



Catalogue of published works on
Maize Lethal Necrosis (MLN) Disease

Mentions of Maize Lethal Necrosis (MLN) Disease - Reports and Journals

J. Crop Prot. 2016, 3(2): 213-228

Research Article
Current and future potential distribution of maize chlorotic mottle virus and risk of maize lethal necrosis disease in Africa

Blaise E. Dubreuil^{1*} and Yves Benschouler²

1 International Biotechnology Agricultural Research Center, Horticulture and Ornamental Plants, Uganda; **2** African Seed Sector, Food and Nutrition Centre, Nairobi, Kenya

Abstract: Maize Lethal Necrosis (MLN), caused by the synergistic effect of maize chlorotic mottle virus (CMCV), Tobacco etch virus (TEV) and any pathogen, has the potential to decrease maize production across Africa. Since its first report in Kenya in 2011, MLN has spread to Tanzania, Uganda, Rwanda, and possibly other neighboring countries. To understand the spatiotemporal distribution of CMCV and TEV in Africa, we developed molecular marker models using a genetic algorithm (GAEP). Model inputs included climatic data (temperature and relative humidity) and disease detection of CMCV and TEV across Africa. Model performance was most statistically significant ($p < 0.01$) for random regression, with Learning Curve (LC) and Mean Squared Error (MSE) across maize yield and region values above 0.94. Field observations generally confirmed model results. CMCV and TEV positive incidence across the region corresponded to a variety of temperature and precipitation regimes in the semi-arid and sub-tropical regions of central and eastern Africa, Ethiopia, Tanzania, and Democratic Republic of Congo. Low to low MLEVN, 20,000 and 40,000 leaf potential maize infections, respectively. In terms of geographical areas of maize production, East Africa, Tanzania and Democratic Republic of Congo have the potential to lose each 100% and 99% of maize yield. Future projections indicate maize potential loss (100% and 90% by 2020 and 2030, respectively) for eastern Africa with maize MLEVN distribution and MLEVN loss are predicted to reach 100% by 2020. MLEVN loss in Africa is high, hence the need for better allocation of resources to management of MLN, with special emphasis on eastern and western Africa, which are and will continue to be the production hot spots.

Keywords: Africa, Climate change, GAEP, Region, Maize, MLEVN, MLN

Introduction: Maize (Lycopers L., in the most important cereal crop in sub-Saharan Africa (SSA), covering over 25 x 10⁶ ha, largely in arid/semi-arid regions (Dane et al., 2011). However, yields are often low (Dane et al., 2011).

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Current and future potential distribution of maize chlorotic mottle virus and risk of Maize Lethal Necrosis disease in Africa. Published in the Crop Protection Journal.

Published Year: 2016

MLN Pathogen Diagnosis, MLN-free Seed Production and Safe Exchange to Non-Endemic Countries

The image shows a close-up of a maize ear with several green leaves. The text is overlaid on the image. At the bottom, the CIMMYT logo is visible.

MLN pathogen diagnosis, MLN-free seed production and safe exchange to non-endemic countries.

Published Year: 2015

Original Article
Genome-wide association and genomic prediction of resistance to maize lethal necrosis disease in tropical maize germplasm
October 2015, Volume 109, Issue 13, pp 1507-1509

Maize Dubreuil¹, Blaise E. Dubreuil², Yusef Benschouler³, Pauline Chamba³, Christophe E. Dubreuil³, Yusef Benschouler³, Yusef Benschouler³, Yusef Benschouler³, Yusef Benschouler³

1 International Biotechnology Agricultural Research Center, Horticulture and Ornamental Plants, Uganda; **2** African Seed Sector, Food and Nutrition Centre, Nairobi, Kenya; **3** International Biotechnology Agricultural Research Center, Horticulture and Ornamental Plants, Uganda

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Genome-wide association and genomic prediction of resistance to maize lethal necrosis disease in tropical maize germplasm. Published in the International Journal of plant breeding research.

Published Year: 2015

Data Sheet on Maize Lethal Necrosis (MLN) Disease

Maize lethal necrosis is a complex disease of maize which first appeared in Kenya in 2011 (Dane et al., 2011). It is now found in many countries of East Africa where maize is grown. The molecular necrosis disease (maize lethal necrosis), MLN, is known to naturally affect multiple maize hybrids (Dane et al., 2011). This report outlines the current status of the disease, causes, diagnosis, and control. It is intended to provide a general overview of the disease and to provide information on the current status of the disease in the region.

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Data Sheet on Maize Lethal Necrosis (MLN) Disease.

