

The Two Spotted Spider Mite in the Northeast Hopyard

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The two spotted spider mite (TSSM) *Tetranychus urticae* Koch is a common pest of many crops and ornamentals. Hop growers, landscapers, arborists, and vegetable and fruit growers are familiar with these small 8-legged creatures that are more closely related to spiders than insects. They can be a major cause of crop reduction in hops, both by reducing productivity of the leaves and direct damage to the hop cones. The TSSM is found worldwide and the Northeast US is no exception.

Life History

Insects and mites are very dependent on ambient temperatures in the development of their life cycle. The TSSM begins life as an egg, then larva, two nymph stages and then adult. The female overwinters as a diapausing adult, meaning she is alive but dormant. These orange-hued adults overwinter on debris in the hopyard or even the poles. As spring develops the females begin feeding on whatever vegetation is available, including hops. They start laying eggs within a few days depending on the weather. These eggs hatch within 2 to 5 days as larvae. They develop, molt and become adults in 7-21 days. The warmer it is (up to 100 Degrees F) the faster they develop. Cold, wet weather is the bane of the TSSM. If we have a hot, dry summer there can be from 4 to 8 generations of mites, moving up the vines as the season warms. Research shows that female mites may lay as many as 240 eggs over the summer, often more than a dozen a day. This is why it is so important to do regular scouting for mites, as the population can explode in warm weather.



Two spotted spider mites (D. G. James)

Identification

Spider mites are small, very small. They are adapted to living on the underside of leaves. This is where you will find them. Using a 10X or 20X hand lens, you can see them very clearly. The eggs look like tiny clear marbles about 1/150 of an inch. The adults are about 1/60 of an inch.

The adult females begin the spring with an orange color and green up as they eat.

Adults have two dark spots that don't develop until late May or June so they are often mis-identified early in the season. There is another important mite pest in the Northeast, the eastern red mite (ERM). These are commonly found in orchards but have not been reported as a pest in hops so far. You also may see predatory mites on leaves. There are many species of these but in general they are larger and faster than the two spotted spider mite. When scouting, you may see them actually chasing the TSSM down. Predatory mites and lady beetles are the two major predators of the TSSM and it is important to try to maintain their populations in the hopyard.

Crop Damage

As stated earlier, the two spotted spider mite feeds on both the leaves and cones of hops. They pierce the plant cells and extract the liquid contents. In large numbers the hop leaves become silvery (often bronze in other plant species). If this is when you first notice them in the yard, then you have waited too long to look. At this point you may also see white webs (hence the name spider mites). This provides the mites with additional protection from predators and pesticide applications. If unchecked, TSSM can defoliate a hopyard, especially under hot, dry conditions.

Although mites cannot fly, they can and do spread in the hopyard by wind. Isolated colonies can move quickly. Severe infestations will certainly weaken the plants and reduce yields, but the most obvious economic damage is to cone quality. Infested cones will develop a reddish discoloration. They will likely shatter as they dry, reducing both quantity and quality. In addition, the mites themselves are considered a contamination and brewers often reject these infested hops. The alpha levels of these hops will be lower and the storage life reduced. Heavy infestations of mites can mean losing a large portion of the crop.



Spider mite webbing is associated with severe infestations. (D. G. James)

Managing TSSM populations

Finding a few of these mites does not mean disaster. Predatory mites and insects can maintain mite populations below an economic threshold. If the weather is cool and rainy, mite populations will likely stay low, however this kind of weather can create the proper environment for fungal disease development. Eggs and mites can be washed off the leaves with heavy rains and some commercial organic producers in the Pacific Northwest have used overhead sprinklers to successfully reduce mite populations. Some home growers use a hose to reduce TSSM populations but remember that the mites are on the underside of the leaves.

