

# Wheat Soilborne Mosaic

Erick De Wolf, Plant Pathologist

Wheat soilborne mosaic is a viral disease of wheat that occurs throughout the eastern and central United States. It is frequently reported in counties in the eastern two-thirds of Kansas. The disease is rare in western Kansas but has been reported in some wheat fields. In addition to wheat, wheat soilborne mosaic occasionally attacks rye, barley, and some species of annual bromegrass.

The symptoms, life cycle, and field pattern of wheat soilborne mosaic are similar to those of wheat spindle streak mosaic. Wheat soilborne mosaic differs from spindle streak mosaic in two important aspects: it causes greater yield loss and its symptoms persist longer into the spring.

## Symptoms

Foliar symptoms of wheat soilborne mosaic are typically described as a mosaic of “green islands” against a pale yellow background (Figure 1). The infected plants also may be significantly stunted relative to healthy plants in the same field.

The symptoms of wheat soilborne mosaic are influenced by with temperature changes. The disease is favored by cool weather and temperatures near 60 degrees Fahrenheit are considered optimal for symptom expression. The intensity of the symptoms may decrease when daytime temperatures consistently exceed 68 degrees Fahrenheit. This reaction to changing temperatures influences the timing of symptom expression within a growing season. Symptoms typically appear in early spring, right after green-up. By jointing, mosaic symptoms have usually faded, but stunting may persist until maturity.

Soilborne mosaic is usually first noticed as large, irregular areas of yellow, stunted wheat. The field pattern often follows the drainage pattern of the field because the fungus-like organism that transmits the virus requires moisture to infect plants. Symptoms of wheat soilborne mosaic can easily be mistaken for nitrogen deficiency when viewed from a distance. Unlike some other diseases, the patches of soilborne mosaic do not grow in size as the season progresses.

As mentioned, wheat soilborne mosaic is often confused with spindle streak mosaic. Symptoms of spindle streak mosaic are yellow spots or dashes on a green background. The situation is confused further by the fact that many plants are often infected with both viruses. In such cases, positive identification requires specialized labora-

## Quick Facts

- Symptoms of wheat soilborne mosaic include a mosaic of small “green islands” on a pale yellow background. The disease often occurs in patches within a field and wheat varieties susceptible to the disease may be significantly shorter than healthy plants in the same field. The intensity of the disease symptoms will often decrease as temperatures warm in the spring.
- Wheat soilborne mosaic virus is spread by a fungus-like organism that can survive for many years in the soil of infested fields. The persistence of this organism makes crop rotation an ineffective means of control.
- Wheat varieties resistant to wheat soilborne mosaic are the best means of control. Fields with a history of the disease should be planted with resistant varieties.



**Figure 1.** Symptoms of wheat soilborne mosaic include a mosaic of “green islands” on pale yellow background.

tory testing. Varietal resistance ratings are also helpful in distinguishing soilborne mosaic and spindle streak mosaic.

## Life Cycle

*Polymyxa graminis*, a fungus-like organism, carries wheat soilborne mosaic virus. The virus particles are carried on or in specialized spores (zoospores) of this organism that are able to swim in the thin film of water surrounding particles of saturated soils. The organism invades root hairs of the young wheat in the fall during periods of high soil moisture. Apparently spring infections are possible, but they are unlikely to cause severe disease problems in wheat. *Polymyxa* forms dark clusters of resting spores in the wheat roots, which are released to the soil as the roots decay. Since the organism survives in the soil as resting spores, the disease is always associated with infested soil. Soils may remain infested for many years. Wheat soilborne mosaic virus is not spread by insects or in the seed produced by infected plants.

Losses are limited to the areas of the field showing symptoms. Therefore, the first task is to estimate the percentage of the field affected by the disease. Within affected areas, losses caused by wheat soilborne mosaic are variable,

depending on variety and weather. Losses are roughly proportional to the length of time during which plants show obvious symptoms. A long cool spring prolongs symptom expression and losses may be 30 to 50 percent on highly susceptible varieties. Losses may be only 10 to 20 percent in a warm spring.

## Control

Planting resistant wheat varieties can effectively control wheat soilborne mosaic. Many wheat varieties are resistant to wheat soilborne mosaic. See K-State Research and Extension publication *Wheat Variety Disease and Insect Ratings*, MF-991 for current information on variety reactions.

Late planting can sometimes allow plants to escape infection in the fall. Wheat planted after the Hessian fly-free date is less likely to be attacked by wheat soilborne mosaic as well as other viral diseases. Due to the longevity of the fungus-like organism that spreads the disease, crop rotation is not an effective control. There are no pesticides that provide economic control of soilborne mosaic.

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