

=== ORAL PRESENTATION ABSTRACTS ===

Theoretical and Biotechnological Approaches in the Institute of Biology Bucharest between 1975 - 2015 Based on Plant Cell and Tissue Culture Technology

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The year 1975 marked the beginning of research on plant biotechnology at the Institute of Biology Bucharest by the study of in vitro culture of plant cells. The team of researchers was coordinated by Dr. Aurelia BREZEANU within the Laboratory of Plant Morphogenesis and Genetic Engineering.

During the first stage (1975-1983) several basic research topics were studied, that contributed to a better understanding of the biology of the plant development:

- Plant in vitro cytodifferentiation and morphogenesis;
- Apoptosis and senescence in plants, using crown gall tissues infected by *Agrobacterium tumefaciens*;
- The role of endo- and exogenous factors in expressing the androgenetic and/or gynogenetic potential thus regenerating haploid plants used in programs of genetic improvement;
- Protoplasts technology, a pioneer activity in Romania. The studies were focused on microbial protoplasts (yeasts, bacteria) and plant protoplasts and included isolation of protoplasts, their chemical or electric fusion, plant cell regeneration, used in experiments of parasexual interspecific plant hybridization.
- Important results were obtained in the field of microbial genetic engineering and plant transgenesis.

The 2nd stage (1983-1989) was more focused on biotechnological applications using plant cell and tissue cultures. A complex network of scientific cooperation was established with research institutes, experimental stations and universities. Important results were obtained regarding: clonal multiplication, production of virus-free plants, production of haploid plants, somaclonal variability in in vitro cultures, and in vitro stress selection.

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The 3rd stage (1990-1998) was mostly devoted to fundamental research on topics including: gene transfer in plant cells mediated by bacterial plasmid vectors using direct (electroporation and electrotransfection) or indirect methods (co-cultivation), electrostimulation in in vitro systems of cytodifferentiation and morphogenesis by using weak electric fields, the effect of hypersalinity and high aluminum concentration on plant genome, study of cell and molecular processes in plant development using in vitro systems, the study of chimaera gene expression involved in pollinic and somatic embryogenesis in in vitro plant cultures.

The 4th stage (1998-2005) continued fundamental research topics, in the international context focused on the phytohormonal control of plant development. Our laboratory initiated studies on several factors that have a potential role as signals (aliphatic polyamines, jasmonates, external electric current) and on biochemical markers involved in the morphogenetic processes in experimental in vitro systems, both in test and recalcitrant plant species. The mechanisms that induce stress tolerance were studied by simulating in in vitro conditions using stress inductors (PEG) and specific mediators (ABA, AS), thus isolating cell line and/or tolerant individuals. Another major research direction was the potential utility of in vitro cultures to proliferate and biosynthesis of secondary metabolites of biotechnological interest. Thus, the study of *Vitis vinifera* callus resulted in the isolation of a long-term cell line highly proliferative and with a high production of compounds valued by the pharmaceutical industry (anthocyanins, pycnogenol and resveratrol).

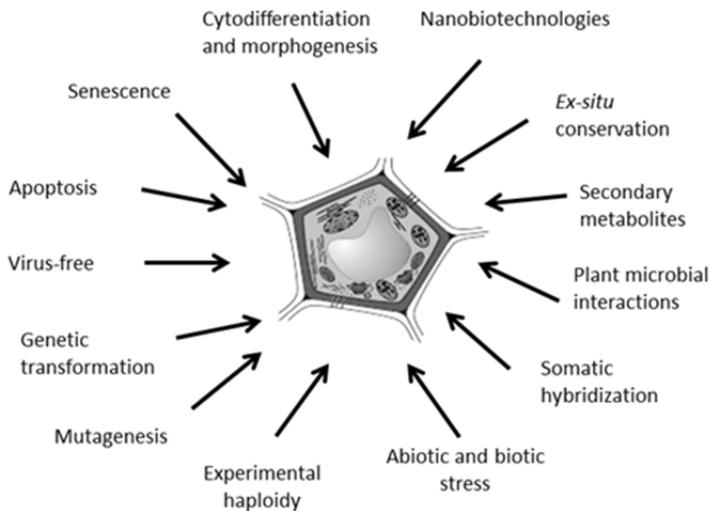


Figure 1. Schematic diagram of the main theoretical and biotechnological research topics at the Institute of Biology Bucharest, during the period 1975-2015 based on plant tissue and cell culture technologies.

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The present stage includes several directions of research. One is focused on conservation, by characterizing the *in vitro* development of protected plant species of Romania for their *ex situ* conservation. Our studies have established a cell and tissue bank, including a large variety of taxa like bryophyte, lichens, ferns and a large number of vascular plants, from many families.

Plant-microbe interactions, plant *in vitro* systems for secondary metabolites biosynthesis and plant *in vitro* systems involved in bio-nano-technologies are our ongoing research topics.

Our laboratory has published over time over 15 books and book chapter and about 1000 scientific papers, both at national and international level. Under the scientific supervision of Dr. Aurelia BREZEANU over 40 doctoral theses in the field of cell biology and plant biotechnologies were finalized. The scientific recognition of the results is also visible in the medals and prizes received.

The results briefly presented in this paper highlight only some of the aspects of the research topics in the Institute of Biology Bucharest in the fascinating field of plant cell and tissue culture over the 40 years of existence.