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Starting and Sustaining a Beneficial Insect Program

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Summary

Having a beneficial insect program provides effective pest control but also helps prevent future pest outbreaks while reducing chemical treatments and chemical resistance. When starting a beneficial insect program essential components to consider include consulting with experts, training staff, and implementing a detailed.

INTRODUCTION

In 2018, Spring Meadow Nursery encountered significant challenges of pest resistance in two-spotted spider mite (TSSM (*Tetranychus urticae*), a key pest in the operation. Despite applying chemicals one to two times per week, TSSM outbreaks persisted, and the effectiveness of traditional spray methods diminished. In response, a trial program was initiated by incorporating beneficial insects into the integrated pest management strategy. Beneficial insect companies suggested targeting the most affected crops with the highest TSSM populations, the roses. A small-scale trial was conducted on approximately two acres of rose greenhouse production. The successful reduction in TSSM populations with minimal chemical sprays in this area led to the expansion of the beneficial insect program across the entire 50+ acres of greenhouse production. This integration of beneficial insects has resulted in improved pest control, particularly for TSSM, a reduction in chemical pesticide use, and valuable insights on how to establish and optimize a beneficial insect program in a large-scale greenhouse operation.

Starting a Biological Insect Program

Spring Meadow Nursery began its beneficial insect program in 2018, and learned many lessons along the way. Several key considerations are crucial when it comes to setting up a program:

1. Identification of target pests: Identifying the primary pest(s) to target and select the most appropriate beneficial insect(s) for control of the pest. It was identified that *Tetranychus urticae* was the primary pest at Spring Meadow Nursery due it its chemical resistance (Maffly, University of Utah, 2023) and its detrimental effects on plant quality.

2. Selection of beneficial insects: Over the past six years, Spring Meadow Nursery has trialed various beneficial insect species for TSSM, including *Neoseiulus californicus, Phytoseiulus persimilis, Amblyseius andersoni,*and *Neoseiulus cucumeris.* Among these species, it was found that *P. persimilis*, commonly known as the spider mite destroyer (**Fig. 1**), proved to be the most effective in controlling TSSM outbreaks under optimal environmental conditions (temperatures between 70-80°F and relatively humidity above 60%). In addition, it was found that supplementing with *N. californicus* and *A. andersoni* during temperature extremes in the beginning and end of the growing season enhanced the program's success, as these species are able to tolerate a broader range of temperature and humidity conditions compared to *P. persimilis.*

Figure 1. *Phytoseiulus persimilis,* commonly referred to as the "spider mite destroyer," preying on *Tetranychus urticae* (two-spotted spider mite). Image courtesy of Biobee.

3. Targeting secondary pests: In addition to TSSM, Spring Meadow Nursery addressed secondary pests such as aphids, thrips, and other soft-bodied insects. To do so, a portable, self-watering banker plant

system (**Fig. 2**) was designed, which is easily moved to areas experiencing pest outbreaks. This system serves both as a protective habitat and as an alternate food source for beneficial insects. The following beneficial insects are commonly released on these banker cart systems: *Aphidius colemani*, a parasitic wasp that feeds on aphids (**Fig. 3**), *Dicyphus hesperus*, which feeds on soft-bodied insects, and *Orius insidiosus*, which preys on thrips.

Figure 2. A portable, self watering banker cart system, custom built at Spring Meadow Nursery, containing *Triticum aestivum* (winter red wheat grass), *Lobularia maritima* (sweet alyssum), *Verbascum spp.* (mullein), *Portulaca grandiflora* (portulaca), and *Capsicum annuum* (purple flash pepper). Image courtesy of a Spring Meadow Nursery grower.

4. Quantifying beneficial insect requirements: To determine the optimal quantity of beneficial insects needed for Spring Meadow Nursery, growers collaborated with insect suppliers to establish insect application rates based on square footage.

The growers, with the help of insect suppliers, developed a calculator that allows growers to input the growing space, select the desired insect species, and determine the required quantity of insects. This calculator serves as a tool that ensures precise, data-driven decisions and effective pest management.

Figure 3. Parasitized aphids, a result of *Aphidius colemani* parasitism. Image courtesy of a Spring Meadow Nursery grower.

Sustaining a Biological Insect Program

While initiating a beneficial insect program is critical, its long-term success depends on dedication and consistent maintenance. At Spring Meadow Nursery, growers have identified several essential strategies for sustaining a successful biological control program over the course of the growing season:

1. Regular applications: Weekly or bi-weekly applications of beneficial insects are necessary to maintain pest control effectiveness. Without a consistent food supply, beneficial insect populations decline rapidly (within 5-7 days). Regular applications

not only replenish the beneficial insect populations but also facilitate their reproduction and growth, ensuring a continual cycle of pest control.

2. Use of Technology: To enhance the efficiency of insect applications, growers at Spring Meadow Nursery integrated modern technologies, such as the BugFlow system from Biobee (**Fig. 4**). This system enables even distribution of beneficial insects across large greenhouse bays, reaching up to 12 feet across from the application point. This has reduced the limitations associated with hand applications, which only covered a limited area and often resulted in uneven distribution of beneficial insects.

Figure 4. (left) Bug flow system developed by BioBee, (right) Freedom Shelley, grower at Spring Meadow Nursery, holding an assembled bug flow unit. Image courtesy of Biobee and Spring Meadow Nursery grower.

3. Chemical Compatibility: One challenge in maintaining a biological control program is the potential of adverse effects of chemical pesticides on beneficial insects. Certain chemicals can kill up to 75% of beneficial insect populations, compromising pest control efforts. To mitigate this, growers at Spring Meadow Nursery prioritize the use of "softer" chemical sprays that have minimal impact on beneficial insects (typically 25% mortality). They also utilize resources such as the spray compatibility tools provided by Koppert and Biobest, which allows them to assess the impact of specific chemicals on beneficial insect populations. This helps ensure that pesticide applications do not undermine the effectiveness of the beneficial control program.

Conclusion

In conclusion, starting small, carefully selecting the appropriate beneficial insect species, consulting with experts, training staff, and implementing a detailed plan are essential components for establishing a successful and sustainable beneficial insect program. Having a beneficial insect program not only provides effective pest control but also helps prevent future pest outbreaks while reducing chemical treatments and chemical resistance. Lastly, a key advantage of using beneficial insects is that pests cannot develop resistance to a predator that consumes them, ensuring no resistance, long-term effectiveness and sustainability of an integrated pest management program.

Resources

Biobee**:** www.biobee.com

Biobest: www.biobestgroup.com/side-effects-app

Koppert – Side Effects**:** Sideeffects.koppert.com/side-effects/

Maffly, B. (2023). Research unravels how spider mites quickly evolve resistance to toxins. The University of Utah. https://attheu.utah.edu/research/research-unravels-how-spider-mites-quickly-evolve-resistance-to-toxins/