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The influence of ascorbic acid on root growth and the root apical meristem in

Arabidopsis thaliana

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Abstract

Cell division is a fundamental biological process governed by molecular networks that are initiated in the apical meristems of plants. L-ascorbic acid (AsA) commonly known as vitamin C is a crucial molecular modulator involved in cell proliferation. In this study, we used AsA application to *Arabidopsis* and four AsA pathway mutants to investigate the influence of AsA on the root apical meristem (RAM) and root growth. Treatment of seeds of wild-type Col-0 with AsA prior to sowing showed a significant increase in the activity of cell division of the RAM, root growth rate and root length when compared with untreated seeds. Seedlings of the AsA pathway mutant *vtc1-1* showed a significant reduction in the level of AsA and a significant increase in the number of quiescent cells in the RAM when compared with Col-0. Cell proliferation was reduced in the AsA pathway mutants *vtc1-1*, *dhar1*, *vtc5-1*, *apx1*, respectively, however, root growth decreased significantly only in *vtc1-1* when compared with Col-0. In addition, hydrogen peroxide (H₂O₂) levels were shown to increase in the AsA pathway mutants, with the highest level of H₂O₂ found in *vtc1-1*. AsA is also shown to have an indirect influence in inducing periclinal division as a reduced level was found in *vtc1-1*. Therefore, in this study, we found that AsA had an influence on cell proliferation and root growth and *VTC1* was shown to be a key modulator of H₂O₂ levels. These findings open the door for further studies to reveal the indirect involvement of AsA in cell

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