THE 2ND PHYTOSANITARY CONFERENCE

BOOK OF ABSTRACT

Theme: *"*Phytosanitary Systems for Safe Trade and food Security"

Dates: 4th to 8thJune 2018

Venue: KEPHIS Headquarters,

Oloolua Ridge-Karen, P.O. Box 49592, 00100, Nairobi, Kenya.

Support by USAID, KEPHIS, COPE and CABI

The venue of the conference is KEPHIS Headquarters, Oloolua Ridge, off Ngong Road, past Karen Shopping Centre, before KCB Training School, Karen, Nairobi. KEPHIS is located approximately 20 kilometres from the Nairobi Central Business District and 35 kilometres from the Jomo Kenyatta International Airport (JKIA).

The conference will commence at 8.30 a.m. on Monday, 4th June 2018 and conclude at 5.00 p.m. on Friday, 8th June 2018.

For more information, please contact:
The Managing Director
Kenya Plant Health Inspectorate Service (KEPHIS)
P. O. Bo 49592-00100, Nairobi, Kenya
Tel: +2542066188000 & +254709891000
Email: phytosanitaryconference2018@kephis.org & director@kephis.org
Website: *www.kephis.org*

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LIST OF ACRONYMS AND ABBREVIATIONS

AATF	African Agricultural Technology Foundation
ADI	acceptable daily intake
APPSA	Agricultural Productivity Programme for Southern Africa
AU	African Union
BW	Bacterial wilt
CAADP	African Union Comprehensive Africa Agriculture Development Programme
CABI	Centre for Bio-Sciences International
CIMMYT	International maize and wheat improvement center
CIP	International potato center
COLEACP	The Europe Africa Caribbean pacific liaison committee
COMESA	Common Market for Eastern and Southern Africa
COPE	Centre of Phytosanitary Excellence
CP-RT	coat protein
DAT	days after transplanting
DFID	Department for International Development
DVMs	decentralized vine multipliers
EAC	East African Community
ECA	Electro-Chemical Activated water
ECOWAS	Economic community of west African states
ELISA	Enzyme Linked Immunosorbent assay
EU	European Union
GDP	Gross Domestic Product
GMOs	Genetically Modified organism
HOs	harmful organisms
HST	Horizon Scanning Tool
IAPSC	Inter-African Phytosanitary Council
IPPC	International Plant Protection Convention
ISPMs	International Standards for Phytosanitary Measures
JKIA	Jomo Kenyatta International Airport
JKUAT	Jomo Kenyatta university of Agriculture and technology
KALRO	Kenya Agricultural and livestock Research Organization
KENTRADE	Kenya National Trade Network
KEPHIS	Kenya Plant Health Inspectorate Service
KWATOS	Kilindini Waterfront Terminal Operating System
LFA	Lateral Flow Assays
LH1	Lower Highland Zone
MCMV	Maize chlorotic mottle virus
MLN	Maize lethal Necrosis
MMUST	Masinde Muliro University of science and technology
MRLs	Maximum Residue Levels
NARS	National Agricultural Research Institutions
NBA	National Biosafety Authority
NGS	Next-generation sequencing
NPPOs	National Plant Protection Organizations
NPTs	National Performance Trials
ODK	Open Data Kit
OPVs	Open-pollinated varieties
ORF1	Open Reading frame
PCR	polymerase chain reaction
PRA	Pest Risk Analysis

PRISE	Pest Risk Information Service
RDP4	Recombination Detection Program
RNA	Ribonucleic acid
RSD	Sugarcane ratoon stunting disease
RT-PCR	Reverse transcriptase -Polymerase chain reaction
SASHA	Sweet potato Action for Security and Health in Africa
SCMV	*Sugarcane mosaic virus*
SCTF	Sea Container Task Force
SDGs	Sustainable Development Goals
SOPs	Standard operating procedures
SPS	Sanitary and Phytosanitary
SSR	simple sequence repeats
UM	Upper Mid-land Zone
UON	University of Nairobi
USAID	United States Agency for International Development
USDA	US Department of Agriculture
ZARI	Zambia Agriculture Research Institute

INTRODUCTION

Sanitary and Phytosanitary (SPS) measures are aimed at protecting people, animals and plants from diseases, pests or contaminants without hindering trade. The measures should be science based and in line with the SPS Agreement that seeks to ensure that such measures do not unjustifiably discriminate. Phytosanitary measures include any legislation, regulation or official procedure having the purpose to prevent the introduction and/or spread of quarantine pests.

International Standards for Phytosanitary Measures (ISPMs) guide countries in setting measures to prevent or limit the entry, establishment and spread of pests that may otherwise have serious impacts on plant resources and food security. ISPMs are developed through a consultative process where all International Plant Protection Convention (IPPC) contracting parties (countries) and other stakeholders worldwide are given a chance to provide their input.

In the last few years a number of pest, diseases and weeds have been identified as being of phytosanitary concern:

- Fall Army Worm (*Spodoptera frungipenda*) – that was introduced in Africa in 2016 and in Kenya in 2017 and has affected maize production in the country. In addition, it has major implications on the EU market access for herbs and vegetables (capsicum and aubergines) and cut flowers
- *Tuta absoluta* – Introduced in Africa and seriously affecting tomato production. It has not been reported in some countries in Africa.
- False Codling Moth (*Thaumatotibia (Cryptophlebia) leucotreta*) – An endemic pest in Kenya which is affecting market access in Europe, especially for cut flowers but also some other horticultural products such as Capsicum
- Maize Lethal Necrosis Disease – The disease was introduced in Kenya in 2011 where it severely affected food production and was spread to other countries. It has not been reported in some countries in Africa.
- Fusarium Tropical race 4 (TR4) –The disease has been reported in Mozambique, but is a risk for it neighbouring countries, with potential to devastate banana production and affect exports.
- Potato Cyst Nematode - affecting production of potato.
- White flies/Bemisia - A pest and vector of plant viruses hence of concern market access
- Larger Grain Borer - A major storage pest and a threat to food security
- Fruit fly (*Bactrocera dorsalis*) - A serious effect to fruit production and market access
- Striga weed - threatens livelihoods as it affects production and food security
- Parthenium weed – invasive weed that affects pasture production and natural habitats.

Apart from diseases and pests a number of other issues have been identified i.e. impact of bio-control agents if they are not well regulated; limited capacity to conduct PRA; lack of capacity to manage phytosanitary risks; lack of capacity in diagnostics and accreditation; limited capacity for surveillance; limited emergency and limited systems for traceability particularly in relation to pesticide residues and aflatoxin.

Therefore in recognition, the Government of Kenya, USAID (Feed the Future Program), KEPHIS and COPE have organized the 2nd Phytosanitary Conference from 4th to 8th June, 2018, at KEPHIS Headquarters, Nairobi, Kenya. The theme of the conference is "Phytosanitary Systems for Safe Trade and food Security". The conference will provide opportunities to discuss phytosanitary systems issues experienced by different countries in the region. The main themes of the conference are:

a. Pest Surveillance in Phytosanitary Systems
b. Import Control and Quarantine Regulations in Phytosanitary Systems
c. Pest Diagnostics in Phytosanitary Systems
d. Export Control in Phytosanitary Systems
e. Industry participation in Phytosanitary Systems
f. Technologies and Innovation in Phytosanitary Systems
g. Food safety issues in phytosanitary systems (MRLs, Heavy metals and Aflatoxins)
h. Cross-cutting issues in phytosanitary systems (To include capacity building,legal requirements, communication in phytosanitary, GMOs, Biosafety, emerging phytosanitary issues e.g. new pests)

A practical field day will be held during the conference to see application of the issues in the conference themes.

Participants will include:

- National Plant Protection Organizations (NPPOs)
- Government (Regulatory agencies, policy makers, extension agents)
- Private/Industry – Farmer, exporter organizations and others.
- International Plant Protection Convention (IPPC)
- Inter-African Phytosanitary Council (IAPSC)
- RECs (COMESA, EAC , SADC, ECOWAS)
- International Organizations and NGOs
- Academic and Research Institutions
- Donor agencies

Major language of communication during the conference will be English.

ACKNOWLEDGEMENTS

We would like to acknowledge the following persons in the various committees for their contribution towards the success of the conference:

Planning and steering Committee
Dr Esther Kimani (MD KEPHIS), Dr Isaac Macharia (GMPS-KEPHIS), James Ang'awa (GMFA-KEPHIS), Simon Kibet (GMQA-KEPHIS), Joseph Kigamwa (KEPHIS), Pamela Kipyab (KEPHIS),Ivan Obare (KEPHIS),Maureen Mwangangi (KEPHIS),Christine Ruoro (KEPHIS), Catherine Muraguri (KEPHIS), Florence Munguti (KEPHIS) Hellen Mwarey (KEPHIS), Peggy Ngaira (KEPHIS), Charles Kamau (KEPHIS), Evelyn Owiti (KEPHIS), Simon Maina (KEPHIS), Faith Ndunge (KEPHIS), Lilian vuhya (KEPHIS),Clement Kioko (KEPHIS), Charles Kamau (KEPHIS), James Aboge (KEPHIS), Lilian Vuhya (KEPHIS),Milka Kamweru (KEPHIS), Timoth Osoro (KEPHIS), Onesmus Muriuki (KEPHIS), Viola Kibiego (KEPHIS), Joseph Ndungu (KEPHIS), Dr. Moses Nyongesa (KALRO), Prof. James Muthomi (University of Nairobi), Dr. Maina Mwangi (Kenyatta University), Abed Kagundu (AATF); Dr. Lorna Migiro (CABI), Dr. MaryLucy Oronje (CABI), Dr. Elizabeth Nambiro (CABI).

Technical Committee
Dr. Isaac Macharia (GMPS KEPHIS), Faith Ndunge (KEPHIS), George Momanyi (KEPHIS), Robert Koigi (KEPHIS), Joseph Kigamwa (KEPHIS), Pamela Kipyab ,Ivan Obare (KEPHIS), Maureen Mwangangi (KEPHIS), Dorothy Olubayo (KEPHIS), Dr. Moses Nyongesa (KALRO), Prof. James Muthomi (University of Nairobi), Dr. Maina Mwangi (Kenyatta University), Abed Kagundu (AATF); Dr. Lorna Migiro (CABI), Dr. MaryLucy Oronje (CABI), Dr. Elizabeth Nambiro (CABI).

In addition we will like to acknowledge support from the government of Kenya, KEPHIS, USAID, COPE, CABI and all exhibitors.

PREFACE BY HON. MWANGI KIUNJURI, EGH, MGH, CABINET SECRETARY, MINISTRY OF AGRICULTURE AND IRRIGATION

It is indeed my pleasure to join you at this 2nd Phytosanitary Conference which is the second of its kind to be held in the world. You will recall that the first conference was held at this same venue in September 2016 and was a great success. I welcome all delegates from Kenya and around the world and I urge international delegates to feel at home.

I am particularly excited to be at this event because it brings together plant health specialists and experts at an opportune time when Kenya and Africa as a whole is facing pest incursion challenges such as of the fall armyworm which is a threat to food security in Africa, especially on our staple food, maize. The pest is also affecting the quality of Kenya's roses exported to the key European Union; a key market. Over the past year, this pest has caused great crop losses which have led to various interventions by the Government of Kenya, including diverting resources that could have been used for development to combat the pest. I hope that this conference will provide an opportunity to all present to further the knowledge available in combating these real plant health challenges faced by our countries.

With the recent pest challenges, we now appreciate that a range of pests of plants pose a greater **threat to food security** more than ever before. This is thanks to changes in global trade that enable the pests to move further and faster than before, and to climate change which creates favourable conditions where they did not exist before. We know that for some pests, management options exist to bring invasions under control, possibly even eradicating the pest. For many others, there may be no way to stem the invasion which can **affect food security negatively**. In both cases, careful pest risk analysis and monitoring to minimize the chances of a pest invasion will be both more efficient and far less costly than mounting a control operation thereby safeguarding food security. You are experts in this field and we hope that in the course of this conference, there will be exchange of expertise and technology available to manage the pest challenges.

As you are already aware, agriculture is the backbone of many economies, especially in developing countries, hence the importance of the deliberations of this phytosanitary conference cannot be over-emphasized.

I am proud to note that Kenya has put in place various initiatives to ensure that plant health and phytosanitary systems are strengthened. Initiatives instituted include: devolving agriculture to take services closer to the farmers, embracing plant clinics led by CABI who are present in this conference and embracing integrated pest management and systems approach to pest management. These together with other interventions to improve agricultural productivity will ensure that Kenya attains the second Sustainable Development Goal of Zero Hunger.

The Government of Kenya under its *Big 4 Agenda* also envisions to enhance food and nutrition security in the next 5 years through enhanced large scale production where new land will be put under irrigation, instituting post-harvest technologies, contract farming, cold storage for fish, produce and seed, locally blended fertilizer, phytosanitary and standards

(potatoes), enforce all critical agricultural regulations and review of idle public land availability. The government further aims to drive small holder productivity and reduce the cost of food.

As I conclude, I wish to commend KEPHIS, the institution hosting this conference which is also Kenya's National Plant Protection Organization for its dedication to assuring the quality of agricultural inputs and produce; I note that its commitment to strict quality assurance processes has ensured that our flowers, fruits and vegetables continue to meet market requirements in our key markets. I wish to note also that the Government of Kenya together with our development partners have built state of the art laboratories that assure the quality of agricultural produce that is exported to key export markets and support pest diagnosis. I hope before the end of the conference that you will make time to visit these facilities.

I once again wish to welcome all delegates from around the world to Kenya and wish you fruitful deliberations. I also encourage you to sample our rich heritage including world famous wildlife.

It is now my pleasure to declare the 2nd Phytosanitary Conference officially open.

Hon. Mwangi Kiunjuri, EGH, MGH,
Cabinet Secretary,
Ministry of Agriculture and Irrigation of the Republic of Kenya
Monday, 4th June 2018

PREFACE BY MR. WYCLIFFE O. MURWAYI, CHAIRPERSON, BOARD OF DIRECTORS, KENYA PLANT HEALTH INSPECTORATE SERVICE (KEPHIS)

It is my pleasure to welcome you to Kenya Plant Health Inspectorate Service (KEPHIS) for the Second Phytosanitary Conference where over 100 delegates from close to seventeen (17) countries are in attendance.

We welcome delegates from Belgium, Burundi, Cameroon, Eritrea, Ghana, Liberia, Malawi, Mali, Nigeria, Namibia, Senegal, Seychelles, Somalia, South Sudan, Uganda, Zambia, Zimbabwe as well as the host country Kenya.

Kenya's and many African countries economies are predominantly agricultural based and the sector contributes significantly to their Gross Domestic Product (GDP) and employment. The sector is also a major driver of both domestic and local trade hence important in providing incomes for farmers and forex earnings for the continent. Here in Kenya, the government through its economic blue print, Vision 2030, seeks to propel the country to achieving economic development at an average ten percent growth rate that will enhance the country's status to a middle income economy. Agriculture is centre stage and remains the main catalyst of growth for Kenya's economy. The sector contributes 26 percent indirectly to GDP. During the second Medium Term Period (2013-2017), growing crops and livestock production contributed an average of 27.3 percent of the national GDP or 65 percent of Kenya's total exports and 60 percent of the total employment.

According to the Kenya National Economic Survey 2017, contribution to GDP by crops and livestock was at 30.9 percent in 2016 thus making agriculture the dominant sector. The sector contributed about 75 per cent of industrial raw materials and 60 per cent of export earnings. The need for sustained agricultural productivity therefore, is very crucial in ensuring food security for the country as well as creating income and wealth for large and small scale farmers.

KEPHIS plays an important role in ensuring the above-mentioned milestones are met for the country. To achieve this, the Corporation has focused on delivering its mandate and has established strong systems and processes that ensure high quality agricultural inputs and produce in the sector. Despite various challenges of pests and diseases, as well as changing climactic conditions, the Corporation still attains major milestones in serving its clients. The Corporation ensures markets for our horticultural produce are sustained and the Organization has continued to spear head penetration into newer ones. KEPHIS has continued to implement stringent measures in inspection of fresh produce and laboratory analyses to ensure proper checks on Maximum Residue Limits which have been a challenge sometimes. Moreover, KEPHIS continues to partner with other regulators and stakeholders in managing any challenges facing the sub-sector.

In the last year, the Corporation developed and is implementing its 2017/18-2021/22 Strategic Plan. This plan provides the road map for meeting our new vision of "Healthy

Plants, Safe Trade and Sustainable Agro-Environment for a Prosperous Kenya" and has taken into consideration key Government of Kenya economic development priorities as well as relevant areas in the United Nations Sustainable Development Goals (SDGs), the African Union Comprehensive Africa Agriculture Development Programme (CAADP), African Union(AU) Agenda 2063 and other regional and international policy documents.

As I conclude, on behalf of the Board of Directors, I take this opportunity to welcome you all once again to KEPHIS and thank you for making time to this important international conference.

MR. WYCLIFFE O. MURWAYI,
CHAIRPERSON, BOARD OF DIRECTORS,
KENYA PLANT HEALTH INSPECTORATE SERVICE (KEPHIS)

PREFACE BY DR. ESTHER KIMANI, MANAGING DIRECTOR, KEPHIS

Kenya Plant Health Inspectorate Service (KEPHIS) welcomes all delegates to this second phytosanitary Conference the other one. We are extremely honored to have you all here where for the next one week we will deliberate on pertinent phytosanitary matters.

This year's conference has three key objectives: To Provide an opportunity for National Plant Protection Organizations(NPPOs) in Africa to share achievements and challenges; To provide the NPPOS with an opportunity to create linkages and promote market access within Africa, and lastly to identify potential areas of cooperation on phytosanitary regulation at regional and international levels.

Our focus thematic areas will include Pest Surveillance in Phytosanitary Systems, Import Control and Quarantine Regulations in Phytosanitary Systems, Pest Diagnostics in Phytosanitary Systems, Export Control in Phytosanitary Systems, Industry participation in Phytosanitary Systems, Technologies and Innovation in Phytosanitary Systems, Food safety issues in phytosanitary systems (MRLs, Heavy metals and Aflatoxins) and cross-cutting issues in phytosanitary systems including legal requirements, communication in phytosanitary, GMOs, Biosafety, emerging phytosanitary issues such as new pests.

Lastly I would like to thank our partners who have made this conference possible, especially the United States Agency for International Development (USAID) through FOODSCAP, Feed the Future, the Centre of Phytosanitary Excellence (COPE) and the Centre for Bio-Sciences International (CABI). I also want to thank staff who have tirelessly worked to make this event possible.

