



inoculum; Pathogen offence- role of enzymes, toxins, growth regulators and polysaccharides (classification, mode of action, disease development); Defense strategies- Physical and biochemical (preformed and post infectional). ISR and SAR; Physiological changes in host after infection- photosynthesis, respiration, transpiration, translocation, absorption, transcription and translation, plant growth etc; Genetics for disease resistance – R genes, vertical and horizontal resistance, tissue culture and genetic engineering for disease resistance.

### **Learning Outcome:**

Help the learners for proper understating of pathogen behaviour, their interaction with host which in turn allow them for developed resistant cultivars.

**PPC- 502\***

**Mycology**

**2+1**

### **Objectives:**

To provide basic knowledge about the fungi, their taxonomy, growth, reproduction and role in nature.

### **Syllabus:**

#### **Theory**

Introduction, definition of different terms, basic concepts; Importance of mycology in agriculture, fungal biodiversity, Origin and evolution of fungi and fungal like organisms, fungi in human affairs, history of mycology; Concepts of nomenclature and classification, different types of classification, Modern methods and limitations, Molecular taxonomy, Phylogenetic relationship; The comparative morphology, reproduction in fungi, ultrastructure, characters of different phylum of fungi up to generic level: i) Chytridiomycota ii) Neocallimastigomycota iii) Blastocladiomycota iv) Glomeromycota v) Ascomycota, vi) Basidiomycota, vii) Deuteromycota. viii) Oomycota, Plasmodiophoromycetes, Lichens types and importance, Mycorrhiza, types and importance; Mycosis and Mycotoxicoses, Aerobiology; Fungal growth- Hyphal elongation of fungi, physiology of growth and factors, production of secondary metabolites.

#### **Practical**

Isolation and identification of plant pathogenic fungi from different sources; Preservation and maintenance of fungal cultures; Study of different reproductive structures obtained under *in vivo* and *in vitro* by camera Lucida drawing and microphotography; Detailed comparative study of different groups of fungi; collection, identification and preservation of specimens. Identification of plant pathogenic fungi. i.e. *Pythium*, *Phytophthora*, *Sclerospora*, *Peronospora*, *Plasmopara* and *Albugo*, *Rhizopus* and *Mucor*, *Erysiphe*, *Glomerella*, *Puccinia*, *Uromyces*, *Melampsora*, *Ustilag* *Neovossia*, *Fusarium*, *Cercospora*, *Helminthosporium*, *Cercospora*. Fungal morphology- Determination of size by micrometric method. Use of haemocytometer for standardization of spore suspension. Isolation of soil fungi by serial dilution technique by using different media

**Learning Outcome:**

Detailed knowledge about fungi and their biology would help the learners for research in the field of host pathogen interaction and management.

**PPC - 503****Plant bacteriology****2+1****Objectives:**

To provide detailed knowledge about bacteria and mollicutes, their taxonomy, growth, reproduction and role in nature.

**Syllabus:****Theory**

History of Bacteriology with emphasis on Plant Bacteriology. Morphology of Bacterial cell and bacterial colony. Ultrastructure of Bacterial cell. Growth – concept, measurement, dynamics and factors of growth. Variability and Recombination in bacteria. Bacteria metabolism. Taxonomy – historical retrospective including concepts of subspecies and pathovar, Different kinds of taxonomy, Modern classification system of bacteria, Advanced techniques and tools in classification. Serology – importance, antigen and antibody, preliminary concept of monoclonal and polyclonal antibody; concept and classification of Immunity. Ecology and epidemiology of bacterial plant pathogens. Mollicutes – concept, nature, culturing, detection, classification. Bdellovibrio and other fastidious prokaryotes – nature and present position. Vectors of Bacteria and mollicutes.

**Practical**

Preparation of different media for isolation of bacteria from infected plant hosts and isolation of plant pathogenic bacteria. Koch' postulates for a bacterial disease. Determination of bacterial growth by turbidometric method and study the variation of growth due to different factors like temperature, salt concentration, Ph. Staining of bacterial cell – gram staining, relief staining, flagella staining etc. Selective biochemical tests as per existing laboratory facilities. Ecological investigation of rice bacterial diseases and wilt of solanaceous vegetables. Inoculation technique in plants and determination of hypersensitive reaction. Detection of phytoplasmal diseases by Oxytetracycline sensitivity assay and Dien's test. Study of natural vectors of bacterial plant pathogens in the locality. Assay for bacteriostatic substances.

