

Yield and Total Solids Content of Four Onion, *Allium cepa*, Cultivars in Southern Puerto Rico¹

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ABSTRACT

The yield and total solids content of four onion cultivars were evaluated in a San Antón soil (Cumulic Haplustolls, fine-loamy, mixed, isohyperthermic) on the southern irrigated coastal plain of Puerto Rico. There was no significant difference in yield between Texas Grano 502 (26,953 kg/ha) and Hybrid F₁ Granex 33 (27,686 kg/ha). Both significantly outyielded cultivars Dehydrator #4 (13,432 kg/ha) and White Creole (12,135 kg/ha). White Creole was significantly superior in total solids content to Dehydrator #4, Hybrid F₁ Granex 33 and Texas Grano 502.

Bulbs of Texas Grano 502 and Hybrid F₁ Granex 33 were significantly superior in mean weight to those of White Creole and Dehydrator #4.

INTRODUCTION

Onions are a very important staple in Puerto Rico. Annual per capita consumption in Puerto Rico increased from 6.12 kg in 1972-73 to 8.23 kg in 1975-76³. For a 3.2 million population in the island, the apparent total consumption for 1975-76 was 28,626 metric tons³. During 1975-76, Puerto Rico imported more than 16,350 metric tons of onions, mainly from the United States. The net value of imports was approximately 4.2 million dollars³.

Onion industrialization would offer an added potential source of income with a reduction of onion powder importation.

According to Mendt et al.⁴, onions are grown for two purposes: a) For the fresh market—with generally big bulbs, slightly or not pungent at all, with low total solids content and not suited for prolonged storage; and b) for industrial use, mainly as powder—compact pungent bulbs, high total solids content, narrow necks, with good curing characteristics and best suited for prolonged storage.

If promising cultivars with high total solids contents were available, Puerto Rico could initiate manufacture of onion powder, thus reducing

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³ Facts and Figures on Puerto Rico's Agriculture, 1974-6. Commonwealth of Puerto Rico, Department of Agriculture.

⁴ Mendt, R., Medrano, C., y Figuera, Alí, 1976. Evaluación de cultivares de cebolla para consumo fresco y de uso industrial. Twenty-fourth Annual Congress, Tropical Region, Puerto Rico, Dec. 5-10, 1976, pp. 33-41.

the importation of this item. This paper deals with the screening of such cultivars.

MATERIALS AND METHODS

One onion experiment was established on a San Antón soil (Cumulic Haplustolls, fine-loamy, mixed, isohyperthermic⁵ at the Fortuna Substation in southern Puerto Rico.

The maximum mean temperature during the experimental cycle was 30° C and the minimum mean was 20° C. Rainfall was 60 mm; this was supplemented with 325 mm through sprinkle irrigation.

Seed of cultivars Texas Grano 502, White Creole, Dehydrator #4 and Hybrid F₁ Granex 33 were hand sown on metal flats 51 × 14 × 4 cm November 16, 1979, and the seedlings were planted in the field December 28, 1979.

A randomized block design with six replications was used. Plots consisted of 3 rows 45 cm apart and 4.5 m long. Fertilizer was sidedressed in one application immediately after planting at the rate of 111 kg/ha each of N, P₂O₅ and K₂O.

Dacthal W-75⁶ was applied immediately after planting at the rate of 8.9 kg/ha as a preemergent herbicide. Tok E-25, at the rate of 4.5 kg/ha, was used as a postemergent herbicide.

Texas Grano 502 and F₁ Hybrid Granex 33 were harvested April 8, 1980 and their fresh weight recorded. After being cured for 10 days the bulbs were weighed again. A sample of 25 dry bulbs per plot was collected to measure bulb diameter. Varieties White Creole and Dehydrator #4 were harvested April 17, 1980 and handled in the same way as the other cultivars.

Onions were completely peeled, cut into small pieces from which a known amount was thoroughly mixed, weighed and used for determining total solids.

RESULTS AND DISCUSSIONS

Table 1 shows the yield and mean bulb weight of the four cultivars. The yield of Texas Grano 502 was of the same magnitude as that obtained from the same cultivar in a previous experiment, 27,890 kg/ha⁷ when

⁵ Lugo-López, M. A., and Rivera, L. H., 1976. Taxonomic Classification of the Soils of Puerto Rico, Bull. 245, Agric. Exp. Sta. Univ. P. R.

⁶ Trade names in this publication are used only to provide specific information. Mention of a trade name does not constitute a warranty of equipment or materials by the Agricultural Experiment Station of the University of Puerto Rico, nor is this mention a statement of preference over other equipment or materials.

⁷ Mangual-Crespo, G., Ramírez, C. T. and Orengo, E., 1979. Effect of plant spacing and fertilizer levels on yield and dry bulb weight of onion cv. Texas Grano 502. J. Agric. U.P.R. 63 (4): 417-22.

planted at 30 cm between rows and fertilized with 100-100-100 kg/ha each of N, P₂O₅ and K₂O, and higher than the yield of 20,000 kg/ha reported by Alers et al.⁸ An excellent yield of 27,686 kg/ha was obtained from Hybrid F₁ Granex 33, which compared favorably with our check cultivar Texas Grano 502.

Cultivars White Creole and Dehydrator #4 were very poor yielders

TABLE 1.—*Marketable bulbs, yield and mean bulb weight of four onion cultivars planted at the Fortuna Substation, 1979¹*

Variety or hybrid	Marketable bulbs	Yield	Mean bulb weight
	No/ha	Kg/ha	G
Texas Grano 502	119,548a ¹	26,953a	227a
White Creole	109,386ab	12,135b	113b
Hybrid F ₁ Granex 33	108,789ab	27,686a	254a
Dehydrator #4	95,838b	13,432b	136b

¹ Mean of six replicates.

