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Floral Notes Newsletter

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New Advances for Biological Controls for Indoor and Outdoor Production of Ornamentals

Co-sponsored by UConn Extension and UMass Extension Floriculture Program
Tuesday, June 21, 2016
Room 331, Student Union, University of Connecticut, Storrs, CT

New Developments You Can Use from Bio-control Research John Sanderson, Cornell University, Ithaca, NY

Bio-control Developments on a Global Level Ron Valentin, Bioline Agrosciences, Oxnard, CA

Biological Control Agents (BCA) Use in Perennial Growing, Roger McGaughey, Pioneer Gardens, Deerfield, MA

Good Garden Bugs: Identifying Native Predators and Parasitoids, Common in Outdoor Ornamental Production Mary Gardiner, Ohio State University, Wooster, OH

Encouraging Beneficials to Enhance Biological Control in Outdoor Production Paula Shrewsbury, University of Maryland, College Park, MD

Registration fee: $40 is due June 14th **payable by check only** to the University of Connecticut. Included in the cost of admission: coffee, continental breakfast, lunch, informational handouts and parking.

Five pesticide recertification credits for attendees in CT, RI, MA, ME, NH, and VT.

Program Details are available at: http://ag.umass.edu/greenhouse-floriculture (click large "Events" tab)

New Fungicide Products for Greenhouse Ornamental Production

Angela Madeiras
UMass Extension Plant Diagnostic Laboratory
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Several new products have received EPA approval for use on ornamental crops grown in greenhouses and are now on the market for the 2016 growing season.

Segovis (Syngenta). Oxathiapiprolin, the active ingredient in Segovis, is a novel chemistry and is the first in FRAC Code category U15. It is labeled for control of downy mildews and *Phytophthora* on ornamentals, but it is not approved for use on vegetables or herbs. Its new mode of action makes it a good candidate for use in product rotation; however, its single site activity carries the potential risk for resistance development. Segovis is not approved for use in New York, but is registered in all six New England States.

Mural (Syngenta). Mural is a combination of azoxystrobin and benzovindiflupyr, a new SDHI. It is a broad spectrum product labeled for control of various leaf spots/ blights, powdery mildews, rusts, and soilborne diseases on ornamentals. It is also labeled for use on solanaceous and cucurbit vegetable seedlings. Note that phytotoxicity has been observed on African violet, some ferns, and Rieger begonia, as well as apple, crabapple, cherry, and privet. It is not approved for use in New York or Massachusetts, but is registered in all other New England States.

Emblem (Nufarm). This product is a new formulation of fludioxonil. It is labeled for control of several foliar and crown/root diseases of ornamentals caused by true fungi. It may also be used to prevent some foliar diseases of brassicas and leafy vegetables, and leaf spots and stem rots of many common herbs. Do not apply to leatherleaf ferns. Emblem is approved for use in all 50 states.

Fame + T (FMC). Fame + T is a combination of fluoxastrobin and tebuconazole. This broad spectrum product is labeled for control of several diseases on turf as well as greenhouse ornamentals. It is not labeled for use on edible crops. Not recommended for use on African violets, begonias, or geraniums. It is not approved for use in New York, but is registered in all six New England States.

Triathlon BA (OHP). This product contains *Bacillus amyloliquefaciens* D747, the same active ingredient found in Double Nickel. Triathlon BA is OMRI certified and labeled for control of several diseases including Botrytis blight, downy mildew, and bacterial leaf spot. It is also labeled for use on most vegetable, fruit, and herb crops. Triathlon BA is approved for use in all 50 states.

UMass Extension Plant Diagnostic Laboratory Services

The UMass Extension Plant Diagnostic Lab recently moved to 3 French Hall, UMass Amherst. (A parking spot is designated for the diagnostic lab in the rear of the building). For help with plant problems contact Angela Madeiras, Ph.D. at (413)545-3208. For sampling instructions and submission forms, go to ag.umass.edu/diagnostics

Take Steps to Prevent and Control Botrytis in Greenhouse Crops

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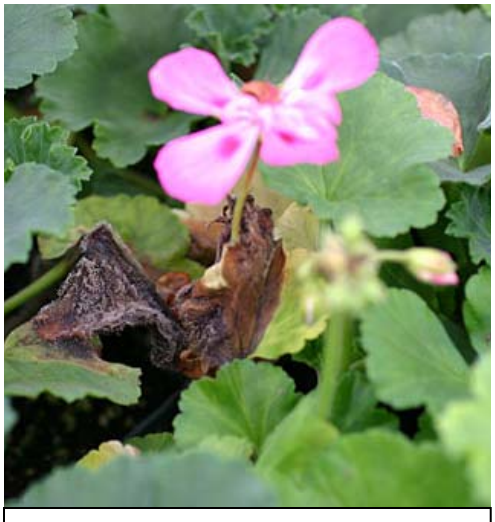
Editor's note: Angela Madeiras of the UMass Extension Plant Diagnostic Laboratory provided input for this article.

