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Electrogenic H⁺-pumps activities of *Coffea* spp. grown under low ultraviolet radiation levels

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Introduction

This work aimed at evaluating the impacts of reduced ultraviolet radiation (UV-A and UV-B) levels on three electrogenic H pumps activities, the membrane and vacuolar type H+ ATPases (P-ATPase and V-ATPase, respectively) and membrane type H⁺-pyrophosphatase (PPase) of *Coffea* spp. genotypes.

Materials/Methods

C. arabica cv. Catuaí Amarelo IAC 62 and *C. canephora* cv. LB1 plants, representing the two most widely cultivated coffee species, were grown inside a greenhouse covered with either glass or polycarbonate, exposing the plants to UV-A (13.85 and 3.92 W m) and UV-B (3.82 and 0.38 W m), respectively. The microsomal fraction from completely mature leaves was isolated by means of differential centrifugation (1). The hydrolytic activity of the H pumps (P-ATPase, V-ATPase and PPase) was colorimetrically determined by measuring the release of Pi (2).

Figure 1: *C. arabica* plants of each treatment, respectively low UV levels and higher UV levels.

Figure 2: *C. canephora* plants of each treatment, respectively low UV levels and higher UV levels.

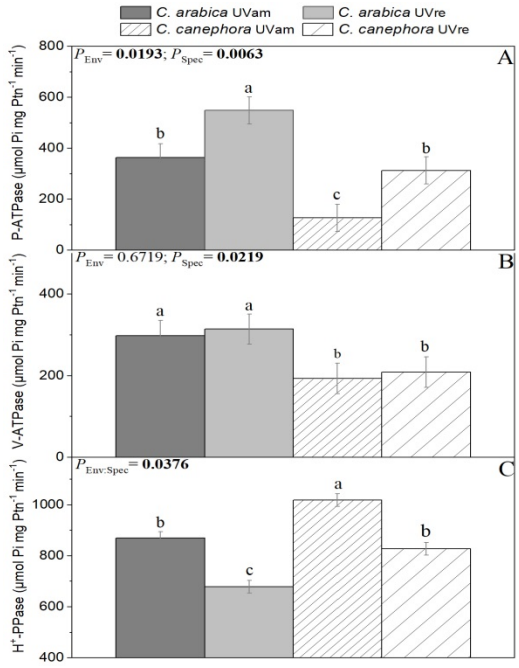

Figure 3: P-ATPase (A), V-ATPase (B) and H⁺-PPase (C) activity of *C.arabica* cv. Catuaí Amarelo IAC 62 and *C. canephora* cv.LB1 plants grown in a greenhouse covered with either glass for UV ambient levels (UVam) or polycarbonate for reduced UV levels (UVre).

Results/Discussion

Regardless the UV treatment, Catuaí showed higher P-ATPase and V-ATPase activities than LB1. Under reduced UV conditions the P-ATPase activity increased in both genotypes, while V-ATPase tended to increase in a species-dependent manner, i.e., only in Catuaí. On the other hand, LB1 had higher PPase activity than Catuaí, and low UV levels decreased its activity in both genotypes. Therefore, under higher UV levels plants usually, presented lower activities of H⁺-PPases (P-ATPase and V-ATPase) due to the lower availability of ATP. However, ions homeostasis across the vacuolar membrane is maintained by the PPases activity, which use pyrophosphate as substrate, which is abundant as a product of various cellular reactions in stress conditions. Thus, it is consistent that we have observed an increase in PPase activity in both genotypes under higher UV levels.

Conclusion/Perspectives

Our results indicate a better metabolic adjustment in coffee plants grown under low UV levels, probably associated with greater efficiency of P-ATPase activity (and V-ATPase only in Catuaí), what might be implicated in the greater plant growth under these conditions.

References: 1-Giannini JL, Briskin DP, 1987. Plant Physiol. 84, 613-618. doi:10.1104/pp.84.3.613; 2-Fiske CH, Subbarow Y, 1925. J. Biol. Chem. 66, 375-400.