A Publication of the UMass Extension Greenhouse Crops & Floriculture Program

Floral Notes Newsletter

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Upcoming Education Events. Save the Date!

MFGA in collaboration with UMass Extension will host a business management program for greenhouse growers and garden centers on **Wednesday November 8, 2017**, 1:00-4.00. Location to be determined. **Topics:** 10+ ways to find $10,000 in your business: maximizing profitability and Ideas on diversifying your business (panel discussion).

UMass Extension will host a greenhouse production and management program on **Thursday January 11, 2017**, 9:00-3:15 at Public House in Sturbridge, MA. **Topics:** Microbes, chemicals, and particles in irrigation water, using PGRs to manage the quality of spring greenhouse crops, managing common root and foliar diseases of spring greenhouse crops, latest research on the impact of neonicotinoids to bees and other pollinators and how to combine biological control with conventional pesticides**.**

For more information contact Geoffrey Njue email: gnjue@umext.edu

Managing Whiteflies on Poinsettia

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Poinsettia is a magnet for whitefly. There are two types of whiteflies: greenhouse whitefly (*Trialeurodes vaporariorum)* and silverleaf or sweet potato whitefly (*Bemisia tabaci).* The B biotype of silverleaf whitefly appeared in Florida in 1986 and began to appear in greenhouses. It was found to be more resistant to insecticides. In 2004 Q biotype of silverleaf whitefly was first detected in Arizona and was found to be even more resistant to insecticides. Since then it has been reported as a pest in greenhouses in several states in the United States.

The Q biotype has developed resistance to a number of commonly used pesticides including pyriproxyfen (Distance), buprofezin (Talus), pyridaben (Sanmite), abamectin (Avid) and neonicotinoid insecticides; (imidacloprid (Marathon), acetamiprid (TriStar) and thiamethoxam (Flagship). However, it appears to still be susceptible to dinotefuran (Safari).

To manage whiteflies effectively the grower should develop an effective integrated pest management (IPM) program to reduce the reliance on insecticides. An effective IPM program would include the following:

Prevention

Start the cropping cycle with a clean greenhouse. If possible, try to have a crop free period before starting the crop in the greenhouse. Inspect incoming plants and cuttings for both adults and immature whiteflies.

Sanitation

Remove sources of infection such as weeds, old plant debris and growing medium from within the greenhouse. While disposing affected plant materials, place debris into a sealed bag or container and discard it in a safe place immediately.

Scouting

Regular scouting is essential to detect whitefly infestations early to avoid damage to your crop. Scouting is also important for evaluating the effectiveness of your management program. Monitor the whitefly population by using yellow sticky cards placed strategically throughout the greenhouse at the rate of one sticky card per 1000 square feet of greenhouse space. Place additional cards near doors and vents. Randomly inspect plant material weekly to help determine which life stage is present. Select 10 plants per 1,000 square feet of greenhouse space and thoroughly examine these plants on the underside of leaves for the presence of whitefly adults, nymphs, and eggs. Whitefly eggs are generally concentrated on upper new leaves of the host, and nymphs are usually found on the lower (old) leaves.

Biological control

Several biological agents for control of whitefly are commercially available. Before using any biocontrol agents (BCA), it is important to check with the supplier of the BCA for their compatibility with chemicals and environmental requirements such as temperature, humidity, and day length. Major BCA suppliers have online compatibility charts on their websites. The most commonly used biological control agents include:

