

# Scientists Innovating MLN-Resistant Maize Seed

*The International Maize and Wheat Improvement Center (CIMMYT) in collaboration with the Kenya Agricultural Research Institute (KARI), Ministry of Agriculture Livestock & Fisheries, seed companies in Kenya and other maize stakeholders in the country are working towards the development of Maize Lethal Necrosis (MLN) resistant seed.*

*This disease is greatly derailing sustainable maize production in Kenya and unless this deadly malady is properly addressed the country could be forced to heavily rely on imported maize.*

Maize is the number one staple crop in Kenya. Over 40 million bags of maize are required annually to feed Kenyans. More than 1 million hectares of Kenya's land is under small and large scale maize cultivation, thus majority of Kenyans depend on maize as an income generating crop, a part from household use.

Unknown to many, MLN was first noticed in 2011 in Bomet, Rift Valley region. In early 2012, a CIMMYT-KARI surveillance report by plant pathologists Dr. Anne Wangai and Dr. George Mahuku indicated its presence in Naivasha and identified the disease as maize lethal necrosis disease.

From here this disease was seen in Narok North and South, Chepalungu, Sotik, Embu, Meru, Murang'a, Nyeri, Trans Nzoia, Uasin Gishu, Busia and recently fears of an unidentified disease resembling MLN are arrayed in the Coast Province.

After maize lethal necrosis was reported in Kenya, in 2012 reports indicated its presence in Tanzania, later on, incidences were reported in Uganda and Rwanda.

This wildfire like spread of the disease has drawn the attention of farmers, government, research institutions like CIMMYT and KARI, research institutes in the US among others, as well as seed companies.

CIMMYT has been leading efforts to address the problem in collaboration with others by organizing workshops on MLN control stratagems culminating in a regional action plan to tackle maize lethal necrosis in the mentioned countries, as well as in Ethiopia, Eritrea, Democratic Republic of

Farmers who depend on maize farming for a living have to contend with heavy losses caused by this lethal disease. One farmer who has witnessed the devastating effects of MLN, Caroline Tuwei (<http://www.youtube.com/watch?v=iPTe70anjE>) resorted to selling her



*Sicily Kariuki, Principal Secretary in the Ministry of Agriculture, Livestock and Fisheries examines a maize crop infected with the maize Lethal Necrosis (MLN) disease as KARI pathologist Dr Anne Wangai explains the disease symptoms at the greenhouse at the KARI-CIMMYT MLN Screening Facility in Naivasha, Kenya.*

Congo, South Sudan and Southern Africa.

The word lethal is used as part of this disease's name because the disease rapidly kills the maize plant. MLN is caused by Maize Chlorotic Mottle Virus (MCMV) and Sugarcane Mosaic Virus (SCMV) with grave damages on maize plantations. Each of the virus on its own can reduce maize yields by as much as 60%. "When the two viruses are combined to form MLN, a farmer can lose up to 100% of the maize crop," said Dr. Mahuku.

cows and other things to finance buying of inputs and other necessities required for maize planting, but her efforts were evaporated by MLN.

"Currently, we are working towards developing maize hybrids that are MLN-resistant and high yielding," said Dr. Mahuku. "Through the trials we have carried out so far, we have identified CIMMYT maize lines that are showing high levels of tolerance to MLN, these shall be put through further testing and then used to develop new hybrids to replace those that are susceptible to the disease," he added.

Climate change, especially the increased occurrence of drought conditions and high temperatures favor and allow rapid multiplication of insects that transmit MLN. This has posed yet another set of challenges to scientists who are grappling with the disease.

As MLN is a result of the synergistic interaction of two viruses, MCMV and viruses belonging to the potyvirus group (Maize dwarf mosaic virus (MDMV), Sugar cane mosaic virus (SCMV), Wheat streak mosaic virus (WSMV), etc, research is needed to identify which of the potyviruses are present in areas where the disease has occurred. So far, SCMV has been identified, but there could be other potyviruses that are involved in the MLN disease problem.

Furthermore, we do not

know which other crop species or grasses can harbor the MLN-causing viruses, but act as the source of the diseases when maize is planted. Thus, when insects visit these grasses they transmit this disease to the maize fields as maize is part of the grass family. More research is needed to identify the alternate hosts for these viruses.

Dr. George Mahuku said "CIMMYT is taking advantage of the wide maize germplasm that it has, to look for those maize varieties that are tolerant or resistant to MLN virus components. Once a suitable source of resistance is found, CIMMYT will use the doubled haploid (DH) technology to rapidly develop inbred lines that are resistant to MLN and perform well under Kenyan maize growing



*The signpost at the MLN screening facility*

conditions." It is hoped that such hybrids will be developed soon, hopefully in a year or two, and be made available to farmers.

Besides maize lethal necrosis, maize industry is mired by a number of problems that researchers are actively trying to solve. As a result of climate change, there are more incidences of drought and infrequent rainfall. Research institutes such as CIMMYT, national agriculture programs and seed companies are developing drought tolerant maize seeds to address this problem. One such effort is the Drought Tolerant Maize for Africa Project (DTMA), a partnership between CIMMYT, the International Institute for Tropical Agriculture (IITA)

and national programs in 13 African countries and is supported by the Bill & Melinda Gates Foundation.

"Through the DTMA Project, CIMMYT and its partners have developed over 100 maize varieties that yield well when it rains and when there is drought, the farmer is assured of a harvest.

"MLN has taught farmers, government agencies, research institutions, seed companies and other partners to be vigilant and to have an efficient rapid alert and response system," said Dr. George Mahuku. "Farmers must be on the lookout and if they see any abnormality in the fields they should promptly notify the agricultural extension officers who promptly should alert the government and researchers to investigate. This will facilitate the process of containing the problem before it gets out of control."

Establishment of a rapid alert and response system is very critical to containing new diseases. Government(s) should set up taskforces and set aside resources to researchers for prompt response in cases of new diseases arising.



*Dr James A Ogwang (centre), Director, National Crops Resources Research Institute (NaCRRRI) in Namulonge, Uganda examines a field affected by MLN in Naivasha accompanied by CIMMYT scientists Dr George Mahuku and Macdonald Jumbo. MLN has been reported in parts of Uganda. Picture credit: Julius Sserumaga/ CIMMYT*



*CIMMYT staff members at the CIMMYT-KARI Double Haploid Maize Facility in Kiboko, Kenya*