

**Rámcová témata doktorských disertačních prací
studijního oboru botanika
vypsáných pro rok 2006/2007
(PřF UP v Olomouci)**

Topics of Ph.D. thesis from botany

Diverzita a ekologie řas dystrofních vod

Diversity and ecology of algae of mires

(supervisor: Doc.RNDr. A.Pouličková, CSc., PřF UP; funding: GA AVČR)

PhD. project represents a phycological part of the project „Past and present changes in mountain mires of the Sudetes“ which intends to study the composition, functioning and development of mountain oligo-ombrotrophic bogs in the Jeseníky and Jizerské hory Mts., affected in a different grade with air pollution in the near past. Phycological part focuses on composition and structure of algal assemblages (particularly Desmidiaceae) and their relations to habitat conditions (hydrochemistry, composition of communities of bryophytes and vascular plants) and their long term changes.

Biologie a ekologie fyto bentosu

Ecology and biology of benthic cyanobacteria and algae

(supervisor: Doc.RNDr. A.Pouličková, CSc., PřF UP; funding: GAČR, MSM)

Bottom sediments represent an important part of fishpond or lake ecosystem. PhD. project focuses on ecology, reproductive biology, surviving strategies of freshwater cyanobacteria and algae (particularly diatoms) occurring in the bottom sediments. The use of algae, particularly diatoms, for monitoring ecological conditions in ponds has a long tradition. The success of such monitoring depends critically on (1) taxonomic precision, (2) biogeography of algae and (3) consistent use of names. All of these are compromised by lack of understanding of the nature of species. Most studies indicate that algal species are often heterogenous complexes, containing several to many semicryptic or cryptic species. Although the use of culture methods for green algae is common, there is little tradition for the use of culture methods in diatom taxonomy in the Czech Republic. The new methods, trained in Royal Botanic Garden Edinburgh, will be used in the Czech Republic for the first time.

Potravní strategie orangutanů v NP Gunung Leuser, Sumatra

Orangutan dietary strategies at Gunung Leuser NP, Sumatra

(supervisor: Mgr. Martin Dančák, Ph.D., PřF UP; funding: GAČR, MŠMT (proposed))

Sunda Islands is one of the World's biodiversity centers and tropical rain forests belong to the most endangered biological systems of the Earth. Primates are the key group of organisms when studying the relations in tropical ecosystems. NP Gunung Leuser belongs to areas with populations of the wild orangutans (*Pongo pygmaeus*), large herbivore primates. Study of the orangutans' diet belongs to the priorities of the current research, because the results reach to many subjects including biochemistry, human medicine, and behavioral sciences. Orangutans consume, amongst the other, plants utilized also in the traditional local medicine. A supposed purpose is suppressing the parasitary diseases, a conscious self-healing. This topic, well documented on chimpanzees, has not been known at orangutans until the very recently. Aims of the study: 1. Listing all species consumed by studied populations of orangutans. 2. Analysis of influence of short- and long-term dynamics of the forest to the orangutans' populations. 3. Elaboration of the commented list of plant species with details on their biology, ecology, and potential use, probably utilized by orangutans to suppress the intestinal parasites.

Ekologické odlišnosti apomiktických a sexuálních rostlin rodu *Hieracium*

Ecological differences of apomictic and sexual plants of *Hieracium* spp.

(supervisor: Doc.RNDr. F.Krahulec, CSc., BÚ AVČR Průhonice; funding: GAČR)

One of the assumption of the present day evolutionary biology is that apomictic and sexual plants have different trade-off. However, present data does not allow an rigorous test, because plants tested differed also in some other parameters, especially in ploidy levels. At present, we have plants of different species and/or ploidy levels differing in only one parameter, so it is possible to do rigorous tests.

Vliv pastvy na druhovou diverzitu travních porostů z hlediska funkčních typů rostlin

Impact of grazing to species functional diversity of grasslands

(supervisor: RNDr. M. Duchoslav, PhD., PřF UP; funding: MŠMT – NPV II (návrh))

Aims of the study: 1) Analysis of structure and plant composition changes considering short vs. tall vegetation types in the case of grazing, mowing or no management. Interpretation of response of particular species from the plant functional types perspective. 2) Time-space analysis of herbivore activity in relation to the heterogeneity of productivity and nutrition quality within a paddock. Evaluation of consequences of selective defoliation, soil disturbance, dung and urine deposition to structure and plant composition of the sward. 3) Research dealing with species richness along the grazing gradients in permanent pastures. Evaluation of frequency of occurrence of vulnerable species groups resp. ruderal plants along the radial transects going from animal concentration sites (water point, resting area).

Biologie a ekologie vybraných polyploidních komplexů cévnatých rostlin

Biology and ecology of selected polyploid complexes of vascular plants

(supervisor: Dr. M. Duchoslav, PhD., PřF UP; funding: GAČR 206/04/P115)

The aims of the study are to study ecological and biological consequences of polyploidy in selected plant groups by both observation and experimental approaches.