Esther Kimani, PhD
Managing Director
Kenya Plant Health Inspectorate Service (KEPHIS)

PROGRAM

Time	Details	Facilitator
	Sunday, 3rdJune 2018	
	Arrival of delegates	KEPHIS
	Monday, 4thJune 2018	
8.30am	Registration Entertainment Opening Prayers Kenya National Anthem	Conference Secretariat *Kayamba* Roots Josiah Syanda *Kayamba* Roots
9.00am	Official opening session *Chair Session – Dr. Esther Kimani – Managing Director KEPHIS*	KEPHIS
	Welcoming Remarks **Remarks by key speakers** • Dr Esther Kimani, Managing Director, KEPHIS • Mr. Wycliffe O. Murwayi, Chairperson, KEPHIS Board of Directors • Dr. Jean Gérard MEZUI M'ELLA, Executive Director of African-Union Interafrican Phytosanitary Council • European Union Representative • H.E. Hon. Jackson Mandago, Governor, Uasin Gishu County • H. E. Johnson Weru, Kenya's Ambassador to Belgium • Ms. Tina Dooley – Jones, Mission Director, Kenya and Eastern Africa, USAID • Prof Hamadi Boga, Permanent Secretary, Agricultural Research **Official opening – Hon. Mwangi Kiunjuri Cabinet Secretary, Ministry of Agriculture and Irrigation**	
	Group photo	Catherine Muraguri KEPHIS
	Tour of exhibition and Analytical Chemistry and Plant Health Laboratory	MD KEPHIS, Dr Esther Kimani
10:30am	Coffee Break	
	Session 1 Pest Diagnostics in Phytosanitary Systems *Chair Session: Dr. Isaac Macharia – GMPS KEPHIS*	
11.00-11:30 am	**Key note address** Pest Diagnostics in Phytosanitary systems	Dr.Maina Mwangi Kenyatta University
11.30-11.50 am	Next generation sequencing as a tool in modern pest risk analysis: a case study of groundnuts (*Arachis hypogaea*) as a potential host of new viruses in Western Kenya	Benard Mukhoye MMUST
11.50-12.10 pm	Distribution, Genetic Diversity and Viral recombination of Maize Lethal Necrosis disease causing Viruses in Kenya	Francis Mwatuni CIMMYT-Kenya

12.10-12.30 pm	Bioinformatics for plant biosecurity as a tool in surveillance systems	Kiguongo A.P.K KEPHIS
12.50-1.20 pm	Moroccan watermelon mosaic virus is responsible for symptoms associated with papaya ringspot disease in Kenya	Naomi Mumo JKUAT
1.20-1.50	Plenary	All
1.50-2:30pm	**Lunch Break**	**All**
Session 2 Pest Surveillance in Phytosanitary Systems *Session Chair: Kenneth Msiska – NPPO Zambia*		
2:30-3:00pm	**Key note address:** Special session for CABI on Invasive species	Dr. Roger Day – CABI, Kenya
3.00-3.20 pm	Pest Risk Analysis: Practices and Experiences in Uganda	Tumuboine. E NPPO Uganda
3.20-3.40 pm	Pest Risk Analysis in Burundi	Masabarakiza Lucien, Burundi
3.40- 4.00 pm	New tools for pest risk analysis	Katherine Cameron CABI-KENYA
4.00-4.20 pm	Improved phytosanitary system ensures the lifting of a vegetable export ban in Ghana.	W. Hevi CABI,GHANA
4.20-4.40 pm	Surveillance of maize lethal necrosis disease in Zambia	Chomba, M. D Zambia
4.40-5.00 pm	Investigating the occurrence of Maize Lethal Necrosis Disease in Malawi.	Doctor Gondwe Malawi
5.00-5.20 pm	Diversity and density of fruit flies of economic importance in Kandara sub county, Muranga County, Kenya	Muriuki .W KALRO
5.20-5.40 pm	Plenary	
5.40 pm	**Coffee break**	**All**
6:00 pm	*Cocktail and networking, KEPHIS Headquarter*	
	End of Day One	
Day 2	**Tuesday, 5th June 2018**	
9:00am-10:00am	**Panel Session 1: Missed opportunities on trade due to non-compliance to phytosanitary issues** **Panelist** • *Selected Government and industry representatives*	Prof. John Nderitu UoN
10:00am-10:40am	***Coffee Break***	All
Session 3 Import Control and Quarantine Regulations *Session chair: Francis Mwatuni - CIMMYT*		
10.40-11:10am	**Key note address** Import Control and Quarantine Regulations	Dr. Washington Otieno CABI
11:10-11:30 am	Tackling Maize Lethal Necrosis (MLN), a major epidemic in eastern with better phytosanitary intervention measures.	Suresh L.M CIMMYT, Kenya
11:30-	Appropriate Surveillance and diagnostics tools in	Francis Mwatuni

11:50 am	Prevention of spread of MLN to Southern Africa	CIMMYT, Kenya
11:50 - 12:10pm	The Guidelines for conducting sea container cleanness Survey and inspection	Fredrick Koome KEPHIS
12:10pm-12:30Pm	Implementation of track and trace system for enhanced control and regulation of imported consignments with Phytosanitary concern	Josiah Synda KEPHIS
12.30-12.50pm	Post-release monitoring of quarantine seaweed (kappaphycus alvarezii) in coast region of kenya	Thomas Kossiom KEPHIS
12:50-1:20pm	Challenges for late blight control for sub-Saharan Africa	A. W Njoroge CIP
1:20 pm-1:40 pm	*Plenary discussions*	All
1:40pm-2:20pm	***Lunch break***	***All***
Session 4 Export Control in Phytosanitary Systems *Session Chair:Abed Mathagu - AATF*		
2:20-3:00pm	**Key note address** Export Control in Phytosanitary Systems	Dr. Esther Kimani KEPHIS
3:00-3:20pm	Quality of mangoes exported from Kenya and strategies for compliance to international market requirements	Augustine Kivi KEPHIS
3:20-3:40pm	Evidence of avocado infestation in the field by fruit flies (Tephritidae) at Kandara, Murang'a County, Kenya	Mulwa, J. KALRO
3.40-4.00pm	Export Controls for Fruits and Vegetables in Uganda	Niyitegeka B Uganda
4.00 4.20 pm	Efficacy of selected bio-pesticides, polythene mulch and sticky traps in controlling liriomyza (diptera: agromizidae) infestation on basil	Alfayo Ombuya KEPHIS
4.20-4.40pm	Effect of phosphine fumigant on false codling moth (FCM) larvae in capsicum	George Momanyi KEPHIS
4.40-5.10pm	Plenary discussions	All
5.10-6.00 pm	Poster presentations	All
	Coffee break	*All*
	END OF DAY TWO	
	Wednesday, 6th June 2018	
Session 5 Industry participation on Phytosanitary Systems *Session chair: Hosea Machuki– FPEAK*		
9:00-9.40am	**Key note address** Industry participation on Phytosanitary Systems	Jane Ngige KHC
9:40-10.00am	New EU Plant Health Regulation	Morag Webb COLEACP
10:00-10.20am	Assessment of pests incidence, pesticide use and application practices on tomato production in Bungoma County, Kenya	Michael Barasa Kenyatta University
10.20-10.40pm	Management of crown gall disease in the production of flower cuttings in Kenya	Magdalene Wanza Kenyatta University
10.40-	***Coffee Break***	***All***

11.10PM		
11.10-11.30 pm	Distribution and management of the invasive Papaya Mealybug, *Paracoccus marginatus*, in Kenya	Koome Makathima KEPHIS
11:30am-11:50 am	Effect of quality of farm saved cowpea seed on bacterial blight and dry grain yield	Njonjo M.W UoN
11.50-12:10pm	Effect of time after incorporation of lablab green manure on establishment of common beans	Oliver.O UoN
12:10-12:30Pm	Phytosanitary challenges facing Irish potato farmers in Uasin Gishu & Elgeyo-marakwet counties, Kenya	Jane Boit KEPHIS
12.30-12.50 pm	Moroccan watermelon mosaic virus is responsible for symptoms associated with papaya ringspot disease in Kenya	Naomi Mumo JKUAT
12.50-1.10pm	Plenary	
1.10pm-2:00pm	***Lunch Break***	***All***
Session 6: Technologies and Innovation in Phytosanitary Systems *Session chair: NPPO Uganda*		
2:00-2:30pm	**Key note address** Technologies and Innovation in Phytosanitary Systems	Prof Muthomi UoN
2:30-2:50pm	Leveraging ICT tools and Earth Observation Satellite data for early warning of pest outbreaks: Extension and Pest Risk Information in Africa.	Mary Lucy CABI,Kenya
2:50-3.10pm	Role of KEPHIS in Promotion and dissemination of quality seed for sweetpotato	Florence Munguti KEPHIS
3.10-3:30pm	Application of electronic phytosanitary certification (ephyto) for enhanced phytosanitary compliance	Josiah Synda KEPHIS
3:30-3:50pm	ISPM 15 (Wood packaging material)	Hellen Mwarey KEPHIS
3.50-4.10 pm	Effect of Hot Water Treatment on Sugarcane Ratoon Stunting Disease, Cane Yield and Quality	Esther S. Philip UoN
4.10-4.30 pm	Management of bacterial wilt (*Ralstonia solanacearum*) in tomato (*Solanum lycopersicum L.)* using resistant African eggplant (Solanum spp) rootstocks	T. Nikuze KEPHIS
4.30-4.50 pm	Influence of Seed Source and Production Practices on Quality of Soybean (Glycine max) Seed	Ochran, M. K. UoN
4.50-5.10 pm	Plenary	All
4.30pm	***Coffee Break***	***All***
	END OF DAY THREE	
	Thursday, 7th June 2018	
8.30 -5.00 pm	Field day- Participant will visit different areas according to the thematic areas of the conference	All
	Naivasha, Thika,	Alfayo Ombuya Pamela Kibwage

	Wood treatment facility and JKIA	Hellen Mwarey
	Official Dinner at Fogo Gaucho - Kilimani	All
	END OF DAY FOUR	
	Friday, 8th June 2018	
Session 7 Emerging issues e.g Food safety issues in phytosanitary systems *Session Chair: Simon Kibet – GMQA KEPHIS*		
9:00-9:30am	**Key note address** Emerging Issues in phytosanitary systems	Abed Kagundu AATF
9:30-9:50am	Role of KEPHIS in safe handling, transfer and use of GMOs.	Margaret Wanjiku KEPHIS
9:50-10:10am	Biological control of *Parthenium hysterophorus* weed in Kenya	Muo Kasina KALRO
10:10-10:30am	Communicating emergency farmer friendly messages in response to Invasive Alien Species; The case of Fall armyworm in Africa	David Onyango CABI-KENYA
10:30-11:00 pm	***Coffee Break***	***All***
11:00-11:20am	Phytosanitary capacity evaluation a case study for Kenya	Faith Ndunge KEPHIS
11:20-11:40am	Role of KEPHIS in mitigating impacts of emerging and re-emerging pests and diseases due to climate change	Alex Njugi KEPHIS
11:40-12:00noon	E. coli and Salmonella contamination of tomato marketed and consumed in Nairobi metropolis	Joseph Nguetti
12:00-12:20pm	Exposure Assessment of the Kenyan population to Pesticide Residues through Vegetable Consumption.	Peter Kamuti KEPHIS
12:20-12:40pm	First report of Colletotrichum boninense and Pestalotiopsis microspora infecting avocado fruits in Kenya	Dr.Stanley Kimaru Kenyatta University
12.40-1.00 pm	Plenary	All
1:00-2:00pm	***Lunch Break***	***All***
2:00-3:00pm	***Panel Session 2: Food safety noncompliance*** ***Panelist*** ***Government and industry representatives***	Industry Representative
3:00-4:00pm	Conference evaluation	GMPs
	Way forward and presentation of certificates of participation	Dr. Esther Kimani KEPHIS
	Closing remarks	Dr. Esther Kimani KEPHIS
	END OF THE CONFERENCE	
	Saturday, 9th June 2018	
	DEPARTURE	

SIDE EVENTS PROGRAM

Date: 5TH June 2018

Time	Morning session	Facilitator	Target group
9.30am-12.30pm	Demonstration on growing fruit trees	Genetics Technologies Limited	Farmers
Time	**Afternoon session**	**Facilitator**	**Target group**
2.00 - 3.30pm	Role of KEPHIS in multiplication and distribution of orange fleshed sweet potato	KEPHIS-PQS	Farmers

Date: 6th June 2018

Time	Morning session	Facilitator	Target group
9.30am -12.30pm	Use of traps in enhancing Phytosanitary controls	Kenya Biologics Ltd Koppert Biologicals Ltd	Farmers
Time	**Afternoon session**	**Facilitator**	**Target group**
2.00 - 3.30pm	Soil sampling Food safety	KEPHIS-ACL	Farmers

Date: 7th June 2018

Time	Morning session	Facilitator	Target group
9.30am -12.30pm	Demonstration on growing fruit trees	Genetics Technologies Limited	Farmers
Time	**Afternoon session**	**Facilitator**	**Target group**
2.00 - 3.30pm	Role of KEPHIS in seed regulation in Kenya	KEPHIS	Seed sellers

YOUTH SIDE EVENT

Program/presentations/talk

- Role of KEPHIS in phytosanitary regulation
- Phytosanitary import procedure
- Phytosanitary export procedures
- Youth in Phytosanitary and trade
- Laboratory tour

SIDE EVENTS PROGRAM – YOUTH IN AGRICULTURE

Friday 8th June 2018			
NO	**TIME**	**ITEM**	**FACILITATOR**
1.	8:30-9:00AM	Arrival and registration	KEPHIS
2	9.00-9:15AM	Introductions	H/ACL
3	9:15-9:30AM	Opening/Welcoming Remarks	GMQA/MD
4	9:30-9:45	Photo Session	Moderator
5	9:45-10:20AM	**Tea Break**	ALL
6	10:20-10:40AM	Export Requirements for new agribusiness entities	B. Okonda
7	10:40-11:00AM	Role of National Food Control Laboratories in Food Control Systems	O. Mwaniki
8	11:00-11:20AM	Sampling and testing for MRLs Compliance	J. Woto
9	11:20-11:40AM	Sampling and testing for agro-inputs quality	A. Njugi
10	11:40-12:00 PM	Sampling and testing for Microbiological hazards	P. Maina
11	12:00pm-12:30PM	Horticultural Crops regulations and Standards	HCD
12	12:30PM-1.00PM	Q&A Session	P. Mbogo
13	1.00-2.00PM	**LUNCH**	ALL
14	2.00-2:30PM	Laboratory tour	R. Koigi
15	2:30-3:00PM	Exhibition tour	ALL
16	9:00-3:00PM	Rapporteur:	G. Wachira
17	9:00-3:00pm	Moderator:	L. Maina

FIELD VISIT PROGRAMME

Time	Activity	Facilitators
Group 1 Visit to a Flower farm in Naivasha		
7.00am-9.00am	Departure to Naivasha	All
9.00am-12.00pm	Flamingo farm	Aalfayo Ombuya
12.00pm-1.00pm	**Lunch at Simba**	**All**
1.00pm-3.00pm	Dudutech	Alfayo Ombuya
3.00pm-5.00pm	Departure	All
Group 2 visit to vegetable and fruit farm in Thika		
7.00am-9.00am	Departure to Thika	All
9.00am-12.00pm	AAA Growers	Pamela Kibwage
12.00pm-1.00pm	**Lunch at Blue Hotel**	**All**
1.00pm-3.00pm	Visit Kakuzi	Pamela Kibwage
3.00pm-5.00pm	Departure	All
Group 3 visit to Wood packaging facility and JKIA in industrial area		
7.30am-8.00am	Departure	All
8.30am-12-00pm	Arrival at Woodtex	Janet Odongo
12.00pm -1.00pm	**Lunch at Industrial area Galitos**	**All**
1.00pm-3.00pm	Visit at JKIA	Hellen Mwarey
3.00pm-5.00pm	Departure	All

KEY NOTE ADDRESS

Prof. James W. Muthomi Associate Professor of Plant Pathology Department of Plant Science and Crop Protection, Faculty of Agriculture, University of Nairobi **Key note Speaker: "**Technologies and Innovation in Phytosanitary" He is an Associate Professor of Plant Pathology in the Department of Plant Science and Crop Protection, University of Nairobi, Kenya. He has 23 years research and teaching experience at the University of Nairobi and agricultural extension with the Ministry of Agriculture. His research interests include management of mycotoxins in cereals, legume diseases and plant disease management. He has attracted research funding and successfully managed 15 research projects in the field of crop protection and plant disease management. He has published over 55 papers in international peer reviewed scientific journals and in over 57 papers in conference proceedings. He has supervised over 40 Masters and five Ph.D students in the field of agriculture. Currently, Prof. Muthomi is the head of Crop Protection section in the Department of Plant Science and Crop Protection, has chaired various committees in the Faculty of Agriculture, coordinator of Open and Distance Learning for MSc Crop Protection and championed development of curricula in Crop Protection, Phytosanitary Measures and Seed Technology.	
Dr. Roger Day SPS Coordinator CABI, Kenya **Keynote Speaker**:" Phytosanitary regulation in international trade" Roger's career in tropical agriculture began in East Malaysia, where he did PhD research on the cocoa pod borer. After post-docs with Imperial College, London, for over 20 years he lived in Kenya working for CAB International. His experience covers research, development and capacity building in CABI's three themes: Invasive Species, Trade & Commodities, and Development, Communication & Extension. In recent years he has worked particularly in SPS and biosecurity capacity development, and he is now CABI's SPS coordinator.	

Abed Kagundu

Regulatory Affairs

African Agricultural Technology Foundation (AATF)

Keynote Speaker:" Emerging Issues in phytosanitary systems"

Abed Mathagu holds a Msc. degree in Plant Pathology from the University of Nairobi in Kenya, a Master's degree in Biosafety from the University of Ancona in Italy and a Bsc. degree in Forestry from Moi University in Kenya. Before joining AATF, Abed was acting as the General Manager for Phytosanitary and Biosafety Services at the Kenya Plant Health Inspectorate Service (KEPHIS). Before this appointment he headed the Plant Quarantine Station and served as the head of Biosafety and Phytosanitary department at KEPHIS. He served in the National Biosafety Authority Board between 2010 and September 2014 as well as in its predecessor, the National Biosafety Committee from 2005 to 2009. He participated in different institutional biosafety committees, including those of the International Livestock Research Institute (ILRI), the Kenya Agricultural Research Institute (KARI) and the International Centre of Insect Physiology and Ecology (ICIPE). He participated in the Codex Alimentarius Commission's Committee on Genetically Modified Food Labelling and *Ad Hoc* Intergovernmental Taskforce on Foods Derived from Biotechnology which developed the Codex *Plant Guideline* for GM Risk Assessment. Abed chaired the Technical Committee on Biotechnology at the Kenya Bureau of Standards from 2009 to September 2014. He also coordinated the Kenya Standing Technical Committee on Imports and Exports hosted by KEPHIS. He has wide experience in regulatory work. As Programme Officer, Regulatory Affairs at the African Agricultural Technology Foundation, Abed is charged with coordinating planning, implementing and monitoring of regulatory activities to secure approvals and ensure compliance with regulatory requirements in several African countries.

Dr Maina Mwangi

Director, Research Support at Kenyatta University

Keynote Speaker:" Pests diagnosis in phytosanitary systems"

Dr. Maina Mwangi is the Director, Research Support at Kenyatta University (2016- current), Kenya and prior to that was Director, Grant Writing and Management (2011-2016). He teaches and conducts research on Plant pathogens and their control at the Department of Agricultural Science and Technology. Dr. Mwangi holds B.Sc and M.Sc in Plant Pathology from the University of Nairobi, Kenya; and PhD in Crop Protection from the University of Bonn, Germany. He undertook postdoctoral training at the International Institute of Tropical Agriculture (IITA) in Ibadan, Nigeria (2003 – 2005) working in West and Central Africa, and later was based at the IITA centre in Kampala, Uganda (2005-2008) working in Central and

Eastern Africa. He serves as a mentor on agribusiness innovations at the Chandaria Business Innovations and Incubation Centre and has led the Agro-Enterprise Development Training at the African Centre for Transformative and Inclusive Leadership (ACTIL), a UN WOMEN center at KU. He has coordinated and participated in many research programs in Kenya and globally aimed at enhancing agricultural productivity and has served on editorial boards of several journals. His interests are in development and deployment of technologies for sustainable food and nutrition security in Africa.	
Dr. Washington Otieno Plantwise Programme Executive, CABI **Keynote Speaker**:" Import Control and Quarantine Regulations" Dr. Otieno has over 25 years work experience in agricultural research and development in several national organizations and the Secretariat of International Plant Protection Organization in the areas of plant protection and other aspects of agricultural biosecurity, particularly capacity needs assessment and support for capacity development. Over the past seven years he has engaged in national, regional and international fora and initiatives that support capacity development for improving plant health systems of developing countries with the aim of effectively and sustainably protecting plant resources and the environment from pests, thereby improving agricultural productivity and market access for plants and plant products. He is currently working with CABI in Africa as the Regional Team Leader of the Plantwise programme and engaged in coordinating implementation of the programme in 12 countries on the continent.	

