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PHENOTYPIC EVALUATION OF CASSAVA (Manihot esculenta Crantz) GENOTYPES FOR ENHANCED BREEDING EFFICIENCY AT NRCRI, UMUDIKE

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ABSTRACT
Two hundred and twenty-five cassava genotypes were evaluated for fresh root yield, dry matter content and other agronomic traits in 2015-2016 growing season at the research station of National Root Crops Research institute (NRCRI), Umudike in Nigeria. The study was conducted to determine genotypes with higher yield and dry matter content. The results of the analysis of variance (ANOVA) showed significant difference among the genotypes evaluated for fresh root yield (FYLD) at $p \leq 0.001$ and dry matter content (DMC) at $p \leq 0.05$. DMC ranged from 23.4 to 60.7% with a mean of 35.6%. FYLD varied from 27.1 to 60.3 t/ha with a mean of 27.1 t/ha. Genotype NR110386 had the highest DMC of 60.7%. The highest mean yield was recorded for genotype NR110512 (60.25 t/ha), while genotype NR100245 had the highest shoot weight of 17.5kg. There were high levels of variability among the genotypes for all the traits studied that will be useful for cassava breeding and for subsequent release to farmers in Nigeria.

Keywords: Cassava, fresh root yield, dry matter content and phenotype

Introduction

Cassava (*Manihot esculenta* Crantz) is an important crop in terms of food security in Nigeria. Food crisis may occur in the absence of cassava. Cassava is a staple food although it is fast becoming an industrialized crop. It is a versatile crop and can be used for so many uses. It provides food for more than 500 million people who depend on it roots for their food and livelihood in the developing world (Maziya-Dixon *et al*., 2009). The starchy root of cassava is an important carbohydrate source and can be boiled or processed at the village level into *gari* or pounded into *fufu* for human consumption. In addition to being consumed in fresh form as food, the roots are also used as a source of raw material for the starch, livestock feed, ethanol, bioplastics and pharmaceutical industries (Ceballos *et al*., 2012). Young cassava shoots or leaves (young stems leaves and petioles) are also edible and are widely used as food (vegetables) in many parts of Africa where they constitute a major component of the diet in the cassava growing regions (Achidi *et al*., 2003). Cassava can grow under dry and high temperature conditions, in marginal soils (Cock *et al*., 1985). It has the ability to increase its yield under better management such as irrigation and fertilizer application (Cock *et al.*, 1985, Howeler *et al*., 2013).

