UG PROGRAMME

{B.Sc. (Hons.) Agriculture}

Courses and Syllabus

of

Plant Pathology

B.Sc. (Hons.) Agriculture

Plant Pathology

Semester	Course Code	Course Title	Credit Hours
II	PPC-121	Agricultural Microbiology	3(2+1)
III	PPC-211	Fundamentals of Plant Pathology	3(2+1)
IV	PPC-221	Bio-Pesticides and Biological Control of Plant Diseases	3(2+1)
V	PPC-311	Diseases of Field & Horticultural Crops & their Management-I	3(2+1)
V	PPC-312	Principles of Integrated Disease Management	2(1+1)
VI	PPC-321	Diseases of Field & Horticultural Crops & their Management-II	3(2+1)
VI	PPC-322	Introductory Nematology	3(2+1)
VII	RAWE	RAWE & AIA	
VIII	ELPPC-421	Mushroom Cultivation	10(0+10)

SYLLABUS

PPC-121: Agricultural Microbiology (2+1)

Theory

Introduction & applied areas of Microbiology; Microbial world: Prokaryotic and eukaryotic microbes. History of Microbiology in brief. Origin of Life: Spontaneous generation theory; roles of microbes in fermentation, germ theory of disease, protection against vaccination. Bacteria: Morphology and cell structure, chemoautotrophy, photo autotrophy, growth. Bacterial genetics: Genetic recombination-transformation, conjugation and transduction, plasmids, transposon. Bacteriophages: structure and properties of bacterial viruses, lytic and lysogenic cycles; Protozoa: Introduction, pathogenic, biocontrol and bioindicating agents; Algae & Cyanobacteria: Elementary idea. Soil microbiology: microbial biodiversity in soil and their role in soil fertility and crop production; Rhizosphere & Mycorrhiza. Carbon, Nitrogen, Phosphorus and sulphur cycles. Biological nitrogen fixation- symbiotic, associative and aysmbiotic. Azolla, blue green algae. Plant Microbe interactions and phyllosphere. Microbiology of water. Microbes in human welfare: silage production, biofertilizers, biopesticides, biofuel production and biodegradation.

Practical

Introduction to microbiology laboratory and its equipments; Microscope- parts, principles of microscopy, resolving power and numerical aperture. Methods of sterilization. Nutritional media and their preparations. Enumeration of microbial population in soil- bacteria, fungi, actinomycetes. Methods of isolation and purification of microbial cultures. Isolation of Rhizobium from legume root nodule. Isolation of Azotobacter from soil. Isolation of Azospirillum from roots. Staining and microscopic examination of microbes.

PPC: 211 Fundamentals of Plant Pathology 3(2+1)

Theory

Introduction: Importance of plant diseases, scope and objectives of Plant Pathology. History of Plant Pathology with special reference to Indian work. Terms and concepts in Plant Pathology. Pathogenesis. Cause and classification of plant diseases. Important plant pathogenic organisms, different groups: fungi, bacteria, fastidious vesicular bacteria,

phytoplasmas, spiroplasmas, viruses, viroids, algae, protozoa, phanerogamic parasites and nematodes with examples of diseases caused by them. Diseases and symptoms due to abiotic causes. Study of phanerogamic plant parasites. Nematodes: General morphology and reproduction, classification, symptoms and nature of damage caused by plant parasitic nematodes.

Dispersal and survival of plant pathogens. Types of parasitism and variability in plant pathogens. Pathogenesis: Infection cycle, recognition between host and pathogen, invasion, host penetration, Role

of enzymes, toxins and growth regulators in disease development. Défense mechanisms in plants: Phenolics, Phytoalexins, phytoanticipins, PR proteins, Elicitors. Epidemiology: Factors affecting disease development, disease triangle.

Principles and methods of plant disease management. Resistance, Exclusion, Eradication, Protection, Avoidance, Therapy. Chemicals in plant disease control, viz., fungicides, bactericides, nematicides, antiviral chemicals. Chemical combination, Classification of chemicals used in plant disease control, mode of action and formulations of fungicides and antibiotics.

Practical

Study of symptoms of various plant diseases. Study of representative fungal genera. Transmission of plant viruses. Study of phanerogamic plant parasites. Study of morphological features and identification of plant parasitic nematodes. Extraction of nematodes from soil. Study of fungicides and their formulations. Methods of pesticide application and their safe use. Calculation of fungicide sprays concentrations. Extraction of toxin from pathogen and its effect on host. Evaluation of host defence against pathogens. In vitro study of fungicides against pathogens etc.

