

Coping with Spider Mites

Spider mites thrive in warm or hot, dry weather. They survive over the winter on a number of plants, including many evergreens. Carbamates such as DDT and Sevin, and pyrethrium based products such as Talstar (and many others) cause an explosion in fertility of spider mites. Use any Carbamate or pyrethrium based product, and you will have spider mites all over. Some of the pyrethrium based insecticides were originally considered to be miticides, but they now all cause an explosion of fertility of spider mites.

If a plant gets a serious case of spider mites, the best control is removing the plant, placing it in a plastic bag, closing the bag tightly, and sending it to a landfill far away.

The American Dahlia Society does not endorse any specific method of mite control, but if you plan to use any of the many available products, this article explains how to use them.

The “organic product” movement has classified certain methods of control (such as horticultural oil) as acceptable and other methods (such as chemicals that target only specific pests) as not acceptable. Spider mites have a very short life cycle and produce hundreds of eggs. Spider mites can destroy a previously healthy dahlia plant in a few days, so learn to see the signs of mites on a plant’s foliage and take immediate action.

If you plan to use any of these products, rotate the chemical class. Mites quickly develop immunity to any product that one uses (except horticultural oil, which kills by smothering). However, over use of horticultural oil can cause serious fungus problems, and horticultural oil is only safe to use when temperatures are below 85 degrees.

Dahlia growers from 50 or 60 years ago would be astonished to hear our concerns with mites, because these tiny creatures were not a serious problem until after World War II. Interestingly, DDT created the mite problem two ways. First, DDT killed many mite predators. Moreover, DDT vastly increased the fertility of mites — by greatly increasing the number of eggs each female mite would lay and by substantially enhancing the percentage of mite eggs that hatched. A widely used miticide in the United States today is Sevin, a carbamate (same chemical class as DDT). I have always heard warnings not to use Sevin on dahlias because it worsens mite problems.

More recently, many dahlia growers use synthetic pyrethroids, a chemical class that emerged in the late 1970s. The most highly regarded synthetic pyrethroid in the United States now is Bifenthrin, sold as Talstar. Synthetic pyrethroids, however, also worsen

mite problems. In addition to killing mite predators, pyrethroids repel spider mites and induce them to migrate to new host plants. The ratio of females to males increases, and reproduction and dispersion of mites both increase. Interestingly, Bifenthrin is marketed in the United Kingdom as a miticide. Studies I have seen have shown Talstar not to be effective as a miticide. I am uncertain whether these studies take into account the effect of Bifenthrin and other pyrethroids in inducing mites to spread beyond the area being sprayed. My problems with spider mites decreased substantially once I stopped using Talstar or any other pyrethroid products near my dahlias.

Compared to insects, mites reproduce far more quickly and mutate more rapidly. The process of mutation creates new variants resistant to any chemical used repeatedly on mites. Anyone using chemical control must therefore rotate chemical classes frequently to prevent the mites from becoming resistant. A general rule is not to use any specific miticide more than twice per season. Horticultural oil helps control mites by smothering mite eggs and the early larval stages, and the pests do not build up an immunity to suffocation. However, one should only use the oil two or three times per season. Repeated use of horticultural oil destroys the natural oils of dahlias and leads to a breakout of serious fungus problems.

Mites have 4 stages: egg, larvae, nymph, and adult. For the 2-spotted red spider mite, the most common dahlia predator, the cycle is 4 days from egg to larvae; 4 days from larvae to nymph; and 6 days from nymph to adult. To attack 2-spotted red spider mites with oil, one would need to spray 2 c.c. of oil per liter of water and repeat in 8 days and then 6 days later. (Figure 5 c.c. per teaspoon and about 3.8 liters per gallon of water.) Because of the potential for fungus problems, one should not use the oil again the same growing season. Because oil does not kill adults, one should combine the first spraying with an adult miticide, such as Avid, Pylon, Floramite, or Forbid. In theory, this schedule should control an existing invasion until new mites migrate from some other nearby crop. Pylon, which seems to be the most effective miticide, has a 3 year shelf life once one opens the package. Put a note with the expiration date (3 years from starting) with first use of Pylon, and replace the product in time. Using an expired bottle of Pylon will probably create new generations of mites resistant to the chemical, so using expired product is dangerous to every user.

