

**Progress Report to the Agriculture Research Foundation
Oregon Potato Commission
1998-1999**

Title: OREGON POTATO VARIETY DEVELOPMENT PROGRAM

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FUNDING HISTORY:

Year initiated: 1974
Funding for 1998-99, this donor: \$25,000

SIGNIFICANT ACCOMPLISHMENTS:

Russet Legend and Umatilla Russet were released in May 1998. Both selections are suited for either table (fresh) or frozen processing uses, and show better fry color and U.S. No. 1 yields than Russet Burbank. Umatilla Russet has generated considerable interest among domestic and international processing and seed companies because of good performance under diverse growing conditions. Seed production during the 1998 growing season for Umatilla totaled 1470 and 111 acres for the U.S. and Canada, respectively. In the U.S., 750 acres of Legend seed were produced in 1998. Reports indicate that the demand for Umatilla seed exceeds the supply.

The release of three additional selections is imminent. Selection AO85165-1 continues to look very good for fresh market uses, particularly in the Klamath Basin. It is a late-maturing, high yielding selection with medium russet skin and long tuber type. AO85165-1 has low specific gravity with mediocre to poor fry color. Two red-skinned selections, NDO2686-6 and NDO2438-6, continue to show promise at all locations where they have been evaluated.

NDO2686-6 produces medium yields of small to medium sized tubers with extremely attractive brilliant red skins. This selection retains its skin color throughout the storage season. NDO2438-6 produces high yields of attractive medium to large tubers with excellent storability.

OBJECTIVES:

- 1) Evaluate new potato lines for adaptation to Oregon growing environments and select cultivars with superior traits. Evaluate these selections for internal and external quality, both for fresh market and processing.
- 2) Develop management guides for selections nearing release.
- 3) Supply seed of promising Oregon selections to cooperating scientists, growers, processors and other interested representatives of the potato industry. Make provisions for the propagation of disease-free, tissue cultured plantlets of advanced selections in the program.
- 4) Cooperate with other western states and the USDA in evaluating, naming and releasing superior selections.

PROCEDURES:

Potato breeding programs in Aberdeen, Idaho (Agricultural Research Service), Colorado, and North Dakota annually provide genetic material for the Oregon potato variety development program. The five Oregon cooperating research sites carry out all phases of a typical 65,000 seedling, field-oriented potato breeding program. All sites participate in early-generation selection and cooperate in the testing of clones. Each Oregon site also provides unique services to the program as follows:

COARC acts as the primary site for planting and evaluating 65,000 single-hill breeding selections; conducts preliminary and advanced yield trials in a short-season site with emphasis on fresh market uses; produces and distributes seed of breeding selections to cooperators conducting state, tri-state, regional, and advanced field trials; and collates and publishes results of Oregon preliminary and advanced yield trials.

HAREC serves as a long-season testing site for Oregon selections in 4-hill, preliminary, statewide, tri-state, and regional trials with emphasis on frozen processing; evaluates breeding selections for resistance to Columbia root-knot nematodes; tests breeding selections for virus resistance in a high virus pressure environment; and determines irrigation and fertility inputs for breeding selections nearing release.

KES functions as a short-season testing site for statewide and regional trials with emphasis on fresh market uses; coordinates the Oregon red-skinned selection program; and defines optimum fertility and seed spacing requirements for advanced selections.

MES operates as a long-season testing site for statewide and regional trials with emphasis on frozen processing uses; evaluates breeding lines and varieties for early harvest for processing; evaluates advanced selections for resistance to dark-ends and physiological disorders under various moisture and nitrogen regimes; performs agronomic trials (irrigation, fertilization) to identify optimum production practices for advanced breeding selections; and examines irrigation system alternatives.

CSS produces 65,000 genetically unique tubers from true potato seed; prepares disease-free *in vitro* stocks and distributes certified pre-nuclear greenhouse tubers and transplants of advanced selections to Oregon seed growers; and evaluates advanced selections for resistance to late blight infection.

