



Photo: USDA/ARS

When it comes to selecting a miticide to control spider mites or “mites” in the greenhouse or outdoors, there is oftentimes confusion that all miticides are similar in terms of their use patterns and the range of mites that are controlled. However, all miticides are not created equal as they can vary in the target mites on the label, mode of action, mite stages controlled, quickness of kill and longevity. Always read the label for specific information regarding these factors. Understanding the various characteristics of miticides will enhance the prospect of selecting the appropriate product and increasing the effectiveness of an application. This article will examine many of the commercially available miticides labeled for controlling mites in greenhouses.

Avid

Avid, manufactured by Syngenta Professional Products, is an insecticide/miticide containing the active ingredient abamectin. The active ingredient, which occurs naturally, is derived from the soil micro-organism, *Streptomyces avermitilis*. Avid is labeled for control of twospotted spider mite, European red mite, carmine spider mite, Southern red mite, spruce spider mite, cyclamen mite, broad mite, and rust and bud mite.

This insecticide/miticide has both contact and translaminar activity. “Translaminar” is a term that refers to insecticides or miticides that can penetrate the leaf tissue and form a reservoir of active ingredients within the leaf, such as the spongy mesophyll and palisade parenchyma cells. Mites, such as the twospotted spider mite (*Tetranychus urticae*), the mite most commonly encountered both indoors and outdoors, particularly from spring through late fall, feed on the leaves and may ingest

Mite-B-Gone — Understanding Miticides

This examination of the various commercially available miticides will help you decide which to use to control mites in your greenhouses.

By Raymond A. Cloyd

enough active ingredient to kill themselves, even after spray residues have dried.

Avid may provide up to 28 days of residual activity. The label rate for all mite species is 4 fl.oz. per 100 gals. Avid is active on the mobile life stages of mites; however, the miticide has no activity on eggs. Although Avid is slow acting, any treated mites are immobilized after exposure. It has a mode of action that affects the gamma-amino butyric acid (GABA) dependent chloride ion channels by increasing membrane permeability to chloride ions, thus leading to inhibition of nerve transmission, paralysis and death.

Akari

Akari has the active ingredient fenpyroximate, manufactured by SePRO Corp. This miticide has a very general label stating control of spider mites. It is also labeled for control of broad mite, cyclamen mite and eriophyid mites (several species). Akari is a contact and stomach poison, so complete coverage of all plant parts is important during application. Akari does not have translaminar activity. It is active on all mite life stages including eggs. However, it has higher efficacy against the larvae than the other life stages. Akari works quickly, providing rapid knockdown of existing mite populations. In fact, treated mites immediately stop feeding and females fail to lay eggs. This miticide provides up to 21 days of residual activity.

The label rate is 16-24 fl.oz. per 100 gals. Akari has a similar mode of action as pyridaben (Sanmite) and acequinocyl (Shuttle). All three miticides are mitochondria electron transport inhibitors (METIs). However, the site of action is different from that of Shuttle. Still, these miticides should not be used in succession in a rotation program. Akari has a mode of action that



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involves inhibition of the mitochondria electron transport system at the NADH-coenzyme Q reductase site of Complex I.

Floramite

This miticide, manufactured by Chemtura Corp., contains the active ingredient bifenazate. It is labeled for control of twospotted spider mite, Pacific mite, strawberry mite, European red mite, citrus red mite, clover mite, Southern red mite, spruce spider mite, bamboo mite and Lewis mite. Floramite is not active on broad, rust or flat mite. It has contact activity only, so thorough coverage of all plant parts is essential. It is active on all mite life stages, including eggs.

Floramite works quickly and may provide up to 28 days of residual activity. The label rate is 4-8 fl.oz. per 100 gals. Floramite has a mode of action involving the blockage or closure of GABA-activated chloride channels in the peripheral nervous system.

