

POTATO VARIETY TRIALS AT ONTARIO, 1997

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Introduction

The Oregon potato variety development program evaluates approximately 80,000 single-hill selections annually from breeding programs in Idaho, Colorado, and North Dakota. These potato lines progress through the selection process until they are discarded or, as occurs more rarely, are named and released as a variety. The Malheur Experiment Station (MES) participates in the overall effort by conducting replicated yield trials at the Preliminary, Statewide, and Western Regional levels. Over 100 selections were included in these trials at MES in 1997. In 1997, additional trials were conducted to evaluate Umatilla Russet compared to Russet Burbank and Shepody.

The normal progression of a new line through the potato development program starts with the plant breeder who crosses two prospective parents. The resulting true seed (like a tiny tomato seed) is planted in an Oregon State University greenhouse in Corvallis. These small plants form tubers that are planted in single-hill trials. The best of the single-hills go to 4 hill trials, then to seed increase. From seed increase, successful lines are entered successively in the Preliminary Yield Trial, Statewide Variety Trial, Tri-state Trials and finally the Western Regional Trials. The remaining successful varieties are increased in commercial seed production and released as warranted.

Two Oregon selections will be released in early 1998. Umatilla Russet (AO82611-7) is a processing variety for French fry production that has performed very well in the Treasure Valley and in the Columbia Basin. Over 400 acres of AO82611-7 seed were certified in 1997. Legend Russet (COO83008-1) has performed well for French fry production in the Treasure Valley of Eastern Malheur County, Oregon, and Southwestern Idaho, and for fresh market in Eastern Idaho. Over 160 acres of COO83008-1 seed passed certification in 1997. Several other Oregon selections are in advanced stages of evaluation and appear to be candidates for release. Three russet skinned selections and two round white selections from the Statewide Variety Trial will be advanced to regional trials in 1998. Most of the entries in the 1997 Statewide Variety Trial exceeded the standard varieties in yield, quality, or both.

Oregon has made considerable progress in the past 10 years in potato variety improvement. Russet Burbank, the long-time industry standard for fresh market and French fry production, requires high inputs and is vulnerable to several physiological disorders. It is no longer the dominant potato variety in the Treasure Valley or the Klamath Basin. New varieties have also captured significant acreage in southeastern Idaho and the Columbia Basin. However, the newer varieties that are replacing Russet Burbank also have weaknesses. Traditional breeding programs continue to produce selections with superior quality for specific markets. Recently, through genetic engineering techniques, standard varieties are being altered to incorporate disease or pest resistance, or to improve other characteristics. A third area being pursued is line selections within a variety. Potato selections from all of these methods were included in material evaluated in the Oregon potato variety development program in 1997. This report summarizes the performance of selections in Oregon and the region with special emphasis on variety performance at Ontario in 1997. Similar trials are conducted each year at Klamath Falls, Hermiston, and Powell Butte.

Materials And Methods

The Western Regional Trial, the Statewide Variety trial, and the Preliminary Yield Variety Trial were all planted on May 2 in the same field of Owyhee silt loam and received the same management. The Preliminary Yield Trial included 5 standard varieties and 67 numbered selections in 35-hill plots with 2 replications. Five standard varieties and 19 numbered selections were included in the Statewide Variety Trial. The Western Regional Trial included 3 standard varieties, 10 numbered selections, and 5 line selections of Russet Norkotah in 30-hill plots and 4 replications. All trials were arranged in a randomized complete block designs.

Treated 2 oz seed pieces were planted 9 inches apart in the row with rows spaced 36 inches apart. Admire at 19 oz/acre was applied in the seed furrow at planting. Standard cultural practices of weed control and fertilizer were followed. Urea was sidedressed after planting at 114 lb N/acre. The potato crop was grown to harvest with solid set sprinkler irrigation. Solution 32 fertilizer was applied through the sprinkler system June 25 to supply 85 lb N/acre. Matrix herbicide was applied at 0.25 oz ai/acre on June 10. The crop was protected from insects, diseases, and mites by aerial applications: Bravo at 0.19 gal/acre plus Thiodan at 0.25 gal/ac on June 24, June 30, and July 7, Dithane at 0.4 gal/acre on July 21, Dithane at 0.5 gal/acre, plus Kocide at 0.25 gal/acre, plus sulfur at 5 lb/acre on August 13, and sulfur at 3.4 lb/acre plus Comite at 0.29 gal/acre on August 22.

