A Publication of the UMass Extension Greenhouse Crops & Floriculture Program

Floral Notes Newsletter

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In This Issue

2015 Summer Conference & Trade Show

July 23, 2015
Topsfield Fairgrounds
Topsfield, Massachusetts

The MNLA/MFGA Summer Conference and Trade Show is being held at Topsfield Fairgrounds in Topsfield, MA. Take advantage of the newest ideas and cutting edge information and education to put you ahead of your competition. Pesticide credits, speed educational sessions and tours are only a few of this years' exciting programs. Plus, there'll be great opportunities to network with your colleagues over wine tastings, local microbrews, and live entertainment! Attending this event is worth 2 MCH cCredits toward continuing education. www.mnla.com

Proven Biological Control Program for Greenhouse and Outdoor Production of Ornamentals

Thursday, June 18, 2015 9:00-3:30
Wilfred B Young Building, University of Connecticut, Storrs

UConn Extension Greenhouse IPM Program and UMass Extension Greenhouse Crops and Floriculture Program, Sponsors

8:00 – 9:00 Registration, Coffee available

9:00-10:00 Biological Controls of Disease: Fungus vs. Fungus in the Greenhouse
Margery Daughtrey, Cornell University, LIHREC, Riverhead, NY Margery will discuss the biological control options available to you for keeping your mildews and rots at bay! Learn how to deploy beneficial microbes to help your crops be healthy.

10:00-11:00 Evaluating Your Biological Control Program
Suzanne Wainwright–Evans, Buglady Consulting, Slatington, PA Once you release the good guys, how do you know they are really working? What do dead pests that have been fed on look like? Learn how to identify eaten and parasitized pests through images.

11:00 - 11:15 Break

11:15 - 12:15 Implementing a Biological Control Program at Longwood Gardens
Grant Jones, IPM Specialist, Longwood Gardens, Kennett Square, PA Grant will discuss the biological control program Longwood uses in their conservatory and production greenhouses. He will discuss their decision-making process from scouting to releasing beneficial insects and discuss some of the challenges they face.

12:15 - 1:15 Lunch provided

1:15 - 2:15 Using Biological Controls in Outdoor Production
Suzanne Wainwright-Evans, Buglady Consulting, Slatington, PA. Biological control started outdoors, but most of the research has been done on protected crops. There is now a trend to take biological control back outdoors. Learn some specific how-to tips and strategies for how to do this.

2:15 - 2:30 Break

2:30 - 3:30 Grower Panel on IPM & Biologicals
Steven Courcy & Keith Salcines, DS Cole Growers, Loudon, NH & Michael Calhoun, Broken Arrow Nursery, Hamden, CT

Five pesticide recertification credits have been approved in categories PA & 3A (New England States)

Partial funding for this program is from USDA NIFA Extension Integrated Pest Management Coordination and Support Program (UConn).

Event Website: http://ag.umass.edu/greenhouse-floriculture

Contact's name: Tina Smith, 413-545-5306, tsmith@umext.umass.edu

Shade for Summer Cooling

John W. Bartok, Jr.
Extension Professor Emeritus & Agricultural Engineer
Natural Resources and the Environment
University of Connecticut, Storrs

In many parts of the United States, cooling a greenhouse is a greater problem than heating. When ventilation will not control temperature, shading can be used. By reflecting the sun's rays or blocking them so they can't get in, a significant portion of the heat load is removed. This can reduce electricity use associated with fan ventilation systems.

The heat load is created by the infrared part of the radiant energy from the sun. Plants are photosynthetically active in the blue to red range (380–700 nanometers) of the total light spectrum. Wavelengths greater than 770 nanometers result in an increase in temperature. This can affect plant growth and at high temperature cause plant injury. It's the same as standing in the sun or putting your hand next to an incandescent light bulb. You are feeling the far-red radiation.

Reducing the heat load in the greenhouse can be done in a number of ways. Ventilation can cool it to near the outdoor ambient temperature. Further cooling requires introducing mist or fog into the air to absorb some additional heat. Fan and pad or fog systems are available for this. These can require considerable energy for fan or high pressure pump operation.

Shading is a low-cost method of providing some cooling. It is best done outside the greenhouse over the glazing but can also be done with screen systems inside. Shading will result in lower electric bills if fans are being used.

