CROPS

Spider Mites in Corn

no. 5.555

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Quick Facts...

Spider mite outbreaks are commonly due to hot, dry conditions, particularly in drought-stressed corn.

Two common species of spider mites in Colorado are Banks grass mite (BGM) and two-spotted spider mite (TSM).

Manage spider mite problems by preserving beneficial insects and mites. Base treatment decisions on mite species present in fields.

Insecticides directed against other corn pests can cause spider mite outbreaks.

Spider mites can be serious corn pests in Colorado, especially during hot, dry years. They feed on the undersides of leaves, eventually killing the leaf and leaving it with a scorched or burned appearance. Commercial yield losses as high as 40 percent for silage (dry matter) have been documented in Colorado, although normal losses generally are lower. In his mite research at Rocky Ford, Frank Schweissing observed grain losses ranging from 6 to 48 percent, with an 18-year average of 21 percent.

Colorado Species

Two species of spider mites attack corn in Colorado: Banks grass mite (BGM), *Oligonychus pratensis*, and two-spotted spider mite (TSM), *Tetranychus urticae* (Figure 1). Banks grass mite traditionally has been a corn pest throughout Colorado, while TSM is a recent problem in certain corn-growing areas of the state. Most corn-growing areas are affected by BGM alone, but north-central Colorado, especially Weld and Larimer counties, and production areas along the South Platte River are prone to serious mixed-species infestations.

Both BGM and TSM overwinter as orange-yellow females. Some eggs may be laid during prolonged warm spells. The BGM life stages (similar in TSM) include: pearly white, spherical egg; 6-legged light to dark green larva; 8-legged pale-bright green protonymph; 8-legged deutonymph with robust females and slender males; adult male with a deep green, pointed abdomen; and a large (0.018 in), active female. Immatures stop moving prior to molting. Generation times depend on temperature and are typically 10 to 20 days. Under laboratory conditions, BGM populations can increase 70-fold in one generation.

Banks grass mite overwinters on alternate grass hosts. Mites return to corn either by walking short distances or by being windborne on silk threads over longer distances. Infestations start on the undersides of lower leaves and gradually move into the upper part of the plant. Banks grass mite is commonly found in corn from the mid-whorl through the grain filling growth stages, while TSM is rare on corn before flowering. Rapid population growth most commonly occurs after pollen shed. Factors that encourage BGM infestations include host drought stress, elevated temperatures, low rainfall, low humidity, absence of TSM, lack of natural enemies, insecticide use, and adequate moisture for alternate hosts during the previous growing season. Most of these factors will also encourage buildup of TSM, although optimum temperatures for TSM (86 to 90 degrees F) are lower than those for BGM (97 to 99 degrees).

Most BGM problems occur in the drier corn-growing areas of the state and always are associated with grasses. For example, many problems in corn start when adjacent wheat starts to dry down. In comparison, TSM occurs in more humid growing areas such as along river bottoms. This mite is found in many

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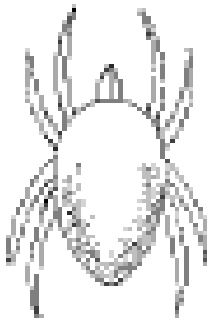

Figure 1: Banks grass mite and two-spotted spider mite.

Figure 2: *Stethorus* lady beetle (spider mite destroyer).

crops, but it is common for corn infestations to occur in fields with nearby alfalfa.

Biological Control

Preservation of biological control agents is critical to proper management of spider mite problems in corn. Thirty-five natural enemy species from 15 families of predatory insects, mites and spiders have been associated with mites on corn. Mites are also subject to fungal disease. Commercial biological control is not cost effective, so conservation of naturally-occurring biological agents is essential.

Many fields go untreated each year because the mites are held in check by various predatory mites, lady beetles, minute pirate bugs, lacewing larvae and thrips. The most important of these are a predatory mite, *Amblyseius fallacis*, a minute pirate bug, *Orius insidiosus*, and a small black lady beetle called *Stethorus* (Figure 2).

A common cause of mite outbreaks is hot, dry conditions under which biological control agents cannot keep up with the increasing mite population. This is particularly a problem in drought-stressed corn. Adequate irrigation and other practices to avoid drought stress can help minimize mite buildups. Frequent overhead irrigation can reduce the rate of mite population increase, but it will not reduce mite populations that already have reached economic levels.

Another common cause of spider mite outbreaks is insecticide applications directed against other corn pests. These kill beneficial insects and mites that, in many cases, keep the pest mite species under control. In Colorado, treatments for western bean cutworm, adult western corn rootworm, southwestern corn borer and second generation European corn borer most often are responsible for insecticide-triggered mite outbreaks. If an insecticide is necessary, monitor the treated crop for mite activity or consider including a miticide in the application.

Cultural Control

Proper irrigation to avoid drought stress is the key cultural practice for avoiding mite outbreaks. However, once mite infestations are established, irrigation cannot reduce mite densities in corn. Other recommended cultural practices include late planting and the use of full-season hybrids if these are compatible with other farm practices. Nitrogen fertilization tends to promote mite infestations, but reducing N application rates to manage spider mites is not economically feasible.

