

Variation in carotenoids content in roots from the same plant and plants from the same cassava genotype

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Introduction

A reliable quantification of total carotenoids content (TCC) in cassava roots is critical for an efficient breeding process. An earlier study measured variation in TCC within the root, between roots of the same plant and between plants from the same genotype¹. This study reports a similar analysis conducted in 2008.

Materials and methods

A total of 35 cloned genotypes were used for this study. Three roots from two plants were harvested from each genotype. Two quantifications per root (aliquots) were made (12 measurements in most genotypes). Carotenoids extraction and quantification was made following standard procedures^{2,3}.

Results

From the 35 clones initially planted for this experiment only 26 allowed the harvest of at least two commercial-size roots from each of two plants. 17 genotypes allowed the harvest of three roots from the two plants for a total of six different root samples. In the case of three genotypes, three roots were harvested in one plant, but only two in the second. From the remaining six genotypes, only two roots from each of the two plants could be harvested and analyzed.

Total carotenoids contents (TCC) ranged widely from 2.87 to 13.60 $\mu\text{g/g}$ (FW basis). The relationship between TCC in the seedling and in the cloned plants was very close (1-2 μg higher in seedlings than in the cloned plants). Average TCC in cloned plants was 8.20 μg and the average standard deviation was 1.27 μg . This variation is slightly higher than that measured earlier¹. In some cases there was a clear difference in the performance of the two plants representing each genotype and/or among roots from the same plant (Figure 1). A plausible explanation for the differences observed among some roots of few genotypes could be that they initiated the bulking process later, and, therefore, the roots would have had a shorter period of time to accumulate carotenoids. Results from this study suggest that it is advisable to take 2-3 roots from each plant in the sampling procedures.

The regression of TCC ($\mu\text{g/g}$ fresh root) on dry matter content (%) in the 26 genotypes analyzed (data averaged across roots within a plant and the two plants per genotype) was positive (regression coefficient 0.31 with an $R^2 = 0.38$). This demonstrates that accumulation of carotenoids does not affect negatively other root quality traits. The coefficient of variation (%) for the different samples analyzed was not associated with higher TCC.

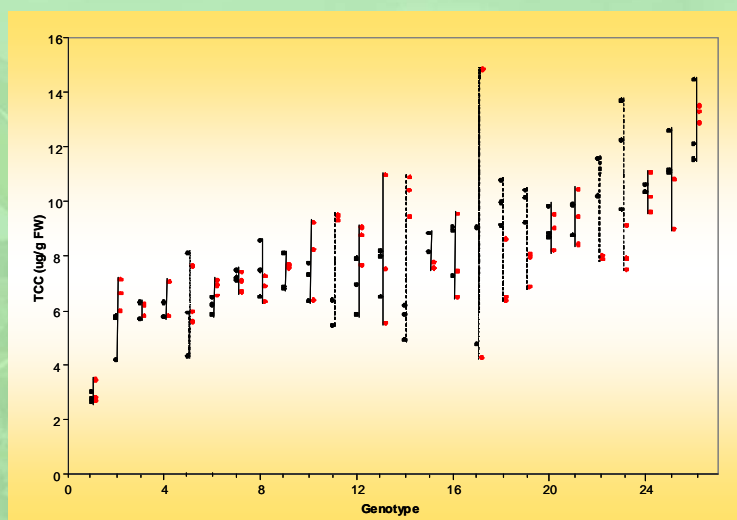


Figure 1. Total carotenoid content ($\mu\text{g/g}$ FW) in roots from 26 genotypes represented by two plants and up to three roots per plant. Dots linked with a line represent roots from the same genotype. Red or black dots identify the roots coming from each of the two plants representing the different genotypes.

References

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