Economic impact

Infection rates and damage can be very high, seriously affecting yields and sometimes causing complete loss of the crop. Infected plants are frequently barren; ears formed may be small or deformed and set little or no seed.

Management

Management of MLND and MLND free seed production:
- Agronomy (early planting, maize free period, crop rotation) and other methods.
- Phytosanitary policies and seed production/movement restrictions
- Seed treatment and soil application of Trichoderma.
- Seed treatment, Nurelle -D spray at weeks interval.
- Biopesticides can be used to control vectors of MLND
- Weeding fields regularly to eliminate alternate hosts for insect vectors.

Conclusions

MLND is a complex disease that needs further investigation as there could be other vectors for the two viruses. Some wild and domesticated grasses serve as alternative hosts of MCMV and SCMV. The use of agronomic practices reduces the virulence of MLND.

Acknowledgement

We thank CIMMYT – Kenya for their technical support in capacity building and taking a leading role to combat the disease. We thank ICIPE for using some of their pictures. We also thank the World Bank through the Agricultural Productivity Program for Southern Africa (APPSA).

In case of suspected MLND disease or vectors, please report to the nearest agricultural officer.

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Maize Lethal Necrosis Disease

Maize Lethal Necrosis disease is diseases caused by a synergistic interplay of maize chlorotic mottle virus (MCMV) and any of the cereal viruses in the family, Potyviridae, such as Sugarcane mosaic virus (SCMV), Maize dwarf mosaic virus (MDMV), or Wheat streak mosaic virus (WSMV).

Distribution

The table below summarises the distribution of the diseases.

<table>
<thead>
<tr>
<th>Country</th>
<th>MLND</th>
<th>Year</th>
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<td>Peru</td>
<td>MLND</td>
<td>1973</td>
<td>Castillo and Habertt (1974)</td>
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<tr>
<td>USA</td>
<td>MLND</td>
<td>1976</td>
<td>Niblett and Caflin (1976)</td>
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<td>Mexico</td>
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<td>China</td>
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<td>Tanzania</td>
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<td>CIMMYT TF Rept to Min. of Agric. Tanz.</td>
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<td>Rwanda</td>
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<td>2013</td>
<td>C. Ngabiyasonga, MLN training Workshop (Nairobi, 2013)</td>
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<td>Southern Sudan</td>
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<tr>
<td>Ethiopia</td>
<td>MLND</td>
<td>2014</td>
<td>CIMMYT TForce Report to Min. of Agric. Ethiopia.</td>
</tr>
</tbody>
</table>

Transmission and symptoms

Maize plants are susceptible to MLN at all stages in their growth, from seedling to maturity. As with all viral diseases in plants, a carrier—known as a “vector”—transmits the MLN-causing viruses from plant to plant and field to field. MCMV is carried by thrips and beetles (Nault et al. 1978; Jiang et al. 1992) and SCMV by aphids (Brandes 1920)

Vectors of MLND

The following are the vectors that transmit the MLND disease.

Maize chlorotic mosaic virus disease is caused by thrips.

- Corn thrips – Franklinealla williamsi
- Onion thrips – Franklinealla schultzei
- Common blossom thrips – Franklinealla tabaci

Sugar cane mosaic virus disease (SCMV) is caused by aphids and beetles.

Figure 1: Cereal leaf beetles – Oulema melanopa

Figure 2: Aphids – Rhopalosiphum maidis

Alternative host of MLND

- Couch grass—Cynodon dactylon
- Kikuyu grass—Pennisetum clandestinum
- Sugar cane—Saccharum officinarum

Symptoms

Mild to severe mottling on the leaves, usually starting from the base of young leaves in the whorl and extending upwards toward the leaf tips.

Stunting and premature aging of the plants. Necrosis of the leaf margins progresses to the mid-rib and eventually the entire leaf. Necrosis of young leaves in the whorl before expansion, leading to a symptom known as “dead heart” and eventually plant death.