K-STATE Kansas State University

Winter Grain Mites

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Winter grain mite (WGM) is the very descriptive common name for *Penthaleus major* (Duges). WGMs are active during cooler periods of the year (mid-fall to late spring) with peak populations occurring during winter months. Originally considered a pest of small grains such as barley, oats, rye and wheat, WGMs are also recognized as a pest capable of damaging various species of turfgrass including perennial ryegrass, bluegrass, bentgrass and fescue.

Identification and Descriptions of WGM Developmental Stages

Various species of mites might be found in turfgrasses including winter grain mites, clover mites, brown wheat mites, Banks grass mites, predatory mites and fungal feeding mites. Acarologist systematists are the only personnel capable of rendering precise identifications of most mite species. However, because WGMs are very distinctive in appearance, they are easily identifiable as such.

Eggs: Freshly deposited WGM eggs are smooth, kidney shaped and reddish orange. Within minutes of being laid, eggs become wrinkled (Figure 1). Several days later, their color changes to straw-yellow. Eggs are not subject to casual observation due to their small size (.25 millimeter in length) as well as their various points of distribution (deposited singly on grass blades, in root systems or in thatch). Eggs provide the mechanism by which WGM oversummer. An additional shorter (in time) egg stage separates the two WGM generations which occur during the period of WGM activity.

Immatures: WGMs emerging from eggs are called **larvae**. Larvae are only .18 millimeter in length and have only three pairs of legs. Initially, larvae are entirely reddish-orange, but they darken to light brown after one day. Legs retain a yellowish-orange coloration. Prior to molting into nymphs, larvae become dark brown and take on a greenish tinge (greenish tinges may not be observable unless viewed under proper or certain lighting).

The most notable comparative difference between larvae and **nymphs** is the addition of a fourth pair of legs. All three nymphal growth stages are similar in appearance except for subtle increases in size through their progressive developmental stages. Overall body color is dark brown. Legs are yellowish-orange. Prior to each molt, nymphs become plump and take on a greenish-tinge. Third instar nymphs undergo a final molt to become adult WGMs.

Adults: In comparison to other mite species associated with grasses, WGMs are relatively large (adults may reach 1 millimeter in length). Adults have dark brownish to black bodies with the aforementioned greenish tinge. Most evident are their reddish-orange legs (Figure 2).

Additional WGM characteristics include: (1) reddish-orange mouthparts; (2) a pair of silvery eyes located behind the second pair of legs; (3) first and fourth pairs of legs that are longer in comparison to the middle pairs (such differences are rather minimal and, therefore, all legs actually appear relatively similar in length); and (4) a dorsal anal pore which is surrounded by a reddish-orange spot. Although these “landmarks” often are cited in literature, they are of little practical importance because of the difficulty of observing such on small mites scurrying about.

Figure 1.

Life History and Seasonal Development

There are no definitive recorded studies for the life history and seasonal development of WGM in Kansas. However, such studies

and information generated for north-central Texas can be used to (probably) closely approximate WGM activities in Kansas.

Life History: Temperature is an important factor influencing the development and abundance of WGM. While durations of time spent in various life stages vary depending on temperatures, under optimum conditions, the average number of days from oviposition to death of an adult mite has been recorded as 98.1 days:

Egg incubation	= 25.0 days
Larval stage	= 12.2 days
Nymphal stage #1	= 8.6 days
Nymphal stage #2	= 7.8 days
Nymphal stage #3	= 7.0 days
Adult	= 37.5 days

Oviposition is heaviest between 50–60˚F (female mites require no males, thus unfertilized eggs produce more female mites—average number of eggs = 31/female). Optimum temperatures for egg hatch is 45–55˚F. Adult activities are greatest between 40–75˚F.

Seasonal Development: There are two generations of WGM per year. Generally speaking, activity begins around November 1 when cooler temperatures, and adequate moisture stimulate the hatching of first generation larvae from aestivated (oversummered) eggs. WGM activities cease about April 15 after second generation adults have completed depositing the next batch of eggs which do not hatch once temperatures exceed 75˚F. During the approximately five and one-half month time frame during which WGMs are present, populations peak about February 1 (Generation #1) and April 1 (Generation #2).

Damage

General: WGM mouthparts are made up of a pair of chelicerae (modified anterior appendages). Each chelicera is short, and armed with two distal and downward-curved teeth. The beaklike chelicerae are used to pierce the epidermal cells of host plant tissue. Mites feed on the escaped exudates (chlorophyll and cellular fluids).

Due to the whitish/grayish appearance of damaged or killed cells, leaves and stems may exhibit a flecked appearance (Figure 3). Extensive feeding on individual leaves and stems may result in a coalescence of "dead spots," thus causing an overall silvery or grayish cast. Logically, then, a heavily infested lawn may take on a gray or silvery cast when viewed from a distance (Figure 4). At the very least, such feeding damage might be no worse than winter-killed leaf tissue. Conversely, if mites persist and move down to the crown area, extensive feeding on meristematic tissues could cause plant death.

Specifics: Most turf entomologists agree that presence of WGM does not automatically spell disaster. In most instances, and even after heavy mite pressure, grass plants and lawns "rebound." Mite population peaks (in April) occur at the time that warmer weather normally begins with regularity—mite activity automatically "shuts down." This also coincides with the time of prolific vegetative growth for cool season grasses. Slow-to-green-up lawns (possibly a result of WGM feeding activities) rapidly flush new growth, and WGM are soon forgotten.

