

Spruce Spider Mite Management in Christmas Trees, 2012

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Spruce spider mite (*Oligonychus umunguis*) is an important pest of conifers in Michigan. This tiny insect can infest all species of commercially produced Christmas trees, regularly causing significant economic losses in spruce and Fraser fir plantings. SSM can be a more common pest in conventionally managed plantations that have lower predatory mite populations due to insecticide use. Predatory mites benefit the grower because they feed on SSM and help keep populations in check, in their absence SSM populations can flare leading to tree damage.

Biology

The SSM overwinters as an egg on budscales, in needle axils, or under webbing. In the spring the eggs hatch and larvae emerge, molt into nymphs and feed on tree sap before molting into adults, mating, and starting the cycle again. The entire lifecycle of SSM can occur in as little as 15 days giving this pest the potential for rapid population growth under the right conditions. SSM are tolerant of cooler weather in the spring and fall with activity in temperatures as low as 43°F. Based on research done by Boyne and Ham (1983), the development of SSM is primarily temperature driven and the time required to complete a lifecycle will continue to accelerate until the ideal maximum temperature of 78°F is reached. In mid-summer when daytime temperatures typically begin to reach the mid-80s, populations crash as egg viability decreases. The few eggs that do survive these temperatures provide the seed population that rebounds as temperatures cool in late summer. Moisture and natural enemy populations also greatly affect SSM populations within the season. Wet or humid conditions greatly reduce SSM egg hatch, conversely predatory mites prefer high humidity further reducing populations in wet years. Accordingly, dry conditions contribute to increased populations of SSM due to higher egg viability and reduced levels of predatory mites.



Figure A. Adult spruce spider mite with egg.
(USDA FS –Northeastern Area Archive, Bugwood.org)

Identification

Confirming the identification of the mite at all life stages (egg, larva, nymph, adult) is the first critical step to effective management. The SSM egg is a tiny bright red sphere with a single hair in the center, eggs that have already hatched will appear clear (Figure A). Spruce spider mites are very small and soft-bodied during the motile stages. The larval stage has six legs, the nymphal stage has eight. Adult SSM are one solid color, elliptical in shape and have hairs along the top of the abdomen. Coloration varies and is not a good indicator of identity for the motile life stages. Beneficial predatory mites can be distinguished from pest mites by observing their movement. When disturbed, adult predatory mites generally move more quickly than pest mites and can be observed moving speedily around on scouting boards. Fine webbing on branches is associated with SSM activity.

Scouting

To scout for SSM growers should sample multiple trees in each plantation and be sure to select trees from different elevations as well as from the interior and exterior rows of plantings. Larger tree samples will increase grower accuracy in their assessment of the population and potential risk. Scouting should be done on a season long basis and not only after symptoms appear as this is often too late for effective treatment. The simplest way to scout for adult and juvenile mites is to shake or tap a branch over a scouting board or piece of paper.



Figure B. Spruce spider mite feeding on needle and associated damage. John A. Weidhass, Virginia Polytechnic Institute and State University, Bugwood.org

To scout for eggs you must look at the branch and needles as eggs are attached and may not readily drop

when you tap the branch. SSM and their eggs must be viewed using a 15X hand lens for magnification. Symptoms of damage include chlorosis, needle drop, and tree mortality. When viewing damage through a hand lens, symptoms appear as small, yellow circular patches that surround the feeding sites (Figure B). Damage is permanent, but becomes less visible over time as the host produces new growth. The symptoms and extent of damage from SSM damage is host dependent and SSM is more likely to cause tree mortality in nursery stock while established trees may partially defoliate but survive. Rust mites damage appears similar, but needles appear more bronzed than chlorotic and when viewed up close do not show the distinct circular pattern associated with SSM feeding.

Management

SSM damage can be prevented through a combination of careful monitoring, resistance management and the utilization of pesticides that are less harmful to beneficial predatory mites. Temperature driven models have been developed in some regions of the United States to more accurately gauge the need and timing for SSM treatment, but there are many variables (tree species, age, environmental conditions, treatment cost) that complicate the question of whether treatment is warranted and somewhat marginalize the practicality of modeling. The simplest way to determine the need for management is to evaluate if scouting indicates that the population is growing or at a damaging level. It is important to remember that SSM populations can fluctuate rapidly so simply observing damage on trees is not an accurate indicator of the need for treatment as damage may have been caused by populations that have since died off, making a spray application pointless. The following table contains current treatment options, their chemical class, the life stage they target, relative efficacy, duration of control and relative toxicity to beneficial predatory mites.

