SunRise University

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Scheme
For Two-year Course in
M.Sc. (Agriculture)
Plant Pathology

2023-2024

SCHOOL OF AGRICULTURE

SUNRISE UNIVERSITY - ALWAR

SUNRISE UNIVERSITY – ALWAR

Campus: Bagad Rajput, Ramgarh, Alwar, Rajasthan 301028

M.Sc(Agriculture) Plant Pathology
Ist Semester (Session - 2023-2024)

Course No.	Course Title	Credit Hours		Maximum Marks				
		T	P	Theory			Practical	G. Total
				Mid Term	Internal Assessment	External Theory		
PPATH-511	MYCOLOGY	2	1	20	-	50	30	100
PPATH-512	DETECTION AND DIAGNOSIS OF PLANT DISEASES	0	3	20	-	-	80	100
PPATH-513	PRINCIPLES OF PLANT PATHOLOGY	3	0	20	-	80	-	100
PPATH-514	FUNDAMENTALS OF MICROBIOLOGY	2	1	20	-	50	30	100
	Total	7	5	-	-	-	-	400

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PPATH- 511 Mycology 3(2+1)

Objective
To study the nomenclature, classification and characters of fungi.
Theory
UNIT I
Introduction, definition of different terms, basic concepts.
UNIT II
Importance of mycology in agriculture, relation of fungi to human affairs, history of mycology.
UNIT III
Concepts of nomenclature and classification, fungal biodiversity, reproduction in fungi.
UNIT IV
The comparative morphology, ultrastructure, characters of different groups of fungi up to generic level: (a) Myxomycota and (b) Eumycota- i) Mastigomycotina ii) Zygomycotina, iii)Ascomycotina, iv) Basidiomycotina, v) Deuteromycotina. Lichens types and importance, fungal genetics and variability in fungi.
Practical
Detailed comparative study of different groups of fungi; collection, identification and preservation of specimens. Isolation and identification of plant pathogenic fungi.
Suggested Readings
Ainsworth GC, Sparrow FK & Susman HS. 1973. The Fungi – AnAdvanced Treatise. Vol. IV (A & B). Academic Press, New York.
Alexopoulos CJ, Mims CW & Blackwell M.2000. Introductory Mycology.5th Ed. John Wiley & Sons, New York.
Mehrotra RS & Arneja KR. 1990. An Introductory Mycology. WileyEastern, New Delhi.
Sarbhoy AK. 2000. Text book of Mycology. ICAR, New Delhi.
Singh RS. 1982. Plant Pathogens – The Fungi. Oxford & IBH, New Delhi.
Webster J. 1980. Introduction to Fungi. 2nd Ed. Cambridge Univ. Press, Cambridge, New York.

PPATH-512 Detection and Diagnosis of Plant Diseases 3(0+3)

Objective
To impart training on various methods/techniques/instruments used in the study of plant diseases/pathogens.
Practical
UNIT I
Methods to prove Koch's postulates with biotroph and necrotroph pathogens, pure culture techniques, use of selective media to isolate pathogens.

UNIT II
Preservation of plant pathogens and disease specimens, use of centrifuge, pH meter, micrometer, haemocytometer, camera lucida.
UNIT III

Microscopic techniques and staining methods, phase contrast system, chromatography, use of electron microscope, spectrophotometer, ultracentrifuge and electrophoretic apparatus, disease diagnostics, serological and molecular techniques for detection of plant pathogens. Evaluation of fungicides, bactericides etc.; field experiments, data collection and preparation of manuscripts.

Suggested Readings

Baudoin ABAM, Hooper G R, Mathre D E & Carroll R B. 1990. Laboratory Exercises in Plant Pathology: An Instructional Kit. Scientific Publ., Jodhpur.
Dhingra O D & Sinclair J B. 1986. Basic Plant Pathology Methods. CRC Press, London, Tokyo.
Fox R T V. 1993. Principles of Diagnostic Techniques in Plant Pathology. CABI Wallington.
Mathews R E F. 1993. Diagnosis of Plant Virus Diseases. CRC Press, Boca Raton, Tokyo.
Pathak V N. 1984. Laboratory Manual of Plant Pathology. Oxford & IBH, New Delhi.
Forster D & Taylor SC. 1998. Plant Virology Protocols: From Virus Isolation to Transgenic Resistance. Methods in Molecular Biology. Humana Press, Totowa, New Jersey.
Matthews R E F. 1993. Diagnosis of Plant Virus Diseases. CRC Press, Florida.
Noordam D. 1973. Identification of Plant Viruses, Methods and Experiments. Cent. Agic. Pub. Doc. Wageningen.
Trigiano R N, Windham M T & Windham A S. 2004. Plant Pathology- Concepts and Laboratory Exercises. CRC Press, Florida.
Chakravarti B P. 2005. Methods of Bacterial Plant Pathology. Agrotech, Udaipur.

PPATH -513 Principles of Plant Pathology 3(3+0)

Objective
To introduce the subject of Plant Pathology, its concepts and principles.

