Sweetpotato Support Platform East & Central Africa

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SWEETPOTATO ACTION FOR SECURITY AND HEALTH IN AFRICA

Outline of presentation

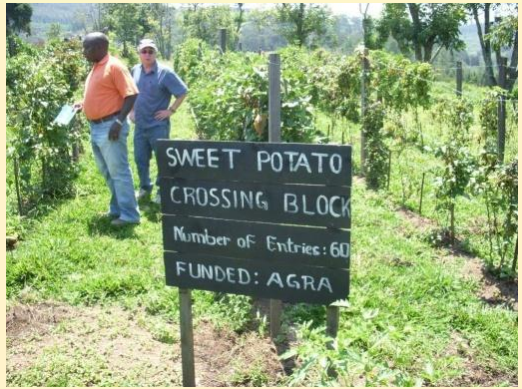
- Objectives of sweetpotato breeding in East and Central Africa
- Progress to date
- Lessons learned

Breed new populations with new methods and varietal development

- Generate a radically expanded range of sweetpotato varieties that combine different quality traits with significant improvements in yielding ability
- Generate by population improvement new populations for major needs of users:
  - Sweetpotato virus disease (SPVD) resistance (East Africa)
  - Incorporate important traits e.g. high beta-carotene content; dual purpose types for animal feed

Main Objective, continued

- Other new breeding methods to use:
  - heterosis into sweetpotato breeding
  - molecular markers for breeding for virus resistance

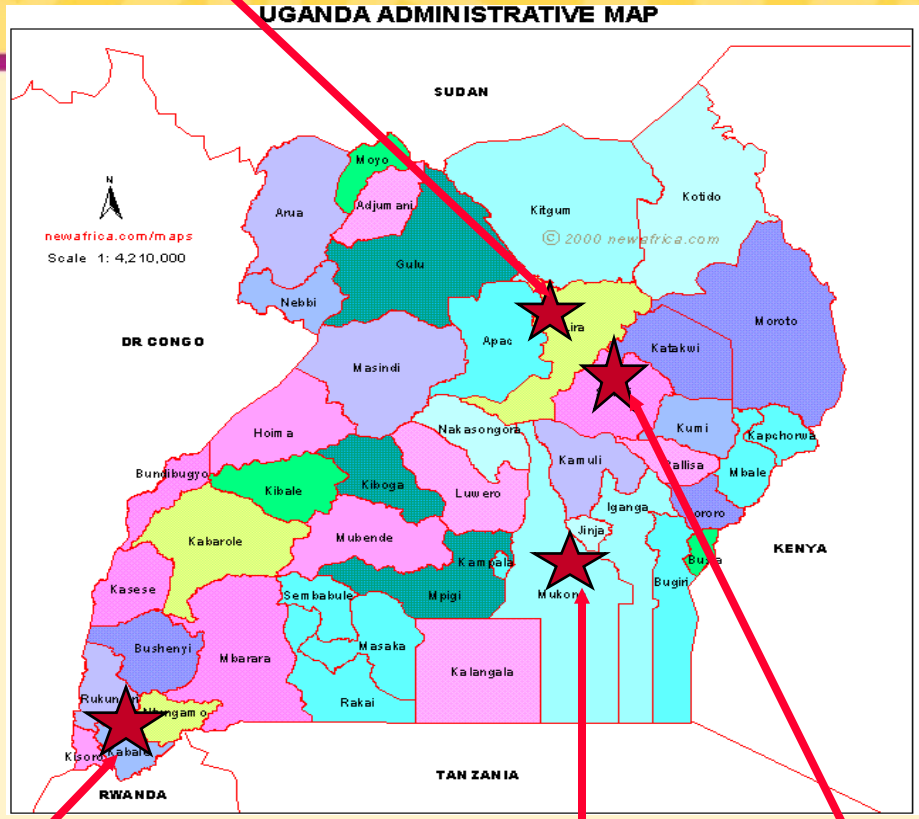


- Redesign the sweetpotato breeding systems in the region to produce varieties in 3-4 years instead of the current 7-8 years: accelerated breeding

Accelerated breeding

Multiply new breeding lines in screenhouses, glasshouses, irrigated fields

Accelerated Breeding, cont.



