Managing Whiteflies in Poinsettias Using Biological Control Agents

Recent research shows the use of biological controls, along with scouting, can be an important part of a grower's whitefly management program.

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Whiteflies are a common annual pest of ornamentals, and with the growth of insecticide-resistant species, retailer restrictions on specific insecticides, and increasing regulations on pesticide applicators, management of whiteflies is not getting any easier.

A whitefly management strategy relying solely on weekly insecticidal applications may be considered shortsighted due to the seemingly inevitable possibility of insecticide resistance. It also fails to consider an increasingly popular pest management strategy: augmentative biological control. This form of biological control utilizes commercially available predators or parasitic wasps that are released regularly (weekly or monthly) to manage a target pest.

When considering the use of biological control to manage pests in greenhouses, growers frequently voice two main concerns: 1) ornamentals have zero pest tolerance, and biological control cannot provide 100% control of pests, and 2) biological control is too expensive. These concerns have good merit, and we will try to address them in this article.

How Many Is Zero?

It is rarely possible to get 100% control of any particular insect pest, but perhaps populations can be low enough to be considered undetectable. At retailers in Texas, we found between four and 36 immature whiteflies in 2016 and between 25 and 73 immature whiteflies in 2018 per poinsettia on average, depending on the retailer. These whitefly densities are with current management practices, which in Texas are regular insecticide rotations. So zero is actually a quantifiable number, and our goal is to maintain whitefly densities below this number in a biological control program.

Which and How Many Biological Control Agents?

Growers are often left to decide whether to use multiple biological control species or double down on a single species. So which is better? We conducted a series of trials with up to 12 poinsettias in isolated cages and consistently found that the combination of the predatory mite *Amblyseius swirskii* and parasitic wasp *Eretmocerus eremicus* provided similar or superior suppression of whiteflies compared to either species alone. One potential explanation is that these two organisms feed on different life stages of whiteflies; the parasitic wasp prefers 2nd instar whitefly nymphs, whereas the predatory mite prefers whitefly eggs and 1st instar whitefly nymphs.

In terms of how many, in a commercial-scale poinsettia biological control trial, we found that releasing between 1.8 to 2.6 *E. eremicus* pupae per square meter every week and between 27 to 44 *A. swirskii* per square meter every four

Adult parasitic wasp (*Eretmocerus eremicus*; left) and predatory mite (*Amblyseius swirskii*; middle). Parasitic wasps are often distributed on pupal cards hung near the plant canopy (right), and predatory mites are often distributed in slow-release sachets (not shown) or distributed through a modified blower on carrier material (seen on leaves in the image on the right). Koppert Biological Systems is one of many companies that produce and sell biological control agents; some others include Beneficial Insectary, Bioline AgroSciences, Applied Bio-nomics, and BioBest. Photos: Erfan Vafaie

weeks on average was economically comparable to insecticide inputs and within the recommended release density provided by commercial insectaries (e.g., Koppert Biological Systems recommends between 1.5 to 3 pupae for *E. eremicus* and between 25 to 50 mites for *A. swirskii* for preventative applications by growers).

Monitoring Is Critical

In trials we conducted in commercial poinsettia production, we monitored a minimum of 50 poinsettias weekly out of 3,722 within a given greenhouse (about 1% of the crop). On average, it took us about one minute to inspect 20 leaves per plant when whitefly densities were low. We counted whiteflies of all life stages and tabulated the results.

Not only does systematic monitoring help determine when curative insecticide applications are needed to suppress whitefly numbers, it also helps inform at what whitefly densities we can expect the population to rapidly increase again in the future, allowing us to be proactive in our management. To draw these kinds of patterns, yellow sticky traps are insufficient. In reality, yellow sticky traps are not great at determining the density of insects on nearby crops, but rather, can serve as an early indicator of the presence of an insect. More elaborate monitoring of the individual plants and inspecting the undersides of leaves will produce a much more accurate idea of infestation levels in the crop.

Can it Work?

In commercial-scale trials at three grower locations in 2019, we released *E. eremicus* weekly and releases of *A. swirskii* every four weeks. We were ultimately able to provide similar whitefly densities in the biologically controlled greenhouses as the conventional insecticide greenhouses and within the densities we found at retailers. Economics of biological control were comparable to conventional insecticides, costing anywhere between 0.6 to three-fold the cost of the greenhouse's management with conventional insecticide rotations. One of the reasons for this discrepancy in cost was related to the valuable information gathered through monitoring; growers had accurate and timely monitoring data available to them, and as a result, drastically reduced insecticidal applications in the conventional insecticide greenhouses due to low whitefly pressure — a lesson to be learned in the economic value of spraying insecticides informed by trends in monitoring data. GG