Insect and mite growth regulators, all based on or containing neem oil, prevent insects and mites from advancing from one stage to the next in their life cycles. Since insects have three stages and mites have four, these products make any other miticide program more effective. My late mentor and friend Bob Moynahan, a top dahlia person and chemist, recommended Azadirachtin as the best neem oil product. This chemical, which organic gardeners approve, is available as Azatrol (in low concentration) or Azatin-O for large growers (much higher concentration). Azadirachtin works on contact only, so it only helps for spider mites if one thoroughly sprays the backs of all the foliage. The residual is seven day, so use this product (with any other insecticide or miticide) every week and use a sprayer that reliably hits the backs of all the leaves.

Selecting the proper products also requires the ability to diagnose a mite invasion. The typical sign of 2-spotted red spider mites is yellowing of the most mature leaves, lowest on the plant. The backs of the leaves show a red webbing. While other conditions can turn old leaves yellow, normally the leaves turn yellow all over. With spider mites, the yellowing is uneven but over large portions of the leaves, starting from the oldest leaves and the leaves closest to the ground. If in doubt, have someone experienced come and show you the signs.

Cyclamen mites, which are a fraction the size of 2-spotted red spider mites, are entirely different. With cyclamen mites, the newest foliage looks like spinach. While chemical damage can give the same symptoms, when you see a spinach effect, suspect cyclamen mites.

Because mites stay only on the backs of leaves, control requires thorough coverage of the backs of all leaves. Because of the difficulty of spraying under all leaves, the most popular miticide in BASF's Abamectin, sold in many areas under the trade name Avid (now also available as a generic). Growers appreciate Avid, because it is partially systemic. On young foliage, Avid penetrates and is effective through the leaf. This chemical, which is synthesized from a natural bacterium in the soil, cannot penetrate mature foliage or move from one leaf to another. Unfortunately, because of over use, many mites could be developing resistance to Abamectin (Avid). Avid has been most effective against broad mites or cyclamen mites. This experience makes sense,

because these types of mites tend to attack the youngest foliage, and Avid penetrates the young foliage (and thus kills on the back of the leaves) while it does not penetrate mature foliage (which the 2-spotted spider mites attack). There is a newer generation of Avid, but it is a restricted chemical and volatile. The restricted Avid update will eat through many types of packaging, so it is not for home users.

Because mites have 4 stages, a miticide can potentially kill mites at any or all of these stages. Some miticides, such as Avid or Floramite, kill adults. A few products kill or neutralize eggs (and sometimes make adults sterile even if they do not kill them). The most effective and longest-lasting control would kill both eggs, adults, and larvae or nymph stages. Combining an ovicide (which kills the eggs) with a product that kills adults greatly enhances the effectiveness of any spraying program. If the spray program does not control all stages, re-spray on a schedule that takes into account the timing of the stages in the mite life cycle. Because mites often lay eggs on the tops of stakes (and the webs are often visible), when spraying with an ovicide, spray the tops of the stakes as well as the backs of the foliage.

Any article on miticides depreciates quickly, because manufacturers release new products annually, and because mites develop resistance rapidly. Because of the expense of the EPA regulatory process and because the ability of mites to develop resistance quickly means that effective product lives are short, most miticides are very expensive. In the National Capital Dahlia Society, some of us get together, purchase a product together, and then subdivide the product. For a \$300 product, with three purchasers, we can normally have enough miticide for a few years for around \$100 each.

The most effective ovicides are horticultural oil and Hexygon (from Gowan Chemical). Hexygon has a long residual (up to 21 days). By interrupting the reproduction cycle, Hexygon used with an effective adult miticide, tends to be very effective if used at the very first sign of any mite activity. Since Hexygon is only effective as a contact killer, one must cover the backs of all the foliage to use it effectively. As with most chemicals (other than horticultural oil), a good spreader-sticker enhances the effectiveness of most miticides.

One organic approach is very helpful in controlling 2-spotted spider mites and other mites that attack the oldest foliage. Strip off all old leaves, put them in plastic bags, and hide them in household trash. Never leave old dahlia foliage in the garden. After topping the dahlia plant, when replacement laterals develop a few sets of leaves, strip off the foliage from the main stem. After cutting a bloom, remove and destroy foliage lower on the lateral. If any plant shows extensive mite attack, rip it out and throw the entire plant into the trash. By the time one recognizes the common yellowing of foliage common from a mite attack, the mites have moved up the plant and left nothing but eggs. If one sees evidence of extensive mite damage, the plant in question is more a breeding factory for mites than anything else, and it will not produce decent blooms, but it will spread mites elsewhere in the garden. Careful attention to stripping old foliage can minimize spread of mites and be more effective than virtually any chemical miticide. A second highly useful organic approach to controlling mites (and insects) is to use Azadirachtin with every spraying and to be careful to hit spray the backs of every leaf.

