

‘NuMex Grandeur’ Onion

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The New Mexico State Univ. Agricultural Experiment Station announces the release of ‘NuMex Grandeur’ onion (*Allium cepa* L.). ‘NuMex Grandeur’ is an open-pollinated, late-maturing, intermediate-day, onion cultivar with red-colored dry outer scales for winter sowing in southern New Mexico and similar environments. ‘NuMex Grandeur’ matures in late July to mid-August when winter-sown in Las Cruces, NM.

Origin

‘NuMex Grandeur’ originates from ‘Texas Early Grano 502 PRR’ bolting-resistant (BR) selection; PI 249538; ‘Temprana’; and germplasm that was used to develop ‘NuMex Crimson’ (Cramer and Corgan, 2003) (Fig. 1). In September of 1980, bulbs of a BR and pink root [causal organism, *Phoma terrestris* (Hansen)] resistant selection of ‘Texas Early Grano 502’ and of a U.S. Department of Agriculture (USDA), PI 249538, were placed in a breeding cage together. ‘Texas Early Grano 502 PRR’, whose origin and description has been described previously (Corgan, 1984; Cramer and Corgan, 2003; Garcia and Fite, 1931; Hawthorn, 1944), is a short-day onion with yellow-colored dry outer scales that originated from ‘New Mexico Early Grano’. PI 249538 was collected from the Seed Testing and Control Station in Helandrión, Attike, Greece, on 1 Jan. 1958 by H. Gentry (USDA, ARS, National Genetic Resources Program, 2013a). The accession produces bulbs that are globe-shaped and possess red-colored outer dry scales (USDA, ARS, National Genetic Resources Program, 2013b). The accession was used because it is short-day in its maturity, expresses a high level of pink root resistance, and produces an extensive root system (J.N. Corgan, personal communication, 2013). When bulbs of both entries flowered in May of 1981, pollinators were introduced to the cage. Once mature, seeds were harvested and kept separate from plants of each entry. Seeds from the ‘Texas Early Grano 502 PRR BR’ parent were then sown in Jan. 1982. Bulbs that possessed red-colored dry outer scales were selected in July 1982.

After bulbs broke dormancy in Oct. 1982, they were placed in a breeding cage identified as New Mexico State University (NMSU) 83-1043. In May 1983, the bulbs flowered and pollinators were introduced into the cage. Seeds were harvested from all plants and combined together. In Jan. 1984, seeds of 83-1043 were sown and 16 bulbs with red-colored dry outer scales were selected in July 1984. After bulbs broke dormancy in Oct. 1984, they were placed as the first entry in a breeding cage numbered 85-36. Bulbs of ‘Temprana’ were placed as the second entry in the same cage (Fig. 1). ‘Temprana’ is a short-day onion with white-colored dry outer scales that is a selection out of ‘New Mexico White Grano’ and was released by the New Mexico Agricultural Experiment Station in 1979 (Enzie and Corgan, 1979).

In May 1985, bulbs of each entry flowered and pollinators were introduced into the cage. Seeds were harvested and kept separate from plants of each entry. In Jan. 1986, seeds of 85-36-1 and 85-36-2 were sown and eight and 15 bulbs, respectively, that possessed dark red-colored dry outer scales were selected in July 1986. After bulbs broke dormancy in Oct. 1986, they were placed in separate breeding cages. Selected bulbs from 85-36-1 were placed in a breeding cage numbered 87-1021, whereas the selected bulbs from 85-36-2 were placed in a separate breeding cage numbered 87-29. In May 1987, plants in each cage flowered and pollinators were introduced into both cages. Harvested seeds were bulked together from all plants within each cage. In Jan. 1988, seeds of 87-29 and 87-1021 were sown. Bulbs that possessed dark red-colored dry outer scales and lacked visible external expression of multiple meristems were selected from each line in July 1988. After selected bulbs from each line broke dormancy in Oct. 1988, they were placed as two separate entries in a breeding cage numbered 89-26 (Fig. 1). In May 1989, bulbs of both entries flowered and pollinators pollinated flowers from all plants within the cage. Seeds were harvested and kept separate. In Jan. 1990, seeds of both entries were sown. Bulbs that did not exhibit multiple meristems visible in the expanded leaves were selected from each line in July 1990. After the selected bulbs broke dormancy, they were placed as two separate entries in a breeding cage numbered 91-22 (Fig. 1).

