Plant Pathology 1005  
Plants Get Sick Too

Instructor: James E. Kurle  
4 credits  
Department of Plant Pathology  
University of Minnesota, College of Agriculture, Food and Environmental Sciences  
Fall Semester 2014

Course Description: This course is an introduction to the science of plant pathology. It is presented in in class lectures, internet based readings and activities, and in hands on laboratory exercises. The lectures are organized into four sections: 1) the concepts and terminology used to describe and understand plant disease, 2) the major groups of plant pathogens, 3) the interaction of host and pathogen biology, crop ecology, and control measures with plant disease development, and 4) major questions confronting plant pathologists, and 5) the role of plant disease in human affairs. Selected viruses, bacteria, fungi, nematodes that are pathogens of plants grown in Minnesota will be used to illustrate concepts presented in lectures. The in-class and on-line lectures are closely integrated with experiments and exercises presented in the laboratory. Supplementary readings from primary sources and supporting textbooks will be available on library reserve.

Plant Pathology 1005 meets the criteria for a Biological Sciences Core presented by the Council of Liberal Education through both lecture and laboratory exercises. The course uses examples drawn from plant pathology to develop an understanding of general biological concepts, such as biological nomenclature, taxonomic rank and organization, ecological roles, natural selection and evolution, diversity, and physiology and primary metabolism. These examples include 1) identification of pathogens and their role in disease development, 2) the interactions of evolution, plant physiological processes, environmental factors, and cultural and management practices in the occurrence of plant disease, and 3) the role human activities in contributing to disease outbreaks and managing plant disease. Throughout the course students are challenged to develop an appreciation of the role of plant disease in human affairs; their direct effects on human health, the environmental consequences of plant diseases and disease management, and their past and potential effect on human welfare. to develop an understanding of general biological concepts, such as biological nomenclature, taxonomic rank and organization, ecological roles, natural selection and evolution, diversity, and physiology and primary metabolism.

The exercises in the laboratory for Plant Pathology 1005 meet the requirements of the Biological Sciences Core that students do hands-on testing of principles presented in the lecture portion of the course and integrate mathematical thinking into analysis and interpretation of data. You are required to conduct hands-on
experiments to: 1) isolate and identify fungal, bacterial, and viral pathogens; 2) transmit plant diseases induced by these pathogens; 3) measure and analyze the interacting effects of plant host, pathogen inoculum, and environmental factors on disease severity, and 4) interpret the results of these experiments. In order to conduct these experiments you will learn to use basic tools found in the biology laboratory including isolation media and the microscope. In order to successfully complete the experiments you will learn to recognize basic microbial structures, including reproductive structures, and develop skill in manipulating these them. You will learn simple techniques for estimating plant disease effects and severity in order to analyze, interpret and draw conclusions from the results obtained in the experiments.

Learner Outcomes:

Students will learn:
1) The agents that cause plant disease.
2) The relationships of hosts, pathogens, and environment that determine the occurrence and severity of plant diseases.
3) How plant diseases are managed or controlled.
4) Major questions confronting researchers and practitioners in the discipline of plant pathology.
5) How plant diseases have affected humans both historically and in modern times.
6) To identify a selection of plant diseases that occur commonly in Minnesota.
7) Basic laboratory techniques used to detect, identify and manipulate plant pathogens.

Course Prerequisites: None

Dr Kurle
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E-mail: kurle001@umn.edu

Office Hours: 10:30 am – 11:15 Tuesdays and Thursdays
If you cannot speak to me during these hours, you are welcome to speak to me after class or make an appointment at another time. You can also schedule meetings outside office hours by exchange of e-mail.

Class Web Site: All class materials are made available on-line in the class web site presented using the Moodle system. As a student in Plant Pathology 1005 you will have access to the class Web Site accessible through your MyU Portal.

I) In-Person Lecture:
Time: 05:10 P.M. - 06:00 P.M., Tuesday
Place: 335 Borlaug Hall
Instructor: Dr James E. Kurle

Although attendance is not taken at each lecture there will be three “pop” quizzes (worth 10 points each) given prior to the in-person lecture during the semester.

IIa) On-Line Lecture: Two on-line lectures are presented each week via Moodle in the folder labeled “On-line Week 1, 2. etc”. The on-line format provides you with the opportunity to study the material presented in the on-line “lectures” at your own pace. The lectures are accompanied by question sets that assess your understanding of the material.

On-Line Lecture 1 (OL-1) examines the material introduced in Tuesday night’s in-person lecture in more detail.

