

# PLP 4104: APPLIED PLANT DISEASE MANAGEMENT

3 CREDITS (GRADED), SUMMER A 2017, ONLINE (SEMI-SYNCHRONOUS)

"The phytopathologists are the trained plant doctors, the 'medicine men of agriculture', whose final goal is successfully to prevent or control plant or crop diseases." *F. D. Heald. 1943. Introduction to Plant Pathology. New York: McGraw-Hill Book Company, p. 1.*

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**OFFICE HOURS:** Office hours are Monday-Friday 9-4 by appointment only; appointments must be requested by email ([clharmon@ufl.edu](mailto:clharmon@ufl.edu)) at least 48 hours in advance. Office hours may take place at Building 1291 (the Plant Diagnostic Center), by phone, or virtually via Lync, Skype, or Zoom. Course-related communications will be addressed once per day between 9 am and 4 pm eastern.

**COURSE WEBSITE:** <http://elearning.ufl.edu/>

**COURSE COMMUNICATIONS:** Questions and discussion are encouraged; the majority of questions should be raised on the class discussion board when relevant to allow for group comment and learning. Private questions should be sent to the instructor at [clharmon@ufl.edu](mailto:clharmon@ufl.edu).

**REQUIRED TEXT:** There are no required texts, but see below for assigned readings. Assigned readings will be provided via the course website.

**ADDITIONAL RESOURCES:** Recommended texts will be available for reference during office hours: *A Practical Guide to Turfgrass Fungicides* by R. Latin; *Fungicides for Field Crops*, Eds. Mueller et al.; *Current Vegetable Production Handbook for Florida*, Eds. Santos et al.; *Plant Pathology*, Agrios et al, 5<sup>th</sup> edition or later; *Essential Plant Pathology*, Schumann and D'Arcy, 2<sup>nd</sup> Edition.

**COURSE DESCRIPTION:** The goal of plant disease management is to reduce the economic and aesthetic damage caused by plant diseases. This course summarizes the methods and strategies used to manage plant diseases by targeting vulnerable points in the pathogen life cycle and disease epidemic. Although this course is not intended as a primer in chemical

classes and modes of action, we will discuss management chemistries as they apply to specific cases. Over the course of the semester, students utilize knowledge of organismal biology, epidemiology, management chemistry, and economics to develop strategies for managing plant diseases.

**PREREQUISITE KNOWLEDGE AND SKILLS:** BSC 2010/L or BOT 2010C and BSC 2011/L or BOT 2011C, or equivalent. Additionally, basic knowledge of plant horticulture will be valuable in the interpretation of management strategies, and an introductory course in plant pathology is strongly advised, but not required. Students should have a working knowledge of the distance-education tools used to disseminate the course content; at a minimum, students will need to be able to navigate the course website and materials, play the lectures, link to online resources, participate in chat-type discussions, use and respond to email, and produce and upload written and video content to the course website.

**PURPOSE OF COURSE:** The purpose of this course is to advance students' knowledge of management options for plant diseases, incorporating pathogen biology, epidemiology, horticulture, management chemistry, and economics.

**COURSE GOALS AND/OR OBJECTIVES:** By the end of this course, students will/will be able to:

- ✓ define plant disease in general terms; label and define the importance of the four components of the disease pyramid; contrast management vs. control; define IPM
- ✓ define types of inoculum, examples of initial vs continuous (monocyclic vs polycyclic), contrast incidence and severity
- ✓ identify common rating scales, define potential pitfalls of disease assessment tools
- ✓ contrast bacterial disease symptoms and signs, name the diagnostic tests and expected results, discuss potential pathogen spread, discuss cultural/environmental factors conducive to bacterial disease development
- ✓ contrast viral disease symptoms and signs, name the diagnostic tests and expected results, vectors, identify vectors/means of spread, discuss cultural/environmental factors conducive to viral disease development
- ✓ contrast fungal symptoms and signs, name the diagnostic tests and expected results, discuss cultural/environmental factors conducive to fungal disease development, and define means of pathogen movement/spread
- ✓ recognize symptoms/signs of common abiotic and arthropod/other agent damage, identify the lab/agent who can identify each type of plant problem
- ✓ identify the information needed and samples required for submission to a lab, interpret lab results
- ✓ identify types of host resistance
- ✓ identify types of chemical resistance
- ✓ explain sanitation in a greenhouse, field, nursery setting; describe general and pathogen-specific cultural management tools
- ✓ understand how to find and interpret product labels; review of chemistries;

