



Update on ○ sweetpotato breeding in South Africa: 2013-14

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Adebola

- Sweet taste & high % dry matter
- High β -carotene content
- High yield, good storage root quality and storability
- Tolerance to Leaf and Stem blight
- Tolerance to Fusarium wilt
- Tolerance to drought
- Screening for virus resistance
- Genetic studies

Stem blight

Most important landraces

PYT Roodeplaat

Country/ Name of landrace	Root yield t/ha	Flesh color	DM (%)	Earl	SP VD	Al t	Remarks
A10	45.3	Cream, orange&purple spots	28.5	L		5	High yield, high starch but not taste,
A2118	43.6	Cream	28.2	L		-	Unif long oblong. Tasty
A2392	32.4	Pale cream	28.8	M	+	-	Better quality. Starchy
A5799	38.9	White	23.7	E	+	3	Attractive purple leaves
A35	32.7	White, Cream	27.3	L		-	Cracks. Long irr.

Flesh color: White (w), cream (cr), yellow (y), light orange (lo), orange (o), deep orange (o)

Earl (Earliness: Early (E) (about 4 months), late (L) about 5 or more months

SPVD resistance (r: resistant, s:susceptible)

Alt (Altenaria blight resistance, r: resistant, s: susceptible

Collections at 3 sites

Most important bred SP varieties

Country/ Name	Root yield t/ha	Flesh color	Dry matter (%)	Earl	SPVD	Alt	Remarks
Blesbok	40.2	c	16.6	early	s	r	ARC1989, major commercial cultivar
Beauregard	30.3	o	18.0	early	?	i	Promoted since 2003 (USA), avg commercial use, export
Ndou	35.0	c	25.6	early	s	r	ARC 2003, avg adoption (Comm. & Informal market)
Bophelo	31.0	o	22.5	med	s	r-i	ARC 2011, best orange, high yield&DM, avg adoption
Mvuvhelo	35.0	c	23	early	s	r	ARC 2013, avg adoption in Limpopo & KZN province
199062.1	36.0	lo	21.4	early	?r	r	Promoted since 2009 (CIP), avg adoption in KZN province
Monate	35.6	c	23.8	early	s	r	ARC 2003, avg adoption Gauteng province
A40	~35	c	~24	med	?	r	UKZN 2001, avg adoption in KZN province

Flesh color: White (w), cream (cr), yellow (y), light orange (lo), orange (o), deep orange (do).

Earl (Earliness: Early (E) (about 4 months), late (L) about 5 or more months

SPVD resistance (r: resistant, s:susceptible)

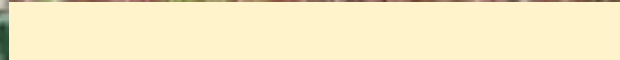
Alt (Alternaria blight resistance, r: resistant, s: susceptible)

Summary of progress 2009- 2014

Type of trial		Details	2009	2013/14
Crossing block				
	1	No. of parents in crossing block	39	13 + 7
	2	No. of seed collected from OP	24393	0
		a. Total no. of families of OP seed	42	
	3	No. of seed collected from crosses	147	340
		a. Total no. of families of controlled crosses	33	55
Seedling nursery				
	1	No of seeds planted	17404	2076
	2	No of seedlings established	9553	1538
	3	Total no. of families planted	15	53

Summary of progress 2009- 2014

Type of trial		Details	2009	2013/14
Observation trial				
(OT)	1	No of clones planted	75	70
	2	No of checks (check clones) planted	7	10
	3	No. of locations	1	1
Preliminary yield (PT)				
	1	No of clones planted	43	271+34
	2	No of checks (check clones) planted	7	7
	3	No. of locations	1	1
Intermediate yield (IT)				
	1	No of clones planted	30	12
	2	No of checks (check clones) planted	7	4
	3	No. of locations	2	3
Advanced yield trial (AT)				
	1	No of clones planted	20	12+12
	2	No of checks (check clones) planted	6	9
	3	No. of locations	6	3



Type of sweetpotato trials 2012/13 (cont)

	2	Total no. of trials whole country		
			3	6
No of varieties released				
No. of clones in pipeline for release by 2014				0
Package used for analysis:				
2009-2012			GenStat? CloneSelector? SAS?	Genstat, Agrobase, Clone Selector
2013/14			?	Genstat, Agrobase

Sweetpotato Foundation Seed system



Tissue culture lab:	Response (a)	Response (b)
No. of laminar flow benches (a)		8
No. of CVs maintained in tissue culture (a)		325
No. of screen houses/need repair (a)		
No. of good screen houses (a)		7
No. of in vitro plantlets wined:		
a) Every 3-4 months (b) every year)		300
No. of vine cuttings:		
a) Distributed every 4-5 months (b) every year)		318
a) Sold every 4-5 months [(b) every year]		1200
How long does it take to breed a variety (years)?		8
How long does the variety release process take? (Assuming all data is available)/1 season/1 year (a)?		2