**Learning Outcome:**

Detailed knowledge about bacteria and mollicutes would help the learners for research in the field of host pathogen interaction and management.

**PPC-504**

**Plant virology**

**2+1**

**Objectives:**

To provide detailed knowledge about virus and sub-viral particles, their taxonomy, growth, reproduction and role in nature.

**Syllabus:**

**Theory**

History of plant virology Isolation, Characterization and identification of plant virus. Symptomatology and movement of plant viruses within plants. Components and physicochemical nature of plant viruses. Origin, evolution, nomenclature and classification of plant viruses. Architecture of plant viruses. Replication of plant viruses. Transmission of plant viruses. Virus vector relationship-concepts in brief. Mycoviruses, Satellite viruses, viroids, prions and satellite RNA's, Bacteriophages. Management of virus diseases with emphasis on special techniques.

**Practical**

Study of different types of symptoms (macroscopic, histopathological) produced by plant viruses. Use of local lesion host for identification. Isolation of plant viruses – certain basic steps. Sap, graft and vector transmission; transmission of plant viruses by dodder. Detection of plant viruses in plants and planting materials. Pathometry of virus diseases known in the locality. A field trial for management of virus disease(s). Visit to advanced laboratories for Electron microscopy.

**Learning Outcome:**

Detailed knowledge about virus and sub-viral particles would help the learners for research in the field of host pathogen interaction and management.

**PPC-505**

**Diseases of field crops and their management**

**2+1**

**Objectives:**

To generate overall knowledge about the cereals diseases and their management.

**Syllabus:**

**Theory**

Classification of plant diseases according to causal agents. All Indian major diseases and diseases of academic interest [International] will be covered for : Fungal Diseases; Major cereals – Rice (Blast, sheath blight, brown spot, sheath rot, stem rot, false smut); Wheat (Rust, bunt, Karnal bunt, loose smut, Helminthosporium Leaf Spots and *Alternaria* leaf blight ); Barley ( Covered smut ); Maize (Stalk Rots of Maize , Downy Mildews of Maize , Helminthosporium Leaf Spots ); Sorghum (Smut, downy mildew); Bajra; (green ear, ergot ). Fibre crops – Jute and Mesta (wilt, stem rot); Cotton (Anthracnose of Cotton, Vascular wilt). Pulses – Pigeon pea (wilt); Bengal gram (*Ascochyta* Blight, wilt); Cowpea (anthracnose); pea (rust, *Ascochyta* Blight, powdery mildew); Lentil (wilt). Oilseed crops- Mustard and rapeseed (Club root , *Alternaria* leaf spot ,downy mildew

, white rust); groundnut (tikka, rust); linseed (rust), Soybean (rust). Cash crops – Sugarcane (red rot, Whip smut, wilt); Tobacco (Black Shank). Fodder legumes – Oat (smut, rust); Lucerne (rust, smut). Bacterial diseases Major cereals – Rice (BLB, BLS); Wheat (Yellow ear rot); Maize (Bacterial stalk and ear rot). Fibre crops – Cotton (Angular leaf spot of cotton). Pulses – Soybean (Bacterial pustule). Oilseed crops - Mustard and rapeseed (Black rot of mustard). Cash crop – Sugarcane (Ratoon stunting). Virus diseases: Major cereals – Rice (Tungro); Wheat (Yellow ear rot); Maize (Maize dwarf virus, Maize mosaic). Pulses – Pigeon pea (Sterility mosaic); Bengal gram and green gram (Yellow mosaic). Oilseed crops – Ground nut (Groundnut rosette and bud blight). Cash crop – Sugarcane (Sugarcane mosaic); Tobacco (mosaic and leaf curl). Phytoplasmal Diseases: Major cereals – Rice (rice yellow dwarf); Fibre crops – Cotton (Stenosis of cotton); Cash crop – Sugarcane (Grassy shoot of sugarcane); Acquaintance with other phytoplasmal diseases; Nematode diseases: Major cereals – Rice (Ufra, Root knot, White tip); Wheat (Ear-cockle), Barley (Molaya); Cash crop – Sugarcane (root knot); Brief knowledge of uniflagellate protozoa, insect, and mites as causal agents of plant diseases; Diseases caused by Angiospermic plant parasites; Diseases due to abiotic causes – Khaira disease of rice, Boron deficiency of wheat; Disease complex and unknown aetiology – Cotton parawilt;

Note: (\*\* Important diseases to be covered including new emerging diseases)

### **Practical**

Isolation of plant pathogens following standard techniques. Study of symptoms, C.O. etc for different plant diseases as outlined in theory courses. Calculations of fungicides or other substances for management of different diseases for seed treatment, soil treatment, spraying/dusting at different stages of plant growth. Histopathological studies. *In vitro* and *in vivo* evaluation of botanicals and fungicides. Camera lucida drawing and micrometric measurement of plant pathogen. At least five semipermanent slides are to be deposited during practical examination. Visits of field, market and storage. Submission of catalogued plant disease herbarium.

