EASTER LILY FORCING

by

Roy A. Larson

The Easter lily is no small crop in the floriculture industry. Almost $6,000,000 worth of potted lilies were sold on the wholesale market in 1959, and this was a 62% increase over the 1949 value. North Carolina ranked fourteenth nationally in lily production, with a wholesale value of approximately $150,000.

A great deal of research and consequent recommendations and/or suggestions can be discussed with regard to lily culture. Such a discussion would result in a manual, however, and not in an article. Much of the work done on lilies has been well publicized and this article will be confined to some of the "latest" ideas in lily culture. Quotation marks logically should go around "latest" because some of the most recent ideas were formerly accepted in lily culture and were then discarded.

First of all, it would be worth while to list some of the major problems facing the average lily grower. Timing, bud count, height, leaf scorch, aphids, and root rots are some difficulties that have faced lily growers for years. Artificial flowers, a more recent problem, are becoming as pesky as aphids and fungi, with no preventive control schedules to help solve the problem.

Another problem reported by growers is the treatment the bulbs get on the West Coast in transit, in storage, and in any other steps which are taken before the bulbs reach the lily forcer. It is true that poorly-grown or poorly-handled bulbs can never make top-notch plants, but the lily forcer should have hope and confidence that his supplier is dedicated to high quality and a satisfied customer, and not to a "fast buck."

Timing: Timing can be extremely difficult for the lily grower, as last year's records may not help him in timing for the approaching Easter as the dates vary. However, several timing schedules have been devised. Dr. Normal Butterfield of the University of Massachusetts suggested the schedule shown in Table 1.

Table 1. Suggested schedule for forcing Easter lilies

	Night temperature	Day temperature
ACE	62° F	70° F
CROFT	60° F	70° F

Days to Easter	Remarks and Condition of Plant
17 weeks (120 days)	Plant into sterilized soil - 1 part sand, 1 part peat moss, 1-3 parts loam, depending on whether crop is grown in clay or plastic pots. Soil of low salt content. Drainage 3/4"-1", pea stones in bottom of pot. Water thoroughly and watch watering until plants are placed on bench.
15 weeks	Plants breaking soil.
13 weeks	Plants 1" tall.
11 weeks	Plants 1-4" tall; give Croft first feed.
10 weeks	Plants 3-5" tall; give Ace first feed. Spray, dust or bomb (use Systox) for insects.

Table 1 (continued)

Days to Easter	Remarks and Condition of Plant
9 weeks	Growth of lily 5-6" tall.
8 weeks	Growth 8-10" tall. Give second feed. Check for insects.
7 weeks	Growth 12-15" tall.
6 weeks	Buds size of a garden pea seed. Space out plants as much as possible.
5 weeks	Give third feeding. Spray, dust or bomb for control of insects.
4 weeks	Buds 1 1/2 -2" long.
3 weeks	Buds 2-3" long. Still bending down. Give feeding.
2 weeks	Buds 3-4" long. Check for insects. If aphids are present, use smoke of dithio.
1 week	If plants are developing too fast, store at 40° F. Water soil well and store when the first bud is just ready to crack open. Mist spray plants with Zineb (1/2 lb. per 100 gals. water) prior to storage for botrytis protection. Remove two days before full bloom is desired. Give final feeding in preparation for sales.

Preparation for Easter sales: 1 or 2 buds nearly white. Don't ship with all flowers opened.

Since conditions in the North are generally darker and cooler than in the South, the timing schedule presented by Jack Gartner in the N. C. Flower Growers Bulletin, Vol. 1(9), December 1959, is shown in Table 2.

Table 2. Timing

Development of plant	Weeks to Easter	Date
Buds can be "felt" in tip	7	Feb. 24 (for 1963)
Buds just visible	6	March 3
Buds 1" long	5	March 10
Buds 2" long	4	March 17
Buds 3" long	3	March 24
Buds crooked over	2	March 31
Some buds swollen and white	1	April 7

This timing schedule was for a 60° F night temperature.

John P. Carroll of Carroll's Greenhouses in Raleigh follows this rule-of-thumb in timing his lilies: if the night temperature is 68 to 70° F, it will take 20 days for 7/8" buds to come into bloom. At 58 to 60° F, 31 days will be required.

The one fortunate fact about lily timing is that flower development can be hastened by increasing temperatures up to 80°, or slowed down by lowering the temperature. However, as not all plants in one house will be at the same stage of development, considerable labor is required to shift the plants from one temperature regime to another.

Bud count: It has been reported that lily flower buds are initiated when the shoots are 2-3" tall. Very recent work indicates that buds may be formed in the fall, while still in the bulb fields. If the buds are formed when the shoots are 2-3" tall, the lily forcer and his practices will largely determine the bud count. If the buds are formed in the bulbs while still in the fields, the forcer can only affect the buds already present when the case arrives; and he can do nothing to increase the bud count, as the maximum number has already been determined. These two philosophies are being re-examined to determine just when initiation does occur.