Ngetta

Kachwekano

Namulonge

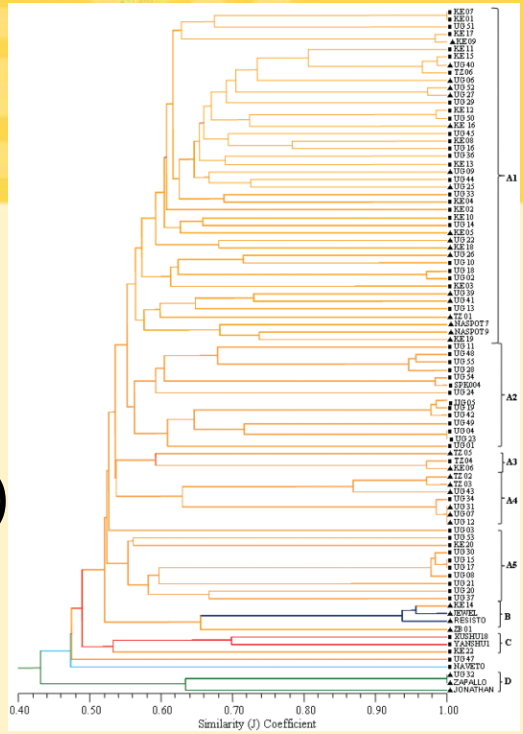
Serere

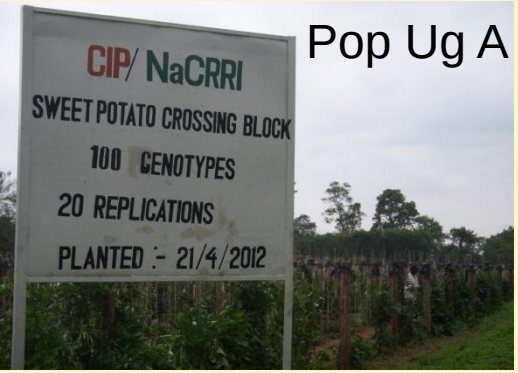
Use more sites at earlier stages in the breeding cycle to substitute for fewer sites over more seasons

★ Trial Sites in Uganda

Developing populations for SPVD resistance and quality traits

- Two distinct genepools (Population Uganda A and Pop Ug B) were formed using molecular markers (18 SSR markers)
- Controlled crossing (inter- and intra-gene-pool) for population improvement and polycross crossing are in progress





Pop Ug A

Pop Ug B

The Goal: New Sources of SPVD Resistant Populations

- Evaluation of new sources of SPVD resistant populations is done under high SPVD pressure at Namulonge, Uganda

Materials and Methods

- 1,410 sweetpotato genotypes (47 families from a diallel cross), true seed from CIP, Lima
- Germinated in screenhouse at Namulonge, high SPVD Pressure
- Grown in field for 3 seasons, 3 locations – Namulonge (Central) Kachwekano (Western), Serere (Eastern Uganda)
- 5 plants/row on ridge (3 rows/plot); 3 reps - RCBD

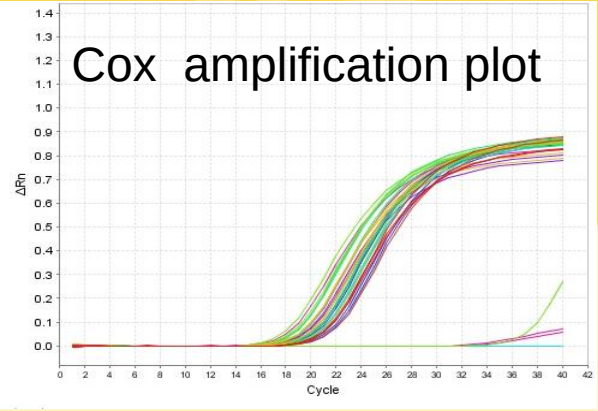
Materials and Methods, cont.

