UTAH PESTS fact sheet
EXTENSION
UtahStateUniversity

Published by Utah State University Extension and Utah Plant Pest Diagnostic Laboratory ENT-177-15-PR August 2015

Spider Mites in Corn

Banks Grass Mites (*Oligonychus pratensis*) & Two-spotted Spider Mites (*Tetranychus urticae*)

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Do You Know?

- **Banks grass mites and two-spotted spider mites are common pests of field and sweet corn and a wide variety of other plants.**
- **Prolonged hot and dry conditions promote spider mite development.**
- **The use of some pesticides, such as neonicotinoids and some organophosphates, can lead to spider mite outbreaks.**

INTRODUCTION

Banks grass mites (BGM) and two-spotted spider mites (TSSM) are important agricultural pests of corn and a wide variety of other crop, garden, and landscape plants. Usually they do not represent a threat, but under prolonged hot and dry conditions, or after the application of some pesticides, their population builds up rapidly and can cause severe economic losses. The damage is caused by mites feeding on the leaves and sucking out chlorophyll from cells, which lead to leaf desiccation. As a consequence, the plant growth is limited, the yield production is reduced, and the nutritive quality of silage is significantly decreased.

IDENTIFICATION

Spider mites are tiny arachnids (related to ticks and spiders) and distribute in clusters on the underside of corn leaves. BGM and TSSM have a similar appearance (Fig. 1). BGM has less defined black spots that cover the entire sides of the abdomen and can merge in some individuals, while TSSM has two well defined black spots on the anterior part of the abdomen. BGM has a slimmer body than TSSM and has a greenish tint, while TSSM appear cream colored. Differences, which are not visible to the naked eye, can be easily observed with a 10X hand lens.

Fig. 1. BGM female on the left and TSSM female on the right.

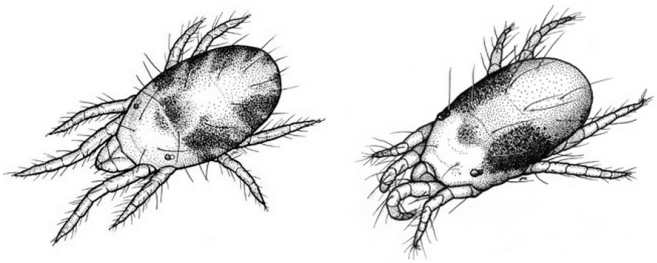

Fig. 2. Generalized spot patterns on BGM and TSSM. BGM (left) have less defined black spots that cover the entire sides of the abdomen, while TSSM (right) have two distinct dark spots on the anterior part of the abdomen.

LIFE CYCLE

Adult spider mites overwinter in the soil, litter, or weeds within and along corn fields. They disperse by crawling, or by being carried in wind currents. Females lay approximately 20 eggs per day and live for 2-4 weeks. Populations can develop exponentially in a very short period of time. TSSM adults appear earlier in the season and prefer slightly cooler temperatures (optimal 86-90°F/30-32°C) than BGM, which thrive under hotter weather conditions (optimal 96-99˚F/35.5-37°C).

Eggs are laid in clusters on the underside of corn leaves (Fig. 3). They are circular (0.10-0.15 mm diameter), initially translucent and white to cream colored just before hatching. Incubation varies from a few days to a couple of weeks, depending on the temperature. Higher temperatures accelerate mite emergence from eggs. Mites can also overwinter in the egg stage.

Larvae are as big as the egg and have three pairs of legs and no black spots on the abdomen (Fig. 4).

Nymphs resemble the adult. The protonymph has four pairs of legs and the black spots start appearing (Fig. 4). The deutonymph is the last immature stage before becoming an adult.

Fig. 3. Spider mite eggs.

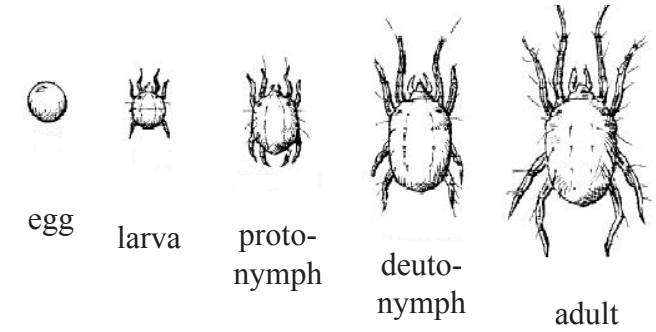

Fig. 4. Spider mite life cycle.

