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'NuMex Arthur' Onion

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New Mexico State Univ. Agricultural Experiment Station announces the release of 'NuMex Arthur' onion (*Allium cepa* L.). 'NuMex Arthur' is a low-pungency, high-yielding, pink-root-resistant, intermediate-day, open-pollinated, yellow onion cultivar for spring seeding or transplanting in southern New Mexico. This cultivar is ideal for fresh-market onion consumption. 'NuMex Arthur' matures in late July when spring planted in Las Cruces, N.M.

Origin

'NuMex Arthur' originates from an intercross between 'NuMex Starlite' (Corgan and Holland, 1993) and a late maturing line originating from an intercross between 'NuMex BR1' (Corgan, 1984), 'Ben Shemen', PI249538, and various sweet spanish type entries in the breeding program. 'NuMex Arthur' has sterile cytoplasm from the 'NuMex BR1' maternal parent. In 1983, 10 bulbs each of the following parents were planted for intercrossing in a pollination cage using honey bees as the pollen vector: 'NuMex BR1', 'Peckham Yellow Sweet Spanish', PI249538 from Greece, progeny developed from 'El Capitan' × PI249538, 'Buffalo', 'Ben Shemen', and progeny developed from crossing 'Ben Shemen' with 'Yellow Granex' and several sweet spanish types. This latter progeny was in 'Ben Shemen' cytoplasm and the various sweet spanish parents included: 'Tucker Yellow Sweet Spanish', 'Utah Sweet Spanish', 'El Capitan', 'Ring King', 'Inca', 'Peckham Yellow Sweet Spanish', and 'Colorado #6 Yellow Sweet Spanish'. Seed was collected in 1984 from the 'NuMex BR1' parent in the pollination cage and designated as 84-57. Seed of 84-57 was planted for seed-to-seed production in an isolation cage to produce 85-54 seed. Seed of 85-54 was planted for bulb production in Spring 1986.

In 1986, mass selection was made for late maturity, firmness, bulb shape, bulb size, and pink root resistance. The main index for onion maturity is collapse of the tissues in the neck, resulting in lodging of the foliage. Selections were made for uniformity of maturity in late July in Las Cruces, N.M., when spring seeded. Selected bulbs were large and nearly round. Populations of 85-54 were grown in fields severely infested with *Phoma terrestris*, the fungus that causes pink root. Bulbs with <20% pink roots were selected. Selected bulbs were intercrossed to produce seed designated as 87-1017. Seed of 87-1017 was planted in spring 1989 for bulb production. During Fall 1989, bulbs of 87-1017 and 'NuMex Starlite' (Corgan and Holland, 1993) were planted in an isolation cage for intercrossing and seed production. Seed of the intercross between 87-1017 and 'NuMex Starlite' was harvested from the 87-1017 maternal parent in 1990, and in spring 1991, the seed was planted for bulb production. The crosses to 'NuMex Starlite' were selected based on early maturity. The population was selected for pink root resistance, and bulb size and shape. Selected bulbs (50) were planted for intercrossing and seed production. In 1993, another cycle of recurrent selection was made for late maturity, bulb size, shape, and firmness. The selected bulbs (50) were intercrossed and seed was produced.

In 1995, the population was selected for bulb shape, size, and firmness, late-July maturity, pink root resistance, single centers, and low pungency. 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 as selected bulbs. Only bulbs with pungency levels <3.0 µmol PA per milliliter of juice (µmol·mL^{-1} PA) were selected. The mean pungency of selected bulbs was 1.6 µmol·mL^{-1} PA. These bulbs (63) were intercrossed in an isolation cage, and the seed was collected separately from each maternal plant in 1996.

In 1997, seed of the maternal, half-sib progeny (96-36) was planted for bulb production, and another selection cycle was made in the field and laboratory, similar to 1995. Selection was made among and within half-sib lines. Only bulbs with pungency levels <1.5 µmol·mL^{-1} PA and single centers were selected. Selected bulbs (46) had a mean pungency of 1.0 µmol·mL^{-1} PA and were intercrossed to produce 98-33 seed. In 1999, bulbs of the 98-33 population were selected for late-July maturity, pink root resistance, large bulb size, round bulb shape, firm bulbs, low pungency, and single centers. Pungency was uniformly low for the bulbs tested in the laboratory, with a mean pungency of 1.8 µmol·mL^{-1}

Table 1. Maturity date, bulb pungency, percentage of single centered bulbs, average bulb weight, and marketable yield of 'NuMex Arthur' onion as compared with 'NuMex Jose Fernandez', 'NuMex Luna', and 'Candy' when grown in Las Cruces, N.M., during 1997 and 1999.