Linkage to Vine multipliers / producers from **sweetpotato scheme**

Linkage to vine multipliers	Proportion	Comment
Government institutions (list): 9548 in seedling trays	50%	
NGOs (list):	0%	Usually more
Farmer multipliers:	12%	
Commercial vine grower: 2450 in seedling trays		
Others (list them): Commercial producers 320 bags	38%	
and 3685 in trays		
50 x 4-node cuttings international		

To Vine multipliers: cuttings from base block at Roodeplaats



Linkage to vine multipliers	Proportion	Comment
Government institutions (list):	%	provide funding
NGOs (list):	%	
Farmer multipliers: 21 vine growers	%	
102 750 cuttings		
Others (list them): directly to farmers, gov programs,	%	
ARC projects: 2.8 mil cuttings		
Vine growers to growers: 1.2 mil (36.5 ha) (40% OFSP) (Gross income \$26640)		

Number of SP varieties released 2009 - 2014



No. of varieties released		No. of release document(s)*	No. of release papers /Manuscripts**
Non-orange	Orange		
1	7	0	16
No. of clones in pipe in pipeline for release (final tests/data already compiled)			
Non-orange	Orange		
0	0	0	3

* Document submitted to Variety Release Committee/Authority; Each release has a separate document (several varieties released at the same time have one document)

**Papers published in journal(s) or manuscript for journal/submitted/to be submitted

Detailed information of variety release documents (2009-2014)



Variety releases:

Isondlo, Purple Sunset, Bophelo, Mvuvhelo, ARC-SP1 to 5

Papers published/Manuscripts (2009-2014)



PAPERS IN PEER-REVIEWED SCIENTIFIC JOURNALS:

- LAURIE, S.M., VAN DEN BERG, A.A., TJALE, S.S., MULANDANA N. S. and MTILENI, M.M., 2009. Initiation and First Results of a Biofortification Program for Sweetpotato in South Africa. *Journal of Crop Improvement* 23(3):235-251.
- RAUTENBACH, F., FABER, M., LAURIE, S. & LAURIE, R., 2010. Antioxidant capacity and antioxidant content in roots of 4 sweetpotato varieties. *Journal of Food Science* 75(5): 400-405.
- LAURIE, S.M. & VAN HEERDEN, S.M. 2012. Consumer acceptability of four products made from beta-carotene-rich sweet potato. *African Journal of Food Science* 6(4):96-103.
- LAURIE, S.M., FABER, M., VAN JAARSVELD, P.J., LAURIE, R.N., DU PLOOY, C.P. & MODISANE, P.C. (2012). β -carotene yield and productivity of orange-fleshed sweet potato (*Ipomoea batatas* L. Lam.) as influenced by irrigation and fertilizer application treatments. *Scientia Horticulturae* 142: 180-184.
- LAURIE, S.M., VAN JAARSVELD, P.J., FABER, M., PHILPOTT, M.F. & LABUSCHAGNE, M.T. (2012). *Trans*- β -carotene, selected mineral content and potential nutritional contribution of 12 sweetpotato varieties. *Journal of Food Composition and Analysis* 27:151-9.

Papers published/Manuscripts (2009-2014)



- LAURIE, S.M., FABER, M., CALITZ, F.J., MOELICH, E.I., MULLER, N. & LABUSCHAGNE, M.T. (2012). The use of sensory attributes, sugar content, instrumental data and consumer acceptability in selection of sweet potato varieties. *Journal of the Science of Food and Agriculture* 93(7):1610-1619. DOI 10.1002/jsfa.5932
- LAURIE S.M., CALITZ F.J., ADEBOLA P.O., LEZAR, A. (2013). Characterization and evaluation of South African sweet potato (*Ipomoea batatas* (L.) LAM) land races. *South African Journal of Botany* 85: 10-16.
- FABER, M., LAURIE, S.M., VAN JAARSVELD, P.J. (2013). Total β -carotene content of orange sweetpotato cultivated under optimal conditions and at a rural village. *African Journal of Biotechnology* Vol. 12(25): 3947-3951.
- ADEBOLA P.O., SHEGRO A., LAURIE S.M., ZULU L.N. & PILLAY M. 2013. Genotype x environment interaction and yield stability estimate of some sweet potato [*Ipomoea batatas* (L.)Lam] breeding lines in South Africa. *Journal of Plant Breeding and Crop Science* Vol. 5(9), pp. 182-186, September, 2013.

