

BREEDING OF SWEETPOTATO AND EVALUATION OF IMPORTED CULTIVARS IN SOUTH AFRICA

S.M. LAURIE, A.A. VAN DEN BERG, M.D. MAGORO and M.C. KGONYANE
Agricultural Research Council (ARC) Roodeplaat Vegetable and Ornamental Plant Institute, Private Bag
X293, Pretoria, 0001, South Africa

ABSTRACT

The ARC-Roodeplaat sweetpotato (*Ipomea batatas*) breeding programme aims at developing sweetpotato cultivars which have good yield and storage root quality combined with sweet and dry taste, early maturity, good keeping ability and drought tolerance. Additionally high beta-carotene content is of great importance. The virus-tested glasshouse collection of 263 local and 52 imported accessions serves as basis of the programme. The breeding activities at Roodeplaat included importation of novel germplasm, polycrossing (5309 seeds), stringent selection at the 3116 seedlings in the seedling nursery, selection of 85 entries from the preliminary yield trial, 10 from the intermediate yield trial and 8 from the advanced yield trial. The most promising cultivars/lines were evaluated at various sites involving farmers in selection for taste acceptability. The result of these trials during 2000/01 and 2001/02 at four sites, is the release of seven new cream-fleshed cultivars and one land race for production in South Africa namely: Ndou (1995-13-2), Monate (1989-17-1), Mokone (1987-16-1), Letlhabula (1995-10-1), Phala (1984-2-201), Amasi (1985-6-3), Mamphenyane (1984-10-340) and Natal Red. The orange-fleshed cultivars, cultivars Excel and W-119 from the USA, and A45 coming from the breeding programme at University of Natal, South Africa, are recommended. Improved ARC lines/cultivars and imported cultivars were also supplied to SADC countries for evaluation.

Key Words: Cream-fleshed cultivars, *Ipomea batatas*, promising lines

RÉSUMÉ

Le programme de reproduction de patate douce ARC-Roodeplaat (*Ipomea batatas*) vise le développement des variétés de patate douce qui ont un bon rendement et une qualité de stockage de racine combinée avec une saveur sucrée et sèche, une bonne habileté de conservation et une bonne tolérance à la sécheresse. En plus un contenu élevé en carotène-beta est de grande importance. Le virus testé de collection de la maison en verre de 263 accessions locales et 52 importées sert de base au programme. Les activités de reproduction à Roodplaat consistent aussi à l'importation des germplasmes originaux, au multi croisements (5309 graines), à la sélection rigoureuse de 3116 semis dans le jardin des jeunes plantes, à la sélection de 85 participants de l'essai préliminaire de rendement, 10 de l'essai intermédiaire de rendement et 8 de l'essai avancé de rendement. Les variétés/ lignées les plus promettant étaient évaluées aux diverses sites impliquant les fermiers en sélection pour l'acceptabilité de saveur. Le résultat de ces essais durant 2000/01 et 2001/02 aux quatre sites, est le largage des sept nouvelles variétés de crème de chair et une race de terre pour la production en Afrique du sud, nommément : Ndou (1995-13-2), Monate (1989-17-1), Mokone (1987-16-1), Letlhabula (1995-10-1), Phala (1984-2-201), Amasi (1985-6-3), Mamphenyane (1984-10-340) et Natal Red. Les variétés de chair orange, les variétés Excel et W-119 des Etats-Unis, et A45 venant du programme de reproduction de l'université de Natal, Afrique du sud, sont recommandées. Les variétés/lignées ARC améliorées et les variétés importées étaient aussi fournies aux pays de SADC pour l'évaluation.

