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Floral Notes Newsletter

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"Grower to Grower" on Greenhouse Biological Control
January 6, 2010, 1:00-3:00, Grower Direct Farms, Somers, CT

Winter Flower Grower Program
February 10, 2010, D&D Farms, Stow, MA

Employee Training for Garden Retailers: Green, Organic & Sustainable Solutions
March 23, 2010, 9:30-3:30, Publick House, Sturbridge, MA

2010 Northeast Greenhouse Conference

New England Floriculture, Inc is excited to announce the name change of the New England Greenhouse Conference to the Northeast Greenhouse Conference. "The name change reflects the formal inclusion of New York on our Board of Directors, and our conference committee, as well as welcoming attendees from outside New England with similar growing and market conditions." said Tina Bemis, President of the Northeast Greenhouse Conference.

The conference will be held on November 3 and 4, 2010 in Worcester, MA. Each day will feature consecutive tracks of educational programs. These educational sessions will focus on greenhouse production, business management, pest management and greenhouse engineering. A trade show will be held on both days. Visit our website: http://www.negreenhouse.org

Crop Production

2010 Connecticut Easter Lily Schedule

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The Easter season in 2009 was a bright spot in an otherwise difficult economic year. With the weak national economy, many growers were concerned going in to the new year but it turned out to be a really solid Easter season with strong sales. It's hard to predict what 2010 will be like but Easter, as the first colorful harbinger of spring, always seems to rekindle the spirits of the gardening public. So hopefully 2010 will be another strong Easter season.

In 2010 Easter falls on a mid-date crop schedule. Mid-date schedules, Easter dates that fall between April 3 and April 15, are best from a grower perspective because they don't require any special management tactics to either slow or speed crop development. Plus in northern climates, having the crop out of the house at the end of March allows plenty of time to fill up for the spring production.

One trend we saw the last couple of years was a push by growers to conserve energy and cut production costs. Last year I reported that some growers added an extra layer of plastic film, suspended above the truss, to provide some extra insulation and that many growers double cropped with overhead baskets. With energy prices on the rise again, I anticipate some of the same pressures in 2010. These tactics are okay, but growers should know that they do pay a price in terms of crop quality. As overhead shading increases, you will be more reliant on PGR's to control stretching and leaf yellowing associated with reduce light.

Critical dates in the 2010 schedule

For Easter 2010, start case-cooling bulbs by October 25 (23 weeks before Easter). If bulbs arrive later than this and you don't have the full 6-weeks of bulb cooling completed by December 6 (17 weeks before Easter), start the greenhouse forcing anyway and just substitute one week of insurance lighting for each week of cooling still needed. For pot-cooled bulbs start 6-weeks of bulb-cooling by November 15 (20 weeks before Easter) and start greenhouse forcing by 14-week before Easter. Ideally pot-cooled bulbs should be potted by October 25 and held at 60-62°F for 3-weeks prior to the November 15 cooling date in order to stimulate root development. If you don't have time for the full 3-weeks rooting period, just give them as much time as you do have while staying on course with the November 15 start date for cooling.

Regardless of bulb cooling method, lilies should reach the visible bud stage at about February 21st or 6-weeks before Easter. Lilies at this stage will reach full bloom in time for shipping 1-week before Easter.

Lilies are a challenging crop even in seasons when the schedule permits adequate time for proper forcing. Bulb response can be notoriously variable from year-to-year and even from batch-to-batch due to variations in summer field conditions during bulb production and handling after the bulbs are dug. For success in 2010, keep a close eye on development from the start. Follow the 2010 schedule to track development and the cultural recommendations to maintain proper plant health and vigor during greenhouse forcing. As always if you do spot a problem, react and make adjustments early to avoid more difficult adjustments later.

Good luck for a successful 2010 season!