Papers published/Manuscripts (2009-2014)



Scientific papers in proceedings:

- LAURIE, R.N., DU PLOOY, C.P. & LAURIE, S.M., 2009. Effect of moisture stress on growth and performance of orange fleshed sweetpotato varieties. African Crop Science Conference Proceedings, Vol. 9. pp. 235 – 239.
- LAURIE S.M., NTOMBELA, S., CHILOANE, N., A GERRANO, T RAMATHAVHANA T, TJALE S & O NYIRENDA, 2013. Sweet potato varieties with improved taste and yield for food security and health of resource-poor communities in Gauteng. Proceedings of the 5th GDARD research Symposium held on the 6th June 2012 at St George's Hotel, Irene. Jun 2013, Gauteng Province Department of Agriculture and Rural Development.
- BELETSE, Y.G., LAURIE, R., DU PLOOY, C.P., LAURIE, S. & VAN DEN BERG, A., 2013. Simulating the yield response of orange fleshed sweet potato 'Isondlo' to water stress using the FAO AquaCrop model. Acta Hort.1007:935-941.
http://www.actahort.org/books/1007/1007_112.htm

Papers published/Manuscripts (2009-2014)



- ZULU, L., ADEBOLA, P.O., SHEGRO, A., LAURIE, S.M. & PILLAY, M., 2013. Progeny Evaluation of some Sweet Potato [*Ipomoea batatas* (L.) Lam] Breeding lines in South Africa. Acta Hort 1007: 247-254.
http://www.actahort.org/books/1007/1007_25.htm
- LAURIE, S.M. AND THOMPSON, A. 2013. Breeding and control strategies against Fusarium wilt, caused by *Fusarium oxysporum* f. sp. *batatas*, for sweet potato in South Africa.
- APA submitted: S.M. Laurie, M.M. Mtileni, W.M. Mphela, A.A. Van den Berg, T. Ramathavhana, L. Sediane, T. Maraganedzha and C.P. du Plooy. Promotion of vitamin A-enriched sweet potato for production by small-scale commercial farmers in South Africa. 9th Triennial African Potato Association Conference, 30 Jun – 4 Jul 2013, Naivasha, Kenya.

Manuals

- Faber M, Laurie S, Ball A & Andrade M (2013). A crop-based approach to address vitamin A deficiency in South Africa. Medical Research Council, Cape Town / ARC-Roodeplaat, Pretoria, South Africa

Papers published/Manuscripts (2009-2014)



- **Dissertations**

- LAURIE, S.M., 2010. Agronomic performance, consumer acceptability and nutrient content of new sweet potato varieties in South Africa. PhD in the Department of Plant Sciences (Plant Breeding), Faculty of Natural and Agricultural Sciences, University of the Free State, May 2010.
etd.uovs.ac.za/ETD-db/.../etd.../LaurieSM.pdf
- SETUMO M.P. 2013. A stochastic frontier approach to economics of production and marketing of orange-fleshed sweet potato at farm level: A case study of KwaZulu-Natal Province, South Africa. MSc Agric mini-dissertation, University of Limpopo, August 2013.
- 3 MSc's submitted, 1 PhD in progress

- **Chapters in books**

- FABER, M & LAURIE SM, 2010. A home-gardening approach developed in South Africa to address vitamin A deficiency. In: Thompson B, Amoroso L (eds). Food Based Approaches (FBAs) for Combating Micronutrient Deficiencies. Food and Agricultural Organization (FAO) and CABI bookshop. Pg. 163-182. ISBN-13: 978 92 5 106546 4.
www.fao.org/docrep/013/am027e/am027e00.pdf
- Faber M, Laurie SM, Van Jaarsveld PJ. Critical issues to consider in the selection of crops in a food-based approach to improve vitamin A status – based on a South African experience. In: Thompson B, Amoroso L (eds). Improving diets and nutrition. Food-based approaches. CABI and FAO, pp 45 – 57, 2014.

Current staff on sweetpotato research (replace example with yours)



Sweetpotato (SP) Staff Category	No.	Gender (M/F)	Age <35 / > 35 yrs
Full/Part time on SP (%) (indicate qualification):			
PhD (Plant breeder, 90%)	1	F	>35
MSc (Biochemist, 20%)	1	M	>35
MSc (1 Agronomy, 1 Breeding; 100%)	2	M	<35
MSc (1 Food Tech, 1 Food Science; 100%)	2	F	<35, >35
Technicians:			
MSc (tissue culture, 10%)	1	F	>35
Diploma (Plant production, 100%)	7	5M:2F	<35
BSc Agric Econ	1	F	<35
BSc Food Science	1	F	<35
Total	6	(3 M:3F)	
Comment:			

Other Project Information



Other initiatives:

- Demonstration agronomy of OFSP – National Department of Science and Technology (2010-2013)
- Collaboration with Rural-based universities – National Department of Science and Technology (2010-2013)
- On-farm trials in Gauteng – Provincial Department of Agriculture and Rural Development (2011-2012)
- Mutation breeding – International Atomic Energy Agency (2009-2014)
- **Agro-processing strategy for sweetpotato – National Treasury (2012-2015)**
- **Sweetpotato vine grower and grower enterprises – Department of Rural Development and Land Reform (2012-2017)**



Other Project Information (cont).

Constraints:

- Slow procurement of infrastructure
- Lack of funding for breeding

Proposed future activities:

- Genetic analysis
- PhD vine nurseries
- MSc profitability of nurseries
- MSc Fus wilt tolerance

Thank you for your attention!