PPC: 221 Bio-Pesticides and Biological Control of Plant Diseases 3(2+1)

Theory

Concept of biological control, definitions, importance, principles of plant disease management with bioagents, history of biological control, merits and demerits of biological control. Understanding of ecological equilibrium in relation to biocontrol. 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. Factors governing biological control, role of physical environment, agroecosystem, operational mechanisms and cultural practices in biological control of pathogens

Classification of bio pesticides viz. pathogen, botanicals and biorationals and their uses against plant diseases. Isolation, purification and pure culturing of recognized biocontrol organisms. Mass production technology of biological control agents, their delivery systems, application and monitoring. Methods of application of bio pesticides. Methods of quality control and Techniques of biopesticides. Compatibility of different bioagents. Commercial production of antagonists. Impediments and limitation in production and use of bio pesticide. Different types of bio control formulation and their efficacy under field level. Legislature Acts in the production and marketing of bio control agents and bio pesticides. Organic amendments, culture filtrates and botanicals etc. for plant disease management. Entrepreneurship development in bio control unit.

Practical:

Visit to biological control laboratory, Identification of important botanicals, Isolation of biocontrol agents from different sources. Pure culturing and evaluation of biocontrol potential of isolates. Testing

antibiotic production in culture, Antibiotics in culture filtrate. Identification of entomopathogenic entities in field condition. Quality control of biopesticides. In-vitro screening of different bio-agents. Mechanisms of biological control- antibiosis, lysis, parasitism, competition. Mass multiplication of biocontrol agents. Application of biopesticides and biocontril agents in soil and seed

Learning Outcome:
Gaining knowledge of eco-friendly management of diseases through Biological controlling agents and their production technique help the learners for decision making and also for developing an entrepreneurial unit.

PPC:311 Diseases of Field & Horticultural Crops & their Management-I 3 (2+1)

Theory

Symptoms, etiology, disease cycle and management of major diseases of following crops:

Field Crops: Rice: blast, brown spot, bacterial blight, sheath blight, false smut, khaira and tungro; Maize: stalk rots and leaf spots; Sorghum: smuts and grain mold, Bajra :downy mildew and ergot; Groundnut: early and late leaf spots, rust, bud necrosis & groundnut rosette; Pigeonpea: Phytophthora blight, wilt and sterility mosaic; Black & Green gram: Cercospora leaf spot, crinkle and yellow mosaic; Castor: Phytophthora blight; Tobacco: black shank, leaf curl and mosaic; Jute: Stem rot of jute & wilt complex.

Horticultural Crops: Guava: wilt and anthracnose; Banana: Panama wilt, bacterial wilt, Sigatoka and bunchy top; Papaya: foot rot, anthracnose, leaf curl and mosaic, Pomegranate: bacterial blight; Cruciferous vegetables: Alternaria leaf spot, black rot, boron & molybdenum deficiency; Brinjal: Phomopsis blight and fruit rot, bacterial and fungal wilt & little leaf; Okra: Yellow Vein Mosaic; Beans: anthracnose and bacterial blight; Ginger: soft rot; Colocasia: Phytophthora blight; Coconut: Leaf spot, root wilt and bud rot; Tea: blister blight and red rust; Coffee: rust; Betelvine: Stem & foot rot, Bacterial leaf spot; Tube rose: Collar rot & leaf blight.

Practical

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; Note: Students should submit 50 pressed and well-mounted specimens.

PPC: 312 Principles of Integrated Disease Management 2(1+1)

Theory

Categories of plant diseases, Economic importance of plant diseases; Methods of detection and diagnosis of plant diseases. Monitoring: Survey, surveillance and forecasting of Plant diseases; Measurement of yield loss, AUDPC, apparent rate of infection of plant diseases. Calculation and dynamics of economic injury level and importance of Economic threshold level. Methods of control:

Host plant resistance, cultural, mechanical, physical, legislative, biological and chemical control. Introduction to conventional pesticides for disease management. Safety issues in pesticide uses. IPM: Introduction, history, importance, concepts, principles and tools of IPM. Ecological management of crop environment. Development and validation of IDM module. IDM module for disease. Implementation and impact of IDM. Political, social and legal implication of IDM. Role of Government in IDM dissemination, Case histories of important IDM programmes.

Practical

Methods of diagnosis and detection of various plant diseases, Methods of plant disease measurement, Assessment of crop yield losses, calculations based on economics of IDM, Identification and nature of damage of important diseases and their management. Preparation of crop disease calendar. Identification of different biocontrol agents. Isolation of Trichoderma, Pseudomonas etc. Monitoring of crops attacked by diseases. Plan & assess preventive strategies (IDM module) and decision making. Awareness campaign at farmers' fields.

