

Tracking Easter Lilies

Our exclusive series on graphical tracking continues with height control strategies for Easter lily crops.

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WHEN growing an Easter lily crop, control of timing and plant height are keys to profitable production. Considerable research has been undertaken on Easter lilies so height and flower development can be programmed with high precision.

Graphical tracking, cooling techniques, leaf counting, and flower bud measurement techniques are used by most lily growers to avoid the stress of knowing whether the crop will achieve market specifications. This article will discuss one of these techniques – graphical tracking.

Calculating The Easter Lily Curve

Five pieces of information are necessary to graphically track Easter lilies. They include:

- 1) The plant emergence date (when leaf tips first emerge from the media surface).
- 2) The visible bud date (when flower buds can be seen without moving leaves).
- 3) The flower date (when the first flower cracks open).
- 4) The desired minimum and maximum height at flower.
- 5) The stem elongation curve.

The stem elongation curve for Easter lilies is simple to calculate. The easiest way to develop the curve is to assume that plants double in height from visible bud to flower. This means the plant height at visible bud, not including the pot, is half the height at flowering (again not including the pot, see Table 1 and Figure 1).

Considering a target total height of 22 inches at flower, plant height at flower will be 16 inches (22 inches minus 6 inches for the pot size). Half of 16 inches is 8 inches. Plant height at visible bud should therefore be no greater than 14 inches (8 inches plus 6 inches for the pot equals 14 inches in total).

We now know the height at emergence (6 inches), the total height at visible bud (14 inches), and flower height (22 inches). Most growers program visible bud 35 days before flower. The actual flowering date will depend on the date of Easter, and whether the plants are shipped directly out of the greenhouse or placed in a cooler prior to shipping.

Plot these three points (height at emergence, visible bud, and flowering) and connect with two straight lines. Two lines are normally plotted to reflect the desired minimum and maximum final plant height (20 and

22 inches respectively in Figure 1).

While creating an Easter lily graphical tracking curve by hand is easy, many growers prefer to use a computer program, especially a spreadsheet. You can create your own spreadsheet, or use the computer program UNH FloraTrack For Lilies (contact Paul Fisher, 603-862-4525). This program also includes curves for Oriental and Asi-florum lilies. The height stick technique described in the second installment of this series also works well for Easter lilies.

Strategies For Height Control

The challenge in Easter lily production is generally to keep Easter lilies from finishing too tall. It helps to anticipate in advance how likely it is that crops will finish tall, and use growth retardants or negative DIF accordingly:

- 1) Plant height increases as bulb size increases. Plants growing from a 9- to 10-inch bulb will grow taller than a plant from an 8- to 9-inch or 7- to 8-inch bulb under similar conditions.
- 2) Plants respond strongly to DIF and will tend to grow taller in areas or greenhouses that have positive DIF conditions compared to zero or negative DIF conditions.
- 3) Easter lilies respond strongly to light intensity. Plants growing in low light (dark greenhouses) will grow taller than plants growing in bright greenhouses.
- 4) Plants grown at high densities (>2.5 plants per square foot) will elon-

Table 1.

Worksheet for calculating target height curves for Easter lilies.

Point on curve	Formula
Pot height (P)	6 inches (set by grower)
Minimum height at flower (a)	20 inches (set by grower)
Minimum height at visible bud	13 inches = (P) + (a - P)/2
Maximum height at flower (b)	22 inches (set by grower)
Maximum height at visible bud	14 inches = (P) + (b - P)/2
Emergence date	January 1 (set by grower)
Finish date (c)	March 28 (set by grower)
Target date of visible bud	February 21 = (c) - 35 days

gate more than plants growing at lower densities.

When The Crop Is Too Tall

If plant height is above the target curve, growth retardants and negative DIF temperatures are the two primary management options.

Growth retardants at the proper rates can be applied up to visible bud, although late and high rate A-Rest applications can cause leaf yellowing. After visible bud, applications may cause distortion of the inflorescence due to "compression" of the flower peduncles. Application is generally not recommended after visible bud, and it is therefore critical that plant height is not above the maximum target curve at the visible bud stage.