- *Encarsia formosa* : a small parasitic wasp that is effective against greenhouse whitefly whitefly (*Trialeurodes vaporariorum)*. The wasp lays its eggs inside the greenhouse whitefly nymphs. The larvae of the parasitic wasp feed on internal contents of the whitefly nymphs and emerge from the whitefly pupae. Parasitized whitefly pupae turn black in color. Encarsia also feeds on whitefly nymphs. Encarsia is most effective at temperatures between 70F– 80F and 50-80% relative humidity. Encarsia is also very sensitive to pesticide residues so it is important to avoid applying insecticides with long residual effect before the wasps are released.
- *Eretmocerus eremicus* : a small parasitic wasp that parasitizes and feeds on both greenhouse whitefly (*Trialeurodes vaporariorum)* and silver leaf whitefly (*Bemisia tabaci)* nymphs. Whitefly nymphs parasitized by Eretmocerus turn into yellow – beige color. Eretmocerus is a valuable tool for whitefly management control because it is effective on both greenhouse and silverleaf whiteflies. It is also more tolerant of higher temperatures and tolerant to pesticide residues. *Eretmocerus* is most effective at temperatures between 77F and 84F.
- *Eretmocerus mundus:* a parasitic wasp that is specific for the control of silverleaf whitefly (*Bemisia tabaci).* It is more active at higher and lower temperatures than *Eretmocerus eremicus.*. It can be introduced anytime during the season and is best suited for early season introduction.
- *Amblyseius swirskii* : is a small predatory mite that feeds on both whitefly eggs and nymphs as well as thrips. It performs best when both whitefly and thrips are available. It is most effective at warmer temperatures (77 – 82F) and a relative humidity of 70%.
- *Delphastus catalinea* : is a small ladybird beetle with a black body and brown head. It can feed on all stages of whitefly. It requires a lot whitefly eggs to sustain itself, therefore it is most effective against high whitefly populations.

Chemical Control

Insecticides should be applied only when scouting report indicates that population densities are at levels that dictate action needs to be taken. Application timing should be based on residual activity of the pesticide.

Check the product labels for specific reapplication intervals. Follow all the directions on the label. Do not apply more than 2-3 times insecticides belonging to the same IRAC – Mode of Action Group. Several insecticides are labeled for control of whiteflies. These include : BotaniGuard, Distance (not for Q biotype), Endeavor, Enstar (not for Q biotype), Judo, Kontos, Ornazin, Orthene 97, Pedestal, Rycar, Sanmite, Talus (not for Q biotype), Insecticidal soap, Horticultural oils, Safari.

Some university researchers have evaluated the new insecticide Rycar ((pyrifluquinazon) and have recorded very good results for the control of both Bemisia B biotype and Q biotype. Some growers also applied Rycar last year and got very good results. Rycar has translaminar activity and is efficient for all life stages. It is gentle to beneficial control agents (BCAs) and pollinators and so it is a good alternative to neonicotinoids. Judo (spiromesifen) provides excellent control of *Bemisia* Q and B biotypes and has performed consistently well against established populations. It has translaminar activity but good coverage will improve results. Safari applied as a soil drench or foliar spray is also effective against either biotype. It has 4- 6 weeks residual activity with drench applications and it is suggested where end-of-season treatments are needed. Apply a drench application 14 days prior to shipment of finished plants

If a pesticide does not adequately control whiteflies, it is recommended you have the whiteflies in your greenhouse biotyped so that you can select insecticides based on the biotype of the whiteflies present. Below is the contact information for the laboratory authorized for biotyping. They provide free biotyping. Contact them for information about how to collect whitefly samples, how to preserve it for evaluation and directions for scheduling shipments.

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After the poinsettia season is over, thoroughly clean your greenhouse by removing all poinsettias and weeds so the whiteflies do not have host plants to feed on.

For more information on managing poinsettia on poinsettia, please see the resources on the following links:

http://www.ipm.uconn.edu/documents/raw2/Managing%20Whiteflies%20in%20the%20Greenhouse/Managing%20Whiteflies%20in%20the%20Greenhouse.php?aid=203

http://msue.anr.msu.edu/news/controlling_whitefly_in_the_greenhouse

http://mrec.ifas.ufl.edu/lso/bemisia/WhiteflyManagementProgram_January%2011,%202017.pdf

http://mrec.ifas.ufl.edu/lso/bemisia/Documents/EDIS-Whitefly-Management-Program.pdf

Survival of Insect and Mite Pests in Empty Greenhouses During Winter

Some growers shut down their greenhouses for a few weeks during the winter expecting the cold temperatures to be sufficient to freeze and eradicate all of their pest populations. However, some pests can survive and continue on your spring crops, especially if infested debris is left in the greenhouse.

