

Timing Easter Lilies

Our exclusive series on graphical tracking continues with a look at tools used for controlling timing of Easter lily crops for Easter sales.

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ONE of the biggest factors that determines Easter lily crop value is proper timing for peak sales - a lily that does not flower until the day after Easter can hardly be given away. In this article, we review several tools to control the timing of an Easter lily crop during forcing.

Easter lily timing is based on understanding key developmental stages of the crop and ensuring that the crop is at the right stage at the right time.

Flower Initiation

Commercially produced Easter lilies are produced from bulbs which are cooled, usually for 6 weeks. One effect of this cooling is to synchronize all the bulbs so that they will respond similarly during greenhouse forcing. This means that all plants will have about the same number of leaves and initiate flowers at about the same time.

The stage when flower buds first become visible on a dissected plant under a magnifying glass is called "flower initiation." When flower initiation occurs, you can estimate how many leaves are on each plant. Checking for flower initiation is important because you can set greenhouse temperatures and control crop timing based on how quickly leaves unfold.

Starting about 3 weeks after plants emerge from the soil, three plants should be dissected twice a week to check for flower initiation. This is done by first removing and counting the unfolded leaves (leaves with tips at an angle of more than 45° from the stem). Then remove and count immature leaves down to the shoot apex. You will need to use a needle to remove the

smallest leaves (<1/16 inch long), and at least a 10x magnifying glass to view the last leaves and shoot tip.

If the apex has distinct bumps on it, these are flower buds and flower initiation has occurred. If the apex is round then the plant is still forming leaves. Once flower buds are evident, take a larger sample of lily plants for dissection (10 per 10,000 plants) and base the calculations below on averages from this sample.

The average number of immature leaves at flower initiation represents the number of leaves that remain to unfold. The number of bumps on the apex also gives an early idea of flower bud count. Separate dissections and leaf counts are necessary for each bulb source and size.

Leaf Counting

The leaf counting method can be used to keep the crop on track between flower initiation and visible bud stages. Visible bud is the stage when all of the leaves have unfolded and flower buds can be seen down in the leaves of the plant without touching the leaves.

To use the leaf counting method:

1) On plants that have initiated flowers, use leaf dissection to count (a) the number of leaves already unfolded, (b) the number of immature leaves that have yet to unfold, and (c) the total leaf number [equals (a) plus (b)].

2) Set a target visible bud date 30-35 days before the flowering date. Calculate how many days are needed to reach this point.

3) From Table 1, estimate the temperature you will need in order to reach the visible bud date by unfolding all leaves. The warmer the temperature, the faster leaves will unfold.

While it is possible to predict in advance the average daily temperature necessary to reach visible bud on a desired date, actual greenhouse and plant temperatures seldom exactly equal that desired. Therefore, it is important to repeat the leaf counting process on at least five plants randomly chosen from the crop twice a week until visible bud.

Each time the number of unfolded

Table 1.

Days to visible bud at various greenhouse air temperatures.

Leaves still to unfold	Greenhouse average air temperature					
	55°F	60°F	65°F	70°F	75°F	80°F
70	64	52	43	37	33	29
65	59	48	40	35	30	27
60	55	44	37	32	28	25
55	50	41	34	29	26	23
50	46	37	31	27	23	21
45	41	33	28	24	21	19
40	36	29	25	21	19	17
35	32	26	22	19	16	15
30	27	22	19	16	14	12
25	23	18	15	13	12	10
20	18	15	12	11	9	8
15	14	11	9	8	7	6
10	9	7	6	5	5	4
5	5	4	3	3	2	2

leaves is counted, one gets a new update on crop development. Temperatures can then be adjusted up or down to keep the crop developing properly. Reaching visible bud at the proper time avoids the problem of having to run excessively cool or warm temperatures during the next stage of lily development, the time between visible bud and flower stages.

Graphically tracking the leaf count (Figure 1) provides a visual check that leaves are unfolding at the correct rate. The graph of the target curve is made when flower initiation occurs. The horizontal bottom axis runs from the date of flower initiation to the target visible bud date. The vertical left axis runs from the number of leaves unfolded at flower initiation to the estimated total leaf count at visible bud. A straight line joining the bottom left and top right corners of the graph represents a target to compare against the actual leaf number. We have also shown the days to visible bud and the number of leaves still to unfold on the top and right sides of the tracking chart.

In the example chart (Figure 1), there were 30 leaves unfolded at flower initiation on January 25. A total of 80 leaves were expected to unfold on the plant by the target visible bud date of March 1, 35 days after flower initiation. This assumes the target flower date to be on April 5 (35 days after March 1).

Each time you count leaves on the crop, you can plot the point on the tracking chart. If leaf count falls below the target line, average temperature

Table 2.

Days to flower at various greenhouse air temperatures.

Flower bud stage	Greenhouse average air temperature					
	55°F	60°F	65°F	70°F	75°F	80°F
visible bud	46	39	35	31	28	25
3 cm	37	32	28	24	21	18
4 cm	31	27	23	20	18	15
5 cm	26	23	20	17	15	13
6 cm	22	19	16	14	12	11
7 cm	18	16	14	12	10	9
8 cm	15	13	12	10	9	8
9 cm	13	11	10	8	7	6
10 cm	10	9	8	7	6	5
11 cm	8	7	6	5	5	4
12 cm	6	6	5	4	4	3
13 cm	5	4	3	3	3	2
14 cm	3	3	2	2	2	1
15 cm	1	1	1	1	1	1

needs to increase or visible bud date will be delayed. If leaf count is above the target line, temperature can be reduced to prevent reaching the visible bud date too early.

From Table 1, an average temperature of about 62°F would initially be required in the example chart to unfold leaves at the target rate (50 leaves per 35 days). Temperature would be increased to 65°F on February 4 to increase leaf unfolding rate (40 leaves in 25 days), and decreased on February 14 to decrease leaf unfolding rate (60°F to unfold 20 leaves in 15 days).

Using this graph assumes that you have a good estimate of final leaf number. If your estimate at flower initiation is not correct, then the line will not accurately represent the correct leaf unfolding rate. If you find the actual leaf number to be greater or smaller than that initially estimated, update the tracking curve to show the correct leaf number.

Visible Bud To Flower

Between visible bud and flower stages, increasing average temperature will reduce crop time (Table 2). For example, it takes about 31 days at 70°F (from Table 2) to reach the flower stage, and 28 days at 75°F. This model (like any) is not perfect. We have found that the actual flowering date

may occur 2-3 days earlier or later than predicted. Unusually sunny weather will increase plant temperature, for example, and plant development will be faster. Errors in measurement usually cause the biggest prediction errors.

When flower buds are large enough to measure, a bud development meter will predict the days to flower at a given temperature. (See GG, January '96, page 100, or visit the web site at <http://envhort.ucdavis.edu/jhl/dss/bud.htm> for a copy of the bud meter.) Time to flower for different bud sizes is shown in Table 2. Again, these predictions have an accuracy of ± 2 days, because flowers sometimes finish larger or smaller than the expected 16-centimeter final length.

If you have a crop with highly variable bud lengths, you can predict when groups of plants with different bud sizes will flower at a particular temperature. This can be helpful when deciding whether to move the plants with small buds to warmer temperatures, or advanced plants to cool temperatures.

All of these tools predict the average timing for a 'Nellie White' lily crop. They can be very helpful, and are used by most lily growers. **GG**

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Figure 1.

An example leaf count graphical tracking curve.

