K-STATE Research and Extension

# Wheat Streak Mosaic

Department of Plant Pathology | MF3383 | Wheat Disease

Wheat streak mosaic is one of the most economically devastating wheat diseases in Kansas and the Great Plains. The disease is most common in the western portion of the state, with sporadic outbreaks in central and eastern Kansas.

## Symptoms

Plants infected with the disease often have yellow leaves with contrasting green and yellow streaks extending toward the leaf base (figures 1 and 2).

Wheat streak mosaic develops most readily when temperatures are higher than 70 degrees Fahrenheit, and the severity of symptoms often increases as temperatures rise in the spring. The symptoms of infection may occur in warm periods during the fall. Wheat streak mosaic is often most severe on the edge of a field that is closest to the source of the disease. The intensity of the symptoms decreases with distance from the source. This gradient of disease within a field reflects the spread of disease and the timing of infection relative to the age of the plants.

The symptoms of wheat streak mosaic are similar to triticum mosaic and high plains wheat mosaic. Laboratory testing is often required to confirm which diseases are present within a field.

## Disease Cycle

Wheat streak mosaic is caused by the *Wheat streak mosaic virus*. The virus is spread by the wheat curl mite, *Aceria tosichella*, which feeds on wheat and other grasses. The wheat curl mite is tiny and can only be seen with considerable magnification (30-40×). Feeding by mites causes the edge of the affected leaf (Figure 3) to curl back over itself (Figure 4). When populations are high, the leaves may become so

## Quick Facts

- Wheat streak mosaic causes a yellow discoloration of leaves. This discoloration is most intense near the leaf tip. Plants infected as seedlings are often stunted and have a reduced head size.
- Wheat streak mosaic can reduce yield by more than 80 percent when susceptible cultivars are infected with the disease as seedlings. Cultivars with intermediate levels of resistance are less damaged by the disease but may still experience up to 20 percent yield loss. Yield losses are reduced if plants are infected after the heading stages of growth.
- Destroying volunteer wheat and other grassy hosts of the virus is the best management strategy. Planting resistant varieties also may reduce losses. No pesticides provide control of the wheat curl mites that spread wheat streak mosaic.

*Figure 1. Wheat with symptoms of wheat streak mosaic. Infected plants often have bright yellow discoloration and are often smaller than healthy wheat. The diseased plants also may have a prostrate growth habit.*

*Figure 2. Leaf of a plant infected with wheat streak mosaic. Notice the yellow discoloration is more intense near the leaf tip with streaks extending down toward the base of the leaf.*

damaged that new leaves become trapped in the whorl of the plant (Figure 5). Even without the virus, high populations of wheat curl mites during grain fill and dry down can reduce grain yield and test weight.

Wheat curl mites and *Wheat streak mosaic virus* require a living host or "green bridge" to survive after wheat harvest. Volunteer wheat is the primary host for the wheat curl mite and the virus during the summer months (Figure 6). Other grassy weeds may serve as hosts, but these weeds are not nearly as suitable or prevalent as volunteer wheat. In Kansas and Nebraska, major outbreaks of wheat streak mosaic are often associated with wet summers that favor the germination and health of volunteer wheat and other grassy hosts. When a new wheat crop is planted, the wheat curl mites move from summer hosts to the newly emerging wheat crop. The mites and virus then survive the winter on the wheat crop.


*Figure 4. Symptoms of wheat streak mosaic include whitish to yellow streaking, which will usually be more pronounced toward the leaf tip. Note the curled leaf is where a colony of mites live.*