### **Learning Outcome:**

Help the learners for identify the diseases through symptoms in field, their proper management as well as identification of causal agents by microscopic study.

**PPC-506                      Diseases of horticultural crops and their managements\*\*                      2+1**

### **Objectives:**

To generate overall knowledge about the diseases of horticultural crops and their management.

### **Syllabus:**

#### **Theory**

Diseases of major fruit crops grown in India: Tropical and sub-tropical fruits- Mango, banana, citrus spp., grape, guava, jackfruit, papaya, pineapple, pomegranate, sapota, ber datepalm. Temperate fruits -Apple, pear, peach, plum, Apricot and strawberry. Diseases of vegetables-

Cole crops (cabbage, cauliflower, knoll khol, radish, broccoli); cucurbitaceous vegetables (cucumber, pumpkin, pointed gourd, bitter gourd, bottle gourd, ridge gourd); leguminous vegetables (pea, cowpea, beans) Solanaceous vegetables (potato, Brinjal, tomato, chilli); others important vegetables (okra, carrot, beet, sweet potato, onion and garlic). Diseases of spices and condiments - Turmeric, black pepper, coriander, cumin, fennel, ginger. Diseases of flowering and ornamental plants - Rose, dahlia, chrysanthemum, gladiolus, marigold, tube rose, carnation, cactus & orchids. Diseases of medicinal and aromatic plants - Plantago, rosagrass, sacred basil, mentha, *Aloe vera*, *Ashwagandha*. Diseases of plantation crops - Tea, coffee, cocco, rubber, coconut, arecanut, betelvine sandal and mulberry. Selected market and storage diseases offruits and vegetables.

### **Practical**

Isolation of plant pathogens following standard techniques. Study of symptoms, c.o. etc. for different plant diseases as outlined in theory course. Calculation of fungicide or other substances for management of different diseases for seed treatment, soil treatment, spraying /dusting at different stages of plant growth. Histopathology- use of stains. *In vitro and in vivo* evaluation of botanicals and fungicides by spore germination inhibition techniques. Camera lucida drawing and Micrometric measurement of plant pathogens. At least five semi-permanent slides are to be deposited during practical examination. Visits of field, market and storage. Submission of a catalogued plant disease herbarium.

### **Learning Outcome:**

Help the learners for identify the diseases through symptoms in field, their proper management as well as identification of causal agents by microscopic study.

**PPC-507**

**Molecular plant pathology\***

**2+1**

### **Objectives:**

To generate knowledge about the Host pathogen interactions at molecular level, developed idea about the recent molecular technologies related to plant pathology

### **Syllabus:**

#### **Theory**

Genesis, importance and scope of molecular plant pathology. Study of basic techniques like Electrophoresis, Immunoassay, Nucleic acid sequencing & hybridization, PCR, RAPD, RFLP, HPLC, MS. Study of basic and advanced serological techniques; production of monoclonal and polyclonal antibodies. Instrumentation and maintenance of molecular plant pathology laboratory. Detection and diagnosis of plant pathogens by various immuno- and molecular techniques. Molecular techniques in understanding of pathogenesis. Molecular techniques to trace origin and evolution of different groups of pathogens, and understanding of phylogenetic relationship, co-evolution. Tissue culture and biotechnological advancements relevant to molecular plant pathology; Gnotobiotic culture. Molecular techniques in epidemiology, food safety etc. Bioinformatics and advanced computations in molecular techniques.

Nanotechnology in Plant Pathology.

### **Practical**

Instrumentation of Molecular Plant Pathology Lab. Use of different equipment. Tissue culture. Detection of Plant pathogens in Plants and Plant Parts.

### **Learning Outcome:**

Acquired knowledge helps in the research of genomics, proteomics and genetic engineering. It also helps them in resistance breeding.

