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## Performance of White-Fleshed Sweetpotato Cultivars at two Locations in Puerto Rico<sup>1</sup>

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### ABSTRACT

More than a hundred white-fleshed sweetpotato cultivars were collected during 1966 throughout the Island. These cultivars, together with others selected from the Station collection, were included in a series of trials at the Isabela and the Fortuna Substations. At Isabela, the soil is a Coto clay (Oxisol); at Fortuna, a San Antón silty clay (Mollisol). The replicated experimental plots consisted of four rows 5.49 m (18.0 ft) long and 1.07 m (3.5 ft) apart. Cultivars Miguela and Blanquita produced higher yields at Fortuna than at Isabela. However, cultivars Mina, Ponceña and Chardón yielded higher at Isabela than at Fortuna.

At Isabela, Miguela yielded 20.6, 25.9, 35.1, 36.9 and 26.1 tons/ha<sup>3</sup> during 1968-69, 1969-70, 1970-71, 1971-72 and 1972-73, respectively. Mina yields were as high as 40.7 tons/ha during 1971-72 and as low as 19.1 tons/ha during 1968-69. Ponceña yields were as high as 38.6 tons/ha during 1971-72 and as low as 18.0 tons/ha during 1968-69. Chardón highest yields (33.4 tons/ha) were obtained during 1971-72 and the lowest 14.6 tons/ha during 1968-69. The highest Blanquita yield (34.1 tons/ha) was obtained during 1970-71.

At Fortuna, the highest Miguela yield (39.1 tons/ha) was obtained during 1971-72. Mina reached its production peak during 1972-73 with 28.3 tons/ha. However, Ponceña's 32.9 tons/ha were obtained during 1971-72. Chardón peak yield (27.8 tons/ha) was obtained during 1969-70, and Blanquita's 33.0 tons/ha was obtained during 1971-72.

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<sup>3</sup> Metric tons.

### INTRODUCTION

Sweetpotatoes (*Ipomoea batatas* (L.) Lam.) have long been an important item in the diet of Puerto Ricans. In 1973-74, the farm value of sweetpotatoes marketed in the Island was \$1,989,000. Sweetpotato production in 1955-56, 1965-66 and 1971-72 was only 68.8, 44.2, and 27.9%, respectively, of the 1950-51 yield, showing a steady decline during that period (1). During 1973-74, 2658 metric tons, (58,591 cwt) of sweetpotatoes were imported from the Dominican Republic with a market value of approximately \$726,000 (2). These data show that demand exceeds local production and suggest the feasibility of increasing the area planted to this crop. Production of other starchy food crops (yams, taniers, plantains and bananas) has remained relatively steady. The decline in local sweetpotato production may be attributed in part to the use of unselected, low-yielding, mixed cultivars.

In some parts of Puerto Rico, the white-fleshed cultivars are preferred for food over those with an orange or deep-yellow color which are reportedly high in vitamin content and generally preferred in the United States.

### MATERIALS AND METHODS

A research program was begun in the late 1950's with the objective of finding higher yielding, pure sweetpotato cultivars, with a wide range of adaptability to local conditions. Under this program, local and introduced yellow- and white-fleshed cultivars were periodically tested and selected. A collection of the best cultivars was maintained throughout the years. They were screened selections made for further trials over a period of several years.

Vines from more than 100 white-fleshed sweetpotato cultivars were collected throughout the Island with the help of Extension Service personnel. Cultivars with identical morphological characteristics, but with different names, were grouped together. Preliminary field plantings for selection were made between 1966 and 1968 and low-yielding, off-shaped, and disease-infected cultivars were discarded. Observations were made at various intervals during the screening tests so as to describe the most promising cultivars horticulturally. The outstanding ones were kept for further trials. Similar observations were made throughout previous years, since 1950, on the cultivars in the Station collection.

Experiments were conducted from 1968-69 to 1972-73 at the Isabela and Fortuna Substations in northwestern and southern Puerto Rico, respectively. At Isabela, the soil has been classified as Coto, a Tropeptic Haplorthox, clayey, kaolinitic, isohyperthermic. It had a pH of 4.8, a CEC (NH<sub>4</sub>OAc) of 13.3 meq/100 g of soil in the topsoil, and the sum of exchangeable bases decreased from 5.0 meq in the topsoil to 1.8 meq in

the subsoil. Exchangeable Al ranged from 0.6 to 1.6 meq (3). At Fortuna, the soil has been classified as San Antón, a Cumulic Haplustolls, fine-loamy, mixed, non-acid, isohyperthermic. It had a pH approaching neutrality, a CEC (NH<sub>4</sub>OAc) of 29.37 meq in the topsoil which increased to 22.94 meq in the subsoil.

