



# Maize lethal necrosis disease

## *Multiple virus infections*



Photo: Eric Boa, CABI, CC BY 4.0

*Once the disease enters a field there is little that can be done to prevent total loss of the crop.*



Photo: Eric Boa, CABI, CC BY 4.0

*Advanced symptoms include browning from the edge of the leaves, which does not occur in maize streak virus.*

**SUMMARY:** Maize lethal necrosis disease (MLND) is a new viral disease for Africa. It has caused great concern because plants are killed and little or no grain is produced. The main thrust of the current management strategy is to prevent the introduction of the disease through sound surveillance and early destruction of diseased plants. Promising resistance exists to maize chlorotic mottle virus (MCMV), the main virus associated with the disease, but further work is needed before recommendations backed by scientific evidence can be given on what varieties to grow.

## KEY SIGNS

The first symptoms are a scattering of small yellow areas (mottling) on leaves. These start to merge and the leaf becomes paler before the edges go brown and dry inwards. In some plants the young leaves die before they have expanded, producing a 'dead heart'. The first stages of mottling are similar to maize streak virus, but thereafter the two diseases are quite distinct: with maize streak virus the streaks do not merge and there is no marginal browning and drying up.

Maize lethal necrosis disease (MLND) kills plants. Plants become stunted and grain production, if it occurs at all, is poor: a consequence of distorted and shrivelled ears. All stages of plant growth are affected and the earlier the plant becomes infected, the greater the damage.

## MANAGEMENT

**Prevention** – what to do before signs are seen

*Cultural approaches:* Take early action to avoid introducing the disease to new areas by using certified seed and varieties recommended by local extension services and national agricultural bodies. Although promising resistance has been identified in Kenyan trials, the maize types are 'pre-commercial hybrids' and therefore not yet available to the public.

Maize planted less than 500 metres from an infected area is more likely to get the disease. Other advice includes removing weeds and burning grasses around the field, both potential sources of the insect vectors.

Avoid walking through established fields since the virus can be physically transmitted on clothes.

Rotate maize crops with non-cereals to reduce the virus inoculum of both MCMV and sugarcane mosaic virus (SCMV), the other virus needed for development of MLND.

*Chemical approaches:* Reduction of vector populations through insecticide application is unlikely to have any impact on the disease unless applied consistently and over large areas. These conditions are difficult to achieve in dense patchworks of smallholder plantings.

**Control** – what to do after signs are seen

*Cultural approaches:* Early removal of infected plants showing first symptoms may reduce the local spread of MLND but is unlikely to constrain its longer term spread.

Collecting and burning of plant remains to reduce the spread of the disease must be done on a large scale to be effective.

## CAUSE

First discovered in 2011 in Kenya, the disease has spread rapidly to neighbouring countries.

MLND is caused by a combination of two viruses, one of which is always maize chlorotic mottle virus (MCMV). This by itself will cause only minor damage on maize, but when another potyvirus of cereals, such as SCMV, wheat streak mosaic virus (WSMV) or maize dwarf mosaic virus (MDMV) is present, the result is MLND. In Kenya only SCMV has been found in co-infections, but other potyviruses are implicated elsewhere.

Much is already known about MLND from research done in the United States. MCMV, for example, is transmitted by thrips, rootworms (*Diabrotica* spp.), leaf beetles and in seed. Different insects may be responsible in Kenya, where research is only beginning. Little is known about the importance of virus movement in seeds. It is important not to make too many assumptions about MLND in Africa generally while maximizing the use of existing knowledge of the disease from other countries.

MCMV occurs widely in maize in Africa but is less damaging on its own, compared to co-infections with another 'enabling' virus, such as SCMV, which result in MLND. There is resistance to MCMV and/or SCMV in maize but of 119 commercial maize varieties for sale in Kenya, 117 were susceptible to MLND.

## IMPACT

MLND destroys whole fields of maize. The stunting and outright death of plants, together with little or no grain production, makes MLND a devastating disease whose long-term impact on maize production in other countries has been significant and poses a major threat to countries in East Africa and beyond.

## DISTRIBUTION

MLND has been confirmed in Kenya, Tanzania, Uganda, Rwanda, South Sudan, Malawi and Mozambique. Unconfirmed reports suggest that the disease is also in DR Congo and Ethiopia.

## FURTHER READING

Check [www.cimmyt.org](http://www.cimmyt.org) and [www.kari.org](http://www.kari.org) for regular updates on MLND. Helpful leaflets summarise current progress:

[www.cimmyt.org/en/component/docman/doc\\_download/37-update-promising-cimmyt-maize-inbreds-and-pre-commercial-hybrids-identified-against-maize-lethal-necrosis-mln-in-eastern-africa](http://www.cimmyt.org/en/component/docman/doc_download/37-update-promising-cimmyt-maize-inbreds-and-pre-commercial-hybrids-identified-against-maize-lethal-necrosis-mln-in-eastern-africa) (January 2013)

[www.cimmyt.org/en/where-we-work/africa/item/maize-lethal-necrosis-mln-disease-in-kenya-and-tanzania-facts-and-actions](http://www.cimmyt.org/en/where-we-work/africa/item/maize-lethal-necrosis-mln-disease-in-kenya-and-tanzania-facts-and-actions) (January 2013)

Check maize doctor for up to date information on management:

<http://maizedoctor.cimmyt.org/index.php/home/22-welcome-to-maize-doctor>

The Plantwise Knowledge Bank contains factsheets on MLND ([www.plantwise.org](http://www.plantwise.org)).

The Crop Protection Compendium has information on maize viruses and pests and diseases ([www.cabi.org/cpc](http://www.cabi.org/cpc)).