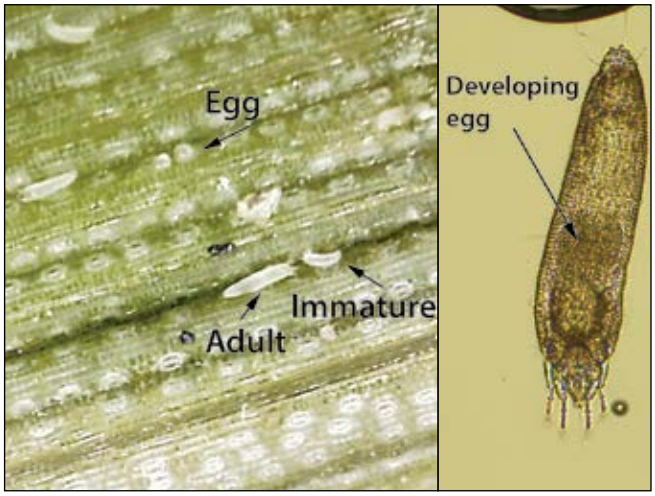


*Figure 3. Wheat curl mites live in colonies on the upper surface of the leaf where the leaf's edges curl around them due to their feeding. Adult, immature, and egg stages magnified 220× (left). Close-up of a female wheat curl mite (smaller than 0.03 mm).*

*Figure 5. Wheat curl mite–infested leaves take on a rolled appearance, similar to an onion leaf. Leaves can be carefully unrolled to expose the mite colonies. These mites will be about the size of a grain of sand to the naked eye. Note, Russian wheat aphids also roll the leaves, but these will generally show a white striping instead of yellow streaking.*

*Table 1. Risk factors influencing the yield loss caused by wheat streak mosaic.*

| Risk Factor | Influence on wheat streak mosaic |
|---|---|
| Time of Infection | The yield loss caused by wheat streak mosaic is rarely uniform throughout a field and reflects the gradient of disease symptoms within a field. This gradient of symptoms results from the timing of infection relative to plant growth and development. Plants infected as seedlings are most at risk. Plants infected after heading may show leaf discoloration but are less at risk for severe yield loss. |
| Additional Viruses | Plants infected with multiple viruses often experience greater yield losses. The presence of triticum mosaic or high plains wheat mosaic along with wheat streak mosaic increases the risk of severe yield loss. |
| Variety | Susceptible varieties are most at risk for severe yield losses. The risk is reduced by varieties with high or moderate levels of resistance to wheat streak mosaic. |
| Weather | Plants infected with wheat streak mosaic are more vulnerable to environmental stress. High temperatures, drought, and other stresses often increase the yield losses caused by the disease. |

