SWEETPOTATO VIRUS DISEASE MANAGEMENT

Cadet: Wilfred Wau

Supervisors:

Dr Birte Komolong

Mr Elick Guaf

Presentation Outlines

- Knowledge gap
- Objective
- Outputs
- Results
- Discussion & Recommendation
- Acknowledgement

Knowledge gap

I. The use of PT SP planting materials is being promoted as a measure to improve sweetpotato yields; trials have shown that use of PT planting materials can increase yields significantly. Little knowledge exists about the rate of re-infection in different agro-ecological climates in PNG sweetpotato production areas, the importance of vectors in re- infection of PT materials and the effects of the most commonly occurring viruses in PNG on yield and root quality especially when occurring in combinations.

II. Little research has been conducted in PNG on sweetpotato viruses and among the knowledge gaps is that little is known about the prevalence, distribution of the known sweetpotato viruses in different production areas. Often what is known is based on observation of symptoms only without validation through diagnostic tests.

Objective

- Main objective:
  - To establish information on virus disease management for sweetpotato production in Papua New Guinea.

- Specific objective:
  1) Information on the prevalence and distribution of sweetpotato viruses in new and old gardens in EU- ARD project pilot sites
  2) Information on timing of virus vectors, aphid and whitefly, infestation and population density in sweetpotato observation plots.
  3) Information on effect of single and dual infection of *Sweetpotato Feathering Mottle* Virus (SPFMV) and *Sweetpotato Virus G* (SPVG) on Beauregard and two other CePaCT varieties, IB/US/11 and IB/PNG/40.

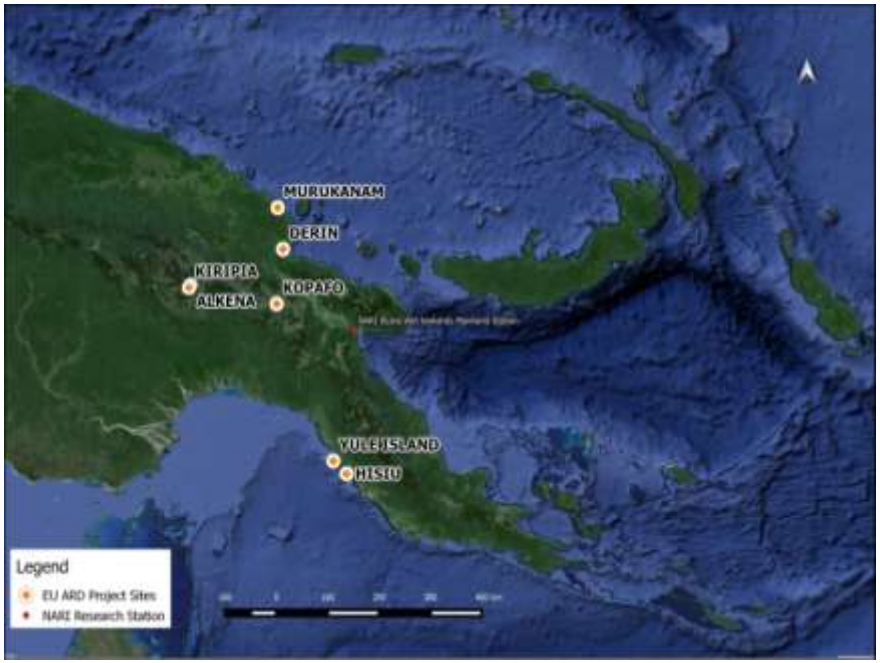
Outputs

1. Prevalence of Virus Disease in EU- ARD Project Pilot Sites.
2. Vectors Epidemiology
3. Effects of Single And Dual Infections of SPFMV and SPVG on Sweetpotato Yield.

Output 1

Prevalence of Virus Disease in EU- ARD Project Pilot Sites in PNG.

