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Limitation of mineral supply as tool for the induction of secondary metabolites accumulation in tomato leaves

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ABSTRACT

Agricultural residues are natural sources for secondary metabolites as high value ingredients for industrial uses. The present work aims to exploit the accumulation potential of rutin and solanesol in tomato leaves following nitrogen and general mineral deficiency in a commercial-like greenhouse. Physiological responses of tomato plants were monitored non-destructively with a multiparametric fluorescence sensor, and biochemical parameters were determined by means of HPLC analysis. Nitrogen and general mineral limitation led to an accumulation of rutin in young tomato leaves while solanesol concentration was higher in mature leaves. In young leaves, the fluorescence indices SFR_R and NBI_G showed lower values compared to control plants for both stress treatments. On the contrary, FLAV and ANTH_RG values increased during the experiment, but no differences could be recorded in mature leaves. However, correlation analysis indicates, that the FLAV index is not a reliable tool to estimate the concentration of rutin and solanesol tomato leaves. To monitor fruit yield/quality as primary objective of tomato production, fruits showing symptoms of blossom end rot (BER) were counted before and after stress treatments. BER was determined more frequently for plants grown under a general mineral deficiency, concluding that a practical applicability at the end of fruit production is advisable. Our results indicate that by-products from Solanaceae plants are promising resources for valuable bioactive leaf compounds. To achieve the highest concentrations, the seasonal variation, the optimal environmental conditions, the concentrations in different plant organs and varieties as well as different production systems are of high interest for commercial implementation.