DIFFERENTIAL EXPRESSION OF CANDIDATE GENES TO RESISTANCE TO MELOIDOGYNE PARANAENSIS IN CLONES OF COFFEA CANEPHORA


*Universidade de Brasilia, Campus Universitário Darcy Ribeiro, Brasilia, DF, Brazil 70910-900, **Federal University of Lavras, MG, Lavras, BRAZIL. ***Embrapa Genetic Resources and Biotechnology, Brasilia, DF, BRAZIL. ****CIRAD, UMR AGAP, Montpellier, FRANCE. *****EMBRAPA Coffee-INOVACAFE, Lavras, BRAZIL.

Abstract
Candidate genes for resistance to Meloidogyne paranaensis in roots of clones 14 and 22 of Coffea canephora, respectively resistant and susceptible to this nematode, were proposed.

Introduction
Root-knot nematode-plant interactions, as well the physiological processes of parasitism and coffee genes involved in the resistance, are still poorly understood. It was previously reported that the drought-tolerant clone 14 of Coffea canephora Conilon was resistant to six different populations of root-knot nematodes, while the drought-sensitive clone 22 was susceptible to these nematodes (1). The aims of this study were to identify candidate genes putatively involved in nematode resistance and to analyze their expression profiles in roots inoculated with Meloidogyne paranaensis.

Methodology
Total RNA was extracted from roots of clones 14 and 22 of C. canephora Conilon at different days (4, 8, 12, 20, 32 and 45) after inoculation with M. paranaensis, converted into cDNAs and used in real time qPCR experiments to check the expression of Cc03_g09540 (CcCPII, JF950585) coding a cysteine protease inhibitor, Cc01_g13400 coding a protein phosphatase, and Cc00_g16260 and Cc10_g14530 of unknown function.

Results
- For the Cc00_g16260, Cc10_g14530 and Cc03_g09540 genes, expression profiles were up-regulated upon nematode inoculation mainly in roots of clone 14 (Fig. 1).
- Compared to clone 14, expression of Cc10_g14530 and Cc03_g09540 remained very low in inoculated clone 22.
- Expression of Cc10_g14530 gene in clone 14 was high soon after nematode inoculation and decreased hereafter. In the same clone, expression of Cc00_g16260 and Cc03_g09540 increased gradually over the time.
- On the other hand, expression of Cc01_g13400 decreased in roots of clone 22 inoculated with M. paranaensis.

Discussion
- Protease inhibitors are important proteins in plant defense processes as providers of natural resistance, and also excellent candidates for defense construction, being active against nematodes and other pathogens (2).
- The up-regulated expression of Cc01_g13400 (coding a PP2C protein putatively involved in the abscisic acid signalization pathway) in inoculated clone 14 is worth noting. It suggests that “cross-talks” between biotic and abiotic signaling pathways (3,4) occurred specifically in the clone 14 of C. canephora.

Conclusion
Our results suggest that the four genes analyzed in this study are involved (directly or indirectly) in the resistance process of the clone 14 of C. canephora Conilon against infection by M. paranaensis.

References:

Figure 1: Relative expression of Cc00_g16260, Cc10_g14530, Cc03_g09540 (CcCPII) and Cc01_g13400 (PP2C-type) genes on clones 22 and 14 of C. canephora Conilon at different days (4, 8, 12, 20, 32 and 45) after inoculation with M. paranaensis. White and black isolars represent control (non-inoculated) and inoculated plants, respectively. Grey isolars represent the mean of expression in inoculated (I) and non-inoculated (C) clones. The x axis mentions the days after inoculation. RQ: relative quantification in arbitrary units. The CcUBQ10 gene was used as a reference gene.