Getting Ahead of Disease in Specialty Cut Flower Production

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Damping-off affects a wide range of floriculture plants and requires a disease prevention and management plan. *Pythium* and *Rhizoctonia* are fungi commonly associated with damping-off. Damping-off fungi can occur early in production by causing a seed rot and attacking seedlings before they emerge from the soil. While growers may think the reduced germination is due to poor seed quality, damping-off fungi may be to blame. Post-emergence damping-off is more readily recognized because the damping-off fungus attacks at the soil line after the seedling emerges from the soil and causes water-soaking, and constriction on the lower stem. Seedlings collapse at the point of constriction.

Damping-off fungi can also infect cuttings resulting in water-soaking stem discoloration and rotting thereby preventing the formation of a root system. Rhizoctonia fungi typically cause a dull brown to dark brown rot on the cuttings. When Pythium is involved, the blight often has a shiny coal-black appearance. In crops where Botrytis is a problem on stock plants, spores of the Botrytis fungus can carryover on the cuttings and cause a blight similar to that described for Rhizoctonia. When Botrytis is the problem, the production of fuzzy, gray spore masses on the blighted tissue will give the culprit away.

Sanitation is the keystone in preventing and managing damping-off. Healthy-looking seedlings grown near plants that have damped-off may be infected with the damping-off fungus and collapse after transplanting. Sudden plant death may also occur if particles of the growing medium carrying the damping-off fungus are transferred from the infested flat and contaminate the new growing medium. When conditions are unfavorable for infection, damping-off fungi form a survival structure that may be found where used soil or plant debris accumulate. Used pots or flats, flat fillers, bench top, and potting areas are some of the places where infested soil and plant debris may be found. Without proper disinfesting, use of these areas results in spreading of infested soil particles from infested to clean areas of the greenhouse. Also, infested soil particles moved from other growing sites by equipment can serve as inoculum.

Biocontrol agents are becoming more widely available for use in controlling damping-off fungi but should be used preventively as an overall disease management program. Communication with sales representatives and extension personnel may be helpful to evaluate biocontrol options to achieve the best results.

Damping-off Prevention and Management

- Choose a well-drained growing site.
- Use cleaned equipment that has been power washed in-between production sites. Always work problem sites last and disinfest equipment after use.
- Choose a production site with good air movement and circulation. Avoid sites where air movement is prevented. Orienting plant rows to take advantage of prevailing winds can be helpful for air circulation within the planting.

- Plant seeds at a time when the temperatures are sufficiently warm so that seeds germinate rapidly, and seedlings are vigorous. Seedlings become more resistant to damping-off as they mature.
- Remove diseased plants from the growing area immediately.
- Identify the cause of damping-off. Don't assume a fungus is responsible for the problem - rule out environmental factors first. If a plant pathogen is involved, identify the specific one using a diagnostic clinic.

Powdery mildew is diagnosed by the white talcum-like colonies that can start small but can rapidly blight the leaves, stems, and flowers of susceptible crops. Some powdery mildews can be specific to one type of plant while other powdery mildews, such as *Golovinomyces cichoracearum*, can infect many different annual and perennial flowers and vegetables. The abundant conidia (spores) give a white, powdery or fluffy appearance. There are times when identifying the disease can be difficult on some crops as infection sometimes can only cause yellowing and withering of leaves and stunted plant growth (white colonies are absent). High relative humidity can prompt epidemics. Some plant species such as asters, zinnia, gerbera daisy, and others are very susceptible and should be scouted regularly for signs of the disease. It should be noted that certain varieties of a plant species may be more susceptible than others.

Growing powdery mildew susceptible flower crops can be a challenge, and fungicides have typically played a key role. The FRAC code is an alphanumeric code assigned by the Fungicide Resistance Action Committee and is based on the mode of action of the active ingredient. When treating for powdery mildew, rotate among products with different FRAC codes to reduce the possibility of resistance developing in the powdery mildew pathogen. Powdery mildews are tricky and have been known to adapt to overcome some of the most effective fungicides. MilStop is a biological product that may also be helpful.

Botrytis can develop on the foliage and flowers of flower crops under conditions and is often called grey mold. The high relative humidity and a lack of air circulation that can often found beneath the plant canopy are especially ideal for this pathogen *Botrytis cinerea*, that can infect all types of flowers. Common disease symptoms include leaf spots, blight, and stem cankers with the fuzzy gray mold being a way to identify the *Botrytis* culprit. Flowers are especially prone to infection by the gray mold and when the infected petals fall to the foliage, leaf infections result. *Botrytis* spores move by air and are carried to healthy plants where new infections begin. Infection requires water, which is needed for spore germination. Penetration of the plant by *Botrytis* can be direct or indirect through natural openings or wounds. Small leaf spot symptoms may quickly combine into large, blighted areas under high relative humidity and wet conditions. *Botrytis* usually becomes established and produces spores on older leaves near the moist soil surface and under the plant canopy and flowers. Dead tissue can support gray mold and spore production.

There are times when Michigan growers face a perfect storm for a *Botrytis* outbreak. Elements of the storm include overcast, wet weather, and maturing floriculture crops with flowers. Preventing and controlling gray mold relies on sanitation which reduces the spore load by removing dead and dying plants, leaves, and flowers from production areas. Improving air flow to reduce relative humidity is also important. Relative humidity can also be reduced by slightly increasing the temperature via heating. Limit watering whenever possible and water at a time of day when the foliage can dry quickly. While these strategies are helpful, they are often not enough to eliminate gray mold if the weather is especially favorable.