On-line Lecture 2 (OL-2) introduces a topic, plant diseases, or disease situations that are particularly relevant to the lecture topic being presented during that week. For instance material presented during weeks 3 through 7 in these lectures are examples of diseases caused by the disease causing organism or agent introduced during that week.

After reading the on-line material you have an opportunity to ask by e-mail for an explanation of points that you may not have understood. Click on the “Ask any questions” link, create a message and send the message with your question(s).

II b) On-line Quizzes. Your open-book responses to questions asked about the “On-line lectures” are worth one-hundred fifty (150) points. Questions pertaining to each of those lectures or series of lectures will appear On-line 9 days before the Due Date for your responses. The responses are received through the class Moodle website and are due by 4:00 PM on the Friday due date.

Late answers cannot be accepted after the Due Date and you will not have the opportunity to answer “make-up” questions later in the semester.

Due Dates for On-line Question sets:

<table>
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<tr>
<th>Question Set</th>
<th>Questions Posted</th>
<th>On-line Responses Due</th>
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<tbody>
<tr>
<td>1</td>
<td>12 Sep</td>
<td>19Sep</td>
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<tr>
<td>2</td>
<td>3 Oct</td>
<td>10 Oct</td>
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<td>3</td>
<td>17 Oct</td>
<td>24 Oct</td>
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<tr>
<td>4</td>
<td>7 Nov</td>
<td>14 Nov</td>
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<td>5</td>
<td>21 Nov</td>
<td>28 Nov</td>
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You will be able to choose the 3 questions that you will answer by any given Due Date from 5 or more possibilities. A correct answer will be worth 10 points and each question set is worth 30 points. Answers will utilize information that is available in the lecture as well as additional materials that are available on reserve in the Plant Pathology library. Your answers will be evaluated on the
basis of content and accuracy and not on their length. Although you are encouraged to work with friends as you prepare your answers to the on-line questions, your answers must be in your own words in order for you to receive credit for them. If you have questions about the above materials or anything else in this course, please ask!

III) Laboratories:

Lab Instructor:
Todd Burnes (burne002@umn.edu)

Teaching Assistants: The teaching assistants for Fall Semester 2014 are:

Austin Case – Department of Plant Pathology
Matthew Hass – Department of Plant Pathology

Labs meet once a week for two hours:

Section 2 (Matt): Tues., 06:15 P.M. - 08:10 P.M. 136 Plant Growth Facility
Section 3 (Austin): Wed., 03:00 P.M. - 04:55 P.M. 136 Plant Growth Facility
Section 4 (Dr. Kurle): Thurs., 03:00 P.M. - 04:55 P.M. 136 Plant Growth Facility

The concepts and techniques learned in laboratory exercises and demonstrations are essential for an understanding of Plant Pathology. Attendance at labs is required in order: 1) to develop this understanding and 2) to obtain a satisfactory grade in this class.

Each weekly laboratory consists of:
III a) Laboratory and Disease of the Week handout available in Laboratory Manual sold in Bookstore.
III b) Laboratory exercises
III c) Disease of the Week – One or two diseases are presented each week.
III d) Follow-up questions on disease of the week – graded weekly.

Completion of the laboratory will enhance your understanding of concepts presented in lectures. It is essential that you read the lab descriptions prior to the lab. An on-line question set is available in the class web-site to help you prepare for the upcoming lab. It will take you one to two hours to complete the hands-on lab exercises and the Disease of the Week. During and after every lab complete the questions at the end of each lab/disease of the week exercise. These will be graded by your TA and the scores will be credited to your lab reports.
III b & d) Lab Grades: Your lab grade will consist of the score on the completed lab/disease of the week exercises (110 points).

III e) Disease of the Week: A demonstration of a plant disease or diseases found in Minnesota will be presented in each lab. This material is the basis for the Disease of the Week questions completed weekly. Each disease worksheet is worth 10 points. There will be 13 plant diseases presented during the semester - some worksheets cover two diseases (90 points).

V) Textbooks or Manuals:

Purchase of the Laboratory Manual, available in the bookstore, is required.

Additional useful texts placed on reserve in the Plant Pathology Library include:


Reading Materials: Recommended readings and background material will be available on reserve in the Plant Pathology Library, 395 Borlaug Hall (612-625-9777).

If you have questions or problems, please talk to me as soon as possible. If at any time during the course you feel I am not covering the information you would like or if I am going too fast over material please let me know. This will not affect your grade.

**Course Expectations and Grading:**

Course Expectations: Regular student attendance at lecture and lab sessions is required. Three unannounced “pop” quizzes will be given during “in-person” lectures throughout the semester. Timely completion of web based lectures is essential for satisfactory completion of the course.

