

Evaluation of newly introduced sweetpotato germplasm under Egyptian conditions

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Summary

Fourteen cultivars/clones of sweetpotato were delivered to AGERI from International Potato Center (CIP)/Nairobi in 2002 as cuttings. They were *in vitro* propagated for their massive micro-propagation. Different media compositions and incubation conditions were examined to determine the optimal conditions for each cultivar. *In vitro* plants were acclimatized under insect-proof greenhouse and used as mother plants for the cuttings to be evaluated at the AGERI experimental field as well as at Kafr El Zayat location. Plants were harvested. Yield was evaluated on bases of weight and number of roots. Eight cultivars and lines have promising yield productivity under Egyptian conditions.

Introduction

Sweetpotato (*Ipomoea batatas* L.), is one of the most important tuber crops worldwide. It has a diverse range of positive characteristics including high yield per unit area, nutritional value, and resistance to several production stresses (Kays, 2005)

Orange-fleshed Sweetpotato cultivars are rich in B-carotene that is the precursor of vitamin A. Its deficiency results in slow development, stunted growth, night blindness and total blindness. In Africa, 250 million children suffer from vitamin A deficiency, VAD, One third of pre-school

children have manifold health problems due to VAD. In Egypt, VAD is prevalent among 0.6% of pre-school children and 0.4% of their mothers (Anonymous, 1995). In Egypt, the area of Sweetpotato under production has reached 30.000 acre. The average yield is 12 tons per acre.

Materials and Methods

- Forteen cultivars/clones of sweetpotato (Table 1) were delivered to AGERI from CIP/ Nairobi in 2002 as 20 cuttings for each cultivar/clone.

- Clones were return to *in vitro* propagation for their massive micro-propagation (Fig. 1).
- Different media compositions (MS basal salt media and 2-4% sucrose supplemented with several concentrations of 0.1, 0.5 and 1.0 mg/l BA and/or kinetin, in combination with 0.5 mg/l GA₃ or IAA) were tested. Plants were incubated at 24°C-30°C under 16 hours of light with intense ranged from 200-500 foot candle.
- *In vitro* plants were acclimatized under insect-proof greenhouse and used as mother plants for the cuttings to be evaluated at the AGERI experimental field (clay heavy soil) as well as Kafr El Zayat location (sandy loamy soil, Fig.2).
- Plants were harvested over 3 times (130, 150 and 170 days).
- Yield characteristics (weight of roots and number of roots) were evaluated (Table, 2 and 3)
- Based on field evaluation results, 8 cultivars were selected to be evaluated for their chemical composition (total soluble solids (TSS), total solids (TS), ascorbic acid, total carotenoids, moisture, total protein, protein digestibility, lipids, reducing sugars, root fiber, ash, carbohydrates, starch and minerals (Zn, Mn, Fe, Ca, Na, and K), in collaboration with the Food

Technology Research Institute (FTRI), ARC.

Results

- MS media supplemented with 0.4% sucrose with 0.5 mg/l GA₃ was the best selected media under incubation conditions of 28°C and 375-400 foot candles for all tested cultivars.
- Field evaluation indicated that cultivars/clones Beauregard, Tainung-64, Gemsa-74-228, NC-1525, Japon Transmesion, Kemb-37, Santo Amaro and Lo-323 were promising in production and root quality (Fig. 3).

Acknowledgment

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References

- Kays, S.J. (2005). Sweetpotato production worldwide: assessment, trends and the future. *Acta Horticulturae* 670: 19-25.
- Anonymous (1995). National survey for assessment of Vit. A status in Egypt. Egyptian Nutritional Institute in collaboration with UNICEF.



Figure (1) Sweetpotato performance in the culture room.



Figure (2) Sweetpotato cultivars evaluation at AGERI experimental fields.