Chemical Control

Under certain conditions, however, it will be necessary or desirable to control spider mites with a miticide treatment. This control strategy often is made difficult by widespread miticide resistance in both TSM and BGM. The level of resistance varies with species, location, and year. Although BGM generally is considered to be less miticide resistant than TSM, it is highly resistant in areas with long histories of insecticide use in corn and other crops. Because of the general differences in resistance between BGM and TSM it is essential to determine which species are present in the field prior to treatment.

Pest Identification

Characteristics in Table 1 will help identify the early season mites. Base your identification on as many features as possible; no one character is foolproof. For the characteristics that require a magnifying glass (at least 10X), look at 20 of the largest, most active mites (the adult females) before deciding which species

makes up the colony. Both species may occur in the same field, on the same plant and on the same leaf, so check plants throughout the field before deciding which mites make up the infestation.

Table 1: A comparison of Banks grass mite and two-spotted spider mites.

Banks grass mite (generalized pigmentation)	**Two spotted spider mite** (concentrated pigmentation)
• burn leaves of plant from bottom up	• may occur in high numbers without burning leaves
• opposite side of leaf from colony usually yellow	• opposite side of leaf from colony usually yellow
• less webbing	• more webbing
• less robust, smaller	• more robust, larger
• pointed rear	• rounded rear
• more susceptible to miticides	• less susceptible to miticides

Some information in this table courtesy of T. Holtzer and J. Kalish, University of Nebraska.

When checking a field for mites, it is best to start with drought-stressed areas. If several fields have to be scouted, start with the shorter-season varieties and/or the earliest-planted fields. These often have more mite problems than later plantings or longer-season varieties.

Preventive Treatments

If a TSM, resistant BGM or TSM/BGM infestation is expected, on the basis of past experience or the identification of early season mites, then the only chemical control options are a pretassel application of propargite (Comite) or Spiromesifen (Oberon 4SC), or a later (10 to 14 days later than the ideal timing for Comite or Oberon) application of bifenthrin and dimethoate. In a mixed infestation, a miticide treatment may well control the BGM, which can result in even faster TSM build-up due to the decreased competition from BGM. In parts of the state where TSM does not occur, older, less expensive miticides such as dimethoate may still be effective.

Preventative miticide treatments are expensive and must be applied before it is certain that the mites will reach economically important levels. Asking several questions can help in making the decision to apply miticides early in the development of mite outbreaks:

- Is the crop near tasseling?
- Are a majority of the plants infested with at least small colonies of mites?
- Are the daily high temperatures expected to be above 95 degrees?
- Is part of the field suffering from drought stress?
- Are predator populations (such as predator mites, minute pirate bugs and *Stethorus*) low?
- Does the field have a history of mite problems?
- Are two-spotted mites expected to be a problem in the field?

The more of these questions receiving a "yes" answer, the more likely it is that either of these treatments will provide an economic benefit.

Treatments are made fairly early in the season, so little residual chemical will be left to control late-season mite buildups. Propargite is, however, less detrimental to beneficial insects than are the other available miticides. Because of this, beneficial species often begin to control the spider mites as the propargite breaks down.

Treating Established Infestations

If TSM is present (see Table 1) then bifenthrin + dimethoate is the only control option that would be expected to perform reliably. If the infestation is all BGM, then it is possible that an older, less expensive miticide such as

dimethoate may be effective. This is unlikely in areas with a long history of miticide applications, such as the Arkansas Valley or the Weld-Larimer County area. The local Colorado State University Cooperative Extension county office can provide information as to which products are effective in a particular area. Details on spider mite management, including currently available products, are found in the *High Plains Integrated Pest Management Guide*, available at www.highplainsipm.org.

Two guidelines are available to help decide if a miticide treatment will be cost effective. These action thresholds are similar for both mite species. The simple guideline is to treat if damage is visible in the lower third of the plant, and mite colonies are present in the middle third. Once the crop has reached the hard-dough stage, no economic benefit will result from the treatment.

A more sophisticated guideline that allows you to take into account cost of treatment and expected crop value (developed for BGM by Archer & Bynum in Texas) is based on percentage infested leaves and leaf area damaged. Compare the actual percent infested leaves to the percent infested leaves given in the Table 2 cell corresponding to expected control cost and crop market value per acre. If it is greater than the table value, then determine percent leaf surface showing chlorotic and stippled damage. If this percentage exceeds the second value in the same cell, then a miticide treatment should be cost-effective.

Table 2: Action threshold for Banks grass mite in grain corn (% infested leaves / % leaf area damaged).

	Market Value/Acre				
Control Cost/Acre	**$350**	**$400**	**$450**	**$500**	**$550**
$10	17/9	15/8	13/7	12/6	11/6
$15	25/13	22/12	20/10	18/9	16/9
$20	34/18	29/16	26/14	24/13	21/11
$25	42/22	37/20	33/17	29/16	27/14

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