

Title of the Course Methods in Plant-Microbe Interactions			
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Number of CFU 9	Activities Lectures, laboratory and seminars	Lectures	18h
		Laboratory	30h
		Seminars	4h
		Other activities (Two-Way Learning and Project conceptualization)	11h
<u>Objectives</u>			
<p>Main objectives of the course are to provide students with both theoretical and practical tools to independently study the great variety of interactions that occur between plants and microorganisms, and to plan novel strategies to tackle plant diseases.</p>			
<u>Learning outcome</u>			
<p>Students will understand which scientific approaches may be used to address key questions arising from the study of plant-microbe interactions. They will also use personal strategies to think, organize and discuss the results of frontiers papers in the field of plant-microbe interactions and empower their problem-solving attitude thanks to the learning-by-doing format of the course.</p>			
<u>Topics</u> (with the indication of the n of hours/topic)			
<p>1- The bases of the interaction between the plant and the environment – 4 hours: Biotic and abiotic agents, Koch's postulates, the disease triangle, economic and health impact of plant-pathogen interactions.</p> <p>2- Pathogens and infection strategies – 4 hours: Mechanisms used by bacterial, fungal and viral pathogens to reach, penetrate and colonize the host.</p> <p>3- Molecular communication between the pathogen and the host plant – 4 hours: genetic resistance of plants, effectors of the pathogen, the "gene by gene" theory of Flor, the "zig-zag model", PAMPs and MAMPs, signaling events occurring during plant-microbe interactions.</p> <p>4- Beneficial microbes and their effects on crop plants– 4 hours: microbial plant symbionts, endophytes, biocontrol agents and their positive effects on crop plants.</p> <p>5- Applications of plant-microbe interactions – 2 hours: remediation technologies, crop biofortification, biological control, plant biostimulants.</p> <p>6- How to study plant-microbe interactions in the lab – 30 hours: genetic manipulation, model systems and microscopy; metabolomic approaches using LC-MS analysis; microbial bioformulates from lab to field scale; how to grow microbes; biocontrol assay on entire plants and fruits; how to recognize symptoms and signs of disease.</p> <p>7- In-depth seminars and Two-Way Learning – 7 hours: students will deepen fundamental and innovative aspects of research in the field of plant-microbe interactions by following seminars held by experts in the field and/or through the collaborative study and presentation of scientific articles (chosen by the teacher or proposed by students) that have revolutionized our knowledge on the subject.</p> <p>8- Tackling biological questions – 8 hours: studying the state of the art, brainstorming, problem solving.</p>			

Evaluation

Final Exam consists in writing a short research project in the field of plant-microbe interactions. Topics will be agreed with the professor and might be tailored to the specific needs of the candidates.

Recommended readings

Course notes, research papers and reviews provided by the professor.