You are expected to be attentive during class, ask questions if you do not understand something and participate in class discussions. You are also expected to listen to other students and your instructor when speaking.

Credits and workloads: For this four credit course students are expected to need the equivalent of at least nine hours of effort per week, averaged over the semester, to obtain an average grade in this course.

Other Items: The Student Conflict Resolution Center in 211 Eddy Hall, U of MN, East Bank Campus (612-624-7272) provides assistance for students with campus based concerns. In addition to handling individual cases, the majority of which are grading and instructional complaints, the office also functions in proactive way to prevent problems in this area.

**Grading: A total of 600 points will be available from the following sources:**

- VI a) Weekly Laboratory/Disease of Week` 200 points
- VI c) Disease of Week Presentation and writeup 20 points
- VI c) On-Line question set 150 points
- Midterm quiz 1 100 points
- Midterm quiz 2 100 points
- Pop quizzes 30 points

Letter grades will be calculated on the basis of the following:
A - achievement that is outstanding relative to the level necessary to meet course requirements.
   A  95.00 and above
   A- 90.00 - 94.99
B - achievement that is significantly above the level necessary to meet course requirements.
   B+ 87.00 - 89.99
   B  83.00 - 86.99
   B- 80.00 - 82.99
C - achievement that meets the course requirements in every respect.
   C+ 77.00 - 79.99
   C  73.00 - 76.99
   C- 70.00 - 72.99
D - achievement that is worthy of credit even though it fails to meet fully the course requirements.
   D+ 65.00 - 69.99
   D  60.00 - 64.99
F - represents failure (or no credit) and signifies that the work was either (1) completed but at a level of achievement that is not worthy of credit or (2) was not completed and there was no agreement between the instructor and the student that the student would be awarded an I (see also I).
   F  59.99 and below
I (incomplete): - This grade can only be given when, due to extraordinary circumstances, e.g., hospitalization, a student is prevented from completing the work of the course on time but has already completed a significant portion of the class. Requires a written agreement between instructor and student. Assigned at the discretion of the instructor.

You will need at least 67% of the available points to earn an “S” if you are taking this course “S-N”.

Academic Dishonesty: Academic dishonesty in any portion of the academic work for a course shall be grounds for awarding a grade of F or N for the entire course.

Students with Disabilities: If you have a disability which requires accommodation in this course, please see an instructor as soon as possible. We are happy to make appropriate accommodations, provided timely notice is received. Further information is available from Disabilities Services (230 McNamara, Phone: 612-626-1333 (V/TTY) or (612) 624-3316 (V/TTY).

Wheelchair access to Stakman Hall is gained via Borlaug Hall on Buford Circle.
### Tentative Schedule

<table>
<thead>
<tr>
<th>Week: Dates</th>
<th>Location: Topic</th>
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<tbody>
<tr>
<td><strong>1</strong>: 1 - 5 Sep.</td>
<td>Lecture: Introduction: Healthy Plants, Sick Plants</td>
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<td>Lab 1: Microscopes, Basic Microscopy</td>
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<td>On-Line: Introducing Plant Pathology</td>
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<td>Recommended Reading: Essentials of Plant Path pp. 1-16.</td>
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<td><strong>2</strong>: 8-12 Sep</td>
<td>Lecture: Signs, Symptoms, Disease Life Cycles</td>
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<td>Lab 2: Field Trip, Microscope, Soil Inoculation</td>
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<td></td>
<td>On-Line: Terminology, Concepts</td>
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<td>Disease of Week: Black Spot of Roses</td>
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<td>Recommended Reading: Essentials of Plant Path pp. 4-6, 8-14.</td>
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<tr>
<td><strong>3</strong>: 15-19 Sep.</td>
<td>Lecture: Pathogens: Fungi</td>
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<td>Lab 3: Introduction to Fungi, Media, Ascomycetes</td>
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<td>On-Line: Fungi as Pathogens, Fungal Plant Disease</td>
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<td><strong>Online Question Set 1 Due: Friday, 19 Sep.</strong></td>
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<td>Disease of Week: Apple Scab</td>
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<td>Recommended Reading: Hungry Planet pp. 21-29, (through ascomycetes). Essentials of Plant Path 21-37.</td>
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<td><strong>4</strong>: 22-26 Sep.</td>
<td>Lecture: Pathogens: Fungi</td>
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<td>Lab 4: Fungi – Part II, Koch’s Postulate 1&amp;2, Basidiomycetes</td>
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<td>On-Line: Fungal Toxins, Fungal Decomposers, Fungal Symbioses</td>
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<td>Disease of Week: Common Smut of Corn, Wheat Rust</td>
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<td>Recommended Reading: Hungry Planet. 29-37. Essentials of Plant Path 27-39, 41-44.</td>
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<td><strong>5</strong>: 29 Sep-3 Oct.</td>
<td>Lecture: Pathogens: Bacteria, Viruses</td>
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<td>Lab 5: Fungi – Part III, Koch’s Postulates, Oomycetes</td>
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<td>On-Line: Bacteria as Pathogens, Bacterial Plant Diseases</td>
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<td>Viral Pathogens, Virus Plant Diseases</td>
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<td>Disease of Week: Late Blight of Potato</td>
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</table>
Recommended Reading: Hungry Planet. 75-84, 233-238. Essentials of Plant Path 51-58, 87-96.