- Sampling method
  - Diagonal; 2 farmers/site with 6 samples each from their old & new garden
  - Some local SP varieties collected for further screening
- Incidence survey
  - Obvious virus symptoms were assessed using a virus symptoms descriptor sheet.
- Serology survey
  - NCM-ELISA provided by CIP Lima, Peru



Satellite map of the EU ARD project pilot sites away NARI MRC Bubia PNG

Output 1

Results

- Common virus symptoms
  - Farmer's field

Purling of leaf edges and curling of leaf surface (Tambul)

Excess purling of leaf surface (Kopafo)

  - Indicator plant, *I.setosa*

Veinal chlorosis

Vein clearing

- NCM-ELISA test results

Site	Suspected virus	Confirmed virus using NCM-ELISA	Confirmed virus using NCM-ELISA and Indicator plant (I.setosa)
Kopafo	SPFMV, SPCFV, SPVG	SPFMV	SPFMV, SPMSV, SPVG, SPCSV, SPCV
Tambul	SPFMV, SPVG, SPCSV	SPFMV	SPFMV
Murukanam	SPFMV	SPCSV	SPMSV, SPCV
Hisiu	SPFMV, SPCSV	Negative	Negative
Yule Island	SPFMV, SPCSV	Negative	Negative
Derin	SPCFV	Negative	Negative

Output 1

Discussion and Recommendation

- Visual assessment showed wide range of virus incidence in both new and old gardens in each sites which with Kopafo being observed commonly followed by Alkena, Kiripia, Hisiu, Yule Island and Derin.
- There was not much difference between old and new gardens, confirming that with the practice of farmers to use the planting material from the old garden for the new garden.
- SPFMV, SPVG, SPMSV, SPCV and SPCSV were detected using NCM-ELISA via grafting on indicator plant of which SPMSV and SPCSV had not been recorded before compare to recent ACIAR funded projects. SPCSV is a great concern because in co-infection with SPFMV, it causes the SPVD which can result in devastating yield decline as shown elsewhere.
- Because of limitations in the sampling and testing method there is need for a re-confirmation test for the preliminary results using more sensitive virus diagnostic techniques such as PCR for rapid detection and identification for timely management.

Output 2

Vectors Epidemiology

- Propagation of PT Beauregard planting materials
  - Tissue culture
  - Insect proof screen house
- Observatory plots establishment
  - Two plots of 16m x 18m
  - Approx. 200m apart with different surroundings
- Binomial sampling technique
  - Sampling after 14 DAP
  - 30 plants sample per plot systematically
  - Done on weekly bases for a total 9 weeks

