

# Forcing Asiatic Lilies

**Trials at Michigan State University look at the greenhouse performance of potted Lily Looks lilies, the effect of bulb size on flowering and the influence of postharvest storage.**

Flower characteristics of select Lily Look cultivars.

by *SONALI PADHYE* and  
*ARTHUR CAMERON*

**A**SIATIC lily hybrids are cultivated as cut flowers, garden plants and potted flowering plants. Traditional Asiatic lily cultivars have been bred for use as cut flowers and, when grown as a potted flowering crop, are relatively tall and require plant growth regulators for height control. Recent introductions of naturally compact cultivars have enabled the dual-use of Asiatic lilies as a potted flowering crop for indoor enjoyment followed by use in the garden.

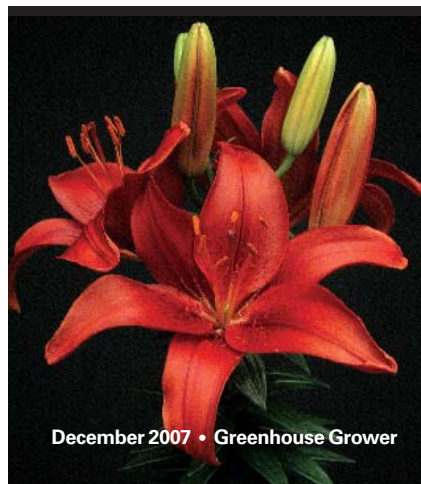
The Lily Looks series of Asiatic lily cultivars bred by Mak Breeding Company are reportedly compact

(Figure 1) and well-suited for this dual-use. At Michigan State University, we conducted four trials over a one-year period on 19 Lily Looks series cultivars with the following objectives: 1) To determine the greenhouse performance and suitability of Lily Looks cultivars as potted flowering crop, 2) To determine how bulb size affects performance, quality and timing, 3) To quantify the influence of postharvest storage at 41°F (5°C) or 68°F (20°C) on flower quality and shelf life, and 4) To determine how production during various growing seasons following different durations of bulb storage influence greenhouse or postharvest performance of Lily Looks cultivars. In this article, we present results from these trials.

## Planting and Forcing Environment

Bulbs of Lily Looks cultivars from a single field harvest were received from the breeder in January, August, October and December. Three bulb sizes were trialed each production cycle: 10/12 cm (4/4.5 inches), 12/14 cm (4.5/5.5 inches) and 14/16 cm (5.5/6.5 inches) and five replicates of each bulb size were evaluated. Upon receipt, bulbs were planted 2 to 3 inches deep in 6-inch round pots in a peat-based medium. Pots were spaced on benches such that during the development of the crop, leaves of adjacent plants did not touch. No fungicides or plant

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growth regulators were applied.

The Lily Looks cultivars were grown in a glass greenhouse set at 68°F under a 16-hour photoperiod provided as day extension using high pressure sodium (HPS) lamps. HPS lamps also provided about 1,200 footcandles of supplemental light when ambient light was low. During the January and December trials, the light levels in the greenhouse were lower compared to August and October trials. Also, the greenhouse was warmer than the set point during August trials.

### Irrigation And Nutrition

During the period of emergence, plants were watered sparingly. The potting soil was allowed to dry out slightly but not completely between waterings. Following emergence, plants were watered regularly when necessary. Plants were fertilized at each watering with a complete fertilizer containing macro and micro nutrients and 125 ppm N.

### Data Collection

Following emergence, plants were centered in the pots and grown until flowering. The date of first open flower was recorded and days to flower were computed from the day of planting of bulbs. At flowering, the number of flower buds, plant height from the base of plant to the tallest point and number of chlorotic and necrotic leaves were recorded. The date of senescence of the last flower on each plant was recorded, and bloom time was computed as days from opening of the first flower to senescence of the last flower.

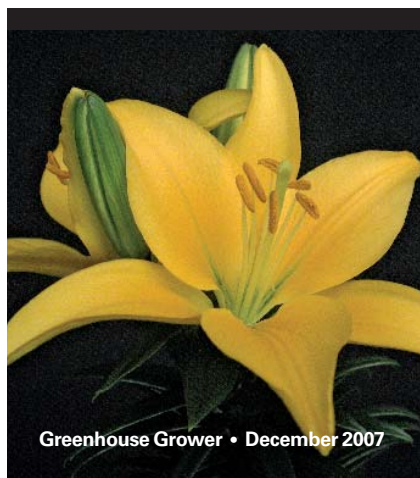
### Postharvest Performance Trial

The postharvest performance of lilies was evaluated by storing them at



Figure 1. Lily Look cultivars featured at Hortifair in 2006. Photo courtesy of Dr. Erik Runkle.

41°F or 68°F in boxes for one week. The storage experiment was initiated when the first bud on a plant showed color. Plants were watered prior to, but not during, storage. Following storage, plants were returned to the greenhouse and monitored. The number of yellow leaves



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## PRODUCTION

### FORCING LILIES

was recorded and the overall plant appearance was evaluated.