**PPC-508**

**Epidemiology of plant diseases**

**2+1**

### **Objectives:**

To provide basic knowledge about the epidemiology, crop loss and modulation of epidemics

### **Syllabus:**

#### **Theory**

Epidemiology- history, concept, components and factors affecting disease, relationship in epidemics as a process. Pathometry -Assessment of incidence, intensity, disease index, Disease Progress Curve and Area under disease progress curve; crop loss due to disease, Principal Component Analysis in epidemiology. Environmental factors affecting disease development; Macro -and Microclimatic factors in relation to disease, climatological tools, Microclimate - tools, Relationship with disease. Analysis of epidemic as a system, Predisposition of hosts and dispersal of plant pathogens. Geophytopathology. Pathosystem Management - Strategy of Control, Monitoring of Disease; detection of new races through molecular techniques, Forecasting - Principles and Methods, Factors affecting forecasting, some early forecasting procedures based on inoculum density and weather; Modern Predictive systems; scope in India. Objectives and effects of genetic control with special reference to epidemiology.

#### **Practical**

Preparation of disease severity scale and determination of Disease Index Percent in different Pathosystems. Preparation of disease progress curve and Calculation of AUDPC, Annual Infection Rate. Principal Component Analysis using computer. Preparation of Geophytopathological maps by using data. *In situ monitoring* of a disease by different methods. Simple correlation and MR of climatological factors in disease development. Acquaintance with meteorological instruments and their function, data recording.

### **Learning Outcome:**

Help the learners for proper understating of crop losses, environmental factor and disease relationship which may help in disease forecasting and formation of forecasting models.

**PPC - 509**

**Seed Pathology**

**2+1**

**Objectives:**

To provide knowledge about various seed borne pathogens, ecology, spread, survival etc. and related seed borne diseases.

**Syllabus:**

**Theory**

Concept, Economic significance; History of seed pathology. Regulations on Seed production and marketing in Developed and Developing Countries with emphasis on South East Asian Countries; The Indian Seed Act. Seed Diseases – Concept, Types. Seed Borne Pathogens – Variety, Nature, Kinds of relationship, Criteria of transmission, mechanisms, proofs of transmission. Biochemical changes in seed. Ecology of seed borne pathogens. Epidemiology – Forecasting losses, and assessment of disease tolerance for seed health testing. Seed health testing – Objectiveness, requirements, and Common and Advanced techniques of seed health. Mycotoxins and seed infections. Strategy of control, Management of seed storage, modern grain storage techniques.

**Practical**

Seed health testing by physical examination and seed washing method. Seed health testing by different incubation methods moist blotter test, 2-4 D, agar plate test for different kind of seeds. Detection of seed borne microflora in paddy, wheat, vegetables etc. *In vivo* and grow on test of seed infection. Forecasting of losses with infected seeds. Biochemical changes in maintenance of seed quality particularly carbohydrate etc. Detection of mycotoxins.

**Learning Outcome:**

Detailed knowledge seed borne pathogens, ecology etc. help the learners for proper management of seed borne diseases

**PPC-510**

**Root pathology**

**2+1**

**Objectives:**

To provide knowledge about various root pathogens, ecology, spread, survival etc. and various soil borne diseases they cause.

**Syllabus:**

**Theory**

General – Root System, root growth and root growth modeling, soil-root interaction and interface, root-shoot interrelationship, host root exudates. Soil-microorganism in relation to plant root diseases and brief account of soilborne plant pathogens. Mycorrhiza – Types and role in



agriculture. Classification of root diseases – systems, chronic and acute, organism involved. Pathogenic root infecting fungi – types and their ecology; factors and measurements of tropism in fungi and other pathogens in host recognition. Ecological concepts – inoculums potential, CSA, EGH, rhizosphere and soil mycostasis. Structure and physiology of resting structure. Molecular detection of soil borne plant pathogens. Polyetic epidemiology and modeling in soil microorganism with special reference to pathogens. Conducive and suppressive soils. Control of root diseases – strategy, methods, side effects of pesticides, biological control.

### **Practical**

Isolation of soil microbes and determination of rhizosphere effect. Determination of mycorrhizal status in different healthy and diseased host roots. Growth and survival of soil microbes. Bioassay of soil fungicides. Laboratory evaluation and field studies with biocontrol agents. Experiments with soil amendments and soil mycostasis. Comparison of soil characteristics between conducive and suppressive soils in selected host pathogen system. Survey for root diseases in the locality.

### **Learning Outcome:**

Detailed knowledge about root pathogens, ecology etc. help the learners for proper management of root and other soil borne diseases

**PPC-511**

**Post-harvest pathology**

**2+1**

### **Objectives:**

To provide knowledge about the post-harvest pathogens, ecology, spread, survival etc. and various diseases they incite.

