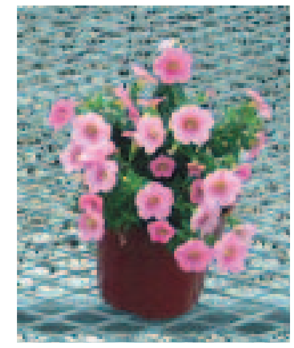
Calibrachoa Photoperiod Requirements

University of Florida research helps you determine which calibrachoa varieties are best for early spring production, hot-weather production and fall flowering.

'MiniFamous Rose Pink'. (Photos courtesy of Jim Barrett)



'Spring Fling Yellow'.

By Erika Berghauer and Jim Barrett

The first calibrachoas were introduced only 12 years ago, but this has already become an important spring crop. Its rapid growth has been both because calibrachoas are popular with consumers and because they have a good growth habit for baskets and mixed containers. Due to this crop's importance, several companies have started calibrachoa breeding programs, and the breeders/marketers have introduced many new varieties in the past few years. Differences in characteristics such as flower color and growth habit are easy to evaluate; however, how the varieties respond to day length is not as easy to see.

Calibrachoas perform best under cooler conditions; however, many varieties flower too late under natural days to be ready for early spring markets. In warmer Southern climates calibrachoas have not become as popular partially due to poor flowering during the fall, winter and very early spring seasons.

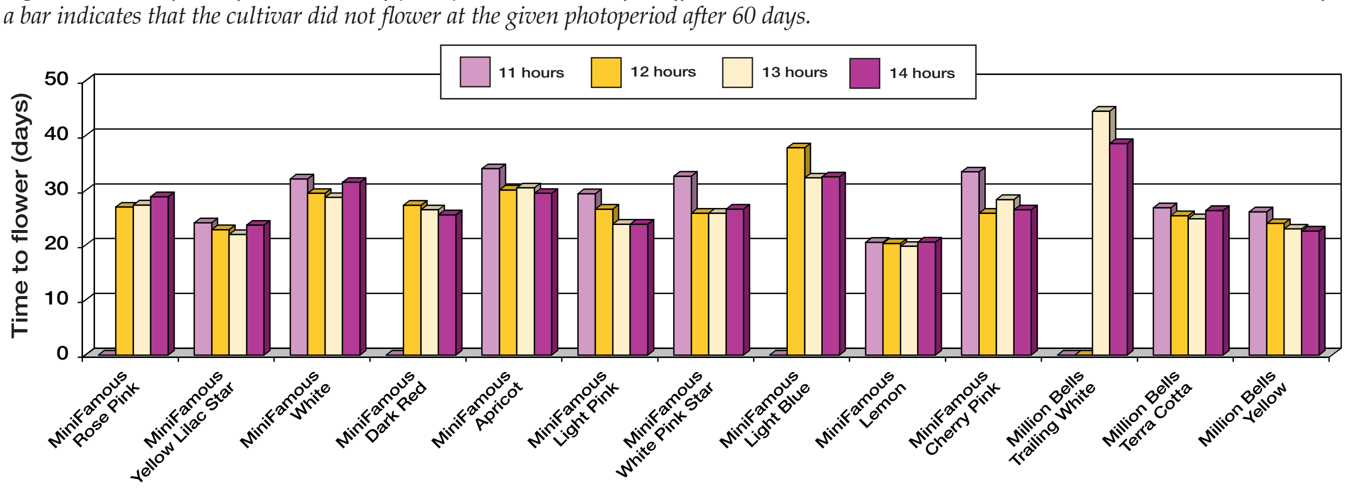
Calibrachoas are facultative long-day plants. This means they flower quicker and better as the day lengths become longer until a "critical day length" has been reached. At day lengths longer than the critical day length there is not an improvement in flowering. Since calibrachoas are so new, there has been little detailed research on the way they respond to photoperiods other than to establish that they are long-day plants. The work presented in this article was conducted over the past three years with the purpose of developing a better understanding of the flowering of this crop.

