

Molecular Physiology and Genetics of Coffee Resistance to Parasites

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SUMMARY

Coffea arabica varieties usually display a high yielding and good coffee quality, but exhibit a high susceptibility to many pests and diseases. Enhancing their resistance to parasites have become a crucial priority toward an economic and sustainable coffee production. Research activities were therefore developed to identify and clone genes involved in the specific resistance of coffee to nematodes (*Meloidogyne* spp.) and rust (*Hemileia vastatrix*).

A positional cloning project was started to isolate a resistance gene derived from *C. canephora*, that confers resistance against *M. exigua*. Based on the analysis of progenies obtained from resistant introgressed arabica lines, 15 AFLP markers tightly linked to the resistance gene were identified. Further linkage investigations allowed the construction of a localised genetic map of the chromosome segment carrying the *M. exigua* resistance. The low rate of recombination indicated these markers could be useful landmarks for map-based cloning of the resistance gene. With this purpose, a BAC library is being constructed.

In addition, disease resistance gene analogs (RGA) were cloned in coffee (*C. arabica* and *C. canephora*) using DNA primers designed from conserved motifs (NBS) of known plant resistance (R) genes. Analysis of PCR-derived coffee NBS sequences revealed nine distinct families of RGAs, belonging to the non-TIR class type of R-genes, in both species. Sequence variation observed among coffee RGAs suggested point mutations as the primary source of diversity within RGAs families. Efforts are being pursued to explore the possibility of implication of isolated coffee RGA families in the identified nematode resistance.

In parallel, genes early expressed during the specific resistance reaction of coffee (*C. arabica*) to the fungus *H. vastatrix* were isolated from cDNA libraries constructed using the suppression subtractive hybridization method (Diatchenko et al., 1996). cDNAs clones showing specific expression in the early stages of the resistance reaction were selected and characterized. Similarities were found with plant sequences involved in plant defence reactions such as chitinases, heat shock proteins, cytochroms P450, metallothioneins and ionic channels. Further work will aim at understanding the role of selected clones in the mechanism of specific coffee resistance to parasites.