- Aphids may overwinter in some greenhouses. In cold climates, aphids generally develop males and females in late summer to early fall. The females mate with males, then lay their overwintering eggs on woody plants or weeds depending on the species. For example, green peach aphid overwinters as eggs on Prunus species. In the spring, winged females start new colonies on herbaceous (or non-woody) plants. Depending upon greenhouse temperature, if you have weeds or pet plants in your greenhouse, ensuring a continuous food supply, non-mated female aphids may continue to give birth to living nymphs rather than laying eggs.
- Two-spotted spider mites (TSSM) enter hibernation (diapause) in the fall during short days, and low temperatures with fewer food sources. During diapause, the spider mites change color, turning orange to orange-red. They leave host plants to hibernate in cracks and crevices in the greenhouse where they overwinter. As soon as temperatures are favorable in the spring, they slowly come out of diapause and move to the nearest plants. This is why growers may have a spider mite problem in the same areas each year.
- Whiteflies and thrips do not go through diapause, but may survive cold periods in unheated greenhouses, especially during mild winters. Although greenhouse whitefly has no hibernation stage, the egg stage is highly tolerant to low temperatures and can survive up to 15 days at 27F, and up to five days at 21F. As long as green plant material exists in the greenhouse, the whiteflies have a good chance of surviving relatively cold conditions in their egg stage.
- Adult Western flower thrips (WFT) may also survive in unheated greenhouses. One study showed that adult Western Flower thrips (from California) survived for three days, and four hours at 14F and for 6 days, and 14 hours at 23F.

Crop residues and leftover plants left in the greenhouse or in areas surrounding the greenhouse provided suitable overwintering sites and can contribute to spring infestations.

The best way to prevent spring pest problems is to thoroughly clean greenhouses and not rely on freezing temperatures to eradicate pest populations. Remove all weeds, unsold plants and plant debris in greenhouses and around the perimeter of the greenhouse (if possible). Be sure cull piles are located as far away from greenhouses as possible.

A fallow period (with greenhouses completely empty) for at least four weeks may help to reduce pest pressure for the upcoming growing season. Even a break in production of as little as two weeks can help reduce pest pressure.

References

Ferguson G. Low Temperatures and Pest Populations. 2009. Greenhouse Vegetable IPM, OMAFRA.

Casey C. Use of Temperature and Moisture Extremes to Manage Western Flower Thrips in Greenhouses. 1995. Cornell Cooperative Extension.

Cold hardiness of adult western flower thrips, Frankliniella occidentalis (Pergande) (Thysanoptera: Thripidae). 2007. Applied Entomology and Zoology.

Tina Smith, UMass Extension and Leanne Pundt, UConn Extension

No Fooling Around with Lilies for Easter 2018

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In 2018 Easter Sunday falls on April Fools' Day. Although this is considered an early date Easter, the forcing schedule shouldn't require a lot of fooling around. So barring any unexpected tricks from Mother Nature, growers should be able to manage this crop without too much complication.

To get on the recommended 23 week forcing schedule growers will need to begin the process by October 22, 2017 and maintain proper cooling and forcing temperatures throughout. This requires that bulbs arrive on time and in good shape and that you handle them immediately upon arrival. The key steps in the forcing program for pot-cooled bulbs include a three-week rooting period (at 63F), followed by six weeks of bulb cooling (at 40-45F). Then plants are forced in the greenhouse at 60-62F until bud initiation is complete (about 4 weeks). Once buds are set, higher temperatures are used to force the crop during the final 10 weeks. With case cooled bulbs the process involves six-weeks of bulb cooling at 40-45F followed by a 17 week greenhouse production phase during which bud initiation occurs and the crop is forced to flower.

