Habilitation Thesis- Ligia ION

Title: Contributions in order to obtaining new varieties in some tree species by using Molecular Markers Assisted Selection

(c)Abstract

The development of a solid research grounding in the field of materials engineering, supported by the teaching foundation of the modern technologies applied for materials making and processing, is a very topical issue in the contemporary society, and this could be primarily achieved through the professional and academic experience of the professors involved in this field.

The habilitation thesis is a summary of the scientific concerns and activities carried out after sustaining the PhD Thesis at University of Agronomical Sciences and Veterinary Medicine Bucharest Romania, in 2000, entitled *„Research on the effects of genetic and chemical damping with retarding substances on the manifestation of the main physiological processes in apple”*, under the guidance of professor dr. eng.NicolaeDorobanţu, when I obtained a doctoral degree in the field of Horticultural sciences, confirmed bythe Ministerial Order no. 3467 din 16.03.2001.

The general objective of the habilitation thesis is the logically argued and documented presentation of the scientific achievements obtained after sustaining the doctorate thesis. The paper is conceived in order to clearly delineate the major research directions.

The results of scientific work falls in the field of materials engineering, being approached the two following research directions:

- ***Modern methods and techniques of molecular biology used to obtain new varieties with natural genetic resistance to some diseases***;
- ***Identification of valuable genotypes in fruit trees in terms of natural resistance to some quarantine diseases and Implementation of Assisted Selection with Molecular Markers in the improvement of new varieties with genetic resistance to some quarantine diseases***

The developed scientific activity allowed the development of skills in:

- Using molecular biology techniques in breeding works of new varieties in fruit trees species;
- Valorisation of a germplasm fund for apricot, peach and apple species;

 Optimization of molecular biology protocols and techniques in relation to the biological material used;

 Identification of new valuable genotypes in terms of resistance to disease and pests;

 Using the most valuable of these genotypes belonging to local varieties in the improvement processes,

 Using assisted selection with Molecular Marker in fruit tree improvement works;

The habilitation thesis is divided into three main parts:

(d) Scientific, professional and academic achievements;

(d-1)Profesional and scientific achievements

(d-2) Research activity

(d-3) Recognition and impact activity (Professional prestige)

(e) Plan of career evolution and development;

(f) References.

The first part of the habilitation thesis presents the most important scientific results obtained after granting the title of Doctor of Engineering, and it is divided into three chapters.

The first chapter of the habilitation thesis-***(d-1)Profesional and scientific achievements-*** presents the results of postdoctoral work carried out since 2000 within the Department of Pomiculture the Department of Hortivitic Sciencies of the Faculty of Horticulture, University of Agronomic Sciences and Veterinary Medicine Bucharest. In terms of professional activity, I have taught, as Course Instructor, the following academic disciplines: *Micro-growing of horticultural plants*, *Insurance and reinsurance in agriculture*, *Modern techniques of biodiversity assessment*, *Identification of valuable genotypes in horticultural species*, *Conversion, certification and inspection of organic farms*, as well as license degree programmes and master's degree . I was a coordinator of undergraduate & dissertation projects, committee member mentoring doctoral students, and referent in committees for sustaining doctoral theses in the *Horticulture* field.

Also, it is shown the involvement in projects, grants and research contracts as a director or collaborator, and the main professional achievements, i.e. evaluator for research projects, organizer or member of the editorial or scientific boards of some scientific journals or conferences, member of various professional associations.

In the 17 years of post-doctoral activity, I have accumulated a rich experience, and the

research directions include either theoretical or practical research. Mainly, I pursued the research results to have practical applicability or utility.

In this Chapter is devoted to the most relevant contributions that targeted ***Innovative methods and techniques of molecular biology used to obtain new varieties with natural genetic resistance to some diseases.***

Research in this area has been oriented towards:

 Optimization of serological and molecular detection techniques for viruses;

 Optimizing the technique of isolating genomic DNA in wood species;

 Elaboration of molecular marker for screening of hybrids population of apple and apricot;

 Validation of best markers for improvement processes of new varieties with natural genetic resistance;

In the context of sustainable development, , regarding the research direction "***Identification of valuable genotypes in fruit trees in terms of natural resistance to some quarantine diseases***", the research activity approached the following topics:

 Identifying new genotypes in terms of disease resistance among the old Romanian varieties in private gardens or the germplasm fund;

 Their phenotypic and genotypic analysis;

 Using the most valuable genotypes identified in improvement programs using molecular marker assisted selection;

 Analysis of hybrid progeny.

Within the Research Direction "*Implementation of Assisted Selection with Molecular Markers in the amelioration of new varieties with genetic resistance to some quarantine diseases*", the research has approached the following topics:

 Validation of the best marker couples in the cais species

 Validation of the best marker couples in apple species

 Validation of the best marker couples in the peach species

In the chapter 2 ***(d-2) Research activity***-The research conducted along with the research team of the Department of BioEngineering of Horti-viticole sciences, after obtaining the Ph.D. title, has been materialised by creating, sustaining and publishing of:

 14 ISI papers, of which 6 in journals with IF

 30 papers in BDI-ranked journals or BDI Conference Proceedings;

 6 books at recognized publishing houses (CNCSIS);

 Winning by contest a Marie Curie post-doctoral individual fellowship FP6 at INRA Bordeaux France Department of Virology, -QLK-CT-2001-51880 - Contract value 125,900 euro for the period 2002-2005

 Coordination as scientist in charge for Romania in FP 7 -SharCO project - 2008-2012

 Coordination as scientist in charge for Romania in FP 7 project - FP7-KBBE-2013-7 contract - MARS - 2013-2015

 Coordination as project director of a CEEX contract P-CD 158/2006, module I - period -2006-2008, the value of the contract 1,500,000 lei

 Scientist in charge national project PN-II-51-022 / 2007, period 2007-2012

Concerns from research activity have expanded to the educational side, where within Master's degree programs I developed disciplines related to the research topics approached. The themes of research contracts correspond to the research fields of interest and are the result of interactions with other universities, research centers as well as with economic agents both in the country and abroad.

(d-3) Recognition and impact activity (Professional prestige) Is illustrated by the number of citations (40) in ISI and BDI international and national journals, a member of prestigious organizations (SRH and ISHS).

The career development plan is presented in the ***second part*** of the habilitation thesis.

Given the results obtained so far, the research will continue in the areas of research presented above, this research being intended to complement the existing achievements and focusing on two strategic approaches, i.e. *education* and *research*.

The specific targets are established for each future research directions, which may be the approach of future doctoral theses. Here is the summary of the strategies adopted to implement each objective:

 Developing new research topics related to the implementation of molecular biology techniques in obtaining new varieties with natural genetic resistance to diseases

 Including of the future doctoral students into the research team;;

 Training of nationally and internationally competitive young researchers;

 Participation in new competitions for obtaining grants;

 Maintaining of existing relationships with universities and companies in the field, and

development of new collaborations;

 Publishing the results in ISI-ranked journals with impact factor or indexed in international databases, as well as at international conferences in the field;

 Publishing of book chapters or specialty books;

 Increasing visibility of research results.

Regarding the plan of evolution and development in teaching, the general objective will be the continuous improvement of the activities and applied techniques, i.e. incorporation of the research results into the teaching programmes, especially for master's degree. The derived objectives and the strategies to achieve them are also included in the presentation.

The references are found in the ***third part*** of the habilitation thesis. Each chapter includes the references associated with each approached research direction, containing articles, patents and published books, as well as articles and reference books in the field.