Assessing Virus Degeneration of Clean Sweetpotato Planting Materials Multiplied in Insect-proof Net Tunnels under Farmer Management

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Sweetpotato farmers incur up to 98% losses due to SPVD
Kinga Marando Project

- Kinga Marando project is piloting the use of low cost net tunnels to help protect vines from whiteflies and aphids, the disease vectors.

- CIP is a sub-grantee in the project led by LZARDI.
Study is part of Kinga Marando project being implemented in Uganda and Tanzania

Uganda

Lz: Kagera, Mwanza & Geita Regions

Zanzibar: Unguja
Objective

- Seeks to determine the rate of virus degeneration in sweetpotato planting material multiplied under net tunnels compared to planting material multiplied in open fields over a period of two years under farmer multiplier management.

- Allows comparison between:
  - Susceptible (Kabode) and less susceptible (Polista) varieties
  - high virus (Mwasonge) and low virus pressure (Nyasenga) areas
  - sprayed tunnels and open field multiplication
Mwasonge (high virus pressure area)
2° 40´ 13˝ S
32° 54´ 45˝ E

Nyasenga (low virus pressure area)
2° 39´ 40.1˝ S
32° 44´ 30.6˝ E
2 Net tunnels and 2 open beds established per site in June 2014: Kabode and Polista varieties

Initial isolation distance between net tunnels and open beds was 1m; from SP plants it was 15m. An isolation distance of 15m was maintained during field multiplication; maize planted as barrier crop

10cm X 20cm spacing for both establishment and multiplication

VDS site in Mwasonge village
Date: 18/8/2014
Photo credit: K.Ogero
- Vines harvested after every 60-80 days and vine yield calculated
- Leaf samples also collected and sent to the laboratory for virus testing through PCR

KEPHIS In-vitro

Indexing on Setosa

Commercial In-vitro multiplier

hardening

Month

Multiplier A
Multiplier B
Multiplier C
Multiplier D
Multiplier E

Year 1
June 13 - May 14

Multiplier A
Multiplier B
Multiplier C
Multiplier D
Multiplier E

Year 2
June 14 – March 15

June - Sept 2014
Multiplication in bed

Net tunnel + pesticides N1

Open plot (farmer practice) O1

600 samples

Net N2
Field N1F
> 15m
Open O1F

600 samples

Net N3
Field N2F
Production N1P
> 15m
Lowland Production O2P
780 samples

Net N4
Field N3F
Production N2P
> 15m
Upland Production O3P
780 samples

9/29/2015

Vines harvested after every 60-80 days and vine yield calculated

Leaf samples also collected and sent to the laboratory for virus testing through PCR
- A visual assessment of virus symptoms and whitefly count done once in each field generation
- Weather data (Rainfall, RH and Temp) recorded using Onset® data loggers

**Year 3**
April 15 – March 16

  Field multiplication/root production

- July – Sept 2015
  Field multiplication

- October 2015 – Nov 2015
  Root production/Field multiplication

- December 2015 - Feb 2016
  Field multiplication/Root production

**We are here**

**3rd season**

- Production O2P
  840 samples

- Production O3P
  600 samples

- Production O4P
  840 samples

- Production O5P
  840 samples

**4th season**

- Production N3P
  15m

- Field N4F

- Net N5

- Field N5F

- Net N6

- Field N6F

- Net N7

- Field N7F

- Net N8

- Field N8F

- Production N5P

- Production N6P
Results: A. Vine yields

Vine yields for the Variety Kabode

9/29/2015
Vine yields for the variety Polista

9/29/2015
Values decrease through generations for the sites and varieties.

NT materials weighing higher compared to OF materials. However, there are no significant differences among the slopes of the curves, which suggest that the reduction in wt is more or less the same in all the sites, varieties, tech
No. of 3-node cuttings for the variety Polista
No. of 3-node cuttings for the variety Kabode

- Mwasonge
- Nyasenga

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9/29/2015
B. Virus testing via PCR

- Samples were screened for begomovirus, potyviruses and SPCSV using polymerase chain reaction (PCR), reverse transcriptase PCR and real time PCR respectively.
- All samples from Crop Biosciences Ltd TC lab tested negative for all the viruses.
- Batch 1 – 4 samples from Mwasonge and Nyasenga also tested negative for potyviruses and begomoviruses.
- Testing of field samples for SPCSV via real time PCR not successful:
  - Low quality DNA
  - To be repeated
Results of samples from Crop Biosciences Ltd

Amplification of Potyviruses from sweet potato samples using SPG, SPC, SPF, SP2 and SPFG2 primer. All samples except controls were negative.

1 = Health sample, 2 = blank, 3 = SPFMV, 4 = SPVC, 5 = SPV, 6 = SPV2, 7 = 1-5 sample from Arusha batch, 8 = 6-10, 9 = 11-15, 10 = 16-20, 11 = 21-25, 12 = 26-30, 13 = 31-35, 14 = 36-40, 15 = 41-45, 16 = 46-50, 15 = 51-55, 16 = 56-60.
Representative results of samples from the field

H = Health, B = Mix+ water, (SPF,SPC,SPG are positive control), 1-12 are samples from site

Potyviruses (batch 2)

Begomo viruses (batch 1)

Representative gel picture of sweet potato samples from Nyasenga&Mwasonge samples batch 1
screening for Begomovirus

H = Health
Be = Begomovirus
1-7 = symptomatic samples (SPVD) established in screen house at MARI
8-31 = sweet potato samples from Nyasenga & Mwasonge batch 1
C. Trend in weather conditions
D. Whitefly count

![Graph showing whitefly count over time for Mwasonge and Nyasenga farms from 1-Jul-14 to 1-Aug-15. The graph indicates peak counts in November 14 for both farms, followed by a decline and then an increase in counts in the following months.](image-url)
E. Root yields

• The first generation of root production was adversely affected by dry conditions. – no marketable roots were produced on both sites.

• In generation two more roots (both marketable and non-marketable) were produced in Nyasenga compared to Mwasonge for both varieties.
  – Poor root production in Mwasonge was affected by high amount of manure in the soil which favored vine production at the expense of roots.

• Next root harvest: October 9, 2015
Challenges

a) Weed management
   - A mulch of rice husks was applied during establishment in order to suppress weeds
   - Assumed to suffice for the entire project period
   - Not the case with emergence of weeds after the 1st harvest

b) Caterpillar infestation after harvesting
   - NTs are sprayed after harvesting before closing.
   - However, it has been observed that butterflies fly into the tunnels when they are open and lay eggs there.
   - Pesticide not effective during this stage of the life cycle.

c) Mealy bug infestation- Not SP pests but are common green house pests
   - The pest problem addressed by spraying with pesticides when spotted.
Conclusion

• There is a reduction in weight and vines through time.
• However, this trend is not significant for both sites and varieties

• OF values for weight are always below the NT, although for both sites and varieties this difference is not significant
• There is a clear positive effect due to the use of net tunnels

  — Provided that NT materials maintain the virus clean status, production of vines will depend on prevailing weather conditions and management.

• With good agronomic practices farmer multipliers should be able produce clean planting materials using the NTs.

• Two rounds of harvesting and sample collection remaining: Oct & Dec 2015.
Mrs. Edna Jonas standing next to her net tunnel closed with a zip
Date: 15/12/2014
Location: Bulyahilu village, Sengerema district
Photo credit: K’Ogero

Asanteni sana

KINGA MARANDO PROTECTING VINES