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*Full Length Research Paper*

# Performance of *Amaranths* (*Amaranthus* species) Varieties in Sokoto Sudan Savanna of Nigeria

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**ABSTRACT:** To study the performance of *amaranth* varieties in the study area, a field trial was conducted during the 2021 rainy season (June to October) at the Fruits and Vegetables Teaching and Research Farm of the Faculty of Agriculture, Usmanu Danfodiyo University, Sokoto. Four *amaranth* varieties were used in the treatments (NHAC 3, NHAC 2019, NHAmGr-1820 and Sokoto Local). The treatments were laid out in a three (3) replicated Randomized Complete Block Design (RCBD). Plant height, number of leaves, number of branches, and leaf area index were all measured. The results revealed that the varieties performed differently five weeks after transplanting. NHAmGr-1820 had a higher plant height, NHAC 3, NHAC 2019 had a higher number of leaves and branches per plant, and NHAC 3 had the highest leaf area index. Based on the research findings, it is possible to conclude that NHAC 3 and NHAC 2019 performed better in the study area.

Keywords: *Amaranthus* species, performance, fruits, vegetable, Nigeria

## INTRODUCTION

*Amaranths (Amaranthus* species L.) are a major leaf vegetable crop, with the seeds used to make a variety of food products (Wayah *et al*., 2014). *Amaranthus*, also known as *amaranth*, is a leafy vegetable with high dietary value that is grown and consumed in most parts of Sub-Saharan Africa, particularly in Nigeria. It has a variety of health benefits, including therapeutic value for cardiovascular diseases, being high in phytosterols, which lower cholesterol levels, and preventing cancer (Dada *et al*., 2017). Vegetables are the cheapest and most readily available sources of important proteins, vitamins, minerals, and essential amino acids in Nigeria, as in most other tropical African countries where the daily diet is dominated by starchy staple foods (Onyango *et al*., 2008). African leafy vegetables are increasingly being recognized as potential sources of micronutrients and bioactive compounds in the diets of African populations (Smith and Eyzaguirre, 2007). Amaranth is the most nutrient-dense of all the vegetables that can be grown in tropical Africa. The leaves account for 76% of the total fresh weight of the shoots and contain 84 g water, 4.6 g protein, 1.8 g cellulose, 410 mg calcium, 8.9 mg iron, 5.7 mg beta-carotene, and 64 mg vitamin C per 100 g. (Musa *et al*., 2014). It is frequently referred to as a promising C4 crop for the semi-arid tropics due to its ability to adapt to the region's diverse climatic conditions (Omamt *et al*., 2006). Despite the significance of the crop, little is known about how improved amaranth varieties perform in the

study area (Musa *et al*., 2014). Farmers in the study area will be able to produce more of the crop by using their knowledge of the performance of improved varieties (Dinsaa *et al*., 2020). The purpose of the research was to examine how four (4) different amaranth varieties performed in the study area.

## MATERIALS AND METHODS

The study was carried out in an irrigation system at Usmanu Danfodiyo University's Sokoto fruit and vegetable farm. Sokoto is located 350 meters above sea level at latitude 130 01' N and longitude $5^0$-15' E. The Sudan savanna vegetation has an average annual temperature of 180°C and $40^0$°C, respectively. The region has a semi-arid climate with mean annual rainfalls between 380mm and 829mm (SERC, 2012). Four different types of amaranths were used as treatments (NHAC 3, NHAC 2019, NHAmGr-1820 and Sokoto Local). A Randomized Complete Block Design (RCBD) that was replicated three (3) times was used to set up the treatments. Plant height, the number of leaves, the number of branches, and the leaf area index were all recorded. GenStat ® 16th edition was used to perform an analysis of variance on the collected data. Using Duncan's multiple range test, mean separation was performed at the 5% level (DMRT).

## RESULTS

### Plant height

Table 1 displays the plant heights of amaranth varieties two, three, four, and five weeks after transplanting (WAT). At all sampling times, there was a significant (p0.05) difference in plant height between the varieties. NHAC 3 and NHAmGr-1820 produced plants that were statistically (p0.05) taller than NHAC 3 and SOKOTO LOCAL at 2WAT. At 3 and 4 WAT, the Sokoto local variety produced shorter plants than all other improved varieties of comparable height. NHAmGr-1820, on the other hand, was significantly (p0.05) taller than all other varieties at 5WAT.

### Number of leaves per plant

The number of leaves of amaranth varieties at Sokoto, Sudan Savanna during the 2021 growing season is shown in (Table 2). At 2WAT, NHAC 3 produced significantly (p≤0.05) more leaves than NHAC 2019, while NHAmGr-1820 and Sokoto Local produced the fewest. At 3, 4, and 5 WAT, NHAC 3 consistently produced the most leaves, while Sokoto Local produced the least.

