Study of biological mechanims involved in drought tolerance in coffee plants

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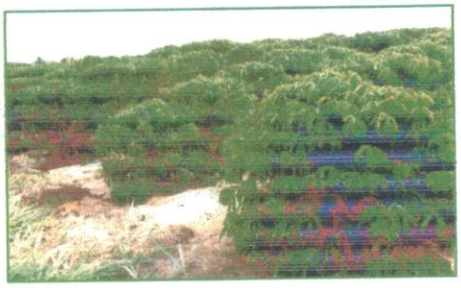
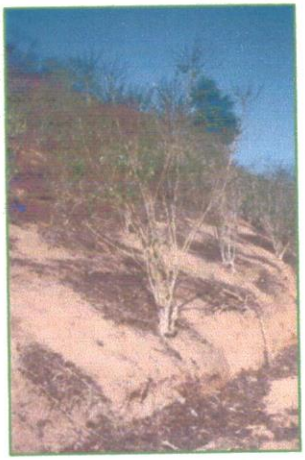
This year (2005-2006), drought stress affected the Brazilian coffee production in several states, with prevision of production loose of around 15% in the Minas Gerais state (- 2.2 M bags), 20% in Espirito Santo state (- 1.6 M bags), up to 50% in the Bahia state (- 0.9 M bags)*.



Clones of *Coffea canephora* var. Conilon evaluated in field (Fazenda Experimental of INCAPER-Sooretama, ES Brazil). The fructification of drought-sensitive clones (central line) that suffered during the dry season was compared to that of drought-resistant clones (upper and lower lines) characterized by high fructification.

In order to investigate the genetic determinism of drought tolerance in coffee plants, a project of scientific collaboration between EMBRAPA, INCAPER and CIRAD is under implementation with the following objectives:

- analysis of the genetic diversity in the *Coffea* genus for drought tolerance,
- identification of candidate genes for drought tolerance,
- search for polymorphisms in candidate genes for this character,
- construction of a genetic map of *C. canephora* and exchanges of molecular markers,
- evaluation of the effects of drought stress on the coffee fruit development, biochemical composition and organoleptic characteristics (NIRS and mass spectrometry).

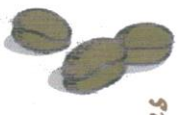


Plant of *Coffea canephora* var. Conilon sensible to drought and exposed to a severe dry season without irrigation. Note the complete absence of leaves.

These objectives will be achieve through the molecular characterization of the genetic diversity of *Coffea canephora* var. Conilon cultivated in Espirito Santo state, where several drought-tolerant clones were previously identified. The search of candidate genes will be realized through the screening of membranes ("macroarray") containing Unigenes coming from the Brazilian EST Genome project (Vieira *et al.*, 2006) and also by the search of complementary genes sequences in the Bacterial Artificial Chromosome (BAC) of *Coffea canephora* (Leroy *et al.*, 2005). Effects of drought stress on coffee fruit development and biochemical composition will be checked by studying fruits from plants of *C. arabica* cultivated in controlled irrigation field test in the EMBRAPA-Cerrados (Planaltina DF, Brazil) by mass spectroscopy and NIR analyses.

This project was approved by the ABC (Brazilian Agency of Cooperation) agency for a period of 3 years (2006-2008).

* source: www.reviacafeicultura.com.br/index.php?tipo=ler&mat=4792



References

Leroy T. et al., 2005. Construction and characterization of a *Coffea canephora* BAC library to study the organization of sucrose biosynthesis genes. Theor Applied Genet 111: 1032-1041.

Vieira L.G.E. et al., 2006. Brazilian coffee genome project: an EST-based genomic resource. Braz J Plant Physiol 18: 95-108.

French Agricultural Research Centre for International Development

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STUDY OF BIOLOGICAL MECHANIMS INVOLVED IN DROUGHT TOLERANCE IN COFFEE PLANTS

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This year, drought stress affected the Brazilian coffee production in several states, with prevision of production loose of around 15% in the "Minas Gerais" state (-2.2M bags), 20% in "Espirito Santo" state (-1.6M bags), up to 50% in the "Bahia" state (-0.9M bags). In order to investigate the genetic determinism of drought tolerance in coffee plants, a project of scientific collaboration between EMBRAPA, INCAPER and CIRAD is under implementation with the following objectives:

- to analyze the genetic diversity in the *Coffea* genus for drought tolerance
- to identify candidate genes for drought tolerance
- to search for polymorphisms in candidate genes for this character
- to evaluate the impacts of drought stress on the coffee fruit development, biochemical composition and organoleptic characteristics.

These objectives will be achieve through the molecular characterization of the genetic diversity of *Coffea canephora* "Conilon" cultivated in "Espirito Santo" state, where several drought-tolerant clones were previously identified. The search of candidate genes will be realized through the screening of membranes ("macroarray") containing Unigenes coming form the Brazilian EST Genome project and also by the search of complementary genes sequences in the Bacterial Artificial Chromosome (BAC) of *Coffea canephora*. Effects of drought stress on coffee fruit development and biochemical composition will be checked by studying fruits from plants of *C. arabica* cultivated in controlled irrigation field test in the EMBRAPA-Cerrados (Planaltina DF, Brazil) by mass spectroscopy and NIR analyses.

This project was used as a support to implement an International Network Initiative on drought tolerance in coffee plants.