

## **POTATO VARIETY DEVELOPMENT 2002 PROGRESS REPORT**

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### **Summary**

Oregon has the most comprehensive potato variety development program in the United States. The five Oregon cooperating locations, coupled with the USDA breeding program in Aberdeen, Idaho, each provide unique contributions in every step of the development process from breeding to the release of new potato varieties. The diversity of cooperating locations provide an effective means to screen for disease susceptibility, internal defects, yield potential in short and long growing seasons, and processing quality. Additionally, facilities provide for cross pollination, production of mini-tubers, increase of seed for testing purposes, and producing early generation certified seed of new cultivars. The consistent and systematic screening of new lines by the Oregon potato variety team has proven to be an efficient program, providing improved potato varieties for growers.

The TriState Variety Development Program has released 12 varieties since 1995. Three more releases are pending. The Oregon Variety Development Team released seven of them, with two releases forthcoming. Release documents for Willamette Russet (AO91812-1), a chipping variety, have been completed and will be submitted pending production of adequate supplies of commercial seed. Modoc, a red-skinned selection, with a high percentage of marketable tubers, will be released in 2003.

### **Introduction**

In 2001, Oregon produced 20.8 million cwt of potatoes on 45,000 acres with a farm gate value of \$122.4 million. Average farm gate value for 1999-2001 was \$136 million for potatoes; alfalfa hay was the only Oregon crop that produced a higher farm gate value (300.5 million dollars) during that period. Finished (processed) value of the Oregon crop approaches \$350 million.

Varieties released by the Tri State research group have and will continue to positively effect the Northwest potato industry. Recently released varieties are now produced on over 100,000 acres in the world and value to growers is placed at \$135 million in farm gate value. A recent economic analysis of the program revealed that for every dollar invested in the program, a \$39 return was realized. Value of the new varieties comes in the form of improved quality, increased yield, and decreased inputs. Increased economic value and minimal environmental impacts will occur, as new varieties require fewer fertilizer and chemical inputs. Breeding projects emphasizing specialty-type potatoes will create new products and increased market share. The overall impact will be to improve the competitiveness of the Northwest potato industry.

The Oregon/Tri-State Variety Development efforts address the shortcomings of existing varieties. Russet Burbank growers continue to battle tuber malformations, internal defects including stem end discoloration, and reduced fresh market demand. The threat of late blight is ever present. Both seed and commercial growers continue to face problems associated with viruses.

The consistent and systematic screening of new lines by the Oregon potato variety team has proven to be an efficient program, providing improved potato varieties for growers. This report details the program's activities at Central Oregon Agricultural Research Center (COARC).

### **Materials and Methods**

The Powell Butte field of COARC was the major site producing seed for cooperative regional, tristate, and statewide potato variety trials. In 2002, 44 lines were increased for regional and tristate trials and 98 lines were increased for statewide trials. Prior to planting, 4.5 pints/acre of Eptam 7-E® were incorporated into the soil on May 22, 2002. On June 3-13, 2002, 120 tuber units (six seed pieces each) of each regional, tristate and statewide selection, and 15 tuber units of each preliminary clone 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. An Iron Age assisted-feed potato planter was used to plant the seed pieces and band 1,025 pounds/acre of 16-16-16-7 (NPKS) fertilizer during the planting operation. A systemic insecticide, Admire® (imidacloprid), was applied to the opened furrows at planting at a rate of 0.30 ai/acre. Sencor® (0.48 lb/acre) and Matrix® (1.2 oz/acre) were applied on July 31, 2002 for weed control. The seed increase block was desiccated with 1.5 pint/acre of Reglone® on September 10 and September 20, 2002. Vines were rolled on September 24, 2002.

First and second field generation material for which less than five total tubers existed were planted in a combination selection/increase trial. Three hundred sixty-four selections retained from seedling tubers grown in 2001 were planted at Powell Butte on May 31, 2002. Approximately 18 seed pieces (three tuber units of six pieces each) of each selection were planted in the same spatial arrangement as the seed increases. Each selection was separated by "All Blue" potatoes, which were planted to reduce variety mixing at harvest. Fertilizer and weed control were the same as used for seed increases. The selection trials/increases were harvested on October 1, 2002, by lifting with a level bed potato digger. Selection was based on appearance, shape, malformations, skin color and type, and size and shape uniformity. Approximately 65,600 seedling tubers (small tubers produced in greenhouses from true potato seed) were planted at Powell Butte. Individual tubers were planted 27 inches apart in 36 inch rows on May 21-23, 2002. Fertility, herbicides, and management practices were similar to the seed increases above.

