Department of Plant Pathology

Faculty of Agriculture

UDAI PRATAP (AUTONOMOUS) COLLEGE

VARANASI-221002

Accredited 'A' Grade By NAAC, Accredited B.Sc (Hons.) Agriculture ICAR (NAEAB)

Syllabus as per ICAR's 6th Dean's Committee

S.No.	Semester	Course Code	Course Title	Credit
1.	Ist	PPA-111	Mushroom Production Technology (SEC)	2(0+2)
2.	IInd	PPA-121	Fundamentals of Plant Pathology	3(2+1)
3.	Vth	PPA-311	Diseases of Field & Horticultural Crops & their Management	3(2+1)
4.	VIth	PPA-321	Agricultural Microbiology and Phyto-remediation	2(1+1)
5.	VIIth	PPA-411	Biopesticides and Biofertilizers (Elective Course)	4(3+1)
6.	VIIIth	PPA-421	Rural Agriculture Work Experience (RAWE) & Agro Industrial Attachment (AIA)	2(0+2)
		TOTAL		16(8+8)

Colleague Member

16-7-25

Dr. (Amit Chauhan)
Assistant Professor
Department Plant Pathology

Head

16.07.25

Dr. (Alok Kumar Singh)
Professor
Department Plant Pathology

Prof. Rakesh Kr Singh

1. 'Mushroom Production Technology, (Skill Enhancement Course) PPA-111, 2(0+2), Semester I[st]

Objectives:

1. To get skill for self employment and entrepreneurship development.
2. Empowering youth individually to create employment.

Practical:

Mushroom Production Technology 2 (0+2)

1. Introduction, importance and morphological studies of edible mushrooms
2. Classification of edible mushrooms
3. Spawn preparation-preparation of culture, preparation of spawn media, preparation of stock cultures (master spawn) and commercial grade spawn
4. Compost preparation-preparation by long method and by short method, study of compost microflora
5. Spawning
6. Preparation of casing mixture and its sterilization
7. Methods of cultivation of different species of common edible mushrooms:
   - A. Cultivation of *Agaricus* spp.-Subsrate preparation, spawn and spawning, cropping and harvesting
   - B. Cultivation of *Pleurotus* spp.-Subsrate preparation, spawn and spawning, cropping and harvesting
8. Identification, isolation and management of mushroom diseases and pests
9. Different mushroom recipes
10. Harvesting and aftercare
    - A. Aftercare of beds
    - B. Aftercare of crop rooms on termination of crop

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2. Fundamentals of Plant Pathology, PPA-121, 3(2+1), Semester II[nd]

Fundamentals of Plant Pathology 3(2+1)

Objectives

1. To get acquainted with the role of different microorganisms in the development of plant disease
2. To get general concepts and classification of plant diseases
3. To get knowledge of general characteristics of fungi, bacteria, virus, and other microorganisms causing plant diseases
4. To acquaint the students with reproduction in fungi, and bacteria, causing plant diseases
5. To get acquainted with various plant disease management principles and practices

Theory

Introduction to Plant Pathology: Concept of disease in plants:
Different terms used in Plant Pathology, History of Plant Pathology with special references to India:
Causes of plant disease: Inanimate and animate causes, Classification of plant disease: Parasitism and pathogenesis
Development of disease in plants: Disease Triangle, Disease cycle:
Fungi: Fungi and their morphology, reproduction and classification of fungi
Bacteria: Morphology, reproduction classification of phytopathogenic bacteria:
Other plant pathogens: Mollicutes: Flagellate protozoa: EVB, Parasitic higher plants: Viruses and viroids, virus transmission
Principles of Plant disease management: Disease management with chemicals, Host resistance, cultural and biological method of Integrated Disease Management (IDM).

Practical

Study of the microscope: Acquaintance with laboratory material and equipment: Study of different plant disease symptoms: Microscopic examination of general structure of fungi: Simple staining of bacteria: Direct and indirect staining, Gram staining of bacteria: Microscopic examination of fungal disease specimen: Preparation of culture media: Isolation of plant pathogens, Fungi and bacteria: Study on plant disease diagnosis: Koch's Postulates, Characteristics, formulation, methods of application and calculation on fungicides.

