FUNCTION OF ABSCISIC ACID IN MAINTENANCE OF MAIZE PRIMARY ROOT GROWTH UNDER WATER DEFICIT

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ABSTRACT

Previous studies suggested that ABA accumulation is required to maintain maize primary root elongation under water deficit and that one of the functions of ABA is to restrict ethylene evolution. These studies were conducted by using carotenoid deficient seedlings to induce ABA deficiency. Using the recently available ABA-deficient mutant *vp14*, it was confirmed that endogenous ABA accumulation maintains root growth under water stress by restricting ethylene synthesis. Gene expression studies confirmed that the *Vp14* is an important regulator of the ABA synthesis required for root growth maintenance under water deficit. Staining for intracellular ROS in *vp14* roots indicated that ABA deficiency under water deficit caused excess ROS levels. Moreover, the increase in ROS levels preceded and caused loss of plasma membrane integrity in *vp14* roots under water deficits. The results provide conclusive evidence that the maintenance of elongation in the maize primary root requires the accumulation of ABA both to restrict ethylene synthesis and to prevent excess levels of intracellular ROS. A supplemental objective was to develop a method for imaging apoplastic ROS. Increased apoplastic ROS levels occurred specifically in the region of growth maintenance in roots under water deficits. Further work is needed to determine the mechanism by which ABA regulates ROS balance in water-stressed roots.