Mots Clés: Variétés crèmes de peau, *Ipomea batatas*, lignes promettantes

INTRODUCTION

A baseline survey on sweetpotato (*Ipomea batatas*) production and uses by resource-poor farmers conducted during 1996/97 in KwaZulu-Natal Province in South Africa (Thompson *et al.*, 1999), indicated preference for cultivar characteristics as good yield and also yield reliability as well as sweet and dry taste as the highest priority. This is basically an improvement on the cultivar Mafutha released by ARC-Roodeplaat in 1959. Similar preferences were recorded in other provinces. Therefore, the aims of the ARC-Roodeplaat sweetpotato breeding are cultivars which have good yield and storage root quality combined to sweet and dry taste, early maturity, good keeping ability and drought tolerance. Recently high beta-carotene content was added. The first report on the ARC breeding program for resource-poor farmers was by Laurie *et al.* (1999) presented at the SARRNET Workshop in 1998. The progress from the 1996/97 to 1999/2000 advanced yield trials at Roodeplaat, was reviewed by Laurie and Van den Berg (2002). This report indicated good progress in terms of marketable yield and keeping ability. Inheritance studies on sweetpotato agronomy and quality characteristics of Kanju (2000) was also done at ARC-Roodeplaat. The second phase of SARRNET commenced in June 2000 and the breeding program and virus-tested genebank were extended to a regional program for the dryer southern region of SADC. Results of the off-station trials in the 2000/01-season in South Africa and on-station trials in neighbouring countries were reported in Laurie *et al.* (2002). At that stage seventeen cream-fleshed cultivars and lines were identified as better than the control cultivar Mafutha. Five promising orange-fleshed cultivars were also identified. These were selected for advanced testing before final recommendations could be made.

This paper reports on the results of the regional sweetpotato breeding at ARC-Roodeplaat and off-station trials in South Africa during the 2001/02-season (year two of SARRNET phase 2).

MATERIALS AND METHODS

Maintenance of germplasm. The collection of sweetpotato is maintained in insect-free

glasshouses with a back-up collection *in vitro*. Annually the glasshouse collection is re-established from virus-indexed cuttings into newly sterilized soil. Cuttings from these mother plants are taken to prepare virus-tested propagation material for evaluation.

Crossing and evaluation. The methodology employed at ARC-Roodeplaat was discussed in detail by Laurie and Van den Berg (2002). During 2001/02 novel germplasm was imported from International Potato Center (CIP), USA and New Zealand to be used in the evaluation and crossing program.

A polycross consisting of 17 cream-orange to orange-fleshed parents which focussed on beta-carotene content, was established to generate new clones.

In the polycross nursery of previous seasons, poor germination was obtained and therefore germination tests were done initially on small samples of seed harvested monthly from the 2001-polycross. The highest percentage germination was found in seeds harvested in March whereas the poorest germination was from the late season harvesting (June). Therefore most seed harvested in March and only some seed harvested April to June were sown. The sowing was in September 2001 and seedlings transplanted to the field on 21 November 2001. From the seed sown of the 2001-polycross, 3147 seedlings were obtained and 68 seedlings from hand crosses. Harvesting took place on 6 - 13 May 2001 and stringent selection was done.

A preliminary yield trial with 108 ARC lines, 27 lines originating from seed imported from CIP (mostly orange-fleshed parents), six imported cultivars, six cultivars from the breeding program at University of Natal, 16 RSA land races and six control cultivars were planted on 19 and 21 December 2001 and harvested 18 - 25 June 2002. Approximately half of these entries were selected in the preliminary yield trial of 2000/01 and the rest from the polycross nursery of 2000/01.

The intermediate yield trial had 20 ARC lines, two imported cultivars and three control cultivars, established 18 December 2001 and harvested 5 - 6 June 2002.

The advanced yield trials consisted of 13 ARC lines, two RSA land races, two imported cultivars

and three control cultivars. One trial was under irrigation and the other dry land and were planted on 14-15 December, respectively, and harvested at the end of May 2002.

Selection was done at the different levels of evaluation for the wanted traits. The data was entered on MS Excel and analyzed with Statistix.

Off-station trials. Twelve ARC lines, two RSA land races, nine imported cultivars and the six cultivars from the breeding program at University of Natal, proceeded to evaluation in various sweetpotato production areas. In these trials the adaptability of the lines/cultivars are determined as well as involving farmers in selection for taste acceptability. The same methodology was used as in Laurie et al. 2002. During 2001/02 trials were executed at three communities namely Vulindlela (27/11/2001 to 28/4/2002), Tshiombo (28/11/2001 to 22/4/2002) and Ditshilo (11/12/2001 to 7/6/2002), replacing Disaneng because of water problems, and at Tompi Seleka College of Agriculture (5/12/2001 to 29/4/2002). Each trial had 15 entries planted with three replicates of 30 plants. The data was entered on MS Excel and analyzed with Statistix.

