

# PERFORMANCE OF SWEETPOTATO VARIETIES IN THE CAPRIVI, OKAVANGO AND OHANGWENA REGIONS

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## ABSTRACT

Twenty-five sweetpotato varieties were evaluated at Mashare Agricultural Development Institute and Sachinga, Bagani and Mahenene Research Stations during the 1997/98 season. The season was characterized by low and erratic rainfall, which started late in the season. Results obtained under these conditions allowed evaluation of drought tolerance of the different varieties expressed in terms of yield potential and maturity. Varieties with high yield potential and early maturity performed best under the conditions of erratic and unpredictable rainfall. Advanced variety evaluation should be repeated for more growing seasons. Planting materials of the best-performing varieties will be multiplied and should be evaluated by farmers in collaboration with Farming Systems Research units or the Directorate Extension and Engineering Services.



Figure 1. Sweetpotato trial inspection at Mashare Agricultural Development Institute.

## INTRODUCTION

Encouraging results obtained previously from sweetpotato variety evaluations (Lenhardt & Rusch, 1996; Rusch, 1997), high interest shown by farmers and further support by the Southern African Root Crops Research Network (SARRNET) through the Namibian Root Crops Research Project led to planning and approval of further evaluation of sweetpotato varieties during the 1997/98 season. Entries for the advanced evaluation trials were the eleven varieties that performed best in the preliminary variety evaluations during the 1996/97 season. The 1997/98 season was characterized by relatively low and erratic rainfall that started late.

## METHOD

Initial evaluation of nineteen introduced improved sweetpotato varieties with one local check was repeated in a preliminary variety evaluation trial at Bagani Research Station. The trial was planted on 16 January 1998.

Advanced variety evaluation trials were planted on 14 January 1998 at Mashare Agricultural Development Institute (ADI) in the Kavango region (Figure 1), on 15 January 1998 at Sachinga Research Station in the Caprivi region and on 20 January 1998 at Mahenene Research Station in the Ohangwena region. The trial entries consisted of the eleven best-performing varieties selected from the preliminary variety evaluation trials during 1996/97 and one or two locally collected varieties as checks. Variety names and origin are shown in Annex A.

The trial layout was a randomized complete block design with three replications and two 3.3m rows per block in the preliminary and four 4.5m rows per block in the advanced trials (Carey & Reynoso, 1996). Cuttings were spaced at 0.30m between plants and 1.2m between rows. Only tip cuttings were used for trial purposes. In the Kavango and Caprivi regions the trials were grown under dryland conditions with vines planted on the flat. The trial at Mahenene Research Station was irrigated and heaped. Rainfall at Mashare, Bagani and Sachinga during the 1997/98 growing season is shown in Table 1. Irrigation was applied at Mashare ADI shortly after planting and in April to save the trial from the severe drought.

Table 1. Rainfall at Mashare Agricultural Development Institute, Bagani Research Station and Sachinga Research Station during the 1997/98 season

	Mashare	Bagani	Sachinga
Sept-Dec 97	220.1	180.5	47
Jan-98	98.5	61	68
Jan-98	104.3	44	77
Irrigation	7		
Feb-98	145.8	110	54.5
Mar-98	142.9	21.5	14.5
Apr-98	6.3	19	2
Irrigation	20		
<b>Total</b>	<b>744.9</b>	<b>436</b>	<b>263</b>

The grey area indicates the rain fallen after planting of the trials

Before planting, 2:3:2 (22) fertilizer was broadcast at 200 kg/ha and at Mahenene Research Station a side dressing of 125 kg/ha LAN was applied six weeks after planting (Soenarjo, 1995). Trials were harvested approximately four months after planting on 12 May 1998 at Sachinga Research Station, 13 May 1998 at Bagani Research Station (Figure 2), 18 May 1998



Figure 2. Sweetpotato trial harvest at Bagani Research Station.

