Proceedings of the 13th ISTRC Symposium, 2007
pp. 801 - 806

Farmers' perception and varieties acceptability of orange-fleshed sweetpotato in Zanzibar

Saleh H.H. and Zahor O.T.
Root and Tuber Improvement Programme, Commission of Agriculture, Research And Extension, P.O. Box 159, Zanzibar

Abstract. Ten orange fleshed sweetpotato varieties were introduced in Zanzibar from CIP-Nairobi in November, 2001. The materials received in the form of mini-cuttings were initially maintained and evaluated and bulked at two research stations, Kizimbani and Matangatuani before being sent for on-farm trials. Five elite clones were participatorily selected and taken on-farm for further evaluation and selection.On-farm, (at farmer Field Schools and Farmer Research Groups) the clones were evaluated using a RCB design with each group of farmers as a replicate. Three of the clones (TIB-4, Zapallo and W-151) were highly ranked and selected by farmers and are being recommended for promotion. This paper illustrates farmers perception and the acceptability of these varieties based on their knowledge, agronomic performance and cooking qualities.

Introduction

Sweetpotato has a very important role as a food crop in Zanzibar. It has of late assumed a cash crop status in some areas of the Islands. Though it is ranked fourth after rice, cassava and banana, sweetpotato has a special role as a food security crop. During drought periods, many low income families substitute it for bread and it also features prominently in the food recipes for breaking the fast (futari) during the holly month of Ramadan.

Sweetpotato like other root and tuber crops is a heavy feeder. It does not do well in marginal land therefore farmers in some sweetpotato producing areas of Zanzibar like Donge Muwanda use urea to improve the fertility of the soil for good production of the crop. Generally, the yield of sweetpotato in Zanzibar is low. Previous studies (COSCA, 1995; KAP Survey, 1994) reported that the average yield of sweetpotato was as low as 5 – 8 t/ha. However, the recently conducted baseline study of cassava and sweetpotato in Zanzibar (Nov, 2001) has revealed that average yield of some selected varieties were as high as 13-15t/ha in farmers' fields (Saleh *et al.*, 2001). Among the important constraints reported to cause the low yield of sweetpotato in Zanzibar were lack of capital for sweetpotato production, poor soils because of continuous cropping on the same piece of land, the use of poor quality vines and growing genetically low producing and disease and pest susceptible varieties (Op cit, 2001).Therefore, there is a need to look for new improved varieties that will be acceptable to farmers. The locally improved varieties SPN/O was introduced in the Islands by the Department of Research in the last few years and it is still the most important variety in the Islands, grown by more than 39% of the farmers (Op cit, 2001).

Sweetpotato in Zanzibar is grown both in the plantation zones where soils are rich and moisture is adequate and at the semi coral rag zone e.g. Bambi juu, Upenja etc. where soils are poor and moisture stress is a common phenomenon. Therefore the availability of drought tolerant varieties in these areas is very important. An experiment was therefore conducted to evaluate, with farmers' participation, the performance of introduced

varieties, and select those that meet farmers' growing conditions and eating qualities.

Materials and Methods

The experiment was conducted in 8 sites for two seasons (2001/2002 and 2002/2003) using seven varieties. Five of them (TIB-4, Salyboro, Zapallo, Tainung 65 and W-151) were introductions from CIP, two were local (SPN/O and Shangazi). All the five CIP varieties are orange-fleshed. They were selected by farmers from among 10 introductions planted on-station. The randomised complete block design (RCBD) was adopted with each site treated as a replication. Each variety was planted on three ridges 10m long and 1m apart. Within rows plants were spaced 0.3m from each other. No fertilizers or herbicides were applied on the plots to simulate farmers' conditions as much as possible. Four farmer field schools (FFS), two Farmer Research Groups (FRG) one prison camp (Magereza) and an individual farmer were involved in the experiment where farmers participated in all activities, from site selection to evaluation of the trial.

The vines were sourced from healthy and young mother stocks. Shoot tip cuttings 25 – 30 cm long were used. At each site soil samples were taken before planting for laboratory analysis. The following data were also taken: plant establishment (%), root yield (kg/plot), number of roots per plot, number of marketable roots per plot, number of non-marketable roots per plot, weight of marketable roots (kg/plot), weight of non-marketable root (kg/plot) and dry matter content (%).

Data were statistically analysed using M stat c computer software. Farmers assessed the varieties in the field using a scale of 1-5 (where 1 = very poor and 5 = very good) for the following characteristics: resistance to diseases, resistance to pests, drought tolerance, maturity, root shape, root size, general root appearance and flesh colour of roots.

