Soluble sugar dynamics in leaves of two coffee genotypes (*C. arabica* and *C. canephora*) subjected to severe heat and/or drought

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Introduction

Coffee bean trade involves over 100 million people, with a major economic and social impact worldwide. As climate change worsens, coffee plants become increasingly exposed to rising temperatures and drought events that greatly reduce C-assimilation [1], limiting growth, yield and bean quality. We highlight the effects of heat and/or drought in coffee leaf soluble sugars (SS).

Materials/Methods

C. arabica L. cv. Icatu and *C. canephora* Pierre ex A. Froehner cv. Conilon (CL153) 8 years old plants grown in 80 L pots under controlled conditions (air temperature, RH, irradiance, photoperiod and CO_2 L^{-1}), were gradually exposed to severe drought (SWD) or maintained well-watered (WW), and afterwards submitted to a gradual temperature raise from 25/20 ° C (day/night) up to 42/30 °C (0.5 °C day^{-1}) [2]. The effect on leaf SS was evaluated through HPLC [3].

Results/Discussion

•No differences in total SS content in either genotype until 37 °C, but by 42 °C the CL153-WW plants showed doubled contents, as compared with 25 °C (Fig. 1).

•SWD greatly increased total SS in both *cvs*. at all temperatures (except in CL153 at 42 °C), but Icatu-SWD plants usually showed higher SS values than CL153 counterparts, especially at 42 °C (Fig. 1).

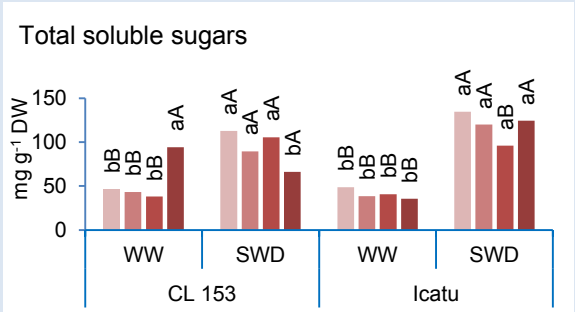

Figure 1: Changes in total soluble sugars leaf content.

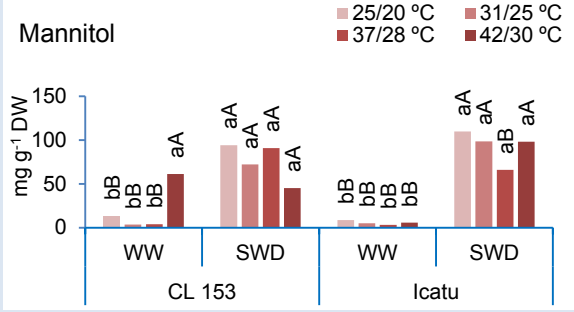

Figure 2: Changes in mannitol leaf content.

Different letters express significant differences between °C treatments for the same water level (A, B), or between water availability levels for each °C treatment (a, b).

• Changes in total SS were closely associated with mannitol variations that represented up to 25% of total SS in WW plants at 25 °C, but raised to *ca*. 80% in both genotypes under single SWD (25 °C) or under maximum stress conditions (SWD-42 °C), especially in Icatu (Fig. 2).

Conclusion/Perspectives

Icatu plants exhibited increased mannitol levels under SWD (25 and 42 °C) reflecting a positive response, as this molecule acts as an osmoprotectant and reactive oxygen species scavenger, protecting membranes, proteins, and the photosynthetic apparatus being linked to stress tolerance [4].

References:
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