#### Flowering

Lily Looks cultivars were compact and offered large and vibrant flowers with a great splash of color ranging from yellow, orange, red, pink, white to speckled and bicolored flower forms (Table 1). The flower bud number of the Lily Looks cultivars ranged from three to 10, depending on the cultivar and bulb size. The average number of flower buds on each cultivar from 12/14 cm bulb size is presented in Table 2. Typically, plants from larger bulbs produced more flower buds (Figure 3), since bulbs are underground carbohydrate storage structures and larger bulbs had more energy reserves.

During forcing, the rate of progress to flowering of lilies is regulated by average daily temperature. We forced Lily Looks cultivars at a constant 68°F setpoint and the average time to first open flower from potting of bulbs from the four plantings ranged between six to seven weeks. During the trial initiated in August, when greenhouse temperatures and light levels were higher, flowering was hastened by about two weeks compared to the January trial. Note that we forced lilies under supplemental lighting provided by HPS lamps and heat given off by the lamps may have slightly hastened flowering in the winter trials.

Bulb size impacted flowering time of some cultivars. Overall, the influence of bulb size on flowering time was variable and cultivar dependant. For example, 'Tiny Hope' flowered one to seven days earlier when larger sized bulbs were used. In contrast, bulb size had no influence on flowering time of 'Tiny Icon.'

Overall, Lily Looks cultivars performed very well and we observed only a few problems with bud abortion or lower leaf chlorosis and no incidence of pests or diseases. For instance, bud abortion was noted only during the summer trial on two individual plants of 'Tiny Toes.' Also, 'Tiny Bell' exhibited some lower leaf chlorosis during the trials.

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**Figure 3. Lily Look cultivars typically had more flower buds when grown from larger bulbs. This photograph shows 'Tiny Icon' grown from 10/12, 12/14 and 14/16 cm bulb size (from left to right) that averaged six, seven and 10 buds per plant, respectively.**



#### Plant Height

Lily Looks cultivars were not treated with plant growth regulators during our trials and ranged in heights from 10 to 22 inches at flowering (Table 3). About 70 percent of cultivars were 12 to 15 inches tall and would require little to no plant growth regulation when forced in 6-inch containers. Generally, larger bulbs produced somewhat taller plants, though this effect was cultivar dependant. For instance, with each unit increase in bulb size, 'Tiny Kissed' plants were about 2 inches taller, while there was no change in the plant height of 'Tiny Diary.'

#### Bloom Time

We recorded bloom time for each cultivar as days from opening of the first flower to senescence of the last flower on a plant. The average bloom time for Lily Looks cultivars grown at 68°F is reported in Table 4. At 68°F, plants bloomed for about 11 to 17 days. Lower production temperatures would likely extend the bloom time.

#### Postharvest Performance

All cultivars except 'Tiny Bell' stored well at both 41°F and 68°F. The lower leaves of 'Tiny Bell' became chlorotic, particularly after storage at 68°F. At 68°F, flowers continued to open and develop during the storage while, at 41°F, this process was greatly delayed. Many dark colored flowers faded slightly after storage at 68°F, while after storage at 41°F, flowers were more vivid in color (Figure 4A and B). Shipping at cool temperatures would thus be beneficial to prolong shelf life and to improve plant quality.

**Table 1. Flower colors of Lily Looks cultivars.**

Flower Color	Cultivar
Yellow	Tiny Bee, Tiny Dessert
Orange	Tiny Diary, Tiny Dino, Tiny Invader, Tiny Skyline, Tiny Star
Red	Tiny Ghost, Tiny Hope, Tiny Kissed, Tiny Puppet
Pink	Tiny Athlete, Tiny Bell, Tiny Icon, Tiny Todd
Salmon	Tiny Toes
White	Tiny Nanny, Tiny Snowflake
Bicolored	Tiny Sensation

**Table 2. Average number of flower buds produced by Lily Looks cultivars forced from 12/14 cm-sized bulbs.**

Average Flower Buds from 12/14 cm Bulbs	Cultivar
4	Tiny Dessert, Tiny Skyline, Tiny Star
5	Tiny Athlete, Tiny Diary, Tiny Invader, Tiny Sensation
6	Tiny Bee, Tiny Bell, Tiny Dino, Tiny Ghost, Tiny Hope, Tiny Kissed, Tiny Toes
7	Tiny Icon, Tiny Snowflake, Tiny Puppet
8	Tiny Nanny, Tiny Todd

**Effect Of Bulb Storage**

During our four trials, which spanned nearly a year, no deterioration in greenhouse performance of any Lily Looks cultivars was observed. All the bulbs were from a single field harvest and stored at temperatures just below freezing. Thus, there was no evidence that extended storage had any negative effect on subsequent performance.

**Additional Tips For Successful Production**

- **Planting depth.** Although lilies develop bulb roots, stem roots are the primary source of nutrition and plant support. Correct planting depth influences the available space for development of stem roots and therefore, bulbs should be planted at least 2 inches deep. Additionally, the planting depth influences time to emergence and subsequently the flowering time. Hence, planting at a uniform depth is necessary for a uniform crop time.

