Roots, Shoots & ENVIRONMENTALS

PART 2

The second installment of this three-part series focuses on producing a successful shoot system.

BY CARL SILVERBERG

Last month, we looked at optimizing the root structure to maximize the effectiveness of your greenhouse. Because the "shoots" section is so diverse, in Part 2 we're only going to focus on a few key elements. Before we do that, let's talk a little bit about cultivation styles.

A Western grower once told me, "For my business to be successful, it needs the shoot system to be successful. For the shoot system to be successful, it needs the root system to be successful. Once the root system has what it needs, the grower can dictate exactly how they want the system to grow."

Most growers would agree that there are two general styles of growing, the first being personal management techniques, i.e., "I have done this with this plant before, it was successful, and I'll do the same thing again." The other is, "I know from studies, research and other professionals that this method of growing will be successful across multiple varieties of plants."

Both styles are compatible with commercial greenhouse operations as long as a grower is willing to adapt to changing inputs. Plants will respond to either growing style.

There are certain critical periods during which a grower can make plants grow as successfully as possible. Without enough water, light, environmental factors or fertilizer at the key times of vegetative growth, you lose your ability to grow optimally. Miss it, and it's gone forever.

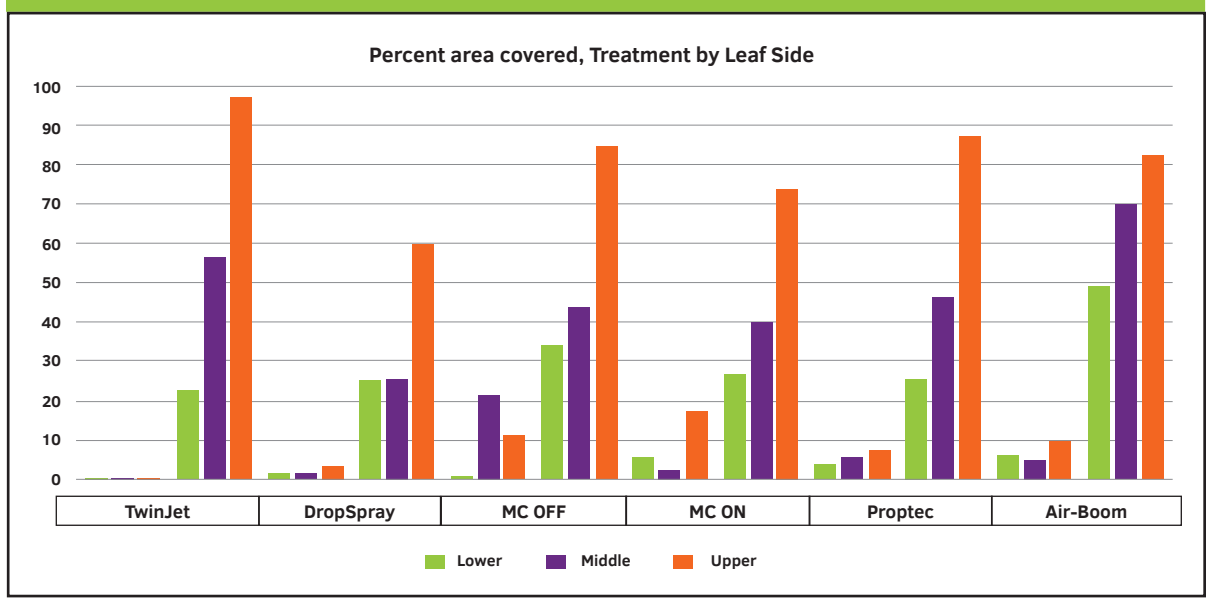
"The biggest pruning mistake that I see growers make is waiting too long; timeliness is critical especially in tomatoes," according to Bob Jones, Jr., owner of The Chef's Garden in Huron, Ohio, where microgreens and heirloom tomatoes are his main focus.

