Ultraviolet radiation causes leaf warming due to partial stomatal closure

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August 10, 2020

Abstract

Variation in solar ultraviolet (UV) radiation induces a wide-range of plant responses from the cellular to whole-plant scale. We demonstrate here for the first time that partial stomatal closure caused by UV exposure significantly increases leaf temperature independently of any increase in incident energy on the leaves. Significant leaf warming in response to UV radiation was consistent in tomato (*Solanum lycopersicum* L.) across different experimental approaches. Exposure to UV radiation significantly decreased stomatal conductance and increased leaf temperature by up to 2°C in field experiments where solar UV was attenuated using filters. Smaller but significant increases in leaf temperature due to decreases in stomatal conductance occurred in multi-day controlled environment (CE) growth room experiments and in short-term (< 2 hours) irradiance response experiments, both using fluorescent lamps to provide UV treatments. We show that leaf warming due to partial stomatal closure is independent of any direct warming effects of UV manipulations. We discuss the implications of UV-induced warming both for crop production and understanding broader plant and ecosystem responses to UV radiation.

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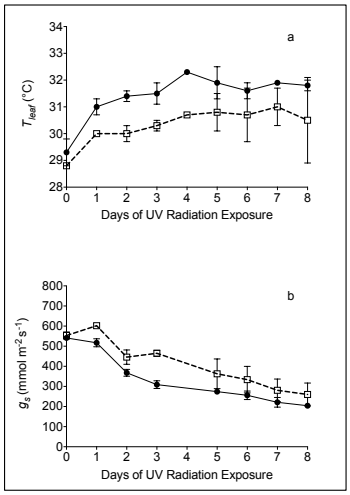
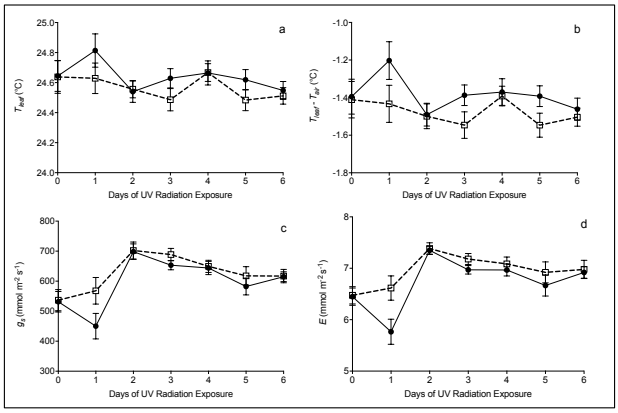


Figure 1.



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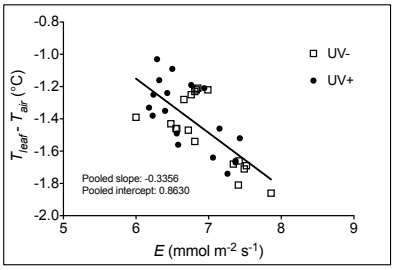

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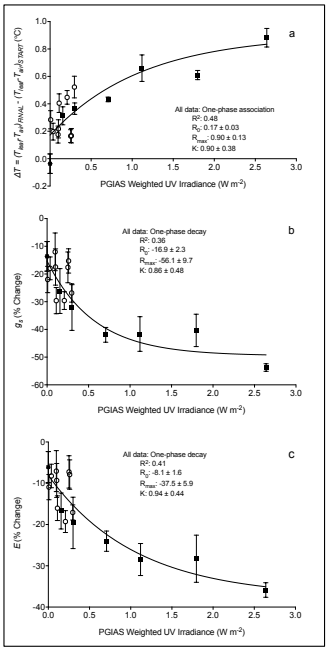

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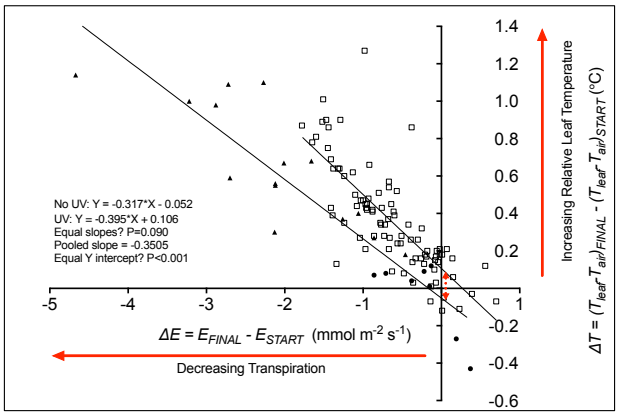

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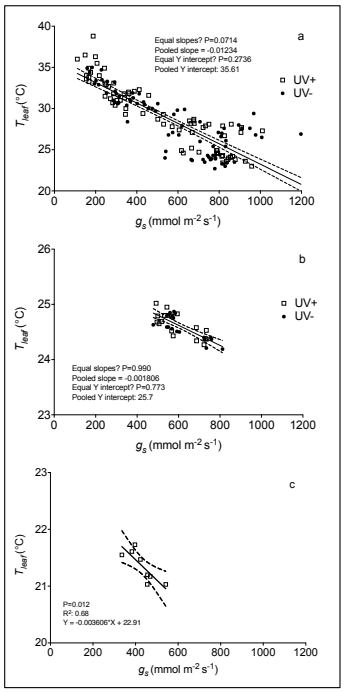

Figure 6