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Effects of different amino acids on root growth and proteomic profiles in maize (*Zea mays* L.)C. Muratore, V. Grassi, A. A. C. Masud, L. Espen, Bhakti Prinsi

Department of Agricultural and Environmental Sciences - Production, Landscape, Agroenergy, Università degli Studi di Milano, Milano, Italia

Nitrate (NO_3^-) is the main nitrogen (N) nutrient for plants. However, recent studies highlighted that individual amino acids have distinct effects on root architecture, that plants can acquire amino acids from the growing media and, moreover, that several amino acids promote growth of *Arabidopsis*. In addition, amino acids are considered key components of protein hydrolysate-based biostimulants. These findings raise questions about possible signalling and nutritional roles of exogenous amino acids in plants, but there is still a lack of comprehensive information.

This work aimed to investigate this topic in maize (*Zea mays* L.), a model species for studying N nutrition in crops. After germination, maize seedlings were grown in hydroponic in CaSO_4 4 mM for the first 24 hours and then transferred in 5 different complete nutrient solutions, containing: NO_3^- 2 mM, Val 2 mM, Gln 2 mM, Asp 2 mM, and Ala 2 mM. The solutions were renewed every day and plants were collected after 6 h of light on the 4th day of treatment. All amino acids sustained lower plant growth than NO_3^- but exerted different effects on root architecture. While Val was almost ineffective, other amino acids induced a reduction in the lengths of primary and lateral roots, clearly more marked in Ala-treated plants. Moreover, in comparison with NO_3^- , all amino acidic treatments induced an increase in free amino acid and protein contents in roots, suggesting metabolic effects that were investigated by proteomics. The GeLC-MS/MS analysis of root profiles led to the identification and quantification of 233 proteins, among which 53 (22.7%) changed in abundance among treatments. The profile of NO_3^- -fed plants showed typical traits linked to the nutrient assimilation. The exposure to Val mainly influenced proteins related to biotic stress. Otherwise, Gln, Asp and Ala treatments induced changes in the abundance of enzymes involved in several pathways, notably transaminations, carbon catabolism, energy supply and stress responses, suggesting broader effects.

Overall, this study supports the hypothesis that the provision of amino acids could influence plant growth and paves the way for further investigation into their metabolic effects.

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