- ✓ understand how to find and interpret efficacy data
- ✓ identify potential biological management methods
- ✓ identify management component costs (labor, product, plant product quality/loss costs/benefits)
- ✓ define IPM, recognize the components of an integrated management plan
- ✓ calculate product application amounts, understand important points in sprayer calibration

#### **HOW THIS COURSE RELATES TO THE STUDENT LEARNING OUTCOMES IN THE PLANT SCIENCE**

**PROGRAM:** After completing this course, students will be able to: 1. evaluate the abiotic and biotic factors that impact plant growth and management, as they pertain to plant disease management; 2. recommend practices that growers and managers can implement to address the plant disease components of their cropping system; and 3. analyze and apply science-based data to solve disease problems in plant production. (Plant Science SLOs 1, 2, and 3).

**TEACHING PHILOSOPHY:** I see opportunity in meshing my extension and research programs with my teaching duties. The courses I teach tend towards those with practical applications. Experiential learning derived from participation in extension projects imbues coursework with real-world examples. There is additional potential for extension impact within the span of the semester, as the students apply their knowledge to solving the field and laboratory problems of extension clientele.

I encourage students to set high expectations for themselves, with a safety net of being able to work through a problem with me or their fellow students. Since my courses tend towards the applied, I employ practicum-style projects and examinations so students have an opportunity to demonstrate they have accomplished the course objectives over the course of the semester. When practical, I assign group projects to encourage students to gain additional perspectives for problem-solving. My assessment methods include quizzes, short papers, projects, and presentations so students have multiple avenues for polishing their communication skills. I have found that the best way to learn something is to teach it to others, so I encourage peer-to-peer learning and rubric-based evaluation opportunities. I strive to provide prompt evaluation and return grades quickly so students can incorporate the feedback.

**INSTRUCTIONAL METHODS:** This course is online. It is structured as a series of modules with assessments built in. I utilize graded quizzes (at the end of a lecture, meant to direct students' attention to important topics and to give me an idea of areas that may need more instruction) and graded projects and papers (at the end of a unit, to assess students' retention and comprehension of important topics). I also assign papers to read for additional information, projects to complete to demonstrate problem-solving, and discussion boards to gauge participation.

This course is taught at the graduate and undergraduate level. The undergraduate version places more emphasis on building a knowledge base and interviewing a professional to develop relationships with potential employers and mentors. Lectures and most quizzes are the same for both graduate and undergraduate versions of the course. There is no final project for the undergraduate section.

## COURSE POLICIES:

**ATTENDANCE POLICY:** Your registration in this course indicates your willingness to participate fully. As this is an online course, you may progress through the modules at your own pace, within the week-long time frame of the assigned modules. Participation is gauged during timed discussion boards (which count as part of the overall grade), but there are no other required attendance opportunities. Withdrawal from this course must be during the normal add/drop window designated by UF.

**QUIZ/EXAM POLICY:** Quizzes and projects are intended to provide the student with opportunities to excel. Grades will be based on timed open-book quizzes, projects, participation in discussion threads, and the final timed, open-book exam. The final exam is cumulative and occurs the last week of classes. I will drop your lowest quiz grade when calculating your overall grade. You may inquire about quiz and exam grades for 48 hours following the return of grades for that quiz or exam; feedback should be pertinent to the learning objectives at that time.

**MAKE-UP POLICY:** Quizzes and projects have a window in which they must be completed. Emergencies do happen, and if they will impact your participation in any graded opportunity, you must contact the instructor by email as close as possible to the quiz/exam/project due date and time. Make-up quizzes/exams/assignments may be allowed under such circumstances; a doctor's note or other official documentation may be required. Power outages, computer problems, and software glitches may occur, even under the best of circumstances. In order to allow yourself plenty of time to work around these unforeseen technological issues, do not wait until the last minute to complete assignments or assessments at the end of each module!

**ASSIGNMENT POLICY:** Assigned readings are for your edification and to expand your knowledge base. Major topics from assigned readings may be addressed in quizzes and the final exam. Assignment/quiz/exam due dates are listed on the website and times are firm; plan accordingly. Rare exceptions may be made in the event of an emergency, see the make-up policy above. Requirements for class attendance and make-up work are consistent with university policies that can be found at: <https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx>.

**COURSE TECHNOLOGY:** This course is delivered through the online resource, Canvas. The course and support and resources are all available at <http://elearning.ufl.edu>. Registration in this course indicates you have basic knowledge in computer use and online technology to enable your full participation in the course. Since we are using an electronic resource, your registration indicates you understand that things such as bandwidth, power, etc., are integral to making it work, and you will plan accordingly.

