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1999-2000 Onion Variety Trials at New Mexico State University

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at New Mexico State University

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During June and July, New Mexico produces more than 50% of the onions sold in the United States (U.S. Dept. Agric., 2000). New Mexico produces three separate onion crops that differ in their harvest times. The fall-seeded crop is planted in September and October and harvested in May and June of the following year. The transplanted crop is transplanted in February and harvested in June. The spring-planted crop is planted from January to March and harvested in July.

For each planting, separate cultivars must be used, because a single cultivar may have a harvest time of only two weeks, and a continual onion harvest from late May to early August is desired. Within each planting, several different cultivars must be grown, because each crop harvest time may last 4 weeks.

In addition, bulbing in onions is initiated by increasing day length. Onion cultivars differ in the number of hours needed for bulb initiation. Cultivars that required 8-12 hours of day light for bulbing often are considered short-day cultivars. Cultivars that require 13-14 hours are considered intermediate-day onions, while cultivars that require 15 hours are considered long-day onions.

Within each classification, cultivars are described based on their relative maturity when compared against each other (early, intermediate, late). For a particular crop, such as the fall-seeded crop in New Mexico, cultivars may be described based on their maturity relative to the length of the entire harvest period for the crop as in early, intermediate, late. For a particular crop, the chosen cultivars may be a mix of short-day and intermediate-day cultivars to give the grower a contnual harvest.

Also, cultivars differ in their scale color, which may be white, yellow, or red. Thus, numerous onion cultivars must be available and adapted to southern New Mexico growing conditions to provide continual harvest of yellow, white, and red onions from May to August.

Southern New Mexico possesses a unique environment for growing onions. Temperatures are warm enough during the winter season for onions to be overwintered without substantial plant losses. Conversely, temperatures are cold enough to induce premature flowering or bolting and yield loss of fall-seeded cultivars, unless bolting resistance is present. In addition, onions are harvested during the hottest months of the year, June and July, which tends to shorten storage life. Also in July, New Mexico receives a significant amount of precipitation that can make harvesting difficult, increase disease problems, and result in yield losses. For these reasons, cultivars that perform well in other growing regions do not necessarily perform well in New Mexico.

This study was initiated to evaluate cultivars and advanced breeding lines from the onion breeding program at NMSU and commercial sources for their adaptability to and performance under southern New Mexico growing conditions.

MATERIALS AND METHODS

Two variety trials, fall-seeded and spring-transplanted, were initiated at the Fabian Garcia Research Center in Las Cruces, N.M., for 2000. Onions have been grown on the fields used for these trials annually for many years. As a result pink root and Fusarium basal rot (FBR) incidences are higher in our fields than levels

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observed in growers' fields. The results obtained from these trials are specific to this location; results may differ in other locations. Also, environmental conditions change from year to year, and the performance of the entries tested could change annually.

Within each trial, entries were grouped based on approximate bulb maturity (early, intermediate, late) for onions grown in southern New Mexico. Within each grouping, entries were arranged in a randomized complete block design with four replications per entry. Entries consisted of commercial cultivars (Cramer, 2000), NMSU cultivars, experimental commercial lines, and experimental NMSU lines. For the fall-seeded trial, 19 entries were placed in the early maturing group (table 1); 10 entries were placed in the intermediate-maturing group (table 2); and four entries were placed in the late-maturing group (table 5). For the transplant trial, 16 entries were placed in the main, transplant season maturity group (table 7); and five entries were placed in the late-maturing group.

Due to poor environmental conditions, entries in the late-maturing, transplanted variety trial were not harvested and data were not collected on those entries. These environmental conditions included periods of high day temperatures in April and May, high thrips population in June, and salt movement into the plant root zone. These conditions arrested plant growth earlier than expected and resulted in poor performance of entries in the late-maturing, transplant trial.

