 (190.00), SAMMAZ2 (187.35) and the least was observed in M1217 (184.67). OBA98 in terms of essential amino acids such as lysine, methionine and tryptophan recorded the highest value ranged.

It is therefore recommended that the cultivation of M1217 for optimum yield, OBA98 for essential amino acids such as lysine, methionine and tryptophan and SAMMAZ2 for optimum nutritional qualities should be encouraged in Wukari and neighboring communities. Dusting of pollen grain should be made on maize thrice or even more, because it determine the grains filling and yield. Further research should be conducted for further recommendations.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

6. IITA (International Institute of Tropical Agriculture). Cereals and legumes systems; 2009.
7. Surinder C. Project feasibility report on maize processing in Himachal Pradesh surinder: Surinder chugh (Roll Number: 25) EPDGCFM 2010-12; 2011.


© 2022 Ibirinde et al.; This is an Open Access article distributed under the terms of the Creative Commons Attribution License (http://creativecommons.org/licenses/by/4.0), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Peer-review history:
The peer review history for this paper can be accessed here: https://www.sdiarticle5.com/review-history/91905