

ABSTRACT

The present habilitation thesis is a synthesis of my research activity and academic work in the field of food product engineering, from the moment of my doctoral thesis defense in September 2015 until the present, as well as the plans for the development and evolution of my teaching career and scientific research activities.

The habilitation thesis, entitled "**Research on increasing the utilization degree of plant bioactive compounds in order to fortify food products and the impact of management systems on food quality and safety**" summarizes the most relevant personal achievements in scientific research, describing the results of representative studies for my areas of interest in the field of research. The main one is related to the biochemistry of biologically active compounds in vegetable raw materials in the context of their utilization in fortified food products, with emphasis on food quality and safety. After a brief introductory chapter, Part 2 (Scientific and Professional Achievements) presents the main research directions addressed, namely:

Chapter 2.1 (*Analysis of bioactive compounds extracted from vegetable raw materials used in the food industry*) presents original studies on the advanced characterization of flour obtained from different hemp seed varieties, in conjunction to wheat flour. Also this chapter presents a number of studies on the use of aromatic plants and spices for meat products and meat analogues, studies on the comprehensive characterization of the composition, nutritional properties, health benefits of medlar fruits (*Mespilus germanica* L.), studies on the chemical composition and classification of 22 apple genotypes based on texture analysis and physico-chemical quality attributes, and studies on the physico-chemical and antioxidant properties of elderberry fruits during growth stages: from buds to ripening.

Chapter 2.2 (*Study of bioactive compounds in vegetable raw materials for food fortification*) includes the most representative studies of our research team, published on topics related to the diversification of the food industry assortment.

Studies on the product diversification in the bakery and pastry industry, aimed to exploit some vegetable raw materials (hemp, mushrooms, nuts, lentils) with a high content of essential amino acids and essential fatty acids to strengthen some plant products such as bread or crackers. The diversification in pastry aimed to develop low fat muffins and the production of nutritionally and sensorially enriched products with pistachios and rose water.

The diversification of sugar-based products proposed to replace cocoa powder, a basic ingredient in chocolate manufacturing, with acorn-derived powder, as an alternative to cocoa powder to obtain chocolate lacking nervous system stimulants. The superior valorization of some food by-products has been addressed by our research team through the evaluation of cytotoxicity and antioxidant activity of a new powder-based drink of roasted avocado seeds, the recovery of peels and mango seeds waste in a variety of biologically enriched biscuits.

Chapter 2.3 (*Quality control and safety of food products with an impact on functional and nutritional properties, through implementation, optimization, and monitoring of relevant parameters*) presents the studies conducted by the research team of our institute, on changes in the physico-chemical and microbiological properties of Apuseni cheese during maturation. Food quality control is another research topic of constant interest both to our research team and to the industry. The results of this article are part of a research project, of which I was also a member.

The last topic addressed in this thesis refers to the implementation of food safety management systems. The published studies cover a wide range of topics, from the employability and employment opportunities upon graduation for students to a growing interest in food safety from both the authorities and all the other actors involved in the food industry. The first study provides education tools for students, the industry, and consumers. Educational tools for good practice, preliminary programs, and the implementation of an HACCP plan (Hazard Analysis and Critical Control Points) in an integrated food safety management system are presented. The second study emphasizes a comprehensive examination of risks and hazards in three egg sorting and packaging stations. The study provides complex prevention tools, readily available at any time, for the elimination, reduction, or mitigation of risks encountered in egg sorting and packaging facilities.

The third part of the thesis presents plans for scientific, professional, and academic development, with the primary objective of increasing the scientific quality, visibility, and national and international recognition of my own research.

Scientific and publishing activity after completing the doctoral thesis, in the field of food product engineering, is presented as follows: the publication of 5 book chapters by international publishers, editor of 3 international books, 2 scientific books by national publishing houses, 3 teaching manuals published by national publications, and 1 practical work guide. I am the author of 25 ISI/ISI proceeding articles and 20 BDI articles. The research has also resulted in 5 patent

applications, 3 invention patents, 4 research projects as director/responsible, and 4 projects as an active member in research teams. I have received 63 awards at the International Research, Innovation, and Invention Exhibition "Pro Invent", Iași National Institute of Invention, Inovaliment, obtaining diplomas of excellence and 12 gold medals.

Future research will focus on the following specific areas: (1) characterization and valorization of plant extracts with biologically active properties, as well as the exploitation of bioactive compounds from residues/by-products of the food industry for the development of functional products or ingredients, (2) the utilisation of vegetal sources for the production of meat analogues, (3) advanced characterization of risks in the food industry to facilitate the development of safe food products with superior quality. Thus, I aim for an efficient development of research activities alongside educational activities to promote innovation in the food industry.