Suggested readings

1. Agrios, G.N. 2010. Plant Pathology, Acad. Press.
2. Alexopoulos, Mims and Blackwel. Introductory Mycology
3. Dhingra, O.D. and Sinclair, J.B. 1986. Basic Plant Pathology Methods. CRC Press London, Tokyo.
4. Gibbs, A. and Harrison, B. 1976. Plant Virology – The Principles. Edward Arnold, London
5. Goto, M. 1990. Fundamentals of Plant Bacteriology. Academic Press, New York.
6. Hull R. 2002. Mathew's Plant Virology, 4th edn. Academic Press, New York.
7. Kamat, M. N. Introductory Plant Pathology. Prakash Pub, Jaipur.
8. Mehrotra, R.S. and Aggarwal, A. 2007. Plant Pathology, 7th edn. Tata Mc Graw Hill Publ. Co. Ltd.
9. Nene, Y.L. and Thapliyal, P.N. 1993. Fungicides in Plant Disease Control. 3rd Ed. Oxford & IBH, New Delhi.
10. Pathak, V. N. Essentials of Plant Pathology. Prakash Pub., Jaipur
11. Rajeev, K. and Mukherjee, R.C. 1996. Role of Plant Quarantine in IPM. Aditya Books.
12. Rhower, G.G. 1991. Regulatory Plant Pest Management. In: Handbook of Pest Management in Agriculture, 2nd edn. Vol. II. (Ed. David Pimental) CRC Press
13. Singh R.S. 2008. Plant Diseases. 8th Ed. Oxford & IBH Pub. Co.
14. Singh R.S. 2013. Introduction to Principles of Plant Pathology. Oxford and IBH Pub. Co.
15. Verma, J.P. 1998. The Bacteria. Malhotra Publ. House, New Delhi.
16. Vyas S. C. 1993. Handbook of Systemic Fungicides. Vols. I-III. Tata McGraw Hill, New Delhi.

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3. Diseases of Field & Horticultural Crops & their Management, PPA-311, 3(2+1), Semester Vth

Objectives

1. To study the symptoms produced on the host
2. To study the etiology of the diseases
3. To know about the disease cycle of the pathogens during pathogenesis
4. To study the epidemiological factors responsible for disease development
5. To study the management techniques for curbing the major diseases of field and horticultural crops

Theory

Symptoms, etiology, disease cycle, epidemiology and management of major diseases of the following field and horticultural crops:

Field crops-

Rice (blast, brown spot, sheath blight, false smut, bacterial leaf blight, khaira):
Wheat (rusts, loose smut, Karnal bunt):
Maize (banded leaf and sheath blight and downy mildew):
Sorghum (smuts):
Bajra (downy mildew, ergot):
Groundnut (early and late leaf spots):
Grams (Ascochyta blight and wilt):
Pea (downy mildew, powdery mildew, rust):
Black gram and Green gram (web blight, yellow mosaic)
Sugarcane (red rot and smut):
Mustard (Alternaria blight, white rust, downy mildew)

Horticultural crops:

Citrus (canker)
Guava (wilt):
Banana (sigatoka, Panama wilt, bacterial wilt, bunchy top):
Papaya (leaf curl) and
Mango (anthracnose, malformation and powdery mildew):
Potato (early and late blight, black scurf, leaf roll, mosaic) and
Tomato (damping off, wilt, early and late blight):
Brinjal (phomopsis blight and fruit rot, sclerotinia blight) and
Chilli (anthracnose and fruit rot, leaf curl).
Cucurbits (powdery and downy mildew) and
Cruciferous vegetables (Alternaria leaf spot)
Okra (yellow vein mosaic):
Turmeric (leaf Spot) and
Coriander (stem gall)
Rose (dieback, powdery mildew, black leaf spot)

Practical

To study the symptoms of different diseases of field and horticultural crops: Blast and brown spot of rice, sheath blight and bacterial leaf blight of rice, downy mildew and powdery of cucurbits, rhizoctonia and Cercospora leaf spot of green gram / black gram, Alternaria blight and downy mildew of mustard, early blight of late blight of potato and tomato, Phomopsis blight of brinjal, powdery mildew and rust of pea, stem gall of coriander, anthracnose and fruit rot of chilli, taphrina leaf spot of turmeric, red rot of sugarcane; acquaintance with fungicides, antibiotics and biopesticides and their use in management of diseases of horticultural crops
Identification and histopathological studies of selected diseases of field and horticultural crops covered in theory.
Field visit for the diagnosis of field problems. Collection and preservation of plant diseased specimens for herbarium

