

Educational Objectives:

1. The course is designed to become familiar with; Nomenclature and taxonomy of plant viruses, Plant viral genome(s), RNA or DNA, of economically important viruses, The biological role of the viral components, Epidemiology, and transmission strategies of plant viruses, Details of the selected plant viral diseases (selection is made on the prevalence of plant diseases in Pakistan i.e. Cotton, Sugarcane, Citrus, Wheat, ornamental plants, vegetables and weeds etc), and Life cycles/replication and Translational strategies of the prevalent plant viruses in Pakistan.

Course Outcomes:

2. The course will give a thorough introduction to DNA and RNA viruses infecting plants, symptoms and an overview of economic losses caused by these viruses. Special emphasis will be given to the plant DNA and RNA viral problems in Pakistan. Replication/life cycle and recombination events will be discussed using genome sequences. Students will be able to determine the incidence of recombination in plant DNA and RNA viruses.

3. **Course Contents:**

- a. Classification and nomenclature of plant viruses
- b. The biological function of viral components
 - (1) Virus infection and virus synthesis
 - (2) Translocation and distribution of viruses in plants
 - (3) Symptoms caused by plant viruses
 - (4) Physiology of virus-infected plants
- c. Plant viral genomes

- d. General properties of plant viral genomes
 - (a) Economy in the use of genomic nucleic acids
 - (b) The Functions of viral gene products
- e. Functional proteins
 - (1) Proteins that initiate infection
 - (2) Proteins that replicate the viral genome
 - (3) Proteins that process viral gene products
 - (4) Proteins that facilitate viral movement through the host
 - (5) Overcoming host defense systems
 - (6) Proteins that facilitate the host to host movement of viruses
- f. Nucleic Acids
 - (1) Multipartite genomes
 - (2) Nucleic acid structures
 - (3) Noncoding regions
 - (4) End-Group structures
 - (5) 5' and 3' noncoding regions
 - (a) Intergenic regions
- g. Transmission of plant viruses by:
 - (1) Vegetative propagation (sap, seed, pollen, insects, mites, nematodes, fungi, and dodder)
 - (2) Mode of transmission.
- h. Molecularbiology of plant viruses
- i. Geminivirus replication and gene expression
 - (1) Geminivirus classification

- (2) Genome structure
- (3) Geminivirus infection cycle
- (4) Geminivirus replication
- (5) Control of viral gene expression
- (6) Role of whitefly endosymbiotic chaperonins in virus transmission
- (7) Deleterious effects of virus on whiteflies
- (8) Sexual transmission of virus among whiteflies
- j. An overview of family *Nanoviridae* (*Banana bunchy top virus*)
- k. An overview of family *Caulimoviridae* (*Cauliflower mosaic virus*)
- l. Positive-Sense Single-Stranded RNA Genomes
 - (1) Family *Closteroviridae* (*Closterovirus-Citrus triesta virus*)
 - (2) Family *Potyviridae* (*Sugarcane mosaic virus, potato virus Y*)
 - (3) Potyvirus Transmission by Aphids
 - (4) Specificity of Potyvirus Transmission by Aphids
- m. Family *Luteoviridae*
 - (1) Diseases Caused by Luteoviridae
 - (2) Viral Passage through the Aphid
 - (3) Barley *Yellow Dwarf Virus*
- n. Recombination in Plant DNA Viruses
 - (a) Recombination in Plant ssDNA Viruses
 - (b) Recombination in Plant dsDNA Viruses
- o. DNA satellites

Recommended books

1. Matthews' Plant Virology by Roger Hull

2. Comparative Plant Virology by Roger Hull
3. Virus-Insect-Plant Interactions by KF. Harris, OP Smith and JE Duffus
4. Molecular Plant Pathology by M. Dickinson
5. Plant Pathology by George N. Agrios
6. Research Articles