



# Pest e-alerts



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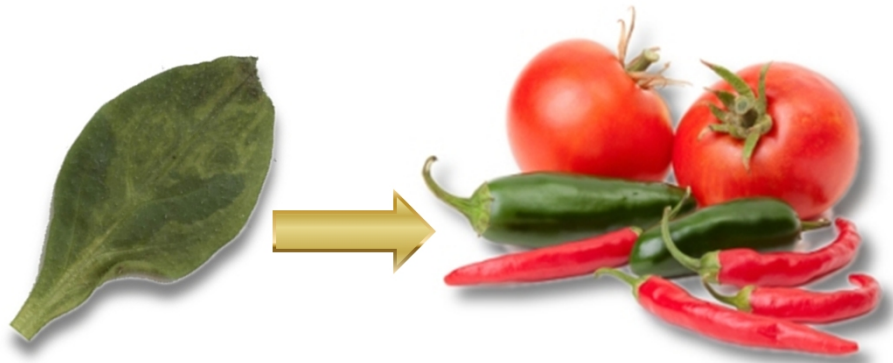
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## Watch for TMV on Tomatoes and Peppers

John Damicone, Extension Plant Pathologist

Petunias infected with tobacco mosaic virus (TMV) reportedly being shipped around the country are a concern for vegetable crops as well as bedding plants. Viruses are sub-microscopic particles that are most often transmitted to plants by



insects such as aphids, whiteflies, and leafhoppers. Viruses are generally short lived outside of a plant or insect vector. However, TMV is notable exception in that the virus particles are extremely stable and can survive extended periods as a surface contaminant on knives, shears and other tools; pots, benches, and other structures; and in dead plant debris and contaminated soil. The virus is readily spread mechanically by human activities. For this reason, TMV can be particularly troublesome in greenhouses where plants are frequently handled or worked. As a result, greenhouse operations and retailers handling both bedding plants and vegetable transplants might be prone to transmitting the virus to susceptible vegetable transplants such a peppers and tomatoes. The virus has a broad host range that includes many bedding plant species in addition to petunias.

Symptoms on tomato and peppers are variable depending on the strain, environmental conditions, and age at which the plant is infected. Symptoms generally include leaf mosaic and mottling (patches of light and dark green color) (Fig 1 and 2) and leaf distortion (Fig 3). Like most virus diseases, symptoms are most pronounced on young leaves around the growing points. Plants infected early are stunted and have reduced yield. Tomato fruit from infected plants often show uneven ripening and are reduced in size and number. Pepper fruit from infected plants are small and disfigured.



**Fig 1.** Leaf distortion and mottling symptoms on tomato from TMV (photo credit: IFAS/UFL)



**Fig 2.** Mosaic symptom on tomato caused by TMV (photo credit: INRA-HYPP)



**Fig 3.** Mosaic symptoms on pepper caused by TMV (photo credit: MO Botanic Garden)

Control of TMV relies on sanitation and planting of resistant varieties. Avoid purchasing, planting or otherwise handling symptomatic plants. Infected plants should be rogued out. Wash hands with soap and water and sterilize tools in 10% bleach to prevent virus spread. Resistant varieties are more numerous for tomatoes than for peppers and are indicated by a 'T' or 'TMV' in the variety descriptions. 'Celebrity' and 'Big Beef' are examples of readily available tomato varieties with TMV resistance. The OSU Plant Disease and insect Diagnostic laboratory can quickly test for TMV and several other viruses. Collect shoots from suspect plants, fold them into a paper towel, and enclose in a zip lock bag prior to submitting samples.

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## Guidelines for Healthy Vegetable Transplants

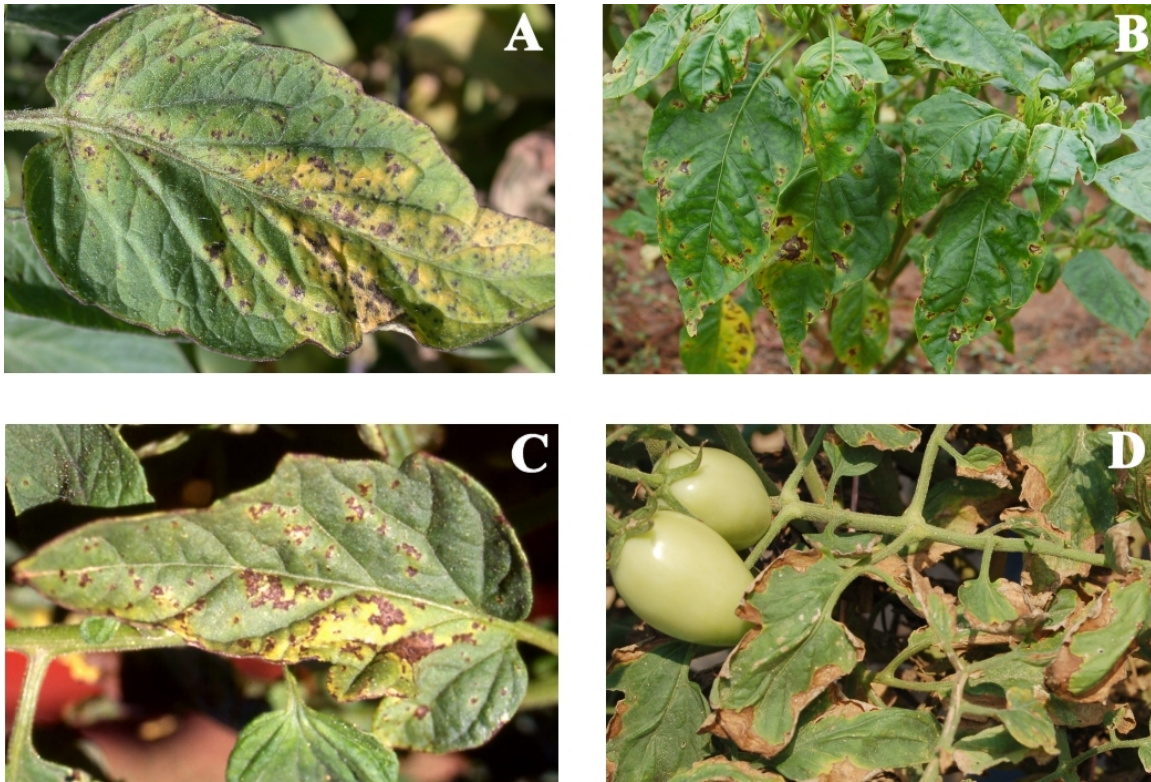
John Damicone, Extension Plant Pathologist

