POLICY BRIEF

September **2019**

Maize leaf diseases: A curse to food security in Kenya

Key messages

- NLB is causing considerable yield losses (60% reported) in maize production and the disease is present in all the maize growing areas in Kenya.
- There are varietal differences within the various maize varieties and plant breeders should deploy this resistance in breeding programmes.
- E. turcicum pathogen has a wide cultural variation and the wide pathogenic variability can render host resistance ineffective as a tool for disease management. Several races of the pathogen exists in Kenya namely 0, 1, 2, 3, N, 12, 13, 13N, 123, 23 and 23N.
- Due to the high cultural variability, there is need for vigilance in detection programmes to avoid introduction of other races of NLB that are not presently reported in Kenya.

Introduction

Maize is a key staple crop in Kenya with over 90% of the people relying on the crop and consume it in various forms. The Kenyan population has been on an upward trend (2.6%) against a declining maize production occasioned by climate change and emergence of new and invasive alien species. This decline in maize production has worsened the food situation in the country with a deficit of 3 million bags per year. This deficit results to high maize and maize flour prices necessitating importation. At times the government has been forced to subsidize the cost of maize flour to enable the majority of the populace who are poor to afford it. Over 70% of maize in Kenya is produced by smallholder farmers (less than 2 acres) thereby underscoring the need for intervention to reduce losses caused by the diseases.

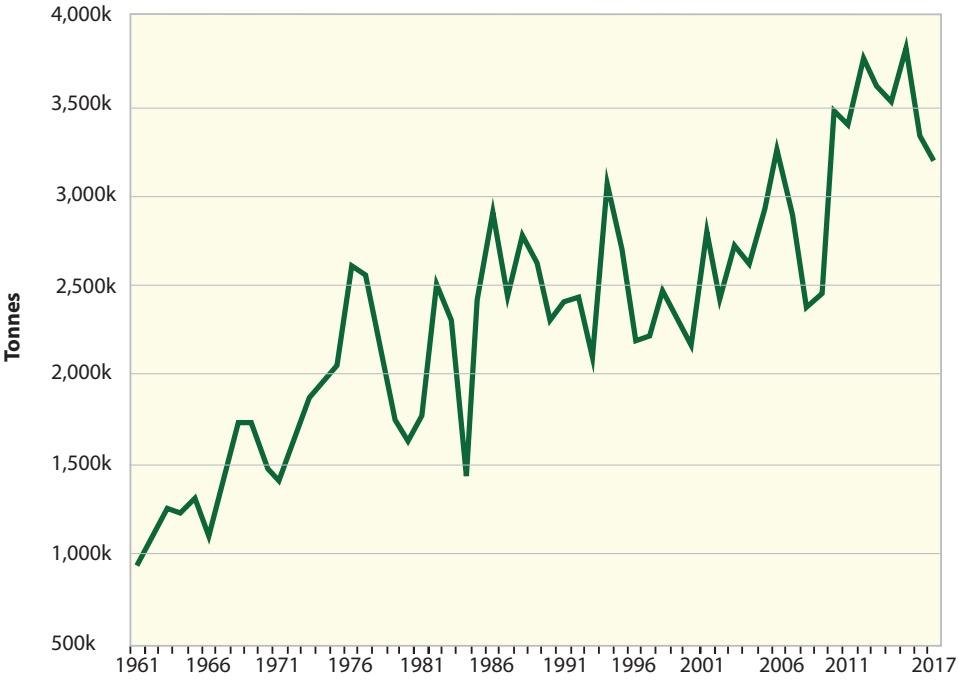

Figure1: *Maize production trend in Kenya*

Several leaf diseases affect maize and among them, northern leaf blight is a serious problem in maize production especially in humid tropical regions. Northern leaf blight (NLB) can result in total foliar blight and plant death. Yield losses of between 40-80% have been reported (Wathaneeyawech et al 2015). It is the most important limiting fungal disease hampering maize production in East Africa and the world in general. Early onset of NLB with a disease severity of 97% causes severe losses in grain yield of around 63%. (Nwanosike et al 2015). Heavily infected fields present a scorched or burnt appearance resulting in premature death of leaves.

Plate 3: *People receiving food aid handouts*

Limited effort is directed towards managing foliar diseases with the use of tolerant varieties being more emphasized. Host plant resistance and tolerant hybrids have been reported to be the most efficient and sustainable approach for management of northern leaf blight. Such maize varieties delays onset of the disease and reduces severity at crop maturity. Apart from use of host resistance, there are other strategies that should be used to enhance the management of the disease. Field sanitation and deep ploughing reduces initial inoculum with reduced disease development. Proper fertilization of the crop is important as it influences the severity of NLB with the disease being more severe in plants deficient of nutrients. Management strategies using an IPM approach is the most practical and sustainable approach to manage the losses occasioned by the disease.

