[P073]

Photosynthetic light curve parameters over vertical profile of *Coffea arabica* plants after five years of FACE experiment

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Trends in climate changes indicate that the air [CO_2] will continue to increase. The first plant response to elevated [CO_2] (e[CO_2]) is the increased photosynthetic rate. Photosynthetic rate dependence on light (*A/*PAR curves) is characterized by several parameters, often used to determine plant species responses to environment and phenological plasticity. The effects of water supply and phenological stage were expected, with no acclimation after long-term *Coffea arabica* L. cultivation under e[CO_2]. The aim of the study was to determine variations in parameters of *A/*PAR curves in coffee leaves over a tree vertical profile after long-term cultivation under free-air-CO_2-enrichment (FACE) system.

The p arameters of *A/*PAR curves in *C. arabica* were estimated after five-years cultivation in FACE under two CO_2 conditions, actual (a[CO_2], ~390µL CO_2 L^{-1}) and e[CO_2] (~590µL CO_2 L^{-1}), in two water regimes (rainfed and irrigation). The *A/PAR* curves were estimated in two phenological stages (grain formation - February 2016 and fruit maturation - May 2016). The *A/*PAR responses were determined by varying photosynthetic active radiation (PAR) from 1117 to 0 µmol photons m^{-2} s^{-1} in four 50 cm-thick layers of vertical plant profile.

The maximum photosynthesis (A_{max}), dark respiration (R_d), apparent quantum efficiency (α), and light compensation point (Γ) generally increased under e[CO_2] compared to a[CO_2], showing higher values during grain formation than during fruit maturation (Figure 1). The R_d and Γ followed the progressive increase by layers only during the grain formation (Figures 1C and 1E).

Continuation in e[CO_2] stimulation indicated that leaf photosynthesis acclimation did not occur after five-years coffee cultivation under FACE. The lack of progressive increase in A_{max}, α and Γ over vertical profile indicates leaf plasticity to light availability, especially considering the high A_{max} of the two lowest layers. The compensation effects of e[CO_2] to low water availability were observed in all *A/*PAR responses.

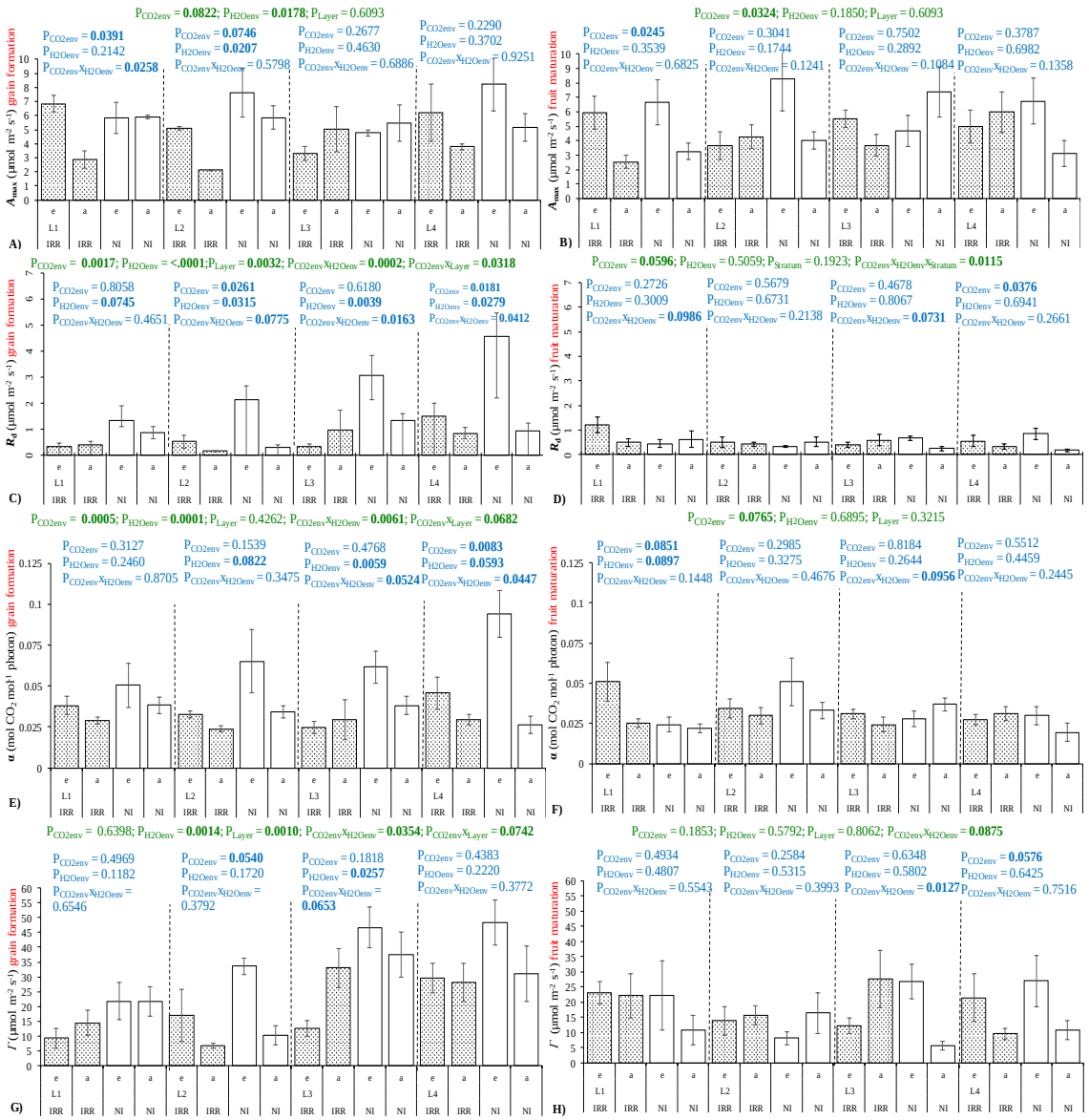

Figure 1. The mean, standard error and ANOVA P-values (n=3-5) of: **A**, **B**) maximum photosynthesis (A_{max}, µmol CO_2 m^{-2} s^{-1}); **C**, **D**) dark respiration (R_d, µmol CO_2 m^{-2} s^{-1}); **E**, **F**) apparent quantum efficiency (α, µmol CO_2 µmol^{-1} photons) and **G**, **H**) light compensation point (Γ, µmol photons m^{-2} s^{-1}) estimated in four layers of coffee plants (L1 = 0 - 50 cm; L2 = 50 - 100 cm; L3 = 100-150 cm and L4 > 150 cm) grown under elevated (e[CO_2]) and actual (a[CO_2]) air [CO_2] under irrigation (IRR) and rainfed (NI) water regimes. Data derived from photosynthetic light response curves formed in two phenological stages (grain formation and fruit maturation). Green letters indicate P-values of general analyses, while blue ones the ANOVA P-values corresponding to effects of CO_2 and H_2O environments (env) by layer. Letters in bold indicate the P<0.1, accepted because of low sample number.

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