Traditionally, growth retardant applications were designed to provide all the growth retardant necessary for height control in one application. The problem with this strategy is that overapplication sometimes would occur. By using graphical tracking, multiple low rate applications of growth retardants can be applied to control plant height with much less danger of overapplication.

Low rate applications consist of Sumagic as a 2.5 ppm spray, A-Rest as a drench at 0.125 mg per 6-inch pot, or A-Rest as a 25 ppm spray. Medium rate applications, which are more appropriate for warmer climatic areas, are up to twice the above rates. Drench applications are less effective for plants grown in bark media. Wait for a week (two height measurements) between growth retardant applications to gauge the previous growth retardant effect.

Sumagic at 10 or 20 ppm can lead to severe stunting or a 'palm tree' effect for plants in most parts of the country. We believe these rates are much too high to be safely applied to Easter lilies.

Negative DIF temperatures have become a standard method of height control in Easter lilies for many lily growers. Negative DIF of up to -20°F can be used if needed. However, large negative DIFs like this normally are not necessary – or even desirable – due to the magnitude of downward leaf curl that will occur. Easter lilies are very responsive to a temperature dip for the first 2

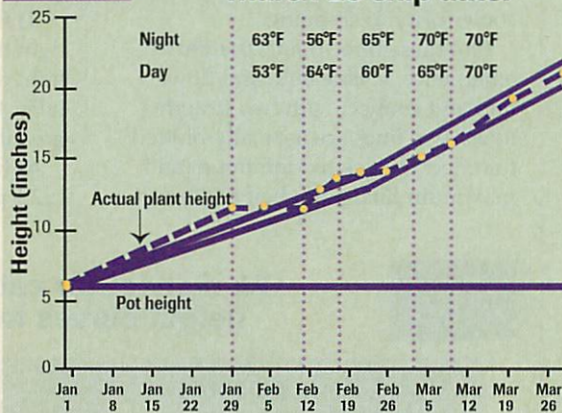
hours after sunrise. Height control is often achieved without the amount of leaf curl that occurs with all-day negative DIF.

To use the temperature dip, lower greenhouse temperatures just before first light in the morning and maintain the lower temperature for 2 hours after sunrise. The temperature can be reduced as low as 45°F if necessary to obtain adequate control of stem elongation. An added advantage of the morning temperature dip is that the average daily temperature can be maintained with a lower night temperature. This is especially important if the average daily temperature must be maintained near 70°F in order to make the crop.

Our experience is that negative DIF is more effective in "bright" greenhouses compared with darker ones. In general, growing a crop using zero DIF or a slight negative DIF in combination with a morning temperature dip is superior to an all-day negative DIF.

Figure 1.

Easter lily graphical track with a March 28 ship date.



It is very important to be aware of the average temperature needed when deciding on DIF. Negative DIF temperatures can be used as a height control technique as soon as the plant is about 2 inches tall. Prior to this time, the shoot meristem is below the soil surface, shoot temperature changes only slightly to air temperature changes during the night and day, and the plant has a very small response to DIF.

After flower bud initiation and be-

Table 2.

Days from visible bud to flower for 'Nellie White' Easter lily at different average air temperatures.

Temperature (°F)	Days from visible bud to flower
55	42
60	38
65	34
70	31
75	27
80	25
85	24

fore visible bud, use leaf counting to determine the best average temperature. After visible bud and before flower buds are long enough to measure, use Table 2 as a guide to set average temperature. Use a flower bud meter to set average temperature in the last 3 weeks before flower.

When The Crop Is Too Short

Short Easter lilies are not as common as tall Easter lilies. If plants are short, they are likely under some stress such as root rot, inadequate water, or being exposed to ethylene. Easter lilies are especially sensitive to ethylene, and short plants with downward curled leaves is a good indicator of ethylene, especially if plants are not exposed to large negative DIFs or are not responding to positive DIF. In this situation, only removal of the ethylene source will allow normal stem elongation.

If plants are short for other reasons, first correct the problem. Then, run positive DIF conditions (up to $+20^{\circ}\text{F}$). If overapplication of growth retardants has occurred, the options to increase height include a combination of positive DIF and long days delivered from incandescent lights. The far-red light from the incandescent lamps, the long days, and the positive DIF normally are adequate to promote stem elongation. **GG**

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