

# Wheat Spindle Streak Mosaic Virus

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Wheat spindle streak mosaic (WSSM) was first reported in Michigan in 1969 and is now found in all of the wheat growing areas of Michigan. The disease was originally called "wheat variegation" because of the intense patterns of yellow and green in infected leaves. In most years, the symptoms are much milder, consisting of light green to yellow spindle shaped dashes and short streaks. Wheat spindle streak mosaic was severe throughout Michigan in 1980 and 1981 with symptoms of intense patterns of yellow and green. Losses due to WSSM are influenced by environmental conditions, variety selection, and some cultural practices. They can range from 2 to 18% or approximately 0.8 to 7.9 bu/acre each year.

## SYMPTOMS

The most important effect of the disease on wheat is a reduction in yields. Warm spring temperatures slow down or halt symptom development. At temperatures continually above 60° F, new growth appears healthy, and diseased plants generally attain the same height as healthy plants. Only during prolonged, cool springs do the symptoms develop on new growth.

WSSM symptoms usually develop uniformly over an entire field although wet areas in fields may have more severe symptoms (Fig. 1). Symptoms appear as yellow or light green dashes and streaks in mildly affected plants (Fig. 2) and as bright yellow-green mottling in more severely affected plants (Fig. 3). The dashes and streaks are oriented parallel to the leaf veins and taper at both ends to form spindles. Symptoms are first evident on lower leaves, and may develop on new growth under favorable conditions. Symptoms develop most rapidly between air temperatures of 48° and 55° F. When cool temperatures persist into late May and June, symptoms may appear on all leaves including the flag leaf. Under these conditions, the chlorotic spindles may coalesce into large non-



**Fig. 1.** Extensive yellowing of WSSMV infected wheat in a low area of a field. Yellowing will occur throughout an entire field when infection is severe and when spring temperatures remain cool.



**Fig. 2.** Milder symptoms are seen as distinctive dashes or streaks in affected plants.

distinct mosaic patterns (Fig. 4). Very intense chlorotic areas may die and turn brown, often giving the appearance of Septoria leaf blotch. Stunting also occurs in infected plants, although it is usually mild.

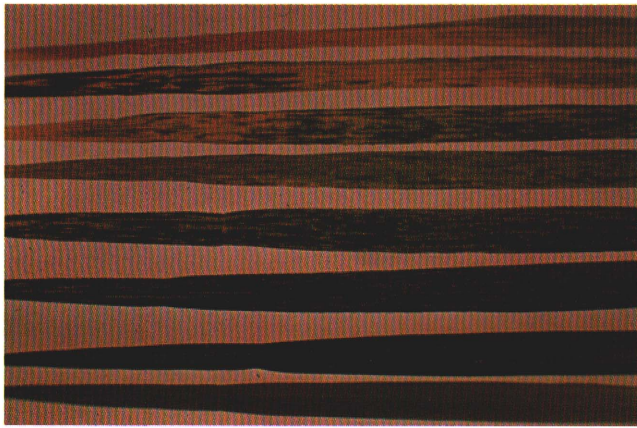


Fig. 3. The mosaic or mottling is more distinctive in severely affected plants, with more yellowing appearing in the place of the lighter green areas. Note increased severity of symptoms from healthy leaf at bottom to severely diseased leaf at top.



Fig. 4. Yellowing of all the leaves on WSSMV infected wheat plants occurs when cool temperatures extend into late May and early June.

## DISEASE CYCLE

WSSM is caused by a virus which survives in soil in association with the soil fungus *Polymyxa graminis*. The fungus invades the roots of wheat plants and transmits the virus. Wheat roots invaded by the fungus without virus are symptomless. Most infections occur in the fall, and symptoms develop in the spring when the plants resume growth. Spring infections do occur, but are not serious, and symptoms are much less severe or absent. This may explain why the disease is less severe on late-planted wheat in Michigan. WSSMV is not carried in the seed.

## CONTROL

Tillage operations move the virus from one part of a field to another. The widespread distribution and severity of WSSM in the spring of 1981 suggest that practices directed toward limiting the spread of the disease will not be effective. Cultural practices, except for delaying fall plantings, appear to have little influence on disease development. Studies at Michigan State University indicate that wheat planting be delayed in the fall at least 10 days past the Hessian fly free date. In addition to WSSM, other diseases are also

reduced by delayed planting. More information on this may be found in MSU Research Report 314.

Soil may remain infective for at least 5 years; crop rotations of 8 years or more may decrease soil infectivity. Differences in varietal reaction to the disease have been observed in research studies at Michigan State University (Table 1).

Table 1. Symptom expression of wheat varieties to WSSMV.<sup>1</sup>

Variety	Symptom expression <sup>2</sup>
Abe	S
Arthur	S
Augusta	S
Frankenmuth	S
Fredrick	S
Genesee	S
Howser	S
Ionia	S
Tecumseh	MR
Titan	MS
Yorkstar	S
Pioneer S-76	MR

<sup>1</sup>A susceptible symptom expression is not an indication that yields will be severely reduced.

<sup>2</sup>S = susceptible; MS = moderately susceptible; MR = moderately resistant.