Non-Chemical Height Control

Integrating height control strategies with traditional chemical control is an approach for growers embracing sustainability.

by CHRISTOPHER J. CURREY and ROBERTO G. LOPEZ

As part of the movement toward sustainable production of greenhouse crops, many growers are looking for non-chemical alternatives to control plant height and size. Fortunately, there are numerous options available. These options include genetic selection, planning and graphical tracking, environmental manipulation of light quality and air temperature, cultural manipulation of irrigation and mineral nutrition and mechanical control.

Genetic Selection

When trying to control plant size, the first step is to select naturally compact or dwarf cultivars. Many breeding companies are constantly introducing new cultivars of popular genera and species with a more compact growth habit (Figure 1). This ben-

Figure 1. Here are two different cultivars of calibrachoa planted on the same day and grown in the same bench showing the impact of cultivar selection.
Production: Height Control

In addition to light quality, you can control plant height by manipulating greenhouse air temperature. Stem elongation is strongly influenced by the difference (DIF) between the day air temperature (DT) and night air temperature (NT). This is represented as: DIF = DT – NT. For instance when the DT is higher than the NT, DIF is positive. If the DT and NT are the same, DIF is zero. If the NT is warmer than the DT, DIF is negative. As DIF is more positive (a larger difference between DT and NT), stem elongation increases (Figure 4). As DIF decreases toward zero or becomes negative, stem elongation is suppressed. Running a higher NT than DT can be a very ef-

Environment Control

Stem elongation is strongly influenced by light quality. Specifically, it is the ratio of red (R) to far-red (FR) light (R:FR) that influences elongation. When plants are grown under a low R:FR light ratio, elongation is greater compared to plants grown under a high R:FR light ratio.

So what would create an environment with increased far-red light? The first is tightly spaced plants. Because leaves preferentially absorb red light, light under the canopy has a lower R:FR light ratio due to the absorption of red light by the canopy. For example, the R:FR ratio of direct sunlight is approximately 1.1, whereas the R:FR light ratio under a leaf is around 0.15. This is why floriculture crops on close spacing stretch more (Figure 3). Increasing container spacing will allow more red light to penetrate the canopy, increase the R:FR light ratio and reduce stem elongation.

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+ DIF
Day: 70°F
Night: 62°F

Figure 4. Here are two Easter lily plants grown under the same average daily temperature (66°F), but the plant on the left was grown with a negative DIF (-8°F) while the one on the right was grown with a positive DIF (+8°F).

temperature early can be very effective in reducing elongation.

Cultural Techniques

One cultural strategy to keep plant size in check is to decrease overall fertilization. By not applying maximum concentrations of fertilizer, you can avoid excessive growth and stem elongation. However, you can take a more targeted approach by reducing nitrogen (N) or phosphorous (P).

While reducing N fertilization will suppress overall growth, this must be done cautiously because N deficiency appears as yellowing leaves. This can produce crops that are visually “unhealthy” and less appealing to consumers. Fertilizing with low P is a viable alternative. Two of the main symptoms of early phosphorous deficiency include reduced height and deep-colored foliage. One drawback of using P deficiency is bedding plants finished from plugs where P starvation was used may flower a few days later.

Another method of height control for many plants is to impose a very mild water stress or grow crops on the drier side throughout the production cycle. These methods are not easy and are best employed by an experienced grower, as allowing too much water stress can ultimately result in unmarketable crops. With certain crops, such as celosia, water stress can cause premature flowering, resulting in plants with color but not up to size.

continues on page 30
Production \ Height Control

continued from page 28

Mechanical

In addition to environmental and cultural height control options, there are also a few mechanical methods to reduce stem elongation. Pinching or shearing is a fairly common practice in many greenhouses, depending on the crop (Figure 5). Pinching does reduce plant height, although it is primarily used to promote

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Integrated Height Management

Hopefully, some of the options presented here will prove to be useful alternatives to chemical height control. Remember to test these techniques on a limited basis before implementing them in your entire production facility or on every crop you produce. The methods described here are additional tools for your height control toolbox, along with chemical PGRs.

We feel that in addition to chemical PGRs, the use of proper plant selection, scheduling and graphical tracking, and managing your greenhouse environment and cultural inputs, you can approach plant height with an integrated height management (IHM) approach. This idea is similar to integrated pest management (IPM), which encourages using several methods for pest prevention and control strategies to manage pest problems. By integrating some of the height control strategies we’ve reviewed here with traditional chemical control, you can approach height control in a more sustainable manner. GG

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