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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 (H_2O_2) levels were shown to increase in the AsA pathway mutants, with the highest level of H_2O_2 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 H_2O_2 levels. These findings open the door for further studies to reveal the indirect involvement of AsA in cell