Suggested Readings

1. Integrated Plant Disease Management By R.C. Sharma
2. Plant Diseases By R.S. Singh
3. Plant Disease Management: Principles and Practices By Uday Chandel
4. Plant Pathology By G.N. Agrios

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4. Agricultural Microbiology and Phyto-remediation, PPA-321, 2(1+1), Semester VI[th]

Objectives

1. To get an introduction to microbiology with specific focus on its significance in agriculture science
2. To get acquainted with the bacterial structure and the function of the different bacterial components
3. To get highlights on different fields of microbiology
4. To get highlights on the bioremediation of polluted soils using microbial mediators and phytoremediation
5. To get a concept of biological control and the role of biopesticides in plant disease management.

Theory

Introduction to Microbiology: Definition, applied areas of Microbiology and Importance of Microbiology.
History of Microbiology: Discovery of microorganisms, spontaneous generation theory, Germ theory of diseases, fermentation, and origin of life.
Bacteria: cell structure, chemoautotrophy, photo autotrophy, growth.
Bacterial genetics: Genetic recombination- transformation, conjugation and transduction, genetic engineering.
Industrial Microbiology: Microbial products, Biodegradation, Biogas production.
Biological control: Microbial biopesticides for plant disease management.
Concepts of rhizosphere microbiology
Rhizodeposits- biochemical nature, release mechanism in rhizosphere.
Potential of plant growth promoting rhizobacteria (PGPR): Phytoremediation of polluted soils.

Practical

Study of the microscope: Acquaintance with laboratory material and equipment: Microscopic observation of different groups of microorganisms: moulds (Fungi): Direct staining of bacteria by crystal violet: Negative or indirect staining of bacteria by nigrosin: Gram staining of bacteria: Study of phyllosphere and rhizosphere microflora. Measurement of microorganisms: Preparation of culture media:

Suggested readings

1. Pelczar, M.J., Chan, E.C.S. and Kreig, N.R. 2002. Microbiology, 5th Edition. Tata McGraw-Hill, New Delhi.
2. Rangaswami, G. and Bagyaraj, D. J. 2005. Agricultural Microbiology. Prentice-Hall of India Pvt. Ltd., New Delhi.
3. Mukherjee, N. and Ghosh, I. 2004. Agricultural Microbiology, Kalyani Publishers, Calcutta
4. Dubey, H.C. 2007. A Textbook of Fungi, Bacteria and Viruses, Vikas Publishing House Ltd., New Delhi 10014
5. Salyers, A. A. and Whitt, D. D. 2001. Microbiology: diversity, disease, and the environment. Fitzgerald Science Press, Inc.
6. Prescott, L. M. 2002. Microbiology 5th Edition. McGraw-Hill Inc. US

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5. 'Biopesticides and Biofertilizers (Elective Course), PPA-411, 4(3+1), Semester VII[th]

Objectives

1. To provide knowledge on principles, methods and mechanisms of bio control agents and their use against plant diseases
2. To provide knowledge on principles, methods and mechanism of biofertilizers and their use in agriculture

Theory

Biopesticides- History and concept of bio pesticides
Importance, scope and potential of bio pesticides
Definitions, concepts and classification of bio pesticides, viz. pathogen, botanical pesticides, and bio rationales.
Botanicals and their uses.
Mass production technology of bio pesticides
Methods of application of bio pesticides
Methods of quality control and Techniques of bio pesticides
Impediments (Barrier) and limitation in production and use of bio pesticides.
Biofertilizers - Introduction, status and scope.
Structure and characteristics features of bacterial biofertilizers – Azospirillum, Azotobacter, Bacillus, Pseudomonas, Rhizobium and Frankia
Cyanobacterial bio fertilizers – Anabaena, Nostoc.
Fungal biofertilizers – AM (mycorrhiza) and ectomycorhiza
Nitrogen fixation – Free living and symbiotic nitrogen fixation
Application technology for seeds, seedlings, tubers, sets etc.
Biofertilizers-Storage, shelf life, quality control and marketing
Factors influencing the efficiency of biofertilizers.

