

WHEN PESTS COME CALLING

Whether you plan to use a bug v. bug approach or chemical sprays, learn as much as you can about your chosen control tactic before unleashing it

In the last few "Beginner's Corner" columns we have been looking at a selection of crop pests that commonly cause problems in hydroponic systems. We've also looked at some safe and basic control options. This article will focus on more complex insect control measures—the use of IPM (integrated pest management) and the safe and effective use of chemical pesticides.

Integrated pest management works through the introduction of natural pest predators and/or parasites, use of cultural controls and compatible sprays in a holistic approach to pest management. Chemical control relies on pesticide sprays applied correctly, using a suitable dose with the right timing and the best product for the problem. Both options can be highly effective in small hydroponic systems both indoor and outdoor. But both need the grower to understand how each method works and to manage the application and monitoring of the pests so that good control is achieved.

Integrated Pest Management (IPM)

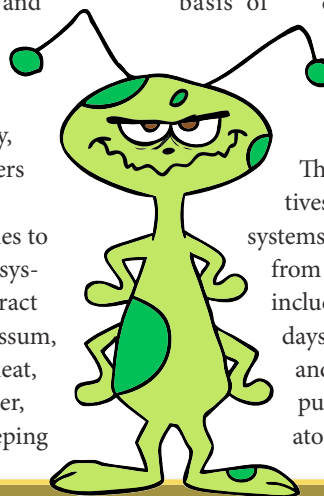
IPM works on a process of using nature against the attacking pest. A combination of cultural and biological controls and minimal use of pesticides are all part of IPM programs that aim to deter pests from an otherwise very attractive home and food source. There are two ways of looking at natural control of insect pests.

The first is to encourage natural predators and parasites into the cropping area. This might involve growing "banker" plants which provide a food source for some of the beneficials in or around the hydroponic system. Most parasitic and predatory insects need nectar at some stage of their life cycle, so flowering plants such as carrots, parsley, parsnips, and other umbellifers which have gone to seed will encourage many useful species to gather around a hydroponic system. Other flowers which attract beneficial insects include alyssum, angelica, aster, tansy, buckwheat, coriander, dill, fennel, lavender, marigold, and sunflower. Keeping

a continual supply of these plants in flower for as much of the growing season as possible is one way to attract and observe beneficial insects do their job in and around hydroponic systems. This often forms the basis of

companion planting which some hydroponic growers prefer as a system of biodiversity that can help with insect pest control.

There are some good alternatives for those whose hydroponic systems are indoors and isolated from the outside environment including beneficial insects. These days hobby hydroponic growers and home gardeners are able to purchase many species of predators and parasites for release



Grower's Checklist for Safe Use of Pesticides

- * Read the label for information on permitted uses and rates.
- * Use a clean sprayer and check compatibility of sprays if mixing two or more products.
- * Read and follow all safety precautions.
- * Use a well-maintained top-quality sprayer and wash it out after use.
- * Trial a small crop area first to check for spray damage.
- * Observe non-entry period and crop-withholding period.
- * Rotate pesticide types for prevention of pest resistance.
- * Monitor for effectiveness of control and respray at recommended time intervals.

into the growing area. This is a good option for greenhouse and grow rooms where beneficial insects may not be naturally present or are only present in small numbers.

Predators and Parasites

Most hydroponic insect pests are attacked and killed by a number of beneficial insects, and some appear to be more effective and suited to small hydroponic set ups than others. There are general insect predators we are all familiar with such as birds and spiders which will devour many different kinds of insects, not just the ones we would like removed. Birds can be a major pest themselves with fruiting hydroponic crops and often need to be screened out. However, there are species of beneficials which are more specific about what they prey on, and it is these little helpers that are artificially bred and sold for pest control in greenhouses and other growing environments.

Predators are insects which will hunt and eat plant pests. (It's very satisfying to watch a lacewing larvae hunting and impaling a fat juicy aphid sucking the life out of a plant.) Other predators such as certain mite species are too small to see in action, but the larvae of many predators can be found and observed out hunting insect pests in the hydroponic crop.

Parasites live part of their life inside insect pests, finally killing them. Usually it is the adult female parasite which seeks out the victim and lays one or more eggs into the body. The eggs usually hatch quickly and the young live and feed within the host insect. By the time the young parasite

becomes an adult the host insect has died. Most of the useful parasitic insects we can purchase for hydroponic crops are small wasps or flies, and they can be highly effective if used under the right circumstances. Parasite species for the control of whitefly, thrips, mealy bug, various caterpillars and aphids are available for release into hydroponic cropping areas. Use a magnifying glass to check out their progress after release.

