INDUSTRIAL SECTOR
Forestry, Reforestation, Agriculture, Biomass, Energy, Environment, Pharmaceutical and Chemistry for Bioproducts

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WEB SITE
Agroforestry Biotechnology

DESCRIPTION OF THE RESEARCH RESULTS

TITLE
Service of plant in vitro culture and genetic characterization, focused on forest tree species.

ABSTRACT
The research group on Agroforestry Biotechnology at Alcalá University and the INIA's Unit on Forest Tree Genomics offer a mixed service consisting of micropropagation and plant genotyping, focused on forest tree species, through in vitro culture and molecular markers of high discriminatory power.
The \textit{in vitro} culture is carried out at facilities of Alcalá University, being the INIA the institution in charge of the plant genotyping for their delivery once they have been molecularly characterized. Other plants obtained by other means can be also genotyped as well.

Both institutions seek to reach commercial agreements with forestry, reforestation, horticultural companies, plant nurseries, companies specialized on cultivation of woody species to obtain biomass, agrarian transformation companies, ornamental companies and municipalities or local administrations interested in the maintenance of native species.

Also, this service would be of special interest for pharmaceutical companies in obtaining bioproducts in general (i.e. willow-Acetyl Salicylic Acid, yew-Taxol, Maritime Pine-Pycnogenol and other active ingredients), and chemical companies interested in obtaining resins and other derivatives.

\section*{DESCRIPTION AND SPECIAL FEATURES}

The \textit{in vitro} culture includes a set of techniques that allow on the one hand:

- The culture of plant cells and tissues under sterile conditions,

- And on the other hand, the use of plant cell plasticity (the ability to regenerate an entire plant from a cell or a group of adult cells), which allows high multiplication rates and the production of genetically identical plants (clones) from outstanding individuals in characters of interest, e.g. Resistance to pests or extreme environmental conditions, high production of biomass, etc. Virus-free plants can be also obtained.

Genotyping for molecular discrimination allows, on the one hand:

- The molecular characterization of trees resulting from micropropagation or other processes using informative markers selected and combined to increase their capacity of discrimination, and reducing costs.

- And on the other hand, technical advances in genome sequencing and genotyping techniques have helped to identify genetic variability in many plant species, including those with complex genomes such as many forest tree species. Genotyping tools with high discriminatory power have been designed for plant management and validation of their clonal origin.
INNOVATIVE ASPECTS

The differentiation of this service from the rest of the services with same characteristics is based on its expertise and experience in recalcitrant forest species (with difficulties to be propagated) and elite genotypes of commercial interest: pine, spruce and other conifers in general, eucalyptus, poplar, walnut, chestnut, etc. In addition, molecular markers with high discriminatory power are available to characterize genotypes of interest in these species.

- Both groups have experience and know-how generated in both fields; obtained from the development of research in the framework of national and international projects during the last 25 years. This know-how is the base for the development of new protocols or for the optimization of existing protocols, which progressively and actively incorporate advances in micropropagation and in vitro culture, as well as characterization of genetic variability and genotyping of forest tree species.

- Both groups have experience in transfer of basic information in analysis tools for the multiplication and genetic characterization of materials provided by companies and administrations.

- In vitro culture and analysis of the in vitro plants are developed by experts in specialized laboratories.

TECHNOLOGY KEYWORDS

In vitro culture, plant micropropagation, plant genotyping, molecular markers, reforestation, biomass, elite genotypes, commercial material

SCIENTIFIC DOMAINS

- Information and Communication Technologies
- Industrial Manufacture, Material and Transport technologies
- Other Industrial Technologies
- Energy and Biomass
- Physical and Exact Sciences
- Biological Sciences
- Agriculture and Marine Resources
- Agrofood Industry
- Measurements and standards
- Environment and risk prevention
- Socioeconomics
CURRENT STAGE OF DEVELOPMENT OF THE RESEARCH RESULT

- Development phase
- Developed, available for demonstration
- Already on the market

FUNDING RESEARCH

- European RTD project
- Regional project
- National project
- Private funding

COMMERCIAL ASPECTS

COMPETITIVE ADVANTAGES

These are some of the competitive advantages of plant *in vitro* culture and molecular certification:

- Uniformity and reproducibility of plant material
- Guarantee of origin, traceability, homogeneity and specific purity, varietal or clonal
- Obtaining a "superior" product
- Greater sanitary control
- Applicable to a wide spectrum of species
- Better planning during the year
- Save space
- High multiplication rate
- Lower costs
CURRENT STATE OF INDUSTRIAL AND INTELLECTUAL PROPERTY

☐ Patent applied  ☐ Exclusive rights
☐ Patent granted  ☒ Secret know how
☐ Software registered  ☐ Copyright protected

COMMENTS

Both research groups have the secret know-how of the methods and procedures to carry out this technical service, which will be adapted to each species or work material.

TYPE OF COLLABORATION SOUGHT

☐ Technical cooperation  ☒ Commercial agreement with technical assistance
☐ Joint venture agreement  ☐ License agreement
☐ Manufacturing agreement

COMMENTS

Both institutions seek to reach commercial agreements with forestry, reforestation, horticultural companies, nurseries, companies dedicated to the cultivation of woody species to obtain biomass, agrarian transformation companies, ornamental companies and municipalities or local administrations interested in the maintenance of native species.

Also, this service would be of special interest to pharmaceutical companies in obtaining bioproducts in general (i.e. willows-Acetyl Salicylic Acid, yew-Taxol, Pine-resin, Pycnogenol and other active ingredients), and chemical companies interested in obtaining resins and other derivatives.
ADDITIONAL FORMATION
(PICTURES)

In vitro culture and genotyping

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