



Bacterial Leaf Blight of *Aglaonema*

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About 170 species of plant-pathogenic bacteria infect foliage plants. Some of the most common and severe diseases of these plants are caused by bacteria classified in the genera *Dickeya*, *Xanthomonas*, and *Pseudomonas*. Bacteria are microscopic, single-cell organisms that reproduce by dividing in half as often as every 20 minutes. Bacteria enter plants through wounds or natural openings (such as leaf stomata).

This publication describes a potentially severe bacterial plant disease caused by *Dickeya chrysanthemi* in *Aglaonema* species and some other important ornamental foliage plants in Hawai'i.

The pathogen

The bacterium *Erwinia chrysanthemi* Burkholder et al. was re-classified into the genus *Dickeya* (Samson et al. 2005) and renamed *Dickeya chrysanthemi*. Older names for the pathogen were *Erwinia carotovora* (Jones) Bergey et al. f. sp. *parthenii* Starr; *Erwinia carotovora* (Jones) Bergey et al. f.sp. *dianthicola* (Hellmers) Bakker; *Pectobacterium parthenii* (Starr) Hellmers; and *Erwinia carotovora* (Jones) Bergey et al. var. *chrysanthemi* (Burkholder et al.) Dye.

D. chrysanthemi is a motile, gram-negative, non-spore-forming, straight rod-shaped cell with rounded ends. Cells range in size from 0.8 to 3.2 μm by 0.5 to 0.8 μm and are surrounded by numerous flagella (peritrichous). On PDA, young colonies depend on the moisture content of the medium. Colonies are commonly circular, convex, smooth and entire, or sculptured with irregular margins. After 4–5 days of growth in culture, colonies have a pinkish, round, raised central region and a lobed periphery.



Foliar symptoms of bacterial leaf disease of aglaonema include hydrosis of infected tissue and leaf spots and blight caused by the bacterial plant pathogen *Dickeya chrysanthemi*. The expression of disease symptoms after inoculation and the progress of disease can be quite rapid. (Photo: S. Nelson)

The pathogen, with its various strains/pathotypes/biovars, has a worldwide distribution (Bradbury 1998, Chao et al. 2006). Names of strains, biovars, or pathotypes and their known distributions on hosts include:

Aechma: Italy

Ananas: Malaysia

Colocasia: Solomon Islands

Begonia: Netherlands

Chrysanthemum: UK, Germany, Italy, Canada, USA, Japan

Dahlia: Netherlands, Romania

Dianthus: Europe, Italy and New Zealand

Dieffenbachia: Germany, Italy, USA

Musa: Central America and probably most other banana-growing areas

Philodendron, *Parthenium*, *Euphorbia* and *Aglaonema*: USA, Taiwan

Saccharum: Australia

Saintpaulia: France, Germany, USA

Zea: Egypt, Sudan, Rhodesia, S. Africa, India, USA, France, Italy, possibly Greece

Worldwide, the disease causes significant destruction of a number of flower and ornamental crops, such as carnation and chrysanthemum. Losses also occur on different glasshouse ornamentals (aglaonema, *Saintpaulia ionantha*, kalanchoe).

The host

Aglaonema species (aglaonema, Chinese evergreen) are common plants grown in shady landscapes and as potted indoor plants. They grow best in heavy shade, about 75–90%, with highest level of shade needed for air temperatures in excess of 95°F. These conditions create an excellent environment for some plant diseases, including those caused by *Dickeya* species.

The reported host range of *D. chrysanthemi* varies among different reports. Some other hosts mentioned in the literature include *Aechmea fasciata* (silver vased bromeliad), *Aglaonema pictum*, *Ananas comosus* (pineapple), *Begonia bertini*, *Chrysanthemum* spp., *Cichorium intybus* (common chicory), *Colocasia esculenta* (taro), *Dahlia* spp., *Dianthus caryophyllus* (carnation), *Dieffenbachia* spp., *Euphorbia pulcherrima* (pointsettia), *Kalanchoe blossfeldiana*, *Musa* sp. (banana), *Parthenium argentatum* (guayule), *Philodendron* spp., *Saccharum officinarum* (sugarcane), *Saintpaulia ionantha* (African violet, Usambara violet), *Scindapsus pictus* (pothos vine,

satin pothos), *Solanum tuberosum* (potato), *Syngonium podophyllum* (arrowhead vine), and *Zea mays* (corn).

