

Transcript for the Plant Virology course, week 4, part 1

4.1. (00:10 00:32) Welcome to the Fourth Lecture of the “Plant Virology” course, concerning the epidemiology of diseases produced by plant viruses, mainly the ways or methods of spread of plant viruses. Epidemiology is the study of the factors influencing the initiation, development and spread of plant viruses and the diseases they produce in plant populations.

4.2. (00:30 01:11) Sources of plant virus infections are: general crop plants (vegetative stock, seeds, volunteer plants, plants in private gardens or germplasm collections), wild plants (weeds), overwintering vectors, resting spores of fungi, plant and roots debris (for very stable viruses).

4.3. (01:11 02:01) Propagation of plant viruses can be via sexual (seeds forming) or asexual (vegetative). Direct passage of virus from mother plant to the offspring is called **vertical transmission**. During generative propagations, viruses are transmitted by seeds and by pollen. Whenever plants are propagated vegetatively by using natural plant organs (tubers, bulbs, corms or rhizome) or during horticultural methods (plant division, grafting, cutting etc.), any viruses present in the mother plant will be transmitted to the progeny. All plant viruses (except cryptic viruses) are transmitted this way.

4.4. (02:01 02:35) The transmission of plant viruses during the vegetation period from an infected host plant to a healthy one is called **horizontal transmission**. Viruses may be transmitted by sap (mechanical transmission), by vectors, by soil or by dodder. Infectious plant viruses were detected in surface waters, clouds, fog and in ancient glacial ice.

4.5. (02:35 02:50) Spread of plant viruses by vegetative propagation of virus-infected stock plants: by tulips bulbs and Iris rhizomes,

4.6. (02:50 02:55) during plant division,

4.7. (02:55 03:02) by hardwood cuttings,

4.8. (03:02 03:10) by leaf cuttings,

4.9. (03:10 03:16) by leaf-stem cuttings,

4.10. (03:16 03:24) during plant propagation by ground layering,

4.11. (03:24 03:31) by grafting,

4.12. (03:31 03:36) by budding

4.13. (03:36 03:43) as well as during the micro propagation of plants in “*in vitro*” cultures.

4.14. (03:43 03:59) Over 20% of plant viruses are transmitted by seeds. It means that newly emerging seedlings are virus infected.

4.15. (03:59 04:21) *Tobacco mosaic virus* and *Tomato mosaic virus* are the only examples of plant viruses transmitted to seedlings from the seed coat at germination. Virus particles are a kind of contamination on the seed surface.

4.16. (04:21 05:03) Seed transmission occurs most frequently through the infection of the gametes prior to fertilization i.e. indirect embryo invasion, although infection of the embryo after fertilization also occurs for many viruses. It is unknown how the virus is able to direct invasion – cross the embryo and boundary between the parental and progeny generations in the ovule.

- 4.17. (05:03 05:17) Virus particles on the surface of or within the pollen grains can be transmitted over a long distance.
- 4.18. (05:17 05:34) Some of the plant viruses infecting embryo.
- 4.19. (05:34 05:57) Virus vectors are living organisms able to carry and transmit pathogens, such as infectious virions and disseminate viral disease.
- 4.20. (05:57 06:20) The most common and economically important means of natural spread of plant viruses is by insect vectors having piercing and sucking mouth parts.
- 4.21. (06:20 07:21) Aphids can carry virus particles on their stylets. This is called noncirculative (nonpersistent) manner. They may also carry viruses in a circulative (persistent) manner, for which the virions must circulate within the vector through the aphid digestive system to the salivary glands before their transmission. Some of the persistent viruses may also replicate in vector cells and they are classified as circulative, propagative viruses.
- 4.22. (07:21 08:01) Non persistent transmission of *Potato virus Y* (PVY) by aphids. Reversible retention of virus particles at stylet tip. Protein HC (helper component) acts as an accessory factor for virus transmission.
- 4.23. (08:01 08:48) Persistent (circulative) transmission of *Beet mild yellowing virus* (BMV) by aphids. Within the vector, virions travel through the food canal (2) and foregut (5), into the midgut (6) and hindgut (8) where they have to cross cellular and tissue barriers to access the hemocoel cavity. With the hemolymph (7) they circulate towards the accessory salivary gland (3) and, after passing the second cellular barrier of the gland, finally reach the saliva (1). [Annu.Rev.Phytopathol.2013.51:177-201]
- 4.24. (08:48 08:56) Thank you for the attention and I invite you to the part two of this week.