Theory
UNIT I
Importance, definitions and concepts of plant diseases, history and growth of plant pathology, biotic and abiotic causes of plant diseases.
UNIT II
Growth, reproduction, survival and dispersal of important plant pathogens, role of environment and host nutrition on disease development.
Unit III
Host parasite interaction, recognition concept and infection, symptomatology, disease development- role of enzymes, toxins, growth regulators; defense strategies- oxidative burst; Phenolics, Phytoalexins, PR proteins, Elicitors. Altered plant metabolism as affected by plant pathogens.
UNIT IV
Genetics of resistance; 'R' genes; mechanism of genetic variation in pathogens; molecular basis for resistance; marker-assisted selection; genetic engineering for disease resistance.

UNIT V
Disease management strategies.

Suggested Readings

Agrios GN. 2005. Plant Pathology. 5th Ed. Academic Press, New York.

Heitefuss R & Williams PH. 1976. Physiological Plant Pathology. Springer Verlag, Berlin, New York.
Mehrotra RS & Aggarwal A. 2003. Plant Pathology. 2nd Ed. Oxford & IBH, New Delhi.
Singh RS. 2002. Introduction to Principles of Plant Pathology. Oxford & IBH, New Delhi.
Singh DP & Singh A. 2007. Disease and Insect Resistance in Plants Oxford & IBH, New Delhi.
Upadhyay RK & Mukherjee KG. 1997. Toxins in Plant Disease Development and Evolving Biotechnology. Oxford & IBH, New Delhi.

PATH-514 Fundamentals of Microbiology 3(2+1)

Objective

To acquaint the students with the basic aspects of microbes and their use in agriculture.

Theory

UNIT I
Scope of Microbiology: groups of microorganisms, distribution of microbes in nature; major fields of microbiology. Concepts of origin of life. History of microbiology-important events in the development of microbiology; Contribution of Leeuwenhoek, Robert Koch, Louis Pasteur, Alexander Flaming and others.
UNIT II
Microscopy: light microscope, phase contrast microscope, electron microscope. Microbial taxonomy: classification system, numerical taxonomy, major characteristics used in taxonomy, kingdom of microorganisms.
UNIT III
Prokaryotic and eukaryotic cell structure and function, microbial nutrition: common nutrient requirement, nutritional types of microorganisms. Growth of microorganisms: growth curve, influence of environmental factors on growth. Viruses: general structure, multiplication and taxonomy.
UNIT IV
Biogeochemical cycling: carbon cycle, nitrogen cycle and sulfur cycle; application of microorganisms in agriculture: biofertilizers and biopesticides.
UNIT V
Industrial microbiology: microbial growth process, culture, medium and growth conditions, strain selection, microbial products.
UNIT VI
Immunology: antigen-antibody reactions, agglutinations, complement fixation, ELISA, immunoprecipitation, serotyping.
UNIT VII
Microbial genetics: genetics of bacteria: transformation, transduction, conjugation, mutation, detection and isolation of mutants, plasmid types and their importance; genetics of fungi.

Practical

Sterilization of glasswares and media. Preparation of culture media; liquid, solid and selective media for growth of microorganisms. Purification and maintenance of microbial culture by pour plate, spread and streak methods. Determination of generation time and growth curve for microorganisms. Determination of carbon and nitrogen requirement for microbial growth. Biochemical tests: Assay of production of amylase, cellulose and pectolytic enzymes by microorganism. Staining techniques for identification of microbes: simple staining, differential staining and capsule staining.

Suggested readings

Atlas, R.M. 1995. Laboratory manual of experimental microbiology. Mosby year book, Inc. Missouri.

Pelczar Jr., M. J., Chan, E.C.S. and Noel, R. K.1993. Tata McGraw -Hill McGraw-Hill Publishing Company Limited, New Delhi.

Sullia, S. B. and Santharam, 1998. General Microbiology. Oxford and IBH.

M.Sc(Agriculture) Plant Pathology
IInd Semester (Session - 2023-2024)

Course No	Course Title	Credit Hours		Maximum Marks				
		T	P	Theory			Practical	G. Total
				Mid Term	Internal Assessment	External Theory		
PPATH-521	DISEASES OF FRUITS, PLANTATION AND ORNAMENTAL CROPS	2	1	20	-	50	30	100
PPATH- 522	PLANT BACTERIOLOGY	2	1	20	-	50	30	100
PPATH- 523	DISEASES OF VEGETABLE AND SPICES CROPS	2	1	20	-	50	30	100
PPATH- 524	SEED HEALTH TECHNOLOGY	2	1	20	-	50	30	100
PPATH- 525	CHEMICALS IN PLANT DISEASE MANAGEMENT	2	1	20	-	50	30	100
PPATH-526	ECOLOGY OF SOIL-BORNE PLANT PATHOGENS	2	1	20	-	50	30	100
PPATH-527	DISEASE RESISTANCE IN PLANTS	3	0	20	-	80	-	100
PPATH-528	BIOLOGICAL CONTROL OF PLANT DISEASES	2	1	20	-	50	30	100
PPATH-529	INTEGRATED DISEASE MANAGEMENT	2	1	20	-	50	30	100
	Total	19	8	-	-	-	-	900

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P PATH -521 Diseases of Fruits, Plantation and Ornamental Crops 3(2+1)

Objective

To acquaint with diseases of fruits, plantation, ornamental plants caused by fungal, bacterial and viral diseases and their management.

