

**”VICTOR BABEȘ” UNIVERSITY OF
MEDICINE AND PHARMACY FROM TIMIȘOARA
DOCTORAL SCHOOL
PHARMACY DOMAIN**



**SYNTHESIS, CHARACTERIZATION, AND
BIOLOGICAL ACTIVITY OF DIFFERENT
COMPOUNDS FROM PLANT AND FOOD**

ABSTRACT

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Titled thesis "Synthesis, characterization, and biological activity of different compounds from plant and food" it represents a link between my research, academic and professional activity, concluding with future research direction.

After presenting my PhD thesis, I followed the line of research started earlier, mainly studying plants and everything related to them, from their phytochemical composition to the actions they have and their role in the field of therapy.

The first chapter is focused on three research directions.

- The study of plants has expanded by analyzing the toxicity of some possible plant compounds, especially the presence of metals, depending on the place of origin and potential soil infestations. Moreover, within the study of plants, I synthesized, characterized, and analyzed different complexes of phytochemical compounds with metals and characterized their toxicity. The results showed that the factors which influence the number of metals in food are very varied starting from the soil system and ending with the type of culture. The analytical results obtained for the heavy metals in the plant sample show that they have lower concentrations than those recommended by the World Health Organization.
- Another direction, I followed consisted of the characterization of different types of melanomas as well as the way in which other plant compounds act on them. I evaluated the biological activity of some complexes formed from acids and dextrins, as well as some enriched extracts with applicability to different types of melanomas and inflammations. An important point is the obtaining of eye drops incorporated in nano molecules with possible application in choroidal melanoma. Plant extracts were nanoencapsulated, characterized from a phytochemical point of view. Next came the synthesis of eye drops. Their biological activity was determined on cell lines. The apoptotic activity of the mixture of oleanolic and ursolic acids in comparison with these acids used separately on the cell lines A375 and A2058 show the best results regarding the measurements of cell viability.
- Betulin together with extracts with a high concentration of betulin developed a strong anti-proliferative effect in vitro and an important activity in vivo, mainly anti-inflammatory activity, which adds to its strong antitumoral properties.
- The research direction also extended to the food field, analyzing different types of food, mainly vegetables, and fruits from the point of view of chemical composition, especially the determination of antioxidant action and the importance they have in food. Of course, the way in which the composition of these compounds acts on the body was taken into account, as well as the differences in composition depending on the place of origin of the food, harvesting, and preservation. The determination of the antioxidant activity of some jams depending on the added pectins represented another important interest, as well as their preservation time depending on this. Peppers grown in the garden have a higher average content of vitamin C compared to peppers from supermarkets, and tomatoes grown in the garden or in the field (medium and small size), have a higher content of vitamin C than those from the supermarket. The findings suggest that vegetables sourced from farmers may

be a better choice in terms of vitamin C content levels than vegetables sourced from supermarkets. The jam's formulation is very important taking into consideration that the composition of the matrix strongly affects its antioxidant properties due to the changes occurring in the interactions between the constituents of the matrix. Small changes in the composition of the jam matrix, such as the type of pectin, greatly affect the quality of the jam. The results suggest that an appropriate selection of pectin type and dosage in the formulation could improve the degree of retention of compounds in gelled products. Polyurethane microstructured samples did not show any antiproliferative activity due to their slow degradation; this is why such structures can be used in prolonged treatments or for sustained-release drugs.

The second chapter provides a brief description of the academic activity. From an academic development point of view, I started as a university assistant in the discipline of inorganic chemistry, gradually rising to a lecturer in the disciplines of pharmaceutical biochemistry and bromatology becoming assoc. prof. During these years, I had countless collaborations with colleagues from other disciplines, but also with colleagues from other faculties in the country. The collaborations were completed by participating in various congresses and symposia in the country and abroad, but also by publications in national and international databases. Within the faculty, I was part of the quality management committee as well as the study completion committee. I have led over 60 undergraduate theses with various topics within the subjects I teach.

Chapter three briefly describes the professional evolution, thus the professional training continued with the specialization in the pharmaceutical laboratory and with the primary pharmacist exam. In all these years I have taken part in continuing education courses in the field of health.

The fourth chapter proposes career development both from a scientific and academic point of view. Thus, on a scientific level, I want to deepen the research directions of the last 15 years, especially in the fields studied, but bringing new applicability.

I want to study plants under the aspect of components with nutritional effects, respectively the involvement of plant-based produces in different biochemical pathways.

Another area of study that I would like to address is the impact of the pharmaceutical and food industry on environmental components. In this sense, I would involve in studies of modern analytical methods such as chromatography, spectrophotometry, and electrophoresis for a better characterization of these components. I also want a continuous improvement of the analysis methods, obtaining a better specificity, sensitivity, and precision of the methods used. I want to make correlations between the composition of plants, their effect on different organs, and the correlation with biochemical parameters.

I want to continue researching the nanocapsules field, which incorporates different compounds to characterize them from the point of view of pharmaceutical applicability. For this I want to use in vitro methods, using different types of cell lines. For these studies, I would like to be able to make interdisciplinary collaborations, especially with pharmacologists and geneticists, thus clearly identifying the mechanisms of action of these molecules.

To cover and achieve these scientific objectives, I would like to attract funds by accessing national and international projects.

By obtaining some results, I hope to be able to propose new study topics that will help to better understand the action mechanisms of medicinal plants, but also how they mutually influence each other with food.

I want the results of research studies to be continuously disseminated through the publication of specialist books, and articles, or participation in national and international scientific events.

On a professional level, I have been and will continue to wish to improve myself by participating in courses that broaden the area of knowledge about plants, food, and nutrition, the possibilities of investigating their composition and biological effects, and also the field of biochemistry, because the possibilities are limitless.

I would like to be able to create and strengthen a team made up of professionals from various fields, from biology, and chemistry, to the pharmacy, medicine, informatics, legislation, etc. with which to study in detail the previously mentioned.

On the didactic level, I want to continue my academic activity by continuously improving the taught courses by adapting them to national and international requirements. To follow the trend of interactive teaching by actively involving students in the entire academic process, culminating in their presentation at various student congresses and the publication of articles. I would also like to modernize the subject sheets following lines from the faculties in the country and abroad.

Through the attractive teaching of the subjects Pharmaceutical Biochemistry, Chemistry of Environmental Factors and Functional, and Protective Nutrition, I would like to attract students interested in research, motivating them to participate and publish the results of their work at student scientific events and thus a small extent contributes to the training of future researchers in the field.

In order to support the training of students, I want to prepare guidelines and course notes that will also help health professionals.

I would like to propose new optional, post-graduate courses in the medical field.