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How to increase plant height

Plant height control is always a topic of interest among greenhouse growers. In most cases, growers are interested in how to inhibit stem extension to produce shorter, more compact plants. However, increasingly growers are asking me how to increase plant height.

In many cases, a crop that is growing too short occurs because of overapplication of a plant growth retardant. Sometimes it is because a new cultivar is naturally shorter than other cultivars with which a grower is familiar.

Regardless of the reason, knowing how to promote stem elongation can be just as important as knowing strategies that inhibit stem extension. Crops that don't meet target retail specifications can have a lower value, regardless if plants are too tall or too short.

Ways to increase height

Raise the temperature. There are two basic strategies to increase plant height. First, a grower can increase the rate of development so that a plant develops leaves (also called nodes) faster. This is achieved by increasing plant temperature. Plant temperature can be raised by increasing the air temperature and, to a lesser extent, by increasing the amount of light available to plants.

Disadvantages are:

1. Adding light or increasing air temperature can require an increase in energy consumption.

2. Accelerating plant development means that crop timing is shortened, which can mean that plants could be ready for marketing ahead of schedule.

Increase internode length. The other strategy to increase plant height is to increase the distance between each node (also called internodes). Inhibiting internode length is the way that most growers inhibit stem extension and thus plant height. Therefore, it should not be a surprise that in most instances, the best way to increase plant height is to promote internode elongation.

There are many ways to increase internode length. These techniques are often exactly the opposite of what we do when trying to suppress internode length. Here are some different strategies to increase plant height by increasing internode length. You may wish to employ more than one strategy depending on the crop and how much of a response is needed.

Space plants closer together. Plants in proximity to others compete for available light. Called the "shade-avoidance response," plants grow upwards instead of outwards to try to out-compete neighboring plants to capture light.

Moving plants so that their canopies touch or nearly touch can be an effective way to increase plant height. There are some major drawbacks, however. A lot of labor may be required to space plants closer together. Plants closely spaced capture less light per plant (because of shading from neighbors), which can reduce crop quality. Plants may have to be returned to their original spacing if they gain the height desired before reaching a marketable developmental stage.

Use positive DIF. DIF describes the mathematical DIFference between the average day temperature and the average night temperature (DIF = day temperature – night temperature). When the day temperature is lower than the night temperature, a negative DIF (or –DIF) is created, which inhibits stem extension in most floriculture crops. In contrast, when the day temperature is higher than the night temperature, a +DIF is created, which promotes stem extension.

Simply raising the day temperature and lowering the night temperature can increase plant height of

many greenhouse crops. The larger the DIF, the larger the effect on plant height. For example, a 75°F day and a 55°F night (+20°F DIF) would promote stem extension more than a 70°F day and a 60°F night (+10°F DIF).

Remember that plant development depends on the average daily temperature. If you raise the day temperature, you need to offset that with a cooler night temperature, or else plants will develop faster.

Avoid phosphorus deficiency. Limiting phosphorus has been shown to effectively inhibit stem extension of bedding plants and potted crops. If a low phosphorus level is in the fertilizer (i.e., 5-10 parts per million delivered at every watering), then increasing the amount of phosphorus (i.e., to 30 ppm at every watering) can increase stem extension. If adequate phosphorus is already being delivered, adding more phosphorus usually does not further increase plant height.

Add far-red light. Far-red light (700 to 800 nanometers) is just beyond the waveband that humans can see. Supplementing far-red light from lamps is a way to simulate close spacing of plants. Most red light is absorbed by leaves for photosynthesis, but most far-red light is transmitted or reflected by leaves. When plants are spaced closely together, there is less red than far-red light. This lower red to far-red ratio is the signal that stimulates the shade-avoidance response in plants resulting in internode elongation.

Light from incandescent lamps is rich in far-red light. Turning these lamps on at the beginning of the night is an easy way to add far-red light. Using incandescent lamps during the day has little or no effect, because the addition of far-red light is minimal compared to the large amount of red light delivered by the sun.

An economical lighting strategy is to deliver 5-10 footcandles (1 to 2 µmol per square meter per second) of light beginning at sunset for one to two hours. For some crops, the longer the lighting period, the stronger the elongation response. Other lamp types are not effective because they emit more red than far-red light.

Apply gibberellic acid. When you apply a plant growth retardant, you use a chemical that inhibits the biosynthesis of the plant hormone gibberellic acid. Gibberellic acid has several functions in plants, including the promotion of stem extension. Applying gibberellic acid will increase internode length.

Fascination, ProGibb (both from Valent Professional Products) and Fresco (Fine Agrochemicals) contain gibberellic acid. Fascination is labeled for a wide range of greenhouse crops. Fresco is only labeled for Easter lilies.

Applying gibberellic acid to floriculture crops can be a little risky, partly because there is limited research data (with notable exceptions on Easter lily and poinsettia) on which to base rate suggestions. These products should be applied as foliar sprays. The addition of a surfactant may be beneficial to ensure good leaf contact, such as when spraying on plants with waxy leaves.

Watch rates. Similar to growth retardants, it is better to error on the side of caution when choosing a rate for one of these products. For many crops, a single Fascination spray of 2-5 ppm may be sufficient to increase extension growth. Sensitive crops such as begonia may require even lower rates.

Initial responses to gibberellic spray treatments are usually seen in three to four days. The final results of a spray may not be realized for seven to 10 days. If the desired increase in height is not observed, a second spray application at a similar rate can be made at least 10 days later.

Applying gibberellic acid is often the best way to overcome a plant growth retardant overdose, especially when plants are severely stunted. Plants that have a severe growth retardant overdose may need a slightly higher rate.

As with all plant growth regulators, read and follow label directions. When possible, conduct your own trials on a small scale first to determine appropriate rates. GMPRO