Distribution of germplasm to SADC. Twenty-three improved ARC lines/cultivars and imported cultivars were available to be ordered by neighbouring countries in spring 2001. Cuttings of the virus-tested germplasm collection in the glass house were multiplied in seedling trays and cuttings there-off were send away by courier.

RESULTS AND DISCUSSION

Maintenance of germplasm. The germplasm collection was updated and currently have 16 ARC cultivars, 24 RSA land races, 233 ARC lines, 5 lines from University of Natal, 35 lines imported from CIP and 12 USA cultivars. A total of 3141 plantlets for evaluation at Roodeplaat and 960 plantlets for off-station trials were produced from the virus-tested mother stock in the glass houses.

Crossing and evaluation. In the 2001/02-season, 1000 seeds originating from 8 parents were imported from Crop and Food Research in New

Zealand, twelve clones from CIP in Lima, and four lines from Louisiana State University in USA.

In the 2002-polycross, 5309 seeds were harvested during April to June from 12 out of the 17 parents. In the polycross nursery, 3116 seedlings survived from the ones that were established and 35 lines from the 2001-polycross and 5 lines from the hand crosses were selected for further evaluation.

In the preliminary yield trial 43 of the 2000-lines were selected for evaluation in the next season, as well as two out of the ten land races and 12 out of the 27 CIP lines. The results of the 28 lines/cultivars that were evaluated for a second season in the preliminary yield trial, are given in Table 1. The best orange-fleshed lines were 1999-1-7 and 1999-6-1, and cream-fleshed lines 1999-10-7, 1999-3-1 and 1999-12-2. These had a combination of good yield, dry matter content and storage root quality. Other promising entries were A40 and A15.

The results of the lines/cultivars selected from the intermediate yield trial (Table 2), indicated 1999-10-1 and Jewel as having most of the wanted traits. Except for 1999-15-1, all the selected lines will be re-evaluated in the intermediate yield trial of the coming season.

In both the irrigated and dry land advanced yield trial, the orange-fleshed line 1997-9-5 had the highest yield (Table 3 and 4). A number of lines with good yield but mediocre taste and dry matter content were discarded. The orange-fleshed line 1998-12-3 and the cream-fleshed line 1998-4-2 and RSA land race TO3-2 performed well. Other entries selected for re-evaluation are: 1997-14-17, 1998-12-10, 1998-12-12 and 1998-8-3. The dry land trial results (Table 4) indicated 1997-9-5, 1998-12-3, NC1560, 1997-14-17, 1998-12-12, Camsa 74-228, Mafutha and Excel as drought tolerant. Through the evaluation trials at Roodeplaat, five orange-fleshed cultivars/lines were identified to be used in food diversification projects to decrease vitamin A deficiency. These are: Resisto, A15, Jewel, 1997-9-5 and 1998-12-3.

Off-station trials. The results of the best lines/cultivars in the four off-station trials during the 2001/02-season, are presented in Tables 5-8.

TABLE 1. Performance of 28 lines/cultivars selected for further evaluation from the preliminary yield trial at Roodeplaats in 2001/2002

