

Organics and Biological Control in Propagation[®]

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Even the most conventionally trained professional growers are learning now how to manage biologically active materials, and living organisms in their greenhouse growing systems. Materials for consideration by nursery operators would include: biologically active container media, the addition of microbial-based products (both bacterial and fungal), biostimulants, beneficial insects, and nematodes.

INTRODUCTION

Growers are discovering a wide range of benefits as they begin to build biodiversity into their operations. We are essentially learning how to stack “environmental services” into otherwise sterile growing systems. Some of the many benefits include increased worker safety, decreased use of pesticides, enhanced root growth and nutrient utilization, heightened flower color, and marketability. As scientific data continues to accumulate regarding the multiple benefits of increasing biodiversity on farms with food crops, there are correlations between growing sectors worth noting. These data support what organic farmers already recognize about the self-regulating effects of their operational models. These concepts are to some degree transferable to our largely conventional models of growing container plants for market. The presentation at IPPS in Bellingham attempted to give an overview of how we might achieve these goals of enhanced biocontrol and fertility through the use of some accessible tools, like beneficial insects and compost teas.

UNDERSTAND YOUR MOTIVES AND GET SUPPORT

Growers please consider the following:

- It is important to have clear and specific goals. Approach the problem all or nothing, or area by area.
- Make sure your goals are realistic. Will the management and staff agree on what is envisioned?
- Create a budget based on these goals. Keep it reasonable and affordable.
- Implement a simple program in propagation. Note and track your small successes, and if there is a glitch, make note and get support.
- Note your improvements in plant quality. Point these things out to team members that might not notice your efforts, or how it might affect them as that plant material move from propagation to the next growing stage.
- Build trust amongst your staff members, so there is an understanding if they communicate well with you, you will be responsive to them, and that you can create a track record of successes as you learn how to use these new tools.

- Document your small victories and share experiences with the rest of your team.
- Distinguish your product and capitalize on your investments and good intentions.

CONSIDERATIONS BEFORE BEGINNING WITH BIOCONTROLS

Adopting the use of beneficial insects and/or nematodes in your operation is a good place to begin, but will take a good, full year to gain experience and confidence in using these new tools. As growers we know there are certain issues that begin at specific times in the crop cycle. Good planning is essential to your success. Planning in the summer and fall for the new cycle of cuttings and seedlings in your propagation makes the most sense for starters. Schedule time or enlist someone in your ranks to help you do the planning. Begin early and give yourself adequate time to do so.

Assess the major problems/pests that you see most important to address. Consider what both the risks and benefits of reducing or eliminating pesticides in a given growing area might be. Maybe the risk of eliminating a certain systemic pesticide in a hanging basket crop is too great an economic risk to take. Consult a knowledgeable supplier that you trust to help you assess the best place to begin. Do plenty of research, reach out, and talk to other growers that have been successful. If you find growers to talk to that have not been successful, try to gain an understanding as to what might have gone wrong for them. It is good to recognize that every growing system is different, even in identical greenhouses with similar crops. There are also seasonal differences in how beneficial insects might work. For example, the aphid predator, *Aphidoletes aphidimyza*, is daylength sensitive and diapause could be a factor in its effectiveness in midwinter without some supplemental light.

Additional factors can affect your biological control program and are important to consider. These include: freshness of product, quality of product, inconsistencies in application methods, and the quality of the monitoring system. All these aspects need to be managed, as they can impact the success of a grower beginning to use biocontrols. Feeling supported and having a backup plan is always important. Learning from people that have made mistakes. Learning from those mistakes can be one of the most invaluable components of your planning process, accelerating the learning curve and creating a short cut to success.

After you have set your realistic first-season goals, make sure you have a game plan for handling spots of pest insects that are bound to occur. These may require a small chemical application.

- What is in your current chemical arsenal?
- Are those materials compatible with insects that you would wish to use in those areas?
- Do you need to have a few “softer” pesticides or perhaps different fungicides on hand?
- Are you committed to stopping all routine spray programs in the treatment area?

A plan “B” is always in order.

You can get some idea of chemical side effects on a web site like this one: <<http://side-effects.koppert.nl/>>. Please consider all off-target innocent bystanders such as bees that will be attracted to pollen in flowers. Consider all impacts. There will be caveats to using information sources like this, but they can be very useful tools.

Develop a pest monitoring system that works for you. If you are not currently using yellow sticky cards, get into the habit of reading and recording fungus gnat, western flower thrips, shore flies, and other basic pests that can be easily monitored by these weekly counts. Some operations make sure that the person who does the counts is different than the pest manager, who may get too busy or take short-cuts. Training someone to take more time to look at the foliage of the crops, digging deep for aphid colonies, watching for early signs of mite damage, or other irregularities out of the norm of the healthy patterns we see in good plant growth is critical. Some data is easy to record and some growers are beginning to take advantage of different computer logging systems for this information, so they can easily reference and note patterns from year to year, crop to crop, area to area. There is a free beta version of a monitoring system you can download created over the last year or so by Krishna Reddy at Blooming Nursery in Oregon. It can be accessed at: <<http://www.ipmsuite.com/>> and login using the following credentials:

- Email Address: krishna@bloomingnursery.com
- Password: demo

You can configure as you like, adding the pests that you wish to track. For someone starting new, they can sign up and create an account. Then setup:

- **Scouts and Locations** being monitored
- **Pests** being monitored
- **Monitoring tools** being using (sticky cards, tape, etc.)
- **Record pest data** by location

Add new locations as needed. For those who choose to experiment, we would love feedback as to how it works for your operation.

