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EVALUATION AND SELECTION OF IMPORTED AND LOCALLY COLLECTED TROPICAL TYPE SWEET POTATO ACCESSIONS

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ABSTRACT: Sweet potato [*Ipomoea batata* (L.) Lam.] is an important root crop in the Caribbean. In 1998 a selection program was established to evaluate landraces and accessions from the USDA Plant Germplasm System, for horticultural traits and adaptability to conditions in the Caribbean. Tuber number fluctuated from 49,056 to 97,170 /ha and yields ranged from 28,577 to 57,798 kg/ha. Analysis of variance showed significant differences for accession and time of harvest but not for the interaction between accession and harvest time. Accession 98-023 produced the highest yield, but root deformation may limit its commercial acceptance. Accession 98-022 and 97-031 produced 43,173 and 43,500 kg/ha, respectively, and have good tuber shape, high quality flesh appearance and good flavor. All of the accessions evaluated in this experiment are susceptible to the sweet potato weevil.

INTRODUCTION

Sweet potato [*Ipomoea batata* (L.) Lam.] is an important root crop in the Caribbean. In Puerto Rico sweet potato production is estimated at 3,013 t with value of $1.9 million. In 1999, imports of sweet potato for fresh market were estimated at 9,510 t with most of the imported sweet potato coming from Dominican Republic. In 1950, the University of Puerto Rico initiated a program to improve local sweet potato varieties (Moscoso, 1955). Cultivars Miguela and Mina were recommended for commercial use after intensive testing (Badillo-Feliciano et al., 1976). In addition, the USDA Tropical Agriculture Research Station at Mayagüez established a program to develop a staple type sweet potato to replace the Irish potato in Puerto Rico (Martin, 1987). Cultivars Papota, Viola, and Ivory were released from that program. Also, nine sweet potato clones (local landraces) have been evaluated by the University of Puerto Rico at the Corozal Experiment Substation in low fertility soils, and for damage by the sweet potato weevil (*Cylas formicarius elegantulus*). More recently, a formal program for the improvement of tropical vegetables was financed by the local Agricultural Experiment Station and by the USDA. This program includes sweet potato breeding. The objective of this work is to introduce and evaluate sweet potato clones for horticultural traits and adaptability to conditions in the Caribbean.

MATERIALS AND METHODS

The experiments were conducted at the Agricultural Experiment Substation in Isabela, in northwestern Puerto Rico. The soil is an Oxisol (Typic Hapludox, very-fine kaolinitic isohyperthermic) with a pH of 6.0 and 15,230, 1400 and 80 mg/kg of P, K, Ca and Mg, respectively. The average rainfall is 1630 mm, with a maximum temperature of 29 C and a minimum of 19 C. The accessions evaluated in this project came from the USDA Plant Germplasm System (NPGS); landraces were from different places of Puerto Rico. Cultivars were propagated from vine cuttings of approximately 45 cm long and were planted in a raised bed. From 1998 to 2001, 120 accessions were evaluated in different sites. Low yielding, off-shaped and disease infected cultivars were discarded. After the preliminary screening seven accessions and two check varieties were selected for the final test. Experimental plots were 5.3 m wide by 6.0 m in long with 4 rows and 1.1 m apart. The experimental design was a Randomized Complete Block with a split plot arrangement and four replicates. Accessions were the main plots and times of harvest the subplots. Fertilizer 6-6-12 at a rate of 1121 kg/ha was banded two weeks after planting. All plots were hand weeded twice. Overhead irrigation rate of 25 mm per week was applied as needed. Other evaluations such as sugar content, number of tubers, yield, and damage by the sweet potato weevil were conducted in

the field and in the laboratory. Analysis of variance and Fisher's Least Significant Difference Test (LSD) were conducted for number of tubers and yield.

RESULTS AND DISCUSSION

After preliminary screening and selection based on skin and flesh color, tuber size and shape, disease tolerance, and desirable agronomic characteristics, seven accessions and two varieties were selected for final evaluation. Skin and flesh color are very important characteristics in sweet potato. Table 1 shows origin and skin and flesh color for the seven accessions and two varieties evaluated in this experiment. All of the accessions, except 97-031, have reddish skin. Flesh color varied from light yellow to yellow. Cultivar 98-022 is the only accession with a white flesh color. Acceptable tuber shape is another trait that has commercial value. Accessions 98-022 and 97-031 had the most commercial root shape and tubers were soft and without any undesirable characteristics. Cultivar 98-023 produced big tubers with some degree of deformation. Venus, Martina and other accessions evaluated had some deformation after 135 days. Accession 98-039 produced a high number of tuberous roots, but most of them were small at harvest time suggesting that this accession is late in maturity compared to the other lines.

Table 1. Origin, skin and flesh color of nine accessions of sweet potatoes evaluated at the Isabela Experiment Substation in 2001.

Local ID (PI)	Origin	Skin Color	Flesh Color
98-022	PR	Purple	White
98-023	PR	Pink	Light-yellow
97-031 (564118)	Taiwan	Cream	Light-yellow
97-033 (564120)	Taiwan	Purple	Yellow
98-039	PR	Pink	Yellow
98-040	PR	Purple	Yellow
97-045 (564770)	Papua	Purple	Light-yellow
Martina	USDA-TARS	Purple	Yellow
Venus	USDA-TARS	Purple	Yellow

Table 2 shows the analysis of variance for number of tubers and yield (at 119 and 149 days after planting). There were significant differences, among varieties and harvesting time at P 0.05. The effect of block and the interaction between accessions and time were not significant. Since there were no significant differences for interaction, Table 3 only shows accessions means for tuberous root number and yield. Root number fluctuated from 156 to 309 in a 31.8 m^2 (Table 3). Venus had the lowest number of tuberous roots in the experiment. Number of tuberous roots is one of the most important components of sweet potato yield. Total number of tuberous roots may be determined as early as 30 days after planting (Togary, 1950).

Table 2. Analysis of variance for number of tubers and yield at 119 and 149 days after planting.

		P-value	
Source	df	Tubers	yield
Block	3	0.0634	0.5716
Accessions	8	0.0001	0.0001
Error (a)	24		
Time	1	0.0062	0.0001
Accession by time	8	0.6031	0.1826
Error (b)	27		
Total	71		
c.v.		13.7598	16.3505

Yield fluctuated from 28,577 to 57,798 hg/ha (Table 3). The analysis of variance shows no significant differences for block and interaction between time and accession (Table 2). The analysis did show significant differences for accession and time of harvest. Accession 98-023 produced the greatest tuber yield and accession 97-045 the lowest yield (Table 3). No significant differences at the five percent level were found between accession 98-040 and Martina.

Table 3. Number of tuberous roots and estimated yield of nine accession of sweet potatoes evaluated at Isabela Experiment Substation in 2001.

Accession	Tuberous Roots Number	Yield kg/ha
98-023	193*	57,798
98-040	165	46,999
98-039	309	43,951
Venus	156	43,769
97-033	218	43,740
97-031	247	43,500
98-022	242	43,173
Martina	175	39,500
97-045	167	28,577
LSD (0.05)	44	12,069

* Numbers of tubers in 31.8 m².

The yield reported here are in accordance with yield levels reported by Badillo-Feliciano (1976). Evaluation of damage by sweet potato weevil (*Cylas formicarius elegantulus*) was also made in the field and in the laboratory (data not show). All of the accessions evaluated were susceptible to damage by this insect.

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