A Publication of the UMass Extension Greenhouse Crops & Floriculture Program

Floral Notes Newsletter

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In This Issue

2012-2013 New England Greenhouse Floriculture Guide

A Management Guide for Insects, Diseases, Weeds and Growth Regulators

The **New England Greenhouse Floriculture Guide** is for commercial production of greenhouse ornamentals and has information on current pest management and growth regulators. Recommendations include IPM and biological control information for greenhouse crops.

This manual is a compilation of input from the members of the New England State University Extension Systems and Raymond Cloyd of Kansas State University.

New for 2013

- 270 pages of up-to-date recommendations for nonchemical and chemical management of greenhouse insects, mites, diseases, weeds and algae, plus recommendations for using plant growth regulators
- Guidelines specific to New England, in a durable plastic comb binding.
- Expanded information about using natural enemies to manage insects and mites.
- Details about how to use pesticides safely and effectively, and how to mitigate development of pesticide resistance.

The Guide is designed to provide commercial growers with technical information on pest management (weeds, diseases and insects) and growth regulators. Because this is a publication written by professionals from throughout New England, and rewritten every two years, it reflects the current collective knowledge for greenhouse crops for this region. Published by New England Floriculture, Inc., sponsor of the Northeast Greenhouse Conference.

$40 (includes Mail Media shipping), order on-line through the UMass Extension Bookstore

Reduce Energy Costs: Greenhouses and Nurseries

Massachusetts Farm Energy Program (MFEP)

Energy Efficiency

Audits & Assessments

Audits provide a snapshot of current farm energy use and costs, and set out recommendations for saving energy.

Free public utility audits - for assessing electricity or natural gas use, typically for lighting, refrigeration, heating systems, and other custom measures.

MFEP custom audits - customized farm energy audits to help farms assess energy-saving options. MFEP pays for 75% of the cost of the audit and the applicant farmer covers the remaining 25%.

NRCS Agricultural Energy Management Plan (AgEMP)- a comprehensive energy audit administered through the USDA-Natural Resource Conservation Service. AgEMPs are required to apply to NRCS for EQIP funding related to energy projects.

Funding Resources

NRCS Environmental Quality Incentives Program (EQIP) - offers audits and financial compensation for part the cost of implementing practices that reduce pollution and greenhouse emissions. Measures funded for greenhouses include shade screens, high efficiency heating systems, fans, and automatic controls.

MDAR Agricultural Energy Grant Program - is a competitive grant program that funds agricultural energy projects in an effort to improve energy efficiency. Funded measures include heaters, shade screens, automatic controls and more.

Public utility incentives - are available to customers of "public" utility companies through conservation programs. Public utilities offer incentives to greenhouse operations to support lighting upgrades, heater upgrades, insulation and more.

USDA/REAP - efficiency and renewable energy - see opposite side of page

Looking for examples of energy savings and practical investments for your farm? Questions to ask your vendor or installed Our **Farm Energy Best Management Practices Guides (BMPs)** walk through energy efficiency and renewable energy projects organized by sector. Available for free download at www.berkshirepioneerrcd.org/mfep

To start your farm energy project contact:

MFEP at (413)256 -1607 or mfep@berkshirepioneerrcd.org.

Sign up online at: http://www.berkshirepioneerrcd.org/mfep/forms/application.php

Invasive Pest Update

April 3, 2013, 9:00 AM – 1:00 PM
Publick House, 277 Main Street - Route 131, Sturbridge, MA

For professional landscapers, garden center employees, horticulture retailers, roadside stands, master gardeners and other horticultural professionals.

Massachusetts has a long and storied history of invasive insects, dating back to the 1860s with gypsy moth. Get on top of the latest and anticipated arrivals! This is a refresher on recognizing exotic weeds, insects and diseases found in landscapes in Massachusetts, how these exotic and invasive pests are regulated, and how these regulations affect you and your business.

