



UNIVERSITATEA DE ȘTIINȚE AGRICOLE ȘI
MEDICINĂ VETERINARĂ CLUJ-NAPOCA
ȘCOALA DOCTORALĂ DE ȘTIINȚE AGRICOLE INGINEREȘTI

TEZA ABILITARE

INCREASING THE DEGREE OF USE OF NATURAL BIOACTIVE COMPOUNDS
IN THE CONTEXT OF HIGHER VALUATION „ZERO WASTE” WITH AN
IMPACT ON FOOD QUALITY AND SAFETY

**CREȘTEREA GRADULUI DE UTILIZARE A UNOR COMPUȘI BIOACTIVI
NATURALI, ÎN CONTEXTUL VALORIFICĂRII SUPERIOARE ȘI „ZERO WASTE”
CU IMPACT ASUPRA CALITĂȚII ȘI SIGURANȚEI ALIMENTELOR**

Domeniul: **Biotehnologii**

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CLUJ-NAPOCA, 2021

ABSTRACT

The habilitation thesis presents the results of my scientific and academic work, in the field of food biotechnology, starting from the time of my doctoral thesis, in October 2010, up until now, as well as my plans for the development and evolution of the teaching career and research activity.

The habilitation thesis, entitled "Increasing the use of natural bioactive compounds, in the context of superior recovery and "zero waste" with an impact on food quality and safety" is structured in three parts, organized as followed: the first part presents scientific and professional achievements, the second part is the career development plan, and in the last part the bibliography is presented. The main field of research is related to the biochemistry of biologically active compounds from plant and animal matrices, in the context of superior recovery and "zero waste" with an impact on food quality and safety.

After a short introductory chapter, in the second part (Scientific and professional achievements), the main research directions are presented, which were the basis of this thesis, namely: (1) Evaluation and characterization of bioactive compounds from plant matrices. (2) Bioactive compounds from native plant matrices and by-products, source of fortification of some foods, (3) Implementation, optimization and monitoring of the quality and safety of some foods with impact on functional and nutritional properties.

Chapter (2.1) Evaluation and characterization of bioactive compounds from plant matrices. This chapter presents studies in which one of the most modern techniques for the extraction of volatile compounds was used, namely "in-tube extraction" (ITEX) coupled with gas chromatography and mass spectrometry (GC-MS) with which the research team, of which I am also a part, managed to determine the volatile profile of some vegetable raw materials. Volatile compounds in plant raw materials are a class of substances with a significant contribution on their flavor, while also having a number of benefits for human health. It is therefore necessary to know in detail the changes that take place during the maturation, storage or processing of raw materials of vegetable origin (tomatoes, plums, apples) regarding the formation of volatile flavor compounds as well as the dynamics of accumulation of biologically active compounds with antioxidant role.

The importance of this research for the current knowledge in the field is supported by their citations in prestigious journals such as Nature, Trends in Chemical Science, Food Research International, etc.

Chapter (2.2) Bioactive compounds from local plant matrices and by-products, a source of fortification of some food products, presents the results of our team's research in terms of diversifying the range in the bakery by utilizing local plant sources of protein and fiber. Another approach of the research team was related to the diversification of the assortment range in the meat

and dairy products industry by capitalizing on bioactive compounds from shock fruits. The studies focused on identifying and characterizing some local sources (mushrooms, hemp, black elderberry) with the role of fortifying some vegetable products: bread, pasta and animal products: meat and cheese. Through the results obtained, three PN III-CI research projects were carried out, two as project manager and two patent applications were filed with these research topics. The superior recovery of some food by-products, in the context of "zero waste" as potential sources of bioactive compounds, was another research topic of our team.

Our research team has had a constant concern regarding the characterization and capitalization of by-products resulting in different technologies for obtaining food, potential sources of bioactive compounds.

Wastes from wine production, consisting mainly of skin, seeds and stems, represent 20% of the processed weight of the grapes and are considered valuable by-products due to their high content of phenolic compounds. The results obtained by our team demonstrated the beneficial effect of these additives (grape seed flour, pomace) on the quality of some foods (cookies, canned meat, cheese) through the important contribution of polyphenols, resveratrol, increased antioxidant capacity, diversifies assortment range and last but not least, capitalizes on the residues resulting from wine technology.

Chapter (2.3)) Implementation, optimization and monitoring of the quality and safety of food products with an impact on functional and nutritional properties, presents original studies on the implementation of food quality management and safety systems for obtaining acidic dairy products.

The study describes the implementation of the food safety system in the pilot dairy factory "Gourmeticus Academicum", a spin-off within the University of Agricultural Sciences and Veterinary Medicine in Cluj-Napoca, Romania. To improve the HACCP safety system, preliminary programs have been integrated into the quality management system by monitoring hazards. The process provides future specialists with educational tools and notions of good practice.

The implementation of the safety management system was done to improve the quality and safety of the products, customer satisfaction, the product image on the market and to develop good practices as an educational tool.

Another topic addressed by our team was a study on optimizing the maturation processes in order to improve the functional and nutritional properties of some dairy products.

The study, published in the Foods journal, focused on changes in physico-chemical, microbiological, fatty acid profile and volatile compounds during the maturation of Apuseni

cheese. The Apuseni assortment is a hard cheese obtained in the Apuseni Mountains (Colțești, Alba) from cow's milk, purchased from local producers, pasteurized and matured for up to 16 months. One way to protect these local products, such as Apuseni Cheese, is to perform a global characterization to determine the main characteristics that make them original, specific and distinct on the market.

In the second part of the thesis, the plans for evolution and scientific and academic development are presented, plans that have defined the primary objective the increase of visibility, scientific quality and national and international recognition of this research.

The scientific and journalistic research activity after the completion of the doctoral thesis is as follows: the publication of 2 chapters at international publishing houses, 3 specialized books at national publishing houses, 3 textbooks published at national publishing houses and 7 guides of practical works for quality control of raw materials and of finished products of plant and animal origin and sensory analysis of food. As the main author / correspondent or co-author, I wrote 32 ISI / ISI proceeding articles (4 ISI papers were awarded by UEFISCDI) and over 50 BDI articles, numerous citations, including one citation in the journal Nature (IF 38,138), an h-index 8 (according to Web of Science) and 9 (according to Google Scholar). The research also resulted in 5 patents, 3 research projects as project director / manager (2 PNII innovation check projects, one business environment project and 21 projects as an active member in the research team). I received 35 distinctions at the International Exhibition of Research, Innovation and Invention "Pro Invent", as well as excellence diplomas and 10 gold medals.

The future plans through which I intend to further develop my teaching and scientific career are based on the transmission of some qualities very important to me: professionalism, perseverance, consistency, transparency, feedback, clear and logical communication and teamwork.

The directions and research topics that I will address in the future will be based on the experience gained and the results of existing research. These have in main focus the quality and safety of food, recovery of biologically active compounds from plants and animal matrices.

Future research will be directed in particular directions, as followed:

- characterization and use of local and less valued vegetable matrices, in order to develop functional products or ingredients,
- capitalization of by-products in the food industry in order to obtain and develop sustainable products,
- making vegetable packaging obtained from reusable waste, in the context of zero waste.