

# **The objective portrait of natural compounds - from the phytochemical background to the diverse palette of biological effects**

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## **ABSTRACT**

Since the beginning of pharmacology, natural compounds have served as its foundation, and they continue to be a key resource for the development of novel therapeutically active compounds.

The overabundance of studies in the field of medicinal plants places them in a prominent position in the field of research, providing important evidence regarding their therapeutic benefits. Nonetheless, there are still concerns about the safety of administration and numerous other issues in pharmaceutical practice. These arise from legislative gaps concerning food supplements, which carry certain risks when taken, as well as from the lack of evidence supporting the therapeutic efficacy of certain compounds or multicomponent extracts.

The first section of this habilitation thesis covers the scientific, professional and academic achievements and is in turn divided into 5 chapters. The first 4 chapters describe the postdoctoral research, which was focused on the following research directions:

- 1. Controversial species with risk of abuse - multiple perspectives in research**
- 2. Exploring the biological diversity of species from the spontaneous flora of Romania and identification of new candidates with therapeutic potential**
- 3. Herbal products from culture with high therapeutic potential**
- 4. Valorization of forest waste - Forest waste or valuable resources?**

The first step in the process of finding new therapeutically active compounds is to choose the plant source from which the desired compounds will be extracted and isolated. During my post-doctoral research, plant products were selected for three key reasons. The first reason that led to the selection of herbal drugs and, implicitly, the research directions, was the ongoing pharmaceutical activity, in which I noticed the patients tendency to overuse certain food supplements containing various plant extracts that "promise" a wide range of metabolic effects, but have no scientific foundations.

The following reasons that directed me towards post-doctoral research were the valorization of indigenous species from spontaneous flora and from culture and the valorization of plant products from different industries considered plant residues or waste.

The selected plant products, starting from the three previously mentioned reasons, were characterized from a pharmacognostic point of view using different analytical methods, both qualitative and quantitative. In addition to the specific pharmacognostic determinations, the study of certain plant products also included different extraction optimization methods, as well as the optimization and validation of some methods of quantification by high-performance liquid chromatography coupled or not with mass spectrometry. The extracts that presented a suitably intricate phytochemical profile were further subjected to pharmacological evaluation, both *in vitro* and *in vivo*. The evaluation of the antioxidant and antimicrobial effect was correlated with the chemical composition, noting the tendency of different classes of active principles to provide protection against free radicals. Also, in the case of certain extracts, alpha-glucosidase and alpha-amylase inhibition activity was also evaluated. In line with the doctoral thesis's theme, the evaluation of the modulatory effect of different plant products in the metabolic changes caused by diabetes, in an animal model, was carried out for *Tribulus terrestris* extracts and fennel essential oil.

The post-doctoral research presented in this habilitation thesis aimed to provide a representative picture in the field of phytochemistry and phytopharmacological studies.

The last chapter within the first section delineate professional and academic achievements. The results of the postdoctoral research were disseminated in 32 *in extenso* articles, of which 25 articles in ISI Web of Science Core collection rated journals and 7 articles indexed in the international database. The cumulative impact factor for postdoctoral publications is 90,296 (66,25 as the main author), and the Hirsch index according to WOS is 8.

Regarding the didactic activity, after obtaining the PhD title, I was the coordinator of Pharmacognosy and Phytotherapy courses within the Pharmacy study program, of the Perfumes and Aromatherapy course at the Medical Cosmetics and Cosmetic Product Technology study program and of the Phytopreparations in cosmetology and dermopharmacy and Clinical Aromatherapy courses within the Master's program of Cosmetology and Dermopharmacy. Starting from the academic year 2023-2024, I am the coordinator of the optional courses Phytotherapy and Food Supplements within the Faculty of Medicine in English, as well as for the course of Phytotherapy within the Faculty of Medicine.

The second section of the habilitation thesis presents the evolution and development plan for the professional, scientific and academic career. Future research directions are in fact a continuation of the research presented in this thesis, namely pharmacokinetic studies of therapeutically active compounds from *Vaccinium myrtillus* and *Tribulus terrestris* extracts in healthy and diabetic rats. The hypothesis from which these studies start is that sterol saponosides can influence the pharmacokinetic profile of compounds in bilberry leaves, and the second premise is that diabetes influences the pharmacokinetic profile of different compounds, through the changes that occur at the metabolic level. The final objective of these studies is to obtain a patented multi-component phytotherapeutic product with proven effectiveness aimed at improving the specific symptoms of diabetes. The second proposed research direction starts from the *Cannabis sativa* species and wants to evaluate the effects of cannabidiol, but also of some lipophilic compounds in periodontal disease. Future goals include obtaining the necessary funds to carry out these researches as well as engaging students and master's students in these research projects. On the didactic level, I propose the permanent updating of the courses according to the latest discoveries in the field of pharmacognosy and phytotherapy, as well as writing of scientific books. I will also maintain up my active participation in the academic community at the university. Last but not least, I aim to integrate into pharmaceutical practice the competencies acquired through academic and research activities. I believe that the pharmaceutical practice complements both teaching and research activities, thereby enriching the overall professional development of a pharmacist.