However, in recent years, it has become apparent that overwhelming WGM populations, especially after having attacked drought-stricken lawns, were responsible for taking out partial or entire lawns in eastern Kansas. There have been striking visual contrasts between lush green lawns which received timely acaracide treatments immediately adjacent to untreated lawns exhibiting damage attributable to WGM.

Control Recommendations

Specific guidelines for implementing control procedures against WGM have not been developed. And because WGMs are not considered a pest of great importance, it is unlikely that any major research effort (necessary for generating control guidelines) will be forthcoming.

Observing WGM: It is difficult to assess WGM population levels for several reasons. (1) As previously mentioned, WGMs are very small. Looking for WGMs requires getting down on hands and knees, keen eyesight and patience.
(2) WGMs are light sensitive. Thus, they "hide" during normal working (daylight) hours. As shadows

Figure 2.

lengthen at day's end, WGMs begin to "come out of the soil" and ascend grass blades in preparation for feeding activities during hours of darkness. On overcast days, mites may be active throughout the day. Under snow cover, WGMs may continually feed. (3) WGM activities are dependent on temperatures. Therefore, activity levels vary during a single day to say nothing of between days. (4) WGMs are sensitive to being disturbed. They readily drop to the ground when blades of grass are touched/handled. (5) It is difficult to count WGMs scurrying about the soil or hiding in thatch or soil. WGMs reportedly burrow into the soil to depths of 5 inches depending on temperatures and moisture availability. (6) WGMs are not equally distributed. A person might spend considerable time searching for, but never finding, WGMs. Experience has shown that WGMs seem to congregate in grassy areas adjacent to porch steps, sidewalks, driveways and decorative stones or timbers, and the bases of trees and mailboxes and lamp posts.

Even if it were possible to accurately count and record the actual numbers of individual WGMs, decisions to initiate or withhold treatments would remain (at best) "a guess" because: (1) there are no established WGM threshold treatment levels; (2) the vigor and health of individual plants, thickness of stand and prevailing environmental conditions (especially availability of soil moisture for plants) would alter the extent of damage caused by varying population levels of WGMs at individual sites.

Implementing WGM Control: It is recommended that lawns under consideration for receiving an acaracide treatment be, at the very least, inspected for the presence of WGMs. Then, whether or not treatment procedures follow may rest upon the requests of individual lawn owners. In instances where "picture perfect turf" is expected, treatments might be demanded even if only a few mites were observed. In situations where there is some tolerance for "natural events," a wait-and-see attitude might prevail where there is an acceptance of some observable damage with rescue treatments being applied only if deemed necessary.

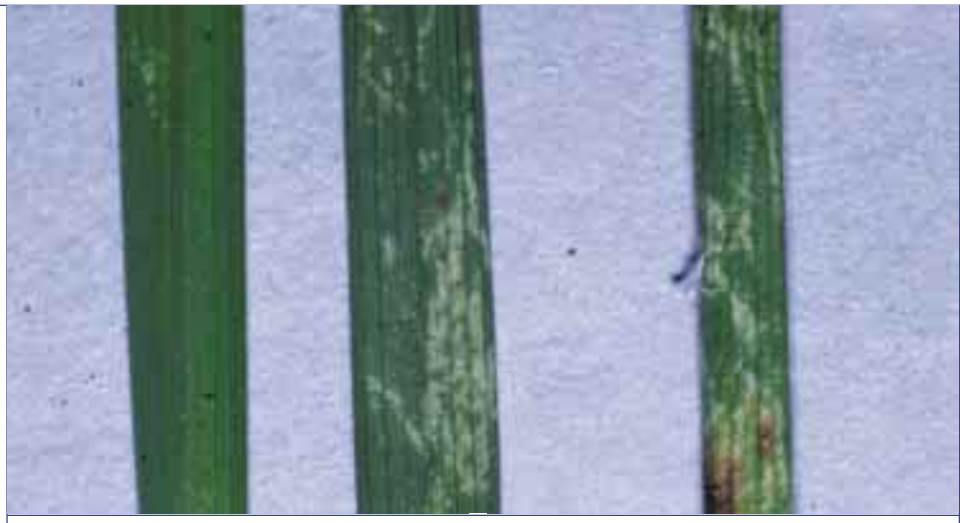

Figure 3.

Figure 4.

When it comes to initiating or not initiating treatments against WGMs, lawn care specialists (especially) are between the proverbial "rock and a hard place." Clientele dissatisfaction will follow decisions not to apply treatments if (at a minimum) WGMs delay greenup or (at the opposite extreme) cause dead spots or kill lawns. Based on prior observations and/or written reports/records, some lawn care professionals have developed "a sense" about if and when acaracide treatments might be warranted.

There are only two active ingredients appropriately labeled for use against WGMs. Winter grain mites are specifically listed on the labels of the chlorpyrifos liquid formulation Dursban^{R} Pro, water soluble packet formulation Dursban^{R} 50W and granular formulation Scotts^{R} 8251. Lambda-cyhalothrin in liquid formulation (Scimitar^{R}) or wettable powder formulation (Battle^{R}) are both labeled against mites in general.

IT IS THE RESPONSIBILITY OF THE END USER TO READ THE LABEL OF THE PRODUCT IN HAND TO ENSURE THE LEGALITY OF ITS INTENDED USE.

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