Theory

UNIT I

Introduction, symptoms and etiology of different fruit diseases.Factors affecting disease development in fruits like apple, pear, peach, plum, apricot, cherry, walnut, almond, strawberry, citrus, mango, grapes, guava, *ber,* banana, pineapple, papaya, fig, pomegranate, date palm and management of the fruits diseases.

UNIT II

Symptoms, mode of perpetuation of diseases of plantation crops such as tea, coffee, rubber and coconut and their management.

UNIT III

Symptoms and life cycle of pathogens. Factors affecting disease development of ornamental plants such as roses, gladiolus, tulip, carnation, orchids, marigold, chrysanthemum and their management.

Practical

Detailed study of symptoms and host parasite relationship of representative diseases of plantation crops. Collection and dry preservation of diseased specimens of important crops.

Suggested Readings

Gupta V K &.Sharma S K. 2000. *Diseases of Fruit Crops*. Kalyani Publ., NDelhi.

Pathak V N. 1980. *Diseases of Fruit Crops*. Oxford & IBH, New Delhi

Singh R S. 2000. *Diseases of Fruit Crops*. Oxford & IBH,NewDelhi.

Thind, T. S 2001. *Diseases of Fruits and vegetables and Their management. Kalyani Publishers,Ludhiana.*

Walker J C. 2004. *Diseases of Vegetable Crops*. TTPP, India.

P PATH -522 Plant Bacteriology 3(2+1)

Objective

To acquaint with plant pathogenic prokaryote (procarya) and their structure, nutritional requirements, survival and dissemination.

Theory

UNIT I

History and introduction to phytopathogenic procarya, viz., bacteria, MLOs, spiroplasmas and other fastidious procarya. Importance of phytopathogenic bacteria.
UNIT II
Evolution, classification and nomenclature of phytopathogenic procarya and list of important diseases caused by them.
UNIT III
Growth, nutrition requirements, reproduction, preservation of bacterial cultures and variability among phytopathogenic procarya.
UNIT IV
General biology of bacteriophages, L form bacteria, plasmids and bdellovibrios.
UNIT V
Procaryotic inhibitors and their mode of action against phytopathogenic bacteria.
UNIT VI
Survival and dissemination of phytopathogenic bacteria.
Practical
Isolation, purification, identification and host inoculation of phytopathogenic bacteria, staining methods, biochemical and serological characterization, isolation of plasmid and use of antibacterial chemicals/antibiotics.
Suggested Readings
Goto M. 1990. *Fundamentals of Plant Bacteriology*. Academic Press, NewYork.
Jayaraman J & Verma JP. 2002. *Fundamentals of Plant Bacteriology*. Kalyani Publ., Ludhiana.
Mount MS & Lacy GH. 1982. *Phytopathogenic Prokaryotes*. Vols. I, II. Academic Press, New York.
Verma JP, Varma A & Kumar D. (Eds). 1995. *Detection of Plant pathogens and their Management*. Angkor Publ., New Delhi.
Verma JP. 1998. *The Bacteria*. Malhotra Publ. House, New Delhi.

P PATH -523 Diseases of Vegetables and Spices Crops 3(2+1)

Objective
To impart knowledge about symptoms, epidemiology of different diseases of vegetables and spices caused by fungal, bacterial and viral diseases and their management.
Theory
UNIT I
Nature, prevalence, factors affecting disease development of bulb, leafy vegetable, crucifers, cucurbits and solanaceaous vegetables. Diseases of protected cultivation.
UNIT II
Symptoms and management of diseases of different root, bulb, leafy vegetables, crucifers, cucurbits and solanaceaous vegetable crops.
UNIT III
Symptoms, epidemiology and management of diseases of different spice crops such as black pepper, saffron, cumin, coriander, turmeric, fennel, fenugreek and ginger.
Practical
Detailed study of symptoms and host pathogen interaction of important diseases of vegetable and spice crops.
Suggested Readings

Chaube HS, Singh US, Mukhopadhyay AN & Kumar J. 1992. *Plant Diseases of International Importance*.Vol.II. *Diseases of Vegetable and Oilseed Crops*. Prentice Hall, Englewood Cliffs, New Jersey.
Godara,S,l,Kapoor,BBS and Rathore,B.S.2010. Madhu Publications,Bikaner-3,India.
Gupta VK & Paul YS. 2001. *Diseases of Vegetable Crops*. Kalyani Publ., New Delhi
Sherf AF & Mcnab AA. 1986. *Vegetable Diseases and their Control*.Wiley InterScience, Columbia.
Singh RS. 1999. *Diseases of Vegetable Crops*. Oxford & IBH, New Delhi.
Gupta SK & Thind TS. 2006. *Disease Problem in Vegetable Production*.Scientific Publ., Jodhpur.6
Walker JC. 1952. *Diseases of Vegetable Crops*. McGraw-Hill, New York.