What is the issue?

In spite of the importance of the maize as a crop in the country, the crop is afflicted by a myriad of foliar diseases chief among them being the Northern leaf blight (NLB). The disease affects the leaves and during favourable weather conditions (warm and humid), the disease can cause considerable yield losses and up to 80% yield losses have been reported (Juliana et al., 2005). The disease also causes changes in maize grain quality leading to decreased sugar content and reduced germination capacity. Heavily infected crop stands are predisposed to stalk rot (Abera et al 2016).

Infection of plant's leaves by NLB leads to reduced green leafy area, increased leaf transpiration, limited translocation and uptake of essential plant nutrients to affected leaves and plant cells (Ogolla et al 2018). Under severe infection, sugars can be diverted from the stalks for grain filling leading to crop lodging. Yield loss is due to loss of active leaf area resulting in less photosynthate during grain filling period thereby resulting to production of small grains.

In spite of all this, there is minimal effort that is being put towards addressing this challenge. Use of fungicides is not the solution due to the costs involved and food safety issues. Research has showed that several disease management strategies applied in an integrated approach can be used to manage the problem. Although use of resistance is one of the most practical strategies to manage the disease, it is limited since the pathogen is known to produce new races that can overcome existing resistance resulting to rapid breakdown of resistance. Other practices such as field sanitation, proper management of crop residues, proper fertilization, adjustment of planting dates, crop rotation can play a pivotal role in the management of the disease problem.

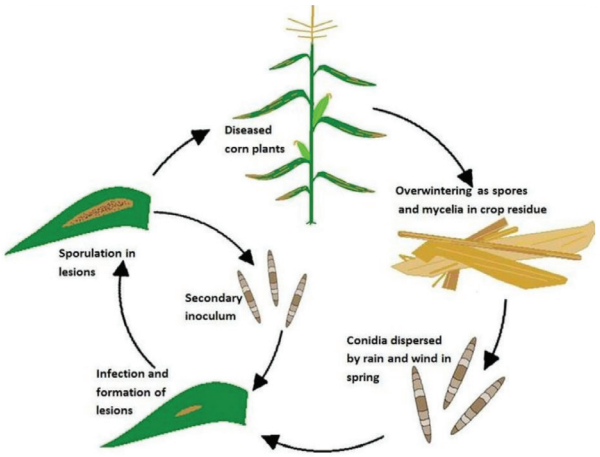

Plate 4: *Life cycle of the NLB pathogen*

Plate 5: *Heavily/severy infected maize field*

What needs to be done?

- There is need to recommend varieties that are tolerant and intensify breeding for resistance to the disease. In the breeding programs, this should take into consideration the existence of many races of the pathogen so that breeding should include quantitative resistance.
- Ensure vigilance at country entry points to avoid the introduction of new races of the pathogen.
- Carry out a country wide survey to generate race distribution maps as part of disease surveillance and in deployment of resistance genes.
- Integrated Pest Management (IPM) approach by use of cultural practices such as proper crop nutrition, handling of crop residues should be taken into consideration to reduce the incidences and severity of the disease.

About the brief

This brief is based on a PhD research undertaken at the University of Nairobi and Goettingen University where most of the laboratory work was conducted by Dr. William Maina Muiru. The research work was funded by DAAD.

Policy recommendations

- Sensitization of growers, extension agents, researchers, breeders and all other stakeholders on the need to address NLB disease.
- Institute necessary phytosanitary measures to avoid introduction of new races of the pathogen as some races are more aggressive and are currently absent in Kenya.
- Train plant inspectors and staff dealing with disease diagnosis on the variability of the pathogen in terms of cultural and microscopic features.
- Adopt IPM approach including use of resistant varieties, proper crop fertilization and proper residue management to address the disease problem. Farmers should adopt cropping systems and tillage practices that reduce or eliminate crop residues.

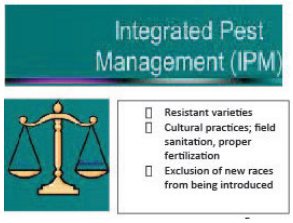

Plate 6: *Showing IPM strategies required to manage the disease*

Plate 7: *Exclusion of pathogen races through screening*

Plate 8: *Training and educating farmers on appropriate cultural control measures and the available resistant varieties*

Plate 9: *A disease free maize crop*

Plate 10: *A bumber harvest with a happy farmer*

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CONTACT ADDRESS

Dr. William M. Muiru

Department of Plant Science & Crop Protection

University of Nairobi, Kenya

Email: wmmuiru@uonbi.ac.ke

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