EFFECT OF HIGH [CO\(_2\)] AND TEMPERATURE ON THE PHOTOSYNTHETIC ENZYMES AND ELECTRON TRANSPORT OF Coffea arabica L.

EFEITO DO AUMENTO DA [CO\(_2\)] E TEMPERATURA NAS EZNIMAS FOTOSSINTÉTICAS E TRANSPORTE DE ELÉTRONS DE Coffea arabica L.

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It is expected that future climate changes and global warming conditions will limit the coffee crop yields. However, the real effects of enhanced air [CO\(_2\)] and temperature on this plant remain completely unknown. Therefore, this work studied the impact of such environmental changes on the photosynthetic machinery of Coffea arabica L. cv. Icatu. Plants were grown for 1 year under controlled conditions (temperature, RH, irradiance, photoperiod), at 380 or 700 µL CO\(_2\) L\(^{-1}\) air, without nutrient, water and root space limitations, and then subjected to temperature increase (0.5°C/day) to 42/34°C. Thylakoid electron transport involving PSI and II, and enzyme activities (RuBisCO and RuB5PK) were assessed at 25/20°C, 31/25°C, 37/30°C and 42/34°C. The results showed a marginal impact until 37 °C irrespective of [CO\(_2\)] conditions, configuring a clear tolerance to supra-optimal temperatures. Also, a higher metabolic performance was observed in the plants under high [CO\(_2\)]. Only at 42 °C the tolerance limit was exceeded, as shown by significant impacts in all parameters, particularly in enzymes, but under elevated [CO\(_2\)] a better performance was preserved regarding the
photosystems functioning. Our findings showed that the elevated [CO₂] allowed maintenance of higher metabolic activity and seemed to some extent mitigate the heat impact at the photosystems level, what is quite relevant in a context of predict global warming scenarios. This work was supported by Portuguese funds from Fundação para a Ciência e a Tecnologia, through the project PTDC/AGR-PRO/3386/2012.

**Keywords**: Climate change, Coffee plants, CO₂ effect, Heat.