REPUBLIC OF KENYA

KEPHIS

4TH INTERNATIONAL PHYTOSANITARY CONFERENCE

18th-21st September 2023

The 4th INTERNATIONAL PHYTOSANITARY CONFERENCE 2023

18TH - 21ST SEPTEMBER

THEME: Enhancing Phytosanitary systems for trade facilitation, Climate smart agriculture and Sustainable Livelihoods

PROGRAM AND BOOK OF ABSTRACTS

FEED THE FUTURE The U.S. Government's Global Hunger & Food Security Initiative

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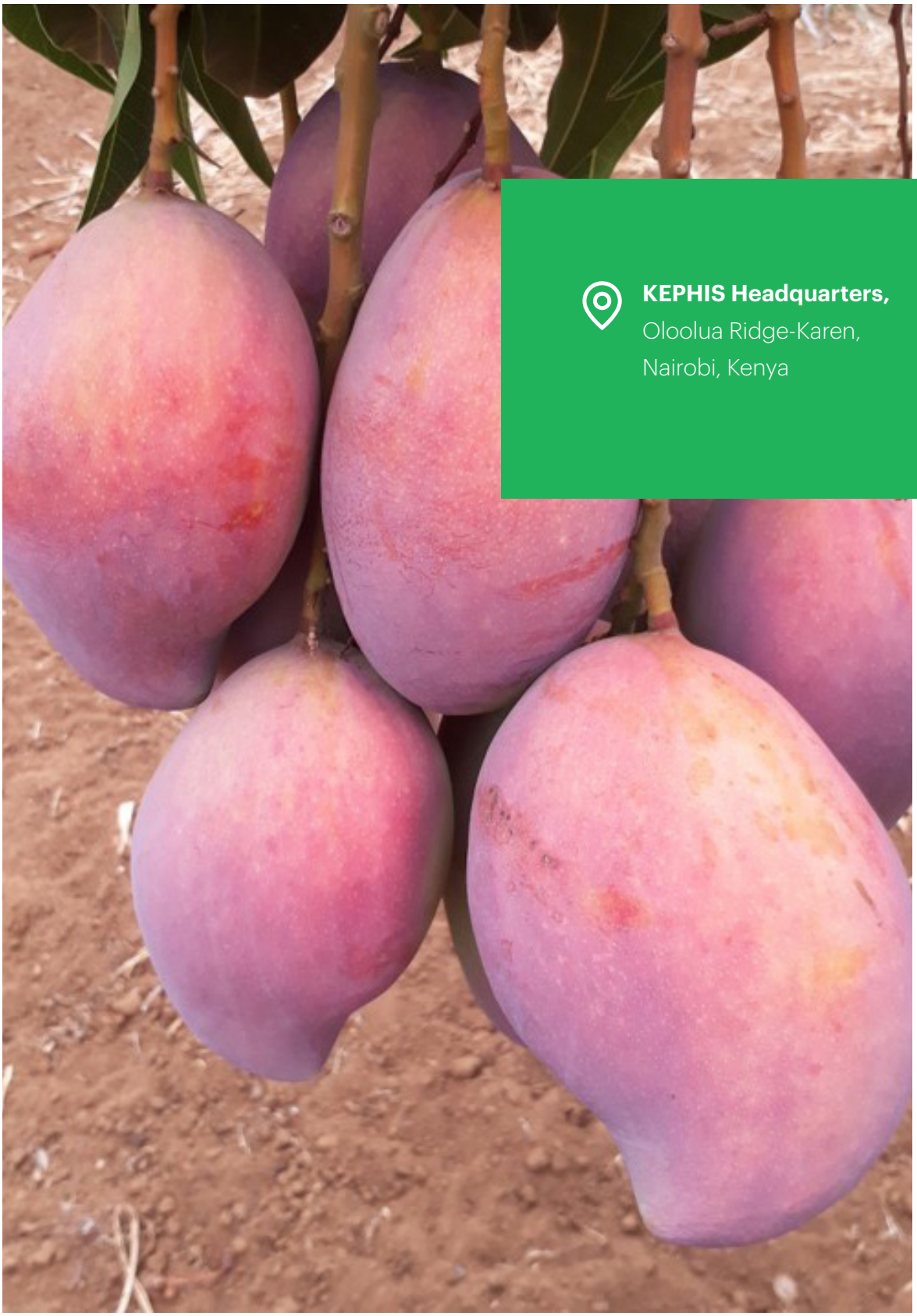

KEPHIS Headquarters,
Oloolua Ridge-Karen,
Nairobi, Kenya

Message

from the Cabinet Secretary, Ministry of Agriculture and Livestock Development

Hon. Mithika Linturi

I am delighted to be here with you today to attend this conference together with the Deputy President and other dignitaries.

Kenya's Economic Growth has been heavily reliant on the agriculture sector, having a direct and significant bearing on food security, economic growth and social stability. Threats to plants for instance from pests and diseases, cross boundary transfer of pests through international travel and trade, disruptive human activities and climate change are increasingly contributing negatively to efforts toward attaining food security. This means that as the African continent produces food, it needs to know how to mitigate against the challenges of pests and diseases which have been identified to cause up to 40% reduction in yield according to the Food Agriculture Organization (FAO) of the United Nations. We appreciate the close ties between African countries, which have translated into tangible outcomes that have not only changed the livelihoods of our farmers, but also cushioned us against hard and unprecedented times – notably the COVID-19 pandemic, droughts, desert locust invasions among others.

The Government of Kenya has a constitutional and civic duty to achieve the right to food for all Kenyans as required under Article 43 of the Constitution. Kenya strives to ensure that food is available, affordable and safe for consumption. Increasing agricultural productivity, providing safe, nutritious food for the population and increasing international markets for Kenyan produce is among the factors that inspired Kenya's new government to launch its Bottom-Up Economic Transformation Plan. The importance of the sector in Kenya has been highlighted through major blueprints, notably; Vision 2030, Medium-Term Plan IV, which emphasize the importance of attaining 100% food and nutrition security for all Kenyans. Furthermore, the government through my Ministry implements the Agricultural Sector Transformation and Growth Strategy (ASTGS) 2019-2029. The strategy seeks to rapidly transform this critical sector by achieving our potential in agriculture that will lead to food and nutrition security, improve our farmer and local community incomes, lower the cost of food, and increase employment, particularly for women and youth. Phytosanitary or plant health is at the center of these blueprints.

The Ministry continues to undertake policy reforms in the sector that are meant to ensure that producers in crops, livestock and fisheries subsectors progressively access quality agricultural inputs. These reforms include the development and review of sector policies, statutes, regulations, standards and guidelines. Reforms have also targeted institutions and implementation of targeted programmes to initiate and consolidate proven approaches based on best practices in agriculture.

As I conclude, let me reassure you that the realization of this conference objectives is key to the revolution of Kenya's agriculture. We desire to support the recommendations from this conference. We are committed to support the phytosanitary fraternity in all fronts so as to yield their impact on food security. As we look ahead to the coming years, we must be ready to move decisively—together—for the sake of our planet, prosperity and for people everywhere. No agenda is more important now for Africa than food security.

Let me close as I congratulate the KEPHIS Board of Directors, Management, all members of the Conference organizing committee for the work done. I thank all stakeholders and organizations including our development partners that provided support in one form or another to this conference.

I wish you fruitful deliberations and an enjoyable stay in Kenya.

Message

from the Principal Secretary, State Department for Crop Development, Ministry of Agriculture and Livestock Development

Mr. Kello Harsama

It gives me great pleasure to be part of this auspicious occasion that is important to Kenya, Africa and the world. Phytosanitary is without a doubt an opportunity for Africa to promote economic growth, job creation, and ultimately contributing to the country`s vision of inclusive and sustainable development.

Increasing agricultural productivity, providing safe, nutritious food for the population and increasing international markets for Kenyan produce is among the factors that inspired Kenya's new government to launch its Bottom-Up Economic Transformation Plan. Our efforts are however frustrated by plant pests which are widespread and negatively affect agriculture, the environment and society in general. Some of these pests have the capacity to directly damage agricultural crops, natural environment, and disrupt livelihoods. The tropical climate pre-disposes Kenya and other African Countries to these high and new pest incidences which require pest management interventions that rely heavily on pesticides. Our rural communities and horticultural producers are adversely impacted due to loss of earnings from lower yields or destruction of crops due to pests.

Economic costs of pest eradication and long-term pest control options are normally borne by taxpayers, farmers and ultimately the produce consumers. Such costs often negatively impact on availability and the international competitiveness of Kenya's produce. Climate change has compounded the problem and has a significant impact on plant health, forestry and environment through the actual and potential expansion of pest distribution and intensity and changes in pest epidemiology. Increased reliance on pesticides has contributed to some challenges including possibility of contamination of fresh water sources, pesticide resistance, influx of unapproved pesticide products due to porous borders and increasing notifications of non-compliance by trading partners. It is gratifying to note that despite the challenges, we have continued to be resilient generating tailored solutions. There is need for enhanced coordination between the public sector, the private sector and research agencies, as well as between government departments.

This conference comes at an opportune time where when the government is implementing the Agriculture Policy, 2021, as it addresses issues of enhancing phytosanitary protection of agriculture and biodiversity, raising agricultural productivity and alleviating poverty. It proposes development of strategies for joint early warning systems for disaster preparedness and control of pests and regulatory procedures for management of pests. There is need for continued result-oriented research in agriculture so as to respond to the identified challenges that hamper optimum productivity.

The wide array of stakeholders with world renowned expertise have opportunity to use this platform and explore potential joint partnership opportunities in Africa to alleviate these challenges. We must foster stronger multilateral and bilateral relations not only in phytosanitary but in agriculture and trade and allied sectors so as to build our economies.

We appreciate the close ties between African countries, which continue to translate into tangible outcomes that have not only changed the livelihoods of our farmers, but also cushioned us against hard and unprecedented times. As we work towards strengthening regional coordination mechanisms, we must also consider a roadmap that would materialize the expected outcomes of the African Continental Free Trade Area (AfCFTA) as an instrument for Africa's development.

The future of Kenya depends on agriculture. As we continue to appreciate the contribution of KEPHIS to Kenya`s agriculture and economic development, we need to critically think of how best to support the African region to enhance the capacity in phytosanitary regulation.

Message

from the Chairman Board of Directors Kenya Plant Health Inspectorate Service

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Joseph M'eruaki M'uthari

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Message

from the Managing Director Kenya Plant Health Inspectorate Service

Prof. Theophilus M. Mutui, PhD

I would like to take this opportunity to warmly welcome you all to the 4th International Phytosanitary Conference. This conference is very important to Africa, Kenya and KEPHIS as it brings together the phytosanitary fraternity.

Kenya Plant Health Inspectorate Service (KEPHIS) is a state corporation established by the KEPHIS Act 2012, whose mandate is to regulate all matters relating to plant protection, administer and enforce sanitary and phytosanitary measures, undertake inspection and grading of plants and plant produce at the ports of entry and exit, regulate import and export of plants and plant materials, and act as a liaison office for international conventions relating to plant variety protection, plant protection and seed certification. Further, KEPHIS deals with endangered species as well as ensuring quality of agro-inputs and produce in Kenya.

The risk of introduction of pests to Kenya during trade is compounded by globalization and trade liberalization which have led to increased movement of goods and people across the world increasing the probability of introduction of plant pests. The implementation of phytosanitary measures aimed at mitigating against the challenge of plant pests is key to Kenya's economy. Recent introductions of pests such as the Maize Lethal Necrotic Disease (MLN), Tuta absoluta, Cassava brown streak disease, and Fall Army Worm (FAW) and re-emergence of pests such as Desert locust have warranted the need for emergency measures and considerable resource allocation from Government for their official management.

The International Plant Protection Convention (IPPC) and Kenya's regulations on plant protection provide a framework for protection of plant resources from introduction and spread of pests. Phytosanitary measures are the foundation of our mandate as National Plant Protection Organisations (NPPOs) and provide the means for protection of plants and plant resources from introduction, spread and establishment of foreign pests and diseases. As an NPPO we are guided by the International Standards for Phytosanitary Measures which enables us to implement activities that regulate importation of plants, plant products and other regulated articles.

To implement the aforementioned mandate as well as combat the phytosanitary challenges while implementing the phytosanitary and other standards, KEPHIS has well-functioning, modern-equipped offices throughout the country with highly-trained officers to offer the plant health, seed certification and analytical services in accordance with international best practices. The accredited plant health and analytical laboratories continues to support the farmers in Kenya for determination on the quality of the inputs and diagnosis of plant pests and diseases whose corrective action leads to productive agriculture. We implore all farmers to ensure their soils and water are tested for appropriate advice.

The state-of-the-art analytical laboratory serves to promote trade in Kenyan fresh produce where reports based on accredited test methods from KEPHIS increases confidence in Kenyan export produce. These facilities also provide precise measurements of elements like heavy metals, aflatoxin and pesticide residue levels which are critical in determining the compliance levels to national and international food safety standards.

Working with the Common Market for Eastern and Southern Africa (COMESA) and East African Community (EAC), KEPHIS continues to play a big role in the regional trade and especially in providing modern diagnostic services and promoting harmonization activities that have made trade easier. This is facilitated by the designated COMESA plant health reference laboratory in KEPHIS Muguga. Further, KEPHIS prides in building capacity of the region through the Centre of Phytosanitary Excellence

(COPE) by training plant health and agricultural practitioners on Good Agricultural Practices, implementation of sanitary and phytosanitary international provisions and modern diagnostics methods.

In regard to seed certification, KEPHIS has put in place systems so that the public have access to high quality climate resilient and high-yielding seeds and propagating materials for enhanced productivity. The presence of the International Seed Testing Association (ISTA) certified laboratory in KEPHIS Nakuru supports not only Kenya but the region in providing certified seed for various crops.

We commit to continue the bilateral and multilateral trade negotiations towards accessing opening new markets and expanding the existing ones. We implore all stakeholders to play their roles in the value chains of various plant, plant products and regulated articles towards compliance to the set market requirements to avoid interceptions that dent the country`s market rating.

This conference is the fourth of its kind with three others having been held in the years 2016, 2018, and 2021. This conference brings together private and public, national, regional and international stakeholders in the plant health arena to discuss current affairs and share experiences in plant health. Delivery in the conference will be through identified strategic world-renowned keynote speakers and, high quality oral and poster presentations aligned to various but relevant thematic areas. We have made arrangements to conduct side events that will include;

1. A parallel workshop on Quality of Fresh Fruits and Vegetables Standards in collaboration with the Organisation for Economic Co-operation and Development (OECD) targeting KEPHIS inspectors and relevant stakeholders
2. A post-workshop to be held on 21st to 23rd September 2023 together with the International Pest Risk Research Group (IPPRG) targeting KEPHIS plant health inspectors and relevant stakeholders
3. A training for Plant health Inspectors by European Food Safety Authority (EFSA) targeting National Plant Protection Organisations
4. A sensitization forum for Exporters of Beans and Chillies on Phytosanitary and Food Safety Market Requirements, seed certification stakeholders and youth in agriculture.

I urge you to participate in the field excursions and visit the exhibitions tents that display the array of efforts and experiences in promoting plant health development. I therefore look forward to the successful execution of this conference which intends to provide insights and greater understanding of the standards in order to improve our effectiveness and efficiency in addressing plant health challenges. I also hope that it will strengthen our capacity for implementation of phytosanitary measures and result in improved phytosanitary status of our countries thus facilitating trade and compliance to market requirements.

Lastly, I want to thank everyone who took part in the successful implementation of this conference.

Acknowledgements

We would like to acknowledge the following persons, institutions and committees for their contribution towards the success of the conference:

KEPHIS Board of Directors

Hon. Joseph M'eruaki (Chair Board of Directors), Prof. Albert Kimutai, Mr. Moses Atuko, Mr. Silas Killingo, Dr. Rose Njeru, Mr. James Wanjohi, Mr. Julius Mutua, Mr. Chrisologus Makokha.

Organizing Committee

Prof. Theophilus M. Mutui (Managing Director KEPHIS), Dr. Isaac Macharia (Director Phytosanitary and Biosecurity Services KEPHIS), Mr. Simon Maina (Ag. Director Seed Certification and Plant Variety Protection KEPHIS), Mr. Bartonjo Cheptarus (Ag. Director Corporate Services KEPHIS), Ms. Hellen Mwarey (Ag. Deputy Director, Phytosanitary and Biosecurity Services KEPHIS), Ms. Catherine Muraguri (Public Relations & Communications KEPHIS), Mr. Ezekiel Mucheru (Ag. Director Finance and Accounting KEPHIS), Ms. Faith Ndunge (Ag. Deputy Director Trade and Standards KEPHIS), Ms. Mellon Kabole (Technical Personal Assistant to The Managing Director - KEPHIS), Mr. Benard Were (Ag. Deputy Director, ICT KEPHIS), Dr. Moses Oyier (KEPHIS), Dr. Alex Muvea (KEPHIS), Dr. Edward Onkendi (KEPHIS), Dr. Benard Mukoye (KEPHIS), Dr. Esther Abonyo (KEPHIS), Mr. Ivan Obare (KEPHIS), Dr. Mary Guantai (KEPHIS), Ms. Emily Wairimu (KEPHIS), Mr. Eric Were (KEPHIS), Ms. Bridgette Mueni (KEPHIS), Ms. Hilda Miranyi (KEPHIS), Ms. Irene Wambui (KEPHIS), Ms. Irene Maina (KEPHIS), Mr. Benson Utali (KEPHIS) Ms. Pamela Kipyab (KEPHIS), Ms. Millicent Mburu (KEPHIS), Ms. Lilian Vuhya (KEPHIS), Ms. Angeline Ruto (KEPHIS), Mr. Timothy Osoro (KEPHIS), Ms. Anne Midecha (KEPHIS), Ms. Betty Waithanje (KEPHIS), Ms. Diana Munyao (KEPHIS), Ms. Basemath Lumumba (KEPHIS), Ms. Margaret Mwangi (KEPHIS), Ms. Florence Mutuku (KEPHIS), Ms. Margaret Komu (KEPHIS), Ms. Ruth Sila (KEPHIS), Ms. Hellen Wanjiku (KEPHIS), Ms. Grace Mbitu (KEPHIS), Ms. Agnes Karei (KEPHIS), Mr. Kevin Gesora (KEPHIS), Ms. Karen Cherono (KEPHIS), Mr. Allan Ndung'u (KEPHIS), Ms. Stellamaris Mulika (KEPHIS), Ms Caroline Mutete (KEPHIS), Mr. Kepha Oganda (KEPHIS), Ms. Janet Odongo (KEPHIS), Mr. Peterson Munene (KEPHIS), Mr. George Momanyi (KEPHIS), Mr. Bernard Okonda (KEPHIS), Ms. Deborah Shituvi (KEPHIS), Mr. James Wahome (KEPHIS), Mr. Peter Shango (KEPHIS), Ms. Dorcas Mugambi (KEPHIS), Mr. Simon Peter Muambi (KEPHIS), Mr. Kevin Sambai (KEPHIS), Ms. Eunice Ringera (KEPHIS) and Ms. Dorothy Olubayo.

Technical committee

Dr. Isaac Macharia (KEPHIS), Dr. Moses Nyongesa (KALRO), Dr. Johnson Nyasani (KALRO), Dr. Muo Kasina (KALRO), Dr. Eston Mutitu (KEFRI), Dr. Wanja Kinuthia (NMK), Dr. D. Omaiyo (MMUST), Dr. Maina Mwangi (KU), Dr. Alex Muvea (KEPHIS), Dr. Moses Oyier (KEPHIS), Dr. Mary Guantai (KEPHIS), Dr. Bernard Mukoye (KEPHIS), Dr. Edward Onkendi (KEPHIS), Ms. Mellon Kabole (Technical Personal Assistant to The Managing Director - KEPHIS), Mr. Clement Tulezi (KFC), Ms Triza Karanja (MOALD), Mr. Abed Mathangu (AATF), Mr. Fernadis Makale (CABI), Mr. Ivan Obare (KEPHIS), Ms. Faith Ndunge (KEPHIS), Ms. Pamela Kipyab (KEPHIS), Prof. James Muthomi (UON), Dr. MaryLucy Oronje (CABI), Dr. Lorna Migiro (USDA), Ms. Florence Munguti (KEPHIS), Dr. Esther Abonyo (KEPHIS), Dr. Edith Avedi (KEPHIS), Mr. Hosea Machuki (FPEAK), Mr. Duncan Onduu (STAK), Ms. Agatha Thuo (ASNET) and Ms. Asenath Koech (KEPHIS).

Companies visited during the field excursion

Ngongveg, Exotic Penina, Kakuzi, Keitt Packhouse Ltd, Penta Flowers, Real IPM Ltd, Dudutech Ltd and CIMMYT.

Development partners

Development partners that have supported with finances towards various activities i.e Trade Mark Africa (TMA), Centre for Agriculture and Bioscience International (CABI), Centre of Phytosanitary Excellence (COPE), Regional Integration Implementation Programme (RIIP), International Potato Center (CIP) and Sunripe Limited.

Sponsors

Kenya Plant Health Inspectorate Service

Table of Contents

List of Acronyms and Abreviations

AEZ	Agro ecological zones
AU-IAPSC	African Union – Inter Africa Phytosanitary Council
ASBVd	Avocado sunblotch viroid
CABI	Centre for Agriculture and Bioscience International
CIMMYT	International Maize and Wheat Improvement Center
COMESA	Common Market for Eastern and Southern Africa
COPE	Centre of Phytosanitary Excellence
CTU	Cargo transport units
EAC	East African Community
EFSA	European Food Safety Authority
EU	European Union
FAO	Food and Agriculture Organization
FAW	Fall army worm
FCM	False codling moth
FFV	Fresh Fruits and Vegetables
GAP	Good Agricultural Practice
GHU	Germplasm Health Unit
HACCP	Hazard Analysis Critical Control Point
IAS	Invasive alien species
ICRISAT	International Crops Research Institute for the Semi-Arid Tropics
IITA	International Institute of Tropical Agriculture
IPM	Integrated pest management
IPPC	International Plant Protection Convention
ISPMs	International Standards for Phytosanitary Measures
ISTA	International Seed Testing Association
KALRO	Kenya Agricultural and Livestock Research Organization
KEFRI	Kenya Forestry Research Institute
KEPHIS	Kenya Plant Health Inspectorate Service
KSTCIE	Kenya Technical Standing Committee on Imports and Exports
LED	Light Emitting Diode
MMUST	Masinde Muliro University of Science and Technology

MRLs	Maximum residue levels
NPPO	National Plant Protection Organization
PCN	Potato cyst nematode
PQBS	Plant Quarantine and Biosecurity Station
PRA	Pest Risk Analysis
RIIP	Regional Integration Implementation Programme
SCCAP	Sea container complementary action Plan
SPS	Sanitary and Phytosanitary Standards
TMA	TradeMark Africa
ToMV	Tomato mosaic virus
UK	United Kingdom
UNFCCC	United Nations Framework Convention on Climate Change
UON	University of Nairobi
USAID	United States Agency for International Development
VPCs	Vegetatively Propagated Crops

INTERNATIONAL PLANT PROTECTION CONVENTION STRATEGIC FRAMEWORK 2020–2030

OUR MISSION

Protect global plant resources and facilitate safe trade

OUR VISION

The spread of plant pests is minimized and their impacts within countries are effectively managed

OUR GOAL

All countries have the capacity to implement harmonized measures to reduce pest spread and minimize the impact of pests on food security, trade, economic growth, and the environment

STRATEGIC OBJECTIVES

- **A** Enhance global food security & increase sustainable agricultural productivity
- **B** Protect forests and the environment from the impacts of plant pests
- **C** Facilitate safe trade development & economic growth

CORE ACTIVITIES

- Standard setting
- Implementation & capacity development
- Communication & international co-operation

IPPC DEVELOPMENT AGENDA 2020–2030

1. Harmonization of Electronic Data Exchange.
2. Commodity- and Pathway- Specific ISPMs.
3. Management of E-commerce and Courier Mail Pathways.
4. Enabling the Use of Third-Party Entities.
5. Strengthening Pest Outbreak Alert and Response Systems.
6. Assessment and Management of Climate Change Impacts on Plant Health.
7. Global Phytosanitary Research Coordination.
8. Diagnostic Laboratory Network.

CONTRIBUTING TO UN 2030 SUSTAINABLE DEVELOPMENT GOALS

SPEAKERS PROFILES

Dr. Sandrine M. Bayendi Loudit epse Essono is an agronomist-entomologist with over sixteen years of crop protection experience. She was appointed as Senior Scientific Officer – Entomology on April 2022 at the Inter-African Phytosanitary Council of African Union (AU-IAPSC) in the Department of Agriculture and Rural Development of the African Union Commission. She is currently the acting Coordinator of the office since December 2022. Before joining the AU-IAPSC, she had worked at the Institute of Agronomic and Forestry Research (IRAF) in Gabon from 2006 to 2022 managing programs and projects related to plant health as a plant protection laboratory manager and then the manager of the Plant Protection Program - pesticide management.

Dr. Sandrine M. Bayendi Loudit epse Essono is a holder of a PhD (2017) in agronomic sciences and biological engineering and a master's degree in the protection of tropical and subtropical crops (2011) from the University of Liege-Gembloux Agro Bio Tech in Belgium.

Dr. Sandrine Bayendi Loudit
Acting Coordinator- Inter-African Phytosanitary Council of African Union (AU-IAPSC)

Dr. Osama El-Lissy
Secretary, International Plant Protection Convention (IPPC)

Dr. Osama El-Lissy is the Secretary of the International Plant Protection Convention (IPPC). The IPPC is a global intergovernmental treaty involving 184 countries and is responsible for setting and implementing international phytosanitary standards to protect the health of plant resources and to facilitate the global trade of agricultural products.

Prior to his current appointment as the IPPC Secretary in March 2022, Dr. El-Lissy worked for the United States Department of Agriculture (USDA) for almost 22 years. For the past nine years, he served as Deputy Administrator of USDA's Animal and Plant Health Inspection Service. In that role, Dr. El-Lissy led the national plant protection organization of the United States and served as the country's chief plant health officer. He also provided leadership to 3,000 employees in the United States and around the world.

Dr. El-Lissy held several other executive positions earlier in his USDA career. These included Associate Deputy Administrator, Director of Plant Health Emergency Programs, and National Coordinator of Cotton Pest Programs.

Before joining USDA in 2000, Dr. El-Lissy worked for the Texas Boll Weevil Eradication Foundation from 1994 to 2000, leading one of the largest pest eradication programs in the world. From 1986 to 1994, he worked with the Arizona Cotton Research and Protection Council, managing large-scale cotton pest eradication programs in Arizona and the southwestern region of the United States.

Dr. El-Lissy holds a doctorate degree in management from the University of Maryland, a Master of Business Administration from Georgetown University, a Master of Public Administration from American University, and a Bachelor of Science in agriculture production and entomology from Cairo University.

Dr. Andrew Edewa has more than 2 decades experience developing and implementing quality and SPS systems for in Africa, having worked in various technical capacities at the United Nations Industrial Development Organization (UNIDO), as Food Safety Officer at the African Union and, as Food Safety Advisor at the Food and Agriculture Organization (FAO). He has practical experience in implementing standards and SPS programmes with private sector, having worked as food systems expert for various food business operations in East Africa.

Dr. Edewa holds a B.Sc. (in Agriculture) degree from the University of Nairobi and Graduate Certificate in Plant Pathology and in Crop Protection from ICIP. He also holds advanced Diploma in Food Safety from the Royal Institute of Public Health (UK); M.Sc. (Food Safety and Quality); and Ph.D. (Sanitary and Phytosanitary Standards) from the University of Greenwich, UK. Dr. Edewa is also a Post-Doctoral Fellowship in TBT and SPS matters at the University of Missouri, USA. Dr. Edewa is also a guest lecturer supporting postgraduate programme in food safety and quality at the University of Nairobi

Dr. Andrew Edewa
Director of the Standards and SPS Programme at TradeMark Africa (TMA)

Dr. Morris Akiri
Senior Regional Director, CAB International (CABI)

Dr. Morris Akiri is the Senior Regional Director for CABI in Africa. He is a mission-oriented leader with over 30 years' experience designing and implementing strategies in fast-paced environments and an analytical expert skilled in leveraging data to influence action, improve processes, and drive organizational change. He has a credible history of collaborating widely and working across the globe.

At CABI Dr Akiri is responsible for overseeing the management of International Development (ID) operations across Africa and leads the growth and development of CABI's ID strategic vision and operations in Africa including defining goals, preparing budgets, delivering membership benefits, building strategic partnerships, cultivating collaboration across multiple centres, maintaining regulatory compliance, ensuring scientific excellence, and monitoring scientific outputs. Prior to this, he was the Group Portfolio Director responsible for CABI's overall programme and project portfolio, reporting on performance across the organisation and implementing systems to monitor and improve delivery and effectiveness.

Dr Akiri holds a Doctorate of Business Leadership, Supply Chain Risk Management from the University of South Africa, a Master of Business Administration - Strategic Management from United States International University and is a Certified Public Accountant of Kenya (CPAK).

