GROWERTALKS

Features

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Preventing Tip Abortion

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Now that many greenhouse growers are knee-deep with sticking cuttings and managing propagation so they can get great liners to transplant, it's time to focus on a common problem I see, especially in northern locations. I'm referring to tip abortion on calibrachoa and petunia cuttings specifically, although other cuttings could suffer the same problem. This problem shows up when cuttings are being rooted under very low-light conditions, high humidity from misting, little dehumidification, and maybe, cooler-than-desired growing temperatures.

Figure 1. Boron deficiency with no pinch.

Figure 2. Tip abortion with no pinch.

Symptoms on calibrachoa and petunia cuttings during propagation include growing tip abortion, strapped or twisted new leaves, stunted growth and poor rooting. There may or may not be lateral branching evident after the terminal growing tip aborts. In some cases, it even looks like the cuttings were pinched, but weren't (Figures 1 and 2). Liners showing these conditions won't grow out very well after transplanting and may even die out (Figure 3).

The causes of these symptoms could be due to calcium or boron deficiency, aggravated by environmental conditions (Figure 4). Calcium is needed for cell walls, cell division and cell elongation. Calcium isn't mobile within the plant; therefore, calcium deficiency will first show up at the top of the plant. Boron is also needed for cell walls, as well as sugar transport and carbohydrate synthesis within the plant. Boron is also not mobile within the plant and will show up at the top of the plant. One method to differentiate between calcium and boron deficiency is that cuttings exhibiting calcium deficiency don't form lateral growing tips after the primary growing tip aborts, whereas cuttings with boron deficiency show lots of short laterals after the main tip aborts (Figure 5). These laterals may also abort if boron continues to be deficient.

Figure 3. Problems growing out after transplant.

Figure 4. Both calcium and boron deficiency.

Figure 5. Boron deficiency showing aborted tip with laterals and stunted growth.

Calcium and boron are both taken up passively by the plant roots. With passive uptake, both these nutrients only move into the plant along with water. Roots only take up water when the rest of the plant loses water through transpiration (the loss of water through the leaves to the atmosphere). So, active water movement through the plant is required to drive uptake of both of these nutrients. When the weather is cool and cloudy, transpiration is greatly reduced, as are water flow and uptake of calcium and boron. Imagine how much transpiration is reduced when you have five days in a row of rainy, cool weather, along with short day lengths. Sounds like weather conditions in much of the Northern U.S. and Canada during January through early March.

Other factors besides high humidity and low light that can reduce transpiration rates, water uptake, and therefore, uptake of calcium and boron, include high salt levels in growing media (high EC), overwatering or underwatering, cool root zone temperatures and root tip damage due to fungus gnats or root rot diseases.

Media pH and nutrient interaction also influence uptake of calcium and boron. Calcium becomes less available at low media pH (<5.5), but becomes too available when media pH is greater than 6.5. Too-high levels of magnesium or boron will tie up calcium within the root zone. Calcium-to-magnesium ratios should be 2:1, no higher than 3:1, for balanced uptake. Boron is opposite in media pH reaction to calcium, in that it's more available at low media pH and becomes deficient when pH climbs up to 6.5 or higher. At this high pH, excessive calcium levels will tie up boron, making it unavailable to the plant roots. This can happen easily with high alkalinity water (>100 ppm) and too much lime in the media. Fertilizer selection can also influence media pH, with 13-2-13 and similar high calcium/low NH4 and phosphorus fertilizers raising the media pH, whereas, fertilizers with high NH4 and phosphorus and low calcium, such as 20-10-20, will lower media pH.

Soil tests may show adequate concentrations of calcium or boron, but because of environmental conditions, it's not getting into the plant. Tissue tests on cuttings will cover up the problem due to only the newest and smallest leaves having low levels and are generally not the ones sampled. Unlike most nutrient deficiencies that typically exhibit symptoms uniformly across the crop (like nitrogen deficiency), calcium and boron symptoms can appear randomly within a crop, section or even a flat or pot. They may seem to appear or disappear at random, or may appear on one crop but not another. I've seen situations where one greenhouse showed problems, but another one right next to it didn't.

A common theme with northern greenhouses is the low light levels. I always recommend having HID lights in the propagation area to increase the total light (daily light integral or DLI) the cuttings receive every day. Aim for DLI of 5 moles/day, which means turning on HID lights during cloudy days and extending days until midnight. Amount of mist applied can be too much for many greenhouse operations. The goal is to reduce stress on the leaves for the first few days, but then wean off of frequent mist to get cuttings to callus and then to send out roots. Keeping too much mist on too long will inhibit rooting, promote more diseases and promote

calcium or boron deficiency. Also, check the temperature of your mist water and heat it to 70F (21C) if it's too cold.

I've found good results when growers foliar feed cuttings at 50 ppm daily with fertilizers such as 15-5-15 or 17-5-17 with added chelated micronutrients. Commercial fertilizers won't have enough micronutrients in them when used at less than 200 ppm, so it's necessary to add a chlelated micronutrient mix to your propagation feed program. This will provide enough foliar calcium and micronutrients to get the cuttings to root faster and break better.

Once roots are coming out and cuttings are off of mist, then increase feed levels to 100 to 125 ppm of the same fertilizer with added micronutrients, but applying into the media instead of foliar feeding. If the cuttings are already showing some boron deficiency symptoms, then drench with Solubor at ¼ oz./100 gal. or Borax at ½ oz./100 gal. There's a fine line between boron deficiency and boron toxicity, so please don't overdo the extra boron applications.

Remember, if you can increase transpiration, then cuttings can take up both boron and calcium through the roots. However, you may get a variety or two that exhibit tip abortion within the first couple of weeks after the cuttings are stuck. This may be due to stock plant management or the particular variety. Check with your cutting supplier to be sure. Otherwise, use mist wisely, foliar feed cuttings, add HID lights to your propagation area, keep your root media temperature 70 to 75F (21 to 23C) and promote good root growth. **GT**

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