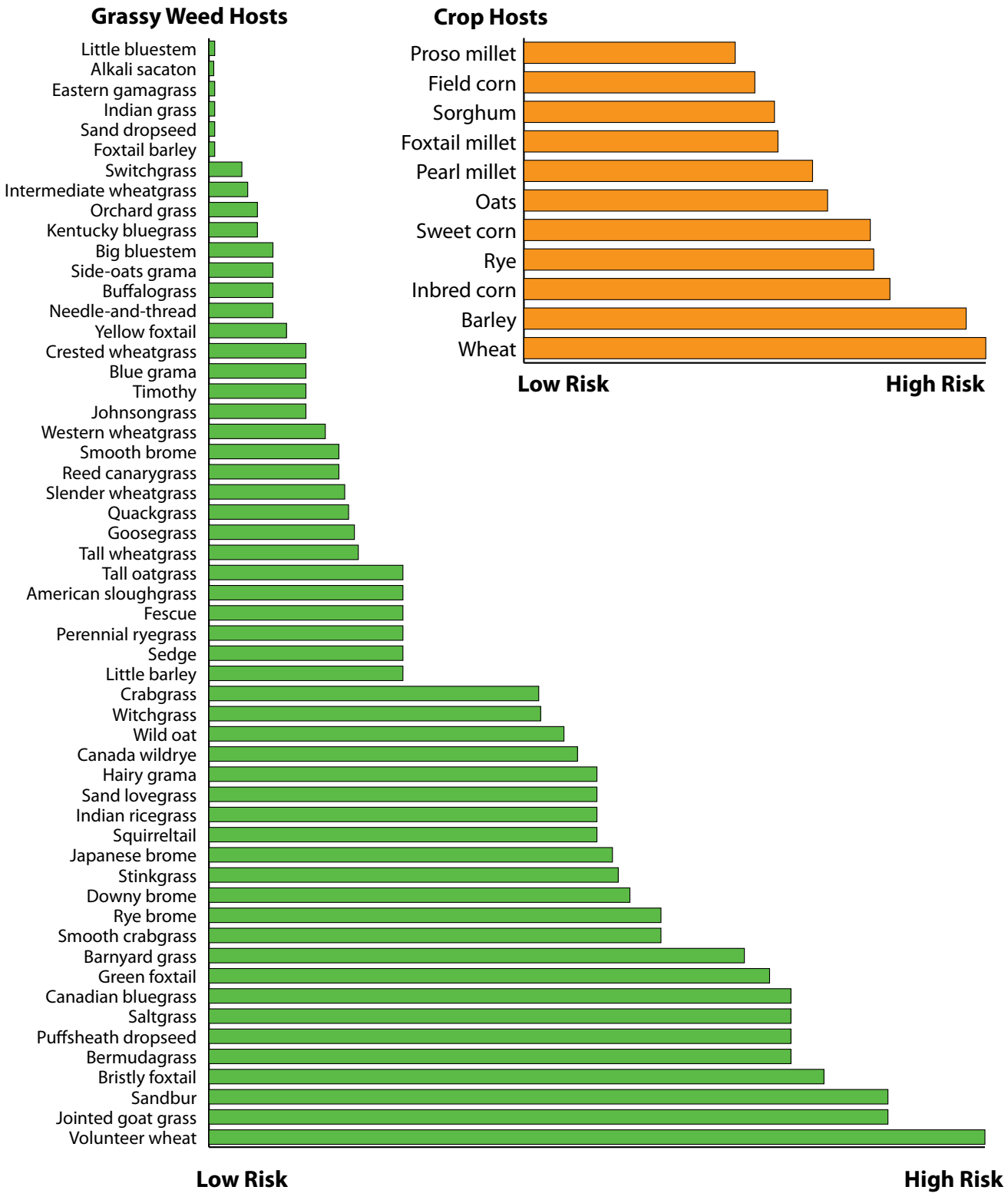


*Figure 6. Relative risk that various crops and grassy weeds will serve as reservoir of wheat streak mosaic virus and the wheat curl mite. This figure summarizes the results of multiple research articles and reports. Risk is a function of suitability of a weedy grass or crop to serve as a host of wheat streak mosaic and the wheat curl mite.*

*Other grasses with only partial information were not included in the figure, but preliminary results indicate that windmillgrass, bearded sprangletop, prairie threeawn, shattercane, and yellow nutgrass are a low risk for becoming a reservoir of either wheat streak mosaic virus or wheat curl mite. Annual bluegrass and fall panicum are a moderate risk. Giant foxtail is a high risk for becoming a reservoir of the disease or mite.*

## Potential Yield Losses

In severe cases, wheat streak mosaic causes yield losses of more than 80 percent. The disease also may result in lower test weight and reduced grain quality. The time of infection, variety, planting date, environmental conditions and other viral diseases influence the losses caused by wheat streak mosaic (Table 1).

## Control

- *Timely removal of volunteer wheat and other grassy weeds.* Volunteer wheat and other grassy weeds can be killed with herbicides or tillage operations. The weeds and volunteer wheat should be dead and dry for 2 weeks before planting the new wheat crop.
- *Avoid early planting.* Planting wheat after the "hessian fly free date" reduces the risk that the new wheat crop will emerge when the populations of wheat curl mites are large and more likely to move to new locations.
- *Plant wheat varieties with moderate or high levels of resistance to wheat streak mosaic.* Varieties such as Oakley CL, Clara CL, and Joe have resistance that is highly effective against wheat streak mosaic. This resistance is not perfect and these plants may still be susceptible to triticum mosaic or high plains mosaic. The resistance to wheat streak mosaic is less effective at temperatures above 75 degrees Fahrenheit. Therefore, planting these varieties early for grazing can place fields at risk for disease-related yield losses. For more information on plant resistance, refer to the K-State Research and Extension publication *Wheat Variety Disease and Insect Ratings*, MF991.
- *Chemical controls are not effective in controlling the wheat curl mite*. Testing has indicated that the currently labeled insecticides and miticides do not provide effective control of the wheat curl mite.

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