8:30 – 9:00 Registration, Coffee and Muffins

9:00 – 9:50 Update on Invasive Weeds Randall Prostak, UMass Extension

Learn to identify the most recent invasive plants in Mass and what to do if you find them.

9:50 – 10:40 Invasive Insect Pests: Asian Longhorned beetles, Brown Marmorated stink bug, Emerald Ash borer, Viburnam Leaf beetle, Winter Moth and Hemlock Woolly Adelgid
Bob Childs, UMass Extension

Massachusetts has a long history of invasive insects. Join us as Bob talks about our most current exotic insects to watch for, what has been done thus far and the work that still lies ahead.

10:40 – 10:55 Break

10:55 – 11:45 Quarantines, Regulations and Reporting Jennifer Forman-Orth, State Plant Pest Survey Specialist, MDAR

Learn about the regulations governing invasive pests like Asian Longhorned beetle and Emerald Ash borer and what it means to have a quarantine in place. Explore the history of the Massachusetts Prohibited Plant List and why certain invasive plants are banned from use in our state. Understand the process that occurs when a new invasive pest is discovered, including what agencies are involved and why it is important for these pests to be reported promptly.

11:45 – 12:15 Update on Invasive Diseases Bess Dicklow, UMass Extension

Bess will update us on the status of invasive diseases in Massachusetts including Ralstonia, Chrysanthemum White Rust, Oak Wilt, Potato Wart, Boxwood Blight and more.

12:15 – 12:45 Impatiens Downy Mildew and Alternatives to Garden Impatiens Tina Smith, UMass Extension

Impatiens Downy Mildew is a new problem in Massachusetts landscapes. Learn to recognize this important disease and steps you should take, if you find it. Discover alternative plant options landscapers can use in place of garden impatiens.

4 Pesticide contact hours for categories 26, 29, 31, 36 and applicator license, Credits for MCA, MCLP, MCH, NOFA.

Cost is $55 per person; $45 per person for three or more registrations from the same company. Morning coffee and muffins and handouts included in registration. For information contact Tina Smith, UMass Extension at 413-545-5306, tsmith@umext.umass.edu

Annual Injector Maintenance

Russell Norton
Horticulture Extension Educator
Cape Cod Cooperative Extension
Barnstable

The proportional dosing pump or injector is a vital piece of equipment for greenhouse growers; however, the equipment often receives little or no attention. This article will go over some of the basic procedures that should be considered part of your annual maintenance of an injector.
http://extension.umass.edu/floriculture/fact-sheets/fertilizer-injectors-greenhouses

Annual injector maintenance includes inspecting, cleaning, and replacing worn parts of your injection equipment. Injectors are an extremely important part of a greenhouse operation and their proper function is necessary to apply nutrients and pesticides accurately. Inaccuracy could lead to crop nutrient problems or in the case of pesticides, ineffective pest control. Proper maintenance of an injector will also increase the lifespan of the equipment and reduce the risk of untimely breakdowns.

The Dosatron DI-16 proportional dosing pump has been a longstanding popular model used in the greenhouse industry and the model I will be referring to in this article. The DI-16 has recently been replaced by the D14MZ2; however, the maintenance procedures are similar for both models and many other Dosatron injectors. There are numerous other brands and models of injectors beyond the scope of this article. Make sure you check your owner's manual or with the manufacturer, on the specific maintenance procedure for your make and model.

The injector should be cleaned and seals replaced at least once year, depending on use. If your injector was used to pump harsh chemicals or pesticides, gloves should be worn during maintenance. Cleaning your injector involves removing the pump motor and soaking it in warm soapy water. A soft toothbrush may be used to help remove stubborn deposits. If the injector has been out of use for an extended period of time, soaking it overnight may help loosen deposits.