"You have to prune at the right time. If you prune too early, you damage the plant. If you prune too late, you damage the plant. You want to prune when it's in a rapid stage of growth, and the goal is to prune it back enough to encourage more growth without doing it so much that you injure the plant. The idea is to train the plant to go where you want it to go so the plant doesn't devote energy to the non-productive areas."

FOCUS ON VPD

Bob's point about key stages can't be stressed often enough. Maximizing each stage is what optimization is all about. Assuming you've got your pruning down to a science,

What you can see when you look more closely



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KC Browne
Cell: (817) 350-3462
kcbrowne@lambertpeatmoss.com

Richard Salas
Cell: (214) 399-0949
richards@lambertpeatmoss.com

Eric Stallkamp
Cell: (419) 787-6680
erics@lambertpeatmoss.com

what are some of the other critical aspects of cultivation that impact growth?

Nathan Eylands, a Ph.D. candidate at Cornell University, spends a good deal of his time in the greenhouse researching plant optimization. He talked about the importance of focusing on vapor pressure deficit (VPD).

"A lot of people measure relative humidity, but, to me, VPD is one of the most important measures," says Nathan. "VPD tells you how much moisture the air can accept whereas relative humidity tells you how much water is in the air. The key is how much water plants can transpire. If the VPD is too low, plants have a difficult time passing water to the air and allocating nutrients to the appropriate tissues. If VPD is too high, plants lose water too rapidly and risk plant stress. Understanding that different stages of plant development require different VPD levels helps optimize growth."

Every grower learned the importance of VPD in school or directly from a senior grower. As someone who's a contemporary of newer growers, I asked him to quantify the mistake of not focusing on VPD.

"You don't want to spend time and money lowering relative humidity when you don't have to. You may see the relative humidity above what is considered to be the optimal level but if your VPD is high enough, the air can accept more water. If you don't focus on VPD, you spend a lot of energy constantly turning on fans to lower your humidity and it's not necessary."

PESTICIDE APPLICATION

We can't have any "shoots" discussion without involving integrated pest management (IPM), but instead let's focus on one of the major greenhouse expenses — sprayers.

Mark Ledebuhr is the principal consultant with Application Insight LLC in Lansing, Michigan, and he designs pesticide application systems. His mantra: "Your control is only as good as the least covered part of your greenhouse. Failing to put a lethal dose of pesticide in difficult places leaves reservoirs of disease such as powdery mildew or thrips. These can blow up again if you don't get them wiped out the first time."

On average, the difference between the most and the least covered area is 50 to 100 times. It's common to get nearly 100% cover on the top of the leaf, while under the leaves in the bottom of the canopy, it can be as low as 1 or 2%.

"Is the answer to double your application rate, either with water, chemical or both? That's incredibly expensive," Mark explains. "Increasing the rate to make up for poor coverage zones just kills the same pest that was probably already dead at 15 to 20% coverage. I have yet to meet a grower that sees value in killing dead bugs. Worse, you may end up with residue problems and if you're growing food or cannabis, you do not want residues."

Mark explains that fine droplets are the key to canopy penetration. Small droplets, if you jet them deeply into your canopy, quickly begin to improve minimum coverage and can show a big improvement in control. A small increase is often all it takes to save your crop.

He says, "My two first suggestions are: 1) Learn where you are vulnerable, and 2) Train your applicators so they know where your weak spots are and how to get them. If you use a boom, get water-sensing paper out there and learn what's happening. Once you know, you can change nozzles, increase pressure, add some air assist, or other technology. Make sure you're getting those fine droplets where it matters in the canopy."

Recapping what we've been discussing, let's start with the fact that there is no right or wrong cultivation style for growing plants. The emphasis is to apply the proper cultivation techniques during the optimal growth stages. Our three experts have stressed the importance of timing whether you're pruning, adjusting your VPD, or controlling pests. Prune too early or too late, be a bit lax with your VPD or miss the signs of pest or pathogen detection, and you lose your ability to deliver maximum production. gpn

Carl Silverberg is senior vice president of outreach and public affairs for iUNU. He can be reached at csilverberg@iunu.com.