Department of Plant Pathology
Faculty of Agricultural Sciences
University of the Punjab, Lahore
Course Outline

Programme	B.Sc. (Hons.) Agriculture (Plant Pathology) 4 Year program	**Course Code**	**NAG-140**	**Credit Hours**	3(2-1)
Course Title	**Plant Disease Management**				

Course Introduction

This course has been designed to make the students aware about all the possible means and strategies, which are useful for management of plant diseases. They will learn about disease management through exclusion (keeping the pathogens away from plants), eradication (reducing pathogen inoculum by cultural, physical, biological and chemical means), immunization (improving resistance), and direct protection (by chemical and biological means). In addition, they will also learn how different disease management strategies can be applied in time and space throughout the growing season of economically important annual and perennial plants following an integrated disease management system.

Learning Outcomes

On the completion of the course, the students will:

1. Learn how a disease-free crop can be obtained by planting disease free seeds and vegetative planting materials.
2. Learn about different cultural, biological, physical and chemical practices necessary for the reduction of pathogen's inoculum in order to reduce yield losses to a minimum level.
3. Be familiar with the strategies necessary for improving plant resistance against the pathogens such as induction of systemic acquired resistance and the use of resistant varieties.
4. Learn about the strategies necessary for protecting a crop if there is an attack of disease during the growing season of that crop.
5. Understand the concept of integrated disease management where all the possible and available resources are used in time and space to safe a crop from pathogens.

	Course Content	Assignments/Readings
Week 1	**Unit-I: THEORY** 1.1 Control methods that exclude the pathogen from the host 1.1.1 Quarantines and inspections 1.1.2 Crop certification 1.1.3 Evasion or avoidance of pathogen 1.1.4 Use of pathogen free propagating material	**1.** Agrios. G.N. 2005. Plant Pathology 5th ed. Academic Press New York. **2.** Internet sources
	Unit-II: PRACTICAL	

	Isolation and identification of fungi associated with rice grains collected from certified and non-certified sources	
Week 2	**Unit-I: THEORY** 2.1 Cultural methods that eradicate or reduce pathogen inoculum 2.1.1 Host eradication 2.1.2 Crop rotation 2.1.3 Sanitation 2.1.4 Creating conditions unfavorable to the pathogen 2.1.5 Polythene trap and mulches	**1.** Agrios. G.N. 2005. Plant Pathology 5th ed. Academic Press New York. **2.** Text book of Introductory Seed Pathology. HEC, Pakistan. **3.** Internet sources
	Unit-II: PRACTICAL Design an experiment to assess the effect of crop rotation on basal rot disease of onion	
Week 3	**Unit-I: THEORY** 3.1 Biological methods that eradicate or reduce pathogen inoculum 3.1.1 Suppressive soils 3.1.2 Control through trap plants 3.1.3 Control through antagonistic plants	**1.** Agrios. G.N. 2005. Plant Pathology 5th ed. Academic Press New York.
	Unit-II: PRACTICAL *In vitro* biocontrol activity of *Trichoderma harzianum* against *Macrophomina phaseolina*	
Week 4	**Unit-I: THEORY** 4.1 Physical methods that eradicate or reduce pathogen inoculum 4.1.1 Soil sterilization by heat 4.1.2 Soil solarization 4.1.3 Hot water treatment 4.1.4 Hot air treatment of storage organs 4.1.5 Control by eliminating certain light wavelengths	**1.** Agrios. G.N. 2005. Plant Pathology 5th ed. Academic Press New York. **2.** Ahmad, I. and A.R. Bhutta. 2005. Textbook of Introductory Plant Pathology. National Book Foundation, Islamabad, Pakistan.

