

## **Návrh témy doktorandského štúdia v odbore Botanika so začiatkom štúdia v školskom roku 2024/2025**

**Systém štúdia:** Doktorské studium pod dvojím vedením disertační práce – Cotutelle, dohoda medzi Karlovou Univerzitou Praha, Česká Republika a Univerzitou Komenského Bratislava, Slovenská Republika

**Meno školiteľa (CBRB SAV, Bratislava):** Mgr. Miroslav Caboň, PhD.

**Meno školiteľa (PRIF UK, Praha):** Mgr. Marek Slovák, PhD.

**Téma dizertačnej práce:** Exploring factors shaping the evolution, diversification, and adaptation of selected *Daphne* (Thymelaeaceae) members to extreme environments.

Relictual and endemic species represent a crucial component of global biodiversity. Despite numerous studies addressing the systematic, evolutionary, and diversification aspects of these rare entities, our understanding remains incomplete regarding the intrinsic and extrinsic mechanisms guiding their evolution, speciation, and long-term survival. This proposed thesis centers on the woody vascular plant genus *Daphne* (Thymelaeaceae), recognized as an ancient relictual genus with the majority of its species classified as relictual and endemic, often exhibiting highly restricted distribution ranges. Notably, these species thrive in environmentally extreme and inhospitable habitats, predominantly characterized by exposed rocky outcrops.

The thesis is structured around two primary focal points concerning the evolution of selected species and the mechanisms driving their adaptation to specific environments. The first segment delves into the impact of interspecific gene flow on the speciation and diversification of endemic entities. It also explores its influence on the fitness and long-term survival of endemics residing in rocky habitats. The second component of the thesis concentrates on the interaction between selected species and their endobiont mycobiome, investigating its effects on the survival and adaptation of these species to particular environments.

The aim of the topic is to:

1. Hybridization-induced speciation among *Daphne* endemics in Mediterranean mountain ranges, with a specific emphasis on *D. cneorum* as a pluripotent parental species
2. Hybridization and introgression dynamics between rocky-dwelling stenoendemic *D. petrea* and its parapatric and sympatric relatives, and assessing their impact on population structure and survival.
3. Microhabitat heterogeneity-induced endobiont mycobiome diversification in the West-Carpathian endemic *D. arbuscula*
4. Bedrock-induced endobiont mycobiome diversification and its role in adaptation of *D. cneorum* populations to specific environmentally hostile habitats

**Proposed methods:**

- While some of the material has been previously collected for earlier studies, the majority of necessary material will be gathered throughout 2024 and finalized in 2025.
- Determination of chromosome numbers and ploidy levels involves direct chromosome counting, DAPI and PI flow cytometry.
- Genetic analyses will include dd RAD-sequencing for population genetic structures and evolutionary inference, as well as Hyb-seq analyses using 353 Angiosperm general probes covering also plastome and ribosomal cistron analyses for evolutionary inference.
- Metagenomic profiling and metabarcoding of mycobiomes will consist of isolating environmental DNA from roots and shoots of the studied species, along with associated soil samples. Metabarcoding will be conducted using the ITS2 region and SSU region of the ribosomal cistron.

**Financial resources:**

- VEGA 2/0098/22; expected fundrasing in 2025
- APVV 22-0365; expected fundrasing in 2026
- DoktoGrant, to be proposed in 2025

**Expected papers:**

Quality WOS papers (preferably Q1 or decile): 3-4