ABSTRACTS

Next generation sequencing as a tool in modern pest diagnosis. A case study of groundnuts (*Arachis hypogaea*) as a potential host of new viruses in Western Kenya

Mukoye B[1]., Mangeni B. C[1]., Sue J[2]., Ndong'a M. F. O[1]. and Were H. K[1].
[1] Department of Biological Sciences, Masinde Muliro University of Science and Technology (MMUST), Kakamega, Kenya
[2] Cell and Molecular Biology Sciences, The James Hutton Institute (JHI), Dundee, UK.

Corresponding author emailF

Presenter: Mukoye B

Abstract

Groundnut (*Arachis hypogaea,* L.*),* is grown in diverse environments throughout the semi-arid and sub-tropical regions. Poor yields of 500-800kg/ha are attributed to poor agronomic practices, pests and diseases. The major disease reported in Kenya is Groundnut rosette disease (GRD). Recent observations in the field showed that the crop has varied and severe symptoms in addition to those caused by GRD. This required deeper analysis to establish the causal agents. Groundnut samples with viral symptoms were collected from Western Kenya in 2016. Total RNA was extracted using All Prep RNA Mini Kit according to manufacturer's instruction. Six mRNA libraries were prepared using the Illumina TrueSeq stranded mRNA library Prep Kit and pooled for multiplexed sequencing using an Illumina HiSeq 2500 to generate paired end reads (FastQ Sanger). The reads were analysed in the Galaxy project platform (customized). Quality reads were first mapped onto plant genome Refseq and unmapped reads isolated and mapped onto virus Refseq using Bowtie 2 (v2.2.3). Groundnut rosette virus satellite RNA, Groundnut rosette virus, Ethiopian tobacco bushy top virus, Chickpea chlorotic stunt virus, Hibiscus latent Singapore virus, Dulcamara mottle virus, White clover cryptic virus 2, Cucurbit aphid-borne yellows virus, Yam bean mosaic virus, Colombian potato soil-borne virus isolate IS9 segment RNA2 putative coat protein (CP-RT) and coat protein (ORF1) genes and Phasey bean mild yellows virus, each had over 20 reads mapping to the virus Refseq. Other viruses including Bean common mosaic virus, Bean common mosaic necrosis virus, Cowpea chlorotic mottle virus RNA 3, and Broad bean mottle virus RNA 3, Passion fruit woodiness virus among others were also mapped. The presence of at least three viruses in groundnuts in Western Kenya highlights the importance of starting a germplasm clean-up program of the plant material used as seed in this crop.

Key Words: Groundnuts, CP-RT, ORF1, RNA, GRD, *Arachis hypogaea*

Distribution, Genetic Diversity and Viral recombination of Maize Lethal Necrosis disease causing Viruses in Kenya

Francis M. Mwatuni[1,3], Francesca Stomeo[2], Joyce Njuguna[2], Aggrey Nyende1, Eunice Machuka[2], Xiong Zhonguo[4]

1Jomo Kenyatta University of Agriculture and Technology, P.O.Box 62000-00100 Nairobi, Kenya. 2BioSciences East and Central Africa, BecA – ILRI Hub P.O. Box 30709 Nairobi 00100, Kenya 3International Maize and Wheat Improvement center (CIMMYT) P.O. Box 1041 – 00621 Nairobi 4University of Arizona - Tucson, Arizona 85721 | (520) 621-2211 | USA
Corresponding author email: F.Mwatuni@cgiar.org

Presenter: Francis Mwatuni

Abstract

Maize is widely grown and ranks highly in food security in Kenya. However, with the emergence of Maize Lethal Necrosis (MLN) disease in East Africa in 2012, average yields plummeted to all-time low with areas severely affected like the south rift region recording 90 – 100% yield losses in 2012 and 2013. This latest nationwide survey conducted in 2015/2016, MLN incidence was 35 – 90%, prevalence 44 – 72% and symptoms severity 1.7 – 4.1 on a 1-5 severity scale This study identified MCMV and SCMV to be the major viruses causing MLN in Kenya through both Laboratory diagnosis and NGS sequencing. The Kenyan MCMV isolates sequences from this study showed 99.75% similarity to the isolate previously reported in Kenya (MF510247.1), Ethiopia (KP798454,) and Rwanda (KP851970.01). The genome sequences also had 99% identity with MCMV isolates from Eastern Africa countries; 99.02% identity with MCMV isolate from Yunnan, China (KF010583.1); and 96 to 97% identical to genome sequences of MCMV isolates from Kansas (X14736) and Nebraska (EU358605). The genome sequences of SCMV were quite diverse within the polyprotein region ranging from (89.81 - 100%). This study SCMV isolates were 99% similar isolates to Rwanda (KF744392.1) and 98% similar to Ohio, US isolate (JX188385.1).The second group were 99% similar to isolates from China(JX047412.1 and JX047425.1). Potential recombination events were detected in 11 genome sequences in my SCMV isolates using the recombination detection program (RDP4) but only 3 SCMV genome sequence recombinants were realized with different possible major and minor parents. MLN still persists in the country and the survey results reveal that it is still endemic in Kenya and in the eastern Africa countries. South Rift has the highest MLN prevalence, incidence and severity at 72%, 82% and 3.6 respectively. SCMV was the only Potyvirus found to synergize with MCMV to cause MLN in Kenya. WSMV and MDMV not identified in this study MCMV isolates are highly similar to the Asian isolates especially from China hence possibility of infection route. There is less genetic variability within MCMV genomes. SCMV genomes are genetically highly diverse as demonstrated by sequence identity analysis, phylogenetic analysis and viral recombination analysis. MLN is a complex challenge and must be effectively addressed through several simultaneously-implemented strategies.

Key Words: SCMV, MDMV, recombination, diversity

Bioinformatics for Plant biosecurity as a tool in surveillance systems

Kiguongo.A.P.K[1*], Obare.I[1], & Wanjiku.M[1]

[1]Kenya Plant Health Inspectorate Service (KEPHIS) P.O Box 49592-00100, Nairobi, Kenya

Corresponding author email: allan.paul@kephis.org.

Presenter: Kiguongo Allan

Abstracts

Detection, identification and prevention of entry of exotic and spread of harmful viruses and viroids is fundamental for the protection of a country's biodiversity, sustainable trade and food security. Viruses and viroids cause significant yield and quality losses in a vast variety of cultivated crops making detection and identification a crucial facet of successful crop production and trade. The existing post-entry quarantine screening methods/protocols rely on time-consuming biological indicators and/or molecular assays which require knowledge of infecting viral and viroid pathogens. The adoption of molecular techniques such as conventional polymerase chain reaction PCR and lately real-time RT-PCR has enhanced efficient, quick and accurate test of viruses and viroids in plant samples. These molecular techniques only allow for the test of known viruses or a small number of known viruses, therefore, missing on other unknown but harmful viruses and viroids. The invent and the introduction of next-generation sequencing (NGS) has revolutionized sequencing of nucleic acids due to its efficiency, deeper resolution and affordability in terms of economic requirements and experimental procedures. Plant diagnostic protocols based on next-generation sequencing has proved to be of fundamental importance in detection and identification of multiple known and emergent viruses and viroids in major crops, nuclear stocks, germplasm in gene banks and imported plants in which the disease symptoms are triggered by two or multiple viruses or unspecific. Viral detection using RNA- sequencing (RNA-seq) requires quick and robust bioinformatics methods to enable for host sequence removal and virus classification. Despite major successes in detection and identification of viruses, the methodologies used faces major challenges which include biological characterization of newly discovered and their analysis of their impact on biosecurity, commercial, regulatory and scientific fields. In this review, recent studies that use RNA-seq for virus detection in a variety of crops and different bioinformatics steps developed for virus detection using NGS data are discussed, their adoption and a framework for efficient biological characterization and risk assessment for previously known or new virus detected using NGS methodologies. The review concludes by discussing the need for virus network remote servers for enhanced plant biosecurity and virus surveillance systems for food security and sustainable trade.

Key words: Bioinformatics & computational biology, next-generation sequencing, viral diagnostics, food security, plant protection.

Challenges for late blight control in sub-Saharan Africa

A. W. Njoroge

International Potato Center (CIP-SSA), Nairobi-Kenya &Department of Forest Mycology and Plant Pathology, Swedish University of Agricultural Sciences, SE 750 07 Uppsala, Sweden

Corresponding author email*:* A.njoroge@cgiar.com

Presenter: A.W Njoroge

Abstract

The greatest hindrance to sustainable late blight disease management in developing countries is farmers' decisions which are based on countlessfactors. Those who cannot afford control measures or have no access to seed of resistant varieties have limited ability to manage the disease. These coupled with a very dynamic late blight pathogen, *Phytophthora infestans*, has repeatedly resulted to severe crop losses with direct effects on diets and incomes. A baseline survey in East-Africa on field resistance of commonly grown potato cultivars have shown that a number of cultivars still maintain reasonable resistance to *P. infestans* even though not widely grown. We have also identified dominance of new pathogen strains by genotyping using simple sequence repeats (SSR) markers thought to have been brought in through seed importations and which could threaten host resistance currently being deployed. Simulation of late blight epidemics using the model LB2004 indicated that these new strains will cause increased difficulties in controlling potato late blight in this region.We specifically plan to use host and pathogen data from Africa to formulate an Africa Blight network that will have data in a centralized system that can be used for selection of late-blight resistant varieties.

Keywords: late blight, SSR, genotyping

Pest Risk Analysis: Practices and Experiences in Uganda

Tumuboine. E, Sebutare G. and Niyitegeka B.

Ministry of Agriculture, Animal and Fisheries P.O.Box 102 Entebbe, Uganda

Phytosanitary and Quarantine Services, Crop Inspection and Certification

Presenter: Tumuboine E

Abstract

Pest risk analysis practices and experiences indicate that I has been widely used to make decision on importation of plants and plant products. It has also been used to regulate internal movement of plants and plant products likely to introduce pests in endangered areas when a new pest is not yet widely distributed. The decision to conduct PRA include importation requests from new origins, when a pest has been intercepted at the border, a new plant species from the already existing country of origin among others. Following the ISPM 11 and 12 which have been domesticated into Standard operating procedure (SOP/DCP11) the process include pest categorization, Pest risk assessment, risk management and communication. The risk rating are qualitative (High, medium, low and negligible) and the overall risk rating is additive.The use of information tools and models has been limited to CABI Crop Protection Compendium and other web based sources including google searches. However, there has been limited access to international journal due to lack of subscription. The capacity to conduct pest risk analysis is limited by high staff turnover, abrupt administrative changes. There is room for improvement if pest risk analysis activities are recognized in the national developmental goals and being accountable to the sovereign obligations of the country. It is hoped that with improved access to internationally recognized sources of information, models and trained personnel, the PRA process will be sustained.

Key words: Pest Risk Analysis, ISPM, CABI CPC,

Pest Risk Analysis in Burundi

Masabarakiza Lucien

Burundi National Plant Protection Organization, P.O.Box 114 Gitega, Burundi,
Corresponding author email: Masabaluc2006@yahoo.fr

Presenter: Masabarakiza Lucien

Abstract

Pest risk analysis is a phytosanitary tool which provide scientific information for phytosanitary decision making. Burundi has experience in pest risk analysis where a group of pest risk analysis are tasked in undertaking PRA. The current study provide a detailed process used for conducting a pest risk analysis in Burundi and the selection of risk management options to mitigate the risk. The process include three steps as in any pest risk analysis: Pest risk initiation for which the result is the potential quarantine pest list; Pest risk assessment that leads to proper quarantine pest list; Pest risk management. According to the pest risk identified, risk management options are selected. Mainly, these management options are import conditions for minimizing introduction of quarantine pests associated with the plant or plant products imported. For that, we recommend inspection of imported plant products and material at the entry/exit points. An import permit, a phytosanitary certificate and when necessary an attestation of treatment and field inspection are required. This presentation describes also the gaps in pest risk analysis that Burundi faces.

Key words: PRA, phytosanitary certificate and permit

New tools for pest risk analysis

Katherine Cameron[1], Gareth Richards[1], MaryLucy Oronje[1], Roger Day[1]

Centre for Agriculture and Biosciences International (CABI), Canary Bird, 673 Limuru Road, Muthaiga. P.O Box 633-00621, Village Market, Nairobi, Kenya

Corresponding author email: M.Oronje@cabi.org

Presenter: Katherine Cameron

Abstract

CABI's Action on Invasives programme aims to protect and improve the livelihoods of 50 million poor rural families impacted by invasive species through an environmentally sustainable, regional approach to comprehensive biological invasion management. The programme's goal is to protect and restore agricultural and natural ecosystems, reduce crop losses, improve health, protect trade and reduce degradation of natural resources and protected areas in three stages; prevention, early detection and rapid response, control and restoration. Supported by the US Department of Agriculture (USDA) and the UK Department for International Development (DFID), CABI has developed Horizon Scanning Tool (HST) to support decision making by risk assessors, plant protection officers, quarantine officers, protected area managers and researchers to identify potential invasive species threats to a country, state or province. It provides a quick and user-friendly means of accessing a large volume of relevant data for categorizing and prioritizing potential invasive species for the more focused / better adoption of preventative measures. Following from the Horizon Scanning Tool, CABI is developing an online pest risk analysis (PRA) decision support tool. The PRA Tool will focus on analysing risk associated with the unintended introduction and establishment of plant pests (any species, strain or biotype of plant, animal, or pathogenic agent, injurious to plants or plant products). The PRA Tool will form a framework for conducting PRA in accordance with the International Plant Protection Convention's international standard for 'pest risk analysis for quarantine pests' (ISPM 8) in a format that is accessible for risk assessors in lower and middle income countries who often lack access to the comprehensive resources or tools available to those in high-income countries. The new tool under development will reflect the functionality of the PRA module previously included in the CPC CD-ROM last published in 2007, but will be available online and link with online resources in order to facilitate access to the latest information on pest statuses, distribution, and pathways of invasion. Users will be able to initiate a PRA for a commodity pathway, or for a specific pest, and collaborate with their team members to complete the analysis. We anticipate that the two tools; HST and PRA decision support tool, will be key sources of information on plant health risks, agricultural market access, enhancing trade and promotion of food security and livelihoods.

Keywords: Invasives, Horizon Scanning Tool, pest risk analysis (PRA) decision support tool, market access

Improved phytosanitary system ensures the lifting of a vegetable export ban in Ghana

W. Hevi[1*], V. A. Clottey[1], E. Aboagye[2] and K. Korboe[3]
[1]CABI West Africa, P.O. Box CT8630, Cantonments, Accra, Ghana
[2]PPRSD/MoFA, P.O. Box M37, Accra, Ghana
[3]MoFA, P.O. Box M37, Accra, Ghana
Corresponding author email: w.hevi@cabi.org
Presenter: W. Hevi

Abstract

The Ghanaian vegetable (chilli pepper, bitter gourd, luffa gourd, bottle gourd, egg plants, okra and fresh beans) export in 2012 was approximately 4,000tons valued at USD 2.6M. Phytosanitary compliance system failure led to a decline to about 900tons in 2016. From 2012 to 2015 EU interceptions of harmful organisms (*Thrips palmi*, *Thaumatotibia leucotreta*, *Bemisia tabaci* and Tephritidae) on Ghana vegetables went up leading to an EU import ban on 5 selected vegetables in 2015. A ministerial taskforce was constituted by the Minister of Food and Agriculture made up of representatives of National Plant Protection Organization (NPPO), private sector, development partners and other relevant institutions to put in place measures to ensure lifting of the ban. Actions undertaken since 2015 included: strengthening technical capacity of inspection staff; recruiting phytosanitary experts to support risk-based inspection and phytosanitary certification; reviewing standard operation procedures (SOPs) for inspection and production to conform to EU plant health requirements; equipping inspection facilities with laboratory equipment for pest diagnosis; conducting on-farm trials to help develop appropriate pest management protocols; and reviewing traceability systems. In September 2017, an EU team evaluated the official control systems for plants and plant products exported to the EU and indicated that: all port officials performing export inspections had technical competence levels conforming to Article 2(1)(i) of Council Directive 2000/29/EC and ISPM 7; Comprehensive SOPs for checks existed and are consistently followed; Laboratory technical capacity to test concerned harmful organisms existed; Sampling was consistently done with representative sample sizes conforming to ISPM 23; Appraisal and follow-up systems to interceptions existed; Upgraded traceability system to operate along entire supply chains existed conforming to ISPM 7; Facilities authorised to carry out heat treatment of wood packaging material had appropriate equipment to meet ISPM 15 requirements. The EC ban on export of the 5 vegetables was eventually lifted from 1st January, 2018. Experience from this activity confirms that public, private sector stakeholders and development partners need to work together to ensure systems compliant with international phytosanitary standards to boost trade.

Keywords: Ghana, vegetables, export ban, interceptions, ISPM, SOP

Surveillance of maize lethal necrosis disease in zambia

[1] Chomba, M. D., [2] Msiska, K.K, [3]Abass M.S., [4] Mudenda, M.., [5]Mukuwa, P.S.C,

[1,2,3,4,5] Zambia Agriculture Research Institute, Plant Quarantine and Phytosanitary Service P/B, 7, Chilanga, Zambia.

Corresponding author email: dchomba71@gmail.com

Presenter: Chomba, M.

Abstract

Maize Lethal necrosis disease (MLN) is caused by synergistic co-infection with *Maize cholortic mottle virus* (MCMV) and any virus from the family Potyviridae, particularly, *Sugarcane mosaic virus* (SCMV, *Maize dwarf mosaic virus* (MDMV) or *Wheat streak mosaic virus* (WSMV) in maize. MLN has been reported in several countries in Africa namely: Burundi, DR Congo, Ethiopia, Kenya, Rwanda, Tanzania, and Uganda causing yield losses of up to 100%. Apart from maize the disease has a wider host range including finger millet, sorghum, sugarcane, Napier grass and Kikuyu grass. Increased grain and seed trading between Zambia and some of the neighboring countries such as DRC Congo and Tanzania poses a threat to introduction of the disease for MCMV is seed borne. *Sugarcane mosaic virus* occurs worldwide and is distributed widely in Africa. This study aimed to establish the presence or absence of MCMV in Zambia. A survey of small-scale and commercial farmers was conducted in Eastern, Central, Copper belt, Southern, Lusaka, Luapula, Muchinga, Northern, North –Western provinces of Zambia in 2014/2015 to 2015/ 2016 cropping seasons. Farmer's fields were sampled at every five to ten kilometer interval and inspected. 424 samples were collected and tested on spot using rapid diagnostic kits capable of detecting MCMV and none tested positive. The negative status of MCMV implies that MLN is not yet present in Zambia. Zambia Agriculture Research Institute (ZARI) together with other Government agencies such as extension service and all stakeholders in the maize value chain should continue to implement measures that are effective in preventing the introduction of MLN in the country.