**GRADING POLICIES:**

Assignment	Percentage
Quizzes/short assignments	45%
Interview assignment	15%
Discussion participation and grading others' assignments (peer-to-peer learning and evaluation opportunities)	5%
Final exam	35%

**GRADING SCALE:** This course will be graded using letter grades, to include minus grades.

Letter grade	%	Points
A	94-100	159
A-	90-93	153
B+	87-89	148
B	84-86	142
B-	80-83	136
C+	77-79	131
C	74-76	125
C-	70-73	119
D+	67-69	114
D	64-66	108
D-	60-63	102
E	<59.5	<101.5
Total points		170

Assignments are weighted by the number of points assigned to them. Final grades are calculated as total points earned out of total points possible for the course assignments. Total points for the course equal 170, and the number of points needed to reach a certain letter grade or percent grade are noted in the table to the left. I round one decimal point, so an 83.5 becomes an 84, but an 84.4 becomes an 84.

**LATE ASSIGNMENTS POLICY:** Although you should make every effort to submit your assignments on time, late assignments will be given half credit (the assignment will be graded, then that grade will be divided by two for your final grade for the assignment) if turned in within two days of the due date. After that, the assignment grade will be a zero. Please plan

accordingly; each assignment is open for a specific time period, often one week.

**EXTRA CREDIT:** Development of a short video or PowerPoint on a specific topic related to disease management will be considered for one extra credit project. The objective of the project will be to enrich the course material with an explanation of a specific concept (e.g., how to calculate a sprayer or how a specific host-pathogen system is detected, diagnosed, or managed). The project must be outlined and proposed to the instructor, approved by the

instructor, and the final product submitted before the last week of the course. Projects will be worth up to five points, and the points awarded for the project will be added to the final points earned.

**Course Schedule:**

**FINAL EXAM:** Wednesday of the last week of the course

This course will be taught as a series of modules during a six-week session (first half of fall in even years, summer A in odd years). You will need to complete the assessment(s) within each module before you can open a new module. Modules will open each Monday at 12:01 am. The final exam will be open for a specific 1.5-hour window of time on the exam day; you may start the exam at any point during the day between 9 am and 7 pm, and the clock will count down for 90 minutes. The exam will close at 7 pm, regardless of when you start the exam (so start no later than 5:30 pm). These timelines will be detailed during the first lecture.

Topic	Description	Assignment/ Assessment
<b>Week 1:</b>		
Course overview	Review of syllabus, grading policy, expectations, how to get help, review accommodations responsibilities; explanation of flow of concepts	Quiz, Discussion thread
Plant Disease Boot Camp I, II.1, II.2, II.3	What is a plant disease; disease pyramid; pathogen life cycles; management vs. control; conventional vs organic; art and science of diagnostics; importance of proper diagnosis; symptoms and signs,	3 Quizzes;
Plant Disease Management Intro	Management vs control; organic vs. conventional production; introduction to IPM	Quiz
<b>Week 2:</b>		
Epidemiology I and II	Disease progress curve; inoculum; monocyclic vs polycyclic diseases; disease cycle weak spots; incidence and severity; spread local and regional; how does management affect the disease progress curve?	Quiz

Disease Assessment I.1, I.2, I.3, II	Disease assessment and rating scales	Quiz; Cane canker disease assignment
The label is the law, I and II; Serving the organic grower	Reading a pesticide label, finding products, efficacy trials, emergency exemptions	Quiz
<b>Week 3:</b>		
Detection and diagnosis of viral plant disease; Management of viral plant diseases I and II	Symptoms, signs, diagnostic tests, cultural/environmental factors, potential means of spread, management options (resistance, chemical, cultural, biological)	Quiz
Detection and diagnosis of bacterial plant disease; Management of bacterial diseases	Symptoms, signs, diagnostic tests, cultural/environmental factors, potential means of spread, management options (resistance, chemical, cultural, biological)	2 Quizzes
Detection and diagnosis of fungal diseases; Management of fungal diseases	Symptoms, signs, diagnostic tests, cultural/environmental factors, potential means of spread, management options (resistance, chemical, cultural, biological)	Quiz
Fungicide mobility and targets; Fungicide resistance	FRAC, modes of action, resistance management	
Confounding factors	Abiotic issues, nematodes, insects; vectors; asymptomatic hosts	
Plan of attack	What data to collect; scouting, sample collection; diagnosis; interpreting results	Assignment: Scouting & sample collection
<b>Week 4:</b>		
Current issues in applied disease management	Interview project – interview a professional applicator, extension specialist, pesticide regulator, or industry professional (grower, or chemical company marketing or R&D rep)	Assignment: Interview and synthesis
Recordkeeping and decision support I and II	Management plan components and considerations; forecasting models	Quiz

