ST. JOSEPH’S COLLEGE FOR WOMEN (AUTONOMOUS) VISAKHAPATNAM

III SEMESTER **AGRICULTURE AND RURAL DEVELOPMENT** Time: 3hrs/week

PATH271(2) **FUNDAMENTALS OF PLANT PATHOLOGY-II** Marks: 100

w.e.f AJ 2022-2023

**Objectives**

* To study about Pathogenesis
* To study about living entities that cause diseases in plants
* To study about mechanism by which the diseases causing agents
* To prevent and control of plant disease of economic importance

**Course Outcomes**

At the end of the course, students will be able to

**CO1:** Explain the history, concepts, patterns of survival and dispersal of plant pathogens.

**CO2:** Outline the phenomenon of infections and pathogenesis.

**CO3:** Summarize the principles of plant disease management and different defence mechanisms.

**CO4:** Explain methods of eradication for phytopathogens

**THEORY**

**UNIT-I: (4hrs)**

1. History of Plant Pathology with special reference to Indian work- contributions of Anton de Bary, Woronin, Oscar Brefeld, Marshal Ward, Millardet, Butler, Mundkur, Stakman, Dastur, Mehta, Sadasivan.

2. Terms and concepts used in plant Pathology - disease - disorder - pathogen - parasite - pathogenicity - pathogenesis - sign - symptom - syndrome - biotroph - hemibiotroph - perthotroph (necrotroph) - inoculum - inoculum potential - infection - incubation period - predisposition - hypersensitivity - epidemic - endemic and sporadic diseases.

3. Survival of plant pathogens - kinds of inoculum - primary and secondary inoculum - pattern of survival - infected host (main host, alternate host and collateral host) - saprophytic survival outside the host (soil, root inhabitants and rhizosphere colonizers) dormant spores or structures (seed borne, soil borne and on infected plant parts).

4. Dispersal of plant pathogens - active dispersal - seed, soil and plant parts, passive dispersal - air, water, members of animal kingdom (agents with examples), fungi and phanerogamic parasites.

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**UNIT-II: (3)**

1. Phenomenon of infection - process of infection - pre-penetration, penetration and post-penetration. Pre-penetration in fungi (spore germination, germ tube growth, formation of specialized structures like appressorium and rhizomorphs), bacteria and virus. Penetration - indirect penetration through wounds or natural openings like stomata, hydathodes and lenticels - direct penetration through plant surface (cutinized and non cutinized surfaces) by chemical or mechanical methods.Post penetration - colonization of the host.

2. Pathogenesis - role of enzymes, toxins, growth regulators and polysaccharides in plant diseases with examples. Enzymes - cutinases, pectinases, cellulases, lignases, proteases and lipases.

3. Toxins - pathotoxins, phytotoxins and vivotoxins - selective (host specific) and non-selective (host non-specific) toxins. Growth regulators - growth promoting substances (auxins, gibberellins and cytokinins) and growth inhibiting substances and polysaccharides.

**UNIT-III: (2)**

1. Defense mechanisms in plants - pre-existing structural defense mechanisms - waxes, thick cuticle and epidermal cell wall - structure of natural openings, internal structural barriers – postinfectional structural defense - histological defense (cork layer, abscission layer, tyloses and gum deposition) and cellular defense (hyphal sheathing) structures.

2. Biochemical defense mechanisms - pre-existing biochemical defense mechanisms - inhibitors released by the plant in its environment (protocatechuic acid and catechol) and inhibitors present in the plant cell (phenolic compounds - chlorogenic acid) – post infectionaldefense mechanisms - phytoalexins, hypersensitive reaction - defense through plantibodies.

3. General principles of plant disease management - importance - general principles - avoidance of the pathogen (selection of pathogen free propagating material and seed, selection of field, choice of time of sowing and disease escaping varieties), - exclusion - plant quarantine and inspection, quarantine rules and regulations.

**UNIT-IV: (3hrs)**

1. Eradication - cultural methods of eradication (rouging, eradication of alternate and collateral host, crop rotation, manure and fertilizer management, mixed cropping, sanitation, summer ploughing, soil amendments, time of sowing, seed rate and plant density, irrigation and drainage).

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2. Physical methods of eradication- solarization and hot water treatment; Biological methods - role of biological control - mechanisms - competition, antibiosis, hyperparasitism, Systemic Acquired Resistance (SAR) and Induced Systemic Resistance (ISR).

3. Important fungal and bacterial biocontrol agents (Trichodermaspp, Psuedomonasfluorescens, Bacillus subtilis and Ampelomycesquisqualis) - Plant Growth Promoting Rhizobacteria (PGPR) against phytopathogens.

**UNIT-V: (3hrs)**

1. Contact and systemic fungicides against lower fungi, downy mildews, powdery mildews, rusts, smuts, coloured fungi, leaf spots and blights. Chemicals for soil drenching.

2. Mode of action and Formulations of fungicides, Antibiotics and their formulations.

3. Introduction to botanicals and other non-chemical preparations used in the disease management in organic and natural farming systems.

**References text books :**

1. Agrios, G.N. 2005.Plant Pathology. Elsevier Academic Press, New York.
2. Chaube, H.S. and Ramji Singh. 2001. Introductory Plant Pathology. International Book Distribution Co., Lucknow. 136
3. Mehrotra, R.S. 1980. Plant Pathology. Tata McGraw-Hill Publishing Co. Ltd., NewDelhi.
4. Singh, R.S. 2002. Introduction to Principles of Plant Pathology. Oxford & IBH Publ. Co.Pvt. Ltd., New Delhi.
5. Vidyasekharan, P. 1993. Principles of Plant Pathology. CBS Publishers and Distributors,New Delhi.

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