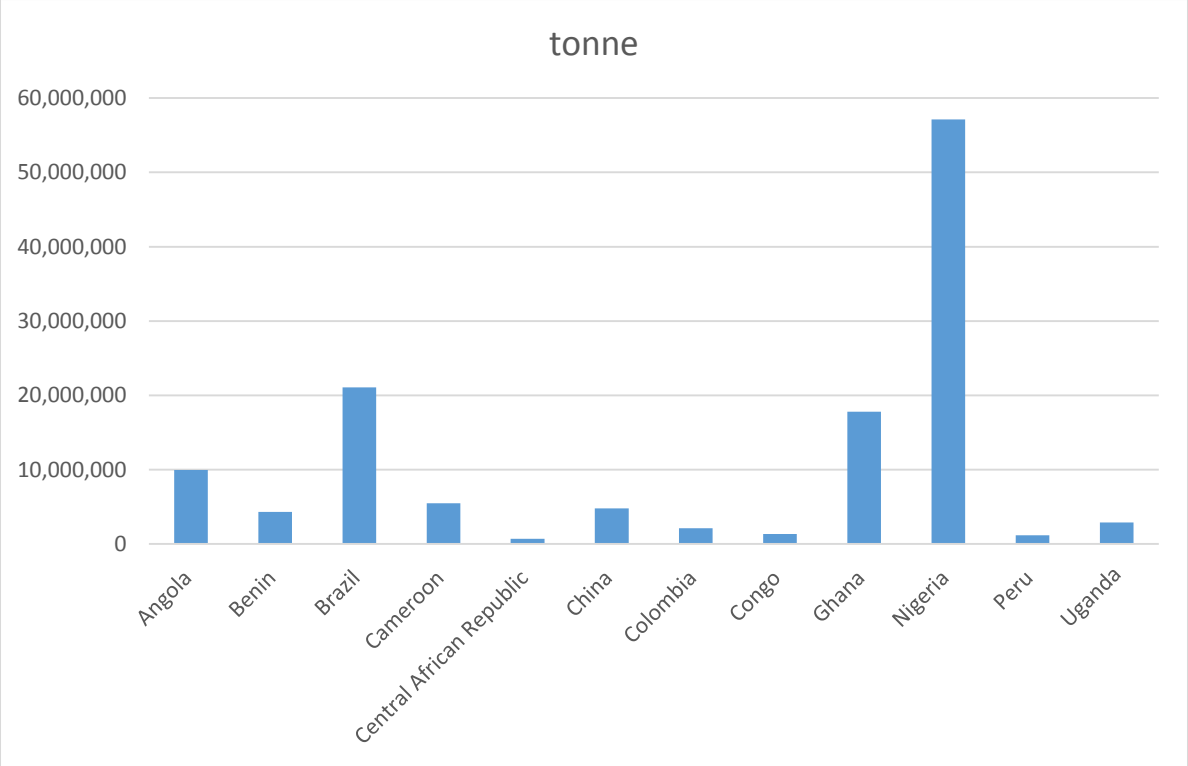

Figure 1: Cassava production (t/ha) for different countries and regions of the world. Source: FAO, 2016

Nigeria is the world leading producer of cassava with average production of 57 metric tonnes in 2016. (FAO, 2016). However, an array of constraints in combination with the crop's long traditional breeding cycle limit the efficient introduction of genes for key useful traits. In genetic improvement of cassava, the breeder's interest is to increase the root yield and other agronomic traits of genotypes that are resistant to major diseases and pest (Ceballos *et al.*, 2004). The aim of the study was to identify genotypes with high yield and dry matter content with a view to increasing the genetic diversity of improved cassava genotypes and subsequent release to Nigerian farmers

Materials and Methods

The experiment was carried out during the 2015/2016 growing season at the western farm of the National Root Crops Research Institute (NRCRI), Umudike. Two hundred and twenty-five cassava genotypes were selected from preliminary yield trial (PYT) based on yield and yield related traits and planted in an advanced yield trial (AYT). The trial was planted using a single row plot of 5 plants using an incomplete block design with three replications. Data on cassava mosaic disease (CMD) were collected at 3, 6 and 9 months after planting (MAP). Fresh root yield, dry matter content (specific gravity method) and harvest index were derived using the method as described by Fukuda *et al.* (2010). Statistics for all the variables evaluated was carried out using R. Studio and Analysis of variance (ANOVA) was performed.

Results and Discussion

There was high variation among the genotypes for all the traits studied. The analysis of variance (ANOVA) showed a significant difference ($p<0.05$) among the evaluated genotypes for fresh root yield, dry matter content, cassava mosaic disease severity (CMDS), and shoot weight (Table 2). Fresh root yield varied from 27.1 – 60.3 t/ha with genotype NR110512 having the highest yield. Also the results showed that the highest percentage dry matter content (DMC) was 60.68 % and was recorded by the genotype NR110386. The mean severity of CMD revealed that genotypes differ significantly in their field reaction to CMD. The difference in the field reaction of the genotypes to CMD severity agrees with the findings of Akinwale *et al*. (2010). Shoot weight varied from 5.63 to 17.5. Root size was positive and significantly correlated with fresh root yield. This observation agrees with Ssemakula and Dixon (2007) who reported significant and positive correlation between the two traits.

Conclusion

High variability existed among the cassava genotypes for agronomic traits such as fresh root yield and dry matter content. Our results revealed that genotypes

responded differently to CMD severity. However, some of the cassava genotypes showed high level of tolerance to CMD severity in Nigeria.