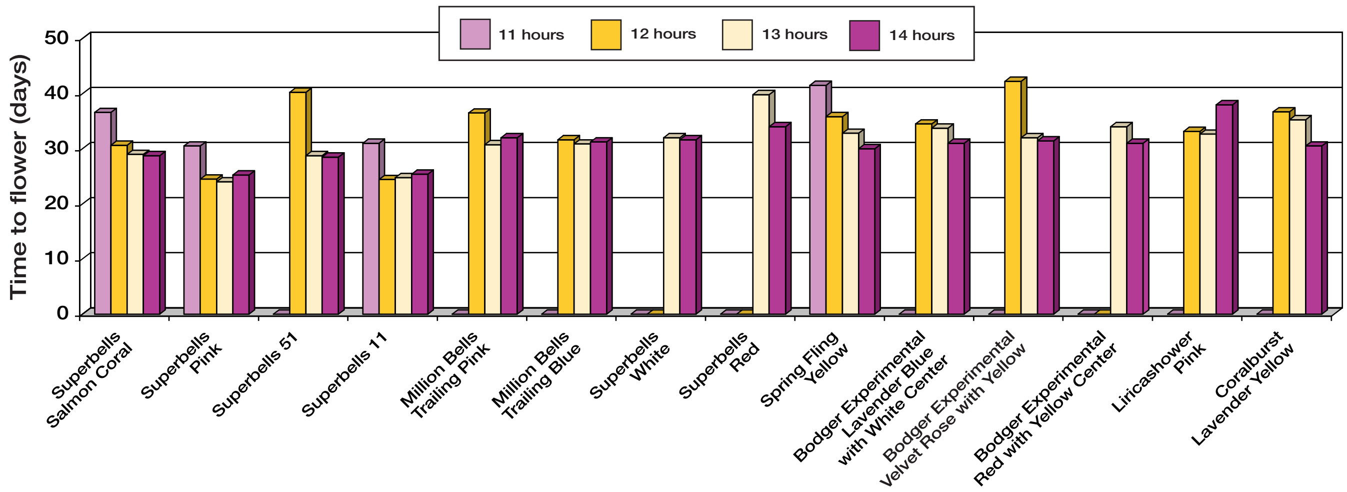
At the beginning of this research, we obtained commercial calibrachoa varieties from several plant breeding/marketing companies. For many of the varieties we established stock plants, and these were maintained at 8-hour day lengths to keep them vegetative. In most of the experiments, vegetative cuttings were planted in 4½-inch containers with one plant per pot. Fertilization was 150 ppm at every watering using a 20-10-20 fertilizer.

TESTING CRITICAL PHOTOPERIOD

In Experiment 1, 27 varieties were established using 8-hour day lengths. Then they were shifted to 11-, 12-, 13- or 14-hour day lengths, and the time to the first open flower was determined. Treatments listed as did not flower in Figure 1, below, had not started flowering after 60 days. ➧

Figure 1. Time to flower from the start of photoperiod treatments for different calibrachoa varieties under 11, 12, 13 or 14 hours. Absence of a bar indicates that the cultivar did not flower at the given photoperiod after 60 days.



