Great Lakes Fruit, Vegetable & Farm Market EXPO

Michigan Greenhouse Growers EXPO

December 9 - 11, 2014

DeVos Place Convention Center, Grand Rapids, MI

Greenhouse: Greenhouse Biological Control - Putting it All Together for a Successful Outcome

Tuesday morning 9:00 am

Where: River Overlook (upper level) Room C & D

Learn how Canadian growers and researchers have teamed up to develop successful biocontrol programs for greenhouse ornamentals. Research will be presented on banker plants, predatory mites, nematodes and fungi used to control greenhouse insect pests

Sponsored by: Biobest USA

MI Recertification credits: 1 (COMM CORE, PRIV CORE)
OH Recertification credits: 0.5 (presentations as marked)

Moderator: Gordon Berkenpas, Green-Dorr Greenhouses, Dorr, MI

9:00 am Putting It All Together for A Successful Outcome (OH: 6D, 0.5 hr)

- Rose Buitenhuis, Vineland Research and Innovation Center, Ontario, Canada

9:50 am Session Ends

Greenhouse Biological Control: Putting It All Together For A Successful Outcome

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A systems approach to IPM

There are many reasons why growers are looking into using biological control, including pesticide resistance, fewer new pesticide registrations, regulatory changes, health and environmental risks and consumer expectations. Yet, biological control is often seen as less reliable and more expensive than the chemical alternatives. One of the causes for this perception is that you can't directly substitute one for the other, but that switching to biological control-based IPM involves a shift in how you approach pest control and how you put it all together for a successful outcome.

Contrary to reactive chemical pest control, which generally has a rapid and readily observed effect on pest numbers, biological control is best utilized in a more preventative manner and effects are less evident in the short-term. This means that we try to predict pest outbreaks and establish biocontrol agents before pest numbers exceed a critical threshold. However, to be really successful, we have to understand the reason why there are pest outbreaks. If not, we will always face a recurrent pest problem. Fixing a situation that is inherently flawed is possible, but takes a lot of effort (and money). Using biological control thus involves a change from reactive interventions to redesigning the components of the production ecosystem to address underlying weaknesses that have allowed organisms to reach pest status. This is also called the **systems approach**. In successful IPM systems, pests are slower to reach damaging levels, biocontrol agents work better, plants are better able to tolerate feeding injury and conventional pesticides are rarely required.

To apply the systems approach to pest control in protected culture, three factors need to be considered to obtain effective pest control: the **right plant**, the **right environment** and the **right control agents** (Figure 1). IPM practitioners need to build their pest management strategy on at least two, preferably all three of these factors. Although they seem separate, these factors are not independent. There are many interactions between the factors and changes in one factor will affect the results of other factors in the system (symbolized by the circle in Figure 1). All parameters within the system have to be chosen to be disadvantageous to the pests, make the crop less susceptible/ acceptable to pests, make biocontrol agents as effective as possible and still produce a good crop for a profit.

To illustrate some of the above mentioned principles I present two case studies: greenhouse poinsettia and potted chrysanthemum.