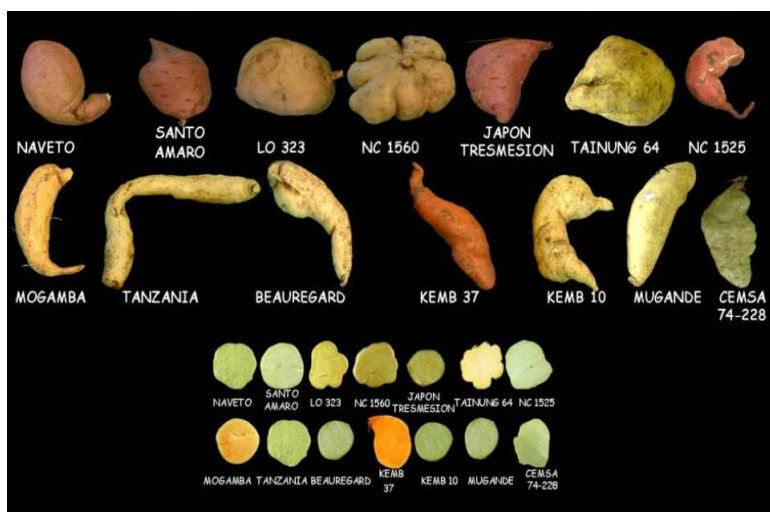


Figure (3) Sweetpotato varieties used in this study and obtained from CIP and their cross section showing the white and orange cultivar.

Table (1) cultivars/clones of sweetpotato delivered to AGERI from CIP/ Nairobi

CIP Accession NO.	Variety/cultivar
400004	CEMSA 74-228
400011	SANTO AMARO
420009	JAPON TRESMESINO
440034	MOGAMBA
440092	NC 1525
440093	NC 1560
440131	NAVETO
440163	MUGANDE
440116	TANZANIA
440169	KEMB 10
440170	KEMB 37
440185	LO 323
440189	TAINUNG 64
440132	BEAUREGARD

Table(2). Effect of location and harvest time on root numbes.

