

**ABSTRACT**

Habilitation: **Biotechnological applications in apiculture and sericulture**

Domain: **BIOTECHNOLOGIES**

Author: **Daniel Severus DEZMIREAN, Professor, Ph.D.**

The habilitation thesis is a synthesis of relevant personal achievements, following the Ph.D. thesis in the year 2004. It is focused on the use of apiculture products in the field of biotechnologies, comprising of scientific papers published in reputed international journals and research contracts with national and international funding agencies.

The guidelines for developing the Habilitation thesis, in accordance with the recommendations of the University of Agricultural Sciences and Veterinary Medicine of Cluj-Napoca's Doctoral School, suggest to design the paper into three sections.

The first part of the thesis is a brief description of the research domain of the studies and experiments necessary for the completion of the Ph.D. thesis from 1999-2004. My professional training coincided with the development of a relatively new field - biotechnologies, applied in the field of apiculture, and later, sericulture. I managed to increase this domain's visibility both in the College and in the University. My 2004 PhD thesis' main objective was the inclusion of

---

apiculture products in the culture mediums for in vitro micro propagation of carnations, as placeholders of some parts (honey vs. sugar source culture medium), i.e. identifying and using the potential of biologically active propolis (phenolic compounds) as a substitute for growth regulators.

The effect of these compounds was tested in specific laboratory conditions of micro propagation, in accordance with the peculiarities of growth and maintenance of *in vitro* cultures. The bee products have been produced and collected under controlled conditions, and fulfills the quality standards of the product, their composition being subsequently analyzed in the College's laboratories. The biological vegetal material was represented by micro saplings of carnations, harvested on plantations, free of virus infections. Biometric measurements of plantlets' organogenetic changes were carried out (plant height, number of tillers, internodes, the number of roots and root length), in order to determine the effect of bee products on in vitro culture mediums of greenhouse carnations (*Dianthus caryophyllus*).

New horizons of fundamental and applied research on topics related to the quality of bee products and their functional or therapeutic actions have emerged subsequently to my PhD thesis and publication of the articles. Addressing the same topic in the field of beekeeping, I applied for research grants with national funding (grant financed by CNCISIS, for the project *Modern methods of control of the authenticity of the origin of honey produced in the beekeeping in Transylvania*, where I was grant director) and international funding as well in the field of sericulture (funding from the World Bank and the Ministry of Agriculture, for the project *Business model for a family farm for growing silkworms in Transylvania*, where I was also grant director).

These two grants were the starting point in addressing the more complex topics of research in the two areas - apiculture and sericulture, and the beginning of studies and publications at international level, through the initiation and membership in a research team within the Apiculture and Sericulture Discipline of the College of Zootechnics and Biotechnologies.

The second part of the habilitation thesis involves a synthesis of the main research developed after my PhD thesis. This period of time captures the development of research themes related to the technology of beekeeping and sericulture, with accents on the identification of the potential of biotechnology in the two areas. Biotechnologies reflect four major areas of application, each of them with its own color code ([www.scielo.cl](http://www.scielo.cl)). The most commonly used are: red for those with applicability in medicine, green for agriculture and food, white for industry and blue for environment and marine. Vilcinskis (2011) proposes the allocation of yellow color for biotechnology that uses cells or molecules derived from insects.

---

Honey bees and silkworms are classified under the category of useful insects. This can be applied to biotechnologies, being used successfully as biological models. Their primary and secondary products are recognized as biologically active properties and dynamic functions. For this purpose, they lend themselves to studies applying the techniques of molecular biology, genetic engineering, artificial planting, trans-genesis, micro propagation, bio-fermentation and so forth.

Bee products (honey, propolis, pollen, beebread or royal jelly) represented the main focus of research. Concurrently with the development of APHIS laboratory and personal involvement in its accreditation at RENAR, I applied for a CEEEX – M4 grant of 2.000.000 RON, which I won and implemented as grant director between 2007 and 2010. The equipment purchased through the project allowed for developing state of the art research facilities, with laboratory techniques such as ones based on atomic absorption chromatography or genomic sequencing. This allowed the development of laboratory procedures on different accredited matrices (honey, propolis, royal jelly or pollen) that were accredited and later facilitated complex experimental designs, leading to publications by different research teams in our laboratory (eg. faculty members, PhD students or graduate students, part of UASVM, and national and international collaborators). These actions lead to proper scientific production, with ISI articles (4 as first author or corresponding author and 24 as co-author) published in impact factor journals (0.45 to 6.08) - Food Chemistry, Journal of Pathology, Invertebrate Evidence-Based Complementary and Alternative Medicine, the Journal of Insect Science, Journals of Gerontology, Molecular Ecology.

