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Original Research

Endogenous Minerals Conditioned Genotypic Variation of Phytochemicals in Broccoli Leaves under Salinity Stress

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Abstract

Here, changes in the leaf mineral composition of broccoli (*Brassica oleracea* L. var. *italica* Plenck) plants in response to single and interactive two-week salt (0, 30, 60 and 90 mM NaCl) exposure and cultivar (cvs. Parthenon and Naxos) factors were studied, as well as their correlations with individual glucosinolates (GSLs), vitamin C and total anthocyanins. Results showed significant differences in micro- (Fe^{2+}, Cu^{2+}, Zn^{2+}, Mn^{2+} and B^{3+}) and macroelements (S, N, C, NH_4^+) contents regarding the studied factors and/or their interaction. Salinity effects on individual GSLs showed contradictor behaviours between both cultivars, being the increase in aliphatics in Parthenon negatively correlated with Mn^{2+} ions, while the decrease in indolics in Naxos related positively with N and N/S ratio and negatively with NH_4^+ content (P<0.01). Interestingly, only in cv. Naxos all bioactive compounds displayed a strong relationship with Zn^{2+} ions, majorly negative. Stress intensity-dependant reductions in vitamin C and total anthocyanin levels in both cultivars were caused by differential endogenous NH_4^+ ions accumulation, reflecting co-participation of these compounds in the leaf antioxidant capacity. Overall, in salt-affected lands, a clear genotypic dependence of broccoli plants regarding endogenous leaf minerals was recorded, influencing individual GSLs, vitamin C and total anthocyanin profiles.

Keywords: broccoli cultivars, correlation, minerals, phytochemicals, salinity

Introduction

Soil salinisation is one of the major abiotic factors limiting agricultural productivity worldwide [1, 2]. Salt stress may occur in areas where soils are naturally high in salts and/or where irrigation with salty underground water brings salt to the surface soil that plants inhabit [3]. In glycophytic plants, salinity can induce nutritional disorders as a result of its osmotic effect, which is equivalent to a decrease in water activity through specific toxic effects of Na^+ and Cl^- ions [4, 5]; thus, reducing their growth [6]. In addition, it also manifested an oxidative stress [7]. However, the microelements are generally less affected by salt stress compared with macroelements because of the fact that they are required in much smaller quantities [8, 9], even though different ideas related to their tendency of variation are

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