



Teaching Guide				
Identifying Data				2020/21
Subject (*)	Molecular Plant-Pathogen Interaction Mechanisms	Code	610441018	
Study programme	Mestrado Universitario en Bioloxía Molecular , Celular e Xenética			
Descriptors				
Cycle	Period	Year	Type	Credits
Official Master's Degree	2nd four-month period	First	Optional	3
Language	SpanishGalicianEnglish			
Teaching method	Face-to-face			
Prerequisites				
Department	Bioloxía			
Coordinador	Diaz Varela, Jose	E-mail	jose.diaz.varela@udc.es	
Lecturers	Diaz Varela, Jose	E-mail	jose.diaz.varela@udc.es	
Web				
General description	This subject is focused on the molecular aspects of plant-pathogen interaction and, in a short view, of interactions related to other organisms (herbivores, rhizobia and mycorrhizae)			
Contingency plan	<p>1. Changes in content</p> <p>The contents will not be modified, as they are necessary for the training of students who choose this subject.</p> <p>2. Methodologies</p> <p>This master includes in the verification report two modalities: presential and semipresential. To access the semipresential modality, students have to demonstrate that they meet certain requirements (residence far away from A Coruña, employment contract that prevents continuous presential attendance, etc.) that justify their absence in part of presential activities. For semipresential teaching the lecturers provide additional materials.</p> <p>Given the current uncertainty due to Covid-19, three situations can occur:</p> <p>A- Access to the Faculty will be allowed at a time and capacity like those before the pandemic. In this case the presential modality would be maintained for the majority of the students and the semipresential one for those who meet the corresponding requirements, that is, as in previous courses.</p> <p>B- Access to the Faculty will be restricted in hours or capacity. In this case all the students would follow the semipresential modality.</p> <p>C- Access to the Faculty will be totally prohibited in the second semester. In this case teaching would be completely non-presential.</p> <p>Teaching methodologies that are maintained</p> <p>In case A, all of them.</p> <p>In case B, only those contemplated in the semipresential modality.</p> <p>In case C, all the activities would be carried out online, making ad hoc materials generated by the teachers available to the students.</p> <p>3. Mechanisms for personalized attention to students</p> <p>Email, tutoring by Teams and forums in Moodle, with daily attention in the case of email and forums, and upon request of the students in the case of tutoring by Teams.</p> <p>4. Modifications in the assessment</p> <p>In case A, presential assessment for the presential modality and on-line assessment for the semipresential modality. In cases B and C, on-line assessment (Moodle and other institutional tools).</p> <p>Assessment remarks:</p> <p>5. Modifications of the bibliography or webgraphy</p> <p>In case A and in case B, none. In case C: if possible, alternative and/or additional books and articles in electronic format that can be accessed from the beginning of that semester (provided that they are published in open access in the coming months or would have an institutional subscription), and in any case additional ad hoc materials generated by the lecturers.</p>			

Study programme competences / results	
Code	Study programme competences / results



A4	Skills to apply molecular techniques to the study of the plant cell physiology, its response to external triggers and their biotechnological applications.
A5	Skills of understanding the microorganisms' role as pathogenic agents and as biotechnological tools.
A6	Skills of understanding the functioning of cells through the structural organization, biochemistry, gene expression and genetic variability.
A8	Skills of having an integrated view of the previously acquired knowledge about Molecular and Cellular Biology and Genetics, with an interdisciplinary approach and experimental work.
B3	Skills of management of the information: that are able to gather and to understand relevant information and results, obtaining conclusions and to prepare reasoned reports on scientific and biotechnological questions
B5	Correct oral and written communication on scientific topics in the native language and at least in another International diffusion language.
B9	Skills of preparation, show and defense of a work.

Learning outcomes		
Learning outcomes	Study programme competences / results	
- To understand the molecular mechanisms of plant-pathogen interaction	AR4 AR5	
- To know the different mechanisms of the plant response to pathogens.	AR4 AR5 AR6 AR8	
To understand and be able to use the experimental approaches to research in this field.	AR4 AR5	BR3 BR5
- Ability for critically reviewing scientific papers related to this subject.	AR5 AR6	BR3 BR5 BR9

Contents	
Topic	Sub-topic
Molecular mechanisms in plant-pathogen interaction.	Recognition of the plant by the pathogen and mechanism to attack the plant. Recognition of the pathogen by the plant and mechanisms of defense. Pathogen Associated Molecular Patterns (PAMPs). Oxidative burst. Salicylates, jasmonates and ethylene. Hypersensitive response. Gene-for-gene resistance. Nonhost resistance. Induced resistance to pathogens: SAR and ISR. Npr1. Priming. Transcription factors involved in resistance.
Other interactions related to plant-pathogen interaction.	Recognition of herbivores, signalling and defense mechanisms. Rhizobium-plant interaction. Mycorrhizae.