PPATH -524 Seed Health Technology 3(2+1)

Objective
To acquaint with seed-borne diseases, their nature, detection, transmission, epidemiology, impacts/loses and management.

Theory
UNIT I
History and economic importance of seed pathology in seed industry, plant quarantine and SPS under WTO. Morphology and anatomy of typical monocotyledonous and dicotyledonous infected seeds.
UNIT II
Recent advances in the establishment and subsequent cause of disease development in seed and seedling. Localization and mechanism of seed transmission in relation to seed infection, seed to plant transmission of pathogens.
UNIT III
Seed certification and tolerance limits, types of losses caused by seed-borne diseases in true and vegetatively propagated seeds, evolutionary adaptations of crop plants to defend seed invasion by seed-borne pathogens. Epidemiological factors influencing the transmission of seed-borne diseases, forecasting of epidemics through seed-borne infection.
UNIT IV
Production of toxic metabolites affecting seed quality and its impact on human, animal and plant health, management of seed-borne pathogen/diseases and procedure for healthy seed production, seed health testing, methods for detecting microorganism.

Practical
Conventional and advanced techniques in the detection and identification of seed-borne fungi, bacteria and viruses. Relationship between seed-borne infection and expression of the disease in the field.

Suggested Readings
Agarwal VK & JB Sinclair. 1993. *Principles of Seed Pathology*. Vols. I & II, CBS Publ., New Delhi.
Hutchins JD & Reeves JE. (Eds.). 1997. *Seed Health Testing: Progress Towards the 21st Century*. CABI, Wallington.
Paul Neergaard. 1988. *Seed Pathology*. MacMillan, London.
Suryanarayana D. 1978. *Seed Pathology*. Vikash Publ., New Delhi.

PPATH -525 Chemicals in Plant Disease Management 3(2+1)

Objective
To impart knowledge on the concepts, principles and judicious use of chemicals in plant disease management.

Theory
UNIT I
History and development of chemicals; definition of pesticides and related terms; advantages and disadvantages of chemicals.
UNIT II
Classification of chemicals used in plant disease control and their characteristics.
UNIT III
Chemicals in plant disease control, viz., fungicides,bactericides, nematicides, antiviral chemicals and botanicals.
UNIT IV
Formulations, mode of action and application of different fungicides;chemotherapy and phytotoxicity of fungicides.
UNIT V
Handling, storage and precautions to be taken while using fungicides; compatibility with other agrochemicals, persistence, cost-benefit ratio, factor affecting fungicides.
UNIT VI
General account of plant protection appliances; environmental pollution, residues and health hazards, fungicidal resistance in plant pathogens and its management.

Practical
Acquaintance with formulation of different fungicides and plant protection appliances. Formulation of fungicides, bactericides and nematicides; *in vitro* evaluation techniques, preparation of different concentrations of chemicals including botanical pesticides based on active ingredients against pathogens; persistence, compatibility with other agro-chemicals; detection of naturally occurring fungicide resistant mutants of pathogen; methods of application of chemicals.

Suggested Readings
Bindra OS & Singh H.1977. *Pesticides - An Application Equipment*. Oxford & IBH, N. Delhi.
Nene YL & Thapliyal PN. 1993. *Fungicides in Plant Disease Control.* 3rd ed. Oxford & IBH, New Delhi.
Torgeson DC (Ed.). 1969. *Fungicides*.Vol. II. *An Advanced Treatise*.Academic Press, NY.
Vyas SC.1993. *Handbook of Systemic Fungicides* Vols. I-III. Tata McGraw Hill, N. Delhi.

PPATH 526 Ecology of Soil-Borne Plant Pathogens 3(2+1)

Objective
To provide knowledge on soil-plant disease relationship.

Theory

UNIT I

Soil as an environment for plant pathogens, nature and importance of rhizosphere and rhizoplane, host exudates, soil and root inhabiting fungi. Types of biocontrol agents.

UNIT II

Inoculum potential and density in relation to host and soil variables, competition, predation, antibiosis and fungistasis.

UNIT III

Suppressive soils, biological control- concepts and potentialities for managing soil borne pathogens.

Practical

Quantification of rhizosphere and rhizoplane microflora with special emphasis on pathogens; pathogenicity test by soil and root inoculation
techniques, correlation between inoculum density of test pathogens and disease incidence, demonstration of fungistasis in natural soils; suppression of test soil-borne pathogens by antagonistic microorganisms. Isolation and identification of different biocontrol agents.

Suggested Readings

Baker KF & Snyder WC. 1965. *Ecology of Soil-borne Plant Pathogens*.John Wiley, New York.
Cook RJ & Baker KF. 1983. *The Nature and Practice of Biological Control of Plant Pathogens*. APS, St Paul, Minnesota.
Garret SD. 1970. *Pathogenic Root-infecting Fungi*. Cambridge Univ. Press, Cambridge, New York.
Hillocks RJ & Waller JM. 1997. *Soil-borne Diseases of Tropical Crops*.CABI, Wallington.
Parker CA, Rovira AD, Moore KJ & Wong PTN. (Eds). 1983. *Ecology and Management of Soil-borne Plant Pathogens*. APS, St. Paul, Minnesota.