The experiments usually were started during the autumn months. During land preparation, Diazinon AG500<sup>4</sup> at the rate of 2337 cm<sup>3</sup>/1870 l of water to the hectare (2 pt/100 gal/acre) was incorporated into the soil. The soil was plowed and disced twice. Rows were 1.07 m (3.5 ft) apart. The center of the row was mechanically opened leaving a small furrow where the vines were set. Vines about 45.7 cm (18 in) long were planted. Enide 50W was applied as a preemergent herbicide at a rate of 13.45 kg/ha (12 lb/acre) immediately after planting. Plot size, experiment design, date of planting, number of replicates and number of varieties tested in each trial were variable. Preventive insect control was practiced by spraying with Diazinon AG500 at a rate of 1168 cm<sup>3</sup>/935 l of water per hectare (1 pt/100 gal/acre) every 20 days. Fertilizer 6-6-12, at the rate of 1121 kg/ha (1000 lb/acre), was banded 2 weeks after planting. The rows were mechanically cultivated and the small areas alongside the vines were hand-hoed; later, the ridge was mechanically formed. The two center rows of a four-row plot were harvested 5 months after planting by means of an Irish potato digger or a conventional plow. The produce was classified as commercial or noncommercial according to local official standards.

Most of the experiments were conducted simultaneously at the Isabela and the Fortuna Substations. The 1968-69 and 1969-70 tests included 49 and 25 cultivars, respectively, at both sites. In the 1970-71 experiments, conducted only at the Isabela Substation, 16 cultivars were compared. In 1971-72 and 1972-73 18 and 7 cultivars were compared, respectively, at both sites.

Evaluation of the cultivars was not solely on the basis of yield. Due consideration was given to other factors such as nematode, insect and disease resistance. Other important factors considered were growth habit, ease of propagation, plant vigor, ability of foliage to smother weeds quickly, and length, shape, flesh color and cracking of roots. Thus, some high-yielding cultivars were not kept after the screening trials or were discarded during the formal, replicated trials, because of undesirable characteristics. Due to the large and variable number of cultivars included in the replicated tests (from 7 to 49) and to the still larger number included in the previous screening tests, results from only the 5

<sup>4</sup>Trade names are used solely for the purpose of providing specific information. Mention of a trade name does not constitute a guarantee or warranty by the Agricultural Experiment Station of the University of Puerto Rico or an endorsement over other materials not mentioned.

outstanding cultivars at each location throughout the 1968-73 formal testing period are presented. Rank, based on yields, plus the agronomic considerations previously mentioned were determinant factors in the final selection of the outstanding cultivars.

## RESULTS AND DISCUSSION

### CULTIVAR DESCRIPTIONS

Miguela is a local cultivar, suitable for the fresh market, collected at the Pedro Pérez González farm in 1966. It is a high yielder. Roots vary in size, length and shape (mostly spindle-shaped, some are globular) with slightly crenated surface, with pink skin and white flesh. The vines are green, large, surface-veined, with entire margins, sagittate, with heart-shaped base and red veins. The petioles are green, but with a red base. The heavy foliage provides an excellent cover for controlling weeds and protecting the soil. It propagates well.

Ponceña is similar morphologically in most respects to Miguela, but is a consistently lower yielder. There is a possibility that one is a selection from the other. This cultivar was collected from various farms at different locations under different names.

Mina is a local cultivar suitable for the fresh market. It was collected at the Benedicto Robles farm, Manatí, Puerto Rico, in 1966. This cultivar is a high yielder with attractive, uniform shaped roots. Roots are large, long, not smooth but rather folded, with pink skin and white flesh. The vines are green, long and vigorous. The leaves are surface-veined, parted, with five lobes. The deep green leaves with pink veins are attached to the vines by long green petioles. The foliage is heavy and provides a good cover for controlling weeds and protecting the soil. It propagates well.

Blanquita is a mutation from UPR #3, discovered by Mr. Carlos G. Moscoso, from the University of Puerto Rico Agricultural Experiment Station staff. This cultivar is a moderate yielder with attractive, uniform shaped roots. Roots are smooth, spindle-shaped with a cream white skin and white flesh. The vines are green, long and vigorous. The green leaves are medium-sized, with a smooth surface, sagittate, with heart-shaped base and with an occasional toothed surface. The leaf vein is purplish, turning more purple at the petiole base. The foliage is somewhat dense. It propagates well.

Chardón is a local cultivar, suitable for the fresh market. It was collected at the Julia Mounier farm, Naguabo, Puerto Rico, in 1966. This cultivar is a moderate yielder with round, long or globular roots. Roots have a smooth surface, cream skin and white flesh. The vines are long, vigorous and thick. The leaves are large, with green petioles and veins,

sagittate, with a heart-shaped base. The stems are green and vigorous. The foliage is very thick. It propagates well.