The use of infected vegetable seed and transplants is a common way that some damaging vegetable crop diseases are introduced into the garden or onto the farm. Bacterial diseases such as bacterial spot of tomato (Fig 4A) and pepper (Fig 4B), bacterial speck of tomato (Fig 4C), and bacterial canker of tomato (Fig4D); and virus diseases such as tomato spotted wilt virus (Fig 5) or TMV (see above) can occur on vegetable transplants and can become stubborn problems for growers to deal with.



Transplants become infected by pathogens carried on the seed or by spread from other sources during transplant production. While only a small percentage of seed may be contaminated, greenhouse conditions are conducive to the development and spread of diseases because plants are often crowded together. Furthermore, bacteria may survive and spread on leaf surfaces without causing symptoms until after transplants are set. Standard recommendations are to “plant disease free seed” or “use disease free transplants”. In reality these recommendations are not very practical because there are few if any independent certification programs that check for pathogens on seeds and transplants. Large seed companies have plant pathology programs that inspect seed fields and test seed for common seed borne pathogens. Quality control from smaller seed companies and transplant growers who supply retailers with plants and seeds is less rigorous. Vegetable crop growers should develop some level of their own certification program to avoid importing disease problems into their operations.

An obvious first step is to inspect plants to ensure they are free of obvious disease symptoms and insect problems. Avoid purchasing plants that have leaf spots, wilt, stunting, or leaf deformities that are symptoms of disease problems. Similarly, plants infested with thrips or aphids may develop virus diseases because these insects carry and spread viruses.



**Fig 4.** (A) Bacterial spot on tomato, (B) bacterial spot on pepper, (C) bacterial speck on tomato, and (D) bacterial canker on tomato.



**Fig 5.** Leaf bronzing and stippling caused by TSWV.

Another choice is to grow your own transplants from high quality seed or seed treated to minimize the chances for introducing seedborne disease. Seed sanitation is especially important for growers who save their own seed. Producing healthy transplants requires an integrated approach using all of the following steps:

- 1) Practice sanitation in the greenhouse, especially when it is vacant. Kill all weedy vegetation growing in the greenhouse. Remove and dispose of dead plant debris. Wash benches and containers (pots, flats, etc.) with disinfectant or a 10% bleach solution.
- 2) Use fresh, heat-pasteurized soil mixes or new soilless potting media. Soilless media containing sphagnum peat moss help suppress seedling diseases (damping-off).
- 3) Assume that saved seed or seed of unknown quality is contaminated and apply a bleach treatment. Place seed in a loose-fitting cheesecloth pouch, immerse the seed in a solution of 20% household bleach (1 qt bleach plus 4 qts water plus ½ teaspoon of dish soap or surfactant), and provide constant agitation for 1 to 2 min. Wash seed in running water for 5 minutes, then dry seed thoroughly. Use treated seed as soon as possible as long storage times will reduce seed germination.
- 4) To control damping-off, purchase seed treated with fungicide or apply a fungicide seed treatment (OSU Extension Agent's Handbook E-) for untreated seed or seed that received bleach treatment. For example, dust tomato and pepper seed with thiram 65W at 1 teaspoon per lb of seed.
- 5) For tomatoes and peppers, use streptomycin (Agri-mycin or Firewall 17W) at 1 lb/100 gal (1.25 teaspoon/gal) as a foliar spray to control bacterial diseases. Begin sprays when seedlings have the first true leaves and repeat every 4 to 5 days until transplanting. Once transplants recover from transplanting, apply a copper fungicide (such as Kocide 101 at 2 lb/A) as a foliar spray and repeat 1-2 times at 7-day intervals.
- 6) Maintain an adequate temperature in the greenhouse to ensure rapid seed germination and seedling growth. Damping-off is favored by cool temperatures, excessive seeding depth, and over-watering.
- 7) Operate greenhouse heaters and fans in such a manner to reduce humidity levels, particularly periods of prolonged leaf wetness, and condensation on plant surfaces. Water during the day when leaves dry most rapidly.
- 8) Routinely inspect plants for symptoms or signs of disease. Rogue and dispose of any plants with disease symptoms and surrounding plants likely to be infected. Identify the disease problem and initiate a spray program if warranted.

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