‘NuMex Quasar’ Onion

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The New Mexico State University Agricultural Experiment Station announces the release of ‘NuMex Quasar’ onion (*Allium cepa* L.). ‘NuMex Quasar’ is an open-pollinated, bolting-resistant, short-day, onion cultivar with white dry outer scales for autumn sowing in southern New Mexico. ‘NuMex Quasar’ matures in late May to early June when autumn-sown in Las Cruces, NM.

Origin

‘NuMex Quasar’ originates from ‘Texas Early White’, a white-scaled onion cultivar released from the Texas Agricultural Experiment Station in 1995 (Goldman et al., 2001; Pike, 1995). ‘Texas Early White’ was developed from an individual white bulb that segregated out of a yellow hybrid cultivar, Ringold (Pike, 1995). Pike (1995) speculated that this white bulb resulted from outcrossing with a white cultivar during the commercial seed production of ‘Ringold’. According to Pike (1995), ‘Texas Early White’ possesses a high level of bolting resistance and pink root tolerance, produces round-shaped bulbs with little greening, and produces a high percentage of single-centered bulbs.

In 1999, ‘Texas Early White’ was sown at an early autumn date (8–15 Sept.) that caused a high percentage (>85%) of plants to form premature seed stalks (bolting) in the following year. Bulbs, from the remaining 29 plants that did not form seed stalks, were saved and placed into two separate crossing cages, 01-170-1 and 01-171-1 (Fig. 1). Once bulbs in each cage began to flower the following year, blue bottle flies (*Calliphora vomitoria* L.) were introduced into each cage to pollinate flowers. Seed was collected from each cage and kept separate. Seed from each breeding line was sown at an early autumn date (18 Sept. 2001) to promote premature seed stalk formation. In the following year, both breeding lines produced greater than 50% of plants with seed stalks. From the remaining, nonbolting bulbs, a selection for deep, round globe-shaped bulbs, and bulbs with fewer pink root [causal organism,

Phoma terrestris (Hansen)] symptoms was made. The bulb selections from each breeding line were placed as two separate entries in the same crossing cage. These entries were labeled 03-17-1 and 03-17-2. Bulbs in this cage flowered, were pollinated, and seed was collected in the following year (2003). Seed from each breeding line was sown at an early autumn date (15 Sept. 2003) to promote premature seed stalk formation. The following year, a bulb selection for deep to round globe shape, no bolting, fewer pink root symptoms, greater bulb firmness when hand squeezed, and for a single growing point in the middle of the bulb when bulbs were cut transversely through their vertical center was made from 03-17-2. No bulbs were selected from 03-17-1. The bulbs selected from 03-17-2 were placed in a crossing cage labeled 05-17. Bulbs in this cage flowered, were pollinated, and seed was collected in the

following year (2005). Seed was sown on 22–25 Sept. 2006. The following year, bulbs that possessed a deep to round globe shape, matured at the same time, exhibited no bolting and fewer pink root symptoms, possessed a single growing point when cut transversely, gave little resistance when hand squeezed, and did not exhibit greening or any discoloration on the dry or fleshy bulb scales were selected. The selected bulbs were placed in a cage that was labeled 08–17. Bulbs in these cages flowered, were pollinated, and seed was collected in the following year (2008). This seed became the breeder seed for ‘NuMex Quasar’.

Evaluation Procedures

In replicated trials grown in several fields at the Fabian Garcia Science Center (FGSC) and Leyendecker Plant Science Research Center (LPSRC) in Las Cruces, NM, ‘NuMex Quasar’ (Fig. 2) was compared with ‘Texas Early White’ (Monsanto Vegetable Seeds, Woodland, CA), the standard commercial short-day onion cultivar with white dry outer scales grown in southern New Mexico, and ‘NuMex Mirage’ (Cramer and Corgan, 2007), a short-day onion cultivar with white dry outer scales released by New Mexico State University (NMSU) in 2006 (Table 1). The field soil texture was a Glendale loam and a Brazito very fine

Fig. 1. Pedigree of ‘NuMex Quasar’.

Fig. 2. ‘NuMex Quasar’ onion bulbs.

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Table 1. Bulb maturity, seed stalk percentage, marketable yield, and percentage of single-centered bulbs of NuMex Quasar as compared with NuMex Mirage and Texas Early White when grown at the Fabian Garcia Research Center, Las Cruces, NM, from 2006 to 2010.