PPATH -527 Disease Resistance in Plants 3(3+0)

Objective

To acquaint with disease resistance mechanisms in plants.

Theory

UNIT I

Introduction and historical development, dynamics of pathogenicity, process of infection, variability in plant pathogens, gene centres as sources of resistance, disease resistance terminology.

UNIT II

Disease escapes, disease tolerance, disease resistance, types of resistance, identification of physiological races of pathogens, disease progression in relation to resistance, stabilizing selection pressure in plant pathogens.

UNIT III

Host defence system, morphological and anatomical resistance, preformed chemicals in host defence, post infectional chemicals in host defence, phytoalexins, hypersensitivity and its mechanisms.

UNIT IV

Gene-for-gene concept, protein-for-protein and immunization basis, management of resistance genes. Strategies for gene deployment.

Suggested Readings

Deverall BJ. 1977. *Defence Mechanisms in Plants*. Cambridge Univ. Press, Cambridge, NY.
Mills Dallice et al.1996. *Molecular Aspects of Pathogenicity and Resistance: Requirement for Signal Transduction.* APS, St Paul, Minnesota.

Parker J. 2008. *Molecular Aspects of Plant Diseases Resistance*. Blackwell Publ.
Robinson RA. 1976. *Plant Pathosystems*. Springer Verlag, New York.
Singh BD. 2005. *Plant Breeding – Principles and Methods*. 7th Ed. Kalyani. Publ., Ludhiana
Van der Plank JE. 1975. *Principles of Plant Infection*. Academic Press, New York.
Van der Plank JE. 1978. *Genetic and Molecular Basis of Plant Pathogenesis*. Springer Verlag. New York.
Van der Plank JE.1982.*Host Pathogen Interactions in Plant Disease*.Academic Press, NY..
Van der Plank JE. 1984. *Disease Resistance in Plants*. Academic Press, New York

PPATH -528 Biological Control of Plant Diseases 3(2+1)

Objective

To study principles and application of ecofriendly and sustainable management strategies of plant diseases.

Theory

UNIT I

Concept of biological control, definitions, importance, principles of plant disease management with bioagents, history of biological control, merits and demerits of biological control.

UNIT II

Types of biological interactions, competition, mycoparasitism, exploitation for hypovirulence, rhizosphere colonization, competitive saprophytic ability, antibiosis, induced resistance, mycorrhizal associations, operational mechanisms and its relevance in biological control.

UNIT III

Factors governing biological control, role of physical environment, agroecosystem, operational mechanisms and cultural practices in biological control of pathogens, pathogens and antagonists and their relationship, biocontrol agents, comparative approaches to biological control of plant pathogens by resident and introduced antagonists, control of soil-borne and foliar diseases. Compatibility of different bioagents.

Commercial production of antagonists, their delivery systems, application and monitoring, biological control in IDM, IPM and organic farming system, biopesticides available in market. Quality control system of biocontrol agents.

Practical

Isolation, characterization and maintenance of antagonists, methods of study of antagonism and antibiosis, application of antagonists against pathogen *in vitro and in vivo* conditions. Study of cfu/g.

Suggested Readings

Campbell R. 1989. *Biological Control of Microbial Plant Pathogens*.Cambridge Univ. Press, Cambridge.
Cook RJ & Baker KF. 1983. *Nature and Practice of Biological Control of Plant Pathogens*. APS, St. Paul, Mennisota.

Fokkemma MJ. 1986. *Microbiology of the Phyllosphere*. Cambridge Univ.Press, Cambridge.
Gnanamanickam SS (Eds). 2002. *Biological Control of Crop Diseases*.CRC Press, Florida.

PPATH -529 Integrated Disease Management 3(2+1)

Objective
To emphasize the importance and need of IDM in the management of diseases of important crops.
Theory
UNIT I
Introduction, definition, concept and tools of disease management, components of integrated disease management- their limitations and implications.
UNIT II
Development of IDM- basic principles, biological, chemical and cultural disease management.
UNIT III
IDM in important crops- rice, wheat, cotton, sugarcane, chickpea, rapeseed- mustard, pearlmillet, *kharif* pulses, vegetable crops and fruit crops.
Practical
Application of biological, cultural, chemical and biocontrol agents, their compatibility and integration in IDM; demonstration of IDM in certain crops as project work.
Suggesed Readings
Gupta VK & Sharma RC. (Eds). 1995. *Integrated Disease Management and Plant Health*. Scientific Publ., Jodhpur.
Mayee CD, Manoharachary C, Tilak KVBR, Mukadam DS & Deshpande Jayashree (Eds.). 2004. *Biotechnological Approaches for the Integrated Management of Crop Diseases*. Daya Publ. House, New Delhi.
Sharma RC & Sharma JN. (Eds). 1995. *Integrated Plant Disease Management*. Scientific Publ., Jodhpur.