2012 Control Options for Spruce Spider Mite

Chemical class	Compound (<i>active ingredient</i>)	Life stage target*	Efficacy	Residual control	Toxicity to predatory mites
Pyrethroids	Asana XL, Adjourn, S-fenvalostar (<i>esfenvalerate</i>), OnyxPro, Sniper, Quali-Pro Bifenthrin Golf and Nursery 7.9F (<i>bifenthrin</i>), Tame (<i>fenpropathrin</i>), Baythroid XL (<i>cyfluthrin</i>)	Motiles	Good	4-6 weeks	H
Organophosphates	Chlorpyrifos 4E AG, Chlorpyrifos 4E AG, Govern 4E, Hatchet, Lorsban Advanced, Lorsban 4E, Lorsban 50W WSP, Lorsban 75WG, Nufos 4E, Quali-Pro Chlorpyrifos 4E, Warhawk, Whirlwind, Yuma 4E Insecticide, Vulcan (<i>chlorpyrifos</i>)	Motiles	Fair	4-6 weeks	H
Avermectins***	Avid 0.15EC, Ardent 0.15EC, Lucid Ornamental, Nufarm Abamectin, Merlin, Minx, Quali-Pro Abamectin 0.15EC, Timectin 0.15EC T&O (<i>abamectin</i>)	Motiles	Good	3-4 weeks	M
Neonicotinoids	Admire Pro, Couraze 1.6F, Couraze 2F, Couraze 4F, Mallet 75WSP, Nuprid 1.6F, Pasada 1.6F, Prey, Provado 1.6F, Sherpa, Widow, Wrangler (<i>imidacloprid</i>)		Poor		M
Tetronic acids	Envidor 2SC Mitecide (<i>spirodiclofan</i>)	Eggs, Motiles	Good	3-4 weeks	S
Thiazoles***	Savey 50DF, Onager, Hexygon DF (<i>hexythiazox</i>)	Eggs, Larvae	Good	3-4 weeks	S
Carbazates	Acramite 4SC, Floramite SC, Sirocco (<i>bifenazate</i>)	Eggs, Motiles	Good	4 Weeks	M
Sulfite esters	Omite (<i>propargite</i>)	Motiles	Good	3-4 weeks	S
Organotins***	Vendex (<i>fenbutanin</i>)	Motiles	Good	4-6 Weeks	S
Horticultural oils****	Damoil (<i>mineral oil</i>), Purespray 10E, Purespray Green (<i>petroleum oil</i>)	Eggs, Motiles	Good	2-6 Weeks	S
Quinolines	Shuttle (<i>acequinocyl</i>)	Eggs, Motiles	Good	3-4 Weeks	M
Quinazolines	Magister, Magus (<i>fenazaquin</i>)	Eggs, Motiles	Good	3-4 Weeks	M
Pyridazinone	Sanmite (<i>pyridaben</i>)	Eggs, Motiles	Good	3-4 Weeks	M
Insect growth inhibitors	Apollo SC (clofentazine)*****	Eggs, Larvae, Nymphs	Good	3-4 Weeks	S
Insect growth regulators	TetraSan (<i>etoxazole</i>)	Eggs, Larvae, Nymphs	Good	4 Weeks	M

* Motile forms include mite larvae, nymph and adult stages.

**S-relatively safe to mite predators, M-moderately toxic, H-highly toxic.

*** Avermectin, organotin, and thiazole miticides are slower acting so growers should not be surprised if mites appear alive following application, it may take 7-10 days to see complete mortality.

**** Horticultural oils can cause phytotoxicity, particularly when used in the summer, and can lighten the blue coloring in blue spruce trees. A 1% concentration of a highly refined horticultural oil is usually a safe rate to spray anytime of the year, but a 2% or higher concentration may damage bloom on glaucous varieties of spruce, and cause other undesirable symptoms.

***** The Apollo label should be read and followed carefully to ensure proper use and slow the development of insecticide resistance.

Pyrethroids, organophosphates and the avermectins all have good knockdown activity and residual control against the motile life stages of SSM, but their lethal effects on predatory mites makes them a poor choice for treatment. The use of these materials often necessitates continued treatments during the season as natural enemy and predatory mite populations are depleted, sometimes leading to SSM population flares.

Neonicotinoids containing imidacloprid as the active ingredient are also a poor choice for SSM control and in some cases may actually contribute to spider mite outbreaks. Research points to increased longevity and reproductive viability in female mites exposed to sublethal doses. The carbazates, quinolones, pyridazinones and the insect growth regulator etoxazole all show good efficacy against SSM and are less toxic to predatory mites than the pyrethroids, organophosphates, and avermectins, lessening the risk for mite flaring. These insecticides provide 3-4 weeks residual control and are active against all lifestages of SSM (with the exception of etoxazole which has limited activity against adults). The tetroneic acids, thiazoles, sulfite esters, organotins, and horticultural oils also show good efficacy against SSM and vary greatly in their duration of residual control. Horticultural oils are particularly useful when positioned early in the season as a dormant application targeting overwintering eggs and newly emerging larvae but coverage is key and not always easily achieved on dense canopied varieties. There is a risk of phytotoxicity and chlorosis with horticultural oils so growers should proceed with caution with new products or when using on previously untreated species. The tetroneic acids, thiazoles, sulfite esters, organotins, and horticultural oils have the important added benefit of being relatively safe to predatory mites and have a low potential to cause mite flaring.

Growers may find that more than one treatment is necessary to control SSM, particularly under high population pressure or when utilizing an insecticide that isn't active against all life stages. Growers are encouraged to note the presence or absence of the different life stages while scouting to help them select the best material and maximize efficacy, this is particularly important in the spring when targeting eggs is an important strategy. To delay the development of miticide resistance growers are encouraged to follow label suggestions limiting the number of applications of a given product in a season and also to select miticides from more than one class of insecticides. For example, growers may apply a dormant oil application in the spring, followed by a tetroneic acid application as populations begin to rebound, the next application should be from a class other than tetroneic acids. The rotation between different classes of insecticides helps prevent the selection of insects that are resistant to a given insecticide and mitigates the risk of resistance development.

Changes in pesticide regulations occur constantly and the information provided in this article does not supersede label directions. To protect yourself, others, and the environment always read and follow the label.

References

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