at Mashare ADI and 8 June 1998 at Mahenene Research Station. For the advanced trials only the two middle rows of each plot were harvested for data recording. Data were analyzed by using SigmaStat ANOVA and MS Excel. In the preliminary variety evaluation trial the varieties SP2004, SP2012, SP2015 and the local check SP1006 did not produce any tubers and were left out of the analysis. The tuber dry matter content was determined after harvest using a drying oven. The establishment was calculated from the number of cuttings that were alive fourteen days after planting. Marketable tubers were those that were more than 3 cm in diameter at the thickest place. Yield was calculated by multiplication of the establishment proportion with the mass per ha calculated from mass per plant and further multiplication with the proportion marketable mass from which the proportion cracked tuber mass was subtracted.

## RESULTS AND DISCUSSION

### 1. Preliminary sweetpotato variety evaluation trial

Although the trial received only 194.5 mm of rain after planting, a small harvest was possible for the best-performing varieties. The taste of varieties with high dry matter content is often most popular.

The yield of the varieties shown in Table 3 was at a relatively low level in terms of sweetpotato production although it is comparable to locally observed pearl millet yields. The previous selection of SP2013, SP2017 and SP2007A as best-performing varieties was confirmed by the results. SP2006 showed good performance under dryland conditions and should be included in the 1998/99 advanced variety evaluation trials. The mass per plant produced by SP2003 was one of the highest, yield was however strongly decreased by the high proportion of cracked tubers.

Table 2. Dry matter content of sweetpotato varieties evaluated during the 1997/98 season at Bagani Research Station

Variety	Dry mass (%)	Variety	Dry mass (%)
SP2007A	35.3 <sup>a</sup>	SP2016	28.2 <sup>d</sup>
SP2002	34.6 <sup>ab</sup>	SP2009	27.3 <sup>de</sup>
SP2018	34.3 <sup>abc</sup>	SP2003	26.8 <sup>de</sup>
SP2010	33.4 <sup>abc</sup>	SP2006	26.0 <sup>ef</sup>
SP2014	33.4 <sup>abc</sup>	SP2019	24.3 <sup>fg</sup>
SP2007B	32.8 <sup>bc</sup>	SP2013	24.0 <sup>g</sup>
SP2001	32.6 <sup>c</sup>	SP2017	22.9 <sup>g</sup>
Mean	29.7		
CV	1.776	F	135.945
SE	0.007	P	0.001

a,b,c,d,e,f,g Values with different superscripts differ significantly

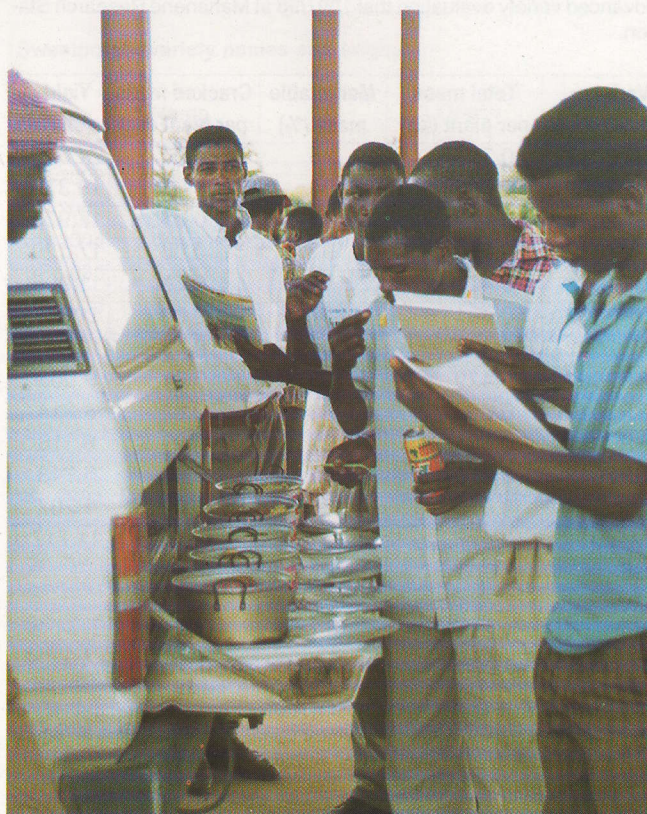


Figure 3. Sweetpotato taste testing at Bagani Research Station.