Cultivar	Maturity date[z]	Pungency[y] (pyruvic acid) (µmol·mL^{-1})	Single[y] centers (%)	Avg bulb wt (g)	Marketable yield[x] (t·ha^{-1})
		Seeded 4 Feb. 1997			
NuMex Arthur	23 July	4.92	10	332	79.4
NuMex Jose Fernandez	17 July	6.33	14	356	93.3
$LSD_{0.05}$	2	0.87	3	NS	9.6
		Transplanted 5 Feb. 1997			
NuMex Arthur	23 June	3.82	86	406	97.3
NuMex Luna	19 June	5.25	52	383	89.7
$LSD_{0.05}$	2	1.06	3	35	8.8
		Seeded 28 Jan. 1999			
NuMex Arthur	2 Aug.	2.31	71	332	65.6
Candy	2 Aug.	6.39	41	338	43.9
NuMex Luna	27 July	7.48	12	279	37.9
NuMex Jose Fernandez	21 July	7.23	70	379	69.9
$LSD_{0.05}$	3	1.08	27	52	11.9
		Transplanted 28 Jan. 1999			
NuMex Arthur	15 July	2.58	73	581	67.8
NuMex Luna	3 July	5.55	17	428	49.4
NuMex Jose Fernandez	2 July	6.80	73	611	70.4
$LSD_{0.05}$	3	0.84	17	NS	14.0

[z]Maturity was defined as the date by which 80% of the tops in the plot had fallen.
[y]Pungency and single center means are averages of 40 and 80 observations, respectively. Ten or 20 bulbs were randomly selected from each replication for pungency testing or evaluation of single centers, respectively.
[x]Four 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).
[NS]Nonsignificant.

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PA. Selected bulbs (137) had a mean pungency of 1.5 μmol·mL^{-1} PA and single centers, and were intercrossed for production of breeder's seed of 'NuMex Arthur' in 2000.

Description and performance

'NuMex Arthur' is a low-pungency, intermediate-day, yellow onion cultivar that matures from 23 July to 1 Aug. when spring seeded in Las Cruces, N.M. Suggested planting dates at Las Cruces are 1–10 Feb. to achieve maturity in late July. 'NuMex Arthur' can mature in early August if planted in late February. From transplants, 'NuMex Arthur' matures earlier, ≈15–20 July. 'NuMex Arthur' has excellent yield, pink root resistance, and late maturity. Bulbs are very mild, firm, large, and nearly round. 'NuMex Arthur' is the only low-pungency onion cultivar in its maturity class and is recommended for spring seeding or transplanting to provide a harvest of low-pungency ("sweet") onions during late July.

Replicated field trials were conducted in the 1997 and 1999 growing seasons comparing 'NuMex Arthur' to 'NuMex Jose Fernandez' (Corgan, 1994), 'NuMex Luna' (Corgan, 1995), and 'Candy' (Table 1). 'NuMex Jose Fernandez' and 'NuMex Luna' mature earlier than 'NuMex Arthur' from spring seeding or transplanting, and are not considered low-pungency cultivars. In 1999, 'NuMex Arthur' had higher yields, lower pungency levels, and a greater percentage of single centered bulbs than 'NuMex Luna' or 'Candy' from spring seeding. The variety, 'Candy' (a hybrid), has been promoted as a "sweet" onion, but in our trials the bulbs were pungent (6.39 μmol·mL^{-1} PA). From transplants, 'NuMex Arthur' bulbs were lower in pungency and later in maturity than 'NuMex Jose Fernandez' or 'NuMex Luna' bulbs. 'NuMex Arthur' was not significantly different from 'NuMex Jose Fernandez' for either yield or percentage of single centers, but was much lower in pungency levels in 1999 trials. The average pungency for 'NuMex Arthur' bulbs for both trials in 1999 was 2.5 μmol·mL^{-1} PA, whereas the average pungency for 'NuMex Luna' and 'NuMex Jose Fernandez' bulbs was 6.5 and 7.0 μmol·mL^{-1} PA, 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, N.M. 88003. Application for Plant Variety Protection has been filed, and certified seed propagation for sale will be authorized through the New Mexico Crop Improvement Association.

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