



Grey leaf spot of maize

Cercospora zea-maydis & *Cercospora zeina*



Photo: Noah Phiri

Maize growing in Zambia showing symptoms of grey leaf spot.



Photo: Noah Phiri

Spots join together resulting in long grey streaks and a blight of the leaf.

SUMMARY: Grey leaf spot of maize has emerged as a yield-limiting disease throughout USA and southern Africa in the last 25 years. Although thought to be one species of fungus, *Cercospora zea-maydis*, molecular tests have shown that another fungus, *C. zeina*, is dominant in eastern USA and southern Africa. Spores, surviving in the remains of previous crops, are rain-splashed onto lower leaves causing long spots, merging on susceptible varieties, to cause a blight. Stems are weakened and fall over (lodge) during epidemics. The disease can be managed by destroying plant debris after harvest, crop rotation, using more tolerant varieties and, where economically justifiable, by fungicides.

KEY SIGNS

Symptoms first appear on the lower leaves as pinpoint spots surrounded by yellow halos, best seen when held to the light. The spots expand parallel to the leaf veins and, on susceptible varieties, are light brown to grey, rectangular, up to 70 mm long and 4 mm wide. The spots may join together on the leaves to cause a blight. Spores form on the spots and the leaves begin to look silvery-grey.

Sheath and stalk infections may also occur, although they are not as clearly seen as those in the leaves. The infections can lead to rots, which result in the plants falling over.

MANAGEMENT

Prevention – what to do before signs are seen

Cultural approaches: Grey leaf spot is best managed by using resistant varieties and a number of hybrids are now available for Africa.

Choice of varieties is extremely important. There are no varieties which are totally resistant (immune to infection), but many are 'tolerant' where leaf spots are small, disease comes late and the impact is low. Check with local seed companies or retailers if open-pollinated varieties with grey leaf spot tolerance are available. Otherwise, consider the use of improved commercial hybrids, which have to be purchased each year. As an example, a recent study (2014) has shown that ZMS616 is the most popular variety with farmers in Zambia because it is suited to a range of environments, drought tolerant and disease resistant. Other varieties that are disease tolerant are SC407 and SC411.

If smallholders want to try a new variety, instead of planting traditional open-pollinated types, it is recommended that only small plots are planted at first, before scaling up only if the new variety is suitable.

If direct seeding (no-tillage or zero tillage) is the preferred method of cultivation, grow legume cover crops before planting the maize; suitable crops are lablab, velvet bean or sunhemp. Clear the legume just before planting the maize by making furrows without cultivating the land. At first weeding plant a short-term food legume cover crop such as beans, peas, mung bean or soybean as an intercrop to cover the soil. Note that continuous maize, and no tillage or

reduced tillage, are high-risk practices, creating conditions for disease development; this is because of the amount of maize debris that remains on the soil surface.

After harvest, if not using conservation tillage practices, plough in or collect and burn crop debris. This is very important as the spores on the leaves and stalks allow the fungus to survive from one season to another.

Control –what to do after signs are seen

Cultural approaches: Even if a tolerant variety is used, it is still important to use a 1-2-year rotation between crops of maize on the same land if grey leaf spot is established in the field. Note that grey leaf spot only infects maize, so other crops in the rotation will not become infected.

Chemical approaches: If fungicides are affordable and available, apply just before tassels (male flower) emerge. In South Africa mixtures of benzimidazoles and triazoles are used, and more recently strobilurins. These, though, are expensive and so unlikely to be economically viable except in large-scale commercial operations.

CAUSE

Grey leaf spot was first thought to be caused by the fungus, *Cercospora zeaе-maydis*. Later, it was found that there was more than one species; there was *C. sorghi*, and two groups within *C. zeaе-maydis*: Group I is the dominant type in the USA, and occurs elsewhere, and Group II occurs mostly in USA and Africa. Molecular studies have now found that Group II is a separate species, *C. zeina*, and that *C. zeaе-maydis* does not occur in South Africa. Whether *C. zeaе-maydis* is in other places in the continent needs to be resolved. There is even speculation that *C. zeina*, the African species, came from sorghum because of molecular similarity between that species and *C. sorghi*.

Grey leaf spot is a serious fungal disease of maize. It first became widespread in the early 1990s. The severity of the disease depends on three factors: the amount of fungus surviving on remains from previous crops, the tolerance/resistance level of the particular maize variety and, most importantly, weather conditions.

The fungus can survive for more than a year between crops on maize debris left above and on the soil surface. Spores are then splashed by rain to the lower maize leaves. There is no evidence that the fungus is spread either in or on the seeds, i.e. it is not seed-borne.

Once the lower leaves are infected, rain-splash spreads the spores to higher leaves and to leaves on plants nearby. Spread further afield occurs via spores carried on the wind. The time from infection to spore production varies from 15-30 days depending on the disease tolerance of the variety. The disease is often seen following periods of warm (25-32°C) overcast days with heavy dews.

IMPACT

The disease has become one of the most serious maize diseases worldwide. It is of particular concern in the USA and Africa. In the USA, the disease has increased because of no-tillage practices and the susceptibility of hybrid maize. In some states of the USA corn belt, maize yields in the 1990s were said to have fallen 20-40% due to grey leaf spot. In Africa, economic losses have been reported from South Africa, but have yet to be detailed in East, West and Central Africa where it is also present. Impact depends on when the eight or nine leaves above the ear become infected, and the amount of disease that develops on them, as these determine 70-90% of the yield: the earlier the infection sets in, the greater the yield loss. If the disease does not affect these top leaves until 6 weeks after tasselling, then yield losses will be small. Yield loss also depends on the length of the crop. Hybrid maize in South Africa and other countries of Africa are particularly vulnerable to this disease as they are long-season types, giving the fungus more time to damage them.

DISTRIBUTION

The disease is present in North and South America, Central America and the Caribbean, with a limited distribution in Asia. In Africa, it is widespread in Ethiopia, Kenya, Malawi, Mozambique, South Africa, Swaziland and Zimbabwe. It is also present in Cameroon, Nigeria and Tanzania, and locally present in Uganda and Zambia. The distribution of the two species, *Cercospora zeaе-maydis* and *C. zeina* differs. *Cercospora zeaе-maydis* is present in North, South and Central America, the Caribbean and Africa (but not South Africa); *C. zeina* is present in China, Brazil, the USA eastern corn belt and throughout Africa.

FURTHER READING

Cercospora zeaе-maydis. CABI Crop Protection Compendium. (<http://bit.ly/1UOLzv2>).

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