Department of Plant Protection

College of Agriculture

University of Salahaddin

Subject: Plant Disease Epidemiology

Course Book – (MSc. And PhD students)

Lecturer's name: Qasim Marzani, PhD

Academic Year: 2020/2021

Course Book

1. Course name	**Plant Disease Epidemiology**
2. Lecturers in charge	**Dr. Qasim Marzani**
3. Department/ College	**Plant Protection/ College of Agricultural Engineering Sciences**
4. Contact	**Dr. Qasim: e-mail: Qasim.marzani@su.edu.krd** **Tel: 07504668898** **07830994022**
5. Time (in hours) per week	**Theory: 2** **Practical: 3**
6. Office hours	**Sunday to Thursday**
7. Course code	
8. Teacher's academic profile	Doctor of Philosophy in Plant Pathology, graduated in the University of Nottingham, England, United Kingdom, 2007 - 2011. Thesis title: Fungicide Resistance And Efficacy for Control Of *Pyrenophora teres* And *Mycosphaerella graminicola* on Barley and Wheat. Supervised by: Dr. Stephen Rossall. My Master is on plant pathology, Salahaddin University, Erbil, Southern Region of Kurdistan, 2000—2003. Thesis title: Epiphytotic and control of chickpea blight caused by *Ascochyta rabiei* in Erbil Province. Supervised by assistant professor Yaqoub Issac Elia. My Bachelor degree is on Agricultural Sciences – Plant Protection, University of Baghdad, Baghdad, Iraq, 1983 – 1990.
9. Keywords	

10. Course overview:

This course will give a comprehensive introduction to disease initiation, development, assessment and epidemiology. The relationship between the amount of diseases and yield losses are also discussed. Disease dynamics and its relation with the change of environmental conditions will be covered. Plant disease predictions would an essential part of the course in which different methods of disease forecasting will be mentioned.

12. Student's obligation

Lectures are the most common method of teaching. It is most important for students to ensure that have a set of good clear notes based on the lectures and student's own reading. Students have to attend every single lecture on time. They are responsible for all explanations and details that will be given by the lecturer and he/she has to write down them in their notebooks. Referring to text books is also required in order to have more details about any subject. Based on time schedule, assignments related to the module, will also be given to the students.

13. Forms of teaching

Use of data show by preparing PowerPoint presentations in which the outlines of each lecture will be shown but the details of the lecture will be narrated by the lecturer himself. The white board is also required for many explanations and illustrations. In some cases, samples will be shown to students to have a close and real idea on the subject. The concentration will be on student-centred learning method instead of lecturer-cantered one.

14. Assessment scheme

Students are evaluated during the semester by preparing an article review on a specific subject related to the module. At the end of the programme, there is a final exam will be taken from all lectures.

15. Course objective

This course will introduce information about the plant disease epidemiology and will display all related things. By the end of the course the postgraduate student will be familiar with disease epidemics, the factors that influence the disease progress, the methods of disease prediction, and the modern technologies that dedicated for plant disease forecasting.

16. Student learning outcome:

Expected outcomes may include:

1. To understand the definition of different terms in the field of plant disease epidemiology
2. To study the methods of plant disease assessments.
3. Learn to know the factors affection disease epidemics.
4. To familiarize with the methods of disease prediction and forecasting.
5. To understand how the epidemic disease will cause the losses to the crops.

16. Course Reading List and References:

Recommended books will be identified at the start of teaching

- Key references:
  1- The Epidemiology of Plant Diseases. Edited by B.M. COOKE, and B. KAYE, Second Edition, 2006.
  2- The Air Spora-A manual for catching and identifying airborne biological particles. By: Maureen E. Lacey and Jonathan S. West. 2006.
  3- Plant Pathology, 5ed. Agrios-chapter 8
- Useful references:
  1. The fifth Kingdom, by Bryce Kendrick, fourth edition, 2017.
  2. Introduction to fungi, by John Webster, 2007.