During extended periods of cloud cover or rain and greenhouses full with plants, air circulation can drop rapidly creating ideal conditions for gray mold. Caused by the fungus *Botrytis cinerea*, gray mold is the most common disease of flower crops in the greenhouse. It can affect almost every type of crop and can either be a nuisance or an economic disaster. *Botrytis* has a very wide host range and can persist in the greenhouse year round living on dead tissue as mycelium (white to gray colored growth), conidia (gray dusty spores) or sclerotia (tiny black balls). The fungus produces a large amount of spores that can infect the crops under ideal conditions of cool temperatures (55-75 °F), high relative humidity (above 85%), little or no air circulation, and free water on the leaf surfaces. The fungus prefers to attack new tender growth, freshly injured tissue, and dead tissue, but it can spread to mature, uninjured tissue after initial infection.

Symptoms

Botrytis symptoms may include leaf spots, flower blights, bud rots, stem cankers, and stem and crown rots. When conditions of high relative humidity persist in the greenhouse there is fungal sporulation on dead tissues that appears as fuzzy grey mold. *Botrytis* leaf spots appear when infected flower petals fall on the leaves. Infection starts as small water spots which coalesce into larger gray brown spots. If leaves have marginal or tip burns, *Botrytis* may invade the damaged tissue and leaves develop triangular shaped gray brown lesions. On flowers, *Botrytis* appears as tannish irregular spots on flower petals which eventually enlarge into larger areas. If flowers are infected in bud stage, the buds turn brown and appear water soaked. The buds fail to open and may abort. If the fungus infects the flower or leaf at the base of attachment to the stem, the disease can spread into the stem causing stem cankers.

Stem canker on Bacopa caused by *Botrytis* (fuzzy spores)



Infected flowers can spread the disease by dropping onto leaves of healthy plants.

Disease management

Managing *Botrytis* successfully requires an integrated approach involving cultural practices, managing humidity in the greenhouse, and possibly chemical controls.

Cultural practices

Sanitation is the first important step in managing *Botrytis*:

- Clean and disinfect production area prior to bringing in crops.
- Control weeds in the greenhouse
- Space plants to avoid crowding and to allow for good air circulation
- Avoid overhead watering late in the day to ensure dry leaves before night time
- Remove infected plants and senescing flowers and leaves from the greenhouse and remove dead or dying tissue such as flower petals and leaves from the plants and soil surface.
- Do not throw crop debris and infected plant material under the benches and don't allow infected plant material to sit in trash cans within the house.

Managing relative humidity

- Relative humidity in the greenhouse can be reduced by heating and ventilating. Make sure you have extra venting early in the morning when moisture has condensed before sunlight warms the air.
- Increase air movement with horizontal air flow (HAF) fans to reduce relative humidity within the crop canopy.

Chemical control (Always read and follow all label instructions).

- Do not rely on one chemical or one group of conventional fungicides to control *Botrytis*. Rotate three or more fungicides with different active ingredients to prevent resistance development by the fungus. The FRAC (Fungicide Resistance Action Committee) code on the product label denotes the active ingredient group(s) found in the product. Some *Botrytis* populations have developed resistance to certain chemical fungicides. There are reports of resistance to the fungicides containing thiophanate methyl (FRAC group 1), iprodione (FRAC group 2) and fenhexamid (FRAC group 17). Avoid making more than two consecutive applications of the same fungicide or group of fungicides. Some conventional fungicides available for *Botrytis* rotations include: Pageant (pyraclostrobin plus boscalid, FRAC group 7 and 11), Daconil (chlorathalonil, FRAC group M5), Palladium (cyprodinil plus fludioxonil, FRAC group 9 and 12), Medallion (fludioxonil, FRAC group 12) and Decree 50 WDG (fenhexamid, FRAC group 17).

- Note that some fungicides may leave spray residue and damage flowers. Pageant can cause discoloration of flowers in impatiens and petunia. Avoid direct application onto the flowers. Decree can leave a slight residue which may be visible after the spray solution dries. Follow the directions on the fungicide label to prevent plant injury.

- Some OMRI listed organic fungicides available for *Botrytis* include: Actinovate SP (*Streptomyces lydicus*), Cease (*Bacillus subtilis*), Cease/Milstop (Potassium bicarbonate) tank mix, Triathlon BA (*Bacillus amyloliquefaciens).*

References

Gibson, J., S. Williams, F. Peduto. 2014. *Botrytis* grey mold in greenhouse floral crops fact sheet. The Ohio State University.