Entry	Maturity date (DAS) ^z	Seed stalks (%) ^y	Marketable yield (t·ha ⁻¹) ^x	Single centers (%) ^w
Trial 1 (25 Sept. 2006 sowing date) ^v				
NuMex Quasar	21 May (238)	0.0	53.7	88.0
NuMex Mirage	31 May (248)	0.0	52.7	16.0
Texas Early White	29 May (246)	2.6	58.4	25.0
LSD (5%)	5 d**	2.2*	NS	15.3***
Trial 2 (2 Oct. 2006 sowing date)				
NuMex Quasar	28 May (239)	0.0	34.3	74.0
NuMex Mirage	5 June (247)	0.0	33.6	10.0
Texas Early White	7 June (249)	2.6	42.3	4.0
LSD (5%)	5 d**	NS	NS	23.9***
Trial 3 (22 Sept. 2006 sowing date)				
NuMex Quasar	17 May (237)	0.0	45.6	—
NuMex Mirage	23 May (243)	0.0	36.8	—
Texas Early White	21 May (241)	23.2	33.1	—
LSD (5%)	4 d*	8.5***	4.9*	—
Trial 4 (17 Sept. 2007 sowing date)				
NuMex Quasar	27 May (253)	0.0	67.2	77.0
NuMex Mirage	29 May (255)	0.8	62.0	39.0
Texas Early White	28 May (254)	43.8	34.0	40.2
LSD (5%)	NS	18.2**	6.4***	9.9***
Trial 5 (20 Sept. 2007 sowing date)				
NuMex Quasar	28 May (251)	0.5	24.9	89.0
NuMex Mirage	6 June (260)	0.5	28.1	22.0
Texas Early White	5 June (259)	5.4	30.6	40.0
LSD (5%)	6 d*	NS	NS	31.3**
Trial 6 (30 Sept. 2008 sowing date)				
NuMex Quasar	21 May (233)	1.5	73.8	68.0
NuMex Mirage	26 May (238)	0.4	59.7	12.0
Texas Early White	28 May (240)	34.0	41.8	11.0
LSD (5%)	2 d***	9.6***	6.0***	13.2***
Trial 7 (25 Sept. 2009 sowing date)				
NuMex Quasar	23 May (240)	22.1	36.5	83.1
NuMex Mirage	26 May (243)	1.4	41.6	47.0
Texas Early White	24 May (241)	62.6	15.3	50.0
LSD (5%)	NS	12.0***	4.9***	19.0*

LSD = least significant difference.

^zA plot was considered mature when 80% of the tops were down and was harvested at that time. DAS = days after sowing.

^yThe percentage of seed stalks was determined at harvest and calculated by dividing the number of plants with seed stalks by the total number of plants per plot and multiplying by 100.

^xMarketable bulb yield (t·ha⁻¹) was calculated by weighing the marketable bulbs per plot and adjusting the plot size to 1 ha.

^wThe percentage of bulbs with single centers (single growing points) was determined by cutting each bulb transversely at the vertical center and measuring the number of growing points that extended 1.3 cm beyond the bulb's center.

^vConventional vegetable cultural practices were used for trials 1, 3, 4, 5, 6, and 7 while organic practices were used in trial 2. Drip irrigation was used for trials 2, 3, 5, 6, and 7 while furrow flood irrigation was used in trials 1 and 4. NuMex Quasar was tested as NMSU 05-17 for trials 1, 2, 3, 4, and 5 and as NMSU 08-17 for trials 6 and 7.

NS, +, *, **, ***Nonsignificant at $P \leq 0.10$ or significant at $P \leq 0.10, 0.05, 0.01$, or 0.001 , respectively. Test was conducted at $\alpha = 0.05$.