Hexygon

Hexygon, manufactured by Gowan Co., contains the active ingredient hexythiazox and is labeled for control of twospotted spider mite, arborvitae spider mite, European red mite, honey locust spider mite, Pacific spider mite, Southern red mite, spruce spider mite, strawberry mite and Willemite mite. Hexygon is a contact and stomach poison miticide, so thorough coverage of all plant parts is essential. The miticide may provide up to 45 days of residual activity. The label rate is 1-2 oz.

per 100 gals. Hexygon is active on mite eggs and the larvae stage. In fact, any eggs deposited by adult females that contact treated surfaces are not viable; however, Hexygon has no direct activity on adult mites. Hexygon has the same mode of action as clofentezine (Ovation), so it is important to avoid using these two miticides in succession in a rotation program. The mode of action of Hexygon involves disrupting the formation of the embryo during development or inhibiting larval maturation. However, the specific mode of action and target site of activity are still not well understood.

Judo

This insecticide/miticide, manufactured by OHP Inc., contains the active ingredient spiromesifen. It is formulated as a 480 soluble concentrate (SC) containing 4 lbs. of active ingredient per gallon. Judo is labeled for control of twospotted spider mite, Southern red mite, Lewis mite, tumid mite, maple spider mite, spruce spider mite, honeylocust spider mite, euonymus mite, boxwood spider mite, broad mite, cyclamen mite, false spider mite and eriophyid mites (several species).

This miticide is similar to pyridaben (Sanmite) in terms of target pests, with activity on both spider mites and whiteflies. Judo is active on all life stages — even the eggs — of both spider mites and whiteflies. However, Judo is less effective against the adult stage. The label rate is 2-4 fl.oz. per 100 gals. The miticide has translaminar activity.

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providing up to 30 days of residual activity, which is similar to other miticides including



hexythiazox (Hexygon), bifenazate (Floramite) and abamectin (Avid).

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, which includes fatty acids, oils and waxes. Lipid molecules are responsible for a number of functions such as cell structure in membranes and sources of energy. As such, Judo blocks the production of lipids, which disrupts cell membrane structural integrity and reduces energy sources.

Ovation

Ovation, manufactured by Scotts Co., contains the active ingredient clofentezine and is labeled for control of twospotted spider mite, Pacific spider mite, McDaniel spider mite, European red mite and yellow spider mite. Because Ovation is a contact miticide only, thorough coverage of all plant parts is critical during application. This miticide is active on mite eggs and the immature stages, such as the nymphs and larvae, with no direct activity on adult mites.