In both cases the entire process requires 23 weeks from start to finish. If bulbs arrive late or if your sales schedule calls for lilies earlier than 1 week before Easter, there are a couple of shortcuts you can take in the 23 week schedule. With pot cooled bulb you can reduce the length of time that pots are held at 63F prior to the six-week cooling period. If you are tempted to cheat here, allow enough time for bulbs to show some root development, two weeks if at all possible but at least one. As an alternative or if your schedule is still a little tight, you can substitute "insurance lighting" for a portion of the 1000-hour (6-week) bulb-cooling period. The same insurance lighting rule applies to all forcing methods including naturally cooled, pot cooled or controlled-temperature forced (CTF), and case cooled bulbs.

Lilies exposed to these long photoperiod conditions immediately after shoots emerge, respond as if the bulbs were exposed to additional hours of cool (40F) temperatures. In seasons when Easter falls on an early date, growers can extend the natural daylength with low intensity light to "insure" that adequate vernalization occurs. You can also use insurance lighting in lieu of cooling if you are trying to reduce the length of the forcing schedule.

Use insurance lighting" to directly substitute for lost bulb cooling time, one day of additional lighting for each day of lost cooling for up to 14 days (but no more). Lighting is most effective when started immediately at shoot emergence. DO NOT use insurance lighting unless the crop is short of the 1000 hour bulb cooling threshold since excess days of insurance lighting, just like excessive bulb cooling, will reduce lily leaf number, reduce bud counts and shorten the time to flower. Reducing time to flower may be your goal but dramatically reducing bud count is not.

Insurance lighting is achieved by providing at least 10 foot-candles (measured at plant height) for four hours (10 pm to 2 am) each night. Incandescent, florescent, LED or HID lamps can be used to provide the necessary night break.

Even though Easter 2018 is early, avoid the temptation to speed up lily growth in the first few weeks after emergence. Too often, growers run temperatures in the 70 to 75F range during this critical period in a misguided effort to get ahead of schedule. The result is excessive lily height, poor bud counts and prolonged cold storage periods at the end of the crop. At emergence, hold a constant day and night temperature of 60-63F until bud initiation is complete. Bud initiation is typically complete when shoots are about 3-5" tall, mid- to late-January 2018. The development of stem roots coincides with flower bud initiation. During this period, it is imperative that temperatures not exceed 65F. If you find yourself short on time, increase the rate of lily development after bud initiation is complete. Do not attempt to make up lost time with high temperatures during the bud initiation period. With a tight schedule growers should pay careful attention to variations in performance of bulbs from different sources as bulb lots often differ in both leaf count and finishing time. These differences can be detected early in the forcing process but growers who fail to respond end up off schedule. You can gauge differences in the maturity and finish time of various bulb lots by counting leaves as soon as bud set is complete.

Leaf counting & crop timing: Start checking leaf counts in mid-January (week 11). If bud set is not yet complete, wait one week and try again. This will allow plenty of time to determine whether lily development is on schedule and make temperature adjustments as needed. Use average daily temperature (ADT) to control the rate of lily development for the remainder of the forcing period. The rates of both leaf and flower development can be modulated with temperature. By controlling the rate of development you can control when the crop reaches the saleable stage. For example, at an average daily temperature of 72F leaves unfold at a rate of 2 per day on average, while at 63F the rate decreases to 1.5 leaves per day. Likewise, a lily will go from visible bud to bloom in 24 days at 81F, 31 days at 70F, 35 days at 64F and 42 days at 59F. If you arrive at visible bud 5 to 7 weeks before Easter and you can control temperature within these limits you should be in good shape to finish on time. Finally, plants that bloom early can be held in a cooler for up to two weeks. Storing finished lilies for longer than two weeks in not recommended.