All entries in the fall-seeded variety trial were seeded on Sept. 20, 1999 and were thinned on Nov. 9, 1999 to 4 in. (10 cm) between plants. All entries for the transplant trial were seeded in a field at the Fabian Garcia Research Center in Las Cruces, N.M. on Oct. 15, 1999 and were transplanted on Feb. 8, 2000. Transplants with three to four true leaves were used. For each entry, transplants of the same relative size were grouped together and placed in the same plot. Transplant size within each plot was kept as uniform as possible. Some variation in transplant size for each entry may have existed between plots in different replications. In general, the largest transplants were placed in the first replication, while the smallest transplants were placed in the fourth replication.

For each trial, entries were seeded or transplanted into raised, shaped beds that were 8 ft (2.5 m) long and 40 in. (1 m) wide (center to center). The number of plants per plot for each trial ranged from 50 to 60 plants. Differences in plant density among entries did not occur. Plots with less than 10 plants were not measured and were considered missing for statistical analysis.

All fields were managed in a similar fashion using standard cultural practices for producing onions in southern New Mexico (Corgan et al., 2000). Before planting, 500 lbs triple superphosphate (0N-20.1P-0K) per acre were applied to each field. Subsurface drip irrigation placed 4 in. (10 cm) below the surface was used with 18 in. (0.5 m) between emitters. Water was applied as needed. Uran 32 (urea and ammonium nitrate) (32N-0P-0K) was applied at 20-30 ppm through the drip lines for a total of 200-250 lbs N per acre for the crop. Trials were sprayed for thrips using a synthetic pyrethrin (Karate) as needed.

Before harvest, the maturity date (80% of tops down) was estimated for each plot. All four replications of a particular entry were harvested when all of the plots exhibited 80% or more of the plants with their tops down (tables 1, 3, 5, 7). The number of plants with seedstalks was counted for entries in the fall-seeded trial. The percentage of seedstalks, a measure of bolting, was calculated by dividing the number of plants with seedstalks by the total number of plants per plot. Once bulbs were removed from the ground, the total number of bulbs was counted.

Twenty-five randomly selected bulbs per plot were rated for pink root (*Pyrenochaeta terrestris*) severity on their roots, using a subjective rating of 1 (no pink roots) to 9 (heavily infected roots). The basal plate of 25 randomly selected bulbs was cut transversely, and the severity of FBR (*Fusarium oxysporum* f. sp. *cepae*) was rated, using a subjective rating of 1 (no diseased tissue) to 9 (70% or more diseased tissue). The percentage of diseased bulbs (either pink root or FBR) was calculated using the rated bulbs. Bulbs infected with FBR remained at the plot and were not used to calculate of bulb yield per plot.

Bulb tops and roots of all plants were clipped. Bulbs were placed in burlap sacks and were cured at field conditions for four days. After curing, the total bulb fresh weight was measured for each plot. Then bulbs were graded to remove culls (diseased bulbs, bulbs under 1.5 in. (3.8 cm) in diameter, split bulbs, double bulbs).

The number of culls was subtracted from the total number of bulbs to yield the number of marketable bulbs per plot. The marketable bulbs per plot were weighed to measure the marketable fresh weight per plot. The percentage of marketable yield was calculated by dividing the marketable weight per plot by the total weight per plot. The number of sacks per acre was determined using marketable bulb weight per plot with approximately 40 in. (1 m) bed width (center to center) and 50 lbs (22.7 kg) per sack.

The average bulb weight was calculated by dividing total marketable bulb weight by total marketable bulb number per plot. The percentage of bulbs with single growing points was determined by counting the number of bulbs with a single growing point (single center) or multiple growing points located within 0.5 in. (1.3 cm) of the bulb's center when each bulb was cut transversely at the vertical center.

The means for each trait over four replications were calculated for each entry and for the sum of entries within each group using the Proc Means statement of the SAS statistical software (SAS Institute, Cary, N.C.). Within each group, differences between entries were calculated for each trait using the Proc GLM statement of SAS. In addition, a protected Fisher's least significant difference (LSD) mean separation test was calculated at a probability level of 5% for each trait using SAS.