#### YIELDS AT ISABELA

*1968-69.* Forty-nine sweetpotato cultivars, planted in October 1968, were harvested 5 months later. A balanced lattice design with six replicates was used. Crop yields fluctuated from 21.3 tons/ha<sup>3</sup> for Aparecida (Jobos) to 1.1 tons/ha for Corredora. Miguela, Mina, and Ponceña yielded 20.6, 19.1 and 17.9 tons/ha, respectively. These were 76.3, 63.8, and 53.7 %, respectively, higher than yields of Blanquita. Blanquita, the check cultivar, yielded 11.7 tons/ha. Yields of Chardón were 25.4% higher than those of Blanquita. There were no significant differences between mean yields of the five cultivars retained for further testing.

*1969-70.* Twenty-five cultivars were planted in October 1969 and harvested in March 1970. A simple lattice design was used with six replicates. Yields fluctuated from 33.4 tons/ha for the Blanca (A) to 15.1 tons/ha for the Mr. Cora cultivar. Chardón, Miguela, and Mina yielded 28.2, 25.9, and 24.2 tons/ha, respectively. They outyielded Blanquita by 19.8, 22.4, and 2.8%, respectively. The check cultivar, Blanquita, yielded 1.3 tons/ha more than Ponceña. The latter was the lowest yielder (22.3 tons/ha) of the five cultivars retained. There were no significant differences between the means of the five cultivars, except in the case of Chardón which differed significantly from Blanquita.

*1970-71.* Sixteen cultivars were planted in November 1970 and harvested in April 1971. A balanced lattice design was used with five replicates. Crop yields fluctuated from 35.2 tons/ha for Miguela to 17.5 tons/ha for Aparecida (A). Blanquita and Ponceña yielded 34.1 and 33.6 tons/ha, respectively. Miguela outyielded Blanquita by 5.9%. Blanquita yielded 0.6, 3.0, 3.0 tons/ha, respectively, more than the Ponceña, Chardón, and Mina. There were no significant differences between mean yields of the five cultivars.

*1971-72.* Eighteen cultivars were planted in October 1971 and harvested 5 months later. The experimental layout followed a partially balanced incomplete block design replicated four times. Crop yields fluctuated from 40.7 tons/ha for Mina to 15.6 tons/ha for PI320448. Mina yielded 71.0% more than Blanquita. Ponceña, Miguela, and Chardón yielded 14.8, 13.1, and 9.6 tons/ha more, respectively, than Blanquita. The check cultivar, Blanquita, yielded 23.8 tons/ha. Mina, Miguela, and Ponceña yielded significantly higher than Blanquita. There were no significant differences between Chardón and Blanquita. The mean yields of Mina, Miguela, Ponceña, and Chardón did not differ significantly.

1972-73. Seven cultivars, planted in October 1972, were harvested 5 months later. A randomized block design was used with six replicates. Crop yields fluctuated from 29.7 tons/ha for Ponceña to 15.0 tons/ha for Blanquita. Mina, Miguela, and Chardón yielded 14.3, 11.1, and 5.8 tons/ha, respectively, more than Blanquita. Ponceña, Miguela, and Mina mean yields were not significantly different at the .05 probability level. However, there were significant differences between the mean yields of Chardón and Blanquita. Ponceña, Miguela, and Mina yielded significantly higher than Chardón and Blanquita.

#### YIELDS AT FORTUNA

1968-69. Forty-nine cultivars were planted in November 1969 and harvested in April 1970. A balanced lattice design with six replicates was used. Crop yield varied from 30.2 tons/ha for Arecibeña to 0.2 tons/ha for Monte Grande. Mina, Miguela, and Chardón yielded 21.4, 19.2, and 18.9 tons/ha, respectively. These three cultivars outyielded Blanquita by 77.4, 59.8, and 57.1%, respectively. Blanquita, which was the check cultivar, yielded 12.0 tons/ha. There were no significant differences between the mean yields of the five cultivars retained for further testing.

1969-70. Twenty-five cultivars were planted in November 1969 and harvested in April 1970. A simple lattice design with six replicates was used. Crop yield ranged from 34.5 tons/ha for the Aparecida (Jobos) to 11.0 tons/ha for Colorada (A). Ponceña, Miguela, and Chardón yielded 28.6, 27.3, and 27.8 tons/ha, respectively. They outyielded Blanquita by 43.04, 36.8, and 39.2%, respectively. There were no significant differences between the five cultivars, except in the case of Ponceña which differed significantly from Mina. Mina yielded 19.3 tons/ha. However, Blanquita produced 0.7 ton/ha more than Mina.