Growers should base mite control on scouting and the application of appropriate pesticides to keep the mite population below economically damaging levels. Scouting in the Northeast should start by late May/early June depending on location and weather conditions. Early in the season, leaf samples should be taken between 3 and 6 ft off the ground. As the season progresses the mites move up and you will have to sample much higher. You will need a 10X or 20X hand lens to get a good look at the underside of the leaves. Examining leaves right in the field is the quickest means to assessing mite populations. Start the scouting process by evaluating 2 or 3 leaves from 25-30 plants per block/or variety. Finding more than 1 or 2 adult mites/leaf in June indicates the need to implement a pest management strategy. By mid July the threshold used in the PNW increases to 5-10 mites/leaf. Research has shown that as long as the cones are not infested, hop plants can tolerate a good deal of damage from mites. Any control measures should include consideration of the impact on beneficial insects and mites. It has been shown that many beneficial insects live in and around cover crops in between the rows and in un-mowed areas adjacent to the hopyard. Selecting insecticides that have a minimal effect on these beneficial insect populations is a good practice. Broad spectrum insecticides such as Pyrethroids and sulfur products applications can actually cause an increase in mite populations in the hopyard due to their negative impact on beneficial insects.

The following table was developed by Tim Weigle Cornell IPM Viticulture Specialist. It contains information on registered pesticides approved for use on hops to manage spider mites in New York and Vermont. Please note there are several pesticides listed with an* which indicates they are not labeled in Vermont. The rest are labeled in both states. The table also highlights pesticide information developed in the Pacific Northwest. Keep in mind that many of the pesticides listed here are restricted use, meaning you will need NYS DEC or your own state pesticide certification to purchase and apply them. Check with your local Cooperative Extension office on how to obtain certification. If you are a certified organic producer, you must only apply control materials that meet USDA organic standards.

Pesticides labeled for management of spider mites in hops in New York and Vermont

*Indicates not currently labeled in Vermont

Active Ingredient	EPA Reg #	Name	Signal Word	Restricted use	Comments
abamectin	100-1154	Epi-Mek 0.15 Miticide/Insecticide	Warning	Yes	See label for restrictions for half trellis growth applications
abamectin	100-1351	Agri-Mec SC Miticide/Insecticide	Warning	Yes	See label for restrictions of adjuvant use, and half trellis growth applications
abamectin	100-898	Agri-Meck 0.15EC Miticide/Insecticide	Warning	Yes	See label for restrictions for half trellis growth applications
abamectin	228-658	Nufarm Abamectin 0.15 EC miticide/Insectidie	Warning	Yes	See label for restrictions for half trellis growth applications
abamectin	34704-923	Reaper 0.15 EC	Warning	Yes	Rate dependant on stage of trellis growth
abamectin	66222-139	Abba 0.15 EC	Warning	Yes	Rate dependant on stage of trellis growth
abamectin	67760-71	Zoro Miticide/Insecticide	Warning	Yes	Rate dependant on stage of trellis growth
abamectin*	67760-71-400	Temprano*	Warning	Yes	Rate dependant on stage of trellis growth
abamectin	83100-4-83979	Abacus Ag Miticide/insecticide	Warning	Yes	
abamectin	84229-2	Timectin 0.15EC			Will not control adult spider mites, will not control existing populations but does render eggs laid by treated females nonviable (from Pacific Northwest Insect Management Handbook)
hexythiazox	10163-250	Savey DF	Caution	No	
bifenthrin	83520-4	Bifen 25% EC Trace Mountain - Bifenthrin 2	Warning	Yes	Short lived at high temps. Harsh on beneficials
Bifenthrin*	86154-4	EC*	Warning	Yes	Short lived at high temps. Harsh on beneficials
bifenthrin	279-3313	Brigade 2EC Insecticide/Miticide	Warning	Yes	
bifenthrin	279-3332	Brigadier	Warning	Yes	
bifenthrin	34704-858	Snniper	Warning	Yes	
bifenthrin	1381-196	Tundra EC	Warning	Yes	
bifenthrin		Discipline 2EC			
bifenthrin		Fanfare 2EC			
Horticultura/ petroleum/ mineral oils					Excellent coverage is essential for horticultural oils as they act by a physical mode of action (smothering), may be more for suppression than control (this is an educated guess coming from grape research and some labels for hops). Most labels call for protective sprays starting at early leaf stage and continuing for 10-14 day intervals which tells me they will not be as effective in controlling existing populations. Always check labels but most also labeled for powdery mildew management.
	19713-123	Drexel Damoil	Caution	No	Discontinue at burr development. See restrictions on label for tank mixes and spray intervals with other materials
	34704-806	Biocover UL*	Caution	No	
	34704-849	Glacial Spray Fluid	Caution	No	Discontinue at burr development.
Petroleum	69526-5-499	Ultra Pure Oil	Caution	No	Discontinue at burr development.
Petroleum	69526-5	Purespray 10E	Caution	No	Discontinue at burr development.
Petroleum	69526-9	Purespray Green	Caution	No	Organic, OMRI approved
Paraffinic oil	65564-1	JMS Stylet Oil/Organic JMS Stylet Oil	Caution	No	See restrictions on label for tank mixes and spray intervals with other materials. Organic formulation OMRI approved Best when day temps above 70 F. Check label for tank mix compatibility problems (i.e petroleum based spray oils and alkaline products)
Propargite	400-104	Comite	Danger	Yes	
bifenazate	400-503	Acramite - 50WS	Caution	No	Spray water pH should be between 5.5 - 6.5 May burn foliage at temps above 90F
Sulfur					
Sulfur	51036-352- 66330	Kumulus DF	Caution	No	Labeled states 'for supression of red spider mites' Do not use within 21 days of an oil spray. labeled for red spider mites beginning at early leaf stage
	55146-75	Micro Sulf (Agtrol)	Caution	No	Do not use within 4 weeks of an oil spray. Labeled for red spider mite. Begin when treatment when infestation first begins
	57538-5	That Flowable Sulfur*	Caution	No	Begin when infestation first occurs
	66330-211	Sulfur 6L	Caution	No	Basically an ovicide/larvicide (eggs and immatures) Should be used when population levels are low.
Etoazole	59639-138	Zeal Miticide1	Caution	No	