Economics of disease management	Thresholds, inputs, and decisions	2 Quizzes
<b>Week 5:</b>		
Nozzle Talk Part I	Pesticide safety and application methods	
Nozzle Talk Part II.1 and II.2	Calibration; Residential vs. Commercial Sprayers; Managing drift	Quiz
Ethics and responsibilities; From plant problem to management recommendation	Finding balance in our responsibilities and moral positions	Assignment: Write a position paper for presidential candidates
Putting it all together	Preparation for final exam	Assignment: Develop and submit 5 exam questions
<b>Week 6:</b>		
Final exam	Cumulative and timed	

Disclaimer: This syllabus represents my current plans and objectives; it is subject to change as the need arises to enhance the class learning opportunities. Such changes, communicated clearly, are not unusual and should be expected.

## UF POLICIES:

**UNIVERSITY POLICY ON ACCOMMODATING STUDENTS WITH DISABILITIES:** Students requesting accommodation for disabilities must first register with the Dean of Students Office (<http://www.dso.ufl.edu/drc/>). The Dean of Students Office will provide documentation to the student who must then provide this documentation to the instructor when requesting accommodation. You must submit this documentation prior to submitting assignments or taking the quizzes or exams.

**UNIVERSITY POLICY ON ACADEMIC MISCONDUCT:** As a student at the University of Florida, you have committed yourself to uphold the Honor Code, which includes the following pledge: “We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honor and integrity by abiding by the Honor Code. On all work submitted for credit by students at the University of Florida, the following pledge is either required or implied: *“On my honor, I have neither given nor received unauthorized aid in doing this assignment.”* It is assumed that you will complete all work independently in each course unless the instructor provides explicit permission for you to collaborate on course tasks (e.g., assignments, papers, quizzes, exams). Furthermore, as part of your obligation to uphold the Honor Code, you should report any condition that facilitates academic misconduct to appropriate personnel. It is your individual responsibility to know and comply with all university policies and procedures regarding academic integrity and the Student Honor Code. Violations of the Honor Code at the University of Florida will not be tolerated. Violations will be reported to the Dean of Students Office for consideration of disciplinary action. For more information regarding the Student Honor Code, please see:

<http://www.dso.ufl.edu/SCCR/honorcodes/honorcode.php>

**SOFTWARE USE:** All faculty, staff and students of the university are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against university policies and rules, disciplinary action will be taken as appropriate.

**NETIQUETTE: COMMUNICATION COURTESY:** All members of the class are expected to follow rules of common courtesy in all email messages, threaded discussions, and chats.

<http://teach.ufl.edu/wp-content/uploads/2012/08/NetiquetteGuideforOnlineCourses.pdf>

**ONLINE COURSE EVALUATION PROCESS:** Student assessment of instruction is an important part of efforts to improve teaching and learning. At the end of the semester, students are expected to provide feedback on the quality of instruction in this course using a standard set of university and college criteria. These evaluations are conducted online at

<https://evaluations.ufl.edu>. Evaluations are typically open for students to complete during the last two or three weeks of the semester; students will be notified of the specific times when they are open. Summary results of these assessments are available to students at <https://evaluations.ufl.edu/results>.

## GETTING HELP:

For issues with technical difficulties for E-learning in Canvas, please contact the UF Help Desk at:

- [helpdesk@ufl.edu](mailto:helpdesk@ufl.edu)
- (352) 392-HELP - select option 2
- <http://helpdesk.ufl.edu/e-learning-support/>

\*\* Any requests for make-ups due to technical issues MUST be accompanied by the ticket number received from LSS when the problem was reported to them. The ticket number will document the time and date of the problem. You MUST e-mail your instructor within 24 hours of the technical difficulty if you wish to request a make-up.

Other resources are available at <http://www.distance.ufl.edu/getting-help>

Students experiencing crises or personal problems that interfere with their general well-being are encouraged to utilize the university's counseling resources. The Counseling & Wellness Center provides confidential counseling services at no cost for currently enrolled students. Resources are available on campus for students having personal problems or lacking clear career or academic goals, which interfere with their academic performance.