H	L	Cultivars														HxL mean	L mean	H mean
		1	2	3	4	5	6	7	8	9	10	11	12	13	14			
1	AGERI	2.100 ^{m-p}	3.900 ^d	1.200 ^u	1.600 ^{rs}	2.800 ^{ghi}	5.00 ^b	0.000	0.000	1.000 ^{i-sw}	1.200 ^{ui}	2.300 ^{k-n}	1.000 ^{i-sw}	3.200 ^{ef}	4.300 ^f	2.114 ^B		
	El-Zayat	1.000 ^{i-w}	2.500 ^{-l}	1.200 ^u	2.300 ^{k-n}	1.800 ^{qr}	5.100 ^b	0.800 ^{v-y}	0.600 ^{vz}	1.000 ^{i-sw}	1.100 ^{uv}	1.600 ^{rs}	0.900 ^{u-x}	2.600 ^{jk}	2.400 ^{im}	1.786 ^C		
	HxC	1.550^{F-L}	3.200^{BC}	1.200^{G-N}	1.950^{D-J}	2.300^{DEF}	5.050^A	0.400^{M-P}	0.300^{NOP}	1.050^{I-O}	1.150^{GN}	1.950^{D-J}	0.950^{K-P}	2.900^{BCD}	3.350^B			1.950^A
	mean																	
2	AGERI	1.600 ^{rs}	3.400 ^e	1.800 ^{qf}	0.800 ^{v-y}	2.800 ^{ghi}	7.800 ^a	0.100	1.700 ^{wp}	1.000 ^{tw}	1.000 ^{i-w}	1.600 ^{rs}	0.500 ^{vz}	3.300 ^{ef}	3.000 ^{gh}	2.179 ^B		
	El-Zayat	1.300 st	1.800 ^{qf}	0.800 ^{v-y}	1.100 ^{tuv}	1.300 st	2.600 ^{jk}	0.000	0.300 ^z	2.100 ^{m-p}	0.500 ^{vz}	0.000	0.900 ^{u-x}	1.300 st	1.300 st	1.093 ^D		
	HxC	1.450^{F-L}	2.600^{B-E}	1.300^{G-M}	0.950^{I-P}	2.050^{D-H}	5.200^A	0.050^P	1.000^{I-P}	1.600^{F-L}	0.750^{I-P}	0.800^{L-P}	0.700^{L-P}	2.300^{C-F}	2.150^{D-G}			
	mean																	
3	AGERI	1.800 ^{pw}	2.800 ^{gh}	1.200 ^u	3.100 ^{efg}	2.700 ^{hij}	7.800 ^a	0.000	1.900 ^{rt}	1.900 ^{rt}	2.000 ^{uq}	2.300 ^{k-n}	2.000 ^{uq}	2.600 ^{jk}	4.300 ^f	2.600 ^A		
	El-Zayat	2.200 ^{l-o}	0.800 ^{v-y}	0.800 ^{v-y}	1.200 ^u	1.600 ^{rs}	2.400 ^{im}	0.300 ^z	0.600 ^{vz}	0.700 ^{wxy}	0.800 ^{v-y}	0.000	0.500 ^{vz}	1.300 st	0.900 ^{u-x}	1.007 ^D		
	HxC	2.000^{D-I}	1.800^{E-K}	1.000^{I-P}	2.150^{D-G}	2.150^{D-G}	5.100^A	0.150^{OP}	1.250^{G-N}	1.300^{G-M}	1.400^{F-L}	1.150^{H-N}	1.250^{G-N}	1.950^{D-J}	2.600^{B-E}			
	mean																	
LxC	AGERI	1.833 ^{m-s}	3.367 ^{def}	1.400 ^{n-t}	1.833 ^{j-o}	2.767 ^{e-i}	6.867 ^b	0.033 ^z	1.200 ^{p-v}	1.333 ^{o-u}	1.400 ^{n-t}	2.067 ^{i-o}	1.167 ^{p-w}	3.033 ^{e-h}	3.867 ^d		2.298 ^A	
	El-Zayat	1.500	1.700 ^{k-r}	0.933 ^{r-y}	1.533 ^{m-s}	1.567 ^{m-s}	3.367 ^{def}	0.367	0.500 ^{v-z}	1.300 ^{o-v}	0.800 ^{s-z}	0.533 ^{u-z}	0.767 ^{s-z}	1.733 ^{k-r}	1.533 ^{m-s}		1.295 ^B	
	Cultivar mean	1.667 ^{DE}	2.533 ^{BC}	1.167 ^{EF}	1.683 ^D	2.167 ^C	5.117 ^A	0.200 ^G	0.850 ^F	1.317 ^{DEF}	1.100 ^F	1.300 ^{DEF}	0.967 ^F	2.383 ^{BC}	2.700 ^B			

Number of roots of sweetpotato germplasm (C) on two different locations (L) over three harvest times (H).

Means in each group of hormones treatments, followed by the same letters are not significantly different at p=0.05 of Duncan's multiple range tests.

Table (3). Effect of location and harvest time on weight of roots.

