Potato Variety Development—2008 Progress Report

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Abstract

Seed increases, single hill, and variety trials were conducted in 2008 at Central Oregon Agricultural Research Center (COARC) as a part of statewide, Tristate (Oregon, Washington, and Idaho) and western regional potato variety development programs. Seed of 651 selections was produced for 2009 statewide, Tristate, and regional trials. Also, 53,662 single-hill selections were grown; 466 were selected for further evaluation. Virus levels were very low in all 2008 seed production.

Advanced and preliminary statewide variety trials were grown at Powell Butte in 2008. AO96141-3, a high-yielding processing selection, has completed 3 years of regional testing and will be considered for release. Selections AO96305-3 and AO96365-2 will be advanced to 2009 regional trials while AO00057-2 will be evaluated another year in the Tristate trial.

Selections AO96160-3 and AO96164-1 were named and are slated for release in 2009. AO96160-3 is an attractive russet with high yields and can be used for fresh market or processing. The name 'Owyhee Russet' was chosen for this selection. AO96164-1 is also a high-yielding russet selection with outstanding processing characteristics. 'Sage Russet' was selected as the name for AO96164-1.

Introduction

A small program to develop new potato varieties for the Oregon potato industry was begun in the early 1970's at what was then called Central Oregon Experiment Station and Klamath Experiment Station. The program has evolved over the years in both the number of selections evaluated and the number of sites used for evaluation. Over 80,000 varieties and selections were evaluated in 2008 at five Oregon sites and one Washington site.

The primary emphasis of the potato variety development program is developing new potato varieties with improved yield, quality, grade, pest resistance, and nutritional quality. The overall objectives of the current program are as follows:

1) Develop efficient potato varieties for processing, chipping, traditional fresh market, and specialty enterprises. Focus on the needs of each production region in Oregon;
2) Identify and incorporate genetic resistance to various production concerns including pests, diseases, nematodes, and environmental stresses;
3) Develop production management guidelines for selections nearing release.

COARC is ideally located and equipped to accomplish these objectives in cooperation with other state and regional experiment stations. The research center has the capacity to screen thousands of new clones and produce high quality, disease-free seed of promising selections. This report discusses activities at COARC in 2008 for developing new potato varieties.

Materials and Methods

Seed Increases

The Powell Butte site of COARC is the major seed potato production site for cooperative regional, Tristate, and statewide potato variety trials.

Prior to planting, 4.3 pt/acre of Eptam® 7E were incorporated into the soil on May 16, 2008. An Iron Age assisted feed potato planter was used to band 864 lb/acre of 16-16-16-7 (NPKS) fertilizer at planting. Seed increases were planted from June 5 to June 17 (excluding weekends). One hundred twenty tuber units (six seed pieces each) of each regional, 60 tuber units of each Tristate and advanced statewide, 30 tuber units of each first-year statewide, and 15 tuber units of each preliminary selection were planted. Individual seed pieces were planted 9 inches apart within the row and tuber units were separated by 18 inches. Two rows were planted 36 inches apart and were bordered on either side by a blank row or a 10-ft alley for tractor access. The blank rows/tractor alleys provided space for sprinkler laterals, roguing, and spraying with minimal vine contact. At planting, 0.29 lb ai/acre of Admire® Pro was sprayed into the open furrow to control aphids and other sucking insects.

The seed increase blocks were rogued for potato virus Y (PVY), potato virus X (PVX), potato leaf roll virus (PLRV), and other bacterial and viral diseases each week during the growing season.

Weeds were sprayed on June 23 with a tank mix of 0.5 lb/acre of Sencor® DF and 1.0 oz/acre of Matrix®. The seed increase block was desiccated on September 5 and again on September 11, using 1.5 pt/acre of Reglone®. The seed increase block was harvested October 8, 9, and 13, 2008.

Single Hills and Early Generation Seed Increases

Approximately 53,660 seedling tubers (small tubers produced in greenhouses from true potato seed) were planted in 2008. These tubers were produced from genetic crosses made in Oregon, Washington, and Idaho. Parental germplasm was selected to produce progeny with russet skin and good internal quality, resistance to PVY, potato tuberworm, root knot and stubby root nematodes, late blight, and powdery scab. Individual tubers were planted 27 inches apart in 36-inch rows June 2-4, 2008. Fertilizer and herbicide application, and management practices were identical to those in the seed increases trials.

First and second field generation material for which less than five total tubers existed were planted in a combination selection/increase trial. Three hundred thirty-nine selections from seedling tubers grown at Powell Butte in 2007 and 35 selections from seedling tubers grown at Klamath Falls in 2007 were planted at Powell Butte on June 5. Approximately 18 seed pieces (3 tuber units of 6 pieces each) of each clone were planted in the same spatial arrangement as the regional and statewide seed increases. Each clone was separated by ‘All Blue’ potatoes, which were planted to reduce variety mixing at harvest. Fertilizer and weed control were the same as for regional and statewide increases.