2010 Connecticut Easter Lily Schedule

Weeks Prior to Easter	Date	Forcing Method: Case-Cooled	Forcing Method: Pot-Cooled (CTF)
25	*Oct. 11*	*Bulbs dug, shipped & in hand by mid-Oct. Programming starts immediately. Treat bulbs for mites before cooling begins.*	
24-23	*Oct. 18 –Oct. 25*	**Start bulb programming as soon as bulbs arrive but no later than 23 weeks before Easter.**	
		Cool at 40-45F for 6 weeks	*Pot and allow roots to grow at 60-62F for 3 weeks*
20	*Nov. 15*	---	*Cool at 40-45F for 6 weeks*
17	*Dec. 6*	***Pot no later than 17 weeks before Easter*** Force in greenhouse at 60-62F in pot.	---
14	*Dec. 27*	*Roots visible by wk 15 & shoots emerge by wk 14.*	Force in greenhouse at 60-62F in pot (no later than 14 weeks before Easter).
		Early plantings *emerging before wk 14 & buds beginning to set. Start fertilizing & keep moist*	
13	*Jan. 3*	1-2" tall. Keep lilies moist & use fungicide drench as needed.	
12	*Jan. 10*	2-3" tall. Bud initiation coincides with stem root development. Run 60-62F day/ night until bud set is complete.	
11	*Jan. 17*	3-4" tall. Apply growth regulator when 3-5” tall. Bud initiation nearly complete, maintain temperature below 65F until done.	
10	*Jan. 24*	Check for bud set. Begin leaf counting & graphical tracking. Keep greenhouse cool if ahead of schedule.	
9	*Jan. 31*	5-6" tall. Adjust temperatures as needed. Space lilies to avoid yellow leaves & stretching. Apply Fascination to lower leaves (7 to 10 days before visible bud) if leaf yellowing is evident.	
8	*Feb. 7*	Check for aphids & root problems. Apply insecticide drench sometime during weeks 10, 9, or 8. Soil test & if leaf scorch is evident, use calcium nitrate for balance of schedule.	
7	*Feb. 14*	7-8" tall. Lilies are about half final height. 42 days to sale. Buds can be felt. If buds are visible on early planting run 60F until finish.	
6	*Feb. 21*	35 days to sale. Buds should be visible no later than 30 days prior to sale. Grade for uniformity as buds become visible.	
5	*Feb. 28*	Buds 1/2-1" long. Re-apply Fascination if necessary.	
4	*Mar. 7*	Buds 1-1 1/2", some bending down.	
3	*Mar. 14*	Buds 1 1/2-2" long. If aphids present, use a total release smoke or aerosol.	
2	*Mar. 21*	Buds 2-4" long., some turning whitish. Stop fertilizing just before sale & apply clear water once. Cool lilies at 35-45F to hold. Prior to cold storage, Fascination can be applied to entire plant.	
1	*Mar. 28*	Ready to sell. Shade lilies once removed from storage. If needed, use EthylBloc prior to shipping.	
0	*Apr. 4*	***Easter 2010***	

Notes and Comments on the 2010 Easter Lily Schedule

Easter 2010 outlook: Easter falls on a mid-date in 2010 (April 4). This is on the early end of the mid-date calendar but will allow enough time for proper programming and forcing. Average heights and times for forcing are presented in this schedule. Adjust schedule according to plant growth, bud development, starting time, and past experience. If you have problems contact your Extension Educator.

Pot-cooled bulbs are normally potted and held for three weeks at 63F before the six weeks of bulb cooling (at 40-45F) begins (see the 2010 Easter Lily schedule for details). The bulbs then require 14 weeks of greenhouse forcing. This entire process requires 23 weeks from initial potting to Easter. This is the same process is used for both naturally cooled or CTF bulbs.

Case-cooled bulbs require six weeks of cooling followed by 17 weeks of greenhouse forcing to flower in time for Easter. Be sure that commercially case-cooled bulb arrive & are planted by Dec 6, 2009. If you cool your own bulbs, start the Oct. 25 (23 wks before Easter). Insurance lighting should not be needed this year but can be used if you can't complete the full 6-weeks of bulb cooling.

