

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 63°F), followed by six weeks of bulb cooling (at 40-45°F). Then plants are forced in the greenhouse at 60-62°F 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 40-45°F 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 short-cuts you can take in the 23 week schedule. With pot cooled bulb you can reduce the length of time that pots are held at 63°F 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 (40°F) 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 75 °F 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 60-63 °F 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 65°F. 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 72°F leaves unfold at a rate of 2 per day on average, while at 63°F the rate decreases to 1.5 leaves per day. Likewise, a lily will go from visible bud to bloom in 24 days at 81°F, 31 days at 70°F, 35 days at 64°F and 42 days at 59°F. 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 is 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° angle to the stem or greater) and the number of undeveloped leaves (those at an angle less than 45° 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.

Height control: The 2018 schedule sets a targeted lily height for each week in the greenhouse. You can adjust these targets to fit your needs (e.g. increase plant height if you desire a taller finished product). This schedule is designed to produce a finished plant of about 16”. You can chart the height of your crop against these target heights. Monitor lily height on a regular basis (daily, bi-weekly or weekly) and compare the actual height to the idealized growth curve for the lily height you wish to produce. If average plant height is too short, run a positive DIF to increase stretch. If plant height is too tall, run a negative DIF or use a plant growth regulator to slow elongation.

While using DIF to control height it is extremely important that you maintain the proper average daily temperature (ADT) so that crop timing is not adversely affected.

Controlling Lily Height with PGRs: Lilies typically double in size in the 5 week period from visible bud to bloom but it takes 9 weeks of forcing prior to visible bud to reach the first 50% of final lily height. A-Rest, Abide, Chlormequat E-Pro, Concise, Cycocel and Sumagic are all labeled for use on Easter Lilies. PGR applications typically begin after buds are set is complete, when lilies reach 3-5" tall. However, with low concentration split applications, PGRs can be applied at any point in development beginning with emergence. A-Rest and Sumagic (or the generic equivalents) can also be used to pre-treat bulbs using bulb soaks. With sprays and drenches, split applications produce the best results. Reduce the concentrations of PGR used when combined with negative or zero DIF.

Leaf yellowing: Crowding, root disease and poor nutrition (especially low phosphorus and nitrogen) during the final stages of development and stress from unfavorable cultural and environmental conditions such as excessive shading and high temperatures all favor lower leaf yellowing. In some years leaf yellowing can be a significant problem for growers especially when encountering unusual weather or when lilies are too crowded or too tall too early, or when plants are subjected to excessive stress and root damage. If you experience conditions that favor lower

leaf yellowing during the final weeks of forcing, apply Fascination or Fresco. Applications in the weeks prior to visible bud or two weeks after visible bud should be applied only to the lower leaves to avoid stem stretching. Higher rates can be applied over the entire plants on mature lilies ready to go into cold storage.

We don't know what climatic challenges will occur in 2018 but proper attention to detail and control of the production environment will go a long way toward mitigating extremes and preventing your crop from falling prey to a bad April Fools gag in 2018.

Figure 1: Lily height is always a critical concern. The final height is dependent upon how well you control stretch during the entire forcing period. Typically growers target a final height that falls within an acceptable range. The Easter lily schedule in this article is designed to produce a lily with a final overall stem length of 16". With a pot height of 6" this would be a plant with a final overall display height of 22". Lilies typically double in size in the 5 week period from visible bud to bloom but it takes 9 weeks of forcing prior to visible bud to reach the first 50% of final lily height.

