

RE-EMERGING VIRUSES: WHAT CAN WE DO?

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Several viruses can cause devastating diseases in tomato (*Solanum lycopersicum*). Major viruses affecting tomato production in New York are *Tobacco mosaic virus* (TMV), *Tomato mosaic virus* (ToMV), *Tomato spotted wilt virus* (TSWV), and *Impatiens necrotic spot virus* (INSV). *Spinach latent virus* (SpLV) is an emerging virus and of potential new threat for tomato production in New York.

Effect of Viruses on Tomato Crop Performance. Viruses can reduce plant growth and cause substantial yield losses in open field, greenhouse, high tunnel tomato production. Fruits are smaller in size, distorted, discolored, and thus, are unmarketable. The impact on the quality and quantity of the crop is usually more severe when the plants are infected at an early development stage.

TMV and ToMV cause foliar mosaic symptoms that are characterized by intermingled patches of normal and light green or yellowish colors, and plant stunting. They also damage the leaves, flowers, and fruit. TSWV causes symptoms on leaves, petioles, stems, and fruit. Young leaves can show small, dark-brown spots, and eventually die. Dark brown streaks can appear on stems and leaf petioles. Growing tips can be severely affected with systemic necrosis and stunted growth. Tomato fruit can be mottled with light green rings and discoloration patterns. SpLV causes stunting, leaf distortion, twisting discoloration, and color streaking and ringspots on fruits. The occurrence of SpLV is rarely reported. There are less than a handful of records to date from the United States, including a couple from New York in 2013 and 2014.

Diagnostic foliar symptoms can be deceiving because they can be confused with herbicide damage, mineral deficiencies, and other plant diseases. In addition, they vary with the cultivar, environmental conditions, and development stage of the tomato plant. It is also difficult to attribute symptoms to one specific virus because mixed infections, in particular with TMV and ToMV, can occur. Only laboratory tests can reliably identify viruses in tomato.

Transmission of Viruses in Tomato. TMV and ToMV are two closely related viruses that are seedborne in tomato and readily mechanically transmitted in greenhouse and high tunnel settings by manual operations such as suckering, tying, harvesting, etc. ToMV is usually more problematic than TMV because it is more adapted to tomato. Both viruses are infectious for very long periods, particularly TMV, which is the most stable and persistent plant virus known. TMV has a very wide host range including vegetables (tomato, pepper, etc) and ornamentals (petunia, snapdragon, delphinium, marigold, etc).

TSWV is transmitted by several thrips species, the most important vector being the western flower thrips (*Frankliniella occidentalis*), tobacco thrips (*F. fusca*), common blossom thrips (*F. schultzei*), and onion thrips (*Thrips tabaci*). In greenhouse and high tunnel settings, the western flower thrips is the primary vector of TSWV. TSWV has a wide host range of

ornamentals (zinnia, dahlia, chrysanthemum, gerbera, gladiolus, peony, etc.) and vegetables (tomato, pepper, celery, eggplant, lettuce, bean, spinach, cucumber, cauliflower, etc.).

SpLV is seed-transmissible and eventually pollen-transmissible. Since seed production takes place in different parts of the world, this virus has the potential to spread with germplasm and become more prevalent in New York.

Management Recommendations of Viruses in Tomato. There is no cure for a virus-infected plant in the field, greenhouse or high tunnel, and there is no direct way to combat a virus besides removing infected plants. Therefore, it is paramount to consider preventive measures such as:

- Selecting cultivars with resistance to ToMV and TMV. Resistance genes to these viruses have been introduced into many commercial cultivars of fresh market, saladette, cocktail, cherry, grape, and roma tomato.
- Inspecting new transplant shipments for evidence of thrips or symptoms of viruses before being introduced into a greenhouse or a high tunnel. Symptomatic plants should be immediately eliminated.
- Avoiding intermixing ornamentals and tomato seedlings should be avoided whenever possible. This is because TSWV or INSV can spread from infected ornamental plants (for example hanging flower baskets) in a greenhouse to tomato seedlings that will be transplanted to the field, resulting in severe epidemics in that crop, and subsequently in adjoining vegetable fields. Ornamentals and tomato seedlings should be grown in separate greenhouse units.
- Eliminating weeds inside and the area surrounding a greenhouse and a high tunnel because several common weed hosts (chickweed, lamb's quarters, burdock, sowthistle, shepherd's purse, purslane, etc.) serve as important virus reservoirs for TSWV and IYSV, or TMV (ivy, plantain, night shade, and jimson weed, etc.).
- Scouting routinely for thrips by determining the onset of an infestation and monitoring seasonal variations in population levels using yellow sticky cards. Reducing thrips populations by using insecticides and avoiding opportunities for virus spread.
- Scouting routinely for infected plants and eliminating them, ideally before the pruning or tying up of production plants.
- Enforcing sanitation measures such as regular hand washing and prohibiting smoking in the greenhouse and high tunnel to limit the transmission of TMV.

In summary, a careful selection of resistant cultivars and high quality seeds, sanitation measures, and best management practices are recommended to mitigate the impact of viruses in tomato.