References

Achidi, A. U., Ajayi, O. A. and Bokanga, M. (2003). Cassava leaf utilization as vegetable source for humans in Africa. In: M. O. Akoroda. Ed. Root crops, the small processor and of local industries for a market. Economy. *Proceedings of the 8th Triennial Root Crops Symposium of the International Society of Root and Tuber Crops-Africa Branch.* International Institute of Tropical Agriculture (IITA), Ibadan, Nigeria. Pp. 104 – 109.

Akinwale, M. G., Akinyele, B. O., Odiyi, A. C. and Dixon, A. G. O. (2011). Genotype x environment interaction and yield performance of 43 improved cassava genotypes at three agro-climatic zones in Nigeria. British Biotechnology Journal 1: 68-84.

Ceballos, H., Luna, J., Escobar, A. F., Ortiz, D., Perez, J. C., Sanchez, T., Pachon, H. and Dufour, D. (2012). Spatial distribution of dry matter in yellow fleshed cassava roots and its influence on carotenoid retention upon boiling. *Food Research International* 45: 52-59.

Cock, J. H., Porto, M. C. M. and El-Sharkawy, M. A. (1985). Water Use Efficiency of Cassava. III. Influence of Air Humidity and Water Stress on Gas Exchange of Field Grown Cassava. *Crop Sci.* **25,** 265 (1985).

Howeler, R., Lutaladio, N. & Thomas, G. (2013) *Save and Grow: Cassava: a guide to sustainable production intensification*. (2013).

Maxiya-Dixon, B., Dixon, A. G. O. and Ssemakula, G. (2009). Changes in total carotenoid content at different stages of traditional processing of yellow-fleshed cassava genotypes. *International Journal of Food Science and Technology* 44: 2350-2357.

Phillips, T., Taylor, D., Sanni, L. & Akoroda, M. A (2004) cassava industrial revolution in Nigeria: the potential of a new industrial crop. (2004)

Ssemakula, G. and Dixon, A. G. O. (2007). Genotype x environment interaction, stability and agronomic performance of carotenoid-rich cassava clones. Scientific Research and Essay 2: 390-399.

Table 1: The mean, maximum, minimum and standard deviation of the traits studied

Traits	**Mean**	**Max**	**Min**	**Std**
DMC	35.61	60.68	23.39	4.9
FYLD	27.07	60.25	27.07	11.35
SHWT	5.63	17.5	5.63	3.12
CMD6S	1.21	3.5	1.21	0.5
CMD9S	1.18	3.5	1.18	0.48

DMC= Dry matter content (%); FYLD = Fresh root yield (t/ha); SHWT = Shoot weight; CMD6S = Cassava mosaic disease severity at 6 months after planting (MAP); CMD9S = Cassava mosaic disease severity at 9 months after planting (MAP); Max = Maximum; Min = Minimum; Std= Standard deviation

Table 2: Analysis of variance of the traits evaluated

Traits	**Genotype**	**Rep**	**Residuals**
DMC	0.006*	0.012	0.005
FYLD	0.107***	0.247*	0.056
CMD6S	0.03***	0.013	0.014
CMD9S	0.149***	0.009	0.053
SHWT	0.809***	1.423*	0.358

DMC =Dry matter content (%); FYLD =Fresh root yield (t/ha); SHWT=Shoot weight; CMD6S =Cassava mosaic disease severity at 6 months after planting (MAP); CMD9S =Cassava mosaic disease severity at 9 months after planting(MAP)

Table 3: Top 5 genotypes for DMC and FYLD

S/N	Genotype	DMC%	Genotype	FYLD(t/ha)
1	NR110386	60.68	NR110512	60.25
2	NR100122	54.51	NR100011	57.67
3	NR110478	51.62	NR110478	55.25
4	NR110095	49.76	NR100230	52.5
5	NR110052	49.56	NR110078	51