	4.1.6 Drying stored grains and fruits	
	Unit-II: PRACTICAL Effect of hot water treatment of wheat grains on the incidence of smut disease	
Week 5	**Unit-I: THEORY** 5.1 Chemical methods that eradicate or reduce pathogen inoculum 5.1.1 Soil treatment with chemicals 5.1.2 Fumigation 5.1.3 Disinfection of warehouses 5.1.4 Control of insect vectors	Agrios. G.N. 2005. Plant Pathology 5th ed. Academic Press New York.
	Unit-II: PRACTICAL To study the effect of soil solarization on inoculum density of important soil-borne fungal pathogens	
Week 6	**Unit-I: THEORY** 6.1 Disease control by immunizing or improving the resistance of the host plant 6.1.1 Cross protection 6.1.2 Systemic acquired resistance 6.1.3 Plant defense activators 6.1.4 Improving growing conditions of plants 6.1.5 Improving growing conditions of plants	**1.** Agrios. G.N. 2005. Plant Pathology 5th ed. Academic Press New York. **2.** Review articles
	Unit-II: PRACTICAL Evaluation of genotypic resistance in mung bean germplasm against charcoal rot pathogen, *Macrophomina phaseolina*	
Week 7	**Unit-I: THEORY** 7.1 Direct protection of plants from pathogens 7.1.1 Direct protection by biological control 7.1.1.1 Fungal antagonists 7.1.1.2 Bacterial antagonists	**1.** Agrios. G.N. 2005. Plant Pathology 5th ed. Academic Press New York. **2.** Review articles
	Unit-II: PRACTICAL	

	In vitro Chemical Control of Ascochyta rabiei, the cause of chickpea blight	
Week 8	**Unit-I: THEORY** 8.1 Direct protection by chemical means 8.1.1 Foliar sprays and dust 8.1.2 Seed treatment 8.1.3 Soil treatment 8.1.4 Treatment of tree wounds 8.1.5 Control of post-harvest diseases	**1.** Agrios. G.N. 2005. Plant Pathology 5th ed. Academic Press New York. **2.** Parthasarathy, S., P. Lakshmidevi, V.K. Satya and C. Gopalakrishnan. 2024. Plant Pathology and Disease Management: Principles and Practices. CRC Press.
	Unit-II: PRACTICAL *In vivo* efficacy of *Trichoderma* species in controlling collar rot of chickpea under pot conditions	
	Mid-Term Exams	
Week 9	**Unit-I: THEORY** 9.1. Integrated control of plant diseases 9.1.1 Integrated control in a perennial crop	**1.** Agrios. G.N. 2005. Plant Pathology 5th ed. Academic Press New York. **2.** Srivastava, D., R.K. Gaur and A.K. Tiwari. 2024. Plant Diseases and Their Management: A Sustainable Approach. CRC Press.
	Unit-II: PRACTICAL To study the effect of different moisture levels on severity of charcoal rot of sunflower	
Week 10	**Unit-I: THEORY** 10.1 Integrated control in an annual crop	Agrios. G.N. 2005. Plant Pathology 5th ed. Academic Press New York.
	Unit-II: PRACTICAL Effect of *Brassica campestris* cultivation on population dynamics of soil-borne fungi	

Week 11	**Unit-I: THEORY** 11.1 Resistance of pathogens to chemicals 11.2 Restriction on chemical control of plant diseases	**1.** Agrios. G.N. 2005. Plant Pathology 5th ed. Academic Press New York. **2.** Review articles
	Unit-II: PRACTICAL *In vitro* biocontrol efficacy of PGPR against *Macrophomina phaseolina*	
Week 12	**Unit-I: THEORY** 12.1 Seed health certification system 12.1.1 Crop inspection 12.1.2 Seed testing 12.1.2.1 Submission of application for sampling 12.1.2.2 Seed analysis 12.1.2.3 Issuing of seed analysis certificate and temporary labels 12.1.2.4 Seed sampling during processing and issuing of final labels and seals 12.1.2.5 Re-testing of seed lots	Seed registration and certification system in Pakistan. Available at: https://www.seedquest.com/statistics/pdf/Pakistan2003b.pdf
	Unit-II: PRACTICAL Induction of resistance in chili against collar rot disease by PGPR	
Week 13	**Unit-I: THEORY** 13.1 Philosophy of TOF (Training of Facilitators) 13.2 Concept of FFS (Farmer Field School)	Internet sources
	Unit-II: PRACTICAL	
Week 14	**Unit-I: THEORY** 14.1. Epidemiological basis of disease management strategies.	Internet sources
	Unit-II: PRACTICAL Management of black scurf disease of potato by soil amendment with leaves of *Chenopodium album*	
Week 15	**Unit-I: THEORY**	