Key words: Maize, Survey, MLN, Losses, Trade

Investigating the occurrence of Maize Lethal Necrosis Disease in Malawi

Doctor Gondwe[1], Johnny Masangwa[2]
[1]Chitala Agricultural Research Station, Private Bag 315, Salima, Malawi, doctorgondwe@gmail.com [2]Bvumbwe Agricultural Research Station, P.O. Box 4558, Limbe, Malawi johnnymasangwa@gmail.com

Presenter: Doctor Gondwe

Abstract

Maize Lethal Necrosis Disease (MLND) is a highly infectious disease with very high levels of damage. Wangai et al. 2012 reported MLND as *pandemic with serious effects on yield and can result in complete loss of the crop.* The affected plants have small cobs with little or no grain set and die before tasselling (Wangai et al. 2012). Thus the disease can cause up to 100% yield loss. MLND is a trans-boundary in nature as such it poses a significant negative impact on food security and nutrition in developing countries like Malawi. The loss or reduction in maize yields can have a serious impact on the growth of international trade in agricultural produce. The Surveillance for the disease started under World Bank Project; Agricultural Productivity Programme for Southern Africa (APPSA) in 2015, with the objective of establishing the presence/absence of MLND. A comprehensive non-regulatory systemic survey using mobile units which involves observers travelling among large numbers of sites was being conducted in all the survey area to establish presence of MLND. All the districts in Malawi have been surveyed. The survey was done using the Lateral Flow Assays (LFA) developed at DSMZ for rapid on-site diagnosis of Maize Chlorotic Mortal Virus (MCMV) which is a pre-cursor of MLND. Having done the surveys for the period of three years no positive results of MCMV have been detected.

Key words: MLND, APPSA, LFA, survey, Malawi

Diversity and density of fruit flies of economic importance in Kandara sub county, Muranga County, Kenya

MuriukiW[1,2], Mulwa J[3], Guantai M[1], Samita N[2], Matolo N[3] and Kasina M[1*],

[1]National Sericulture Research Centre, Kenya Agricultural and Livestock Research Organization (KALRO), P.O. Box 7816-01000 Thika, Kenya
School of Agriculture and Entreprise Development, Kenyatta University
[3]Kenya Agricultural and Livestock Research Organization (KALRO)-Kabete, P.O. Box 14733-00800 Nairobi, Kenya

Corresponding author email: Muo.Kasina@kalro.org

Presenter: Muriuki. W

Abstract

Fruits demand has been increasing globally due to their nutrition and increased consumer awareness on nutritious foods. At the same time, access to the international market is becoming more restrictive as countries develop mechanisms for preventing pest entry through imports. On the other hand, fruits provide much needed income for farmers and foreign exchange to government. Fruit flies are key economic pests of fruits that attract a lot of international trade interest. This study was conducted in Kandara, Murang'a County in Kenya from January to May 2018 with purpose of determining temporo-spatial differences of fruit flies across the agroecologies and months. Kandara is composed of four agro-ecological zones; LH1 (Lower Highland Zone / tea and dairy zone), UM1 (Upper Mid-land Zone / coffee and tea zone), UM2 (main coffee zone), and UM3 (marginal coffee zone). Traps were set in six stations in every agro-ecological zone. Three sets of traps each containing different pheromone lure were set in every station: Methyl-Eugenal, Cuelure and Trimedlure. The results show that *Bactrocera dorsalis* increased across the four agro-ecologies from LH1 to UM3. The pest trap density was higher compared with other fruit flies. *Ceratitis capitata* were the most abundant in UM1 as expected. *Ceratitis cosyra* were well distributed across the agro-ecologies with the highest population in UM3. *Zeugodacus cucurbitae* and *Dacus bivittatus* had low trap catches across the agroecologies as expected. *Perilampsis* spp was mainly found in UM1 but in low numbers. Further evidence show that *B. dorsalis* trap catch peaked in May, *C. capitata* in February and *C. cosyra* in January, which is related to peak fruiting seasons of their host plants in the area. *Zeugodacus cucurbitae* and *D. bivittatus* were in low numbers across the season. The results of this ongoing study show the importance of mainstreaming surveillance in fruit fly control to ensure reduced infestation. It shows importance of developing centralized digital platform for providing quick-time advise to farmers on control practices. This will enhance participation in international trade through exclusion of the fruit flies in the commodities.

Key words: lures, *Bactrocera dorsalis, Zeugodacus cucurbitae, Ceratitis capitata, Ceratitis cosyra, Perilampsis* spp

Tackling Maize Lethal Necrosis (MLN), a major epidemic in eastern with better phytosanitary intervention measures

Suresh L M, Yoseph Beyene, Manje Gowda, Jumbo MacDonald Bright, Michael Olsen, Mosisa Regasa Dan Makumbi, Anne Wangui, Francis Mwatuni, and B.M. Prasanna
International Maize and Wheat Improvement Center (CIMMYT), ICRAF Campus, UN Avenue, Gigiri, PO Box 1041-00621, Nairobi, Kenya

Corresponding author email: l.m.suresh@cgiar.org

Presenter: Suresh L.M

Abstract

Maize (*Zea mays* L.) is critical for food security in sub-Saharan Africa (SSA). The sudden outbreak of Maize Lethal Necrosis (MLN) disease in 2011 in Kenya, followed by confirmed reports of MLN in D.R. Congo, Ethiopia, Rwanda, Tanzania and Uganda. CIMMYT in partnership with the Kenya Agricultural and Livestock Research Organization (KALRO), established a centralized MLN Screening Facility at Naivasha in 2013 as a rapid response to the epidemic. Protocols for artificial inoculation of maize germplasm against MLN, as well as for the individual viruses have been optimized. The present CIMMYT phytosanitary protocols are used in the facility for ensuring safe movement of maize germplasm is in place to meet internationally established phytosanitary standards for the safe screening of germplasm for MLN. MLN phenotyping services are also offered to the national agricultural research institutions or NARS (without any charge) and for seed companies (on a cost recovery basis). More than 130,000 germplasm entries have been screened against MLN in the facility. These includes inbreds, open-pollinated varieties (OPVs), pre-commercial hybrids, commercial hybrids, mapping populations, landraces etc. Five first-generation MLN-tolerant (CIMMYT-derived) hybrids have been identified and released in Kenya (H12ML & H13ML), Tanzania (HB607) and Uganda (UH5354 and UH5358) and are being scaled-up by seed company partners for commercialization. A total six second generation MLN-tolerant/resistant hybrids have been released in Kenya in 2017 and 10 MLN tolerant hybrids are under National Performance Trials (NPTs) in Kenya, Tanzania and Uganda. Several more promising MLN-tolerant/resistant hybrids are in the pipeline. The Facility is also used for studies to understand the genetic basis of resistance to MLN and research on seed transmission of MLN-causing viruses. Robust disease diagnosis is important to determine the disease severity and to track and monitor the disease using simple and cost effective diagnostic method such as immunostrip diagnostic method. NPPO's are fully engaged in tracking MCMV. Further, effective handling the contaminated seeds is critical by using the chemical treatment for cleaning the seeds, especially using 10% TSP. Thus, various phytosanitary intervention measures that are followed in tracking, monitoring and managing the devastating disease such as MLN is the key for good crop production and food security.

Key words: MLN, MCMV, CIMMYT, Phenotyping.

Appropriate Surveillance and diagnostics tools in preventing the spread of Maize Lethal Necrosis (MLN) to Southern Africa

Francis Mwatuni, B.M. Prasanna, David Hodson and Suresh L.M.
International Maize and Wheat Improvement Center (CIMMYT), ICRAF Campus, UN Avenue, Gigiri, PO Box 1041-00621, Nairobi, Kenya

Corresponding author email: F.Mwatuni@cgiar.org
Presenter: Francis Mwatuni

Abstract

Since 2011, Maize Lethal Necrosis (MLN) disease has emerged as a major threat to food security in the Sub Saharan Africa. There are several strategies in the management and in preventing further spread of the disease to southern Africa countries where Maize is a staple food and the seed maize industry is vibrant. One of the approaches is to have a robust disease surveillance structure and appropriate diagnostics tools within the Phytosanitary systems and NPPOs from the countries in the region. CIMMYT through the MLN Diagnostics and Management project has worked with NPPOs and other institutions from the five MLN endemic countries in eastern Africa (Kenya, Uganda, Tanzania, Rwanda and Ethiopia) and the three countries in southern Africa (Zambia, Malawi and Zimbabwe) in strengthening their Phytosanitary systems towards this end. An effective MLN surveillance system was established, including web-based information exchange amongst relevant institutions. Using the latest technology in surveillance, the android based Open Data Kit (ODK), the MLN surveillance protocols were designed and uploaded in the application for use. Further, an MLN data Toolbox was also set up to manage surveillance data generated from the massive regional surveillance exercise. The data generated is published in MLN Web portal, a product of the Project. Harmonized surveillance, sampling and diagnostics protocols for detecting MLN-causing viruses especially MCMV in farmers' fields, seed fields and in commercial seed lots were designed and implemented. Various stakeholders have been trained on the ODK surveillance tool, field testing for MCMV using immunostrips and testing for MLN viruses in seed using ELISA.The establishment of the MLN Phytosanitary Community of Practice, understanding seed transmission of MCMV, appropriate surveillance and diagnostic protocols have contributed immensely in the management strategies for MLN in eastern Africa and hence prevented its spread to southern Africa

Key words: surveillance, diagnostics, maize, phytosanitary.

The Guidelines for conducting sea container cleanness Survey and inspection

Makathima. F, Karri. T, Downes. M, Marie-Claude. F, Albakari. M, Jesulindo. N, Gu. G, Beltz. W.Waghorn. S, Hesselink. T, Horn. N, Hedley. J, Rysz. B, Kjaer. L, Morrissey. T, Minde. J

Kenya Plant Health Inspectorate Service (KEPHIS), P. O. Box 49592-00100, Nairobi, Kenya

Corresponding author email: makathima@kephis.org

Presenter: Makathima. F

Abstract

In 2016 the International Plant Protection Committee's (IPPC) Commission on Phytosanitary Measures (CPM) endorsed a Sea Container Complementary Action Plan (SCCAP) to reduce the pest risks associated with sea containers. The SCCAP includes measures to increase awareness of pest risks as well as monitor the uptake and measure of the impact of, the International Maritime Organisation/International Labour Organisation/United Nations Economic Commission for Europe Code of Practice for Packing of Cargo Transport Units (CTU Code) on container contamination. An IPPC Sea Container Task Force (SCTF) was established to supervise the implementation of the SCCAP. As part of its mandate, the SCFT has developed guidelines for conducting sea container cleanness survey and inspection. The purpose of this document is to guide Nation Plant Protection Organizations (NPPOs) in selecting a statistically valid container- sample size and provide instructions on how to inspect and record bio-contamination data in a consistent and measurable manner within a country and across countries. The guideline covers the following areas: determination of the study population, inspection procedures on internal and external surfaces of a container, report and record keeping, general instructions, and work health and safety. The sea container cleanness survey form and the sample size container contamination prevalence matrix are also provided in the document. The data collected will be used to assess the impact of the CTU Code and the level of phytosanitary risk posed by the sea containers in respective countries. The results will also assist in determining further complementary actions to be included in the SCCAP.

Key words: IPPC, CTU, NNPPO, SCCAP, SCFT, CTU

Implementation of track and trace system for enhanced control and regulation of imported consignments with Phytosanitary concern

***J. Syanda**

Kenya Plant Health Inspectorate Service (KEPHIS) P.O Box 49592 Nairobi Kenya

Corresponding author email: jsyanda@kephis.org

Presenter: Josiah Syanda

Abstract

Detection and identification of imported consignments with Phytosanitary concern is the first basic step of performing import control and quarantine regulation in phytosanitary systems. However, most phytosanitary agencies at points of entry and exit experience difficulties in ensuring 100% detection of such consignments. Failure or reduced levels of detecting consignments with phytosanitary concerns increases risks of pest introduction into a country. To mitigate against this threat at Kenya's main sea port Mombasa, the Kenya Plant Health Inspectorate Service (KEPHIS) implemented a track and tracing system. Information of impending consignment arrival is obtained from the Kilindini Waterfront Terminal Operating System (KWATOS) owned and operated by Kenya Ports Authority and the Kenya National Single Window System (KENSWS owned and operated by Kenya National Trade Network (KENTRADE). KWATOS provides data on Vessel schedules and the bill of lading while KENSWS provides specific consignment description. The data is combined organized, analyzed and a schedule of expected consignments drawn to prepare for inspection and quarantine regulation. The schedule is used at the functional control areas which includes the physical inspection, the accounts and the documents endorsement. Implementation of the system has enhanced KEPHIS regulatory control of imports and quarantine measures. The system has narrowed the gap where importers would ordinarily import without going through the regulatory process. Using the track and tracing system, KEPHIS has initiated smart inspections where prior and preliminary document inspection is done before consignment arrival. Pre-arrival document inspection enables higher confidence levels in detection of consignments with phytosanitary concerns and facilitation of safe trade.

Key words: KEPHIS, KENTRADE, KENSWS, consignments, Safe trade

Post-release monitoring of quarantine seaweed (*Kappaphycus alvarezii*) in coast region of Kenya

Kosiom T. [1*], Mbae C[1]., Koome F[1]., and Macharia I[1].

[1] Kenya Plant Health Inspectorate Service (KEPHIS), P. O. Box 49592-00100, Nairobi, Kenya

Corresponding author email:tkosiom@kephis.org

Presenter: Thomas Kosiom

Abstract

Kappaphycus alvarezii (Doty) Doty ex Silva (Rhodophyta: Solieriaceae) is economically important red tropical seaweed highly demanded for its cell wall polysaccharide, being the most important source of n-carrageenan in the world. This compound has high commercial value as it is used in gelling, stabilizing and viscosity building agent in many industries. However, if not regulated, red algae has been reported to spread outside its cultivation sites, negatively impacting on the ecosystem by outcompeting native species, destroying habitats for other marine organisms and introducing alien pathogens. In Kenya, *K. alvarezii* was first introduced in 2010 under strict quarantine requirements and procedures that included dossier evaluation, environmental impact assessment, inspection and approval of the site was carried out by KEPHIS, issuance of plant import permit and monitoring of quarantine facility. The monitoring results showed that the seaweed was not posing any threat to marine ecosystem and it was released for commercialization in 2015. However, due to high sensitivity of *K. alvarezii* to environmental factors including high surface water temperatures and associated epiphyte and disease infection, many farmers found it harder to cultivate than the less popular *Eucheuma denticulatum* (spinosum). This resulted in high mortality rates in all the sites almost entirely wiping out the seaweed. Three years of post-release monitoring results show that *K. alvarezii* does not pose any threat to the marine ecosystem. Further monitoring is ongoing at the release sites and surrounding areas for early detection of invasiveness and subsequent emergence response measures.

Key words: Seaweed, invasiveness, monitoring, *Kappaphycus alvarezii,* red algae

Quality of mangoes exported from Kenya and strategies for compliance to international market requirements

Kivi A.[1] Macharia I.[1] and Kiambi D.[1]
Kenya Plant Health Inspectorate Service (KEPHIS), P.O Box 49592-00100 Nairobi, Kenya
P.O Box 49592-00100 Nairobi, Kenya
Corresponding author Email: akivi@kephis.org

Presenter: Kivi A

Abstract

Mango is one among the most exported fruit from Kenya. The country has been exporting unprocessed and processed mangoes to European Union (EU) and other international markets. In the year 2014, several consignments of unprocessed mangoes were intercepted in EU due to presence of fruitflies. Since then, the country stopped the export of mangoes to the markets. The objective of this survey was to establish the quality of mangoes exported from Kenya three years after the EU ban and to establish a protocol for certification that will ensure compliance to international markets requirements in reference to fruit flies and mango seed weevils. Fruitfly traps were installed in sixteen farms in Makueni County. Data for adult fruitflies was collected, recorded and analyzed. Samples of mango consignments, 162 in number, at exit point (JKIA) being exported to middle east and other countries other than EU were also collected from 14 companies. The mangoes consignments originated from Makueni and Machakos Counties where farmers employ use of pesticides as pest management practice. Samples were incubated for ten days and data on number of adult mango seed weevils and fruitflies larvae taken. In Makueni County 25% of farms were found to have fruit flies (*Bactrocera invadens*). At the point of exit, 3% of samples were found to be infested with mango seed weevil and 0.1% with fruit fly larvae of *Bactrocera dorsalis*. From these observations it was established that post harvest grading and quality control was able to reduce fruitflies and mango seed weevil to a level that could guarantee pest free mangoes from Kenya a reason of reduced infestation at the point of exit. However, presence of 3% of infested mangoes fruits by mango seed weevil call for further action that would guarantee pest free mango fruits. The general conclusion from this survey was that development of a protocol which will incorporate aspect of sustainable pest management at farm level including use of traps, cultural practices, proper sorting & grading at packhouse level to ensure quality and inspection by KEPHIS would guarantee pest free mangoes for export from Kenya hence compliance to international market requirements.

Key words: Mangoes, fruitflies, mango seed weevil, mango export certification protocol, compliance to international markets requirements

Evidence of avocado infestation in the field by fruit flies (Tephritidae) at Kandara, Murang'a County, Kenya

Mulwa, J.[1], Karanja, T.[3], Momanyi, G.[4], Kyalo, G.[5], Matolo, N.[1] and Kasina, M [2]

[1]Kenya Agricultural and Livestock Research Organization (KALRO)-Kabete, P.O. Box 14733-00800 Nairobi, Kenya
[2]National Sericulture Research Centre, Kenya Agricultural and Livestock Research Organization (KALRO), P.O. Box 7816-01000 Thika, Kenya
[3]Ministry of Agriculture, Plant Protection Services Division (MoA – PPSD/SDCD), P.O. Box 14733-00800 Nairobi
[4]Kenya Plant Health Inspectorate Service (KEPHIS), P.O. Box 49592 Nairobi, Kenya
[5]Horticultural Crops Directorate (HCD), P.O. Box 42601-00100 Nairobi

Corresponding author email: josemulwa0009@gmail.com | Muo.Kasina@kalro.org

Presenter: Mulwa. J

Abstract

Fruit flies (Tephritidae) are phytosanitary pests of economic importance worldwide. Fruit infestation by both native and exotic fruit flies result to reduced market access, impacting negatively on family incomes and country foreign exchange. This larval surveillance study was carried out in Kandara Sub County, Murang'a County from September, 2013 to February, 2015. Fruits were sampled on avocado orchards, both market ready fallen and incubated in the lab under room temperature to allow for pest development to adult. Further, other fruit types were collected and incubated alongside avocado fruits. Fruit inspection was done twice weekly for larva, pupa and adult fruit flies emergence. From the results, *Bactrocera dorsalis, Ceratitis spp,* and *perilampsis spp* were recorded. *Bactrocera dorsalis* and *Ceratitis* spp. emerged from guava, loquats and mango. Coffee berries hosted *Ceratitis spp* and *Perilampsis spp.* There were no infestations on avocado fruits harvested from the tree by any fruit fly species. However, only *Ceratitis spp* emerged from fallen avocado fruits. This study therefore confirms that avocado is not a natural host of *B. dorsalis* and field infestation does not occur. It also confirms that export-grade avocado is not infested by fruit flies and therefore any further phytosanitary treatments may not be warranted. It is therefore concluded that fruit flies should not be used as technical barrier to trade for avocado fruits from Kenya.

Key words: *Bactrocera dorsalis*, *Ceratitis capitata*, *C. cosyra*, *Perilampsis spp*, phytosanitary

Export Controls for Fruits and Vegetables in Uganda

Niyitegeka B., E[1] and Tumuboine E[1]
[1] Ministry of Agriculture, Animal industry and Fisheries. P. O. Box 102, Entebbe.

