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Making The Case For Pesticide Use

No single pest management strategy will effectively solve every arthropod pest problem, so other pest management strategies must be implemented or considered.

By **James A. Bethke**

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Those of us who study issues related to ornamental plant production are well aware of the trend or demand toward reducing pesticide (insecticide and miticide) use based on the concerns associated with harmful effects to humans, animals, water and the environment. Federal and state laws or regulations limiting the number and types of pesticides available to greenhouse producers have challenged the ornamental industry, and ongoing reviews of pesticide classes like the pyrethroids and neonicotinoids may further limit the number available in the future.

Our industry, however, can make a good case for the appropriate and proper use of both conventional and alternative pesticides in greenhouse production systems where alternative pest management strategies may not result in a saleable crop.

Need For Quality

First, it is critical a quality crop be produced to successfully compete in the global marketplace. The value and quality of the crop are based on aesthetics, and consumer demand for high-quality ornamental crops is high. To that end, more attention needs to be focused on arthropod pests (insects and mites) and the potential economic losses they can cause.

In addition, predicting future crop production, which can take a year or more, is based on the market. However, a single arthropod pest population can render a crop unmarketable at any point during the production cycle. Therefore, most greenhouse producers cannot wait for arthropod pest populations to build up to threshold levels that are common in agriculture. So in actuality, pesticides serve as an "insurance policy" to manage or regulate the diversity of arthropod pests.

In contrast to the common monoculture production systems in agriculture, the diversity of plant material grown in greenhouse production systems lends itself to a greater arthropod pest complex. Therefore, the challenge is protecting an aesthetically valuable crop from a broad spectrum of arthropod pests, including aphids, thrips, mites, whiteflies, mealybugs and fungus gnats.

The intensive nature of production and aesthetic quality requirements of producing ornamental plants makes the use of pesticides imperative to the ornamental industry. The use of pesticides also allows greenhouse producers to successfully compete in national and international markets.

Fear Of Pesticides

The mere mention of the term "pesticides" to the general public unfortunately conjures up images associated with environmental and groundwater contamination, harmful effects to humans and animals, negative effects on natural enemies such as parasitoids and predators, and concerns regarding pesticide resistance. It has been proposed that no chemical, whether natural or synthetic, may be considered completely "safe."

Although these are valid concerns, the benefits of applying pesticides (both conventional and alternative) correctly are rarely if ever acknowledged. The advantages of using pesticides in food production are well known, accepted and generally taken for granted. The benefits of pesticides, however, as it pertains to the production of greenhouse-grown crops is seldom presented or brought to the attention of the end-users: consumers or homeowners.

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Benefits Of Pesticides

In addition to their selectivity, many of the newer alternative pesticides have short residual activity, are less toxic to humans and mammals, and require less active ingredient in order to achieve "control." They also leave minimal hazardous residues, are less harmful to the environment and have minimal direct and/or indirect impact on natural enemies, including parasitoids and predators. In fact, a number of commercially available alternative pesticides may be used in conjunction with natural enemies. Research has demonstrated certain alternative pesticides are compatible with parasitoids, predatory mites, predatory bugs, green lacewings and ladybird beetles.

Pesticides allow greenhouse producers to control or regulate a myriad of arthropod pests, which may be less expensive and more practical than other pest management options. For example, the costs associated with using the parasitoid, *Encarsia formosa* for regulation of the sweet potato whitefly B-biotype, *Bemisia tabaci* (informally called the silverleaf whitefly) on poinsettia (*Euphorbia pulcherrima*) were more than 300 percent higher than applying the systemic insecticide, imidacloprid.

A single application of a systemic insecticide may provide "control" or regulation of several different phloem-feeding insect pests such as aphids, whiteflies and mealybugs, and any residues may continue to kill insect pests for days or even weeks, depending on the physical and molecular characteristics of the pesticide applied.