A third entry, described below, was also placed in the 91-22 breeding cage. This entry traced to ‘NuMex Crimson’, a short-day, overwintered cultivar with red-colored dry outer scales that originated from intercrosses

between short-day cultivars (Kurenai, Red Grano, Rojo) with red-colored dry outer scales, short-day cultivars (Henry’s Special, Texas Grano 502 PRR) with yellow-colored dry outer scales, and an intermediate-day cultivar (Peckham Yellow Sweet Spanish) with yellow-colored dry outer scales (Cramer and Corgan, 2003). ‘Peckham Yellow Sweet Spanish’ and ‘Henry’s Special’ were used in the development of ‘NuMex Grandeur’. NMSU 89-78-3 originated from ‘Peckham Yellow Sweet Spanish’ and NMSU 89-78-4 originated from an intercross between ‘Henry’s Special’ and ‘Peckham Yellow Sweet Spanish’ (Fig. 1). In Jan. 1990, seeds of 89-78-3 and 89-78-4 were sown and bulbs with red-colored dry outer scales were selected from each line in July 1990. After the selected bulbs broke dormancy, they were combined and placed as the third entry in the breeding cage numbered 91-22 (Fig. 1).

In May 1991, bulbs of all three entries flowered, seeds were harvested, and they were kept separate. In Feb. 1992, seeds of each entry were sown and bulbs with red-colored dry outer scales and the absence of multiple meristems visible in the expanded leaves were selected from each line in June 1992. After selected bulbs from each line broke dormancy in Oct. 1992, they were placed as three separate entries in a breeding cage numbered 93-26 (Fig. 1). In May 1993, bulbs of all three entries flowered and honeybees pollinated flowers from all plants within the cage. Once mature, seeds were harvested and kept separate. In Jan. 1994, only seeds of 93-26-1 were sown and bulbs with red-colored dry outer scales that were larger in size exhibited fewer pink root symptoms and did not exhibit multiple meristems visible in the expanded leaves were selected in July 1994. After the bulbs broke dormancy in Oct. 1994, they were placed in a breeding cage numbered 95-15 as three separate entries. In May 1995, bulbs of all three entries flowered and honeybees pollinated flowers from all plants within the cage. Once mature, seeds were harvested and kept separate. In Feb. 1996, seeds of each entry were sown and bulbs with red-colored dry outer scales that did not exhibit multiple meristems visible in the expanded leaves were selected from each line in July 1996. After selected bulbs from each line broke dormancy in Oct. 1996, they were placed as three separate entries in a breeding cage numbered 97-23 (Fig. 1). In May 1997, bulbs of all three entries flowered and honeybees pollinated flowers from all plants within the cage. Once mature, seeds were harvested and kept separate. In Jan. 1998, seeds of each entry were sown and 13, 10, and 15 bulbs, respectively, with red-colored dry outer scales and the absence of multiple meristems were selected from each line in July 1998. After the bulbs broke dormancy in Oct. 1998, they were placed in a breeding cage numbered 99-34 as three separate entries. In May 1999, bulbs of all three entries flowered and honeybees pollinated flowers from all plants within the cage. Once mature, seed was harvested and kept separate. In Jan. 2000,

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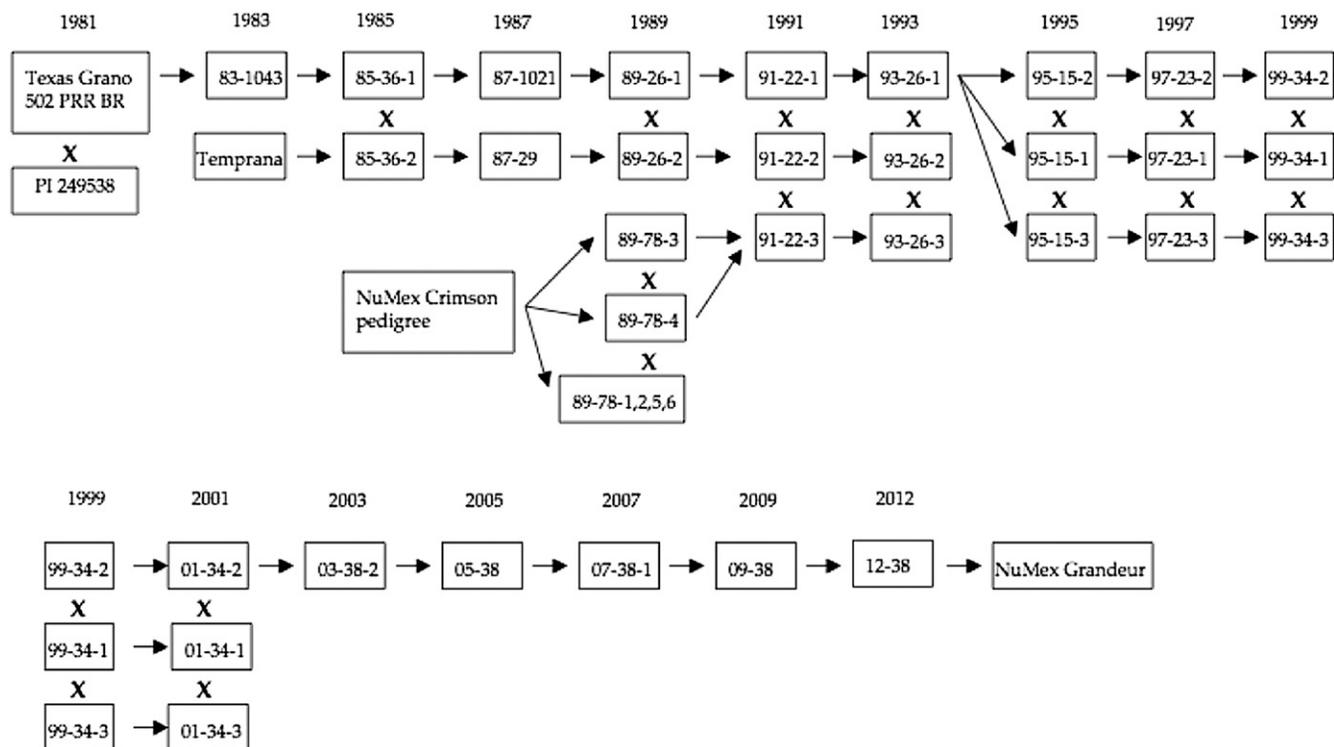