### **Syllabus:**

#### **Theory**

History, concept, definition, significance with reference to environment and health. Losses in durables and perishables. Postharvest diseases of durables – types and control. Postharvest diseases of perishables – important pathogens and important diseases in India. Host-pathogen relationships aflatoxigenic and other mycotoxigenic fungi and monitoring for any health hazard. Ecology and Epidemiology of postharvest diseases of perishables. Descriptions of selected diseases of mango, banana, citrus, apple, tomato, potato, cucurbits, okra subterranean crops. Management – Principles, strategy, methods, botanicals, chemicals and biocontrol agents, induced resistance.

#### **Practical**

Isolation of grain deteriorating fungi using agar plate technique and grain washing. Survey for occurrence and loss of perishables and interpretation of data. Diagnostics by comparative symptomatology. Isolation and identification of postharvest pathogens. Koch's postulates. Exercises on host parasite relationship. Selected exercises on ecology and epidemiology (Association, infectivity titration, effect of temperature and pH. Bioassay and management with chemicals, botanicals, volatile oils etc. Mycotoxin assay. Submission of catalogued specimens and permanent slides.

**Learning Outcome:**

Detailed knowledge about post-harvest pathogens, ecology etc. help the learners for proper post-harvest disease management.

**PPC-512****Mushroom cultivation****1+2****Objectives:**

To generate knowledge about edible and cultivated mushroom, their cultivation and entrepreneurship development.

**Syllabus:****Theory**

Historical developments of mushroom cultivation and present status, taxonomy, classification. Food, medicinal value, uses of mushroom, edible and poisonous mushrooms. Life cycle of cultivated mushroom, preparation and strain improvement, maintenance of pure culture preparation of spawn and facilitated required for establishing commercial spawn lab. Cultivation technology of *Agaricus bisporus* (different *Agaricus* species, composting and its formulation, casing, preparation of casing mixture, sterilization; *Pleurotus* sp.( different *Pleurotus* species , substrate selection and cultivation technique: *Volvariella* sp.( different *Volvariella* species and their cultivation); other cultivated mushroom i.e. *Calolalia indica*, *Lentinus edodes* and *Ganoderma lucidum*. Facilities for setting up mushroom farm for seasonal and environmentally control cultivation, requirement and maintenance of temperature, relative humidity, CO<sub>2</sub>, ventilation in cropping rooms. 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**

Survey of locally available mushrooms and their identification. Preparation of spawn, compost, spawning, casing, harvesting and postharvest handling of edible mushroom. Identification of various pathogens, competitors of various mushrooms. Development of mushroom isolates through somatic anatomises. Spore print and single spore culture.

**Learning Outcome:**

Student can start their own entrepreneurship by acquiring the knowledge and skills about mushroom cultivation

**PPC- 513**

**Ecology of plant pathogens**

**1 +1**

**Objective:** To provide basic knowledge about the pathogen ecology , spread , survival etc.

**Syllabus:**

**Theory**

Microbial ecology and its relation to plant pathogens; contribution of Odum, Patten, Garrett, Gregory, Neergard and others. Survival, Distribution and population dynamics of plant pathogens. Ecosystem analysis of microbial community and Mathematical tools and statistical designs in ecosystem. Microchemistry of Plant/ microbe interactions. Autoecology and Evaluation of plant pathogens in complex ecosystems. Study of ecology of soil borne plant pathogens, airborne pathogens, seed borne pathogens and postharvest pathogens, phaenerogamic plant parasites.

**Practical**

Use of mathematical and statistical tools for ecosystem analysis. Ecosystem analysis in soil borne and airborne diseases in cereals, oilseeds, vegetables. Biodiversity of postharvest pathogens. Techniques in microchemistry analysis to investigate plant /microbe interactions.

**Learning Outcome:** Detailed knowledge about pathogen ecology help the learners for proper understanding survival of the pathogens which help for developing forecasting modules and disease management.

**PPC- 514**

**Virus -vector relationship**

**1+1**

**Objectives:**

To provide detailed knowledge about viruses their vectors and their interrelationship in different ecosystem.

**Syllabus:**

**Theory**

History of virus vector relationship and critical gaps. Designing glass house, insectory and maintenance; Modern instrumentations of virus vector relationship studies. Transmission characteristics in different types of virus-vector relationship. Evidence of propagation of viruses in vectors. Identification of different groups of vectors up to species level. Techniques of handling of different vectors and maintenance of viruliferous insect colony. Concepts of terminologies in virus-vector relationship. Detailed studies of virus-vector relationship of arthropods, nematodes and fungi.

