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Achieving Your Goal With Pest Control

What's new for dealing with those pestiferous insects and mites?

By Raymond Cloyd

It is that time of year in which we discuss the new, the old and the soon-to-be-registered pest control materials. Pest control materials, including insecticides and miticides, are relied upon by greenhouse growers to manage plant-feeding insects and mites (arthropods).

It is important that labels are expanded and/or new products become available in order to provide an "arsenal" of materials that may be used in pest management programs. However, what is more important is that enough materials with different modes of action are available to create rotation schemes — thus reducing the potential of insect and mite populations developing resistance.

There are a number of label expansions, and several new insecticides and miticides have become available this year. In fact, several of these have new modes of action, which again is very important when implementing rotation programs to avoid resistance.

Label Updates

Pedestal. Pedestal, an insect growth regulator from Chemtura Corp. (formally Crompton Corp.) that contains the active ingredient novaluron, is now approved for use in New York. This insect growth regulator — a chitin synthesis inhibitor — is labeled for use in greenhouses, shadehouses and outdoor nurseries for control of thrips, whiteflies and caterpillars (armyworms). As with all insect growth regulators, Pedestal is only active on the immature stages of target insects. However, based on our research at the University of Illinois, Urbana, Ill., we have demonstrated that adult female silverleaf whiteflies (*Bemisia argentifolii*) treated with Pedestal lay non-viable eggs or eggs that fail to hatch.

Akari. Akari, which is a contact miticide with the active ingredient fenpyroximate available from SePRO Corporation, has a supplemental label, expanding the use to include additional mite species such as broad mite (*Polyphagotarsonemus latus*), cyclamen mite (*Phytonemus pallidus*) and certain eriophyid mites. In addition, the supplemental label includes suppression of mealybugs including citrus mealybug (*Planococcus citri*) and long-tailed mealybug (*Pseudococcus longispinus*).

Enstar II. Enstar II, an insect growth regulator — juvenile hormone mimic — contains the active ingredient kinoprene. Enstar II, available from Wellmark International, has been around for a while, but there are several



Of the many insecticides introduced recently, the majority are registered for whitefly control. (Photo courtesy of Jim Bethke)

recent label changes. The product is now labeled for control of thrips, and its label has been expanded to include use in chemigation systems. In addition, Enstar II is labeled for use in shadehouses and lath houses.

Pylon. Pylon, a miticide available from OHP, Inc. (formally Olympic Horticultural Products), contains chlorfenapyr as the active ingredient. Label changes include use on greenhouse-grown vegetables in the potato family (Solanaceae). Additional insect and mite pests on the label include two-spotted spider mite (*Tetranychus urticae*), broad mite, western flower thrips (*Frankliniella occidentalis*), melon thrips (*Thrips palmi*) and onion thrips (*Thrips tabaci*).

Treatment	Quantity of formulation per 60-ml drench	2nd instar mean (± SE)	3rd instar mean (± SE)
Celero	0.009 g	0.0 (± 0.0)	0.1 (± 0.07)
Celero	0.013 g	0.05 (± 0.05)	0.0 (± 0.0)
Celero	0.018 g	0.0 (± 0.0)	0.0 (± 0.0)
Marathon II	0.008 ml	1.7 (± 0.6)	0.7 (± 0.3)
Flagship	0.018 g	0.0 (± 0.0)	0.0 (± 0.0)
Water Control	n/a	13.1 (± 0.8)	8.1 (± 0.8)

Figure 1. Number of adult fungus gnat (*Bradysia* sp. nr. *coprophila*) emerging from growing medium samples initially inoculated with 20 fungus gnat larvae, based on yellow sticky card (2.5x2.5-cm) counts, for all treatments. Sticky cards were counted 24 days (2nd instars) or 20 days (3rd instars) following application of all treatments. (SE = standard error)