Corresponding author email:blairemmanuel@gmail.com

Presenter: Niyitegeka B

Abstract

Ugandas' export earnings from fruits and vegetables to regional and international market total $90 million annually. Among these commodities; *Capsicum, Momordica*, aubergine and mangoes face phytosanitary challenges especially in the European Union. According to Uganda Export Promotions Board, earnings from Capsicums (peppers) dropped from $1.74m in 2013 to $573,000 in 2014 due to detection. A system has been designed to minimize the noncompliance along the value chain. The critical controls points program including, registration of exporters and producers, regular audit of the exporters plant health control systems and pre-export inspection has resulted into tremendous outputs. Exporter registration is done after acceptance of the application. Several traceable elements are included such as recommendation from Uganda Export Promotion Board, evidence of permit to operate business in Uganda, available source of supplies for export and adherence to food safety handling of food products. The accepted applications are further audited to ensure compliance according to the submitted information. In particular, the exporter must show evidence of understanding the phytosanitary market requirements of the destination market and record keeping. Phytosanitary controls begin from the fields and involve farm verification inspection. This is done on pest management records and traceability at farm level. Pre-export examination by inspector is done immediately after harvest and observations recorded in the harvest inspection form. The National Plant Protection Organization (NPPO) has established a public private partnership that requires company staff to check phytosanitary attributes of fruits and vegetables three times at packing facility. The requirements include pre-processing inspection, inspection during grading and after packaging. Records for these inspections are sent to the NPPO at application for inspection. At exit points, inspection of consignments and documentation ensures that fraud is minimized by exporters. The system has reduced noncompliance with phytosanitary requirements to a minimum.

Key words: Export, Vegetable, Market, NPPO, Inspection, and Phytosanitary

New EU Plant Health Regulation

Morag Webb
The Europe-Africa-Caribbean-Pacific Liaison Committee (COLEACP)-Belgium
Corresponding author email: morag.webb@coleacp.org

Presenter Morag Webb

Abstract
The new EU Plant Health Regulation (EU 2016/2031) was introduced on 13 December 2016. It is a major overhaul of the existing EU Plant Health legislation, which has been in place since 1977, and repeals and replaces the seven existing Council Directives on harmful organisms (HOs). The aim is to have common rules at the EU level for the production, inspection, sampling, testing, import, movement and certification of plant material, as well as the notification, detection, and eradication of pests that the plant material might host.
The new regulation is not fully applicable until 14 December 2019. In the meantime, the current Directive 2000/29/EC, and annexes III and IV, remain in force. The details on how the new regulation will be applied and implemented will be issued through a series of delegated and implementing acts between now and December 2019. The new regulation takes a more proactive approach that focuses on the prevention of entry or spread of plant pests within the EU. This involves rules for surveillance, eradication, and import. It is based on the conclusion that, to avoid future harm to EU agricultural production or the environment, more resources need to be invested at an early (preventative) stage.
While the import of most plants and plant products from non-EU countries will in principle be allowed, they will be subject to more stringent conditions, and there will inevitably be some consequences for exporting countries. The short timescale means that operators in the fresh produce sector, and plant health competent authorities, need to start preparing for the new regulation as soon as possible

Key words: EU, EC and Regulations

Assessment of pests incidence, pesticide use and application practices on tomato production in Bungoma County, Kenya

Michael Barasa*, Ruth Kahuthia-Gathu, Maina Mwangi and Waceke Wanjohi

Department of Agricultural Science and Technology, Kenyatta University, P O Box 43844-00100; Nairobi, Kenya

Corresponding author email: mimimike1234@gmail.com

Presenter*:* Michael Barasa

Abstract

Tomato *Solanum lycopersicum* L. is an important crop in Bungoma County, Kenya. A survey was carried out in Sirisia, Bumula and Mt Elgon Sub-Counties to investigate major pests that hinder tomato production and their management practices. The study aimed at establishing farmers' knowledge on major arthropod pests and the pesticides used to control them. A structured questionnaire was used to collect data from ninety randomly selected farmers who were distributed in the study areas. Data collected included prevalence of pests, pesticides usage and frequency of application in tomato production. The major pests reported in study areas were leaf miner moth *Tuta absoluta*, thrips *Frankiliniella occidentalis*, whiteflies *Bemisia tabaci*, red spider mites *Tetranychus* spp., African boll worm *Helicoverpa armigera* and aphids *Aphis gossypii.* The study showed that the pesticides used in the areas included pyrethroids, organophosphates and carbamates. These included Lambda-cyhalothrin, Imidacloprid, Mancozeb, Acephate, Flubendiamide and Alpha-Cypermethrin. On the frequency of application, it was found that 100.0% of respondents in Sirisia Sub-County applied chemicals weekly while 10.0% and 6.9 % respondents in Bumula and Mt Elgon Sub-county respectively applied twice a week. It was also found that 26.8%, 17.2% and 10.0% of respondents in Sirisia, Mt Elgon and Bumula respectively, used more than one pesticide in one application. The study showed that 53.7% of the respondents in Sirisia Sub-county indicated that the pesticides used were effective while 60.0% and 58.6% of the respondents in Bumula and Mt Elgon respectively reported that they were ineffective. It was also found that 2.4 % of respondents in Sirisia Sub-County used bio-pesticides as alternative to synthetic pesticides. The study therefore recommend for increased awareness on the appropriate pesticide use and the frequency of application on tomato production

Keywords: Tomato, pests, management, pesticides, bio-pesticides.

Management of crown gall disease in the production of flower cuttings in Kenya

Magdalene Wanza

Kenyatta University, P. O Box 43844-00100, Nairobi, Kenya

Corresponding author email: Magdalenep3@gmail.com

Presenter: Magdalene W

Abstract

Flower cuttings production in Kenya faces challenges in the marketing stage because of crown gall disease caused by *Agrobacterium tumefaciens*. Although crown gall is not a quarantine disease in Kenya, strict regulations in the markets require that flower cuttings be free of the disease. The disease causes great financial loss in the nursery when large numbers of plants are affected. So far, losses of up to 80% have been recorded in nurseries. Crown gall disease can move systemically throughout the root system and destroy the plants completely. The disease is spread through infected substrate, planting materials, and pruning, budding and grafting tools. Highly infected production areas do not attain their production potential and often the plants have to be uprooted. So far, there has been no conclusive research on effective management strategies of crown gall in the production of flower cuttings. Chemicals have been largely used in the past for management of diseases, however, this is changing due to worldwide concern on the risk to the environment and health due to occupational exposure, and residues on food as well as in drinking water. This paper will highlight ongoing research to come up with better management strategies to minimize pesticide use in production of flower cuttings. The management strategies being evaluated include use of oils, foliar fertilizers, bio-pesticides, chemical pesticides and Electro-Chemical Activated water (ECA water).

Key words: *Agrobacterium tumefaciens*, ECA water

Distribution and management of the invasive Papaya Mealybug, *Paracoccus marginatus*, in Kenya

Macharia.I, Kimani.E, Syanda.J, makathima.F, Kosiom.T, Heya.H,

Kenya plant health inspectorate service (KEPHIS) PO Box49592-00100, Nairobi, Kenya
Corresponding author email: imacharia@kephis.org

Presenter: Makathima F

Abstract

The papaya mealybug, *Paracoccus marginatus* Williams and Granara de Willink (Hemiptera: Pseudococcidae), a serious invasive pest affecting horticultural crops, was first reported in Kenya in 2016 at Kwale, Mombasa, and Kilifi Counties of the coastal region. A series of studies were conducted to establish its identification, distribution, host ranges and management at the coastal region. The papaya mealybug was found to infest papaya (*Carica papaya*), cassava (*Manihot esculenta*), chili pepper (*Capsicum annuum*), guava (*Psidium guajava*), mango (*Mangifera indica*), and eggplant (*Solanum melongena*) in these studies. In the first study, an average yield loss of 91% on papaya crop was reported in the affected farms. Due to robust pest management strategies that were put in place by KEPHIS, subsequent studies have shown significant reduction on yield losses- with some farms reporting zero losses on papaya crop. The pest has not spread beyond the coast region where it was first observed.

Key words: Papaya Mealybug, invasive, *Paracoccus marginatus*

Effect of quality of farm saved cowpea seed on bacterial blight and dry grain yield

Njonjo M.W, [1] Muthomi J.W.[1] and Mwang'ombe A.W.[1]

[1]Department of Plant Science and Crop Protection, University of Nairobi P.O Box 29053-00625, Nairobi, Kenya

Corresponding author email: wanjikunjonjo2015@gmail.com

Presenter: Njonjo M.W

Abstract

Most cowpea farmers use seed of uncertified source which include markets and farm saved which are characterised with of unknown quality. Contamination of such seeds with impurities and disease causing pathogens is common leading to reduced field establishment and high incidences of seed borne diseases. The study was carried out to evaluate the effect of quality of farm saved cowpea seed crop establishment, incidence and severity of bacterial blight, and dry grain yield. Cowpea seeds collected from farmers and local markets together with certified seeds of varieties M66, K80 and KVU were evaluated in field experiments at two sites. Seedling emergence, plant stand, incidence and severity of bacterial blight and dry grain were determined. Farm saved seed had reduced seedling emergence and plant stand by up to 16.7% and 18.2% compared to the certified seeds. Incidence of bacterial blight was highest in market sourced seeds which had an incidence of o 11.4% compared to certified seeds. The mean grain yield, dry matter yield of farm saved and market sourced seeds reduced by up to 29.8% and 41.9% respectively compared to certified seeds. Seeds per pod, pod length and a 1000 seed weight were not affected by the seed quality. The result shows that seed source has effect on seedling emergence, dry grain and dry matter yield which are of importance to farmers. Therefore farmers are advised to use certified cowpea seed to achieve maximum yields.

Key words: Farm saved seed, seed quality, seed borne diseases, seedling vigour, Vigna unguiculata

Effect of time after incorporation of lablab green manure on establishment of common beans

Oliver. O[1*], Muthomi. J[1], Narla. R[1], Ojiem. J[2], Nderitu. J[1]

[1]Department of Plant Science and Crop Protection, University of Nairobi, **P.O. Box 30197**, Nairobi, Kenya

[2] Kenya Agricultural Livestock and Research Organization (KALRO), P.O Box 1490, Kisumu, Kenya

Corresponding author email: oliverotieno182@gmail.com

Presenter: Oliver.O

Abstract

Green manure contributes to soil nutrient pool through mineralization of decaying biomass thereby promoting soil fertility and improved crop production. However, undecomposed plants residues have been reported to reduce crop establishment and plant stand. Therefore, there is need to determine the appropriate time for green manure incorporation before planting. The effect of time after incorporation of lablab green manure on root rot of bean and crop establishment was evaluated in field by incorporating lablab green manure at 0, 7, 14, and 28 days before planting. Soil samples were collected from experimental plots before and after incorporation of the green manure at planting, and at two, four and six weeks after planting. Crop emergence, plant stand, root rot incidence and severity, population of root rot pathogens and yield were measured. Incorporation of lablab residues 28 days before planting resulted in improved 90% germination and crop stand with corresponding reduction in root rot incidence and severity by 8% and 36% compared to plots where green manure was incorporated at planting. Incorporation of green manure at planting was found to stimulate the population of root rot pathogens which included *Fusarium solani, Fusarium oxysporum* and *Pythium ultimum*. However, it reduced the population of saprophytic microorganisms such as *Aspergillus, Trichoderma,* and *Penicillium* and also reduced grain yield by up to 71% compared to plots where green manure was incorporated 28 days before planting. The results of the study showed that increasing the time after incorporation of green manures before planting will allow proper decomposition and reduction in root rot incidence but increased grain yield.

Keywords: Soil health, green manures, *Lablab purpureus*, soil borne pathogens

Phytosanitary challenges facing Irish potato farmers in Uasin Gishu & Elgeyo Marakwet counties, Kenya

Boit J, Kivaya D and Dr.Macharia
Kenya Plant Health Inspectorate Service (KEPHIS)-P.O BOX 49592-00100.Kenya

Corresponding author email:jboit@kephis.org
Presenter: Boit J

Abstract

Despite Irish potato being an economic important crop in Kenya, ware potato suppy is constrained by unavailability of certified seeds, among the most limiting factors to potato yields are diseases. Bacterial wilt (caused by Ralstonia solanacearum) has spread to all potato growing areas in Kenya, affecting over 70% of potato farms and causing yield losses of between 50% - 100%; followed by late blight affecting 67%, viral diseases (12%) and the potato cyst nematode. Bacterial wilt disease was first reported in Kenya in 1945 around the Embu area from where it spread to other parts of the country. The disease is believed to have been introduced with tuber seeds imported from Europe. In potatoes, the bacteria is tuber borne and is primarily disseminated through infected seed tubers. It is further spread through infected run-off water or soil adhering to tools and shoes. Infected seed tubers from bacterial wilt infested areas have mainly contributed to the spread of the disease to many potato producing areas in Kenya; this is mainly a consequence of the informal potato seed system prevalent in the country. Currently over 38 potato varieties have been released in Kenya courtesy of collaborative work between Kenyan and Netherlands breeds. Despite these national certified seed requirement is still not adequate to meet the ever growing demand thus most farmers are forced to plant seeds from informal sources such as farm-saved (self-supply), local markets or neighbours. Farmers also perceive that certified seeds are highly priced thereby discouraging most small scale farmers from using them. With no option, potato growers continue using planting material from informal sources. With informal sources, seed quality cannot be assured. The situation has however improved due to enhanced official controls at Kenyan borders. Before uncontrolled and/or illegal cross border trade was prevalent; goods could cross borders un-inspected. In addition to the prevalence of informal seed systems, farmers are unaware and/or are unable to apply affective measures for the control of bacterial wilt. Farmers have been sensitized on control measures of most pests and diseases that have over the years posed challenges in commercial production of Irish potato. KEPHIS has instituted measures to address some of the pest concerns. One milestone that KEPHIS succeeded over the years is to make bacterial wilt a regulated non quarantine pest. The disease is prevalent at Keiyo south sub county and Elgeyo Marakwet County and most areas of Ainabkoi sub county Uasin Gishu County

Key words: KEPHIS, irish potato, *Ralstonia solanacearum*, Bacteria

Leveraging ICT tools and Earth Observation Satellite data for early warning of pest outbreaks: Extension and Pest Risk Information in Africa

Oronje M.L., Agwanda C., Finegold C., H. Ruffhead, Chacha, D., Oppong-Mensah, B., Phiri, N
Centre for Agriculture and Biosciences International (CABI), Canary Bird, 673 Limuru Road, Muthaiga. P.O Box 633-00621, Village Market, Nairobi, Kenya.

Corresponding Author email: M.Oronje@cabi.org

Presenter: Oronje M.L

Abstract
High demand for plant health information coupled with rising unexpected pest outbreaks and new invasion makes traditional agricultural extension approaches inefficient and at times redundant. The scenario is expected to worsen as the production environment becomes more unpredictable as a result of climate change. Innovative, efficient and timely ways of reaching the small scale farmers with relevant information is therefore critical. Currently CABI and its partners are addressing this challenge through the plant health networks operated through the plant clinics. CABI recognises the unpredictability of small scale production systems and together with partners in Kenya, Ghana and Zambia, is developing a Pest Risk Information Service (PRISE) that uses state-of-the-art crop and pest modelling techniques to provide Extension officers and plant doctors with advanced warning of a damaging outbreaks and appropriate advice on mitigation responses.PRISE models the risk to crop health due to insect pests using Earth Observation satellite data, climatic data, and observations on crop growth, to provide a risk levels and relevant mitigation measures to extension officers/plant doctors and farmers in specific defined regions. Field observations and validations are targeting Fall Armyworm (*Spodoptera frugiperda*), bean fly (*Ophiomyia phaseoli*), whitefly (*Bemisia tabaci*), *Liriomyza* spp, cocoa mirids (Sahlbergella singularis) Tomato leafminer (*Tuta absoluta*), maize stalk borers (*Busseola fusca*) and stem borers (*Chilo partellus*). Using pest population models, the pest risk information is shared via social media networks including Telegram and the plant clinic networks as early warning information which is key in successful pest management.

Key words: Early warning, pest outbreaks, pest management, pest risk information, plant clinics

Role of KEPHIS in Promotion and dissemination of quality seed for sweetpotato

Florence Munguti, M. Mwangangi, A.Edith, E.Ngundo, I. Obare, S.Ngare S. Kivuva, J.Nyapur and S.Khisa.

Kenya Plant Health Inspectorate Service (KEPHIS), P.O.Box 49421-00100, Nairobi, Kenya
Corresponding author e-mail: fmunguti@kephis.org

Presenter: F Munguti

Abstract

Sweetpotato production and exchange of planting material is on the rise in Africa. This growth is driven by increasing awareness about the benefits of sweetpotato, in particular the vitamin A rich orange-fleshed varieties. However, increased production requires timely access to increased quantities of disease-free planting material. KEPHIS through collaboration with the International Potato Center (CIP), and in particular under the Sweetpotato Action for Security and Health in Africa (SASHA) II Project is producing virus-free tested pre-basic sweetpotato planting materials to multipliers who bulk for subsequent sale to root producers. The starter materials undergo virus indexing at KEPHIS ISO 17025 accredited laboratories. The materials found to have viruses are taken through virus clean-up process involving thermotherapy and meristem tip culture after which they are multiplied *in-vitro*, hardened in the screen houses for further multiplication. Through the project, KEPHIS has managed to distribute over 150,000 clean pre-basic sweetpotato cuttings to decentralized vine multipliers (DVMs), for multiplication and subsequent sell to root producers. The project has seen a strengthened linkages and enhanced coordination between seed system stakeholders through the demand projection workshops. Initiatives like the revolving fund business model being implemented in the sweetpotato pre-basic production can be adopted for other crops for sustainable production of clean planting material to enhance food security.There is therefore need for more innovative ways to enhance marketing for the sweetpotato products as well as on the benefits of using clean planting materials.

Key words: sweetpotato, decentralized vine multipliers, virus indexing

Application of electronic phytosanitary certification (ePhyto) for enhanced phytosanitary compliance

J. Syanda , Isaac Nyateg , P. Ulare , Macharia I

Kenya Plant Health Inspectorate Service (KEPHIS) P.O Box 49592 Nairobi Kenya

Corresponding author email: jsyanda@kephis.org

Presenter: Josiah Syanda

Abstract

Over the last two decades, National and Regional Plant Protection organizations have pursued different innovative options to mitigate phytosanitary noncompliance risks. Adoption of electronic phytosanitary certification known as ePhyto has attracted global acceptance. ePhyto is an electronic equivalent of the paper phytosanitary certificate. Agricultural consignments moving in international trade must be accompanied by a phytosanitary certificate also known as plant passport. The plant passport is issued by a competed authority of the exporting country as an attestation to the importing country that import requirements and conditions have been fulfilled. EPhyto has been viewed as a more secure and faster method of exchanging phytosanitary information between countries. In the current model, a paper certificate is issued by the exporting country but it is conveyed to the importing country through various methods of transport. Some of the methods exposes the certificate to defacing, loss of integrity, alteration, delays among others. Adoption of the ePhyto by trading partners is seen as the future for ensuring safe trade and efficient movement of agricultural consignments.
The international Plant Protection Convention (IPPC) has taken a leading role in providing an electronic certificate (ePhyto) exchange platform, the ePhyto hub. In 2016, the IPPC initiated development of ePhyto hub for secure and safe transmission of phytosanitary data. Kenya is one of the 8 countries taking leading role in piloting of ePhyto initiative. Preliminary tests and proof of concept carried between January and March 2018 on ePhyto hub has shown that ePhyto is the solution for the future.

