

Public Abstract

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Title:Function of Abscisic Acid in Maintenance of Maize Primary Root Growth under Water Deficit

Drought causes major reductions of crop yields. Improvements in crop productivity are essential to feed the increasing human population. To achieve this goal, it is particularly important to gain an understanding of the mechanisms of plant adaptation to water deficits. Despite much investigation for several decades, the mechanisms of adaptation are not fully understood.

It has been suggested that abscisic acid (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. In this study, using the ABA-deficient mutant *vp14*, it was confirmed that endogenous ABA accumulation maintains root growth under water deficit by restricting ethylene synthesis. The endogenous ABA synthesis under water deficit was contributed by *Vp14* gene expression. Furthermore, staining of roots of the *vp14* mutant for intracellular reactive oxygen species (ROS) indicates that ABA deficiency caused excess ROS levels and associated cellular damage in the root growth zone under water deficit. 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. These physiological findings will improve interpretation of massive data sets generated by microarrays and facilitate the utilization of advanced genetic techniques.