- SPVD and *Alternaria* blight evaluated at 2 months after planting and 2 weeks before harvest
- Scoring scale 1- 9 (1 = no disease symptoms, 9 = clear disease symptoms and reduced growth in all plants
- SPVD resistant check: NASPOT 11 (NSP11)

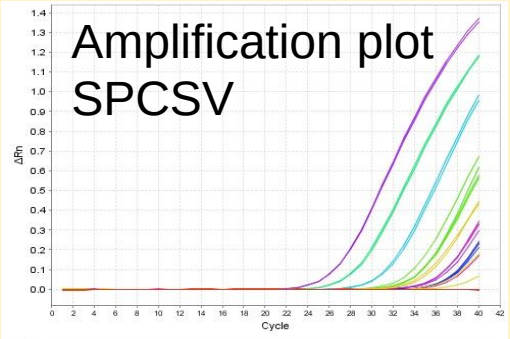
SPVD

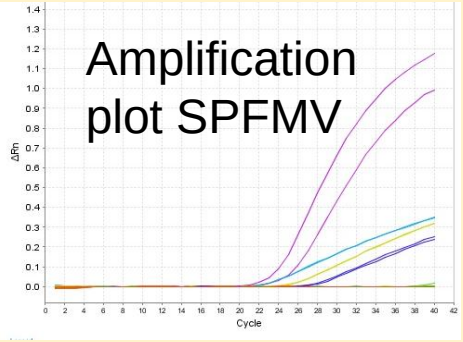
Alternaria blight

Evaluating New Sources of SPVD Resistance



- Optimized RT-PCR Conditions
- Quantification of viruses in sweetpotato clones
- RNA extraction
- Run qRT-PCR
- To relate Ct values with compute 1/Ct