**Practical**

Identification common vectors up to species (major stress on insect vectors). Study of

characteristics of nematode and fungal vectors with permanent slides and isolation. Transmission of plant virus by plant vectors. Handling of aphids, leaf and plant hopper, white fly beetle and weevil etc. practical on designing glass house.

**Learning Outcome:**

Detailed knowledge about viruses, vectors and their interrelationship help the learners for proper understanding of virus spread and their multiplication which help for developing forecasting modules and disease management.

**PPC- 515**

**Principles of plant disease management**

**2+1**

**Objectives:** To generate knowledge about crop loss, risk management, IDM

**Syllabus:**

**Theory**

Principles of plant disease management, various methods of plant disease management- cultural, physical, biological, chemical, organic amendments of soil ,use of botanicals, traditional /indigenous techniques for plant disease control, integrated control measures of plant diseases. Disease resistance and molecular approach for disease management. Crop losses and their assessment, risk management and options, decision making factors. History of fungicides and bactericides. Nature, properties and mode of action of antifungal, antibacterial and antiviral chemicals. Foliage, seed, soil and other methods of application of chemicals, role of stickers, spreaders and other adjuvants. Health *vis-a-vis* environmental hazards, residual effects and safety measures.

**Practical**

*In vitro* and *in vivo* evaluation of chemicals against plant pathogens; ED and MIC values. Study of structural details of sprayers and dusters. Assessment of crop loss. Acquaintance with different formulations and preparation of certain homemade fungicide and botanicals etc.

**Learning Outcome:**

Acquired knowledge may help the students for predicting crop loss and disease management through various approaches.

**PPC-516**

**Plant nematology**

**1+1**

**Objectives:**

To provide basic knowledge about the nematodes, their taxonomy, biology growth, importance, various symptoms they produced and their managements.

**Syllabus:**

## **Theory**

History, Importance and scope of Plant Nematology with special reference to India. Morphology of nematodes especially taxonomically diagnostic parts. Study of digestive, reproductive, excretory, and nervous system in nematodes; Life cycle pattern and phases in *Meloidogyne*. Parthenogenesis, senescence, quiescence, and anabiosis in nematodes. Taxonomic characteristics of Dorylaimida, Tylenchida, Pratylenchida, Aphelenchida with typical genera. Adaptation of plant pathogenic nematodes - morphological, physiological, ecological. Infection behaviours and plant disease development patterns in different host parasite systems. Ecology- Population ecology and factors affecting population. Management of nematodes - Brief outline with examples of different conventional and non - conventional methods exclusively used by plant nematologists.

## **Practical**

Isolation of nematodes from soil and plant by different techniques. Study of taxonomic characters of important plant pathogenic genera of nematodes. Study of reproductive structures in *Meloidogyne* spp. Estimation of population and community analysis. Management of nematodes (*in-vitro* assay and field trial).

## **Learning Outcome:**

Detailed knowledge about Plant Parasitic nematode, their biology and other aspects would help the learners for research in the field of Phytonematology.

**PPC-517**

**Phytopathological techniques**

**0+2**

## **Objectives:**

To generate knowledge about the basic techniques related to plant pathology and microbiological research.

## **Syllabus:**

### **Practical**

Methods to prove Koch's postulates with biotroph and necrotroph pathogens, pure culture techniques, use of selective media to isolate pathogens. Preservation of disease specimens, use of haemocytometer, micrometer, centrifuge, pH meter, camera lucida. Microscopic techniques and staining methods, phase contrast system, spectrophotometer. *In vitro* evaluation of fungicides, bactericides etc.

## **Learning Outcome:**

Acquired knowledge may help the students for isolation, inoculation, culturing, preservation, maintenance of microorganisms and handling of different instruments.

**Objective**

To study about the different biological controlling agents, their mechanism of parasitism and their application for management of plant diseases in a sustainable manner.

**Syllabus:****Theory**

Concept of biological control, definitions, importance, principles of plant disease management with bioagents, history of biological control, merits and demerits of biological control. Types of biological interactions, competition, mycoparasitism, exploitation for hypovirulence, rhizosphere colonization, competitive saprophyticability, antibiosis, induced resistance, mycorrhizal associations, operational mechanisms and its relevance in biological control. Factors governing biological control, role of physical environment, agro-ecosystem, 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.

**Learning Outcome:**

Help the learners for identify the biological controlling agents and their proper application for management of plant diseases in a sustainable manner.