Plant/Insect Identification and Diagnostic Clinic

Colorado State University Extension

Common Tomato Viruses in Colorado

Quick Facts……

- The three most common tomato viruses in Colorado are Tomato Spotted Wilt Virus, Tobacco Mosaic Virus and Beet Curly Top Virus.
- Good cultural practices and insect management are key to the prevention of virus diseases.
- Once the plant is diagnosed with a virus, it is best to remove and destroy it to prevent the virus from spreading.

Tomatoes are among the most popular garden vegetables to grow in Colorado. They can thrive in gardens, raised beds, and in containers. Good cultural care will protect tomatoes from problems caused by nutrient deficiencies, diseases and insects. However, for many tomato diseases, including viruses, once the plant is infected, the only solution is to remove the infected plant from the garden to prevent spread of the disease.

The three most common viruses that infect tomato plants are Tomato Spotted Wilt Virus (TSWV), Tobacco Mosaic Virus (TMV) and Beet Curly Top Virus (BCTV). Other vegetables in the Solanaceous family, eggplant, potatoes and peppers, are also susceptible to these three viruses. These three viruses each consist of nucleic acid (the genetic material of the virus) coated by protein. They are too small to see without an electron microscope and cannot replicate unless they are inside a living cell.

Virus management methods depend on knowing how the virus is transmitted, sources of the viruses in a garden or surrounding environment, and on only planting virus-free transplants in a garden.

Tomato Spotted Wilt Virus

Tomato Spotted Wilt Virus is transmitted by several species of thrips, a small insect less than ¼ inch long. Once the thrips have acquired the virus, as adults they can transmit it for their entire life. Adult thrips can also fly to new host plants. These insects are very hard to see without the aid of a good hand lens or microscope. They feed on leaves and can cause damage even if the virus is not present because the thrips will kill leaf cells that they feed on. Seed transmission of TSWV is rare and this virus is not transmitted in soil. It is a very unstable virus, so it does not survive long on contaminated containers, stakes, or garden equipment. Early symptoms of TSWV are difficult to diagnose. The leaves may appear slightly curled with a purplish color to the underside of the leaf. The most common TSWV symptoms are

Figure 1: Tomato fruit exhibiting spotting and mottling caused by TSWV

Figure 2: Curling, dieback and slight purpling; foliage symptoms of TSWV

Figure 3: Extreme stunting, leather-like thickened leaves and yellowing symptoms of BCTV (R. Hammon)

Figure 4: Classic rugosity or puckering foliage symptoms of TMV

yellow/orange rings on tomato fruit. Weeds and ornamental plants can be reservoirs (sometimes without showing symptoms) of this virus and thrips feeding on these alternate host plants can then transmit the virus to tomatoes and peppers.

Tobacco Mosaic Virus

Tobacco Mosaic Virus is the second most common virus diagnosed in the Plant Disease Clinic. The virus is very stable and can easily be spread between plants on workers' hands, tools, and clothes with normal activities such as plant tying, removing of suckers, and harvest or leaves rubbing together. Because this virus is extremely stable, it can survive the curing process in tobacco. Smokers can then transmit this virus to tomatoes if they do not properly wash their hands and follow good sanitary practices. This virus can last for long periods of time on garden equipment, so equipment (pruners, scissors, etc.) should be cleaned regularly. Seed transmission of this virus can occur if seed from an infected plant is not properly cleaned and any fruit tissue is left on the seed. Symptoms on the fruit include spots and rings on the fruit itself and these symptoms resemble those caused by TSWV. When tomatoes are infected with TMV, their leaves may show a yellow/green mosaic and be slightly curled.

Beet Curly Top Virus

Beet Curly Top Virus (BCTV) is the type species of the genus *Curtovirus*. Although once the prevalent virus, it is rarely found today in North America. The two most prevalent curtoviruses in NA are Beet Severe Curly Top Virus (BSCTV) and Beet Mild Curly Top Virus (BMCTV). All three of these viruses are vectored by the beet leafhopper. The virus is very stable in the insect. Once the insect acquires the virus, it can vector the virus for life. These viruses, which are limited to the phloem, are not mechanically transmitted. BCTV has a wide host range, more than 300 plant species in 45 families. Besides tomato, other important crop hosts are swiss chard, sugar beet, spinach, green pepper, beans and cucurbits. The insect vector is well adapted to desert conditions and can overwinter in uncultivated areas with limited vegetation including weeds, which can also be a host for BCTV. Severity and spread of the virus depends on the seasonal cycle of the leafhopper.

The virus is common on the Western Slope of Colorado but it is not generally found in eastern Colorado. Symptoms are severe stunting and yellowing of the foliage. Leaves become thickened and crisp and roll upwards as the petioles turn downward. Immature, dull and wrinkled fruit are characteristic of curly top. Fruit ripen prematurely. Symptoms of BCTV are similar to TSWV, but BCTV viruses are often far more severe on tomato.

General Management Strategies

Once the plants are infected with a virus, there is no cure. The best management is prevention and good cultural care of the plants. Start with clean transplants. This means making sure that plants are free of insects and are not showing any signs of virus infection. Only purchase vigorous transplants with no hint of leaf malformation, rings on leaves, or brittleness. If any plants are positive for a virus, remove the plant from the garden so it does not become a source of virus for other plants in the garden. Reducing weeds in the garden will also help since weeds can be asymptomatic hosts for the viruses. Garden tools such as pruners, scissors, stakes, and containers should be cleaned with detergent between uses to manage disease, including viruses. Diseased plants should be disposed of and not composted. If the plant material does not fully decompose, it can still harbor the virus and can be an inoculum source for the vectors.