CONFERENCE PROGRAM

Conference Day 1

Monday, 18th September, 2023

OFFICIAL OPENING SESSION

Moderators: Prof. Theophilus Mutui (MD, KEPHIS) and Dr. Isaac Macharia (DPSB, KEPHIS)
Rapporteurs: Dr. Alex Muvea, Mr. Ivan Obare

8.30-9.00 am	**Arrival and registration – Registration foyer**
9.00-9.10 am	**Opening Remarks** **Prof. Theophilus Mutui,** Managing Director, KEPHIS
9.10-9.15 am	**Opening Remarks** **Dr. Morris Akiri,** Centre for Agriculture and Biosci-ence International (CABI)
9.15-9.20 am	**Opening Remarks** **Dr. Andrew Edewa,** Trade Mark Africa
9.20-9.30 am	**Keynote Address 1** **Ms. Carla Elisa Luis Mucavi,** FAO Representative in Kenya
9.30-9.40 am	**Keynote Address 2** **Dr. Sandrine Bayendi Loudit**, AU-IAPSC
9.40-9.50 am	**Keynote Address 3** **Dr. Osama El-Lissy**, Secretary General, IPPC
9.50-10.00 am	**Welcoming Remarks** **Joseph M'eruaki M'uthari,** Board Chairman, KEPHIS
10.00-10.10 am	**Welcoming Remarks** **Mr. Kello Harsama,** the Principal Secretary, Min-istry of Agriculture and Livestock Development, State Department of Crop Development
10.10-10.30 am	**Official Opening** **Hon. Mithika Linturi,** EGH, Cabinet Secretary, Ministry of Agriculture and Livestock Development
10.30-11.00 am	**Overview of the Phytosanitary Conference** **Dr. Isaac Macharia,** (DPB, KEPHIS)
11.00 -11.20am	**Coffee Break | Photo Session**

SESSION 1: PEST RISK ANALYSIS (PRA)

Moderators: Dr. Eston Mutitu (KEFRI) and Mr. George Momanyi (KEPHIS)
Rapporteurs: Dr. Alex Muvea and Mr. Ivan Obare

11.20-11.40 am	**Keynote Address** **Prof. Darren Kriticos,** IPRRG
11.40-11.50 am	**Mazimba E.** Engaging NPPOs of trading partners during the pest risk analysis process - The case of **Zambia**
11.50-12.00 pm	**Momanyi G.** Towards the use of a simplified scheme for Rapid Pest Risk Analysis in **Kenya**
12.00-12.10 pm	**Darren J. K.** Pest Risk Assessment: Historical roots and emerging chal-lenges **- Australia**
12.10-12.20 pm	**De la Peña E.** Exploring the impact of escalating demand of subtropical fruit crops on emerging pests in Europe **- Spain**
12.20-12.30 pm	**Avedi E.** Horizon scanning for prioritizing invasive alien viruses and vi-roids with potential to threaten agriculture and biodiversity in **Kenya**
12.30-12.40 pm	**Momanyi G.** Towards the use of a simplified scheme for Rapid Pest Risk Analysis in Kenya
12.40-12.50 pm	**Mazimba E.** Pest risk registers for improving pest risk management **- Zambia**
12.50-1.10 pm	**Momanyi G.** Towards the use of a simplified scheme for Rapid Pest Risk Analysis in Kenya
10.10-10.30 am	**Q&A Session**
1.10-2.00 pm	**Lunch break | Promotion videos and exhibition**

SESSION 2: SPS Technical Assistance to Gain and Maintain Market Access

Moderators: Dr. Lorna Migiro (USAID) and Dr. Edward Onkendi (KEPHIS)
Rapporteurs: Dr Edith Avedi and Mr. Isaac Nyateng

2.00 - 2.50 pm	**Dr. Andrew Edewa** Leveraging SPS Technical Assistance to Gain and Maintain Market Access - Experience from TradeMark Africa
2. 50 - 3.00 pm	**Q&A session**

SESSION 3: Invasive Species and Management

Moderators: Ms Triza Karanja (MOALD) and Mr. Peter Shango (KEPHIS)
Rapporteurs: Dr. Benard Mukoye and Ms. Janet Odongo

3.00-3.20 pm	**Keynote Address:** **Dr. Ivan Rwomushana,** CABI
3.20-3.30 pm	**Wabuyabo C.** Dodder as an invasive weed affecting residents residing near the Malaba One Stop Border Post (Teso South): A call for improved border surveillance **- Uganda**
3.30-3.40 pm	**Ndlela S.** Potential of entomopathogenic fungi in the management of the invasive spotted wing Drosophila, Drosophila suzukii Matsumura **- Kenya**
3.40-3.50 pm	**Mutitu E. K.** Morphological taxonomy and distribution of dodder (Cuscu-ta species) in **Kenya**
3.50-4.00 pm	**Privat N.** Prioritization of alien pest species likely to threaten agriculture, biodiversity, and forestry in Burundi through horizon scanning **- Burundi**
4.00-4.10 pm	**Sambai K.** Status of Biological control of invasive cactus *(Opuntia spp.)* using *Dactylopius opuntiae* in Laikipia County **- Kenya**
4.10-4.20 pm	**Mwangi M.** Effects of golden apple snails on rice seed and its man-agement in Mwea, Kenya **- Kenya**
4.20-4.40 pm	**Q&A Session**
4.40 - 5.00pm	**Coffee Break | Promotion videos and exhibition**

Conference Day 2

Tuesday 19th September 2023

SESSION 4: CABI DIGITAL TOOLS

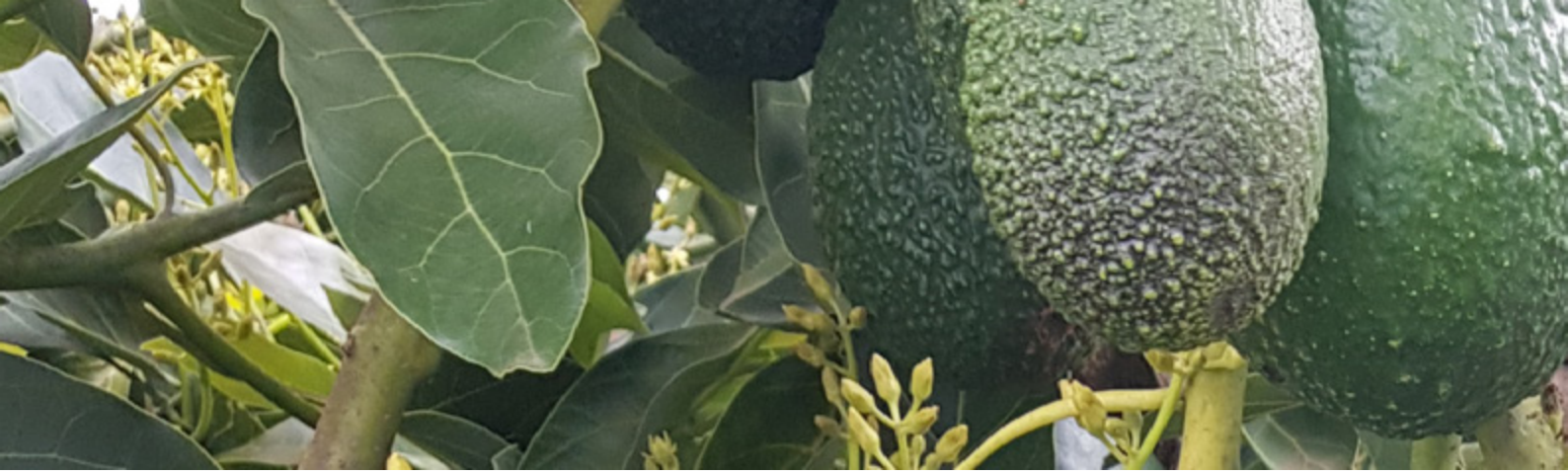
Moderators: Dr. Mary Lucy Oronje (CABI) and Dr. Alex Muvea (KEPHIS)
Rapporteurs: Dr. Benard Mukoye and Ms. Janet Odongo

8.30-9.00 am	**Dr. Ivan Rwomushana.** CABI's role in supporting management of inva-sive alien species in Africa: A historical perspective and future interventions.
9.00-9.10 am	**Q&A session**

SESSION 5: Pest Surveillance in Phytosanitary Systems

Moderators: Dr. Muo Kasina (KALRO) and Dr. Moses Oyier (KEPHIS)
Rapporteurs: Dr Edith Avedi and Mr. Isaac Nyateng

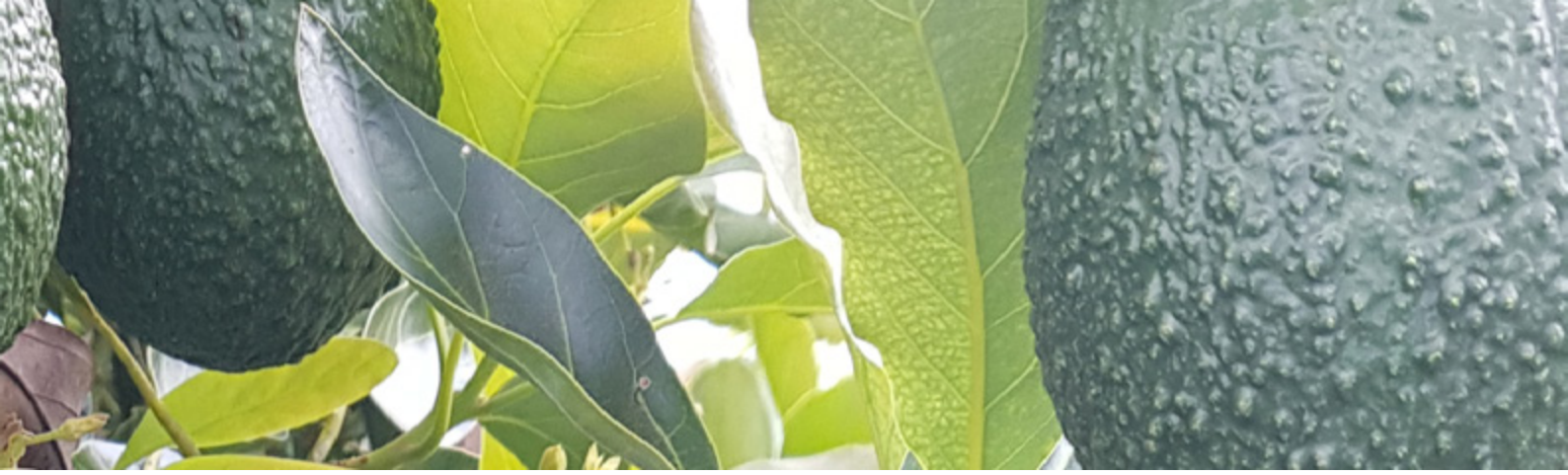
9.10-9.30 am	**Keynote Address:** **Dr. Sybren VOS,** European Food Safety Authority (EFSA)
9.30-9.40 am	**Swinteh J.** Fruit fly surveillance in three counties namely; Nimba, Bong and Lofa; major mango fruit production areas in **Liberia**
9.40-9.50 am	**Hategekimana A.** Outbreak of aphids in pastures: Infestation status, farmers' knowledge and their control strategies in **Rwanda**
9.50-10.00 am	**Kaluski Tomasz.** The European Food Safety Authority's role in safe-guarding food safety, protecting plant health, and enhancing pest sur-veillance in the European Union **- Italy**
10.00-10.10 am	**Kipkoech H.** Avocado sunblotch viroid: an emerging threat to avocado production in **Kenya**
10.10-10.20 am	**Guantai** M. Detection of tomato fruit borer *(Neoleucinodes elegantalis)* in **Kenya**
10.20-10.30 am	**Helen H. T**he status of the invasive fruit-tree/mango mealybug *(Rastro-coccus invadens)* in **Kenya**
10.30-10.40 am	**Q&A Session**
10.40-11.00 am	**Coffee break | Promotion videos and exhibition**



SESSION 6: Safe Exchange of Vegetatively Propagated Crop Germplasm

Moderators: Mr. Duncan Onduu (STAK) and Mr. Simon Maina (KEPHIS)
Rapporteurs: Mr. Ivan Obare and Ms. Florence Munguti

11.00-11.20 am	**Keynote Address:** **Dr. Christopher Ochieng Ojiewo,** International Maize and Wheat Improvement Center (CIMMYT)
11.20-11.30 am	**Amah, D.** PROSSIVA: Program for Seed Systems Innovations for Vegeta-tively-propagated crops in **Africa**
11.30-11.40 am	**Ferguson M.** New laboratory and regional hub for VPCs germplasm at KEPHIS-**Kenya**
11.40-11.50 am	**Owoko P.** Development and status of draft Seeds and Plant Varieties Vegetatively Propagating Seeds) regulations 2023 in **Kenya**
11.50-12.00 pm	**Mlay P** Building a sustainable sweetpotato seed system in **Tanzania**
12.00-12.10 pm	**Tolulope R.** Innovations to strengthen the management of seed quality for Vegetatively Propagated Crop (VPC) seed systems in **Nigeria**
12.10-12.20 pm	**Wamatsembe I.** The use of the Quality Declared Seed (QDS) certifica-tion Scheme to increase access to quality planting materials for vegeta-tively Propagated Crops, a case for **Uganda**
12.20-12.30 pm	**Mwankemwa Z.** Development of banana seed certification standards in **Tanzania**
12.30-12.40 pm	**Kariuki J.** Establishing sustainable cassava seed systems in Kenya and **Rwanda**
12.40-12.50 pm	**Aluoch P.** Status of cassava multiplication in **Kenya**
12.50-1.10 pm	**Q&A Session**
1.10-2.00 pm	**Lunch | Promotion videos and exhibition**



SESSION 7: Pest Diagnostics in Phytosanitary Systems

Moderators: Dr. Joseph Mulema (CABI) and Dr. Edward Onkendi (KEPHIS)
Rapporteurs: Mr. Ivan Obare and Ms. Dorothy Olubayo

2.00-2.10 pm	**Uzayisenga B.** Morphological and molecular characterization of Phakopsora apoda causing leaf rust on brachiaria grass in **Rwanda**
2.10-2.20 pm	**Silva G.** Molecular diagnostic tests in support of yam seed systems: a case study, **United Kingdom**
2.20-2.30 pm	**Benjamin M.** Foliar diseases and the associated fungi in rice cultivated in **Kenya**
2.30-2.40 pm	**Waithera J.** Effect of interactions of maize chlorotic mottle virus and sugarcane mosaic virus on maize lethal necrosis disease development in infected maize in **Kenya**
2.40-2.50 pm	**Q&A session**

SESSION 8: Import and Export Certification in Phytosanitary Systems

Moderators: Mr. Hosea Machuki (FPEAK) and Mr. James Wahome (KEPHIS)
Rapporteurs: Dr. Alex Muvea and Dr. Edith Avedi

2.50-3.10 pm	**Keynote Address:** **Ms Sylvie Mamias,** UnionFleurs
3.10-3.20 pm	**Cyril Julius.** OECD Fruit and Vegetables Scheme – **South Africa**
3.20-3.30 pm	**Bachabi,** F. Role of Africa Rice-Germplasm Health Unit (GHU) in regulating rice seed exchange in Sub-Saharan Africa**- Cote d' Ivorie**
3.30-3.40 pm	**Omondi L.** Regulatory status of quarantine pests of rice in international trade: A review for **Kenya**
3.40-3.50 pm	**Koome F.** Resumption of Kenya's fresh mangoes to European Union market – **Kenya**
3.50-4.00 pm	**Mazimba M.** Prioritizing plant pathogenic pests with the potential to threaten agriculture, biodiversity and forestry in Zambia – **Zambia**

4.00-4.10 pm	**Buldur G.** Evaluation of phytosanitary fumigation technology using mag-toxin plate 61% (magnesium phosphide 61%) insecticide against thrips and spider mites in roses, gypsophila and hypericum**-Kenya**
4.10-4.20 pm	**Mwando N. L.** Evaluation of thermal tolerance of immature stages of fall armyworm *(Spodoptera frugiperda)*: A basis for the development of postharvest disinfestation parameters in export commodities **- Kenya**
4.20-4.40 pm	**Q&A session**
4.40 – 5.00pm	**Coffee break | Promotion videos and exhibition**
5.00-8.00 pm	**Networking & Cocktail** **Venue:** KEPHIS Headquarters

Conference Day 3

Wednesday, 20th September, 2023

SESSION 9: Climate Change Resilience, Mitigation and Adaptation

Moderators: Dr. Moses Nyongesa (KALRO) and Dr. Benard Mukoye (KEPHIS)
Rapporteurs: Dr Edith Avedi and Mr. Isaac Nyateng

8.30-8.50 am	**Keynote Address:** **Mr. Joab Josiah Langi Osumba,** Adaptation Consortium (ADA)
8.50-9.00 am	**As Oyekale.** Cocoa farmers' perceived phytosanitary impacts of climate change and mitigation options in **Cameroon**
9.00-9.10 am	**Muthama E.** Impacts of selected climate smart agricultural practices on African indigenous vegetables in Kenyan drylands - **Kenya**
9.10-9.20 am	**Parton K.** Impact of climate change on the production of fruit produced in **South Africa**
9.20-9.30 am	**Cheptaiwa J.** Tracking resilience of Kenya crop varieties over time to climate change **- Kenya**
9.30-9.40 am	**Waweru M. N.** Polycentric participation and success of climate change resilience, mitigation and adaptation strategies **- Kenya**
9.40-9.50 am	**Altus V.** Preparedness for Fusarium TR4 disease **- South Africa**
9.50-10.10 am	**Q&A session**
10.10-10.30 am	**Coffee Break | Promotion videos and exhibition**

SESSION 10: Emerging innovations in phytosanitary systems

Moderators: Mr. Abed Mathangu (AATF)
and Ms. Florence Munguti (KEPHIS)
Rapporteurs: Mr. Ivan Obare and Dr. Moses Oyier

10.30-10.40 am	**Ndirangu, E.W.** Atoxigenic Aspergillus flavus (Aflasafe KE01) application reduces Fumonisin contamination in Maize in Lower Eastern **Kenya**
10.30-10.40 am	**Syanda J.** Adoption of ePhyto solution for enhanced phytosanitary com-pliance **- Kenya**
10.40-10.50 am	**Mukuwa P. S. C.** Digitalization of phytosanitary services: Lessons from **Zambia**
10.50-11.00 am	**Cherotich S.** Phytosanitary interventions to avert pest spread and en-sure safe exchange of tree germplasm: the role of CIFOR-ICRAF tree germplasm health unit**-Kenya**
11.00-11.10 am	**Mwambu.** Experiences of promoting electronic phytosanitary certificates in **Uganda**
11.10-11.20 am	**Q&A Session**

SESSION 11: Role of private sector in implementation of successful phytosanitary systems

Moderators: Ms. Agatha Thuo (ASNET) and Ms. Faith Ndunge (KEPHIS)
Rapporteurs: Dr. Alex Muvea and Dr. Edith Avedi

11.20-11.30 am	**Tumuboine E.** Systems approach to mitigating pest risks in fruits and vegetables for export to **European Union**
11.30-11.40 am	**Syanda J.** Role of horticultural trade logistic providers in phytosanitary compliance – the case of **Kenya**
11.40-11.50 am	**Mwambu P.** Public and private sector partnerships to facilitate fruits and vegetable exporters' certification in **Uganda**
11.50-12.10 pm	**Q&A session**

Panel discussion for stakeholders

Moderators: Ms. Agatha Thuo (ASNET) and Ms. Faith Ndunge (KEPHIS)
Rapporteurs: Dr. Edith Avedi and Ms. Asenath Koech

12.10-12.40 pm	**Contribution of scientific research in phytosanitary systems** **Panellists:** Academia, KALRO, KEPHIS, CIP, IITA, CIMMYT, CABI, ICIPE
12.40-1.00 pm	**Q&A Session**
1.00– 2.00 pm	**Lunch Break | Promotion videos and exhibition**

SESSION 12: Cross cutting issues in phytosanitary systems (legal requirements, capacity building, regulatory framework, trade negotiation and communication, biosafety, gender issues in SPS)

Moderators: Mr. Clement Tulezi (KFC) and Ms. Hellen Mwarey (KEPHIS)
Rapporteurs: Dr Edith Avedi and Mr. Fredrick Koome

2.00-2.20 pm	**Keynote Address:** **Dr. Kenneth Msiska -** Zambia
2.20-2.30 pm	**Migiro L.** Successes and lessons learned from the United States Department of Agriculture - Animal and Plant Health Inspection Service (USDA-APHIS) activities in Eastern Africa - **Kenya**
2.30-2.40 pm	**Mukoye B.** The future of plant health regulation and research; Lessons from one hundred important questions facing plant science: an interna-tional perspective - **Kenya**
2.40-2.50 pm	**Judith C. C.** Capacity building to enhance phytosanitary compliance in places of production: A case of Syngenta plant pathology laboratory **- Kenya**
2.50- 3.00 pm	**Lagat. S. J.** Contribution of women in seed companies in Kenya: a case study of Nakuru County **- Kenya**
3.00-3.10 pm	**Suresh M.** Tackling Maize Lethal Necrosis (MLN) in Eastern Africa through effec-tive phytosanitary approaches **- Kenya**
3.10-3.20 pm	**Komi M.** An Innovative Python-based Tool for Spatio-temporal Dispersal Modelling of parasitoid of agricultural pests - **Kenya**

3.20-3.30 pm	**Q&A session** **Moderator:** Dr. Isaac Macharia **Rapporteurs:** Dr. Mary Guantai and Dr. Esther Abonyo
3.30-4.30 pm	**Plenary Session - reflection on entire conference proceedings, Way forward**
4.30-5.10 pm	**Closing Ceremony** **Closing remarks:** • Awarding winners in essay writing competition • Dr. Isaac Macharia, Director, Phytosanitary and Biosecurity- KEPHIS • Prof. Theophilus Mutui, Managing Director, KEPHIS
5.10 – 5.20pm	**Coffee break | Promotion videos and exhibition**

Conference Day 4

Thursday 21st September, 2023

FIELD EXCURSIONS

Departure: 8.00am

AM Session: 10.00-12.00 pm

Lunch: 12.00-1.00 pm

PM Session 2.00- 3.30 pm

Travel back: 3.45 pm

Group 1:
Kajiado – Ngongveg (Pest Free Place of Production) and Exotic Penina (Herbs production)

Team Leaders:
- Ms. Dorothy Olubayo
- Mr. Eric Were

Group 2:
Muranga - Kakuzi (avocado fruit production) and Keitt Packhouse (avocado fruit packhouse)

Team Leaders:
- Mr. George Momanyi
- Dr. Mary Guantai

Group 3:
Penta Flowers (cut flower production) and Real IPM Ltd (biological control agents multiplication)

Team Leaders:
- Ms. Eunice Ringera
- Dr. Alex Muvea

Group 4:
Dudutech Ltd (biological control agents multiplication) and CIMMYT (MNLD research site)

Team Leaders:
- Ms. Florence Munguti
- Mr. Kevin Sambai

● End of the conference

POSTER PRESENTATIONS

PRESENTER	TITLE OF THE ABSTRACT	COUNTRY
Ochieng B.J.	Reaction of potato cultivars to potato cyst nematodes under greenhouse condition	Kenya
Chomba D.M.	Status of fusarium wilt in Zambia	Zambia
Ndirangu E.W.	Displacement of toxigenic Fusarium Species by atoxi-genic *Aspergillus flavus* (Aflasafe KE01) application in Maize Fields in Lower Eastern Kenya	Kenya
Kivi A.	Application of integrated pest management (IPM) in cut flowers	Kenya
Momolu P.	Assessment of Upland Rice Production Constraints and Farmers' Preferred Varieties in Liberia	Liberia
Cheruiyot J.	Effect of Seed Priming on the Physiological Character-istics of Sorghum Seeds	Kenya
Shango P.	Study on viability and validity period for vegetable seeds a case of seed certification system in Kenya	Kenya
Mouzdalifa M.	*Fusarium oxysporum cubense* wilt TR4 Foc in Comoros	Comoros
Momanyi G.	Horizon scanning for potential arthropod quarantine pests which threaten agriculture and biodiversity in Kenya in 2023	Kenya
Syanda J.	Adoption of IPPC ephyto solution by African Union (AU) member states - Kenya	Kenya
Khisa S.	Technology transfer and capacity development for more sustainable cassava seed production in Kenya	Kenya
Cheptaiwa J.K.	Testing procedure towards release of the 1st FAW tol-erant maize varieties in Kenya	Kenya
Dida M.M	Application of Ga1 and Ga2 genes in isolation of tropi-cal maize in seed production	Kenya
Mutheu L.	Beware of the Khapra Beetle (Trogoderma granarium): The Tiny Terror of Stored Grains	Kenya
Sambai K.	Desert locust invasion in Kenya; triumphs, challenges and lessons	Kenya
Ombuna D.O	Evaluating the Effects of Cobalt/Molybdenum, Rhizobi-um Inoculants and Diammonium Phosphate Fertilizer on the Growth and Yield of Soya Beans in Kisii County (Glycine max)	Kenya

PRESENTER	TITLE OF THE ABSTRACT	COUNTRY
Yahuma N.	Cereal-legume intercrop: non - chemical strategy to manage fungal diseases in sorghum	Kenya
Otukho, B.	Effects of Gro-aloe on yield and yield components of wheat *(Triticum aesitvum)* in Kenya	Kenya
Rugang L.	Development of a simple, rapid, and sensitive Ampli-fyRP isothermal assay for detection of Fusarium ox-ysporum f. sp. *cubense* Tropical Race 4	China
Hughes D.	Enhancing agricultural resilience through the plantvil-lage ag observatory: monitoring, insights and solutions	Kenya
Mudenda M.	Role of the seed industry in NPPO seed maize crop in-spections: The case of Zambia	Zambia
Hilman R.	Prioritization of absent quarantine pests in Brazil through the analytical hierarchy process	Brazil
Siazemo M.	Realignment of Phytosanitatry Legal Framework – The Case of Zambia	Zambia
Waweru B.W	Understanding farmers' knowledge of passionfruit viral diseases and their coping strategies in Rwanda	Rwanda
Avedi E.K.	Genetic diversity of whitefly populations infesting to-mato crops in Kenya	Kenya
Odhiambo M.A	Characterization of cuticular hydrocarbons that gener-ate dessication resistance in two crickets species: *Acheta domesticus* and *Gryllus bimaculatus* (orthop-tera; gryllidae)	Kenya
Nabwire J.	Host Preference for and Performance of *Thaumatotibia leucotreta* on Different Varieties of Capsicum	Kenya
Kirasi M.P	The status of tomato mosaic virus in tomato crops in Kenya	Kenya
Karwara A.	Certification of Fruit Tree Nurseries	Kenya
Matilda M.	Evaluation of pests infesting imported maize across Malawi borders	Malawi

SIDE EVENTS

Tuesday, 19th September, 2023

Time: 9.00am to 12.00pm (EAT)
Venue: KEPHIS Headquarters

Sensitizing Exporters of Beans and Chillies on Phytosanitary and Food Safety Market Requirements

Facilitators: Ms Caroline Mutete, Mr. Bernard Okonda, Ms. Janet Odongo and Mr. Ivan Obare

African Countries continue to face challenges in meeting the stringent export market requirements during trade in horticultural produce. Beans and chillies exported to the European Union from Kenya have been listed under increased levels of official controls as a result of exceedance of maximum residue limits (MRLs) for pesticides. KEPHIS plans to hold a sensitization of the stakeholders during the 4th IPC. This training targets to sensitize stakeholders on the requirements and the importance of instituting food safety management systems for enhanced compliance of their produce to food safety market requirements.

Program

- Arrival and Registration
- Preliminaries
- Current Phytosanitary Market Requirements for agricultural products (PPT)
- Phytosanitary Notification Trends (PPT)
- Food Safety Requirements for Beans and Chillies exported to the EU (PPT)
- Quality of Seeds (PPT)
- Questions and Answers

Lunch and Departure

Tuesday, 19th September, 2023

Time: 9.00am to 12.00pm (EAT)
Venue: Virtual event

Sensitization on Seed Certification

Facilitators: Ms. Stellamaris Mulika, Ms Caroline Mutete, Mr. Kepha oganda and Mr. Ivan Obare

During the 4th IPC, KEPHIS will sensitize stakeholders on the process of seed certification virtually. Seed certification is governed by the Seeds and Plant Varieties Act (Cap 326) and encompasses seed merchant registration, field inspections, processing, Laboratory tests, marketing, post control and post certification. Stakeholders will be enlightened on the means of identification of certified seed in the marketplace and the existing complaint handling and feedback process on issues related to seed in Kenya.

Program

- Arrival and Registration
- Preliminaries
- What is certified seed and its benefits to farmers (PPT)
- How can a farmer identify certified seeds and varieties for different ecological zones (PPT)
- How farmers can avoid fake seed (PPT)
- Requirements for registration as a seed merchant, seller, grower (PPT)
- Questions and Answers

Lunch and Departure

Wednesday 20th September, 2023 | **Time:** 9.00am to 12.00pm (EAT) **Venue:** KEPHIS Headquarters

Sensitizing Youth in Agriculture

Facilitators: Ms. Janet Odongo, Mr. Peterson Munene, Mr. George Momanyi, Mr. Eric Were and Mr. Ivan Obare

KEPHIS will hold a youth sensitization forum on covering diverse agricultural opportunities.

The program will cover nursery certification, production and, avocado market requirements to China and other markets.

The session is envisaged to create awareness of available opportunities for the youth in agriculture.

Program

- Arrival and Registration
- Preliminaries
- Nursery certification (PPT)
- Avocado production (PPT)
- Avocado market requirement to china and other markets (PPT)
- Questions and Answers

Lunch and Departure

Wednesday, 20th - Friday 22nd September 2023 | **Venue:** KEPHIS, JKIA

OECD Fresh Fruit and Vegetable (FFV) Scheme Capacity Building

Facilitators: Ms. Stellamaris Mulika, Ms Caroline Mutete, Mr. Kepha oganda and Mr. Ivan Obare

Kenya is a member of the OECD Fresh Fruits and Vegetable (FFV) Scheme. The scheme ensures FFV standards implementation. Kenya has hosted national, regional and international workshops linked to this scheme since 2009 to enhance working relationships in application of FFV standards within the region and internationally. These workshops enable countries to share experiences on application of FFV standards, demonstrations on practical application of FFV standards and to discuss issues like traceability and food safety in marketing of Fresh fruits and vegetables. The last regional workshop was held in 2018 at KEPHIS Headquarters. The KEPHIS and OECD will hold a workshop for capacity building of stakeholders on the sidelines of the 4th International Phytosanitary Conference.

Program

TIME	TOPIC	FACILITATOR
20th September, 2023		
0900-0930	Preliminaries	
0930-1000	Introductions of participants	
TEA BREAK		
1030-1100	Objectives of the Training	KEPHIS

TIME	TOPIC	FACILITATOR
1100-1145	Introduction to OECD FFV Scheme	OECD Facilita-tors/Experts
1145-1315	Interpretation of FFV Quality standards of various vegetables and Fruits	KEPHIS OECD EXPERTS
LUNCH BREAK		
1400-1600	Practical Interpretation of the FFV Quality standards	KEPHIS
1600-1630	Feedback/Plenary session	OECD EXPERTS KEPHIS
TEA BREAK		
21st September 2023		
0900-0930	Recap of the previous day training	
0930-1000	Country/Industry experience	
TEA BREAK		
1030-1100	Online training tool on conformity assessment	COLEAD (DAVID SO-DADE)
1100-1230	Interpretation of Quality stand-ards of various fruits and vegetables	KEPHIS OECD EXPERTS
1230-1300	Quality Checks at the point of entry- Beans and Snowpeas (The Netherlands)	OECD Facilitators/ Experts
LUNCH BREAK		
1400-1600	Practical Interpretation of the FFV Quality standards	KEPHIS OECD EXPERTS
1600-1630	Feedback/Plenary session	KEPHIS
22nd September 2023		
0900-1100	Field visit to a Pack house	KEPHIS
1100-1300	Field visit to a supermarket	KEPHIS
LUNCH BREAK		
1400-1500	Training Evaluation/Closure	
Coordinators: Ms. Deborah Shituvi, Ms. Dorcas Mugambi, Mr. Simon Peter Muambi		

19th to 20th September 2023

Time: 2.00 – 5.00pm (EAT)
Venue: KEPHIS Headquarters

EFSA Workshop on Plant Pest Surveillance

Coordinator: Dr. Alex Muvea

The European Food Safety Authority (EFSA) is the agency of the European Union (EU) that provides independent scientific advice and communicates on existing and emerging risks associated with the food chain. KEPHIS together with EFSA will hold a two-day workshop on the sidelines of the 4th International Phytosanitary Conference to train KEPHIS Plant Health Inspectors. The session will cover modern surveillance technologies including risk-based sampling and practicals on survey parameters.

Program

TIME (MIN)	ITEM	PRESENTER/SOS/ RAPPORTEURS
Day 1: 19th September 2023		
	Session 1: Background and theory	
30	Risk based sampling: the statistics be-hind the scenes	Elena LÁZARO
30	Methodological framework and survey parameters	Sybren VOS
30	Survey process: preparation	Martijn SCHENK
30	TEA BREAK	
	Session 2: Practical exercise Setting survey parameters	
15	Setting Proxy of absence	
45	Target population structure and size	
30	Choosing the detection method	
30	Summary of day 1 and Q&A	
Day 2: 20th September 2023		
75	**Session 3: Pest survey toolkit**	Tomasz KALUSKI, Elena LÁZARO, Ignazio GRAZIOSI
	Pest survey cards	Ignazio GRAZIOSI
	Guidelines	Elena LÁZARO
	Statistical tools: RiPEST and RiBESS+	Tomasz KALUSKI, Elena LÁZARO
	Survey design using RiPEST	Tomasz KALUSKI

TIME (MIN)	ITEM	PRESENTER/SOS/ RAPPORTEURS
75	**Session 4: Pest survey toolkit**	Tomasz KALUSKI, Elena LÁZARO, Ignazio GRAZIOSI
	Pest survey cards	Ignazio GRAZIOSI
	Guidelines	Elena LÁZARO
	Statistical tools: RiPEST and RiBESS+	Tomasz KALUSKI, Elena LÁZARO
	Survey design using RiPEST	Tomasz KALUSKI
30	**TEA BREAK**	
90	**Session 5: Practical exercise for survey design**	Sybren VOS, Martijn SCHENK
	Calculation of survey sample using statistical tools	
	Survey conclusions	
30	General conclusion and Q&A and closure	All

KEYNOTE SPEAKERS

SESSION 1:
Pest Risk Analysis (PRA)

Day 1: 18th September 2023

Prof. Darren Kriticos

Darren Kriticos is a Principal Research Scientist with CSIRO and an Honorary Professor at the University of Queensland, Australia. He has used ecological modelling tools to solve problems in biosecurity, pest management and food security. He has an interest in modelling species niches, and their population dynamics. He currently works with International Pest Risk Research Group.

SESSION 3:
Invasive Species and Management

Day 1: 18th September 2023

Dr. Ivan Rwomushana, CABI

Ivan Rwomushana is Senior Scientist, Invasive Species and one of the Global Team Leaders for Plantwise Plus Programme at CAB International (CABI). He is based at the CABI Africa Regional Centre, Nairobi, Kenya. An entomologist by training, Ivan's research focuses on the development of climate resilient IPM strategies for the management of invasive insect species that constrain crop production in sub-Saharan Africa. He employs basic and applied research to unravel the invasion biology and ecology of invasive pests of agricultural crops in Africa, risk assessment of such invasions and the development of lower risk pest management options with a strong inclination towards biological solutions. His overall research goal is to provide farmers with novel pest management solutions, that reduce the heavy reliance on chemical pesticides. Ivan has over 60 refereed publications.