Two variety trials were grown at Powell Butte in 2002. Twenty-two varieties/selections were entered in the statewide variety trial and 81 varieties/selections were evaluated in a statewide preliminary variety trial (PYT2). Five and one-half pints/acre of Eptam 7-E were incorporated into the soil on May 22, 2002. The plots were planted May 29, 2002, and 1,025 lbs/acre of 16-16-16-7 (NPKS) fertilizer was banded to the sides and slightly below the seed pieces at planting time. On July 31, 2002, a tank mix of 0.5 lb ai/acre of metribuzin and 1.25 oz/acre of Matrix was applied when plants were 4 - 5 inches high. The field was irrigated with one-half inch of water after the herbicide 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 19.5 ft long (26 seed-pieces) and the PYT2 plots were 16.5 ft long (22 seed-pieces). The trials were sprinkler irrigated twice weekly according to demand. Potato vines were desiccated with 1.5 pint/acre of Reglone on September 10, 2002 and again on September 20, 2002. The statewide trial was harvested on October 10, 2002, the PYT2 on October 14, 2002. 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. No.1s, 6 – to 12 oz U.S. No. 1's, and over 12-oz U.S. No.1's ones. A 10-16 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 recorded 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 single 1-inch by 0.25-inch slab from each of the 10 tubers were fried for 4 minutes at 375°F. Each strip was evaluated for color and dark ends using a photovolt reflection meter.

## Results

The TriState variety development program has released 12 varieties since 1995. Three more releases are pending. The Oregon Variety Development Team released seven of them, with two releases forthcoming. Release documents for Willamette Russet (AO91812-1), a chipping variety, have been completed and will be submitted pending production of adequate supplies of commercial seed. Modoc, a red-skinned selection, with a high percentage of marketable tubers, will be released in 2003. A journal article for Wallowa Russet was submitted to the Potato Association of America for publication in the *American Journal of Potato Research*.

Varieties graduate from the Oregon Potato Variety Development Program to be tested in the Tri State and Regional Trials, and eventual release to growers. The program continues to generate many promising lines as evidenced by the results of the 2002 statewide trial (Table 1). These results are averages for Hermiston, Klamath Falls, Ontario, and Powell Butte. Selections AO96160-3 and AO96164-1 were advanced to tristate trials. Table 2 highlights the results for standard varieties and retained selections from the Powell Butte, Oregon PYT2 trial. All of the retained selections had equal or better yields and quality than Russet Burbank.

In addition to the variety trials, COARC produced and stored seed of 842 clones at Powell Butte for Oregon, tristate, regional, chip, red-skinned, and other trials to be conducted in 2003; packaged and shipped 44,408 lb of seed to 22 research and 6 industry cooperators in 11 states; preselected, planted, harvested, and evaluated 65,617 single-hill seedling tubers, and selected 651 for further evaluation in subsequent years; summarized and published all variety trial information from four Oregon sites; and updated and maintained a fully interactive, dynamic World Wide Web database for all Oregon, tristate, and western regional entries.

Table 1. 2002 statewide potato variety trial results averaged over four Oregon locations (Hermiston, Madras, Klamath Falls, and Ontario).