CROP INJURY

Injury commonly starts on the field edges and spreads into the field. Adults colonize the plant from the bottom and gradually move upward. The initial stage of mite colonization appears as stippling or yellowish-reddish brown spots on the leaves (Fig. 5 A-B), in correspondence with the location of the colony clusters found on the underside of the leaf. Leaves initially turn yellow (Fig. 5 B,C) and, with high population density, desiccate and die (Fig. 5 D).

MANAGEMENT

MONITORING

Unfortunately, no predictive models to time treatments for BGM and TSSM in corn fields are available; therefore, it is important to frequently monitor mite populations.

- Randomly collect leaves located on the first corn row and at 2, 4, 6, and 8 m (6, 12, 18 and 24 ft) from the edge;
- Examine the underside of the leaves;
- Check for yellowish-reddish brown spots, webbing (Fig. 5 C), and the mites;
- Repeat scouting every 10 days and, beginning 2 weeks before tasseling, scout every 2-3 days.

PREVENTIVE MANAGEMENT

Some agricultural practices can help prevent developing mite populations, such as:

- Frequent and uniform irrigation to avoid drought stress; overhead irrigation to wash mites off; and monitoring after heavy rain events, which mechanically decrease mite abundance and reduce dust, which protects mites from predators.
- Removal of weeds which can host mites to delay the mite contamination of corn fields.
- Reduced fertilization, or more frequent application of lower nitrogen doses, since high nitrogen concentrations promote the development of mite populations.

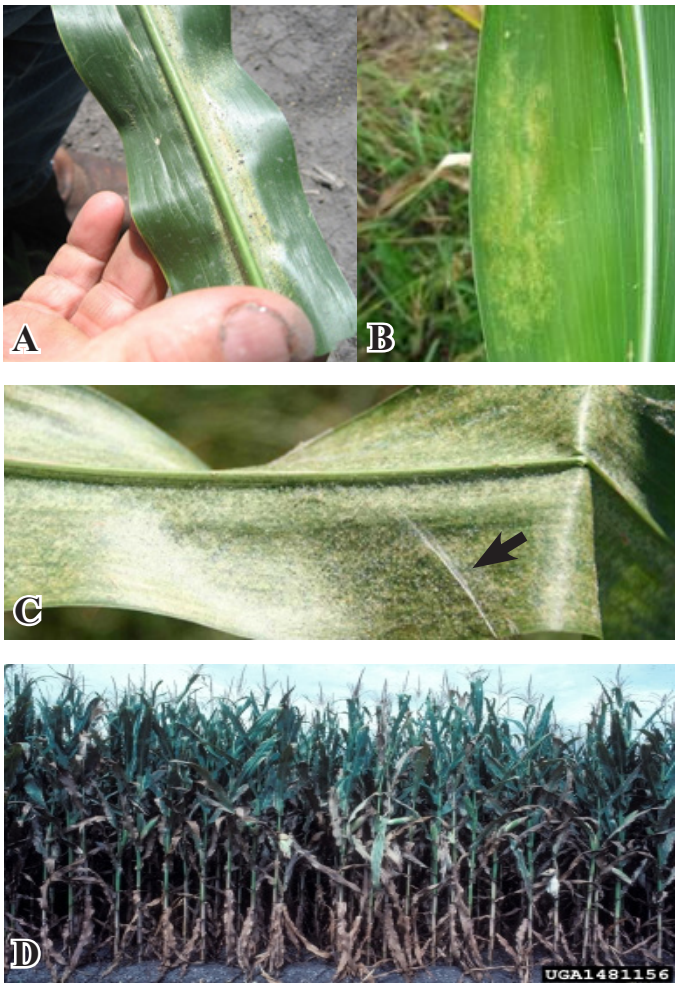

Fig. 5. Spider mite injury on corn. A) Injury on the underside of the leaf, where yellowish spots are visible; B) Injury visible on the upper side of the leaf; C) Webbing covering mites and eggs; D) Desiccation of corn leaves caused by mite feeding in the first third of the plant.

