**UNIVERSITY OF SARGODHA**

**DEPARTMENT OF PLANT PATHOLOGY, COLLEGE OF AGRICULTURE**

COURSE OUTLINE **Spring 2020**

Course Title: Pesticides their application and action

Course Code: PP-406

Credit Hours: 3(2-1)

Instructor: Dr. Muhammad Usman Ghazanfar

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| **DESCRIPTION AND OBJECTIVES** |

Significant changes has occurred in the world of crop protection in general and in fungicides in particular. The most significant of these changes is the growth in demand for food crops. The world’s population has risen from about 6 billion to 7 billion in that period. Many people eat more meat than before and hence the demand for grain is growing even faster than the population. Fungicide utilization has grown significantly in the last decades. In 1998, fungicide use was dominated by Europe and Japan but is now much more widespread. While many of the fungicide classes in use in 1998 are still providing good value, several new classes, especially the quinone outside inhibitor (QoI) and succinate dehydrogenase inhibitor (SDHI) groups, have been introduced. There is a strong pipeline of new compounds especially to combat *Oomycota* and powdery mildews. The underlying sciences have advanced in important ways. We now have a firm understanding of the evolution of the major groups of target organisms. *Oomycota* have been clearly differentiated from the true *Fungi* and we no longer talk about *Deuteromycota* or the *Fungi Imperfecti*.

This course is taught with the objectives to acquaint the students with the chemicals available for the control of diseases and insect pests. They also learn the new groups of chemicals available in the market, the applications equipment for their application, resistance management against these chemicals.

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| **INTENDED LEARNING OUTCOMES** |

After successful completion of this course the students will be able to:

* Understand the available chemicals for the management of diseases and insect pests
* Their mode of action, host specificity, new group of chemicals, resistance management
* Application equipment for the applications against different target crops
* Chemical poisoning and first aid for pesticide poisoning during their application

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| **COURSE CONTENTS** |

Theory

Introduction and history of pesticides; major groups of pesticides and their classification; formulation and mode of action; residues, resistance and phytotoxicity problems of pesticides (fungicides, bactericides, and nematicides etc.); equipments and different methods of application; FAO code of conduct for pesticide use and handling (codex alementerious; pesticide regulation, registration and distribution in Pakistan; major hazards of pesticides and their safety measures; pesticides compatibility and selectivity; pre-harvest safety intervals.

Practical

Demonstration of different groups of pesticides used to control plant diseases; preparation, formulation and doses; use of various equipments and calibration and measurement of droplet size; *In vitro* comparison of systemic and protectant pesticides; visits to pesticides testing labs and warehouses; protective measures and first aid.

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| **READINGS** |

1 Biddle, A. 2001. Seed Treatment, Challenges and Opportunities. The BCPC Publications, UK.

2. Harris, J. 2000. Chemical Pesticide Markets, Health Risks and Residues. CABI, UK.

3. Jorgen, S. 2004. Chemical Pesticide. Mode of Action and Toxicology. CRC Press, London.

4. Mathews, G.A. and M.A. Meladen. 2000. Pesticides Application Methods. 3rd ed. Blackwell Science Publication, New York.

5. Parmar, B.S. and S.S. Tomar. 2003. Pesticides Formulation. Theory and Practices. CBS Publ. Co. India.

6. Robert, T. 2000. Metabolism of Agro-chemicals in Plants. John Willey & Sons. USA.

7. Thompson, W.T. 1993. Agricultural Chemicals. Book IV. Fungicide. California, USA.

8. Tomlin, C. 2003. The Pesticide Manual. 13th Edition. BCPC – UK.

9. R.P. Oliver and H.G. Hewitt 2014. Fungicides in Crop Protection. CABI, Nosworthy Way Wallingford Oxfordshire, OX10 8DE, UK.

