Why grow plants with warmer nights

by John Erwin, Royal Heins, Robert Berghage, Meriam Karlsson, William Carlson and John Biernbaum

At first, it may seem illogical to grow plants with warmer night temperatures than day temperatures—but there are at least two reasons why this method can make sense. First, it limits plant height while still allowing control of plant development. Second, it can save money in two ways: by reducing or eliminating the need for growth retardants and by reducing heating costs provided that you have a thermal blanket system.

To understand the benefits of reversing day and night temperatures, let's review the ways temperature affects stem elongation and plant development.

How temperature affects height

Day temperature influences plant height in a different way than night temperature. Plant height increases as day temperature increases. This height increase can be substantial in lilies, poinsettias and chrysanthemums (Figure 1). Conversely, plant height decreases as night temperature increases (Figure 2).

It is the combined effect—that is, the degree of difference between day and night temperature—that ultimately controls the height of the plant at flower. The warmer the day, relative to the night, the taller the plant will be at flower. The warmer the night, relative to the day, the shorter the plant will be at flower.

In other words, as the difference (DIF) between day and night temperatures (day temperature minus night temperature) becomes more positive, plant height increases; as it becomes more negative, plant height decreases (Figures 3 and 4). For example, a crop grown at 70°F days and 60°F nights (+10°F DIF) will be taller at flower than another crop grown at 65°F days and 65°F nights (0°F DIF).

This 0°F DIF crop will still be taller than another crop grown at 60°F days...
than days?

Figure 3 (below). Comparison of poinsettia Annette Hegg Dark Red grown with a −10° F difference (left) or a −21° F difference (right) between day and night temperature.

Figure 4 (above). Comparison of chrysanthemum Bright Golden Anne 60 days after the start of short days when grown with a −4° C (−25° F) difference or a +8° C (18° F) difference between day and night temperature.

Figure 5. Appearance of Easter lily plants at flower when grown with a constant difference between day and night temperature (4° C) but with different average daily temperatures.
and night, the night temperature influences plant height regardless of the absolute temperature. Although each of the four lilies in Figure 5 was grown with a different average temperature, the difference was the same—therefore, plant height at maturity was the same. This effect occurs with certain short-day plants, such as chrysanthemums.

Very warm night temperatures (over 70°F) nights (—10°C). With a degree of difference between day and night temperatures, plants grown between .50°F and 35°F, the difference between day and night temperatures influences plant height. Although each of the four lilies in Figure 5 was grown with a different average temperature, the difference was the same—therefore, plant height at maturity was the same. This effect occurs with certain short-day plants, such as chrysanthemums.

How temperature affects plant development is not affected by the difference between day and night average temperature. Rate of plant development increases as the 24-hour temperature, but rather by the 24-hour average temperature. It doesn't matter whether these are day or night temperatures or how much the temperature difference there is between day and night temperatures. However, 'heat' growth as tools to 'fine tune' the difference in temperature can result in an increase in plant height at flower.

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How do poinsettias respond?

Controlling height with reversed day/night temperatures is possible with poinsettias, but it is not as easy or economically attractive as it is with Easter lilies. A reason for this is that total growth regulator costs per square foot of bench space are considerably lower with poinsettias than with lilies.

One effective way to use the day/night temperature relationships to control poinsettia height is to minimize day temperature as much as possible—avoid a positive DIF as much as possible. Reducing day temperature from late September through October will reduce the “stretch” seen during this time of year.

October 15 is commonly the last date recommended to apply growth regulators in the northern states; a somewhat later date is recommended in the South. Applying growth regulators after this date will reduce bract size. So what’s to be done if poinsettias are getting too tall after this date? Growers historically have had to choose between plants with smaller bracts and plants that are too tall.

Reversed day/night temperature strategy offers another option. Height can still be controlled after October 15 without reducing bract size by growing with days cooler than nights.

If you use such a temperature regime, remember to lower both the day and night temperatures the last two weeks of the crop. This will improve bract coloration and prevent cyathia drop (center drop).

Flexibility and control

With any crop, the benefits of a reversed day/night temperature regime go beyond cost reduction. The greatest benefit is the flexibility this method offers growers in controlling stem elongation rate on a day-to-day basis. Growth retardant applications do not allow such flexibility. The reversed day/night temperature regime is a precision tool growers can use to produce crops that flower at the right time and the right height.

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