Line	Colour internal	Cracks %	TSS °Brix	Dry matter %	Keeping ability %	Blossy damage t ha ⁻¹	Marketable yield t ha ⁻¹	Total yield t ha ⁻¹	Cooked taste ~
Bosbok *	Light cream	2.5	6.8	21.7	80	5.0	71.7	87.9	
1999-3-1	Cream	0.0	5.3	22.3	95	0.8	68.8	82.9	
Ribbok *	Cream	3.7	6.4	17.7	90	5.5	63.0	77.2	
Carolina Ruby	Darker orange	4.0	8.1	17.4	75	2.2	62.3	75.7	
1999-6-1	Darker orange	4.0	7.9	18.6	90	2.1	62.3	75.0	Average
Koedoe *	Dark cream	1.6	5.3	19.5	55	2.9	55.6	68.7	
Mafutha *	Cream, orange ring	3.0	9.8	22.4	40	1.3	54.4	61.6	Good
A2	Yellow orange	1.0	6.5	19.6	90	8.4	54.3	71.6	
1999-10-7	Light cream	0.0	6.5	23.4	75	3.7	52.8	64.2	Very good
1999-1-7	Darker orange	0.0	7.1	20.2	90	7.9	50.2	62.9	Average
Blesbok *	Cream	0.0	6.5	15.9	95	3.5	50.1	61.7	
1999-12-3	Cream, light orange	0.0	7.0	23.1	84	7.8	48.5	67.8	
1999-1-4	Light yellow	0.0	7.5	23.5	90	1.5	46.9	57.4	
1999-11-1	Light cream	3.7	5.2	24.3	85	3.2	46.9	56.0	Very good
A40	White	13.0	8.7	23.8	100	0.0	46.2	58.0	Excellent
W-119 *	Dark orange	0.0	7.4	21.4	80	0.0	46.3	52.3	Poor
Jewel New	Darker orange	0.7	8.8	21.1	45	6.2	45.2	58.3	
1999-10-4	Dark cream	0.0	6.8	29.4	87	1.0	44.5	53.1	
1999-12-2	Cream	0.4	7.8	26.8	45	2.4	42.9	52.4	Excellent
1999-10-6	Cream	1.8	8.6	32.0	55	5.1	42.7	54.1	
A15	Darker orange	0.0	10.3	17.6	80	5.1	39.8	52.1	
1999-10-2	Cream, orange specks	1.5	7.5	25.1	65	1.0	39.5	44.6	Good
Japan TS	Orange	3.4	6.5	20.6	47	1.1	39.4	51.1	
PD2A-Finger	White	10.0	7.2	23.7	10	0.3	39.0	51.7	Avg-Good
Beauregard	Dark orange	0.0	7.1	16.0	71	8.2	38.9	54.9	
Mavundla Hox	White	5.3	6.1	25.0	70	0.7	37.5	43.5	
1999-12-1	Cream - Light yellow	2.0	7.6	25.6	70	2.5	36.8	48.6	Very good
A56	Light cream	8.1	6.9	26.0	100	7.3	34.1	49.8	Excellent
MA7A(1)	White	0.0	6.7	24.8	47	0.0	33.8	37.5	Good
1999-14-1	Dark orange	0.0	7.6	22.2	100	3.5	32.0	41.2	Average
1999-5-1	Dark orange	14.4	9.0	23.3	95	0.3	31.2	45.9	Good
A45	Orange	0.6	8.4	22.6	82	3.0	30.9	38.2	
Jonathan	Orange	9.8	7.8	22.4	0	0.0	27.8	38.6	Excellent
1998-15-2	Cream, orange spots	0.0	7.1	24.6	100	3.2	24.7	32.8	Excellent
Mean		3.5	7.3	22.0	75	3.3	41	54.2	

* control cultivars

~ Only some clones were cooked and tasted in this trial

TABLE 2. Characteristics of sweetpotato cultivars/lines selected from the 2001/02 intermediate yield trial at Roodeplaats

Line	Colour Internal	Grooves %	TSS °Brix	Dry matter %	Keeping ability %	Blossy damage t ha ⁻¹	Marketable yield t ha ⁻¹	Total yield t ha ⁻¹	Cooked taste ~
1999-9-4	Cream	7.5	6.9	20.6	95	1.1	69.3	75.3	
1998-25-10	Light cream	0	6.7	16.4	95	4.1	65.8	76.6	Average
Blesbok *	Cream	4	6.0	16.9	97	5.5	62.3	86.3	Poor-Good
1999-10-1	White	1	8.7	27.1	67	3.3	58.7	68.6	Good
1998-6-1	White	0	6.7	23.6	85	0.3	57.1	63.7	
1997-21-1	Cream	25	7.9	22.1	90	0.3	52.2	56.6	Good-Excel.
Jewel	Orange	3	8.3	22.0	80	2.6	51.4	63.5	
1999-1-3	Orange	2.5	7.1	20.3	90	3.4	51.0	62.1	
1998-21-1	Light orange	0	8.9	19.7	69	5.4	50.8	61.5	Good
Mafutha *	Cream, orange spots	12.5	8.1	25.4	50	1.1	49.9	57.5	
Ning Shu 1	Cream	4	6.6	21.2	80	0.9	46.6	54.3	Avg - Good
W-119 *	Dark orange	0	8.6	21.7	83	1.3	45.4	49.4	Avg-Good
1999-15-1	Orange, cream ring	2.5	7.7	27.3	55	0.2	40.8	45.9	Excellent
Mean		3.7	7.3	21.7	79	2.5	47.7	60.8	
CV%			7.1	5.1		62.8	8.0	8.9	
LSD (P=0.05)		1.1	2.3			3.2	14.6	11.2	