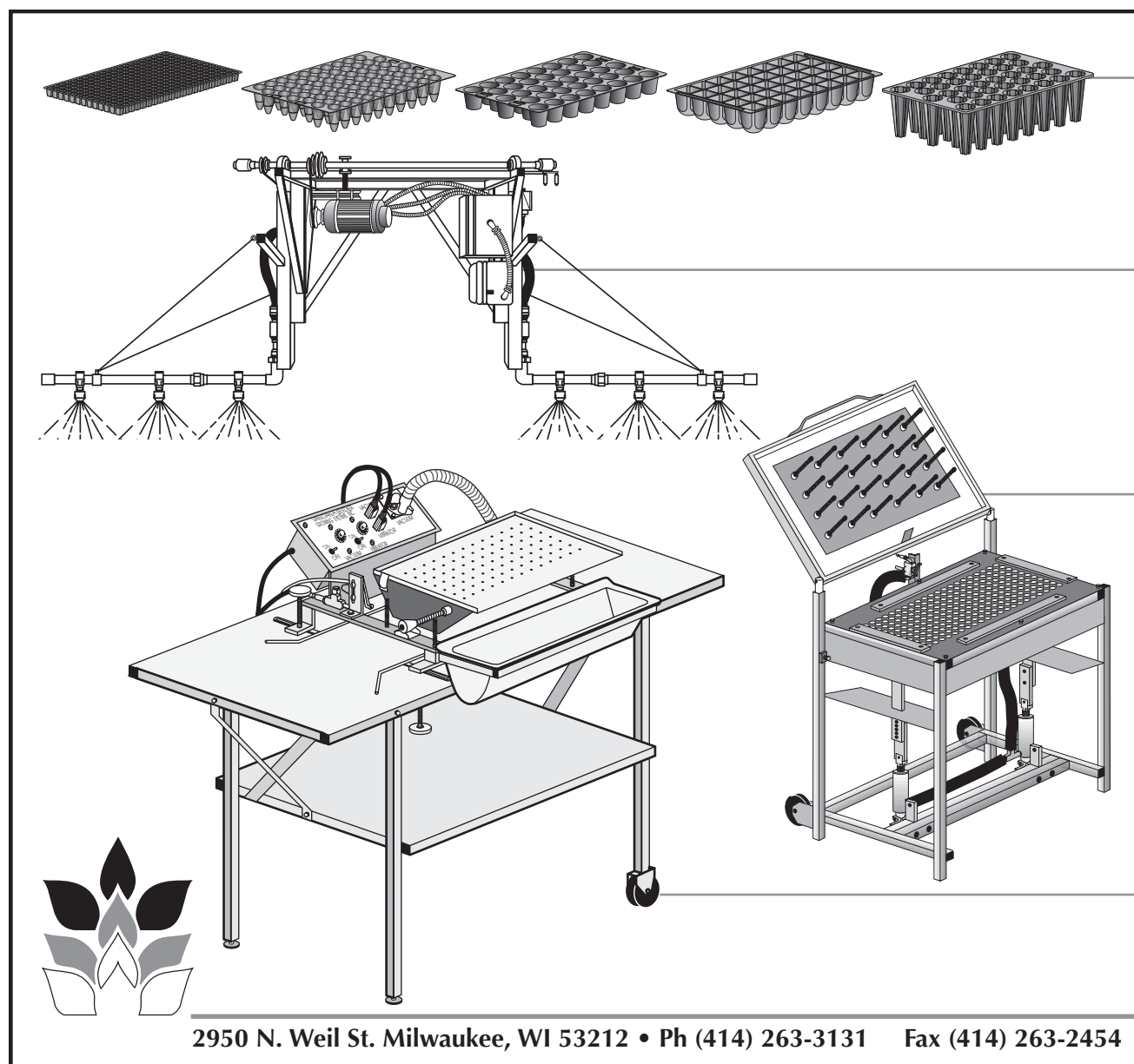
Although Ovation is slow acting, it can provide up to 45 days of residual activity. The label rate is 2 fl.oz. per 100 gals. Ovation has the same mode of action as hexythiazox (Hexygon),

which means these two miticides should not be used in succession in a rotation program. Ovation has a mode of action that disrupts the formation of the embryo during development or inhibiting larval maturation. However, the specific mode of action and target site of activity are still not well understood.


Pylon

Pylon is an insecticide/miticide containing the active ingredient chlorfenapyr. Pylon, manufactured by OHP Inc., is labeled for control of twospotted spider mite, broad mite, cyclamen mite, citrus bud mite and rust mite. This insecticide/miticide has both contact and translaminar activity. Additionally, Pylon works as a stomach poison when ingested. The insecticide/miticide is active on the mobile life stages, including larvae, nymphs and adults. It has no activity on mite eggs.

Pylon may provide up to 28 days of control. The label rate is 2.6-5.2 fl.oz. per 100 gals. The mode of action of Pylon involves uncoupling oxidative phosphorylation, which is a major energy-producing step in cells, by disrupting the H⁺ gradient, and thus preventing the formation of adenosine tri-phosphate (ATP), a high-energy organic phosphate responsible for energy transfer during cellular reactions. ♦



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Sanmite

The active ingredient in Sanmite, manufactured by Scotts Co., is pyridaben. Sanmite is labeled for control of twospotted spider mite, broad mite, European red mite, Southern red mite and tumid mite. Sanmite is a contact insecticide/

miticide only, so thorough coverage of all plant parts is important for effective control. It has activity on all mite life stages, including eggs, nymphs, larvae and adults. Sanmite works quickly on the mobile stages and may provide up to 45 days of residual activity.

