Introducing the Floral and Apicultural Research Group

The Floral and Apicultural Research Group of the Department of Pharmacognosy, Faculty of Pharmacy, University of Pécs, has been investigating the apicultural significance of fruit bearing trees and medicinal plants, and the nectar production of various plant species under diverse ecological conditions, for two decades. Recently, our research has focused on the quality of Hungarian honeys. Honey samples are identified by sensory and physicochemical analysis, and by their pollen profile. Our research includes the chemical analysis of biologically active compounds, such as polyphenols, as well as macro- and microelements. The health benefits, including the antioxidant activity and the antibacterial and biofilm inhibiting effect of honeys are investigated in numerous *in vitro* assays.

The roots of our apicultural investigations date back to the 1990s, when graduate and PhD students investigated the floral biology, nectar production, pollen viability and other, economically important pollination biological traits of deciduous fruit bearing trees (almond, apricot, peach, sour cherry, pear, apple and quince) under the supervision of Dr. Zsuzsanna Orosz-Kovács. I was lucky enough to join this dynamic team as a member of the student researchers' society, and had the opportunity to master the basics of scientific research, familiarize myself with the challenges of field and laboratory work, as well as the strength in teamwork.

After obtaining my PhD degree and joining the pharmacist training at the University of Pécs, the focus of my teaching and research activity has shifted to medicinal plants. Following the good practice of my previous supervisor, I invited interested students to join my postdoctoral research project supported by the National Research, Development and Innovation Office, which investigated the floral and pollination biology and the apicultural significance of various medicinal plants, e.g. wild garlic (Fig. 15). Students were attracted by the possibility to do research both in the field and in the lab. Field nectar measurements were frequently conducted during the whole day, and covering the whole blooming period of the plant species, which can be physically and mentally challenging, requiring perseverance, precision and good stamina. The nectar producing glands of the flowers were investigated with light and scanning electron microscopy, for which we made the preparations ourselves. The chemical composition of the nectar was analyzed with thin layer chromatography and high-performance liquid chromatography.

In the following years our research team was joined by pharmacy students, who intended to do research related to the beehive product prepared from the floral nectar, i.e. honey, since their family was keeping bees themselves. Thus, they were able to conduct scientific research on their own honey samples. The first such student wrote her thesis about the antimicrobial effect of acacia (*Robinia*) honey samples collected from various regions of the Carpathian Basin. The next student tested the antibacterial and antioxidant activity of acacia and other monofloral honeys from multiple years. In the coming years, we included an ever-growing number of Hungarian and occasionally foreign honey types in our research, and similarly, more and more aspects were investigated, with an increasing number of methods. Students who are members of the student researchers' society, regularly present their results at the local and national student competitions, having been awarded first, second or third prize and even special prizes.

The most talented ones continue their floral biological and/or honey research as PhD students. To date, three members of the research group have defended their PhD theses: Helga Déri-Nagy analyzed the insect attraction traits of quince cultivars, András Kerchner investigated the nectar chemistry and floral biology of Solanaceae species, while Alexandra Bodó analyzed nectar sources and honeys of various botanical and geographical origin, applying a complex approach. In the near future, Lilla Nagy-Radványi is expected to defend her PhD thesis entitled "Changes in the antibacterial activity of Hungarian varietal honeys as a function of storage". In the latter two doctoral works, Dr. Marianna Kocsis acted as co-supervisor. She has attained a significant role in our research team during the past decade, being responsible predominantly for analyzing the antioxidant capacity and mineral content of honeys.

In the currently running PhD investigations (Regina Koloh: mechanisms of action in the background of antibacterial and anti-inflammatory effect of monofloral honeys; Virág Diána Ángyán: antibacterial effect of honey-essential oil combinations) my co-supervisors are representatives of the younger generation, Dr. Viktória Lilla Balázs and Lilla Nagy-Radványi. Their main research interest lies in the antibacterial and biofilm inhibitory activity of honeys. Thanks to their enthusiastic and high standard researcher attitude, several graduate students joined

our research team under their supervision. The microbiological investigations are carried out in cooperation with the Department of Medical Microbiology and Immunology at the Medical School of the University of Pécs, with the professional help of Dr. Béla Kocsis.

