

Maize Streak Virus (MSV)

Introduction

Maize streak virus (MSV) causes a leaf disease in maize known as maize streak disease, also commonly called 'MSV' or 'maize streak.' MSV is a serious threat to maize production on the African continent. Virus infection at early crop stages may result in total crop loss. This *Field Facts* briefly discusses MSV and its leafhopper vector, maize streak disease symptoms and strategies for managing this disease.

Important terms

Virus: a disease organism that can only live and reproduce in the cells of living hosts. The virus that causes maize streak disease is MSV.

Vector: the agent that transmits the virus from one host to another. The vector of maize streak disease is an insect called a leafhopper.

Plant host: the living host that provides an environment for the virus to reproduce. Maize is one of the plant hosts for MSV. All plant hosts for MSV are in the grass family.

Chlorotic streaks, streaking: long, thin, yellowish to whitish stripes on the leaf caused by the disease. This hurts the plant by taking away the ability of the leaf to make food from sunlight.

Susceptible variety: variety of maize that easily gets a certain disease, like MSV. Yield usually suffers when this variety gets the disease.

Resistant variety: variety of maize that has been bred to fight against disease or to accept certain levels of disease but still yield well.

The virus, insect vector and plant host



Figure 1. *C. mbila*, the leafhopper vector of MSV.¹

Virus

Transmission of MSV to a plant host is accomplished only by sap-feeding leafhoppers. Once in the plant, the virus multiplies and moves in the sap above the point where infection occurred, causing characteristic streaking in the leaves above.

Leafhopper vector

The leafhopper *Cicadulina mbila* is the most important insect vector of MSV. This insect is very small, two to four



Figure 2. Maize streak disease symptoms on susceptible maize hybrid in Zimbabwe. Normal-coloured leaves from separate plant in upper right corner.

millimetres long with a yellow body and grey folded wings. Leafhoppers live and feed on a wide range of grassy plants and rarely fly more than 12 metres at one time. Virus infection occurs during feeding.

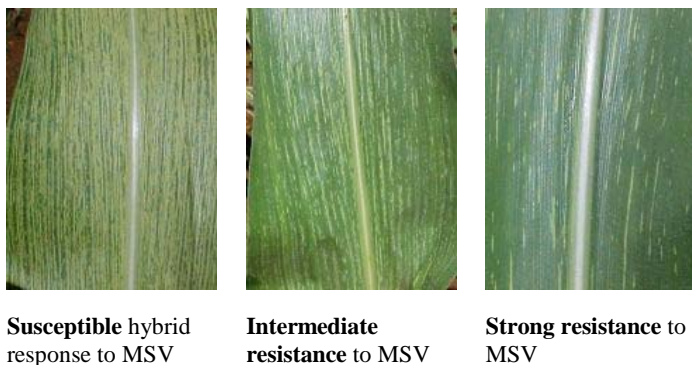
Plant hosts of MSV

MSV can infect many crops such as maize, oats, barley, wheat, rye, teff, sorghum, pearl millet, napier grass and finger millet. Many noncrop grasses are also natural hosts.

Maize streak disease symptoms

Maize plants are vulnerable to infection from emergence to tasselling, but the stage at which infection occurs is important. Maize plants infected within 3 weeks of emergence become **stunted** and may **die early** or produce **small poorly filled ears**. Infection after 8 weeks usually has little or no visible effect on vigour or productivity of the plants.

Figure 3. Maize leaf appearance with different levels of streaking.



The main symptom of MSV is **broken to almost continuous, narrow chlorotic streaks** centred on leaf veins. The amount of the streaking varies according to maize hybrid or variety. In susceptible varieties, noticeable irregular or continuous streaks are distributed uniformly over the leaf surface of infected leaves. The parallel, yellowish streaks may partially or almost completely combine, leaving irregular green lines centred between small veins.

In resistant hybrids or varieties the chlorotic streaking occurs much less and may be completely absent in highly resistant hybrids or varieties.

Control and management

Plant resistant hybrids

Planting resistant hybrids is the most effective way to control maize streak disease. Seed companies are developing better MSV resistance in hybrids. If planting a susceptible or average-resistance hybrid, follow management guidelines to slow the migration of leafhoppers into the field and to prevent leafhoppers from feeding during the critical period. If testing hybrids with MSV resistance, be sure to manage MSV resistant hybrids and check hybrids (controls) exactly the same, or the test may not be a valid comparison.

Observe good crop management practices

Keep plants in good health to strengthen them against disease. Infected plants are easy to spot because of the leaf streaking. Poor growth in nearby plants that do *not* exhibit streaking would be due to other causes such as pests or diseases, poor soil fertility or poor tillage practices. Good management helps identify true MSV yield reductions and prevent yield loss to other causes that might appear to be MSV-related. This is

especially true when planting susceptible hybrids or hybrids with average resistance to MSV.

Prevent or slow migration of leafhoppers into maize

Plant early to avoid infection. The critical stage for infection of MSV by leafhoppers is in the first three weeks after emergence. Infection at this time can significantly reduce plant health and grain yield. Infection at later stages, particularly after 8 weeks, may reduce yield slightly or not at all. Planting early as a sole control measure will be ineffective if there are winter crops nearby (like irrigated maize) that harbor leafhoppers. This is also true if natural winter grassland habitats for leafhoppers are present.

A 10- to 12-m barrier of cleared ground between fields can reduce the number of immigrant leafhoppers. Remove remnants of previous crops and perennial grasses, perhaps by animal grazing.

Time the planting of a trap crop (wheat, for example) to attract leafhoppers during the first three weeks after maize emergence. Intercropping may reduce the activity of leafhoppers in maize, but this has not shown to be consistent in reducing MSV disease. Intercropping by itself tends to reduce maize yield.

Remove alternate feeding sources for leafhoppers

Alternate feeding sources could include:

- trap crops or crops that are known plant hosts for Cicadulina leafhoppers, like napier grass
- grass weeds and volunteer plants of maize, sorghum, or other cereals
- grassy field verges (edges), contours, or grassy waterways

Field sanitation efforts may slow the spread of disease into the field and allow the maize crop to avoid being infected during the first critical weeks.

Apply systemic insecticide that prevents leafhopper feeding

Certain insecticides can safely move in the sap of a plant. When are applied as a seed treatment (Gaucho² or Cruiser³) or in the furrow at planting (carbofuran), these insecticides can prevent early leafhopper feeding. Although effective, applying chemicals at planting can be economically difficult for the small farm sector. Note that postemergence contact and systemic insecticides have not been found effective.

¹Figure 1, image published by permission of Dr. Margaret Boulton, Dept. Disease and Stress Biology, John Innes Centre, Norwich NR4 7UH, UK.

²Gaucho is a registered trademark of Bayer AG

³Cruiser is a registered trademark of Syngenta