Dissecting genetic variation and linking crop functional traits to iron, zinc and carotenoids contents in amaranth (*Amaranthus cruentus* L.) genetic resources

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Abstract

The evaluation of germplasm collection is a prerequisite for the development of vegetable amaranths breeding program. The present study examined the variation in carotenoids, zinc and iron content as well as plant architecture, and leaf-yield related traits for 25 accessions of amaranth (*Amaranthus cruentus* L.) from various origins. Experiments were conducted during the early planting season (April-June) and the late planting season (August-October) 2019 in the experimental field of the Department of Crop production and Landscape Management, Ebonyi State University, Nigeria and the extraction of nutrients content in the Laboratory of Biochemistry of Alex Ekwueme Federal University, Nigeria. All horticultural traits showed significant differences among all the accessions except the survival rate after cutting. For the nutrient content, significant variation was only found among accessions for carotenoids and zinc levels. Seasonal variation significantly affected all the traits. The broad-sense heritability estimate for 19 quantitative traits ranged from H^2 <0.05 for carotenoids content in the leaves to 0.85 for length: width leaf ratio. The Pearson correlation matrix and genetic correlation indicated significant and strong positive correlations between most of the yield-related traits, the total yield, and the marketable fresh vegetable yield. A moderate to strong significant correlation was noticed between the horticultural traits and all the nutrients except total carotenoids levels. Overall, the accessions were grouped into three clusters based on only the horticultural traits. These results confirmed the hypothesis that selection can be made for leaf yield; other related traits, and zinc content. The study provides information on the variation for traits of interest to enhance breeding for leaf yield and nutrient content in *A. cruentus.*

Keywords: Amaranth, Nutrient content, Leaf yield, horticultural traits, Breeding