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The transcriptomic basis for understanding the mitigation of heat impact by elevated [CO_2] in the photosynthetic response of *Coffea arabica* and *C. canephora*

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Our study

Leaf transcriptomic changes were evaluated in 1.5-year-old plants of *C. canephora* cv. Conilon Clone 153 (CL153) and *C. arabica cv.* Icatu (Icatu), grown at 25 °C and at two supra-optimal temperatures (37 °C, 42 °C), under ambient (aCO_2) or elevated air CO_2 (eCO_2).

Results

- A high number of differentially expressed genes (DEGs) were observed as temperature rose but especially at 42 °C (Fig. 1).
- Transcriptomic changes showed that both CL153 and Icatu were strongly affected by 42 °C, although they can endure temperatures (37 °C) higher than previously assumed (Fig. 2).
- Although eCO_2 helped to mitigate the heat stress, 42 °C had a severe impact on both species, but mostly in Icatu, where genes related to ribulose-bisphosphate carboxylase activity, chlorophyll a-b binding, and the reaction centers of photosystems I and II were down-regulated, regardless of CO_2.

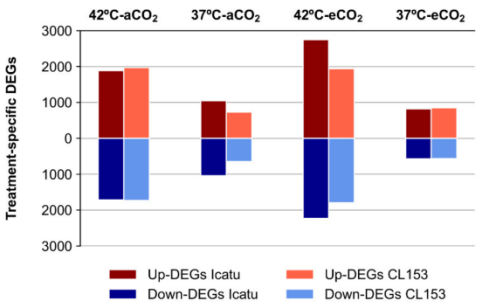

Figure 1. The effect of the supra-optimal temperatures of 37 °C and 42 °C on the number of up- and down-regulated DEGs in Icatu and CL153, grown in either aCO_2 or eCO_2.

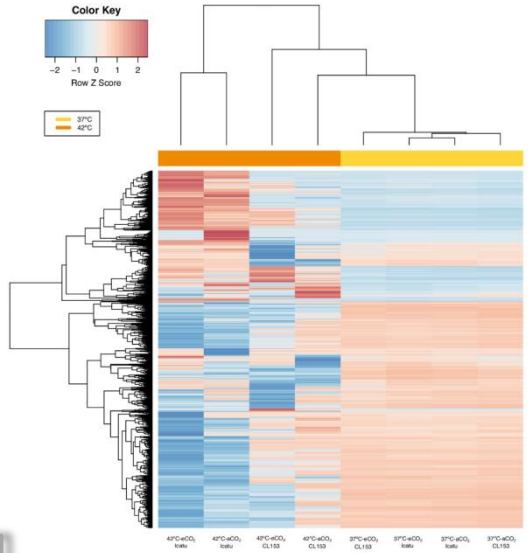

Figure 2. Clustered heat maps visualizing the expression of DEGs in Icatu and CL153, as a response to 37 °C and 42 °C temperatures under aCO_2 or eCO_2. Hot colors represent up-regulated and cold colors represent down-regulated DEGs. Column color labels group comparisons by temperature treatments (yellow: 37 °C; orange: 42 °C).

More details in:


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Article

A Transcriptomic Approach to Understanding the Combined Impacts of Supra-Optimal Temperatures and CO_2 Revealed Different Responses in the Polyploid *Coffea arabica* and Its Diploid Progenitor *C. canephora*

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