- University Counseling & Wellness Center, 3190 Radio Road, 352-392-1575, [www.counseling.ufl.edu/cwc/](http://www.counseling.ufl.edu/cwc/)
  - Counseling Services
  - Groups and Workshops
  - Outreach and Consultation
  - Self-Help Library
  - Wellness Coaching
- U Matter We Care, [www.umatter.ufl.edu/](http://www.umatter.ufl.edu/)
- Career Resource Center, First Floor JWRU, 392-1601, [www.crc.ufl.edu/](http://www.crc.ufl.edu/)

Should you have any complaints with your experience in this course please visit <http://www.distance.ufl.edu/student-complaints> to submit a complaint.

Each online distance learning program has a process for, and will make every attempt to resolve, student complaints within its academic and administrative departments at the program level. See <http://distance.ufl.edu/student-complaints> for more details.

## Assigned Readings

Ade, J. and R.W. Innes. 2007. Resistance to Bacterial Pathogens in Plants. In eLS. Chichester: John Wiley & Sons Ltd. <http://www.els.net> DOI: 10.1002/9780470015902.a0020091

Allen, T.W., A. Martinez, and L.L. Burpee. 2004. Pythium blight of turfgrass. The Plant Health Instructor. DOI:10.1094/PHI-I-2004-0929-01.

Antignus, Y. 2001. Manipulation of wavelength-dependent behaviour of insects: An IPM tool to impede insects and restrict epidemics of insect-borne viruses. Virus Res. 71:213-220.

Broschat, T.K. 2008. Nutrient Deficiency Symptoms of Woody Ornamental Plants in South Florida. IFAS Extension Publication ENH1098.

Carlson, G.A. and C.E. Main. 1976. Economics of disease-loss management. Annu. Rev. Phytopathol. 14:381-403.

Common and Trade Names of Fungicides. Ct.gov

Cultural practices for reducing crop diseases. Texas Plant Disease Handbook. Texas A&M AgriLife Extension. <http://plantdiseasehandbook.tamu.edu/problems-treatments/methods-and-materials/cultural-practices-for-reducing-crop-diseases/>

Elliot, M., K. Pernezny, A. Palmateer, N. Havrane. 2008. Guidelines to Identification and Management of Plant Disease Problems: Part I. Eliminating Insect Damage and Abiotic Disorders. . IFAS Extension Publication PP248/MG441 (<http://edis.ifas.ufl.edu/mg441>).

Elliot, M., K. Pernezny, A. Palmateer, N. Havrane. 2008. Guidelines for Identification and Management of Plant Disease Problems: Part IV. Plant Health Questions to Ask the Client. IFAS Extension Publication PP 251/MG444 (<https://edis.ifas.ufl.edu/mg444>).

Equipment (Sprayers and Dusters). Texas Plant Disease Handbook. Texas A&M AgriLife Extension. <http://plantdiseasehandbook.tamu.edu/problems-treatments/methods-and-materials/equipment-sprayers-and-dusters/>

Finckh, M.R., A.H.C. van Bruggen, and L. Tamm (Eds.). 2015. Plant Diseases and Their Management in Organic Agriculture. St. Paul, MN: APS Press.

Fishel, F., W. Bailey, M. Boyd, B. Johnson, M. O'Day, L. Sweets, and B. Wiebold. 2009. IPM1006: Introduction to Crop Scouting. University of Missouri Extension. <http://extension.missouri.edu/explorepdf/agguides/pests/ipm1006.pdf>