The selection trials/increases were harvested on September 30, 2008 by lifting with a level bed potato digger. Selection was based on appearance, shape, malformations, skin color and

type, and size and shape uniformity. Selections were bagged and all non-selected clones were left in the field.

Variety Trials

Two variety trials were grown at Powell Butte in 2008. Twenty-four varieties/selections were entered in the statewide variety trial and 78 varieties/selections were evaluated in a statewide preliminary variety trial (PYT2).

Prior to planting, 4.3 pt/acre of Eptam 7E were incorporated into the soil on May 16, 2008. The plots were planted May 22, 2008 and 864 lbs/acre of 16-16-16-7 (NPKS) fertilizer was banded to the sides and slightly below the seed pieces at planting time. On June 23, 2008, 0.38 lb ai/acre of metribuzin and 1 oz/acre of Matrix was applied as a tank-mix when plants were 4 to 5 inches high. The field was irrigated with 0.5 inch of water after the application.

The variety trials were arranged in randomized block designs; the statewide trial had four replications, the PYT2 trial two replications. Seed pieces were placed 9 inches apart in rows spaced 36 inches apart and each plot was separated by two hills of 'All Blue' potatoes. The individual plots in the statewide trial were 21 ft long (26 seed pieces) and the PYT2 plots were 18 ft long (22 seed pieces). The trials were sprinkler irrigated twice weekly according to demand.

Potato vines were desiccated with 1.5 pt/acre of Reglone on September 5 and September 11 and the vines were removed by flaming prior to harvest. The statewide trial was harvested on October 21, 2008 and graded the following day. The PYT2 trial was harvested on October 14; the PYT2 plots were graded October 16 and 20. For each plot, the total number of tubers was recorded and the total weight was recorded for each of six categories: under 4 oz, culls, twos, 4- to 6-oz U.S. number ones, 6- to 12-oz ones, and over 12-oz ones. A 10-lb sample from each plot was taken for french frying, specific gravity determination, and internal defect grading.

Specific gravities were determined by weighing approximately 10 lb of tubers in air and water. Ten tubers from each plot were sliced longitudinally and internal defects were scored as percent of tubers with a given defect. Ten tubers from each plot were stored for 2 months at 50°F for french frying. A 1-inch by 0.25-inch-thick strip from each tuber was fried for 4 min at 375°F. Each strip was evaluated for color and dark ends. Color was assessed using a photovolt reflectance unit and converted to USDA scores based on the "USDA Standard Color Chart for Frozen French-fried Potatoes".

Results and Discussion

Seed Increases

In 2008, 31 selections were increased for regional and Tristate trials and 621 selections were increased for Oregon trials. Of the 10,500 tuber units planted in 2008, 153 were diagnosed in the field with PVY (1.46 percent) and removed from production. About one-third of the total PVY was limited to four selections. The improvement in PVY infection was likely due to obtaining certified seed of several of the check varieties and improvements in sterilization at

cutting.

Because of the large number of clones and the importation of material from other programs, it has been difficult to totally eliminate viral infection. Winter eye-indexing, ELISA testing during the growing season with field test kits, intensive roguing, and aphicide applications have kept viral infection relatively low as compared with the early days of the variety development program.

Single Hills and Early Generation Seed Increases

Over 53,660 seedling tubers from 511 genetic crosses were planted in 2008. These single-hill selections were dug on September 30 and evaluated by a team of potato researchers, breeders, and processors from several western states. The evaluation team retained 466 selections to be advanced to 2009 second field generation selection trials. The selections were based on visual criteria, such as relative yield, tuber size, shape, uniformity, and overall appearance. More intensive evaluations as well as pest resistance will be assessed in future years.

The 343 selections retained from the 2007 Powell Butte single-hills plus 35 specialty selections retained from single-hills grown at Klamath Falls in 2007 were planted at Powell Butte in 2008. Advancing to preliminary trials to be conducted in 2009 were 68 russet-type and 11 specialty selections. Many of the advancing selections have some type of pest resistance.

Statewide Variety Trial

The results of the statewide russet potato variety trial grown at Powell Butte are shown in Table 1. AO96141-3, a high-yielding processing selection, has completed 3 years of regional testing and will be considered for release. Selections AO96305-3 and AO96365-2 will be advanced to 2009 regional trials while AO00057-2 will be evaluated another year in the Tristate trial. Both AO96305-3 and AO96365-2 are attractive russets with uniform shape and size. These two selections have excellent internal quality and are suited for fresh market or processing. Additional retained selections include AO02183-2, AO01114-4, AO02060-3, AO02118-2, and OR04057-2. The decision to retain or discard individual clones was based on collective data from identical trials grown at five Oregon locations: Powell Butte, Hermiston, Klamath Falls, Ontario, and Corvallis.

