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'NuMex Dulce' Onion

Marisa Wall[1] and Joe Corgan[2]
Department of Agronomy and Horticulture, New Mexico State University, Las Cruces, NM 88003

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In the United States, there is an increasing demand for fresh-market, low-pungency onions (*Allium cepa* L.). These onions are promoted as "sweet" and have an annual farm value >$100 million (Vavrina and Smittle, 1993). Several states, including Georgia, Texas, Washington, California, Hawaii, and New Mexico, produce and promote low-pungency onions. New Mexico markets low-pungency onions under the trademarks "Nu-Mex Sweet" and "Carzalia Sweet."

'NuMex Dulce' is a low-pungency, short-day, yellow grano-type onion that matures from late May to early June when fall planted in southern New Mexico. It has excellent yield, pink root resistance, and bolting resistance (Table 1), similar to 'NuMex Starlite' (Corgan and Holland, 1993). However, bulbs of 'NuMex Dulce' are lower and more uniform in pungency than those of 'NuMex Starlite'.

Origin

'NuMex Dulce' is a low-pungency selection from 'NuMex Starlite'. 'NuMex Starlite' was derived from five cycles of mass selection from 'Texas Grano 502 PRR' (Corgan and Holland, 1993). In developing 'NuMex Dulce', the first selection for low pungency was made in June 1990. Prior to pungency analysis, field selections were made for uniform maturity, bulb shape, and pink root resistance. The main index for onion maturity is collapse of the tissues in the neck, resulting in lodging of the top. Selections were made for uniformity of maturity during late May to early June when fall seeded. We selected bulbs that were slightly top-shaped and of medium depth. Selection for pink root resistance was accomplished by growing populations in soil severely infested with *Phoma terrestris* E.M. Hans., the causal agent for pink root, and only selecting bulbs with <20% pink roots.

Bulbs selected from the field were taken to the laboratory for pungency evaluation using the pyruvic acid (PA) technique (Wall and Corgan, 1992). Pyruvic acid is a by-product of the metabolic reactions that result in onion pungency. Low PA production, from the action of the alliinase enzyme, is correlated with low pungency (Wall and Corgan, 1992). Taste panels rated onions with PA levels <4.5 $\mu M \cdot g^{-1}$ fresh mass (FM) as mild. In breeding for low pungency, we only selected bulbs with PA levels of 4.0 $\mu M \cdot g^{-1}$ FM or lower. We also evaluated single centers by cutting each bulb transversely. Any bulb with one or two growing points within the center diameter of 3.5 cm was considered as single-centered.

Selected bulbs (24) from 'NuMex Starlite' were intercrossed, and the seed was collected individually from each bulb in 1991. The population was designated as 91-1 and consisted of maternal half-sib progeny lines. Seed of these lines were planted in Fall 1991 for bulb production. A second selection cycle in the field (for maturity, pink root resistance, and shape) and laboratory (for low pungency and single-centers) was made among and within half-sib progeny lines of 91-1 in June 1992. Selected bulbs (32) were planted and the plants intercrossed in an isolation cage to produce 93-17 seed. Replicated field trials were conducted in Las Cruces, N.M., in 1994 and 1995 comparing 93-17 ('NuMex Dulce') with 'NuMex Starlite' (Table 1). Based on those results, the line 93-17 was released as 'NuMex Dulce' in 1995.

Description and Performance

'NuMex Dulce' is a short-day, yellow grano-type onion with an estimated adaptation range of lat. 28 to 32°. Bulbs are slightly top-shaped with pale-yellow, thin outer scales, and white interior. 'NuMex Dulce' produces large bulbs and foliage, the latter being medium-green with a light bloom.

'NuMex Dulce' is recommended for fall seeding or spring transplanting to provide a supply of low-pungency onions during the month of June. Suggested planting dates at Las Cruces, N.M., are 1–10 Oct. 'NuMex Dulce' also performs well when transplanted during February. Late maturity (15–25 June) can be obtained by transplanting about 1 March.