Insurance lighting: Provide insurance lighting if you know or suspect that bulbs have not received the entire six weeks of cooling by the time greenhouse forcing in scheduled to begin. Insurance lighting refers to night break lighting used to produce a long day photoperiod. When insurance lighting is used immediately following shoot emergence it will produce the same effect as bulb cooling or vernalization. Therefore, insurance lighting can be used to substitute for inadequate bulb cooling. Provide one day of insurance lighting for each day of lost cooling. Incandescent, fluorescent, or HID lighting in excess of 10 f.c. from 10 pm to 2 am daily will provide the necessary night break.

Fertigation: Start fertilizing with soluble formulation when lilies emerge and continue to within 7 days of sale. Combine calcium nitrate (3 parts) with potassium nitrate (2 parts) to make a 15-0-18 soluble fertilize, or use a commercial 15-0-15 formulation. If phosphorus was not added to the medium, 20-10-20 can be used on an alternating basis with a 15-0-15. Fertilizer rates should range from 200-400 ppm. Do not allow medium EC to exceed 3-3.5 mmho/cm based on a Saturated Media Extract. Stop fertilizing just before sale. Provide one clear watering before lilies are shipped - this will reduce salt levels in the potting medium and maximize lily-keeping quality. Do not withhold water or fertilizer to slow development. Do not over water (i.e. water too frequently) or root rot problems may occur.

Decrease Leaf Yellowing & Delay Flower Senescence: To prevent early-season (7 to 10 days before visible bud) & mid-season (7 to 10 days after visible bud) leaf yellowing, spray Fascination at 10/10 ppm. (Note: Fascination contains two active ingredients and recommendations include the concentration of each). Apply only to lower leaves & cover thoroughly. To prevent late-season leaf yellowing and post-harvest flower senescence, spray 100/100 ppm to thoroughly cover all foliage & buds. Apply when buds are 3 to 3 ½" long & NOT MORE than 14 days before shipping or cooling. Protects leaves from yellowing for up to 14 days. **Note**: Side effects include increased stem stretch. Avoid direct contact of spray to immature leaves during early- & mid-season applications.

Disease and pest control: Before planting, clean bulbs of debris removing any damaged scales, especially scales that show evidence of infection. Once potted, root rots associated with Rhizoctonia, Fusarium, and Pythium are a concern. Drench immediately with Banrot or Insignia, broad-spectrum fungicides, or you can treat to control these diseases separately by selecting from the fungicides specifically registered for Rhizoctonia, Fusarium and Pythium control on lily. Materials registered for Rhizoctonia and/or Fusarium include 26GT, 26/36, Contrast (Rhizoctonia), Sextant, and Terraclor WP (Rhizoctonia). Materials registered for controlling Pythium include Alude, Banol, Subdue Maxx, and Truban. Check with manufacturers regarding compatibility when tank mixing fungicides for Pythium with Rhizoctonia/Fusarium controlling materials. Fungicides may need to be re-applied later in the crop, check labels for guidance.

Aphids, fungus gnats and bulb mites are a major concern. Use only smokes or aerosols once in bud. Many chemicals are listed for aphid control, including, Safari, Celero, Flagship, Tristar, Marathon, DuraGuard, Distance, Enstar II, Preclude TR, Tame, Ultrafine Oil, Insecticidal Soap, Talstar and Endeavor. Fungus gnats can be controlled with many of these same chemicals as well as Citation, Adept, insect parasitic nematodes (Nemasys, NemaShield, Scanmask) and Gnatrol. Bulb mites, Rhizoglyphus robini, represent on of the more troublesome insect pests on lilies. Duraguard is labeled as a drench for soil borne organisms that may include bulb mites. Bulb mites are more likely to attack physically damaged bulbs – so be sure to control fungus gnats and handle bulbs gently.