Shading compounds are materials that are brushed, rolled or sprayed onto the glazing. They are applied in the spring and if the correct material is used will usually wear off before the first frost occurs. These materials are difficult to get on uniformly. Some growers add additional layers of shading as the sun's intensity increases during the summer or the shade material wears off. Some materials, such as ReduSol (available from Griffin Greenhouse & Nursery Supplies (www.griffins.com), have been developed to allow a high light level but reduce the amount of infrared light to penetrate.

An alternative is woven or knitted shade fabrics from materials such as polypropylene, saran, polyethylene and polyester. These are lightweight, easy to apply and available in several degrees of shade from 10% to 90%. They usually have to be custom-fabricated to fit the greenhouse. Most materials are ultra-violet stabilized and have a life of about 10 years. Cost depends on the amount of shade but is usually between 10-40¢/sq ft.

Polypropylene is strong, tough and highly resistant to flexing, abrasion and chemical attack. It will shrink about 1% when placed on the greenhouse. Saran is fireproof and shrinks about 3%, requiring that it be installed with a slight sag. Lock-stitched, knitted polyethylene netting will not fray or rip-run when cut. It is fire and mildew resistant. Metalized material, such as Aluminet from GREEN-TEK (www.green-tek.com) will moderate both day and night temperatures.

Research by Dr. Dan Willets, Agricultural Engineer, North Carolina State University in Raleigh, determined that the percentage shade ratings were accurate but the reduction in total energy was only half of the shade percentage due to conduction of heat from the material to the glazing. A black or green material although it gives longer life will conduct more heat than a white material. A 50% shade reduced radiation about 10°F. Keeping the material wet with spray nozzles will increase its effectiveness as it removes heat from the material.

Laboratory tests conclude that any shade material is more effective on a windy day as a greater amount of energy that is intercepted is removed before it is transferred to the interior. Tests also indicate any shade material will perform better in reducing heat if the greenhouse interior is painted a light color.

Interior mechanized screen systems are becoming popular for both gutter-connected and free-standing greenhouses. Usually referred to as energy/shade screens, these systems may be eligible for USDA grant programs.

A shade screen is a mechanical system consisting of a drive motor, support cables, energy/shade material and controls. A single gear motor will power up to an acre of shade system. The screen material is supported or suspended from the cables and can be closed or opened as needed. Control can be by timer, thermostat or light level sensor.

A retractable system has the advantage that it can be pulled back on dull, cloudy days to allow maximum light transmission. Being located inside the greenhouse, it is not affected by weather conditions.

A typical screen material is made of 4 mm wide aluminum and polyester strips held together with a polyester filament yarn. The aluminum reflects the incoming sun back outside the greenhouse rather than being absorbed. This will reduce the inside temperature about 10°F. At night when the greenhouse is being heated, the screen is closed and it traps the heat within. Screen materials are light weight and available with a wide range of light transmission and energy conservation. One of the largest suppliers is Svensson (www.svenssonamericas.com).

In free-standing greenhouses such as a hoophouse, the mechanical system to move the screen can be simple. Three or more light weight tracks with rollers are suspended from the frame. The rollers with clips support the screen material. This system can be opened and closed by hand or can be fully automated. In a 100’ greenhouse, the screen is usually split into two 50’ sections that store at each endwall.

Mechanized systems usually have 8-12’ panels that move between the trusses or collar ties. The gear motor powers the drive cable or rack and pinion to move the panels. For energy conservation, an edge seal is needed to contain the heat under the screen. For shade purposes, this is not as important. Mechanized systems usually cost from $1.50- $4/sq ft installed.

Shading is one method of controlling greenhouse temperatures during warm weather. It can supplement fan or louver ventilation and evaporative cooling. It also helps to reduce plant leaf temperature reducing burning.

Greenhouse Growers' Guide to Testing Irrigation Water for Water-borne Pathogens

Angela Madeiras, UMass Extension Plant Diagnostic Laboratory
Rob Wick, Stockbridge School of Agriculture, University of Massachusetts, Amherst

Occasionally, greenhouse irrigation systems can become contaminated with plant pathogens. Wells and municipal water sources are highly unlikely to contain plant pathogens; however, rivers, irrigation ponds, sources of run-off water, and irrigation recycling systems (such as ebb-and-flow) may become contaminated. Water-borne pathogens can be extremely destructive in hydroponic systems. *Pythium* is of particular concern to greenhouse growers; *Phytophthora* species, although potentially devastating, are less commonly encountered in greenhouse settings.

