'NuMex Freedom' Onion

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New Mexico State Univ. Agricultural Experiment Station announces the release of 'NuMex Freedom' onion (*Allium cepa* L.). 'NuMex Freedom' is a low-pungency, high-yielding, bolting-resistant, pink-root-resistant, intermediate-day, open-pollinated, yellow onion cultivar.

Origin

'NuMex Freedom' originates from a 1988 intercross between yellow grano and sweet spanish type onions. 'NuMex Sunlite' (Corgan, 1988) and other bolting resistant selections from 'Texas Grano 502 PRR' (Corgan, 1984) were parents, as well as some later maturing (July) bulbs from sweet spanish origin. Seed was collected, designated 89-77, and planted for bulb production in 1989. Mass selection was made within the 89-77 population in 1990 for late-June maturity, bolting resistance, pink root resistance, large bulb size, grano shape, and bulb firmness. For bolting resistance, populations were planted in early September, and only nonbolting bulbs were selected. Selected bulbs were large and nearly round. Selections were made for maturity in late June in Las Cruces, N.M., when fall seeded. Populations were grown in fields severely infested with *Phoma terrestris*, the fungus that causes pink root. Bulbs with <20% pink roots were selected. Selected bulbs (59) were planted for intercrossing and seed (91-66) production in an isolation cage.

In 1992, bulbs from the 91-66 population were selected for low pungency, single centers, large size, firmness, late maturity (June 20), bolting resistance, and resistance to pink root. Pungency was measured in the laboratory using the pyruvic acid (PA) technique of Schwimmer and Weston (1961) as modified by Randle and Bussard (1993). Low PA production is correlated with low sensory perception of pungency (Wall and Corgan, 1992). Single centers were evaluated by cutting each bulb transversely at the equatorial plane. Any bulb with one or two growing points within the center diameter of 2.5 cm was considered to be single-centered. The top portions of bulbs were analyzed for PA,

and the bottom portions were saved. Only bulbs with pungency levels <4.0 μmol PA per milliliter of juice ($\mu\text{mol}\cdot\text{mL}^{-1}$ PA) were selected. The mean pungency of the 35 selected bulbs was 3.7 $\mu\text{mol}\cdot\text{mL}^{-1}$ PA. These bulbs were intercrossed in a pollination cage, with honey bees as pollen vectors, and the seed was collected from each maternal plant in 1993. The population was designated as 93-52 and consisted of 35 maternal, half-sib progeny lines. Seed of the half-sib lines was fall-planted for bulb production, and another cycle of phenotypic recurrent selection was made in the field and laboratory in 1994. Selection was made among and within half-sib lines in 1994. The 37 selected bulbs had a mean pungency of 3.3 $\mu\text{mol}\cdot\text{mL}^{-1}$ PA and were intercrossed to produce 95-2 seed.

In 1996, the latest maturing bulbs in the 95-2 population were selected, and another

cycle of recurrent selection was made for bulb shape, size, and firmness, pink root resistance, single centers, and low pungency. The 26 selected bulbs had a mean pungency of 3.4 $\mu\text{mol}\cdot\text{mL}^{-1}$ PA and were intercrossed to produce 97-27 seed. In 1998, the pungency of 97-27 bulbs was uniformly low; 100 bulbs were selected with a mean pungency of 1.3 $\mu\text{mol}\cdot\text{mL}^{-1}$ PA. These bulbs were intercrossed to produce 99-26 seed. Seed of 99-26 was planted in an isolation cage for a seed-to-seed increase to produce breeder's seed of 'NuMex Freedom' in 2000.

Description and performance

'NuMex Freedom' is a low pungency, intermediate-day, yellow grano type onion that matures from 22 to 30 June when fall seeded or spring transplanted in Las Cruces, N.M. (Table 1). Suggested planting date in southern New Mexico is 1 Oct. for fall seeding or 1 Feb. for spring transplanting. 'NuMex Freedom' also can be spring seeded for maturity 8–10 July, but the bulb size is smaller than from fall seeding. 'NuMex Freedom' has excellent yield, pink root resistance, and bolting resistance. From fall seeding, 'NuMex Freedom' matures $\approx$ 3 weeks later than 'NuMex Starlite' (Corgan and Holland, 1993) and 'NuMex Dulce' (Wall and Corgan, 1998). 'NuMex Freedom' is the

Table 1. Maturity date, bulb pungency, percentage of single centered bulbs, average bulb weight, percentage of marketable bulbs, and marketable yield of 'NuMex Freedom', 'NuMex Luna', and 'Candy' onions, grown during 1998–99, 1999–2000, and 2000–01 seasons.

