Maize Dwarf Mosaic Virus

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Maize Dwarf Mosaic Virus (MDMV) is the most common virus disease of corn and sorghum in Kansas. The incidence of this disease is usually less than 5 percent, but levels as high as 65 percent have occasionally been reported. On a statewide basis, yield losses seldom exceed 1 percent but can be much higher in individual fields. Losses are generally more severe in sweet corn and grain sorghum than in field corn.

Two strains of the virus are commonly found in Kansas. Geographically, strain A is most prevalent in the southern part of the state and strain B is most prevalent in the northern half of the state.

Symptoms

Corn

Symptoms in corn are highly variable. Infected plants may occur randomly, or they may be clustered in localized spots in the field. These infected spots may appear first along one side or end of a field, particularly if johnsongrass is in close proximity. Infection is most severe when it occurs early; those plants infected at pollination time or later may appear normal.

On the youngest leaves, irregular, light and dark green mottle or mosaic patterns appear that may develop into yellow streaks *(Fig. 1)*. The mosaic often appears as dark green "islands" on a lighter green background. Plants are sometimes stunted to half their normal height with a reduction in ear size and seed set. As the season progresses and air temperatures increase, the mosaic symptoms often disappear and young leaves become more yellow. Plants infected with MDMV may be predisposed to root and stalk rot and premature death.

Sorghum

Plants infected as seedlings are more severely diseased than plants infected later in the growing season. Symptoms first appear in the newest emerging leaves as an irregular light and dark green mosaic pattern similar to that in corn. As the plant matures, the mosaic pattern develops into narrow, light green or yellow streaks.

Another prominent symptom which follows mottling is red leaf, a red discoloration that may appear on leaves, particularly when night temperatures are below 60° F *(Fig. 2)*. As the red leaf symptom spreads, infected areas merge and become necrotic. Dead tissue forms at the tip of the leaf and progresses toward the base. Red leaf symptoms appear more often when plants are infected with strain B of the virus. This may be due in part to the fact that strain B-infected plants will begin to show red leaf symptoms at temperatures as high as 69° F.

In severe cases, the plants may be stunted and flowering delayed. Plants may fail to head or set seed, or, if seed is produced, "small seed disease" may result. Small seed disease is character-

Figure 1. Corn with mosaic symptoms caused by MDMV.

Figure 2. Red leaf symptoms on grain sorghum infected with MDMV.

Figure 3. The purpling of panicle branches is a symptom of MDMV infection.

ized by seeds smaller than normal and light in weight with a chalky endosperm. The panicle branches may turn a reddish-purple in sorghum hybrids that carry the gene for red pigmentation *(Fig. 3)*, especially when night temperatures are cool.

MDMV symptoms are often confused with two bacterial leaf diseases common to Kansas, streak and stripe *(Fig. 4 and 5)*, as well as greenbug damage *(Fig. 6)* and parathion burn *(Fig. 7)*. Bacterial streak and stripe can sometimes be differentiated from MDMV by the production of a bacterial ooze on the undersides of the leaves during periods of wet weather. These droplets usually dry to form small crystalline patches along the lesions on the underside of the leaf. Parathion burn can occur not only in fields which have been sprayed with the material, but also in adjacent fields via drift. Spots caused by parathion are usually concentrated on the outer edges of the uppermost leaves.

Insect Carriers

The virus is spread from plant to plant and field to field by several species of aphids. The most common carriers (vectors) in Kansas are the greenbug and the corn leaf aphid. Initial infections may occur when overwintering aphids feed on infected weed hosts and then move into a field. Additionally, the virus can be spread great distances when virus-carrying aphids are moved by strong winds associated with weather fronts.

Controlling virus-carrying aphids with insecticides has not proven effective. Most commonly used insecticides will not kill the insects quickly enough to prevent the initiation of feeding or inoculation of the plant with the virus.

Host Plants

In addition to corn and grain sorghum, a wide range of commonly found grasses and grassy weeds are also susceptible to MDMV. These include johnsongrass, sudan grass, sorghum-sudan hybrids, shattercane, barnyardgrass, green and yellow foxtail, jointed goat grass, Japanese brome, cheat, downy brome, smooth and hairy crabgrass, goose grass, stink grass, witch grass, proso millet, switch grass, indiangrass, eastern gamma grass, lovegrass, and big and little bluestem.

The small grains—wheat, oats, barley and rye—and perennial grasses such as bluegrass, smooth bromegrass, the fescues, orchard grass, wild rye, quackgrass, and reed canary grass appear to be immune to MDMV. None of the forage legumes—alfalfa, clover, lespedeza and vetch—are known to be susceptible to MDMV.

Control

MDMV is controlled by cultural practices that minimize the virus source. Johnsongrass is known to be the primary overwintering host of strain A of the virus. Several native perennial grasses are known to be reservoirs of strain B of the virus, but to date, none have been positively identified as an overwintering source.