1971-72. Eighteen cultivars were planted in October 1971 and harvested 5 months later. A partially balanced incomplete block design replicated four times was used. Crop yields ranged from 39.7 tons/ha for Blanca Americana to 19.8 tons/ha for PI318661. Miguela yielded 39.1 tons/ha which was 18.4% more than the Blanquita. The check cultivar, Blanquita, yielded 33.0 tons/ha which is 0.1, 5.9, and 7.1 tons/ha more than the yields of Ponceña, Mina, and Chardón, respectively. Miguela yielded significantly higher than Mina and Chardón. There were no significant differences between mean yields from Miguela, Blanquita, and Ponceña. Neither were there significant differences between the mean yields of Blanquita, Ponceña, Mina, and Chardón.

1972-73. Seven cultivars were planted in October 1972, and harvested 5 months later. A randomized block design replicated six times was used. Crop yield varied from 28.6 tons/ha for Miguela to 15.5 tons/ha for Blanquita. Mina, Ponceña, and Chardón yielded 12.8, 8.3, and 2.7 tons/

ha more, respectively, than Blanquita. Miguela and Mina yielded significantly higher than Chardón and Blanquita. There were no significant differences between the mean yields from Miguela, Mina, and Ponceña. Neither were there differences between the mean yield of Chardón and those of Ponceña and Blanquita.

#### EFFECT OF LOCATION

No consistent effect of location on relative sweetpotato yields was evident. With few exceptions, the behavior of the cultivars followed the same trend. A cultivar that ranked high at Isabela also ranked high at Fortuna for a specific year, irrespective of crop yields.

Miguela yielded higher at Fortuna than at Isabela during 1969-70, 1971-72, and 1972-73. However, during 1968-69 yields at Isabela were higher than at Fortuna. Yields of Mina and Chardón were higher at Isabela than at Fortuna during 1969-70, 1971-72, and 1972-73. However, they were higher at Fortuna during 1968-69. Ponceña yields were higher at Isabela than at Fortuna during 1968-69, 1971-72, and 1972-73, but during 1969-70 yields were higher at Fortuna than at Isabela. Yields of Blanquita were higher at Fortuna than at Isabela during 1968-69, 1971-72, and 1972-73, but during 1969-70 yields were higher at Isabela.

In general, yields of Miguela and Blanquita were higher at Fortuna than at Isabela. On the other hand yields of Mina, Ponceña, and Chardón were higher at Isabela than at Fortuna.

#### RESUMEN

Durante el 1966 se recolectaron a través de la Isla, con la cooperación del personal del Servicio de Extensión Agrícola, más de cien cultivares de batata de pulpa blanca. Mediante un programa de selección se descartaron los cultivares iguales pero con distintos nombres o con características indeseables. Estos, conjuntamente con los cultivares seleccionados anteriormente de la colección que se mantenía en la Subestación de Isabela, se incluyeron en una serie de ensayos formales para eliminar los cultivares de producción inferior y de características agronómicas indeseables. Este trabajo se efectuó en las Subestaciones de Isabela y Fortuna. Se encontró que los cultivares Miguela y Blanquita producen bien en la zona sur de la Isla, mientras que los cultivares Mina, Ponceña y Chardon producen mejor en la zona noroeste.

En términos generales, no hubo un efecto aparente muy marcado atribuible a zona de ubicación sobre los rendimientos de ninguno de los cultivares. Tampoco hubo diferencias marcadas en producción de ningún cultivar en una u otra localidad.

En Isabela el rendimiento del cultivar Miguela fue de sólo 20.6 Tm./Ha. en el 1968-69. Sin embargo, aumentó a 37.0 Tm./Ha. en 1971-72. El rendimiento del cultivar Mina fue de sólo 19.1 Tm./Ha. en el 1968-69, pero aumentó a 40.7 Tm./Ha. en el 1971-72. El cultivar Ponceña produjo 17.9 Tm./Ha. en 1968-69 pero produjo el máximo, 38.6 Tm./Ha., durante el 1971-72. Chardón produjo 14.6 Tm./Ha. en el 1968-69, mejorando en rendimiento hasta llegar a 33.4 Tm./Ha. en 1971-72. Blanquita produjo 34.1 Tm./Ha. en 1970-71; sin embargo, había producido 11.7 Tm./Ha. en el 1968-69.

En Fortuna el cultivar Miguela produjo 19.2 Tm./Ha. en 1968-69, pero aumentó en

producción hasta 39.1 Tm./Ha. en 1971-72. La producción del cultivar Mina aumentó de 19.3 Tm./Ha. en el 1969-70 a 28.3 Tm./Ha. en el 1972-73. Durante el 1968-69 el cultivar Ponceña produjo 16.9 Tm./Ha., pero aumentó a 32.9 Tm./Ha. en el 1971-72. La mejor producción del cultivar Chardón se obtuvo en el 1969-70 con 27.8 Tm./Ha., sin embargo, ésta se redujo a 18.2 Tm./Ha. en el 1972-73. El cultivar Blanquita produjo 12.0 Tm./Ha. durante el 1968-69, aumentando a 33.0 Tm./Ha. durante el 1971-72.

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