If you are concerned that your source for irrigation water may be harboring plant pathogenic *Pythium* or *Phytophthora* and you would like to have it tested, water may be hand-carried to the lab or sent via mail. Ideally, about 3L (3/4 gal) of water should be tested, but this makes for a heavy package and is costly to ship. Alternatively, collect 300-500 ml (about 1 pint to 1 quart) water in a clean plastic bottle. Cap tightly and refrigerate if not shipping immediately. Ship next-day delivery.

Keep in mind that if the contamination level is less than 1 or 2 spores per pint or quart, it is unlikely that the pathogen will be detected.

Preventing Contamination

Keep watering nozzles off the ground or floor where they can become contaminated with soil. Control fungus gnats and shore flies in greenhouses, as these insects can transport pathogens from place to place. If you use a source of surface water such as a river or pond, keep plant waste and compost piles as far as possible from the water. Any plant material known to be infected with *Pythium* or *Phytophthora* should be disposed of off-site.

There are many treatment methods and systems available to purify water before it enters or re-enters an irrigation system. More information on this topic can be found at http://www.greenhousemag.com/bioworks-enews-irrigation-water-disinfestation.aspx

Sample Submission

Send all samples by next day mail. Please include a submission form, which can be found at http://ag.umass.edu/plant-problem-diagnostics/vegetable-floriculture-diagnostics. Laboratory tests may take several days to yield results.

Note: We do not routinely screen irrigation water for other plant pathogens. This may be done under special circumstances; however, other pathogens are much more easily and accurately diagnosed by examination of plant material.

Reference: Biology, Detection, and Management of Plant Pathogens in Irrigation Water. Hong, Moorman, Wohanka, and Büttner, Eds. APS Press, 2014. www.apsnet.org

Powdery Mildew

The characteristic white spots of powdery mildew usually first appear first on the upper surfaces of the lowermost leaves of many types of plants such as non-stop begonias, calibrachoas, dahlias, asters, phlox, monarda and other susceptible crops. Stems and flowers may also become infected.

All powdery mildew fungi need a living plant host in order to grow and develop. Because they tend to look alike, growers often assume that powdery mildew infections are caused by the same fungus. Powdery mildew diseases are caused by different species of fungi such as *Erisyphe*, *Leveillula*, *Microsphaera*, *Podosphaera*, *Odium*, and *Sphaerotheca*. Some of the powdery mildew fungi have wide host ranges, however, and others are relatively host-specific. For example, *Erysiphe cichoracearum* infects many different annuals, perennials and vegetables, whereas *Sphaerotheca pannosa* var. *rosae* only infects roses. The powdery mildew *Podosphaera xanthii* that infects verbena and calibrachoa also infects cucurbits, so it's important not to grow squash and cucumber transplants in the same house with susceptible verbena varieties and calibrachoas. For more examples of cross listing see the link at the end.

The whitish powder on leaves is composed of fine threads of fungal vegetative tissue (mycelium) and light colored mats of asexual spores (conidia). Some powdery mildews produce conidia on short, erect branches that resemble tiny chains, while others form threads so sparse that the mildew cannot be seen without the aid of a microscope. These spores (conidia) are easily moved by air movement and water splash. Because powdery mildews are obligate parasites, they require living hosts. So, unlike Botrytis blight they do not colonize dying or weakened plant tissue. When spores land upon a susceptible host, they germinate and send a specialized feeding structure into the epidermis to obtain their nutrients from the plants. This infection process may take as little as 3 days or as long as 7 days. The pathogen survives in the greenhouse in weed hosts or on crops. Outside, the pathogen can overwinter as mycelium in infected plant parts or in resting structures and are visible as small, dark specks on dying leaves.

Powdery mildews, unlike most other fungal diseases, do not need free water on the leaf surface to germinate and infect. They are favored by high relative humidity (greater than 95%), moderate temperatures (68°-86° F), and low light levels.

To prevent powdery mildew, maintain proper plant spacing to reduce relative humidity levels within the plant canopy. This will also help with better spray coverage. Grow susceptible crops on wire benches to help increase airflow.

Heat and ventilate in the late afternoon and early morning to reduce relative humidity levels at night, and avoid watering late in the day. Select less susceptible cultivars whenever possible. For example, monarda and phlox cultivars vary greatly in their susceptibility to powdery mildew.

