ECOS
SCIENCE FOR SUSTAINABILITY

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Published: 16 January 2012

Gift of the gab helps plants beat drought

Australian researchers have discovered a new cellular communication process used by plants to respond to drought.

Credit: John Bussell, The ARC Centre of Excellence in Plant Energy Biology

The team, led by Dr Gonzalo Estavillo and Professor Barry Pogson from the Australian National University (ANU), examined a small plant called *Arabidopsis*, a relative of canola.

They discovered evidence of a process called ‘retrograde signalling’, the movement of chemical signals between different compartments within cells. This movement switches on a defence mechanism that could help plants cope with drought conditions.

‘The chloroplast is the cellular subunit in a plant that converts light into sugars,’ says Dr Estavillo. She adds that communication between the nucleus, the control centre of the cell, and the chloroplast is required because the nucleus ‘needs to ensure efficient assembly and function of the chloroplast’.

‘The chloroplast is also an environmental sensor of stress. In the presence of stress, it communicates with the nucleus to change the activity of thousands of genes, impacting on photosynthesis and growth.’

The team found evidence that the movement of a chemical called PAP from the chloroplast to the nucleus signals to the plant that it is suffering from drought conditions, initiating changes in gene activity to cope with drought stress.

‘Our hypothesis is that PAP accumulation allows drought-adaptive genes to be freely expressed,’ says Dr Estavillo.

The breakthrough could be used to establish natural forms of drought resistance in food crops. In *Arabidopsis*, a protein

called SAL1 usually degrades the PAP chemical. The team removed the SAL 1 chemical from some of the plants, creating mutants with higher levels of PAP.

‘The SAL1 mutation has the advantage of facilitating less controversial solutions to the enhancement of food crops,’ said Dr Estavillo.

‘Because the basis of the mutation is a missing gene, it could be possible to create drought tolerance in commercially important crops by a traditional process of interbreeding instead of the transfer of foreign genes, alleviating public concerns about genetically-modified food.’

The research was jointly funded by the ANU Research School of Biology and the ARC Centre of Excellence in Plant Energy Biology.

Source: Australian National University