SESSION 5:
Pest Surveillance in Phytosanitary Systems

Day 1: 18th September 2023

Dr. Sybren VOS

European Food Safety Authority (EFSA)

Sybren VOS is trained as an agricultural engineer in France whose career begun in 1993 in the private sector, working on crop production for export to European agro-industries. In 2008, he joined the European Food Safety Authority (EFSA) as a scientific officer, performing pest risk assessments for the European Union (EU) and contributing to the development of the methodologies for quantitative risk assessments in plant health.

In 2017, Sybren took on the important task to develop a harmonised method for plant pests surveillance in EU Member States. This work aims at facilitating consistent and comparable pest surveillance practices across the European Union.

Since 2021, He has been leading the EFSA's Plant Health Monitoring team whose main tasks are to support EU risk managers by identifying new emerging pests through horizon scanning activities and to assist the EU Member states with the planning and execution of surveys of pests that might pose a threat to the European Union agriculture and environment.

SESSION 6:
Safe exchange of Vegetatively Propagated Crop germplasm

Day 2: 19th September 2023

Dr. Christopher Ochieng Ojiewo

International Maize and Wheat Improvement Center (CIMMYT)

Dr. Ojiewo aims to enhance varietal turnover to mitigate losses from evolving climate patterns, especially in dry areas with the poorest of the poor farmers, while addressing pest and disease complexes, and enabling public-private partnerships for enhanced seed delivery. Core to his sense of purpose is: improving productivity and profitability for smallholder farmers; gender equity; youth empowerment; nutrition security; knowledge sharing; and solving the perpetual problem of food, nutrition and income insecurity of the less privileged in developing countries. He works to establish a robust system that ensures sustainable, timely availability of and access to quality seed of dryland cereals and grain legumes at affordable prices through the participation of multiple stakeholders along the seed value chain. He is committed to gender equity as a guiding principle, considering the critical role women play in choosing legume and cereal varieties and seed sources.

SESSION 8:
Import and Export Certification in Phytosanitary Systems

Day 2: 19th September 2023

Ms Sylvie Mamias

UNION FLEURS, Secretary General

Sylvie Mamias is the Secretary General of Union Fleurs, the International Flower Trade Association, since 2011. She manages the association, coordinates its various activities and liaise with its network of international members. She also engages on behalf of Union Fleurs in advocacy activities in Brussels and beyond to promote and defend at EU and international levels the various sizeable interests of private operators involved in the international floriculture trade.

Specialised in European & international affairs and agri-trade law & economics, Sylvie Mamias has over 20 years of first-hand expertise in international trade policy, preferential trade schemes, SPS issues and global agri-food supply-chain issues. Working since 2003 for the international floriculture industry and for other agri-trade business organisations in Brussels, she has extensive experience in monitoring, analysing and disseminating complex regulatory developments to agri-trade sectors at EU and international levels.

A French national, Sylvie Mamias is a graduate of the Institut d'Etudes Politiques (Sciences Po) in Paris (France), where she studied law, economics and international relations. She also holds a MA in European Studies from the University of Birmingham (UK) and graduate certificates in European Law from the Friedrich-Schiller-Universität in Jena (Germany) and in Agriculture, Development & International Trade from the World Trade Institute in Bern (Switzerland).

SESSION 9:
Climate Change Resilience, Mitigation and Adaptation

Day 3: 20th September 2023

Mr. Joab Josiah Langi Osumba

Agriculture Lead at Adaptation Consortium (ADA)

Joab Langi Osumba holds a BSc in Agriculture, a Post Graduate Diploma in Agricultural Education, a Master of Philosophy in Environmental Science, a Certificate in Environmental Impact Assessment and Audit, and is currently pursuing a PhD in Climate Change Adaptation. Joab is currently the Agriculture Lead at Adaptation Consortium (ADA), Kenya. Prior to that Joab was a Research Officer on Climate-Smart Agriculture Policy with CGIAR Research Program on Climate Change Agriculture and Food Security (CCAFS) East Africa, at International Livestock Research Institute (ILRI), Nairobi (2019-2022). Joab has been a Technical Advisor on Climate-Smart Agribusiness under UKaid's Climate Change Programme in Kenya (2014-2018), and an Agriculture Officer at various capacities in the State Department of Agriculture, Government of Kenya (1997-2014). Besides the above specifics Joab has been a Consultant on Environmental Risk Management (Impact Assessment and Audit) since 2009 and on Climate-Smart Agriculture and policy dialogues since 2011. Joab has authored or co-authored peer-reviewed journal articles, policy briefs, technical briefs, books, book chapters, training manuals, working papers, and technical reports, covering agricultural development, environmental stewardship, and climate risk management.

SESSION 12:
Cross cutting issues in phytosanitary systems (legal requirements, capacity building, regulatory framework, trade negotiation and communication, biosafety, gender issues in SPS)

Day 3: 20th September 2023

Dr. Kenneth Msiska

Sybren VOS is trained as an agricultural engineer in France whose career begun in 1993 in the private sector, working on crop production for export to European agro-industries. In 2008, he joined the European Food Safety Authority (EFSA) as a scientific officer, performing pest risk assessments for the European Union (EU) and contributing to the development of the methodologies for quantitative risk assessments in plant health.
In 2017, Sybren took on the important task to develop a harmonised method for plant pests surveillance in EU Member States. This work aims at facilitating consistent and comparable pest surveillance practices across the European Union.
Since 2021, He has been leading the EFSA's Plant Health Monitoring team whose main tasks are to support EU risk managers by identifying new emerging pests through horizon scanning activities and to assist the EU Member states with the planning and execution of surveys of pests that might pose a threat to the European Union agriculture and environment.

ABSTRACTS

Engaging NPPOs of trading partners during the pest risk analysis process: The case of Zambia

Mazimba E.[1]*, Msiska K. K.[1]*, Lyowa L.[2], Chomba D. M.[3], Mudenda M.[4], Mukuwa P. S. C.[5], Chivanga J.[6], Siazemo M.[7], Mtawa M.[8] and Goma A.[9]

[1]CABI, Nairobi Kenya
[2]CABI, Lusaka, Zambia
[3]CABI, Wallingford, United Kingdom
[4]Mulungushi University, Kabwe, Zambia
[5]National Biosafety Authority (NBA), Lusaka, Zambia
[6]Natural Resources Development College (NRDC), Lusaka Zambia
[7]Plant Quarantine and Phytosanitary Service (PQPS), Lusaka, Zambia
[8]University of Zambia (UNZA), Lusaka, Zambia
[9]Zambia Agriculture Research Institute (ZARI), Lusaka, Zambia
[10]Zambia Environmental Management Agency (ZEMA), Lusaka, Zambia
*Corresponding author email: emmamazimba@yahoo.com

Abstract

The Pest Risk Analysis (PRA) and Data Management Unit under the Plant Quarantine and Phytosanitary Service (PQPS), Zambia's National Plant Protection Organisation (NPPO) has in the past used CABI, journals, EPPO databases and other sources of literature to conduct PRAs. Engaging NPPOs of the exporting countries for information on a pest is key in conducting a PRA. However, since start of 2023, the NPPO of Zambia has enhanced its PRA process by requesting for pest information from the NPPOs of the exporting countries. Initially, this was a challenge because the NPPO's did not respond to the requests on time or hardly did so. Currently, there is a tremendous progress to the responses. From March 2023 to date, 15 completed pest information packages from Turkey, Lithuania, Mexico, China, Nigeria, Malawi and Namibia have been received. This has resulted in the development of appropriate phytosanitary measures and has facilitated international cooperation between the NPPO of Zambia and the NPPOs of the exporting countries. During the PRA process, an official letter and a pest information package is sent to the exporting country via email. The former contains specifications of the plant products to be imported while the latter is a questionnaire containing specific details. Engaging with trading partners during the PRA processes has been essential in ensuring a consistent approach to pest risk assessments and reducing the likelihood of introducing pests.

Key words: Pest Risk Analysis, NPPO, Exporting country, pest information package, phytosanitary measures, trading partner

Towards the use of a simplified scheme for Rapid Pest Risk Analysis in Kenya

Momanyi G.*, Koech A. and Macharia I.

Kenya Plant Health Inspectorate Service (KEPHIS). P.O Box 49592-50100 Nairobi, Kenya

Corresponding author email: gmomanyi@kephis.org

Abstract

The international standard for phytosanitary measures ISPM 11 [2001]: *Pest risk analysis (PRA) for quarantine pests* (and its revisions) provides an outline of the procedures to be followed in conducting pest risk analysis. Regional and national PRA schemes based on ISPM 11 have been developed to provide a logical structure for the analysts to follow. The current PRA protocol used by KEPHIS is both time consuming and does not provide for situations where quick decisions or prior screening is required to determine whether a full PRA is necessary. Simplified PRA guidelines are developed to provide a simplified PRA scheme to be used in various scenarios, such as when an unfamiliar pest is detected in an imported consignment, or when there is a request to import plant products for emergency situations. In such cases, the rapid PRA can be undertaken within the time that the consignment can be detained and/or for quick issuance of a plant import permits. A rapid PRA process will allow for quick decisions as to what action to take with regard to intercepted consignments (e.g. destruction, treatment, return to origin, no action, etc.), and also determine temporal import requirements for plant materials for emergency situations, while at the same time giving an appropriate level of protection for Kenya. The rapid PRA may be followed by a full PRA in order to decide on permanent measures whenever the risk levels dictate. This paper proposes all the steps for rapid PRAs to be conducted and indicates how each step builds up to reach a conclusion on the PRA process.

Key words: Rapid PRA, full pest risk analysis, Simplified Pest Risk Analysis Scheme, Import requirement

Exploring the impact of escalating demand of subtropical fruit crops on emerging pests in Europe

de la Peña E.[1]*

[1]Spanish National Research Council (CSIC), Institute for Subtropical and Mediterranean Horticulture (IHSM-UMA-CSIC), Avenida Dr. Wienberg, s/n., 29750 Algarrobo-Costa, Malaga, Spain

*Corresponding author email: e.delapena@csic.es

Abstract

The cultivation of subtropical fruit crops in Europe historically had few insect pests and was limited to specific regions in southern Europe with a favorable year-round climate. However, escalating demand for these commodities, coupled with climate change, is radically altering the pest landscape and expanding agricultural areas across the Mediterranean. Consequently, the growing cultivation of subtropical crops in Europe has led to increased demand for planting materials, resulting in a substantial rise in imports of nursery items and plants from third world countries with lack of established quarantine facilities. Despite enactment of elaborate import control by the EU which guide importation of plants and plant products from the third world countries, imports likely facilitated the introduction and establishment of various emerging pest species throughout the Mediterranean region. Notable pests include *Sternochetus mangiferae, Aulacaspis tubercularis, Scirtothrips dorsalis, S. aurantii,* and *S. citri*. Understanding the causes and implications of these emerging pest threats is crucial to safeguarding the future of subtropical fruit cultivation while protecting traditional Mediterranean crops. This paper analyzes the escalating threats posed by emerging pests to subtropical fruit orchards in Europe, focusing on three major crops—avocado, mango, and custard apple—in Mediterranean Europe. The findings emphasize three important actions: 1) assessing and modeling climate change's impact on pest dynamics; 2) conducting comprehensive pest risk assessments and identifying introduction pathways resulting from increased importation of nursery materials and plants; 3) developing and implementing sustainable integrated pest management (IPM) strategies essential for preserving plant health in these crops.

Key words: Mediterranean region, quarantine, import control, European Union, emerging pests

Horizon scanning for prioritizing invasive alien viruses and viroids with potential to threaten agriculture and biodiversity in Kenya

Avedi E.[1], Mukoye B[1], Ndirangu E.[1], Mwangi J.[1], Obare I.[1], Macharia I.[1], MaryLucy O.[2], Rwomushana I.[2], Lucinda C.[3], and Mulema J.[2]

[1]Kenya Plant Health Inspectorate Service, P.O Box 49592-50100 Nairobi, Kenya
[2]CABI, 673 Canary Bird, Limuru Road Muthaiga, P.O Box 633-00621 Nairobi, Kenya
[3]CABI, Nosworthy Way, Wallingford, Oxfordshire, OX10 8DE, United Kingdom.

Corresponding author email: e.aved@kephis.org

Abstract

Globalization of trade in plants has been the cause of introduction of Invasive alien species (IAS) to new environments. Such introductions pose plant health risks that include species extinction and environmental degradation resulting in significant impacts on socio-economic development. The spread of IAS has increased significantly in recent years, affecting food and income security of several million resource-poor farmers in sub-Saharan Africa. This has been attributed to weak cross border biosecurity, porous borders, and limited capacity to stop invasions. Horizon scanning is an approach that prioritizes the risks of potential IAS through rapid assessment. This approach provides risk managers with a ranking system that helps identify pests of high risk that deserve close attention in terms of management strategies. In collaboration with CABI, KEPHIS conducted a horizon scanning activity of potential IAS (fungi, nematodes, insects, bacteria, and viruses) however, this paper focuses on viruses and viroids. Prioritization was carried out using an adapted version of horizon scanning and consensus methods developed for ranking IAS. A total of 363 potential viruses and viroids on a 5-point scale for the likelihood of entry and establishment, potential socioeconomic impact, and impact on biodiversity. The individual scores were combined to rank the species according to their overall potential risk for the country. Confidence in individual and overall scores was recorded on a 3-level qualitative scale. This resulted in a priority list of 108 potential viruses (102) and viroids (6). The vectors were also considered during the scanning. Majority of the viruses and viroids are likely to arrive via infested planting materials or through viruliferous vectors as stowaways. Actions suggested for those species that scored highly include full pest-initiated risk analyses, and detection surveys for those recorded in the neighbouring countries.

Key words: Horizon scanning, Viruses, Viroids, Pest prioritization, Invasive species

Nature of pest risks posed by the sea container pest pathway in Kenya and steps taken to mitigate the risks

Koome F.*, Mukoye B., Kosiom T. and Macharia I.

Kenya Plant Health Inspectorate Service (KEPHIS). P.O. Box 494592, 00100 Nairobi

*Corresponding author email: fkmakathima@gmail.com

Abstract

The issue of pest risk associated with sea container has become a matter of growing concern in the global trade. Recent studies in US, Australia, New Zealand and China have shown that the bodies of sea container, both empty and loaded can present significant risk of movement and introduction of invasive species and pests in a country. From 2019, KEPHIS initiated a surveillance program to evaluate the likely pest risk associated with sea container pest pathway in Kenya. The main objective of the surveillance was: to determine the nature and frequency of bio-contaminants, particularly plant pests; the level of biosecurity risk posed by the sea container pathway; and the effectiveness of the cargo transport units (CTU) code in preventing contamination. Using a questionnaire developed by the IPPC, a survey of 789 sea containers imported from 54 countries was undertaken at 6 entry points in Kenya between April 2019 and August, 2022. Data was recorded using the ODK software and submitted to server for analysis. Approximately 56.3% of the containers surveyed contained bio-contaminations. Soil was the main type of contaminant seen, and was found on an estimated 53.8% of the contaminated containers. Approximately 30.9% of the contaminated containers were found with plant materials, 5% seeds, and 7.8% with arthropods - including live pests and egg mass, and 2.5% with other bio-contaminants. Based on these findings, it is clear that the sea container pathway poses a significant pest risk to Kenya. Kenya has taken measures to mitigate the risks presented by the sea container path through; development of the Kenya sea container inspection guideline, awareness creation on the said risks, and inspection of the sea containers.

Key words: Sea container, pathway, contaminants, Survey, inspection

Pest risk registers for improving pest risk management

Mazimba E.[1], Attipoe P.[1], Momanyi G.[3*], Lyowa L.[2], Beseh P.[2], Macharia I[3]. and Day R[4].
[1] Plant Quarantine and Phytosanitary Service, Mount Makulu Research Station, Private Bag 7 Chilanga, Zambia
[2] Plant Protection and Regulatory Services Directorate, P.O. Box M37, Pokuase, Accra, Ghana
[3] Kenya Plant Health Inspectorate Service, P.O. Box 49592, Nairobi, Kenya
[4] CAB International, UK
*Corresponding author email: gmomanyi@kephis.org

Abstract

National Plant Protection Organizations are mandated to assess and manage the risk of introduction and establishment of pests, to prevent or reduce economic damage. There may be thousands of pests that could be introduced, so prioritization of programs to address potential pest introductions based on risk, allows scarce resources to be used more cost effectively. Ghana, Kenya and Zambia have all conducted pest risk prioritization (horizon scanning). The risk prioritization needs to further complement with pest information from other sources and be regularly updated to accommodate more pest groups as risks change with time. A regularly updated pest risk register would be of use to different units within the NPPO, particularly those involved in assessing and managing risks, including pest prevention, pest preparedness and response. Other public and private sector stakeholders might also use such a register. The NPPOs in Ghana, Kenya and Zambia are each establishing a pest risk register using the outputs of the pest risk prioritization process as the basis. Pests in the register will primarily be quarantined, although some which might require regulating will also be included. Pests which are not included in the register, but have been pre-assessed, may require archiving separately in case their pest status changes. Initially the register will be a spreadsheet with various inter-phases shared with several stakeholders including the general public. Pest taxonomy, hosts, distribution and risk will be recorded, plus recommended risk management actions such as surveillance, contingency planning and full pest risk analysis. For lower risk pests no action may be recommended. Processes are being established for managing the risk register to ensure it stays up-to-date. A working group or committee is being set up with the overall aim of running the register, and implementing workflows for the monitoring of multiple information sources to identify possible pests for addition or updating where significant changes to risk have occurred.

Keywords: Pest risk assessment, risk prioritization, risk register, risk management

SESSION TWO | SPS TECHNICAL ASSISTANCE TO GAIN AND MAINTAIN MARKET ACCESS

About the Ecomonic Recovery and Reform Activity presented by TMA

The Economic Recovery and Reform Activity (ERRA) is a US$ 75 million five-year program (2022 - 2027) funded by the United States Agency for International Development (USAID) through TradeMark Africa - TMA (formerly, TradeMark East Africa). ERRA aims to promote transformative trade and investment reforms in the East and Horn of Africa while supporting the region to return to a growth pathway and recover from the negative impacts of the COVID-19 pandemic while advancing competitiveness, resilience, and sustainability. TradeMark Africa (TMA) is an Aid-for-Trade organization established in 2010 to grow prosperity through trade. By facilitating trade along economic corridors, deepening regional integration, and supporting inclusivity through women in trade, TMA has made an impact by decreasing the time and cost of trade, boosting exports, and creating jobs. For more information, please visit www.trademarkafrica.com

Leveraging SPS Technical Assistance to Gain and Maintain Market Access- Experience from TradeMark Africa

Andrew Edewa*

TradeMark Africa

*Corresponding author email: andrew.edewa@trademarkafrica.com

Introduction

African countries have taken important steps to improve sanitary and phytosanitary (SPS) systems promote food security and to facilitate trade in food and agricultural commodities. However, the ability to meet SPS requirements in regional and overseas markets is a major factor determining access to high value markets and more broadly the capacity to export. Many African countries are increasingly being marginalized from international agrifood trade because of their inability to establish minimum SPS institutional environment and conditions for an appropriate supply of tradable goods. While there is demonstrated political will to expand intra-regional trade, the application of sanitary and phytosanitary (SPS) regulations, remains a major impediment to effective agri-food trade.

Method

TradeMark Africa supports African Countries establish requisite SPS trading conditions and enhance export capabilities through SPS Technical Assistance Programmes. The aim is to increase market access by reducing SPS related barriers to trade and enabling enterprises meet SPS requirements in target markets. TMA SPS programme focusses on enhancing continental, regional and national SPS systems for efficient SPS service delivery to address SPS risks along the agrifood chains and enable enterprises meet SPS regulatory requirements along key trade corridors.

Results:

- Strengthening Continental SPS Coordination Mechanisms
- Enhancing EAC SPS Frameworks, including SPS information sharing.
- Developing National SPS Systems in 10 African Countries
- Implementing SPS Solutions for agricultural products along key trade corridors in Africa

Discussion

To reap the benefits of regional and international trade, African countries must first put their houses into order by reviewing a whole raft of domestic SPS policies so that the appropriate trade environment in food and agricultural commodities is created. At the same time, the need to produce and supply food and agricultural products that comply with SPS requirements of importing countries has posed new challenges

and opportunities for operators along the supply chain. While non-compliance with SPS standards quickly leads to exclusion, particularly smallholder producers and traders, export-oriented supply chains facilitate flows of resources and knowledge that enable actors comply with SPS requirements.

African countries must adjust both to the quickening pulse of international exchange and to reform on many fronts simultaneously in order to catchup with the rest of the world and reap from benefits of international trade. Governments and support institutions are required to make fundamental changes in policies, strategies, organisational linkages, and the provision of skills to enable their agro-based industries to compete in the globalised markets, but often do not have the technical, human and information resources to be able to do so. SPS Technical Cooperation offers hope for African countries to enhance participation in international trade in agricultural products. However, governments and businesses should prioritise SPS investments in their export strategies.

Dodder as an invasive weed affecting residents residing near the Malaba One Stop Border Post (Teso South): A call for improved border surveillance

Wabuyabo C.*

*Corresponding author email: wabuyaboc@gmail.com

Abstract

The biological invasion of parasitic weeds, such as the dodder, directly and indirectly, affects the host and the entire environment. Dodder is one of the parasitic weeds that have highly invaded the areas near Malaba border One Stop Border Post hence posing a threat to the Malaba residents as well as the larger Teso south constituency. Dodder compromises the hosting plant's nutritional status, adversely weakening the plant's growth and development. Dodders also affect the ecosystem; humans massively receive these effects in their normal agricultural practices. Dodder, an invasive species, having a wide geographic range and host species makes it spread very fast, posing direct and indirect effects on agriculture, the main economic activity sustaining livelihoods in Busia County. These impacts range from affecting the host plant's reduced productivity to death under severe infestation. Understanding and identifying the spread and distribution, particularly related to climate variability, is important in understanding dodder and finding effective and sustainable weed management options. Identifying the hosts in the study area is also key. Thus, these findings will aid in improving border surveillance especially at the Malaba OSBP as well as identifying non-host species which can be used for crop rotation. Finally, evaluating the management methods that farmers have used to manage dodder shall be important in assessing the most effective and sustainable methods farmers will be advised to adopt. In addition, this information helps in understanding the biology and ecology of dodder, which is important in improving the available management options and even establishing new and more effective methods, particularly in the horticultural sector because the study area depends heavily on horticultural farming as a socio-economic activity. This would improve yields, safeguard food security and increase income from agriculture. The information could also be used nationally by policymakers in policy formulation for the control and management of dodder.

Key words: Parasitic weeds, invasion, yields, management, host plant

Potential of entomopathogenic fungi in the management of the invasive spotted wing Drosophila, *Drosophila suzukii* MATSUMURA

Ndlela S.*, Azrag A. G. A., Ambaka M., Mohamed S. A. and Ekesi S.

International Centre of Insect Physiology and Ecology (*icipe)*. P.O. Box 30772-00100 Nairobi, Kenya

Corresponding author email: sndlela@icipe.org

Abstract

The invasive spotted-wing *Drosophila suzukii* is a serious pest of soft berries, in both open fields and tunnel/greenhouse production. It is native to Asia but has since invaded various parts of the world including Europe and the USA. Recently it was detected in continental Sub Sahara Africa and there are fears that its devastating effects may be amplified owing to the fragmented nature of production and poorly co-ordinated management approach. To contribute to the management of this novel pest, we screened various isolates of *Metarhizium anisopliae* (13), *Metarhizium brunneum* (1), *Beauveria bassiana* (3) and *Isaria sp* (3). Infection of flies was done using plastic tubes whose inner walls were lined with velvet material on which 0.3 g dry conidia of each fungal isolate were evenly spread. Flies were allowed to walk on the velvet material for two minutes to allow them to pick spores before being transferred to experimental cages. The acquisition of conidia by adult flies, horizontal transmission between sexes, repeated infection by single donors, and the resultant effect on the fecundity of infected flies and percent mortality was assessed. Five of these isolates ICIPE 07, 18, 20, 30, and 78 were found highly potent, causing between 80-100% mortality of adult flies. There was no significant difference in the virulence of the five isolates of *D. suzukii* flies ages 3, 5, and 8 days old. There were no significant differences in spore acquisition by males and females of different ages. Harvesting of berries is daily, and this presents a challenge as no synthetic pesticide has a post-harvest interval of hours or less than a day. This calls for safer alternatives that do not pose any harm to users, consumers, and the environment. Entomopathogenic fungi present safe options and can be adopted in the berries production system.

Keywords: *Metarhizium anisopliae*, Biological control, Berries, Mortality, Horizontal transmission

Morphological taxonomy and distribution of dodder (*Cuscuta* species) in Kenya

Mutitu E. K.*, Kaigongi M., Njuguna J., Mwangi L., Omondi S., Kimani P., Njehu J., Muthama A., Magare C., Adienge A., Otieno B., Moile R., Nyaundi O. and Jillo R.

Kenya Forestry Research Institute (KEFRI). P.O. Box 20412-00200, Nairobi- Kenya

*Corresponding author email: emutitu@kefri.org

Abstract

Dodders are parasitic plants that attack other plants. In Kenya, reports on dodder have identified *Cuscuta reflexa, Cuscuta campestris* and *Cuscuta kilimanjari.* However, several other species may be widespread in the county. The weed poses a threat to Kenya's ecosystem and biodiversity with adverse environmental impacts. Currently, the identity of the species causing havoc in the Kenyan ecosystems is not known. Data on the extent of spread and damage caused by dodders on plants as well as the magnitude of their socio-economic impacts is also lacking. A national survey was conducted to identify sites with dodder infestations using transects to taxonomically identify species in Kenya, their distribution and infestation. Dodder samples were collected from the infested areas and characterized morphologically. Host plants were determined. Known road transects were used in the collection of samples at a distance of 1km apart. Identification was done by examining the morphological features such as colour and floral characteristics and compared with known keys. Western and Rift Valley were the most affected areas while Eastern and Coastal areas had moderate infestations. Six species of Dodder were identified and their occurrence documented. The species identified were: *Cuscuta kilimanjari* (85.4%)*, Cuscuta suaveolens* (5.4%), *Cuscuta campestris* (4.3%) *Cuscuta planiflora* (3.7%) *Cuscuta epilinum* (0.5%) and *Cuscuta australis* (0.5%). *Cuscuta kilimanjari* was the most widely distributed species and had a wide host range. It was the dominant species in the Eastern Kenya region. *Cuscuta suaveolens* and *Cuscuta australis* were only found in Central Kenya region. *Cuscuta planiflora* was found in both Central and Nyanza. *Cuscuta campestris* was found in both the Central and Rift Valley regions. *Cuscuta epilum* was only found in Rift Valley on *Bougainvillea gabra.* The major species attacked by *Cuscuta sp.* are *Thevetia peruviana* followed by *Lantana camara* and *Senna siamea*. The *Cuscuta spp* were found to affect different plant species including high agricultural crops and trees. The findings of the study have expanded the knowledge base on the distribution and host range of dodders in Kenya.

Key words: *Cuscuta spp*, Taxonomy, Morphology, Distribution, Kenya

*Prioritization of alien pest species likely to threaten agriculture, biodiversity, and forestry in Burundi through horizon scanning

Privat N.[6], Neilla N.[6], Placide B.[7], Epitace B.[4], Eustache C.[4], Elie G.[7], Egide H.[4], Arlene I.[6], Antoine I.[6], Marie G. I.[4], Lycien M.[4], Alexis M.[6], Samson M.[6], Jacqueline N.[4], Pascal N.[5], Deo N.[8], Emerance N.[4], Schadrack N.[4], Evariste N.[6], Marie N.[6], Sakayoya E.[3], Fernadis M.[1], Celestin N.[6], Lucinda C., Willis O.[1], Joseph M.[1]

[1]CABI, Nairobi Kenya
[2]CABI, Wallingford, United Kingdom
[3]Direction Générale de l'Agriculture (DGA)
[4]Direction de la Protection des Vegetaux (DPV)
[5]Food and Agriculture Organisation of the United Nations (FAO), Bujumbura, Burundi
[6]Institut des Sciences Agronomiques du Burundi (ISABU)
[7]Office National de Contrôle et de Certification des Semences (ONCCS)
[8]University of Burundi
Corresponding author email: ndayihanzamasoprivat@gmail.com

Abstract

The lack of information about potential invasions is one of the main reasons that have resulted in introduction and spread of invasive pests. Availability of such information can help in constricting pathways by reducing and limiting the means of entry and spread, interception of movements at border points, assessing risk of planned imports and guiding on import requirements through pest risk assessments. Horizon scanning supports generation of such information hence, an activity was conducted with the objective of identifying pests that have not been reported in Burundi but could be introduced and become invasive. The CABI Horizon Scanning Tool was used to identify pests that have not been reported as present in Burundi but in countries that trade with Burundi especially in plants, plant parts for planting and plant products. The tool identified 8,737 pests which included 5,647 arthropods 301 bacteria, 171 chromista, 1,719 fungi, 27 molluscs, 206 nematodes, 9 protista, and 657 viruses and viroids. Pests that affect value chains key to the Burundi economy were selected and subjected to a risk assessment based on published guidelines. The assessment was conducted by Subject Matter Experts from Burundi institutions. Following the assessment, actions to prevent introduction of the pests were suggested which included pest-initiated pest risk analyses and detection surveillance for pests reported in neighbouring countries. For some pests, no action was suggested because they recorded a risk score below the suggested minimum of 54 although this was based on the significance of the pathway. For those where the pathway was key and if the pest was introduced, it would become destructive, a no action with continued monitoring was suggested. The prioritised list will be used to guide updating the list of regulated pests. They will also be added to the Plant pest risk register for Burundi.

Key words: Horizon scanning, Invasive species, Pest risk analysis, Pest risk register, Quarantine pests, Surveillance

Status of biological control of invasive cactus (*Opuntia* Spp) using *Dactylopius opuntia* in Laikipia County, Kenya

Sambai K*, Munguti F., Muvea A., Kabole M. and Macharia I.

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

*Correspondence author email: ksambai@kephis.org

Abstract

Opuntia stricta (Haw) (Cactaceae) is an invasive plant in Kenya especially in the arid and semi-arid areas. Negative impacts on biodiversity and livelihoods have been noted due to invasion of *O. stricta*. Chemical control using herbicides and physical control by slashing and burning in the past have proved ineffective. Prickly pear cochineal (*Dactylopius opuntiae*) an insect that feeds exclusively on cactus has been applied in South Africa, Argentina and Australia to control prickly pear cactus (*Opuntia stricta and Opuntia engelemanii*). In Kenya, first release was done in 2011 in Laikipia County but the colonies didn't establish well. In 2022, a second release of this biocontrol was done in Laikipia County (Loisaba Conservancy) where cactus growth was posing a risk to wildlife by reducing the pastures available to the herbivores. Pastures for animals have been made inaccessible by the cactus but this insect has a potential of controlling this invasive plant in Kenya. *D. opuntiae* was reared and multiplied at the Plant Quarantine and Bio Security Station's Entomology Laboratory before being released to augment the control of prickly pear cactus in Laikipia County. This paper addresses the challenges in establishment, spread, and knowledge gaps in biological control of the prickly pear cactus in Kenya.

Key words: Opuntia, biocontrol, Cactus, establishment, augmentation

Effects of golden apple snails on rice seed and its management in Mwea, Kenya

Mwangi M.*

Mwea Rice Growers Multipurpose Co-operative Society Limited

*Corresponding author email: Mmwangi50@yahoo.com

Abstract

Golden Apple snails, GAS (*Pomacea canaliculata*) is an exotic snail that has successfully invaded ecosystems outside its native ranges with negative impacts being reported in all invaded areas. GAS was first reported in 2020 after it had invaded one of the largest rice producing schemes, Mwea irrigation scheme. They have high fecundity rates whereby one snail lays about 1,200 eggs in a month. The eggs are laid on any vegetation and objects such as sticks, and even stones above the water surface and hatches in seven days. The pest lives in irrigated fields, canals and waterlogged areas. Their bronchial respiration system is comparable to the gills of fish located on the right side of the snail's body, that enables them to survive while submerged in water. GAS damage rice by feeding voraciously through scraping of plant surface with their rough tongues. The most vulnerable rice stage to GAS damage is newly transplanted rice seedlings. Their feeding on the base of young seedlings, causes significant economic damage to the farmers. Based on the rate of infestation and management level, GAS can cause damage of up to 92% on the planted rice in the scheme. Management of the pest requires a complete Integrated Pest Management System approach that includes: i. Cultural methods –Draining the fields, Intermittent irrigation between 14-21 DAT, physical collection of the snails from the fields and killing them, use of ripe banana peelings; ii. Biological methods – Migratory ducks that are feeding on them iii. Chemical control - A Bio mollusk which is also a biopesticide, formulated from natural materials with a high knock down effect, and minimal toxicity to human, environment and non-target organisms such as fish has been found to be highly effective. It is derived from *Saponins* of the *Chenopodium quinoa*, which acts as the active ingredient.

Key words: High fecundity, rice damage, integrated management, biopesticide

SESSION FOUR | CABI DIGITAL TOOLS

About CABI

CABI is an international not-for-profit organization that improves people's lives by providing information and applying scientific expertise to solve problems in agriculture and the environment. Through knowledge sharing and science, CABI helps address issues of global concern such as safeguarding the environment and improving global food security. We do this by helping farmers grow more and lose less of what they produce, combating threats to agriculture and the environment from pests and diseases, protecting biodiversity from invasive species, and improving access to agricultural and environmental scientific knowledge. Our 49 member countries guide and influence our core areas of work. These include development and research projects, scientific publishing and microbial services. For more information visit www.cabi.org

Fruit fly surveillance in three counties namely; Nimba, Bong and Lofa; major mango fruit production areas in Liberia

Swinteh J.[1]* and Massaquoi L.[2]

[1]Ministry of Agriculture. P.O. Box 10-90100, 1000 Morovia 10, Liberia
[2]Department of Technical Services, Quarantine Services, Monrovia, Liberia
Quarantine Regulatory Office/NPPO-SPS-Liberia
*Corresponding author email: Swinteh1979@gmail.com

Abstract

Fruit fly is one of the major pests of horticultural crops (fruits and vegetables). In Liberia, study and research activities were conducted to assess population density, impacts on yield and management measures to mitigate yield loss by fruit fly. Farmers are currently practicing use of pheromone traps, application of attractants and DDVP Chemical measures and field sanitation as management strategies. In Liberia, The Ministry of Agriculture/NPPO and its Partner (the Innovative Regional Fruit Fly Control System in West Africa" (SyRIMAO) Project provide the services regarding surveillance, monitoring and management of fruit fly. In context of Liberia-European Union (EU) agreement to export Mango fruit from Liberia in 2025, for the quarantine fruit fly species in three counties namely; Nimba, Bong and Lofa, surveillance activities are ongoing. The surveillance of fruit flies in selected Mango orchards of Nimba, Bong and Lofa Counties, in Liberia during May to December 2022 revealed that trapped species of *Bactrocera species* were *B. dorsalis*, *B. cucurbitae*, *B. ceratitis capitata* and *B. ceratitis cosyra*. Among them, only the first three species were of quarantine concern for exporting Liberian Mangoes to the European Union (EU).

Key words: *Bactrocera* spp., mango Fruits, fruit flies, quarantine species, surveillance

Outbreak of aphids in pastures: Infestation status, farmers' knowledge and their control strategies in Rwanda

Hategekimana A.*, Bahunde E. N., Nkima G. and Mawcha K. T.
Rwanda Agriculture and Animal Resources Development Board (RAB), P.O. Box 5016 Kigali, Rwanda
*Corresponding author email: athanase.hategekimana@rab.gov.rw

Abstract

Pastures are a major source of forage for animal feeding mainly in open grazing systems. Pastures and forage species face a range of challenges including insect pests and diseases. In Eastern province of Rwanda, an outbreak of aphids spp (Aphididae/Hemiptera) which is a major pest of several plants including pastures was noticed in July 2021. To respond to the outbreak, a study was conducted to evaluate the infestation level, to provide the farmers' perceptions and to determine effective management strategies. For animal feeding purpose, there was a need to find out a safe product for the management of aphids and EWC+ as a new organic product on the market, it was evaluated in laboratory and open fields conditions. The results indicated that 98.2% of natural farms were affected versus 1.8% of cultivated pastures. The aphids were recorded in 3.6% of managed farms against 96.4% in unmanaged and overgrazed farms. The aphids colonized various plants in the pasture, such as *Hyparrhenia* sp., *Sporobolus* spp. and *Brachiaria* spp. The symptoms of attack included yellowing, reddening and drying. No actions to stop the outbreak were reported by 93% of interviewed farmers. In laboratory conditions, the results revealed that EWC+ could cause 100% mortality of artificially introduced aphids when 2-4ml are used. However, when the product was used in open pastures, it could reduce at 85% of the population of aphids when 4ml/1 liter of water is used. The efficacy of Pyrethrum EWC+ increased with the time of exposure and it was effective against aphids at doses ≥3ml/l of water. Integrated aphids management in pastures may be very important to reduce the incidence and severity of aphid and manage the pest.

Key words: aphids, management, outbreak, pastures, pyrethrum

The European food safety authority's role in safeguarding food safety, protecting plant health, and enhancing pest surveillance in the European Union

Vos S.*and Kaluski T.

European Food Safety Authority, Via Carlo Magno 1A, 43126 Parma, Italy.

*Corresponding author email: sybren.vos@efsa.europa.eu

Abstract

The European Union (EU) places a high priority on ensuring the safety of its food and feed, as well as the protection of animal and plant health. To achieve these objectives, the European Food Safety Authority (EFSA) plays a crucial role in supporting EU risk managers with scientific advice on risks associated with priority areas afore mentioned. EFSA's main objective is to assess and communicate risks related to the food chain, including risks arising from pests, diseases, contaminants, and other factors that may impact food safety. Through its extensive network of experts, EFSA collects and evaluates scientific data to identify potential hazards and assess their potential impact on human health, animal health, and the environment. As concerns plant health, EFSA is involved in evaluating potential threats posed by pests and diseases to plants, crops, and ecosystems. By providing comprehensive risk assessments, EFSA aids in the development of preventive measures, early detection systems, and effective control strategies to mitigate the impact of plant pests and diseases on agricultural production and biodiversity. This work has placed emphasis on the significant role of EFSA in providing scientific support to EU risk managers in surveillance of quarantine pests with the development of a methodological framework. The concepts and tools for plant pest surveillance that have been developed for assisting the EU Member States in the planning and execution of the pest surveys are also elaborated.

Key words: European Union, surveillance, risk-based survey

Avocado sunblotch viroid: an emerging threat to avocado production in Kenya

Kipkoech H.,[1, 2*] Avedi E.,[1] Kibwage P.,[1] Munguti F.,[1] Nyaboga E.,[2] and Macharia I.[1]

[1]Kenya Plant Health Inspectorate Service (KEPHIS), P.O. BOX 49592-00100, Nairobi, Kenya. [2]University of Nairobi, P.O BOX 30107-00100, Nairobi, Kenya
*Correspondence Email: khillary@kephis.org

Abstract

Avocado (*Persea americana*) belongs to the family Lauracea, which is an evergreen tree. It is one of the most important commercial fruits in Kenya, grown for both local and export markets. Kenya is the 6th largest producer of avocados in the world. Avocado sunblotch viroid (ASBVd) disease is an economically important disease of avocado. Symptomatic trees often produce avocado fruits with a reduced yield and quality of between 18% -30%, while symptomless tree carriers can lead to a yield reduction of up to 95%. Worldwide distribution of ASBVd includes Asia, Europe, Australia, North, Central, and South America, and the Caribbean. ASBVd symptoms were first reported in Kenya in December 2022 in Muranga County in an avocado orchard. This necessitated a detection survey in major avocado production regions in the country. A field survey was conducted in Murang'a, Laikipia, Nyeri, Meru, Uasin Gishu, Kisii, and Nakuru regions. The objective of this study was to detect and establish the distribution of ASBVd in Kenya. Two hundred and seventy (270) leaf and fruit samples were collected from 16 counties and tested by RT-PCR and RT-qPCR for the presence of ASBVd. Five samples (1.85%) tested positive, 261 (96.67%) tested negative, while for the remaining four samples (1.48%), were positive only with RT-qPCR method hence the results were inconclusive. Based on these results, there is a need to institute phytosanitary measures to prevent the spread of the disease in the country. Such measures include certification of avocado nurseries and mother plants, testing of imported consignments including seedlings, scions and rootstock, and enhanced quarantine measures. It is important to create awareness of the disease to facilitate rapid reporting. There is need to conduct more research to understand the diversity of this viroid in Kenya.

Key words: *Persea americana*, Avocado sunblotch viroid, Distribution, detection, RT-PCR

Detection of tomato fruit borer (*Neoleucinodes elegantalis*) in Kenya

Guantai M.*, Olubayo D. and Heya H.

Kenya Plant Health Inspectorate Service (KEPHIS). P.O. Box 494592, 00100 Nairobi

Corresponding author email: mguantai@kephis.org

Abstract

The tomato fruit borer (*Neoleucinodes elegantalis,* Guenee, Synonyms; *Leucinodes elegantalis,* Guenee) is a moth belonging to the family Crambidae. It is an oligophagous pest attacking fruits of plants belonging Solanaceae family such as *Solanum quitoense* Lam., tree tomato (*Solanum betaceum*), cocona (*Solanum sessiliflorum*), lulo del pacifico or luloeperro (*Solanum pseudolulo*) and vegetable crops such as tomato (*S. lycopersicum*), eggplant (*S. melongena*) and green and red pepper (*Capsicum annuum*). The pest is known to occur in Central and South America and so far, it has not been reported in Africa and the EPPO region. In 2014, it was listed as an EPPO A1 pest (OEPP/EPPO, 2015) and in March 2019, the pest was added to the EU list of regulated pests and published in the Commission Implementing Directive 2019/523 of March 2019. Therefore, KEPHIS carried out a detection survey to establish the status of the pest in Kenya. A total of 151 samples comprising of Aubergines (*Solanum melongena*), Chillies (*Capsicum annum*), Tree tomato (*Solanum betaceum*), Tomatoes (*Solanum lycopersicum*) and Sodom apple (*Solanum incanum*) were collected from nine counties and incubated in the laboratory. Field observations and results from laboratory incubated samples showed that the pest was not present in Kenya. However, *Leucinodes laisalis* which is a pest known to occur in Kenya, was recorded in eggplant and Sodom apple. Other pests recorded from laboratory incubations include: *Thaumatotibia leucotreta* in Capsicum, *Tuta absoluta* in Tomato and *Bactrocera* sp in Tree tomato. We recommend continuous monitoring to ensure that *Neoleucinodes elegantalis* pest does not get into the country through any of the common pathways.

Key words: Regulated, pest, solanaceae, incubation, moth, crambidae

The status of the invasive mango mealybug (*Rastrococcus invadens*) in Kenya

Helen H., John K., Kevin S., Fredrick K., Florence M. and Macharia I.

Kenya Plant Health Inspectorate Service

Correspondence email: hheya@kephis.org

Abstract

The fruit tree mealybug, *Rastrococcus invadens* (Williams) is a mealybug belonging to Family *Pseudococcidae*. This mealybug has been an important polyphagous pest of horticultural crops. In Africa, the pest has been listed in 45 species of host plants from 22 Families including the mango Family Anacardiaceous. A detection survey for this invasive pest was carried out from February to May 2023 in four Counties of Kenya namely Kitui, Machakos, Makueni and Kwale. The objective of the survey was to establish the status (presence or absence) of the pest in mango production areas. Open Data Kit (ODK) software was used to record data collected and send to the server. GPS coordinates for the farms were also recorded as part of the data filled in the ODK application. A total of 60 farms (11 farms in Kitui, 18 in Machakos, 11 in Makueni and 20 in Kwale) were surveyed. Leaves and fruits samples infested with various pests were collected in Khaki bags and taken to the Plant Quarantine and Biosecurity Station laboratory for identification. The findings of this survey indicate that the mango fruit tree mealy bug; *Rastrococus invadens* was absent in all the surveyed farms in the four Counties. However, other Scale insects species were identified such as the Papaya mealybug (*Paracoccus marginatus*), mulberry scale (*Pseudaulacaspis sp*), red scale (*Aonidiella aurantii*), cottony cushion scale (*Icerya purchase*), mango scales (*Aulacaspis tubercularis*) mango leaf gall midges; *Procontarinia mangiferae*, Lomgtail mealybug (*Pseudococcus longispinus) and white mango scale (Aulacaspis tubercularis*). We recommend another extensive survey in mango growing regions of Kenya to establish if the pest is indeed absent or not.

Keywords: Scales, Polyphagous, *Pseudococcidae*, Pest, Infested, Survey

SESSION SIX | SAFE EXCHANGE OF VEGETATIVELY PROPAGATED CROP GERMPLASM

Seed equal: a cross-disciplinary and collaborative CGIAR initiative for quality seed delivery and adoption

*[1]Ojiewo C.O., [2]Spielman D., [3]Barker I., [4]Legg J., [5]McEwan M., [5]Gatto M[3]. and Ellul P.

[1]International Maize and Wheat Improvement Center (CIMMYT)

[2]International Food Policy Research Institute (IFPRI)

[3]Consultative Group on International Agricultural Research (CGIAR) Systems Organization

[4]International Institute of Tropical Agriculture (IITA)

[5]International Potato Center (CIP)

Correspondence: c.o.ojiewo@cgiar.org

Abstract

Research and innovation in agrifood systems are crucial for a sustainable, climate-resilient world free from hunger and malnutrition. The CGIAR 2030 Research and Innovation Strategy takes cognizance of evolving global context demanding a systems transformation approach. The Genetic Innovation Action Area impact is driven by a Theory of Change linking the work of Market Intelligence, Genebanks, Accelerated Breeding, Breeding Resources and, for the last mile delivery of quality seeds, the Seed Equal Initiative. Seed Equal aims to develop innovative models for delivering climate-resilient, market-preferred, and nutritious varieties of staple crops; building strategic partnerships, developing capacities and coordination to scale-up technology adoption; supporting enabling policies for accelerated varietal turnover, seed quality assurance, and seed trade; renewed commitment to benefit disadvantaged, resource-poor farmers and consumers, especially women; supporting emergency seed delivery and overall seed systems security through value-chain approach. Through cross-disciplinary work packages, and leveraging results from precursor projects and programs, Seed Equal Initiative made evidence-based recommendations that enabled regulatory reforms in the seed sector in Kenya. In 2022, in close collaboration with the Kenya Plant Health Inspectorate Service (KEPHIS), a new comprehensive regulatory approach to seed quality assurance was proposed and effective seed laws, regulations, and guidelines implemented specifically for the regulation of the multiplication and sale of seeds from vegetatively propagated crops (VPCs). Building on the success of this work, Seed Equal Initiative is supporting innovative and proven strategies and tools that work to successfully diagnose, plan and develop new vegetative seed systems. It includes 11

tools: (1) multi-stakeholder framework, (2) impact network analysis, (3) Seed Tracker, (4) integrated seed health approaches and models, (5) seed tracing, (6) small-N/exploratory case study, (7) four-square method, (8) means-end chains method, (9) experimental auctions, (10) seed regulatory framework analysis, and (11) sustainable early generation seed business analysis tool (SEGSBAT). Additional tools such as VarScout for tracking varietal adoption are underway. Seed Equal initiative key results and progress toward outcomes for 2022 are available at Seed Equal Annual Report 2022.

Key words: Seed equal, breeding, climate resilient, market preferred

PROSSIVA: Program for Seed Systems Innovations for Vegetatively-propagated crops in Africa

Amah D.[1*], Legg J.[2], Balogun M.[1], Adegoroye T.[3], Rogers W.[4], Ogero, K.[5], Rajendran S.[6] Diebiru-Ojo M.[1] and Sanni L.[1]

[1]International Institute of Tropical Agriculture (IITA), Ibadan, Oyo State, Nigeria.

[2]International Institute of Tropical Agriculture (IITA), Dar es Salaam, Tanzania.

[3]SAHEL Consulting, FCT Abuja, Nigeria. [4]Resourced, St Louis, USA.

[5]International Potato Center (CIP), C/o Tanzania Agricultural Research Institute (TARI) - Ukiriguru, Mwanza, Tanzania. [6]International Potato Center (CIP), Kampala, Uganda.

*Corresponding author email: D.Amah@cgiar.org

Abstract

Vegetatively-propagated crops (VPCs) such as banana/plantain, cassava, sweet potato and yam are critical crops for building climate-resilient food systems in Africa. However, the seed sectors for these crops are poorly developed, limiting the availability of quality seeds of productive varieties to millions of smallholder farmers who depend on these crops for their livelihood. Their vegetative nature of propagation limits seed availability due to inherently low multiplication ratios and promotes disease spread through infested planting material in the absence of appropriate seed regulation and quality assurance schemes. Recognizing this challenge, the Bill and Melinda Gates Foundation (BMGF) made significant investments in the past decade to build sustainable seed systems for yam (YIIFSWA), cassava (BASICS & BEST), sweet potato (SweetGAINS) and banana (RAPID) within respective crop x geography contexts. Progress recorded from these efforts with developing VPC regulatory frameworks, optimizing propagation techniques and establishing seed enterprises warranted a consolidation to enhance coordination and foster cross-learning across crops. PROSSIVA is an innovation research initiative which builds on these efforts, aiming to enhance the efficiency, productivity, and profitability of VPC seed systems for banana/plantain, cassava, sweet potato and yam. Led by the International Institute of Tropical Agriculture (IITA), the 5-year project, funded by the BMGF is implemented by 25 partners comprising national research organizations, CGIAR centres, seed regulatory authorities, consulting agencies and private seed companies. Crop experts and seed value chain actors identified key bottlenecks that informed research questions and high-priority research activities for the project. This co-creation and co-implementation approach will facilitate cross-interactions among crop and discipline groups to ensure that prioritized technological, marketing and institutional innovations are generated to build VPC seed systems in target countries. Innovations generated will be scaled beyond target countries and will contribute to poverty

alleviation, improved livelihoods, and new job opportunities, particularly for women and youth, by raising VPC productivity, increasing volumes of sale, and building capacities for various seed system actors.

Key words: innovation, regulatory frameworks, profitability, seed companies, seed quality, vegetatively propagated crops

Establishing a regional germplasm hub for vegetatively propagated crops in Africa

Ferguson M.[1*], Munguti F.[2], Ngundo G.[2], Mwangangi M.[2], Onkendi E.[2], Lindqvist-Kreuze H.[3], Kreuze J.[3], Kumar L.[4], McEwan M.[5], Mendes T.[5], Shah T.M.[1], Rajendran S.[6] and Pereira da Rocha V.[7]

[1] International Institute of Tropical Agriculture (IITA), P.O. Box 30709, Nairobi, Kenya.

[2] Kenya Plant Health Inspectorate Service – Plant Quarantine and Biosecurity Station (KEPHIS-PQBS), Muguga, Kenya.

[3] International Potato Center (CIP), Avenida La Molina 1895, La Molina Apartado Postal 1558, Lima, Peru.

[4] International Institute of Tropical Agriculture (IITA), P.M.B, 5320, Oyo Road, Ibadan, Oyo State, Nigeria.

[5] International Potato Centre (CIP), P.O. Box 30709, Nairobi, Kenya

[6] International Potato Center (CIP), Kampala, Uganda

[7] International Maize and Wheat Improvement Center (CIMMYT), ICRAF House, United Nations Avenue, Gigiri, Nairobi, Kenya

*Corresponding author email: m.ferguson@cgiar.org

Abstract

Vegetatively Propagated Crops (VPC), which include essential staples such as cassava, potato, sweetpotato, yams, and bananas are the mainstay of food security and nutrition in many parts of Africa. Pathogen carryover from one season to the next is a major challenge to maintaining the quality of planting material and, thus, the productivity of these crops and the risk of the pathogen spread with vegetative propagules. Pathogen infection or the potential for infection also delays the regional distribution of VPC germplasm and slows the dissemination of improved varieties to farmers. The Kenya Plant Health Inspectorate Service (KEPHIS), the International Institute of Tropical Agriculture (IITA) and the International Potato Centre (CIP) have partnered, together with Crops to End Hunger (CtEH), to establish a dedicated infrastructure to facilitate the production and phytosanitary safe and timely regional distribution of pathogen-free quality, end-user preferred cultivars, and breeding material of VPCs. The new facility will be situated at the KEPHIS Plant Quarantine and Biosecurity Station, Muguga, Kenya. It will have the capacity for VPC germplasm services such as cultivar identification, virus elimination and indexing, in addition to the regional distribution of certified clean *in vitro* plantlets. It will also serve as a center of excellence and training. The facility is anticipated to become operational by the end of 2024.

Key words: vegetatively propagated crops, phytosanitation, regional distribution, virus elimination, virus indexing

Development and status of draft seeds and plant varieties (vegetatively propagating seeds) regulations 2023 in Kenya

Owoko P[1]*., Odame P[2]., Maina[3] S.M., Ombalo D.O[1]., Wamache A. K[2]., Olwande J[4]., Cheptaiwa J. K.[3]

[1]Ministry of Agriculture and livestock Development Kenya

[2]Centre for African Bio-Entrepreneurship

[3]Kenya plant Health Inspectorate Service

[4]Tegemeo Institute

*Corresponding author email: spowoko@yahoo.com

Abstract

The importance of vegetatively propagated crops in food and nutrition security in Kenya has gained traction due to the rapidly growing population and increasing nutritional awareness. However, the country's limited capacity to deliver quality and affordable seed for vegetatively propagated crops has compromised Kenya's efforts to improve the yield and quality of the crops, including fruit trees, roots and tuber crops, oil and nut crops, grasses and pasture crops. Kenya's seed industry is guided by the National Seed Policy,2010 and a legal framework comprising the Seeds and Plant Varieties Act, Cap 326 and regulations for Plant Variety Evaluation and Release; Plant Variety Protection; and Seed Certification. This regulatory framework has not adequately addressed the seed needs of vegetatively propagated crops, and so the government and seed industry players have not been able to effectively address phytosanitary requirements and measures necessary for ensuring plant health for the crops. It is on this basis that the Ministry of Agriculture and Livestock Development initiated the process of development of Seeds and Plant Varieties (Vegetatively Propagating Seeds) Regulations 2023. The process is at the Regulatory Impact Assessment (RIA) stage and has been participatory and consultative to include the views of the diversity of Kenya's seed industry stakeholders. When complete, approved and implemented, the Regulations are expected to significantly increase the supply of and demand for quality seeds for vegetatively propagated crops and increase food production, food and nutrition security, and household incomes, and incentivise private sector investments in agro-processing.

Key words: Vegetatively propagating seeds, regulatory framework, seed access

Building a sustainable sweetpotato seed system in Tanzania

Kwame Ogero[1*], Peter Mlay[2], Hadija Musa[2], Saadan Edson[1], Srinivasulu Rajendran[3] and Margaret McEwan[4]
[1]International Potato Center (CIP), C/o Tanzania Agricultural Research Institute (TARI) - Ukiriguru, P.O. Box 1433, Mwanza, Tanzania
[2]Tanzania Agricultural Research Institute (TARI) – Ukiriguru, P.O Box 1433, Mwanza, Tanzania
[3]International Potato Center (CIP), Plot 47, Ntinda II Road, P.O Box 22274, Kampala, Uganda.
[4]International Potato Center, Regional Office for Sub-Saharan Africa (CIP – SSA), ILRI Campus,
Old Naivasha Road, P.O. Box 25171-00603, Nairobi, Kenya

*Corresponding author email: k.ogero@cgiar.org

Abstract

Sweetpotato (*Ipomoea batatas*) is the third most important root and tuber crop in Tanzania after cassava and potato. It is a food security crop mainly grown by smallholder female farmers. Despite this, there is limited use of quality seed leading to low productivity. The predominant sweetpotato seed system is characterized by farmer-to-farmer exchange of planting material. This is an informal system that involves recycling of vines and is often seen as the main cause for perpetuation of viruses which are yield limiting. There are ongoing efforts to develop a vibrant formal seed system through which farmers can access quality seed. The International Potato Center (CIP) has partnered with Tanzania Agricultural Research Institute (TARI) to develop a sustainable business model for sweetpotato seed production. This includes building viable linkages across the seed value chain. TARI is linked with the Kenya Plant Health Inspectorate Service (KEPHIS) – Plant Quarantine Station for supply of virus-cleaned planting material. The clean materials are then bulked up by TARI under sandponics technology and disseminated downstream to seed producers who produce certified seed. The seed producers are supported through a cost-sharing approach whereby they contribute a percentage of resources needed to run a successful seed enterprise. This model also involves capacity building on good agronomic practices and business planning. Forty-three seed producers are now officially registered by the Tanzania Official Seed Certification Institute (TOSCI). The seed producers have also formed an association through which they can promote their businesses, identify markets and access training opportunities. The association which is officially registered is now gaining recognition as a key platform for access of quality seed. It is expected that these activities will lead to sustainable commercially oriented seed enterprises and increase access to quality seed of market preferred varieties.

Key words: Quality seed, formal, sandponics, seed producers, cost-sharing, association

Innovations to strengthen the management of seed quality for Vegetatively Propagated Crop (VPC) seed systems in Nigeria: a case study of the National Agricultural Seeds Council (NASC), Nigeria

Mewase Tolulope R.[1], Osho-Lagunju B.[1], Ishiak O. K.[1], Ubandoma H.[1], Lava K.[2] and Onyeka J.[3]

[1]National Agricultural Seeds Council, Nigeria.

[2]International Institute of Tropical Agriculture, Ibadan, Nigeria.

[3]National Root Crops Research Institute, Umudike, Nigeria.

Corresponding author: tololuperebecca43@gmail.com

Abstract

Seed certification systems in Nigeria started in 1975 with cereal crops and they have evolved over the years. However, the vegetatively-propagated crops (VPCs) have been neglected. Despite the significant role of VPCs in assuring food security in Nigeria, there had been only limited development of quality assurance systems for VPC seed until recent years. The National Agricultural Seed Council (NASC) has now greatly increased its efforts to enhance quality assurance in VPC seed certification because of a growing awareness of the potential benefits of VPC seed quality in Nigeria. NASC has developed or adopted different models to enhance quality assurance in seed certification. Among these are improved diagnostic models, which are imperative in the face of the peculiar susceptibility of VPCs to diseases and pests. A light touch certification system that can be applied by authorized seed inspectors has been developed and is now being applied. This is helping to improve the speed of VPC seed inspection for certification and to reduce the overall cost through decentralizing inspections. Also, NASC has started to promote a self-compliance model for seed certification through using digital tools for disease detection. In collaboration with other organizations such as the International Institute of Tropical Agriculture, and by working with pertinent programs like BASICS and now PROSSIVA, NASC has been successful in developing standard operating procedures for the certification of VPC crops. All these efforts are dedicated to improving management practices in seed production of VPCs and ultimately to establishing vibrant VPC seed systems which will facilitate the supply of increased quantities of quality seed for these crops.

Key words: seed certification, light touch, digital tools, diagnostics, vegetative propagated crops

The use of the Quality Declared Seed (QDS) certification Scheme to increase access to quality planting materials for vegetatively Propagated Crops (VPCs): a case study in Uganda

Wamatsembe I. M.[1*], Paul M.[1], Mary T. A.[1]

Ministry of Agriculture, Animal Industry and Fisheries, Uganda

*Corresponding author email: wamusoi@gmail.com

Abstract

The seed certification system for Vegetatively Propagated Crops (VPCs) such as cassava, sweetpotato, and bananas has been a challenge in many countries, including Uganda. This is due to the low interest of seed companies and other actors in investing in the seed production of VPCs due to low seed demand. As a result, many farmers use farm-saved seeds or seeds from the local market or nearby farmers. However, the seeds from these sources are characterized by high levels of disease, variety admixtures, and low vigor, which disadvantages the users. To bridge this gap, the Ministry of Agriculture, Animal Industry, and Fisheries in Uganda has developed an intermediate seed certification scheme, the Quality Declared Seed (QDS) certification scheme. This scheme enables the production of quality seeds with minimum certification standards and costs in local areas. Under this system, local seed inspectors or authorized seed inspectors (ASIs) are doing the job of field inspection instead of inspectors from the National Seed Certification Services (NSCS) based at Ministry headquarters. This has decentralized the seed system of VPCs and consequently enabled access to quality seed of improved varieties in local areas. However, NSCS is still building the capacity of the ASIs to conduct diagnostic tests, as many local governments have no laboratory infrastructure. Once the seeds are declared disease-free, coupled with the inspection reports from the local governments, they are issued with labels for commercial marketing. This system has helped increase access to quality planting materials for VPCs in the country.

Key Words: Seed certification, Quality Declared Seed, Vegetatively Propagated Crops, Seed, Inspection

Development of banana seed certification standards in Tanzania

Mwankemwa, Z.*, Swella G., Lwabulala D. and Kombo S.

Tanzania Official Seed Certification Institute (TOSCI), P.O. Box 1056, Morogoro, Tanzania

*Corresponding author email: z.mwankemwa@tosci.go.tz

Abstract

Banana (*Musa spp.*) is among the most significant and reliable food crops in Tanzania. After Uganda, Tanzania is the region's leading producer of banana in East Africa. The most important production areas are the Lake (Victoria) Zone, the Southern Highlands, and the North and Eastern Zones. The yield of bananas in Tanzania has, however, been significantly reduced due to abiotic and biotic stresses, going from 18 t/ha per year in the 1960s to 10 t/ha per year in 2021. To raise banana production, the Tanzania Agricultural Research Institute (TARI) has developed and released four high yielding improved varieties – TARIBAN 1, TARIBAN 2, TARIBAN 3 and TARIBAN 4. However, the seed system of vegetatively propagated crops (VPCs) including banana in Tanzania has long been characterized by informal methods in which farmers source the planting materials from uncertified sources. This has resulted in the use of unhealthy planting materials, a problem which is compounded by limited access to and availability of seed of improved varieties. These factors prevent farmers from benefiting from the potential genetic gains of these varieties. This has prompted the Tanzania Official Seed Certification Institute (TOSCI) and other seed stakeholders to collaborate to enhance the VPC seed system and ensure the accessibility and availability of high-quality seeds. TOSCI has succeeded in developing banana seed certification standards for pre-basic, basic, and certified seed producers, which are currently being rolled out. TOSCI is also collaborating with other actors in the *Program for Seed System Innovation for Vegetative Propagated Crops in Africa* (PROSSIVA) project to address bottlenecks in VPC seed systems. In this project, TOSCI is working to improve point-of-care disease diagnostic tools such as LAMP, RPA, and LFD as well as the application of digital tools in banana seed certification. This will assure access to healthy banana planting materials for banana producers.

Key words: Banana, Certification, Diagnostics, Disease, Seed, Vegetatively-propagated-crops

Establishing sustainable cassava seed systems in Kenya and Rwanda

Kariuki J.*, Opiyo V., Wanguba E., Akoth C., Folkerts K., Magige S., Wachira J., Rutaburura T.

Mennonite Economic Development Associates (MEDA) Kenya, Rwanda, Tanzania and Canada

*Corresponding author email: jkariuki@meda.org

Abstract

Cassava is an important food security crop for close to 1 billion people in the tropical and sub-tropical countries especially sub-Saharan Africa. In Kenya and Rwanda, majority of farmers exchange planting materials or recycle own cassava cuttings every year. In such a system, the dissemination of viral diseases is common just like for the other vegetatively propagated crops. Farmers plant and saturate their fields with a mixture of local cassava varieties which are low-yielding and highly susceptible to diseases. This makes adoption of new/improved varieties a challenge especially in the absence of formal certification systems. The greatest threat to improved production and yields for cassava has been CBSD and CMD diseases, which have been responsible for cutting production by more than 80%. The VIRCA program is addressing this challenge by developing and delivering CBSD and CMD resistant varieties to farmers in Kenya and other African countries. MEDA is leading the seed systems development activities in Kenya and Rwanda. By engaging with KALRO, IITA, Universities, KEPHIS, RAB and RICA, MEDA is coordinating development of a sustainable seed system in cassava growing regions. This system has been initiated with elite conventional varieties and designed to be self-sustaining by the end of the project. The system will be capable of distributing disease-free conventional and transgenic cassava planting materials to Kenyan and Rwandese farmers on a sustainable basis.

Key words: cassava, seed system, disease free, certification, sustainability, transgenic.

Status of cassava germplasm multiplication in Kenya: Rapid Multiplication using SAH, Single Node and Mini Sets Technologies

Ferguson M[1]*, Peter A.[2], Ruth M.[3] and Allan M.[4]

[1]Self Help Africa, P.O. Box 142041 – 00800 Nairobi Kenya

[2]International Institute of Tropical Agriculture (IITA) P.O. Box 30709, Nairobi, Kenya.

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

[4]Kenya Plant Health Inspectorate Service

*Corresponding author email: peter.aluoch@selfhelpafrica.org

Abstract

Food crops such as cassava, sweet potato, bananas, pineapples, and yams, just to mention a few, are vegetatively propagated. While vegetative propagation is an important horticultural practice, it is unfortunately a very effective method for perpetuating and spreading viruses. In Kenya, cassava value chain has suffered effect of virus spread as many farmers share and recycle planting materials and this has drastically lowered the crop yields. Most of these varieties have low resistance to the viruses. Despite this challenge, according to the KNBS 2017 figures on county Gross Domestic Products (CGDPs) adjusted to 2018, cassava does play a notable role in the Kenyan economy of some counties, of which it contributes to 5% of the value of marketed agricultural production and 2.8% of the whole economy of Busia and Kilifi County. Self Help Africa (SHA), the International Institute of Tropical Agriculture (IITA), Kenya Agricultural and Livestock Research Organization (KALRO) and the Kenya Plant Health Inspectorate Service (KEPHIS) have partnered to establish a cassava rapid germplasm multiplication centres at KALRO Muguga, KALRO Kakamega and KALRO Mtwapa. It is expected that with the new flour blending regulation in Kenya, and the shift of cassava utilization to industrial starch, the demand for cassava will be stimulated, and thus the need for a well-functioning cassava seed system. The establishment of the germplasm multiplication center using the SAH, and Semi-sets will ensure availability of high-quality virus-free planting materials. This will further spur up participation of the private sector players on the cassava value chain.

Key words: vegetatively propagated crops, Semi-Autotrophic Hydroponic, Cassava, virus free.

Morphological and molecular characterization of *Phakopsora apoda* causing leaf rust on brachiaria grass in Rwanda

Uzayisenga B.[1*], Mutimura M.[1], Muthomi W. J.[2], and Mwang'ombe, W. A.[2]

[1]Rwanda Agriculture and Animal Resources Development Boar. P.O. Box 5016, Kigali, Rwanda.
[2]Department of Plant Science and Crop Protection, University of Nairobi. P.O. Box 30197-00100, Nairobi, Kenya.

*Corresponding author email: bellancile@gmail.com

Abstract

Brachiaria grass remains one of the major forages and it plays a key role in push-pull technology. Different diseases including leaf rust caused by *Phakopsora apoda* have recently become an important challenge resulting in yield loss of *Brachiaria* grass in different countries including Rwanda. The objective of this study was to profile morphological and molecular characteristics of *Phakopsora apoda* affecting *Brachiaria* grass. We analyzed spores isolated from rusted *Brachiaria* leaves collected in five districts of Rwanda. Samples were put in paper bags and left in room temperature for two days. Thereafter, spores were removed using brushes and they were put in Microfuge tubes, stored in 4°C in darkness for further characterization. For morphological characteristics, color, shape and measurements of spores were recorded using the Optika B-350 microscope with installed camera and the calibrated micrometer. The multigene analysis using Bracharia rust specific primers and large subunit of nuclear ribosomal RNA (LSU) was performed for molecular characterization. The results indicated that the color of spores was yellow or brown while the shape was illepsoidal or circular with the average measurements of 25.1µm and 16.8µm for length and width respectively. Primers amplified regions of DNA between 1291bp to 1381bp and 874bp to 882bp for rust specific primers and LSU respectively. The similarity of isolate sequences was 96% with e-value of 0, with coverage of 60% for rust primers. For LSU primers, the isolate sequence identity was 94.97% to 95.37% with coverage of 99% to 100% and e-value of 0. All sequences recovered from five isolates of leaf rust matched to the GeneBank accession number MG461668.1 for both rust specific and LSU sequences. The results of this study provide useful information to develop effective options for leaf rust disease management in Rwanda.

Key words: Internal transcribed spacer, large subunit of nuclear ribosomal RNA, *Phakopsora apoda*, spore

Molecular diagnostic tests in support of yam seed systems: a case study

Silva G.[1*], Festus R.[1], Prempeh R.[2], Quain M. D.[2], and Seal S. E.[1]

[1]Natural Resources Institute, University of Greenwich, Central Avenue, Chatham Maritime, Kent ME4 4TB, UK.

[2]Council for Scientific and Industrial Research-Crops Research Institute, Fumesua, P. O. BOX 3785, Kumasi, Ghana.

*Corresponding author email: g.silva@gre.ac.uk

Abstract

Yam (*Dioscorea* spp.) is a preferred staple food for over 300 million people in West Africa, but its productivity is severely compromised by the impact of viruses and the lack and high cost of clean planting material. Propagation through 'seed' yam tubers encourages the recycling of infected planting materials, contributing to high virus incidence and yield losses, as is a common problem for vegetatively propagated crops. In Ghana, yam farmers rely on obtaining their planting material either from their own farms, or through any surplus from neighbouring farmers. This means that the planting material is often of low quality and infected with viruses. The only effective method of controlling these virus diseases is to use virus-free seed yam. The Council for Scientific and Industrial Research-Crops Research Institute (CSIR-CRI) developed an aeroponics and hydroponics system to boost the production of seed yam. This system has a very high multiplication rate and thousands of plantlets can be generated from a single plant. However, virus titres in the generated tissues are generally decreased but not eliminated. This poses an increased challenge for reliable virus detection, which makes it difficult to ensure that planting material is virus-free. This could result in the false virus-negative certification of planting materials, leading to the spread and transfer of infected materials, with potentially disastrous consequences for crop production and food security. We have developed and evaluated isothermal amplification- and high throughput sequencing (HTS)-based diagnostic tests for virus detection in a range of crops. The yam tests have been transferred to CSIR-CRI, improving their capacity in yam disease diagnostics and seed certification and contributing towards the production and sustainable supply of high-quality seed yams. We will describe the potential wider application of these tests and discuss the drivers that will shape their future deployment in support of seed systems.

Key words: LAMP, Field- based diagnostics, High Throughput Sequencing (HTS); MinION sequencing, virus diagnostics

Occurrence and severity of rice blast and brownspot diseases affecting rice cultivated in Kenya

Benjamin M[1]*., Everlyne M[2], Mutiga, K[3], Rosemary M[2]., Isaac M[1]., Wilson K[3] and Florence M[1].

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

[2]International Rice Research Institute, P.O Box 30709 Nairobi.

[3]International Livestock Research Institute, P.O. Box 30709 Nairobi.

Corresponding author email: mainambugua65@gmail.com/bmaina@kephis.org.

Abstract

A field survey was conducted to assess the occurrence and severity of rice blast and brown spot diseases on popular cultivars grown in the Busia, Kirinyaga, and Kisumu counties of Kenya in 2019. Working with agricultural extension workers within rice production areas in the three counties, we interviewed farmers (n = 89) regarding their preferred cultivars and their awareness of blast disease, as this was the major focus of our research. Scoring of symptoms of blast and brown spot and assessed the lodging, plant height, and maturity of the crops (days after planting). Furthermore, leaf and neck tissues were collected for the assessment of the prevailing fungal populations. Specific DNA primers were used to screen for the presence of the causal pathogens of blast and brown spot, I, on asymptomatic and symptomatic leaf samples. Fungal isolations and PCR-sequencing was also conducted to identify the fungal species in these tissues. Busia and Kisumu had a higher diversity of cultivars compared to Kirinyaga. The aromatic Pishori (NIBAM 11) was preferred and widely grown for commercial purposes in Kirinyaga, where 86% of Kenyan rice is produced. NIBAM108 (IR2793-80-1) and BW196 (NIBAM 109) were moderately resistant to blast, while NIBAM110 (ITA310) and Vietnam were susceptible. All the cultivars were susceptible to brown spot except for KEH10005 (Arize Tej Gold), a commercial hybrid cultivar. A diverse pathogenic and non-pathogenic fungi, with a high incidence of Nigrospora oryzae, in the rice fields of Kirinyaga were also identified. There was a marginal correlation between disease severity/incidence and the occurrence of causal pathogens. This study provides evidence of the need to strengthen pathogen surveillance through retraining agricultural extension agents and to breed for blast and brown spot resistance in popular rice cultivars grown in Kenya.

Key words: rice, disease surveillance, multi-infections, foliar diseases, blast, brown spot

Interactions of maize chlorotic mottle virus and sugarcane mosaic virus in infected maize plant

Waithera, J.[1, 2*] Douglas W.M.,[2] William M. M.[2], Eunice M.[2] and Macharia I[1].

[1]Kenya Plant Health Inspectorate Service, P.O. Box 49592, Nairobi.

[2]Department of Plant Science and Crop Protection, Faculty of Agriculture, University of Nairobi, P.O. Box 29053 00625 Kangemi, Nairobi.

*Correspondence email: jwaithera@kephis.org

Abstract

Maize is a significant crop in Africa's sub-Saharan regions and a basic food to approximately 70 million of the population (Melinda *et al.*, 2013). Production of maize has been constrained by presence of pest and diseases with maize lethal necrosis (MLN) been rated as a major constraint (Yang et al., 2017). The disease maize lethal necrosis (MLN) is produced by a synergistic reaction of maize chlorotic mottle virus (MCMV) together with any maize infecting potyviruses mainly Sugarcane mosaic virus (SCMV) in Kenya. This research was done to determine the effects of interactions of MCMV and SCMV in maize plant. A greenhouse experiment was set up using two susceptibility varieties to ascertain the effects of interactions of MCMV and SCMV in single and mixed infections. Disease severity, incidence, heights and sampling of leaves was done 7 days post inoculation (dpi) up to 56 dpi weekly. Stored leaves were tested for MCMV qRT-PCR and Ct values recorded for each sampling point in each treatment. Results showed significant difference ($P<0.05$) in heights, disease severity and incidence between treatments. The M+S treatments recorded the highest disease severity and incidence score throughout the data collection period. For all data collection days, there was a significant difference ($P<0.05$) in Ct values between treatments. Treatments M+S recorded the lowest Ct values which is inversely proportional to the virus titer in the infected maize. The concentration of the MCMV was seen to increase in mixed infections compared to single inoculations. Similarly growth was retarded in mixed infections and disease severity and incidence was increased compared to single infections. This is mostly due to synergistic interaction of the potyviruses which plays a role in increasing the MCMV accumulation in plants. These effects of the interactions are the one leading to the lethal and necrotic effects of the MLN disease in maize plants.

Key words: MCMV, SCMV, MLN, Maize, Interactions

SESSION EIGHT | IMPORT CONTROL AND EXPORT CERTIFICATION IN PHYTOSANITARY SYSTEMS

Organisation for Economic Cooperation and Development Fruit and Vegetables Scheme

Cyril Julius and José Brambila-Macías

Corresponding author email: Cyril@ppecb.com

Abstract

The OECD Fruit and Vegetables Scheme, based in Paris, France, is an international initiative aimed at promoting the trade of high-quality and safe fruit and vegetable products among member countries. The scheme was established by the Organisation for Economic Cooperation and Development (OECD) in collaboration with participating countries. The primary objective of the OECD Fruit and Vegetables Scheme is to ensure that the production, processing, and marketing practices of fruits and vegetables meet specific quality and safety standards. By adhering to these standards, member countries can enhance consumer confidence in the safety and quality of their produce, which ultimately leads to increased market access and trade opportunities. One of the key aspects of the Scheme is, for fruits and vegetables covered by a quality standard, the development of common rules for conformity checks and of explanatory brochures. The explanatory material is regularly updated to reflect the standard updates and the latest developments in trade and technological advancements in the field. To participate in the Scheme, countries need to implement a comprehensive national quality assurance system for fruits and vegetables. This system includes the establishment of regulatory frameworks, the development of inspection and certification procedures, the training of personnel, and the implementation of effective enforcement mechanisms. These measures ensure that all relevant stakeholders, including growers, processors, exporters, and consumers, adhere to the agreed-upon standards. The Scheme also aims to promote information exchange and cooperation among member countries. Regular meetings, workshops, and seminars are organized to facilitate the sharing of best practices, experiences, and technical knowledge. This collaborative approach helps countries learn from each other and improve their fruit and vegetable sectors collectively.

Key words: OECD, fruit and vegetable quality, quality standards, conformity

Role of AfricaRice-Germplasm Health Unit (GHU) in regulating rice seed exchange in Sub-Saharan Africa

Bachabi, F. and Onaga G.

Africa Rice Center, 01 BP 2551 Bouaké Côte d'Ivoire

*Corresponding author email: g.onaga@cgiar.org

Abstract

AfricaRice mission is to contribute to food security and poverty alleviation in Sub-Sahara Africa (SSA) through research, partnerships, capacity strengthening and policy support on rice-based systems. One strategy to accomplish this mission is to implement a Quality Management System (QMS) to assist the organization and its partners in upholding seed health standards, and provide assistance to National Plant Protection Organizations (NPPOs) in carrying out their roles in preventing the global spread of plant diseases. AfricaRice germplasm health Unit (GHU) was set up in 2012 to put this strategy into action by ensuring that no pests of quarantine concern are present in the materials handled and exchanged as part of seed health operations between NPPOs and AfricaRice Rice Biodiversity Center for Africa (RBCA) and other programs. This work will describe how AfricaRice - GHU contributes to maintaining phytosanitary standards in compliance with the International Plant Protection Convention (IPPC), and the exporting and importing countries' specific laws, regulations and import conditions. This paper will enlist the standard procedures providing a detailed process from when the germplasm arrives at AfricaRice GHU to the time it leaves, including inspection upon arrival, seed health tests, suitable seed treatments, diagnosis and characterization of seed-borne pathogens. The paper will also cover the steps taken to create standard operating procedures and protocols for dealing with emerging diseases like bakanae and Pantoea spp. as well as more established rice diseases, in accordance with the guidelines set forth by the consultative group on international Agricultural Research (CGIAR) GHU and the Crop Trust.

Key words: Exchange, pathogens, QMS, regulation compliance, seed, sub-Saharan

Regulatory status of quarantine pests of rice in international trade: A review for Kenya

Omondi L*., Ombuya A. and Kosiom T.
Kenya Plant Health Inspectorate Service (KEPHIS). P.O. Box 494592, 00100 Nairobi
*Corresponding author email: akuomonashon@gmail.com

Abstract

The global emergence of non-native pests in agricultural ecosystems poses significant threats, including potential production losses and trade restrictions. The growing number of importing countries and the influence of climate change have exacerbated the introduction and interception of alien species. Kenya, like other nations, faces challenges in effectively managing the risks associated with non-native pests. This paper comprehensively analyzes Kenya's regulatory framework for rice, covering production practices, seed certification, and quarantine regulations for imported rice. The evaluation focuses on enforcement and performance relative to international standards, particularly those outlined by the International Plant Protection Convention (IPPC). While international regulations and standards have been established for rice and phytosanitary measures, individual countries enforce their national phytosanitary legislation to safeguard plant health and prevent pest spread within their territories. These national measures generally share similar objectives, aiming to regulate the import and export of plant materials and promote effective pest management techniques to enhance agricultural productivity. However, compliance with Article VII.2i of the approved Convention remains incomplete, as many countries have yet to submit their updated phytosanitary regulations to the IPPC. Moreover, the absence of specific information on regulated organisms for each crop species, particularly within the quarantine list, poses challenges for rice genetic resource exchange and trade, hindering research and commercial activities. This review addresses the implementation challenges of these regulations in Kenya, identifying existing gaps and inconsistencies. It also provides recommendations to improve the implementation of quarantine measures and other pest control initiatives, aiming for better harmonization and alignment with international standards.

Key words: IPPC, regulatory measures, quarantine pests, phytosanitary regulations

Resumption of Kenya's fresh mangoes to European Union market

Koome F., Hellen H., Hellen M., Macharia I.

Kenya Plant Health Inspectorate Service

Corresponding author email: hheya@kephis.org

Abstract

Mango is the third important fruit in Kenya at Mt 55,100,586. Its production is majorly challenged by Oriental fruitfly documented to cause 100% loss hampering trade. In 2014, Kenya imposed a temporary self-ban to protect the EU market due to increased interception. Strategies from production to export levels were employed by KEPHIS to facilitate the resumption journey to EU market. Implementation of fruit fly management strategies (Pest free zones) at farm level involving: PFA (mapping production area, implementing of IPM technologies {pheromone traps, food baits, solar sanitation bags and augmentorium}, monitoring and traceability systems, awareness creation/ training of farmers). Training of farmers and harvesters on monitoring, traceability, technologies and infestation preventive measures. Training of transporters on monitoring, traceability systems, transport technologies, prepacking technologies, pre grading and sorting and infestation preventive measures. Training of pack house team on postharvest treatment, grading and sorting, monitoring traceability, packhouse pest status audit, infestation/ re-infestation preventive measures at post harvesting level and training of exporters, inspection and documentation. Development of certification protocol/guide for production of fresh mango fruits to EU Market and awareness creation on the requirement/standards for the EU mango market emphasizing only establishment of PFA and post-harvest treatment. Certification of post-harvest treatment facilities (Hot Water Treatment / Vapor Heat Treatment, negotiation with EU for the market return, inspections and issuance of phytosanitary certificate to facilitate export of mango. In 2020, KEPHIS applied to the EU for approval to resume mango export and in 2021, EU approved the Kenya request, the first consignment was successfully exported and accepted in the EU and all EU members' states have since been notified of Kenya's intention to export fresh mango fruits.

Key words: Resumption, treatment, phytosanitary certification protocol

Prioritising plant pathogenic pests with the potential to threaten agriculture, biodiversity and forestry in Zambia

Mazimba E.[7], Sydney P.[2], Nchimunya B.[4], Rodwell C.[10], Mutibo C.[5], Hildah C.[9], Paul K.[8], Francisca K.M.[9], Mathews M.[9], Sydney M.[7], Mtawa M.[7], Miyanda M.[8], Wiza M.[4], Millens M.[6], Rabson M.[9], Brenda M.[7], Damien N. M.[9], Phillip O. N.[8], Isaiah N.[9], Mathias T.[9], Chapwa K.[2], Ivan R.[1], Noah A. P.[2], Lucinda C.[3], Ken M.[7], Fernadis M.[1], Joseph M.[1]

[1]CABI, Nairobi Kenya. [2]CABI, Lusaka, Zambia. [3]CABI, Wallingford, United Kingdom
[4]Mulungushi University, Kabwe, Zambia. [5]National Biosafety Authority (NBA), Lusaka, Zambia. [6]Natural Resources Development College (NRDC), Lusaka Zambia.
[7]Plant Quarantine and Phytosanitary Service (PQPS), Lusaka, Zambia
[8]University of Zambia (UNZA), Lusaka, Zambia.
[9]Zambia Agriculture Research Institute (ZARI), Lusaka, Zambia.
[10]Zambia Environmental Management Agency (ZEMA), Lusaka, Zambia.

Corresponding author email: j.mulema@cabi.org

Abstract

A number of invasive pests have been introduced in sub-Saharan Africa in the last decade causing massive economic loses. While it is unrealistic to expect border security to stop their spread, the situation could be improved by availing timely and adequate information at the national and regional levels on the highest risky species and enhancing the sharing of information to support planning and implementation of strategies that support prevention, early detection, containment and eventual eradication where possible. In line with development of such information, a horizon scanning activity was conducted to identify pests not reported in Zambia which could be introduced and become invasive. These pests were identified by the horizon scanning tool developed by CABI. In total, 8,373 pests were identified which included 2,627 (284 bacteria, 164 chromista, 1,545 fungi, 10 protista, and 624 viruses and viroids) pathogenic species and 5,746 (5,535 arthropods, 26 molluscs, and 185 nematodes) invertebrates. Based on value chains, 129 bacteria, 68 chromista, 528 fungi, 8 protista, and 392 viruses and viroid, and around 600 arthropods, 20 molluscs, 123 Nematoda were selected for assessment. The selected pests were subjected to rapid risk assessment based on agreed guidelines. Based on the overall risk score, some pests were recommended for pest-initiated pest risk analysis; surveillance especially for pests reported in neighbouring countries or where there was high traffic of importation of plants and plant products; no action where the risk score was too low and the pathway for introduction was weak; and lastly, no action but the pest should be monitored if the risk score was too low because of the current pathways however, the pest could be destructive if introduced. All priority pests will be added to the Plant pest risk register for Zambia.

Key words: Biological invasions, Horizon scanning, Invasive species, Pest risk analysis, Pest surveillance, Quarantine pests

Evaluation of phytosanitary fumigation technology using magtoxin plate 61% (magnesium phosphide 61%) insecticide against thrips & spider mites in roses, gypsophila & hypericum

Buldur G.[2*], Mehret G.[1] and Evans K.[1]

[1]ChemRaw EA Ltd, P.O Box 4735800100 GPO, Nairobi, Kenya

[2]Detia Degesch, Dr.- Werner-Freyberg-str. 11 69514 Laudenbach, Germany.

*Corresponding author email: ekosgei@chemrawea.com

Abstract

This study investigated effectiveness of post-harvest phytosanitary fumigation technology using Magtoxin plate 61% against Thrips and spider mites in cut flowers. The study was conducted to identify phytosanitary treatments of agricultural commodities that would provide 100% insect mortality in order to meet phytosanitary requirement that regulate introduction and spread of quarantine insect pests into new territories. The fumigation study was carried out with two 40 feet reefer containers. Treatments (concentrations) were studied using a split plot in a randomized complete block design (RCBD). Each reefer container represented a main plot to accommodate a concentration treatment. Varieties of cut flowers constituted the subplots. Some cut flowers were used to check for acute phytotoxicity & numbers of dead and alive thrips and spider mites. Mortality rate of thrips and spider mites were calculated by dividing the number of dead insects by the total number of insects. Vase life performance was evaluated by monitoring stems in a vase. The data of insect mortality and vase life were analysed using the split plot in a RCBD model. Significantly different means were separated through pairwise LSD comparison. The vase life data were analysed using the RCBD model. The results showed that phytosanitary fumigation technology using Magtoxin Plate fumigants at the tested rate of 6- 8 plates per 40 feet reefer equivalent to 6.42-8.56 g a.i./m^3 is effective in controlling thrips and spider mites without having negative effect on the quality of the cut flowers. The study provides sustainable solution in management of quarantine insect pest that will promote global trade. Phytosanitary measures can be realized through adoption of advanced technologies, continua's innovation, capacity building & investment in research.

Key words: Magtoxin Plate, application rate, mortality rate, shelf-life performance, rose, gypsophila, hypericum.

Evaluation of thermal tolerance of immature stages of fall armyworm (*Spodoptera frugiperda*): A basis for the development of postharvest disinfestation parameters in export commodities

Mwando N. L.[1,2*], Ndlela S.[1], Mohamed S. A.[1] and Subramanian S.[1]

[1]International Centre of Insect Physiology and Ecology. P. O. Box 30772-00100, Nairobi, Kenya.

[2]Institute of Horticultural Production Systems, Section Phytomedicine - Applied Entomology, Leibniz Universität, Hannover, Germany.

*Corresponding author email: nmwando@icipe.org

Abstract

The fall armyworm (FAW) is listed on the European and Mediterranean Plant Protection Organization (EPPO) A1 as an invasive and quarantine pest. The pest has a wide host range including economically important crops. Hence, its further spread poses a serious threat to agriculture and food security. Several interceptions of agricultural commodities, especially fresh produce such as cut flowers (*Rosa* sp.) and capsicum infested with FAW have been reported from the European Union. The preharvest management measures presently available cannot offer 100% control efficacy against the pest, thus effective postharvest phytosanitary treatment protocols for the disinfestation of some of the host commodities are required to give quarantine assurance to importing markets in the European Union. Here, the thermal tolerance of the FAW egg and first instar was evaluated by treating them at 1 and 4ºC for different time schedules. Then, a time-mortality relationship was established, probit analysis and large-scale-confirmatory tests were performed to validate the efficacy of the treatments. According to our findings, the minimum time required to achieve a 99.99% control level of the egg at 4º C is 130.4 h (95% CL: 123.27 - 137.52). Similarly, at least 130.21 h (95% CL: 123.45 - 136.96) is required to achieve a 99.99% control level of first instar at 1º C. The cold treatment schedule of 4º C /130.4 h and 1º C/130.21 h for the egg and first instar, respectively, were used in the confirmatory trials, and none of the 41,653 and 34,180 individuals treated survived. Evaluation of any potential impact of the treatment on the quality of export-grade, cut flowers, *Solanum* spp*,* and capsicum is ongoing. The development, adoption, and eventual implementation of these phytosanitary measures, either as stand-alone measures or as part of FAW's IPM methods, will facilitate access to lucrative but stringent export markets.

Key words: Invasive species, phytosanitary, quarantine pest, cold treatment

Cocoa farmers' perceived phytosanitary impacts of climate change and mitigation options in Cameroon

As Oyekale*
Department of Agricultural Economics and Extension, North-West University Mafikeng Campus, Mmabatho 2735 South Africa.
*Corresponding author: asoyekale@gmail.com

Abstract

Cocoa (*Theobroma cacao* L.) productivity is dependent on favourable weather variables. In Cameroon, climate change presents some phytosanitary challenges to cocoa farmers, due to the growing problems of weeds and cocoa pests. This paper analyzed the perceived phytosanitary impacts of climate change and the determinants of selected mitigation options in Cameroon. Data was collected using stratified random sampling from 303 farmers in Centre Cameroon. It was analyzed with Probit regression. The results showed that delay in rainfall commencement (86.14%) and high temperature (77.56%) were mostly perceived, while much rainfall (14.85%) and stormy rainfall (46.86%) were least perceived. Cocoa farming operations were affected by climate change through weed control problems (51.48%), more incidence of black pod disease (65.02%), more cocoa pests (72.94%), death of cocoa trees (74.26%) and general reduction in cocoa yields (78.88%). The Probit regression results revealed that the probability of changing cocoa planting time was significantly and positively influenced by members being sick and inability to get drinking water, but negatively influenced by missing cocoa spraying time, more pests, weed control problem and weather-induced inability to spray effectively. Also, the probability of farm enterprise diversification was positively and significantly influenced ($p<0.05$) by farming as primary occupation, death of cocoa trees and increase in black pod disease, while the number of cocoa farms had negative influence. The likelihood of non-farm diversification significantly increased ($p<0.05$) with problem with drying cocoa pods, death of cocoa trees and cocoa being the primary crop, but negatively influenced by farming being the primary occupation and more pests. It was concluded that climate change presents some constraints to cocoa production, and efforts to address the problem should integrate proper education among farmers to facilitate phytosanitary impact perception and mitigation enhancement with consideration on farmers' nature of primary occupation.

Key words: Cocoa, Farmers, Climate Change, Phytosanitary, Cameroon

Prospects for Classical biological control of papaya mealybug using its parasitoid *Acerophagus papayae* in Africa

Opisa S.[1], Makale F.[1], Nyasani J.[2], Muvea A.[3], Kabole M.[3], Chacha D.[1], Agboyi L.K.[4], George O., Asudi G.O.[5], Rehman A.[6], Luke B.[7] and Rwomushana I.[1]

[1]CABI, Canary Bird, 673, PO Box 633-00621, Nairobi, Kenya
[2]Kenya Agricultural and Livestock Research Organization, Food Crops Research Institute, Kisii, P.O.BOX 523-40200, Kisii.
[3] Kenya Plant Health Inspectorate Service, P.O.BOX 49592 – 00100, Nairobi.
[4]CABI, CSIR Campus No.6 Agostino Neto Road Airport Residential Area, P.O Box CT 8630, Cantonments Accra, Ghana.
[5]Department of Biochemistry, Microbiology and Biotechnology, Kenyatta University, P.O. Box 43844, 00100 Nairobi, Kenya.
[6]CABI, Opposite 1-A, Data Gunj Baksh Road, Satellite Town, Pakistan.
[7]CABI, Bakeham Lane, Egham, Surrey, TW209TY, United Kingdom.

*Corresponding author email:S.Miller@cabi.org

Abstract

Papaya mealybug (PMB) (*Paracoccus marginatus*) is an invasive pest from Mexico and Central America that was first reported in East Africa between 2016 and 2020. The pest has been reported to cause 57% yield losses and £2,224/ha household economic losses annually. Majority of papaya farmers manage PMB using highly hazardous pesticides, thus harming native insect biodiversity. To reduce on pesticide reliance, conserve biodiversity and protect the environment, Classical biological control (CBC) of PMB using its parasitoid, *Acerophagus papayae* provides the most ecologically sound and climate-smart approach. Consequently, CAB International in partnership with Kenya Agricultural and Livestock Research Organization, Kenya Plant Health Inspectorate Services and National Museums of Kenya are implementing the classical biological control of PMB using *Acerophagus papayae* parasitoid that was imported from Ghana to Kenya in 2020 for efficacy testing in quarantine facilities. A release dossier was subsequently prepared and approval granted by the Kenya Technical Standing Committee on Imports and Exports (KSTCIE) for the release of *A. papayae* in Kenya in 2021. Field releases of *Acerophagus papayae* adults commenced in December 2021 at 6 research sites in three coastal counties of Kenya i.e. Kilifi, Mombasa and Kwale) to evaluate the efficiency of the parasitoid to establish and parasitize papaya mealybug under field conditions. The parasitoid was able to establish within the first month of introduction after collection of papaya infested fruits and monitored for emergence of *A. papayae* in the laboratory. Parasitism levels varied across the sites with the highest parasitism of 72% being recorded at Kwale. *Acerophagus papayae* establishment in the field and parasitizing the mealybug to levels not detectable in the field has proved to be the most effective control strategy that should be implemented in Kenya and Africa beyond.

Key words: Classical biological control, parasitism rate, sex ratio, Coastal Kenya, developmental time, invasive pest

Impact of Climate Change on the production of fruits produced in South Africa

Khumalo P. and Ngcemphalala W.

Perishable Products Export Control Board (PPECB). 45 Silwerboom Avenue, Plattekloof, 7500, South Africa

*Corresponding author email: Cyril@ppecb.com

Abstract

Climate change has become an observed and experienced reality. This phenomenon brings with it great challenges to the world such as threatened food security and the risk to human livelihoods. South Africa is not immune to the possible deleterious effects of climate change. Similar to the rest of the world, South Africa is experiencing increases in average annual air temperature and changes in precipitation. Due to the dependence of fruit production on climate, it is inevitable that climate change will affect production and quality. This project was conducted to establish the impact of climate change on the quality of fruit produced in South Africa. The study obtained empirical data, from different sources within South Africa, to analyse fruit quality trends. It also got the opinion of farmers on the problem of climate change, through a survey. The study was able to show that climate change has an effect on fruit production and quality. The report goes at length to explain and discuss these observed quality trends on the different fruit types. Fruit growers surveyed were aware and concerned about future production and sustainability due climate change. Undoubtedly, climate change is a major concern to agricultural industry and for this sector to remain viable in the midst of unfavourable temperature and rainfall trends, it is important for it to adapt. The report discusses some adaptation techniques employed in South Africa. The project has highlighted the need to do more research on climate change. Therefore, the PPECB will continue with this important line of research and analyse fruit quality from the orchard, throughout the value chain, until arrival in the market.

Key words: Climate change, fruit production, fruit quality, climate change adaptation

Tracking resilience of Kenya crop varieties over time to climate change

Cheptaiwa J. K[1*]. Maina. S, Muthee J and Ogolla S.

Kenya Plant Health Inspectorate Service

*Corresponding author email: jcheptaiwa@kephis.org

Abstract

The world's climate is changing, and Kenya is not spared of this global trend. Climate change has resulted to increased temperatures, changes in seasonal trends and patterns. Since the 1960s, global temperatures have increased gradually and the impact is being felt now. Overtime, farmers have adopted some crop varieties and stuck with them despite release of new varieties. This experiment was done to find out the resilience of these crop varieties over a period of 6 years. The consideration was on maize and bean varieties suitable for different agro-ecological zones in Kenya. These varieties are also utilized as Check varieties in the National Performance Trials. An experiment was set in four production areas for 6 years with data collection done, analysis and report writing. The yield of the variety was found to justify the resilience of the varieties over time despite changes in weather conditions over seasons. This could be the justification why farmers prefer these varieties over new ones. Adaptability to wide range of production areas is a major factor in adoption of a variety in addition to yield.

Key words: Climate change, Resilience, crop varieties, Seasons

Polycentric participation and success of climate change resilience, mitigation and adaptation strategies

Waweru M. N.*
American Economic Association
*Correspondence Email: Meshackwaweru29@gmail.com

Abstract

Climate change is a global reality that requires dedicated attention to reduce its harmful impact now and in the future. Earth climate has been changing albeit slowly until the Ice ages 11,700 years ago when we started to experience rapid climate changes. However, notable and rapid climate change began in the 19th century occasioned by rapid increase in temperatures. To forestall these changes, the Common wealth countries have agreed on the strategies and approaches of resilience building to mitigate the escalation of climate change through the United Nation Framework Convention on Climate Change (UNFCCC). Kenya being a member of the UNFCCC has developed various policies to guide this path. These include; the National Climate Change Response Strategies, (2010), the National Climate Change Action Plan (2018-2022) and the Kenya National Adaptation Plan (2015-2030). These polices ground the action the government intends to pursue in realization of 1.5 degree resilient world as set out in Paris (COP21). However, as countries strive to institutionalize adaptive strategies, the effects of climate change continue to wreak havoc to humanity. This is because there exists a knowledge gap between governments and lower level stakeholders (the communities, civil societies and the private sector). This paper investigates the correlation between polycentric participation and success of climate resilience strategies, the cost of adoption of mitigation and adaptive activities to climate change, and the socio-economic impacts of climate change to the low-income households in Kenya. The study will use desktop review and content analysis of previous studies to collect secondary data. Correlation analysis will be used to draw conclusions. Preliminary findings conclude that for achievement of climate resilience, there is a critical need to intensify awareness among all stakeholders, carry out an incisive climate risk assessment, mobilize resources, monitor and track progress, and share knowledge.

Key words: Stakeholders, resource mobilization, communities, action plan, socio-economic, polycentric participation

Why should banana Fusarium wilt TR4 be considered a major threat to African food security?

Altus V.* and D. Mostert
Department of Plant Pathology, Stellenbosch University, Stellenbosch, South Africa
Corresponding author email: altus@sun.ac.za

Abstract

Fusarium oxysporum f. sp. *cubense* tropical race 4 (TR4), a soil-borne fungus that causes Fusarium wilt, is considered a major threat to global banana production. The fungus originated in Asia and was first detected in Africa when it was found on commercial banana plantations in northern Mozambique in 2013. The pathogen has not been reported from neighbouring countries on the continent but was detected on two islands in the Comoros archipelago. The spread of Foc TR4 to continents and island nations is often unexpected, and due to human error. Once present in a banana field, the fungus rapidly disseminates with planting materials, soil and water. There are numerous reasons why Africans should be concerned about the presence of Foc TR4 on the continent. In Africa, bananas constitute part of the staple diet of families, with consumption as high as 400 kg/person per year. Losses in production could thus threaten food security and income generation for millions of people. The fungus cannot be eradicated from infested fields, and susceptible banana varieties thus need to be replaced with resistant ones or with less profitable crops. The large-scale production of susceptible bananas, use of suckers as planting material, lack of awareness, and deficient phytosanitary measures, makes Foc TR4 a significant threat to banana cultivation in Africa. Research and development on the continent now focus on Foc TR4-resistant bananas, the strengthening of biosecurity measures, capacity development and greater awareness.

Key words: TR4, soil borne, fungus, food security, awareness, profitable crops

Atoxigenic *Aspergillus flavus* (Aflasafe KE01) application reduces Fumonisin contamination in Maize in Lower Eastern Kenya

Ndirangu, E. W[1*]., Muthomi, J[2]., Wagacha, J. M[1]., Mutegi, C.[3]
[1]School of biological sciences, University of Nairobi
[2]Department of crop science and crop protection, University of Nairobi
[3]International Institute of Tropical Agriculture, Nairobi
Corresponding author email: esther.ndirangu@kephis.org

Abstract

Management of fumonisin contamination in maize has been a challenge since effective management measures against *Fusarium* ear rots and resistant maize varieties are lacking. This study was conducted to determine the efficacy of atoxigenic *Aspergillus flavus* (Aflasafe KE01) on fumonisin contamination of maize. The study was carried out in four sub counties of (Kaiti, Kathiani Nzambani and Wote) in lower Eastern Kenya. Twenty-four maize fields were selected in each of the sub counties where 12 fields were treated with Aflasafe KE01, while 12 fields comprised the untreated controls. Aflasafe KE01 was applied at a rate of 5 kg/ha and 10kg/ha by hand broadcasting in the maize fields two to three weeks before tussling of maize. Fumonisin level in the maize samples was determined using Accuscan Pro-reader enzyme-linked immunosorbent assay (ELISA). The results showed that application of Aflasafe KE01 reduced the fumonisin in the maize from the Aflasafe KE01 treated fields by up to 68% compared to samples from untreated fields. About 62.5% of the maize fields treated with 5kg/ha of Aflasafe KE01 met the European commission regulatory threshold of ≤2ppm for total fumonisin as compared to about 45% from the control fields. This indicates that Aflasafe KE01 is a potential biopesticide for the management of fumonisin production in maize. Therefore, efficacy of Aflasafe KE01 on reducing fumonisin contamination of other key staples in Kenya should be evaluated.

Key words: *Fusarium* species, fumonisin, Aflasafe KE01, maize, atoxigenic *Aspergillus* spp

Adoption of IPPC ephyto solution by African Union (AU) member states

Syanda J[1]., Oronje M.L[2]. and Maryben C[3].

[1] Kenya Plant Health Inspectorate Service, Nairobi, Kenya

[2]Center for Agricultural Biosciences Institute (CABI)

[3]Inter Africa Phytosanitary Council (IAPSC)

Abstract

International Plant Protection Convention (IPPC) introduced International Standards for Phytosanitary Measures (ISPMs) as guidelines for a common and harmonized approach of implementing SPS agreement among trading partners. The phytosanitary certificate, is a document issued by the exporting country to the importing country as a guarantee that the plants, plant products or regulated objects described therein meet the conditions set out by importing country. In 2019, IPPC developed a digital platform, "the ePhyto solution" for exchange of phytosanitary certificate data between National Plant Protection Organizations (NPPOs). The ePhyto solution is aimed at improving management of plant health risks by reducing challenges associated with paper certificates. Notably, there has been a low adoption and implementation of ePhyto solution among the African Union Member States. A study was initiated to Catalogue the ongoing ePhyto initiatives in the African region and identify areas where support is required to enhance adoption of e-Phyto forward. The study identified challenges AU Member States were facing while implementing IPPC ePhyto solution. These include: minimal understanding of ePhyto solution and its benefit to both trade and plant health risk management, inadequate legal provisions for implementation of electronic transactions, lack of infrastructure for ICT systems management and low skills and competences required for managing ePhyto solution after its adoption. More ePhyto workshops and seminars are recommended. Further recommendations include providing support for NPPOs to review their laws and regulations and align them to electronic transactions (IPPC: IV.2(a) and V., ISPM 7 ISPM 12), strengthening organizational capacity (Art.IV IPPC 1997), training to build staff capacities and competence to manage electronic transactions and financial interventions to enable NPPOs undertake the proposed recommendations.

Key words: ISPMs, ePhyto, phytosanitary certificate, plant products

Digitalization of phytosanitary services: Lessons from Zambia

Mukuwa P. S. C.*, Msiska K. K., Chomba D. M., Mudenda M., Mazimba M., Chivunga J., Lyowa L., Mtawa M. and Siazemo M.

Plant Quarantine and Phytosanitary Service, Ministry of Agriculture. Private Bag 7, Chilanga, Zambia

*Corresponding author email: pritchardmukuwa@yahoo.com

Abstract

The Covid-19 pandemic ravaged various world systems. The agriculture sector was not spared. Agricultural aspects affected included agriculture trade flows, which propelled a rapid need for adoption of safer and efficient innovations for service delivery with minimal human interactions. Such innovations included the digitalization of phytosanitary services. In view of this, the innovation spearheaded by the IPPC in developing the ephyto Hub and the Generic system (GenS) saw an upspring of countries developing a lot of interest following the pandemic and thereby exploring onboarding options onto the ephyto hub. To date, 126 countries are registered on the hub with 87 countries actively exchanging ephyto's. Zambia already onboarded and has since integrated its national system to the ephyto hub. This paper therefore focuses on the Zambian experience with regards to digitalization of phytosanitary services. The Zambia Electronic Single Window (ZESW), a system solely used for the issuance of all agriculture trade documents and the Plant Quarantine and Phytosanitary Service (PQPS) were developed. Zambia's National Plant Protection Organisation (NPPO) further developed the Phytosanitary Information Management System (PIMS), a database which houses phytosanitary information and import conditions, herein referred to as addendums for importation of plants and plant products. Notably, there was increased compliance levels and fraudulent cases significantly reduced. However, low adoption rates owing to ICT literacy challenges, poor internet connectivity, lack of ICT equipment and inadequate end-user/stakeholder involvement are the challenges faced. A huge challenge also came in with regards to exports to the EU and Asia as electronically generated phytosanitary certificates could not be accepted because they were not generated through the ephyto system. This led to many consignments being intercepted despite prior official notification that was done through the IPPC.

Key words: Digitalization, ePhyto, Phytosanitary certificate, Systems, Innovation

Phytosanitary interventions to avert pest spread and ensure safe exchange of tree germplasm: the role of CIFOR-ICRAF tree germplasm health unit

Cherotich S.*, Hendre P. and Kinyanjui Z.

Genetic Resource Unit, World Agroforestry. P. O. Box 30677-00100, Nairobi, Kenya

*Corresponding author email: s.cherotich@cifor-icraf.org

Abstract

International exchange of tree genetic resources plays a pivotal role in diversification, conservation and food security. Tree genebanks have made vital contribution by collecting, conserving and making germplasm available for users, which is fundamental for tree improvement, breeding programs and other uses. CIFOR-ICRAF genebank conserve over 7,000 and 17,000 accessions both in seed bank and field genebank respectively, representing more than 200 tree species. The genebank is among the CGIAR genebanks distributing samples accounting for 10% of total annual international exchanges with greater percentage of recipients being developing countries. The demand for these vital resources is increasing due to worldwide effort to enhance food and nutrition security, adapt to ever changing climate and build resilience of landscapes. However, international germplasm exchange has been recognized as an important pathway for transboundary spread of pests. This is due to seed and propagative materials known to harbor pests, hence posing a risk of spread during exchange. Numerous countries have established phytosanitary and quarantine measures to reduce pest spread by screening import and export consignments of germplasm. The effectiveness of these procedures relies on knowledge of pest, diagnostic tools, experts, inspection and phytosanitary procedures. This review provides approaches used by Tree Germplasm Health Unit (GHU) to ensure phytosanitary protection for conservation and safe exchange of tree germplasm. It also highlights challenges, lessons and recommendations from our experience as we collaborate with national quarantine systems to export tree germplasm globally. Furthermore, it describes how GHU align to changing phytosanitary regulations and pest risk scenario and highlight the importance of globally coordinated approach to prevent transboundary spread of pests through propagative materials.

Key words: Gene bank, germplasm, pests, phytosanitary interventions

Experiences of promoting electronic phytosanitary certificates in Uganda

Mwambu P.[1], Kisingiri J. B.[1], Nankinga C.[1,2], Kibago R.[1], Ssamula A.[1], Ekalu S.[1], Owiny R.[1]. Syanda J.[3]

[1]Ministry of Agriculture, Animal Industry and Fisheries (MAAIF), P. O. Box 102, Entebbe
[2]National Agricultural Research Laboratories, P.O. Box 7065 Kampala
[3]Kenya Plant Health Inspection Service, Nairobi Kenya. P.O. Box 494592, 00100 Nairobi
*Corresponding author email: jsyanda@kephis.org

Abstract

Uganda has implemented the Generic ePhyto National System (GeNS) since 2020. The system is designed, monitored, managed and supported by United Nations International Computing Centre (UNICC). Exporting companies apply for registration and on approval by the Uganda National Plant Protection Organisation (NPPO) Country Administrator, they gain access and transact through the system. Inspection applications once generated are received by the inspectors. If the inspection report is approved, the ePhyto is issued. A certificate is sent to the ePhyto Hub where it is accessed by GeNS user partner countries. The GeNS was first piloted with the horticulture sector and later scaled out to all crop commodities. At national level, NPPO Uganda implemented GeNS through a public and private sector partnership. The main countries that Uganda exchanges ePhytos with include Kenya, the European Union via TRACES, United States of America, Argentina and South Africa where so far over 96,000 ePhytos have been issued. Uganda enjoys several benefits for introducing e-phyto certification. The GeNS has strengthened official controls through reliable and timely provision of ePhytos, enabled other NPPOs to authenticate issued PCs, access real time reliable statistics to inform decision making, eliminated paper procurement and reduced storage space for records. ePhytos reduced documentation non-compliances and enabled collecting reliable trade statistics for report writing. Private sector cost of doing business reduced through less travel time and expenses to submit application requests and collection of manual phytosanitary certificates. e-phyto is able to translate certificates to other languages such as French. The main challenge in implementing the e-phyto is to ensure that each NPPO inspector and private sector has an e-gadget connected to Internet.

Key words: Non-compliance, inspections, public-private partnerships, exports, official controls

SESSION ELEVEN | ROLE OF PRIVATE SECTOR IN IMPLEMENTATION OF SUCCESSFUL PHYTOSANITARY SYSTEMS

Systems approach to mitigating pest risks in fruits and vegetables for export to European Union

Tumuboine E.*

Corresponding author email: etumuboine@gmail.com

Abstract

The trade in plants and plant products for food and raw materials for industries is threatened by pests and diseases. The pest challenge is aggravated by failures in the production chain to ably detect and apply pest management measures at critical points. The measures must also be able to achieve pest infestation reduction. Such measures should be feasible to implement and be widely acceptable by producers and other key stakeholders. Eventually, assessment of management measures should be carried out. The decision tool is used to analyse all the applicable measures along the production chain with stakeholders. The European market requires that fruits and vegetables from Uganda be declared free of false codling moth (*Thaumatotibia leucotreta*) or subject the commodity to systems approach. The dossier was submitted to EU and needs to be verified under Ugandan conditions to future up scaling to other commodities and related pests. A total of 20 measures have been assessed using given criteria. The actual operationalisation of the measures and the results thereof will be demonstrated in farmers' fields. Depending on the outcome of the demonstration, the dossier will be revised and resubmitted for continued market access.

Key words: Pest detection, systems approach, impact assessment, European market

Role of horticultural trade logistic providers in phytosanitary compliance: the case of Kenya

Syanda J[1]., Macharia I.[2]. and Nyang'ang'a J[2].
[1] Kenya Plant Health Inspectorate Service, Nairobi, Kenya
[2]University of Nairobi.

Corresponding author email: jsyanda@kephis.org

Abstract

Movement of plants, plant products and other regulated objects at global, regional and or national levels contributes significantly to food security and national development. Consequently, this cross-border movement of plants, plant products and other regulated objects presents a risk of introduction, establishment and spread of exotic pests and diseases in new territories which often results in negative economic and environmental impact. Article IV of the International Plant Protection Convention makes general provisions for National Plant Protection Organizations (NPPO) to set up measures for preventing introduction, establishment and or spread of pests in foreign territories. The conventional practice by NPPOs to comply with this requirement has been to focus mainly on producers, exporters and importers of plants, plants products and regulated articles of agricultural nature. In most regulatory systems, inspection for phytosanitary compliance commences at the production level while certification is done at the point of exit. The consignments are then handed over to logistic providers for conveyance. Although the agricultural commodity logistic providers are primarily understood in terms of transportation (conveyance) of consignments from exporters to importers, they are also responsible for cold chain management, documentation, temporary storage and transportation of consignments after certification. Previous studies show that interceptions related to documentation were higher than those related to harmful organisms. A trace-back on such interceptions indicates that the documentation non compliance occurred while the consignment was with the logistic service provider. Given that agricultural produce consignments are handed over to logistic providers for conveyance either during or after certification the study finds that trade logistic providers have a role of ensuring sustained phytosanitary compliance.

Key words: Agricultural commodity logistics providers, phytosanitary certification, certificates lost in transit

Public and Private Sector Partnerships to facilitate Fruits and Vegetable Exporters' Certification in Uganda

Mwambu P.[1*], Nankinga C.[1,2], Kisingiri J. B.[1], Kibago R.[1],1 Ssamula A.[1], Ekaru S.[1], Kamugisha T.[3], Okecho R.[3], Zake F.[4], Balagadde S.[4], Baguma J.[4], Owino M.[4], Nakitto F.[4], Kanyije J.[4] and Kavuma J.[4]

[1]Ministry of Agriculture, Animal Industry and Fisheries (MAAIF). P. O. Box 102, Entebbe.
[2]National Agricultural Research Laboratories, P. O. Box 7065, Kampala.
[3]Uganda Export Promotion Board P. O. Box 5045, Kampala.
[4]Hortfresh Uganda Ltd, Plot 669, Senkatuka, Balintuma Road, Mengo Kampala.

*Corresponding author email: paul.mwambu@agriculture.go.ug

Abstract

Since 2014, Uganda's fruits and vegetables (F&Vs) products have been frequently intercepted in the European Union. This is due to documentation errors, exceeding pesticide residue limits, biological contaminants and quarantine pests (Europhyt Traces, RASFF monthly reports). This necessitated streamlining of sector SPS certification procedures. Basing on the World Trade Organisation (WTO) Sanitary and Phytosanitary (SPS) Agreement and therein control, inspection and approval procedures, in 2019, NPPO Uganda embarked on export registration regulatory reforms for F&Vs and communication of new procedures. Before exporters of F&Vs can export, they are required to apply to the NPPO for a commodity value chain audit comprised of production practices, human resource capacity, packing facility infrastructure, GMPs, GHPs and HACCP systems. This requires time and resources, hence necessitated innovative collaboration between Ministry Departmental Agencies and the private sector. Currently, private sector F&Vs apex body is required to perform pre-assessment of production farms, packing facilities of intending exporters and sensitize members on application paperwork required by the NPPO. Uganda Export Promotion Board conducts export preparedness training while Ministry of Trade Industry and Cooperatives has linked its website with that of Ministry of Agriculture Animal Industry and Fisheries (MAAIF) to communicate export procedures. The reforms improved Uganda's compliance to SPS transparency obligations, enabled the NPPO to leverage its limited human resources, reduced NPPO financial burden through shared responsibility, increased private sector's responsibility for SPS compliance, improved sector organization, necessitated development of private sector codes of practice, contributed to reduced time it takes MAAIF to register new exporters and resulted into exponential enrollment F&Vs exporters from 60 in 2019 to 350 in 2023.

Key words: Pesticide, quarantine pests, compliance, certification, production

SESSION TWELVE | CROSS CUTTING ISSUES IN PHYTOSANITARY SYSTEMS (LEGAL REQUIREMENTS, CAPACITY BUILDING, REGULATORY FRAMEWORK, TRADE NEGOTIATION AND COMMUNICATION, BIOSAFETY, GENDER ISSUES IN SPS)

Successes and lessons learned from the United States Department of Agriculture - Animal and Plant Health Inspection Service (USDA-APHIS) activities in Eastern Africa

Migiro L.*
United States Department of Agriculture - Animal and Plant Health Inspection Service (USDA-APHIS)
*Corresponding author email: lorna.migiro@usda.gov

Abstract

The Animal and Plant Health Inspection Service (APHIS) is a 50-year-old agency of the United States Department of Agriculture (USDA) that protects the health of U.S. agriculture and natural resources against invasive pests and diseases, regulates genetically engineered crops, administers the Animal Welfare Act, and helps people and wildlife coexist. APHIS also certifies the health of U.S. agricultural exports and resolves phytosanitary and sanitary issues to open, expand, and maintain markets for U.S plant and animal products. APHIS represents the US National Plant Protection Organization (NPPO) and Chief Veterinary Officer (CVO) and serves as the international contact point for the IPPC and WOAH. The agency works in partnership with various stakeholders to maintain and expand safe trade of agricultural products nationally and internationally. APHIS includes many different programs; the Plant Protection and Quarantine (PPQ), Veterinary Services (VS) and International Services (IS). The IS program support APHIS mission through building international relationships and its overseas offices serve as liaison points on SPS issues keeping agriculture healthy and trade markets open thus, helping the U.S. and global economies to thrive. This paper presents successes and lessons learned from APHIS' activities including technical assistance and capacity building programs aimed at promoting agricultural trade between the USA and its partners in Eastern Africa, Kenya as an example.

Key words: USDA-APHIS, Invasive pests, National Plant Protection Organization, Chief Veterinary Officer, capacity building, successes and lessons

The future of plant health regulation and research; lessons from one hundred important questions facing plant science: an international perspective

Mukoye B.*

Kenya Plant Health Inspectorate Service

*Corresponding author email: bmukoye@kephis.org

Abstract

Hundred Important Questions Facing Plant Science Research' project aimed to capture a global snapshot of the current issues and future questions facing plant science. Over 600 questions were collected from anyone interested in plants, which were reduced to a final list of 100 by four teams of global panellists. The project demonstrated how focussing on climate change, community and protecting plant life has become increasingly important for plant science over the past years. Eleven areas of critical global importance across diverse plant science research were identified. These were: Climate change, Science in the community, Food security, Biodiversity, Sustainability, Plant–plant interactions, Plant disease, Plant–microbiome interactions, Plant adaption, Plant stress responses, Ecosystem services. In each area, various questions were identified which clearly demonstrates the areas of focus in the future of plant science. The identified questions clearly provide a global perspective on the need to review plant health regulation and research in order to meet the future demands. The questions illustrate the collaborative and international need for long-term funding of plant science research, alongside the broad community-driven efforts to actively ameliorate and halt the negative impact of climate change, while adapting to its consequences. This work therefore, highlights questions that seem to guide the future of plant health regulation and research and the view of changing environment, policy and climate. It is aimed to inform plant health regulators and researchers on the focus areas of research, regulation and policy development.

Key words: Plant adaption, Sustainability, Plant health, Questions, Climate change

Capacity building to enhance phytosanitary compliance in places of production: A case of Syngenta plant pathology laboratory

Judith C. C.*

Syngenta Flowers, Kenya Cuttings, Kenya. P.O. Box 27774, Nairobi

Corresponding author email: Judith.chumba@syngenta.com

Abstract

Plant pests and diseases pose a significant threat to profitable cut-flower production. In particular, new pests and diseases at places of production can disrupt trade, lead to revenue loss and negatively affect livelihoods. It is the desire of cut-flower producers and the National Plant Protection Organizations (NPPOs) to have plant products that are compliant to both local and international standards. However, to achieve the desired compliance, the private sector, NPPOs and all value chain actors must play their specific roles. Over the years, Syngenta has sought to be the leading cut-flower producer besides other products. Therefore, to enhance global competitiveness of cut-flower products produced in Kenya, in 2011, Syngenta established a plant pathology laboratory at Kenya Cuttings to provide a first line layer of testing and monitoring plant materials produced in the facilities. This was done besides mandatory testing of priority samples by the NPPOs in line with existing regulations. To strengthen the laboratory and further make it fit for purpose, Syngenta Global continually supports capacity enhancement of technical staff done through among others, in-house and external technical trainings and participation in proficiency testing schemes. Further, the laboratory has strengthened collaboration with others both locally and internationally besides adopting several globally accepted test procedures. Since its establishment, the laboratory has significantly enhanced cut-flower compliance, reduced pest surveillance by the Kenyan NPPO, increased customer trust through supply of certified quality planting material, reduced the cost of managing widespread pest outbreaks in our production facilities and provided jobs as well as learning opportunities to several young people before they join the flower industry. Therefore, based on our experience, this is one of the innovative approaches through which the private sector can leverage to enhance phytosanitary compliance of plant products in places of production and mitigate spread of economically important plant pathogens.

Key words: Cut-flowers, pest monitoring, regulations, certification, private sector

Contribution of women in seed companies in Kenya: A case study of Nakuru county

Lagat S. J.*

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

*Corresponding author email: samanthalagat4@gmail.com

Abstract

Seed companies contribute greatly in agricultural development in Kenya. Their work force is drawn from young men and women equipped with various skills but information about the contribution of women in the sector in research and development, regulatory compliance, quality assurance, sales, marketing, leadership and management is scanty. It is therefore difficult to articulate their actual contribution in the industry. The objectives of the study were: To assess the role of women in seed companies, to examine how seed companies support women and to find out the challenges that impede women in seed companies in Nakuru County. The study is guided by The Gender perspective theory which provides a perception of how the society comprehends diverse activities and roles based on gender therefore recognizing men and women participation in societal development. The research adopted Descriptive Survey Research design and targeted four Seed Companies in Nakuru County. The seed companies were chosen through simple random sampling and the sample population were 300 women and men aged 18yrs and above. Purposive sampling was done to identify respondents for the focus group discussions (FGDs) and Key Informant Interviews (KII). The study incorporated both primary and secondary data and the data collected through Key Informant Interviews (KII), and FGDs while employing a concurrent mixed method research design. Qualitative data was analyzed using the deductive approach, grouped according to the research questions, evaluated then presented thematically. Quantitative information was coded and entered into the Statistical Package for the Social Sciences V25 and analyzed descriptively. Results of the study revealed that women representation in the seed companies was higher by 55 % compared to the men due to the nature of work, integrity and ability to withstand the challenging work environment. However, women were fewer in the top management hence there is need to advocate for gender equality in the seed companies.

Key Words: Gender, seed companies, seed industry, women, men, youth

Tackling Maize Lethal Necrosis (MLN) in Eastern Africa through effective phytosanitary approaches

Suresh L. M*., Beyene Y., Makumbi D., Gowda M. and Prasanna B. M.
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

Abstract

Maize (*Zea mays* L.) is critical for food security and livelihoods in sub-Saharan Africa (SSA). Maize Lethal Necrosis (MLN) disease first appeared in Kenya in 2011 and became a major threat to maize production in eastern Africa in subsequent years. In eastern Africa, MLN is caused mainly by synergistic interaction between two viruses, Maize Chlorotic Mottle Virus (MCMV) and Sugarcane Mosaic Virus (SCMV). The yield loss in susceptible commercial varieties could be up to 100% if the disease strikes early in crop growth. CIMMYT, in partnership with several international and national partners, has been implementing multipronged approaches to tackle the challenge of MLN. These efforts include: a) breeding for MLN resistance by phenotyping maize germplasm in a state-of-the-art MLN Screening Facility at Naivasha, Kenya; the facility was established in 2013 in partnership with Kenya Agriculture and Livestock Research Organization (KALRO) b) optimizing MLN diagnostic protocols; c) strengthening capacities of national plant protection organizations (NPPOs) across SSA on MLN diagnostics, monitoring, and surveillance system; d) creating awareness among the maize seed companies on SOPs for producing and exchanging MLN-free commercial seed; e) disseminating information on farming practices for minimizing MLN incidence; and g) probing the epidemiology of the disease, especially the factors underlying maize seed contamination by MCMV. In addition to accelerated breeding and deployment of MLN-tolerant/resistant varieties various phytosanitary intervention measures involving tracking, monitoring, and managing MLN are key for sustainable management of the disease in SSA.

Key words: Capacity building, phytosanitary measures, tracking, monitoring

Pidisp: An Innovative Python-based Tool for Spatio-temporal Dispersal Modelling of Parasitoids of agricultural pests

Komi M. A., Elfatih M. Abdel-Rahman and Henri EZ T.

International Centre of Insect Physiology and Ecology (*icipe*), P.O. Box 30772-00100, Nairobi, Kenya.

Abstract

Dispersion constitutes a fundamental life-history strategy, impacting resource competition, population dynamics, distribution, and host-seeking behavior, particularly among parasitoids. Despite its pivotal role in parasitoid survival and population dynamics, gaining insights into the mechanics of dispersal remains an elusive challenge. This is attributed largely due to the dearth of specialized analytical tools designed for this purpose. In this context, we introduce Pidisp, a Python-based, freely available visual data analytics tool tailored for spatio-temporal dispersal modeling. The tool's interface empowers users to undertake swift and interactive spatio-temporal assessments of species dispersal, utilizing pertinent bio-ecological and climatic data. Pidisp, utilizing principles such as the Fuzzy cellular automata algorithms, ensures its amenability for reuse and upgrade. The software enhances data analysis with its intuitive user interface, encompassing features like effortless data loading, uncomplicated dispersal constraint settings, and dynamic dispersal pattern plotting within its graphical user interface. This not only boosts user-friendliness but also facilitates a lucid illustration of dispersal dynamics and patterns. Pidisp's uniqueness is further underpinned by its portability and adaptability, thereby granting researchers a new degree of flexibility and efficacy, and significantly enhancing the accuracy and efficiency of their investigations. The potential for dispersal modeling is exemplified through a case study focusing on predicting the dispersal of the koinobiont endoparasitoids, Fopius arisanus (Sonan), a commonly utilized control agent for *Bactrocera dorsalis* (Hendel) (Diptera: Tephritidae) in Kenya. The results garnered from the application of Pidisp reinforce its efficacy in unveiling parasitoid dispersal, thereby contributing to more effective biological pest control. This positions Pidisp as an indispensable resource for understanding pest populations and signifies a notable progression in the field of dispersal studies.

Key words: Data science, computer intelligence, migratory pests, biological control, crop protection, landscape ecology

ABSTRACTS FOR POSTERS

Reaction of potato cultivars to Potato Cyst Nem atodes under greenhouse conditions

Ochieng B[1, 2], Kimenju J. W.[1], Muiru W. M.[1], Nyongesa M. W.[2], Mbiyu M. W.[2], Otipa[2] M. J., Wasilwa L.[2].

[1] Department of Plant Science and Crop Protection, University of Nairobi, Kenya

[2] Kenya Agricultural and Livestock Research Organization (KALRO), Kenya.

* Corresponding author email: berrickotieno2@gmail.com

Abstract

Several measures have been recommended in the control of potato cyst nematodes (PCN) with resistant potato cultivars being considered the most practical and affordable for smallholder potato farmers in Kenya. However, the level of resistance in locally grown potato varieties is yet to be established. The aim of this study was to screen Kenyan potato cultivars against PCN under greenhouse conditions. Eleven potato cultivars namely: Shangi, Dutch Robijn, Sherekea, Nyota, Roseline tana, Tigoni, Unica, Asante, Chulu, Kenya Mpya and Arka were screened with Desiree (susceptible variety), Manitou (resistant cultivar) as controls. For each potato cultivar, there were two sets of plants with the first set inoculated with 50 cysts, while the second batch was nematode-free. The experiment was done in a completely randomized design, in three replicates. A scale of 1-9, was used to assess PCN severity on each potato plant. Nematode infestation caused reductions in root mass across the cultivars by a range of 20 to 100% compared to uninoculated control. The reproductive index of viable eggs across the cultivars was <1 compared to control. Potato cultivars Shangi, Tigoni, Dutch, Chulu, Asante, Unica, Arka, Kenya Mpya and Roseline Tana had a severity score of 1-3 (>100-5%), hence considered to be susceptible to PCN, while cultivars Sherekea and Nyota had a severity score of 4-6 (<25-3%) hence considered partially resistant to PCN. Study findings provide a basis of integrating partially resistant potato cultivars into PCN management in smallholder farms.

Key words; Resistance, susceptible, cyst viable eggs, smallholder farmers, severity score

Status of fusarium wilt in Zambia

Chomba D. M.*, Msiska K. K., Goma A., Mtawa M., Mukuwa P. S. C., Mazimba E., Chivunga J., Lyowa L. and Siazemo, M.

Plant Quarantine and Phytosanitary Service. Ministry of Agriculture, Private Bag, Chilanga
*Corresponding author email: dchomba71@gmail.com

Abstract

Bananas (*Musa* spp) are rated as the fourth-most important food crop in the world. They are also regarded as a source of income and provide food security to more than 70 million Africans. In Zambia, banana fruit cultivation provides a livelihood to many farmers and is a well-known source of various vitamins and carbohydrates. However, a wide range of factors affect banana production and yields, among them abiotic, biotic, socioeconomic factors including pests. *Fusarium oxysporum* f. sp. *cubense* (Foc), the soil-borne fungus is one of the pests affecting banana production in countries where it is reported. The tropical race 4 (TR4), affects a wide range of banana varieties including the Cavendish clones. The disease has been reported in Mozambique one of Zambia's trading and neighbouring country. In this context, a survey was conducted for one season in banana growing areas covering Central, Copperbelt, Eastern, Northern and Southern provinces of Zambia to establish the status of Foc in both the small scale and commercial farms. Samples were screened for Foc TR4 using morphological and molecular techniques. 32 out of 271 fungal isolates resembled *Fusarium*-like growth. However, the confirmatory results showed no presence of TR4. *F. oxysporum* and *Fusarium verticillioides* isolates are the common fungus associated with bananas. Information obtained in this study could help Zambia to develop and implement regulatory measures to prevent the incursion of Foc TR4. Surveillance should be extended to other parts of the country known to be growing bananas. The use of disease free and resistant planting materials should be promoted in all the banana growing areas.

Key words: Survey, fusarium wilt, bananas, disease, tropical race 4, safeguard

Management of toxigenic *Fusarium* Species by atoxigenic *Aspergillus flavus* (Aflasafe KE01) application in Maize Fields in Lower Eastern Kenya

Ndirangu E. W.[1*], Muthomi J.[2], Wagacha J. M.[1], Mutegi C.[3]

[1]School of biological sciences, University of Nairobi

[2]Department of crop science and crop protection, University of Nairobi

[3]International Institute of Tropical Agriculture, Nairobi

*Corresponding author email: esther.ndirangu@kephis.org

Abstract

Maize (*Zea mays*) is grown in areas with environmental conditions that are ideal for growth of most cereal pathogens such as *Fusarium* fungi. However, there is lack of effective fungicide to control fumonisin producing *Fusarium.* This study was conducted to determine the efficacy of atoxigenic *Aspergillus flavus* (Aflasafe KE01) on the population of *Fusarium* species in maize fields. The study was carried out in four sub counties in lower Eastern Kenya. Twenty-four maize fields were selected in each of the sub county where 12 fields were treated with Aflasafe KE01, while 12 fields comprised the untreated controls. Aflasafe KE01 was applied by hand broadcasting in the maize fields two to three weeks before tasseling of the maize. Maize grain samples were collected from each field at harvest. *Fusarium* species were isolated from the ground maize using pour plate method following serial dilution on low strength potato dextrose agar and Spezieller Nahrstoffarmer. The results showed that application of Aflasafe KE01 effectively displaced the toxigenic *Fusarium* species in maize fields. Maize samples from Aflasafe KE01 treated maize fields recorded lower incidence (41%) of the *Fusarium* species especially in the prevalence level of *F. verticillioides* compared to untreated maize fields (60%). This indicates that Aflasafe KE01 is a potential biopesticide for the biocontrol of *Fusarium* species in maize.

Key words: *Fusarium* species, Aflasafe KE01, maize, atoxigenic *Aspergillus* sp

Application of Integrated Pest Management (IPM) in cut flowers

Kivi A.

Kenya Plant Health Inspectorate Service (KEPHIS). P.O Box 49592-00100 Nairobi, Kenya
Corresponding author email: akivi@kephis.org

Abstract

Kenya's economy largely relies on the agricultural sector. Horticulture sub-sector is one of the top foreign exchange earners for the country generating approximately US$ 1 billion annually. Floriculture contributes 85% of Kenya's export and is the fastest-growing export sector in the Kenyan economy. The sector provides direct employment for over 200,000 workers and to more than one million peoples indirectly and impacting in excess of 5 million lives. Kenya is the leading exporter of rose cut flowers to the European Union with a market share of 40%. Production of cut flowers has been facing challenges among them being infestation by pests. This has affected quality of flowers, yield and resulted in rejection of flowers in the countries of destination. Among the main pests include moths (caterpillars), whiteflies, thrips, red spider mites, leaf miners, aphids, bugs and beetles. Growers and exporters have employed various methods of pest management in cut flowers. However, despite these efforts they have suffered rejections of their flowers at points of exit in exporting countries and point of entries in importing countries. Integrated Pest Management (IPM) is an effective and environmentally sensitive approach to pest management. It is an ecosystem-based strategy that focuses on long-term prevention of pests through a combination of various techniques. Currently there is no comprehensive literature outlining integrated pest management in cut flowers. Hence, this paper outlines several compatible pest management strategies in the most practical and efficient way to ensure exported cut flowers are free from pests. The main areas covered are production site selection, source of planting materials, use of resistant varieties, certification of production sites, producer registration, training, site preparation, staff competencies, planting techniques, cultural techniques, pest monitoring and reporting procedures, field crop inspections, harvesting techniques, post harvesting procedures, transportation and distribution procedures and internal quality checks.

Key words: Integrated Pest Management (IPM), cut flowers, compliance, pests, compatible, export

Assessment of upland rice production constraints and farmers' preferred varieties in Liberia

Pope M.[1]* and Moses M.[2]

[1]College of Agriculture and Forestry, University of Liberia, Liberia

[2]Faculty of Agriculture, Department of Seed Crop and Horticulture Science, University of Eldoret, Kenya

*Corresponding author email: mosesmuga00@gmail.com

Abstract

Rice (*Oryza spp*) is the primary staple food crop for over 5.3 million people in Liberia which significantly contributes to food security. Despite the numerous benefits of rice, its production in Liberia has remained heavily constrained by low yield, diseases, and rainfall variability. To improve rice adoption and productivity in Liberia, it is very important to understand farmers' production constraints and identify their own preferred rice varieties. This study was conducted to assess key production constraints, and farmer-preferred rice varieties across the three major upland rice growing counties in Liberia. Participatory and group discussions were conducted among 328 upland rice farmers using a comparative approach, probing, and semi-structured interviews. The results of the survey found that most of the farmers cultivated more than one variety. It also showed that there were significant differences in farmers' preferences for rice varieties among the three counties and the choice of varieties varied significantly across districts. Of the nine districts, Jorquelleh had the highest proportion of farmers who chose to grow Jaowo followed by Fassama, Mienpea Mahn district, and Congo, Zoe Gbao Districts. Across the nine districts, Jaowo is the most preferred variety grown by farmers followed by Fassama and Black rice respectively. Constraints such as drought, pests and diseases, availability of seed, high input cost, and harvesting were the major challenges affecting upland rice production as observed in the study areas. The study found that farmers grow these rice varieties due to their high-yielding capacity, early maturity, and drought tolerance. The highly preferred varieties desired by farmers had attributes such as high grain yield, tall plant height, early flowering, and good cooking quality. Rice breeders in Liberia should grasp the preferences of farmers and consumers in their breeding programs and the farmers must also be aware of consumer preferences in order to be able to meet their demands.

Key words: Upland rice, constraints, varieties and farmers' preferences

Effect of seed priming on the physiological characteristics of sorghum seeds

Jackline Cheruiyot

West Africa Center for Crop Improvement, University of Ghana, PMG LG 30, Legon
Corresponding author email: jjeruiyot@wacci.ug.edu.gh, jjeruiyot@st.ug.edu.gh

Abstract

Sorghum (*Sorghum bicolor* (L.) Moench) is a crucial crop in many people's diet, nutrition, and financial security because of its endurance in arid environments. Nonetheless, a common issue with the majority of sorghum cultivars is restricted field emergence. Poor stand establishment of sorghum is influenced by specific post-sowing circumstances, which have a significant impact on the rate of germination, seed vigor, and seedling emergence. The objective of the study was to evaluate the effect of seed priming durations on the seed viability, mean germination time, and seedling vigor of sorghum seeds and to evaluate the effect of storage duration and ambient conditions on viability, vigor and seedling establishment of primed sorghum seeds. The study was carried out in Kenya Plant Health Inspectorate Service in a factorial completely randomized design with four replicates. The factors tested were sorghum varieties (Serena, Gadam, Seredo), and 3 priming agents (Distilled water, 1% Potassium Nitrate, 1.5% Sodium Chloride) and unprimed seeds were used as control. Each seed lot was primed for varying lengths of time (0, 6 hours, 12 hours, and 18 hours). Analysis of variance (ANOVA) was conducted by use of GenStat®, 12th Edition at the 5% level of significance. The results of the study revealed that there were significant differences among the priming durations across all the varieties tested and storage durations affected the performance of primed sorghum seeds. By using seed priming, it is anticipated that the productivity of sorghum will increase hence recommending it to farmers.

Keywords: Priming, seed establishment, seed vigor, seed viability

Study on viability and validity period for vegetable seeds a case of seed certification system in Kenya

Shango P.[1*] Oganda K.[2], Mutwiri J.[2] Sitienei W.[1], Maina J.[1], Koskei K[1]. and Wesa P.[3]

Kenya Plant Health Inspectorate Service

*Corresponding author email: pshango@kephis.org

Abstract

Seed validity is an important parameter in assuring seed quality in any seed certification system. In Kenya different species have a different validity period from the time seed is released as certified by the certifying body. For vegetable seeds, the current validity period is nine months after which the seed has to be resampled and retested afresh. Numerus resampling requests has cost implication to traders. A study was carried out from April 2022 to June 2023 at Kephis Nakuru Regional office, the National Seed Testing Laboratory. The study aimed at assessing the period of vegetable seed validity and inform decision on whether a review of resampling period was required. The study involved analyzing the existing data for seed testing since the year 2004 to 2023. The work involved data cleaning (where necessary) and analyzing all vegetable crops tested for the last 18years. The germination rates from initial test through resamples for each year over 18years for each vegetable crop was determined. This was followed by Synthesizing, analyzing and simulation of models for the purposes of predicting and reviewing current period of validity. A total of 30 different vegetable species were reviewed under this study. The data under review was analysed using STATA version 13 which gave a projection of possible outcome for the different validity of different seed species. It was clear that there was a drop in mean germination percentage for different seed lots over a period of 12 months for 17 years (between 2004-2021) and for different species of vegetable crops. The highest drop was noted on Cynara scolymus (French artichoke/Globe artichoke/green artichoke) at 28% and the lowest being Asparagus species and Spinacia oleracea at 3% respectively. The study revealed that whereas different vegetable species have different levels of decline in germination percentage over a period of time, it was also possible to have an overall cumulative mean as prescribed in the Seeds and Plant varieties Act Cap 326 whereby a threshold value is given in terms of period of validity e.g. 9months, 12months or 15 months. From this study, it is clear that the current period of vegetable validity should not exceed 14months because the study reveals that there is already a 20% cumulative drop in the overall germination capacity

Key Words: Seed, Germination, validity, vegetable modelling, simulation

Fusarium *Oxysporum cubense* wilt TR4 Foc in Comoros: A Threat to Banana Agriculture

Mouzdalifa Mmadi

Corresponding author email: mouzdalifammadi@gmail.com

Abstract

Fusarium wilt TR4, caused by the soil-borne fungus *Fusarium oxysporum* f. sp. cubense Tropical Race 4 (Foc TR4), poses a severe threat to global banana agriculture. This paper aims to provide a comprehensive overview of the disease, its impact, and potential mitigation strategies in Comoros. The abstract begins with an introduction to Fusarium wilt TR4, highlighting its rapid spread and devastating effects on susceptible banana cultivars. It emphasizes the significance of this disease, as bananas are a major staple crop and a critical source of income for millions of smallholder farmers worldwide. The paper delves into the characteristics of Foc TR4, including its long survival in the soil, persistence in infested fields, and lack of effective chemical control. It discusses the mechanisms of pathogen transmission, which include the movement of infected planting materials and soil-borne dissemination in our country. Furthermore, the abstract highlights key symptoms and diagnostic methods used to identify Fusarium wilt TR4 in banana plants, enabling early detection and prompt action. In addressing Fusarium wilt TR4, the abstract presents current and potential management strategies, such as the use of disease-resistant banana varieties, soil biocontrol agents, and cultural practices aimed at reducing disease spread. The abstract concludes by stressing the urgency of collaborative efforts among governments, researchers, and the agricultural community to combat Fusarium wilt TR4.

Key words: TR4, banana, pathogen transmission, disease resistant,

Horizon scanning for potential arthropod quarantine pests which threaten agriculture and biodiversity in Kenya in 2023

Momanyi G.[1]*, Koech A.[1], Kabole M.[1], Munene P.[1], Ombuya A.[1], Muvea A.[1], Guantai A.[1], Nyamai I.[1], Omwenga B.[1] and Mulema J.[2]

[1]Kenya Plant Health Inspectorate Service (KEPHIS). P.O. Box 494592, 00100 Nairobi
[2]Centre for Agriculture and Bioscience International (CABI)

Correspondence email: gmomanyi@kephis.org

Abstract

World trade in agricultural commodities and movement of people and conveyances is increasing, with the introduction of quarantine pests into new areas reaching an all-time high. As a result, a number of alien species (introduced beyond their native ranges) continues to rise among geographic regions including Kenya. Arthropod pests form the bulk of these quarantine pest introductions. A horizon scanning process is thus necessary to systematically identify and assess the potential quarantine pest threats facing Kenya. This will lead to the creation of pro-active contingency plans to mitigate against new pest introductions once they occur. As a build-up to the work initiated in 2018, a group of plant health experts in arthropod pests in June 2023, used an adapted methodology to assess about 400 potential quarantine pests on a 5-point scale for the likelihood of entry and establishment, potential socio-economic impact and impact on biodiversity. The individual scores were combined to rank the species according to their overall potential risk for the country. Confidence in individual and overall scores was recorded on a 3-point scale. This resulted in a priority list of potential arthropod quarantine pests for Kenya. Options for risk mitigation such as full pest risk analysis and detection surveys were suggested for prioritized species while species for which no immediate action was suggested, were added to the plant health risk register and a recommendation was made to regularly monitor the change in risk. By prioritizing risks, horizon scanning guides resource allocation to interventions that are most likely to reduce risk and is very useful to National Plant Protection Organizations and other relevant stakeholders.

Key words: Quarantine pests, horizon scanning, arthropods, risk prioritization, risk

Adoption of ePhyto solution for enhanced phytosanitary compliance

Syanda J., Macharia I., Wanyeki K. and Were B.
Kenya Plant Health Inspectorate Service

Corresponding author email: jsyanda@kephis.org

Abstract

Over the last two decades, National and Regional Plant Protection organizations have pursued different innovations options to mitigate phytosanitary risks. Adoption of electronic phytosanitary certification known as ePhyto has attracted global acceptance. ePhyto is an electronic equivalent of the paper phytosanitary certificate in digital format. Movement of plants, plant products and other objects considered as pest pathways being moved across international borders should, where required be accompanied by a phytosanitary certificate also known as plant passport. The plant passport is issued by a competed authority of the exporting country to assure the importing country that import requirements and conditions have been fulfilled. The IPPC ePhyto solution is 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 physical means. The paper certificates are therefore exposed to risks including defacing, loss of integrity, alteration, delays among others. Adoption of the IPPC ePhyto solution assures NPPOs safe and efficient movement of plants, plant products and other regulated objects. The IPPC ePhyto solution has Generic Ephyto National System (GeNS) for use by countries who do not have system for exchange of ePhyto in place. The IPPC ePhyto solution Hub and harmonization module enables higher compliance and hence safer and efficient trade facilitation

Key words: Electronic phytosanitary certification, IPPC, ePhyto

Technology transfer and capacity development for more sustainable cassava seed production in Kenya

Khisa S.*, Munguti F. and Macharia I.

Kenya Plant Health Inspectorate Service, P.O. Box 49592-00100, Nairobi, Kenya.
*Correspondence author email: skhisa@kephis.org

Abstract

Cassava (*Manihot esculenta* Crantz) grows in diverse agro-ecological zones. In Kenya, it is widely cultivated in Western and Coastal regions. It is mainly grown for food and nutrition security and excess roots are sold to generate income for the farm households. Its productivity per unit of the land area is high compared to maize and wheat which are staple crops in the country. However, scarcity of cassava planting materials and pests and diseases limit production in these regions. Most cassava farmers in Kenya, recycle the planting material by using cuttings from the previous crop. Kibandameno and Tajirika Varieties being most preferred. It is critical to increase cassava production as well as its quantity attributes. the technology innovation offers great potential to drive this envisioned change. This paper highlights technological tool and resources available in cassava production. Here the reviewed approaches used for cassava production highlighting the methodologies linked to quality and uniform product. The technologies have been developed to reduce disease pressure to manageable levels. Sustained research and innovation capacity is imperative for agricultural transformation. Cassava has potential to be grown in semi-arid areas as a climate smart crop.

Key words: Cassava, productivity, scarcity, new technologies, disease pressure

Testing procedure towards release of the 1st FAW tolerant maize varieties in Kenya

Cheptaiwa J.K.* Maina S. Muthee J. and Ogolla S.

Kenya Plant Health Inspectorate Service

Corresponding author email: jcheptaiwa@Kephis.org

Abstract

Since the first reporting of Fall Army Worm pest in Kenya in 2017, efforts have been going on to manage the pest given that the pest attacks a wide range of crops where maize and sorghum are the most preferred hosts. The pest can cause up to 100% yield loss if left uncontrolled in the preferred hosts. Management of pest involve use of tolerant or resistant varieties, cultural control, biological control and use of insecticides. Testing of potential tolerant varieties was done to ensure that only superior varieties with value are released for recommendation to the farming community to use. The tests involved the National Performance Trials (NPT) and Distinctness, uniformity and Stability (DUS) tests. The process involved introduction of False army worm neonate into growing potential tolerant plant trials and documenting the plant reactions and development of a trial report. The report was discussed by the National performance trial Committee and National variety release committee where 3 varieties made the criteria for release and were finally released for commercialization.

Key words: Variety testing, Tolerant varieties, False Army Worms

Application of *Ga1* and *Ga2* genes in isolation of tropical maize in seed production

Mathews M. Dida*

School of Agriculture, Food Security and Environmental Science, Maseno University
Private Bag, Maseno, 40105

*Corresponding email: mitodida@yahoo.com

Abstract

Maize pollen can be carried up to about one kilometer by wind, therefore, maintaining genetic purity in commercial seed production is challenging in the tropics. The challenge is substantially reduced in popcorn, which carries the Ga1-s allele or any other maize lines with Ga2 allele. These barriers enabled some breeders to explore the use of these factors for isolating breeding and production materials from other maize. Three loci are known to confer cross-incompatibility: *Gametophyte-factor1* (*Ga1*), *Gametophyte-factor 2* (*Ga2*), and *Teosinte-crossing-barrier 1* (*Tcb1*). Pollen from most tropical dent maize lines have *ga1* allele and cannot fertilize ovules *Ga1* and *Ga2* lines. At Maseno University, we have introgressed *Ga1s* and *Ga2* from a popcorn and tropical dent line 511N, respectively. This paper reports the preliminary observations and attempts to explain the observed aberrant segregations in F_2 generations. Currently, most seed certification agencies use spatial and temporal isolation in maize seed production. In this paper, I propose and discuss potential applications of *Ga1* and G2 genotypes in isolation in maize seed production in eastern Africa.

Key words: Genetic purity, cross-incompatibility, breeding, genotypes

Beware of the Khapra Beetle (*Trogoderma granarium):* the tiny terror of stored grains

Mutheu L.*, Omondi L., Ombuya A. and Kosiom T.

Kenya Plant Health Inspectorate Service (KEPHIS), Phytosanitary Department, P.O. Box 494592, 00100 Nairobi

Corresponding author email: nziokalilianmutheu@gmail.com

Abstract

The Khapra Beetle (*Trogoderma granarium)* is a notorious pest that threatens agricultural productivity and food security worldwide. As an invasive pest, it causes extensive damage to stored grains and seeds, resulting in reduced food security, restricted export opportunities, and increased management costs. The khapra beetle is absent in Kenya based on the NPPO detection surveys. Kenya continues to raise awareness among stakeholders and farmers about the devastating impact of the Khapra Beetle and to provide essential information on detection to prevent introduction, and enhance eradication programs in case of detection.

Keywords: Khapra beetle, *Trogoderma granarium*, NPPO, eradication program

Desert locust invasion in Kenya; triumphs, challenges and lessons

Sambai K.*, Munguti F. and Macharia I.

Kenya Plant Health Inspectorate Service, P.O. Box 49592-00100, Nairobi, Kenya.
*Correspondence author email: ksambai@kephis.org

Abstract

In December 2019, Desert locusts (*Schistocerca gregaria*) invaded Kenya. The first swarm of desert locusts moved into Kenya from Somalia on 28th December 2019. This swarm came through Mandera County. More swarms continued to fly into Kenya from Somalia. Due to the destructive nature of the desert locusts, management efforts had to be instituted immediately. Desert Locust Control Organization of East Africa (DLCO-EA) and The Plant Protection Services Division (PPSD) are the organizations that were tasked with leading the management efforts against migratory pests, the desert locust being one of the migratory pests. Other organizations, including KEPHIS, joined in the management of the desert locusts. Twenty-six, (26) counties in Kenya were invaded by desert locusts. The invasion started with Mandera in North Eastern Kenya, and then spread to Wajir, Isiolo, and Marsabit counties. Other counties that were infested by desert locusts are Samburu, Laikipia, Tharaka Nithi, Meru, Embu, Garissa, Makueni, Murang'a, Machakos, Baringo, Turkana, West Pokot, Elgeiyo Marakwet, Kajiado, Kirinyaga, Trans Nzoia, Kajiado, Nyandarua, Baringo, Kitui, Tana River and Bungoma. This paper discusses the efforts done by KEPHIS and the Multi Institutional Technical Team (MITT) on locusts in management of Desert locusts and the triumphs, the challenges and lessons learnt from the desert locust management efforts

Key words: Desert locust, Invasion, Survey, Migratory pests, triumphs, challenges

Evaluating the Effects of Cobalt/Molybdenum, Rhizobium Inoculants and Diammonium Phosphate Fertilizer on the Growth and Yield of Soya Beans in Kisii County (*Glycine max*)

Dorice Ombuna Omwocha

Correspondence email: dorisombuna1@gmail.com

Abstract

Soya bean is an important crop grown globally. It is the main source of dietary protein and oil and is used commercially to produce livestock feed and food for humans as well. Production is low in Kisii yet the potential for optimum yield is documented. Poor soya bean yield is thought to be caused by infertile soils due to poor agronomic and management practices, acidified soil, deficient nutrients in the soil and use of unimproved seed varieties. The study evaluated the effects of cobalt/molybdenum, rhizobium inoculants and diammonium phosphate fertilizer on the growth and yield of soya beans in Kisii County. A randomised complete block design experiment replicated in four blocks was done at Kisii Agricultural Training Centre.Treatments used for seed dressing per kg/seed included: Rhizoliq Top Soya 3mls, Wuxal Extra CoMo15 at 1ml, Wuxal Extra CoMo 15 at 1.5 mls, (Wuxal Extra CoMo 15 at 1.5 mls / Rhilizic top 3mls) and (Waxul Extra15 CoMo1m/Rhizoliq top 3ml, Control (Without Treatments), DAP 125kg/ha-1, of soya seed. Analysis of variance was conducted using SPSS version 22 and any significant means were further analysed using DMRT all at 95% confidence level. Soil analysis revealed moderately acidic soil (pH 5.5) low nitrogen (0.12%), moderate Phosphorus (20ppm) and low potassium levels (40%). Cobalt was 54.6 and Mo 6.44 Mg/lg. On germination CoMo1ml+Rhizob yielded the highest percentage, followed by CoMo1.5ml, with a significant statistical difference between treatments (< 0.05). CoMo1ml+ Rhizobium had the highest flowering percentage. Above ground biomass was highest with the use of CoMo1.5ml/ Rhizobium. CoMo1ml/ Rhizobium treatment showed highest pod weight per plant and had a statistically significant difference (<0.05). On the six plants seed weight per plant, Rhizobium treatment exhibited highest weight whereas the least was CoMo1ml. CoMo1.5ml/Rhizob was shown to have the highest 100 seeds weight, with statistically significant difference among the treatments (<0.001). The highest yielding inoculant was CoMo1ml/Rhizob followed closely by Rhizob. ANOVA showed a strong significant difference among the treatment's yield per ha (<0.006). Plant height was highest with CoMo1ml, ANOVA exhibited a significant difference among treatments (<0.001). CoMo1ml/Rhizob exhibited the heaviest weight of seeds with the least weight from the control and CoMo1ml respectively. The study concluded that low yield in Kisii and other soya bean growing zones in Kenya can be enhanced by use of combined selected inoculants.

Key Words: Cobalt/molybdenum, Rhizobium inoculants, Diammonium phosphate fertilizers, Soya beans

Cereal-legume intercrop: non - chemical strategy to manage fungal diseases in sorghum

Yahuma N.A.[1*] and Ndeda M[2].

[1] University of Eldoret, School of Agriculture and Biotechnology, P.O. Box, 1125 - 30100, Eldoret, Kenya.

[2] Nehemiah International, P. O. Box, 1687 – 40100, Kisumu, Kenya.

Corresponding author email: yahuman92@yahoo.com

Abstract

Sorghum (*Sorghum bicolor* L., Moench) is ranked fifth globally after maize, wheat, rice and barley and second after maize in Sub-Saharan Africa. The crop has the ability to adapt in semi-arid, sub-tropical, tropical and temperate climates where most people consume it directly for its nutritional and health benefits. In Kenya farmers have consistently reported low yields below breeders' potential. Limited awareness and adoption of appropriate integrated legume-sorghum intercrop systems together with parasitic weeds, foliar diseases and insect pests can lead to more than 70% yield loses in sorghum. To address these constraints, a study was conducted focussing on assessing sorghum-legume intercrop systems for effective management of foliar diseases in Western Kenya. For field experiment, the total area was 25m by 20m and planting done in RCBD with five treatments replicated three times. Experimental plot for each treatment was 4m by 3m with 2m path between blocks and 1m between plots. Susceptible sorghum genotype was planted at a spacing of 60cm by 20cm to ensure severe expression of foliar disease severity under different cropping systems. Five treatments were: sorghum monocrop, soybean-sorghum and dolichos-sorghum simple systems, soybean-sorghum and dolichos-sorghum mbili systems. Data on disease severity and incidence were collected. Disease severity levels will be assessed on a 0-5 rating scale. These data collected were subjected to analysis of variance, descriptive and inter-principle component analysis (IPCA) using Genstat statistical software, 16th edition at 5% level of significance. The results were presented in biplot correlation matrices, Box- and -Whisker plots, Bar graphs with error bars and table of means. Study findings contribute towards climate-smart agricultural innovation and enhanced food and nutritional security through sorghum-legume integrated cropping systems for sustainable management of fungal diseases in sorghum.

Key words: Sorghum-legume, intercrop, disease, severity, inhibitory, management

Effects of *Gro-aloe* on yield and yield components of wheat (*Triticum aesitvum*) in Kenya

Otukho B.[1,2*] , Oyier M.[3], Wanyoike G. W.[,2,] Chirchir B.[1,2] and Owuoche J.O.[1]

[1]Egerton University, Department of Crops Horticulture and Soil Science, P.O. Box 536- 20115, Egerton, Kenya.

[2]Kenya Agricultural and Livestock Research Organization (KALRO) P.O. Njoro - Kenya

[3]Kenya Plant Health Inspectorate Service, -Lanet, P.O. Box1679 Nakuru Kenya.

*Corresponding author: otukhobernard@yahoo.com

Abstract

Wheat (*Triticum aestivum* L.) is one of the cereal crops that is important world wide. A field trial was conducted at KALRO Njoro to determine the effect of *Gro- aloe* on yield and yield components of wheat. A 3- season field experiment was carried out at Kenya Agricultural and Livestock Research Organization (KALRO) in a randomized Complete Block design (RCBD) in split-plot arrangement. Wheat varieties (*Kenya Tai* and *Njoro BWII*) were considered as main plots while *Gro-Aloe* (seed dressed and spray) was assigned to sub-plot. The results from analysis of variance indicated that there were significant ($p \leq 0.01$) effects due to spray for plant height, biomass, yield, and thousand kernel weight. Effects due to Spray × Season interaction were significant ($p \leq 0.01$) for biomass thousand kernel weight, and ($p \leq 0.05$) for yield. Although effects due to Season × Variety were significant ($p \leq 0.01$) for yield, test weight, 1000-kernel weight, kernel spike^{-1} and kernels spikelet^{-1}. Seed dressing and spraying of wheat at 4% did grow to a height of 83.449, biomass of 3.982 tonnes/hact and yield of 2.042 tonnes (17.559 % more than the check 0). A 1000-kernel weight of 26.485g was observed on the kernels from wheat that was treated with 4% *Gro-Aloe* compared to 25.641g observed on the kernels from the control plot. The weight of kernels from wheat dressed and sprayed with 4% was more than those from 6% Gro-Aloe treatment. The results from this study showed wheat dressed and sprayed with 4% *Gro-Aloe* increases yield and grain quality.

Key words: Gro-aloe, wheat, seed dress, Yield, Yield components

Development of a simple, rapid, and sensitive AmplifyRP isothermal assay for detection of *Fusarium oxysporum* f. sp. *cubense* Tropical Race 4

Rugang Li[1], Bryant Davenport[1], Shulu Zhang[1], Robert Emmitt[1], Keith Schuetz[1], Tingting Bai[2], Gang Fu[3], Si-Jun Zheng[2, 4,] Marcos Amato[5]

[1]Agdia Inc., U.S.A.; [2]Yunnan Academy of Agricultural Science, China; [3]Guangxi Academy of Agricultural Sciences, China;

[4]Bioversity International, China. [5]Agdia EMEA, France.

Corresponding author email: marcos.amato@agdia-emea.com

Abstract

Fusarium oxysporum f. sp. *cubense* Tropical Race 4 (Foc TR4) is threatening worldwide Cavendish banana production. Despite quarantine efforts, the pathogen continues to spread through transport of contaminated plants, human migration, and infested soil and water. Hence, a simple, rapid, and sensitive diagnostic assay is needed for implementing quarantine measures and mitigating spread of the pathogen. Agdia has developed an AmplifyRP assay for the detection of Foc TR4 based on recombinase polymerase amplification. The AmplifyRP assay targets a unique Foc TR4 virulent gene (Gene Bank ID: JX090598). Three DNA sequence regions from this gene were selected for designing AmplifyRP primers and probes to distinguish Foc TR4 from Foc R1, Foc R2, Foc R3, and Foc STR4. Two combinations of the primers and probes have been identified through extensive screening and shown to have specific reaction to Foc TR4 but not to the other Foc races. The limit of detection is 4 copies of DNA amplicon fragment or 6-25 pg of Foc TR4 genomic DNA depending on the DNA purity. Detection results can be obtained within 20 minutes using a portable fluorometer such as AmpliFire. This assay was initially successful to distinguish five Foc TR4 DNA samples from ten other Foc DNA samples from Yunnan province of China. This assay can detect Foc TR4 directly from crude extract of banana tissue, infested soil, and contaminated water samples.

Key words: AmplifyRP, DNA Sequences, TR4, contaminated plants, diagnostic assay

Role of the seed industry in NPPO seed maize crop inspections: the case of Zambia

Mudenda M.*, Msiska K.K., Chomba D.M., Mukuwa P.S.C, Siazemo M., Mtawa J.M. and Lyowa L.

Plant Quarantine and Phytosanitary Service, Ministry of Agriculture, P/B 7, Chilanga,

*Correspondence e-mail: mablemudendabanji @gmail.com

Abstract

The Agriculture sector in Zambia is considered a catalyst for enabling adequate food security, employment creation and sustained trade and socio-economic development. The production of seed maize is a key component of the sector with the maize seed industry been regarded as one of the most competitive in Sub-Saharan Africa. The industry is however confronted by many challenges such as pests that attack the seed maize crop while in the field and maize seed in storage. The Plant Quarantine and Phytosanitary Service (PQPS), Zambia's National Plant Protection Organisation (NPPO) undertakes routine inspections for pests of the seed maize crop while the crop is actively growing for the purpose of reporting the occurrence, outbreak and spread of pests, and of controlling those pests. The seed crop inspections conducted are guided by ISPM 23 and are undertaken in collaboration with the stakeholders in the maize seed sector. The number of seed companies participating in the inspection program has increased from 12 in the 2019/2020 season to 20 in the 2021/2022 season. In the same period the hectarage under the production of seed maize increased from 11, 540.30Ha in the 2019/20 season to 17, 242.4ha in the 2021/22, with a reported increase of 100% in maize seed exports within the region. The effective Stakeholder engagement in the NPPO inspection program has assisted in its sustainability. It has also enabled the NPPO to further identify new opportunities for more partnerships and has contributed to the ability of the NPPO to stretch its limited financial resources to achieve more in its national phytosanitary programs. The Zambian NPPO is developing a strategic plan to strengthen these impactful and relevant relationships by having a robust and thorough stakeholder mapping and categorization in its future stakeholder engagements.

Key words: Agriculture, Seed sector, inspections, stakeholder, IPPC, NPPO, Zambia

Prioritization of absent quarantine pests in Brazil through the analytical hierarchy process

Hilman R[1]*., Abot A. R[2] and Garcia F. R. M.[3]

[1]Ministry of Agriculture and Livestock, Esplanada dos Ministérios, Bloco D, Anexo B, 3º andar, Sala 326, Brasília/DF, Brazil

[2]State University of Mato Grosso do Sul, Rodovia Aquidauana- km 12, 79200-000 Aquidauana, MS, Brazil

[3]Federal University of Pelotas, Instituto de Biologia, Departamento de Ecologia, Zoologia e Genética, Zip Code 96010900, PO Box 354, Bairro Porto, Pelotas, RS, Brazil

*Corresponding author email: ricardo.hilman@agro.gov.br

Abstract

When an Absent Quarantine Pest (AQP) enters a country, it has the potential to cause severe economic losses, social and environmental impacts, and these may affect the food security of vulnerable human populations. The method called Analytical Hierarchy Process (AHP) stands out as an important tool for prioritizing AQPs. This method allows countries to create targeted strategies to mitigate phytosanitary risks and rationalize the use of their human and financial resources. In this context, the work aimed to determine the AQPs to be prioritized by Brazil. For this purpose, 20 pests from the official list of AQPs in Brazil (777 species) were selected. The AQPs were selected through records of pests intercepted from 2015 to 2018 by Brazil and by countries of the European and Mediterranean Organization for Plant Protection (EPPO) within the scope of the international trade of plants. After selection, the 20 AQPs were then submitted to the AHP methodology. As the AHP results were similar, it was necessary to use the k-means algorithm, organizing the AQPs into three groups. Group 1 (with 2 AQPs) had significantly lower results. Groups 2 (with 10 AQPs) and 3 (with 8 AQPs) did not show significant differences. It was concluded that, of the 20 AQPs analyzed, 18 of these (group 2 and 3) are priorities for Brazil and that the AHP method adapted to the prioritization of AQPs is efficient for the proposed objective. Based on these results, other countries will be able to use the adapted AHP method and carry out strategic planning to prioritize these pests and prevent their entry into their territories, thus avoiding social, economic and environmental impacts.

Key words: AHP, pests, prioritization, risk mitigation, impacts

Re-alignment of phytosanitary legal framework – The case of Zambia

Siazemo M.[1*], Msiska K. K[1], Chomba D. M.[1], Mtawa M.[1], Mukuwa P. S. C.[1], Mazimba E.[1], Chivunga J.[1], Lyowa L.[1] and Mudenda M.[1]

[1]Plant Quarantine and Phytosanitary Service. Ministry of Agriculture, Private Bag 7, Chilanga

*Corresponding author email: martinkabemba@yahoo.com

Abstract

A comprehensive phytosanitary regulatory framework is fundamental to provision of legal authority to an NPPO to conduct, develop and maintain a phytosanitary certification system related to trade. A contemporary legal framework is in itself a useful tool to unlock resources to operationalize phytosanitary systems that best place a country in the context of globalization. In the case of Zambia, the phytosanitary legal framework required realignment to current phytosanitary system in line with international standards. The inadequacies in the current phytosanitary legal framework can be cited as lack of domestication of international instruments, outdated list of regulated pests and ports of entry among other aspects. This necessitated the process of repealing and replacing the current phytosanitary law enacted in 1959. The process started with a regulatory impact assessment. This was followed by wider reference to international instruments, plant health laws in the region and other national legislations related to plant health and trade facilitation and produced a zero draft Plant Health Bill. The draft Plant Health Bill was reviewed by the Ministry of Justice and the NPPO and the department of Policy and Planning from the Ministry of Agriculture. The reviewed Bill was subjected to stakeholder consultations across the country. The comments from stakeholders were reviewed by the Ministry of Justice and the NPPO and incorporated those that were qualified from a legal perspective. The Bill with stakeholders input incorporated, will be taken back to stakeholders for validation before clearance by the internal processes at the Ministry of Justice and onward approval by Cabinet for presentation to the National Assembly for enactment. The implementation of the new legal framework is expected to enhance the operation of the NPPO.

Key words: Legal framework, phytosanitary, comprehensive, plant health bill, stakeholders, consultation

Understanding farmers' knowledge of passion fruit viral diseases and their coping strategies in Rwanda

Waweru B. W.[1*], Munganyinka E.[1,2], Kanyange M. C.[1], Kankundiye L.[1], Mukashimwe M. [1], Muhigirwa C.[1], Uwizerwa F.[1], Niyonteze G.[1] and Umubyeyi J.[1]

[1]Rwanda Agriculture and Animal Resources Development Board (RAB). P.O Box 5016, Kigali, Rwanda

[2]National Council for Science and Technology (NCST). P.O. Box 2285, Kigali, Rwanda

*Corresponding author email: bancy.waweru@rab.gov.rw

Abstract

Passion fruit is an important fruit crop globally as income earner, for food and nutrition security. However, its productivity can only increase after addressing factors that limit its production. Understanding farmers' knowledge and coping strategies against viral diseases can help to support their efforts and develop interventions more suited to the local context. Using questionnaire and interviews conducted with 72 passion fruit farmers across 3 agro-ecological zones (AEZ) from August to December 2021, data was collected and analyzed using descriptive statistics. A chi-square test ($\chi 2$) was used for mean comparison. Majority of farmers (81.8%) indicated that pests and diseases were the main constraints to passion fruit production. Diseases associated with fruit woodiness/leaf crinkling were perceived as number one challenge by 87% of the farmers followed by wilting 42%, leaf spots 29%, fruit abortion 15.9%, collar rot 13% and flower abortion 5.8% respectively. Farmers' awareness of viral diseases differed significantly ($\chi 2=5.829$, $P=0.050$) across AEZ. 56% of farmers did not know that fruit woodiness/leaf crinkling were results of viral infection. Half of the respondents associated the symptoms to either infected seeds (27.5%) or insect pests (22.5%). 45% of farmers attributed viral diseases to bad weather and poor soil conditions while 5% did not know the cause. Management options for diseases did not vary significantly ($\chi 2=3.964$, $P=0.138$) across AEZ. Farmer-based coping strategies for viral diseases included; field sanitation through removal of crop residues and burying them (29.6 % of responses), spraying of insecticide (25.6 %), uprooting of infected plants (21.6 %), crop rotation (10.4%) and maintenance of clean field by regular and timely weeding (2.4% of the farmers), and 10.4 % did nothing. Farmers (83.1%) relied mainly on farmer-interactions for information as they did not have access to training ($\chi 2=3.531$; $P=0.171$). The findings indicate, there is a need to improve farmers' access to disease-free planting materials through efficient dissemination pathways and increase farmers' knowledge on passion fruit pests, diseases and integrated management through public awareness creation and capacity building by extension agents and research institutions.

Key words: Passion fruit, viral diseases, farmers' knowledge, management options

Genetic diversity of whitefly populations infesting tomato crops in Kenya

Avedi, E. K.[1]*, Kilalo C. D.[2], Olubayo F. M.[2] and Macharia I.[1]
[1] Department of Phytosanitary Services and Biosafety, Kenya Plant Health Inspectorate Service. P.O Box 49592-00100, Nairobi, Kenya
[2] Department of Plant Science and Crop Protection, University of Nairobi, Nairobi, Kenya
*Corresponding author email: e.aved@kephis.org

Abstract

Whiteflies are agricultural pests with a worldwide distribution. They cause damage to plants through direct feeding, secretion of honey dew and transmission of viruses. Overall, whiteflies contribute to yield loss of about 50% in infested crops. Among the most economically important whiteflies are the greenhouse whitefly *Trialeurodes vaporariorum* (Westwood, 1856). Management of whiteflies in agroecosystems majorly involve use of pesticides leading to emergence of new biotypes that exhibit pesticide resistance and also leads to reduction of natural enemies. This study was conducted to determine the genetic diversity of whitefly populations colonizing tomato plants in Kenya. A field survey was carried out in seven major tomato growing regions in Kenya between September and December 2018 and January to March 2019. A total of 259 farms were sampled and adult whiteflies were collected using a hand-held aspirator into a vial. The whiteflies were preserved in 95% ethanol and DNA extraction was done using Chelex procedure and Sanger sequencing done at Macrogen. Sequences (163) were analyzed using Bioedit software. BLASTn similarities of all sequences with those in the database revealed 98.93-99.75% identities with *T. vaporariorum.* A phylogenetic tree was constructed using Maximum likelihood method and Kamura 2 parameter model. Population genetic analysis and neutrality tests were performed using DnaSp software and median joining network evaluated using NETWORK software. Phylogenetic analysis resulted into all the *T. vaporariorum* sequences forming one monophyletic clade indicating lack of intraspecies diversity. Demographic analysis of the whitefly populations revealed negative Tajima's D, Fu and Li tests indicating population expansions. This study concluded that, tomato plants in Kenya are colonized by *T.vaporariorum* and there was no genetic diversity amongst the existing populations. *T. vaporariorum* present in tomato crops in Kenya is similar to those reported in other parts of the world.

Key words: *Trialeurodes vaporariorum,* tomato, Kenya, interspecies diversity, genetic diversity

Characterization of cuticular hydrocarbons that generate dessication resistance in two cricket species: *Acheta domesticus* and *Gryllus bimaculatus* (Orthoptera: Gryllidae)

Odhiambo M. A.[1*]., Olweny C.[1] and Okuto E.[1]
[1]Jaramogi Oginga Odinga University of Science and Technology, School of Agricultural and Food Sciences. P.O. Box 210-40601, Bondo, Kenya
*Corresponding author email: odhiambom2012@gmail.com

Abstract

Insects are liable to desiccation stress and sustain their internal water stores by controlling transcuticular water flux through the hydrocarbons on their cuticle. These hydrocarbons prevent water loss due to transpiration across the cuticle and function as chemical signals for kin and mate recognition. The cuticular hydrocarbon profiles of two cricket species *Acheta domesticus* and *Gryllus bimaculatus* were identified and quantified by gas chromatograph – mass spectrometry (GC-MS). A homologous series of n- alkanes (pentacosane, hexacosane, heptacosane, octacosane, nonacosane and hentriacosane), alkenes (heptacosene, nonacosene, and hentriacosene), monomethyl alkanes (3-,5-,6-, 7-, 8-, 9-,11-, 12-, 13-, and 14-methyl), and dimethyl alkanes (3,7-, 3,9-, 5,9-, 6,14-, 8,12-, 9,15- and 11,15-) with a carbon number range of C25 - C31) were identified. Results showed that similar to *Gryllus bimaculatus*, *Acheta domesticus* showed the same patterns of hydrocarbon diversity, but with a considerable reduction in hydrocarbon abundance. Significant variability was recorded between the species with *Gryllus bimaculatus* recording greater quantities of long chain hydrocarbons, relative to *Acheta domesticus* and a shift in the position of the first branch in their dimethyl-branched alkanes. Both crickets showed sexual dimorphism in their cuticular hydrocarbons. Males possessed more unsaturated alkenes while females had higher abundance of mono methyl alkanes and straight chain n-alkanes demonstrating greater desiccation resistance than the males. While there were gender specific differences in the cuticular hydrocarbons of the species, results indicated no gender difference with females recording the same profile as the males. Male like females designate a male imitation, to circumvent sexual harassment, and in addition a possible tradeoff between protective saturated and unsaturated sex hydrocarbons. The results suggest that cuticular hydrocarbons are plastic with respect to a cricket's habitat where, the long chain hydrocarbons increase with increase in temperature of the cricket's habitat and provide greatest protection against desiccation.

Key words: *Acheta domesticus*, Cuticular hydrocarbons, Crickets, Desiccation resistance, *Gryllus bimaculatus*

Host Preference for and Performance of *Thaumatotibia leucotreta* on Different Varieties of Capsicum

Judith N. O.[1,2]*, Shepard N.[2], Abdelmutalab G. A. A.[2], Dora K.[1], Florence O.[1] and Samira A. M.[2]

[1]University of Nairobi, Faculty of Agriculture, Department of Plant Science and Crop Protection, Nairobi P.O. Box 52428-00200, Kenya.

[2]International Centre of Insect Physiology and Ecology, P. O. Box 30772-00100, Nairobi, Kenya.

*Correspondence: judienabw@gmail.com

Abstract

The False Codling Moth (FCM) *Thaumatotibia leucotreta* is an invasive quarantine pest with a wide host range. The pest attacks more than 70 plant species including capsicum. Host plants have a significant impact on how insects develop and reproduce. Thus, an understanding of host plant preferences is crucial in pest management. There is limited information on the susceptibility of *T. leucotreta* to different species of capsicum. Hence in this study, we used a life table analysis to determine host preference, larval and pupal development duration, larval mass, body fitness, and fecundity on four species (bullet, capsicum, long chilies, and birds' eye). Among the capsicum species tested, bell pepper is preferred for oviposition. The longest and shortest larval developmental time were observed on birds' eyes (22.83 days) and bullet (21.66 days) respectively, while the longest pupal development period was recorded on bell pepper (16 days) and the shortest in bullet (14.3 days). The mass of final instar larvae differed significantly from larvae reared on bell pepper; however, they did not differ significantly between bullet, birds' eyes, and long chilies. Female fecundity ranged from 234 to 275.33 eggs. The results are useful in the development of sustainable environmentally friendly management strategies.

Key words: *Thaumatotibia leucotreta*, capsicum varieties, larval mass, developmental time, fecundity

The status of tomato mosaic virus in tomato crops in Kenya

Kirasi M. P.[1], Ateka M. E.[2], Avedi E. K.[1] and Pappu R. H.[3]

[1] Department of Phytosanitary Services and Biosafety, Kenya Plant Health Inspectorate Service, Nairobi, Kenya. P.O. Box 494592, 00100 Nairobi

[2] Department of Horticulture and Food Security, Jomo Kenyatta University of Agriculture and Technology, Nairobi, Kenya

[3]Department of Plant pathology, Washington State University, Pullman, WA, United States of America

Corresponding author email: kphostine@yahoo.com

Abstract

Tomato mosaic virus (ToMV) is one of the most economically damaging pests with an extremely wide host range most of which are cultivated crops in Kenya. ToMV is highly contagious with its transmission mediated mainly by mechanical means and contaminated seed hence it is regulated in many countries. The virus can retain its infectivity for prolonged periods in soil and plant debris which act as an important source of inoculum for its spread. Infected plants exhibit leaf mottling, mosaic and necrosis symptoms with total crop loss. In Kenya, ToMV was first reported in 1985 where it was found to cause significant losses in glass-house protected tomato. Since then, no comprehensive research has been undertaken to establish its distribution. A field survey was carried out in four major tomato growing counties; Baringo, Kirinyaga, Kajiado and Laikipia between January and March 2023. Random and purposive sampling was applied and 57 farms were sampled. Both symptomatic and asymptomatic leaves of tomato and other alternative hosts were collected. A total of 335 leaf samples were collected and analyzed using molecular techniques. A total of 78 samples tested positive (68 tomato; 10 nightshade). The detection of this virus in Kenya means that we need to enhance the current phytosanitary measures to mitigate spread of the virus and to ensure tomato seeds imported and propagated in the country are ToMV free.

Key words: Tomato mosaic virus, tobamovirus, tomato, phytosanitary measures

Certification of Fruit Tree Nurseries

Karwara A., Kosiom T.and Mbae C.

[1]Kenya Plant Health Inspectorate Service (KEPHIS), Phytosanitary Department,

P.O. Box 494592, 00100 Nairobi

Correspondent email: karwaraagatha@gmail.com

Abstract

Certification of fruit tree nurseries in Kenya is carried out by Kenya Plant Health Inspectorate Services (KEPHIS) to enhance the supply of high-quality fruit tree planting materials and ensure that farmers have access to clean propagation materials which are free from pests and diseases. The fruit tree nurseries provide a source of livelihood because they create a source of income and a major contribution of food security and nutrition mainly to the local communities. In the year 2022/2023, KEPHIS inspected and certified 96 nurseries in the coastal region; Mombasa, Kilifi, Kwale, Lamu, Tana River and Taita Taveta counties. Fruit tree nursery inspection is carried out to determine the status and management of pests and diseases, and prevent introduction and spread of pests through plant materials. The main objective of nursery certification is to determine the compliance to phytosanitary requirements to ensure that farmers have access to clean propagation materials, free from pests and diseases so as to minimize the risk of moving plant pests from one location to another. Nursery certification is done by auditing phytosanitary systems annually using a standard checklist. This includes examination of documents, records, plant material and interviews with staff. During the audit process, the nursery site is inspected to ensure; nursery layout has proper drainage to prevent flooding and water logging which may harbor pests and diseases; that nursery structures are appropriate for the type of seedlings and; the nursery is free of weeds. Verification of sanitation procedures in place includes the use of personal protective equipment (PPEs), availability of a footbath with disinfectant at the entrance of the nursery, disinfection of tools and equipment and a limited access to the nursery area. It also involves nursery audits. After inspection of the nurseries, the findings are presented and areas of non-compliance and corrective measures are discussed whereby a time period is given for implementation of corrective measures. As a proof of compliance a certificate is issued at the end of the process.

Key words: Certification, inspection, nursery, phytosanitary, food security

Evaluation of pests infesting imported maize across Malawi borders

Mdyetseni M.[1, 2*], Muthomi J. W.[1] and Kachigamba D.[3]

[1]Department of crop science and crop protection, University of Nairobi, College of Agriculture and Veterinary science, P.O Box 29053, Lerosho ridge Road, Nairobi, Kenya.

[2]Department of Agricultural Research Services (DARS) Chitedze Research Station, P.O Box 158, Lilongwe, Malawi.

[3]Bvumbwe Research Station, P.O Box 5748, Limbe, Malawi.

*Corresponding author email: nyengomdyetseni@hotmail.com

Abstract

Cross-border trade is one of the major factors that puts maize at risk as it creates pathways for spread of different maize pests in Malawi. This study, was carried out to identify pests associated with imported maize in order to improve the phytosanitary measures to avoid introduction of pests. Random sampling technique was used to collect samples from imported maize at borders and commercial cities. There were no significant differences ($P<0.05$) in the number of insect pests before incubation in all the surveyed districts. Significant differences were observed after incubation for larger grain borer and common maize weevil. The highest amount (32%) of living larger grain borer insect pests was reported in Karonga and the least in Mzuzu. On the other hand, the highest amount of maize weevil infestation (20%), was reported in Nkhatabay while the least was observed in Lilongwe district. Common fungal pathogens isolated include *Fusarium* (70%) *Aspergillus* (29%) and *Penicillium* (1%). The highest percentage of kernel infection with *Fusarium* was recorded in Dedza and Lilongwe while for *Aspergillus* were in Mzuzu. *Aspergillus* spp isolated were *A. niger* (29%), *A. flavus* (22%) and *A. parasiticus* (5%) while *Fusarium* spp isolated was *Fusarium verticillioides.* The study provided the status and causes of storage losses by various pests on maize and consequently recommended the improvement of the Phytosanitary management system. This can be achieved through human and infrastructure capacity building, strict compliance with importation laws, regulations and improve funding in the phytosanitary organizations.

Key words: Pathogens, food security, grain storage, consignment, sanitary and phytosanitary measures

PROFILES FOR EXHIBITORS

Kenya Plant Health Inspectorate Service

Kenya Plant Health Inspectorate Service (KEPHIS) is the government parastatal whose mandate is to assure the quality of agricultural inputs and produce to promote sustainable agriculture and economic growth. Our mandate covers three key areas:

Seed Certification and Protection of Plant Varieties

This is a set of activities ranging from seed grower registration, field inspections, processing, laboratory tests, marketing, post control, and post certification, all governed by the Seeds and plant varieties Act (CAP 326) of the Laws of Kenya. The Seeds and Plant Varieties Act (CAP 326) provides for the protection of newly bred or discovered plant varieties based on their distinctness and uniformity and stability (DUS). Once the protection of a variety is granted, consent must henceforth be sought from the breeder prior to the variety being used for commercial production and marketing.

Phytosanitary Services

All plant or plant material to be imported into Kenya must be declared to a KEPHIS plant inspector on arrival at an entry or exit point, together with a Phytosanitary (plant health certificate issued by the country of origin, indicating adherence to the specifications on the Kenya Plant Import permit, importers who intend to use the plant material(s) for commercial production must obtain consent from the variety breeder.

Analytical Chemistry Laboratory and Food Safety.

The analytical chemistry laboratory and food safety analyses pesticide formulations and residues in a wide range of agricultural produce, soil, water, and animal tissues. It also checks formulations of commercial pesticides. Exporters of agricultural produce to overseas markets utilize the facility to ensure compliance with Maximum Residue Limits (MRLs)

Contacts:

The Managing Director, KEPHIS
Director@kephis.org, kephisinfo@kephis.org
Tel: 0206618000 Cell: 0709891000
Facebook: kephispage Twitter: @KEPHISKE

KEPHIS Countrywide Offices

Nairobi(headquarters)/ Plant Quarantine and Biosecurity Station, Muguga/Plant Inspection Unit-Jomo Kenyatta International Airport, Nairobi/ Mombasa/Nakuru /Kitale/Kisumu/ Embu / Naivasha/Eldoret Airport/ Malaba Border Office/ Busia Border office/Isebania Border Office/Namanga Border Office/ Oloitokitok Border Office/ Taveta Border office/Lunga Lunga Border Office/Moyale Border Office/Bura Office/Timau Office

About the Ecomonic Recovery and Reform Activity:
The Economic Recovery and Reform Activity (ERRA) is a US$ 75 million five-year program (2022 - 2027) funded by the United States Agency for International Development (USAID) through TradeMark Africa - TMA (formerly, TradeMark East Africa).
ERRA aims to promote transformative trade and investment reforms in the East and Horn of Africa while supporting the region to return to a growth pathway and recover from the negative impacts of the COVID-19 pandemic while advancing competitiveness, resilience, and sustainability.

TradeMark Africa (TMA) is an Aid-for-Trade organization established in 2010 to grow prosperity through trade. By facilitating trade along economic corridors, deepening regional integration, and supporting inclusivity through women in trade, TMA has made an impact by decreasing the time and cost of trade, boosting exports, and creating jobs. For more information, please visit www.trademarkafrica.com

Centre for Agriculture and Biosciences International

CABI is an international not-for-profit organization that improves people's lives by providing information and applying scientific expertise to solve problems in agriculture and the environment. Through knowledge sharing and science, CABI helps address issues of global concern such as safeguarding the environment and improving global food security. We do this by helping farmers grow more and lose less of what they produce, combating threats to agriculture and the environment from pests and diseases, protecting biodiversity from invasive species, and improving access to agricultural and environmental scientific knowledge. Our 49 member countries guide and influence our core areas of work. These include development and research projects, scientific publishing and microbial services. For more information visit www.cabi.org

Centre of Phytosanitary Excellence (COPE)

The Centre of Phytosanitary Excellence (COPE) is domiciled in KEPHIS and was founded as a result of a partnership between organizations to solve issues related to phytosanitary capacity. Through the development of knowledge and capacity, COPE aims to improve phytosanitary compliance and sustainability. Since its founding, COPE has made significant strides, such as training more than 4,500 people from various African nations, assisting with regional pest risk analysis, hosting global phytosanitary conferences, and creating publications like the African Phytosanitary Journal and the Potato production manual.

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 online sessions for some courses. These courses are either offered at KEPHIS or in the country of interest. Some of the courses with summarized content are as below:

Introduction to International Treaties and Standards in phytosanitary systems	Phytosanitary import regulations and export certification 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 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)	**Pest Surveillance**
• Principles of PRA • Sources of PRA Information • Stages of Pest risk analysis • Tools for PRA	• 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

For more information 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.africa-cope.go.ke

Saidia Dada Networks

Pest Control and Products Board

PCPB is a statutory organization of Kenya Government established by an Act of Parliament- Pest Control Products Act Cap 346, 1982. This is an Act of Parliament to regulate the importation, exportation, manufacture, distribution and use of products used for the control of pests and of the organic function of plants and animals and for connected purposes.

MISSION: To provide an efficient and effective regulatory service for the importation, exportation, manufacture distribution, transportation, sale, disposal and safe use of pest control products and mitigate potential harmful effects to the environment.

MANDATE: Assessing the safety, efficacy, quality, merit and economic value of pest control products. Assessing suitability of premises used for manufacture/formulation, re-packing, storage and distribution of pest control products for purposes of licensing Processing and issuing import/export permits. Advising the Minister on all matters relating to the Provisions of the PCP Act and Regulations. Creating awareness to the general public on all aspects of safety, storage, handling, disposal and use of PCPs Monitoring and ensuring adherence of quality standards of pest control products throughout the supply chain Investigating and prosecuting contravention of the Pest Control Products Act. Supervising the disposal of obsolete or undesired pest control products

The National Biosafety Authority (NBA)

The National Biosafety Authority (NBA) is a state corporation in Kenya mandated to ensure safety to human and animal health and provide adequate protection of the environment from harmful effects that may result from genetically modified organisms (GMOs). The Authority was established pursuant to the provisions of the Biosafety Act No. 2, 2009 to regulate all activities involving GMOs in food, feed, research, industry, trade and environmental release and it fulfils its mandate by ensuring and assuring safe development, transfer, handling and use of GMOs in Kenya.

KOPPERT – Partners With Nature

At Koppert, we believe that the solutions to most environmental and agricultural challenges already exist, in nature. We believe that It's our job to find them and develop a better understanding of them so that we can apply them with respect, and in collaboration with nature itself.

We were founded in 1967 by Jan Koppert, a Dutch grower with a clear vision; the world needed an alternative to chemical pesticides. He found a natural solution to combat the pests in his crop, setting in motion a major transformation toward sustainable agriculture.

For more than 50 years, we have driven agricultural innovation and continued to explore, formulate, and introduce these natural solutions to our growers. Our solutions are both safe and healthy, helping growers to support, protect, and strengthen their crops above and below the ground. These include natural enemies that combat pests, microbials, and bio-stimulants.

Our goal is 100% sustainability in horticulture and agriculture. To produce safe crops and ensure food security, it is necessary to think in terms of sustainable cultivation systems. Our expertise lies in developing solutions that ensure vital and resilient ecosystems as the basis for healthy and resilient crops.

FPEAK is a legal entity registered as a company limited by guarantee.
The activities of FPEAK are governed by an elected Board of Directors consisting of members actively engaged in exporting business.The Administrative body of the Association is formed by the secretariat, which is responsible for providing services to the members.The Association operates independently and receives support from partners.

Our Vision

To make Kenyan horticulture the Global choice.

Our Mission

To develop, unite and promote the Kenyan horticultural industry in the global market with due regard to safety, good agricultural practices, social, ethical and environmental responsibilities.

Our Goal

- Influence enactment of a facilitative environment for the horticulture industry
- Create awaereness in the horticulture industry on market requirements, changes and regulations
- Undertake continuous identification of market opportunities

Avocado Society of Kenya

Avocado Society of Kenya is the principal association for growers, exporters and other Value - chain players. Our goal is to promote efficiency of production and organized marketing towards a long-term profitability of avocado agribusiness in Kenya

Vision: To take the lead role towards a sustainable and profitable avocado agribusiness.

Mission: Working in partnership with public and private stakeholders, to provide innovative services that influence the transformation of agriculture, empower members and specifically small- holders to sustainably increase productivity in response to the market demands for improved livelihoods.

The Cereal Millers Association

The Cereal Millers Association is an association that represents the grain milling industry comprising of varied wheat, maize, and other cereals millers in Kenya"
CMA was established in the year 2000, but officially registered in 2007. We currently have a membership that comprises of more than 32 large grain milling companies and still growing. CMA represents about 40% of total grain milling capacity in Kenya. Our members operate mills in Mombasa, Machakos, Mwingi, Kitui, Nairobi, Thika, Nakuru, Uasin Gishu, Kitale, Kisumu, amongst others. The Cereal Millers Association was formed with the objective of dealing with policy issues in relation to the Government. Of particular importance then was to lobby against high wheat import duties, address problems faced with cyclical maize shortages and to lobby for a liberalized maize and wheat market

Vision: We are Responsible for Food Security by
"Providing safe, affordable and adequate food to our esteemed Consumers"

Mission: We Redefine the Sector by
"Ensuring we have an efficient and transparent grain milling industry in Kenya and East Africa"

Keitt Exporers Limited

Keitt Exporers Limited prides itself on being the leading exporter and importer in fruits and vegetables to markets in Europe and the Middle East for over a decade now.
Our commitment to quality and consistency has helped us grow and retain our customers.

MISSION:

- To maintain the highest quality standards for our products.
- To provide the best customer service possible.
- To promote an inclusive workplace and help the community.

QUALITY CONTROL:

To ensure quality control, all our shipments carry the seals of Horticultural Crop Development Authority (HCDA) and Kenya Export Plant Health Inspectorate Services (KEPHIS).

Simlaw Seed Company Limited

Simlaw Seed Company Limited, a subsidiary of Kenya Seed Company, is a leading vegetable seed marketing company with over 30 years of experience in production, processing and marketing of horticultural seeds in Kenya and the Eastern Africa region.
Mission: To avail superior certified seeds and other agricultural inputs to maximize productivity.
Vision: A world class supplier of superior certified seeds
Examples of Simlaw seeds Products includes:-

- Beans & Pulses. BEANS. COWPEAS. GREENGRAMS. PEAS.
- Maize. Maize - Transitional Varieties. Maize - Medium Altitude Varieties. Maize - Lowland-coastal Varieties. Maize - Highland Varieties. Maize - Dryland Varieties.
- BEETROOT. BROCOLLI. CABBAGE. CAPSICUM. CARROT. CAULIFLOWER. CELERY. COLLARD. CUCUMBER. EGGPLANT. LOCAL-VEGETABLES. KALE. LEEKS etc

Agdia has been a leading provider of plant pathogen diagnostics since 1981. Today we offer the most comprehensive and trusted portfolio of plant pathogen and GMO testing solutions around the world.
We offer a wide range of testing technologies, products and services that are aimed at providing our clients with the confidence they need to make more educated and informed plant health management decisions. These technologies include, but are not limited to:

- ELISA
- ImmunoStrip
- AmplifyRP isothermal amplification
- Conventional and real-time PCR
- Nucleic Acid Hybridization
- Immunoblot
- ImmunoPrint
- Immunofluorescence

We also have a Testing Services laboratory that can test your samples for you using one or more of the testing methods mentioned above, depending on the pathogen targeted. Our diagnostic permits allow us to receive and test plants from all over the world.

Certification and Accreditation
Agdia is ISO 9001:2015 certified by Smithers Quality Assessments and our Testing Services Laboratory is ISO/IEC 17025:2017 accredited by the ANSI National Accreditation Board (ANAB).
We are proud of these achievements as they are a testament of our quality commitment to you, our clients.

Inqaba Biotec East Africa

Inqaba Biotec East Africa Ltd (IBEA) has an established office in Nairobi providing excellent support to leading research and academic institutions as well as diagnostic laboratories in the region since its founding in 2010. From the start of its operation, IBEA's aim has been to improve the logistics of the supply of life science and molecular diagnostics products and the offering of genomics services in East Africa. As always, we want to offer quality products/services at competitive pricing to all our customers in East Africa.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Contact Us

Oloolua Ridge, Off Ngong Road
P.O Box 49592-00100, Nairobi
020 661 8000 | 0709 891 000
director@kephis.org | kephisinfo@kephis.org
www.kephis.org