The leaf counting technique is based on the fact that once flower buds initiate, leaf number is set and will not change. However, the exact number of leaves varies from year to year, between bulb lots, and with bulbs exposed to different cooling conditions.

After bud initiation, select five lilies for every 1000 plants in each lily group (per bulb source, emergence time etc). Select plants representative of the overall crop, and then remove, count and record the total number of leaves. Use a needle to remove and count the smallest, un-expanded leaves, and use magnification if necessary to determine if the shoot tip shows evidence of flower bud formation. If bud formation is not evident wait a week and try again. Record the number of fully developed leaves (those at a 45 degree angle to the stem or greater) and the number of undeveloped leaves (those at an angle less than 45 degrees to the stem). Now, divide the number of fully developed leaves by the number of days since shoot emergence. This is the “current rate of leaf development”. Divide the number of undeveloped leaves by the number of days remaining until visible bud. This is the “required rate of leaf development” or the rate you need to maintain as you move forward in the schedule.

If the “current rate of development” is too fast, meaning you will reach visible bud too early, reduce the average daily temperature (ADT) in the greenhouse. If the “current rate of development” is too slow, meaning you will reach visible bud too late, increase the ADT.

Determine a new current rate each week (the rate since last count) and a new required rate. Determine the new required rate by subtraction - you do not have to destroy any more plants. Simply subtract the number of fully developed leaves from the average total number of leaves previously determined. You can flag your indicator plants and use a marking pen to mark the last leaf you counted as mature.

For more information and the 2018 Easter Lily Schedule visit Greenhouse Update negreenhouseupdate.info/update

Storm Preparedness and Response

Severe storms of different types can occur at any time of the year. Here are some useful links to prepare for storms and where to go for assistance after a storm. The information was put together by John Bartok, Extension Professor Emeritus and Agricultural Engineer, NRME Department, University of Connecticut.

- Reducing Storm Damage to Your Greenhouses - UMass Extension (with additional links to MA resources on storm preparation and response)
- Reducing Storm Damage to Your Greenhouses (More info) - UConn Greenhouse IPM.
- 10 Snow-Related Causes of Greenhouse Failure 2013. Greenhouse Grower Magazine.
- Snow Melting Tips 2015. Greenhouse Management Magazine.

Preparing Your Greenhouse for a Hurricane, 2013, Skip Paul, Wishingstone Farm, Little Compton, RI.

Also, in recent winters, frigid temperatures and frequent snow storms caused delays of shipments of plugs and cuttings for spring production which arrived chilled or frozen. The damage often showed within a few hours after exposure to warmer temperatures.
Learn to recognize the damage. See this article with photos: "Chilling Injury on Cuttings: What to look for" by Tom Dudek, Michigan State University Extension.

Fact Sheet: Reducing Storm Damage to Your Greenhouse
Massachusetts Emergency Management
http://www.mass.gov/eopss/agencies/mema/
Mass. Dept. of Agricultural Resources Farm Emergency Plan Template
http://www.mass.gov/eea/agencies/agr/animal-health/farm-emergency-plan/

UConn Workshops on Hydroponic Greenhouse Vegetables

Hydroponic Production Short Course:

How to Start a Commercial Hydroponic Production Greenhouses

Floriculture Greenhouse, 1395 Storrs Road, Storrs, CT, 9:30am – 3:30pm

November 11, 2017. The first workshop will help new farmers learn how to establish and manage a hydroponic system. Cost: $55/person by November 3, 2017, space is limited.

Greenhouse Vegetable Production in Hydroponics and Soilless Systems

Floriculture Greenhouse, 1395 Storrs Road, Storrs, CT, 9:30am – 4:00pm

December 9, 2017. The second workshop is intended for experienced growers who would like to improve their production practices in hydroponic or soil-less systems. COST: $55/person by December 1, 2017, late registration $70 per person space is limited.

Contact Leanne Pundt for more information: (860)486-6855 or leanne.pundt@uconn.edu

UMass Greenhouse Crops and Floriculture Extension Program

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