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By Dan Gilrein

Time to think about mites

Just as growers anticipate the seasons so too do entomologists. Pest cycles closely parallel growers' production cycles. Experienced growers know all this intuitively and incorporate a control plan for sequentially addressing pest problems. For example, yellow sticky cards are one of the simplest and practical techniques for early detection of flying insects, including fungus gnats and thrips. Mites are trickier to identify as the initial infestation symptoms are easily overlooked and mites are not detected with sticky cards or other tools.

Spider mites

Most growers are familiar with spider mites, particularly the two-spotted spider mite. It has hundreds of host plants and thoroughly enjoys life in the greenhouse. Females can overwinter off of plants in unheated greenhouses, surprising growers when they become active as plant production resumes.

The presence of two-spotted spider mites is more often associated with prefinished plants or cuttings brought in from outside suppliers. Symptoms of infestation, which are most typically seen on lower leaves and on older plants, usually include a fine flecking (stippling) or sometimes just a yellowing. This flecking is most apparent in the concave hollows or protected spots along veins under leaves where the mites prefer to reside.

Some plants, specifically geraniums, can show more dramatic yellowing, brown spotting and leaf distortion. Samples of mite-infested zonal geraniums have been mistakenly submitted as bacterial blight suspects. Inspect the underside of the leaves where the eggs, mites and webbing are visible. An OptiVisor or other head-mounted magnifier can be used for scouting.

Control options

Populations of two-spotted spider mites have been known to develop resistance to miti-

cides (e.g. Avid), especially when the same product is relied upon exclusively. Rotating products with different modes of action is one solution. Using insecticidal soap (M-Pede), Triact or horticultural oils (SuffOil-X, Ultra-Fine, etc.) or similar materials in a rotation is a good idea where mites are a year-round problem.

Fortunately most miticides have unique modes of action and the rotation rule is easy: avoid rotating Akari with Sanmite or Hexygon with Ovation. Products that work well against two-spotted spider mite include Pylon, Floramite, TetraSan, Shuttle, Judo and the familiar Avid (or generic version). Hexygon and Ovation have worked best as an early preventive treatment when mite populations are still low. Be sure to note the sensitive plant species on the labels of Pylon, Shuttle, Judo and Avid. If using Judo, see the OHP Judo Technical Bulletin (www.ohp.com/Labels_MSDS/PDF/Judo_Tech_Bulletin_07.pdf).

ProMite is an older product labeled for greenhouses that is still used occasionally. It is highly compatible with beneficial predatory mites. However, its long re-entry interval of 48 hours and Danger signal word on the label are among the reasons it is little used.

Pylon, TetraSan, Judo and Avid all have translaminar activity, especially on very tender growth. Expect less of this activity on conifers and hardened-off evergreen foliage, which may be useful where good coverage with a contact miticide is difficult. Kontos is the newest mite control product. It acts primarily by ingestion, but is only labeled as a miticide when used systemically.

Lewis mites

Lewis mites on poinsettia have made a comeback in the last two decades, though they are less common in recent years. Infestation symptoms on poinsettia include a particularly fine flecking on foliage, almost like nitrogen-deficient chlorosis. Infestations have

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been quite spotty in crops and usually confined to one or a few cultivars.

Floramite, Shuttle, Akari and Avid have been found to work well against this mite. Pylon provided only partial control.

Broad mites

Broad mite, in a group separate from spider mites, has been on the rise in greenhouses during the last decade. Its appearance apparently relates to the increasing use of vegetative cuttings rather than seed-produced starter plants. Like two-spotted spider mite, the broad mite also enjoys a wide host range. It has been identified on common greenhouse plants including standard and New Guinea impatiens, marigold, begonia, gerbera, celosia, jasmine, hydrangea, salvia and even zonal geranium. It can become a pest on vegetable transplants such as peppers and tomatoes.

Growers typically express surprise at how fast broad mite damage symptoms seem to appear. Symptoms include stunting, distortion and the bronzing of leaves. On impatiens the flowers can fail to open entirely or a fine white flecking can appear on the petals.

Broad mites are extraordinarily small, but they can be seen with a good magnifier. Suspect samples can be sent to a diagnostic lab for confirmation.

Broad mite eggs have distinctive raised dots that distinguish them from other mite species. Broad mites can hitchhike on the legs of whiteflies, which explains how infestations can move to new locations.

Cyclamen mite is closely related to broad mite but is a less common species that can cause similar symptoms on greenhouse and outdoor plants. Cyclamen mites overwinter in northern areas of the United States and they are occasional problems on perennial cut flowers including delphinium.

Monitoring for the broad and cyclamen mites is mainly by recognizing and identifying early injury symptoms, confirming the cause and treating with an effective miticide. Not all miticides are effective, but those that are include Avid, Pylon, Akari, Sanmite (labeled for broad mite) and Judo. Kontos is labeled for spider mite, but in one trial we found a drench provided very good control of broad mite.

Eriophyid mites

Eriophyid mites are infrequently seen in greenhouses in some regions of the country. Tomato russet mite on tomato is perhaps the most common one, but there are several others such as purple tea mite on spathiphyllum and fuchsia gall mite on fuchsia. We have identified a suspected new kind of eriophyid mite on *Ficus binnendykii* 'Alii,' and some others are common pests of landscape plants.

Eriophyid mites are small, but symptoms of infestation can be quite dramatic depending on species, ranging from bronzing to galling or distortion. Fortunately they are gener-

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ally host-specific so their spread is limited to related plants. If eriophyid mites are identified, it's important to know that they are susceptible to only a few miticides, including the products labeled for broad and cyclamen mites mentioned earlier.

For effective biological control options, check for pesticide compatibility informa-

tion on the Koppert (<http://side-effects.koppert.nl>) and Biobest (www.biobest.be/neveneffecten/3/none/) web sites.

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Scouting Notes

Geraniums could hold key to controlling Japanese beetles.

Japanese beetle (*Popillia japonica*) feeds on nearly 300 plant species in almost 80 plant families. It is considered to be the most destructive pest of ornamental and turf plants in the eastern United States, with more than \$450 million spent each year to control it and replace damaged plants.

Geranium (*Pelargonium zonale*) is one plant whose flowers can be deadly to beetles. Within 30 minutes of consuming the petals, the beetle rolls over on its back and it remains paralyzed for several hours. Under laboratory conditions, the beetles typically recover within 24 hours, but under field conditions they often die because predators devour them.

USDA-Agricultural Research Service scientists are working on a natural, botanical formulation for beetle control based on the paralyzing compounds isolated from geraniums. Scientists are also studying the differences in the leaf surfaces of geraniums to determine ways to help leaves retain pesticides that are applied to them, which could help to reduce pesticide use.

For more: USDA-Agricultural Research Service Application Technology Research Unit, (330) 263-3897; www.ars.usda.gov/is/AR/archive/mar10/garden0310.htm.



USDA-Agricultural Research Service scientists are studying the paralyzing effects of compounds isolated from geranium petals on Japanese beetles. Photo by Stephen Ausmus