Treatment	Rate per 100 gal.	Live TSSM nymphs		
		0 DAT mean (± SE)	14 DAT mean (± SE)	28 DAT mean (± SE)
Shuttle	6.4 fl.oz.	84.2 (± 14.6)	37.8 (± 15.7)	1.0 (± 0.3)
Shuttle	12.8 fl.oz.	124.8 (± 29.9)	20.6 (± 9.6)	0.4 (± 0.2)
Shuttle	25.6 fl.oz.	76.8 (± 9.0)	9.4 (± 7.1)	1.6 (± 0.6)
Avid	4.0 fl.oz.	130.6 (± 28.8)	146.4 (± 44.5)	272.2 (± 15.2)
Untreated Check	n/a	93.0 (± 21.8)	178.0 (± 33.5)	296.0 (± 32.7)

Figure 2. Number of live two-spotted spider mite (TSSM) (*Tetranychus urticae*) nymphs for all treatments 0, 14 and 28 days after treatment (DAT). (SE = standard error)



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New Products

Celero. Celero is the newest neonicotinoid-based insecticide from Arysta LifeScience (formally Arvesta Corp.). The active ingredient is clothianidan. Celero is formulated as a 16-percent water-soluble granule (WSG) and is registered for control of aphids, whiteflies and mealybugs. Celero is a systemic insecticide with the same mode of action as imidacloprid (Marathon, OHP, Inc.), thiamethoxam (Flagship, Syngenta Professional Products), acetamiprid (TriStar, Cleary Chemical Corporation) and dinotefuran (Safari, Valent U.S.A. Corporation). All the neonicotinoid-based insecticides act on the central nervous system, causing irreversible blockage of the post-synaptic nicotinic acetylcholine receptors.

As with most of the neonicotinoid-based insecticides, Celero provides long residual activity. The insecticide works by contact and ingestion and has translaminar properties. Although target insects may still be alive following an application, they will stop feeding, and females will not lay eggs. The restricted entry interval (REI) is 12 hours. Celero is effective in controlling citrus mealybug as a foliar spray based on research conducted at the University of Illinois. In addition, it has proven to be very effective against fungus gnat larvae (see Figure 1, left).

Shuttle. Shuttle is a new miticide also available from Arysta LifeScience. The active ingredient is acequinocyl. The miticide is formulated as a 15-percent soluble concentrate (SC). Shuttle is primarily active on two-spotted spider mite. It works strictly by contact activity, controlling all mite life stages including eggs. It is fast-acting and provides long residual control. Shuttle's mode of action is similar to fenpyroximate (Akari, SePRO Corporation) and pyridaben (Sanmite, The Scotts Company LLC), as all three materials are mitochondria electron transport inhibitors (METI). However, whereas both Akari and Sanmite work in blocking electron transfer at Complex I in the mitochondria, Shuttle binds to the Qo center of Complex III, causing inhibition of electron transfer — indicating a different site of action. Regardless, it may be best to avoid using any one of these three insecticides/miticides in succession in a rotation program. The REI is 12 hours. Research conducted at the University of Illinois has demonstrated that Shuttle is extremely effective in controlling two-spotted spider mite 28 days after a single application (see Figure 2, left).

Aria. Aria, an insecticide available through FMC Corporation, contains the active ingredient flonicamid. The product is formulated as a SG. Aria

is labeled for control of aphids, whiteflies, thrips and mealybugs. In addition, there appears to be some activity on plant bugs and certain scales. Aria is not a neonicotinoid-based insecticide and has a mode of action (selective feeding blocker) similar to pymetrozine (Endeavor, Syngenta Professional Products). Aria has both systemic and translaminar properties. Application methods include foliar sprays and drenches. The label rate is 20-120 grams product (10-60 grams active ingredient) per 100 gal. of water. The rate used is dependent on the target insect pest to be controlled. The REI is 12 hours.