RESULTS

Fall-Seeded Trial

The maturity date of entries in the early maturing, fall-seeded trial ranged from May 11-17, 2000 (table 1). Several entries matured earlier than in previous years (Cramer et al., 2000; Cramer et al., 1998). The percentage of seedstalks varied among entries tested (table 1). Most NMSU and 'NuMex' entries exhibited a low percentage of seedstalks, while several commercial entries had 30-40% seedstalk production. The date chosen for the fall planting was 1 to 3 weeks earlier than the planting dates used by commercial growers in this area, as a screening method for bolting resistance. The bolting percentage of some entries would be less with later planting dates.

Pink root rating generally was good for most entries. However, 'Buffalo' was very susceptible to pink root, showing a significantly higher percentage of infected bulbs and more severe infection than any other entry (table 1). The percentage of bulbs with pink root was quite variable among entries. Several entries had the lowest incidence of pink root diseased bulbs, which ranged from 24% to 48%. The FBR incidence was variable among entries (table 1). 'Buffalo' had a high incidence, and the highest disease severity of FBR. All entries produced a high percentage of marketable bulbs (table 2).

The number of sacks per acre varied greatly. 'NuMex Mesa' produced high bulb yields, while 'Buffalo', NMSU 99-28, and 'Texas Early White' produced yields lower than a majority of the cultivars tested (table 2). The low yield of 'Buffalo' resulted from pink root susceptibility and small bulb size. Bulb size was generally large, with only 'Buffalo' and NMSU 99-28 producing small bulbs (table 2). The percentage of single centers varied from 20% (99C 3102) to 87% ('NuMex Chaco') (table 2). Several entries produced greater than 60% single centers.

For the intermediate-maturing entries, maturity date ranged from May 22 to June 14, 2000 (table 3). The bolting incidence was generally low, and less bolting was observed for the intermediate-maturing entries than for the early maturing entries (tables 1 and 3).

The percentage of bulbs with pink root was generally high among entries (table 3). 'Cardinal' was rated as having the most severe pink root symptoms. Generally, a higher pink root incidence was observed for the entries in the intermediate-maturing group than for the entries in the early maturing group (tables 1 and 3). Among the intermediate-maturing group, 'NuMex Crispy' expressed less pink root damage than all entries, except NMSU 98-20 or RCX 6783. The FBR incidence varied greatly among entries, with 'Cardinal' having the highest incidence and 'NuMex Dulce' having a significantly lower incidence than all entries except NMSU 98-20 or 'NuMex Starlite' (table 3). FBR severity was greatest for 'Cardinal'.

The percentage of marketable bulbs produced by each entry was generally high (table 4). Yield and bulb size were excellent for all entries except 'Cardinal' and NMSU 99-29-1 (table 4). Entries averaged 1,338 sacks (50 lb) per acre with an average bulb size of 15.4 oz. NMSU 98-20 produced a greater yield than all entries except 'NuMex Starlite' and RCX 6783. The low yield and small bulb size of 'Cardinal' resulted from its high pink root incidence (table 3). Entries in this group averaged 55% single centers, with NMSU 99-29-1 producing a higher percentage of single-centered bulbs than all entries except 'NuMex Dulce' (table 4).

Among the late-maturing entries, maturity dates ranged from June 8-22, 2000 (table 5). These entries matured one to two weeks earlier than in previous years (Cramer et al., 2000; Cramer et al., 1998). Seedstalk production was low among the four entries tested (table 5).

The pink root incidence was generally high (96% average); however, the severity was generally low (2.7) (table 5). The FBR incidence and severity was generally low, 30% and 2.1, respectively (table 5) as compared with earlier maturing varieties (tables 1 and 3) and the same entries tested last year (Cramer et al., 2000). NMSU 99-24 had a lower FBR incidence (18%) than NMSU 98-97 or 'NuMex Luna'.