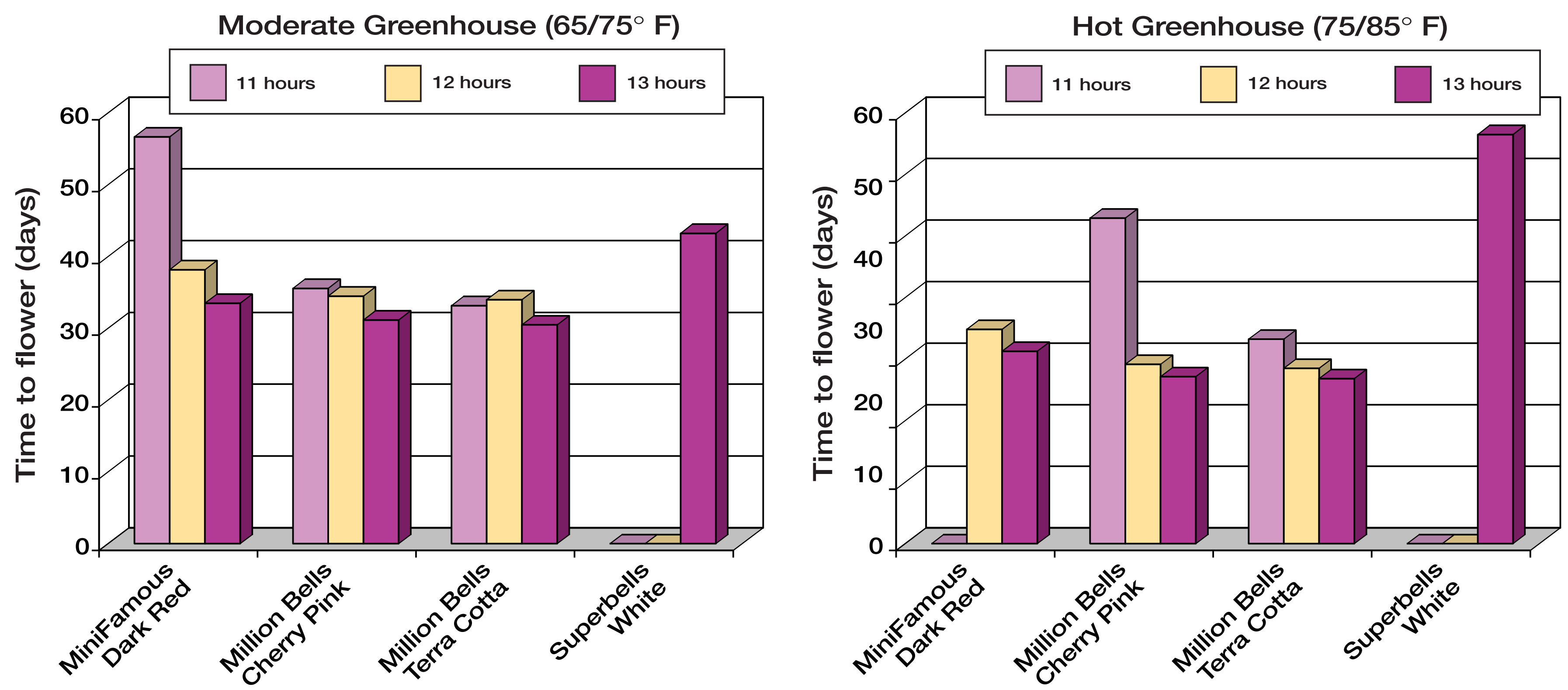


There are two reasons varieties performed differently in the first experiment. The first reason is that the critical photoperiod was different from variety to variety. 'MiniFamous Yellow Lilac Star', 'MiniFamous Lemon' and 'Million Bells Terra Cotta' did not vary in the time to flower under the four photoperiod treatments. Thus, their critical photoperiod for uniform flowering is less than 11 hours. 'MiniFamous White Pink Star' and 'Superbells Pink' are also pretty good varieties to grow because they have a critical photoperiod between 11 and 12 hours. These are examples of cultivars that would work well for propagators or growers who are timing their crop for early spring sales. On the other hand, there are varieties like 'Superbells White', 'Superbells Red' and 'Million Bells Trailing White' that have critical photoperiods near or greater than 13 hours. These varieties would not be good choices for early sales grown under natural days.

The second difference between plants in Experiment 1 is the number of days it takes each to flower at day lengths greater than the critical photoperiod. Note the time to flower at 14 hours, which is longer than the critical photoperiod for all the varieties in this study (see Figure 1, page 72). Varieties such as 'Million Bells Trailing Blue' and 'Superbells Red' flowered in 32-39 days. Whereas, varieties like MiniFamous Yellow Lilac Star and 'Million Bells Yellow' only took 20-24 days to flower. This indicates there will be differences in time to flower even if the varieties are grown with lights to give long days or if they are planted for late spring or summer sales.

Given this information, we now

Figure 2. Time to flower for calibrachoas under 11-, 12- or 13-hour photoperiods in a moderate greenhouse at 65/75° F or hot greenhouse at 75/85° F night/day. Absence of a bar indicates no flowering.



know that how early a calibrachoa variety flowers under natural days will depend on what the critical day length is and how fast the flower develops after the critical day length is satisfied. It would be best if all varieties in a series flowered together, which would make scheduling easier. Currently, none of the series we studied are very uniform; the crop and breeding programs are just too new.

This is a technical point, but from what we have seen there are not any "day neutral" calibrachoa varieties. There are varieties that have shorter critical photoperiods, and varieties that will flower earlier than others; however, this does not mean they are day neutral.