BIOLOGICAL CONTROL

Predatory mites such as *Phytoseiulus* spp. (Fig. 6 A) and *Neoseiulus* spp. (Fig. 6 B), are two of the most voracious predators of spider mites. They can be easily distinguished from spider mites since they are larger, have longer legs, and a teardrop body shape. Predatory mites occur naturally in corn fields and are a good curative agent, since they feed on all mite life stages, are very active and reproduce quickly. They are commercially available and represent an alternative to chemical treatments in small scale corn fields and gardens.

Fig. 6 Predatory mites. A) *Phytoseiulus* spp.; B) *Neoseiulus* spp.

Beetle predators are commonly found in corn fields and include lady beetle larvae and adults, and the spider mite destroyer lady beetle (*Stethorus* spp.)(Fig. 7 A, B). Although commercially available, some adult lady beetle species tend to fly away when applied.

Predatory bugs feeding on spider mites include damsel bugs (*Nabis* spp.) (Fig. 7 C), big eyed bugs (*Geocoris* spp.) (Fig. 7 D), and the commercially available minute pirate bugs (*Orius* spp.) (Fig. 7 E) which commonly appear in Utah.

Other mite predators include sixspotted thrips (*Scolothrips sexmaculatus*) (Fig. 7 F) and lacewing larvae (Fig. 7 G), which are also commercially available and naturally occur in corn fields.

Many of these predators are natural residents in the environment. It is important to limit the use of broad-spectrum insecticides, since these products can reduce predator populations that provide natural pest control and may lead to spider mite outbreaks.

CHEMICAL CONTROL

In general, chemical applications for spider mites in corn should occur before the formation of the kernel, when the injury is visible in the lower third of the plant and mites can be found in the middle region of the plant (Fig. 8). During grain formation (reproductive phase R1-R2), carbohydrates and nitrogen accumulate in the kernels. It is in R1-R2 phase that mites become an active competitor for plant nutrients. Rapid mite population growth usually occurs after pollen shed. The economic benefit of treatment diminishes after the R2 phase.

The use of chemicals to control spider mites, however, can induce negative side effects. For example spider mites can quickly develop resistance to pesticides. There are populations of TSSM and BGM, for example, that have developed resistance to bifenthrin and λ-cyhalothrin (pyrethroids), and to dimethoate (organophosphate), which is widely used in corn. Also, some neonicotinoids such as clothianidin and thiamethoxam, which are common seed treatments in corn for other pests, have been shown to increase mite abundance through stimulation of reproduction and changes in plant defenses.

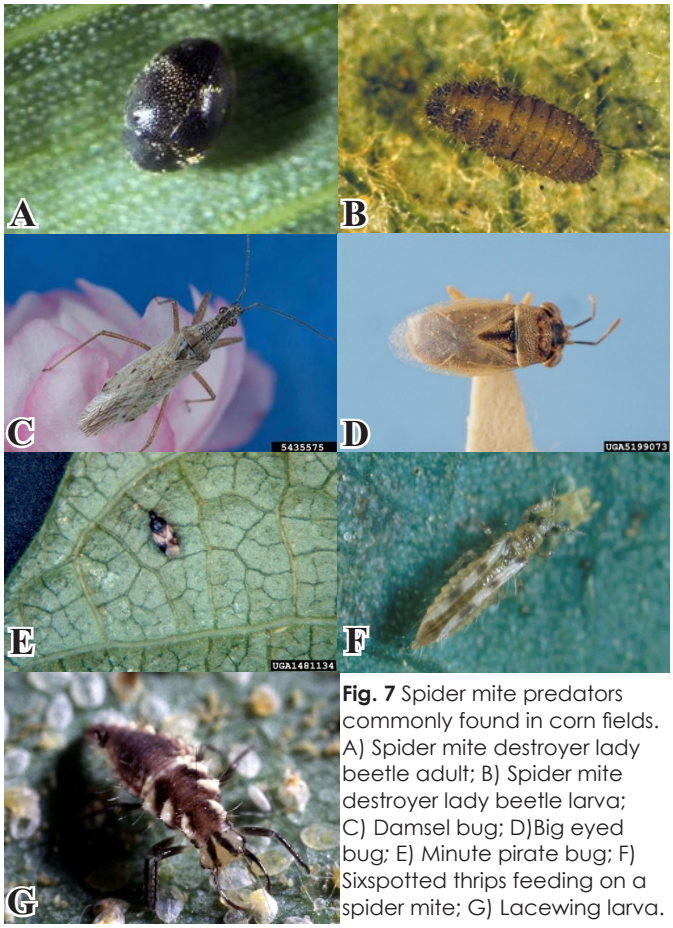

Fig. 7 Spider mite predators commonly found in corn fields. A) Spider mite destroyer lady beetle adult; B) Spider mite destroyer lady beetle larva; C) Damsel bug; D)Big eyed bug; E) Minute pirate bug; F) Sixspotted thrips feeding on a spider mite; G) Lacewing larva.

