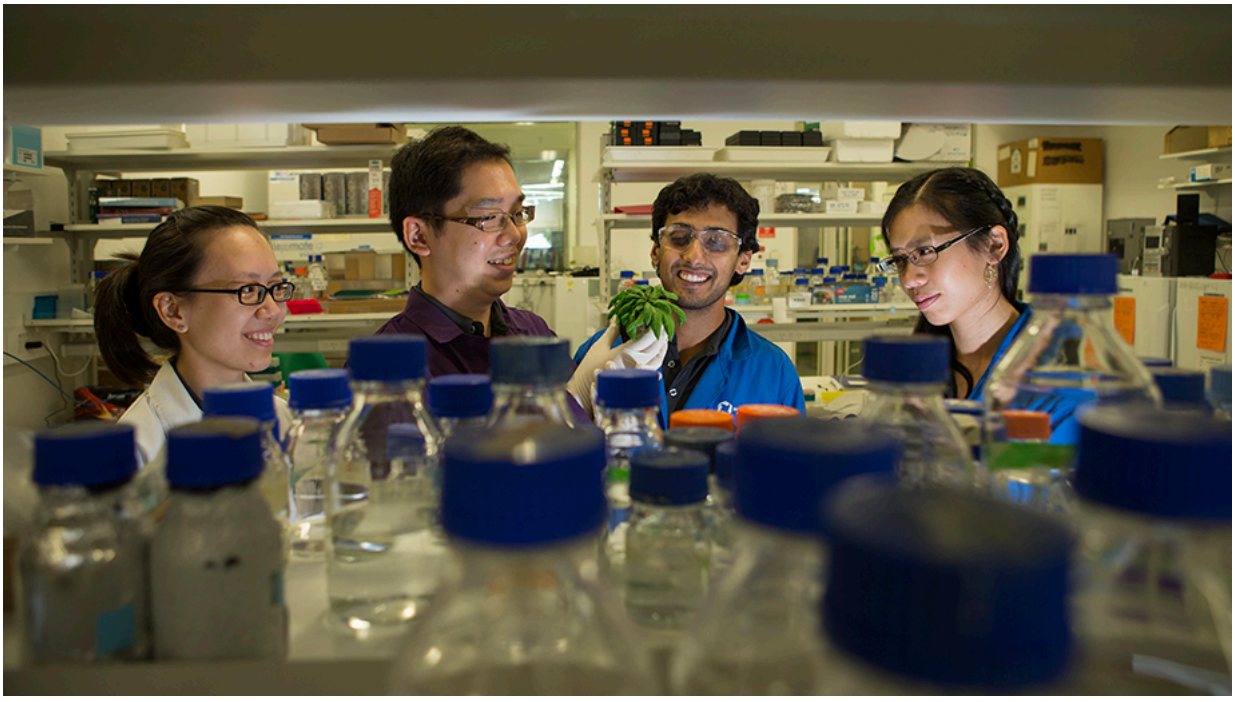
Lending plants a hand to survive drought

June 26 2017



Dr. Su Yin Phua, Dr. Kai Xun Chan, Diep Ganguly and Estee Tee from the ANU Research School of Biology. Credit: Stuart Hay, ANU

The findings have helped some plants survive 50 percent longer in drought conditions, and could eventually benefit major crops such as barley, rice and wheat, which are crucial to world food supplies.

The research team, led by Dr Wannarat Pornsiriwong, Dr Gonzalo Estavillo, Dr Kai Chan and Dr Barry Pogson from the ANU Research

School of Biology, mapped a new molecular signalling pathway that controls the ability of plants to close the pores on their leaves to conserve water during drought stress.

"This basic scientific research has the potential to be able to improve farming productivity not just in Australia, but potentially in other countries that suffer from drought stress," Dr Pogson said.

"If we can even alleviate drought stress a little it would have a significant impact on our farmers and the economy."

The researchers found that chloroplasts, better known for their role in photosynthesis, are actually key players that work together with plant hormones during drought stress.

Dr Pogson said the research found chloroplasts in cells surrounding the pores on leaves, called stomata, can sense drought stress and thereby activate a chemical signal that closes stomata to conserve water.

"This finding was completely unexpected and opens new avenues of inquiry into how chloroplasts can contribute to plant responses to the environment," Dr Pogson said.

Researchers Diep Ganguly and Dr. Kai Chan from the Research School of Biology. Credit: Stuart Hay, ANU

The team conducted tests on barley and Arabidopsis, a small flowering native plant, and enhanced levels of the chloroplast signal which helps plants close stomata.

"Boosting the levels of this chloroplast signal also restores tolerance in drought-sensitive plants and extended their drought survival by about 50 per cent," Dr Chan said.

He said boosting the chloroplast signal, by breeding, genetic or agronomic strategies, could be the key to help plants preserve water and boost drought tolerance.

"Dr Pornsiriwong, who has started her own research lab in Thailand, is

currently investigating breeding strategies that naturally enhance levels of this drought tolerance-promoting chloroplast signal in rice," Dr Chan said.

The research was funded by the Australian Research Council Centre of Excellence in Plant Energy Biology and was a collaboration between ANU, the University of Adelaide, University of Western Sydney, CSIRO, Kasertsart University (Thailand) and the University of California San Diego (United States).

The research has been published in *eLIFE*.

More information: Wannarat Pornsiriwong et al. A chloroplast retrograde signal, 3'-phosphoadenosine 5'-phosphate, acts as a secondary messenger in abscisic acid signaling in stomatal closure and germination, *eLife* (2017). DOI: 10.7554/eLife.23361

Provided by Australian National University