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

Gerardo Mangual Crespo and Essau Orengo Santiago

ABSTRACT

The yield and total solids content of four onion cultivars were evaluated in a San Anton 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 1975-76. For a 3.2 million population in the island, the apparent total consumption for 1975-76 was 28,626 metric tons. 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 dollars.

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

According to Mendt et al., 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...
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, isohyperthermic) 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-75 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/ha when

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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.

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 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

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### Table 1.— Marketable bulbs, yield and mean bulb weight of four onion cultivars planted at the Fortuna Substation, 1979

<table>
<thead>
<tr>
<th>Varieties or hybrid</th>
<th>Marketable bulbs</th>
<th>Yield</th>
<th>Mean bulb weight</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No./ha</td>
<td>Kg/ha</td>
<td>G</td>
</tr>
<tr>
<td>Texas Grano 502</td>
<td>119,548a¹</td>
<td>26,953a</td>
<td>227a</td>
</tr>
<tr>
<td>White Creole</td>
<td>109,386ab</td>
<td>12,135b</td>
<td>113b</td>
</tr>
<tr>
<td>Hybrid F₁ Granex 33</td>
<td>108,789ab</td>
<td>27,686a</td>
<td>254a</td>
</tr>
<tr>
<td>Dehydrator #4</td>
<td>95,838b</td>
<td>13,432b</td>
<td>136b</td>
</tr>
</tbody>
</table>

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, 1979

<table>
<thead>
<tr>
<th>Cultivar</th>
<th>Moisture</th>
<th>Total solids content</th>
</tr>
</thead>
<tbody>
<tr>
<td>White Creole</td>
<td>82.99</td>
<td>17.01a¹</td>
</tr>
<tr>
<td>Dehydrator #4</td>
<td>86.10</td>
<td>13.90b</td>
</tr>
<tr>
<td>F₁ Hybrid Yellow Granex 33</td>
<td>92.25</td>
<td>7.75c</td>
</tr>
<tr>
<td>Texas Grano 502</td>
<td>92.35</td>
<td>7.65c</td>
</tr>
</tbody>
</table>

¹ Mean of six replicates.
² Values in columns followed by the same letters do not differ significantly at the 5% probability level.

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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 (7.6%). 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>
<thead>
<tr>
<th>Cultivar</th>
<th>8.9 cm or bigger</th>
<th>8.8 cm to 7.6 cm</th>
<th>7.5 cm to 6.4 cm</th>
<th>6.3 cm or less</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hybrid F1 Granex 33</td>
<td>75</td>
<td>14</td>
<td>11</td>
<td>0</td>
</tr>
<tr>
<td>Texas Grano 502</td>
<td>33</td>
<td>37</td>
<td>28</td>
<td>2</td>
</tr>
<tr>
<td>White Creole</td>
<td>10</td>
<td>14</td>
<td>70</td>
<td>6</td>
</tr>
<tr>
<td>Dehydrator #4</td>
<td>6</td>
<td>20</td>
<td>63</td>
<td>11</td>
</tr>
</tbody>
</table>

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.

![White Creole](image)
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.