The potato vines were shredded with a flail mower September 8, and tubers were lifted with a mechanical potato digger and picked by hand into burlap sacks in late September. External tuber characteristics were noted for each replication during harvest. The sacks of potatoes were stored under tarps on pallets in a barn until they were graded. USDA grade standards were followed to separate B size (under 4 oz), U.S. Number One tubers (4 to 12 oz and over 12 oz), U.S. Number Two tubers over 4

ounces, and culls. Yields of Number One tubers were not adjusted for external blemishes such as rhizoctonia or scab, or internal defects such as hollow heart or brown center. Ten large (usually over 10 ounces) tubers from each plot were cut longitudinally and inspected for internal defects. The data on external and internal defects is not presented in this report.

Twenty tuber samples were taken of each variety in each plot from all trials and placed in refrigerated storage. In November the tubers were evaluated for specific gravity and fry color. Specific gravity was measured by the weight-in-air, weight-in-water method. Data on yield, grade, and processing quality were evaluated using ANOVA and NCSS software. Where significant differences were present, the LSD (0.05) was calculated.

Decisions on the disposition of selections at all levels of evaluation are based on data accumulated at all trial locations. The Preliminary Yield Trial and Statewide Variety Trial data from four Oregon sites (Hermiston, Ontario, Powell Butte, and Klamath Falls) are compiled and reviewed by Oregon potato variety development committee members. Cooperators at Aberdeen, Idaho, compile Tri-state and western regional trial data, which is reviewed at annual committee meetings attended by up to 30 cooperators and industry representatives.

Results And Discussion

The 1997 growing season was favorable for the potato production at Ontario. No hail, frost, or late blight occurred in 1997.

Western Regional Trial. Russet Burbank had among the lowest yield of U.S. Number One tubers and among the highest yield of U.S. Number Two tubers and culls of all entries (Table 1). The selections A82360-7 and TX1385-12RU were among the most productive of total yield and marketable yield. The line A82360-7 was the highest yielding variety over the nine Pacific Northwest sites in 1997 and was also highly productive at Ontario.

Three Texas and two Colorado line selections of Russet Norkotah were included in this trial. All had later vine maturity than the standard Norkotah entry (data not shown). The Colorado selections (CORN-3 and CORN-8) and the Texas selection (TXNS 223) were entered in the regional trial for the first time in 1997. In 1996 trials, TXNS 112 and TXNS 278 were only slightly later in vine maturity than the standard Norkotah across seven locations. All Norkotah line selections were similar to or higher than the standard Norkotah in specific gravity. CORN-3 had a higher incidence of hollow heart at Klamath Falls, Ontario, and Aberdeen than Russet Norkotah. This selection produced a higher yield of large tubers compared to the other Russet Norkotah selections. CORN-3 achieved the highest Number One yield, but tuber size was excessive. CORN-3, and CORN-8 produced significantly higher Number One yields than the standard Norkotah. TXNS 278 was the lowest yielding Norkotah line selection.

Three entries: A82360-7; CO85026-4; and TXAV657-27Ru, have completed three years in regional trials. Two selections, A8792-1 and CO87009-4, were discarded. All other selections in the 1997 trial will be continued in the program. The Colorado and Texas selections of Russet Norkotah have undergone extensive seed increase and will constitute a significant portion of 1998 acreage in these states. Averaged over nine regional trial sites in 1997, all of these strains produced higher Number One yields than the standard Norkotah by 20 to 80 cwt/acre.

Statewide Variety Trial. Russet Burbank produced a high total yield, but many Number Two tubers and culls (Table 2). Across all locations, Russet Burbank ranked low in yield of Number One tubers, but the U.S. Number One yield of Russet Burbank was reasonable at Ontario in 1997. The overall quality and performance of entries in this trial was very good. Most of the Russet-skinned selections were attractive in appearance, had relatively good tuber type, produced high yields, and had fewer external and internal defects than Russet Burbank. Russet Norkotah had 182 cwt/acre less total yield than Russet Burbank.

The two round, white, chipping selections, AO91812-1 and AO91812-2, ranked 1st and 2nd, respectively, in Number One yields across all locations and will advance to the regional chipping trial in 1998. Both lines produced very high yields. Late vine maturity and attached stolons were noted in both selections. Six additional selections will be retained in the statewide trial in 1998. Only three selections from this trial were discarded from the program.

The official release of AO82611-7 as Umatilla Russet and COO83008-1 as Russet Legend is planned for early 1998. Both selections have good processing quality. Russet Legend is considered acceptable for fresh market by growers in Eastern Idaho.

AO85165-1, an attractive fresh market russet variety, completed three years of evaluation in the regional trial in 1996, has been increased in greenhouse culture in 1997, and will be supplied to seed growers for rapid increase and commercial evaluation. It resembles Russet Norkotah, which was the male parent, in appearance, and typically exceeds Norkotah in Number One yield by 100 cwt/acre or more.