Planning				
Methodologies / tests	Competencies / Results	Teaching hours (in-person & virtual)	Student's personal work hours	Total hours
Guest lecture / keynote speech	A4 A5 A6 A8	12	30	42
Document analysis	A5 A6 B3 B5 B9	2	10	12
Laboratory practice	A4 A5 B3 B5	7	10.5	17.5
Objective test	A4 A5 A6 A8	2.5	0	2.5
Personalized attention		1	0	1

(*)The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.

Methodologies	
Methodologies	Description



Guest lecture / keynote speech	Lectures about main contents of the subject, supported by presentations and videos. Presentation is combined with critical dialogue with the students about the topics.
Document analysis	Reading and analysis of a primary research paper related to the subject, accompanied by its presentation in the classroom by the student and further discussion with the lecturer and the other students.
Laboratory practice	Practicals related to the subject, consisting in experiments, followed by data analysis, discussion and writing of a report.
Objective test	Exam about the topics of the lectures.

Personalized attention

Methodologies	Description
Document analysis	The students can attend, in the corresponding hours, to the lecturer's office to ask any question about the subject, and particularly about the work to do. For those students with official part-time dedication, the attendance to the lectures might be replaced by a written work, if the student requires it.

Assessment

Methodologies	Competencies / Results	Description	Qualification
Guest lecture / keynote speech	A4 A5 A6 A8	Attendance and participation in the lectures.	10
Document analysis	A5 A6 B3 B5 B9	Aspects to be assessed: Proper understanding of the paper by the student, the presentation in the classroom and the participation in the discussion in the classroom (including the critical review of the paper).	40
Laboratory practice	A4 A5 B3 B5	Attendance and participation in the laboratory, as well as a written report.	20
Objective test	A4 A5 A6 A8	Exam about the topics in the lectures.	30

Assessment comments

<p>The students who pass the subject in the first opportunity, will be preferentially considered to get the highest qualification (with honors). For those students who are semipresential or with official part-time dedication, the attendance to the lectures might be replaced by a written work, if the student requires it.</p>

Sources of information

Basic	<p>Dickinson, M. 2003. Molecular Plant Pathology. Bios Scientific Publishers. Hammond-Kosack, K.E. & Jones, J.D.G. 2015. Responses to plant pathogens. En: Buchanan, B.B., Grisse, W. & Jones, R.L (eds.) "Biochemistry and molecular biology of plants" Capítulo 22, pp. 984-1050. Wiley-Blackwell-ASPB. Lucas, J.A. 2020. Plant pathology and plant pathogens. Wiley Blackwell. Smith, A.M., Cupland, G., Dolan, L., Harberd, N., Jones, J., Marin, C., Sablowski, R. & Amey, A.. 2009. Plant Biology. Garland Science. Capítulo 8. Taiz, L., Zeiger, E., Moller, I.M. & Murphy, A. 2014. Plant Physiology and development, Sixth Edition. Sinauer Associates, Inc. Capítulo 23. Walters, D. R. 2011. Plant defense. Wiley-Blackwell.</p>
Complementary	<p>- Agrios, G. N. 2005. Plant pathology, 5ª Ed. Academic Press.- Albersheim, P. Darvill, A., Roberts, K., Sederoff, R. & Staehelin, A.. 2010. Plant Cell Walls: from Chemistry to Biology. Garland Science. Capítulo 8.- Dyakov, Y., Dzhavakhiya, V. & Korpela, T. 2007. Comprehensive and molecular phytopathology. Elsevier.- Huang, J.-S. 2001. Plant pathogenesis and resistance: biochemistry and physiology of plant-microbe interactions. Kuwer Academic Publishers.- Nuez, F., Pérez de la Vega, M. & Carrillo, J.M. 2004. Resistencia genética a patógenos vegetales. Univ. Politécnica de Valencia ? Univ. de León.- Pallás, V., Escobar, C., Rodríguez Palenzuela, P. & Marcos, J.F. 2008. Herramientas biotecnológicas en fitopatología. Ed. Mundi-Prensa.- Parker, J. 2009. Molecular aspects of plant disease resistance. Blackwell Publishing Ltd.- Slusarenko, A. J., Fraser, R. S. S. & van Loon, L. C. 2000. Mechanisms of resistance to plant diseases. Kluwer Academic Publishers.- Walters, D., Newton, A. & Lyon, G. 2007. Induced resistance for plant defence. A sustainable approach to crop protection. Blackwell Publishing.</p>



Recommendations
Subjects that it is recommended to have taken before
Subjects that are recommended to be taken simultaneously
Plant Biotechnology/610441019
Subjects that continue the syllabus
Cellular Techniques/610441001 Molecular Techniques/610441002 Cell Signaling/610441004
Other comments

(*)The teaching guide is the document in which the URV publishes the information about all its courses. It is a public document and cannot be modified. Only in exceptional cases can it be revised by the competent agent or duly revised so that it is in line with current legislation.