M.Sc(Agriculture) Plant Pathology
IIIrd Semester (Session - 2023-2024)

Course No	Course Title	Credit Hours		Maximum Marks				
		T	P	Theory			Practical	G. Total
				Mid Term	Internal Assessment	External Theory		
PPATH-531	PLANT VIROLOGY	2	1	20	-	50	30	100
PPATH-532	PRINCIPLES OF PLANT DISEASE MANAGEMENT	2	1	20	-	50	30	100
PPATH-533	DISEASES OF FIELD AND MEDICINAL CROPS	2	1	20	-	50	30	100
PPATH-534	EPIDEMIOLOGY AND FORECASTING OF PLANT DISEASES	2	1	20	-	50	30	100
PPATH-535	POST HARVEST DISEASES	2	1	20	-	50	30	100
PPATH - 536	INSECT VECTORS OF PATHOGENS	2	1	20	-	50	30	100
PPATH - 537	MUSHROOM PRODUCTION TECHNOLOGY	2	1	20	-	50	30	100
PPATH - 538	PLANT QUARANTINE	2	1	20	-	50	30	100
	Total	16	8	-	-	-	-	800

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PPATH- 531 Plant Virology 3(2+1)

Objective

To acquaint with the structure, virus-vector relationship, biology and management of plant viruses.

Theory

UNIT I

History of plant viruses, composition and structure of viruses.

UNIT II

Symptomatology of important plant viral diseases, transmission, chemical and physical properties, host virus interaction, virus vector relationship.

UNIT III

Virus nomenclature and classification, genome organization, replication and movement of viruses.

UNIT IV

Isolation and purification, electron microscopy, protein and nucleic acid based diagnostics.

UNIT V

Mycoviruses, phytoplasma arbo and baculoviruses, satellite viruses, satellite RNAs, phages, viroids, prions. Principles of the working of electron-microscope and ultra-microtome.

UNIT VI

Origin and evolution, mechanism of resistance, genetic engineering, ecology, and listing of important diseases and their management.

Practical

Study of symptoms caused by viruses, transmission, assay of viruses, physical properties, purification, method of raising antisera, serological tests, electron microscopy and ultratomy, PCR.

Suggested Readings

Bos L. 1964. Symptoms of Virus Diseases in Plants. Oxford & IBH., New Delhi.

Brunt AA, Krabtree K, Dallwitz MJ, Gibbs AJ & Watson L. 1995. Virus of Plants: Descriptions and Lists from VIDE Database. CABI, Wallington.

Gibbs A & Harrison B. 1976. Plant Virology - The Principles. Edward Arnold, London.

Hull R. 2002. Mathew's Plant Virology. 4th Ed. Academic Press, New York.

Noordam D. 1973. Identification of Plant Viruses, Methods and Experiments. Oxford& IBH, New Delhi.

PPATH -532 Principles of Plant Disease Management 3(2+1)

0bjectives

To acquaint with different strategies for management of plant diseases.

Theory

UNIT I

Principles of plant disease management by cultural, physical, biological, chemical, organic amendments and botanicals methods of plant disease control, integrated control measures of plant diseases. Disease resistance and molecular approach for disease management.

UNIT II

Foliage, seed and soil application of chemicals, role of stickers, spreaders and other adjuvants, health vis-a-vis environmental hazards, residual effects and safety measures.

UNIT III

History of fungicides, bactericides, antibiotics, concepts of pathogen, immobilization, chemical protection and chemotherapy, nature, properties and mode of action of antifungal, antibacterial and antiviral chemicals.

Practical

In vitro and in vivo evaluation of chemicals and bioagents against plant pathogens; ED and MIC values, study of structural and functional details of sprayers and dusters.

Suggested Readings

Fry WE. 1982. Principles of Plant Disease Management. Academic Press, New York.
Hewitt HG. 1998. Fungicides in Crop Protection. CABI, Wallington.
Marsh RW. 1972. Systemic Fungicides. Longman, New York.

PPATH -533 Diseases of Field and Medicinal Plants 3(2+1)

Objective

To educate about the nature, prevalence, etiology, factors affecting disease development and control measures of field and medicinal crop diseases caused by fungal, bacterial and viral diseases.

Theory

UNIT I

Diseases of Cereal crops- wheat, barley, rice, pearl millet, sorghum and maize.

UNIT II

Diseases of Pulse crops- gram, urdbean, mothbean, mungbean, lentil, pigeonpea, soybean.

UNIT III

Diseases of Oilseed crops- rapeseed and mustard, sesame, linseed, sunflower, groundnut, castor.

UNIT IV

Diseases of Cash crops- cotton, sugarcane.

UNIT V

Diseases of Fodder legume crops- berseem, oats, guar, lucerne, cowpea.

UNIT VI

Medicinal crops- plantago, liquorice, mulathi, rosagrass, sacred basil, mentha, ashwagandha, Aloe vera.

Practical

Detailed study of symptoms and host parasite relationship of important diseases of above mentioned crops. Collection and dry preservation of diseased specimens of important crops.