The roots were then boiled and farmers assessed each variety for the following characteristics using a scale of 1-3 (where 1 = very good and 3 very poor): Appearance, taste, flavour, starchiness, fibrousness and general acceptability. Data were statistically analysed using the SPSS statistical software.

During the assessment, the varieties were given numbers instead of their actual names to reduce biasness in ranking of popular varieties. For each attribute the majority score was taken for each variety.

Results and Discussion

Soil nutrient content. The results of soil sample analysis are presented in Table 1. In general the soil sample analysis shows that soil fertility status in experimental sites was not a factor that could influence the performance of the sweetpotato varieties.

The Upenja site lies within the semi-coral rag zone (with soils mixed with coral stones). The Fujoni FFS site is situated in the rice valleys of the sandy belt of northern part of Unguja Island. The rest of the zones lie between the belts of plantation area and multi-storey crop patterns.

Farmers' field assessment. The average performance (mean score for all characteristics) of each variety across sites and the overall rank for each is presented in Table 2. In general, SPN/O was the high ranked variety, followed by the orange-fleshed varieties W-151 and Zapallo. Salyboro was the least preferred variety. The local control (Shangazi) was ranked second last (Table 2). This result proves that farmers can evaluate and select their preferred varieties according to their own criteria, skills and experiences.

The mean performance of the varieties for different agronomic traits across 8 sites is presented in Table 3. Significant differences (P = 0.05) were observed between varieties for percentage establishment (Table3). Varieties SPN/O and Zapallo had highest percentage establishment of 97.75% and

97.38% respectively, where as variety Salyboro had the lowest (80.94%).

Varieties differed significantly in the number of marketable roots/plot (Table3). SPN/O had the highest number (23) whereas Salyboro and Tainung 65 had the lowest (12). No significant differences were detected between varieties for marketable root weight with a range of 3 – 7 kg/plot (Table3). All the varieties had dry matter contents above 30%. However, varieties Shangazi (local check), SPN/O, Salyboro and TIB –4 had the highest dry matter contents. The differences between varieties were statistically significant (Table 3).

The mean site performance for the various agronomic characteristic is presented in Table 4. Significant differences existed between sites for number of marketable and non-marketable roots, and dry matter content. No significant

Table 1: Soil properties across eight experiments sites.

Site	Soil type	Sample depth (cm)	pH H_2O 1:2.5	Total N[1]. %	P[2] ppm	K.[3] meq K_2O/100g soil	Na[3] meq/ 100g soil
Mitakawani	Sandy clay loamy	0.30	6.1	0.145	4	0.041	0.111
Junguni	Silt loamy	0.30	7.2	0.100	23*	0.060	0.135
Fujoni	Sandy clay	0.30	6.4	0.084	3	0.064	0.489*
Kinumoshi	Clay loamy	0.30	5.7	0.334*	4	0.136	0.156
Kizimbani	Sandy loamy	0.30	5.6	0.145	6	0.248**	0.052
Upenja	Silt loamy	0.30	7.7	0.282*	45**	0.117	0.058
Matangatuani	Clay loamy	0.30	5.3	0.084	45**	0.120	0.100
Kiuyu	Sandy clay	0.30	6.4	0.066	27*	0.180*	0.207

[1]Total nitrogen (N %) was determined by semi micro-Kjeldah method using block digester.
[2]Available P (P_2O_5) by Spectrometer from Bray and Kurtz 1 extraction.
[3]Available potassium (K_2O) and Extractable Sodium (Na) were analysed by absorption spectrophotometer (AAS) using NH_4Oac.

Table 2: Average performance of sweetpotato varieties for all characteristics evaluated in the farmers.

Variety	Sites									
	Mitakawani	Junguni	Fujoni	Prison camp Kinumoshi	Kizimbani	Upenja	Matangatuani	Kiuyu	Mean	Rank
TIB-4	3.73	3.34	3.64	3.30	3.09	3.45	3.36	3.54	3.43	4
Salyboro	3.18	2.90	3.18	2.50	2.90	3.09	2.55	3.00	2.91	7
Zapallo	3.73	3.55	3.81	3.36	3.27	3.36	3.63	3.72	3.55	3
Tainung 65	2.54	3.27	3.45	2.63	2.81	3.45	3.36	3.37	3.11	5
W – 151	3.90	3.82	3.63	3.27	3.63	3.73	3.81	3.72	3.69	2
SPN/O	4.00	3.72	3.81	4.00	3.73	4.00	3.81	3.73	3.85	1
Shangazi (control)	2.7	3.18	3.09	3.00	3.18	3.00	3.27	3.27	2.96	6

Field across eight sites.
N.B.Subjective ranking is 1 – 5.
Where 1 = very bad; 2 = bad; 3 = moderate; 4 = good; 5 = very good.

differences were detected between sites for marketable root weight.