The use of biological control or natural enemies may be a viable pest management option in some cases, depending on the arthropod pest. However, sole use of either parasitoids or predators cannot be relied upon to provide sufficient regulation of most arthropod pest populations, particularly if multiple arthropod pests on many different crops are involved. In addition, the presence of the natural enemy or any byproducts may affect sales.

Generally, customers shy away from plants that have an insect or mite on them regardless of whether it is a pest or a beneficial – whereas a pesticide may be able to regulate a multitude of arthropod pests on many crops simultaneously. Pesticides may also be needed in order to maintain phytosanitary requirements when marketing plants out of state or out of the country. One of the most significant consequences associated with the movement of ornamental plants is the problem regarding invasive or exotic arthropod pest species.

For example, insect and mite pests, and even diseases, which are not indigenous to the United States but are known to be exotic arthropod pests in exporting countries, are more likely to be introduced into new areas where certain arthropod pests do not exist. This is a major concern to federal and state agencies responsible for excluding or eradicating exotic arthropod pests. As such, measures often recommended to deal with exotic arthropod pests include stringent phytosanitary practices, where pesticide use may be imperative. This then allows the continued export and import of ornamental plant material among countries.

Most greenhouse-grown crops are susceptible to multiple arthropod pests including aphids, whiteflies, thrips, leafminers, beetles, caterpillars, scales and spider mites (Table 2). One benefit of pesticide use is there is still an array of broad-spectrum insecticides that can "control" numerous pests with one application. In addition to the physical or aesthetic damage these arthropod pests cause, several insect pests that feed on ornamental plants are vectors of destructive plant pathogens, especially the phloem and mesophyll and epidermal cell feeders.

The array of feeding behaviors of the arthropod pests listed in Table 2 demonstrates the diversity of potential arthropod pest problems associated with producing ornamental plants. For example, in the hydroponic production of cut Transvaal daisy (*Gerbera jamesonii*), plants can be fed upon and damaged by a multitude of arthropod pests simultaneously including thrips and mites, leafmining flies, chewing caterpillars, phloem-feeding aphids and whiteflies, along with xylem-feeding lygus bugs.


Overall, no single pest management strategy will effectively solve every arthropod pest problem, so other pest management strategies must be implemented or considered in conjunction with the use of pesticides, including cultural (proper irrigation and fertility), sanitation (removal of weeds and debris), exclusion (installing micro-screening over greenhouse openings such as vents and sidewalls), and biological (releasing parasitoids and predators).

Although these strategies are important in minimizing arthropod pest problems, they do not provide the same level of regulation or protection as pesticides.

Future Prospects

Pesticide use will continue to be a significant strategy in dealing with arthropod pest populations so greenhouse producers can stay competitive in their markets. The benefit of pesticides as it relates to the production of greenhouse-grown crops is seldom emphasized or brought to the attention of the end-users. The end user – the consumer – benefits visually, psychologically and environmentally from the purchase and use of ornamental plants.

The development of traditional broad-spectrum pesticides has declined substantially within the last 10 years. But the advent and use of alternative or selective pesticides (insect growth regulators, insecticidal soaps, horticultural or petroleum-based oils, selective feeding blockers, beneficial fungi and bacteria, and micro-organisms) with favorable environmental and toxicological properties will continue to increase as long as they are affordable and effective against the diversity of arthropod pests




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encountered in greenhouse production systems.

Although these materials tend to be more selective, greenhouse producers can broaden the activity against the array of arthropod pests by tank mixing several materials together. In addition, many of these alternative pesticides appear to be compatible with certain natural enemies, which may augment currently existing pest management programs.

It should be noted from our experience, most growers are already using less-harmful pesticides. The use of pesticides may be the most feasible and cost-effective strategy to deal with arthropod pests in many greenhouse production systems. However, if federal and state regulations continue to restrict the use of pesticides, it will be more difficult for greenhouse producers to provide quality plant material that is actually "pest-free."

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