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**INTENSIVE STUDY PROGRAMME “Resistance mechanisms”**

*Swedish University of Agricultural Sciences (SLU), Uppsala*

*- 6<sup>th</sup> to 17<sup>th</sup> of February, 2017 -*

Plants are in contact with a large number of microorganisms, some of which cause disease. The objective of this intensive course was to acquaint the students with inducible resistance mechanisms of plants to pathogens at molecular level and methods to study changes in gene expression in connection to disease resistance.

The course had in total 17 participants with two students from Ege University, seven students from Polytechnic University of Valencia, four students from Ghent University and four students from UniLaSalle. Most of the course activities, including the practical exercises, were also followed by four students taking the SLU master’s course “Plant-microbe interactions”, which is partly organized in collaboration with University of Helsinki.

The course contained the introductory lectures “Defence mechanisms of plants” and “Molecular genetics” as well as five lectures on mechanisms of virus infections, plant defence to virus infections, transgenic resistance to pathogens, biological control of plant diseases and plant diseases of natural populations. Two of these lectures were given from University of Helsinki using videoconference.

In a computer exercise, the students were familiarized with analyses of DNA sequences using publicly available programmes and data bases. As examples, the students were given virus DNA sequences that they should identify and analyse. The results of the exercise were handed in as reports.

In the laboratory exercise “Induction of systemic acquired resistance by pathogens”, the students carried out mechanical virus inoculation of plants, symptom monitoring, RNA extraction, quantitative PCR to analyse RNA transcript levels and ELISA testing for virus infection. Also for this exercise, the students compiled and discussed the results as written reports.

The students went for two study visits outside the campus area with one tour to the historic site of Old Uppsala, including a guided tour of the museum, and one guided tour of the tropical greenhouses of the Uppsala University Botanical Garden.

A written evaluation was carried out at the end of the course. The students thought that the general impression was very good (4.5 out of 5). The main problem identified was long waiting times in the practical lab exercise. Sometimes long times are difficult to avoid, but for another time this will be organised differently.

## INTENSIVE STUDY PROGRAMME

### Monday 6th of February

- 11.00 Meeting at Uppsala City Hostel
- 13.15-14.00 Introduction to SLU, Ultuna, BioCenter, Room C216
- 14.15-15.00 Lecture: Defence mechanisms of plants; Daniel Hofius, SLU; Room C216
- 15.15-16.00 Introduction (cont.), Room C216

### Tuesday 7th of February

- 09.15-10.00 Introductory to molecular genetics; Anders Kvarnheden, SLU; Room C216
- 10.15-12.00 Infection by viruses; Anders Kvarnheden, SLU; Room C216
- 13.15-15.00 Practical exercise: Inoculation of tobacco plants with tobacco mosaic virus; BÖL Lab 1

### Wednesday 8th of February

- 09.15-11.00 Lecture: Transgenic resistance to pathogens; Anders Kvarnheden, SLU; U-hus, Room L
- 13.15-15.00 Lecture: Defence to viruses by gene silencing; Jari Valkonen, University of Helsinki; U-hus, Room L

### Thursday 9th of February

- 09.15-16.00 Computer lab: DNA sequence analyses; Library Computer Room 1

### Friday 10th of February

- 09.15-11.00 Lecture: Biological control of plant diseases; Johan Meijer, SLU; VHC, Room Audhumbla
- 13.15-15.00 Lecture: Plant disease dynamics in natural populations; Anna-Liisa Laine, University of Helsinki; VHC, Room Audhumbla

### Saturday 11th of February

- 13.00- Excursion to Old Uppsala

### Monday 13th of February

- 13.15-16.00 Introduction to the lab exercise "Induction of systemic acquired resistance by pathogens" (virus detection by DAS-ELISA and monitoring of PR1a gene expression by realtime-RT-PCR in tobacco plants inoculated with tobacco mosaic virus)

### Tuesday 14th of February

- 10.00-12.00 Guided tour of Tropical Greenhouse of Uppsala University Botanical Garden
- 13.15-17.00 Sampling and RNA extraction; BÖL Lab 1

### Wednesday 15th of February

- 09.15-16.00 RNA extraction (cont.), reverse transcription and DAS-ELISA; BÖL Lab 1
- 19.00- Course dinner (Aaltos)

### Thursday 16th of February

09.15-16.00 DAS-ELISA (cont.) and realtime-PCR; BÖL Lab 1

**Friday 17th of February**

09.15-12.00 Analyses of results, discussion, evaluation; BÖL Lab 1

13.15-15.00 Analyses of results, discussion, evaluation (cont.); Library Computer Room 1