Virus vector sampling at MRC Bubia research field

Output 2

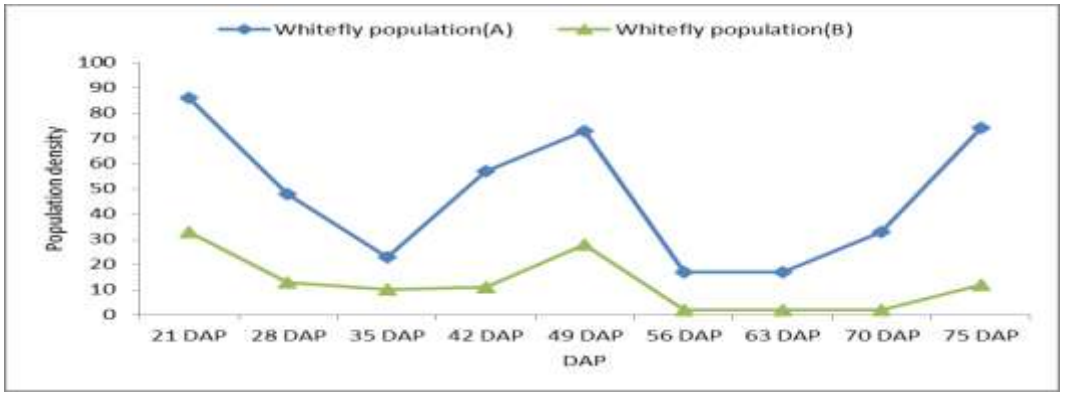
Results

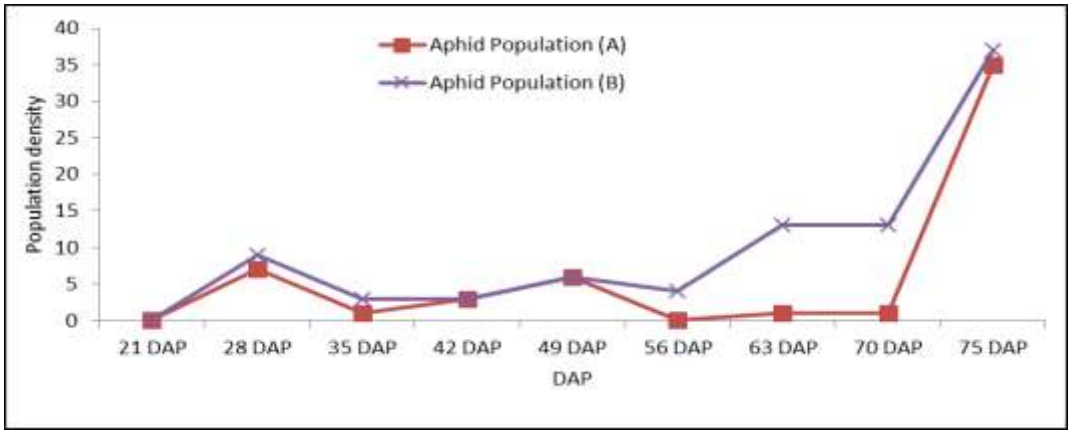
- Virus vectors

Whiteflies (*Bemisia tabaci*)

Aphid (*Myzus persicae*)