### Number of branches per plant

The influence of variety on the number of amaranth branches at Sokoto Sudan Savanna during the 2021 season is shown to be significant (p≤0.05) (Table 3). The outcome demonstrates that NHAmGr-1820 and the LOCAL variety are not branching types. However, at 2 and 4 WAT, NHAC 3 produced more branches than NHAC 2019, but at 3 and 5 WAT, they were equal.

### Leaf area index

The leaf area index of amaranth as influenced by variety at Sokoto Sudan Savanna during the growing season of 2021 is shown in (Table 4). NHAC 3 produced significantly (p≤0.05) higher leaf area index than NHAC 2019, while NHAmGr-1820 and Sokoto Local varieties produced similar and lower leaf area index.

## DISCUSSION

The plant height recorded in this research which ranged from 38.3-41.7 at 5WAT was within the range of 33.2-50.5 cm reported by Tongos (2016). The higher performance of NHAmGr-1820 (41.8cm) compared to other varieties (38.3-39.9 cm) could be attributed to its genetic make-up and the response of the varieties to the growing conditions under which the experiment was conducted. Wayah *et al*. (2014) reported variations in growth and yield of amaranths genotype. The number of leaves (12.5-24.6 cm) recorded in this research at 5WAT falls within the range of 12.0-25.8 cm reported by Tongos (2016). The lower performance of Sokoto Local compared to other varieties could be due to difference in genetic makeup and adaptation to various growing conditions. The number of branches per plant recorded in this experiment (0.0-3.7) was lower than the range of 2.7-16.0 reported by Shiyam and Binang (2011). The leaf area index value recorded in this research at 5WAS which ranged from 0.84-2.15 was lower than 4.4-17.5 recorded by Tongos (2016). The lower performance of NHAmGr-1820 and Sokoto Local in number of branches and leaf area index among the varieties could be attributed to their genetic makeup. Wayah *et al*. (2014) reported variations in growth and yield of amaranths genotype. Tongos (2016) reported a range of 33.2-50.5 cm for plant height in this study, which ranged from 38.3-41.7 cm at 5WAT (2016). The higher performance of NHAmGr-1820 (41.8cm) compared to other varieties (38.3-39.9 cm) could be attributed to its genetic make-up and the varieties' response to the growing conditions under which the experiment was carried out. Wayah *et al*. (2014) discovered genotype differences in amaranth growth and yield. The number of leaves (12.5-24.6 cm)

**Table 1:** Plant height of amaranth varieties at Sokoto Sudan Savanna during 2021 season.

| Treatment | | | | |
|---|---|---|---|---|
| **Variety (V)** | **Number of leaves** | | | |
| | 2WAT | 3WAT | 4WAT | 5WAT |
| NHAC 3 | 15.45b | 24.73a | 32.42a | 38.94b |
| NHAC 2019 | 15.85a | 24.98a | 33.36a | 39.91b |
| NHAmGr-1820 | 15.91a | 25.11a | 33.81a | 41.79a |
| SOKOTO LOCAL | 14.79b | 22.08b | 29.45b | 38.34b |
| SEM | 0.229 | 0.530 | 0.758 | 0.922 |
| P value | .002 | <.001 | <.001 | <.001 |
| Significance | ** | ** | ** | ** |

*Means followed by same letter(s) within the same column are not significantly different at 5% level using DMRT. WAT = weeks after transplanting. * = significant at 1% level. P value = probability value*

**Table 2:** Number of leaves of amaranth varieties at Sokoto Sudan Savanna during 2021 season

| Treatment | | | | |
|---|---|---|---|---|
| **Variety (V)** | **Number of leaves** | | | |
| | 2WAT | 3WAT | 4WAT | 5WAT |
| NHAC 3 | 9.97a | 15.05a | 19.88a | 24.63a |
| NHAC 2019 | 8.61b | 13.60b | 18.65a | 23.49a |
| NHAmGr-1820 | 6.40c | 9.60c | 11.96b | 14.51b |
| SOKOTO LOCAL | 5.89c | 8.24d | 10.44c | 12.48c |
| SEM | 0.253 | 0.391 | 0.517 | 0.626 |
| P value | .001 | <.001 | <.001 | <.001 |
| Significance | ** | ** | ** | ** |

*Means followed by same letter(s) within the same column are not significantly different at 5% level using DMRT. WAT = weeks after transplanting. ** =significant at 1% level. P value = probability value.*

**Table 3**: Number of branches per plant of amaranth varieties at Sokoto Sudan Savanna during 2021 season.

| Treatment | | | | |
|---|---|---|---|---|
| **Variety (V)** | **Number of branches** | | | |
| | 2WAT | 3WAT | 4WAT | 5WAT |
| NHAC 3 | 0.68a | 1.68a | 2.59a | 3.56a |
| NHAC 2019 | 0.44b | 1.43a | 2.35b | 3.33a |
| NHAmGr-1820 | 0.00c | 0.00b | 0.00c | 0.00b |
| SOKOTO LOCAL | 0.00c | 0.00b | 0.00c | 0.00b |
| SEM | 0.058 | 0.063 | 0.0713 | 0.1067 |
| P value | <.001 | <.001 | <.001 | <.001 |
| Significance | ** | ** | ** | ** |