Certain pansy cultivars may be sensitive to applications of Aria. In our studies, Aria has proven to be effective as both a foliar spray and a drench in controlling citrus and long-tailed mealybug. In addition, we have evaluated the lethal and sub-lethal effects of Aria on the natural enemies of citrus mealybug including the mealybug destroyer, *Cryptolaemus montrouzieri*, and the parasitoid, *Leptomastix dactylopii*. Based on our results, Aria is very compatible with both natural enemies.

Judo. Judo is an insecticide/miticide available from OHP, Inc. that contains the active ingredient spiromesifen. The product is formulated as a flowable (suspension concentrate) containing 4 lbs. of active ingredient per gallon or 480 grams active ingredient per liter. Judo has a very unique mode of action compared to the other insecticide/miticides currently available. The active ingredient works as a lipid biosynthesis inhibitor. Lipids are a group of compounds made up of carbon and hydrogen. They include fatty acids, oils and waxes. Lipid molecules are responsible for a number of functions such as cell structure in membranes and sources of energy. No other commercially available product has this mode of action.

Judo is similar to pyridaben (Sanmite) in terms of target pests, with activity on both mites (two-spotted spider mite) and whiteflies. It is active on all life stages — even the eggs — of both mites and whiteflies. The label rate is 2-4 oz. per 100 gal. Judo has translaminar properties, providing up to 30 days of residual activity, which is similar to other miticides including abamectin (Avid, Syngenta Professional Products), bifentazate (Floramite, Chemtura Corp.) and hexythiazox (Hexygon, Gowan Company). The REI is 12 hours. Our research has shown that one application of Judo provides the same level of control for two-spotted spider mite as chlorfenapyr (Pylon, OHP, Inc.) (see Figure 3, left). Additionally, we have evaluated the acute or lethal effects of Judo on the

Treatment	Live TSSM nymphs			
	Rate per 100 gal.	0 DAT mean (± SE)	7 DAT mean (± SE)	14 DAT mean (± SE)
Judo	2.0 fl.oz.	41.6 (± 10.0)	11.2 (± 4.8)	0.2 (± 0.2)
Judo	4.0 fl.oz.	13.4 (± 1.5)	4.6 (± 1.8)	0.4 (± 0.2)
Pylon	4.0 fl.oz.	19.2 (± 3.6)	34.4 (± 2.5)	4.6 (± 3.6)
Water Control	n/a	14.6 (± 6.6)	82.4 (± 33.5)	112.6 (± 55.8)
Untreated Check	n/a	8.6 (± 1.9)	73.6 (± 17.3)	220.2 (± 46.4)

Figure 3. Number of live two-spotted spider mite (TSSM) (*Tetranychus urticae*) nymphs for all treatments 0, 7 and 14 days after treatment (DAT). (SE = standard error)

Treatment	Quantity of formulation per 60-ml drench	2nd instar mean (± SE)	3rd instar mean (± SE)
Distance	0.0093 ml	0.0 (± 0.0)	0.0 (± 0.0)
Safari	0.026 g	0.0 (± 0.0)	0.0 (± 0.0)
Safari	0.054 g	0.0 (± 0.0)	0.0 (± 0.0)
Safari	0.10 g	0.0 (± 0.0)	0.0 (± 0.0)
Water Control	n/a	14.7 (± 1.4)	13.7 (± 0.6)

Figure 4. Number of adult fungus gnat (*Bradysia* sp. nr. *coprophila*) emerging from growing medium samples initially inoculated with 20 fungus gnat larvae, based on yellow sticky card (2.5x2.5-cm) counts, for all treatments. Sticky cards were counted 24 days (2nd instars) or 20 days (3rd instars) following application of all treatments. (SE = standard error)



The pesticide storage area may need to be cleared out for all of the newly registered insecticides/miticides.

2006 greenhouse chemical trends

predatory mites *Neoseiulus californicus* and *Phytoseiulus persimilis* and found that Judo is more acutely toxic to *P. persimilis* than *N. californicus*. Based on our results Judo appears to be very compatible with *N. californicus*.