For commercial corn fields, the available miticides include Zeal, Oberon 2 SC, Comite II, and Onager. Miticides primarily act by contact, therefore it is important that there is good coverage on both leaf surfaces. Miticides are more efficient when the mite population is relatively low and the plants can be easily sprayed by ground equipment. Application by air is possible, but limited to the upper layer of the canopy; therefore less efficient, since mites tend to occupy the lower part of the plant and the underside of the leaves.

Other pesticides that are commonly used to control spider mites are the broad spectrum insecticides dimethoate, Hero and Portal. It is important to reduce

CONSIDERATIONS BEFORE TREATMENT

- **Is the crop near tasseling?**
- **Are leaves starting to desiccate in the first third of the plant due to mite feeding?**
- **Are the daily high temperatures expected to be above 95 degrees?**
- **Is the field suffering from drought stress?**
- **Does the field have a history of mite problems?**
- **Are predator populations low?**

Adapted from Colorado State University (Peairs 2014). Respond to the following questions before scheduling a chemical treatment. If at least three of these questions receive a "yes" answer, a treatment may provide an economic benefit to growers. These considerations do not differ among field and sweet corn and the scale of production.

the use of these insecticides since they can reduce the density of mite predators and lead to mite outbreaks. Also, development of resistance has been observed in some mite populations after treatments with dimethoate.

In order to prevent spider mites from developing resistance to pesticides, it is a good practice to treat only when strictly necessary, and switch between two or more products with different modes of action (the way in which the pesticide kills the mites).

For small scale corn fields (gardens), other products can be used, such as insecticidal soaps, horticultural oils and sulfur. Be aware that phytotoxic effects (plant burn) can occur from applying these products. Monitoring, preventive control practices and biological control can also help maintain low levels of infestations.

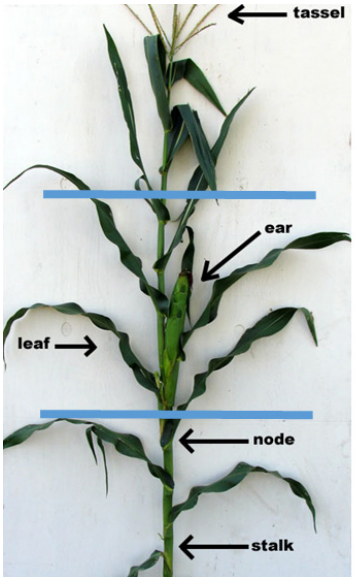

Fig. 8 Chemical control for spider mites in corn should occur when the injury is evident in the first third of the plant and colonies start to appear in the second third. Adapted from University of Nebraska-Lincoln.

Table 1 Principal pesticides used in large scale corn fields against spider mites and their mode of action. * Broad-spectrum insecticides which should be rotated with other products over time, due to the risk of reducing mite predators. Cases of population resistance development have been observed with dimethoate and bifenthrin.

Trade Name	Active Ingredient	Activity	Targeted Life Stages	Mode of Action
Oberon 2 SC	Spiromesifen	Contact and translaminar	All life stages	Inhibition of lipid biosynthesis
Comite II	Propargite	Contact	Juveniles & adults	Inhibition of ATP synthesis
Onager	Hexythiazox	Contact	Eggs & juveniles	Growth regulator
Zeal	Extoxazole	Contact and translaminar	Eggs & juveniles	Growth regulator
Hero*	Bifenthrin & zeta-cypermethrin	Contact	Adults & juveniles	Alteration of sodium channels
Dimethoate*	Dimethoate	Systemic and contact	Adults & juveniles	Cholinesterase inhibitor
Portal*	Fenpyroximate	Contact	All life stages	Mitochondrial electron transport inhibitor

FOR ADDITIONAL INFORMATION

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