

GROWERTALKS

Features

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Examining Xanthomonas

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1. *Poinsettias in propagation showing Xanthomonas leaf spots.*
2. *Spotting and some chlorosis caused by a Xanthomonas species on hydrangea.*
3. *Blighting of swamp milkweed by a Xanthomonas species.*
4. *Purple spots and necrosis on peony foliage affected by Xanthomonas sp.*

Its name tells you that it's one cell (a monad) and that it has a yellow pigment (a xanthomonadin). Xanthomonas is the Latin name for a genus of bacteria that act as parasites on many of our favorite greenhouse-grown plants, as well as other agricultural crops. You'll see vein-bounded or round spots, V-shaped wedges on leaves or wilting, sometimes with chlorosis (yellowing) of the tissue or yellow haloes around the spots. Only in the laboratory do cultures allow you to see the yellow color of the pathogen's cells en masse, with a texture indicating that each individual has a slimy coat (the better to clog the xylem with, my dear).

One of the chief challenges with Xanthomonas diseases is that they can be seedborne. When we grow plants from cuttings (Hiemalis begonias, geraniums, lavender, hederas), Xanthomonas transmission happens through vegetative propagation of the pathogen along with the plant. With zinnias, ornamental peppers and kale, and vegetables like tomatoes and peppers, though, Xanthomonas transmission is largely about the seed.

If the seed were clean, the crops would be clean. Unfortunately, very low percentages of bacterial contamination can create high-level problems for individual growers because of the extremely contagious nature of Xanthomonas.

Seed companies tell us that seed disinfestation treatments reduce germination too much for plug growers to meet their full-tray standards. Very carefully treating the seed yourself with hot water is one option—one grower in New York has had Xanthomonas-free crops of cabbage and kale for two years since taking seed cleanliness into his own hands. Working to improve the production system is another option—the Gloeckner Foundation has initiated collaboration with the Seed Science Foundation to focus research on reduction of the bacterial problem for greenhouse ornamental growers.

Examples of some ornamental crops with *Xanthomonas* problems

Geranium

Whether you grow *Pelargonium x hortorum*, the florist's geranium, or *Geranium sanguineum* and other hardy geraniums, *Xanthomonas hortorum* pv. *pelargonii* is a threat. In the case of the hardy plants, the bacteria are leaf spotters—ugly, but not life threatening. Growers who produce herbaceous perennials and florist's geraniums would do well to take precautions to avoid spreading a highly contagious and crippling disease from the perennials to the pelargonium crop, where the disease has a very high impact.

On pelargoniums, *Xanthomonas* bacteria cause round, brown leaf spots 2 to 3 mm in diameter—but also gain access to the vascular tissue and spread throughout the plant, leading to wilting and death.

The constant problem with *Xanthomonas* in greenhouse pelargonium crops in the 20th century was licked by an intensive effort on the part of APHIS and the greenhouse industry to prevent introduction of *Ralstonia solanacearum* Race 3 Biovar 2 into the U.S. in geranium cuttings. Sometimes regulation is a great way to reduce disease losses. The sanitation practices, testing and tracking that curb *Ralstonia* are also brought to bear against *Xanthomonas* in geraniums.

Ornamental kale and cabbage

Seed-grown crops such as ornamental cabbage and kale are susceptible to a disease that farmers have long referred to as black rot. Large Vs at the edge of leaves (infections via hydathode glands) turn yellow then brown. Close inspection of the V-shaped areas will show you blackened veins. Greenhouse growers of ornamental brassicas face the same adversary: *Xanthomonas campestris* pv. *campestris*. Looks are more important for an ornamental crop and symptoms can become quite severe. This disease is seed-borne and also survives on weeds. Check plug trays regularly for spotting and yellowing.

Poinsettia

Xanthomonas disease on poinsettias is especially problematic during propagation, as the environmental conditions (humidity, moisture and warmth) during this stage of a poinsettia's production sequence are most conducive to bacterial infection and spread. The vein-bounded leaf spots that *Xanthomonas* causes are disfiguring and are a trial for the finishing grower.

Putting a single name on the pathogen is difficult with poinsettia. *Xanthomonas arboricola* pv. *poinsettiicola* is the primary name in use, but other *Xanthomonas* species can be associated with poinsettia disease as well, as shown by research in Florida by Rockey et al. in 2015. Meanwhile growers cope with disease management using the few tools at their disposal.

Herbaceous perennials

Xanthomonas diseases aren't just on major florist crops—a wide range of plants can be affected by this genus of bacteria, including many that we grow in outdoor nursery settings with overhead irrigation plus rain. The absence of a covering magnifies the potential for problems with bacterial diseases. New bacterial problems are noted in herbaceous perennials frequently.

One notable example is the *Xanthomonas* on peonies, a *Xanthomonas hortorum*, which causes ugly purple spotting on leaves and stems. This disease was formally reported from Virginia in 2009 by Parkinson et al. and by Klass et al. from Ohio 10 years later. This year we saw an *Asclepias incarnata* with leaf blighting due to a *Xanthomonas* sp. We expect this was the same disease first reported by Flynn and Vidaver in 1995 after it had affected crops of common milkweed (*A. syriacus*) being cultivated for its floss in Nebraska and Kansas. This new pathovar,

Xanthomonas campestris pv. *asclepiadis*, caused symptoms on inoculated *A. speciosa* (showy milkweed) and *A. tuberosa* (butterfly weed), as well as *A. syriacus*. It's even been suggested for use as a bioherbicide to eliminate common milkweed!

Woody plants

Bacterial diseases can be troublesome during woody plant production, where monocultures are watered from overhead. Two examples of significant *Xanthomonas* problems on woodies would be the *Xanthomonas* leaf spot on shrub roses and Indian hawthorn caused by an organism with the proposed name *Xanthomonas axonopodis* pv. *rosa* reported by Huang et al. in 2013 and the *Xanthomonas* leaf spot of increasing importance in production and landscape on various hydrangea species.

We have no long-lasting or especially effective treatments against bacterial diseases for use in the landscape and homeowners are averse to weekly sprays on their grounds. The best management for these problems would be clean, or better yet, disease-resistant nursery stock. Developing attractive cultivars with low susceptibility to these *Xanthomonas* diseases should be a priority of all parts of the ornamentals industry. **GT**

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Management of *Xanthomonas* Diseases

- Side-stepping a disease problem is an excellent control strategy, so use more resistant species and cultivars when that's an option. One example: the level of bacterial leaf spot of zinnia has been happily reduced by shifting culture away from *Zinnia elegans*, which is highly susceptible. *Zinnia angustifolia* x *elegans* hybrids such as the Profusion series show moderate disease resistance, while even stronger resistance is reported for the Crystal and Star series.
- Scout for symptoms in seed flats or young cutting-grown plants, which appear as miniature versions of symptoms on older plants. Mark and cordon off plants you suspect of having a *Xanthomonas* leaf spot, then get a lab verification of your suspicions before discarding plants—diseases are hard to diagnose with the eye alone.
- Keep overhead irrigation to a minimum and time irrigation so that foliage dries before nightfall. Splashing spreads bacteria and quickly expands the zone of infected plants. Subirrigation isn't safe for crops like geraniums that get a systemic *Xanthomonas* disease.
- Utilize copper-based fungicides and *Bacillus*-based biocontrols to suppress the *Xanthomonas* diseases. (But note that zinnias can be sensitive to copper treatment).