

The New Pesticide



Top: Green peach aphid; Bottom: Silverleaf whitefly.
(Photos courtesy of Ron Oetting)

The much-anticipated approval of Flagship triggers questions about efficacy and usage; here are the answers.

By Ron Oetting

The silverleaf whitefly, *Bemisia argentifolii*, invaded greenhouses in the United States in the late 80s and has been a major concern for growers ever since. A big step in the management of this pest was the introduction of imidacloprid (Marathon) in the mid 90s, and there have been other insecticides introduced in the last decade to combat this pest.

The latest addition to the arsenal for whiteflies is thiamethoxam, marketed by Syngenta under the trade name Flagship for growers of ornamentals. Thiamethoxam is a second-generation neonicotinoid insecticide that belongs to the thianicotinyl subclass of chemistry. We have been waiting for this registration for some time, and it is really exciting to finally have it available for growers to use in their rotation for greenhouse pests.

Flagship has systemic activity and can be applied as a foliar spray or as a soil or soil-less medium treatment. As a foliar spray it has translaminar activity and will be taken into the cells of the plant tissue upon which it is sprayed. As a soil application, the roots will take the active ingredient up from the soil or medium and translocate it via the xylem to the above ground parts of the plant. The formulation is a 25-percent water-dispersible granule (WG). Water-dispersible granules, water-soluble products and other soluble solid formulations are rapidly replacing the old wettable powder (WP) formulations that often were very dusty when pouring or mixing.

Flagship is active either through contact or ingestion on most stages of target insect development, with the exception being the egg stage. It is a broad-spectrum insecticide and is active against several sucking and chewing insects. The mode of action is a type that utilizes the nicotinic acetylcholine receptor as the target site. Upon coming in contact with or ingesting thiamethoxam, insects will stop feeding and undergo abnormal behavior until they die. As a result, damage stops soon after exposure, but death may not occur for a few hours or even a day or two.

Flagship's chemical class is in the neonicotinoid group of insecticides, which contains three registered insecticides for greenhouse use. The mode of action of these compounds is

not necessarily the same, but will there be cross resistance when resistance to one of these insecticides does occur? It is my opinion that eventually we will have resistance develop from overuse of one of these compounds; since imidacloprid has been around the longest, it is the most probable candidate for the first resistance, though there's no sign of it at this point. We must continue to try to be good stewards of this chemistry to delay resistance from occurring. I do not know if there will be cross resistance, but I feel we need to precede with the assumption that there could be and place these materials into our rotation accordingly. If two or more insecticides are going to be used, then rotate to another class and mode of action with the second application.

Flagship is registered for use against several pests of ornamentals, but the most important ones in greenhouse production are aphids, whiteflies, mealybugs and other scales. The dosage for these pests varies from 2-4 oz. per 100 gal. of finished solution, depending upon the target pest. I have worked with this compound against several pests of greenhouse crops and find it very active, especially with the sucking insects.

WHITEFLY AND APHIDS

My earliest trials were against silverleaf whitefly and aphids. Against silverleaf whitefly Flagship performed very well with good knockdown and residual control. I have applied it as a foliar spray, drench, sprench and soil mix, and it provided excellent whitefly control with all methods.

We typically get slower knockdown and less residual when insecticides such as Flagship or Marathon are applied as foliar sprays, and it usually requires a second application to get the duration of control that one obtains with a soil or medium treatment. When applied as a foliar spray a second application was applied at 14-28 days to get the best results. We have obtained at least seven weeks of control with one drench application of Flagship. The increased volume of solution used in a drench has a tendency to result in longer residual control than a sprench, where only the surface of the soil is treated.

We often recommend a sprench for control of



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fungus gnats over the use of a drench and consequently less material is used in the pot. There are completely different targets and reasoning in comparing these two pests. Fungus gnat eggs are laid on the surface or under debris that is on the surface, and the young larvae start in that upper layer. The older larvae may be deeper, but the best result is obtained against the younger larvae. A srench or good wetting of the surface of the medium with the spray solution works well here. In the case of an insecticide being applied to the medium — which must be taken up by the roots, translocated via the xylem and eventually get to the site of insect damage, the leaf — the solution must be in the root zone so it can easily be absorbed. A drench works best in this situation.