Practical

Isolation and purification of important biopestisides; trichoderma Pseudomonas, Bacillus, and its production.
Identification of important botanicals.
Visit to biopesticide laboratory in nearby area.
Field visit to explore naturally infected cadavers.
Identification of entomopathogenic entities in field condition.
Quality control of biopesticides.
Isolation and purification of Azospirillum, Azotobactor, Rhizobium, P-solubilizers and cyanobacteria.
Mass multiplication and inoculums production of biofertilizers.
Isolation of AM fungi- Wet sieving method and sucrose gradient method.
Mass production of AM inoculants.

Suggested readings

1. Baker, K.F. and James, R.C. 1987. Biological Control of Plant Pathogens. American Phytopathological Society
2. Bhatnagar, R.K. and Palta, R.K. Earthworm Vermiculture and Vermicomposting. Kalyani Publishers.
3. Boland, G.J. and David, L. 1998. Plant Microbe Interactions and Biological Control. Kuykendall Marel Dekker, INC.
4. Borkar, S.G. 2015. Beneficial Microbes as Biofertilizers and its Production Technology.
5. Ciancia, A. and Mukerji, K.J. 2007. General Concepts of Integrated Pest and Disease Management. Edited Published by Springer.
6. Cincholkar, S.B. and Mukherji, K.G. 2007. Biological Control of Plant Diseases. Hawarth Food and Agricultural Products.
7. Gehlot, Dushyent. Organic Farming: Standards, Accreditation, Certification and Inspection. Agrobios (India).
8. Gnanamanickam, S.S. 2002. Biological Control of Crop Disease. Kuykendall Marel Dekker, INC.
9. Nehra, Sampat. Biofertilizers for Sustainable Agriculture. Aavishkar Publishers, Jaipur, India
10. Ramanujam, B. and Rabindra, R.J. 2006. Current Status of Biological Control of Plant Disease using Antagonistic Organisms in India. Precision Fototype Services, Bengaluru.
11. Singh, Awani Kr. Handbook of Microbial Biofertilizers. Agrotech Press, Jaipur, India.
12. Singh, A.K. Organic Farming, New India Publishing Agency, New Delhi
13. Singh, S.P. and Hussaman, S.S. 1998. Biological Suppression of Plant Disease, Phytoparasitic Nematodes and Weeds Precision Fototype Services, Bengaluru.
14. Trivedi, P.C. Fungal Biopesticides and VAM, Agrobios (India) Publishers, Jaipur, India.

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Syllabus of Pre Ph. D. course work according to NEP-2020 with effective from academic session 2025-26

Course Title: Advances in Plant Pathology

Course Code: PPA-711

Credit: 4(4+0)

Unit I	Introduction, Importance of plant diseases, scope and objectives of Plant Pathology. Symptoms and signs of plant diseases.
Unit II	Fungi: general characters, definition of mycelia, somatic structures, types of fungal thalli, fungal tissues, modifications of thallus, reproduction (asexual and sexual). Classification of fungi, key to divisions, sub-divisions, orders and classes. Bacteria and mollicutes: general morphological characters. Viruses: nature & properties, structure and transmission. Study of phanerogamic plant parasites.
Unit III	Pathogenesis, disease triangle and its interaction and classification of plant diseases. Important plant pathogenic organisms, fungi, bacteria, phytoplasmas, spiroplasmas, viruses, viroids, phanerogamic parasites and nematodes with examples of diseases caused by them. Liberation / dispersal of plant pathogens. Survival of plant pathogens.
Unit IV	Epidemiology: Factors affecting disease development. Role of enzymes and toxins in disease development. Principles and methods of plant disease management.
Unit V	Molecular basis of host-pathogen interactions. Plant innate immunity: PAMP/DAMP induction of defence responses- HR, Programmed cell death, reactive oxygen species, Systemic acquired resistance, induced systemic resistance, pathogenesis related proteins, phytoalexins, and R-gene expression.
Unit VI	Study of Plant Diseases caused by fungi, bacteria, virus, nematodes, phytoplasma, etc **Diseases of cereal crops:** wheat, barley, rice &maize **Diseases of pulses crops:** mung bean, chickpea and pigeonpea **Disease of oilseed crops:** mustard, & groundnut **Diseases of vegetable crops:** potato, brinjal, tomato, chilli, cauliflower. **Diseases of fruit crops:** mango, banana, papaya and guava.

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