The percentage of marketable bulbs was variable among entries, with NMSU 99-24 producing a higher percentage of marketable bulbs than NMSU 98-97 or 'NuMex Freedom' (table 6). Bulb yield and size were generally large at 1243 sacks/acre and 15.3 oz, respectively. NMSU 98-97 produced smaller bulbs and a lower yield at 10.8 oz. and 841 sacks/acre, respectively, than the other three entries (table 6). The percentage of bulbs with single centers was generally high (62%), with 'NuMex Luna' producing fewer single-centered bulbs (40%) than NMSU 98-97 or NMSU 99-24 (table 6).

Transplant Trial

Maturity dates of transplant trial entries ranged from June 14-30, 2000, with an average maturity date of June 22 (table 7). Several entries matured at a similar time as the late-maturing, fall-seeded entries (table 5). Maturity dates this past year were two weeks earlier than maturity dates of entries tested in the previous year (Cramer et al., 2000).

All entries possessed a relatively high pink root incidence (96%) and moderate severity (2.8) (table 7). 'Candy' and 'NuMex Casper' had the lowest pink root incidence (84% and 81%, respectively) and severity (2.1 and 2.0, respectively). The FBR incidence and severity was generally low for all entries at 8.5%, and 1.2, respectively (table 7). For both fall- and spring-seeded entries, the FBR incidence and severity was generally lower when entries were transplanted (table 7) than when entries were direct-seeded (tables 3, 5, and 9).

The percentage of marketable bulbs was generally high (93%) (table 8). Bulb yield was variable among entries and generally correlated well with bulb size (table 8). High bulb yields resulted from large bulbs, while low bulb yields resulted from small bulbs. 'Cimarron' produced a high yield (1,004 sacks) and the largest bulbs (11.5 oz), while NMSU 98-97 produced the lowest yield (363 sacks) and smallest bulbs (3.9 oz).

For fall-seeded cultivars, bulb yield and size were generally greater when entries were direct-seeded (tables 4 and 6) than when entries were transplanted (table 8). The percentage of single-centered bulbs was variable among entries (table 8). Several entries produced greater than 60% single-centered bulbs.

Table 1. Bulb maturity, seedstalks, and disease evaluation of fall-seeded, early maturing entries in 1999-2000 onion trial at Fabian Garcia Research Center in Las Cruces, N.M.

Entry[z]	Seed source	Harvest date[y]	Maturity date[x]	Seedstalks (%)[w]	Pink root[v]	Pink root (%)[u]	Fusarium[t]	Fusarium (%)[s]
99C 3102	Sakata	May 18	May 16	31.4	2.1	46.0	3.1	49.0
Buffalo	Shamrock	May 18	May 15	1.1	6.1	100.0	6.8	97.0
Daybreak	Shamrock	May 18	May 17	21.1	1.7	42.4	2.3	28.8
Don Victor	Sunseeds	May 18	May 16	33.4	2.5	59.0	2.0	37.0
Excalibur	Sunseeds	May 18	May 17	38.0	1.8	45.3	1.7	25.3
Ibex	Shamrock	May 18	May 17	2.0	1.8	47.0	1.8	25.0
Nikita	Sunseeds	May 11	May 11	22.5	2.3	62.0	2.7	55.0
NMSU 98-13-1	NMSU	May 11	May 11	0.0	2.0	68.0	1.8	28.0
NMSU 98-16	NMSU	May 11	May 11	0.5	2.1	73.0	2.9	63.0
NMSU 99-16	NMSU	May 11	May 11	0.0	1.9	73.0	1.6	37.0
NMSU 99-28	NMSU	May 11	May 11	0.9	1.6	53.0	1.9	41.0
NMSU 99-91	NMSU	May 11	May 11	5.4	1.3	24.0	1.5	46.0
NuMex BR1	NMSU	May 18	May 16	2.9	2.0	47.0	1.4	12.0
NuMex Chaco	NMSU	May 18	May 16	0.5	2.0	48.0	2.5	47.0
NuMex Mesa	NMSU	May 18	May 16	1.5	1.9	48.0	1.7	24.0
NuMex Sweetpak	NMSU	May 18	May 16	18.6	2.1	46.0	1.9	39.0
RCX 5758	Sunseeds	May 18	May 16	18.6	1.9	45.0	1.9	38.0
SSC 6355	Shamrock	May 18	May 15	5.0	2.6	55.0	2.7	46.0
Texas Early White	Petoseed	May 18	May 17	28.8	1.8	33.4	2.1	32.0
Mean			May 14	12.0	2.2	53.4	2.3	40.6
LSD (5%)			2***	7.7***	0.7***	24.1***	1.1***	20.5***

