PBIO*4000 Molecular and Cellular Aspects of Plant-Microbe Interactions

Fall 2018
Section(s): C01

School of Environmental Sciences
Credit Weight: 0.50
Version 1.00 - September 06, 2018

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1 Course Details

1.1 Calendar Description

This course examines molecular and cellular aspects of the interaction between plants and microorganisms such as mycorrhizae, pathogenic fungi, Agrobacterium, pathogenic bacteria, and plant viruses. Topics include microbial virulence, signaling, gene expression, and disease resistance in plants.

Pre-Requisite(s): 1 of BOT*2100, MICR*2030, (BIOL*1070, BIOL*1090, MBG*2040)

1.2 Course Description

This course examines molecular and cellular aspects of the interaction between plants and microorganisms, such as mycorrhizae, pathogenic fungi, Agrobacterium, pathogenic bacteria, and plant viruses. Topics include microbial virulence, signaling, gene expression, and disease resistance in plants.

1.3 Timetable

TTh 4:00-5:20, Alexander 28

1.4 Final Exam

Date and Time: **Wed, Dec. 12, 8:30-10:30**
Weight: 35%

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2 Instructional Support

2.1 Instructor(s)

Paul H Goodwin
Email: pgoodwin@uoguelph.ca
Telephone: +1-519-824-4120 x52754
Office: Bovey Building 3239
Office Hours: MWF, 3:30-4:30

3 Learning Resources

3.1 Required Resource(s)

Required Texts (Textbook)

The research papers listed below are available electronically at the libarary. (http://sfx.scholarsportal.info/guelph/az) and/or by searching the web (http://www.google.ca/) using the title of the article. These papers are the basis of the oral quizzes and in-class discussions):

Topic of plant disease defenses: Guo, A., Salih, G. and Klessig, D.F. 2000. Activation of a diverse set of genes during the tobacco resistance response to TMV is independent of salicylic acid; induction of a subset is also ethylene independent. Plant Journal 21: 409-418.

Topic of host-pathogen recognition and PAMPs: Segonzac, C., Feike, D., Gimenez-Ibanez, S., Hann, D.R., Sipfel, C. and Rathjen, J.P. 2011. Hierarchy and roles of pathogen-associated molecular pattern-induced responses in *Nicotiana benthamiana*. Plant Physiology 156: 687-699.

Topic of host-pathogen recognition and effectors: Swiderski, M.R. and Innes, R.W. 2001. The Arabidopsis PBS1 resistance gene encodes a member of a novel protein kinase subfamily. Plant Journal 26: 101-112.

Topic of induced disease resistance: Van der Ent, S., Van Hulten, M. and Pozo, M.J, et al. 2009. Priming of plant innate immunity by rhizobacteria and beta-aminobutyric acid: differences and similarities in regulation. New Phytologist 183: 419-431.

Topic of fungal pathogenicity: Voigt, C.A., Schäfer, W. and Salomon, S. 2005. A secreted lipase of *Fusarium graminearum* is a virulence factor required for infection of cereals. Plant Journal 42: 364-375.

Topic of bacterial pathogenicity: Wei Guo, Lu-Lu Cai, Hua-Song Zou, Wen-Xiu Ma, Xi-Ling Liu, Li-Fang Zou, Yu-Rong Li, Xiao-Bin Chen and Gong-You Chen. 2012. Ketoglutarate transport protein KgtP is secreted through the type III secretion system and contributes to virulence in *Xanthomonas oryzae* pv. *oryzae*. Applied and Environmental Microbiology 78: 5672-5681.

Topic of endophytes: Gagné-Bourque F, Mayer BF, Charron J-B, Vali H, Bertrand A, Jabaji S. 2015. Accelerated growth rate and increased drought stress resilience of the model grass *Brachypodium distachyon* colonized by *Bacillus subtilis* B26. PLoS ONE 10: e0130456.

Topic of viral pathogenicity: Kramer, S.R., Goregaoker, S.P. and Culver, J.N. 2011.

Association of the Tobacco mosaic virus 126 kDa replication protein with a GDI protein affects host susceptibility. Virology 414: 110-118.

Recommended Texts (Textbook)

Agrios, G.N. 2005. Plant Pathology, 5th Ed., Academic Press.

Yu, X. *et. al.* 2017. From Chaos to Harmony: Responses and Signaling upon Microbial Pattern Recognition. Annual Review of Phytopathology, Volume 55. pp. 85-107.

Walters, D. 2017. Fortress plant : how to survive when everything wants to eat you. 1st Ed., Oxford University Press. [electronic version]

Watson, J.D. *et. al.* 2014. Chapter 7: Techniques of Molecular Biology. pp. 147-191. *In*: Molecular Biology of the Gene. 7th Ed., Pearson/CSH Press.

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4 Learning Outcomes

4.1 Course Learning Outcomes

By the end of this course, you should be able to:

1. Memorize examples of the components of molecular and cellular biology of plant-microbe interactions.
2. Apply the concepts of plant-microbe interactions to the study of particular microbial virulence and plant defense response mechanisms.
3. Orally present results and conclusions in class for selected research papers in molecular plant-microbe interactions.
4. Evaluate and analyze results and conclusions in class for selected research papers in molecular plant-microbe interactions.
5. Demonstrate the ability to observe similarities and differences in the techniques and approaches used to generate new knowledge in molecular plant-microbe interactions.