sandy loam thick surface (pH 7.6). Seeds were sown ≈ 1 –2 cm deep in two rows 6 cm apart from mid September to early October depending upon year (Table 1). For each two-row plot, 1.0 g of seed was sown and plants were thinned to 10 cm between plants within the row. Each plot was 2.4 m long and 1 m wide and separated by an alley of 0.6 m from the next plot on the same bed. The trials were conducted in randomized complete block designs with four replications. Standard cultural practices to produce autumn-sown onions in southern New Mexico were followed (Walker et al., 2009). Drip irrigation was used for trials 1, 2, 3, 5, 6, and 7, while furrow flood irrigation was used at the LPSRC for trial 4. Subsurface drip irrigation lines (T Tape; T-Systems International, San Diego, CA), which had emitters every 20 cm, were placed 10 cm deep in the center of each bed. Irrigation was applied as needed. A urea-based liquid fertilizer (26N–0P–0K–6S; Western Blend, Inc., Las Cruces, NM) was applied as needed for trials 1 and 4, while a fish fertilizer (2.2N–4.4P–0.3K–0.2S;

Neptune's Harvest Fertilizer, Gloucester, MA) was applied as needed for trials 2, 3, 5, 6, and 7.

Each plot was harvested when 80% of the plants in the plot had lodged. The harvest date was considered the maturity date, and the days from sowing until harvest were counted for each plot. The root systems of 20 bulbs from each plot were rated for the severity of pink root symptoms on a scale of 1 (no infected roots) to 9 (completely infected roots). After rating, bulbs were placed in mesh sacks and, on the same day, transferred indoors to an onion shed. Bulbs were cured for 3 to 4 d under ambient conditions to reduce storage losses and decay. After curing, the total bulb fresh weight was measured for each plot. Bulbs were graded to remove culls (diseased bulbs, bulbs under 3.8 cm in diameter, split and double bulbs). The number of culls was subtracted from the total bulb number to obtain the marketable bulb number per plot. After bulbs were graded, they were weighed again to obtain marketable bulb weight per plot. The average bulb weight

was calculated by dividing marketable bulb weight by marketable bulb number. After weighing, 25 bulbs were cut transversely at the widest point on the vertical axis to determine the percent of bulbs possessing a single meristem. If a bulb possessed a single meristem or multiple meristems within 1.3 cm of the bulb center, then the bulb was considered single centered.

Before harvest during the 2007–08 test year, five plants from each plot of both trials were measured for plant height, leaf length, sheath length, and sheath diameter. Plant height was the distance from the soil line to the highest point of the longest leaf. Leaf length was the distance from the sheath to the tip of the longest leaf. Sheath length was the distance from the soil line to the base of the lowest succulent leaf. Sheath diameter was measured at the midlength of the sheath. These traits were measured to further characterize 'NuMex Quasar' and to determine its distinctiveness from 'Texas Early White'. In addition, five bulbs from each plot were measured at harvest for bulb height and diameter.

Table 2. Plant height, leaf length, sheath length and diameter, and bulb height and shape index of NuMex Quasar, NuMex Mirage, and Texas Early White when grown in two fields at the Fabian Garcia Science Center, Las Cruces, NM, during the 2007–08 growing season.

Entry	Plant ht (cm) ^z	Leaf length (cm) ^y	Sheath length (cm) ^x	Sheath diam (mm) ^w	Bulb ht (cm) ^v	Bulb shape index ^u
NuMex Quasar	57.3	46.2	12.2	17.9	7.9	0.99
NuMex Mirage	68.3	57.7	12.2	21.5	7.9	0.99
Texas Early White	66.8	53.4	14.4	19.5	6.9	0.83
LSD (5%)	5.9**	5.7**	2.0*	1.5***	0.5***	0.04***

^zPlant height is the distance from the soil line to the highest point of the longest leaf.

^yLeaf length is the distance from the sheath to the tip of the longest leaf.

^xSheath length is the distance from the soil line to the base of the lowest succulent leaf.

^wSheath diameter is measured at the midlength of the sheath.

^vBulb height is measured from the base of the bulb to the top of the bulb.

^uBulb shape index is calculated as bulb height divided by bulb diameter.

*, **, ***Significant at $P = 0.05, 0.01, \text{ or } 0.001$, respectively.

Bulb height was measured from the basal plate at the bottom of the bulb to the top of the bulb. Bulb diameter was measured at the widest distance perpendicular to the vertical height of the bulb. A bulb shape index was calculated by dividing the bulb height by bulb diameter.

The F test in the general linear model procedure and Fisher's protected least significant difference procedure of the SAS statistical software (version 9.2; SAS Institute, Cary, NC) were used to determine differences between means of 'NuMex Quasar', 'Texas Early White', and 'NuMex Mirage' for each trait. The Proc Means statement was used to calculate the cultivar means across four replications.