*control cultivars

~ Only some clones were cooked and tasted in this trial

TABLE 3. Characteristics of sweetpotato lines from the irrigated advanced yield trial at Roodeplaat in 2001/2002

Line	Colour internal	TSS °Brix	Dry matter %	Keeping ability total	Blossy damage	Marketable yield t ha ⁻¹	Total yield t ha ⁻¹	Cooked taste
1997-9-5	Orange, SI yellow cream	6.9	19.7	98	2.1	63.7	73.0	Good
Malavuvu VM-B	Cream	5.8	17.6	98	1.7	62.5	73.5	Very good
Duiker	White	5.9	20.9	95	0.3	59.5	64.1	Good - Avg
Bosbok *	Cream	5.6	21.5	95	3.7	59.0	68.2	Poor - Good
1995-8-6	White	5.6	17.7	100	4.7	57.0	75.5	Very poor
1997-20-2	Orange (yellow ring)	6.6	19.3	95	4.8	56.1	65.6	Good - Avg
1998-12-3	Light orange, yellow ring	7.3	26.0	85	0.7	55.4	62.0	Excellent
NC 1560	Cream, light orange	7.0	20.3	68	2.8	54.1	67.9	Poor - Good
1997-9-2	Cream	6.9	23.6	43	1.7	53.6	60.0	Poor
1998-4-2	White	5.9	24.8	85	2.3	53.4	70.0	Excellent
1997-14-17	Light orange, cream spots	7.4	21.8	95	2.8	49.8	63.1	Excellent
1998-12-10	Orange, white spots	7.2	20.7	49	3.0	47.8	59.6	Good - Avg
1998-12-12	Cream	7.3	22.8	70	1.2	44.8	55.1	Excellent
Cemsa 74-228	White	6.4	26.7	50	0.5	44.1	56.0	Poor
1998-8-3	White	6.3	26.9	93	0.7	43.6	49.8	Poor
T03-2	White	5.6	26.4	83	0.0	43.2	54.1	Good
Mafutha *	Cream, orange spots	6.9	25.0	53	1.4	42.9	53.6	Average
Excel *	Orange	7.8	23.5	75	4.4	39.3	48.4	
1997-12-1	White	7.2	25.0	44	1.0	35.9	40.9	Excellent
1997-1-1	Cream	6.5	26.2	91	1.6	22.8	28.9	Good
Mean		6.6	22.8	78.1	2.1	49.4	59.5	
CV%			3.3	13.8		15.7	14.4	
LSD (P=0.05)		NS	1.6	22.6	NS	12.8	14.2	

* control cultivars

TABLE 4. Characteristics of cultivars from the dryland advanced yield trial at Roodeplaat in 2001/2002

