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Can reducing stomatal density in rice mitigate the effects of climate change?

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As climate changes continue to unfold, climate proofing of rice will be integral in protecting future production and so therefore, future food security. Improvements will need to include better tolerance to increased temperature, submergence, and drought and water salinity. Improving these tolerances will need to be achieved concurrently reducing rice water use; this currently equates to around 2500 litre of water per 1 kilogram of grain produced. Rice (and most other plants) primarily regulates water loss via adjustments to microscopic pores on the epidermis called stomata. These adjustments can be made either via changes to stomatal aperture, or via changes to stomatal development, in this case via alterations to stomatal size and or density. We have engineered rice plants with reduced stomatal density which uses around 40% less water during the seedling stage. This leads to improved drought tolerance both at 30° and 40°C. Recently we have also begun to assay how our plants under different salt concentrations, and found that reduced stomatal density positively impacts performance under high water salinity. Taken together our results indicate that reducing stomatal density positively impacts performance under multiple abiotic stresses and thus represents an encouraging trait to select for future rice cultivation.

Biography

Robert Caine completed his undergraduate degree at Oxford Brookes University with first class honours in biology and beginners Japanese. He subsequently completed his PhD in plant molecular biology and evolution at the University of Sheffield. He is currently a research associate at the University of Sheffield where he works on a Newton Fund grant focusing on protecting rice against climate change derived abiotic stresses. He has published in many high impact journals including Nature Plants, New Phytologist, Plant Physiology, Development and Current Opinion in Plant Biology.

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