Phenotypová variabilita genových zdrojů rodu *Lactuca* L.

Phenotypic variability of genetic resources of *Lactuca* L.

(supervisor: Prof. Ing. A. Lebeda, DrSc., PřF UP; funding: MSM 6198959215)

Genetic resources of wild *Lactuca* species have been of great importance in commercial lettuce breeding especially as sources of race-specific genes against lettuce downy mildew. In this respect the best attention has been paid to effective germplasm management of these species in last decades, especially to *L. serriola*. Generally *L. serriola* is assumed to be a direct progenitor of cultivated lettuce (*L. sativa*). Populations of wild *Lactuca* spp. collected in European countries will be cultivated in a greenhouse under controlled conditions and morphologically characterised following the descriptor list of wild *Lactuca* spp. germplasm. Assessment includes quantitative and qualitative characters of stem, rosette and cauline leaves, inflorescence, flower and fruit. The obtained data will be statistically elaborated. The study will contribute to deeper knowledge on inter- and intraspecific variability of wild *Lactuca* germplasm in relation to lettuce breeding.

Genetický polymorfismus genových zdrojů r. *Lactuca* detekovaný pomocí proteinových a molekulárních markerů

The genetic polymorphism of wild *Lactuca* spp. genetic resources detected by protein and molecular markers

(supervisor: Prof. Ing. A. Lebeda, DrSc., PřF UP; funding: MSM 6198959215)

Isozyme analysis will be applied for investigation of phylogenesis, relationship, and polymorphism in collections of genetic resources of wild *Lactuca* spp. The techniques of molecular markers (RAPD, AFLP) will be adapted and used for the study of variability of closely related species too.

Obsah jaderné DNA a jeho variabilita u vybraných skupin genových zdrojů rostlin

Content of nuclear DNA and its variability in selected plant genetic resources

(supervisor: Prof. Ing. A. Lebeda, DrSc., PřF UP; funding: MSM 6198959215)

Genetic resources of selected crop plants (e. g. *Ceratonia*, Cucurbitaceae, *Hordeum*, *Lactuca*, *Pistacia*) constitute important gene potential for future breeding process. Although there is a lot of data concerning geographical distribution, ecology, reproduction biology, hybridization, morphological and karyological variability of the taxa, limited information on ploidy level and absolute genome size is available. The study will focus mainly on nuclear DNA content variability in wild relatives in relation to microclimate conditions.

Srovnání reakce hostitel–patogen analýzou vybraných „pathogenesis-related“ proteinů a enzymů

Comparison of host-pathogen interactions by analysis of pathogenesis-related proteins and enzymes

(supervisor: Prof. Ing. A. Lebeda, DrSc., PřF UP; funding: MSM 6198959215)

The investigation of plant – pathogen interaction in different plant tissue cultures (calus, embryogenic and shoots cultures) by the analysis of selected „pathogenesis-related“ (PR) proteins. The determination of total protein concentration, the activity of peroxidase (POX) and its isozyme variability will be investigated (POX or possibly catalase and acid phosphatase; native PAGE electrophoresis).

Endogenní fytohormony v interakcích rostlin s houbovými patogeny

Endogenous phytohormones in plant-fungal pathogen interactions

(Supervisor: Prof. Ing. A. Lebeda, DrSc., PřF UP; funding: MSM 6198959215)

Plant growth regulators/phytohormones influence responses to stress stimulators including the course of a microorganism pathogenesis. JA and SA, molecules involved in signalling pathways and indispensable for resistance activation will be studied. Cytokinins known as senescence antagonists are expected to be gently regulated in plant interactions with biotrophs. However, mechanisms of phytohormones effects are highly specific for each plant-pathogen interaction, thus several pathosystems will be compared.

Studium inhibitorů metabolismu rostlinných hormonů cytokininů.

Study on inhibitors of metabolism of plant hormones cytokinins.

(Supervisor: Mgr. L. Spíchal, PhD., PřF UP; funding: MSM 6198959216)

Important plant hormones cytokinins are synthesized by enzyme isopentenyltransferase (IPT). It is well known from studies on transgenic plants with altered cytokinin perception or decreased cytokinin level that absence of cytokinin signal leads to developmental events interesting from agricultural point of view. The object of the work is study of synthetic inhibitors of IPT, their biological characterisation in set of *in vitro* and *in vivo* assays.

Vývoj a biologická aktivita reálných anticytokininů.

Development and biological characterisation of real anticytokinins.