Selection	Yield		%	Tuber	L/W	Sp.	Fry	Sugar	HH/	Black	Vine
	Total	No. 1	No. 1	size	ratio	grav.	color	ends	BC <sup>1</sup>	spot	mature
	cwt/a	cwt/a	%	oz			USDA	%	%	%	5 = Late
R. Burbank	604	371	61	7.3	2.01	1.080	1.26	18	6	11	3.4
Ranger	546	428	78	10.1	1.96	1.086	0.53	0	0	10	3.9
Shepody	582	369	63	10.1	1.64	1.076	1.64	14	1	5	2.8
Norkotah	459	390	85	7.9	1.89	1.070	1.22	23	9	2	1.5
Umatilla	571	415	73	9.1	1.86	1.083	0.62	3	0	6	3.2
AO94110-203	588	494	84	7.0	1.63	1.088	0.89	1	6	10	3.5
AO96160-3	603	535	89	8.6	1.81	1.088	0.41	0	2	9	3.8
AO96164-1	627	549	88	10.7	1.85	1.079	0.61	0	0	7	2.7
AO96176-3	517	434	84	7.8	1.92	1.078	0.36	3	0	7	3.0
AO96177-6	501	410	82	10.6	1.92	1.086	0.38	0	6	17	2.5
AO96382-3	459	397	86	9.1	1.92	1.081	0.65	1	1	3	2.5
AO97178-1	606	543	90	11.1	1.81	1.092	0.82	3	1	6	3.8
AO97318-2	484	403	83	8.6	1.93	1.086	0.54	3	18	9	2.9
AO97133-2	585	523	89	9.9	1.71	1.080	0.59	1	12	6	3.0
AO97278-3	546	358	66	10.4	2.01	1.081	0.88	15	2	6	2.8
AO97303-2	578	482	83	7.7	1.85	1.088	0.56	0	0	16	3.5
AO97109-3	525	409	78	8.1	2.02	1.089	0.30	1	0	4	3.7
AO97118-3	494	411	83	8.1	1.88	1.074	0.55	1	1	8	2.8
AO97131-3	533	478	90	8.8	1.94	1.079	0.89	3	0	5	2.5
AO97143-1	610	466	76	6.3	1.76	1.093	0.41	0	3	8	3.4
AO97171-4	500	424	85	9.0	1.75	1.077	1.39	1	7	9	3.0
AO97175-13	619	449	72	7.7	1.92	1.084	0.79	2	0	10	3.5

<sup>1</sup> – Hollow heart and brown center.

Table 2. PYT2 results for standard and retained selections grown at Powell Butte, Oregon in 2002.

Selection	Yield		% No. 1	Tuber size oz	L/W ratio	Sp. grav.	Fry color USDA	Sugar ends %	HH/ BC <sup>1</sup> %	Black spot %	Vine mature 5 = Late
	Total cwt/a	No. 1 cwt/a									
R. Burbank	546	349	64	6.6	2.02	1.080	1.11	10	6	7	3.3
Ranger	536	421	78	9.3	2.00	1.087	0.62	4	0	4	3.5
Shepody	498	351	70	9.1	1.64	1.078	1.02	15	3	3	2.5
Norkotah	497	403	81	7.6	1.89	1.071	1.57	18	14	3	1.5
Umatilla	522	358	69	8.3	1.92	1.083	0.80	1	0	11	3.0
AO95250-4	505	414	82	8.2	1.85	1.085	0.32	1	10	7	2.0
AO95250-5	467	410	88	8.8	1.79	1.091	0.13	0	9	7	2.3
AO96128-10	472	347	73	5.3	1.94	1.088	0.49	0	3	15	3.0
AO96141-3	630	474	75	8.8	2.15	1.092	0.42	3	8	3	4.3
AO96148-1	733	579	79	9.3	2.10	1.083	0.96	3	9	7	3.0
AO96201-1	483	353	73	5.4	1.92	1.088	0.28	0	0	1	4.3
AO96205-3	541	433	80	7.6	1.86	1.091	0.61	1	1	6	3.3
AO96212-3	541	409	75	7.1	2.06	1.094	0.77	0	13	3	3.3
AO96212-6	503	423	84	7.5	2.04	1.093	0.65	3	1	9	3.0
AO96213-3	595	503	84	6.7	1.75	1.088	0.80	0	6	3	3.8
AO96240-5	633	450	71	7.0	1.97	1.085	1.27	1	1	4	3.5
AO96241-3	642	485	76	6.5	1.77	1.074	0.40	0	0	7	3.0
AO96249-16	688	525	76	7.0	1.86	1.087	1.18	3	1	2	3.3
AO96261-2	689	530	77	10.2	1.97	1.094	0.67	6	10	4	3.3
AO98130-1	485	436	90	7.4	1.74	1.085	0.66	3	8	7	3.8
AO98133-2	581	500	86	10.3	1.91	1.090	0.36	0	3	7	3.3
AO98133-4	548	445	81	7.3	1.65	1.091	0.97	0	1	10	3.5

<sup>1</sup> – Hollow heart and bron center.