- **Centering shoots in pots.** Shoots should be centered immediately after emergence. If it is delayed, newly formed stem roots can make this process cumbersome.

- **Fertigation.** Since the bulbs act as

**Table 3. Height of Lily Looks cultivars from 12/14 cm-sized bulbs at flowering, measured from the tip of the plant to the surface of medium.**

Plant Height (inches) from 12/14 cm bulbs	Cultivar
10-12	Tiny Invader, Tiny Skyline, Tiny Diary, Tiny Nanny, Tiny Bell, Tiny Sensation
13-15	Tiny Bee, Tiny Dino, Tiny Star, Tiny Toes, Tiny Dessert, Tiny Ghost, Tiny Athlete, Tiny Puppet
16-22	Tiny Todd, Tiny Icon, Tiny Hope, Tiny Snowflake, Tiny Kissed

**Table 4. Average bloom time computed as number of days from opening of the first flower to senescence of the last flower. Plants were maintained in the greenhouse set at 68°F while the flowers developed.**

Average Bloom Time (days)	Cultivar
11	Tiny Sensation
14	Tiny Hope
15	Tiny Icon, Tiny Diary, Tiny Bee, Tiny Puppet, Tiny Athlete, Tiny Kissed, Tiny Invader
16	Tiny Dessert, Tiny Star, Tiny Dino
17	Tiny Bell, Tiny Skyline, Tiny Nanny
18	Tiny Toes, Tiny Ghost
19	Tiny Snowflake, Tiny Todd

larly when grown under high humidity. This problem can be corrected by improving air circulation and applying foliar prays of calcium. In our studies, leaf tip burn was not observed.

- **Forcing temperature.** Asiatic lilies are best grown at relatively cooler

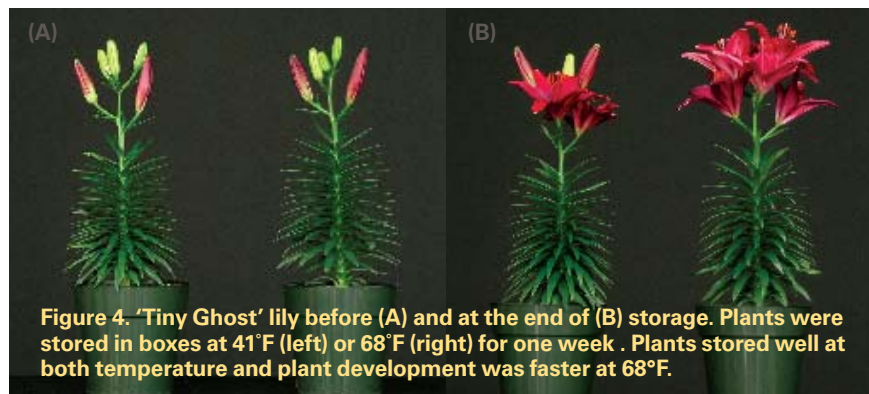
will likely bend towards HPS lamps. Therefore, appropriate spacing of supplemental lights creating uniform light distribution is important to ensure upright plant growth.

- **Supplemental lighting.**

Reportedly, when grown under very low irradiance, flower bud abortion or drop can occur and hence, supplemental lighting may be beneficial. We used supplemental lighting in these studies and observed no abortion that would have been caused by low irradiance.

- **Photoperiodic response.** Most lilies are day neutral after flower initiation and hence, can be successfully forced under any photoperiod. However, there are notable exceptions, particularly some Oriental lilies which flower considerably earlier under long days. We grew lilies under a 16-hour photoperiod, and did not determine the influence of photoperiod on flowering time. **GG**

**About the authors:** Sonali Padhye is a post doctoral research associate and Art Cameron is a professor in the department of horticulture at Michigan State University. The authors gratefully acknowledge Mak Breeding Company for financial support of the trials, Michigan Grower Products for donations of media and The Blackmore Company for donations of fertilizer. They also thank Mike Olrich and undergraduate student employees in the Floriculture Program at Michigan State University for providing plant care.



**Figure 4. 'Tiny Ghost' lily before (A) and at the end of (B) storage. Plants were stored in boxes at 41°F (left) or 68°F (right) for one week. Plants stored well at both temperature and plant development was faster at 68°F.**

a source of nutrient reserve, lilies are light feeders. The plants can be fertilized after emergence using a slow release or constant liquid fertilizer.

- **Fluoride toxicity.** Lilies can develop phytotoxic symptoms of leaf burn when an excessive amount of fluoride is present in irrigation water, particularly likely when city water is used for irrigation.

- **Calcium deficiency.** Due to insufficient calcium translocation, many lilies can develop leaf tip burn, particu-

temperatures. It has been reported that growing lilies at temperatures over 71°F (21°C) can promote abortion and subsequent abscission of flower buds. We forced lilies in our research greenhouses set at 68°F, although during the August trial, greenhouse temperatures were warmer than 68°F. We did not observe any obvious physiological disorders related to high temperature stress.

- **Phototropic response.** Lilies are strongly phototropic and the stems