**Unknown Efficacy
against TSSM in
Northeast US**

Malathion	9779-5	Malathion 5	Warning	Yes
Pyrethrin	1021-1771	Pyganic Crop Protection EC 1.4	Caution	No
Sucrose Octanoate	70950-2-84710	Sucrashield		No
Azadirachtin	71908-1-10163	Aza-Direct		NO
Bt	73049-40	Xentari biological insecticide		No
Beauveria Bassiana GHA	82074-1	Bontanigard ES		No
Potassium silicate	84846-1	Carbon defense		Yes
Azadirachtrin	2217-836	Azatrol EC		No
pyrethrin/piperonyl Butoxide	432-1033	Pyrenone Crop Spray		No
pyrethrin/piperonyl Butoxide	655-489	Prentox Pyronyl		No
Neem Oil	70051-2	Trilogy		No

This publication may contain pesticide recommendations. Changes in pesticide regulations occur constantly, and human errors are still possible. Some materials mentioned may no longer be available, and some uses may no longer be legal. Questions concerning the legality and/or registration status for pesticide use should be directed to the appropriate extension agent or state regulatory agency. Read the label before applying any pesticide. Cornell and University of Vermont Cooperative Extensions, and their employees, assume no liability for the effectiveness or results of any chemicals for pesticide usage.

Remember that the pesticide label is the law. Copies of the labels listed in the table above can be found on the Cornell PMEP Product, Ingredient, and Manufacturer System (PIMS) at <http://pims.psur.cornell.edu/>

For more information on spider mites on hops check out the following publications:

Compendium of Hop Diseases and Pests by APS Press www.apsnet.org

Field Guide to Integrated Pest Management in Hops available on line at <http://hops.wsu.edu>

Pest Management Strategic Plan for Hops In Oregon, Washington and Idaho: a summary of workshops held in 2008

<http://www.ipmcenters.org/pmsp/pdf/or-wa-idhopspmsp.pdf>