Instructor: Dr. Ariena H.C. van Bruggen
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Course Description:
This graduate-level course is designed to provide students with an introduction to the theory, concepts and applications of plant disease epidemiology. Students will carry out an experiment on the infection cycle of one pathogen and will be introduced to equipment and quantitative methods used in the analysis of epidemics and the factors that affect epidemic development. Practical applications of epidemiology in plant disease management will also be presented. Students will discuss recent refereed papers fundamental to epidemiology.

Credit Hours: 4

Course Objectives:
- Provide students with basic understanding of epidemiological theory and concepts
- Understand the implications of quantitative components of the infection cycle
- Introduce students to equipment and methods used in epidemiological research
- Demonstrate the practical applications of epidemiology in plant disease management
- Identify current areas of epidemiological research

Prerequisite: Introductory Plant Pathology

Class Schedule: Mondays, 8.30-11.30 am
            Wednesdays, 8.30-9.30 am
            Fridays, 8.30-11.30 am

Class Location: Monday, Wednesday and Friday: 2564 Fifield Hall or 2306 Fifield Hall (Plant Path Teaching lab), as indicated on the class schedule; first day of class (January 7, 2015) in Fifield Hall room 2564

Lecture Topics:

I. General overview of plant epidemiology
   History and terminology
   Measurement of disease
   Disease progress over time

II. Factors that affect epidemic development
   Influence of pathogen on disease development
   Airborne pathogens (quantification of inoculum, virulence, ecology)
Seed- and soil-borne pathogens
Vector-borne pathogens
Influence of host plant on disease development
   Plant growth
   Host resistance
Influence of environment on disease development
   Moisture, temperature, wind, radiation, chemical environment
   Meteorological variables and their measurement

III. Basic concepts in plant disease epidemiology
   Disease progress in time
      Simple models
      Model fitting, model comparison
      Comparison of epidemics
      Complex models
      Advanced topics
   Analysis of plant disease epidemics using SAS
   Disease progress in space
      Dispersal gradients, long-range transport
      Spatial patterns of disease and inoculum
      Spatial variability, sampling, interplot interference

IV. Modeling of plant disease
   Intro to modeling, relational diagrams
   Modeling of vector-borne diseases
   Modeling of a disease cycle
   Modeling of population dynamics in the rhizosphere

V. Epidemiology and disease management
   Epidemiological strategies for disease management
      Reducing initial inoculum
      Reducing the rate of epidemic development
      Reducing the duration of epidemic development
   Crop loss assessment
      Components of crop loss
      Assessment techniques
      Modeling crop loss
   Disease forecasting, advisories, risk indices
   Decision aids for disease management
      Examples of forecasting models
      Example of a risk model
   Risk analysis and management of enteric pathogens associated with plants

Lab, greenhouse, field and computer exercises:

I. Disease assessment on the computer and in the field
II. A class experiment on quantification of successive phases in the disease cycle (with *Colletotrichum* sp. on melons), including analysis of data and entering parameter estimates into a simulation model

III. Various exercises to calculate parameter values for different disease progress curves over time and spread of disease in space using SAS;

   **BRING YOUR OWN LAPTOP WITH SAS ON IT!!!!**

IV. Various computer simulation and modeling exercises.

**Requirements for grading:**

**Lab reports (individual):**
- Lab Experiments: January 23, February 9 and March 30
- Computer exercises: February 6, February 13, February 16, February 20, February 23, February 27, March 9, March 20, April 10, April 13

**Quizzes and Exams:**
- Quiz 1 and 2: February 4 and April 1
- Midterm Exam: March 11
- Final Exam: May 1

**Literature presentations (groups of three students):**
- Presentations: February 20, February 25, March 13, March 18, March 25, April 3, April 15

**Grading:**
- Quizes (together): 10%
- Midterm exam 10%
- Final Exam 30%
- Experimental lab reports 20%
- Computer exercise reports 20%
- Oral presentations 10%