It is known that excessively long storage will reduce the bud count. To avoid this deleterious effect of storage, some research workers and growers have tried potting lily bulbs immediately upon arrival (in October or November) and placing them in cold frames. The potted bulbs are moved into the greenhouse after the poinsettia crop is gone and forced normally. The advantage of this method is increased bud count, while the disadvantages are uneven flowering of the crop and a longer time needed for forcing.

Many lily growers recognize this cold frame treatment as the practice generally used prior to the excellent work on storage done by Neil Stuart at Beltsville. It was for this reason that "latest" was placed in quotation marks, as it was once standard procedure in many lily ranges. Some revolutionary ideas on pre-forcing treatments of lily bulbs may be forthcoming in the near future.

Height: Height of lily plants plagues the grower, who has often just recovered from the struggle of keeping poinsettia plants within bounds. As for poinsettias and pot mums, there are different approaches to lily height control.

Growers will frequently blame fertilizers for excessively tall lilies, but plants which have been properly fertilized will often be stockier and shorter than plants inadequately fertilized. Withholding water has also been advocated as a means to keep lilies short. A degree of success can be achieved by keeping the soil on the dry side, but bud blasting can occur if this practice is over-done.

Excessive crowding and low light intensity will induce stretching, so remedies are adequate spacing and clean glass. If the grower feels he has to crowd the plants to get maximum return per square foot of bench area, then he should resign himself to leggy lily plants.

This year many lily growers obtained bulbs with 4-6" sprouts upon arrival. Inclement weather on the West Coast made bulb harvesting at the proper time impossible in many fields, which resulted in the sprouted bulbs. A fear of excessively tall plants has been expressed by several North Carolina growers who obtained such bulbs and they want to know how to keep them short. The first step was to plant the bulbs as deep in the pot as possible. A second step could be the use of a 9-hour day length, applied when the shoots are 3" above the soil surface and until the buds are readily visible. This suggestion is based on work of Smith and Langhans at Cornell.

It should only be tried on a limited scale, but the short-day treatment has worked in the North and Bob Langhans felt it might be more effective in the South where the days are brighter.

Any grower who has been reading the literature pertaining to the flower industry has been exposed to the heavy publicity given to the use of growth retardants on several crops. However, successful as these chemicals have been on other crops, the results have not always been satisfactory on Easter lilies. Results of lily height control work done at N. C. State College in 1962 are shown in Figure 1 and Table 3. The greatest differences with the variety Croft occurred when 15,000 ppm of Cycocel was used. Plants given such a treatment were approximately 4 1/2" shorter than the control treatment. The same results were noted with Ace lilies.

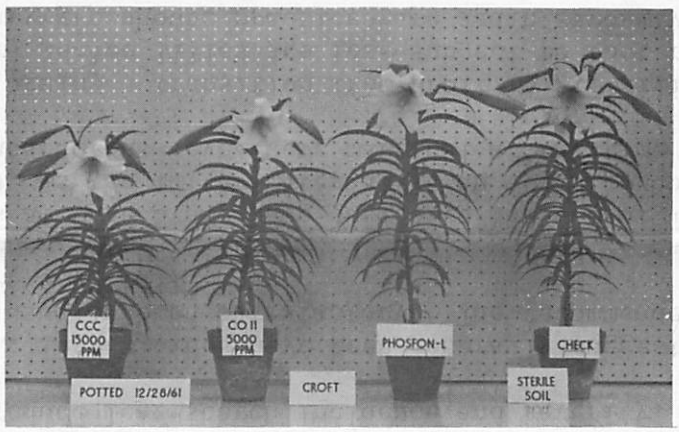

Figure 1. Effects of growth retardants on height and other plant characteristics (Variety Croft). The bulbs were planted December 28, 1961. The photograph was taken April 13, 1962.

Table 3. Effects of growth retardants on height and other plant characteristics

Variety	Treatment	Height (inches)	Number flowers	Trumpet length (inches)	Leaf scorch*	Number of days to flower
Croft	COll 5000 ppm	21.2	4.4	6.9	1.1	109
	1000 ppm	20.6	4.2	6.9	3.1	109
	500 ppm	20.2	4.1	7.1	1.0	109
	Phosfon-L	20.6	4.1	6.9	2.4	109
	CCC 15,000 ppm	16.2	4.0	6.9	0.1	109
	10,000 ppm	17.4	3.9	7.0	1.9	111
	5,000 ppm	19.4	4.4	7.0	0.2	112
	Control	20.9	4.3	7.0	1.1	109

Table 3 (continued)

Variety	Treatment	Height (inches)	Number flowers	Trumpet length (inches)	Leaf scorch*	Number of days to flower
Ace	COll 5000 ppm	18.4	5.6	6.3		97
	1000 ppm	17.4	5.4	6.3		97
	500 ppm	17.2	5.0	6.3		97
	Phosfon-L	16.6	5.1	6.2		98
	CCC 15,000 ppm	12.2	5.1	6.2		98
	10,000 ppm	14.5	5.2	6.2		97
	5,000 ppm	15.7	5.5	6.1		100
	Control	17.0	5.4	6.3		100

* Average number of "scorched" leaves per plant.