Entry	Maturity date ^a	Pungency ^b (pyruvic acid) ($\mu\text{mol}\cdot\text{mL}^{-1}$)	Single ^c centers (%)	Avg bulb wt (g)	Marketable bulbs (%)	Marketable yield ^d (t·ha ⁻¹)
<i>Seeded 15 Sept. 1998</i>						
NuMex Freedom	25 June	2.79	64	568	86	71.4
NuMex Luna	25 June	5.27	47	579	77	50.9
LSD _{0.05}	NS	0.60	NS	NS	NS	15.1
<i>Transplanted 28 Jan. 1999</i>						
NuMex Freedom	30 June	3.07	37	429	90	69.9
NuMex Luna	3 July	4.83	25	428	90	49.4
Candy	7 July	4.44	37	470	95	67.0
LSD _{0.05}	3	0.70	NS	NS	NS	19.1
<i>Seeded 20 Sept. 1999</i>						
NuMex Freedom	22 June	2.10	59	455	78	74.4
NuMex Luna	8 June	5.27	40	509	92	81.2
LSD _{0.05}	4	0.81	NS	NS	NS	NS
<i>Transplanted 8 Feb. 2000</i>						
NuMex Freedom	22 June	2.13	74	182	92	34.5
NuMex Luna	23 June	3.72	66	232	94	44.2
Candy	25 June	4.34	46	196	85	36.2
LSD _{0.05}	1	0.72	10	40	NS	7.6
<i>Seeded 14 Sept. 2000</i>						
NuMex Freedom	16 June	0.92	51	591	92	98.2
NuMex Luna	16 June	2.40	29	577	90	95.5
LSD _{0.05}	NS	0.74	11	NS	NS	NS
<i>Transplanted 30 Jan. 2001</i>						
NuMex Freedom	24 June	1.75	81	510	98	89.7
NuMex Luna	26 June	3.68	42	400	100	78.0
Candy	26 June	3.79	56	451	98	84.0
LSD _{0.05}	NS	0.67	12	28	NS	6.9

^aMaturity was defined as the date by which 80% of the tops in the plot had fallen.

^bPungency and single center means are averages of 40 observations. Ten bulbs were randomly selected from each of four replications.

^cFour replications of all entries were grown on raised beds that were 1 m wide (center to center) and 2.5 m long with two rows per bed. Marketable yield was the total yield minus the weight of culled bulbs (diseased bulbs, bulbs under 3.8 cm in diameter, split bulbs, and double bulbs).

^dNS=Non-significant.

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only low pungency onion in its maturity class that can be fall seeded to produce high yields of 'sweet' onions for marketing from late June to mid-July.

Replicated field trials were conducted in the 1998–99, 1999–2000, and 2000–01 growing seasons comparing 'NuMex Freedom' to 'NuMex Luna' (Corgan, 1995), and 'Candy' (Table 1). 'NuMex Luna' is a fall-seeded cultivar that sometimes matures at a similar date as 'NuMex Freedom', but is not considered a low pungency cultivar. 'Candy' (a hybrid) is promoted as a low pungency cultivar, but does not have bolting resistance, and therefore, cannot be fall-seeded. From transplants, 'Candy' matures 3–7 d later than 'NuMex Freedom'. The data were analyzed according to a randomized complete-block design with four blocks. Analysis of variance and Fisher's protected least significant difference (LSD) tests ($P \leq 0.05$) were performed. Ten bulbs from each block were analyzed for pungency and cut horizontally to determine the percentage of single centers.

In the 1999 harvest (Table 1), 'NuMex Freedom' had higher yields and lower pungency levels than 'NuMex Luna' from fall seeding and transplants. From transplants,

'NuMex Freedom' bulbs matured earlier than bulbs of 'NuMex Luna' or 'Candy'. In the 2000 harvest (Table 1), 'NuMex Freedom' bulbs matured later and were lower in pungency than 'NuMex Luna' bulbs from fall seeding. From transplants, 'NuMex Freedom' bulbs were lower in pungency than 'NuMex Luna' and 'Candy' bulbs. However, 'NuMex Luna' produced the highest yields and the largest bulbs in that trial. In 2001, 'NuMex Freedom' bulbs were lower in pungency, with a higher percentage of single centers than 'NuMex Luna' or 'Candy' bulbs in both trials. From transplants, 'NuMex Freedom' produced larger bulbs and higher yields than 'NuMex Luna'.

From fall seeding and transplants in 1999 to 2001, the average pungency for 'NuMex Freedom' was 2.9, 2.1, and 1.3 $\mu\text{mol}\cdot\text{mL}^{-1}$ PA, respectively, whereas the average pungency for 'NuMex Luna' was 5.1, 4.5, and 3.0 $\mu\text{mol}\cdot\text{mL}^{-1}$ PA, respectively. 'Candy' bulbs averaged 4.4, 4.3, and 3.8 $\mu\text{mol}\cdot\text{mL}^{-1}$ PA from transplants in 1999 to 2001, respectively.

Availability

Small samples of breeder's seed are available from Marisa Wall. Foundation seed may

be purchased from the New Mexico Crop Improvement Association, Box 30003, MSC 3CI, New Mexico State Univ., Las Cruces, NM 88003. A Plant Variety Protection certificate has been issued, and certified seed propagation for sale will be authorized through the New Mexico Crop Improvement Association.

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