EXAMINING HEAT SENSITIVITY

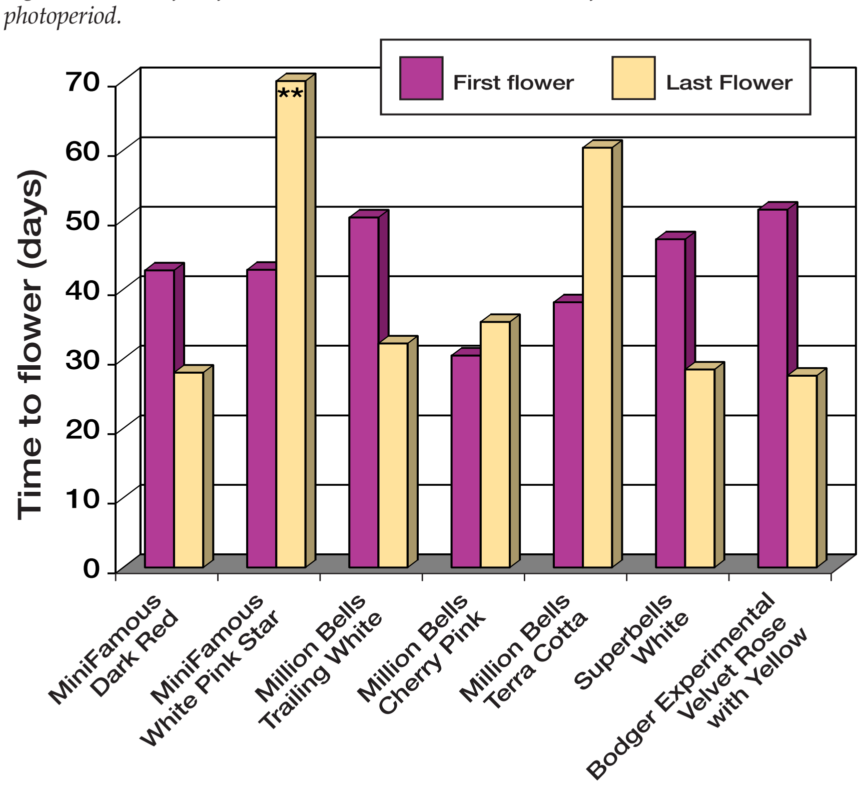
"Heat delay" is the term that refers to high temperatures delaying flowering in photoperiodic crops. The heat delay effect is evident when the crop is grown at day lengths close to the critical photoperiod. Heat delay of calibrachoa is an important concept for Northern growers with hot spots in the greenhouse or for growers who hang baskets in warm houses. Northern growers are less likely to see heat delay on varieties with shorter critical photoperiods, since the natural longer spring days will overcome the effect.

In warm production climates, the potential for heat delay makes variety selection more critical for production under natural days. It is also a problem in production for fall sales, as temperatures are still high, and the natural day lengths are becoming shorter.

Experiment 2 shows how flowering can be affected by high greenhouse temperatures. For this experiment, nine varieties were selected to provide a range of flowering responses, based on their photoperiod response in Experiment 1. The nine varieties were given 11-, 12- or 13-hour day lengths and were either in a moderate-temperature greenhouse with night/day temperatures of 65/75° F or a hot greenhouse with night/day temperatures of 75/85° F. Four varieties in Figure 2, left, are examples of the way all nine varieties responded. Million Bells Terra Cotta is an example of a variety that was not affected by the higher production temperatures; however, the other three varieties were affected.

The critical photoperiod for 'Million Bells Cherry Pink' is longer in the hotter greenhouse. Under moderate greenhouse temperatures, the critical photoperiod is 11 hours or less. In a hot greenhouse, Million Bells Cherry Pink flowered slower, at 12 hours. 'MiniFamous Dark Red' flowered at 11 hours in the moderate greenhouse but did not flower at 11 ➧

Figure 3. Time to first flower under 14 hours and time to last flower when moved to 8-hour photoperiod.



*** This variety continued flowering until end of experiment at 70 days.*

hours in the warm greenhouse. Superbells White is a variety with a longer critical photoperiod of about 13 hours. It took longer to flower in the hotter greenhouse, indicating the critical photoperiod is longer under higher temperatures. These results show that flowering in varieties with both shorter and longer critical photoperiods can be affected by temperature.

