

Evolution of Disease-resistance Gene in Coffee Trees (*Coffea* L.)

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SUMMARY

The ability of plant species to survive over evolutionary time depends to some instance on their capability to maintain and generate useful diversity at resistance loci. Therefore, analysis of diversity and evolution of resistance genes (R) in plant species could be of particular interest in the elaboration of strategies for developing durable resistance mediated by major genes. Molecular analysis of R-gene evolution concern so far mainly plants with short life cycle while perennial plants have retained little attention.

The majority of R-genes isolated so far encode a predicted nucleotide-binding site (NBS) domain. NBS domains related to R-genes show a highly conserved backbone of amino acid motifs offering the possibility of isolating resistance gene analogous sequences (RGAs) by polymerase chain reaction (PCR). Multiple combinations of primers with low degeneracy designed from two conserved motifs in the NBS regions of R-genes of various plants were used in coffee trees. Nine distinct classes of NBS-like resistance gene analogs (RGAs) representing a large diversity were isolated from *Coffea arabica* and *C. canephora* species. The analysis of one coffee RGA family suggested point mutations as the primary source of diversity. With one exception, coffee RGA families appeared closely related by sequence to at least one cloned R-gene. In addition, deduced amino acid sequences of coffee RGAs were identified showing strong sequence similarity with almost all known non-TIR type R-genes. The high similarity between particular coffee RGAs and R-genes isolated from other angiosperm species such as *Arabidopsis*, tomato and rice indicated an ancestral relationship and the existence of common ancestors. As revealed in coffee trees, the evolution of NBS-encoding sequences seems to involve accumulation and slow divergence mechanisms within distinct R-gene families rather than a fast-evolving process. Functional inference of the suggested NBS domain type of evolution is also discussed.