Publication Year: 2014

Crop Protection

Community-survey based assessment of the geographic distribution and impact of maize lethal necrosis (MLN) disease in Kenya

Hugo De Couvel¹, Pauline Chamba², Yusef Benschouler³, Blaise E. Dubreuil⁴

1 International Biotechnology Agricultural Research Center, Horticulture and Ornamental Plants, Uganda; **2** African Seed Sector, Food and Nutrition Centre, Nairobi, Kenya; **3** International Biotechnology Agricultural Research Center, Horticulture and Ornamental Plants, Uganda; **4** African Seed Sector, Food and Nutrition Centre, Nairobi, Kenya

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Published Year: 2015

GAIN Report

Maize Lethal Necrosis - The growing challenge in Eastern Africa

USAID Foreign Agricultural Service
GAIN Report Number: 13102014

Kenya

Researcher: Blaise E. Dubreuil

Country: Kenya

Report Category: Agricultural Situation

Requesting Agency: USAID

Approved By: Pauline Chamba

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Maize Lethal Necrosis – The growing challenge in Eastern Africa. USDA publication

Published Year: 2014

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Research Article
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Maize Lethal Necrosis (MLN), an Emerging Threat to Maize-Based Food Security in Sub-Saharan Africa. Published in the APS journal.

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Published Year: 2016

Mentions of MCMV/SCMV

FactSheet - Corn

First described in 1936, corn lethal necrosis (CLN) is found primarily in north central Kansas and south-central Nebraska. CLN is associated with a vector of CLN (corn leafhopper) and a virus (CLN agent). CLN is caused by a complex of CLN agents (CLN1, CLN2, CLN3, CLN4, CLN5, CLN6, CLN7, CLN8, CLN9, CLN10, CLN11, CLN12, CLN13, CLN14, CLN15, CLN16, CLN17, CLN18, CLN19, CLN20, CLN21, CLN22, CLN23, CLN24, CLN25, CLN26, CLN27, CLN28, CLN29, CLN30, CLN31, CLN32, CLN33, CLN34, CLN35, CLN36, CLN37, CLN38, CLN39, CLN40, CLN41, CLN42, CLN43, CLN44, CLN45, CLN46, CLN47, CLN48, CLN49, CLN50, CLN51, CLN52, CLN53, CLN54, CLN55, CLN56, CLN57, CLN58, CLN59, CLN60, CLN61, CLN62, CLN63, CLN64, CLN65, CLN66, CLN67, CLN68, CLN69, CLN70, CLN71, CLN72, CLN73, CLN74, CLN75, CLN76, CLN77, CLN78, CLN79, CLN80, CLN81, CLN82, CLN83, CLN84, CLN85, CLN86, CLN87, CLN88, CLN89, CLN90, CLN91, CLN92, CLN93, CLN94, CLN95, CLN96, CLN97, CLN98, CLN99, CLN100).

SYMPTOMS

Symptoms of single infections with either MCMV or SCMV include light greenish necrotic (retreating light and dark green areas) of the leaves. Other than a little necrotic damage occurring, and the symptoms may become milder or disappear. When both viruses are found in the same plants, however, a bright greenish-yellow necrotic damage occurs in the leaves. The necrotic damage is more extensive when present alone in corn, however, when a second virus also infects the same corn plant, a synergistic necrotic rapidly develops, resulting in necrotic damage to the plants. Both single and mixed virus infections (MCMV + SCMV) also known as maize lethal necrosis (MLN) and maize lethal mottle virus (MLMV), have become common viruses, even severe as the important second virus, however, the (MCMV) + SCMV combination occurs infrequently in the field. The combination in plant damage is far in excess of that produced from the cumulative effects of the individual viruses.

Corn Lethal Necrosis Symptoms Vectors.

Use of next-generation sequencing for the identification and characterization of Maize chlorotic mottle virus and Sugarcane mosaic virus causing maize lethal necrosis in Kenya

L. P. Adhiambo¹, D. W. Mwangi², E. M. Kinyua³, A. Wangi⁴, K. Kirati⁵, N. Prati⁶, H. Fawcett⁷, K. Hagi⁸, H. Gwani⁹, U. Hanyu¹⁰, H. Otsu-Okazaki¹¹, P. Dasgupta¹², T. Nishimura¹³, A. Fuku¹⁴, A. Bwalya¹⁵, J. Smith¹⁶, A. Shamba¹⁷, H. Thresh¹⁸, H. Mwangi¹⁹ and H. Bwalya²⁰

The objective of this study was to identify the viruses causing maize lethal necrosis (MLN) in Kenya. The study was conducted in the central highlands of Kenya, where MLN is a major constraint to maize production. The study was conducted in the central highlands of Kenya, where MLN is a major constraint to maize production. The study was conducted in the central highlands of Kenya, where MLN is a major constraint to maize production.

