Effect of water availability on changes in root amino acids and associated rhizospere on root exudation of amino acids in Pisum sativum L

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Résumé en anglais	Root exudation is considered to regulate the abundance of the microbial community. It may vary both qualitatively and quantitatively in response to the environment in which the plant is growing. A part of exuded N derives from amino acids (AAs). This, in turn, may help plants to cope with abiotic stresses by favouring positive interactions with the rhizosphere environment, thus playing a potential role in maintaining healthy plants. In this respect, an under-investigated area is the effect of stress due to water deficit (WD). It is proposed that the AA profile in the rhizosphere may be altered by WD, reflecting a modulation of root AA exudation linked to a physiological response of the plant to water stress. To investigate this, Pisum sativum L. plants, grown in unsterilised Rhizobium leguminosarum-enriched soil, were stem-labelled with 15N-urea for 96 h, and then subjected/not subjected to 72 h of WD. The concentrations and abundance of 15N-labelling in individual AAs were determined in both roots and the associated rhizosphere at 24, 48 and 72 h after stress application. It was found that both AAs metabolism in the pea root and AAs exudation were strongly modified in WD conditions. After 24 h of WD, the concentrations of all measured AAs increased in the roots, accompanied by a dramatic stress-related increase in the 15N-labelling of some AAs. Furthermore, after 48–72 h of WD, the concentrations of Pro, Ala and Glu increased significantly within the rhizosphere, notably with a concomitant increase in 15N-enrichment in Pro, Ser, Asn, Asp, Thr and Ile. These results support the concept that, in response to WD, substantial amounts of recently assimilated N are rapidly translocated from the shoots to the roots, a portion of which is exuded as AAs. This leads to the rhizosphere being relatively augmented by specific AAs (notably HSer, Pro and Ala) in WD conditions, with a potential impact on soil water retention.

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