IPM Management for Small Growers and Grow Rooms

While using predator and parasite insects to control all pests present in a hydroponic system may seem like an easy and effective option, it's actually a complex system that needs regular monitoring. The beneficial insects can't be released until they have sufficient numbers of pests to feed on, otherwise they will starve and die out. If too many pests are already present, the beneficials may not be able to reduce the population down to levels where the plants are not being continually damaged or killed, and an initial clean up spray may be required before an IPM program is implemented. To keep the beneficials alive, fed and breeding they do need a continual supply of pests to feed on or parasitize, so growers need to accept that a few pests always need to be present for this system to work. It also helps if the grower can correctly identify all the life stages of the pest and the beneficial insect and have some way of monitoring these. This helps with decisions such as when to reintroduce more beneficial insects or when a clean-up

spray is needed. Keeping the IPM system in balance takes more time, effort and monitoring than use of pesticides. However, there can be peace of mind knowing that an army of beneficials is munching away.

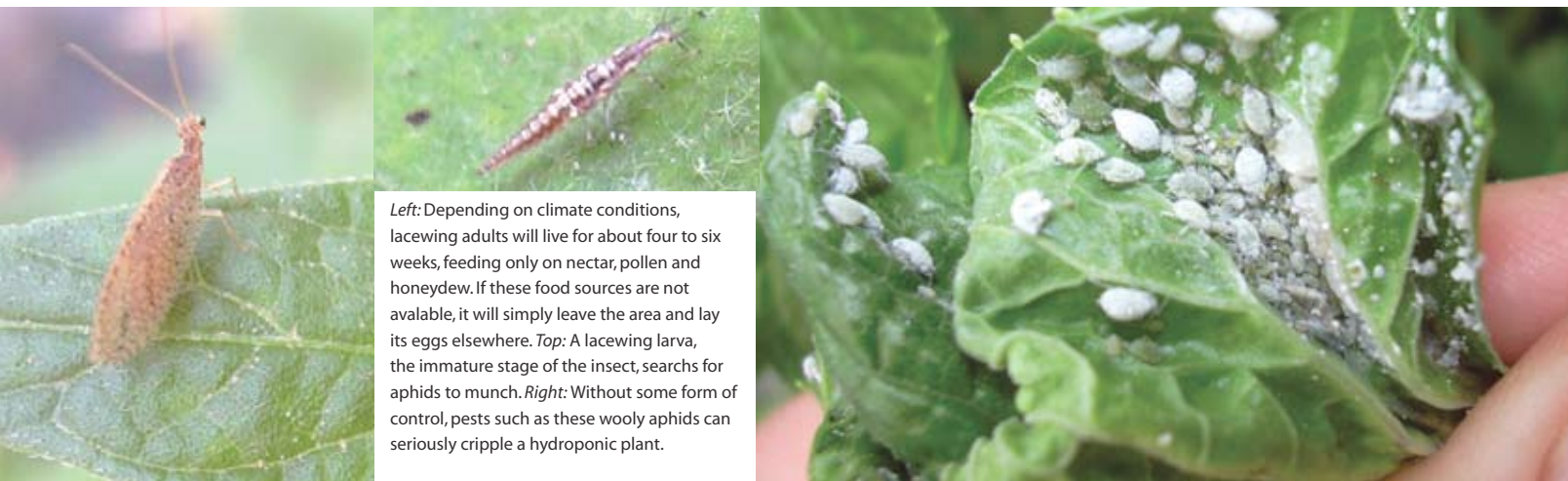
Useful Predators and Parasites

Failures with IPM usually involve the early introduction period and not being able to get the predator or parasite to colonize the crop due to incorrect environmental conditions, selection of the wrong species or unsuitable numbers of prey. Suppliers of many of the commonly used beneficial insects in hydroponic systems usually provide detailed information on the predator/parasite including conditions for introduction, timing of release and ways of monitoring numbers. This sort of information is important for the success of IPM program, whether it's in a commercial or small-scale cropping situation.

Some of the most useful predator and parasite insects are listed below for common hydroponic pest problems.

Whitefly: Whitefly has several natural enemies including predators, parasitoids and pathogens. The most commonly used predator is a small parasitic wasp, *Encarsia formosa*, which kills whitefly nymphs by laying an egg inside the nymph's body, parasitizing it and causing it to turn black in the case of the greenhouse whitefly and yellow/brown in the silver leaf whitefly.

Aphids: Ladybugs, lacewings, praying mantis, Aphidius, Aphidoletes and minute pirate bugs are all sold for use in control of aphids.



