
Modification of reactive nitrogen species metabolism as a secondary mode of action of meta-Tyrosine in tomato roots

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Abstract

A non-protein amino acid (NPAA) - *meta*-Tyrosine (*m*-Tyr) a structural analog of phenylalanine is a harmful compound produced by chewing fescue (*Festuca rubra* L. ssp. *commutata*) and donkey-tail spurge (*Euphorbia myrsinites* L.) roots. In animal cells *m*-Tyr is commonly considered as a marker of oxidative stress, due to its generation in the presence of reactive oxygen species. As a material we have used 3-4 days old tomato (*Solanum lycopersicum* L.) seedlings treated for 24-72 h with *m*-Tyr (50 or 250 μ M), resulting in inhibition of root growth by 50 or 100%, without lethal effect. Fluorescence of DAF-FM and APF derivatives was determined to show reactive nitrogen species (RNS) level in roots of tomato plants. *m*-Tyr-induced restriction of root elongation growth was related to formation of nitrated proteins described as content of 3-nitro tyrosine. Supplementation of tomato seedlings with *m*-Tyr enhanced superoxide radicals generation in roots and stimulated protein nitration. It correlated well to increase of fluorescence of DAF-FM derivatives, and transiently stimulated fluorescence of APF derivatives corresponding respectively to NO and ONOO-formation. Modifications in RNS formation induced by *m*-Tyr were linked to metabolism of nitrosoglutathione (GSNO). Activity of nitrosoglutathione reductase (GSNOR), catalyzing degradation of GSNO was enhanced by long term supplementation of tomato seedlings with *m*-Tyr, similarly as protein abundance, while transcripts level were only slightly altered by tested NPAA. We conclude, that secondary mode of action of *m*-Tyr in roots of tomato plants involves perturbation in RNS formation, alteration in GSNO metabolism and modification of protein nitration level. Acknowledgments: The work was financed by National Science Centre grant 2014/13/B/NZ9/02074

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