Note: Registration of pesticides varies by state so consult and follow labels for registered uses. To avoid any potential phytotoxicity or residue problems, spot test first before widespread use. No discrimination is intended for any products not listed.

Controlling Lily Height: Use A-Rest, Chlormequat E-Pro, Concise, Cycocel, Topflor or Sumagic as needed when shoots are 3-5" tall. Split applications provide the best results. You can apply any of the PGRs at ¼ to ½ normal rate, as needed, to control height. Reduce the concentrations of Sumagic used when combined with DIF. Use DIF, or cool morning DIP, to control lily height. Equal day/night temperatures, high night/low day temperatures or cool morning temperatures will keep lilies short.

Lily storage: Lilies can be stored for up to 10 days in the dark at 35-45F when buds turn white but before they open. Spray for Botrytis control prior to moving lilies to cold storage. Materials registered for botrytis control on lilies include 26GT, 26/36, Daconil, Exotherm Termil, Sextant, and Protect DF. Follow label directions. Water Easter lilies thoroughly before starting cold storage. After removing from the cooler, place lilies in a shady location to avoid excessive wilting.

Graphical Tracking of Lily Height: Monitor lily height regularly during forcing. If height exceeds the target size, run negative DIF to slow stem elongation. If height is less than the target size, run positive DIF to increase stem elongation.

Growth Medium pH and Water-soluble Fertilizers

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Growth medium pH is affected by many of factors during commercial production. The most important of these are components of the mix (e.g., peat moss, compost, etc.), limestone type and rate of incorporation, plant root effects, irrigation water pH/alkalinity, and fertilizer type. In my experience fertilizer type is not fully recognized as a pH factor by many growers.

Fertilizer effects on pH

All water-soluble fertilizers potentially affect growth medium pH and you can find an indication of what the effect will be on the bag of most brands. Fertilizers are rated as to their calcium carbonate equivalent (CCE) or **potential acidity/ potential basicity** (Table 1). For example, Peat-lite 15-16-17 has a **potential acidity** of 196 lbs. of calcium carbonate per ton of fertilizer. This means it would take 196 lbs. of calcitic limestone to neutralize the **acidic** effect caused by the application of one ton of 15-16-17. On the other hand 15-0-15 has a **potential basicity** of 290 lbs. of calcium carbonate per ton of fertilizer. A ton of 15-0-15 would **raise** the pH of the growth medium as much as 290 lbs. of calcitic limestone. In each case, the larger the number the greater the potential effect of the fertilizer on pH.

The pH effect is the result of the nitrogen form in the fertilizer and how it is used by the plant roots and the microorganisms in the growth medium. Fertilizers with high percentages of ammonium and/or urea are acidic fertilizers and tend to lower pH. Basic fertilizers are characterized by a high percentage of nitrate and tend to raise pH.

Switching between acidic and basic fertilizers will not cause a quick change in growth medium pH. The effect make take several weeks before a change will start to show up.

Table 1. Acidity or basicity of some common water-soluble fertilizers

Fertilizer	Potential acidity	Potential basicity
General Purpose 20-20-20	558	
Peat-lite 20-10-20	406	
Geranium Special 15-15-15	246	
Peat-lite 15-16-17	196	
Peat-lite Special 20-1-20	86	
Poinsettia Peat-lite 15-5-25	37	
High Cal Peat-lite 20-0-20		10
EXCEL Cal-Mag 15-5-15		141
Dark Weather 15-0-15		290
EXCEL Cal-Lite 15.5-0-0		400
Potassium nitrate 13-0-44		520

Remember that many factors are interacting to determine pH. Obviously pH must be measured periodically to check the progress of change.

