Syllabus for Ph.D Entrance Examination 2024-25

Unit1: HistoryandPrinciples of PlantPathology

Milestonesinphytopathologywithparticularreferencetoindia.Majorepidemicsandtheirsocial impacts.Physiologicspecialization,Koch'spostulates.
Growth,reproduction,survivalanddispersalofplantpathogens.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.Factorsinfluencinginfection, colonizationanddevelopmentofsymptoms.Genetics of resistance; 'R' genes; mechanism of genetic variation in pathogens; molecular basis for resistance; marker-assisted selection; genetic engineering for disease resistance.

Unit2: LaboratoryandAnalyticalTechniques

Preparationandsterilizationofcommonmedia.Methodsofisolationofpathogensandtheiridentification. Preservationofmicroorganismsinpureculture.Methodsofinoculation. Measurementofplantdisease.

DetectionandDiagnosisofpathogensinseedsandotherplantingmaterials:Nucleicacidprobes, Southern,NorthernandWesternhybridization,ELISA,ISEMandPCR.Nucleicacidprobes, Southern,NorthernandWesternhybridization,ELISA,ISEMandPCR.Laboratoryequipment andtheiruse:autoclave,hotairoven,laminarflow,spectrophotometer,electrophoresis,lightand electronmicroscopy,incubator,ultracentrifuge.

Unit3:Mycology

Classificationoffungi(AccordingtotheClassification–Kirk*etal.,*2008).Lifecyclesof importantphytopathogenicfungi.Economicmycology,ediblefungi.
Mycorrhizalassociations.Cellorganelles,theirmorphology,functions andchemical composition.

Unit4: PlantBacteriology

Identificationandclassificationofbacteria.morphology,ultrastructureandchemicalcomposition ofprokaryoticcellinrelationtofunction.Growthcurve,nutritionandauxotrophicmutants. Restingcellsinelementarybacterialgeneticsandvariability:transformation,conjugation, transduction.Biologyofextrachromosomalelements:plasmidbornegenesandtheirexpression.Bacteriophages:lyticandlysogeniccycles.Prokaryoticinhibitorsandtheirmodeofaction. Economicusesofprokaryotes.Morphology,biochemicalcharacteristics,reproductionandlifecycleofphytoplasmaandotherfastidious prokaryotes.

Unit5: PlantVirology

Nature,compositionandarchitectureofvirusesandviroids.Propertiesofviruses.Nomenclature andclassificationofviruses.Variabilityinviruses.Satellitevirusesandsatelliternna. Mycovirusesandbaculoviruses.Assayofplantvirusesincludingbiological,physical,chemical, serologicalandmolecularmethods.Conventionalandbiotechnologicaltechniquesusedin detectionanddiagnosis.Behaviourofvirusesinplantsincludinginfection,replicationand movement.Histopathologicalchangesinducedbyvirusesinplants,inclusionbodies.Transmission

ofviruses:virus-vector relationships.

Unit6: PlantDiseaseEpidemiology

Conceptsinepidemiology.Developmentofdiseaseinplantpopulation.Monocyclicand polycyclicpathogens.Roleof environmentandmeteorologicalfactorsinthedevelopmentofplant diseaseepidemics.Survey,surveillance(includingthroughremotesensing),andpredictionand forecastingofdiseases.

Unit7: FungalDiseases of Crop Plants

Fungaldiseasesofcereals,millets,oilseeds,pulses,fruits,vegetables,plantation,fiber,spices, medicinalandornamentalcropswithspecialreferencetoetiology,diseasecycle,perpetuation, epidemiologyandmanagement.Postharvestdiseasesintransitandstorage;aflatoxinsandother mycotoxinsandtheirintegratedmanagement.

Unit8:BacterialandViralDiseases ofCrop Plant

Cropdiseasesof cereals,pulses,oilseeds,sugarcrops,vegetables,fruits,plantationandfibercrops causedbybacteria,viruses,viroids,phytoplasmasandotherfastidiousprokaryotes.Modeoftransmission andpathogenvector relationships.Epidemiologyandmanagement.

Unit9:Managementof Plantdiseases

Generalprinciplesofplantdisease management.Historicaldevelopmentsofchemicals,legislative,culturalandbiologicalprotection measuresincludingclassificationofplantdiseases.Exoticpathogensandpathogensintroducedintoindia. Sanitaryandphytosanitaryissuesunder WTO,TRIPSandPRA.Geneticbasisofdisease resistanceandpathogenicity:geneforgenehyphothesis;;breedingfordiseaseresistance. Productionofdiseasefreeseedsandplantingmaterials.Seedcertification.Chemicalnatureand classificationoffungicides andantibiotics:theirbioassayandcompatibilitywithotheragricultural chemicals;resistancetofungicides/antibiotics;effectonenvironment.Sprayinganddusting equipments,theircareandmaintenances.Importantculturalpracticesandtheirroleindisease management,solarization,integrateddiseasemanagement.Microorganismsantagonistictoplant pathogensinsoil,rhizosphereandphyllosphereandtheiruseinthecontrolofplantdiseases;soil fungistasis.PlantgrowthpromotingRhizobacteria. Biotechnologyforcropdiseasemanagement