The lines AO92173-2 and AO87277-6 were among those with the highest marketable yield at Ontario in 1997. The russeted selection AO87277-6 was included in the Western Regional Trial for the first time in 1997. It will remain in the 1998 regional trial as a dual purpose line. Another dual purpose russeted line, AO89128-4, was included in the 1997 Tri-state trial and will advance to the regional trial in 1998. The lines AO90014-1 and AO88103-3 are being advanced to the Tri-state trial and are considered dual purpose, attractive russets. The line AO90319-1 was probably the most attractive russet-skinned selection in this trial. It has very nice yellow flesh color. This selection will be entered in the regional specialty variety trial in 1998. It produced lower yields than most other clones in both 1996 and 1997.

Preliminary Yield Trial. Most of the entries in this trial were selections from crosses made at Aberdeen, Idaho, in 1992 and 1993. Several entries had excessive vine growth and immature skins at harvest which resulted in serious skinning damage. Yields were acceptable, but several of the selections, including Russet Burbank and Shepody, had many off-type, rough, or growth cracked tubers. Russet Burbank ranked low in Number One yield (Table 3).

After reviewing data from all locations, only 11 lines of the 67 tested were selected for further evaluation (Table 3). All of these are russeted lines. Several selections had adequate dry matter content and fry color for processing as French fries. Ranking in Number One yields across four locations ranged from 1st for AO93317-5, which produced the highest Number One yield at three locations, to 32nd for AO92281-3. None of the clones saved in 1997 were equal to Russet Norkotah in tuber type and appearance. Entries selected from this trial were advanced to the Statewide Variety Trial.

Summary

The quality of advanced selections in the Oregon and regional potato variety development programs was excellent. Oregon will formalize releases for Russet Legend and Umatilla Russet in 1998. Idaho plans to release a round white chipping selection, NDO1496-1, which was selected from the Oregon program; a red-skinned selection, A82705-1R as Idarose; and two russeted selections, A81473-2 and A8495-1, in 1998. Colorado plans to release a russet selection, AC83064-6, and a red-skinned selection, DT6063-1R in 1998. Releases planned for the near future in Texas include a round white chipping selection, ATX85404-8, and a russet selection, TXAV657-27Ru. Texas and Colorado continue moving forward with development of Russet Norkotah selections. Based on evaluation of the russet skinned selections at MES, Umatilla Russet and Russet Legend have promise for processing based on marketable yield, high percentage of U.S. Number One tubers, high specific gravity, and light fry color.

Table 1. Yield, grade, fry color, and specific gravity of seventeen potato varieties and selections in the Western Regional Trial, Malheur Experiment Station, Oregon State University, Ontario, Oregon, 1997.

Varieties	Yield by market grade						Total yield	Quality	
	4 - 6 oz	6 - 12 oz	> 12 oz	Total U S No. 1s	Total U S No. 2s	Marketable		Fry color	Specific gravity
	-----cwt/acre-----							%	
R. Burbank	69.1	190.9	61.1	321.1	146.1	467.2	580.0	37.7	1.075
Ranger R.	32.5	180.5	140.1	353.1	97.1	450.3	529.5	46.6	1.093
R. Norkotah	70.4	206.4	58.1	334.9	19.4	354.3	409.0	37.2	1.071
A82360-7	94.4	332.0	91.5	517.9	79.6	597.5	714.1	52.5	1.086
A8792-1	26.8	130.3	208.6	365.6	119.1	484.7	575.4	48.0	1.094
AC87804-3	38.4	167.6	142.7	348.7	80.9	429.6	491.3	46.2	1.097
AO87277-6	52.5	231.5	117.3	401.3	64.3	465.5	532.0	48.3	1.091
CO85026-4	44.8	149.9	105.6	300.3	46.7	347.0	405.2	48.3	1.086
CO87009-4	74.7	225.7	76.8	377.2	87.1	464.3	534.5	56.2	1.095
CORN-3	36.1	156.4	180.1	372.6	118.4	491.0	569.0	40.7	1.076
CORN-8	50.4	189.3	148.1	387.8	70.0	457.7	513.6	40.9	1.07
ND840-1	85.2	251.0	112.4	448.6	72.6	521.1	630.7	43.4	1.082
TX1385-12RU	44.4	147.0	210.0	401.4	149.4	550.8	647.8	54.0	1.081
TXAV657-27RU	51.4	183.5	174.1	408.9	55.8	464.7	536.2	47.2	1.08
TXNS112	55.0	215.4	117.8	388.3	61.8	450.1	511.4	38.2	1.071
TXNS223	78.6	224.4	71.0	374.0	77.4	451.3	535.0	37.9	1.071
TXNS278	54.3	211.0	134.2	399.5	67.3	466.8	537.6	38.7	1.072
Mean	56.4	199.6	126.4	382.4	83.1	465.5	544.3	44.8	1.082
LSD(0.05)	17.5	40.4	63.1	78.8	33.2	79.9	77.1	4.4	0.004