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from signaling to development

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17 ALTERED ASCORBATE REDOX STATE IN TOBACCO PLANTS RESULTS IN DELAYED DARK-INDUCED SENESCENCE IN DETACHED LEAVES

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Ascorbate oxidase (AO) is an apoplastic enzyme that uses oxygen to catalyze the oxidation of ascorbate (AA) to dehydroascorbate (DHA) via the unstable radical monodehydroascorbate (MDHA). Here, we report that transgenic tobacco plants (*Nicotiana tabacum* L. cv. Xanthi) with an in vivo lowered apoplast AA redox state through increased AO expression demonstrate signs of delayed dark-induced senescence compared with wild-type plants, as shown by chlorophyll loss and lipid peroxidation assays. In situ localization of H₂O₂ suggests that although transgenic plants have higher constitutive levels of H₂O₂ under normal growth conditions, imposed dark-induced senescence results in smaller induction levels of H₂O₂, an observation which correlates with increased antioxidant enzyme activities and an induction in the expression of AA recycling genes compared with that in wild-type plants. Our current findings, combined with previous studies which showed the contribution of AO in the regulation of AA redox state, suggest that the reduction in AA redox state in the leaf apoplast of these transgenic plants results in an increase in the endogenous levels of H₂O₂, which provides a form of 'acquired tolerance' to oxidative stress imposed by dark-induced senescence.