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Warming impact and intraspecific differences in thermoregulation of *Coffea arabica* L. genotypes

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Introduction

Elevated temperatures predicted for next decades will reduce global yields of major crops (1) including coffee (2). Adapted genotypes are required and thermotolerance intraspecific variation could be useful for breeding programs. Here, the effects of warm temperatures on two coffee genotypes were evaluated by different methods (3).

Materials/Methods

Coffee genotypes were maintained in growth chambers at 23/19°C (day/night) and after for 30/26°C. Plant physiology was accessed by IRGA, gene expression by RNAseq and sugar contents by enzymatic assays (3).

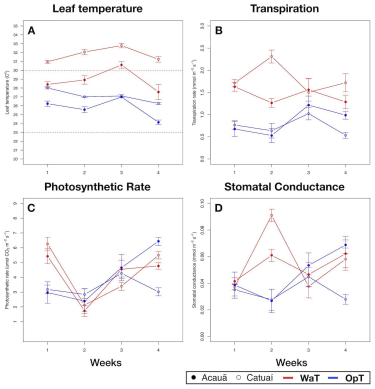

Fig. 1: Physiological analysis of two coffee genotypes under optimal and warm temperatures. *Same legends Fig. 3.

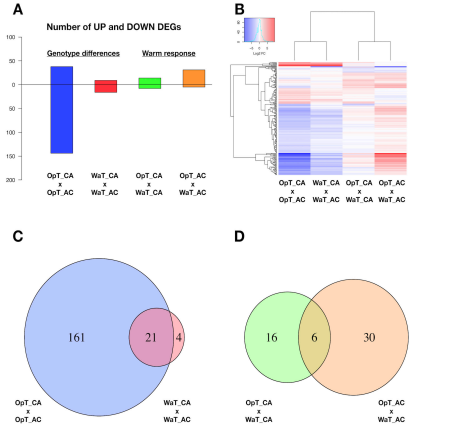

Fig. 2: RNAseq analysis of two coffee genotypes under two temperature conditions. *Same legends Fig. 3.

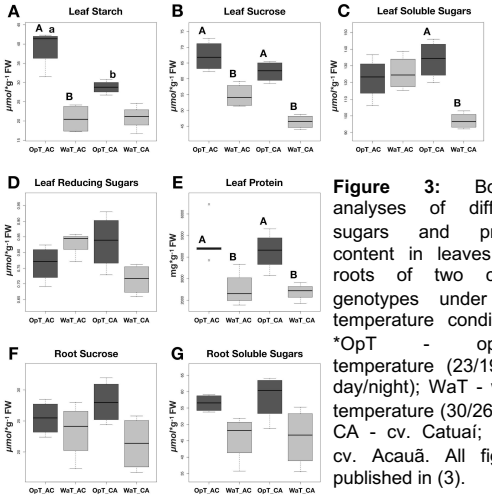

Figure 3: Boxplot analyses of different sugars and protein content in leaves and roots of two coffee genotypes under two temperature conditions. *OpT - optimal temperature (23/19° C, day/night); WaT - warm temperature (30/26° C); CA - cv. Catuaí; AC - cv. Acauã. All figures published in (3).

Results/Discussion

Genotypes showed differences mainly in the control of leaf temperatures compared to other evaluated parameters. The leaf global transcriptome (RNAseq) revealed a number of differentially-expressed genes (DEGs) under optimal temperature between genotypes, however DEGs strongly decrease in both genotypes as warmer temperature (WaT) was imposed indicating a transcriptional constraint. The examination of DEGs in response to WaT revealed shared genes, as well as, genotype-specific ones that were mostly related to carbohydrate metabolism. Indeed, the WaT impacted sugar contents in a genotype dependent manner in coffee plants.

Conclusion/Perspectives

This work provides a first examination of the intraspecific molecular responses of coffee genotypes to warmer temperatures, relating thermotolerance to the carbohydrate homeostasis capacity, which may be useful for crop breeding in face of the expected climate changes. Many differentially expressed genes were revealed and can be used as potential markers for tolerant genotypes. In future works, we intend to explore the role of such genes in thermotolerance and the coffee development.

References: 1) Zhao et al. 2017. PNAS, 114(35):9326-9331; 2) DaMatta et al. 2019. Climatic Change, 152:167; 3) de Oliveira et al. 2020. *Frontiers in plant science*, 11:1113.