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Enhanced air [CO_2] and high temperature induced changes in membrane integrity and lipid composition in elite *Coffea arabica* L. genotypes

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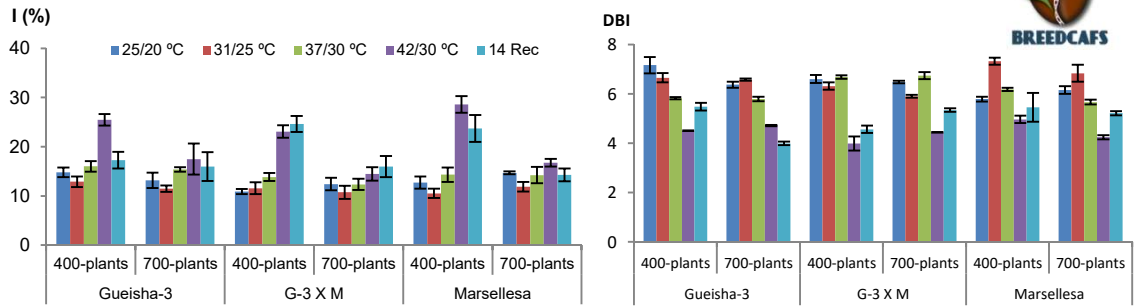
Introduction

Elevated air [CO_2] was found to strengthen plant vigour, and to mitigate heat impacts in leaf photosynthesis, membranes and mineral content (1-3). Here we briefly describe changes induced by heat and/or elevated air [CO_2] in cellular membrane permeability and in chloroplast lipid composition of elite *C. arabica* genotypes.

Materials and Methods

Two-year-old plants of *C. arabica* (cvs. Geisha 3, Marsellesa and their hybrid (G-3xM)) were grown under controlled RH, photoperiod (12 h), PPFD *ca*. 700 µmol m^{-2} s^{-1}, temperature and 400 or 700 µL CO_2 L^{-1} , without water restriction. Temperature was increased from 25/20 ºC to 42/30 ºC as described in (1), followed by a 2 weeks recovery period. Changes in fatty acid (FA) content, profile and unsaturation were evaluated by GC-FID, and membrane integrity through electrolyte leakage (injury index, I%) (1-3).



Injury index (I) and DBI variation in three *Coffea* genotypes subjected to 400 or 700 µL CO_2 L^{-1} (400-plants or 700-plants, respectively) under increasing temperature and during 14 days of recovery.

Results:

In plants grown at 400 µL CO_2 L^{-1}, heat (42/30 ºC) induced an electrolyte leakage rise in all genotypes. Under 700 µL CO_2 L^{-1}, membrane permeability remained unaltered with temperature increase. Fatty acids adjustments resulted mainly in unsaturation decreases (lower DBI) in heat stressed plants under both [CO_2] , and lipid profile showed similar trends between genotypes.

Conclusion/Perspectives: Present findings confirm that elevated [CO_2] mitigates the negative heat impact in membrane integrity, as inferred from I%. TFA unsaturation decline under heat, irrespective of [CO_2], and more gradual in Geisha and Marsellesa, may reduce susceptibility to lipoperoxidation and confer greater membrane resilience.

References:
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