K-STATE Research and Extension

Wheat Soilborne Mosaic

Department of Plant Pathology | EP166 | Wheat Diseases

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

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 often are significantly stunted relative to healthy plants in the same field.

The symptoms of wheat soilborne mosaic are influenced by temperature. The disease is favored by cool weather and temperatures near 60 degrees Fahrenheit are 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 within a field. The virus is spread by a fungus-like organism that invades wheat roots when soil conditions are moist. As a result, wheat soilborne mosaic is often most severe in low areas of a field and natural water drainage paths within a field. Symptoms of wheat soilborne mosaic can easily be mistaken for nitrogen deficiency when viewed from a distance.

Wheat soilborne mosaic can be confused with other diseases. It is most likely to be confused with wheat spindle streak mosaic. The diseases can be distinguished based on symptoms. The mosaic pattern of soilborne mosaic is more blotchy than the delicate streaks caused by spindle streak mosaic. The situation is confused further by the fact that many plants are often infected with both viruses. In most cases, laboratory testing is required to distinguish these viral diseases.

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..

Life Cycle

Polymyxa graminis, the fungus-like organism that carries the wheat soilborne mosaic virus survives in the soil for decades. This organism produces spores that invade the roots of wheat and transmit the virus to the young plants. Most infections occur in the fall when extended periods of high soil moisture favor the movement of *Polymyxa*. Infections can occur in the spring, but are often less damaging than infections initiated in the fall. Wheat soilborne mosaic is not spread by insects or mites and is not transmitted by seed.

The yield losses caused by wheat soilborne mosaic are strongly influenced by the proportion of plants showing symptoms of disease. Remember, most infections occur in the fall and the disease is unlikely to spread to new areas of the field in the spring. Therefore, the areas showing the severe symptoms early are most likely to experience yield loss. Other areas may be relatively unaffected by the disease. The level of yield loss within the affected areas is influenced by the susceptibility of a variety and plant's environment. The yield loss is roughly proportional to the length of time that temperatures remain favorable for symptom expression. For example, the risk of severe yield loss increases in cool years when temperatures favor activity of the virus within the infected plants and extends the time symptoms are expressed. A highly susceptible wheat variety may experience a 30 to 50 percent yield reduction in a cool year. In contrast, the same varieties may only experience 10 to 20 percent yield loss in warm years that suppress disease development.

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*, MF991 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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