Cultivar/ line	Colour internal	Cracks %	Grooves %	TSS °Brix	Dry matter %	Keeping ability %	Marketable yield t ha ⁻¹	Total yield t ha ⁻¹
1997-9-5	Light orange, yellow ring	12.3	0.0	7.6	19.2	45	26.6	36.4
1998-12-12	Cream	6.2	0.7	9.4	23.2	89	20.7	29.5
1997-14-17	Orange, cream spots	4.1	1.33	9.4	19.1	89	18.7	24.8
1998-12-3	Orange, cream ring	14.9	0.0	11.2	28.0	79	17.1	34.2
1995-8-6	Cream	4.7	0.7	7.0	20.0	90	16.6	26.8
NC 1560	Slightly cream	6.7	0.0	8.1	21.7	80	15.6	27.2
Cemsa 74-228	Cream	28.4	1.33	9.5	23.6	58	15.1	22.2
Excel *	Orange	17.5	0	10.8	23.0	80	14.8	22.2
Malavuvu VM-B	Cream	7.3	0.0	7.8	17.1	90	13.8	22.1
Mafutha *	Cream, orange spots	2.5	83.3	9.8	26.9	80	13.6	17.0
1998-8-3	White	29.8	5.67	8.5	21.7	100	12.7	22.9
1997-9-2	Cream	1.1	63	8.8	22.2	73	12.4	19.0
T03-2	White	19.4	3.3	7.7	26.7	100	10.8	19.0
1998-12-10	Light orange	10.0	0.67	10.6	22.3	100	10.3	16.6
Duiker	White	16.3	0.0	7.7	24.5	92	9.9	18.9
Bosbok *	Cream	23.2	1.3	7.4	18.4	90	9.4	22.5
1997-20-2	Light orange, orange	42.7	1.7	7.2	17.3	83	9.4	22.2
1997-1-1	Cream	8.1	0.7	8.7	26.5	81	6.9	12.5
1998-4-2	White	56.0	5.0	7.7	19.6	100	6.9	24.6
1997-12-1	White	33.0	90	10.2	28.5	45	5.6	10.6
Mean		17.2	0.7	8.7	22.5	82.2	13.3	22.6
Coeff. Variation							27.9	17.3
LSD (P=0.05)		NS	NS	NS	NS	NS	6.1	6.4

TABLE 5. Performance of the best cultivars and lines in the off-station trials at Mafikeng in North West Province during 2001/02. The three entries that are recommended are highlighted and the underlined one can be suggested for planting because of very good yield although the taste is average

Cultivar/line	External colour	Internal colour	Marketable yield		Small t ha ⁻¹	Insect damage t ha ⁻¹	Total yield t ha ⁻¹	Cooked taste	Choice 2001
			t ha ⁻¹	%					
1995-13-2	Cream	Cream	14.2	74.5	3.7	1.5	19.4	Good	Yes
Blesbok	Pink	Pink	11.1	36.0	13.9	4.7	29.7	Poor	Yes
1995-10-1	White	White	10.0	30.3	16.5	4.4	30.9	Avg - poor	Yes
W-119	Brownish orange	Dark orange	9.0	37.7	11.1	2.1	22.2	Good	Yes
1989-17-1	Cream	Cream	8.3	32.4	13.3	3.3	25.0	Good	
Kenia	Pink	Cream	8.1	46.3	6.3	3.9	18.3	Avg	
1986-12-2	Red	Cream	7.8	48.6	7.6	1.1	16.5	Very poor	Yes
Mean			7.5	37.7	4.8	1.4	20.1		
CV(%)			36.1	25.3			21.4		
LSD (P=0.05)			4.5	15.9	NS	NS	7.2		

TABLE 6. Results of the most promising cultivars and lines in the off-station trials at Tompi Seleka College of Agriculture in Limpopo Province during 2001/02. The recommended entries are highlighted and the underlined one can be suggested for planting because of very good yield although the taste is average

Cultivar/line	External colour	Internal colour	Marketable yield		Small t ha ⁻¹	Cracked t ha ⁻¹	Insect damage t ha ⁻¹	Total yield	Cooked taste	Choice 2001
			t ha ⁻¹	%						
W-119	Orange	Orange	48.2	91.1	3.3	0.0	0.3	51.8	Avg-Poor	Yes
1987-16-1	Cream	Cream	34.6	62.3	3.3	2.4	10.9	51.2	Good	
1984-2-201	Purple	Cream	31.1	79.4	2.6	1.4	4.1	39.3	Poor	
1989-23-1	Orange	Orange	29.6	71.0	4.9	0.0	7.8	42.2	Poor	
Excel	Orange	Orange cream	29.6	78.9	2.6	3.0	2.1	37.3	Excellent	Yes
A45	Orange pink	Orange	27.2	82.7	3.4	0.0	3.2	33.8	Avg-Good	Yes
1984-10-340	Cream orange	Cream	26.1	83.7	1.5	18.1	1.4	31.5	Good	Yes
Mean			15.1	36.6	1.4	1.7	2.0	19.1		
CV%			47.4	19.7				35.5		
LSD (P=0.05)			20.0	24.7	NS	NS	NS	19.9		