*Means followed by same letter(s) within the same column are not significantly different at 5% level using DMRT. WAT = weeks after transplanting. ** = significant at 1% level. P value = probability value.*

**Table 4**: Effect of variety on leaf area index of amaranth at Sokoto Sudan Savanna during 2021 season.

| Treatment | | | | |
|---|---|---|---|---|
| **Variety (V)** | **Leaf area index** | | | |
| | 2WAT | 3WAT | 4WAT | 5WAT |
| NHAC 3 | 0.385a | 0.884a | 1.444a | 2.148a |
| NHAC 2019 | 0.282b | 0.696b | 1.190b | 1.850b |
| NHAmGr-1820 | 0.169c | 0.424c | 0.655c | 1.023c |
| SOKOTO LOCAL | 0.167c | 0.365c | 0.596c | 0.835c |
| SEM | 0.1381 | 0.0289 | 0.0484 | 0.0766 |
| P value | <.001 | <.001 | <.001 | <.001 |
| Significance | ** | ** | ** | ** |

*Means followed by same letter(s) within the same column are not significantly different at 5% level using DMRT. WAT = weeks after transplanting. ** = significant at 1% level. P value = probability value.*

recorded in this study at 5WAT falls within Tongos (2016) reported range of 12.0-25.8 cm (2016). Sokoto Local's lower performance compared to other varieties could be attributed to genetic differences and adaptation to different growing conditions. The number of branches per plant recorded in this experiment (0.0-3.7) was lower than 2.7-16.0. Shiyam and Binang (2011). reported range of The leaf area index value recorded in this study at 5WAS ranged from 0.84-2.15, which was lower than 4.4-17.5 (Tongos 2016). The lower performance of NHAmGr-1820 and Sokoto Local among the varieties in terms of number of branches and leaf area index could be attributed to their genetic makeup. Wayah *et al*. (2014) discovered genotype differences in amaranth growth and yield.

## Conclusion

Based on the research findings, it is possible to conclude that NHAC 3 and NHAC 2019 performed better in the study area.

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### REFERENCES

Dada, O. A., Imade, F., and Anifowose, E. M. (2017). Growth and proximate composition of *Amaranthus cruentus* L. on poor soil amended with compost and *arbuscular mycorrhiza* fungi. *International Journal of Recycling of Organic Waste in Agriculture*, *6*(3): 195-202.

Dinsaa, F., Nyabinda, N., Byrnes, D. R., Ndinya, C., Merchant, E. V., and SimoN, J. E. (2020). Performances of vegetable Amaranth entries in yield and nutrient contents in Tanzania and Kenya, and variety release. *Journal of Medicinally Active Plants*, 9(3), 181-194.

Musa, M., Singh, A., and Aliyu Lawal, A. (2014). Influence of priming duration on the performance of Amaranths (*Amaranthus cruentus* L.) in Sokoto semiarid zone of Nigeria. *International Journal of Agronomy*, 475953:1-4.

Omamt, E. N., Hammes, P. S., and Robbertse, P. J. (2006). Differences in salinity tolerance for growth and water-use efficiency in some amaranth (*Amaranthus* spp.) genotypes. *New Zealand Journal of Crop and Horticultural Science*, 34(1), 11-22.

Onyango, C. M., Shibairo, S. I., Imungi, J. K. and Harbinson, J. (2008). The physico-chemical characteristics and some nutritional values of vegetable amaranth sold in Nairobi-Kenya. *Ecology of Food and Nutrition*, 47(4): 382-398.

Shiyam, J. O., and Binang, W. B. (2011). Effect of poultry manure and urea-n on flowering occurrence and leaf productivity of *Amaranthus cruentus*. *Journal of Applied Sciences and Environmental Management*, 15(1): 13-15.

Smith, F.I. and Eyzaguirre, P. (2007). African leafy vegetables: their role in the World Health Organization and Apos. S Global fruit and vegetables initiative, pp 1-8.

Sokoto Energy Research Centre (2012). Meteorological Data Sokoto Energy Research Centre Sokoto, Nigeria.

Tongos, M. D. (2016). Growth rate of vegetable amaranth (*Amaranthus cruentus* l.) As influenced by row spacing and nitrogen fertilizer in Mubi, Northern Guinea Savannah Zone, Nigeria. *Int. J. Innovative Agric. & Bio. Res*. 4 (2):8-20.

Wayah, S. B., Singh, A., Waziri, P. M., Theng, Z. Y., Nkem, B. M., Van Nguyen, T. T. and Yap, C. L. (2014). Effect of Genotype and Organic Fertilizer on Red: Far Red Ratio, Stomatal Conductance, Leaf Temperature, and Dry Weight of Amaranth. *Agricultura Tropica et Subtropica*, 47(3): 79-86.