PPC: 321 Diseases of Field & Horticultural Crops & their Management-II 3(2+1)

Theory

Symptoms, etiology, disease cycle and management of following diseases:

Field Crops:

Wheat: rusts, loose smut, karnal bunt, powdery mildew, Alternaria and Helminthosporium leaf blight & ear cockle; Barley: Covered smut; Sugarcane: red rot, smut, wilt, grassy shoot, ratoon stunting and Pokkah Boeng; Sunflower: stem rot (Sclerotium, Sclerotiana and Macrophomina), Alternaria blight; Mustard: Alternaria blight, white rust, downy mildew and club root; Bengal gram: wilt complex, grey mould and Ascochyta blight; Lentil: rust and wilt; Linseed: Rust; Pea: downy mildew, powdery mildew and rust; Soybean: Bacterial spot, rust and mosaic; Cotton: anthracnose, vascular wilt and black arm.

Horticultural Crops: Mango: Anthracnose, malformation, bacterial blight and canker, red rust & black tip; Citrus: canker, die back, gummosis and included greening; Grape vine: downy mildew and anthracnose; Sapota: Shooty mould; Apple: scab and crown gall; Peach: leaf curl; Pear: Fire blight; Strawberry: leaf spot; Tomato: damping off, early and late blight, buck eye rot and leaf curl and mosaic; Potato: early and late blight, black scurf, wart, scab & bacterial soft rot; mild mosaic, sever mosaic, rugose mosaic, acuba mosaic, leaf roll and hairy sprout; Chillies: anthracnose and fruit rot, wilt and leaf curl; Cucurbits: downy mildew, powdery mildew, wilt and mosaic; Onion and garlic: purple blotch, and Stemphylium blight and potash deficiency; Turmeric: leaf spot; Coriander: stem gall; Marigold: Leaf spot & bud rot; Rose: dieback, powdery mildew and black leaf spot.

Practical

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. Note: Students should submit 50 pressed and well-mounted specimens.

PPC: 322 Introductory Nematology 3 (2+1)

Theory

Introduction: History of phytonematology. Economic importance. General characteristics of plant pathogenic nematodes. Nematode general morphology and biology. Digestive and reproductive system in nematode. Classification of nematodes upto family level with emphasis on groups containing economically important genera. Classification of nematodes by habitat. Identification of economically important plant nematodes upto generic level with the help of keys and description. Symptoms caused by nematodes with examples. Interaction between plant parasitic nematodes and disease causing fungi, bacteria and viruses. Nematode diseases: Root knot of vegetables, ufra disease of rice, tundu or ear cockle of wheat, golden nematode of potato; List of other important nematode diseases in India. Basic knowledge of nematode management.

Practical

Methods of survey – sampling methods, collection of soil and plant samples; Extraction of nematodes from soil and plant tissues following combined Cobb's decanting –sieving and Baermann funnel technique. Counting and estimation of plant parasitic nematodes. Preparation of temporary and permanent mounts; Study and identification of most important plant parasitic nematodes with special reference to their characteristics and symptomatology. Estimation of loss and severity of diseases. Experimental techniques used in pathogenicity studies with root knot nematode.

Learning Outcome:

Student will understand the details of PPN, symptoms of nematode diseases and their management which help the learners for decision making and also for further research in the field of Plant Nematology.

ELPPC: 421 Mushroom Cultivation 0+10

Objectives:

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

Syllabus:

Mushroom- Definition, history and importance of mushroom cultivation; present scenario of mushroom cultivation in India. Types of mushrooms- edible, poisonous, medicinal mushroom; puff balls, truffles and false truffles. food value of mushroom. General morphological features, life cycle pattern of cultivated mushroom. Pure culture of mushroom fungi and their nutritional requirements. Mushroom terminologies - spawn, spawn run period, substrate, supplements, casing, composting, cropping, weed mushroom. Spawn - types, characteristic of a good quality spawn, methods of spawn production, storage of spawn. Cultivation of button mushroom - different Agaricus species, composting and its formulation, casing, preparation of casing mixture, sterilization. Cultivation of Oyster mushroom - different

Pleurotus species, substrate selection and cultivation technique. Cultivation of paddy straw mushroom – different Volvariella species and their cultivation. Other cultivated mushroom - Lentinus, Calocybe, Auricularia and Ganoderma. Identification and management of different pests and diseases of mushrooms. Postharvest treatments and preservation of mushrooms. canning and dehydration and preparation of different recipes. Packing and processing – Different methods of processing, fortification in other food items Economics of mushroom cultivation

Learning Outcome:

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