Basic research enhances potential for cultivation in extreme climates

May 9 2011

Research on gene expression has resulted in plants that can survive drought, high salt concentrations, and infections. This opens the possibility of forestry in harsh climates. The plants produce more leaves than usual, which mean that they can yield more food per plant. These are the findings of researchers at Umeå University in Sweden in an article in the *Proceedings of the American Academy of Sciences (PNAS)*.

All living organisms are dependent on water, but this is especially true for plants. Limited access to water is one of the decisive factors for humans to be able to survive in large parts of the earth. The development of plants (crops) with greater tolerance for drought is of great importance for more people to be able to live a decent life.

In a pure basic research project, where the goal was to understand how cells regulate protein expression, scientists in Umea have now taken a giant step forward on the road to developing plants with greater resistance to drought, infections, and high concentrations of salt. By deactivating a gene that codes for a protein that is part of the so-called mediator complex in the plant mouse-ear cress, the researchers have shown that these plants evince a much greater ability to survive drought. At the same time, they have stronger resistance to high salt concentrations and their blooming is delayed, which indirectly leads to increased leaf production.

The research project is a collaboration between scientists at the Department of Medical Biochemistry and Biophysics at Umea

University and the Department of Forest Genetics and Plant Physiology and the Department of Microbiology at the Swedish University of Agricultural Sciences (SLU).

More information: The Arabidopsis thaliana Med25 mediator subunit integrates environmental cues to control plant development Nils Elfving, Céline Davoine, Reyes Benlloch, Jeanette Blomberg, Kristoffer Brännström, Dörte Müller, Anders Nilsson, Mikael Ulfstedt, Hans Ronne, Gunnar Wingsle, Ove Nilsson and Stefan Björklund. *Proceedings of the National Academy of Sciences (PNAS)* 2011; published ahead of print May 2, 2011: www.pnas.org/cgi/doi/10.1073/pnas.1002981108

Abstract

Development in plants is controlled by abiotic environmental cues such as day length, light quality, temperature, drought, and salinity. These signals are sensed by a variety of systems and transmitted by different signal transduction pathways. Ultimately, these pathways are integrated to control expression of specific target genes, which encode proteins that regulate development and differentiation. The molecular mechanisms for such integration have remained elusive. We here show that a linear 130-amino-acids-long sequence in the Med25 subunit of the Arabidopsis thaliana Mediator is a common target for the drought response element binding protein 2A, zinc finger homeodomain 1, and Myb-like transcription factors which are involved in different stress response pathways. In addition, our results show that Med25 together with drought response element binding protein 2A also function in repression of PhyB-mediated light signaling and thus integrate signals from different regulatory pathways.

Provided by Umea University