THE OHIO STATE UNIVERSITY
Extension FactSheet

# Twospotted Spider Mites on Hops

**Susan Ndiaye**, Graduate Student, Department of Entomology

## Introduction

The twospotted spider mite, *Tetranychus urticae*, is an economically important pest on hops in Ohio. It can cause significant damage to both the hop plant and the hop cone, reducing yield quality and quantity. Spider mites thrive in hot, dry conditions, which are often prevalent in Ohio during the months of July and August. Spider mites can be managed, but only if they are treated before their population explodes.

*Figure 1. Stippling on hop leaf caused by twospotted spider mites.*

## Damage

Spider mites feed by sucking the juices out of plant tissue, causing a stippling effect (Fig.1). When populations are high, mite damage will decrease the photosynthetic capacity of a leaf and mites will begin to migrate into the cones. Once in the cones, spider mites will continue to feed, initially causing the cones to start browning and eventually causing them to become dry and brittle. (Fig. 2).

*Figure 2. Browning of hop cones caused by twospotted spider mites.*

## Appearance

Spider mites are approximately 0.4-0.6 mm long, which is slightly larger than the period at the end of this sentence. The twospotted spider mite is named for the distinct dark spots found on either side of its body. Like spiders, these mites produce a silky web. These webs are made on plant surfaces and protect them from predators, dryness, and pesticides. These webs can be used to connect plants thus facilitating the mites' movement between plants. Spider mites are not insects, but are closely related to spiders. Like spiders, the adult form of spider mites has eight legs. Spider mites do not have wings and their main form of locomotion is walking, but they can also travel by being blown on air currents.

*Figure 3. Adult spider mite and eggs on leaf vein.*

## Life Cycle

Female spider mites overwinter as adults in the crowns of hop plants. These diapausing (hibernating) females are bright orange in color. In the spring, these females, come out of diapause and begin laying tiny colorless spherical eggs that turn white as they develop. Female spider mites are parthenogenic, meaning they do not need to mate to produce offspring. Under ideal conditions, the average generation time of the twospotted spider mite is about two weeks and an average female will lay over 140 eggs. This quick generation time and abundant progeny results in rapid population growth.

## Scouting

A weekly scouting program throughout the growing season (May until harvest) is essential for proper management of spider mites. Becoming familiar with a healthy hop plant will allow for quick identification of potential problems. Stippling on the leaves is a good indication of spider mites, although further investigation is necessary because insects such as leafhoppers can also cause stippling. Because spider mites are very small, a 10x hand lens should be used for proper identification. Spider mites are found on the bottom of the leaf, usually where the leaf blade joins the petiole (Fig. 3). The adult form can easily be spotted walking around the leaf. Eggs are also visible, but have known to be confused with the lupulin glands found on the bottom of hop leaves. To avoid this confusion, it is necessary to become familiar with the appearance of normal hop leaves.

Scouting patterns depend on the size and shape of the hop yard. Plants from each variety in the hop yard should be scouted as all varieties are not equal in susceptibility to spider mite infestation. It is recommended to scout several plants from each variety and/or each row. When scouting a plant, one should look at no less than two leaves. Most infestations start low and move up the plant, so initially leaves in the lower 1 meter of the plant should be scouted. If you notice stippling or discoloration on leaves higher up on the plant, the use of telescoping clippers can be used to clip the leaves so that they can be observed close up (Fig. 4). When deciding on a scouting protocol keep in mind that spider mites usually appear on near the edge of a hop yard first; then they slowly move across it, usually in the direction of the prevailing winds.

As with all scouting, it is important to record your findings. Keep a close eye on areas of the hop yard were spider mites have been detected. Looking at scouting records from the previous year is helpful as spider mites overwinter in the hop yard and areas that are heavily infested one year are likely to show the earliest signs of infestation the following year.

*Figure 4. Clipping of high leaves with telescoping clippers for scouting purposes.*

## Management Strategies

### Cultural

Because spider mites overwinter in the crown of the plant, they are ever present in a hop yard after the initial infestation. At the beginning of the season, after the plants are pruned, it is important to remove and destroy all the clippings because they may contain spider mites.