Leaf scorch: This problem is almost confined to Croft lilies, a trait which has reduced the popularity of Croft, along with the introduction of Ace lilies. A soil pH of 6.5 to 7.0, adequate nitrogen and calcium, and low phosphorous levels have been recommended to reduce leaf scorch incidence and severity.

Aphids: Systemic insecticides have been generally suggested for aphid control, and the results have usually been satisfactory. The recommended time of application is when the plants are 5-6" tall.

Research workers at Ohio State have suggested the use of Thimet on Croft rather than Demeton (Systox), as the latter material is an organic phosphate and leaf scorch could occur if the phosphorous level were marginal at the time of application.

Root rot: Once again, a transition from Croft to Ace lilies has reduced the severity of a problem, as Ace lilies are less subject to root rot. Soil sterilization, bulb dips, and sanitary greenhouse practices are again strongly urged.

Tammen and Nichols at The Penn State University recommend the following procedure for controlling diseases of growing lily plants:

Production Practice	Disease Controlled	
	Disease	Causal organism
A. Water plants thoroughly, but only with need.	Pythium root rot	(*Pythium* spp.)
B. Keep nitrogen levels high, relative to potassium and phosphorus, until the plants are ready for market.		
C. Drench potted bulbs with DEXON-TERRACLOR 35-35%WP: Mix 4-6 ounces per 100 gallons, apply one pint per 6 inch pot. One application only (Do not drench if DEXON-TERRACLOR has been mixed with the soil before planting).	Rihizoctonia root rot Pythium root rot	(*Rhizoctonia solani*) (*Pythium* spp.)
D. Spray regularly with insecticides to control aphids.	Fleck, mottle, and streak	(Virus)

(Taken from Easter Lily. A Guide to Programmed Disease Control by James Tammen and L. P. Nichols. Dept. of Botany and Plant Pathology. The Penn State U., University Park, Penna.)

An extensive root-rot study was conducted in 1962 at N. C. State College by Haasis, Larson, and McIntyre, in which several hundred plants were subjected to numerous treatments. A Dexon drench was very effective, as shown in Figure 2. However, even the control treatments were vigorous and root rot lesions were found on only 10 plants.

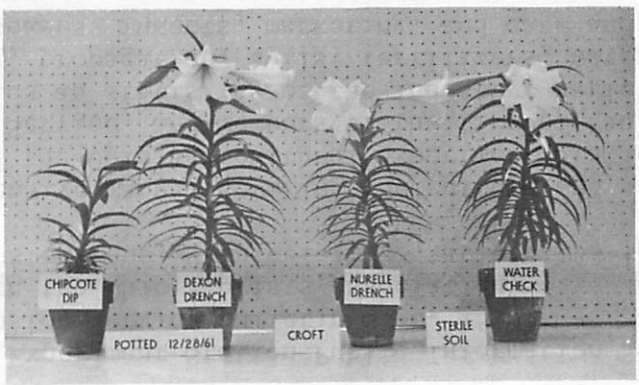

Figure 2. Four treatments included in the lily root rot study of Haasis, Larson, and McIntyre, 1962

Artificial lilies: The Easter lily grower can successfully eliminate insects and fungi through the application of toxic materials, but for reasons unknown to some lily growers the makers of artificial lilies are protected by law from such treatment. Unless the commercial flower growers become more influential in state and federal goverments, this legal protection will undoubtedly continue and more refined methods of meeting this problem must be found.

There can be no denial of the fact that plastic lilies can do as much damage to the sale of live lilies as can aphids, Pythium, or poor growing conditions. The manufacturers of artificial flowers have been more successful in the reproduction of artificial lilies than with almost any other flower. No land-grant college can recommend a biological control, and this problem will have to be faced by growers.

Advertising is an effective means of getting a message across to the buying public. The best advertisement for live lilies is a high-quality product. Some of the poorly-grown lilies dumped on the market by irresponsible "growers" have enabled the makers of artificial lilies to find a dissatisfied market. Lilies which are well-timed, with a good bud count and of acceptable height, free from leaf scorch, insects, and root rots, will be most effective in combatting the seventh major problem.