

Isolation, identification and characteristics of plant-associated fungi		
Institute of Plant Genetics Polish Academy of Sciences	Dr hab. Lidia Blaszczyk <a href="mailto:lgol@igr.poznan.pl">lgol@igr.poznan.pl</a>  Coordinator	Tutors: team of scientists from the Department of Pathogen Genetics and Plant Resistance, IPG PAS and Department of Chemistry, Poznan University of Life Sciences

#### General information:

Number / form (s) / type (s) of classes	20 didactic hours (lectures and practical courses)
Didactic cycle	Spring-summer 2019
Language	English
ECTS credits	2

**Objective of the course:** Expanding knowledge on methods of isolation of fungi from environmental samples, species identification and characterization of their metabolites.

#### Topics:

1. Micromycetes and their interaction with plant species important in agriculture and industry  
– 1x45 min lecture, Prof. Jerzy Chelkowski, IPG PAS;
2. Plant partners and pathogens - phylogenomics of eukaryotic microorganisms  
– 3x45 min lecture, Dr Grzegorz Koczyk, IPG PAS;
3. Development of diagnostics tools and techniques in the isolation and detection of plant-associated fungi (recent advances in molecular techniques for the identification of fungi)  
– 2x45 min lecture, Dr hab. Lidia Blaszczyk, IPG PAS;
4. Isolation and cultivation of filamentous fungi  
– 2x45 min practical course, Dr hab. Lidia Blaszczyk, IPG PAS;
5. Morphological and molecular identification of isolated fungi  
– 3x45 min practical course, Dr hab. Lidia Blaszczyk, IPG PAS;
6. Secondary metabolites in the plant-fungus interaction  
– 2x45 min lecture, Prof. Piotr Kachlicki, IPG PAS;
7. Changes in primary and secondary metabolism of plant-pathogenic fungi under abiotic and biotic stress conditions  
– 2x45 min practical course, Dr hab. Łukasz Stepień/ dr Justyna Lalak-Kańczugowska, IPG PAS;
8. Methods for the extraction, purification and identification of mycotoxins of different environmental samples  
– 2x45 min practical course, Dr hab. Karolina Gromadzka, Department of Chemistry, Poznan University of Life Sciences;
9. Patho(genes) in air - methods used in aerobiology for the detection of plant pathogenic fungi  
– 2x45 min lecture, Prof. Małgorzata Jędryczka, IPG PAS;
10. Aeromycology in practice  
– 2x45 min practical course, Dr Joanna Kaczmarek, IPG PAS.

#### Effects of course (in terms of knowledge, skills)

##### PhD student:

- understands the division into core fungal lineages in context of their evolutionary history (main differences, time periods),
- is familiar with basic methods of phylogenetic reconstruction and understands differences between them;
- is familiar with basic practical knowledge in the mycological laboratory;
- knows methods of isolation of filamentous fungi from plant tissues, rhizosphere and other environmental samples;
- knows methods of filamentous fungi cultivation in laboratory conditions
- can define the type of microbiological medium culture for plant-pathogenic fungi;

- knows methods for fungal identification and how designed and performed the experiments on taxonomy and identification of fungi;
- knows advantages and drawbacks of visual and molecular detection methods;
- knows infection methods of plants by plant-pathogenic fungi;
- understands the biochemical processes active during the plant – pathogen interaction;
- knows the major groups of fungal secondary metabolites and is able to give examples of fungal adaptation to pathogenesis;
- can define stress factors (biotic and abiotic) which have an impact on metabolism of plant-pathogenic fungi;
- knows how designed and performed the experiments evaluating the influence of various abiotic and biotic factors on the metabolism of fungi in laboratory conditions;
- knows how analyzed the results of the experiment to assess the impact of stress factors on metabolism of pathogenic fungal;
- knows what mycotoxins are, knows their harmfulness;
- can choose the right solvents for the mycotoxins extraction;
- knows how to extract and clean of samples in which the content of the mycotoxins is analyzed;
- knows the basic principles of mycotoxin analysis using liquid chromatography;
- knows methods used in aerobiology for the detection of fungal spores;
- can detect and quantify the spores of selected plant pathogens in air samples;
- can define the contribution of aerobiology to the decision support systems in plant protection;
- understands the usefulness of spore trapping for epidemiological studies of air-borne plant pathogenic fungi;

#### **Course content:**

- evolutionary history of eukaryotic microorganisms and origins of higher fungi - current state of knowledge;
- basic methods and pitfalls of phylogenetic and phylogenomic reconstructions;
- diagnostics tools and techniques in the isolation and detection of plant-associated fungi;
- identification of fungal isolates based on the culture growth and morphological characteristics;
- molecular identification based on the sequencing of selected phylogenetic markers;
- genesis of fungal adaptations to pathogenesis and biosynthesis of secondary metabolites;
- plant secondary metabolites protecting them against infection and growth of pathogenic fungi: constitutive compounds and compounds synthesized in result of infection;
- phytotoxic substances produced by fungi: host-specific and non-host-specific phytotoxins;
- plant – pathogen interaction; detoxification of chemical substances active in this process;
- environmental stress factors influenced on fungal metabolism in *in vitro* conditions;
- characterization of solid and liquid culture medium for pathogenic fungi;
- methods used in plant inoculation with pathogenic fungi;
- design and analysis of experimental results related to evaluating the influence of various abiotic and biotic factors on the metabolism of pathogenic fungi in laboratory conditions;
- mycotoxin extraction methods;
- methods of cleaning samples;
- chromatographic analysis of mycotoxins;
- definition and history of aerobiology
- methods used in aerobiology for the detection of fungal spores in air samples;
- characteristics of Burkard, Lanzoni, Tauber, Cyclone and MicroBio spore traps
- visual and molecular techniques used for spore trapping;
- identification and characterization of genetic variants of plant pathogens using molecular tools

#### **Teaching methods / techniques:**

- lectures in English, using multimedia techniques
- practical course in laboratory conditions at IPG PAS and PULS

#### **Evaluation of learning outcomes:**

- **oral exam**