

Bacterial Blight of Geraniums

(*Xanthomonas campestris* pv. *pelargonii*)

What is It?

Bacterial blight caused by *Xanthomonas campestris* pv. *pelargonii* is the single most important disease of geraniums. This disease becomes systemic in the plant and can quickly kill it. Bacterial blight may occur wherever geraniums are grown and is a continual threat to their production.

Xanthomonas bacterial blight infects all varieties of cutting and seed zonals, (*Pelargonium X hortorum*), cutting and seed ivies, (*P. peltatum*), seed, scented, Regal/Martha Washington (*P. X domesticum*), and perennial geraniums. Ivy leaf geraniums are especially susceptible. Martha Washingtons and specialty types, such as *P. acerfolium*, *P. 'Toronto'*, *P. tomentosum* and *P. scarboroviae*, have some tolerance to the disease and while they may not show symptoms, they can act as carriers of the bacteria.

Debris from infected plants is a source of seasonal carry-over of *Xanthomonas*. In addition, *Xanthomonas* can survive on the leaves or wounded stems of several ornamental species such as tuberous begonia, chrysanthemum, coleus, fuchsia, impatiens, lantana, verbena and vinca. Surfaces such as pots, benches, and tools can also be a source of infection. Research has found that the disease may also survive on weeds and infect healthy plants the following season. It is uncertain how long the bacteria can survive in soil.

Where does it come from?

- ❖ infected cuttings
- ❖ carry-over of infected stock
- ❖ debris from infected plants

How is it spread?

- ❖ **mechanical**
 - taking cuttings, whether by cutting or pinching
 - cleaning plants
 - workers' hands
 - workers' clothing
- ❖ **insects**
 - greenhouse whitefly
 - fungus gnats
- ❖ **water**
 - splashing during irrigation from diseased tissue or contaminated surfaces
 - water films - capillary mats, ebb and flow benches
 - recirculating irrigation systems
 - pesticide spraying

**There is no cure for this disease,
so the focus is on preventing the introduction
and spread of the bacterium.**

Floriculture FACTSHEET



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What are early symptoms to look out for?

Xanthomonas spreads quickly and easily, so early detection is of paramount importance. What makes the disease even more devastating, is that there can be a considerable time lag between when plants are infected and when they begin to show symptoms. By the time plants begin to show symptoms, thousands of plants may already be infected and have to be destroyed.

Do routine weekly checks of the geranium crop, looking out for any browning or yellowing leaves, and be very suspicious of any signs of wilting. Carefully remove suspect plants from the growing area to avoid contact with other plants. Have the plants tested for *Xanthomonas* at a lab. When you are moving plants through the greenhouse, make sure that you don't become a disease vector. Inform your staff of the symptoms to look for and encourage them to report suspicious plants to you. If your crop is doing poorly and your weekly monitoring of pH and EC levels indicates they're within acceptable parameters, you should consider sending plants to a lab for testing for *Xanthomonas*.

- ❖ Look for dark brown, sunken leaf spots 1.5 - 3 mm in diameter. Note: Not all geranium varieties will show leaf spot symptoms.
- ❖ Look for V-shaped yellow wedges that form at the leaf margin and taper down to the base of the leaf. The wedge is usually bound by leaf veins on both sides. *Botrytis* can cause similar symptoms, but the infections usually do not taper down to the leaf base and are not confined by leaf veins.
- ❖ Cut the base of the leaf petiole and the stem in half to check for a dark discolouration in the vascular tissue.
- ❖ *Xanthomonas* wilting can usually be differentiated from a *Pythium/Phytophthora* root rot because the *Xanthomonas* affected plants will usually have healthy roots.

Symptom development is highly dependent on the geranium species or variety, the growing conditions, and environmental conditions. Symptoms usually do not develop when the temperature is below 21°C. The optimum temperature for disease development is 27 to 29°C. In the cooler months of winter and early

spring, affected plants may not show the "classic" symptoms.

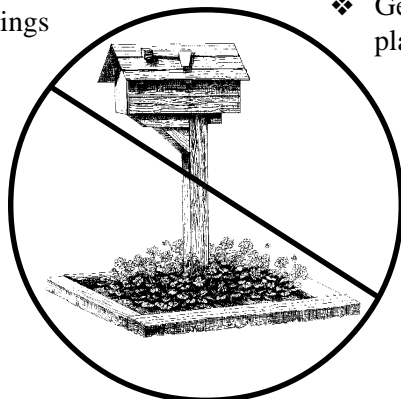
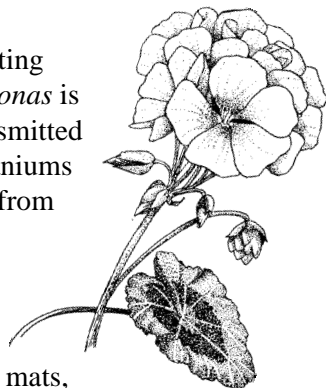
What growing techniques help to minimize the spread of the bacterium?

Strict sanitation combined with the exclusive use of culture virus indexed (CVI) stock from reputable propagators is the only way to minimize losses from bacterial blight.

