General methods for reducing seed contamination by MLN viruses

Global Maize Program

Dr. Suresh, L.M.
CIMMYT- Kenya

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USAID-MLN Diagnostics and Management Project
MLN is a viral disease caused by combined infection of maize with Maize Chlorotic Mottle Virus (MCMV) and any of the Potyviruses infecting cereals, especially Sugarcane Mosaic Virus (SCMV).

The disease was first reported in Africa, particularly in Kenya in Sept 2011, and since then reported in Uganda, Tanzania, Rwanda, D.R. Congo, and Ethiopia.
MLN Disease Development

Virus: Either individual or compound

Susceptible Germplasm

Vectors: Presence of aphids and thrips

Environment: Conditions favoring vectors and disease
Individual infection with mixture of viruses can also cause disease.
Typically, infection with one virus results in milder symptoms than MLN but reaction depends on germplasm and viral strain.
Why is the MLN devastating in EA?

- MCMV is new to the region
- Potentially new strains of SCMV/MDMV
- Widespread cultivation of susceptible germplasm that has never been screened for MCMV

- Characterization of viral populations will reveal identify of strains in the region.
Disease Symptoms

- Dying leaves, leading to premature plant death
- Failure to tassel and sterility in male plants
- Malformed or no ears
- Rotting cob
Symptoms of the disease

• Symptoms observed vary widely depending on:
  - Germplasm
  - Time of infection
  - Prevailing environmental conditions
  - Ratios of the viruses infecting the plant

• The symptoms can easily be confused with drought, micro-nutrient deficiency or stalk borer infestation
Symptoms in artificially inoculated maize plants in screen house

MCMV

SCMV
Early Symptoms

Mild mosaic and mottling

Mild mosaic and mottling
Early MLN Symptoms

Chlorosis and Mottling

Diffuse mottling and chlorosis
Severe chlorosis and leaf necrosis
Shortened internodes and severe chlorotic mottle
‘Dead Heart’ symptoms
Premature drying of the husks
Poor or no grain filling
Management Strategies of Viral Diseases

**Avoidance:**
- Plant a maize in such location where the virus or vector is not present.
- Time planting so that plants are at a less susceptible growth stages when the virus and the vectors is present.

**Exclusion**
- Impose quarantine (local and international)
- Use virus free seeds

**Eradication:**
- Use herbicides to kill the weed hosts.
- Rogue infected plants.
- Use insecticides to kill vectors

**Protection**
- Mandate crop free periods
- Plant barrier crops.
- Apply insecticide
- Plant MLN resistant or tolerant maize cultivars.
Avoidance:

- Avoid visiting your maize field once in contact with any MLN affected maize field.
Avoidance

✓ Don’t feed infected MLN plants to livestock (cattle, sheep, goat., etc.,)
Avoidance:

Use clean tools and equipment’s during cultivation

- Keep your farm equipment clean and disinfect after and before use.
Avoidance

Community of Practice (CoP)

- Discuss within community and get common solution in consultation with the ministry of agriculture
Avoidance:
Disease free certified seeds

✔ Use certified seeds from a reputed seed agency or a seed company
Avoidance

✓ Do not use seeds from MLN / MCMV infected maize plants
Exclusion

- Remove the weed host and alternate host before and during the crop cultivation
Exclusion

Maize free period

✓ Avoid growing maize up to 2 months
Exclusion: Crop Rotation

- Grow non-maize crop like legumes after the maize crop to avoid regular MLN host.
SUCKING PESTS ROLE

Aphids

Thrips

Whitefly

Transmits Viruses
Eradication

Insect vector management

- It is very important to spray suspected or infected field with systemic insecticide in consultation with your local ministry of agriculture.
Eradication:
Rogue the suspected MLN plants

• Rogue the infected plants and burn them
  – Rogue the plant during evening hours after pesticide spray.
Seed treatment using Chemical

- The virus transmitted as an external source of contamination would serve as source of primary inoculum and hence create many epiphytotic.
- The purpose of seed disinfestation is to kill pathogens living on the surface of the seed without actually affecting the vigour and viability of the seed.
- Transmission of maize chlorotic mosaic virus on maize seed can be eliminated by soaking seeds in a solution of a tri-sodium phosphate (10%).
- Initial encouraging result showed significant effect on elimination of virus on maize seeds.
- Large scale protocol harmonization is in progress
MLN Screening Facility established by CIMMYT-KALRO at Naivasha, Kenya
MLN Phenotyping at a Glance - 2014 to till date

### Season

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<th>Seed companies</th>
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*Note: updates from Naivasha; 2014 to till date

### Private Partner
- Monsanto
- Seedco
- Dupont - Pioneer
- East Africa seed company
- Western Seed
- Syngenta
- Kenya Seed
- NASCO
- Pannar Seeds
- Advanta Seeds
- ZAM Seeds
- Tan seed
- Aminata
- Gicheha Farm
- Victoria seed UG

### Public Partner (Country / Organization)
- KALRO - Kenya
- Student - Uganda
- EiAR NARO
- NCRRRI - Uganda
- ZIMBABWE
- Mozambique
- RAB - RAWANDA
- SARI - Tanzania
- University of Nairobi
- KEPHIS - Kenya
- South Sudan
- Malawi
- Rongo University
- Burundi
MLN - infected

MLN - free
Thank you for your interest!