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INTRODUCTION

Biofortified cassava has great potential to alleviate vitamin A deficiency (VAD) in sub-Saharan Africa (SSA) and can be used as a complementary approach to other interventions¹. Development of provitamin A carotenoids (pVAC) cassava varieties, would sustainably improve nutrition and reduce prevalence of VAD in communities that primarily depend on cassava particularly among resource poor farmers. Ideally, pVAC cassava varieties are also expected to have high dry matter content if they are to be adopted. Varieties with these two traits and high fresh yield are likely to be adopted for subsistence agriculture². However, compared to efforts in other important crops, genetic improvement of cassava has lagged behind keeping the crop's production below its potentials.

OBJECTIVE

This current study was conducted to evaluate biofortified cassava varieties at the preliminary breeding stage for total carotenoid content (TCC), dry matter content (DMC) and fresh root yield (FYLD).

MATERIALS AND METHODS

A total of 464 clones derived from a 6 x 6 full sib diallel cross combinations with 10 checks were evaluated in a preliminary yield trial (PYT) at International Institute of Tropical Agriculture (IITA), Ikenne sub station in 2014/2015. The i-check analytical kit was used for measuring TCC⁵. 100g of each homogenous sample were taken for measurement of DMC using the oven dry method (70°C for 72 hours). Estimate of genotypic mean values (GMV) and genetic variances for general and specific combining abilities (GCA and SCA) were computed. Broad sense heritability was computed for each trait measured. Analysis of variance (ANOVA) was done using procedures in SAS and mean were separated using the standard error of difference.

RESULTS AND DISCUSSION

The mean performance for the top eight ranked genotypes for dry matter, fresh yield and total carotenoids content (Table 1) showed that these genotypes performed better than the check genotypes for each of these traits. TC ranged from 10.6-13.6µg/g, fresh root yield ranged from 39.9-57.6 (t/ha), while dry matter ranged from 36.2-41.2 (%). Negative correlation coefficient were observed for some of the traits, FYLD:TC ($r=-0.18$), and negligible for TC:DM ($r=-0.03$), while FYLD:DM were positively correlated (Table 2).

Fresh root yield and total carotenoid content with higher SCA values than GCA suggests the two traits are more likely to be controlled by non-additive genes while dry matter with higher GCA values than SCA infers that DM is largely controlled by additive genes (Table 3). Heritability estimates was high for TCC (68%), and FRY (61%) and moderate for DM (51%).



Cassava food products



Icheck device

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Table 1: Mean performance of Top 8 genotype for TC, FYLD and DM

Selections for Carotenoid content (TC)			
clone	Total carotenoids (µg/g fr. wt.)	Fresh yield (t/ha)	Dry matter (%)
IKN120920	13.6	1.3	30.0
IKN120874	11.9	11.3	27.6
IBA121683	11.7	10.8	31.4
IKN120767	11.7	20.0	23.8
IKN120828	11.2	3.8	33.1
IKN120775	10.7	1.9	27.0
IKN120763	10.6	9.1	18.7
IBA121708	10.6	16.3	29.5
IBA070593 (chk)	9.7	24.2	28.8

Selections for Fresh yield (FYLD)			
clone	FYLD	tcchk	DM
IKN120858	57.6	3.6	31.9
IKN120629	50.0	2.9	25.1
IKN120636	46.4	3.1	24.3
IKN120726	46.3	6.2	16.6
IKN121028	44.3	5.1	37.1
IKN121034	43.4	6.8	24.7
IKN120578	40.4	6.8	28.4
IKN121029	39.9	7.3	25.3
IBA070593 (chk)	24.2	9.7	28.8

Selections for Dry matter (DM)			
clone	DM	tcchk	FYLD
IBA140939	41.2	3.6	2.5
IKN120691	39.4	8.0	27.6
IKN120697	39.0	3.8	28.0
IKN120956	37.7	8.0	2.9
IBA121595	37.6	4.4	8.3
IKN121028	37.1	5.1	44.3
IKN120793	36.7	6.4	1.8
IKN120741	36.2	6.3	5.0
IBA070593 (chk)	28.8	9.7	24.2

Table 2: Correlation coefficient (r) for 464 clones

Trait pair	corr coefficient (r)
FYLD: TC	-0.18
TC:DM	-0.03
FYLD:DM	0.18



FYLD= fresh root yield, DM= dry matter, TC= total carotenoid content

Table 3: GCA, SCA, standard error and heritability of selected traits of yellow cassava in Ikenne

Effects	Fresh root yield	Total carotenoids	Dry matter
Vgca	9.89	0.31	5.36
Vsca	10.98	0.39	1.08
Ve	105.91	3.09	39.02
H2	0.61	0.68	0.51

Vgca= variance of general combining ability, Vsca= variance of specific combining ability, Ve= environmental variance H²= Heritability.

CONCLUSION

Genotypes with improved performance identified in this study could be further advanced to the next breeding stage for varietal improvement. The top 5 genotypes with high TCC could provide more vitamin A in diets and contribute to reducing vitamin A deficiency among the vulnerable groups in SSA.

REFERENCES

- Bouis H.E, Hotz C, McClafferty B, Meenakshi J.E Pfeiffer W.H (2011). Biofortification: a new tool to reduce micronutrient malnutrition. Food Nutri Bull 32: S31-40..
- Njukwe, E., R. Hanna, H. Krirscht and S. Araki 2013. Farmers perception and criteria for cassava variety preference in Cameroon. Afr. Study Monogr. 34: 221-234