The mesh water filter located in the body of the injector should be cleaned once a month and as part of your annual maintenance. If this filter has collected a lot of debris, make sure the upstream filter is functioning properly. This is a good time to clean this piece of equipment as well, to make sure the filter is functioning properly. Another sign as to whether or not filtration is adequate is the presence of scratches on the inside of the bell housing. These scratches can easily be detected by rubbing your fingers along the inside of the bell housing. Scratches can eventually lead to malfunction of the equipment. For more information on filters, check out the UMass fact sheet on Protecting Your Water System with a Good Filter
http://extension.umass.edu/floriculture/fact-sheets/protecting-your-water-system-good-filter

The next part of annual maintenance includes the replacement of the dosing and injection seals. Parts and kits are available from your Dosatron distributor. Be careful replacing seals and O-rings. Do not use metal tools as they are likely to damage the plastic parts. While replacing dosing seals, pay attention to the orientation of the parts to ensure proper replacement. While the injector is apart, inspect all the seals and O-rings. Replace seals and O-rings that have cracks, have become hard, or are misshapen. I like to have an extra set of parts on hand to avoid the potential loss of use due to an untimely breakdown.

After you have the replaced your dosing seals it is time to put the unit back together. I like to cut a half-inch or so off the end of the suction hose that connects to the injector when doing annual maintenance. This helps avoid the potential of air entering the system from the worn tubing. Hand-tighten all parts when putting the injector back together. Once the unit is back together slowly turn the water on and check for leaks.

Now that you have successfully completed your annual maintenance you will want to recalibrate your injector. For information on calibrating your injector refer to this UNH Cooperative Extension video
http://www.youtube.com/watch?v=3fzobTdmkh8

Preventing and Rescuing Overgrown Plants

Tina Smith and Douglas Cox
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The trend toward using fewer chemicals for crop production also pertains to managing plant height. A common problem for growers during the spring season is overgrown plants. Some growers lower the night temperatures to save on energy costs, while the daytime temperatures soar during bright sunny days result in plant stretch. The greater the difference between day and night greenhouse temperatures, the greater the plant stretch. Spring crops may also become too tall if they are started too soon or are grown in low light levels. Fast-growing herbs such as basil, chives, and dill and vegetable plants easily become overgrown if started too early. Low light levels can result from plants being spaced too close together, hanging baskets shading plants below or greenhouse glazing being old and dirty. Old, dirty greenhouse film in combination with lack of daytime ventilation commonly causes plant stretch. Depending on the extent of these factors, growers can sometimes use cultural practices and plant growth regulators to salvage plants by slowing down stretch.

Using Temperature to Manage Plant Height

The DIF technique of temperature control was developed at Michigan State University during the 1980's. Research showed that the difference (DIF) between day temperature (DT) and night temperature (NT) could be used to control stem stretch in many plant species. Stem elongation is promoted by warmer days than nights (+ DIF) and inhibited by warmer nights than days (- DIF). Plants become taller when DIF becomes more positive and plants stay shorter as DIF becomes smaller or more negative. A different, but easier approach to using DIF with similar results is to reduce the greenhouse temperature 5-10° F lower than the night temperature for 2- 3 hours at dawn. Called a "cool morning pulse", this approach reduces plant height as much as a negative DIF. DIF has its greatest effect on height during the period of most rapid stem elongation. DIF does not have to be applied continuously throughout a crop cycle to be effective, but rather only during the period of most active vegetative growth.

Temperature also affects the rate of plant development to flowering or marketing time. Growth rate is a function of the average daily temperature (ADT). When using DIF, the ADT should also be calculated and used with DIF. As ADT increases the rate of plant development will increase and as ADT decreases the rate of plant growth will decrease. The average daily temperature (ADT) can be calculated by adding the night temperature times the length of the night period (in hours) to the day temperature times the length of the day period (in hours), and then divide this total by 24 (the number of hours in the day).

Table 1. The response of some plants to DIF.