As the johnsongrass resumes growth in the spring, aphids feed on it and acquire the virus from infected plant parts. The aphids then move to nearby crop plants and the virus is transmitted to those plants. The destruction of johnsongrass and other susceptible annual grasses in and around corn and sorghum fields reduces the early-season virus reservoir. However, outbreaks of MDMV in late-planted corn have occurred in areas as far as 400 miles north of the overwintering limit of johnsongrass.

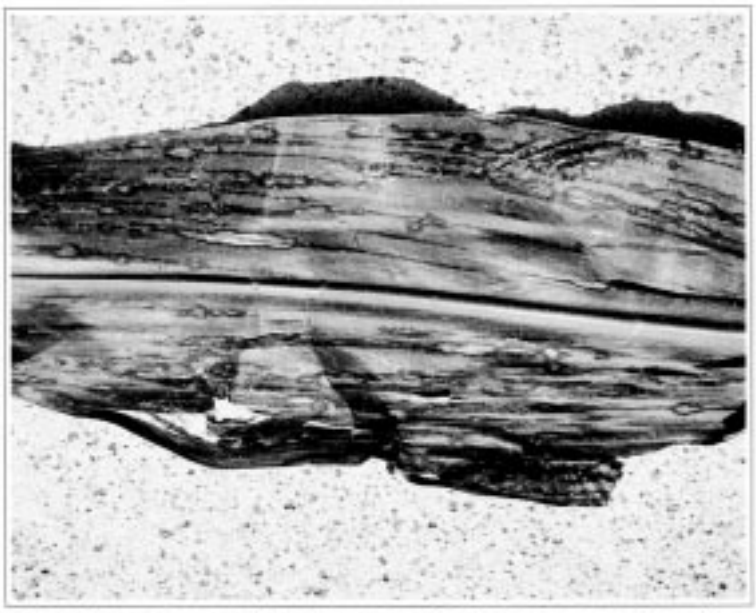

Figure 4. Bacterial streak symptoms on grain sorghum.

Figure 5. Bacterial stripe symptoms on grain sorghum

A better means of control is the use of tolerant hybrids. No hybrid is known to be immune to the disease, but many are resistant to the red leaf symptom which is associated with more severe yield losses.

For instance, in research conducted at the Fort Hays Branch Experiment Station[1], sorghum having only the mosaic reaction to infection by strain B of the virus had yield reductions of 0-8 per-

cent. However, sorghum genotypes having the red-leaf reaction to infection had yield reductions of 33–75 percent.

Most commercial sorghum hybrids are tolerant to strain A of the virus, but to date, relatively few have good tolerance to strain B. Information regarding the tolerance of individual hybrids to MDMV is available in the Kansas Agriculture Experiment Station bulletin, Keeping Up With Research 90, *Disease Reaction of Sorghum Hybrids to Infection by Maize Dwarf Mosaic Virus Strains A and B.* Information can also be obtained from many of the seed company catalogs.

[1]**Seifer,, D. L., and Hackerott, H. L. 1987.** ***Estimates of yield loss and virus titre in sorghum hybrids infected with maize dwarf mosaic virus strain B.*** **Agric. Ecosystems Environ. 19:81-86.**

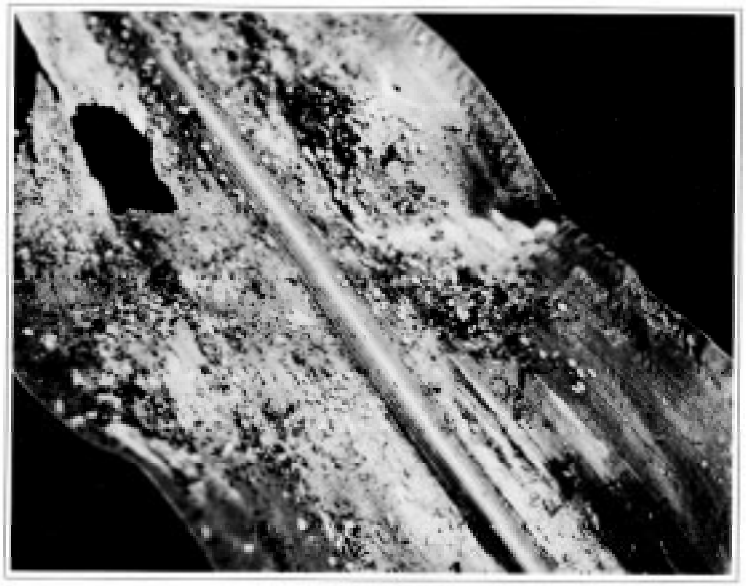

Figure 6. Aphid damage on grain sorghum caused by greenbugs.

Figure 7. Methyl-parathion burn on grain sorghum.

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