Plant establishment was lowest at Upenja FRG (85%). This was not surprising because this site is dominated by poor soils (coral rag) and moisture stress is a common phenomenon. At this site, farmers rated variety Zapallo the best. Zapallo also proved the best performer under water logged conditions at Donge Muwanda (this site was later abandoned due to floods). All the other varieties perished. Furthermore, Zapallo was highly preferred by farmers because its narrow leaves resemble those of a popular local variety whose leaves are used as a vegetable (mtoriro).

The average performance of the varieties for cooking qualities across the sites is shown in Table 5. In general five varieties (TIB-4, W-151, Zapallo and SPN/O and Tainung 65) were

Table 3: Mean performance (per plot)of seven sweetpotato varieties across eight sites evaluated by two seasons (2001/02, 2002/03).

Variety /clone	Establishment (%)	Plants with storage roots	No. of marketable roots	No. of non-marketable roots	Weight of marketable roots (kg)	Weight of non-marketable roots (kg)	Dry matter content (%)
TIB – 4	89.50	8.88	15.50	8.38	4.48 (14.9)	0.62 (2.0)	34.88
Salyboro	80.94	7.88	12.38	4.63	3.33 (11.0)	0.52 (1.7)	35.51
Zapallo	97.38	8.63	13.75	3.87	4.32 (14.4)	0.35 (1.2)	30.13
Tainung 65	75.88	7.25	12.50	6.63	7.08 (23.5)	0.46 (1.5)	30.14
W.151	92.05	8.38	16.13	6.25	4.65 (15.5)	0.61 (2.0)	31.14
SPN/O	97.75	8.70	23.38	8.75	6.72 (22.3)	0.85 (2.8)	36.16
Shangazi	92.75	8.47	22.00	5.57	5.52 (18.3)	0.55 (1.85)	36.51
Mean	89.40	8.30	16.52	6.29	5.16	0.56	33.49
LSD (0.05)	10.39	1.21	3.21	NS	NS	NS	4.88
CV (%)	8.88	14.45	42.63	69.42	96.93	77.7	11.14

Figures in brackets represent ton/ha, NS = Not statistically significant.

Table 4: Mean site performance for several agronomic characteristics of seven sweetpotato varieties evaluated for two seasons(2001/02, 2002/03).

Sites	Establishment (%)	No. of plant with storage roots /plot	No. of marketable roots/plot	No. of non-marketable	Weight of marketable roots (kg/ plot) roots/ plot	Weight of non-marketable roots (kg/ plot)	Dry matter content (%)
Mitaka. FFS	86.93	7.00	13.14	4.71	3.06	0.50	36.99
Upenja FRG	84.94	9.14	10.71	5.29	3.80	0.30	31.11
Kiuyu FRG	96.14	8.86	16.43	4.57	8.62	0.14	31.90
Fujoni FFS	91.71	9.14	15.00	5.85	5.30	0.95	33.97
Kizimbani	90.29	6.71	16.43	10.29	4.44	0.76	29.67
Kinumoshi	92.58	9.57	17.00	9.00	5.23	1.06	33.57
Junguni FFS	86.29	8.86	18.50	5.28	3.97	0.35	31.66
Matangatuani	86.82	8.43	24.80	5.57	6.78	0.24	34.09
Mean	89.46	8.46	16.50	6.32	5.15	0.53	32.57
LSD (0.05)	9.38	1.45	8.33	5.04	NS	0.52	4.412

Table 5: Mean scores of seven sweetpotato varieties for seven cooking characteristics evaluated across eight sites for two seasons (2001/02, 2002/03).