Fig. 1. Pedigree of 'NuMex Grandeur'.

seed of each entry was sown and two, eight, and three bulbs, respectively, with red-colored dry outer scales and the absence of multiple meristems were selected from each line in July 2000. After the bulbs broke dormancy in Oct. 2000, they were placed in a breeding cage numbered 01-34 as three separate entries. In May 2001, bulbs of all three entries flowered and honeybees pollinated flowers from all plants within the cage. Once mature, seeds were harvested and kept separate.

In Jan. 2002, only seeds of 01-34-2 were sown and 26 bulbs that exhibited darker red-colored dry outer scales, greater bulb height, and were firm when hand-squeezed were selected in July 2002. After the bulbs broke dormancy in Oct. 2002, they were placed in a breeding cage numbered 03-38. In May 2003, bulbs flowered and honeybees pollinated flowers from all plants within the cage. Once mature, seeds were harvested from all plants and were bulked together. Four additional cycles of phenotypic recurrent selection were conducted in 2004, 2006, 2008, and 2011. Bulbs were selected for a more rounded and uniform shape, increased bulb firmness, and darker red-colored dry outer scales. In 2004 and 2006, selected bulbs were cut transversely at the vertical center after 3 months of storage to observe the number of meristems within the center of the bulb. Only bulbs that possessed a single meristem in the center of the bulb were selected. The seed harvested from the 12-38 breeding cage became 'NuMex Grandeur'.

Evaluation Procedures

'NuMex Grandeur' was compared with 'Rumba' (Nunhems USA, Parma, ID) in

replicated trials grown in several fields in the Mesilla Valley of New Mexico (Table 1). The field soil texture at the NMSU Fabian Garcia Science Center (FGSC) in Las Cruces, NM, is a Glendale loam and a Brazito very fine sandy loam, thick surface (pH 7.6), whereas the field soil texture at the NMSU Leyendecker Plant Science Research Center (LPSRC), 9 miles south of Las Cruces, NM, is a Glendale loam (pH 7.7). Seeds were sown ≈ 1 to 2 cm deep in two rows 6 cm apart from late January to mid-February depending on field location and year. 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 winter-sown onions in southern New Mexico were followed (Walker et al., 2009). For each field, diammonium phosphate (18N-20P-0K; Helena Chemical Co., Collierville, TN) was applied at a rate of 170 kg·ha⁻¹ before seeding as a band 10 cm below the soil surface. Drip irrigation was used at the FGSC for Trials 2, 3, 4, and 5, whereas furrow flood irrigation was used at the LPSRC for Trials 1 and 6. Subsurface drip irrigation lines (T Tape; T-Systems International, San Diego, CA), that 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 at the LPSRC for Trials 1 and 6, whereas a fish-based fertilizer (2.2N-4.4P-0.3K-0.2S; Neptune's Harvest Fertilizer, Gloucester, MA)

was applied as needed at the FGSC for Trials 2, 3, 4, and 5.

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.

Starting in 2009, dry outer scale color, adherence, thickness, and quality were rated for 20 bulbs per plot. Color was rated on a scale of 1 (very light pink) to 9 (dark purple). Adherence was rated on a scale of 1 (scales easily removed when force is applied) to 5 (scales remained attached to bulb when force is applied). Thickness was rated on a scale of 1 (very thin) to 5 (very thick). Quality was rated on a scale of 1 (poor) to 9 (very excellent). Poor scale quality characteristics included very light pink-colored dry outer scales, few scale layers, easily removed dry outer scale such that no scale remained on