Safari. Safari is a product available from Valent U.S.A. Corporation; it contains the active ingredient dinotefuran. Safari is formulated as a SG with 20-percent active ingredient. The product is labeled for control of aphids, whiteflies, leafminers, mealybugs, scales (both soft and hard), fungus gnats and thrips. Safari can be applied as a foliar spray, drench or through chemigation. The active ingredient is very water soluble, which means it is rapidly taken-up and distributed throughout the plant. Dinotefuran is another neonicotinoid-based insecticide with the same mode of action as imidacloprid (Marathon), acetamiprid (TriStar), thiamethoxam (Flagship) and clothianidin (Celero). The rates for foliar applications are 4-8 oz. per 100 gal., whereas the drench application rates are 12-24 oz. per 100 gal. The REI is 12 hours. In our research trials conducted at the University of Illinois, we have found Safari to be very effective (as are most of the neonicotinoid-based insecticides) as a drench for control of fungus gnat larvae (see Figure 4, page 17).

Future Products

Overture. Overture, which will be available in 2006, is an insecticide with the active ingredient pyridalyl. The product will be distributed through Valent U.S.A. Corporation

and is formulated as a 35-percent wettable powder (WP). Target pests include thrips and caterpillars. Insects typically are killed within 2-3 hours following an application. Overture may be useful in rotation programs for thrips. It is a contact insecticide with translaminar properties that is applied as a foliar spray. Overture is minimally harmful to beneficial insects and mites. The label rate will be 8 oz. per 100 gal. of water. The REI will be 12 hours.

This article has addressed label expansions to not-so-new products, new insecticides/miticides and future pest control materials. It is important that greenhouse growers have a variety of products available so they can effectively deal with plant-feeding insects and mites and, more importantly, implement appropriate rotation schemes. GPN

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Preplant Bulb Soaks With Bonzi

Bulb crops have a wide range of growth characteristics and height control requirements. Excessive elongation, either in the greenhouse during production or in the marketing channel, is common. Bonzi has become an important tool in the production of high quality crops for many bulb species.

Bonzi sprays are useful to fine tune final height, but are not effective enough on rapidly elongating bulb crops to provide the amount of early control needed. Bonzi media drenches, therefore, are preferred over sprays on most bulb crops. Early drenches can control rapid early growth of leaves, stems and/or flower spikes. An alternative to drenching that is used by many producers of bulb crops is for preplant bulb soaks in a Bonzi solution. Bulb soaks can provide the same control of early growth as Bonzi drenches.

A large number of plants can be treated in a short time using bulb soaks; it is often much easier and less labor intensive to treat a crop with a bulb soak than a drench. This is especially true for smaller containers and when control is needed while pots are still stored on racks. A bulb soak application is very useful for crops, such as caladiums, where there can be significant foliage or shoot growth before there is much root growth to absorb a drench.

Users should refer to the Bonzi label for information and rate recommendations for many bulb crops, including tulips, lilies, caladiums, amaryllis, daffodils and others. Because of the large growth variations that are inherent with bulb crops, it is important for users to conduct their own trials to become familiar with bulb soaks and establish use protocols and rates that best fit their individual situations.

Soak time can range from 1 minute to 1 hour, depending on the crop and individual practices. Generally, as soak time increases, Bonzi concentration in the bulb increases. Additionally, as water temperature increases, Bonzi uptake into the bulbs increases. The relationship between soak time, temperature and concentration is especially important when a moderate amount of activity is desired. Where maximum Bonzi effect is desired, variations in soak time become less important.

Some other sources of variation with bulb soak applications include bulb size, especially in lilies. Larger bulbs require high Bonzi concentrations and prewashed bulbs take up less of the Bonzi solution, so slightly higher concentrations may be desired.

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