RESULTS, DISCUSSION AND CONCLUSIONS:

Umatilla Russet and Russet Legend were the second and third new potato cultivars released by the Oregon potato variety development program (Century Russet was the first). Umatilla produces high yields of oblong, attractive russeted tubers with excellent frozen processing qualities. It also shows good promise for fresh market in warmer producing areas such as the Columbia Basin of Oregon. Umatilla has an excellent disease resistance profile. Western Regional Trial evaluations have shown Umatilla to be: resistant to metribuzin injury, common scab, late blight tuber decay and net necrosis from PLRV; moderately resistant to *Verticillium* wilt and Potato Virus Y (PVY); moderately susceptible to early blight; susceptible to powdery mildew, *Fusarium* dry rot and bacterial soft rot; and very susceptible to PLRV. Relative to Russet Burbank, Umatilla shows high levels of protein and Vitamin C and very low levels of glycoalkaloids.

Legend produces good yields of oblong, russeted tubers with good processing potential in most situations and excellent fresh market potential in certain short-season areas including eastern Idaho and central Oregon. It has shown resistance to late blight foliar injury in Oregon, Washington, and New York. Tubers appeared to be notably resistant to tuber decay in 1997 Corvallis screening trials. Russet Legend is resistant to metribuzin injury and common scab but susceptible to most other potato diseases including potato leafroll virus (PLRV) and related net necrosis. Legend has shown susceptibility to severe tuber stem-end discoloration in some situations and is not recommended for long term storage pending further study.

Several other advanced selections are nearing release. AO85165-1 is a late maturing, high yielding selection with medium russet skin and long tuber type for fresh market use. It has moderately low specific gravity and will not fry under most circumstances. Strengths of AO85165-1 include resistance to *Verticillium* wilt and early blight. Two red-skinned selections, NDO2686-6 and NDO2438-6, have performed well at all locations where they have been evaluated. NDO2686-6 produces medium yields of small to medium sized tubers with extremely attractive brilliant red skins. This selection retains its skin color throughout the storage season. NDO2438-6 produces high yields of attractive medium to large tubers with excellent storability.

Over twenty replicated trials of preliminary, advanced, and named cultivars were conducted in Oregon during the 1998 growing season. Entries were selected primarily from preceding cycles of the Oregon program. Results from the 1998 statewide variety trial are shown in Table 1. Russet Burbank produced the lowest U.S. No. 1 yields and also the lowest percentage of U.S. No. 1's of any selection in the trial. All locations experienced severe environmental stress during the growing season that apparently adversely affected Russet Burbank. A number of the selections appeared to be better adapted to environmental (heat) stress than Russet Burbank, producing higher yields, a higher percentage of marketable tubers, higher specific gravity, and better internal quality. Selections with poor yields,

grade, internal quality, or other undesirable traits will be eliminated from the variety development program at the annual research meeting in mid-January.

Table 1. 1998 statewide potato variety trial results averaged over four Oregon locations (Hermiston, Powell Butte, 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	Spot	Mature
	cwt/a	cwt/a	%	oz			USDA	%	%	%	5=Late
R. Burbank	440	251	57	6.51	1.93	1.081	1.38	9	6	4	3.2
Ranger	446	332	74	8.13	1.94	1.087	0.93	1	1	3	3.3
Shepody	486	301	62	8.08	1.64	1.071	2.00	4	1	4	3.2
Norkotah	383	290	76	5.94	1.75	1.072	1.81	10	6	1	1.9
Atlantic	349	265	76	5.75	1.03	1.085	0.21	0	21	4	2.6
AO85165-1	393	301	77	7.22	1.63	1.072	2.45	8	13	4	3.5
AO87277-6	461	374	81	7.44	1.85	1.087	0.68	1	5	1	3.4
AO89128-4	447	275	61	5.56	1.92	1.085	0.35	1	7	2	3.2
AO90014-1	376	288	77	6.17	1.94	1.084	0.47	3	0	1	2.9
AO90319-1	395	271	69	4.75	1.85	1.075	1.81	10	3	4	3.1
AO88103-3	485	354	73	6.06	1.63	1.084	0.60	0	12	2	3.3
AO91812-1	563	491	87	7.30	0.96	1.084	0.07	0	0	2	3.8
AO91812-1	614	400	65	6.73	1.06	1.084	0.18	1	1	2	4.3
AO92007-2	427	333	78	6.78	1.95	1.080	1.33	8	5	5	3.0
AO92016-3	424	290	68	6.79	1.82	1.079	0.85	2	0	14	2.9
AO92017-6	552	440	80	9.41	1.71	1.081	1.24	12	2	2	3.7
AO92019-13	439	293	67	7.89	1.92	1.084	2.48	18	6	7	4.0
AO92023-3	538	331	62	10.16	1.65	1.074	1.76	7	2	5	4.0
AO92173-2	518	388	75	6.73	1.67	1.076	1.69	13	11	0	3.9
COO93031-1	473	399	84	8.23	1.87	1.074	2.04	2	1	4	3.3
AO92130-2	566	458	81	6.71	1.76	1.085	1.36	6	10	11	3.4
AO92246-3	411	315	77	5.49	1.66	1.079	0.68	2	5	3	3.6
AO92252-1	448	350	78	7.33	2.00	1.084	1.07	6	2	15	3.2
AO92260-8	469	322	69	6.46	1.77	1.078	2.39	12	0	1	4.4
AO92270-4	445	329	74	6.55	1.69	1.086	1.03	4	1	3	3.4
AO92281-3	469	352	75	7.18	2.14	1.084	1.29	4	1	2	3.5
AO92303-3	441	325	74	5.40	1.81	1.093	0.73	1	25	3	2.9
AO92304-1	487	312	64	6.51	1.89	1.084	1.05	5	1	5	3.4
AO92378-1	379	325	86	7.65	1.67	1.081	0.37	0	1	2	3.2
AO93317-5	531	441	83	6.62	1.49	1.082	0.52	1	0	0	3.1

