



**UNIT V:** Genetic engineering with plant viruses, viral suppressors, a RNA dynamics, resistance genes. Viruses potential as vectors, genetically engineered resistance, transgenic plants.

**UNIT VI:** Techniques and application of tissue culture. Origin evolution and interrelationship with animal viruses.

### **Practical**

Purification of virus(es), SDS-PAGE for molecular weight determination, production of polyclonal antiserum, purification of IgG and conjugate preparation, serological techniques (i) DAC – ELISA (ii) DAS – ELISA (iii) DIBA (iv) Western blots (v) (ab) 2- ELISA, vector transmission (one each with aphid, leafhopper and whitefly), methods for collecting vectors and their maintenance, nucleic acid isolation, DOT-blot, southern hybridization, probe preparation and autoradiography, PCR application and viral genome cloning, sequencing annotation of genes.

**PL. PATH 703**

**Advanced Bacteriology**

**2+1**

### **Theory**

**UNIT I:** Current approaches for the characterization and identification of phytopathogenic bacteria. Ultrastructures and biology of bacteria.

**UNIT II:** Current trends in taxonomy of phytopathogenic procarya.

**UNIT III:** Role of enzyme, toxin, exopolysaccharide, polypeptide signals in disease development. Mechanism of wilt (*Ralstonia solanacearum*), development, mechanism of soft rot (*Erwinia spp.*) development, mechanism of crown gall formation (*Agrobacterium tumefaciens*)

**UNIT VI:** Host- bacterial pathogen interaction, quorum-sensing phenomenon, Type III secretion system, HR / SR reactions, R-genes. Avr-genes, hrp genes, Effector protein.

**UNIT V:** Molecular variability among phytopathogenic procarya and possible host defense mechanism(s). Genetic engineering for management of bacterial plant pathogens-gene silencing, RNA technology.

**UNIT VI:** Epidemiology in relation to bacterial plant pathogens. Development of diagnostic kit.

**UNIT VII:** Beneficial prokaryotes- Endophytes, PGPR, phylloplane bacteria and their role in disease management. Endosymbionts for host defence.

### **Practical**

Pathogenic studies and race identification; plasmid profiling of bacteria, fatty acid profiling of bacteria, RAPD profiling of bacteria and variability status, Endospore, Flagellar staining, test for secondary metabolite production, cyanides, EPS, siderophore, specific detection of phytopathogenic bacteria using species / pathovar specific primers. Basic techniques in diagnostic kit development, molecular tools to identify photoendosymbionts.

**PL. PATH 704      Molecular Basis of Host- Pathogen Interaction      2+1**

**Theory**

**UNIT I:** Importance and role of biotechnological tools in plant pathology-Basic concepts and principles to study host pathogen relationship.

**UNIT II:** Molecular basis of host- pathogen interaction – fungi, bacteria and viruses; recognition system, signal transduction.

**UNIT III:** Induction of defense- pathogenesis related proteins, HR, reactive oxygen species, phytoalexins and systemic acquired resistance, programmed Cell Death, Viral induce gene silencing.

**UNIT IV:** Molecular basis of gene for gene hypothesis; R-gene expression and transcription profiling, mapping and cloning of resistance genes and marker-aided selection, pyramiding of R- genes.

**UNIT V:** Biotechnology and disease management; development of disease resistance plants using genetic engineering approaches, different methods of gene transfer, biosafety issues related to GM crops.

**Practical**

Protein, DNA and RNA isolation, plasmid extraction, PCR analysis, DNA and Protein electrophoresis, bacterial transformation.

**PL. PATH 751      Principles and Procedures of Certification      1+0**

**Theory**

**UNIT I:** Introduction to certification, International scenario of certification and role of ISTA, EPPO, OECD etc. in certification and quality control.

**UNIT II:** Case studies of certification system, of USA and Europe, National regularity mechanism and certification system including seed certification standards. National status of seed health in seed

certification. Methods of testing genetic identity, physical purity, germination percentage seed health etc.

**UNIT III:** Fixing tolerance limit for diseases and insect pests in certification and quality control programmes. Methods used in certification of seeds vegetative propagules and *in vitro* cultures. Accreditation of seed testing laboratories. Role of seed / planting material health certification in national and international trade.

**Theory**

**UNIT I:** History of biosecurity, Concept of biosecurity, Components of biosecurity, Quarantine, Invasive Alien species, Biowarfare, Emerging / resurgence of pests and diseases.

**UNIT II:** National regulatory Mechanism and International agreements /Convention viz., Agreement of Application of Sanitary and phytosanitary (SPS) Measures / World Trade Organization (WTO), Convention on biological Diversity (CBD), International Standard for phytosanitary Measures, pest risk analysis, risk assessment models, pest information system, early warning and forecasting system, use of Global Positioning system (GPS) and Geographic Information System (GIS) for plant biosecurity, pest / disease and epidemic management, strategies for combating risks and costs associated with agroterrorism event, mitigation planning, integrated approach for biosecurity.

**UNIT III:** Biosafety, policies and regulatory mechanism, Cartagena Protocol on Biosafety and its implications, Issues related to release of genetically modified crops.