ROOT ENGINEERING: A STRATEGY FOR AGRICULTURE IN MARGINAL AREAS OF CULTIVATION

Roberto A. Gaxiola

Arizona State University

We have recently shown that AVP1, a type I intracellular H^+-PPase, plays a key role in root development in Arabidopsis, likely through its effects on the transport of the growth hormone auxin. These effects are due to the formation and maintenance of auxin gradients being intimately involved in root growth and development. There is a high degree of identity at the amino acid level among the type I H^+-PPases across the plant kingdom. Thus, over-expression of Arabidopsis AVP1 leads to similar phenotypes in tomato and rice, making it an ideal target to engineer larger and more branched root systems and increased root biomass. These plants also exhibit increased shoot system biomass and stress resistance i.e., they exhibit those desirable features for improving crop performance. Furthermore, we have data that provide evidence consistent with the model that links enhanced auxin sensitivity, root architecture modifications, and rhizosphere acidification triggered by P_i deficiency through AVP1 action. Arabidopsis, tomato and rice plants engineered to express the *35S:AVP1* cassette outperform vector controls when challenged with Pi deficient media.