BACTERIAL BLIGHT OF GERANIUM

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Probably one of the most serious and potentially devastating diseases of geraniums in greenhouse production is bacterial blight (*Xanthomonas campestris* pv. *pelargonii*). Bacterial blight is a "single-celled" organism that can divide every 20 minutes into two identical daughter cells. Under ideal conditions it can reproduce in the vascular system of geranium rapidly, until millions of cells plug the xylem leading to disease symptoms. If you grow geraniums, you and your employees need to learn to recognize the early symptoms associated with bacterial and what to do if suspect plants are found. Infected plants show tiny, sunken, round, brown, leaf spots (1/8 inch diameter); necrotic V-shaped areas with a yellow halo (wide part along the leaf margin and the point on a vein) and wilting of the leaves; blackened, shriveled stem cankers and black streaks in non-rotted stem portions; and death of the entire plant. The wide range of symptoms are due to the ability of bacterial blight to gain entrance to the xylem system and spread throughout the plant.

Several steps should be taken by growers to ensure that plants are free of bacterial blight and remain that way throughout production. The first step is to purchase "cultured" or culture-indexed cuttings from a propagator whose reputation is unmatched. Major propagators take great care to ensure that their plant material are clean because they have a reputation to uphold. Top quality, cultured cutting may cost a little more, but they are worth it because growers often find themselves defenseless when systemic disease strikes the geranium crop.

Culture-indexing is an elaborate program designed to remove bacterial blight and other systemic diseases from plants used as stock for propagation. Even though cutting from cultured stock should be disease free, culture-indexing does not impart immunity and plants can be re-infected from other sources. Further, poor-quality, infected geranium cutting received by a grower may not express symptoms immediately. Often symptoms become more pronounced as temperatures warm in the spring. Therefore, a great deal of disease spread can occur before symptoms are detected.

As a purchaser of geranium cutting, consider the following steps to prevent bacterial blight from entering the greenhouse:

1. Ask detailed questions and to see a copy of records about the culture-index procedures used by a prospective propagator.

2. Ask other growers about the experiences they have had with a propagator.

3. Inspect all incoming plant material carefully and have suspect material tested by an independent pathology laboratory.

4. Place incoming plant material in a quarantine area for a couple of weeks and continue to look for symptomatic plants.

Isolation is an important means of limiting bacterial blight spread. Cutting geraniums should be kept separate from seed geraniums. Even though bacterial blight can be transmitted on the seed of seed geraniums, it is highly unlikely. However, the disease can spread for infected cutting geraniums to seed geraniums. Grow seed geraniums alongside other bedding plants, but separate from cutting geraniums. Likewise, keep plants from different propagators separated. If a problem does arise, you can be sure that it doesn't spread to the entire inventory and there is a better chance that the source of the problem can be identified. Also, do not hang baskets of ivy geranium above cutting or seed geraniums. Ivy geraniums can be infected with bacterial blight and show few or no symptoms of infection. Water dripping from the bottom of infected ivy geranium baskets can carry the bacteria onto plants below.

Speciality geraniums are increasing in popularity and production of this diverse group of geraniums is increasing. Speciality geraniums include Regal geraniums, geraniums with variegated or uniquely-shaped foliage, atypical flower shapes and sizes and a wide variety of scented geraniums. Recent information from Ohio State University indicates that these plants can carry bacterial blight and show few if any classic symptoms of the disease. Scented geraniums in particular have a sticky leaf surface and residue left on the hands after handling plants can carry the bacteria. Keep speciality geraniums isolated from cutting and seed geraniums and insist that works handling speciality geraniums wash their hands with warm, soapy water before contacting other geraniums.

A key component of preventing a bacterial blight problem is a strict sanitation program. Begin by designating greenhouse areas as "clean" or "dirty". Not only are greenhouse areas designated clean treated differently than other areas, but employees should be trained to behave differently while working in these areas.

To be sure that the greenhouse is pathogen free before bringing in geraniums, sanitize the entire production area and areas where geraniums will be handled (potting area, etc.). Clean up all containers, plant residue and spilled potting medium from previous crops. Non-porous greenhouse surfaces including bench tops, floors, walks, glass or plastic sidewalls and working surfaces can be sanitized using a commercial greenhouse disinfectant such as Greenshield, Physan-20 or Zerotol. Irrigation equipment, including breakers, spray nozzles and microtubes, should also be soaked for 30 minutes in disinfectant between crops.

Keep hose-ends and breakers off the floor. Anything that falls to the floor should be considered "dirty" and should not be returned to the bench top. Do not allow hose ends or breakers to come in contact with plants. Educate all employees about how they may spread bacterial blight. Insist that they thoroughly wash their hands before handling geraniums and that they keep tools and surfaces used for geraniums sanitized. Containers previously used to grow geranium should not be re-used, start with clean, new containers when potting geraniums. Do not try to carry-over plants from pro-

duction one year to the next year as stock plants. Remove all geraniums at the end of the production season and purchase new cultured material next year.

Bacterial blight can survive for up to one year in infected cuttings, plants and plant debris in soil. Therefore, each area where geraniums are grown should be given a geranium-free period during the year. If the area will be empty, clean up and sanitize production surfaces and solarize the greenhouse by closing it up and turning off the ventilation for a couple of weeks to allow heat to eliminate residual pathogen. This establishes a host-free period and prevents carry-over to the next geranium crop.

Bacterial blight can be carried on the hands or cloths of workers and visitors. Therefore, restrict the movements of casual visitors and limit the number of employees that can enter clean areas where geraniums are grown, especially from dirty greenhouse areas. Sales representatives from greenhouse supply companies often visit several greenhouse operations during the day and may unknowingly be exposed to infection and bring the bacteria into your greenhouse. Restrict their entry or insist that they do not touch benches or plants.

Bacterial blight is spread in splashing water and can be carried by greenhouse whiteflies. Overhead irrigation should be avoided where possible. If not, space plants far enough apart to minimize plant to plant splashing. Microtube irrigate limits disease spread, but do not use capillary mat irrigation. Many recommendations encourage steam or chemical sterilization of potting media. Treat insect infestations promptly. Remove all vegetation within 20 feet of the outside of the greenhouse.

Scout crops in the production area frequently and be prepared to act quickly if suspect plants are found. Roguing infected plants and sanitation are the important controls. Remove plants with bacterial blight symptoms from the benches immediately. Send samples to a diagnostic laboratory that can accurately and rapidly detect the presence of the disease. Rogue symptomatic plants and those immediately adjacent to symptomatic plants from the production area, place them in a plastic bag and discard, container and all. Removing immediately adjacent plants is important because they may be infected, but symptom free, and a future source of infection. Be sure to wash hands with soap and water after handling suspected disease plants. Spray the remaining plants with a legally registered copper-containing pesticide such as Phyton-27 or Kocide 101. This will help slow spread of the bacteria from plant to plant. No bactericides are available for this disease.

Avoiding bacterial blight in geraniums can be accomplished by preplanning and being aware how the pathogen makes a living. However, this is one disease with which you cannot cut corners. The disease is far easier to prevent (exclude) than to try to control once it starts.