***Significant at P = 0.001.

[z]All entries have yellow skin, except NMSU 99-28, NMSU 99-91, and 'Texas Early White', which have white skin, and NMSU 98-16 which has red skin.

[y]An entry was harvested when all four replications had 80% of their tops down within the plot.

[x]A plot was considered matured when 80% of the tops were down.

[w]The percentage of seedstalks was determined at harvest and calculated by dividing the number of plants with seedstalks by the total number of plants per plot.

[v]Pink root rating. Root system of bulbs were rated based on a scale of 1 (no infected roots) to 9 (completely infected roots).

[u]Percentage of bulbs with pink root.

[t]Fusarium basal plate rot rating. Cut basal plates were rated based on a scale of 1 (no disease tissue) to 9 (70% or more of basal plate decayed).

[s]Percentage of bulbs with Fusarium basal plate rot (FBR). Each bulb's basal plate was cut transversely to reveal the presence or absence of FBR.

Table 2. Yield performance of fall-seeded, early maturing entries in 1999-2000 onion trial at Fabian Garcia Research Center in Las Cruces, N.M.

Entry[z]	Seed source	Marketable yield (%)[z]	Sacks/acre (number)[y]	Average bulb weight (oz)[x]	Single centers (%)[w]
99C 3102	Sakata	92	1010	17.0	20.0
Buffalo	Shamrock	93	487	8.5	66.7
Daybreak	Shamrock	87	1069	16.0	54.5
Don Victor	Sunseeds	88	1089	19.4	61.3
Excalibur	Sunseeds	97	1229	20.8	48.0
Ibex	Shamrock	89	1166	13.1	38.7
Nikita	Sunseeds	97	1033	13.9	64.4
NMSU 98-13-1	NMSU	94	1225	12.8	73.3
NMSU 98-16	NMSU	95	1127	11.7	70.0
NMSU 99-16	NMSU	97	1256	12.8	81.1
NMSU 99-28	NMSU	88	694	7.6	51.1
NMSU 99-91	NMSU	92	965	10.5	51.1
NuMex BR1	NMSU	95	1166	12.1	61.3
NuMex Chaco	NMSU	92	1283	13.8	86.7
NuMex Mesa	NMSU	94	1497	15.6	60.0
NuMex Sweetpak	NMSU	88	1211	18.1	60.0
RCX 5758	Sunseeds	88	1292	17.6	68.0
SSC 6355	Shamrock	84	1312	15.1	22.7
Texas Early White	Petoseed	92	717	12.9	47.3
Mean		92	1094	14.1	57.3
LSD (5%)		NS	228***	2.8***	22.8***

NS, ***Nonsignificant, significant at P = 0.001, respectively.

[z]Percentage of marketable yield was calculated by dividing marketable bulb weight by total bulb weight.

[y]Number of 50 lb sacks produced per acre was calculated by weighing the marketable bulbs per plot and adjusting the plot size to one acre.

[x]Average bulb weight was calculated by dividing the marketable bulb weight by the number of marketable bulbs.

[w]The percentage of bulbs with single centers (single growing point) was determined by cutting each bulb transversely at the vertical center and measuring the number of growing points that extended 0.5 in. beyond the bulb's center.

Table 3. Bulb maturity, seedstalks, and disease evaluation of fall-seeded, intermediate-maturing entries in 1999-2000 onion trial at Fabian Garcia Research Center in Las Cruces, N.M.