Suggested Readings

Joshi LM, Singh DV & Srivastava KD. 1984. Problems and Progress of Wheat Pathology in South Asia. Malhotra Publ. House, New Delhi.

Rangaswami G. 1999. Diseases of Crop Plants in India. 4th Ed. Prentice Hall of India, N Delhi.

Ricanel C, Egan BT, Gillaspie Jr AG & Hughes CG. 1989. Diseases of Sugarcane, Major Diseases. Academic Press, New York.

Singh RS. 2007. Plant Diseases. 8th Ed. Oxford & IBH, New Delhi.

Singh US, Mukhopadhyay AN, Kumar J & Chaube HS. 1992. Plant Diseases of Internatiobnal Importance. Vol. I. Diseases of Cereals and Pulses. Prentice Hall, Englewood Cliffs, New Jersey.

Thind,T.S. 1998. Diseases of field Crops and their management.National Agril. Technology Information Centre, Ludhiana,India.

PPATH -534 Epidemiology and Forecasting of Plant Diseases 3(2+1)

Objective

To acquaint with the principles of epidemiology and its application in disease forecasting.

Theory

UNIT I

Epidemic concept and historical development, pathometry and crop growth stages, epidemic growth and analysis.

UNIT II

Common and natural logrithms, function fitting area under disease progress curve and correction factors, inoculum dynamics, population biology of pathogens, temporal spatial variability in plant pathogens.

UNIT III

Survey, surveillance and vigilance, crop loss assessment and models.

UNIT IV

Principles and pre-requisites of forecasting, systems and factors affecting various components of forecastings, some early forecasting, procedures based on weather and inoculum potential, modeling disease growth and disease prediction.

Practical

Measuring diseases, spore dispersal and trapping, weather recording, survey, multiplication of inoculum, computerized data analysis, function fitting, model preparation and validation.

Suggested Readings

Campbell CL & Madden LV. 1990. *Introduction to Plant DiseaseEpidemiology*. John Wiley & Sons. New York

Cowling EB & Horsefall JG. 1978. P*lant Disease.* Vol. II. Academic Press, New York.

Laurence VM, Gareth H & Frame Van den Bosch (Eds.). *The Study of Plant Disease Epidemics*. APS, St. Paul, Minnesota.

Nagarajan S & Murlidharan K. 1995. *Dynamics of Plant Diseases*. Allied Publ., New Delhi.
Thresh JM. 2006. *Plant Virus Epidemiology.* Advances in Virus Research 67, Academic Press, New York.
Van der Plank JE. 1963. *Plant Diseases Epidemics and Control*.Academic Press, NY.
Zadoks JC & Schein RD. 1979. *Epidemiology and Plant Disease Management*. Oxford Univ. Press, London.

PPATH -535 Post Harvest Diseases 3(2+1)

Objective
To acquaint with post harvest diseases of agricultural produce and their ecofriendly management.
Theory
UNIT I
Concept of post harvest diseases, definitions, importance with reference to environment and health, principles of plant disease management as pre- harvest and post-harvest, merits and demerits of biological/ phytoextracts in controlling post-harvest diseases.
UNIT II
Types of post harvest problems both by biotic and abiotic causes, rhizosphere colonization, competitive, saprophytic ability, antibiosis, induced resistance, microbial associations, concept, operational mechanisms and its relevance in control.
UNIT III
Factors governing post harvest problems both as biotic and abiotic, role of physical environment, agro-ecocystem leading to quiescent infection, operational mechanisms and cultural practices in perpetuation of pathogens, pathogens and antagonist and their relationship, role of biocontrol agents and chemicals in controlling post-harvest diseases, comparative approaches to control of plant pathogens by resident and introduced antagonists. Isolation, characterization and maintenance of pathogens, role of different storage.
UNIT IV
Integrated approach in controlling diseases and improving the shelf life of produce, control of aflatoxigenic and mycotoxigenic fungi, application and monitoring for any health hazard, knowledge of Codex Alimentarious for each product and commodity.
Practical
Isolation characterization and maintenance of pathogens, role of different storage conditions on disease development, application of antagonists against pathogens *in vivo* and *in vitro* conditions. Comparative efficacy of different chemicals, fungicides, phytoextracts and bioagents.
Suggested Readings
Pathak V N. 1970. *Diseases of Fruit Crops and their Control*. IBH Publ., N Delhi.
Chaddha K L & Pareek O P. 1992. *Advances in Horticulture* Vol. IV, Malhotra Publ. House, New Delhi.

PPATH -536 Insect Vectors of Plant Viruses and other Pathogens 3(2+1)

Objective

To teach the students about the different groups of insects that vector plant pathogens, vector-plant pathogen interaction, management of vectors for controlling diseases.

Theory

UNIT I

History of developments in the area of insects as vectors of plant pathogens. Important insect vectors and their characteristics; mouth parts and feeding processes of important insect vectors. Efficiency of transmission.

UNIT II

Transmission of plant viruses and fungal pathogens. Relation between viruses and their vectors.

UNIT III

Transmission of plant viruses by aphids, whiteflies, mealy bugs and thrips.