Left: Depending on climate conditions, lacewing adults will live for about four to six weeks, feeding only on nectar, pollen and honeydew. If these food sources are not available, it will simply leave the area and lay its eggs elsewhere. Top: A lacewing larva, the immature stage of the insect, searches for aphids to munch. Right: Without some form of control, pests such as these woolly aphids can seriously cripple a hydroponic plant.

Caterpillars: Fruit worms, leaf worms, cutworms and caterpillars can be controlled with minute pirate bugs (Orius), green lacewings, and trichogramma.

Thrips: Predaceous mites are available that attack the immature thrips. Minute pirate bugs are more useful for control of adult and immature thrips on hydroponic crops.

Mites: The predatory mite, *Phytoseiulus persimilis*, is a predator of the two-spotted mite. This is a red, shiny, fast-moving mite with an enormous appetite for its prey, with the added advantage of breeding twice as fast as the pest.

Mealy bugs: There is a predator (*Cryptolaelmus*) and a parasite (*Leptomastix*) for control of large mealy bug infestations.

Fungus gnats: There are two main gnat predators available: a predatory soil mite and a species of nematodes. *Hypoaspis* mites is a soil mite which feeds on fungus gnat larvae in the growing media. Beneficial nematodes are microscopic worms that occur naturally in many soils. The species used for gnat larvae control are *Steinernema* and *Heterohabditis bacteriophora*. These only attack soil-dwelling insects and won't harm plants.

Pesticides

Chemical insecticides sometimes receive a lot of negative feedback concerning their use in hydroponic systems, particularly those used in and around homes by smaller growers. Not all pesticides are toxic chemicals. In fact, many of the commonly used pesticides these days are not toxic or harmful to people and have been based on insect growth regulators, natural agents or microbial controls. Those that are more toxic often have a very short active or residual life, meaning they can effectively kill the insect pests then deactivate rapidly, so they are not a long-term risk to the environment. If used correctly, pesticides can be safely and effectively used for pest control. However, they should only be applied by growers who are informed about the product's use and have the right equipment.

Insecticides are readily available in small quantities for the home gardener or hydroponic grower, and many of the commonly used pesticide products used by

commercial growers can be purchased in small quantities for home use. A common problem with this seems to be inexperienced growers not following the advice on use of spray protection suits, respirators and other equipment. This becomes an even more serious problem in indoor grow rooms where poor ventilation can lead to serious complications when spraying.

Reading the label on the pesticide product should give detailed information on the product's toxicity, usage instructions, crops, rate of application and protective equipment to be worn. It should also give information on what to do in the case of accidental exposure and the waiting period. It's a good idea to first test any new pesticide product on the plants to be sprayed. Often, with greenhouse and grow room plants the foliage is thinner and softer than plants grown outdoors exposed to the elements, and damage is more likely to occur, even at or below recommended rates. Testing one or two plants or even a few leaves and checking for damage over the next day or so can prevent problems.

If the product label indicates that a spray suit or protective covering needs to be used, then a simple and cheap option is to buy a plastic disposable suit available from hardware stores.

Investing in a good respirator is also important, particularly for enclosed areas such as greenhouses and grow rooms. Canister type respirators are good for pesticide spraying as the canister give good protection and can be replaced. Eyes and hands also need to be protected from pesticides. Plastic disposable gloves make good options for spraying.

Finally, growers should strictly observe waiting periods—the time period after pesticide application when growers shouldn't come into contact with the crop or enter the greenhouse or grow room. Usually the waiting period is usually no more than 24-48 hours. This prevents anyone not wearing protective gear from inhaling or picking up pesticide residues. Some growers, however, might be tempted to enter before the waiting period is over, especially small-scale growers with a nutrient tank and irrigation system that needs daily maintenance, or

when their crop is close to harvest.

Crop-withholding is the period of time after pesticide application when crops must not be harvested. Most withholding periods are 1-3 days.

This time allows the active ingredient in the pesticide to degrade so that the crop is safe to eat. In some cases the pesticide label will present this as the time period before harvest—a certain number of days or weeks—when a pesticide can't be used.

Avoid Failures

Many failures of pesticide products to control a certain pest actually result from either incorrect application or from not following up with further sprays to break the insect's life cycle. Smaller growers who use hand-held sprays may not achieve good coverage within the crop, particularly where plants are crowded and difficult to reach. Many contact pesticides require the spray to hit the insect directly. This can be difficult since many pests hide or run for cover when they sense vibrations. Attention to spraying under leaves and into the canopy can help with getting good control, as can the use of electrostatic sprayers and other spraying equipment. 🌿

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