

The IPM Way to Manage Bedding Plant Diseases

Part II: Foliar Diseases Caused by Viruses and Bacteria

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(Editor's Note: This is Part II of a three-part article provided to help growers better understand how to manage bedding plant diseases. Part I (see CGNL #190) discussed some general information and contagious diseases; Part II will discuss foliar diseases caused by viruses and bacteria; and Part III will review noncontagious diseases. Adherence to the basic principles outlined here plus using good growing techniques will allow growers to produce quality plants.)

Foliar Diseases Caused by Viruses

Although there are relatively few virus problems associated with bedding plants, two tospoviruses—tomato spotted wilt (TSWV) and impatiens necrotic spot (INSV)—are of considerable importance. Among the spring bedding plant crops, impatiens, New Guinea impatiens and begonia are the most frequently harmed by one of these viruses. They are both transmitted by thrips; Western flower thrips being the usual carrier in greenhouses. The viruses can also be carried in infected cuttings or tubers (e.g. impatiens cuttings or dahlia tubers) as well.

Symptoms of infection for the two viruses are similar and include brown or black spots on leaves; yellow, black or necrotic rings or oak leaf patterns on leaves, stems or flowers; wilting or stunting; tip dieback; or a chlorotic mottle or mosaic on foliage. Of all bedding plants tested, only geranium appears to be little prone to infection. Ivy geraniums, which are favored by thrips, have, on rare occasions, shown yellow ring spots when infected by TSWV.

Symptoms of INSV or TSWV may not be apparent in infected plants, but these symptomless plants may still be a source of virus for thrips. A few species and cultivars will show symptoms within two or three days if infected, whereas others, such as cyclamen, may not show symptoms for as long as two months.

Do not keep virus-infected material in the greenhouse from year to year. Inspect new plants for thrips and virus infection as they are brought into the greenhouse. Plants suspected of carrying thrips and/or virus should be isolated from other susceptible plants. Plants infected with virus cannot be cured.

Monitoring Tips

Keep Track of Thrips. Take regular sticky card counts for thrips in order to monitor populations of the virus vector. Yellow or blue cards can be used. Blue cards are somewhat more attractive to thrips and can be used where thrips are a primary concern. Yellow cards are less specific and will also trap shore flies, fungus gnats, whiteflies and aphids.

Look for Symptoms. Scan over the crop regularly looking for the typical symptoms. Randomly select plants for closer examination, looking closely at stems and leaf petioles. Sometimes leaf spots may be visible only on leaf undersides.

Use Indicator Plants. Plants which show virus infection quickly are useful for detecting the spread of the disease by thrips in the greenhouse. Potted fava beans ('Little Toto' works well) or petunia cultivars 'Summer Madness', 'Super Blue Magic' and 'Calypso' will show both signs of thrips feeding damage and, if thrips are carrying the virus, dark spots within a few days after feeding. Where virus-infested thrips have fed on fava bean, small, round black spots will appear, while on petunia, there will be small, dark brown spots about 1/8" diameter. To monitor virus spread, place these indicator plants at crop level in areas where thrips are known to be present, and check them every few days for the virus spots. If virus appears to be spreading around the greenhouse, tighter control of thrips and stricter roguing of infested plants is advised.

Foliar Diseases Caused by Bacteria

There are several bacterial diseases that affect bedding plant crops. Most are controlled through cultural practices; no effective controls exist for infected plants. Bactericides, such as copper, provide limited benefits.

Xanthomonas campestris pv. *pelargonii* is the notorious cause of bacterial blight of geranium. Zonal, ivy and regal/Martha Washington geraniums are susceptible, although infection of Regal geraniums (*Pelargonium domesticum*) is relatively unusual. Bacterial blight is an extremely serious problem when it occurs because of the importance of the crop to many growers and propagators. Symptoms are not always apparent when the bac-

teria are present and are even less observable during winter months. As temperatures increase in the spring and overhead watering is supplied to crops of geraniums, symptoms tend to become obvious. Infected plants do not recover and should be discarded. The bacteria are spread from plant to plant by splashing water or handling; cuttings from infected plants can carry the pathogen as well. The bacteria are not spread via seed, therefore, seed-grown geraniums produced in isolation from cutting-grown material are not likely to contract the disease.

The symptoms of bacterial blight include small (1/16 to 1/8") brown spots on foliage, often with yellow halos. Sometimes the spots appear in a V-shaped brown wedge on a leaf. Entire plants, or perhaps only a leaf or stem, may show wilting (check roots and stems to rule out *Pythium* and *Botrytis* respectively). Overhead watering and warm, moist conditions favor the disease. Bacteria can enter a plant through wounds or directly through natural openings (stomates).

Control the Problem Preventively. Use culture-indexed cuttings and grow cuttings separately from seed crops. Destroy suspect material promptly after obtaining a definite diagnosis from a laboratory.

Monitoring Tips

Monitor for bacterial blight by scanning the foliage of geraniums, looking for the typical symptoms. Since seed-grown plants are less likely to have the disease (unless it is introduced from another source), watch cutting-grown crops most carefully.

Xanthomonas campestris *pv.* *zinniae* is the pathogen causing a bacterial leaf spot of zinnia. This pathogen is spread in seed and also from plant to plant by splashing water and handling. The small angular brown spots have yellow haloes and are often seen on young seedlings. The problem is controlled by seed treatment in a 1:4 dilution of bleach (containing 5.25% sodium hypochlorite) for 30 minutes. Water zinnias early in the day avoiding splashing (or subirrigate) and destroy infected material if a problem is observed. *Alternaria* leaf spot on zinnia caused by *Alternaria zinniae* has similar symptoms and is often confused with bacterial leaf spot. Its effects are also lessened by minimizing foliar wetness.

Another bacterium, *Xanthomonas campestris* *pv.* *begoniae*, causes bacterial leaf spot of begonia, but this disease is rarely a problem in bedding plant production. Vegetatively-produced begonias are more commonly affected.

Pseudomonas syringae causes Pseudomonas leaf spot of usually minor importance on *Impatiens wallerana* and New Guinea impatiens. The small (1/8" or less) brown spots have tan centers and are often associated with a leaf hydathode (water pore). Avoiding splashing water helps minimize this problem. Under wet conditions, the bacteria can cause serious losses to impatiens.

(This article was reprinted from *Greenhouse IPM Update*, Vol. 5(7), 1995.)