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Biotic and Abiotic Stress Tolerance in Plants: the Challenge for the 21st Century

BOOK OF ABSTRACTS

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S02P13

Identification and characterization of genes involved in ABA perception and signal transduction in *Coffea* spp.

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The *Coffea* genus represents a major agricultural commodity in world trade. Nowadays, drought and elevated temperatures are the major climatic limitations for coffee production. These variations also influence biochemical composition of beans, affecting directly the final cup quality. There is genetic variability within the *Coffea* genus that could be used to increase drought tolerance and generate coffee varieties better adapted to climatic variations. Abscisic acid (ABA) is a vital plant hormone acting as central regulator that protects plants against abiotic stresses such as drought. Recently, novel intracellular ABA receptors (PYL/RCARs) involved in ABA sensing and signaling have been identified in several species. A mechanism of ABA transduction has been proposed, involving PYR/PYL/RCARs receptors interacting with PP2Cs phosphatases and SnRK2 protein kinases. The goal of this study was to identify and characterize ortholog genes of this tripartite system in *Coffea* sp. For this purpose, protein sequences from *Arabidopsis*, citrus, rice, grape, and tomato were chosen as query to search ortholog genes in the coffee-sequence database. Using 51 PYR/PYL/RCAR sequences from those plant species, it was possible to identify 9 sequences for ABA receptors in coffee. Likewise, the 40 and 29 sequences query resulted in 6 and 9 similar sequences of PP2Cs and SnRK2 specific to ABA in *Coffea* sp. The 24 genes isolated, that belong to the tripartite system of the coffee's ABA pathway, showed *in silico* differential expression in tissues as leaves, seeds, roots and floral organs. Polymorphisms were found among the orthologs and homeologs genes. All analyses allowed the identification in *C. arabica* genome of sequences variations between the two ancestral diploid sub-genomes, *C. canephora* (*CaCc*) and *C. eugenioides* (*CaCe*). Further analyses will predict the functional effect of these polymorphisms in protein structure in different coffee species. All these evidences will also help us to identify the genetic determinism of drought tolerance essential to obtain molecular markers that could be used in coffee-breeding programs.

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Physiological and molecular responses of diploid and tetraploid Carrizo Citrange under water stress

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In citrus, the use rootstock promotes productivity, improves fruit quality and may confer resistance or tolerance to biotic and abiotic stress. 'Carrizo' citrange (*Citrus sinensis* [L.] Osbeck × *Poncirus trifoliata* [L.] Raf), is one of the most popular rootstock in the Mediterranean basin. It is sensitive to drought and salt stress but confers tolerance to Tristeza virus, and promotes very good fruit quality. Previous studies have shown that doubled diploid (4x) 'Rangpur' lime (*Citrus limonia*, Osbeck) seedlings are more tolerant to water deficit than their respective diploid (2x). In the present work, we have characterized the water deficit tolerance in 2x and 4x 'Carrizo' citrange seedlings. Water deficit was applied for 35 days, followed by irrigation. Several physiological parameters were measured periodically during the experiment and samples were collected to investigate i) the activity of enzymes involved in detoxification processes, ii) the expression analysis of candidate genes involved in ABA biosynthesis, as well as iii) ABA and H_2O_2 production. Doubled diploid 'Carrizo' citrange seedlings were showed to be more drought tolerant than 2x. Water deficit caused a greater reduction in photosynthetic rates and stomatal conductance in 2x compared to 4x. Also higher ABA and H_2O_2 production were induced in 2x