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5 Teaching and Learning Activities

5.1 Lecture

Topic(s):	Lecture Content
Introduction	
Plant disease defenses	
Host-pathogen recognition and PAMPs	
Host-pathogen recognition and Effectors	
Induced disease resistance	
Fungal pathogenicity	
Bacterial pathogenicity	
Endophytes	
Viral pathogenicity	
Colloquium of graduate student presentations of research articles	

Thu, Sep 7 - Thu, Sep 6
Topic(s): First Class

Tue, Oct 10 - Tue, Oct 9
Topic(s): Fall Study Break

Near end of semester
Topic(s): Graduate Student Colloquium Presentations

Tue, Nov 28 - Tue, Nov 27
Topic(s): Last Regularly Scheduled Class

Thu, Nov 30 - Thu, Nov 29
Topic(s): Reschedule of Fall Study Break (Tuesday Schedule)

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6 Assessments

6.1 Marking Schemes & Distributions

Name	Scheme A (%)
Midterm	35
Oral Quizzes	30
Final Exam	35
Total	100

6.2 Assessment Details

Midterm (35%)
Date: Thur Oct 25

Oral Quizzes (30%)

Final Exam (35%)
Date: Fri, Dec 8, 2:30 PM - Wed, Dec 12, 8:30 AM

6.3 Additional Notes

Exams are to be completed in pen only. Essay questions to be completed using full sentences and paragraphs.

Examination questions include information from class discussions of research papers, graduate student colloquium presentations and lecture material.

Oral quizzes are part of in-class discussions of each research paper linked to a specific lecture topic (topics listed above in the lecture content). The date of the oral quiz of each research paper (papers listed below in the required text) will be announced in class following completion of the lecture material for the corresponding topic. It is important to thoroughly read, analyze and prepare to answer questions for the oral quiz of each research paper.

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7 Course Statements

7.1 Grading Policies

Exams are graded for knowledge of specific lecture and class discussion material.

Oral quiz marks are based on responses to specific questions for each research paper (papers listed above in the required text section). The instructor will choose questions for students to answer orally in class.

Grading of responses to oral quiz questions are based on the ability to show depth of understanding and the ability to evaluate and analyze the background, techniques, results and conclusions of each research paper.

If the oral quiz of a research paper is missed, then the student must contact the instructor within 7 days to arrange a make-up time for discussion of that paper.

7.2 Group Work

Group work is allowed to prepare for class discussions only.

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8 University Statements

8.1 Email Communication

As per university regulations, all students are required to check their e-mail account regularly: e-mail is the official route of communication between the University and its students.

8.2 When You Cannot Meet a Course Requirement

When you find yourself unable to meet an in-course requirement because of illness or compassionate reasons please advise the course instructor (or designated person, such as a teaching assistant) in writing, with your name, id#, and e-mail contact. The regulations and procedures for Academic Consideration are detailed in the Undergraduate Calendar.

8.3 Drop Date

Courses that are one semester long must be dropped by the end of the fortieth class day; two-semester courses must be dropped by the last day of the add period in the second semester. The regulations and procedures for Dropping Courses are available in the Undergraduate Calendar.

8.4 Copies of Out-of-class Assignments

Keep paper and/or other reliable back-up copies of all out-of-class assignments: you may be asked to resubmit work at any time.

8.5 Accessibility

The University promotes the full participation of students who experience disabilities in their academic programs. To that end, the provision of academic accommodation is a shared responsibility between the University and the student.

When accommodations are needed, the student is required to first register with Student Accessibility Services (SAS). Documentation to substantiate the existence of a disability is required, however, interim accommodations may be possible while that process is underway.

Accommodations are available for both permanent and temporary disabilities. It should be noted that common illnesses such as a cold or the flu do not constitute a disability.

Use of the SAS Exam Centre requires students to book their exams at least 7 days in advance, and not later than the 40th Class Day.

More information: www.uoguelph.ca/sas

8.6 Academic Misconduct

The University of Guelph is committed to upholding the highest standards of academic integrity and it is the responsibility of all members of the University community – faculty, staff, and students – to be aware of what constitutes academic misconduct and to do as much as possible to prevent academic offences from occurring. University of Guelph students have the responsibility of abiding by the University's policy on academic misconduct regardless of their location of study; faculty, staff and students have the responsibility of supporting an environment that discourages misconduct. Students need to remain aware that instructors have access to and the right to use electronic and other means of detection.

Please note: Whether or not a student intended to commit academic misconduct is not relevant for a finding of guilt. Hurried or careless submission of assignments does not excuse students from responsibility for verifying the academic integrity of their work before submitting it. Students who are in any doubt as to whether an action on their part could be construed as an academic offence should consult with a faculty member or faculty advisor.

The Academic Misconduct Policy is detailed in the Undergraduate Calendar.

8.7 Recording of Materials

Presentations which are made in relation to course work—including lectures—cannot be recorded or copied without the permission of the presenter, whether the instructor, a classmate or guest lecturer. Material recorded with permission is restricted to use for that course unless further permission is granted.

8.8 Resources

The Academic Calendars are the source of information about the University of Guelph's procedures, policies and regulations which apply to undergraduate, graduate and diploma programs.
