Leaf anatomical traits responsiveness to increased air [CO_2] in *Coffea arabica* L. hybrid and its parental genotypes

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Introduction

Different tolerance potential has been reported among *C. arabica* genotypes under environmental stresses, with elevated air [CO_2] (eCO_2), influencing the plant's acclimation ability [1]. Foliar traits are important for the success of this process [2]. Therefore, anatomical responses of *C. arabica* genotypes to eCO_2 were studied.

Materials/Methods

C. arabica L. cvs. Geisha 3 (G3), Marsellesa (Mar) and their Hybrid (Hy)

700–800 µmol m^{-2} s^{-1}, 12 h

70 %

25/20 °C (day/night)

Well-watered conditions

[CO_2] 400/700 µL L^{-1} (aCO_2 /eCO_2)

Leaf samples were prepared for microscopic anatomical quantitative analysis [3, 4]

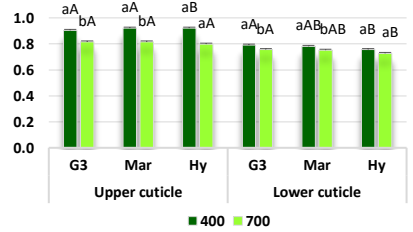

Figure 1: Effect of air [CO_2] on cuticle thickness (µm) of *C. arabica* cvs. G3, Mar and Hy. Means with different letters were statistically different ($p < 0.05$), between [CO_2] in each genotype (a, b) and between genotypes in each [CO_2] (A, B) (two-way ANOVA and Tukey test).

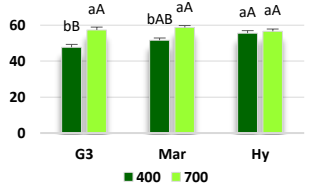

Figure 3: Effect of air [CO_2] on palisade parenchyma thickness (µm) of *C. arabica* cvs. G3, Mar and Hy. Statistics as in Fig. 1 caption.

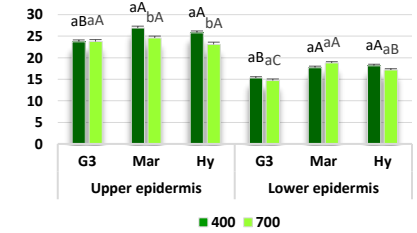

Figure 2: Effect of air [CO_2] on epidermis thickness (µm) of *C. arabica* cvs. G3, Mar and Hy. Statistics as in Fig. 1 caption.

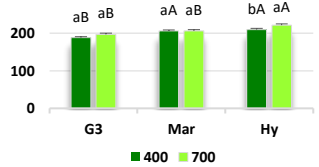

Figure 4: Effect of air [CO_2] on mesophyll thickness (µm) of *C. arabica* cvs. G3, Mar and Hy. Statistics as in Fig. 1 caption.

Results/Discussion

Both leaf upper and lower cuticles thickness decreased under eCO_2 in all genotypes, except in Hy (Fig. 1). Hy and Mar upper epidermis thickness had also a significant decrease under eCO_2 while lower epidermis was not affected (Fig. 2). Thickness of palisade parenchyma under eCO_2 was higher except at Hy (Fig.3). Mesophyll thickness was not affected in G3 and Mar but increased significantly in Hy at eCO_2 (Fig. 4). Overall, Hy was more similar to Mar than to G3.

Conclusion/Perspectives

Palisade parenchyma and upper cuticle trends were similar for all genotypes while for other studied parameters genotypes showed different response. Under both CO_2 levels genotypes Mar and Hy had similar outcomes. Genotype evaluation to CO_2 increase is a tool at plant acclimation to environmental stresses [5].

References:

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