'NuMex Dulce' and 'NuMex Starlite' were evaluated in replicated field trials in 1994, 1995, and 1996. All data were subjected to analysis of variance for a randomized complete-block design with five blocks. In the laboratory, 10 bulbs of each cultivar were analyzed from each block (total of 50) for pungency, and 20 bulbs per block were cut to evaluate the percentage of single centers. 'NuMex Dulce' bulbs harvested in 1994 and 1995 (Table 1) were not significantly different from 'NuMex Starlite' bulbs for percent bolting, percentage of marketable bulbs (data not shown), percentage of single centers, average bulb mass, maturity, or yield. The average pungency for 'NuMex Dulce' bulbs in the three field trials in 1994 and 1995 was 4.65 μM PA/g FM compared with 5.45 μM PA/g FM for 'NuMex Starlite' bulbs, a relatively large difference (Table 1). The pungency of 'NuMex Dulce' bulbs was significantly lower ($P \leq 0.05$) than that of 'NuMex Starlite' bulbs in two of the three trials. In the trial seeded 30 Aug. 1994, differences were detected at $P = 0.08$. A seed increase of 'NuMex Dulce' was tested in 1996 in replicated field trials with 'NuMex Starlite' (Table 2). In that study, maturity dates were varied by altering seeding dates and transplant size. 'NuMex Dulce' was less pungent than 'NuMex Starlite' at the earliest (28 May) and latest (14 June) maturity dates.

Spring 1994 was hotter than normal in southern New Mexico, and pungency values for both varieties were higher than in typical years. Data from bulbs harvested in 1995 and

Table 1. Performance comparison of 'NuMex Dulce' onion with 'NuMex Starlite' (control) grown on soil moderately infested with the pink root pathogen (*Phoma terrestris*) and harvested in 1994 and 1995.

Cultivar	Pungency (μM PA/g)[z]	Single centers (%)	Bulb mass (g/bulb)	Bolting (%)	Maturity	Yield ($t \cdot ha^{-1}$)[y]
		Seeded 1 to 15 Sept. 1993				
NuMex Dulce	5.45 ± 0.30[x]	---	375	11	May 19	64.3
NuMex Starlite	6.13 ± 0.36*	---	356[NS]	16[NS]	May 18[NS]	63.6[NS]
		Seeded 30 Aug. 1994				
NuMex Dulce	3.61 ± 0.33[w]	38	553	29	June 4	91.8
NuMex Starlite	4.43 ± 0.37[NS, v]	25[NS]	587[NS]	19[NS]	June 2[NS]	83.9[NS]
		Seeded 29 Sept. 1994				
NuMex Dulce	4.10 ± 0.29[w]	43	463	3	June 5	120.2
NuMex Starlite	5.11 ± 0.40*	30[NS]	543[NS]	1[NS]	June 3[NS]	108.2[NS]

[z]PA = pyruvic acid.
[y]Field plots were 2.4 m long and 1 m wide with four rows per bed.
[x]Mean ± SE. Pungency means (μM pyruvic acid/g fresh mass) are averages of 100 observations.
[w]Mean ± SE. Pungency means are averages of 50 observations.
[v]Cultivar means significantly different at $P = 0.08$.
[NS, *]Nonsignificant or significant at $P \leq 0.05$.

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[1]Associate Professor.
[2]Professor Emeritus and Jose Fernandez Chair of Crop Production.

Table 2. Effect of cultivar and maturity date effect on the pungency of onions grown on soil moderately infested with pink root (*Phoma terrestris*) and harvested in 1996.

Cultivar	Maturity date			
	28 May[z]	5 June[y]	10 June[x]	14 June[w]
	Pungency (μM pyruvic acid/g fresh mass)			
NuMex Dulce	3.45 ± 0.23[v]	3.90 ± 0.25	3.88 ± 0.26	4.45 ± 0.21
NuMex Starlite	4.20 ± 0.28[*]	3.85 ± 0.22[NS]	3.91 ± 0.27[NS]	5.84 ± 0.31[*]

[z]Plots were direct seeded on 26 Sept. 1995.
[y]Plots were transplanted with large transplants (10-mm diameter) on 6 Feb. 1996.
[x]Plots were direct seeded on 10 Oct. 1995.
[w]Plots were transplanted with small transplants (5-mm diameter) on 6 Feb. 1996.
[v]Mean ± SE. Pungency means are averages of 50 observations.
[NS,*]Nonsignificant or significant at $P \leq 0.05$.

1996 (Tables 1 and 2) are more representative of the performance of these cultivars in a normal year. Production characteristics were similar for both cultivars, and the mean pungency of 'NuMex Dulce' was significantly lower than that of 'NuMex Starlite' in four of the seven tests. In the other three tests, the pungency of the two cultivars did not differ. 'NuMex Starlite' was never found to be significantly less pungent than 'NuMex Dulce' in any trial. The pungency of 'NuMex Dulce' over several environments and planting dates was more consistent than that of 'NuMex Starlite'.

Availability

Small samples of breeder's seed are available from Marisa Wall. Foundation seed can be purchased from the New Mexico Crop Improvement Association, Box 3CI, New Mexico State Univ., Las Cruces, NM 88003. A certificate for Plant Variety Protection has been issued, and certified seed propagation for sale will be authorized through the New Mexico Crop Improvement Association.

Literature Cited

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