Early detection is needed to prevent the plants from becoming covered with the white fungal mycelium. Powdery mildews only colonize the upper layer of cells, so chemical eradication is possible. Fungicides should be applied as soon as the disease is first detected. Additional treatments may be necessary to protect new growth. Rotate among fungicide classes to discourage development of resistance.

There are many fungicide labeled for powdery mildew on ornamentals, however fewer fungicides are labeled for herbs. Fungicides labeled for herbs include *Bacillus subtillus* (Cease), hydrogen dioxide (OxiDate), copper sulfate pentahydrate (Phyton 35), potassium bicarbonate (Milstop) and *Streptomyces* (Actinovate). Most fungicides work as protectants and repeat applications may be needed to protect the new growth from infection. Read label directions carefully for rates and registered crops. Leanne Pundt, UConn Extension & Tina Smith UMass Extension, *New England Greenhouse Update*, April 24, 2015.

Young Biological Horticulturists Supply Banker Plants

Roger McGaughey, Head Grower
Pioneer Gardens
Deerfield, Massachusetts

Editor's Note: This article was published in the March 2015 issue of *GrowerTalks*. "Amanda" mentioned in the article is a Stockbridge School of Agriculture alumni.

Spring is almost here and we're making plans for another, even better, biological growing season. In previous articles, I've mentioned that our production of aphid banker plants needs to be improved. One of the biggest challenges with this crop is preventing early parasitization of the young cherry aphids while a large population is being produced. We still had a good supply of *Aphidius* in our houses in early November last year, which was fantastic, so I knew we were going to have even more difficulties than in the past. Banker cages and hairnets have been successful, but this season we're going in a completely different direction-off site.

Last fall, I spoke with Jaap, my boss, about the possibility of involving some school students in a horticultural project, learning how to grow aphid banker plants and being our suppliers. It just so happened that one of his valley friends, Kurt, was a schoolteacher. So contact was made and Kurt thought it would be a great spring semester project for his landscape students. He and his class came to Pioneer Gardens for a tour through the nursery and I outlined the basics of the task ahead. They left with some educational literature and a feel for the greenhouse and a commitment that, with some coaching along the way, they would be happy to grow the plants that we needed.

In early January, my assistant, Amanda, and I visited Kurt and his associate, Mark, at Franklin County Technical School in Turners Falls to check out their facilities. We brought a supply of pots, potting mix, cereal seed, some RootShield Plus WP, slow-release fertilizer and a few pots of already germinated seedlings. We viewed their germination chamber complete with grow lights and the bench area in their workshop that was being constructed with HID lamps where our banker plants would be grown. We were impressed with the setup and their desire to make the process an educational project. Amanda demonstrated the pot filling, seeding and RootShield application process to the students. I emphasized the need to do their homework and read the literature that they'd been given in order to understand the biology of banker plant production.

Their goal was to provide us with 10 banker plants each week starting in early March. The students are only at school five days a week and they needed to figure out the timing of the seed germination process so that aphids can be introduced to the new pots as the seedlings are just breaking through the soil surface.

The following week we took an aphid banker plant to them that we received from BioBest. We also brought some of our seeded pots with us so that we could compare our germination stage with what they'd managed to produce. Theirs, unfortunately, were too tall, but this made them more aware of how fast things can happen and the need to get their timing right. A lesson on aphid introduction into our pots was provided by Amanda and we departed with the promise to return in a week to bring another banker plant and see how well they would proceed with their new aphid crop.

On our next weekly visit we were impressed with the enthusiasm that greeted us and found that one student, Emily, had stepped up and wanted to be the leader of the project. They showed us the record-keeping chart that they'd created and the construction progress that had been made. The watering of last week's banker left a little to be desired, but all wasn't lost. I tried to emphasize that planting a rockwool cube into a peat/perlite mix needs more regular water applications than they'd given it to aid in its establishment. With the five-day school schedule, timing and attention to detail are again good lessons learned.

At the time of writing this article, I have every confidence that the student/teacher growers will be successful. With Amanda's continued monitoring and checking in with her new friend Emily, they will time their germination correctly, produce good quality plants and supply us with our weekly requirement of heavily aphid-infested banker plants. The future young biological horticulturists are raring to go and will have fun learning along the way.

Update. Since this article was written, two of the students from Franklin Tech placed first at the MA State Future Farmers of America (FFA) convention with their science fair project about the banker plants and will be competing at the national convention in October. Tina Smith, UMass Extension.

UMass Greenhouse Crops and Floriculture Extension Program

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