Our research infrastructure is largely provided by the Department of Pharmacognosy, and financial support is ensured by research grants. Our recently finished 4-year project investigated the nectar yield of the invasive medicinal plants milkweed (*Asclepias*) and goldenrod (*Solidago*), as well as the active compounds and biological activities of their honeys. In this project our research team was completed by Dr. Rita Filep and Dr. Dragica Purger, also from our department, participating mainly in field studies; and Dr. Szilvia Czigle from the Comenius University, Bratislava, who was responsible for antioxidant capacity assays.

Our future plans include determining the components of plant origin (pollen profile, phytochemical composition, minerals) in varietal honeys not investigated so far. We intend to reveal the relationships between these traits and their contribution to the antioxidant capacity of honeys, which can refer to their medicinal potential. A further objective is to study the effect of geographical origin and year of harvest on the above-mentioned characters, in case of commonly available honey types in several consecutive years. The therapeutical and market value of honeys can be higher in case their more pronounced antimicrobial and/or anti-inflammatory activity is proved. Thus we aim to investigate the mechanisms of effect that can be in the background of the pharmacological activities of honeys, applying various *in vitro and in vivo* assays.

I am grateful that I can supervise the research work of this dynamically changing team (Fig. 16), where each member provides the best of their knowledge, with ever-increasing enthusiasm. Our team members regularly propose novel ideas, how to widen our knowledge regarding high quality Hungarian honeys, which are the joint product of our diverse bee pasture and the diligent work of honeybees and beekeepers.

Dr. Ágnes Farkas
Dept. Pharmacognosy, University of Pécs
agnes.farkas@aok.pte.hu

Ethnopharmacobotanical Research Group

The study of ethnopharmacobotanical and ethnomedicinal data started 17 years ago at the Department of Pharmacognosy, Faculty of Pharmacy, University of Pécs. My first personal motivation dates back to 2006, when several studies were presented at the congress entitled "*Traditional use of medicinal plants – phytotherapetutical values*" organized by Section of Medicinal Plants, Hungarian Society of Pharmaceutics (Szentendre, 2006 Sept). Among them, studies presented by Dr. Tamás Grynaeus involved 50-year ethnomedicinal data from Transylvania (part of Romania) and Hungary, which piqued my interest for the topic. Tamás and Kata Frendl organized a field survey in summer of 2007 in Uz Valley (RO), to study the traditional use of plants by Csángós. Having joined this survey allowed me to investigate the botanical and human/personal aspects, methods, and everyday life of informants in the frame of field work. This journey launched me to study traditional data on plants, involving the local treatments and use of flora elements in less known areas in Transylvania.

Based on this decision, as second step, the *Ethnopharmacobotanical Research Team* was established with participation of students, PhD students, and colleagues at our department. Based on Tamás's proposals, the first trip was conducted with a biologist student in Lueta (~3000 inhabitants) to prepare her thesis, which was followed by several surveys until 2017, and resulted a complex monograph (364 pp) about the settlement (in Hungarian). Thereafter many field surveys were performed at various areas of Transylvania, first of all along the Kis and Nagy Homoród rivers in County Harghita. Although earlier data were published about 6 settlements of the region (inhabited by ~20 000 Székelys), in order to maintain the traditions and inheritances, and due to migration of young people and many changes in the landscape and culture, we started new field works in the above 6 and other villages in the area.

During these surveys new contacts were established with dwellers of neighboring 13 settlements, using the snow ball method (2011-). As follows, the structured and systematic ethnobotanical survey of the region evolved step by step. In the meantime,