Key words: Electronic phytosanitary certification, IPPC

Effect of Hot Water Treatment on Sugarcane Ratoon Stunting Disease, Cane Yield and Quality

Esther S. Philip[1], James W. Muthomi[1], R. D. Narla[1] and G. M. Riungu[2]

[1]Department of Plant Science and Crop Protection, University of Nairobi
[2]Sugar Research Institute (SRI), Kenya Agricultural and Livestock Research Organisation

Corresponding author e-mail: sheilaesther@yahoo.com

Presenter Esther .S.P

Abstract

Sugarcane ratoon stunting disease (RSD) caused by bacterium *Leifsonia xyli subsp xyli* causes huge losses to sugarcane ratoon crops. Hot water treatment is commonly used in many countries to control RSD but conflicting results show that it may have either positive or negative effects on yield based on variety, temperature and duration of therapy. Effect of hot water treatment in management of RSD was determined on three sugarcane varieties (CO421, D8484, KEN 83737) at 45°C, 50°C, 52°C and 55°C for two hours. Control cane was treated with cold water at room temperature at 25°C. The treated cane was planted in the field and data collected included cane girth, cane height, number of millable stalks, cane weight and sucrose content. Hot water treatment at 45°C, 50°C and 52°C significantly reduced RSD and increased cane yield while treatment at 55°C completely eliminated RSD but significantly reduced cane yield. The cane setts which were treated with cold water at 25°C were stunted and had low overall cane yield. Hot water treatments at 50°C was the most effective and produced the highest cane yield followed closely by treatment at 52°C. Therefore the two temperatures are hereby recommended for management of ratoon stunting disease of sugarcane. Treatment of sugarcane setts at high temperatures of 55°C for two hours though effective in reducing RSD is harmful through reduction in germination of setts and thus total plant population and eventually low cane yield.

Key words: Cane quality, Hot water treatment, *Leifsonia xyli subsp xyli,* Sugarcane ratoon stunting

Management of bacterial wilt (*Ralstonia solanaceerum)* in tomato (*Solanum lycopersicum* L.) using resistant African eggplant *(Solanum spp)* rootstocks

T. NIKUZE[1], E. M. ATEKA[1], J. AMBUKO[2] AND W. O. OWINO[1]

1. Jomo Kenyatta university of Agriculture and Technology (JKUAT) P. O. Box 62,000 Nairobi
2. University of Nairobi. P.O Box 30197, GPO, Nairobi

Presenter: T. Nikuze

Abstract

In Kenya, tomato (*Solanum lycopersicum* Mill.) production is produced by small and medium scale farmers as a cash and food crop. It is however susceptible to numerous soil-borne diseases like fusarium wilt (*Fusarium oxysporum* Schlecht. f. sp. melongena), bacterial wilt (*Ralstonia solanacearum)* and verticillium wilt (*Verticillium dahliae*). Bacterial wilt (BW) is the most devastating problem in tomato production. Use of resistant varieties is the only assured way to controlling crop losses from bacterial wilt but little has been achieved. The present study was carried out to evaluate phenotypic reaction of African eggplant accessions to BW and determine genetic markers for resistance to *Ralstonia solanacearum*. Fifty three African eggplant accessions collected from the Asian Vegetable Research and development center-regional center for Africa (AVRDC- RCA) in Arusha Tanzania, were planted in sick plots and also artificially inoculated for two seasons. A scale of 1-5 was used to score diseases severity. Thirteen accessions and nine accessions in season 1 and 2, respectively showed BW symptoms (wilting of lower leaves) fourteen days after transplanting (DAT) in the field while it took twenty one days after inoculation for wilting to occur in greenhouse. Bacterial colonies showed typical characteristics of *R. solanacearum*. Although none of the accessions appeared resistant, there were significant differences in bacterial wilt severity among the accessions. Accessions in naturally sick plots manifested wilting symptoms compared to artificial infection, thus no significant difference. Latent infection was exhibited in a number of accessions with BW colonization of vascular elements with no wilting symptoms. All accessions that had low disease severity and incidence carried resistant markers. Eggplant is a good source of resistant genes to BW. These accessions could be used as rootstocks in management of bacterial wilt of tomato.

Key words: *Ralstonia solanacearum* (bacterial wilt), *Solanum lycopersicum*, African eggplant *(Solanum spp)*, resistance

Influence of Seed Source and Production Practices on Quality of Soybean (Glycine max) Seed

Ochran M. K.[1], Muthomi J. W.[1], Narla, R. D.[1], and Ochuodho J. O.[2]

[1]University of Nairobi P.O. Box 30197, GPO. Nairobi, Kenya

[2]University of Eldoret P. O. Box 1125-30100, Eldoret, Kenya

Corresponding author email: ochran.mutai@gmail,com

Presenter: Ochran M

Abstract

Majority of farmers growing legumes use and recycle seeds from informal sources for the next crop. The quality of such seeds is unknown and usually ends in accumulation of pest, diseases and reduced yields. This study was carried out to determine production practices and quality of soybean seeds obtained from informal sources in Busia County. A survey was conducted to collect information on soybean production practices, source of seeds and post-harvest handling. Seed samples were collected from farmers, local market and agro-dealers. The seeds were evaluated for purity, seed coat damage, germination, vigour and infection. Majority (48%) of farmers in Busia County used farm saved seeds while29% and 23% of farmers used seeds from community based organizations and local markets, respectively. About 80% of the farmers did not treat seed before storage or during planting. Almost 15% of the farmers reported poor germination and disease incidence as problems associated with using farm saved seeds. Soybean rust (*Phakospora pachyrhizi*) was the most prevalent disease reported by farmers. Most of the farmers (92%) used inappropriate threshing techniques like beating with sticks and 81% sold their produce to the local markets and fellow farmers for general purpose. Roughly 68% stored soybean for three months only. Seeds from informal sources had low purity, higher seed coat damage and infection as compared to certified seeds. The physical purity of seeds from the informal sources did not meet the recommended standard of 98% however their germination is comparable to 75% germination standard. Farmers therefore, should be advised to adopt use of certified seeds and appropriate handling techniques.

Keywords: *Glycine max*, informal seed systems, seed quality, seed production

Role of KEPHIS in safe handling, transfer and use of GMOs

M.Wanjiku, S.Ngare, I. Obare and Allan Paul

Kenya Plant Health Inspectorate Service, P.O.Box 49421-00100, Nairobi, Kenya
Corresponding author email: mwanjiku@kephis.org

Presenter: M. Wanjiku

Abstract

Genetically modified organisms (GMOs) are novel organisms created using genetic modification/engineering techniques. A selected gene(s) is inserted into or deleted or silenced from the cells of a plant and all future generations of that plant will contain or lack that gene. All countries that are signatory to the Cartagena Protocol on Biosafety, require to put in place mechanisms to regulate GMOs. As a regulatory agency under the Biosafety Act, KEPHIS together with the lead Agency - National Biosafety Authority (NBA), regulates safe handling, transfer and use of plant genetic modified materials in Kenya. KEPHIS has been involved in the trials of GMOS since the 1990's when modified plants were first tried in the country. The institution also played a critical role within the National Biosafety Committee, Institutional Biosafety Committees and now the National Biosafety Authority as a regulatory agency. A laboratory for screening plant material was established since 2005 and continues to serve with an expanded mandate. KEPHIS issues plant import permits after NBA has approved importation of GMOs. Currently only permits for trials are issued. To ensure plant import permits are used to import only the GMOs that have been approved by the NBA, an advisory is included in every import permit to direct applicant to the NBA in case they intent to import GMO. Annual surveillance and analyses of samples for qualitative is undertaken to confirm presence of unauthorised GM. Methods used include Polymerase Chain Reaction - PCR, Any presence of GM protein beyond 1% is considered adequate to label material as containing GMO. KEPHIS conducts joint inspections of bio-containment facilities and confined field trials with NBA to ensure compliance, participates in development of ISO – Standards and review of risk assessment for applications of introduction and research of GMO. KEPHIS has developed guidelines for conducting National Performance Trials (NPT) for GMO plants.

Key words: Genetic modified organism (GMO), Kenya Plant Health Inspectorate Services (KEPHIS), National Biosafety Authority (NBA), Confined field trial (CFT))

Biological control of *Parthenium hysterophorus* weed in Kenya

Kasina, M. [1], Musyoki M. [1] and Wasilwa L.[2]

[1]National Sericulture Research Centre, Kenya Agricultural and Livestock Research Organization (KALRO), P.O. Box 7816-01000 Thika, Kenya

[2]Kenya Agricultural and Livestock Research Organization (KALRO)-HQ, P.O. Box 57811-00200 Nairobi, Kenya

Corresponding author email: Muo.Kasina@kalro.org

Presenter: Kasina M

Abstract

Invasive pests are challenging to manage particularly if their invasion is progressive and takes time before economic effects are noted. The first record of *Parthenium hysterophorus* in Kenya was more than 40 years ago. However, it was not noted as serious. It is only until less than 10 years ago that importance of this weed has increased in the country as it spreads in pasture-land, road reserves and drainage sites. At farm level, it is yet to cause outcry, probably because Kenyans understand how to manage weeds and that apart from its prolific seed production and effects on human health, it seems possible to manage. The current rains since March 2018 have exposed the country to the possibility of massive spread of this annual weed. Most pasture lands are invaded as well as road and drainage places. Therefore urgent need for its control is required. The KALRO is partnering with the Ethiopian Government and Virginia Tech University to access two biological control agents that have already been introduced in Ethiopia where the weed has had massive economic effects. KALRO is in the formative stage for the project, to develop sustainable mechanism for long term release and monitoring of the natural enemies. It is hoped that the procedure for introduction to the country will be hastened to ensure Kenya benefits from this initiative.

Key words: *Parthenium, Zygogramma bicolorata, Listronotus setosipennis*

Communicating emergency farmer friendly messages in response to Invasive Alien Species; The case of Fall armyworm in Africa

Onyango D.O., Davis T., Oppong-Mensah, B., Alokit C.

Centre for Agriculture and Biosciences International (CABI), Canary Bird, 673 Limuru Road, Muthaiga. P.O. Box 633-00621, Village Market, Nairobi, Kenya

Corresponding author email: D.onyango@cabi.org

Presenter: Onyango D.O

Abstract

The geographic spread and impact of Invasive alien species is on the rise due to climate change, increasing trade, globalization and tourism across the globe. This invasive alien species spread has increased pressure on existing natural resources, key for agricultural production hence directly affecting millions of farming communities and threatening their livelihoods. The Fall armyworm (FAW) (*Spodoptera frugiperda*) is an Invasive alien Species that was first detected in West Africa in 2016 and has rapidly spread to over 40 African countries. FAW primarily prefers feeding on maize although is known to feed on an additional 80 crop species. Yield losses up to 70% have been estimated on smallholder farms. As a result, there has been an appreciation that FAW is first and foremost a farmers' problem and farmers should play a central role in its management. Mass farmer information and capacity building initiatives have been proposed as an initial immediate response to mitigating FAW invasion, given its migratory and gregarious nature. In 2017, CABI working with in-country plant health system stakeholders conducted emergency mass communication campaigns targeting farmers in 6 African countries with timely, validated, actionable information on FAW identification, prevention and management. The campaigns used participatory and complementary mass communication channels including agricultural radio programmes, posters, factsheets and social media messages to reach over 1.3 million farmers. This supported additional efforts to manage this pest through plant health networks operated through plant clinics and plant health rallies.

Key words: Communication, Fall armyworm, Invasive Alien Species

Role of KEPHIS in mitigating impacts of emerging and re-emerging pests and diseases due to climate change

Jared Nyang'au[1,2], Alex Njugi[1] and Stephen Ahenda[1]

[1]Analytical Chemistry Laboratory, Kenya plant Health Inspectorate Service, 49592-00100.Nairobi, Kenya.

[2]Africa centre of Excellence for Climate Smart Agriculture & Biodiversity conservation,

Haramaya University, Ethiopia

Corresponding author email:jnyangau@kephis.org

Presenter: Jared Nyang'au

Abstract

Climate change has intensified the risk of catastrophic natural disasters all over the world. It influences the ecology and biology of insect pests and diseases. Increased temperature causes migration of insect species towards higher latitudes, while in the tropics higher temperatures might adversely affect specific pest species. Likely impacts of any change in climate on population of pests are manifold. They range from expansion in the geographical range, increased risk of invasion in new area, change in overwintering and over summering patterns, change in crop pest synchrony, extension of crop development season, change in pest complexes on spatial and temporal bases and finally pests management strategy. Severe and widespread climate change impacts on agricultural productivity will require adaptation through complex systemic and transformational changes in food systems accompanied by a combination of improved trade policies and shifts in diets. Kenya has experienced new and re-emerging outbreaks of pests and diseases among them the fall army worm and Maize Lethal Necrosis (MLN). The aftermath has been decreased crop production and in worst cases total crop failure. These outbreaks are partly associated with climate change as it affects plant pathosystems at various levels. Pesticides use often leads to scourges of pest resurgence, eventual resistance and secondary pest outbreaks as well as adverse effect on ecosystem and human health. KEPHIS as an institution mandated to protect Kenyan's agriculture through a science based quality assurance of agro-inputs and produce, has been involved at different levels to alleviate impacts of these pests and diseases. This has been enhanced through pest field survey and surveillance, plant health clinics, plant quarantine, release of disease resistant varieties/seeds, grading and inspection, advisory services on IPM techniques and bolstering diversification through hass avocados, potatoes and clean and highly nutritious orange-fleshed sweet potato vines. Apart from mitigation of the impacts of pests and diseases, these practices form basis of Climate Smart Agriculture as they lead to increased productivity and resilience of farmers against climate change.

Key words: Climate change, pests and diseases, Surveillance, IPM, Diversification, Resilience

Escherichia coli and *Salmonella spp* contamination of tomato marketed and consumed in Nairobi metropolis

J. H. Nguetti, J. K. Imungi, M. W. Okoth, J. Wang'ombe, W. F. Mbacham and S. E. Mitema

University of Nairobi *Science nutrition and technology

Corresponding author email: jhguetti@gmail.com

Presenter: J. H. Nguetti

Abstract

Tomato, a worldwide cultivated and consumed commodity for its nutritive values preventing illnesses is a potential carrier of *Salmonella* and *E.coli*. With pathogenic bacteria, fresh tomato contributes to diarrheal illnesses; increases disabilities and associated burden in households and communities. Seasonal microbial analyses of these contaminants were conducted from January to June 2017. The study focused on peeled tomato and only the inner side was analyzed. Anatomy of the tomato was considered and the fruit was dissected into four sections: Head; Flesh; Jelly and Bottom. Results showed the bottom as the most infected part (1.900±0.17164) followed by the head (1.711±0.256; $p < 0.05$). All fractions analyzed for *E. coli* revealed 84% contamination for the head, flesh (80%), bottom (88%) and jelly (88%). This discloses that, tomato peeled at all seasons is 85% contaminated. Only 3% of the produce peeled was contaminated with *Salmonella*. February had the highest contamination in dry season (2.977±0.03; p= 0.05). May (3.155 ± 0.1^{k}) and April (3.032 ± 0.4^{jk}) had highest infection in wet. Thus, seasons have influence on microbial contamination in tomato. Surfactants from pesticides contribute to internalization of microorganisms within the good. Heads and bottoms of tomato appeared as sections frequently contaminated with suspected pathogens. Thus, they might be seen as fractions to worry about or sections of high risk when consuming the fresh produce in dishes as salad and Kachumbari. This profiling of the vegetable can be considered as an explanation of why consumption of the same good such as tomato in salad can result on infection in some bodies and no illness in others. It discloses that, the suspects can be concentrated in some parts of the vegetable and might not follow a proportionate or equitable distribution alongside the body of the vegetable. Consumption of those highly concentrated fractions with health aggressors may injure consumers' immune system.

Key words: *E. coli, Salmonella,* vegetables, profiling

Exposure Assessment of the Kenyan population to Pesticide Residues through Vegetable Consumption

Peter Kamuti

[1]Analytical Chemistry Laboratory, Kenya plant Health Inspectorate Service, 49592-00100.Nairobi, Kenya.

Corresponding author email: pkamuti@kephis.org

Presenter: Peter Kamuti

Abstract

The output of a pesticide residues surveillance program (detection frequency and number of exceeding measures) can lead to unnecessary concern among consumers since they lack information concerning the actual exposure. In this study, the exposure to pesticide residues through vegetable consumption is evaluated based on the 2011-2016 national pesticide residues surveillance data of the Kenya Plant Health Inspectorate Services (KEPHIS). The results indicated that maximum consumers of kales exposure to residues was between 2 to 71 times higher than the corresponding acceptable daily intake (ADI) for the pesticides studied for the total population while for tomatoes consumption only chlorpyrifos exposure was more than 2 times higher than the ADI. However, it was demonstrated that cooking reduced the exposure by an average of 90%. For the probabilistic exposure assessment, results indicated that the exposure of the consumers and the general population (adults) was generally under control even at high or frequent consumption of vegetables. For most of the pesticide residues studied, the exposure is one hundred times lower than the acute reference dose (ARfD) and ADI. In the risk assessment, the results showed that occurrence of pesticide residues in vegetables could not be considered a serious public health problem. Nevertheless, an investigation into continuous monitoring and tighter regulation of pesticide residues in vegetables in the whole country is recommended. The risk assessment study, including the proposed mitigation measures, can be a valuable input for risk managers such as food safety authorities.

Key words: exposure assessment, risk assessment, pesticide residues, vegetables

Effect of phosphine fumigant on false codling moth (fcm) larvae in capsicum

Momanyi[1] G.K, Macharia[2] I., Ratemo[3] N., Egziabher[4] S.G.

[1]Kenya Plant Inspectorate Service (KEPHIS), P.O Box 49492-0001, Nairobi Kenya
[2]AAA Growers Ltd P.O Box 32201-00600, Nairobi Kenya
[3]ChemRaw EA Ltd P.O Box 47358-00100, Nairobi, Kenya
Corresponding author email:gmomanyi@kephis.org

Presenter: George Momanyi

Abstract

False Codling Moth (FCM) is an important pest in capsicum production and has been rated as a quarantine pest in the European Union (EU) since 2017. This has significantly affected export of capsicums from Africa and other countries where FCM has been reported to occur. Export of *Capsicu*m from countries where FCM occurs should be from pest free places of production or are treated using appropriate post-harvest treatment. Cold treatment has been recommended as a treatment option which is not suitable for *Capsicum* due to injury hence need for alternative treatment option. Fumigation using phosphine gas has been viewed as an alternative treatment method for fresh produce although data of it efficacy on FCM in *Capsicum* is lacking. A study was commissioned to evaluate the efficacy of phosphine gas at 23^0C on FCM in freshly harvested *Capsicum* fruits. It was observed that there was 100% larval mortality after 72 hours of phosphine exposure. Moreover, there was no immediate phytotoxic effect on capsicum due to phosphine application. This trial therefore demonstrates potential for commercial efficacy of aluminium phosphide in the post- harvest quarantine treatment of fresh capsicum fruits. There are however observations that the shelf life of the capsicums is compromised as a result of the treatment. This commercial trial therefore is in-conclusive in determination of efficacy of phosphine gas in the treatment of FCM in fresh capsicums for export purpose at ambient temperatures. Further investigation is thus needed to optimize and validate the treatment protocols. Moreover, there is need to evaluate the effect of phosphine in a range of other capsicum varieties and lower storage temperature treatment regime, efficacy against a range of life stages of FCM found on exported commodity, demonstration of probit 9 mortality level and tolerance of the fresh produce to a range of the treatment parameters that have been demonstrated to cause a high level of pest mortality.

Keywords: false codling moth, phosphine fumigation, capsicums.

