

Cell-wall pectins in the roots of Apiaceae plants: Adaptations to Cd stress

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Abstract

The influence of Cd-stress on changes in the pectin of root cell walls (CWs), and the Cd content in the initial growth of plants of two species of Apiaceae L. (parsnips and celeriac) were investigated. Plants were grown in hydroponic systems under controlled environmental conditions, with and without the addition of Cd²⁺ ions. Higher amounts of Cd²⁺ ions were taken up and accumulated in the roots of the parsnips than in the celeriac. An increase in pectin content and its degree of methylation (DM), and a decrease in pectin methylesterase (PME) activity in parsnip root CWs under Cd stress were noted. With regard to celeriac, a decrease in pectin content and its DM occurred with increasing PME activity. The total soluble pectin content under Cd-stress was predominantly related to changes in the diluted alkali (sodium carbonate)-soluble pectin (DASP). Similar amounts of CW-bound Cd²⁺ in both species were caused by an increase in pectin content (parsnip) or a decrease in DM pectin (celeriac), related to an increase in PME activity under stress. Differences between parsnips and celery in Cd uptake and binding suggest that metal fixation in storage roots depends on a cell compartment other than that of the CW.

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