### 2. Advanced sweet potato variety evaluation trials

Yield performance is only shown for Mahenene Research Station as sweetpotato variety evaluations were performed at this station for the first time during the 1997/98 season.

Table 3. Performance of sixteen sweetpotato varieties in the 1997/98 preliminary variety evaluation trial at Bagani Research Station

Variety	Establishment (%)	Mass per Plant (kg)	Marketable Mass (%)	Mass Cracked (%)	Yield (t/ha)
SP2013	97.20 <sup>ab</sup>	0.181 <sup>ab</sup>	84.60 <sup>ab</sup>	3.99	3.939
SP2017	94.40 <sup>ab</sup>	0.183 <sup>ab</sup>	92.50 <sup>a</sup>	13.68	3.782
SP2007A	80.60 <sup>bc</sup>	0.180 <sup>ab</sup>	91.70 <sup>a</sup>	0.00	3.695
SP2006	91.70 <sup>abc</sup>	0.199 <sup>a</sup>	91.10 <sup>a</sup>	46.56	2.258
SP2016	100.00 <sup>a</sup>	0.074 <sup>bc</sup>	98.50 <sup>a</sup>	0.00	2.025
SP2019	95.80 <sup>ab</sup>	0.072 <sup>bc</sup>	87.50 <sup>ab</sup>	1.96	1.630
SP2010	93.10 <sup>abc</sup>	0.087 <sup>bc</sup>	82.40 <sup>ab</sup>	17.50	1.452
SP2009	80.60 <sup>bc</sup>	0.063 <sup>bc</sup>	85.30 <sup>ab</sup>	0.00	1.211
SP2003	100.00 <sup>a</sup>	0.080 <sup>bc</sup>	94.80 <sup>a</sup>	41.49	1.186
SP2001	87.50 <sup>abc</sup>	0.045 <sup>bc</sup>	83.80 <sup>ab</sup>	10.71	0.806
SP2008	98.60 <sup>a</sup>	0.027 <sup>c</sup>	98.50 <sup>a</sup>	0.00	0.728
SP2018	76.40 <sup>c</sup>	0.034 <sup>c</sup>	96.30 <sup>a</sup>	0.00	0.685
SP2011	97.20 <sup>ab</sup>	0.027 <sup>c</sup>	92.00 <sup>a</sup>	0.00	0.661
SP2007B	95.80 <sup>ab</sup>	0.038 <sup>c</sup>	81.20 <sup>ab</sup>	20.83	0.614
SP2014	77.80 <sup>bc</sup>	0.050 <sup>bc</sup>	90.40 <sup>a</sup>	36.11	0.581
SP2002	98.60 <sup>a</sup>	0.028 <sup>c</sup>	71.10 <sup>c</sup>	11.43	0.461
Mean	91.58	0.085	88.86	12.77	1.607
CV	5.400	32.84	5.449		
SE	0.014	0.012	0.013		
F	5.765	7.545	3.913		
P	0.001	0.001	0.001		

<sup>a,b,c</sup>Values with different superscripts within a column differ significantly

Table 4. Performance of twelve sweetpotato varieties evaluated in the advanced variety evaluation trial 1997/98 at Mahenene Research Station.