The label rate is 4 oz. per 100 gals. Sanmite has a similar mode of action as fenpyroximate (Akari) and acequinocyl (Shuttle). All three are METIs; however, the site of action is different from Shuttle. Still, these miticides should not be used in succession in a rotation pro-



gram. Sanmite has a mode of action that involves inhibition of the mitochondria electron transport system at the NADH-coenzyme Q reductase site of Complex I.

Shuttle

Shuttle has the active ingredient acequinocyl. Manufactured by Arysta LifeScience, this miticide is formulated as a 15-percent soluble concentrate (SC). Shuttle is labeled for control of twospotted spider mite and spruce spider mite. The miticide works by contact activity only but is active on all spider mite life stages, including eggs. It kills spider mites quickly and provides up to 28-days of residual activity. The label rate is 6.4 to 12.8 fl.oz. per 100 gals. Shuttle has a mode of action similar to fenpyroximate (Akari) and pyridaben (Sanmite) as all three miticides are METIs. 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 in the mitochondria, reducing energy production by preventing synthesis of ATP. Regardless, it is still important to avoid using any one of these three miticides in succession in a rotation program.

TetraSan

TetraSan, manufactured by Valent U.S.A. Corp., contains the active ingredient etoxazole, and is actually a growth regulator for mites, inhibiting the molting process. TetraSan is labeled for control of twospotted spider mite, citrus red mite, European red mite, Lewis spider mite, Pacific spider mite, Southern red mite and spruce spider mite. This miticide has both contact and translaminar activity providing up to 28 days of control from a single application. The label rate is 8-16 oz. per 100 gals. TetraSan is active on the egg, larvae, and nymphal stages of mites. It generally has minimal activity on adult mites. However, adult female mites that are treated do not produce viable eggs. The mode of action of TetraSan is as a

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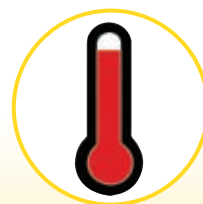
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chitin synthesis inhibitor by preventing the formation of chitin, which is an essential component of an insect and mite's exoskeleton causing the cuticle to become thin and brittle. As a result, mites die while attempting to molt from one life stage to the next.

ProMite

ProMite (formally Vendex) is one of the older miticides and contains the active ingredient fenbutatin-oxide. Manufactured by Griffin LLC, this miticide is available in water-soluble packets and is labeled for control of twospotted spider mite, clover mite, oak mite, Southern red mite and spruce spider mite. ProMite is a contact miticide only, so it is important to thoroughly spray all plant parts during application. This miticide is slower acting than most miticides, taking 7-10 days to eventually kill mites. However, it provides up to 30 days of residual activity. The label rate is 8-16 oz. per 100 gals. ProMite is a warm-weather miticide providing better control when the ambient air temperature is above 70° F. ProMite has a mode of action involving the inhibition of oxidative phosphorylation at the site of dinitrophenol uncoupling, which disrupts the formation or synthesis of ATP. This is a restricted use miticide (48-hour restricted entry interval).

Conclusion

It is fortunate there are a plethora of miticides available, for both indoor use in greenhouses and outdoor use in nurseries, which have distinctive modes of action. This makes it easier to develop rotation programs based on using different modes of action in order to avoid mite populations developing resistance to currently available miticides. Be sure to read the label carefully prior to mixing any

miticide in order to obtain essential information, including which mite stages are controlled, number of applications recommended, frequency of applications, recommended pH of the spray solution and any phytotoxicity issues for particular crops. [GPN](#)

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