Wick R.L., T. Smith , M.B. Dicklow .2013. *Botrytis* of greenhouse crops fact sheet. UMass Extension

Botrytis or Gray Mold fact sheet. Penn State Extension.

Retail Care: Watering, Cleaning, Fertilizing

Plants on display in your garden center or farm stand require regular, gentle watering to maintain high quality. Watering should be completed during the daylight hours, to allow plants to dry before dark. The drying will help prevent foliar diseases. If plants are to be watered by hand, be sure to furnish sufficient time and personnel to water thoroughly. Anything less, and plant quality will decline rapidly.

Place hanging baskets in areas beside the aisles, not over aisles where water and fertilizer will drip onto customers and create a hazard.

Keep plants and surrounding areas in order and clean even during the busiest times. Removing dead and injured plants and spent flowers are essential at least twice a day even during the busy season. Clean plants in hanging baskets by shaking over a trash barrel to dislodge spent or decaying flowers. Decaying flowers and plants give off ethylene and high ethylene concentrations will causes premature loss of foliage and flowers of surrounding plants. Encourage employees to carry pruning shears and wear work aprons with large pockets where they can keep dead flowers and debris from plants in the sales area until they can find a waste can.

Plants in hanging baskets and planters will stay in those containers throughout the summer and will need to be fertilized in a retail operation. Depending on the plants, options include using a water soluble fertilizer at a rate of 200 ppm N or topdressing with a controlled- release fertilizer according to directions (if it was not applied prior to shipping). Retailers should communicate with their wholesale growers to make sure controlled-release fertilizer has not already been applied prior to shipping. Another option is to look for fertilizer prills in the planter.

Potted plants and bedding plants left over after the busy weekend will also need fertilizing, especially if they have been irrigated and spot watered with only plain water for several days. Inspect the root health and if healthy, fertilize, using 200 ppm N. Poor root health may indicate a need for a fungicide application. Maintaining fertility levels in the sales area will extend the life of plants in small containers and the period of time the flowering basket looks good for the consumer.

Resources

Caring for Plants in the Retail Setting, UMass Extension
Don't Let Your Plants Go Hungry in Retail, University of New Hampshire Extension

Tina Smith, UMass Extension, UMass Greenhouse Update, May 22, 2015

Garden Mums - Early Season

Begin the mum season by reviewing your fertilizer program and teaching new employees to recognize symptoms of Chrysanthemum white rust.

Mums are heavy feeders during the first few weeks. Growers use a variety of ways to fertilize mums. Some growers use 100% water soluble fertilizer through a drip system, some use 100% controlled-release fertilizer and some use a combination of water soluble and controlled-release. Regardless of the program you use, start plants off right and prevent premature buds by using moistened soil when potting up plants, then water-in newly planted cuttings with a fertilizer solution.

Avoid stress to young plants during their first 4 to 5 weeks of growth and especially during the first 10 days of the crop or plants will develop buds prematurely and plants will be short. Keep plants moist, well fertilized and properly spaced. Also check plant roots regularly to monitor plant health.

To encourage soft growth that branches freely, many growers use 200-300 ppm 20-20-20 or a fertilizer that is at least 60% ammoniacal nitrogen as a constant feed during the first 2-3 weeks. After that they rotate to 200-250 ppm 20-10-20 constant feed. The 20-10-20 contains less ammoniacal nitrogen. Once plants start to show color, fertilizer is reduced to 100 ppm constant feed.

If using controlled-release fertilizer, keep in mind that the rate of release is affected by its formulation (rate of release), soil temperature and frequency of irrigation. Most formulations release at temperatures of 70°F or above, therefore during cool temperatures, fertilizer may be slow to release. We often have cool temperatures in June when plants need the most fertilizer. This is the reason liquid feed becomes important, to get plants growing and create vegetative growth.

Garden mums initiate flower buds easily and develop rapidly if plants are stressed in any way. If terminal flower buds are observed when cuttings arrive, plants should still perform satisfactorily. Cuttings with terminal flower buds should be pinched hard (allow 4-5 leaves to remain) when they are turgid (4-5 days after planting). This will force out lower breaks which tend to be more vegetative. If both terminal and lateral buds have developed when cuttings arrive, it may be best not to plant them, as they most likely will not perform satisfactorily.

Chrysanthemums are short-day plants. Both flower initiation and development of the flower buds occur more rapidly under short days than long days. However, temperature has a greater influence than day-length on flowering of garden mums. We can experience very cool nights in June. With several cool nights in a row, garden mums can initiate many buds prematurely which results in early flowering of the plants. If premature budding occurs, buds should be pinched off, and adequate moisture and fertilizer supplied. The plants will almost always continue to grow and develop into a quality fall crop. *Tina Smith, UMass Extension, UMass Greenhouse Update, June 10, 2015*

Silicon for Greenhouse Floriculture Crops?