UNIT IV

Transmission of mycoplasma and bacteria by leaf hoppers and plant hoppers.

UNIT V

Transmission of plant viruses by psyllids, beetles and mites. Epidemiology and management of insect transmitted diseases through vector management.

Practical

Identification of common vectors of plant pathogens- aphids, leafhoppers, whiteflies, thrips, beetles, nematodes; culturing and handling of vectors; demonstration of virus transmission through vectors- aphids, leafhoppers and whiteflies.

Suggested Readings

Basu AN. 1995. *Bemisia tabaci (*Gennadius*) - Crop Pest and Principal Whitefly Vector of Plant Viruses.* Oxford & IBH, New Delhi.

Harris KF & Maramarosh K. (Eds.).1980. *Vectors of Plant Pathogens*. Academic Press, London.

Maramorosch K & Harris KF. (Eds.). 1979. *Leafhopper Vectors and Plant Disease Agents*. Academic Press, London.

Youdeovei A & Service MW. 1983. *Pest and Vector Management in theTropics*. English Language Books Series, Longman, London.

PPATH -537 Mushroom Production Technology 3(2+1)

Objective

To develop mushroom cultivation skills for entrepreneurial activity. Historical development of mushroom cultivation and present status of mushroom industry in India.

Theory

UNIT I

Historical development of mushroom cultivation and present status, taxonomy, classification, food, medicinal value, uses of mushroom, edible and poisonous mushrooms.

UNIT II

Life cycle of cultivated mushrooms, reproduction and strain improvement, maintenance of pure culture, preparation of spawn and facilities required for establishing commercial spawn lab.

UNIT III

Preparation of substrate for mushroom cultivation, long, short and indoor composting methods, formulae for different composts and their computation, qualities and testing of compost, uses of spent mushroom compost/substrate.

UNIT IV

Facilities for setting up mushroom farm for seasonal and environmentally control cultivation, requirement and maintenance of temperature, relative humidity, CO_2, ventilation in cropping rooms, cultivation technology of *Agaricus bisporus, Pleurotus* sp.*, Calocybe indica, Lentinus edodes* and *Ganoderma lucidum.*

UNIT V

Insect pests, diseases and abnormalities of cultivated mushroom and their management, post harvest processing and value addition, economics of mushroom cultivation, biotechnology and mushroom cultivation.

Practical

Preparation of spawn, compost, spawning, casing, harvesting and post- harvest handling of edible mushroom; identification of various pathogens, competitors of various mushroom.

Suggested Readings

Chadha KL & Sharma SR. 2001. *Advances in Horticulture* (*Mushroom*). Vol. XIII. Malhotra Publ. House, New Delhi.

Chang ST & Hays WA. 1997. *The Biology and Cultivation of Edible Mushrooms*. Academic Press, New York.

Chang ST & Miles PG. 2002. *Edible Mushrooms and their Cultivation*.CRC Press, Florida.

Kapur JN. 1989. *Mushroom Cultivation*. DIPA, ICAR, New Delhi.

Dhar BL. 2005. *Cultivation Technology of High Temperature Tolerant White Button Mushroom*. DIPA, ICAR, New Delhi.

PPATH -538 Plant Quarantine 3(2+1)

Objective

To acquaint the learners about the principles and the role of Plant Quarantine in containment of pests and diseases, plant quarantine regulations and set-up.

Theory

UNIT I

Definition of pest, pesticides and transgenics as per Govt. notification; relative importance; quarantine – domestic and international. Quarantine restrictions in the movement of agricultural produce, seeds and planting material; case histories of exotic pests/diseases and their status.

UNIT II

Plant protection organization in India. Acts related to registration of pesticides and transgenics. History of quarantine legislations, PQ Order

2003. Environmental Acts, Industrial registration; APEDA, Import and
Export of bio-control agents.
UNIT III
Identification of pest/disease free areas; contamination of food with toxigens, microorganisms and their elimination; Symptomatic diagnosis and other techniques to detect pest/pathogen infestations; VHT and other safer techniques of disinfestation/salvaging of infected material.
UNIT IV
WTO regulations; non-tariff barriers; Pest risk analysis, good laboratory practices for pesticide laboratories; pesticide industry; Sanitary and Phytosanitary measures

Suggested Readings

Rajeev K & Mukherjee RC. 1996. Role of Plant Quarantine in IPM. Aditya Books.
Rhower GG. 1991. Regulatory Plant Pest Management. In: Handbook of Pest Management in Agriculture. 2nd Ed. Vol. II. (Ed. David Pimental). CRC Press.

M.Sc(Agriculture) Plant Pathology
IVth Semester (Session - 2023-2024)

Course No	Course Title	Credit Hours	Maximum Marks				
			Theory			Practical	G. Total
			Mid Term	Internal Assessment	External Theory		
PPATH-541	SEMINAR	1	-	-	-	-	100
PPATH-542	COMPREHENSIVE	2	-	-	-	-	100
PPATH-543	RESEARCH	15	-	-	-	-	100
	Total	-	-	-	-	-	300

Dean

College of Agriculture

SunRise University, Alwar