Sampling variability in cassava roots for total carotene content

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Introduction

As the interest for a precise determination of the provitamin A carotenoids content of foods is becoming more generalized, efforts had to be directed at improving the validity/reliability of the data. Because of the inherent difficulties in carotenoid analysis, which are sometimes not perceived by the analysts themselves, the reliability of a substantial portion of existing data may be questionable.

It is recognized that the carotenoid composition varies as a function of several factors (e.g., stage of maturity, cultivar, handling, analysis method, etc.). However, little is known about the variability of the samples used for measuring carotene content in tissue-like cassava (Manihot Sculenta Crantz) roots.

The overall objective of this project is to improve the nutritional status of people living in marginal environments of the tropics, by selecting and promoting cassava genotypes with high and good bio-availability of micronutrients and vitamins. This research is part of the HarvestPlus Initiative and was financed by DANIDA and USAID.

Results

Figure 1 summarizes the results observed in the 279 samples evaluated for carotenoid content. Three roots from nine plants plus two roots from two additional plants (a total of 31 roots) were used in this study.

![Carotenoid Measurements](image)

Figure 1. Average and standard deviation for the carotenoid measurements in different sections of cassava roots, based on a sample of 31 roots, from 11 different plants of cultivar CM 2173-7. Values in mg / 100 g of fresh tissue.

The overall average for carotene content was 0.355 ± 0.028 mg / 100 g fresh tissue. The range of variation in the average carotene content among the 11 plants evaluated was 0.293 to 0.391 mg / 100 g fresh tissue. The average standard deviation among roots within the same plant was 0.034 mg / 100 g fresh tissue.

The highest and lowest individual measurements among the 279 data points were 0.742 and 0.214 mg / 100 g fresh tissue, respectively. This variation involves experimental error in the measurements, plant to plant variation (see the standard error of 0.028, above), root within plant variation (see the standard variation of 0.034 above), and sector variation along the length and radial position of the samples within the roots (Figure 1).

Although no position in the root resulted in a statistically significant difference for carotene content, there was a clear trend for the proximal section to have higher carotene contents that the distal section. Also, the periphery of the root tended to have lower amounts of carotenoids that the more internal tissue.

Conclusions

To reduce experimental error through differences in sampling procedures, it is recommended that a standard sampling procedure is used for measuring carotene content in cassava roots. A section of the central part of the root, from periphery to center would probably minimize the sampling effect.

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