



# UNIVERSITÀ DI PISA

## Chemical ecology

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### LUCIA GUIDI

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| Anno accademico | 2020/21  |
| CdS             | AGRI FOOD PRODUCTION AND<br>AGROECOSYSTEM MANAGEMENT |
| Codice          | 390GG  |
| CFU             | 6  |

|                  |           |         |     |             |
|------------------|-----------|---------|-----|-------------|
| Moduli           | Settore/i | Tipo    | Ore | Docente/i   |
| ECOLOGIA CHIMICA | AGR/13    | LEZIONI | 64  | LUCIA GUIDI |

#### Learning outcomes

##### *Knowledge*

The course is aimed at understanding the origin, function and meaning of natural chemical molecules that mediate the interaction between and with living organisms with particular regard to the evolutionary aspect of these interactions. The course will focus on the biochemistry and ecology of molecules or groups of molecules belonging to primary and secondary metabolism directly involved in the interaction of living organisms with the environment in which they live with particular reference plants to other plants and to other living organisms (insects, herbivores, nematodes, microorganisms).

##### *Assessment criteria of knowledge*

For the assessment of the knowledges, during the course, the teacher will give lessons and meetings aimed at evaluating the gained information.

##### *Skills*

At the end of the course student is able to:

- discuss on different type of inter- and intra-specific communication modulated by natural chemical molecules
- understand as biotic (and abiotic) stresses influence chemical communication
- apply the principles of chemical ecology to understand and evolve possible solutions to some problems

##### *Assessment criteria of skills*

During the course lessons will be carried out during which student must prove:

- to have acquired concepts related to inter- and intra-specific chemical communication
- to have acquired the ability to connect the synthesis of chemical molecules in response to biotic (and abiotic) stresses

##### *Behaviors*

At the end of the course student will acquire and/or develop:

- the ability to use analytical instruments useful to characterize chemical molecules involved in plant communication
- discuss of topics related to chemical ecology

##### *Assessment criteria of behaviors*

The behaviour verification will be carried out:

- during the laboratory exercises
- during focus on specific topic proposed by the teacher

##### *Prerequisites*

The course requires preferentially the initial knowledges concerning:

- general chemistry
- organic chemistry
- biochemistry
- agricultural entomology
- plant disease



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### Teaching methods

- lectures are held with the help of slides
- exercises are carried out in the Lab of Chemistry of the DAF
- the E-learning site of the study course provides the teaching material used during lectures and disseminates information to students
- the interaction between teacher and students takes also place through meetings, e-mail and counselling student
- possibility for the student to carry out active seminars related to case studies that can also be held in the entire class

### Syllabus

#### Introduction

Meaning of the term chemical ecology and nods to biotic and abiotic plant/environment interactions.

#### Chemical ecology and food acquisition

Food supply and importance of chemical molecules involved in food acquisition. Autotrophic and heterotrophic organisms. Subdivision in the context of heterotrophs into saprofiti, herbivores, carnivores and omnivores. Symbiosis, commensalism, mutualism, parasitism. Food chain and energy flow. Overview of the biogeochemical cycles of the main elements.

#### Role of chemical molecules in competition, inter- and intraspecific territoriality

Role of chemical molecules in interactions with particular regard to semiochemicals (allelochemicals and pheromones).

#### Chemical defense

Mechanisms of defense of plants against herbivores, and characteristics of the main classes of compounds involved: terpenes, phenols, compounds containing nitrogen.

#### VOCs

Volatile compounds and the language of plants. VOCs in phytophage defense, insect attraction, plant communication, plant/pathogenic interaction, ROS removal, thermo-tolerance and adaptation to biotic and abiotic stresses

#### Perception and signalling

Aspects related to the perception of the signal in the plant and transduction of this.

### Bibliography

B.B. Buchanan, J. Wilhelm, L. Russell - Biochimica e biologia molecolare delle piante. Zanichelli, 2000.

Teaching material provided by the teacher during the lessons or available on E-learning of the course

### Non-attending students info

Not-attending students can follow the lessons using the teaching material provided on the E-learning web site by the teacher before the beginning of the lectures, and consulting the lesson log

Updated: 26/08/2020 13:59