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| **COURSE SCHEDULE** |
| **Week** | **Topics and Readings** | **Books with Page No.** |
| 1 | Introduction about chemicals used as pesticides, Nomenclature, definitions, and terminology Toxicology, ecotoxicology, and environmental toxicology Pesticides, biocides, common names, chemical names, and trade names Chemical structures are versatile | R.P. Oliver and H.G. Hewitt 2014. Fungicides in Crop Protection, Jorgen, S. 2004. Chemical Pesticide. Mode of Action and Toxicology |
| 2 | Chemical control in integrated pest management | Mathews, G.A. and M.A. Meladen. 2000. Pesticides Application MethodsPg. 1-23 |
| 3 | Targets for pesticide deposition, Pesticides interfering with processes important to all organisms | Mathews, G.A. and M.A. Meladen. 2000. Pesticides Application MethodsPg. 23-63, Jorgen, S. 2004. Chemical Pesticide. Mode of Action and Toxicology |
| 4 | The Fungicides Market, Fungicide Discovery | R.P. Oliver and H.G. Hewitt 2014. Fungicides in Crop Protection, Pg. 21-38 |
| 5 | Fungicide Performance | R.P. Oliver and H.G. Hewitt 2014. Fungicides in Crop Protection, Pg. 38-123 |
| 6 | Fungicide Resistance | R.P. Oliver and H.G. Hewitt 2014. Fungicides in Crop Protection, Pg. 38-123 |
| 7 | Strategy and Tactics in the use of fungicides | R.P. Oliver and H.G. Hewitt 2014. Fungicides in Crop Protection, Pg. 123-150 |
| 8 | Mode of action of pesticides | Jorgen, S. 2004. Chemical Pesticide. Mode of Action and ToxicologyPg. 35-64 |
| 9 | Mid |  |
| 10 | Formulation of pesticides, Spray droplets, Hydraulic nozzles  | Mathews, G.A. and M.A. Meladen. 2000. Pesticides Application MethodsPg. 63-159 |
| 11 | Manually carried hydraulic sprayers, Power-operated hydraulic sprayers  | Mathews, G.A. and M.A. Meladen. 2000. Pesticides Application MethodsPg. 159-215 |
| 12 | Air-assisted sprayers, Controlled droplet application | Mathews, G.A. and M.A. Meladen. 2000. Pesticides Application MethodsPg. 215-275 |
| 13 | Electrostatically charged sprays, Aerial application, Spray drift, 275-337 | Mathews, G.A. and M.A. Meladen. 2000. Pesticides Application MethodsPg. 299-33 |
| 14 | Application of biopesticides, Maintenance of equipment, Safety precautions | Mathews, G.A. and M.A. Meladen. 2000. Pesticides Application MethodsPg. 411-44 |
| 15 | Legislation and Regulation | R.P. Oliver and H.G. Hewitt 2014. Fungicides in Crop ProtectionPg. 162-177 |
| 16 | The Future Prospects for Fungicides and Fungal Disease Control | R.P. Oliver and H.G. Hewitt 2014. Fungicides in Crop ProtectionPg. 177-183 |

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| **RESEARCH PROJECT/PRACTICAL/LABS/ASSIGNMENTS** |

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| Week | Contents to be covered | Books/Journals | Chapter/Pages |
| 1 | Demonstration of different groups of pesticides | Handouts |  |
| 2 | Available chemicals for disease and insect pest | Handouts |  |
| 3 | Collection of pesticides available in market | Handouts |  |
| 4 | Preparation of formulation | Handouts |  |
| 5 | Calibration of doses of chemicals | Handouts |  |
| 6 | Application equipment | Handouts |  |
| 7 | Different types of sprayers | Handouts |  |
| 8 | Maintenance of equipment | Handouts |  |
| 9 | Mid |  |  |
| 10 | Nozzles and their use | Handouts |  |
| 11 | Application of biopesticides | Handouts |  |
| 12 | Selection of application equipment for chemical and biological pesticides | Handouts |  |
| 13 | *In vitro* comparison of systemic and protectant pesticides | Handouts |  |
| 14 | *In vitro* comparison of systemic and protectant pesticides | Handouts |  |
| 15 | Visits to pesticides testing labs and warehouses | Handouts |  |
| 16 | protective measures and first aid | Handouts |  |

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| **ASSESSMENT CRITERIA** |

Sessional: 04

Project: 02

Presentation: 01

Participation: 01

Mid: 12

Final Exam: 20

Practical: 20