	15.1 Concept of field biodiversity; conservation and crop appraisal	
	Unit-II: PRACTICAL Use of an antagonistic plant to control nematodes	
Week 16	**Unit-I: THEORY** 16.1 Revision 16.2 Group discussion 16.3 Questioning / answering	
	Unit-II: PRACTICAL Discussion with students regarding problems/confusions related to practicals about plant disease epidemics	
	Final-Term Exams	

Textbooks and Reading Material

Textbooks

1. Agrios. G.N. 2005. Plant Pathology 5th ed. Academic Press New York.
2. Ahmad, I. and A.R. Bhutta. 2005. Textbook of Introductory Plant Pathology. National Book Foundation, Islamabad, Pakistan.
3. Atwal, A.S and G.S. Dhaliwal. 2008. Agricultural Pests of South East Asia and their Management. Kalyani Publishers, Ludhiana. India
4. Bhutta, A.R. 2010. Text book of Introductory Seed Pathology. HEC, Pakistan.
5. Gadewarr, A.V. 2006. Plant Protection in New Millennium. Vol.1. Hardcover Publisher.
6. Helyer, N., K. Brown and N.A. Cattlin. 2003. Biological Control in Plant Protection (A Colour Hand Book). Manson Publication Ltd, London, UK.
7. Narayanasamy, P. 2008. Molecular Biology in Plant Pathogenesis and Disease Management: Disease Management. Volume 3. Springer.
8. Singh, R.S. 2001. Plant Disease Management. Science Pub. Inc. India.
9. Fry, W.E. 2012. Principles of plant disease management. Academic Press.
10. Rai, J.P. 2014. Plant Diseases: Identification and Management (with Illustrations). New India Publishing agency, New Delhi.
11. Parthasarathy, S., P. Lakshmidevi, V.K. Satya and C. Gopalakrishnan. 2024. Plant Pathology and Disease Management: Principles and Practices. CRC Press.
12. Srivastava, D., R.K. Gaur and A.K. Tiwari. 2024. Plant Diseases and Their Management: A Sustainable Approach. CRC Press.

Suggested Readings

1.1. Books

1.2. Journal Articles/ Reports

Teaching Learning Strategies

1. Providing access to various databases, research articles, and presentations related to plant disease management.
2. Organizing visits to farms and fields to learn about different strategies being used to save plants from pests and diseases.
3. Assigning projects to the students to understand how related to plant disease management.
4. Inviting experts from academia and research institutes to learn their experiences and acknowledge regarding latest innovations in plant disease management strategies.

Assignments: Types and Number with Calendar

1. Two assignments will be given to each student, one before midterm exams and the other before final-term exams.
2. Each student will be independently (not in group) assigned topics related to their course contents.

Assessment

Sr. No.	Elements	Weightage	Details
1.	Midterm Assessment	35%	Written Assessment at the mid-point of the semester.
2.	Formative Assessment	25%	Continuous assessment includes: Classroom participation, assignments, presentations, viva voce, attitude and behavior, hands-on-activities, short tests, projects, practical, reflections, readings, quizzes etc.
3.	Final Assessment	40%	Written Examination at the end of the semester. It is mostly in the form of a test, but owing to the nature of the course the teacher may assess their students based on term paper, research proposal development, field work and report writing etc.