### Conservation Biological Control

One way in which spider mite populations are controlled is through natural enemies such as predatory mites and predatory beetles that feed on spider mites. In conservation biological control, growers protect and enhance the activities of these natural enemies already present in a hop yard. This can be done by growing plants that provide habitat and food for predators. This includes flowers, because some predators will feed on pollen when prey is scare. Another way to enhance predator activity is by using only narrow-spectrum, pest specific pesticides. Broad-spectrum pesticides such as bifenthrin (Brigade), will kill off natural enemies and have been known to cause spider mite outbreaks.

### Augmentative Biological Control

Because spider mites have a short life cycle and produce abundant progeny, they have been known to rapidly develop resistance to chemical acaricides. Another reason that acaricides do not always provide effective control of spider mites is that their webbing protects them from contact with spray droplets, and in hop yards there is the added challenge of spraying a plant that is five meters tall. For these reasons, there is a great interest in the use of augmentative biological control, which is the release of purchased natural enemies in the hop yard to manage spider mite populations. Predatory mites are released in hop yards of the Pacific Northwest, but release rates and timings widely vary. Because hops are still a new crop in Ohio, research into the effectiveness of predatory mites on is being do but not yet completed. Currently two species of predatory mite are being considered, *Neoseiulus fallacis* and *Galendromus occidentalis*. When releasing predators to control spider mite populations, it is important to release them before spider mite populations reach outbreak levels, or the predators will not be able to suppress their populations to tolerable levels.

### Chemical Control

Currently the thresholds established for twospotted spider mite on hops in the Pacific Northwest should be used, because spray thresholds specific to Ohio have not yet been established. In the beginning of the season (May-June), the threshold is more than two adult mites per leaf. By mid-July, that threshold increases to five mites per leaf. When spraying, it is important to keep in mind what other mites and insects will be affected by the spray. This is especially important if you are using chemical control in conjunction with augmentative biological control. Some chemicals that can be used for spider mite management can also be effective in control of other hop pests such as leafhoppers and aphids. Using these sprays can reduce the number of chemical necessary to control pest populations in a hop yard. It is important to rotate between different modes of action, especially because spider mite populations are known to rapidly develop resistance. Applications must also be scheduled to allow for the required re-entry interval (REI) and pre-harvest interval (PHI).

# Mite Control Products

## Conventional

| Mode of Action Group | Trade Name | Active Ingredient | Affected Stage | Considerations | Residual Control | REI | PHI | Control of Other Hop Pests | Impact on Predatory Mites |
|---|---|---|---|---|---|---|---|---|---|
| UN | Acramite 50WS or 4SC | bifenazate | motiles° | | 6-8 weeks | 12 hours | 14 days | none | 1 |
| 20B | Kanemite | acequinocyl | eggs, motiles° | safest miticides for beneficial | unknown | 12 hours | 7 days | none | 1 |
| 21A | Portal | fenpyroximate | motiles° | | 6-8 weeks | 12 hours | 15 days | leafhoppers | 1 |
| 10A | Savey | hexythiazox | egg/larvae | apply before cone formation | 6-12 weeks | 12 hours | 0 days | none | 1 |
| 23 | Envidor | spirodiclofen | egg, motiles° | | 6-10 weeks | 12 hours | 14 days | none | 2 |
| 10B | Zeal | etoxazole | eggs/larvae | | 6-10 weeks | 12 hours | 7 days | none | 2 |
| 6 | *Agri-Mek 0.7SC or 0.15EC | abamectin | motiles° | requires an adjuvant, application rate is based on bine height | 6-12 weeks | 12 hours | 28 days | leafhoppers | 3 |

*Restricted Use

° Motile forms include mite larvae, nymphs and adult stages

1. Residual control is based on studies in tree fruit and is highly dependent on rate, coverage, weather and mite pressure at the time of application
2. Rankings represent relative toxicity based on mortality data from studies conducted in tree fruit, hop, mint and grape following direct exposure. 1 = <30% mortality; 2 = 30-79% mortality; 3 = 79-99% mortality; and 4 = >99% mortality

Based on Table from Michigan State Fact Sheet

## Organic

OMRI-listed products for mite control on organic crops

- *soap:* M-Pede; Des-X
- *oils:* Ecotek, TriTek, Grasroots, SeaCide
- *sulfur:* Kumulus DF; Wilbur-Ellis Dusting Sulfur
- *neem:* Trilogy
- Grandevo
- Sil-Matrix
- PFR-97
- SucraShield