Department of Employment, Economic Development and Innovation
Agri-Science Queensland

Tobamoviruses—tobacco mosaic virus, tomato mosaic virus and pepper mild mottle virus

Integrated virus disease management

Tobamoviruses—tobacco mosaic virus (TMV), tomato mosaic virus (ToMV) and pepper mild mottle virus (PMMV)—are stable and highly infectious viruses that are very easily spread from plant to plant by contact. These viruses can survive for long periods in crop debris and on contaminated equipment.

Although these viruses affect field crops, they are more often a problem in greenhouse crops where plants are generally grown at a higher density and handled more frequently.

Key points

- Tobacco, tomato and pepper mild mottle viruses (tobamoviruses) are highly infectious and are easily spread by contact (leaves touching and people handling plants).
- The viruses can be carried on seed.
- The viruses survive in crop debris, including roots in soil and on contaminated equipment and clothing.
- Healthy seedlings and strict hygiene form the basis of effective management.

Host plants and symptoms

TMV infects a wide range of hosts, including crop plants, weeds and ornamentals. ToMV also infects a wide range of host plants, but is most frequently found in tomato and capsicum. PMMV is largely restricted to capsicums, including chilli types.

The symptoms caused by TMV and ToMV can vary considerably with the strain of virus, time of infection, variety, temperature, light intensity and other growing conditions. Foliar symptoms include mosaic, mottling, leaf distortion and sometimes leaf death and defoliation. Plants infected as seedlings are usually stunted and pale.

The leaf symptoms of PMMV are generally a mild mosaic or mottle.

Fruit from plants infected by tobamoviruses may be undersized with a rough surface, and are often deformed, mottled or blotched. Most affected fruit is either unsaleable or reduced in quality.

Survival and spread

Unlike most plant viruses, tobamoviruses are not transmitted by insects.

Tobamoviruses are very stable in the environment and can survive on implements, trellis wires, stakes, containers and contaminated clothing for many months in the absence of any plant material.

The viruses can also survive in crop (leaves, stems) and root debris on the soil surface for at least several months and can infect a new crop planted into a contaminated site. Tobamoviruses are also carried on seed, leading to the infection of germinating seedlings.

Tobamoviruses are easily spread by contact; this includes touching infected and healthy plants during operations such as transplanting, pruning, tying, cultivation, spraying and harvesting.

Tomato plant and capsicum fruit and leaves with symptoms of tobamovirus

Management

Healthy seedlings and strict hygiene form the basis of effective management:

- Use healthy seed or treat in trisodium phosphate (TSP)—soak seeds in 15% TSP for 20 minutes or for 2.5 hours in 10% TSP, changing the solution after 30 minutes. Stir seeds during treatment and rinse seeds thoroughly in water after treatment to remove residues of TSP and then spread seeds out to dry. These treatments should not affect germination. Store seeds in a clean container not previously used for seed storage. Do not reuse the TSP solutions.
- Locate seedling production areas well away from cropping areas.
- Use new potting mix and new or thoroughly cleaned containers to raise seedlings.
- Make sure greenhouses are within a clean zone on your property and control movements of people, plants, vehicles and materials into the greenhouse areas.
- Treat each greenhouse as a separate unit and keep protective clothing, tools, gloves and bins etc. in each greenhouse. Do not move them between units.
- Rotate susceptible crops in a two-year rotation and keep areas free of weeds, which can host the viruses. Capsicums, tomato and eggplant are among the crops susceptible to these viruses.
- Wash hands and small tools in milk (non-fat dry milk powder at 20% wt/vol). Milk is a cheap, safe and non-corrosive material for inactivating tobamoviruses.
- Dip hands in milk every five minutes when handling plants, or use disposable gloves and discard into a rubbish bin after use.

- Disinfect stakes, implements and picking bins etc. with sodium hypochlorite (household bleach). Use a 1 in 10 dilution of bleach for 10 minutes and do not rinse (unless the material will corrode with bleach). Metal equipment will corrode. Make sure solutions are fresh.
- Using hot water and strong detergent, wash any clothing that has come into contact with diseased plants.
- Remove infected plants, taking care not to touch other plants when removing them.
- Resistant plant varieties are available. You will need to consider adaptability, potential yield, resistance to other important diseases and fruit type when selecting varieties.
- Applying insecticides does not control tobamoviruses.
- If you discover infected plants, restrict access to the area and remove (if possible); otherwise always work in the affected area last and decontaminate yourself and equipment before working elsewhere.

More information

For more information, contact the Department of Employment, Economic Development and Innovation (DEEDI) on 13 25 23 or visit www.deedi.qld.gov.au

Refer to *Diseases of vegetable crops in Australia* (eds Persley, Cooke & House 2010), available from CSIRO Publishing at www.publish.csiro.au

This technical reference note has been produced by Denis Persley and Cherie Gambley (DEEDI) as part of Horticulture Australia Limited project VG0 7128-Integrated management of virus diseases in vegetables.

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PR10_5352