



By Erik Runkle



# Non-Chemical Height Control Techniques

Plant growth retardants are routinely applied to inhibit extension growth to keep plants short and compact. Although effective, growers are sometimes interested in other ways to control plant height, particularly on edible crops such as vegetables and herbs. There are several environmental and cultural practices that can produce shorter plants, but unlike PGRs, strategies must be implemented over a period of time, often for a majority of the production period.

**Limit phosphorus fertility.** In January 2002, researchers at North Carolina State University published an article in *GPN* (<http://tinyurl.com/n9f8wxr>) that revealed phosphorus — not nitrogen — has the greatest impact on stem elongation. Before then, the paradigm was that nitrogen, particularly the amount of ammoniacal nitrogen, was what regulated extension growth. In the last decade, an increasing number of growers are limiting the amount of phosphorus in their fertilizer to suppress stem extension while also reducing fertilizer costs and phosphorus runoff. However, a lot of growers are still using large amounts of phosphorus that the plants simply do not need — and also result in tall plants that require more height control.

How much phosphorus do plants need? Phosphorus is one of the essential macronutrients and so

it's important that plants receive it throughout production. Generally, a constant fertility of 10 to 20 ppm is sufficient to meet plants' needs. Some growers are also working with media suppliers to reduce the amount of phosphorus fertilizer in the starter charge of their media. We performed a small study exploring the impact of media starter charge on growth and flowering of several common bedding plants. The results were rather dra-

matic, as shown in Figure 1.

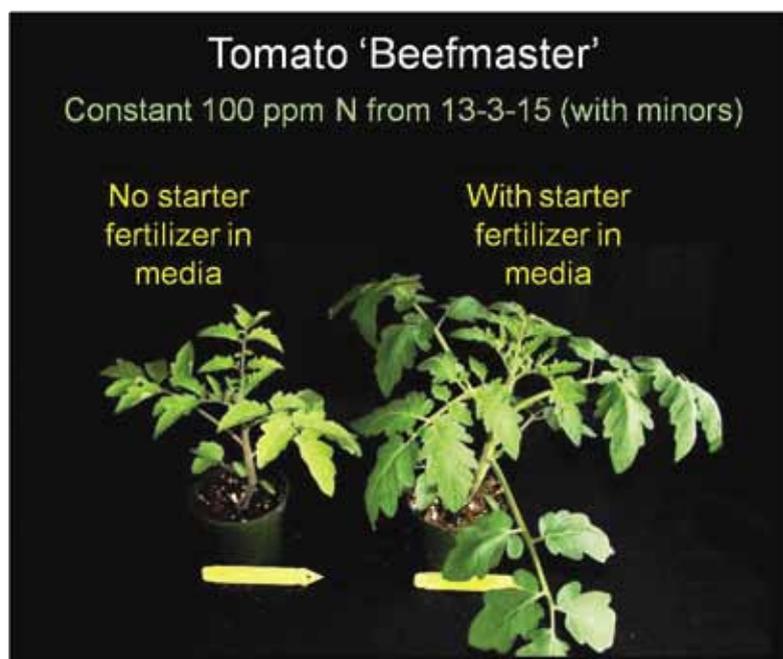
**-DIF and temperature drop.** Extension growth of most crops is also influenced by temperature changes during the day and night. A positive temperature differential (+DIF) means that the day is warmer than the night, and this promotes stem extension. A negative DIF (-DIF) occurs when the day is cooler than the night, and this suppresses plant height. If plants are grown at a day/night temperature (each for 12 hours) of 60/70, 65/65, or 70/60, the tallest plants will be those at 70/60 and the shortest will be those at a day/night of 60/70.

A temperature drop before sunrise can produce an inhibitory effect on stem elongation similar to a -DIF. This strategy requires lowering the temperature (by 5 to 15° F) approximately 30 minutes before sunrise and maintaining that low temperature for two to three hours. More information on these height control strategies with temperature can be found online at <http://flor.hrt.msu.edu/temperature>.

**Brushing.** Although not commonly used, brushing plants repeatedly each day inhibits extension growth. Commercially, the most common way to brush plants is to hang a plastic sheet (sometimes cut into strips) from an irrigation boom. The boom runs back and forth many times a day when not irrigating and when the foliage is dry. With repeated use, over time plants are shorter when brushed than when not.

**Light quality.** Light has a profound effect on plant height, especially the quality (or color) received by plants. Extension growth typically decreases as the ratio of red to far-red light increases (more red than far red). Since the red to far red ratio decreases as sunset, blocking this out, such as through the use of blackout screens, can produce shorter plants. The spectral quality of lamps also influences plant elongation: those that emit far-red light (such as incandescent lamps) promote elongation whereas those rich in red (such as from red LEDs) inhibit elongation. Ultraviolet and blue light can also inhibit stem elongation, but these effects are much more noticeable in growth rooms without sunlight. ☒

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**Figure 1.** Growth of tomato was suppressed when grown in a peat-based media without any fertilizer starter charge, even when provided with 100-ppm nitrogen and 10-ppm phosphorus at every irrigation. Therefore, some media starter charge with minors is suggested. (Photo: Mike Olrich)