In interiorscapes, other plants commonly affected by *Dickeya* infections include dracaena, alocasia, anthurium, pothos, bromeliads, sansevieria, cacti, succulents, cordyline, and syngonium (Chase 1997).

Biology and disease symptoms

D. chrysanthemi degrades succulent fleshy plant organs such as leaves, roots, tubers and stems. It is also can be a xylem pathogen, causing vascular wilt and becoming systemic within the plant. The pathogen can remain latent in stock plants. Symptoms range from distinct spots on blighted leaves to mushy, foul-smelling rot of main stem. Symptoms may begin at leaf edges or in wounds. New leaves can yellow and wilt. Also there may be a rapid, mushy leaf collapse. The bacteria may attack some plants systemically with yellowing of new leaves, wilting, and a distinctive foul-smelling odor associated with the rot or blight.

D. chrysanthemi isolates tend to produce a high amount of pectin methyl esterase, polygalacturonase, and cellulase, which indicate the role of these enzymes in inducing soft rot and blight disease.

Disease symptoms on other hosts vary with the host plant, pathotype, and environmental conditions; they include stunting, yellowing, wilting, necrosis of parenchyma, and soft rotting. Stunting and wilting usually appear on begonia, chrysanthemum, carnation, dahlia, and poinsettia. Rots appear on leaves of aechmea, philodendron, and saintpaulia, while in other hosts various other parts show rotting. On sugarcane, a leaf mottle is produced (Bradbury 1998).

Initially, the bacterium should be identified by a diagnostic laboratory, and thereafter the soft rots and odor may be used to indicate presence of the disease. Rapid microplate assays are possible (Arias et al. 1998), and antisera and ELISA kits are commercially available to detect some bacterial strains.

The pathogen is usually transmitted in or on vegetative propagating material. Cuttings and sets from infected plants may be infected. Spread may also be via cutting knives or tools, soil and growth media, and water splash. It survives in plant debris that is not completely decomposed, on or in infected plants, on other greenhouse plants (without causing disease), and in soil.

Integrated management

Management of this disease relies principally on cultural practices. Sprays of bactericides on plants infected with *Dickeya* spp. are not very effective. Some copper-based products are listed for soil use for control of the bacteria on ornamental foliage plants (Duoclear and Nature2 products containing 8.23% copper sulfate pentahydrate and 3.51% silver).

- Do not purchase or plant any plants with symptoms (wet, rotted, foul-smelling, mushy areas).
- If possible, purchase culture-indexed plants known to be free of the pathogen.
- Use only new or sterilized pots and potting media.
- Avoid splashing water to minimize disease spread; avoid overhead irrigation if possible.
- Scout plants frequently for disease symptoms; use your sense of smell also in this process. If infected plants are found, destroy them.
- Sanitize the propagation bed and growth medium between crops. Clean up the greenhouse benches and floors periodically by picking up fallen leaves and sterilizing the surfaces.
- Do not handle soil or debris on the potting soil surface before handling plants.
- Minimize the conditions that might favor bacterial growth and reproduction and infection, including high humidity, crowding of plants, and poor air circulation around plants.
- Avoid conditions that place plants under stress, including too much, too little, or irregular watering, low light intensity, fluctuating temperatures, poor soil drainage, too small or too large a pot, and deficient or excess nutrients.
- Obtain an accurate diagnosis of the disease.
- Water plants early in the day, rather than late in the day.
- Grow the plants under a plastic cover to prohibit rainfall from splashing onto leaves.
- Intercrop non-susceptible plants with susceptible plants.

Note: Bactericide labels may list the former name of the pathogen genus, *Erwinia*, instead of *Dickeya*.

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