



AGROPOLIS
LES DOSSIERS

Expertise of the Agropolis scientific community

Genetic
resources
Genomics
Plant
biotechnology



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Dissemination of innovations

From research to applications

Improved seeds and plants are the traditional and most favoured way of transferring genetic advances to producers.

Plant biotechnologies have greatly accelerated and enhanced this transfer. The research groups of the Languedoc-Roussillon region participate actively in the development of these new technologies. They have fine-tuned methods and processes that are available from Agropolis, and some of these have been transferred to the private sector and the countries of the South.

Facilitating the creation of new varieties

The creation of a new variety is time-consuming and costly. Numerous techniques now improve the performance of traditional methods, and some of these are presented below.

• **Haploid methods**

The use of pure lines is often necessary when the goal of the breeding programmes is to create hybrids. Traditional methods need eight to ten years, whereas haploid methods (haploid-diploidization) rapidly yield hybrid varieties by generating pure lines in a single generation. Plants with only half of the genetic make-up are produced by growing reproductive cells – ovules or pollen – whose genetic make-up is

then doubled to restore fertility. For instance, a cross between such pure lines is currently used to produce hybrids of tropical or temperate rice.

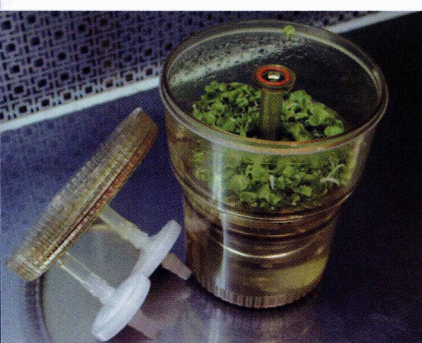
• **Somatic fusions and hybridizations**

The exchange of genetic material between different varieties during reproduction is an important source of variability, but some species hybridize poorly and are therefore difficult to improve by classical methods. Somatic fusions and hybridizations enable mixing in the laboratory of the genetic and cytoplasmic structures of plants by fusing protoplasts, thereby increasing the genetic diversity of certain species. At Agropolis, this technique is used with citrus fruits.

• **Marker-assisted selection**

To ensure that a cultivated hybrid has recovered the gene or genes controlling the agronomic trait of

Marc Lartaud (© Cirad-Amis, Biotrop)



The RITA device with coffee vitroclone

RITA, an apparatus which facilitates in vitro culture

In vitro culture allows routine preparation of thousands of "certified copies" of a plant from a simple tissue fragment from the mother plant. This is achieved through the use of complex mixtures of mineral salts, sugars, amino acids, vitamins, and

immersion recipient). This two-compartment apparatus makes use of the advantages of the liquid medium but does not suffer its drawbacks, since the plant material is only briefly in contact with the liquid. Rita is easy to use because of its design and size and is currently being utilized to micropropagate a large number of plants, notably selected hybrids of *Coffea arabica*.

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growth regulators. Although a liquid medium is considered ideal for the mass production of vitroplants, there are frequent problems of hyperhydricity and of physiological disorder (asphyxia) caused by the presence of residues in the medium. It has long been known that temporary immersion reduces these problems. From 1988, the Biotrop laboratory of Cirad has worked on the use of this technique and the development of a simple, easy-to-use apparatus: Rita (automated temporary