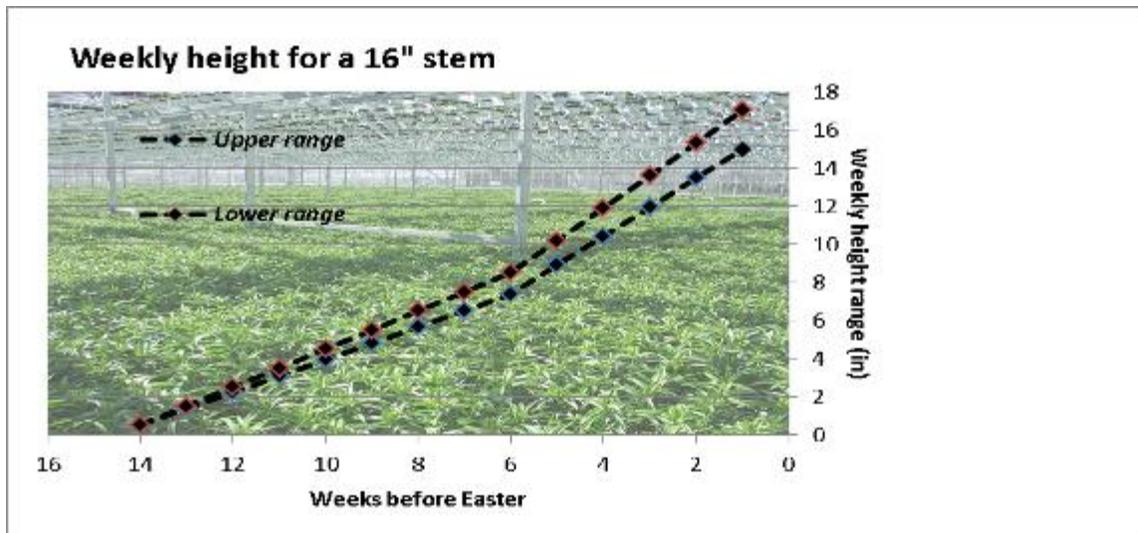


Figure 2. An environmentally uniform growing environment will produce a crop that is most uniform in development. Included in the environment is the light the crop received on a daily basis, the average daily temperature, uniformity of water and fertilizer delivery and uniform application of PGRs. Static shading (shadows that don't move) from overhead baskets or structures disrupt that uniformity and result in less uniform crop development.



Figure 3. Lily height can be controlled with plant growth regulators and temperature (DIF). The lilies (left) too tall to clear the watering boom still have 7-10 days to go before shipping. Lilies of the same age (right) are considerably shorter. Monitor lily height regularly. Low concentration PGRs can be applied throughout the production period to control stretching within the desired range. Preplant bulb soaks with Sumagic can be used to produce an extremely uniform run of lilies. Rates will vary with cultivar and some in-house testing will be needed to refine the technique.



Figure 4. Unusually warm temperatures in late February and March can push lily maturity earlier than desired. The lilies pictured here still have 17 days to go before Easter. Excessive cold storage (longer than 14 days) is undesirable. Monitor development during the entire greenhouse forcing period and adjust temperature regularly to avoid long storage intervals.



2018 EASTER LILY SCHEDULE

Weeks Prior to Easter	Date	Forcing method	
		Case-Cooled	Pot-Cooled (CTF)
24	Oct. 15	<i>This schedule designed to produce 16" lilies that bloom 1-week before Easter. Bulbs dug in early October and shipped. Prep for lily arrival by testing your soil & checking your environmental control & crop production systems. Inspect bulbs for insects, rots or physical damage. Pot bulb & starts programming immediately.</i>	
23	Oct. 25	Start bulb programming as soon as bulbs arrive but no later than 23 weeks before Easter.	
20	Nov. 12	---	Pot and allow roots to grow at 60-62F for 3 weeks
17	Dec. 3	---	Cool at 40-45F for 6 weeks
14	Dec. 24	Pot no later than 17 weeks before Easter	
13	Dec. 31	Force in greenhouse at 60-62F in pot.	---
12	Jan. 7	Shoots emerging ~ 0.5" tall & buds beginning to set. Start fertilizing & keep moist.	
11	Jan. 14	---	Begin greenhouse forcing no later than week 14. Maintain pots at 60-62F.
10	Jan. 21	1.25-1.5" tall. Keep lilies moist & use fungicide drench as needed. Run 60-62F day/ night during bud initiation. Bud initiation coincides with stem root development.	
9	Jan. 28	2.25-2.5" tall. Run 60-62F day/ night during bud initiation. Check for bud set & begin leaf counting and graphical tracking.	
8	Feb. 4	3-3.5" tall. Apply growth regulator as needed. Keep below 65F until bud set is complete.	
7	Feb. 11	4-4.5" tall. Begin leaf counting as soon as bud set is complete. Use temperature to control the rate of lily development & DIF to control height. ADT 65-70F. Check for aphids & root problems. Apply Marathon sometime during weeks 10, 9, or 8.	
6	Feb. 18	4.75-5.5" tall. Space lilies to avoid yellow leaves & stretching. Soil test & if leaf scorch is evident, use 15-0-15 for balance of schedule otherwise maintain complete nutrition. Repeat leaf count on late batches of lilies.	
5	Feb. 25	5.5-6.5" tall. Adjust temperatures as needed.	
4	Mar. 4	6.5-7.5" tall. 42 days to sale. Buds can be felt.	
3	Mar. 11	If buds are visible on early planting run 60F until finish.	
2	Mar. 18	7.25-8.5" tall. Buds ~0.75". Lilies are about half final height. Buds should be visible no later than 30 days prior to sale. Grade for uniformity as buds become visible. Apply Fascination or Fresco if leaf yellowing is evident, or if cooling is anticipated.	
1	Mar. 25	Lilies 9-10.25" tall. Buds 1.25" long.	
0	April 1	Lilies 10.5-12" tall. Buds 1.75-2" some bending down.	
		Lilies 12-13.5" tall. Buds 2.75". If aphids present, use a total release smoke or aerosol.	
		Lilies 13.5-15.25" tall. Buds 4-4.25" long. Some turning whitish. Stop fertilizing & apply clear water once before sale. Cool lilies at 35-45F to hold. Apply Fascination or Fresco prior to cold storage.	
		Final lily height 15-17" tall. Buds 6-6.25" long & at or near bloom. Shade lilies immediately after they are removed from storage.	
		Easter Sunday 2018	

NOTES & COMMENTS ON THE 2018 EASTER LILY SCHEDULE

Easter 2018 outlook: Easter falls on an early date in 2018 (April 1). The 2018 schedule is tight but allows adequate time to complete the full 23 week program. If you have problems contact your Extension Educator.