Entry[z]	Seed source	Harvest date[y]	Maturity date[x]	Seedstalks (%)[w]	Pink root[v]	Pink root (%)[u]	Fusarium[t]	Fusarium (%)[s]
Cardinal	Shamrock	June 1	May 30	0.0	4.2	100.0	5.7	99.0
Caribou	Shamrock	June 1	May 30	3.1	2.7	84.0	3.8	65.0
NMSU 98-17-1	NMSU	May 30	May 30	0.0	3.1	100.0	4.3	75.0
NMSU 98-20	NMSU	May 30	May 29	0.0	1.7	63.0	1.8	35.0
NMSU 99-29-1	NMSU	May 30	May 29	0.0	3.1	99.0	3.4	66.0
NuMex Crispy	NMSU	June 1	May 31	0.5	1.5	59.0	2.4	48.0
NuMex Dulce	NMSU	June 14	June 14	0.6	2.6	100.0	2.2	26.0
NuMex Starlite	NMSU	June 1	May 30	1.0	2.2	87.0	1.8	36.0
NuMex Vado	NMSU	June 6	June 6	2.4	2.9	99.0	2.8	53.0
RCX 6783	Sunseeds	May 23	May 22	9.7	2.0	71.0	2.3	49.0
Mean			May 31	1.7	2.6	86.2	3.0	55.2
LSD (5%)			1***	2.8***	0.6***	15.9***	0.9***	15.4***

***Significant at P = 0.001.

[z]All entries have yellow skin, except NMSU 98-20 and 'NuMex Crispy', which have white skin, and 'Cardinal', NMSU 98-17-1, and NMSU 99-29-1, which have red skin.

[y]An entry was harvested when all four replications had 80% of their tops down within the plot.

[x]A plot was considered matured when 80% of the tops were down.

[w]The percentage of seedstalks was determined at harvest and calculated by dividing the number of plants with seedstalks by the total number of plants per plot.

[v]Pink root rating. Root system of bulbs were rated based on a scale of 1 (no infected roots) to 9 (completely infected roots).

[u]Percentage of bulbs with pink root.

[t]Fusarium basal plate rot rating. Cut basal plates were rated based on a scale of 1 (no disease tissue) to 9 (70% or more of basal plate decayed).

[s]Percentage of bulbs with Fusarium basal plate rot (FBR). The basal plate of each bulb was cut transversely to reveal the presence or absence of FBR.

Table 4. Yield performance of fall-seeded, intermediate-maturing entries, 1999-2000 onion trial at Fabian Garcia Research Center in Las Cruces, N.M.

Entry	Seed source	Marketable yield (%)[z]	Sacks/acre (number)[y]	Average bulb weight (oz)[x]	Single centers (%)[w]
Cardinal	Shamrock	90	616	8.8	41.3
Caribou	Shamrock	86	1184	16.0	30.0
NMSU 98-17-1	NMSU	89	1132	13.4	46.7
NMSU 98-20	NMSU	95	1718	18.0	42.5
NMSU 99-29-1	NMSU	93	884	10.5	88.2
NuMex Crispy	NMSU	86	1306	14.6	58.7
NuMex Dulce	NMSU	96	1277	15.7	76.0
NuMex Starlite	NMSU	94	1822	18.7	61.0
NuMex Vado	NMSU	93	1552	16.8	52.0
RCX 6783	Sunseeds	89	1696	19.4	47.0
Mean		91	1338	15.4	54.6
LSD (5%)		NS	267***	2.6***	18.0***

NS, ***Nonsignificant, significant at P = 0.001, respectively.

[z]Percentage of marketable yield was calculated by dividing marketable bulb weight by total bulb weight.

[y]Number of 50 lb sacks produced per acre was calculated by weighing the marketable bulbs per plot and adjusting the plot size to one acre.

[x]Average bulb weight was calculated by dividing the marketable bulb weight by the number of marketable bulbs.

[w]The percentage of bulbs with single centers (single growing point) was determined by cutting each bulb transversely at the vertical center and measuring the number of growing points that extended 0.5 in. beyond the bulb's center.