Description and Performance

'NuMex Quasar' is a short-day, open-pollinated, bolting-resistant, round globe-shaped onion with white-colored dry outer scales that matures from 17 to 28 May when autumn sown in Las Cruces, NM (Table 1). Suggested planting dates at Las Cruces are 20 to 30 Sept. 'NuMex Quasar' matures earlier than the earliest maturing, white-scaled, commercial cultivar, Texas Early White. In five of the seven fields tested over 4 years, 'NuMex Quasar' matured 4–10 d earlier than 'NuMex Mirage' and 'Texas Early White' (Table 1). Within a single year, the maturity time of 'NuMex Quasar', in terms of number of days from sowing, is very consistent from field to field. When cultivars were grown during the 2006–07 test year, the number of days until maturity ranged from 237 to 239 for 'NuMex Quasar' and 241 to 249 for 'Texas Early White' (Table 1). Likewise in 2007–08, the number of days until maturity ranged from 251 to 253 for 'NuMex Quasar' and 254 to 259 for 'Texas Early White'.

When conditions that favor premature seed stalk formation were present, 'NuMex Quasar' had greater bolting resistance than

'Texas Early White'. In five of the seven environments tested, 'NuMex Quasar' produced fewer seed stalks than 'Texas Early White' (Table 1). When 'Texas Early White' produced a high percentage of seed stalks, 'NuMex Quasar' produced a higher marketable bulb yield than 'Texas Early White' (Table 1). Since bulbs that produce a seed stalk are unmarketable, marketable bulb yield is reduced when a cultivar produces a high percentage of seed stalks. Otherwise, the marketable bulb yield of 'NuMex Quasar' was comparable to 'Texas Early White' and 'NuMex Mirage'. 'NuMex Quasar' produced a high percentage of bulbs with a single growing point (68% to 89%). In all six environments in which the percentage of single-centered bulbs was measured, 'NuMex Quasar' produced a greater percentage of bulbs with a single growing point than 'NuMex Mirage' and 'Texas Early White' (Table 1). 'NuMex Quasar' was comparable to 'NuMex Mirage' and 'Texas Early White' with respect to pink root disease severity and average bulb weight (data not shown). On a rating scale of 1 (no infected roots) to 9 (completely infected roots), the pink root rating of 'NuMex Quasar' ranged from 1.4 to 4.6 with a mean of 2.7 over the seven trials while the rating of 'Texas Early White' ranged from 1.4 to 3.6 with a mean of 2.4. Over the seven trials, the average bulb weight of 'NuMex Quasar' ranged from 179 to 306 g with a mean of 234 g while the average bulb weight of 'Texas Early White' ranged from 179 to 284 g with a mean of 235 g.

When tested during the 2007–08 season, plants of 'NuMex Quasar' tended to be shorter in height by 9–11 cm than plants of 'NuMex Mirage' or 'Texas Early White' (Table 2). Likewise, the leaf length of the longest leaf of plants of 'NuMex Quasar' tended to be shorter in length by 7–11 cm than similar leaves of 'NuMex Mirage' or 'Texas Early White' (Table 2). Plants of 'NuMex Quasar' tended to have a short

sheath length (distance from top of bulb to leaf axil opening) than plants of 'Texas Early White' (Table 2). Likewise, the sheath diameter of 'NuMex Quasar' plants was smaller than the sheath diameter of plants from 'NuMex Mirage' or 'Texas Early White' (Table 2). The results from these vegetative characteristics suggest that 'NuMex Quasar' is distinct from 'Texas Early White' even though 'NuMex Quasar' was selected from 'Texas Early White'. Bulbs of 'NuMex Quasar' tend to have a greater bulb height or "depth" than bulbs of 'Texas Early White'. The average bulb height of 'NuMex Quasar' was 1.0 cm greater than the bulb height of 'Texas Early White'. In addition, the bulb shape index, that is bulb height divided by bulb diameter, was greater for 'NuMex Quasar' (0.99) than for 'Texas Early White' (0.83). Bulbs that possess a shape index close to 1 tend to be more rounded in shape that is more commercially desirable.

Availability

Interested parties should contact Ms. Terry Lombard, Arrowhead Center, MSC 700, Box 30001, New Mexico State University, Las Cruces, NM 88003-8001, (575) 646-2791, tlombard@nmsu.edu.

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