Department of Plant protection

College of Agricultural Engineering Sciences

University of Salahaddin

Subject: Advanced biological control

Course Book – Postgraduate (Master)

Lecturer's name: Tavga Sulaiman Rashid, PhD

Academic Year: 2023/2024

Course Book

1. Course name	**Advanced biological control**
2. Lecturer in charge	**Dr. Tavga Sulaiman Rashid**
3. Department/ College	**Plant protection department/ Agriculture college**
4. Contact	**e-mail: tavga2020@yahoo.com, tavga.sulaiman@gmail.com, tavga.rashid@su.edu.krd, Tel: 009647504524781**
5. Time (in hours) per week	**Theory: 2 Practical: 3**
6. Office hours	**Availability of the lecturer to the student during the week**
7. Course code	
8. Teacher's academic profile	**BCs (Bachelor of Science) from Faculty of Agriculture, plant protection department, at Salahaddin University, Erbil, Iraq in July 2004. After obtaining MSc (Master of Science) at the same college in January 2008 in Plant Pathology, I cooperated as a lecture in Agriculture college, Salahaddin University for a period of 4 years. I have received PhD from Faculty of Agriculture, plant protection department in University Putra Malaysia (UPM). https://www.researchgate.net/profile/Tavga_Rashid5**
9. Keywords	**Biological control, plant extracts, beneficial microbes and bio-fertilizer**

10. Course overview:

Plant diseases need to be controlled to maintain the quality and abundance of food, feed, and fiber produced by growers around the world. Beyond good agronomic and horticultural practices, growers often rely heavily on chemical fertilizers and pesticides. Such inputs to agriculture have contributed significantly to the spectacular improvements in crop productivity and quality over the past 100 years. However, the environmental pollution caused by excessive use and misuse of agrochemicals, as well as fear-mongering by some opponents of pesticides, has led to considerable changes in people's attitudes towards the use of pesticides in agriculture. Today, there are strict regulations on chemical pesticide use, and there is political pressure to remove the most hazardous chemicals from the market. Additionally, the spread of plant diseases in natural ecosystems may preclude successful application of chemicals, because of the scale to which such applications might have to be applied.

11. Course objective:

-Understand theory and application of biological control principles.
-Introduce students to the biological control agents used to control plant pathogens.
-Gain a deeper understanding for the history of biological control
-Provide the student with an overview of the field of biological control
-Study the interactions of these biological control agents with their target, host plant, and environment.
-Discuses the feasibility of utilization these control agents in a real and practical way.
-Explore how biological control fits into integrated pest management and sustainable

agriculture systems.

12. Student's obligation

Students are responsible and required to attend every lecture on time and they have to be ready for the daily quizzes and follow the lecture. They are responsible for the explanations and all details that given during the lecture and write down them in their notebook.

13. Forms of teaching

The lecturer will uses data show by preparing PowerPoint presentations in which outlines of each lecture will be shown however the details of the lecture will be narrated by the lecturer herself. In some cases, samples will be shown to students to have a close and real idea on the subject.

14. Assessment scheme

15. Student learning outcome:

- On successful completion of this module, students should be able to:
-Explain the history, theory, practice and science of biological control.
-Evaluate scientific studies and concepts related to biological control.
-Asses the current and future roles of biological control within context of agricultural and natural ecosystem.
-Apply ecological principles of biological control and methods used in biological control of plant pathogens.
-Design and implement projects involving biological control agents and methods.

16. Course Reading List and References:

▪ Key references:

Baker, K. F., & Cook, R. J. (2004). *Biological control of plant pathogens*. WH Freeman and Company..

Cook, R. James, and Kenneth Frank Baker. *The nature and practice of biological control of plant pathogens*. American Phytopathological Society, 1983.

Wilson, M., & Backman, P. A. (1999). Biological control of plant pathogens. *Handbook of pest management*, 309-335.

Madigan, M. T., Martinko, J. M., & Parker, J. (2017). *Brock biology of microorganisms* (Vol. 13). Pearson.

Berg, G., Köberl, M., Rybakova, D., Müller, H., Grosch, R., & Smalla, K. (2023). Plant microbial diversity is suggested as the key to future biocontrol and health trends. *FEMS microbiology ecology*, *93*(5).

17. The Topics:	**Lecturer's name**
1. Introduction to Biological control **Botanical Biological control** Chemical composition and mode of action of plant products Current aspects of commercially available natural products Major Groups of Plant Secondary Metabolites **2. Plants Secondary Metabolites Extraction Methods** Non-conventional extraction techniques	Dr. Tavga Sulaiman (2 hrs)

- Accelerated solvent extraction
- Supercritical fluid extraction
- Microwave assisted extraction (MAE)
- Ultrasound-assisted extraction (UAE)
- Subcritical water extraction (SWE)

3. Use of Plants Extracts and Secondary Metabolites in Controlling Crop Health And Diseases

- Plants extracts as antifungal agents
- Pesticides and insecticides from plants extracts
- Plant extracts as bio-stimulants for plants growth

4. Beneficial Microorganisms

- Beneficial plant–microbe interactions
- Detection of beneficial microbes (isolation and identification)

5. Plant Growth-Promoting Rhizobacteria (PGPR) Nitrogen-fixing symbioses

- Legume–rhizobia symbiosis
- Genetic programs for the nodule development
- Plant control over nodule development
- Bacterial genes for host-specific nodulation

6. The Role of (PGPR) in Modifying Root and Shoot Development

- Auxins and Cytokinins
- Effect of PGPR on Primary Root Development
- Effect of PGPR on Lateral Root Development

7. Metabolic integration (Oxygen regulation, C- and N-metabolism, Genetic regulation)

8. Plant Growth-Promoting Rhizobacteria (PGPR) Improving yield production

- Gibberellins
- The involvement of gibberellin produced by bacteria in plant growth and yield promotion

9. Epiphytic strategy and Endophytic strategy in plant growth-promoting rhizobacteria

10. Mycorrhizae

11. Beneficial Bacteria

12. Beneficial Fungi

13. Beneficial Cyanobacterium

14. Pesticide Discovery (Metabolism and phyto-compounds, TLC, GCMS,LCMS,HPLC) **15. Formulation**	
18. Practical Topics	
Isolation and identification of endophytic and epiphytic beneficial fungi and bacteria from soil, root, leaf and stem. Test beneficial bacteria against phyto-pathogens.	Dr. Tavga S. Rashid (3hrs)
19. Examinations:	
20. Extra notes: Here the lecturer shall write any note or comment that is not covered in this template and he/she wishes to enrich the course book with his/her valuable remarks.	
21. Peer review **پێداچوونەوەی هاوەڵ** I approve that the course is comprehensive and cover all the aspects of the course. Name: Degree: Specialty: Sign: Date:	