Large response				Small or no response	
Easter lily	Dianthus	Portulaca	Gerbera	Squash	Platycodon
Chrysanthemum	Tomato	Hypoestes	Petunia	French marigold	Tulip
Poinsettia	Snap bean	Snapdragon	Geranium	Hyacinth	Narcissus
Salvia	Watermelon	Impatiens	Asiatic lilies	Aster	
Celosia	Sweet corn	Rose			
Fuchsia	Oriental lilies				

A DIF treatment raising the average daily temperature would speed crop development, while a treatment lowering the average daily temperature would slow crop development. DIF, like a PGR, has its greatest effect on height during the period of most rapid stem elongation. DIF does not have to be applied continuously throughout a crop cycle to be effective, but rather only during the period of most active vegetative growth.

A note of caution: DIF treatments affect the *rate of crop development* as well as stem elongation. Growers using DIF should determine the effect of their DIF treatment on the average daily temperature. A DIF treatment raising the average daily temperature would speed crop development, while a treatment lowering the average daily temperature would slow crop development.

Light

One of the easiest ways to reduce height is to maximize the amount of light plants receive to reduce "stretch." Providing adequate spacing, reducing the number of overhead planters and new or clean glazing will all help to prevent overgrown plants. Note that dirty glazing can reduce light by 20%!

Nutrition

Reducing fertilizer or water are other methods used to prevent stretch. Some growers try to hold back plants using low temperature in combination with nutrient and/or water stress. Low fertility or mild water stress can be successful if carefully controlled. However, there are risks - such as the development of nutrient deficiency symptoms which are difficult to correct, or plant damage due to water stress. The nutrients which have the most effect on the size of greenhouse plants are nitrogen (N) and phosphorus (P). Limiting nutrition and water will not likely help plants that are already overgrown.

Plant Growth Regulators (PGRs)

PGRs are useful tools for slowing down plant growth, but should be used wisely on spring crops and not as substitutes for good cultural practices. PGRs are treated as pesticides and have re-entry intervals. There are no PGRs labeled for use on herbs, however, the PGR Sumagic (uniconazole) is labeled for use as a foliar spray on several vegetable transplants (eggplant, ground cherry, pepino, pepper, tomatillo and tomato) grown in greenhouses.

Using PGRs in Mixed Containers

How does a grower handle growth when different species are mixed in the same container and (1) plants in the same container have widely different vigor and require different PGR control and (2) the growth regulation objectives vary for plants in the same container. For example a grower may have a dwarf angelonia that requires no PGR control in the center of a container surrounded by an extremely vigorous petunia cultivar that requires aggressive PGR control. In another situation, a grower may want to increase branching on an ornamental millet plant in the center of the mixed container but also control vigor of sweet potato vines planted along the margins.

In both of these situations a grower cannot apply a single PGR treatment to the mixed container and achieve the desired result. The solution requires that the grower treat individual plants in the mixed container without affecting the others in the same planting.

To control growth of the most vigorous varieties or species without affecting the less vigorous plants, the best option is to pre-treat the transplants as needed. A "plug dip" is a useful technique for this purpose. Here the plug flat is set in a tray of PGR solution and the rooting medium of the plugs is allowed to soak up the growth regulator. Allow the plug flat to sit in the solution for at least 5 minutes, some growers will allow 30 minutes but the plug root volume should reach saturation before that much time. After soaking allow the plug sheet to sit on the bench overnight before transplanting into the final container. Only root-active PGRs such as A-Rest, Topflor, Bonzi and Sumagic (and their generic equivalents) can be used for this purpose. These chemicals can remain active in the root zone for months, and they tend not to migrate far from the treated soil. Therefore, control is conveyed to just the individually treated plugs and not the other plants in the mixed containers. For rates, use Bonzi at

between 4-16 ppm, use Sumagic at 2-8 ppm, for Topflor use 3-12 ppm. If you have not tried this before, start with rates in the lower half of the recommended range.