My professional training continued to focus primarily on research contracts, won in national and international competitions (4 as project director, 7 as responsible for the implementation of the project and 12 as member of the team). Through these research grants, I have enabled the application of biotechnologies in apiculture and sericulture, through fundamental and applied scientific research, experimental and demonstration, as well as increased visibility by organizing international symposia, conferences and other international scientific events.

The research project with the most comprehensive and practical in the field of biotechnologies applied in apiculture was RoBeeTech. Financed through POS CCE 2.1.1-618/2010-high, and entitled *Core competence in apiculture in biotechnology Chair faculty members Romania*, it had a value of 6.541.000 RON. The project was lead by Robin Moritz, Professor at the Martin Luther University, Halle, Germany. Personally, I was responsible for implementing the project in UASVM CN, being awarded with "best research project UASVM CN in 2014". The international milieu of the implementation team, with researchers coming from Germany, Australia and Romania, as well as the magnitude of the experimental design and the publications enabled the successful implementation of the

---

objectives of the project in the APHIS laboratory. Among these may be mentioned the following:

1. Monitoring the incidence of pathological diseases to bee populations from Romania
2. The study of genetic diversity of populations of bees from Romania and the identification of host-parasite interactions-pesticides
3. Discovering new techniques of control and treatment based on biological effect of bee products and secondary metabolites of plants
4. Increasing the visibility of the activity of the project implementation team

The main techniques used to implement the objectives of the project were those in the field of biotechnology, genetics and biochemistry. The results were a deeper understanding of the genetic mechanism in response to the action of the main parasites in families of bees (*Varroa destructor*, *Nosema apis* and *Nosema ceranae*) and the identification of new genes that confer resistance to disease, with establishing physiological changes caused by usage of pesticides. The mechanisms of action and repellent effect of bee products (propolis, royal jelly), and the mechanisms of secondary plant metabolites on the pathogens were also studied.

The field of sericulture represented a continuously preoccupation for me, due to its potential in the field of biotechnologies. Considering that the lepidopteran species, *Bombyx mori*, had a wholesome sequential genome in the year 2008, I had the opportunity to get involved as a project manager, in the project COSERISTECH, PNDCI No.2 51-014 - *Conservation of Genetic biodiversity Potential and Resources of the local Sericulture*. The project represented a solution to inventorying domestic breeds and hybrids of *Bombyx mori* species in our country. At present, these interests in the field of sericulture are represented through the activities that take place in the Global Centre of Advanced Research in Sericulture and Promotion of Silk Production, based in UASVM CN, research entity that is warranted and recognized by the International Sericulture Commission based in Bangalore, India. The research fields we've addressed were related to the characterization of domestic breeds and hybrids of the species *Bombyx mori* and their potential for reinvigorating sericulture in Romania and Europe. Sericulture's potential at a conceptual level in *Pharma-Farming*, using biotechnology applied in sericulture, is an important one, both for the textile industry and for others related, such as pharmaceutical, food. I had the opportunity to promote these concepts at the level of the *Bombyx mori* section that I have been chairing in the International Sericulture Commission since 2013.

The third part of the habilitation thesis represents a summary of the activities that I propose to engage in from a managerial point of view, as a PhD coordinator. Given the potential of both apiculture and sericulture products

---

(honey, pollen, propolis, royal jelly, bee bread, silk, chrysalides, mulberry fruits, biomaterials, anthocyanins from mulberry fruits or any other by-product of those two technologies) and also of the two biological entities, honeybees (*Apis mellifera*) and Silkworm (*Bombyx mori*), and the applications that they have in research and development, I consider that I will have maximum responsibility for coordinating research in biotechnologies, both for PhD programs and strengthening technological transfer in the domain.

Cluj Napoca,

Prof. Dr. Daniel S. DEZMIREAN

05.07.2017