Table 5. Bulb maturity, seedstalks, and disease evaluation of fall-seeded, late-maturing entries in 1999-2000 onion trial at Fabian Garcia Research Center in Las Cruces, N.M.

Entry[z]	Seed source	Harvest date[y]	Maturity date[x]	Seedstalks (%)[w]	Pink root[v]	Pink root (%)[u]	Fusarium[t]	Fusarium (%)[s]
NMSU 98-97	NMSU	June 22	June 22	2.1	2.2	87.0	2.3	44.0
NMSU 99-24	NMSU	June 14	June 14	2.8	2.7	100.0	1.7	18.0
NuMex Freedom	NMSU	June 22	June 22	1.5	3.2	99.0	2.2	24.0
NuMex Luna	NMSU	June 6	June 8	5.5	2.5	98.0	2.1	35.0
Mean			June 15	3.0	2.7	96.0	2.1	30.3
LSD (5%)			3***	NS	0.5**	4.3***	NS	16.9*

NS, *, **, ***Nonsignificant, significant at P = 0.05, P = 0.01, P = 0.001, respectively.

[z]All entries have yellow skin, except NMSU 98-97 which has white skin.

[y]An entry was harvested when all four replications had 80% of their tops down within the plot.

[x]A plot was considered matured when 80% of the tops were down.

[w]The percentage of seedstalks was determined at harvest and calculated by dividing the number of plants with seedstalks by the total number of plants per plot.

[v]Pink root rating. Root system of bulbs were rated based on a scale of 1 (no infected roots) to 9 (completely infected roots).

[u]Percentage of bulbs with pink root.

[t]Fusarium basal plate rot rating. Cut basal plates were rated based on a scale of 1 (no disease tissue) to 9 (70% or more of basal plate decayed).

[s]Percentage of bulbs with Fusarium basal plate rot (FBR). The basal plate of each bulb was cut transversely to reveal the presence or absence of FBR.

Table 6. Yield performance of fall-seeded, late-maturing entries in 1999-2000 onion trial at Fabian Garcia Research Center in Las Cruces, N.M.

Entry	Seed source	Marketable yield (%)[z]	Sacks/acre (number)[y]	Average bulb weight (oz)[x]	Single centers (%)[w]
NMSU 98-97	NMSU	75	841	10.8	74.0
NMSU 99-24	NMSU	94	1360	16.6	76.0
NuMex Freedom	NMSU	78	1322	16.0	59.0
NuMex Luna	NMSU	92	1450	17.9	40.0
Mean		85	1243	15.3	62.3
LSD (5%)		16*	298**	3.4**	21.1*

NS, *, ***Nonsignificant, significant at P = 0.05, P = 0.001, respectively.

[z]Percentage of marketable yield was calculated by dividing marketable bulb weight by total bulb weight.

[y]Number of 50 lb sacks produced per acre was calculated by weighing the marketable bulbs per plot and adjusting the plot size to one acre.

[x]Average bulb weight was calculated by dividing the marketable bulb weight by the number of marketable bulbs.

[w]The percentage of bulbs with single centers (single growing point) was determined by cutting each bulb transversely at the vertical center and measuring the number of growing points that extended 0.5 in. beyond the bulb's center.

Table 7. Bulb maturity and disease evaluation of transplanted entries in 1999-2000 onion trial at Fabian Garcia Research Center in Las Cruces, N.M.