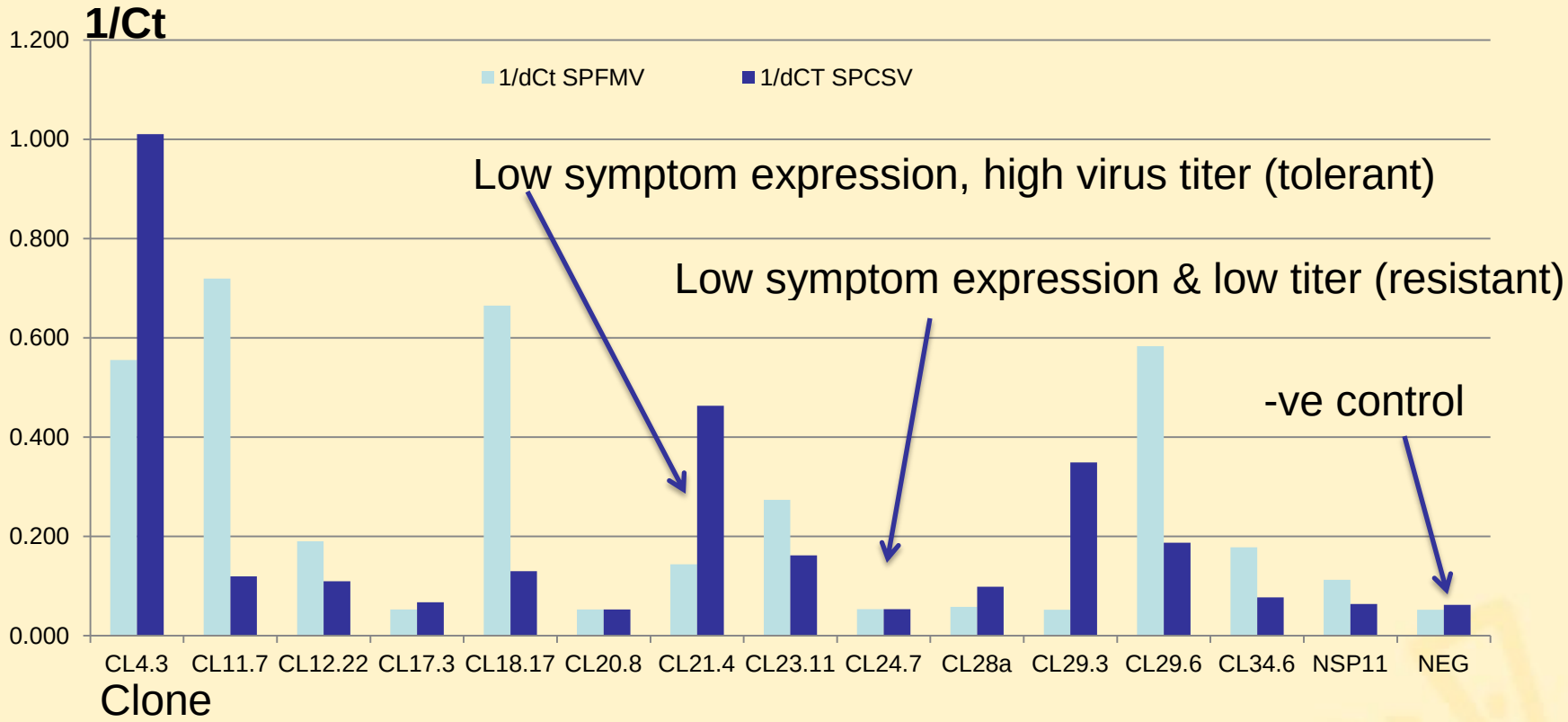
RT-PCR = real time PCR, RNA = Ribo nucleic acid, qRT-PCR = quantitative RT-PCR, Ct = thresh hold cycle, Cox = Cytochrome oxidase
SPCSV = sweetpotato chlorotic stunt virius FMV = feathery mottle virus

Virus accumulation in promising clones

Access. code	Root yield (t/ha)	[1]SPVD (3 seasons)	Mean scores (3 reps, May-Aug 2012) SPVD	Alternaria		SPFMV [2](1/ΔCt)	SPCSV (1/ΔCt)
4.3	5.1	5.3	2.3	3.0		0.556	1.011
12.22	6.6	6.0	3.7	3.0		0.19	0.11
17.3	6.1	3.0	2.0	2.7	Resistant	0.053	0.067
20.8	14.3	4.0	2.3	5.3		0.053	0.053
21.4	16.2	3.3	2.0	2.7	Tolerant	0.144	0.463
23.11	19.9	2.3	2.7	3.7		0.273	0.162
24.7	5.4	2.7	1.0	1.3	Resistant	0.053	0.053
29.3	7.0	5.3	4.0	2.7		0.052	0.349
34.6	9.8	5.0	3.0	2.0		0.178	0.077
NSP11	17.4	2.7	2.3	2.0	Tolerant	0.113	0.064
Mean	10.7	4.1	3.1	2.9	[3]Negative control	0.052	0.062
$LSD_{0.05}$	4.9	2.0	1.8	1.9			
CV (%)	27.3	29.8	35.1	39.6			

[1]SPVD = sweetpotato virus disease; SPFMV = *Sweet potato feathery mottle virus*; SPCSV = *Sweet potato chlorotic stunt virus*. [2]ΔCt = Delta Ct = Ct gene test – Ct endogenous control.
[3]Negative C = negative control

Quantification of virus in clones from CIP, Lima, at Namulonge



May-August 2012

Conclusion about new SPVD resistant source

- Accessions 21.4 and 23.11 are tolerant to SPVD; main interest is in resistant genotypes

- Except accession **24.7** all evaluated genotypes can be eliminated as sources SPVD and *Alternaria* resistance on the basis of symptom expression (score 3.5 or more) or high virus titer accumulation (3x value of negative control) or both