- ❖ Purchase CVI disease-free plants each year, use a sterile, soilless mix, and new or clean pots.
- ❖ Break off cuttings from stock plants rather than using cutting knives.
- ❖ Keep exact records of plant sources when taking cuttings so that batches can be traced back to an infected source so all potentially infected material can be destroyed.
- ❖ Limit entry into stock and production areas. Entry into the stock plant growing areas should be tightly restricted and limited. Entry into the growing area should also be tightly controlled. Consider providing visitors, such as sales representatives, inspection and extension staff, with disposable overalls and overboots. This is especially true, if they have been in another greenhouse before they called upon you.
- ❖ Start work from the cleanest production area to the dirtiest, i.e. stock plants to propagation area to production area and ending at the cull pile. Do not work in the reverse direction from the cull pile.
- ❖ Isolate your scented and Regal/Martha Washington geraniums from the zonals. They can be carriers of the disease and not show symptoms.



- ❖ Isolate incoming material and keep shipments in different greenhouse, or at least in different blocks in the greenhouse. It's important to be able to locate specific shipments in case any problems develop at a later date.
- ❖ Do not hang geraniums, whether they be ivies, zonals, or mixed spring baskets, above other geraniums. Dripping irrigation water will quickly spread any disease.
- ❖ Separate seed and cutting geraniums. *Xanthomonas* is not thought to be transmitted by seed, but seed geraniums can catch the disease from other geraniums.
- ❖ Avoid plant-to-plant contact, common water films (capillary mats, ebb and flow benches, trough irrigation systems), and overhead watering particularly for stock plants.
- ❖ Adequate spacing will promote air circulation and minimise water splashing affects.
- ❖ Minimize splashing when watering.
- ❖ Keep hoses off the ground.
- ❖ Provide a footbath with quaternary ammonium or buffered bleach at each doorway. Clean and recharge it daily.
- ❖ Keep the greenhouse interior weed-free and maintain at least a three metre weed-free zone around the perimeter of each greenhouse.
- ❖ Do not have ornamental plantings of geraniums outside the greenhouse.



What about end of season clean-up?

- ❖ Discard all geraniums at the end of *each* season. This includes old favourites that may not be commercially available anymore.
- ❖ Clean up and remove all debris on tables or the floor of the greenhouse.
- ❖ Wash down all bench surfaces with bleach, Virkon or quaternary ammonium compounds. **Do not mix these compounds as hazardous gases can result.**
- ❖ Disinfect watering lines with a disinfectant.
- ❖ Do not save outdoor-grown geranium plants for use as stock plants.
- ❖ Discard all plants returned by customers and do not allow such plants to be brought into the growing areas.
- ❖ If you reuse pots, they must be treated with a disinfectant, and they must not be reused for a geranium crop.

What should I do if my plants test positive for the bacterium?

- ❖ Immediately discard all plants found to be infected. They should be buried or removed off site. Do not compost them on the greenhouse site or spread them on adjacent fields.
- ❖ Do not carry infected or suspicious plants openly through the greenhouse; place them inside a plastic garbage bag or box before they're moved.
- ❖ Geraniums immediately next to an infected plant should be discarded off-site, as well as the flats or boxes they might be growing in. Do not reuse pots or trays from infected plants.

- ❖ Wash down all greenhouse surfaces (benches, walls, drippers, walkways) and disinfect all tools used to handle the plants with a disinfectant such as a quaternary ammonium compound, bleach or Virkon.
- ❖ Disinfect the irrigation system if you have a recirculating system.
- ❖ You may want to consider not growing geraniums of any type for three months.

Are there any pesticides that can be used to control the disease?

There is limited effective chemical control for geranium bacterial blight. Fungicides, other than coppers, will not control a bacterial disease. Copper sprays can only prevent spread, they will not eradicate the bacteria inside the vascular system of the plant.

Phyton 27 (copper complex)

250 mL/100 L Apply as a foliar spray at 1,000 - 2,000 L/ha for greenhouse grown geraniums. Note that it will only help prevent the spread of *Xanthomonas* to finished plants; it will not eradicate the disease.

If some of your plants have tested positive, Phyton 27 can be used as a possible early indicator of *Xanthomonas* infection in symptomless plants.

A foliar spray at the label rate of 250mL/100 L may produce bright yellow foliage in plants that have *Xanthomonas* and appear symptomless. Under the right growing conditions, plants turn colour within five days. Plants with the bright yellow leaves have a strong possibility of infection and should be isolated and tested for the disease or rogued out. The test is most effective when plants are growing rapidly, stems are not corky, and temperature and relative humidity are high. In other words, don't rely on the test under cool conditions and slow plant growth. It doesn't work on large stock plants. It hasn't been determined why affected plants turn colour when sprayed with Phyton 27, but it could be related to plant stress.

Absence of yellowing is not a reliable indicator that the crop has no risk of disease outbreak.

Do not rely on this method alone for an initial *Xanthomonas* diagnosis. Suspect plants must first be tested by a qualified laboratory. Only after the disease has been confirmed, should you use Phyton to indicate infected plants.

Phyton 27 should be used only as an early warning of disease spread. It also has the added benefit of protecting the uninfected geraniums from plant-to-plant movement of *Xanthomonas* in splashing water.

Conclusion

Xanthomonas is the single most devastating disease of geraniums. It is a bacterium, so it is easily spread through crops by water, handling or working the crop, and moving plants. In early propagation stages when the weather is generally cool and dark, affected plants will not always show the classic symptoms. Growers might notice that the cuttings root poorly or look slightly off. One of the major problems in dealing with this disease is the lag in time between infection and diagnosis. While the plants may not show signs of the disease, they may be spreading it to others.

There is no cure for the disease once geraniums have *Xanthomonas*. Therefore, the key to managing the disease is **PREVENTION** and strict **SANITATION**.