Use of next-generation sequencing for the identification and characterization of Maize chlorotic mottle virus and Sugarcane mosaic virus causing maize lethal necrosis in Kenya. Published in the Plant Pathology Journal.

Published Year: 2013

Maize Chlorotic Mottle

Maize chlorotic mottle (MCM) is a viral disease of maize caused by the maize chlorotic mottle virus (MCMV). MCMV is a member of the Tombusviridae family and is transmitted by the green peach aphid (GPA). MCMV causes a range of symptoms in maize, including chlorotic mottle, necrotic streaking, and yield loss. MCMV is a major constraint to maize production in many parts of the world, particularly in the tropics and subtropics.

Maize Chlorotic Mottle. Published in the Plant Disease Journal.

Published Year: 2011

Dissecting the Mode of Maize Chlorotic Mottle Virus Transmission

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Dissecting the Mode of Maize Chlorotic Mottle Virus Transmission. Published in the Journal of Economic Entomology.

Published Year: 2013

Combined linkage and association mapping reveals candidates for Scmv1, a major locus involved in resistance to sugarcane mosaic virus (SCMV) in maize

Yuehui He¹, Yong Chen², Jingjing Liu³, Lin Zhang⁴, Fu Zhang⁵, Chuanbin He⁶, Lixian He⁷, Jianjun He⁸, J. Zhang⁹, J. Zhang¹⁰, J. Zhang¹¹, J. Zhang¹², J. Zhang¹³, J. Zhang¹⁴, J. Zhang¹⁵, J. Zhang¹⁶, J. Zhang¹⁷, J. Zhang¹⁸, J. Zhang¹⁹, J. Zhang²⁰

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Combined linkage and association mapping reveals candidates for Scmv1, a major locus involved in resistance to SCMV in maize. Published in the BMC Plant Biology.

Published Year: 2013

Genetic analysis of resistance to six virus diseases in a multiple virus-resistant maize inbred line

Jian-Lin He¹, Mark W. Jones², Bob Doonan³, David M. Fawcett⁴, James M. Rees⁵, Margaret C. Collinge⁶

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Published Year: 2014

Transmission of Maize Chlorotic Mottle Virus by Chrysomelid Beetles

Y. He¹, M. W. Jones², B. Doonan³, D. M. Fawcett⁴, J. M. Rees⁵, M. C. Collinge⁶

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Transmission of Maize Chlorotic Mottle Virus by Chrysomelid Beetles. Published in Phytopathology.

Published Year 1978

Seed Transmission of Maize Chlorotic Mottle Virus

Y. He¹, M. W. Jones², B. Doonan³, D. M. Fawcett⁴, J. M. Rees⁵, M. C. Collinge⁶

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Seed Transmission of Maize Chlorotic Mottle Virus. Published in Plant Disease Journal.

Published Year 1981

Country Reports on MLN



First report of maize lethal necrosis disease in Rwanda.

Published Year: 2014



First Report of Maize chlorotic mottle virus and Maize Lethal Necrosis in Kenya. Published in the APS Journal.

Published Year: 2012



First Report of Maize chlorotic mottle virus and Maize Lethal Necrosis on Maize in Ethiopia. Published in the APS Journal.

Published Year: 2015



First Report of Maize chlorotic mottle virus Infecting Maize in the Democratic Republic of the Congo. Published in the APS Journal.

Published Year: 2014



MLN disease in Kenya and Tanzania: Facts and Actions.

Breeding Work on MLN



Disease Resistance in Maize and the Role of Molecular Breeding in Defending Against Global Threat. Published in the Journal of Integrated Plant Biology.

Published Year: 2012



CIMMYT Breeding Progress for Tolerance to Maize Lethal Necrosis in Eastern Africa. Published in the American Society of Agronomy.

Published Year: 2015

MLN Diagnosis



Detection of Maize Chlorotic Mottle Virus Serotypes by Enzyme-Linked Immunosorbent Assay.



Quantitative Trait Loci Mapping and Molecular breeding for developing stress resilient maize for sub-Saharan Africa. Published in the Crop Science Society of America.

Published Year: 2014



Molecular mapping of quantitative trait loci (QTLs) determining resistance of Sugarcane mosaic virus in maize using simple sequence repeat (SSR) markers. Published in the African Journal of Biotechnology.

Published year: 2012