² Values in columns followed by the same letters do not differ significantly at the 5% probability level.

TABLE 2.—*Moisture and total solids content of four onion cultivars planted at the Fortuna Substation, 1979¹*

Cultivar	Moisture	Total solids content
	%	%
White Creole	82.99	17.01a ¹
Dehydrator #4	86.10	13.90b
F ₁ Hybrid Yellow Granex 33	92.25	7.75c
Texas Grano 502	92.35	7.65c

¹ Mean of six replicates.

² Values in columns followed by the same letters do not differ significantly at the 5% probability level.

with only 12,135 and 13,432 kg/ha, respectively. Their yields were significantly lower than those of Texas Grano 502 and Hybrid F₁ Granex 33.

Mendt et al.⁴ reported yields of 37,867 and 30,733 kg/ha, respectively, for cultivars Texas Grano 502 and yellow Granex PRR. They considered these two cultivars excellent yielders. They recommended their use for the fresh market, but not for long storage because of their low total solids content.

Table 2 shows the moisture and total solids content of the four

⁸ Alers-Alers, S., Orengo-Santiago, E., and Cruz-Pérez, L., 1979. The influence of various N-P-K fertilizer levels on onion production on Southern Puerto Rico. *J. Agric. U.P.R.* 63 (2): 111-15.

cultivars. White Creole registered the highest total solids percentage (17%), being statistically superior in this aspect to all other cultivars. Texas Grano 502 had the lowest percentage (7.65). Dehydrator #4 ranked second with 13.9%, being significantly superior to Texas Grano 502 and Hybrid F₁ Granex 33.

Table 3 shows the diameter of the onion bulbs of the four cultivars. Hybrid F₁ Granex 33 produced the largest bulbs with 75% being 8.9 cm or

TABLE 3.—*Diameter of the bulbs of four onion cultivars planted at Fortuna Substation, 1979*

Cultivar	8.9 cm or bigger	8.8 cm to 7.6 cm	7.5 cm to 6.4 cm	6.3 cm or less
	%	%	%	%
Hybrid F ₁ Granex 33	75	14	11	0
Texas Grano 502	33	37	28	2
White Creole	10	14	70	6
Dehydrator #4	6	20	63	11

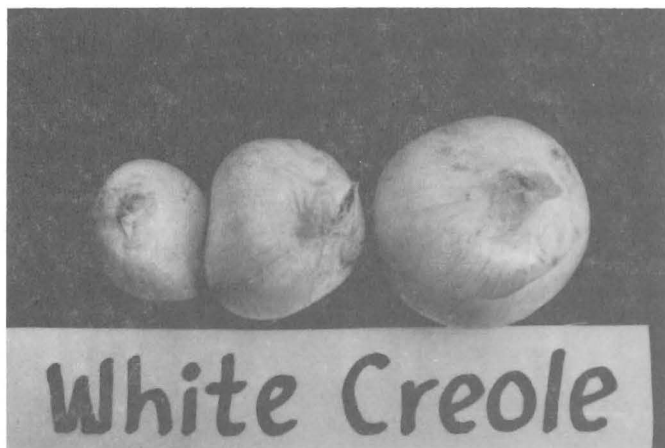


FIG. 1.—Bulbs of onion variety White Creole. Left, twin bulb; right, normal bulb.

bigger. This allowed for jumbo bulbs, which are probably preferred by restaurants and hotels. This hybrid had 14% of its bulbs in the 7.6 cm bracket totalling 89% of the yield in the diameter range of 7.6 to 8.9 cm. Texas Grano 502 was second with 33% in the 8.9 cm diameter and 37% in the 7.6 cm, totalling 70% in the higher diameter brackets. White Creole produced the smallest bulbs. In addition, this variety showed a marked tendency to produce twin bulbs (fig. 1), a detrimental condition if the bulbs are to be used for slicing.

Hybrid Granex 33 had the mean heaviest bulbs (table 1) with 254 g. This was significantly superior to those of White Creole and Dehydrator #4 but not to that of Texas Grano 502.

RESUMEN

Una siembra de cebollas de las cultivares Texas Grano 502, White Creole, Dehydrator #4 y el Híbrido F₁ Granex 33 se estableció en la Subestación de Fortuna, en el sur de Puerto Rico, el 16 de noviembre de 1979.

El Híbrido F₁ Granex 33 produjo un excelente rendimiento de 27,686 kg/ha, seguido muy de cerca por Texas Grano 502 (testigo), con 26,953 kg/ha. Las variedades Dehydrator #4 y White Creole produjeron rendimientos muy bajos—13,432 y 12,135 kg/ha, respectivamente.

La variedad White Creole arrojó el porcentaje de sólidos totales más elevado; esto es, 17%, seguida por uno excelente, 13.9%, de Dehydrator #4. Las cultivares Texas Grano 502 e Híbrida F₁ Granex 33 tuvieron un contenido de sólidos totales de 7.65 y 7.75% en cada caso.

El peso medio más alto de bulbos correspondió a la Híbrida F₁ Granex 33 seguido por el de Texas Grano 502. Dehydrator #4 y White Creole produjeron bulbos más livianos. White Creole demostró una tendencia marcada a producir bulbos gemelos, lo cual podría ser detrimental si los bulbos se cortan en tajadas para consumo en fresco.