Entry[z]	Seed source	Harvest date[y]	Maturity date[x]	Pink root[w]	Pink root (%)[v]	Fusarium[u]	Fusarium (%)[t]
Candy	Petoseed	June 20	June 25	2.1	84.0	1.2	8.0
Cimarron	Sunseeds	June 14	June 14	2.4	95.0	1.4	11.0
NMSU 98-31	NMSU	June 20	June 30	2.6	95.0	1.1	5.0
NMSU 98-97	NMSU	June 20	June 25	2.6	98.0	1.4	20.0
NMSU 99-24	NMSU	June 20	June 20	3.0	98.0	1.1	11.0
NuMex Bolo	NMSU	June 20	June 17	3.0	94.0	1.2	6.0
NuMex Casper	NMSU	June 20	June 23	2.0	81.0	1.1	8.0
NuMex Dulce	NMSU	June 20	June 22	2.7	99.0	1.1	7.0
NuMex Freedom	NMSU	June 20	June 22	3.3	100.0	1.1	5.0
NuMex Jose Fernandez	NMSU	June 20	June 30	3.1	100.0	1.2	18.0
NuMex Luna	NMSU	June 20	June 23	3.9	100.0	1.2	10.0
NuMex Mesa	NMSU	June 14	June 14	3.0	100.0	1.0	2.0
NuMex Starlite	NMSU	June 14	June 14	2.5	100.0	1.1	4.0
NuMex Vado	NMSU	June 20	June 20	3.4	100.0	1.2	8.0
Texas Grano 1015Y	Asgrow	June 20	June 24	3.1	99.0	1.1	5.0
Utopia	Asgrow	June 20	June 24	2.7	94.0	1.2	8.0
Mean			June 22	2.8	96.1	1.2	8.5
LSD (5%)			1***	0.3***	8.3***	NS	NS

NS, ***Nonsignificant, significant at P = 0.001, respectively.

[z]All entries have yellow skin, except NMSU 98-97 and 'NuMex Casper' which have white skin.

[y]An entry was harvested when all four replications had 80% of their tops down within the plot.

[x]A plot was considered matured when 80% of the tops were down.

[w]Pink root rating. Root system of bulbs were rated based on a scale of 1 (no infected roots) to 9 (completely infected roots).

[v]Percentage of bulbs with pink root.

[u]Fusarium basal plate rot rating. Cut basal plates were rated based on a scale of 1 (no disease tissue) to 9 (70% or more of basal plate decayed).

[t]Percentage of bulbs with Fusarium basal plate rot (FBR). The basal plate of each bulb was cut transversely to reveal the presence or absence of FBR.

Table 8. Yield performance of transplanted entries in 1999-2000 onion trial at Fabian Garcia Research Center in Las Cruces, N.M.

Entry	Seed source	Marketable yield (%)[z]	Sacks/acre (number)[y]	Average bulb weight (oz)[x]	Single centers (%)[w]
Candy	Petoseed	85	643	7.0	46.0
Cimarron	Sunseeds	100	1004	11.5	38.0
NMSU 98-31	NMSU	88	704	8.1	63.0
NMSU 98-97	NMSU	81	363	3.9	54.0
NMSU 99-24	NMSU	100	564	6.0	79.0
NuMex Bolo	NMSU	95	812	8.6	74.0
NuMex Casper	NMSU	97	870	8.9	79.0
NuMex Dulce	NMSU	95	764	8.0	73.0
NuMex Jose Fernandez	NMSU	90	839	9.2	92.0
NuMex Freedom	NMSU	92	613	6.5	74.0
NuMex Luna	NMSU	94	785	8.3	66.0
NuMex Mesa	NMSU	95	561	6.4	41.0
NuMex Starlite	NMSU	95	771	8.1	66.0
NuMex Vado	NMSU	94	720	8.8	53.0
Texas Grano 1015g	Asgrow	92	659	7.1	40.0
Utopia	Asgrow	94	796	8.6	55.0
Mean		93	717	7.8	62.1
LSD (5%)		NS	143***	1.2***	14.0***

NS, ***Nonsignificant, significant at P = 0.001, respectively.

[z]Percentage of marketable yield was calculated by dividing marketable bulb weight by total bulb weight.

[y]Number of 50 lb sacks produced per acre was calculated by weighing the marketable bulbs per plot and adjusting the plot size to one acre.

[x]Average bulb weight was calculated by dividing the marketable bulb weight by the number of marketable bulbs.

[w]The percentage of bulbs with single centers (single growing point) was determined by cutting each bulb transversely at the vertical center and measuring the number of growing points that extended 0.5 in. beyond the bulb's center.

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