Precise pH control with acid and basic fertilizers has not been worked out yet. But this technique can be effective in checking a drifting pH or correcting pH ±0.1-0.3 units. Switching fertilizers is what I recommend when a grower has a pH at or slightly above or below the upper or lower ends, respectively, of the pH optimum range for a species.

Be careful when using the acidic fertilizers because they supply significant amounts of ammonium. Many plants can not tolerate ammonium nutrition. I recommend Peat-lite 20-10-20 or 15-16-17 as the best acidic fertilizers. Also, if you decide to use 15-0-15 to raise pH keep in mind that it doesn't supply phosphorus. Prolonged use of this fertilizer may lead to phosphorus deficiency.

Making big changes in pH

Sometimes pH is much higher or lower than the desired optimum with the real potential for poor plant performance. Abnormally low pH is much more common in Massachusetts than abnormally high pH. This mainly due to the acidic nature of the fertilizers and soilless growth media in common use and the low alkalinity of most water supplies in the state (*see box*). If very high pH is a common occurrence, acid injection might be appropriate following a water test confirming high alkalinity.

Abnormally low pH most often results from inadequate liming and/or the prolonged use of a very acid fertilizer. Also, some plants, particularly geranium, can have dramatic acidic effects on pH. If pH is too low by more than 0.3 units a grower should switch to a basic fertilizer and consider the use of a liquid limestone treatment which will change pH faster than the fertilizer alone. A commercial liquid lime can be used following the label rates or mix 1 lb. of hydrated lime (calcium hydroxide) with 5 gal. of water and apply the clear solution to the plants. Potassium hydroxide can be injected during irrigation but I consider this a treatment of last resort for most growers.

Water pH and Alkalinity

Many growers are confused by "high pH" and "high alkalinity" in relation to water quality and growth medium pH. Generally water with a high pH (7-8) and **low** alkalinity (<100 ppm $CaCO_3$) is **not** a problem. This type of water is typical in Massachusetts and it has very little effect on pH relative to fertilizer type and the other cultural factors. Generally acid injection is **not** needed to maintain the proper growth medium pH range when water has **low alkalinity** regardless of pH level.

The combination of high pH and **high** alkalinity (>100 ppm $CaCO_3$) is a problem; irrigation with alkaline water will lead to increased growth medium pH which could adversely affect some species and plant types (e.g., certain plug species). This situation may call for acid injection. However, with the exception of some parts of Berkshire county, alkaline water is not typical in Massachusetts.

Controlled-release & Water-soluble Fertilizer Combination Programs

Some growers have reported that using combination fertilizer programs (low-to-medium rate of controlled-release fertilizer [CRF], along with supplemental applications of lower concentrate water-soluble fertilizer [WSF] as needed) can round out a potentially inefficient fertilizer program and provide benefits:

For growers who raise many crops types at once, they can simplify their WSF programs - use one concentration of WSF on all plants, CRF can meet additional needs of heavy feeders or plants with special fertilizer requirements.

- The WSF program allows growers to react to specific situations that arise, e.g. pH issues, micronutrient deficiencies, N draft from green bark.
- CRF provides a base feed when you can't use water-soluble fertilizers - during cool, cloudy weather (no need to irrigate) or during busy shipping times (no time to irrigate or to mix up fertilizer stock tank solutions). CRF maintains better foliage color due to constant, uniform feeding throughout the crop cycle.
- CRF continues after the plants leave the greenhouse, fertilizing for the retailer and homeowner, providing your customers with a value-added difference.
- Potential to minimize nutrient run-off by utilizing controlled release fertilizers.

From: Scotts The Exchange Tech Shares.

Up-grade Your Environment Control Equipment

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Mechanical thermostats, the traditional temperature control devices common in greenhouses and other buildings having heating and cooling equipment are being replaced by controllers and computers. These solid state devices can better manage the complex interactions between the weather, plant requirements and equipment to produce better plants while saving energy and labor.

