FEASIBLE BIOTECHNOLOGICAL TECHNIQUES IN THE FORESTRY SECTOR

LIVIU FĂRTĂIŞ*

Key words: micropropagation, germplasm storage, cryopreservation

Abstract: The forest species are characterized by a high level of genetic variability and many natural ranges. It is essential to preserve this high level of genetic variation, the most important component of biodiversity, to ensure the adaptability to permanent changing environmental conditions. Biotechnologies based on molecular markers or vegetative propagation are very important to identify and to estimate the level of the genetic variation in the landraces of tree species.

INTRODUCTION

Plant biotechnology registered a very fast progress in the last decades, having at the same time a great potential for agriculture, food industry or medicines and pharmaceutical products development. The forestry sector is one of the most important and very young beneficiary of the plant biotechnology.

Many forest tree species need very long periods of time between generations and a long youthful phase before flowering and fruits production.

The adoption in the last period of distinct biotechnologies ("in vitro" propagation, somatic hybridization or molecular marker techniques) led to a considerable decrease of the methodological delay in the forest improvement, given the cultivated plants. As well as, using plant biotechnologies, it is possible to obtain a large biological material amount in a very short time.

I. DNA MARKERS

DNA contains the genetic information. The DNA polymorphism can by studied by many methods. The most directly strategy is the determination of the nucleotidic snapshots of some definite regions of DNA. This technique has a very high fidelity permitting an informational analysis of data. This method, combined with measuring morphological and quantitative characters in the field, is required for reliable results. These studies are necessary to obtain a correct and unrestricted image of the genetic diversity level.

The molecular markers are used for the determination of the genetic variation, within and between landraces of tree species, for genetic conservation activities which are aimed at maintaining the genetic diversity.

Studies concerning the taxonomy and genotypes identification are based on molecular markers technology, as well as studies of mating systems, pollen movement and seed dispersal.

The "**genetic fingerprints**" technique is widely applied for germplasm identification for advanced breeding programmes.

QTL markers technique evidenced many determinant areas in plant genom for quantitative characters (productivity, precociousness, flowering duration). The QTS or QTL areas in plant genom are available to show in long time the spatial expression of genes, even the genotype – environment interaction.

Gene mapping and **marker assisted selection** have a high potential in the clonal forestry programmes. Here, the additional genetic gains can by fastly multiplied.

II. VEGETATIVE PROPAGATION – IN VITRO MICROPROPAGATION

These techniques serve for many and various purposes:

- Micropropagation (plants regeneration);
- obtaining of artificial seeds;
- "in vitro" mutagenesis and somaclonal variability;
- andro and gynogenesis;
- protoplasts.

The micropropagation benefits by a specific trait of plant cell – allpotentiality – regeneration of an entire plant starting from one cell. The plant cells have the capacity to reorganize new and specialized tissues. The economical efficiency of this technology is doubtless.

Many methods of "in vitro" propagation were performed in the forestry sector too but the vegetative propagation must be integrated into tree improvement programmes. One of these allows for a fast release of new materials and for matching of clones to different local conditions or to efficiently change the mixing of clones used in a programme.

Using "in vitro" propagation, the forest germplasm can be stored in aseptic culture, under laboratory conditions (fig.1). This is the **slow growth storage** conditions (Fărtăiş,). On the other hand, the storage of cells, tissues, seeds, organs requires **cryopreservation** at temperature of nitrogen liquid (-196^{o}C). These techniques are not widely used in genetic conservation activities for forest trees but are very appropriate techniques for species with recalcitrant seeds as oak or nut tree.

A very interesting and important aspect is about "in vitro" selection which is based on test results and correlations between "in vitro" response and the expression of field traits. In present, there are few correlations for the selection criteria of important traits like vigour, stem form or wood quality but there are sure opportunities for screening disease resistance or tolerance to salt, frost and drought (FAO,2001).

In present, successful protocols exist for a large number of forest tree species. The number of species which successful use the **somatic embryogenesis** is also increasing (fig.2). The somatic cells are differentiated into somatic embryos and this process is a very important step in micropropagation.

Fig. 1. Nut tree plantlets stored under slow growth conditions (The Center of Advanced Biological Technologies, Chişinău-Rep. Moldova)

Fig. 2. Somatic embryogenesis in oak (The Center of Advanced Biological Technologies, Chişinău-Rep. Moldova)

BIBLIOGRAPHY

Cristea, .M., 1981 – *Resurse genetice vegetale*. Edit. Acad. RSR, 160-188.

Fărtăiş, L., et all, 1996 - I Simp.Nat.de Res. fitogenet. Suceava, vol I, 161-164.

F.A.O, 2001 – *Electronic Forum on Biotechnology in Food and Agriculture*. Conf. 5, Rome

* University "Ştefan cel Mare", str. Universităţii nr.1, 5800, Suceava, România