GROWERTALKS

Growers Talk Production

2/1/2019

Biological Control—Reinventing Pests

Albert Grimm

How do we decide that a pest is a pest?

On the surface, this may sound like an absurd question, but it becomes legitimate when we step outside our conventional pest control box. Some old horticulture text books list spidermites not as a pest, but as an indicator for poor climate control. Whitefly was considered economically unimportant by several authors. The greenhouse pests that everybody was worried about included the Camel Cricket (*Diestrammena asynamorus*) and the Chrysanthemum Midge (*Diarthronomyia hypogaea*). I've never seen either of these insects, and without the help of Wikipedia, I wouldn't even know what they look like. What happened?

Pests didn't evolve in nature; pests were created by man. Before human civilization started to farm, nature maintained perfect balance between those that were being eaten and those that were eating. This levered balance is what we call an ecosystem. When humans started farming, we began to extract more food from nature than what the natural system had reserved for us. Farms were still an ecosystem, but we moved the pivot point of natural balance. Farmed crops provided more food, not just for the farmer, but also for those critters that had the ability to quickly adapt to changing circumstances. We had created pests.

Until pesticides emerged about 150 years ago, farmers intuitively understood this notion, and they used various methods of ecosystem management to put pressure on the pests that competed with them for food. In essence, those farmers were practicing biological control. They just didn't give it a fancy name.

When the first pesticides (arsenic, cadmium, lead, sulfur, copper and kerosene) became commercially available towards the end of the 19th century, farmers gradually changed the paradigm of pest control from trying to manage the ecosystems within their farms toward attempting to remove individual species from these systems. This concept of targeting and eliminating became pervasive with the advent of synthetic pesticides in the late '40s and early '50s, and it's changed our understanding of what "makes" a pest in very fundamental ways.

What's lost in our understanding is the fact that we continue to manage ecosystems, even if we rely exclusively on synthetic pesticides. Until very recently, pesticides attempted to shift the fulcrum on which our ecosystem rests to one extreme, i.e., to exclude anything but the crop. We tried to remove any need for balance by attempting to allow only a single factor to occupy the entirety of these ecosystems.

This obviously worked very well for the primary pests of the 1950s because we no longer recognize them, but it also provided a perfect environment for the most pesticide resilient among the remaining occupants of those systems. They could now take advantage of a plentiful buffet where they no longer had any competition from other hungry guests.

And this is how we ended up with our current collection of problem pests: thrips, whitefly, aphids, leafminers and spidermites. None of these had been able to secure a top spot on the target list of our grandfathers. These organisms had morphed into primary pests not because they were particularly damaging to our crops, but because they were particularly effective at adapting to the eco-sterile environment created by broad-spectrum pesticide use. Worse—the more pesticides we threw at them, the more effectively we selected those individuals with the most advanced ability to escape any effects.

Thankfully, manufacturers today are creating more targeted pest control solutions and are also seeking out new modes of action that help prevent resistance. These products, used wisely, help create less-exclusive environments, which should allow us to re-introduce natural antagonists that help us re-create a pivot point, which we can use to manage the ecosystem we call a greenhouse. When we learn how to use biological control, we're simply rediscovering some of the concepts that were once bread-and-butter (quite literally) to our farming ancestors.

It's important to understand that we must shift our pest control paradigm from target-and-destroy to balance-and-exclude if we want to be successful with biological control. It's a fallacy to think that biocontrol would be as simple as replacing synthetic chemicals with biological pesticides that come in a shaker bottle—such an approach leads to the wrong conclusions, the wrong methods and to a lot of wasted money.

With biological control, we cannot realistically expect to achieve a goal of pest eradication, but we can accomplish a managed ecosystem in which we move the pivot point of balance further away from the pest and closer to the predator until any damage to the crop becomes negligible compared to the cost of control.

The smaller we maintain pest populations in our system, the less biological counterweight it takes to balance them. If we build up our biocontrol agent (BCA) populations very early, when pests are still barely detectable, it takes a lot less input to keep up enough pressure to out-compete the pests. Comparatively small populations of beneficial antagonists can provide adequate control, as long as we can detect pest pressures before they become acutely noticeable.

Consequently, it's critically important to adopt new scouting methods that allow us to assess very small populations of different pests. Simple monitoring with yellow sticky cards is inadequate for this purpose because the detection threshold is too crude.

For the same reason, biological control must be preventative and anticipatory. We must always maintain enough beneficial population to out-compete any potential developing problem before it becomes visible. We save a lot of money later if we spend enough on early controls.

Ultimately, it's not possible to outsource these pest management tasks without direct involvement of the crop manager because no external scout has the ability to assess the pest status of a crop with the necessary accuracy. Likewise, an external scout cannot accurately quantify the necessary BCA introductions because this requires awareness of all aspects of a greenhouse's specific parameters.

There are no universal recipes. Every greenhouse ecosystem has too many levers, which are as diverse as crop temperature, photoperiod, air flow, humidity and the engagement of every staff member that interacts with this system. Whether you like it or not, you'll have to learn how to work all of these levers before you can operate a machine running on biocontrol. **GT**

Albert Grimm is head grower for Jeffery's Greenhouses in St. Catharines, Ontario, Canada.