Notice that when a variety such as Million Bells Cherry Pink is given 13-hour days, which is longer than the critical photoperiod, it flowers as fast or faster under high temperatures. This means that heat delay can be overcome by lighting to provide longer days. Varieties like Million Bells Terra Cotta would be a better fit than MiniFamous Dark Red for warm conditions.

For more on heat delay effects on flowering of short-day crops, see the article on heat delay of poinsettias on page 30.

UNDERSTANDING DAY LENGTH INTERVAL

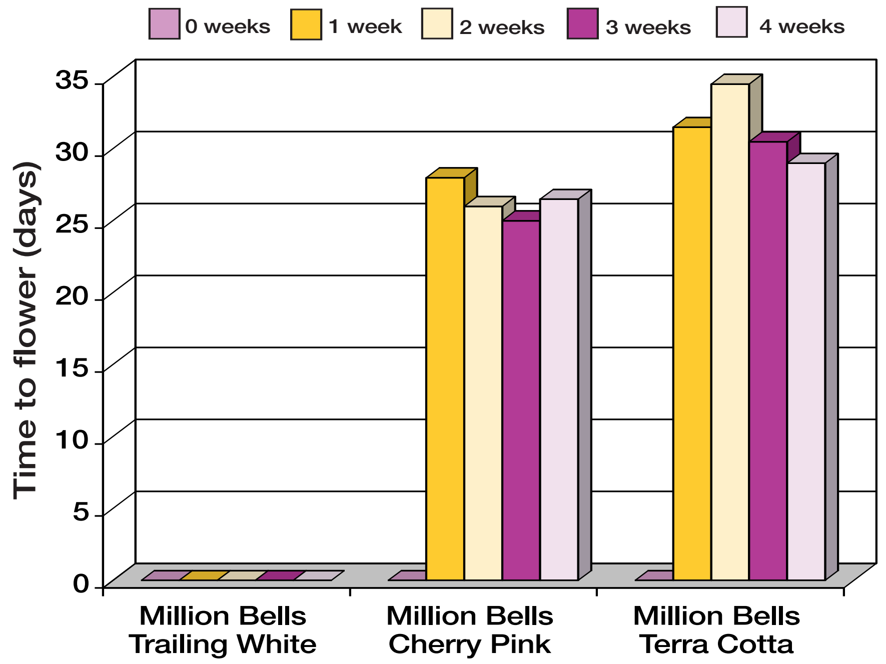
Experiment 3 examined the differences in variety response to being placed under long days to induce flowering and then back under short days. Figure 3, page 75 shows three different ways calibrachoa varieties tend to respond. Varieties like Million Bells Trailing White and Superbells White come into flower and go out of flower quickly; varieties like Million Bells Cherry Pink come into flower and stop flowering in about the same amount of time; and varieties like Million Bells Terra Cotta and MiniFamous White Pink Star came into flower and stay in flower for a long time when moved to short days.

This information is especially useful to commercial operations that use lights to provide long days during propagation and to landscapers in the South who plant calibrachoa in the fall. In these situations, a variety that stayed in flower for a long time after going back to short days would be favorable. Million Bells Terra Cotta and MiniFamous White Pink Star are examples of desirable varieties.

It has become fairly common for propagators and some growers to provide long-day lighting to induce flowering in calibrachoas. In Experiment 4, we examined how many consecutive long days were required to promote flowering. First, three varieties were moved from short to long days for 0, 1, 2, 3 or 4 weeks and then moved back to 8-hour days. Just one week of long days was enough to cause flowering in Million Bells Cherry Pink and Million Bells Terra Cotta. Providing more long days did not significantly speed up flowering. However, Million Bells Trailing White did not flower within 60 days, even after receiving four weeks of 14-hour days (see Figure 4, below).

We were surprised by the ability of some varieties to flower after being exposed to only one week of long days. Therefore, we conducted a follow-up experiment using five varieties and giving them only 0, 3, 6, 9 or 12 days under 14-hour photoperiods before going back to short days. Figure 5, page 78, shows that just six days of inductive photoperiods was enough to cause flowering for MiniFamous White Pink Star and Million Bells Cherry Pink, but three days was not enough. In commercial situations where lighting is used to provide long days, varieties that require fewer inductive photoperiods for flowering are important. MiniFamous White Pink Star, Million Bells Cherry Pink and Million Bells Terra Cotta flower with seven or less days of inductive photoperiod. Varieties like Million Bells Trailing White, which require more than four weeks of long days, are a potential problem where cuttings are given lights for four weeks during rooting but then given natural days after transplanting. From this study, we can not determine what is required for MiniFamous Dark Red, Superbells White and Bodger Experimental Velvet Rose with Yellow, but they need more than 12 days of long days.

