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A new perspective on the red-light response of stomatal movement

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Slatyer seminar room R.N. Robertson Building (Bldg. 46), Linnaeus Way, ANU



Stomata control the uptake of CO₂ and the loss of water in leaves of higher plants. To minimize water loss while maximizing CO₂ uptake stomatal movement is tightly regulated in response to environmental factors, such as light intensity or CO₂ availability. While the response of stomata to CO₂ and blue light is well described, the underlying mechanism of the response to red light is still unknown. The role of photosynthesis as a trigger for the stomatal red-light response has been disputed for decades.

In this talk I will present support for the hypothesis that red light is sensed by the redox state of the photosynthetic electron transport chain, in particular by plastoquinone (PQ), a molecule that is involved in balancing the supply of energy from absorbed light and the utilization of energy by the Calvin-Benson cycle. Experiments in *Arabidopsis* and tobacco, in which the CO₂ and O₂ concentrations, red-light intensity and the redox state of PQ were varied independently and in combination show that stomatal conductance does not correlate with these parameters per se, but can be well described by one parameter that all of these factors and their interactions influence: the redox state of PQ. This insight could lead to new approaches for enhancing water-use efficiency in crops and improve predictions of stomatal conductance in global climate models.

Presented by
ANU College of
Medicine, Biology
& Environment

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