Selections AO96160-3 and AO96164-1 were named and are slated for release in 2009. Variety trial testing for these two selections was completed in prior years. AO96160-3 is an attractive russet with high yields and can be used for fresh market or processing. The name ‘Owyhee Russet’ was chosen for this selection. AO96164-1 is also a high-yielding russet selection with outstanding processing characteristics. ‘Sage Russet’ was selected as the name for AO96164-1.

Preliminary Yield Trial (PYT2)

The retained selections from the PYT2 potato variety trial grown at Powell Butte are shown in Table 2. The trial contained a total of 78 entries but only 9 were advanced to the 2009 statewide variety trial. Selections OR05078-1 and OR05081-1 have resistance to potato tuberworm, while retained selection POR06V12-3 has resistance to PVY. The decision to

retain or discard individual clones was based on collective data from identical trials grown at four Oregon locations: Powell Butte, Hermiston, Klamath Falls, and Ontario.

Table 1. 2008 statewide russet potato variety trial grown at Powell Butte, Oregon.

Selection	Yield		%	Tuber	L/W	Spec.	Fry	Sugar	HH/	Black	Vine
	Total	No. 1	No. 1	size	ratio	grav.	color	ends	BC	spot	mature
	cwt/a	cwt/a	%	oz			USDA	%	%	%	5=Late
R Burbank	414	248	60	4.5	1.93	1.084	1.39	0	0	0	3.5
Ranger	368	292	79	6.7	1.94	1.086	0.77	0	0	0	3.0
Norkotah	466	369	79	6.8	1.85	1.076	1.84	0	3	0	2.0
AO96141-3	419	335	80	7.1	2.08	1.096	0.00	0	0	3	3.5
AO96305-3	340	278	82	6.1	1.99	1.087	0.00	0	0	0	3.0
AO96365-2	410	306	75	6.7	1.53	1.080	0.48	0	0	0	3.0
AO98282-5	378	266	70	5.9	1.88	1.094	0.00	0	3	5	4.0
AO00057-2	351	260	74	8.3	1.64	1.085	0.00	0	3	0	3.0
AO01057-5	435	361	83	7.3	1.58	1.078	1.45	0	0	0	2.0
AO02019-3	349	267	77	7.9	1.99	1.083	0.95	3	0	0	4.0
AO02182-1	370	274	74	7.9	1.82	1.072	1.38	0	0	0	3.5
AO02183-2	407	289	71	5.1	1.98	1.082	0.00	0	0	0	3.0
AO01114-4	367	286	78	5.8	1.73	1.093	1.53	3	0	3	3.5
AO02060-3	411	334	81	7.5	1.82	1.083	0.25	0	0	0	3.5
AO02118-2	361	306	85	6.8	1.56	1.075	0.00	0	0	0	3.0
AO03003-3	419	277	66	4.9	1.91	1.079	0.00	0	0	3	2.0
AO03096-5	427	317	74	5.4	1.82	1.098	0.57	0	0	0	4.0
OR03085-5	378	266	70	6.1	1.49	1.085	0.41	0	0	3	3.0
OR03151-4	410	254	62	5.1	1.59	1.082	1.21	3	0	5	4.0
OR04018-5	311	246	79	7.7	1.94	1.085	0.00	0	0	0	3.5
OR04057-2	392	226	58	5.2	1.83	1.081	0.00	0	0	3	3.0
OR04062-1	340	251	74	5.4	1.60	1.087	0.46	0	0	0	3.0
POR05V016-2	391	311	80	6.6	1.69	1.078	0.42	0	0	0	3.0

Table 2. Retained selections from the 2008 preliminary-2 russet potato variety trial grown at Powell Butte, Oregon.

Selection	Yield		%	Tuber	L/W	Spec.	Fry	Sugar	HH/	Black	Vine
	Total	No. 1	No. 1	size	ratio	grav.	color	ends	BC	spot	mature
	cwt/a	cwt/a	%	oz			USDA	%	%	%	5=Late
R Burbank	367	191	52	3.9	1.93	1.086	1.21	5	0	0	3.5
Ranger	349	261	75	7.1	1.88	1.091	0.00	0	0	5	3.0
Norkotah	318	246	77	5.5	1.90	1.074	0.90	0	10	0	2.0
AO99135-3	338	275	81	7.6	1.73	1.084	0.49	0	0	0	3.5
AO99152-1	389	304	78	6.3	1.89	1.095	1.27	0	0	0	3.0
AO00131-1	384	292	76	5.6	1.67	1.090	1.19	5	0	10	4.0
AO03087-4	379	317	84	7.0	1.72	1.090	0.00	0	0	10	4.0
AO03420-1	269	129	48	5.0	1.58	1.092	0.67	0	0	0	3.5
OR05039-4	391	350	89	7.4	1.91	1.084	0.56	0	0	0	3.5
OR05078-1	421	312	74	5.3	1.18	1.078	0.00	0	10	0	3.5
OR05081-1	416	329	79	5.5	1.23	1.082	0.08	0	35	0	3.0
POR06V12-3	434	309	71	5.1	1.86	1.102	0.30	0	0	5	3.5