Variety	Total mass per plant (kg)	Marketable mass (%)	Cracked mass per plant (kg)	Yield (t/ha)
SP2017	0.794 <sup>a</sup>	95	0.00	21.016
SP2009	0.748 <sup>ab</sup>	94	0.00	19.379
SP2019	0.678 <sup>ab</sup>	97	0.01	17.975
SP2013	0.669 <sup>abc</sup>	92	0.00	17.129
SP2018	0.471 <sup>abcd</sup>	92	0.00	11.906
SP2007A	0.491 <sup>abcd</sup>	87	0.00	11.817
SP2002	0.487 <sup>abcd</sup>	81	0.00	10.947
SP2003	0.429 <sup>abcd</sup>	93	0.07	9.083
SP2010	0.363 <sup>bcd</sup>	89	0.02	8.314
SP2011	0.301 <sup>bcd</sup>	97	0.07	6.116
SP2012	0.253 <sup>cd</sup>	92	0.03	5.713
Local	0.075 <sup>d</sup>	85	0.02	1.207
Mean	0.477	91	0.021	11.717
SE	0.040	0.01	0.006	
CV	25.78	5.54	75.79	
F	5.799	H*	53.91	19.828
P	<0.001	<0.001	0.048	

\*The H statistic is used for ANOVA on Ranks analysis when data is not normally distributed. Values shown for varieties are medians on which the analysis is based instead of means. Different letters indicate significantly different values

<sup>a,b,c,d</sup>Values with different superscripts within a column differ significantly

Results shown in Table 4 indicate that the varieties performing best in the Kavango and Caprivi region were also the top performers at Mahenene Research Station. Evaluations by farmers during a farmer's day held after harvesting resulted in selection of four varieties based on yield, marketability of tubers and taste (Figure 3). Varieties with the highest yield,

acceptable taste and least cracked or misformed tubers were identified as SP2017, SP2002, SP2009 and SP2007A. Although SP2018 and SP2019 showed high yields, their round tuber shape was seen as less marketable than the longitudinal shapes. SP2013 was not taken into consideration because it had a virus infection. Table 5 shows sweetpotato variety yield potential in terms of tuber formation and maturity which could be well evaluated during the 1997/98 season with the low rainfall at Mashare and Sachinga Research Stations.

Potential yield of the evaluated varieties was measured by the total number of tubers initiated. The potential for early maturity was reflected in the proportion marketable tubers shown in Table 5. Varieties that could produce a relatively high proportion of marketable tubers from planting in mid January through to the last rains in mid April were perceived as early maturing. Early maturing varieties with high potential have shown the highest yields during the 1997/98 rainy season (Figure 4).

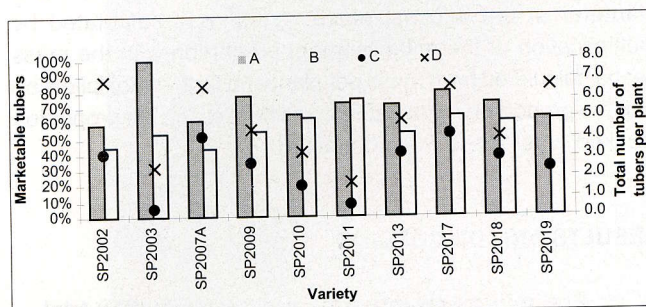


Figure 4. Comparison of percentage marketable tubers at Mashare Agricultural Development Institute (A) and Mahenene Research Station (B) and total number of tubers per plant at Mashare Agricultural Development Institute (C) and Mahenene Research Station (D) of ten sweetpotato varieties evaluated during the 1997/98 season.

Table 5. Total number of tubers per plant and proportion marketable tubers harvested from advanced sweetpotato variety evaluation trials during 1997/98 at Mahenene Research Station, Mashare Agricultural Development Institute and Sachinga Research Station