- Florida Department of Agriculture and Consumer Services Citrus Insecticide Pollinator Protection Label Language- Interpretive Guidance. 2015.  
[http://www.freshfromflorida.com/content/download/35554/832609/Citrus\\_Bee\\_Statements.pdf](http://www.freshfromflorida.com/content/download/35554/832609/Citrus_Bee_Statements.pdf)
- Folimonova, S.Y., A. S. Folimonova, S. Tatineni, and W.O. Dawson. 2008. *Citrus tristeza* virus: survival at the edge of the movement continuum. *J. Virol.* 82:6546-6556.
- Fungicide Additives. Texas Plant Disease Handbook. Texas A&M AgriLife Extension.  
<http://plantdiseasehandbook.tamu.edu/problems-treatments/methods-and-materials/fungicide-additives/>
- Gergerich, R.C. and V. V. Dolja. 2006. Introduction to Plant Viruses, the Invisible Foe. The Plant Health Instructor. DOI: 10.1094/PHI-I-2006-0414-01
- Gottwald, T.R. 2010. Current epidemiological understanding of huanglongbing. *Annu. Rev. Phytopathology* 48: 119-139.
- Graham, J.H., T.R. Gottwald, and R.P. Leite. 2006. Prospects for control of citrus canker with novel chemical compounds. *Proceedings of Florida State Horticultural Society* 119:82–88.
- Grogan, R.G. 1981. The science and art of plant-disease diagnosis. *Annu. Rev. Phytopathol.* 19:333-351.
- Gusmini, G., T.C. Wehner, and G.J. Holmes. 2002. Disease assessment scales for seedling screening and detached leaf assay for gummy stem blight in watermelon. *Cucurbit Genet. Coop. Rpt.* 25:36–40.
- Jones J. B., G.E. Vallad, F.B. Iriarte, A. Obradović, M.H. Wernsing, L.E. Jackson, et al. 2012. Considerations for using bacteriophages for plant disease control. *Bacteriophage* 2:208–214 10.4161/bact.23857
- Ma, Z., D. Felts, and T.J. Michailides. 2003. Resistance to azoxystrobin in *Alternaria* isolates from pistachio in California. *Pestic. Biochem. Physiol.* 77:66-74.
- Maas, J.L. and F.A. Uecker. 1984. *Botryosphaeria dothidea* cane canker of thornless blackberry. *Plant. Dis.* 68:720-726.
- McManus, P. and V. Stockwell. 2000. Antibiotics for Plant Diseases Control: Silver Bullets or Rusty Sabers. APSnet Features. Online. doi: 10.1094/APSnetFeature-2000-0600

- Obradovic, A., J.B. Jones, M.T. Momol, S.M. Olson, L.E. Jackson, B. Balogh, K. Guven, and F.B. Iriarte. 2005. Integration of biological control agents and systemic acquired resistance inducers against bacterial spot on tomato. *Plant Dis.* 89:712-716.
- Palmateer, A., K. Pernezny, M. Elliott, and N. Havranek. 2008. Guidelines for Identification and Management of Plant Disease Problems: Part III. Managing Plant Diseases. IFAS Extension Publication PP 250 (<https://edis.ifas.ufl.edu/mg443>).
- Paret, M., N. Dufault, T. Momol, J. Marois, and S. Olson. 2002. Integrated Disease Management for Vegetable Crops in Florida. IFAS Extension Publication PP-193 (<https://edis.ifas.ufl.edu/pp111>).
- Pavan, W., Fraise, C. W., and Peres, N. A. 2011. Development of a web- based disease forecasting system for strawberries. *Comput. Electron. Agric.* 75:169-175.
- Pernezny, K., M. Elliott, A. Palmateer, and N. Havranek. 2011. Guidelines for identification and management of plant disease problems: Part II. Diagnosing plant diseases caused by fungi, bacteria and viruses. IFAS Extension Publication PP 249/MG442 ([edis.ifas.ufl.edu/mg442](https://edis.ifas.ufl.edu/mg442)).
- Putnam, M.L. 1995. Evaluation of methods of plant disease diagnosis. *Crop Protection* 14:517–25.
- Seebold, K. 2008. Bacterial Canker of Tomato. University of Kentucky – College of Agriculture Cooperative Extension Service. Plant Pathology Fact Sheet PPF5-VG-06 ([http://www2.ca.uky.edu/agcollege/plantpathology/ext\\_files/PPFShtml/PPFS-VG-6.pdf](http://www2.ca.uky.edu/agcollege/plantpathology/ext_files/PPFShtml/PPFS-VG-6.pdf)).
- Seem, R.C. 1984. Disease incidence and severity relationships. *Annu.Rev. Phytopathol.* 22:137-50.
- Shober, A. and G. Denny. 2010. Identifying Nutrient Deficiencies in Ornamental Plants. IFAS Extension Publication SL 318 (<http://edis.ifas.ufl.edu>).
- Stansly, P.A., H.A. Smith, D.R. Seal, E. McAvoy, J.E. Polston, P.R. Gilreath, and D.J. Schuster. 2007. Management of whiteflies, whitefly-vectored plant virus, and insecticide resistance for vegetable production in southern Florida. IFAS Extension Publication ENY-735 (<http://edis.ifas.ufl.edu/pdf/IN/IN69500.pdf>).
- Wieczorek, P. and A. Obrępańska-Stęplowska. 2014. Suppress to survive – implication of plant viruses in PTGS A. *Plant Mol. Biol. Rep.* DOI: [10.1007/s11105-014-0755-8](https://doi.org/10.1007/s11105-014-0755-8)