

Louisiana State University – Department of Plant Pathology & Crop Physiology
AgCenter, College of Agriculture - Spring Semester, 2020

Syllabus - PLHL 7080: Host-Parasite Interactions and Disease Resistance
(Plant-Pathogen Interactions)

Spring semester 2020 (offered even years)

Credits: 3 (Three hour lecture discussion per week)

Instructor: Ely Oliveira-Garcia, PhD

Course Description:

This course covers concepts related to plant-parasite-environment interactions and disease resistance, underlining the main plant pathogen groups (Fungi, bacteria, viruses and nematodes). The most recent literature on plant-parasite-environment interactions will be targeted during this course.

Course objectives:

1. To understand the gene-for-gene theory, resistance gene management and evolution of new races. Topics also include molecular mechanisms of parasitism; symbiosis; the genetics of pathogen population structure; horizontal transfer of pathogenicity determinants; and the emergence of new diseases.
2. To understand how different bacterial pathogens cause disease, overcome and suppress plant defenses, and manipulate hosts to their advantage.
3. To understand the mechanisms by which fungal pathogens have evolved to interact with plants and cause disease. The underlying physiology, molecular mechanisms and regulation of pathogen development and production of virulence factors will be covered.
4. To understand plant virus-host-interactions, underlining the mechanisms that viruses exploit to cause diseases in plants and the types of plant resistance to viruses. This section presents the most recent data on host factors and cellular structures that viruses hijack in order to complete their life cycle and discusses the role of viruses in host evolution.
5. To understand the mechanisms by which plant parasitic nematodes have evolved to interact with plants and cause disease.
6. To understand plant disease resistance mechanisms, resistance cultivar development and pyramiding of *R*-genes.
7. To develop the ability to interpret and evaluate scientific manuscripts and build constructive criticisms.

Intended audience:

Graduate students in the life sciences with interests in host-parasite interactions and disease resistance, and in particular, molecular bases of plant resistance and pathogen virulence mechanisms.

Prerequisite: Introductory courses in Plant Pathology, Genetics and Biochemistry/Molecular Biology are recommended.

Class Schedule (subject to revision)

Lecture	Lecture Topic
1	Course introduction
2	Prepenetration: Sensing and development Penetration by chemical and mechanical force
3	Nonhost resistance
4	Flax rust and gene-for-gene
5	Plant perception and immunity
6	Fungal and oomycete biotrophy
7	Necrotrophy and toxins
8	Fungal AVR effectors
9	Fungal effectors
10	Oomycete effectors
11	<i>Agrobacterium</i>
12	Plant-bacterial interactions I (Virulence mechanisms of bacterial pathogens)
13	Plant-bacterial interactions II (Defense mechanisms of host plants)
14	Review
15	Host-induced gene silencing
16	Incorporating new <i>R</i> genes in main crops: Strategies
17	Phage, plasmids & horizontal gene transfer
18	Plant viruses: Viral life cycle; Outcomes of virus infections; Types of plant resistance against viruses
19	Virus replication, movement and mutation mechanisms
20	Student presentations 1 and 2
21	Student presentations 3 and 4
22	Student presentations 5 and 6
24	Plant-parasitic nematodes
25	Student presentations 7 and 8
26	Pyramiding <i>R</i> -genes and novel techniques to achieve crop resistance to a broad group of plant pathogens
27	Review

Literature:

Textbooks: none but very good background reference text are:

- 1 Agrios G.N. (2004) Plant Pathology. 5th Edition. Elsevier.
 - 2 Journal articles (to be assigned)
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Course outline:

The spring 2020 course will be a lecture-discussion format.

Assessment:

Class Participation, homework problems:	10%
Take-home problem set (Project1): material through class 13.	30%
Take-home problem set (Project2): material from class 15 on.	30%
Student seminar	30%
TOTAL	100%

Homework questions may form the basis of a review of the last lecture or introduction of new material.