Thermostats that are used principally to control heating and cooling equipment have improved over the years with better sensors and switches. They still have the disadvantage of a large differential between the on and off switch position which allows the temperature to exceed the setpoint by several degrees.

For example, a thermostat that has a ± 3°F differential will require a setting (setpoint) of 63°F to maintain a 60°F minimum temperature in the greenhouse. Heating equipment will not shut off until the greenhouse temperature reaches 66°F. This six- degree override increases, winter heat loss by creating a greater temperature difference between inside and outside. Controllers and computers, utilizing solid state technology, usually have a ±1°F differential.

Controllers integrate several pieces of equipment

Controllers are designed to accept input signals from sensors and send output signals to equipment that needs to be activated to adjust the environment. The simplest controllers utilize one input sensor for temperature. They may control from 2-4 heating equipment stages and 3-5 cooling equipment stages around a setpoint.

In a typical system, root zone heat may be activated as a first stage when the greenhouse starts to cool off. Unit heaters may be activated in Stage 2 and 3 if the greenhouse continues to cool down. During the day if the temperature exceeds the setpoint, intake louvers may be opened on Stage 1, fans may be started on Stages 2 and 3 and the evaporative cooling system activated on Stage 4. The air circulation fans may be operated with any stage but usually run at the setpoint stage and with some of the heating stages to prevent stratification.

Separate controllers are available to control misting, irrigation equipment, lighting and carbon dioxide level. These are individual controllers that operate specific equipment.

Some manufacturers have designed units that incorporate all the above controls into a single box. The larger units will accept 30 or more sensors and control 40 or more stages. With the menu driven program it is easy to input or change the setpoints. An optional weather station can record temperature, humidity, wind, precipitation and light level for future reference.

Individual or multiple controller units can usually be interfaced with a personal computer (PC) that creates a history of a particular crop that can be used for future reference or duplication. Using the PC, changes to the greenhouse environment can be made from your home or office. Reports and graphs of sensor readings, equipment operation and maintenance scheduling can also be made.

Computers can control and record the environment history

Environment control computers are usually designed to fit the requirements of a particular greenhouse installation. With the integral software, they provide anticipatory control in addition to control based on sensor readings.

For example, if the wind speed suddenly increased resulting in a cooling of the greenhouse, the computer would reduce the vent opening based on a signal from the temperature sensor. The computer software could also be programmed to anticipate that cooling would occur when the wind speed picked up and reduce the vent opening before the cooling was detected by the sensor at plant level. This would save heat and fuel usage. Anticipatory actions might also be programmed for light levels related to varying cloud cover, weather forecasts, heating pipe temperature and plant models.

Research to develop plant models is ongoing at many universities. These complex measurements and calculations try to anticipate how a plant grows due to many factors. Models are continually improved as better data becomes available. With a model as a basis, the computer can compare actual plant growth to a model plant and make adjustments to the environment to speed up or slow down the growth. Light is usually the limiting factor in plant growth so optimum values for other factors usually relate to it. Computers have the advantage that they can process large amounts of data very quickly and they can retain this data for future reference. They also have the capability of taking and recording frequent sensor readings. This offers the opportunity to control equipment with the average of many measurements.

For example, on a partly cloudy day, light levels can rise or fall every few minutes. The computer can be programmed to store light sensor readings every minute and keep a running average over a 5 or 10 minute period. Using this average rather than individual readings could eliminate the frequent opening and closing of a movable shade screen inside the greenhouse.

The computer can also do a better job of controlling a heating system. We know that outside temperature and wind speed influence the amount of heat that has to be provided by the heat distribution system. The computer can be utilized to calculate this for varying weather conditions and modulate the water temperature in the pipes so that a uniform air temperature can be maintained. This is not possible with the standard thermostat that only turns on the circulating pump when the sensor indicates that the greenhouse is getting cold.

Developments in controller and computers continue to improve the control that we have over the environment in the greenhouse. The improved plant quality and reduced energy costs help to pay for these devices.

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