Lab 6: Koch’s Postulate 3, Bacteria  
On-Line: Nematodes as Pathogens, Nematode Caused Diseases  
**Online Question Set 2 Due: Friday, 10 Oct.**  
Disease of Week: Powdery Mildew, Dutch Elm Disease  
Recommended Reading: Hungry Planet, 166-172. Essentials of Plant Path 69-79.

**Biological Concept: Interactions Between Plants and Pathogens**

Lab 7: Plant pathogenic bacteria & viruses  
Assign DOW  
On-Line: How Pathogens Cause Disease, Abiotic Diseases  
Disease of Week: White Mold, Ergot  

8:20-24 Oct. Lecture: Signs and Symptoms:  
**First Midterm Lecture Quiz**  
**Question Set 3 Due: Friday, 24 Oct.**  
Lab 8: Plant Viruses, Fungal Disease of Week Assigned  
On-Line: Plant Defenses against Disease.  
Disease of Week: Armillaria Root Rot, Crown Gall  
Recommended Reading: Essentials of Plant Path 197-203, 204-209.

Lab 9: Plant Parasitic Nematodes Introduction  
**Disease of Week Draft Due**  
On-Line: Signs & Symptoms, Pathogen/Symptom Associations  
Disease of Week: Plant Parasitic Nematodes  
Recommended Reading: Hungry Planet 213-231. Essentials of Plant Path 197-209.

**Biological Concept: The Environment: Temperature, Moisture, Chemistry**

10:3 - 7 Nov. Lecture: Environment & Plant Disease, Epidemiology of Plant Disease
Lab 10: Parasitic Seed Plants & Abiotic Diseases, Signs & Symptoms
On-Line: Pathogens in the Environment, Pathogen Movement
Disease of Week: Parasitic Plants
Recommended Reading: Hungry Planet 115-120.

11:10 - 14 Nov
Lecture: Tools of Plant Pathology
Lab 11: Signs & Symptoms
DOW draft returned
Question Set 4 Due: Friday, 14 Nov.
On-Line: Visualizing and Diagnosing Plant Disease,
Disease of Week: *Aspergillus flavus*
Recommended Reading: Schumann 239-243, Essentials of Plant Path 311-315.

12:17 - 21 Nov
Lecture: Managing Plant Diseases
Lab 12: Food isolation results. Microorganisms in Food, Disease Resistance
On-Line: Chemical and Cultural Management
Recommended Reading: Hungry Planet 39-53, 121-129.
Essentials of Plant Path 264-284.

13: 24 - 28 Nov
Thanksgiving (Holiday 27, 28 Nov.) - No Lecture, No Lab
Online Question Set 5 Due: Friday (28 Nov)

Biological Concept: Competition, Coevolution, Natural Selection

14:1 - 5 Dec
Lecture: Managing Plant Disease
Lab 13: Disease of Week Presentation
Disease of Week Writeup
On-Line: Resistance and Biological Control.

15: 9 Dec
Second Midterm

The University of Minnesota Student Handbook on Scholastic Conduct states that the following are scholastic misconduct, are unacceptable in class, and can lead to a reduced grade, failure, or expulsion from class:
**Disruptive classroom conduct:** Behavior that substantially or repeatedly interrupts either the instructor's ability to teach or student learning.

**Scholastic dishonesty:** Cheating on assignments or examinations; Plagiarism, misrepresenting as your own work any part of work done by another; depriving another student of necessary course material; or interfering with another student's work.

**Threatening, harassing, or assaultive conduct** that endangers or threatens to endanger the health, safety, or welfare of another person.

The Student Conflict Resolution Center in 211 Eddy Hall, U of MN, East Bank Campus (612-624-7272) provides assistance for students with campus based concerns. In addition to handling individual cases, the majority of which are grading and instructional complaints, the office also functions in a proactive way to prevent problems in this area.

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