Abstract:

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As the changing climate is expected to raise temperatures globally, the purpose of this study is to see how tropical rainforest tree leaves adapt to different temperatures. Biosphere 2's tropical rainforest, a controlled ecosystem facility, holds five different temperature zones, separated by height; top ++, top +, top, mid, and low. The highest zone is the hottest (top ++), while the lowest zone is the coolest (low). Under these five temperature zones, six tropical tree species were tested: *Pachira aquatica*, *Coffea arabica*, *Piper auritum.*, *Clitoria fairchildiana*, *Theobroma cacao*, and *Annona muricata*, under these different temperature levels. Micro-Pulse Amplitude Modulated (Micro-PAM) sensors measured photosynthetic active radiation (PAR), temperature, non-photochemical quenching (NPQ), vapor pressure deficit (VPD), electron transport rate (ETR), and quantum yield of photosystem II (Y(II)) on leaves at different temperature levels. Sensors were rotated among each leaf species every three to four days, and data were analyzed using the WinControl program. Leaf was collected after data collection. Leaf samples were weighed wet and dry, their areas measured, in order to determine leaf water content (LWC) and leaf mass area (LMA). As a result of increasing temperature and PAR, each leaf's NPQ also increased. Although increasing temperatures may lower Y(II), there was no long-term damage seen, due to each leaf species being able to bounce back the next day. Leaves with higher LWC aren't as affected by higher temperatures than leaves with lower LWC. Having higher temperatures do affect leaf chemistry, but with these temperatures it is not long term.