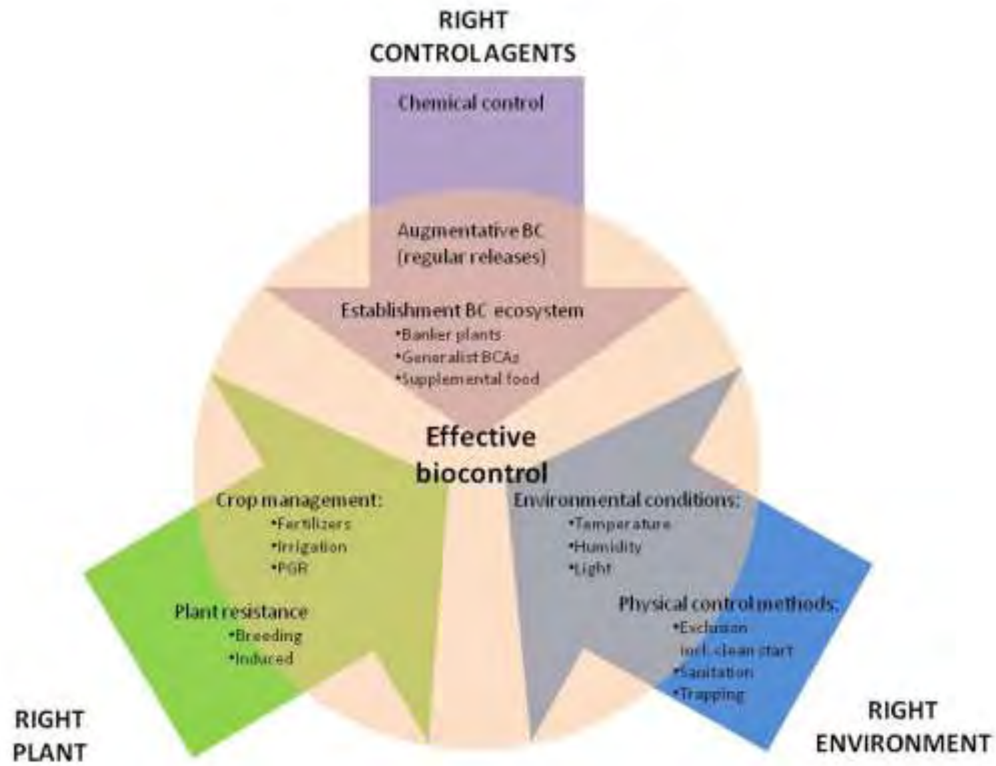

Figure 1. Essential factors for effective pest management using a systems approach.

Greenhouse poinsettia: clean start

Although many insects and mites can infest poinsettias, by far the most important are whiteflies (*Bemisia*). The emergence of resistant whitefly biotypes, lack of access to effective products in Canada and inconsistent control provided by insecticides prompted growers to shift to biological control. Many growers now effectively use biological control to manage *Bemisia* with minimal to no pesticide inputs.

Historically, poinsettia cuttings shipped into Ontario from offshore production facilities have carried very low levels of immature *Bemisia*. In 2012, though, cuttings arrived into Ontario carrying large numbers of *Bemisia* eggs and nymphs. Although parasitoid releases proceeded as normal, they failed to regulate whitefly populations and multiple pesticide treatments were required. However, endemic whitefly resistance (owing to heavy pesticide pressures in offshore production facilities) means that pesticides registered in Canada frequently have reduced efficacy. Furthermore, pesticide residues on imported material can have a direct effect on parasitoid survival and performance, which can further impact control efforts. To ensure greater sustainability in poinsettia production, new methods of control are required that can be applied to cuttings to prevent pest populations developing beyond the ‘capacity’ of the parasitoids used, and to ensure that effective biological control systems can be maintained through the crop production cycle.

Several biopesticide treatments, applied to infested cuttings by dipping immediately prior to sticking, have been tested to assess their relative effectiveness against whitefly, ensure compatibility with parasitoids, and that they are not phytotoxic. The project has allowed effective treatments to be identified that can be readily implemented on a commercial scale.

Potted chrysanthemum: so many options

Use of biocontrol in greenhouse ornamentals, such as potted chrysanthemums, has increased dramatically over the past 10 years. One major factor driving this change was control of western flower thrips. When this pest developed resistance to spinosad, Canadian growers were left with few effective pesticide options. Biological control strategies for thrips have to be devised to accommodate many factors and a preventative approach is required for their management. The following paragraphs describe research that has helped optimize thrips biocontrol strategies in greenhouse ornamentals.

Assume the cuttings arrive infested with low numbers of thrips. To start clean, cuttings can be immersed in reduced risk materials or biopesticides before sticking. Under misting and in long days, weekly Botanigard sprays and broadcast applications of predatory mites will control foliar stages of thrips, while weekly nematode sprenches (heavy spray) to the soil will manage thrips pupae in the substrate. Note that it is increasingly difficult to apply nematode sprenches to the substrate as the plant canopy grows and covers the soil. Combining nematode applications with another entomopathogenic fungus, Met52, incorporated in the soil will cause even higher thrips mortality.

When plants are then spaced, they form small isolated islands. Predatory mites will not easily spread from pot to pot unless the plant canopies are touching. Growers in Ontario have had good success using slow-release mini sachets. When using sachets, they should be placed in the plant canopy where they are protected from the sun. Direct exposure to sun in the summer raises the temperature and lowers the relative humidity inside the sachets, which significantly reduces the number of predators produced and the ‘lifespan’ of the sachets. The two main predatory mites used in Canada for thrips control, *Neoseiulus cucumeris* and *Amblyseius swirskii*, are very similar. However, in summer, *A. swirskii* performs better due to better survival under hot greenhouse conditions.

The generalist predator *Orius insidiosus* is not normally considered for use in greenhouse ornamentals because production cycles are relatively short. This does not provide enough time for populations of the predator to establish and the lack of an alternative food source (e.g. pollen) further limits population growth. The use of ornamental peppers (cv. Purple Flash) as banker plants solves both these problems, providing a long-term refuge for the predator combined with a pollen source. *Orius* populations will develop on these banker plants, and migrate into the main crop where they will contribute to thrips control.

Finally, the use of biocontrol for thrips necessitates the use of biocontrol for other pests as well, due to the limited availability of compatible pesticides.

Final thoughts:

Although details are important, take a step back from time to time to look at the big picture. The solution to a problem might not be where you expect it to be.

For more information on any of the presented materials, please contact Rose Buitenhuis (Rose.Buitenhuis@vinelandresearch.com).

Acknowledgements

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