With groups of plants that have different growth regulator requirements such as increased branching associated with Florel versus height control associated with growth retardants, the option again is to treat the plants separately. Here you can go two ways. Transplant the plants that require Florel into the final container and spray, and then fill in with plugs of the vigorous species that have already been treated with a root-active PGR as previously described. Alternatively, the container can be planted with the treated plugs, leaving a space for the Florel requiring plants. Grow the plants that require Florel in small containers (e.g. 4-6" pot) until the treatment schedule is complete and then drop them into the empty space. Growers will often plant an empty pot to facility the late transplant with minimal disruption to the other plants growing the mixed container.

Using PGRs to Hold Plants

PGRs can also be used to hold plants in check once they reach their final size. This is helpful when weather conditions dictate that plants be held longer than anticipated. In these situations, a spray or drench application of one of the root-active compounds (A-Rest, Bonzi, Sumagic, Topflor) can work but sprays are preferred since high concentrations are required to hold the plants at this stage and sprays work faster but have a shorter residual effect. Therefore, high concentration sprays are less likely to reduce garden performance than high concentration drenches. Growers should take precautions to prevent an overdose, which can have a long residual effect and as a result, plants may not perform in the garden for the consumer. For a proper hold, growers should consider selecting a concentration in the upper half of the normal recommended range for that crop or even 50% higher than the rate recommended for slowing growth during the grow-out stage. For example, the normal spray rate for A-Rest on Ageratum in flats during grow-out is 10-15 ppm, but a rate of 15-26 ppm is recommended to hold this crop. The same principle would apply for the other PGR compounds. Note that Cycocel is not recommended for this purpose since the spray rates required would be so high that phytotoxic injury would likely occur. Plants can also be treated before being transplanted into larger containers or combination planters to hold them.

Growers without experience using PGRs to hold plants can start with the high end of the normal recommended rate to put a hold on growth. A second treatment can be applied if the first is not enough. A proper hold rate should give enough control to hold a mature plant under hot weather for 2-3 weeks but low enough that the plant will recover and grow for the consumer. Spray treatments carry less of a risk of overdose than drench treatment, especially when the root-active PGRs are used.

When using a PGR for the first time, treat a small group of plants and keep accurate records of the response and conditions in the house.

Cutting Back and Pinching Plants

And finally, when all else fails, some growers simply cut back the growth. *Cutting back* is the process of removing one-half or more of the plant to reduce the size of overgrown plants. Some plant species respond well to being cut back by producing abundant new growth, but others do not. Growers should be aware that pinching some overgrown plants can result in poor branching from hard woody stems below. If the response to cutting back a particular species is unknown, cut back a few containers to test the species' ability to recover. Cutting back should be reserved as a last measure to reclaim plant quality.

Perhaps the plants are just slightly overgrown, or need some shaping, by using a soft pinch or hard pinch. *Pinching* is the process of removing soft growth from a plant to overcome its natural tendency to branch. This tendency, called *apical dominance,* results from the production of auxin, a natural plant hormone, by the terminal growing point and young leaves. Removing the terminal growing point and one or two uppermost leaves, is a *soft pinch.* A soft pinch removes the source of auxin and allows dormant buds below the pinch to grow. A soft pinch is done by pinching off the stem using your thumb and forefinger, or by cutting off the growth mechanically, using a knife, scissors, or clippers. Many

growers make one or more soft pinches to plants in hanging baskets to control their overall size and shape, to increase flower number, and to create full, thick growth.

When plants are overgrown, beyond using a soft pinch, growers may remove the terminal growing point and two to four leaves. This is considered a *hard pinch* and delays flowering more than a soft pinch. It may also result in less-than-desired branching from the original plant if not enough nodes are left behind.

Plants can be pruned and shaped at any time to reduce stretch and improve aesthetics, however, flowering or re-flowering will be delayed by two or more weeks and pinching is labor intensive. Some growers will make subsequent pinches at 3- to 6-week intervals, depending on the plant species, and growing conditions. Additional pinches result in fuller growth and add to quality but also add significantly to total crop production time.

Unfortunately, tasks often do not get performed on time during the peak production season, and as a result, overgrown plants need to be rescued.

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