H	L	Cultivars														HxL	L mean	H mean
		1	2	3	4	5	6	7	8	9	10	11	12	13	14			
1	AGERI	955.00 ^{ab}	655.00 ^{a-i}	610.00 ^{-k}	555.00 ^{d-m}	660.00 ^{b-n}	428.00 ^{e-s}	0.00 ^v	0.00 ^v	126.00 ^{-v}	146.00 ^v	330.00 ^{-v}	473.00 ^{-v}	913.00 ^{bc}	604.00 ^{c-k}	461.07 ^{AB}		
	El-Zayat	222.50 ^{-v}	353.00 ^{b-u}	127.00 ^{fv}	288.00 ^{kv}	145.00 ^{qv}	207.50 ^{lv}	25.00 ^{uv}	112.50 ^{-v}	29.50 ^{uv}	90.00 ^{uv}	92.50 ^{uv}	32.50 ^{uv}	514.50 ^{e-p}	385.00 ^{e-t}	187.46 ^C		
	HxC	588.750^{A-F}	504.00^{C-H}	368.50^{E-M}	421.50^{E-K}	402.50^{F-L}	317.750^{H-O}	12.500^S	56.250^{RS}	77.750^{P-S}	118.0^{N-S}	211.25^{K-S}	252.75^{L-R}	713.75^{ABC}	494.500^{D-I}		324.3B	
	mean																	
2	AGERI	937.00 ^{ab}	701.00 ^{-g}	866.00 ^{cd}	71.00 ^{uv}	748.00 ^{bc}	674.00 ^{bc}	24.00 ^{uv}	146.0 ^{uv}	129.00 ^{-v}	143.00 ^v	387 ⁴ .00	134.00 ^{-v}	437.20 ^{-s}	508.00 ^{e-p}	421.80 ^B		
	El-Zayat	547.00	e- ⁵ 78.00 ^{d-l}	118.00 ^{sv}	186.00 ^{pv}	384.00 ^{e-t}	248.00 ^{m-v}	0.00 ^v	93.00 ^{uv}	264.00 ^{-v}	72.00 ^{uv}	0.00 ^v	306.00 ^{fv}	348.00 ^{bu}	219.00 ^{pv}	240.21 ^C		
	HxC	742.0^{A-B}	639.50^{A-E}	492.0	D-I 128.50	N-S 566.0 ^{B-G}	461.0^{E-J}	12.00^S	119.50^{N-S}	196.50^{L-S}	107.5^{0-S}	193.5^{L-S}	220.0^{K-S}	392.6^{F-L}	363.50^{G-M}		331.0B	
	mean																	
3	AGERI	530.00 ^{-o}	966.00 ^{-b}	259.00 ^{qv}	309.00 ^{qv}	457.00 ^{qv}	674.00 ^{bc}	0.00 ^v	207.00 ^{lv}	243.00 ^{m-v}	292.00 ^{-v}	711.00 ^{bc-l}	475.00 ^e	903.00 ^{bc}	1218.00 ^a	517.42 ^A		
	El-Zayat	621.00 ^{-j}	154.00 ^v	37.00 ^{uv}	350.00 ^{bu}	32.00 ^{lv}	291.00 ^{kv}	62.00 ^{uv}	375.00 ^{q-s}	73.00 ^{uv}	380.00 ^{vt}	0.00 ^v	73.00 ^{uv}	689.00 ^{bg}	171.00 ^{pv}	257.71 ^C		
	HxC	575.50^{B-G}	560.0^{B-G}	148.0	M-S 329.5 ^{H-O}	394.5^{F-L}	482.50^{D-I}	31.00^{RS}	291.0^{H-P}	158.0^{M-S}	336.0^{H-N}	355.5^{G-M}	274.0^{I-Q}	796.0^A	694.50^{A-D}		387.6A	
	mean																	
LxC	AGERI	807.33a	774.0ab	578.33c	311.66efg	621.66bc	592.0c	8.00k	117.66h-k	166.0g-k	193.66f-j	476.00cde	360.66def	751.06ab	776.66ab	466.76A		
	El-Zayat	463.50cde	361.66def	94.00ijk	274.66fgh	287.0fgh	248.83f-i	29.00jk	193.5f-j	122.167h-k	180.66g-h	30.833j-k	137.16g-k	517.16cd	258.33f-i	228.46B		
	Cultivar mean	635.417 ^A	567.83 ^{AB}	336.16 ^{DE}	293.16 ^{EF}	454.33 ^C	420.417 ^{CD}	18.500 ^H	155.583 ^G	144.083 ^G	187.167 ^{FG}	253.417 ^{EPG}	248.917 ^{EPG}	634.1 ^A	517.5 ^{BC}			

Weight of roots of sweetpotato germplasm (C) on two different locations (L) over three harvest times (H).

Means in each group of hormones treatments, followed by the same letters are not significantly Different at p=0.05 of Duncan's multiple rang