Pot-cooled bulbs are normally potted & held for three weeks at 60-62F before the six weeks of bulb cooling (at 40-45F) begins (see the 2018 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 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 3, 2017. If you cool your own bulbs, start as soon as bulbs arrive but no later than Oct 22, 2017 (23 wks. before Easter).

Insurance lighting: Insurance lighting may be needed this year if you are unable to complete the full 6-weeks (1000-hours) of bulb cooling before the designated greenhouse forcing date. Substitute 1-day of insurance light for each day of bulb chilling required for the full 1000 hours. See article for details.

Fertigation: Start fertilizing using a 15-0-15 or comparable formulation when lilies emerge. 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 1-week prior to sale. Provide one clear watering before shipping lilies - this will reduce salt levels in the potting medium and maximize 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 leaf yellowing (7 to 10 days before visible bud) & mid-season leaf yellowing (7 to 10 days after visible bud) spray Fascination or Fresco at 10/10 ppm. Apply only to lower leaves & cover thoroughly to protect leaves from yellowing for up to 14 days. 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 but not more than 14 days before shipping or cooling. Note: Avoid direct contact of spray to immature leaves during early- & mid-season applications unless you wish to induce stem stretching.

Disease and pest control: Before planting, clean bulbs of debris removing any scales showing evidence of infection or physical damage.

Once potted, root rots associated with Rhizoctonia, Fusarium, and Pythium are a concern. Drench immediately with Banrot, Pageant Intrinsic, 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 3336, OHP 6672, 26GT, 26/36 and many generics; Pageant Intrinsic, Emblem, Mural and Terraclor (Rhizoctonia). Materials registered for controlling Pythium include Alude, Banol, Subdue Maxx (beware of using mefenoxam exclusively because of widespread fungicide resistance issues with this active ingredient), Segway O, and Truban. Check with manufacturers regarding compatibility when tank mixing fungicides. Fungicides may need to be re-applied later in the crop, check labels for guidance. Preventative biological fungicides (RootShield, Rootshield Plus, Cease, Actinovate, Mycostop, Companion, Prestop and Triathlon BA or Double-Nickel (Triathlon BA and Double-Nickel have the same a.i.) may be applied at planting for disease suppression and to enhance root growth. Check with company or product labels information for safe time intervals between application of biological agents and chemical fungicides.

Aphids, fungus gnats and bulb mites are a major concern. Many chemicals are listed for aphid control, including: Safari, Flagship, Tristar, Marathon and many generics, DuraGuard, Enstar AQ, Suffoil X, Insecticidal Soap, M- Pede, Kontos, Endeavor, Aria, Mainspring GNL and Rycar. Fungus gnats can be controlled with some of these same chemicals as well as Citation, Distance, Adept, Pylon, insect parasitic nematodes (Nemasys, NemaShield, Scanmask, Entonem) and Gnatrol WDG. Bulb mites, Rhizoglyphus robini, represent one of the more troublesome insect pests on lilies and effective management requires an integrated approach. Bulb mites are considered a secondary pest and are commonly associated with decay caused by fungus gnat damage and soil-borne fungal pathogens. Note: Registration of pesticides varies by state so consult and follow labels for registered use. To avoid any potential phytotoxicity or residue problems, spot test before widespread use. No discrimination is intended for any products not listed.

Height Control: Monitor lily height regularly during forcing. If height exceeds the target size, run negative DIF or use a growth retardant such as A-Rest, Chloromequat E-Pro, Concise, Cycocel or Sumagic to slow stem elongation. If height is less than the target size, run positive DIF or use a gibberellin PRG such as Fascination or Fresco to increase stem elongation. Split applications of PGRs provide the best results. You can apply any of the PGRs at ½ to ¼ the normal rate (or even less) and use multiple applications as needed. 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 a cool morning temperature dip will produce a DIF effect and keep lilies short.

Lily storage: Lilies can be stored for up to 14 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. Fungicides labeled for botrytis control include Affirm, Phyton, and the biofungicide Cease. Always follow label directions and test fungicides on a small group of lilies for damage to or residue on lily buds before using on the entire crop. Water Easter lilies thoroughly before starting cold storage. After removing from the cooler, place lilies in a shady location to avoid excessive wilting.

If you have problems contact your Extension Educators.

All agrichemical/pesticides listed are registered for suggested uses in accordance with federal and Connecticut state laws and regulations as of the date of printing. If the information does not agree with current labeling, follow the label instructions. The label is the law. Contact the Connecticut DEEP for current regulations. Where trade names are used for identification, no product endorsement is implied nor is discrimination intended.

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