Status of AGRA Collaboration

AGRA countries[1]		Non-AGRA
Supported	Submitted	
Malawi	Ghana (approved, need breeder)	Angola
Rwanda	Uganda, waiting	Burkina Faso[3]
Tanzania	Kenya, rejected	Burundi
Kenya (Njoro, W. Kenya)[2]	Ethiopia, needed national support	Madagascar
Nigeria		S. Africa
Zambia		
Mozambique		

[1] Criteria for AGRA support: Active sweetpotato breeding program (full time breeder, on-going breeding activities, including crossing

[2] Funded before start of SASHA project, now 2nd phase

[3] One PhD supported by AGRA at W. African Center for Crop Improvement (WACCI), Ghana, [4]and at Kwazulu-Natal University, S. Africa

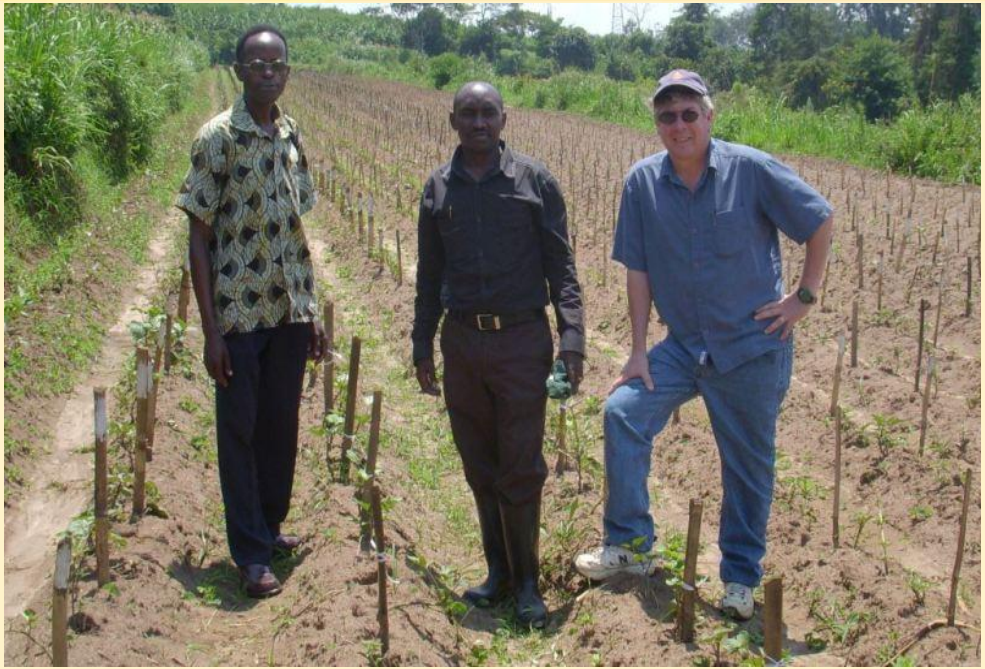
Progress on Updating the OFSP Catalogue

- Silver Tumwegamire collected data, pictures and other data for all new released OFSP varieties since 2009
  - Mozambique (15),
  - Rwanda (2)
  - Malawi (4)
  - Tanzania (2)
  - Uganda (2)
- Not included
  Ghana (2), Nigeria (1)

Major Lessons Learned

- Ordering equipment and supplies poses dynamic challenges
- Changing venue for annual breeders' meeting and training exposes breeders to different methods, conditions, and challenges, enhancing the community of practice
  - 1ST year: Uganda
  - 2nd year: Mozambique
  - 3rd year: Ghent University, Belgium
- CloneSelector requires follow-up training in-country to get consistent use

Thank you for your attention



Sweetpotato Breeders

Dr. Silver Tumwegamire leaves CIP, March 17, after 11 years of dedicated service to CIP and since start of SASHA