

## Course description

### Bioactive Molecules in Agroecology

ECTS credits: 5

#### Course parameters

Language: English

Level of course: PhD course (also offered for MSc students)

(<https://kursuskatalog.au.dk/en/course/111805/Bioactive-Molecules-in-Agroecology> )

Semester/quarter: Monday 8 Aug – Friday 19 August 2022

#### Workload:

- one week preparative work
- two weeks on-site activities, consisting of 8 theoretical lectures of approx 3 hours and 6 laboratory experiments of a mean length of 9 hours, each of them distributes over several days
- two weeks report writing

Total workload: 150 hours

Capacity limits: 16 (year 2022)

#### Objectives of the course:

Thousands of molecules influence the biological interactions in ecological systems. The overall objective of the course is that the students achieve understanding of the importance of bioactive molecules in agroecological interactions. The students get acquainted with bioactive plant defense compounds, phytochemicals, contaminants and pesticides and will obtain the qualifications for explaining how the structure of the compounds determines their uptake in neighbouring biological organisms or in mammal consumers, their possible beneficial or negative effects as well as their transformation in soil or biological organisms. Student qualifications will cover both theoretical understanding and experience in performing laboratory assays related to fate and effects of bioactive compounds.

More information look [here](https://kursuskatalog.au.dk/en/course/111805/Bioactive-Molecules-in-Agroecology) <https://kursuskatalog.au.dk/en/course/111805/Bioactive-Molecules-in-Agroecology>

#### Learning outcomes and competences:

On completion of the course the students have attained competence to:

- Classify bioactive compounds of importance in agriculture on basis of their structure, physico-chemical properties and their origin.
- Explain the degradation (aerobic and/or anaerobic) and sorption processes of small bioactive molecules in soil, water, and atmosphere, and conclude on the factors that influence these processes.
- Use LC-MS/MS equipment for quantitation of bioactive molecules and their degradation products in soil, plants and biofluids
- Model the kinetics for bioactive compound degradation in soil
- Evaluate the applicability of the newest practical methods used in bioactive molecules research: quantitative measurements of residues in the environment and body fluids,

toxicological cell tests, toxicological test on nematodes, uptake and transformation in plants and mammals, effect of natural compounds fed to bees on the bees' capacity of transforming pesticides.

- Explain the principles of Absorption, Distribution, Metabolism, Excretion (ADME) of bioactive molecules, including Phase 1 and Phase 2 metabolism processes.
- Report and discuss data from laboratory tests.

### **Compulsory programme:**

Entire course.

### **Course contents:**

The course is constructed as follows:

- ◆ Preparatory reading of selected parts of textbook
- ◆ Theoretical lessons:
  - Small bioactive molecules in agriculture – wanted or unwanted (I: contaminants)
  - Ecotoxicology beneficial insects
  - Small bioactive molecules in agriculture – wanted or unwanted (II: natural compounds)
  - Absorption, distribution, metabolism and excretion (ADME) of bioactive compounds
  - Toxicology testing
  - Degradation kinetics
  - Contaminants in agriculture coming from sludge
- ◆ Laboratory experiments
  - Does the pesticide bentazone have a potential for leaching to groundwater?
  - Effects of plant defense benzoxazinoids on non-target soil organisms
  - Using a maize root culture system to study metabolism of contaminants
  - Bioactive benzoxazinoids in bread – excretion in urine from rye-bread-eating students
  - Testing the toxicity of a common detergent on fibroblast proliferation and survival
  - Will bees' intake of a dietary phytochemical affect their capability of metabolising pesticides?
- ◆ Subsequent elaboration of reports on the laboratory experiments.

### **Prerequisites:**

The course is for PhD students or MSc students

### **Lecturers**

Professor Inge S. Fomsgaard (course leader)

<https://pure.au.dk/portal/en/inge.fomsgaard@agro.au.dk>

Senior scientist Mette Vestergård; Laboratory Technician Bente Laursen; PhD student Ida KL Andersen, postdoc Jawameer Hama

### **Course coordinator**

Administrative case officer Sonja Graugaard (Sonja.Graugaard@agro.au.dk)

**Type of course/teaching methods:** Lectures, Laboratory experiments

### **Literature**

Selected chapters from C.J. van Leeuwen and T.G Vermeire: Risk Assessment of chemicals: an introduction. 2nd edition, Springer 2007. Hand outs of articles and scientific reports. Detailed information will be sent to course participants in advance of the course.

### **Course homepage:**

<https://kursuskatalog.au.dk/en/course/104495/Bioactive-Molecules-in-Agroecology>

### **Course assessment:**

Elaboration of a 30- to 40-page report on the total of six laboratory experiments (Take-home assignment, to be handed in no later than two weeks after the end on the on-site study period). For PhD students the report is assessed as "passed" or "not passed". Presence at a minimum of 90% of theoretical and practical lessons is required to obtain the course diploma. For MSc students the assessment will use the 7-point grading scale. Grading will be with internal co-examination.

**Provider:** Department of Agroecology, Aarhus University

### **Special comments on this course:**

none

### **Course venue**

The course venue is Research Centre Flakkebjerg, situated in Southwest Zealand, 10 km south of Slagelse (100 km west of Copenhagen). Complete address:

Department of Agroecology, Research Centre Flakkebjerg, Forsøgsvej 1,  
DK-4200 Slagelse, Denmark, Tel: +45 87 15 81 92

Direct telephone number to Inge S. Fomsgaard (+45 22 28 33 99).

[Inge.Fomsgaard@agro.au.dk](mailto:Inge.Fomsgaard@agro.au.dk).

### **Accommodation**

We can suggest a hotel or hostel in Slagelse. Please contact the course administrator [Sonja.Graugaard@agro.au.dk](mailto:Sonja.Graugaard@agro.au.dk). Assistance can also be given in search for alternative accommodation

### **Comments from former participants**

“The course was very well structured. It was easy to follow the course, because of the good connection between theory and practice”

“It was impressive how we went through so many different themes in the short period of time”

“Very good methodological variation”

“I liked the small group, the number of teachers and the time that was hands-on (however, you always run short on time)”

“Nice to have a folder with the printed hand-outs”

**Time:** Monday 8 August – Friday 19 August 2022

**Place:** Aarhus University, Department of Agroecology, Forsøgsvej 1, DK-4200 Slagelse, Denmark

### **Registration**

**MSc students:** Registration is open 17 January – 21 March 12:00 2022 and takes place through the AU Summer University.

<https://international.au.dk/education/admissions/summeruniversity/browse>. Cost for participation depends on agreements between AU and your home university

**PhD students:** Registration is open. Sign up by email to [Sonja-Graugaard@agro.au.dk](mailto:Sonja-Graugaard@agro.au.dk). By 1 April 2022 invoices of 500 EUR will be sent to the signed up students with two weeks deadline for payment. Maximum number of participants in year 2022: 16.

### **Cancellation**

Registration is binding, but you may cancel your registration by sending an e-mail to [sonja.graugaard@agro.au.dk](mailto:sonja.graugaard@agro.au.dk) no later than 1 July 2021. If you cancel your registration later than 1 July, your registration fee will be forfeit, and your seat may be transferred to another person.

If you have any questions, please contact Sonja Graugaard, e-mail: [sonja.graugaard@agro.au.dk](mailto:sonja.graugaard@agro.au.dk)