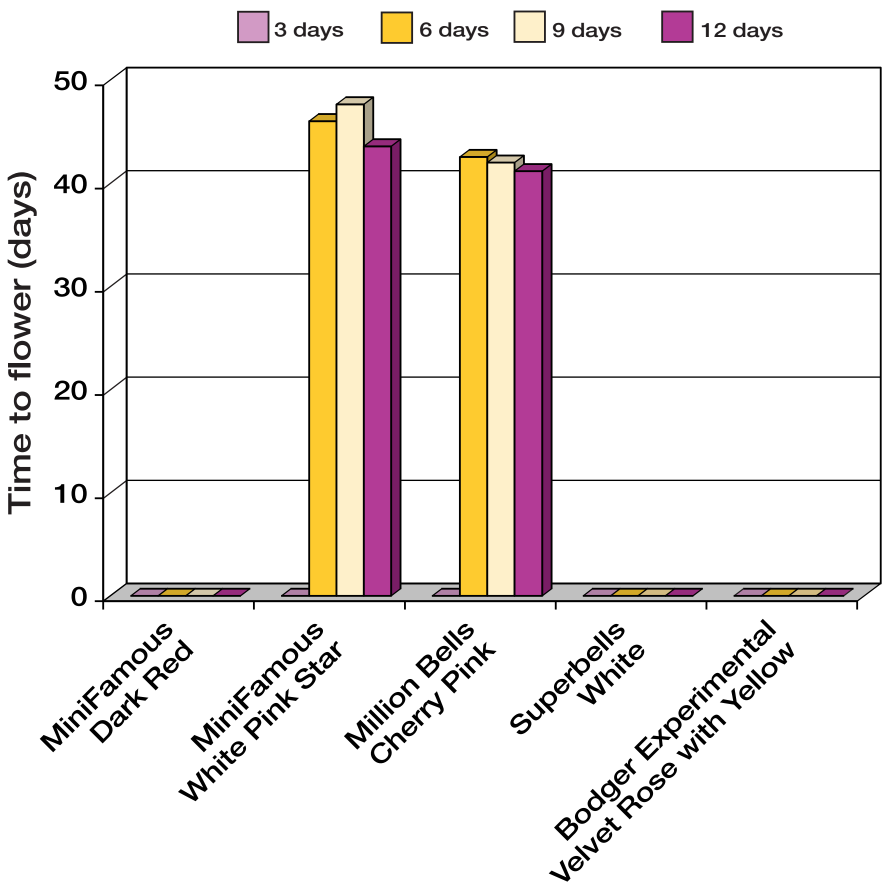
Figure 4. Number of long days (14 hours) to initiate flowering. Absence of a bar indicates the cultivar did not flower. Plants were moved back to 8-hour photoperiod after the given number of 14-hour days.



USING THE RESULTS

Currently, calibrachoa varieties are variable, even within a series. This inconsistency is seen in ➧

Figure 5. Number of long days (14 hours) to initiate flowering. Absence of a bar indicates the cultivar did not flower. Plants were moved back to 8-hour photoperiod after the given number of 14-hour days.



regards to critical photoperiod, time to flower under an inductive photoperiod, sensitivity to heat, how long it takes a flowering plant to stop flowering under short days, and the number of consecutive inductive photoperiods required to promote flowering.

This research evaluated only a few of the current varieties, and unfortunately there is not much detailed information for most other varieties. Plant breeder/marketer companies can provide some information. Propagators and growers should test varieties early in the season for their flowering performance, not at the end when days are longer. How nice a variety looks in May or June is not indicative of what it will do early in the season. Additionally, where crops are lit in propagation, the propagator can run early tests by keeping some of the rooted cuttings and making sure they flower rapidly in finished production under natural days.

Breeders are introducing new calibrachoa varieties rapidly, and some of the varieties used in this research have been dropped and replaced with improved plants. Several breeders are focusing on producing varieties that have a shorter critical photoperiod, and this will lead to improved varieties for early markets and production in warmer climates. GPN

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