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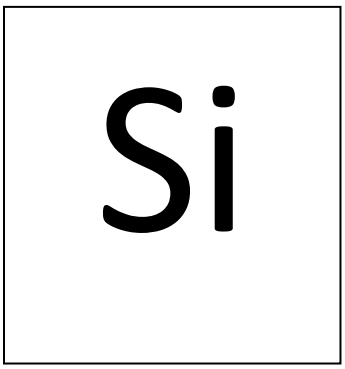

The element silicon (Si) has received little or no attention for greenhouse crop production until recently when Sun Gro Horticulture began marketing their family of commercial and retail soilless media with a silicon amendment called RESILIENCE®. Also, there are a number of liquid formulations of potassium silicate from other manufacturers available on the web targeted for agronomy, but they seem to be more popular for growing plants hydroponically and for plants currently outside the mainstream of horticulture and agronomic production.

Silicon is second to oxygen in abundance in the earth's crust, but its essentiality to plants in general is questionable. Cereal and other grasses, wetland rice, and sugarcane accumulate significant amounts of silicon and it's generally agreed that silicon is at least "semi-essential" for these plants. Another plant which New Englanders might know about, Horsetail (*Equisetum*), accumulates silicon on the surface of its stems and was used by Native Americans and the colonists to scour pots and bowls. However, it has not been possible to conclusively demonstrate that silicon is required to successfully grow most other plants. This, in part, may be due to the fact that most plants are grown in soil and they can extract an adequate amount of silicon from the soil. However, soilless mixes used in greenhouse horticulture have little or no available silicon for plants.

Beneficial effects of silicon on plants

Silicon has a remarkable number of potential beneficial effects on plant growth and function as well as resistance to fungal diseases and insect pests. Some of these effects could potentially be relevant to greenhouse crop production. Silicon is absorbed by the roots as monosilicic acid and travels through the stem in the xylem (i.e., "plant water plumbing") with water to the upper and lower leaf epidermal ("skin") cells. Along the way silicon is deposited in some root tissues, the cell walls of the xylem, and the outer walls of the epidermal cells. Silicon deposits in the stem may increase strength and stiffen leaves.

Silicon accumulating in the walls of the leaf epidermal cells becomes firm and blocks water loss through the cuticle (i.e., the wax layer covering the leaves) increasing drought tolerance and help plants tolerate dry down periods which sometimes occur in the greenhouse. The silica layer is also a barrier to fungal pathogens and insects by preventing penetration into the leaf cells of by fungal hyphae and the insects' sucking or chewing mouthparts.

Silicon can stimulate the growth of plants by preventing manganese and iron toxicity. Uptake of manganese and iron is reduced when silicon is applied and the manganese may be distributed more uniformly in the leaves rather allowing damaging high accumulations in spots.

What to expect from silicon fertilization

Most of the knowledge about the benefits of silicon to plants comes from research conducted with the agronomic crops mentioned earlier. A recent research article by Judith Pozo and colleagues published in *HortScience* reported on the responses to the responses to silicon fertilization by lettuce, tomato, pepper, cucumber, and melon grown in coconut (coir) fiber. Overall, height, leaf number, stem diameter, root length leaf area, fresh weight, and dry weight was increased by about 10% with silicon compared to no silicon fertilization. Epidermis and cuticle thickness also increased with silicon. Some reduction in foliar *Botrytis* infection was noted for lettuce, tomato, and pepper with silicon. In my opinion results were encouraging but not very dramatic. Visit the Sun Gro website (sungro.com/resilience) and view the videos showing the response of various flowering bedding plants and other greenhouse plants to RESILIENCE®. What do you think of the silicon responses shown in the videos?

There is strong scientific evidence for the beneficial effects of silicon fertilization as well as other growth medium amendments like mycorrhizal fungi and disease suppressive bacteria. However, results, if any, mostly show up when certain stress conditions develop. So silicon would work best during water stress; mycorrhizae, phosphorus deficiency or water stress; and suppressive bacteria, the presence of fungal pathogens. Otherwise in everyday plant culture the benefits of the enhancements may not be obvious.

References

Marschner, H. 1990. Mineral nutrition of higher plants. Academic Press, New York.

Pozo, J. and others. 2015. Effects of silicon in the nutrient solution for three horticultural families on the vegetative growth, cuticle, and protection against *Botrytis cinerea. HortScience.* 50(10):1447-1452.

“Time to say Si´ to silicon – a Q&A”. sungro.com/resilience/article-2html

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