Variety	Total number of tubers per plant			Marketable tubers (%)		
	Mahenene	Mashare	Sachinga	Mahenene	Mashare	Sachinga
2002 LM 88.014	6.896 <sup>a</sup>	3.167 <sup>a</sup>	1.192	44.3	59.2 <sup>bc</sup>	3
2003 Japon TS	2.480 <sup>def</sup>	0.357 <sup>ef</sup>	0.444	53.1	99.4 <sup>a</sup>	17
2007A Xushu A	6.617 <sup>ab</sup>	4.064 <sup>ab</sup>	1.107	43.1	62.0 <sup>bc</sup>	13
2009 TIS 2534	4.450 <sup>bcd</sup>	2.674 <sup>bcd</sup>	0.864	54.0	76.8 <sup>abc</sup>	0
2010 TIS 3290	3.251 <sup>cde</sup>	1.590 <sup>def</sup>	0.940	62.6	64.9 <sup>bc</sup>	3
2011 Naveto	1.696 <sup>ef</sup>	0.624 <sup>f</sup>	0.000	74.7	72.6 <sup>bc</sup>	0
2013 Blesbok	4.959 <sup>abc</sup>	3.202 <sup>abc</sup>	0.889	53.5	71.0 <sup>bc</sup>	9
2017 Kudu	6.664 <sup>ab</sup>	4.192 <sup>a</sup>	1.383	64.2	80.0 <sup>ab</sup>	8
2018 Mafutha	4.076 <sup>cd</sup>	2.948 <sup>abcd</sup>	0.610	60.0	71.9 <sup>bc</sup>	0
2019 Ribbok	6.696 <sup>ab</sup>	2.385 <sup>cde</sup>	1.218	61.9	63.1 <sup>bc</sup>	10
Local 1**	1.150 <sup>f</sup>	0.723 <sup>f</sup>	0.000	50.7	58.7 <sup>bc</sup>	0
Local 2***	1.359 <sup>ef</sup>	0.905 <sup>ef</sup>	0.000	59.1	53.3 <sup>c</sup>	0
Mean	4.191	2.236	0.799	56.8	69.4	6.4
SE	0.375	0.235	0.107	0.025	0.022	0.017
CV	14.21	21.97	33.36	22.59	10.69	103.64
F (H* for Sachinga)	28.281	24.216	55.947	1.244	5.779	54.888
P	<0.001	<0.001	<0.001	0.322	<0.001	<0.001

\* The H statistic is used for ANOVA on Ranks analysis when data is not normally distributed. Values shown for varieties are medians on which the analysis is based instead of means.

\*\* SP1010 at Mahenene, SP1005 at Mashare, SP1016 at Sachinga

\*\*\* SP2012 at Mahenene, SP1003 at Mashare, SP1024 at Sachinga

## ANNEX A

### Sweetpotato variety names and origin

Variety	Name	Origin
SP 2001	LM 88.002	CIP
SP 2002	LM 88.014	CIP
SP 2003	Japon Tresmesino Selecto	Peru
SP 2004	Camote Yuca	Peru
SP 2005	Zapallo	Peru
SP 2006	Yan Shu 1	China
SP 2007A	Xushu 18 A	China
SP 2007B	-	Unknown
SP 2008	Imby 3102	Burundi
SP 2009	TIS 2634	IITA
SP 2010	TIS 3290	IITA
SP 2011	Naveto	Papua New Guinea
SP 2012	Chingovwa	Zambia
SP 2013	Blesbok	South Africa
SP 2014	Borrie	South Africa
SP 2015	Bosbok	South Africa
SP 2016	Brondal	South Africa
SP 2017	Koedoe	South Africa
SP 2018	Mafutha	South Africa
SP 2019	Ribbok	South Africa
SP 1001	Oshana	Oshana
SP 1003	Kavandja	Caprivi (Shadikongoro)
SP 1005	Shinguru	Caprivi
SP 1006	Shinguru	Caprivi (Bagani)
SP 1010	Ogongo	Oshana
SP 1012	Epalela	Omusati (Epalela)
SP 1016	Kanjoro	Caprivi (Mpacha)
SP 1024	Choto	Caprivi

## RECOMMENDATIONS

It is recommended that, due to the unusually low rainfall during the 1997/98 season, advanced variety evaluation is repeated in the 1998/99 season to consolidate the findings. Planting materials of the best-performing varieties will be multiplied and should be evaluated by farmers in collaboration with Farming Systems Research units or the Directorate Extension and Engineering Services.

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