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ORIGINAL PAPER

The effects of transplant age on elemental content determined by wavelength-dispersive X-ray fluorescence spectrometry of broccoli cultivars

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Abstract

The aim of this study was to investigate the effects of cultivar and transplant age on the elemental composition of broccoli (*Brassica oleracea* L. var. *italica*) and to evaluate the suitability of wavelength-dispersive X-ray fluorescence (WDXRF) as a quantitative method for mineral analysis in broccoli samples. Three broccoli cultivars were used in the field experiment: Jade F₁, Monaco F₁, and Monopoly F₁. The results showed that all the elements were present at considerable levels. Among the factors assessed in the experiment, cultivar had the greatest impact on the elemental composition, followed by year and transplant age. The Monopoly F₁ cultivar generally showed a greater ability to accumulate multiple elements. P, S, and Cl contents were significantly affected by the year factor, underscoring the importance of environmental factors in nutrient absorption. Higher concentrations of P, S, and Cl were also associated with an increasing transplant age. Principal component analysis (PCA) further showed that the nutrient composition of broccoli varied depending on the interaction between genotype, transplant age and experiment year, with some nutrients being more closely associated with specific combinations of genotype and transplant age. Additionally, the findings indicate that WDXRF is a rapid and accurate method for determining the elemental makeup of broccoli samples. Overall, the findings imply that the mineral composition of broccoli is influenced by a combination of developmental, environmental, and genetic factors.

Keywords: broccoli, elemental analyses, transplant age, WDXRF

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