Site	Average score (1-3) for combined attributes per variety.						
	Varieties						
	TIB-4	Salyboro	Zapallo	Tainung	W-151	SPN/O	Shangazi
Mitakawani	1.00	1.50	1.17	1.50	1.00	1.70	2.00
Upenja	1.00	1.50	1.33	1.17	1.17	1.33	1.33
Kiuyu	1.00	2.00	1.50	1.00	1.00	1.67	2.16
Fujoni	1.67	1.50	1.33	1.67	1.60	1.00	1.67
Kizimbani	1.00	1.66	1.67	1.33	1.17	1.33	1.50
Kinumoshi	1.17	1.67	1.00	1.67	1.17	1.00	1.67
Junguni	1.00	1.83	1.00	1.50	1.00	1.17	1.83
Mat/tuani	1.17	1.67	1.17	1.33	1.00	1.17	1.33
Overall mean	1.12	1.66	1.27	1.39	1.13	1.29	1.68
Overall rank	1	6	3	5	2	4	7

N.B The subjective ranking score is 1-3 where as 1 =good, 2 moderate and 3 = bad.

Table 6: Mean scores of six sweetpotato cooking characteristics for seven varieties evaluated across eight sites for two seasons (2000/01, 2001/02).

Sites	Attribute (Score 1-3)							
	Appearance	Taste	Flavour	Starch	Fibrousness	General acceptability	Mean	Rank
Mitakawani	1.57	1.14	1.42	1.42	1.14	1.28	1.33	5
Upenja FFS	1.28	1.00	1.57	1.51	1.00	1.14	1.26	1
Kiuyu	1.57	1.42	1.42	1.28	1.14	1.57	1.40	8
Fujoni FFS	1.42	1.28	1.14	1.42	1.14	1.28	1.28	3
Kizimbani	1.20	1.28	1.42	1.42	1.00	1.28	1.30	4
Kinumoshi	1.42	1.00	1.57	1.57	1.14	1.42	1.33	5
Junguni	1.57	1.42	1.28	1.28	1.14	1.28	1.33	5
Mat/tuani	1.28	1.28	1.42	1.42	1.00	1.42	1.26	1
Mean	1.44	1.22	1.38	1.45	1.08	1.33		
Rank	5	2	4	6	1	3		

Ranking score 1-3 (1=good, 2=moderate, 3= bad).

rated "good" across the sites. Two of them (Salyboro and the local check-Shangazi) were rated "moderate" (Table 5).

All the cooking qualities were rated good for all the varieties across sites. It is also noteworthy that these varieties were not fibrous and tasted sweet (Table 6). Farmers in Zanzibar prefer non-fibrous sweet varieties (Saleh and Mohammed, 2001).

Conclusion and Recommendations

From this experiment, it was observed that farmers' participation in selection of the

varieties is very important in enhancing adoption of new technologies (varieties). Farmers Field School and Farmers Groups were vital in this work.

All the seven varieties possessed had attributes desirable to farmers. All the seven varieties will therefore be recommended to farmers. Farmers at each agro-ecology will select the varieties to adopt.

More on-farm testing of these varieties should be encouraged. In addition, measures should be put in place for multiplying and distributing quality planting materials for the selected materials.

Acknowledgements

We are grateful to CIP for the support and provision of OFSP mini-cuttings. The support of Zanzibar Government through the Commission of Research and Extension and National Agricultural Extension Project Phase II is highly appreciated. The collaborating farmers and inputs and comments from Mr. K.S. Mohammed and Dr. M.A. Juma of Ministry of Agriculture, Zanzibar are also appreciated.

References

Ali, F.H., Salim, S.A., Rashid, F.S. and Hilal, S.M. 1996. Collaborative Study of Cassava in Africa (COSCA) survey results, Zanzibar Island.

Root and Tuber Improvement Programme, Ministry of Agriculture, Livestock and Natural Resources, Zanzibar.

Ali, F.H., Khatib, A.I. and Foum. 1995. Survey of Knowledge, Attitude and Practices (KAP) of five food crops and poultry production for Strategic Extension Campaign in Zanzibar, United Republic of Tanzania.

Mbwana, M.W. 1999. Crop Statistics in Zanzibar, with special reference to Cassava and Sweetpotato.

Root and Tuber Improvement Programme, Zanzibar (MANREC).

Nxumalo, M.H. and Edje, O.T. 1998. Farmers Participation in the selection of sweetpotato cultivars for on-farm trials. Paper presented in the SARRNET scientific workshop in Harare, Zimbabwe, 1998.

Saleh, H.H. 2002. The adaptive research: Progress and Constraints, the case of Zanzibar. Paper presented at the Curriculum workshop held at Kizimbani Agric. Training Institute, Zanzibar, 2002.

Saleh, H.H. and Mohammed, S.O. 2001. The baseline study of cassava and sweetpotato in Tanzania (Zanzibar zone). Root and Tuber Crops Improvement Programme, Zanzibar.