In addition to the overall achievements outlined above, each Oregon cooperating site accomplished the following:

COARC:

- Produced and stored seed of 565 clones at Powell Butte for statewide, tri-state, regional, chip. red-skinned and other trials to be conducted in 1999;
- Shipped 30,960 pounds of seed to 18 research and 6 industry cooperators in 11 states and one Canadian province;
- Pre-selected, planted, harvested, and evaluated 68,513 single-hill seedling tubers and selected 465 for further testing in subsequent years;
- Evaluated 90 selections in advanced, replicated statewide yield trials, and 408 selections in three preliminary non-replicated screening trials;
- Collected, summarized, and published all variety trial information from four Oregon locations.

HAREC:

- Conducted a total of eight replicated statewide, chipping, tri-state, and regional yield trials on station and in growers commercial fields;
- Screened 6,000 single-hill selections for resistance to PVY/PLRV infection;
- Conducted five trials to evaluate advanced and transgenic (PVY resistant) selections under commercial growing conditions;
- Tested advanced selections for resistance to viruses and early die (six trials);
- Planted other miscellaneous trials to evaluate stem-end browning, effect of Vapam on advanced selections, and effect of harvest date on advanced selections

KES:

- Evaluated 72 selections in replicated preliminary yield and statewide trials and 16 selections in the western regional trial. Additional replicated trials evaluated 18 selections of transformed Russet Norkotah, Shepody, and Russet Burbank lines, 7 specialty selections, 7 chipping lines, and 18 advanced red-skinned selections;
- Screened 22 second-generation and 4 third-generation KES red-skinned selections in 12 and 50-hill plots, respectively;
- Collected, compiled, and summarized data from all cooperators in the regional red-skinned variety trial;
- Assisted in roguing of COARC seed increase plots and single-hill selections.

MES:

- Evaluated 72 selections in replicated preliminary and statewide yield trials and 16 selections in the western regional trial;
- Tested advanced selections for resistance to dark-ends and physiological disorders under Treasure Valley growing conditions;
- Conducted two replicated screening trials with selections from the ARS breeding program for early harvest and adaptation to the local environment;
- Made preliminary trials for the use of drip irrigation for potato production.

CSS:

- Screened 25,000 single-hills for foliar and tuber resistance to late blight; selected about 1300 for further evaluation;
- Screened more than 500 5-hill clones and 40 advanced selections for foliar and tuber resistance to late blight;
- Compared chipping, red-skinned, and russet-skinned cultivars;
- Produced pre-nuclear seed of advanced selections for distribution to seed growers-including free minitubers of selections nearing release;
- Produced minitubers from true potato seed of over 60,000 new breeding selections for screening at Powell Butte during the 1999 growing season.