- Vector population density

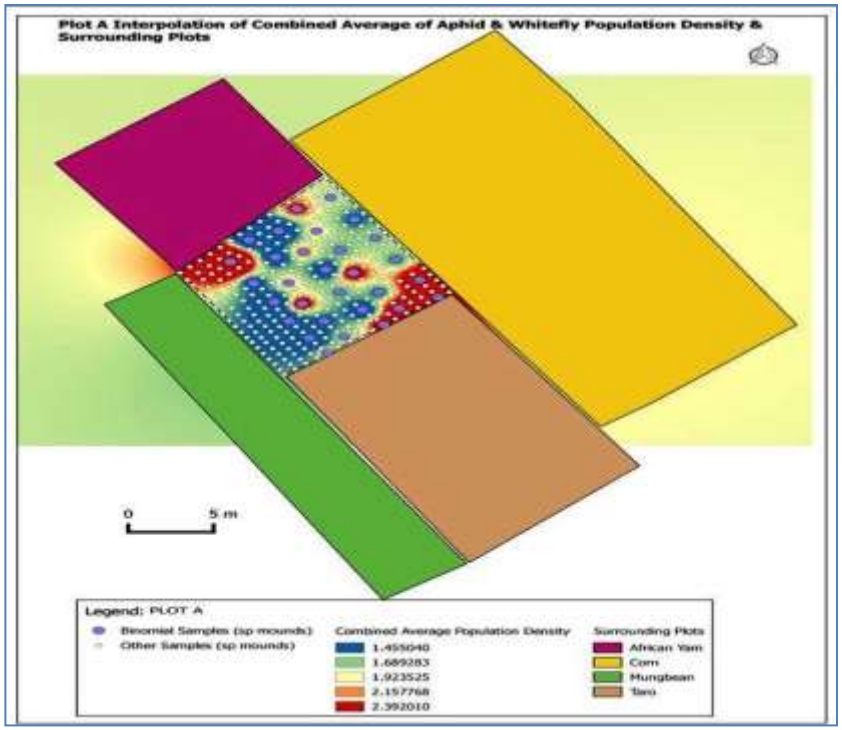




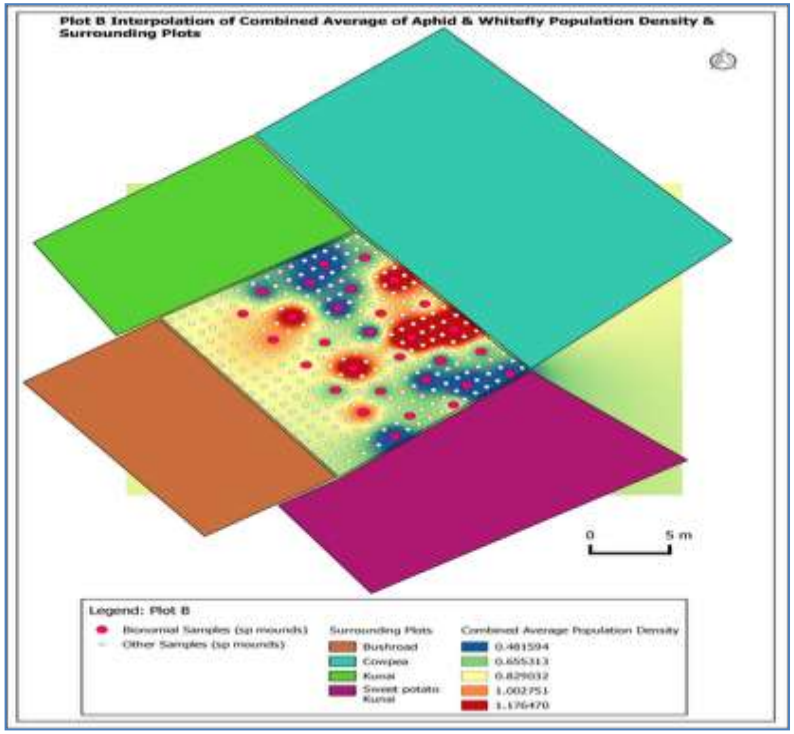
Output 2

Results

- Alternate plant host identification using Geographic Information System (GIS)



Plot A- Interpolation of vectors population density



Plot B- Interpolation of vectors population density

Output 2

Discussion and Recommendation

- Vectors were observed to start moving into the crop soon after the establishment of the sweetpotato plants.
- Incursions in particular happened from other crops growing adjacent to the sweetpotato trial plots.
- Whiteflies were observed colonize sweetpotato plants all throughout growing season but rarely seen aphids colonizing.
- Whitefly and aphids population fluctuated at different times but generally peaked towards the harvesting.
- In terms of PT and sweetpotato virus management, these may suggest that farmers should clear weeds around the plots and grow non-host (or lesser favored hosts) as wind-breaks which may help in reducing incursion of vectors.
- For next planting season farmers should only use planting material for new crop from inside the plot not from the edges since high population density of vectors is concentrated there.