First report of *Colletotrichum boninense* and *Pestalotiopsis microspora* infecting avocado fruits in Kenya

Kimaru, K. S[1*], Monda, E[2],Cheruiyot, R. C[1], Mbaka, J[3] and Alakonya, A[4]
[1]Kenyatta University, Department of Plant Sciences, P. O. Box 43844, Nairobi.
[2]Kenyatta University, Department of Microbiology, P. O. Box 43844, Nairobi.
[3]Kenya agricultural and Livestock research organisation, P. O. Box 220 Thika
[4]Jomo Kenyatta University of Agriculture and Technology, P.O. Box 62000, Nairobi.
*__Corresponding author email__: skimaru1@gmail.com

Presenter: Kimaru K

Abstract

Anthracnose disease of avocado contributes to a huge loss of avocado fruits due to post - harvest rot in Kenya. The causal agent of this disease have not been clear but presumed to be *Colletotrichum gloeosporioides* as reported in other regions where avocado is grown. The fungus mainly infects fruits causing symptoms such as small blackish spots 'pepper spots' and black spots with raised margin which coalesce as infection progresses. Due to economic losses associated with the disease and emerging information of other species of fungi as causal agent of the disease, this study was aimed at identifying causal agent(s) of the disease. A total of 80 fungal isolates were collected from diseased avocado fruits in Murang'a County the main avocado growing region in Kenya. Forty six isolates were morphologically identified as *Colletotrichum spp* based on their cultural characteristics mainly whitish, greyish, creamish colour and cottony /velvety mycelia on the top side of the culture and greyish cream with concentric zonation on the reverse side. Their spores were straight with rounded end and non- septate. Thirty four isolates were identified as *Pestalotiopsis spp* based on their cultural characteristics; whitish grey mycelium with black fruiting structure on the upper side and greyish black on the lower side, septate spores with 3-4 septa and 2 or 3 appendages at one end. Further molecular studies using ITS indicated *Colletotrichum gloeosporioides*, *Colletotrichum boninense* and *Pestalotiopsis microspora* as the causal agent of anthracnose disease in avocado. However, this being the first report, there is need to conduct further studies to establish whether there is co-infection or any interaction thereof.

Key words: *anthracnose, avocado, Colletotrichum boninense, identification and Pestalotiopsis microspore*

Moroccan Watermelon Mosaic Virus is responsible for symptoms associated Papaya Ringspots disease in Kenya

Naomi Nzilani Mumo[1], George Edward Mamati[1], Elijah Miinda Ateka[1], Fredah Wanzala[1], George Ocheing' Asudi[2], Laura Boykin[3], Joyce Njuguna[4] and Roger Pelle[4]

[1]Jomo Kenyatta University of Agriculture and Technology, P.O Box, 62000-00200, Nairobi, Kenya

[2]Kenyatta University, P.O Box, P.O Box, 43844-00100, Nairobi Kenya

[3]University of Western Australia, ARC Centre of Excellence in Plant Energy Biology and School of Chemistry and Biochemistry, Crawley, Perth 6009, Western Australia, Australia

[4]International Livestock and Research Institute BecA- ILRI hub, P.O Box, 30709-00100, Nairobi, Kenya

Presenter: Naomi Nzila

Abstract

Papaya fruit production in Kenya is severely constrained by viral disease whose symptoms of infection resemble those of papaya ringspot virus (PRSV). Attempts to detect the virus (PRSV) using PCR procedures and primers available in the literature was not successful. Designed primers from the database could also not detect the virus. The true identity of the virus was elucidated through next-generation sequencing and validated through Sanger sequencing. Complete genome sequences of Moroccan Watermelon Virus (MWMV), a potyvirus in the family potyviridae were obtained. Primers were developed from the sequences obtained and used for virus detection studies. The virus was found all elsewhere except the coastal region. The highest prevalence was found in central and some parts of Eastern. The symptoms associated with PRSV are actually associated with the MWMV. Therefore appropriate management strategies need to be devised and directed towards preventing further spread of this new virus.

Efficacy of selected bio-pesticides, polythene mulch and sticky traps in controlling *liriomyza* (diptera: agromizidae) infestation on basil

Alfayo Ombuya[1, 2], Dora Kilalo[2], Florence Olubayo[2], and Emmanuel Ariga[2]

[1]Kenya Plant Health Inspectorate Services, P.O Box 49592-00100, Nairobi, Kenya

[2]Department of Plant Science and Crop Protection, University of Nairobi P.O Box 30197-00100, Nairobi, Kenya

Correspondence: A. Ombuya, Department of Plant Science and Crop Protection, University of Nairobi, P.O. Box 30197-00100, Nairobi, Kenya

Presenter: Alfayo Ombuya

Abstract

The leaves of basil (*Ocimum basilicum*) are used to add aroma and flavor to food. The herb is also medicinal applied in the treatment of various ailments. *Liriomyza spp* attack basil reducing its market value. The study aimed at evaluating the efficacy of neem and spinosad integrated with yellow sticky traps and polythene mulch in the management of *Liriomyza spp* on basil. Eight management options compared with the untreated control were tested to evaluate their efficacy in reducing the number of leaflets damaged by *Liriomyza spp* and the number of larvae that hatched on the oviposited leaflets. The two sets of data were obtained from three tagged plants randomly selected per treatment on a weekly basis. Analysis of variance using SAS version 9.4 was done and least significant difference ($LSD_{0.05}$) pair-wise comparisons at 5% significance used to compare treatments. The treatment comprising of neem alternated with spinosad sprayed weekly with polythene mulch and yellow sticky traps significantly ($P \leq 0.05$) reduced the number of leaflets damaged and the number of *Liriomyza* larvae hatched on the infected leaves. It was observed that the integrated application of neem, spinosad, polythene mulch and yellow sticky traps is efficacious in the management of *Liriomyza spp.* This IPM tool can be adopted as an option in addressing phytosanitary incompliance, food safety, pestcide resistance and environmental concerns that occur with the use of conventional chemical pesticides in basil production systems in Kenya.

Key words: Efficacy, bio-pesticides, Leaf miner (*Liriomyza spp.)*, Basil (*Ocimum basilicum*).

Challenges for late control in sub-Saharan Africa

A. W. Njoroge

International Potato Center (CIP-SSA), Nairobi-Kenya & Department of Forest Mycology and Plant Pathology, Swedish University of Agricultural Sciences, SE 750 07 Uppsala, Sweden

Corresponding author email: A.Njoroge.cgiar.org

Presenter: A. W. Njoroge

Abstract

The greatest hindrance to sustainable late blight disease management in developing countries is farmers' decisions which are based on countless factors. Those who cannot afford control measures or have no access to seed of resistant varieties have limited ability to manage the disease. These coupled with a very dynamic late blight pathogen, *Phytophthora infestans*, has repeatedly resulted to severe crop losses with direct effects on diets and incomes. A baseline survey in East-Africa on field resistance of commonly grown potato cultivars have shown that a number of cultivars still maintains reasonable resistance to *P. infestans* even though not widely grown. We have also identified dominance of new pathogen strains by genotyping using simple sequence repeats (SSR) markers thought to have been brought in through seed importations and which could threaten host resistance currently being deployed. Simulation of late blight epidemics using the model LB2004 indicated that these new strains will cause increased difficulties in controlling potato late blight in this region. We specifically plan to use host and pathogen data from Africa to formulate an Africa Blight network that will have data in a centralized system that can be used for selection of late-blight resistant varieties.

ASIAN CITRUS PSYLLID *(DIAPHORINA CITRI)* STATUS IN CITRUS AND CURRY LEAF PRODUCTION AREAS OF KENYA

Thomas Kosiom, Isaac Macharia, Esther Kimani, Fredrick Koome, George Momanyi, and Hellen Heya

Kenya Plant Health Inspectorate Service, P.O Box 49592-00100, Nairobi, Kenya.

Corresponding author email: tkosiom@kephis.org

Presenter: Thomas Kosiom

Abstract

The Asian citrus psyllid (ACP), *Diaphorina citri* Kuwayama (Hemiptera: Psyllidae), has been reported as an important pest of citrus worldwide because it is an efficient vector of "*Candidatus* Liberibacter" species that cause huanglongbing (citrus greening disease). The psyllids have been reported to survive in different agro-ecological environment and is able to establish in lowlands. Surveillance for *D. citri* was carried out in citrus production areas in coast region of Kenya to establish its occurrence and spread. Farms were randomly selected and sampled plants were inspected for the presence of psyllids. Adult psyllids samples that were collected were identified using morphological identification keys. Survey results indicated that Asian citrus psyllids had been introduced and was spreading rapidly in Kenya. Upon its incursion in September 2016, the psyllids have rapidly spread and in December 2016, *D. citri* it was found on 7 farms out of the 13 surveyed in Kwale County more than 60km from where it was first detected. In June 2017, *D. citri* was detected in Mombasa, Taita Taveta and Kilifi Counties 24 farms out of 78 surveyed were infested. In a recent countrywide surveillance which was done in March 2018 indicated that *D. citri* was not detected in other parts of the country other than coast region.

Key words: Asian citrus psyllid, *Diaphorina citri*, citrus greening, surveillance, citrus, infestation

The Pest Information Management System (PIMS)

[1]Esther Muchiri and [2]Asenath Koech

[1]EAPIC, P.O. Box 659, 00600 Nairobi

[2]Kenya Plant Health Inspectorate Service (KEPHIS) P.O Box 49592-00100, Nairobi, Kenya

Corresponding author email: *emuchiri@ementoringafrica.or.ke*.

Presenter: Esther Muchiri

The World Trade Organization (WTO) Trade Facilitation Agreement (TFA) calls for member country trade regulations to be clearly published, which includes Sanitary and Phytosanitary (SPS) measures. The SPS Agreement requires that measures be applied for no other purpose than that of ensuring food safety, animal and plant health. Through the East Africa Phytosanitary Information Committee (EAPIC), the Pest Information Management System (PIMS) was developed as a collaboration of the EAC NPPOs. PIMS serves as a regional repository of pest information to streamline the Pest Risk Assessment (PRA) process. PRAs evaluate information related to specific pests, to protect a country's agriculture sector from potential damage caused by harmful (quarantine) pests. The PIMS (Ver.1.0) was developed in 2009 with support from UN-FAO, and upgraded further in 2011 and 2014. The current PIMS Ver. 1.3 (2016) allows easier entering of pest information and generation of pest lists. However, further enhancements are still required namely: Data Importation Tool; Fact Sheets and User-Friendly Pest Information Reports; Interactive Discussion Blogs; SMS and/or Email Activation; Secure Cloud Hosting and Integrated GIS Maps for Pest-Free Areas. This paper provides an overview of PIMS, the achievements to date and challenges that have contributed to the slow uptake and utilization at a regional level. One major contributor is the over-reliance of donor support and limited or no financial support from relevant government ministries or agencies. During the 7th EAPIC regional meeting in Kigali, Rwanda, NPPOs present recommended that EAPIC be established as a secretariat to coordinate regional and national efforts of pest list development, surveillance, information sharing, stakeholder engagements, increased information sharing and capacity building efforts. This paper calls on the NPPOs and national governments to support this initiative that is designed to enhance intra-regional trade.

Keywords: PIMS, EAPIC, Pests and NPPOs.

POSTERS

Presenter (s); bold is main presenter	Title
Fredrick Koome , Esther Kimani, Thomas Kosiom, and Caroline Mbae, Isaac Macharia	Status of coconut lethal yellowing disease and its vectors in coconut production areas in Kenya
Isaac Macharia, Esther Kimani, Josiah Syanda, Thomas Kosiom, Fredrick Koome and Hellen Heya	Distribution and management of the invasive papaya mealybug, *Paracoccus marginatus* in Kenya
Thomas Kosiom, Fredrick Koome, George Momanyi, Hellen Heya, Isaac Macharia, Esther Kimani	Asian Citrus Psyllid *(Diaphorina Citri)* status in citrus and curry leaf production areas of Kenya
Heya, H, Momanyi, G., Koech A., Muriithi, D., Mweke, A., Gachamba S., Macharia I.	Distribution *of Bemisia Tabaci* and other Whitefly species in major horticultural production areas in Kenya
Asenath A. Koech, Robyn McConchie, Florence Olubayo, George Mondoh, Andrew Wanga	Minimizing waste through value addition and preservation of fresh mango fruit in Kenya – establishment of mango value chain innovation platform
Olubayo Dorothy, Faith Ndunge and Eric Were	Importance of FCM (*Thaumatotibia leucotreta*) on the export of Kenyan Produce
Joyce waithera, Isaac Macharia	Prevalence of MCMV in major seed production areas in Kenya

EXHIBITORS

Number	Exhibitors
1	KEPHIS
2	GTIL
3	COPE
4	KCB
5	CBA
6	Kenya Seed Company/ Simlaw
7	CABI

ADMINISTRATIVE & LOGISTICS NOTE

With few exceptions, most persons entering Kenya must be in possession of a valid passport and visa. Participants are advised to ascertain the entry requirements for Kenya, where required, obtain the necessary visas (including en route transit visas if applicable) prior to departure from their home countries for all segments of travel. Please see below link for online visa: http://evisa.go.ke/evisa.html. The International Phytosanitary Conference Secretariat will provide an official invitation letter to facilitate visa processing. However, the Secretariat will not be able to intervene in any matter relating to visas, visa fees and other related costs. All participants will be responsible for making their own travel arrangements; to and from the conference venue except as otherwise agreed in the invitation letter.

Dress Code
The dress code is official attire apart from the field visits.

Mobile Telephones
Mobile phones should be switched off or be put on silent mode when inside the conference hall.

Smoking
KEPHIS is a non-smoking area

Security
Participants are required to wear their official meeting badges during the conference and comply with all official instructions in the event of an emergency.

Time in Kenya
Time in Nairobi, Kenya is GMT+3:00

Mobile Phone Service
Upon arrival in Nairobi, participants may purchase a mobile phone sim card at the airport for easy communication. Common mobile service providers in Kenya include *Safaricom, Airtel,* and *Orange.*

Weather
The weather in June is likely to be cool at 23°C during the day and it is likely to be sunny but the night will be cold. The conference room may be cool because of air conditioning, so we suggest you bring a jacket/sweater.

Local Currency
The Kenyan Shilling (KES) is the local currency. Credit cards are widely accepted in Nairobi, and are widely accepted in larger hotels; there are a number of forex bureaus where you can change your currency and are within reach in Karen and at the airport. All major currencies can be exchanged in Kenya.

Social Amenities

There are several shopping malls around KEPHIS; the nearest being *The Hub*. Others include *The Junction* and *Galleria Mall*, both about 10 kilometers away. Banks and Exchange Bureaus are also located within 3 kilometres from KEPHIS. The Karen Hospital and AAR Medical Centre is also about 10 kilometres away from the venue.

Accommodation

KEPHIS has accommodation rooms at a cost of USD 35 per person per day for residents and USD 50 per person per day for international guests (this is half board). In addition, alternative accommodation is available at KCB Leadership Centre which neighbours KEPHIS at a cost of USD 57 per person per day (half board).

Extra Meals and Additional Expenses

All additional expenses such as extra meals, telephone, laundry, alcoholic and non-alcoholic beverages, printing, will be at the participant's own expense.

Conference Documents

Printed copies of the programme and other materials will be made available as necessary for all participants.

Refreshments

Refreshments will be provided throughout the duration of the conference as follows:
10.00 a.m. tea/coffee & snacks | *1.00 p.m.*: Buffet lunch | 3.30 *p.m.* tea/coffee & snacks | Drinking Water | Sweets

Internet / Wi-Fi

Participants will have free access to Wi-Fi throughout the duration of the conference.

IPC Secretariat

A secretariat office will be on standby throughout the duration of the conference for any assistance/additional information. Contacts:

1. Email address: phytosanitaryconference2016@kephis.org
2. Dr. Isaac Macharia, General Manager Phytosanitary Services | Mobile: +254702255235 | Email: isaac.macharia@kephis.org
3. Mr. Joseph Kigamwa, Coordinator Projects, KEPHIS | Mobile: +254727963907 | Email: jkigamwa@kephis.org
4. Mrs. Pamela Kipyab, Deputy Coordinator Projects | Mobile: +254721292063 | Email: pkipyab@kephis.org
5. Ms. Evelyne Awiti, Administrative Staff | Mobile: +254722774310 | Email: jkigamwa@kephis.org

Official Dinner

You are cordially invited to a reception dinner hosted on Thursday, 7th June 2018 from 6.30 p.m. at Fogo gaucho, Kilimani

Cocktail

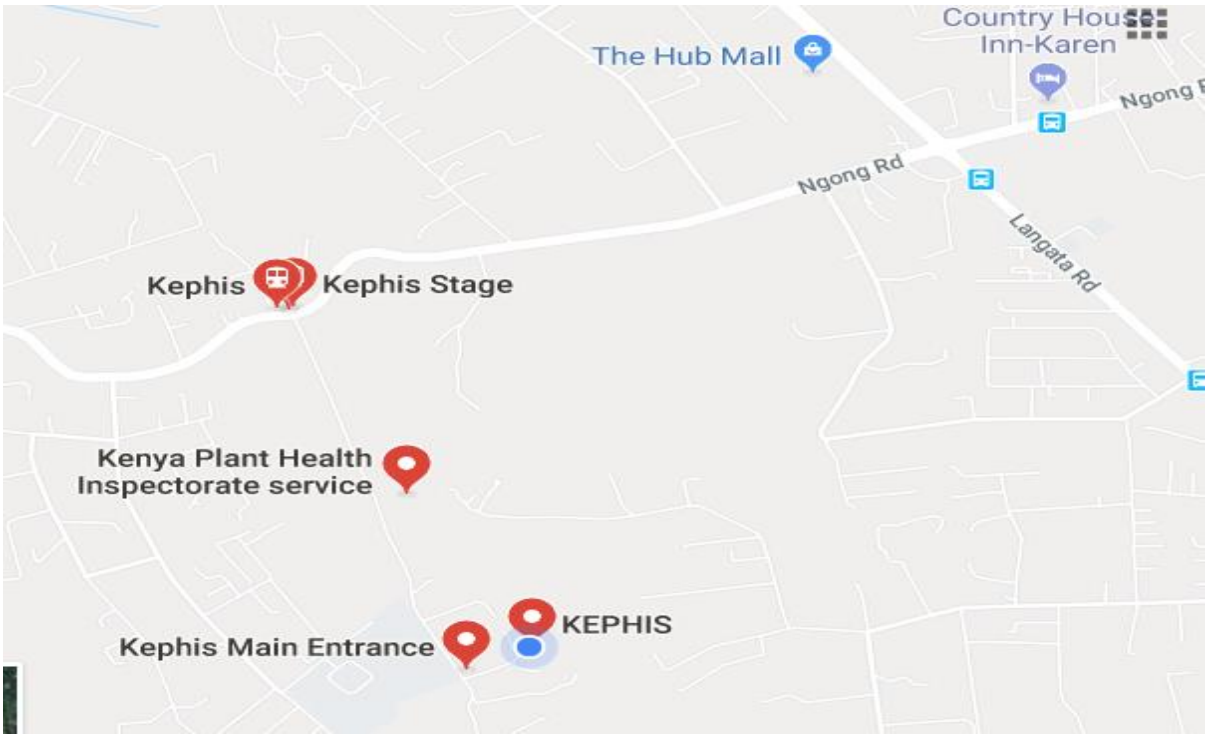
There shall be cocktail on Monday, 4th June 2018 to welcome you to Kenya and provide networking opportunities with all present at KEPHIS Hq, Karen outside the main conference hall.

