



# Extension FactSheet

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## Wheat Yellow Mosaic

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Wheat yellow mosaic (WYM) is the new name of the virus disease of wheat previously known as wheat spindle streak mosaic (WSSM). This virus disease was first described in Japan in the early 1960's. About the same time it was detected in Ontario, Canada. Since that time, WYM has been reported in most northeastern and midwestern states of the United States. However, states neighboring the Great Lakes have had persistent problems with WYM. In Ohio, this virus disease appears to be widespread. The virus is transmitted through soil by a soil-borne fungus whose activity is dependent on cool, wet conditions. Wheat is the only plant species known to be susceptible to infection in the United States. Both winter wheat and spring wheat are susceptible, but spring wheat rarely develops symptoms. Yield losses have been reported to range from 7 to 40 percent in individual fields depending on the variety and severity of symptoms in plants.

### Symptoms

In early spring, symptoms appear as light green to yellow dashes and short streaks in young leaves. The discontinuous streaks are oriented parallel to leaf veins and taper at the ends to form chlorotic spindles. As plants mature, the spindle-shaped lesions and the chlorotic streaks on older leaves coalesce and become necrotic. Older leaves look mottled with yellow and green blotches. Spindle shaped lesions will continue to develop in the upper new leaves through April and May if temperatures remain cool. During late May and June, warmer temperatures may prevent symptom development on newly expanded leaves. Infected plants appear to "outgrow" the disease and symptoms are confined to the older, lower leaves. Severe symptoms can be seen on susceptible varieties in years with cool temperatures that prolong symptom development through early June. In general, plants with WYM tend to be uniformly distributed throughout the field. Infected plants produce fewer tillers, smaller heads and less seed per head than healthy plants. The kernels produced by infected plants are not shriveled or light in weight. Plants may be mildly stunted, but this is not often evident.

### Disease Cycle

Transmission of the virus that causes WYM is through soil and soil may remain infested for many years. WYM survives in soil in close association with the soil-borne fungus *Polymyxa graminis*, the vector of the virus. The *Polymyxa* fungus survives in the form of resting spores clustered in the cells of wheat root residue. In the fall, the fungus produces large numbers of swimming spores (zoospores) in saturated soil at cool temperatures. The zoospores carry the virus particles to wheat root hairs and epidermal cells. The spores penetrate the cells of the root and infect the plant, carrying the virus particle inside the plant. Wheat sown in infested soil becomes infected soon after emergence (about 2 weeks after seeding) if the soil temperature is near 60 degrees F (15 degrees C). When the wheat resumes growth in the spring, symptoms develop if the soil temperature remains cool, 40-55 degrees F (5-13 degrees C). Optimum temperature for symptom development is 50 degrees F (10 degrees C). If higher temperatures occur early in the spring, infected plants fail to develop mosaic symptoms, leaving little visual evidence of the disease. Normally, spring infections occur too late to cause



Figure 1. Spindle shaped streaks in the upper leaves of plants are characteristic for wheat yellow mosaic.

damage before warmer temperatures prevent their progress. Infections do not occur above 68 degrees F (20 degrees C) and symptom development ceases above 64 degrees F (18 degrees C). WYM is spread by cultivating equipment, wind, water and other factors that disperse infested soil.

## Diseases with Similar Symptoms

Wheat yellow mosaic is most easily diagnosed by symptoms when the chlorotic spindle shaped lesions appear on the upper leaves of the plant prior to heading. Wheat soil-borne mosaic (WSBM) and wheat streak mosaic (WSM) produce symptoms similar to WYM. Wheat soil-borne mosaic is also transmitted by *Polymyxa graminis*. Wheat streak mosaic is transmitted by *Aceria tulipae*, the wheat leaf curl mite. Wheat soil-borne mosaic symptoms range from a light green to a prominent yellow leaf mosaic and infected plants are usually restricted to low-lying, wet areas of the field. Wheat streak mosaic symptoms are somewhat variable, but infected plants normally are stunted with mottled green and yellow streaks extending the length of the leaf. Also rolling or curling of the youngest leaves due to damage by the wheat leaf curl mite may be an indication of wheat streak mosaic virus, but are rarely seen in Ohio. Plants with WSM are usually located near the edges of the field. Plants with WYM and WSBM generally “outgrow” symptoms in late spring, whereas those with WSM do not recover.

Symptoms expressed by wheat plants in response to these and other viruses are various forms of chlorotic streaks or mosaic

patterns on the leaves. All are difficult to differentiate based on symptoms alone. Positive identification can be made only by assaying infected plants for the presence of virus particles. Assays used in identification include serology, electron microscopy, and transmission studies. Diagnosis requires sending fresh samples to laboratories that can perform the assays.

## Control

1. WYM is best controlled by planting varieties of wheat with resistance. Many varieties adapted to Ohio with high yield potential and high levels of resistance to WYM are available. Obtain a list of current resistant varieties from OSU Extension offices or consult your seed dealer. Consult OSUE bulletin 785 “Wheat Disease Control in Ohio” for more information on viruses affecting wheat.
2. Delayed planting in the fall until late October may reduce infection by WYM. However, optimum yield is obtained by planting 7 to 10 days after the Hessian fly free date. Avoid sowing wheat too late for satisfactory winter survival and vigorous spring recovery.
3. Crop rotations may limit the incidence of WYM. Limited observation indicates that a long rotation with legumes is better than a short rotation with corn and/or oats. Continuous wheat favors the disease by favoring the survival of the fungus vector. It has been reported that some fields not planted to wheat for 10 years still harbor the virus and the fungus. Therefore, rotations may reduce the population of *Polymyxa graminis* in the soil, but will not eliminate it.

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