Aphids are very susceptible to Flagship, and excellent control can be achieved for this pest with either a spray or drench. A foliar spray provides a quicker knockdown of aphids, which is the opposite of what we observe with whiteflies. The same was true of Marathon applied against aphids and whiteflies. If the aphids are in the flowers, a spray is the most effective method of management. One application of Flagship against aphids was usually sufficient for good control. Care must always be taken when applying insecticides on flowers because they are very susceptible to phytotoxicity. However, we have observed that Flagship, and the neonicotinoids in general, cause less phytotoxicity on plants and flowers than the average insecticide. We have not observed any phytotoxicity on the leaves of plants we have treated with these insecticides.

MEALYBUGS

I have also looked at Flagship against mealybugs. This is an area where researchers have obtained mixed results. All of our work in the last few years has been against the madeira mealybug, *Phenococcus madeirensis*. Because this is one of our most difficult pests to manage, many insecticides are no longer effective against it. We obtained some reduction in madeira populations with Flagship but not adequate for management. However, some colleagues have gotten good results against madeira mealybugs in other areas with the neonicotinoid compounds, and that is a good message to take home. We must anticipate that some pests will have different levels of susceptibility (resistance?) in different areas depending upon their exposure to different insecticides or even environmental conditions. Eventual resistance will probably expand to all areas, but there also could be differences because of the environment.

We are still looking for an insecticide with systemic activity because of the difficulty controlling mealybugs with foliar sprays. It is difficult to con-



Madeira mealybug.

trol mealybugs with one application of insecticides that work best against them. Once the population builds, there are individuals deep in hard-to-get places on the plant, and they will even move onto the pot or bench, where they are not contacted by the spray plume when applying a foliar application. A systemic compound would provide protection on most areas of the plant and usually has a longer residual for individuals that move back on the plant from below.

There are research reports of good activity of Flagship against other species of mealybugs. Good activity has been reported against citrus and longtailed mealybugs, as well as Fletcher, cycad and other scale species. Mealybugs and other scales will be similar to whiteflies in that repeat applications will be required to get good control. It is hard to determine the activity of an insecticide treatment against scales for at least a couple of weeks because it is hard to determine if the individuals are alive or dead and the eggs are protected and will continue to hatch for several days.

Flagship is our newest insecticide for pests of greenhouse grown ornamentals, and it will fit well into the rotations against sucking pests. We have lost some of the compounds that we did have, and resistance is always a threat for the ones that are available. It is always good to add another compound to the

FLAGSHIP: WHAT ABOUT IT?

The Environmental Protection Agency (EPA) has finally granted registration of Flagship insecticide for use in the ornamental market. With the active ingredient thiamethoxam, Flagship is a broad-spectrum insecticide that can be soil or foliar applied for control of sucking and chewing pests on ornamental plants.

"We are very excited about Flagship, which is a novel chemistry used to control destructive insects like whiteflies, aphids and mealybugs," said Chuck Buffington, ornamental market manager for Syngenta Professional Products. "Growers will appreciate Flagship's application flexibility and speed of activity versus other long residual ornamental insecticides."

A member of the neonicotinoid class of chemistry, Flagship has demonstrated excellent systemic uptake and translocation throughout the plant when applied to the soil. When foliar applied, Flagship is rapidly absorbed into the foliage, resulting in a reservoir that insects encounter when feeding. Flagship is slowly metabolized within the plant, which results in extended residual control of up to 6-8 weeks.

"Flagship is available as a 25WG (wetable granule) formulation that allows growers to dial-in rates to provide the desired length of control for their production cycles," Buffington said. "Flagship provides outstanding efficacy against ornamental insects and exhibits both contact and ingestion activity. Insects stop feeding within hours and total control typically occurs in 24-48 hours."

products that we have available for insect and mite pests that we must control. GPN

Ron Oetting is professor of entomology at The University of Georgia, CAES/Griffin Campus. He can be reached by phone at (770) 412-4714 or E-mail at roettin@griffin.peachtree.edu.

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