Electricity

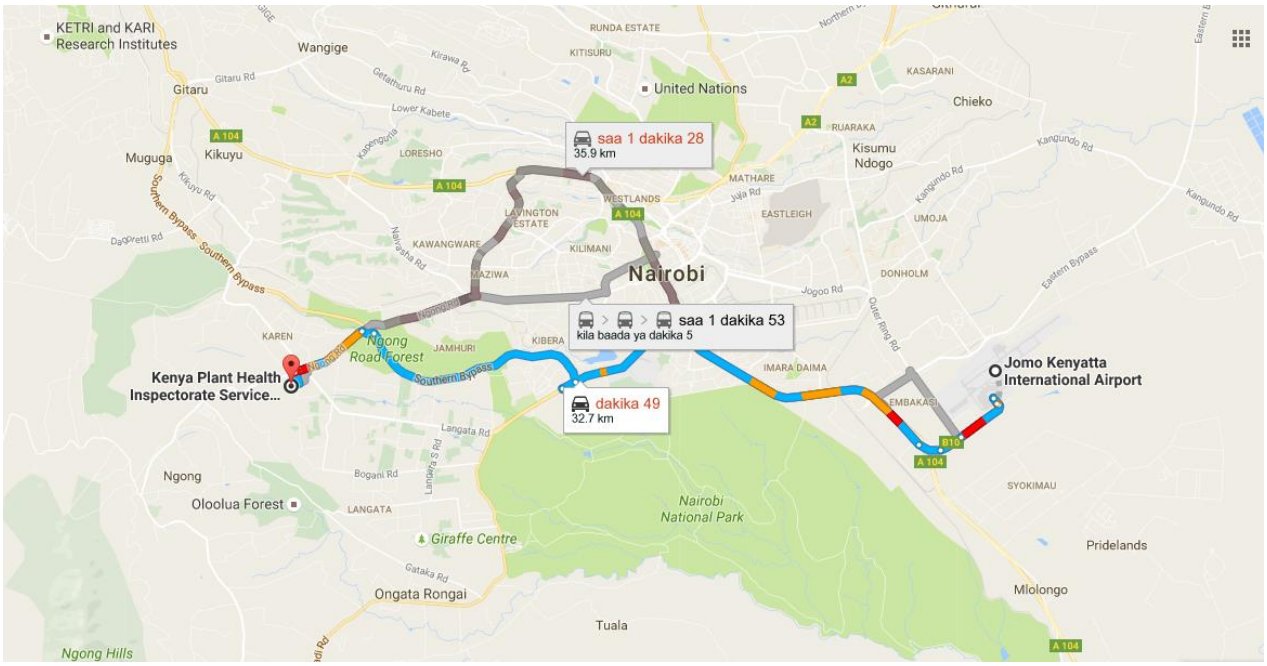
Electrical sockets (outlets) in Kenya are the "Type G" British BS-1363 type. If your appliance's plug doesn't match the shape of these sockets, you will need a travel plug adapter in order to plug in. Travel plug adapters simply change the shape of your appliance's plug to match whatever type of socket you need to plug into.

IMPORTANT MAPS

Amenities around Kenya Plant Health Inspectorate Service, Karen Hq



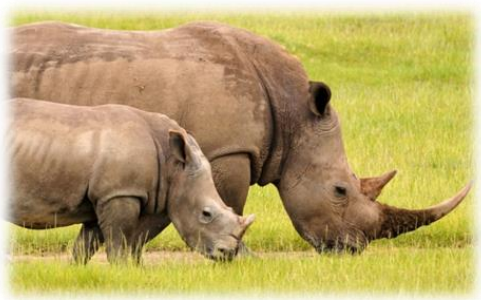
Direction of KEPHIS hq from Jomo Kenyatta International Airport



ABOUT KENYA

Kenya is one of the most beautiful and culturally diverse countries in the world, a nation which brings visitors from all over the globe to admire and experience it's magnificent wildlife, sandy and white beaches, great savannahs, rich history, mountains and hills and to sample cuisine that is second to none.

Located in East Africa, with a coastline in the Indian Ocean, the country is home to world famous long distance runners, Mount Kenya which is Africa's second highest mountain, the Cradle of Mankind and *Mpesa*, the mobile money transfer service that is a first of its kind in the world. The country also boasts of the Nairobi National Park, the only game park in the world located inside a capital city. Kenya's horticultural exports, i.e. coffee, tea, flowers, fruits and vegetables are enjoyed worldwide. Kenya is home to the Big 5 – the Elephant, Rhino, Buffalo, Lion and Leopard and the small 5 – the Rhinocerous Beetle, Buffalo Weaver, Elephant Shrew, Leopard Tortoise and the Ant Lion. The annual wildebeest migration, one of the seven wonders of the world, takes place in the internationally known Maasai Mara.

	
A herd of elephants	**A rhino and her young**

Fact File:

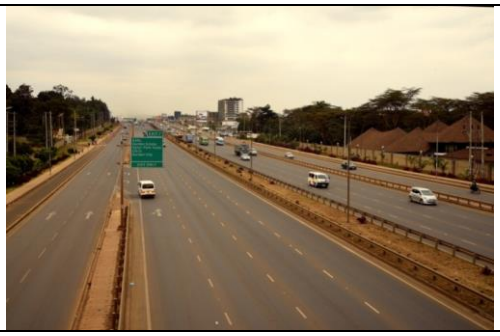
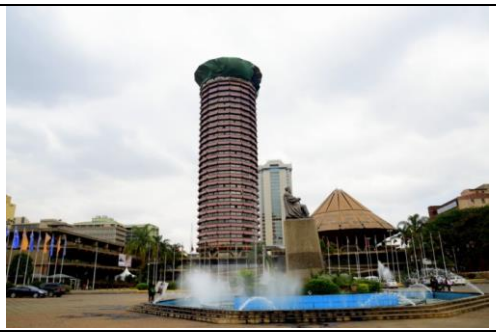
Full Name: Republic of Kenya (Jamhuri ya Kenya)
President: H. E. Uhuru Kenyatta
Land area: 582,644 square kilometers
Capital and largest city: Nairobi
Number of counties: 47
Currency: The Kenyan shilling
National Languages: English and Kiswahili
Location: Lies astride the equator. It neighbours Uganda to the East, Tanzania to the South, the Indian Ocean to the south east, Somalia to the west and Ethiopia and South Sudan to the north.
Weather patterns: Long rains (March-May) and short rains (October-November).

National Parks and Reserves

Nairobi National Park
Aberdare National Reserve
Amboseli National Park
Lake Nakuru National Park
Tsavo National Park
Meru National Park
Marsabit National Park and Reserve
Rimoi National Reserve

NAIROBI

Nairobi is the capital and largest city of Kenya. It is also the financial, technological, commercial, social and economic gateway hub of east and central Africa. In 2016, it has been ranked among the 20 most successful cities in the world for its innovation, livability and capacity to reinvent itself. A multi-cultural city with people from all walks of life, it is adorned with skyscrapers, is home to world class restaurants, modern shopping malls, modern banking facilities, road and rail transport and is a central attraction for Kenyan tourism and local and international activities and events. Some global organizations have their headquarters here such as the United Nations Environment Programme (UNEP). The name Nairobi comes from the Maasai word 'Nyrobi' meaning a place of cool waters. It has been described as having very good weather, conducive for both work or leisure.

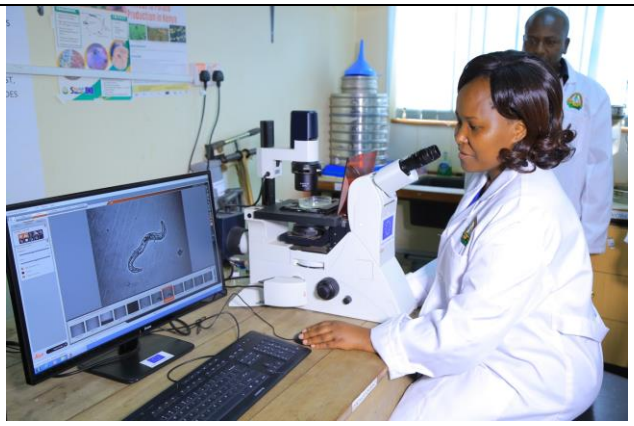
	
The Thika Superhighway is a masterpiece world class road that links the industrial town of Thika to the city centre	The Kenyatta International Convention Centre, located at the City Centre, is a masterpiece work of art. The statue of Kenya's founding president *Mzee* Jomo Kenyatta is located here

ABOUT Centre of Phytosanitary Excellence (COPE)

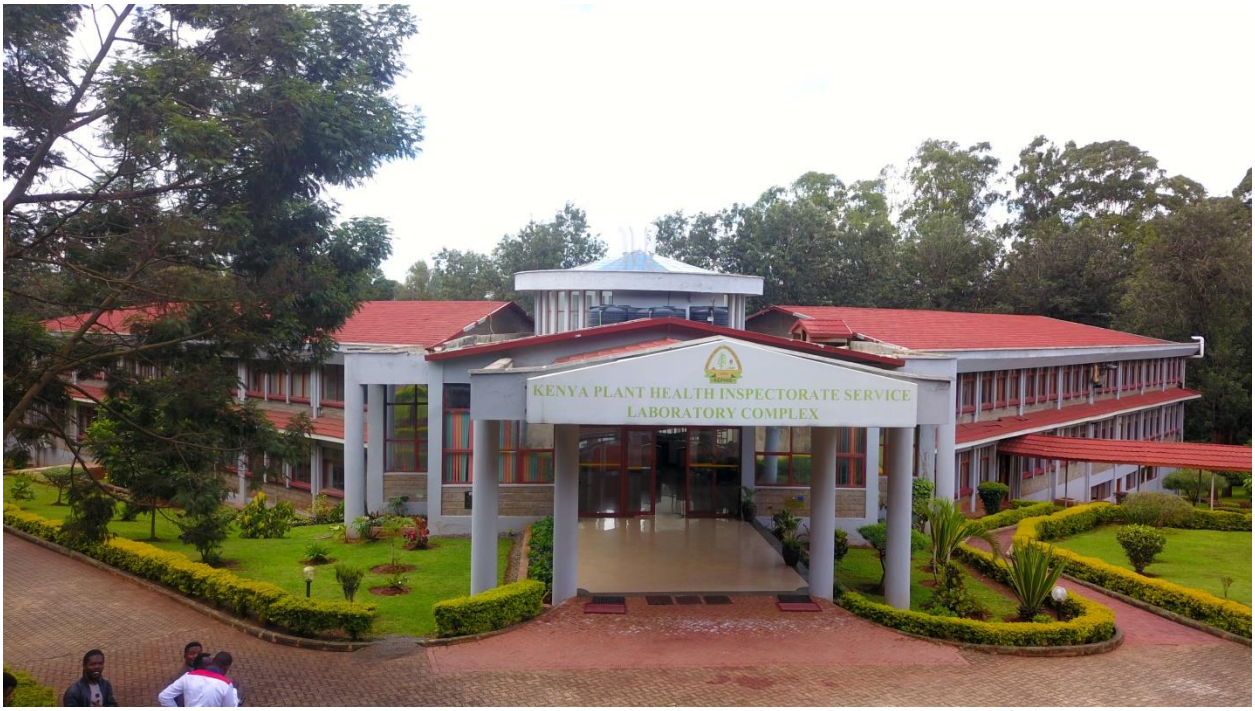
COPE domiciled in KEPHIS was officially launched in October 2010 and since then has trained 1852 stakeholders from Kenya and beyond. COPE was established with the rationale that African countries lack effective systems for managing phytosanitary measures at the national level and also lack good regional co-ordination of the implementation of the International Plant Protection Convention – International Standards on Phytosanitary Measures (ISPMs); hence the need to build phytosanitary capacity of African countries. The courses offered at COPE are In-service training to enhance capacity of Africa's national phytosanitary systems. The course duration is between 1-2 weeks but can be tailor made to suit clients institutional requirements; the mode of course delivery is face to face training sessions, laboratory and field practical sessions, demonstrations and attachments. These courses are either offered at KEPHIS or in the country of interest. The indicative fees are from USD 1000 per student for two week training course and USD 700 for one week training course. Some of the courses with summarized content are as below:

Introduction to International Treaties and Standards in phytosanitary systems • World Trade organization – Sanitary and PhytoSanitary Agreement • The international Plant Protection Convention • International Standards on Phytosanitary measures • National and regional frameworks • Private standards	**Phytosanitary import regulations and export certification systems** • phytosanitary import regulatory systems • phytosanitary export certification systems • phytosanitary import inspections **Pre and post harvest phytosanitary management** • Pests of phytosanitary significance • Pre and post harvest management practices • Quality checks and traceability

Pest Risk Analysis (PRA) • Principles of PRA • Sources of PRA Information • Stages of Pest risk analysis • Tools for PRA	**Pest Surveillance** • Types of pest surveillance • Surveillance methodology • Analysis of surveillance data • Pest reporting and pest listing • Establishment of pest free areas in places of production and areas of low prevalence

Pest Diagnostics • Types of diagnostics and diagnostic protocols • Diagnostic and detection capacity evaluation • Pest detection methods and identification procedures • Reference collection and documentation • Pest management	 Pest diagnostics at KEPHIS Muguga

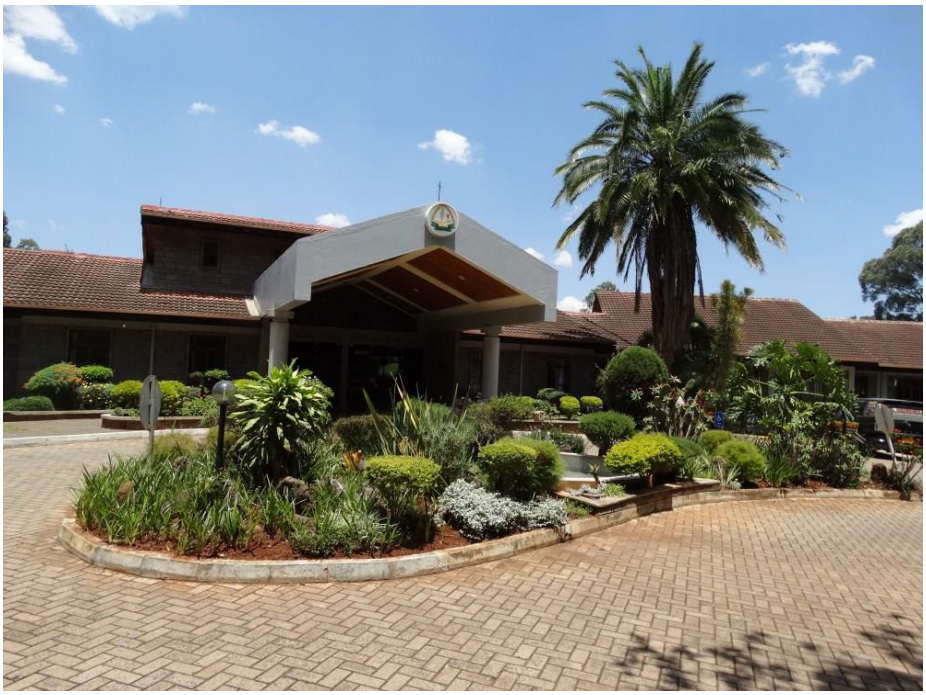
Contact: The COPE Secretariat; C/O The Managing Director; Kenya Plant Health Inspectorate Service (KEPHIS); P. O. Bo 49592-00100, Nairobi, Kenya ; Tel: +254709891000 ; Email: director@kephis.org
Website: www.kephis.org; www.africacope.org

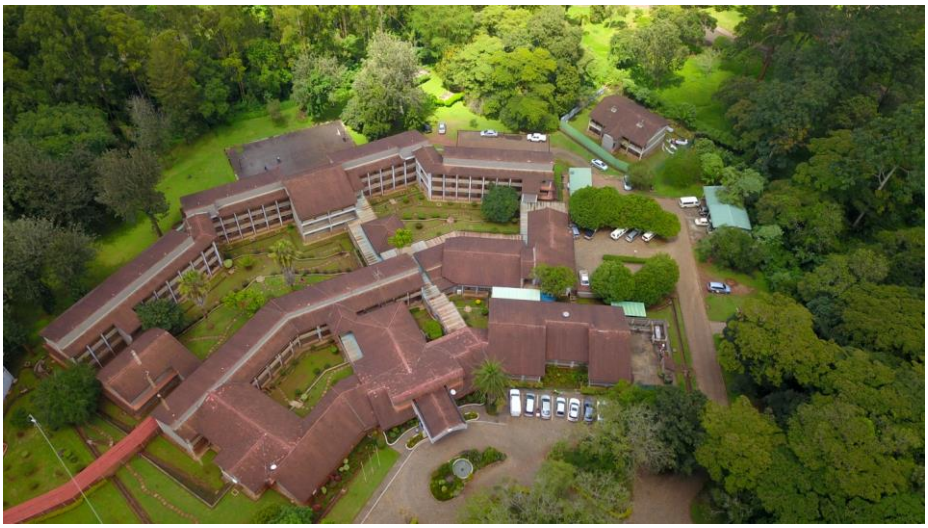


USAID

U.S. Government Global Food Security Strategy 2017-2021 | U.S. Agency for International Development

The U.S. Government, in partnership with other governments, civil society, multilateral development institutions, research institutions, universities, and the private sector, will build on experience to date to address these challenges, take advantage of opportunities, and advance food security and improved nutrition by focusing efforts around three interrelated and interdependent objectives: *Inclusive and sustainable agricultural-led economic growth*, as growth in the agriculture sector has been shown in some areas to be more effective than growth in other sectors at helping men and women lift themselves out of extreme poverty and hunger. It does this by increasing availability of food, generating income from production, creating employment and entrepreneurship opportunities throughout value chains, and spurring growth in rural and urban economies. Strengthened resilience among people and systems*, as increasingly frequent and intense shocks and stresses threaten the ability of men, women, and families to sustainably emerge from poverty. A well-nourished population*, especially among women and children, as undernutrition, particularly during the 1,000 days from pregnancy to a child's second birthday, leads to lower levels of educational attainment, productivity, lifetime earnings, and economic growth rates Through this approach, we will strengthen the capacity of all participants throughout the food and agriculture system, paying special attention to women, the extreme poor, small-scale producers, youth, marginalized communities, and small and medium enterprises. Several key elements of our approach strengthen our ability to achieve these objectives. The first is targeting our investments in countries and geographic areas where we have the greatest potential to sustainably improve food security and nutrition and strategically focusing our resources on those approaches and interventions that evidence shows will reduce extreme poverty, hunger, and malnutrition at scale. The second is implementing a comprehensive, multi-faceted *whole-of-government approach rooted in lessons learned and evidence to date that reflects emerging trends. The third is country leadership, recognizing that developing countries, above all others, must own and be empowered to lead and guide these efforts to drive progress. The fourth is *partnerships with a wide range of development actors and groups, which will improve the reach, effectiveness, efficiency, and sustainability of our efforts. This includes using foreign aid strategically to catalyze domestic resource mobilization and private sector-driven trade and economic development. The fifth is harnessing the power of science, technology, and innovation* to dramatically improve food and agriculture system practices as well as increase local capacity to address these issues. Finally, we will focus on the *sustainability* of our programs as we work to create the conditions where our assistance is no longer needed, including reducing susceptibility to recurrent food crises and large international expenditures on humanitarian assistance and ensuring a sustainable food and agriculture system with adequate and appropriate finance available to key actors.





For more information on the conference, please contact:
The Managing Director
Kenya Plant Health Inspectorate Service (KEPHIS)
P. O. Bo 49592-00100, Nairobi, Kenya
Tel: +254 709891000
Email: phytosanitaryconference2016@kephis.org
Website: www.phytosanitaryconference2016.com