Before beginning to implement your beneficial insect program, it is important to reduce pest pressure in your operations. Biological control is largely preventative in nature and it is important to have a proactive approach, and to start with as clean a crop as possible. One of the biggest problems in biocontrol today is not knowing what your plug or liner supplier might have used on their plant material before shipping to you, the customer.

The importance of cultural sanitation and hygiene in your operation should go without saying, as build up of wet soils or decaying plant material, drip zones, or leaky faucets can all create an environment where pests that feed on algae (and plant roots) can thrive. Keeping the propagation area very clean, even if you have gravel floors is a great goal. Improving this can be as simple as covering well-drained gravel floors with ground cloth that is pinned to the very edge of where your cement walkways begin. This makes for much easier cleaning. Short of that, many growers find creative ways to “take advantage” of these not-so-positive wet pockets and use them to propagate their own biocontrol agents under the benches: for example, the rove beetle, *Atheta coriaria*, can be established in these wet conditions and used to augment a grower’s shore fly and fungus gnat control. This complements the use of the predatory mite, *Stratiolaelaps scimitus* (syn. *Hypoaspis miles*), for fungus gnat control. While the *Stratiolaelaps* predator mite is busy on fungus gnat larvae in the container soil, the rove beetle is patrolling the floor and flying up into the container area as needed. Adding the next dimension, western flower thrips (WFT, *Frankliniella occidentalis*), is often the next consideration. Another voracious predator mite, *Amblyseius cucumeris* (syn. *Neoseiulus cucumeris*), works in the canopy of the plants and searches for young thrips as they hatch out of the foliage. The addition to

A. cucumeris helps complete the control program, increasing efficiency of the other biocontrols. Bases are now covered for fungus gnats, shore fly, and to a good degree the western flower thrips. Western flower thrips are now the key pest in ornamental horticulture. They transmit both tomato spotted wilt virus (TSWV) and impatiens necrotic spot virus (INSV). Feeding directly on leaf and flower tissue, WFT need to be considered at all stages in horticultural plant production. Biocontrol for WFT is indeed possible, but requires proactive planning and monitoring. An adult WFT can lay 300 eggs in her lifetime and larvae can crawl or jump quickly through a plant system. Wherever pollen is present, the WFT can cause extensive damage. For all these reasons it is crucial to reduce pest pressure before beginning your program. Chemical treatments have become largely ineffective because of extensive pest resistance in our industry. Biological control is actually quickly becoming a more effective means for WFT control in North America, Holland, Spain, Denmark, and other places where biocontrol is quickly becoming more the norm.

MICROBIAL APPROACHES TO PLANT HEALTH — COMPOST TEAS

There are many more examples, even in greenhouse ecosystems, where, as we begin to build more diverse, interactive systems between insects, and perhaps the microbial world, there is a natural balance that can be achieved. Biodiversity continues to be the keyword here, yet the challenge of creating that in a plant container is something that most growers are just becoming familiar with. Examples of registered organic fungicides that are based on beneficial microbes would be the Cease™ (*Bacillus subtilis*), Actino-Iron® (*Streptomyces lydicus*), and PlantShield® and RootShield® (*Trichoderma harzrianium* T-22). These materials are most often beneficial bacterial strains that have specific modes of action against common diseases like *Pythium*, *Phytophthora*, *Rhizoctonia*, *Verticillium*, and others. They have been used on a wide range of crops at this time and much info is available online.

Just coming into the spotlight is the use of aerated compost teas, which although they are not registered biological fungicide products, they are enjoying popular acceptance. Compost teas can and will vary from grower to grower, depending on their production methods. Those who make them consider this a positive, not a negative. How a grower brews their compost tea extraction, what composts are chosen, temperatures, foods, air level in the tank, extraction devices, can all affect the outcome. Custom tea recipes are available for specific target problems. Organic and conventional farmers around the world have been fine-tuning these methods for some time and now professional horticulturalists are doing the same. The downside of the compost teas in comparison to the aforementioned “bugs in a jug” approach is that they do not contain the exact concentration of specific lab-reared microbes that the registered products must meet. Another downside could be that they do take equipment to brew on site and take a little time to set up and clean up. The upside is that they can indeed be tailor-made for a grower’s needs and contain a huge array of beneficial bacteria and fungi. This diversity is where we find a growing body of scientific knowledge every day, as we determine that there are so many microbial modes and mechanisms of activity in both the soil system (rhizosphere), as well as above ground in the plant canopy.

LITERATURE AVAILABLE TO YOU ON REQUEST

- Biological control questionnaire to get you started.
- Tech sheets for specific beneficial insects and compost-tea production guidelines.
- Biocontrol quality assurance standards and checklists.
- Becker Underwood nematode/chemical compatibility charts.
- Illustrated guide to biocontrol: *Knowing and recognizing the biology of glasshouse pests and their natural enemies*. M.H. Malais and W.J. Ravensberg, published by Koppert Biologicals.

QUESTIONS AND ANSWERS

Anonymous: How can I learn more on this topic? Can you direct me to resources?

Alison Kutz-Troutman: Check out <<http://soundhorticulture.com/>> and I'd be happy to talk with you individually. I'd also be happy to visit anyone's nursery.