Output 3

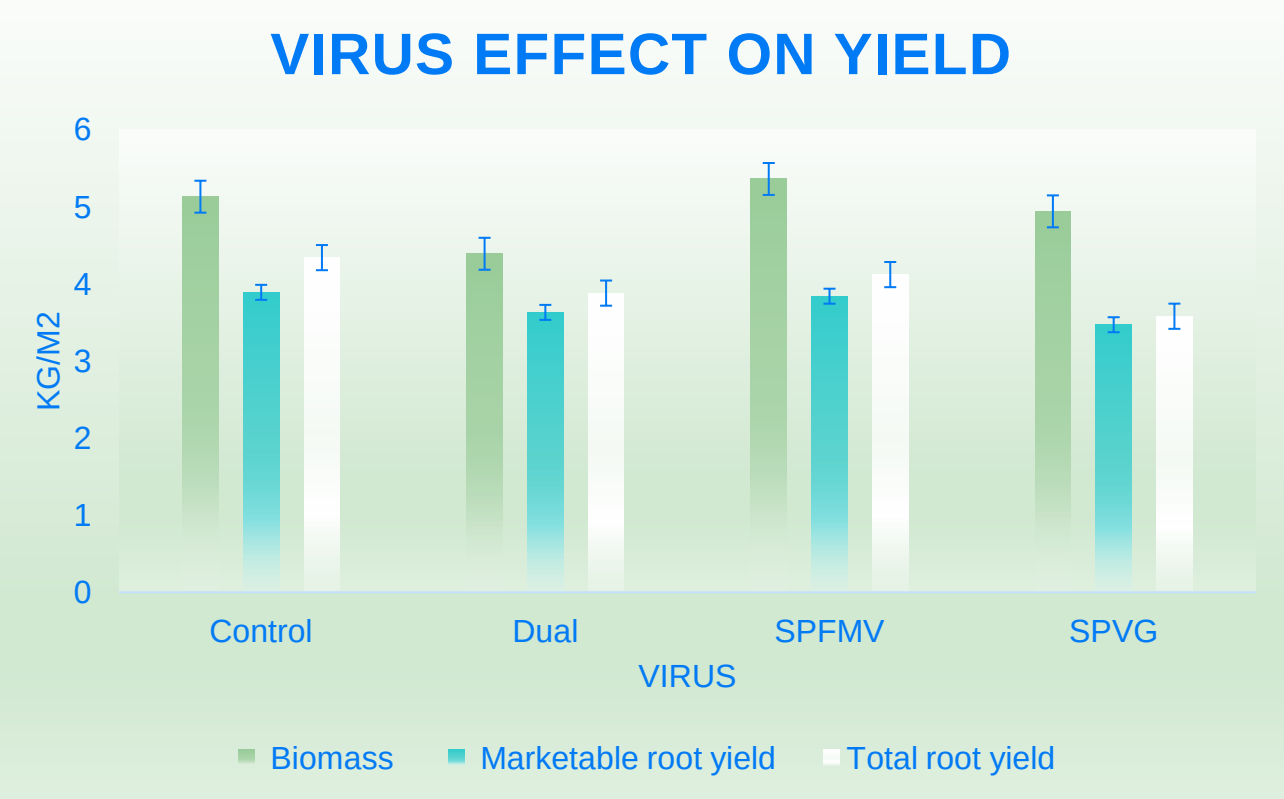
Effects of Single And Dual Infections of SPFMV and SPVG on Sweetpotato Yield.

- Propagation of PT SP cultivar of Beauregard, IB/US/11 & IB/PNG/40 planting materials
  - Tissue culture
  - Insect proof screen house
  - Mechanical virus (SPFMV, SPVG, Dual) inoculation
- Field preparation and trial establishment
  - Split-plot design (main plot=varieties, sub-plots=virus + controls, 3 reps)
- Insecticide application (Mustang & Thunder)

Trial plot view before harvest at MRC Bubia reach field

Output 3

Results



Output 3

Discussion and Recommendation

- During weekly monitoring sweetpotato virus symptoms were not obvious as observed.
- Yield of fresh top biomass and marketable tubers demonstrated single infection of both virus and combination generally have no significant difference, however, slight yield effects were observed compared to their respective virus-free controls to be significantly different.
- Dual infection of two viruses in overall has cause high yield reduction than each of the single infection on respective cultivars.
- The severity of virus infection depends on virus titre overtime and this may result probably low virus because of new infections and no build up over generation. The titre level was not also quantified after acquisition during inoculation. The verification test of virus consistency and distribution among or within the treatments by vectors if present was unsuccessful. These activities may contribute to the results and that could be improved. Thus, there would be a need to repeat the experiment to validate the results.

Acknowledgement

- EU
- NARI
- Supervisors
  - ✓ Dr Birte Komolong
  - ✓ Mr Elick Guaf
- Colleagues
  - ✓ Joel Pilon
  - ✓ Cyril Atung
  - ✓ Martin Lobao
  - ✓ Amanda Wandau
- Ancillary staffs
  - ✓ Samuram Sali & Philip Waki
- Farmers at project sites during the survey periods