(Supervisor: Mgr. L. Spíchal, PhD., PřF UP; funding: MSM 6198959216)

The work is based on the finding that classical anticytokinins are not competitors of natural cytokinins at receptor level. Recent progress in the field of cytokinin signalling enables systematic screen of library of compounds derived from cytokinins by simple bioassays. Potential cytokinin antagonist can be then biologically characterised in set of *in vitro* assays as well as in *in vivo* studies. Real anticytokinin can be useful for study of mode of action of important plant hormones cytokinins.

Studium metabolismu kyseliny abscisové (ABA) pomocí imunodiagnostik a HPLC/MS

Study of abscisic acid (ABA) metabolism using immunodiagnosics and HPLC/MS

(Supervisor: Prof. Ing. M. Strnad, DrSc., PřF UP; funding: MSM 6198959216)

This study will be focused to development of new methods for estimation and analyses of abscisic acid (ABA) and its metabolites in plants. Main objective is to develop new antibody based purification strategy combined with high performance liquid chromatography-mass spectrometry. Part of the theses will be also an attempt to isolate individual meristematic plant cells by laser microdissection and estimate ABA in these cells as well as in all other type of plant tissue cells. This theme is suitable mainly for these PhD students who would like to get much deeper knowledge in plant hormone analyses, their biochemistry, immunology and physiology.

Isolace a identifikace nových farmakologicky aktivních látek z rostlin

Isolation and identification of new pharmacologically active compounds from plants

(supervisor: Dr. K. Doležal, PhD., ÚEB AVČR Olomouc; funding: MSM 6198959216)

The work will be focused on development of new methods for isolation and identification of endogenously occurring compounds from plants, exhibiting an interesting biological/pharmaceutical (antiparasitical, antiprotosomal, anticancer) activity. The approach will be based on combination of highly sophisticated chromatographic and mass spectroscopic methods with appropriate bioassays. The newly developed methods will be subsequently used to isolate and characterise biologically active compounds from various plant species.

Kvalitativní a kvantitativní analýza cytokininů v rostlinách

Qualitative and quantitative cytokinin analysis in plants

(supervisor: Dr. K. Doležal, PhD., ÚEB AVČR Olomouc; funding: GAČR 522/06/0108, MSM 6198959216)

The work will be focused on development of new sensitive and selective analytical methods for identification and quantification of cytokinins in plants. The methods will be based on combination of immunoaffinity

chromatography, HPLC and mass spectrometry. The newly developed methods will be subsequently used to determine compounds of interest in normal as well as transgenic plants (*Arabidopsis thaliana*, *Populus x Robusta*) under different physiological conditions.

Analýza struktury a evoluce genomu pšenice

The analysis of the wheat genome structure and evolution

(supervisor: Doc. Ing. J. Doležel, DrSc., ÚEB AVČR Olomouc; funding: GAČR 521/05/H013, GAČR 521/06/1723, MŠMT LC06004)

The analysis of the wheat genome structure is hampered by its large size and allopolyploid nature. A successful applicant will use laser flow cytometry to purify particular chromosomes with the aim to fractionate the genome into small and defined parts. DNA of sorted chromosomes will be used for the construction of subgenomic BAC libraries. These will be used as a source of cytogenetic markers for physical mapping and comparative analysis of chromosome structure and evolution in wheat.

Epidemiologie karanténních fytoplazem

Epidemiology of quarantine phytoplasmas

(supervisor: Doc. RNDr. Milan Navrátil, CSc., PšF UP; funding: Eureka OE 180, GAČR 522/06/0618)

The work will be focused on study of role of insect vectors in phytoplasma epidemiology. Vectors of apple proliferation group phytoplasmas and stolbur phytoplasma will be determined. Vectors biology will be studied with special emphasis on population dynamics, natural vector infectivity, mutual seasonal migrations, and primary and alternative host plants.

Molekulární determinace interakce rostlina/*Potyvirus*.

Molecular determination of plant/*Potyvirus* interaction.

(supervisor: Doc. RNDr. Milan Navrátil, CSc., PšF UP; funding: MSM 6198959215)

The work will be focused on study of selected genes (etc. eIF4E) in plant/*Potyvirus* interaction and functional and genetic validation of their potential role. The expression patterns of some these genes will be also studied in susceptible and/or resistant genotypes. The focus will be aimed on the study of *Prunus*/PPV and pea/PSbMV pathosystems.

Histologické a cytologické aspekty virové patogenese rostlin

Histological and cytological aspects of plant virus pathogenesis

(supervisor: Doc. RNDr. Milan Navrátil, CSc., PšF UP; funding: MSM 6198959215)

The work will be focused on localization of viruses and viral proteins in infected tissues and cells as well as on the dynamics of virus propagation. The study will embrace determination of the effect of virus infection on changes in organization of actin and microtubular cytoskeleton. We will further investigate a role of secretory pathways, such as those involving ER, Golgi apparatus, endosomes, and cytoskeleton in virus reproduction and its spreading to the surrounding cells.