TABLE 7. The best performing cultivars and lines in the off-station trials at Tshiombo, Venda, in Limpopo Province during 2001/02. The recommended cultivars/lines are highlighted

Cultivar/ line	External colour	Internal colour	Cracks %	Dry matter %	Marketable yield		Weevil damaged t ha	Total yield t ha ⁻¹	Cooked taste	Choice 2001
					t ha ⁻¹	%				
Natal Red	Purple-red	White	40.4	27.9	9.5	50.1	0.8	19.9	Very good	
1987-16-1	Cream	Cream	8.2	28.3	9.4	68.0	2.0	13.0	Average	
1984-2-201	Purple-red	Cream	2.4	24.1	9.3	82.6	1.4	11.5	Good	Yes
1995-13-2	Cream	Cream	2.9	24.2	9.0	73.1	2.7	12.4	Very good	
Excel	Cream orange	Orange, cream	29.5	26.9	8.5	54.7	2.3	14.8	Good	
Kenya	Purple-red	White	16.7	20.3	8.1	75.5	0.7	10.7	Avg-Good	
Atacama	Purple-red	Cream	9.4	24.0	5.8	78.0	1.0	7.8	Average	Yes
Mean			7.3	11.7	5.1	56.4	1.1	8.9		
CV(%)					60.7	25.5		44.2		
LSD (P=0.05)			NS	NS	5.2	24.1	NS	6.5		

TABLE 8. Performance of the most promising cultivars and lines in the off-station trials at Vulindlela in KwaZulu-Natal Province during 2001/02

Cultivar/ line	External colour	Internal colour	Marketable yield		Small t ha ⁻¹	Insect damage t ha ⁻¹	Total yield t ha ⁻¹	Cooked taste	Choice 2001
			t ha ⁻¹	%					
W-119	Brownish orange	Dark orange	14.4	55.2	10.2	1.3	25.9	Avg	
1995-10-1	White	White	14.4	52.8	7.9	5.2	27.4	Avg	Yes
Natal Red	Pink	White	14.1	46.7	11.2	5.5	30.8	Avg	Yes
A56	Pink	Cream	12.9	44.2	8.0	7.7	28.7	Poor	
1995-13-2	Cream	Cream	11.8	53.0	5.0	5.0	21.9	Very good	
A40	White	White	10.7	34.8	10.9	9.1	30.8	Avg - Good	
1989-23-1	Cream	Dark orange	9.8	29.3	13.1	10.4	33.3	Very poor	
1989-17-1	Cream	Cream	9.8	40.3	7.0	7.5	24.3	Avg - Good	Yes
1985-6-3	Cream	Pale yellow	9.7	63.0	2.7	2.7	15.2	Good	
Mean			7.2	28.0	5.1	3.6	15.9		
CV (%)			38.1	25.2			26.0		
LSD (P=0.05)			6.1	17.3	NS	NS	10.1		

The four entries that are recommended for this area are highlighted and the underlined one can be suggested for planting because of very good yield although the taste is average

Resulting from the trials during 2000/01 (see Laurie *et al.*, 2002) and 2001/02 at four sites, is the release of seven new cream-fleshed cultivars and one land race for production in South Africa namely: Ndou (1995-13-2), Monate (1989-17-1), Mokone (1987-16-1), Letlhabula (1995-10-1), Phala (1984-2-201), Amasi (1985-6-3), Mamphenyane (1984-10-340) and Natal Red. In terms of orange-fleshed cultivars, the USA cultivars Excel and W-119, and A45 coming from the breeding program at University of Natal, South Africa, are recommended. These are already used in food diversification projects for decreasing vitamin A deficiency.

Distribution of germplasm to SADC. Botswana obtained twenty cuttings each of six ARC lines, 3 cultivars from University of Natal, three cultivars imported from CIP and one RSA land race at the end of October 2001. Malawi received approximately nine cultivars/lines which were classified in Laurie *et al.*, 2002 as very dry and dry types in December 2001.

ACKNOWLEDGEMENTS

Funding by USAID through the Southern African Root Crops Research Network (SARRNET) and by the Agricultural Research Council are acknowledged.

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