17. The Topics:	Lecturer's name
Week 1: Disease assessment and yield loss Introduction Disease components Why assess disease and yield loss in plants? Methods used in sampling plants for disease Timing and frequency of disease assessment Methods of disease assessment	Dr. Qasim Marzani

Assessment of yield loss
Conclusions and future developments
Week 2: Surveys of variation in virulence and fungicide resistance and their application to disease control
3.1 Introduction
3.2 Characterising individual pathogens
3.3 Populations and samples
3.4 Molecular detection of virulence and fungicide resistance
3.5 Characterising pathogen populations
3.6 Applications of pathogen survey data
3.7 Dissemination of survey results
3.8 Pathogen surveys and disease management
Week 3: Infection strategies of plant parasitic fungi
4.1 Introduction
4.2 The pre-penetration phase
4.3 Entering the plant tissue
4.4 Strategies for colonizing the host tissue
4.5 Concluding remarks
Week 4: Epidemiological consequences of plant disease resistance 139
5.1 Introduction
5.2 Horizontal resistance
5.3 Vertical resistance
5.4 Cultivar mixtures
5.5 Induced resistance
5.6 Non-host immunity
5.7 Tolerance
Week 5: Dispersal of foliar plant pathogens: mechanisms, gradients and spatial patterns
6.1 Introduction
6.2 Underlying mechanisms: spore dispersal
6.3 Spore deposition and disease gradients
6.4 Disease spread: modelling development of foci
6.5 Conclusions
Week 6: Pathogen population dynamics
7.1 Introduction
7.2 The measurement of populations
7.3 Time-scales
7.4 Changes in populations
7.5 Density-dependent and density independent factors
7.6 Short-term change in a static host population
7.7 Affected host tissue and pathogen multiply at comparable rates
7.8 Changes over time-scales longer than either crop or pathogen lifetime
7.9 Spatial population structure
Week 7: Modelling and interpreting disease progress in time
8.1 Introduction
8.2 General considerations
8.3 Analysing individual epidemics

8.4 Reducing data dimension
8.5 Comparing epidemics
8.6 Concluding remarks
Week 8: Disease forecasting
9.1 Introduction
9.2 What is forecasting?
9.3 Polycyclic and monocyclic diseases
9.4 Equipment
9.5 Forecasting schemes
9.6 Potatoes
9.7 Cereals
9.8 Oilseed rape
9.9 Conclusions
Week 9: Diversification strategies
10.1 Introduction
10.2 Definitions
10.3 Benefits from spacial diversification: small-scale
10.4 Benefits of diversification in time (crop rotation)
10.5 Diversity and interactions
10.6 Responses of pest and pathogen populations to diversification strategies
10.7 Diversification strategies in practice
10.8 Conclusions
Week 10: Epidemiology in sustainable systems
11.1 Introduction
11.2 Inoculum
11.3 Disease development
11.4 Control strategies
11.5 Conclusions
Week 11: New Tools In Epidemiology: Molecular Tools – Gis Remote Sensing – Image Analysis – Information Technology
Information technology in plant disease epidemiology
12.1 Introduction
12.2 Definition of information technology in plant disease epidemiology
12.3 The world according to 'Google'
12.4 Real world data capture
12.5 Information accumulation or dissemination?
12.6 Bringing together disciplines
12.7 Models, expert systems and decision support systems
12.8 Some examples of DSS
12.9 Disease forecasting and decision making in an information theory framework
12.10 Where next?
12.11 Conclusions

Case Examples
Week 12: Seedborne diseases
13.1 Introduction
13.2 Epidemiology
13.3 Case studies

13.4 Future developments References **Week 13: Diseases caused by soil-borne pathogens** 14.1 Introduction 14.2 The soil-borne disease epidemic 14.3 Modelling soil-borne disease epidemiology 14.4 Conclusion **Week 14: Wind-dispersed diseases** 15.1 Introduction 15.2 Meteorological and biotic effects on the phases of the asexual life cycle 15.3 Survival and sexual state 15.4 Population dynamics 15.5 Concluding remarks **Week 15: Environmental biophysics applied to the dispersal of fungal spores by rain-splash** 16.1 Introduction 16.2 Removal of spores by splash of single incident drops 16.3 From a single impacting raindrop to splash droplets 16.4 Influence of target characteristics on splash parameters 16.5 Relevant characteristics of rainfall-canopy interactions 16.6 Characterizing rainfall in relation to splash-dispersed pathogen diseases 16.7 Concluding remarks **17 Potato late blight** 17.1 Introduction 17.2 Population biology of *P. infestans* 17.3 Pathogen biology 17.4 Late blight management 17.5 Concluding remarks **18 Apple scab: role of environment in pathogen and epidemic development** 18.1 Introduction 18.2 Aetiology of apple scab 18.3 Predicting apple scab risk based on the physical environment 18.4 Predicting apple scab risk based on primary inoculum levels 18.5 Summary	
18. Practical Topics (If there is any)	
1-	Dr. Qasim Marzani
19. Peer review	**پێداچوونەوەی هاوەڵ**

I thereby approve that the course is comprehensive and cover all aspects of the course. The subjects are arranged sequentially that enable the students to learn gradually step by step.
Name:

Degree:

Speciality:

Signed:

Date: