Sweetpotato begomoviruses: Are they important

SASHA

Sweetpotato Action for Security and Health in Africa

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9th Annual SPHI TECHNICAL MEETING
CONCORD HOTEL
NAIROBI, KENYA
24-27 September, 2018

Introduction

- Third most important root crop after potato and cassava
- Seventh in global food crop production
- Fourth in developing world after rice, wheat, and maize
- Viral diseases are greatest production constraints

Major viruses infecting sweet potato

Virus name	Abb	Family (genus)	Transmission
Sweet potato feathery mottle virus	SPFMV	Potyviridae (*Potyvirus*)	Aphid (non-persistent)
Sweet potato virus G	SPVG	Potyviridae (*Potyvirus*)	Aphid (non-persistent)
Sweet potato latent virus	SPLV	Potyviridae (*Potyvirus*)	Aphid (non-persistent)
Sweet potato leaf curl virus[a]	SPLCV	Geminiviridae (*Begomovirus*)	Whitefly (persistent)
Sweet potato mild speckling virus	SPMSV	Potyviridae (*Potyvirus*)	Aphid (non-persistent)
Sweet potato mild mottle virus	SPMMV	Potyviridae (*Ipovirus*)	Whitefly (persistent)
Sweet potato chlorotic stunt virus	SPCSV	Closteroviridae (*Crinivirus*)	Whitefly(non-persistent)
Sweet potato collusive virus	SPCV	Caulimoviridae(*Cavemovirus*)	*
Sweet potato virus 2	SPV2	Potyviridae (*Potyvirus*)	Aphid (non-persistent)
Sweet potato virus C	SPVC	Potyviridae (*Potyvirus*)	Aphid (non-persistent)
Sweet potato symptomless virus 1	SPSMV-1	Geminiviridae (*Mastrevirus*)	*
Sweet potato chlorotic fleck virus	SPCFV	Betaflexiviridae (*Carlavirus*)	*
Sweet potato vein clearing virus	SPVCV	Caulimoviridae (*Solendovirus*)	*
Sweet potato pakakuy virus	SPPV	Caulimoviridae (*Badnavirus*)	*
Sweet potato C6 virus	SPC6V	Betaflexiviridae (*Carlavirus*)	*
Sweet potato leaf speckling virus	SPLSV	Luteoviridae (*Polerovirus*)	*
Cucumber mosaic virus	CMV	Bromoviridae (*Cucumovirus*)	Aphid (non-persistent)

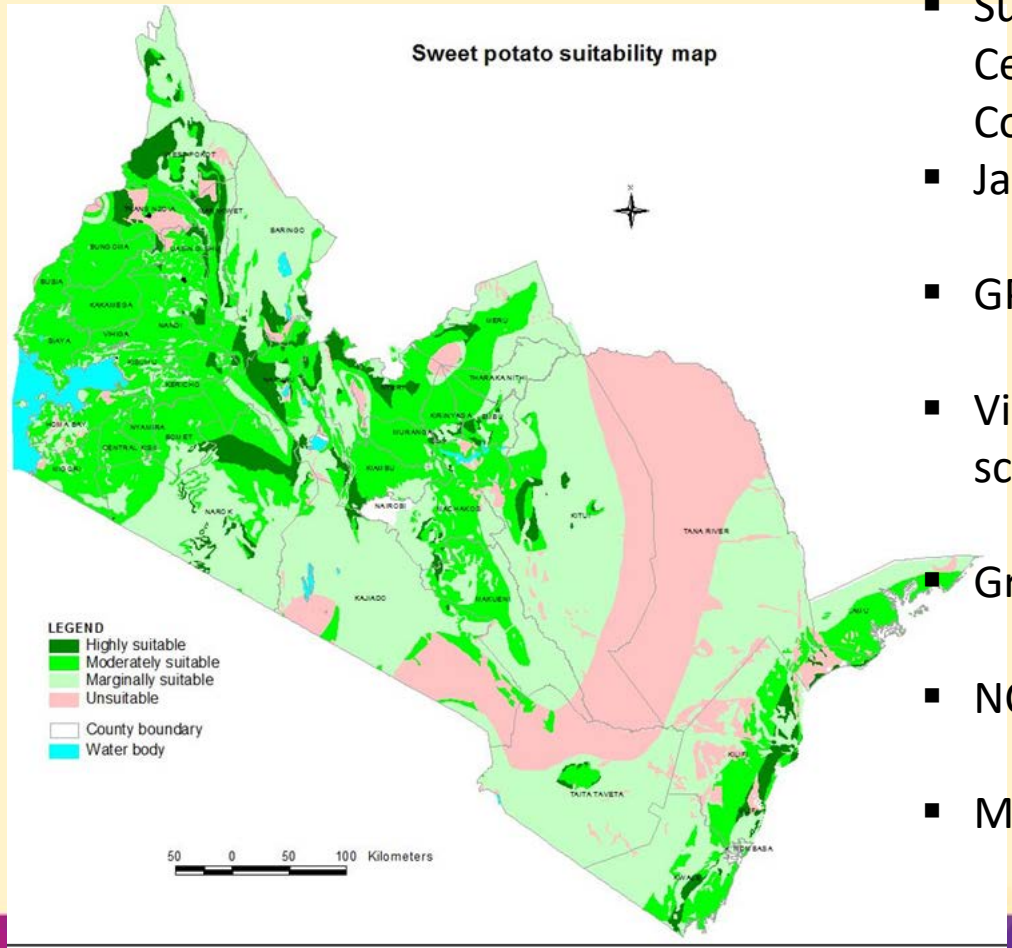
[a]*Sweet potato leaf curl virus* has been classified into seven species: *Sweet potato leaf curl virus* (SPLCV), *Ipomoea yellow vein virus* (IYVV), *Sweet potato leaf curl Georgia virus* (SPLCGoV), *Sweet potato leaf curl China virus* (SPLCV-CN), *Sweet potato leaf curl Lanzarote virus* (SPLCLaV), *Sweet potato leaf curl Canary virus* (SPLCCaV), and *Sweet potato leaf curl Spain virus* (SPLCESV) by ICTV.
*Not reported.

Effect of specific virus unknown for the recently described viruses

Why begomoviruses

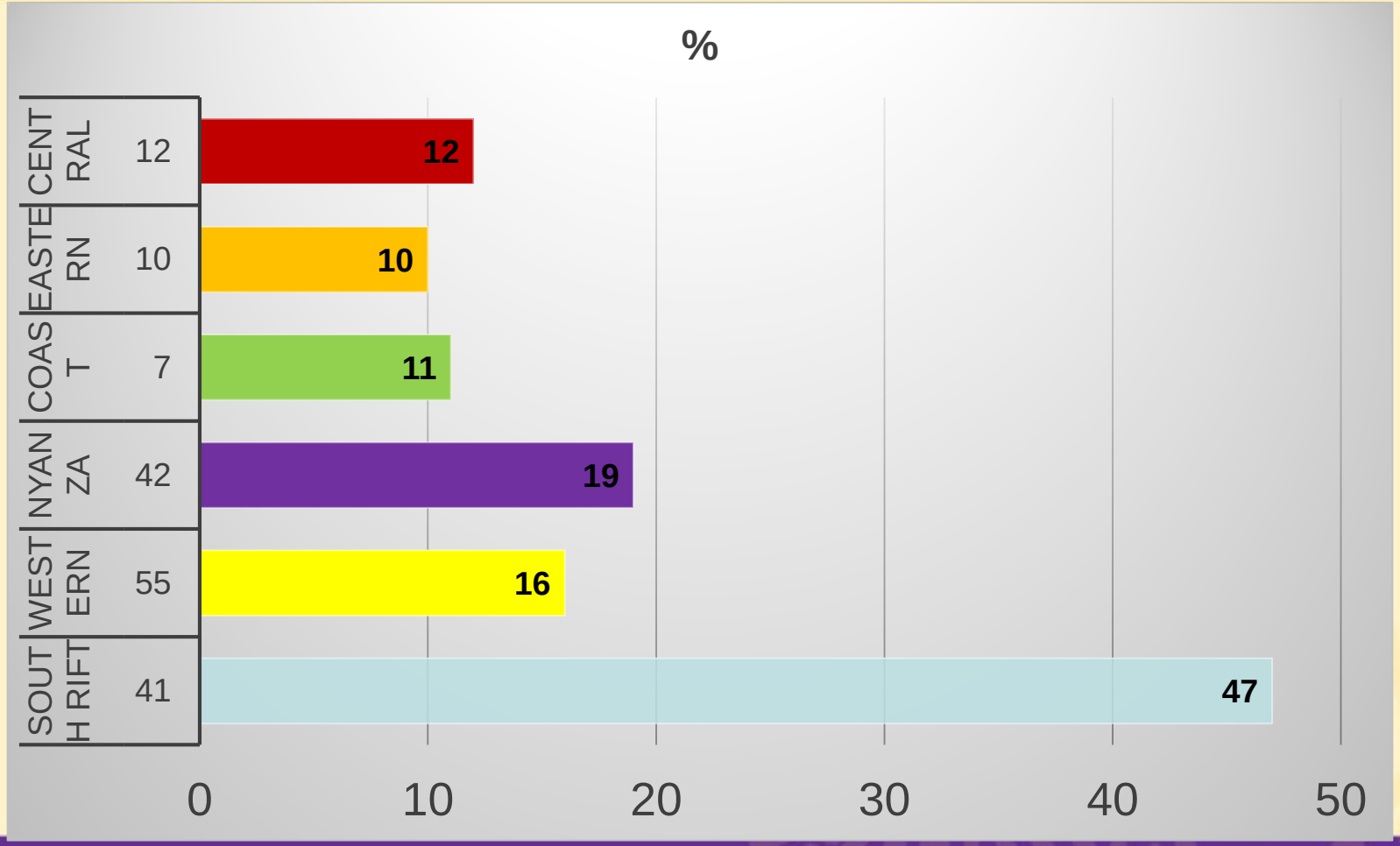
- Genus of economic importance to many crops
- Widely distributed/diverse
- Cause yield loses in sweetpotato up to 40%
- Occurrence, distribution and diversity in Kenya?

Conduct country-wide survey to assess the incidence and distribution of begomoviruses in Kenya



- Survey Western, RV, Eastern, Central and Coastal-25 Counties
- Jan-Dec,2016/2017
- GPS location, photographs
- Vines established in screenhouse
- Graft inoculation
- NCM-ELISA
- Molecular tools:
  - PCR,
  - RT-PCR and
  - Q-PCR

Percentage of begomovirus positive samples collected from different sweetpotato growing regions in Kenya



Yield impact on selected sweetpotato varieties

- Two season yield trial KALRO Kiboko
- Varieties: Kakamega and Ejumula
- Treatments combinations of: Begomo, SPFMV SPCSV, and controls
- Expt design: RCBD, 3 replicates, 4 rows/block, 10 plants
- Data collection: Stand count ,length of vines, weight of vines and weight of tubers, tuber quality
- Visual symptoms will be recorded biweekly
- Virus testing of will be done at end of trial

Figure A: var. Ejumula – SPFMV, **B:** SPCSV, **C:** SPVD and **D:** begomoviruses

Figure A: Top marketable and bottom non-marketable roots of var. Ejumula infected with SPCSV + begomoviruses

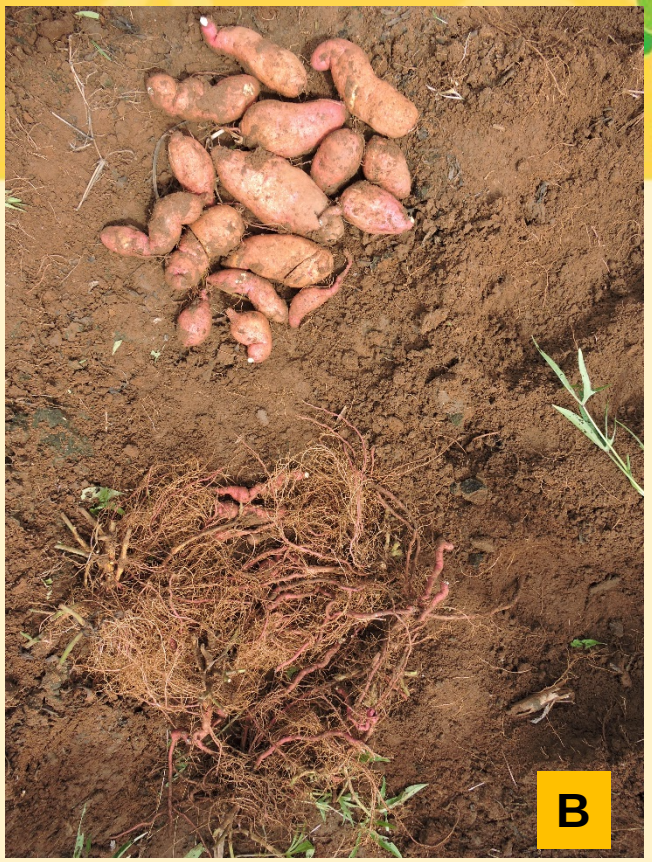
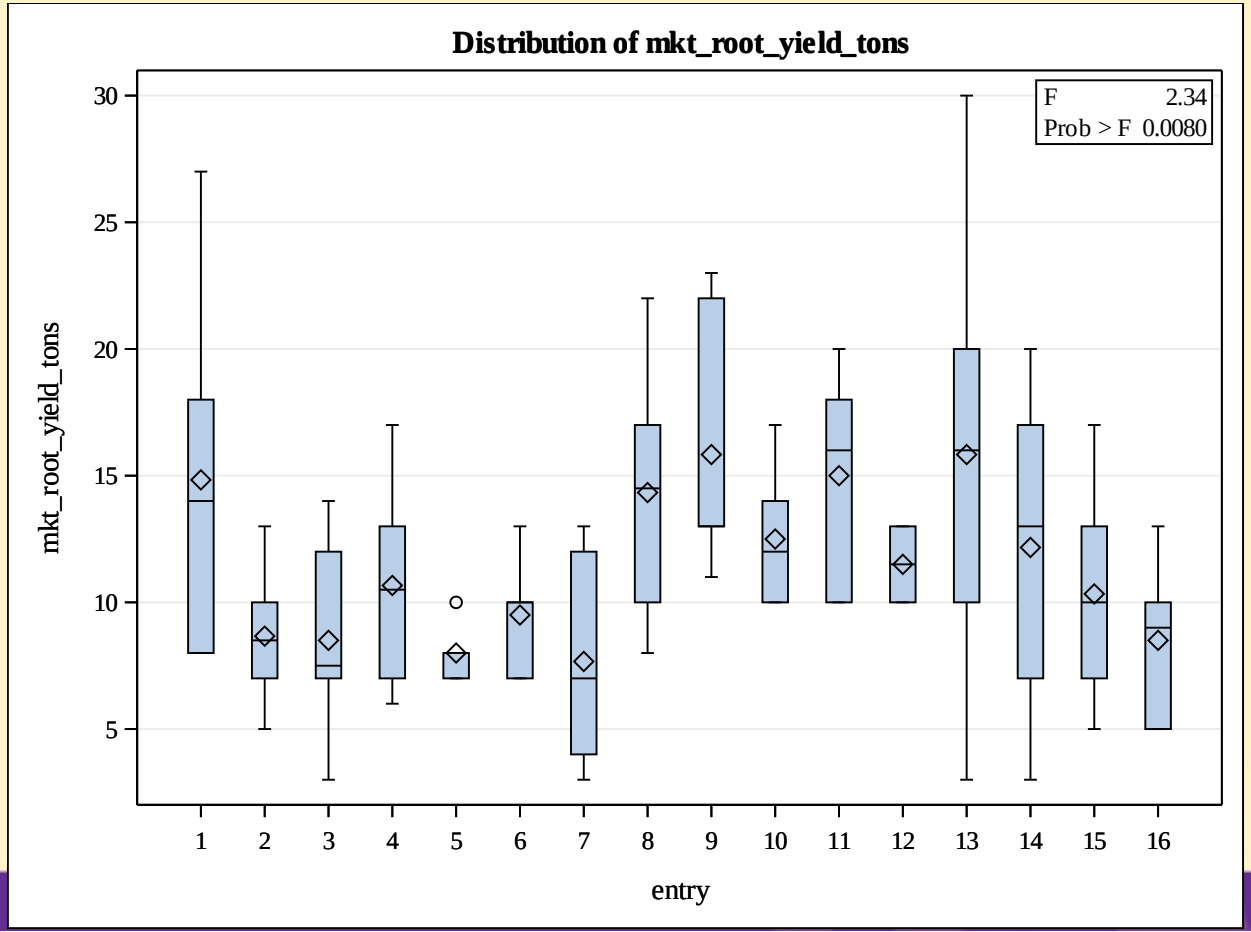


Figure B: Top marketable and bottom non-marketable roots of var. Kakamega infected with SPCSV + begomoviruses

Figure A: Roots of var. Ejumula infected with SPVD + begomo and **B:** healthy roots Ejumula

Figure . Biplot root yield for the two seasons. 1- Healthy Ejumula, 2- SPCSV infected Ejumula, 3- SPFMV infected Ejumula, 4- Begomo+SPCSV infected Ejumula, 5- Begomo+SPFMV infected Ejumula, 6- SPCSV+SPFMV infected Ejumula, 7- Begomo+SPFMV+SPCSV infected Ejumula, 8- Begomo infected Ejumula, 9- Healthy Kakamega, 10- SPCSV infected Kakamega, 11- SPFMV infected, 12- Begomo+SPCSV infected Kakamega, 13- Begomo+SPFMV infected Kakamega, 14- SPCSV+SPFMV infected Kakamega, 15- Begomo+SPCSV+SPFMV infected Kakamega and 16- Begomo infected Kakamega



Findings

- Occurrence of begomo ranged from 10-50 %
- Seasonal variations in the trial rendered most of the differences statistically non-significant
- Yield reduction was observable in ‘Kakamega’ when begomoviruses were infecting it which was not evident for ‘Ejumula’
- Var. ‘Ejumula’ was affected more by SPFMV and SPCSV infections
- Single infection with SPFMV/SPCSV/ begomo had a high number of non-marketable roots
- High above ground biomass did not translate to high root yield

Recommendations

- Establish genetic diversity of begomoviruses
- Screen more varieties for begomovirus resistance
- Test for begomoviruses prior to import/export plant material

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