Note: home composting typically does not become hot enough to kill spider mite or insect eggs, so I do not recommend composting dahlia trash.

There are several adult miticides, and numerous others are undergoing EPA testing. Uniroyal introduced a new adult miticide called Floramite in 2000. This product seemed to be very effective against 2-spotted spider mites and some other types, but it is not effective against broad mites or cyclamen mites. Floramite claims that it kills some eggs, but it is not reliable as an ovicide. I have no information on whether Floramite is still effective 20 years later.

Pylon, introduced in 2000 or 2001, has the major advantage of being partially systemic. Like Avid, it penetrates young foliage. Pylon was tremendously effective when first introduced, but there have been reports of resistance in some areas. Pylon does not damage either blooms or foliage, and it kills the large mites that often run all over dark blooms (primarily reds, dark reds, and purples). Unfortunately, Pylon has a short shelf life, and one must discard it within three years of purchase. Twenty years after introduction, Pylon seems still to be the most effective chemical miticide.

Cinnamite, made from food grade cinnamaldehyde, was effective when introduced, but

it has a short residual. Cinnamite can damage foliage in hot weather, so be careful not to use it when high temperatures will be greater than the high 80s. Cygon 2-E, an organic phosphate, has been effective against mites. Cygon 2 E is systemic and long lasting. One may use it as a soil drench early in the season for broad spectrum control of insects and possibly help with mites. However, because most mites do not reproduce rapidly until hot, humid weather, the absence of symptoms early in the season could indicate that the mites have not gotten started yet rather than any effectiveness of the Cygon 2-E against mites.

Remember: use Azadirachtin with every spraying and to be careful to hit spray the backs of every leaf.

Several other new products are always under regulatory review, so any article on miticides becomes dated quickly. Forbid is a newer miticide active against all life forms of spider mites. Since I have only used Forbid in combination with other miticides, I have no information on how effective it is.

A Practical Schedule for Attacking Mites

Early in the season, as long as the temperatures remain relatively cool, a soil drench with Cygon 2-E is probably sufficient in most areas. However, at the first sign of mites, or when dry and hot summer weather starts, one should begin a regular program. Because mites quickly develop resistance to any chemical, any effective program requires rotating a minimum of three chemical classes before repeating any chemical class, and discipline not to use any chemical control more than twice in any growing season. The exception is that every serious grower should use Azadirachtin with every spraying and to be careful to hit spray the backs of every leaf.

If the first sign of mites is early enough in the season that high temperatures are no higher than 85 degrees, consider using horticultural oil plus Cinnamite for the first treatment. An advantage of these products is that both are inexpensive. The horticultural oil will smother the eggs and early stages while the Cinnamite will hopefully kill the adults. Be careful to hit the backs of all foliage, because neither product is systemic. Use the timetable above to time a second treatment of the horticultural oil in 8

days and a third treatment 6 days later. Do not use the horticultural oil again the same season (because of the potential for fungus damage). Because horticultural oil kills by smothering rather than by chemical action, the mites cannot build up resistance to it.

An excellent choice for a second chemical class is to use Hexygon for long lasting control of eggs plus an adult miticide such as Avid. For 2-spotted red spider mites, the next two treatments should be Pylon, Forbid, and Floramite (the order does not matter). In case of cyclamen or broad mites, the choices are Avid or Pylon. I have normally found a single treatment of Avid to be highly effective against cyclamen mites.

After using a minimum of three different chemical classes, it is safe to repeat a miticide and use it a second and final time in a given season. Try to reserve Pylon to use it around show time, in case of any mites attacking dark colored blooms. Because Pylon will not damage the blooms and will kill the large mites that can ruin dark blooms, it is especially useful during show season. However, if you have used Pylon recently before a show, using it again before rotating two other chemical classes is an invitation to developing chemical resistance and losing the benefit of one of the most effective miticides we have ever had.

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