NEW POTATO VARIETY DEVELOPMENT AT CENTRAL OREGON EXPERIMENT STATION-1987

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ABSTRACT

Seed increases, selection, and variety trials were conducted in 1987 at Central Oregon Experiment Station as a part of statewide, tri-state (Oregon, Washington, and Idaho), and western regional variety development programs. Seed of 864 clones was produced for 1988 statewide, tri-state, and regional trials. Also, 25,634 single-hill selections were grown; 348 were selected for further evaluation. Virus levels were very low in all 1987 *seed* production.

Advanced and preliminary statewide variety trials were grown at Redmond in 1987. ND01496-1 was advanced to the regional chip trial. A081216-1, A082260-8, A082283-1, A082611-7, and A082616-18 (all oblong russets) were advanced to tri-state trials. In 1987 statewide trials these five selections had good internal quality, excellent yields, and promising processing quality.

Seed of fresh market selection A74212-1 (oblong, medium-light russet) was increased and evaluated commercially in on-farm trials in major Oregon and Washington potato growing areas. Some of the growers experienced problems with seed rotting in the ground prior to emergence; no other serious problems were encountered in production, handling, or marketing. A74212-1 will likely *be* named and released in the fall of 1988.

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INTRODUCTION

A small program to develop new potato varieties for the Oregon potato industry was begun in the early 1970's at Central Oregon Experiment Station and Klamath Experiment Station. The program has evolved over the years in both the number ofselections evaluated and the number of sites used for evaluation. Over 80,000 varieties and clones were evaluated in 1987 at five Oregon sites and one Washington site.

The primary emphasis of the potato variety development program has been placed on developing new processing varieties, but chipping and fresh market selections are also being developed. The current effort arose from a need for high-yielding, disease resistant varieties which will process well and maintain their quality in long term storage. The overall objectives of the current program are as follows:

1) Develop and release superior new potato varieties for the Oregon potato industry through a cooperative program involving four branch experiment stations, two campus departments, O.S.U. Seed Certification, and O.S.U. Foundation Seed and Plant Materials Project.

2) Cooperate with neighboring states in evaluating advanced selections.

3) Develop optimized field production, storage, and use recommendations for selections nearing release.

4) Supply seed of promising Oregon selections to cooperating scientists in neighboring states.

Central Oregon Experiment Station is ideally located and equipped to accomplish these objectives in cooperation with other state and regional experiment stations. The station has the capacity to screen thousands of new clones and produce high quality, disease-free seed of promising selections. The station also has the facilities and equipment necessary to free clones which have become contaminated with viruses and maintain and increase disease-free seedstocks of these clones. This report discusses 1987 activities at Central Oregon Experiment Station in these areas.

METHODS

Seed Increases. The Powell Butte field of Central Oregon Experiment Station was the major site producing seed for cooperative regional, tri-state, and statewide potato variety trials. In 1987, 13 lines were increased for regional trials and 197 lines were increased for statewide trials.

Prior to planting, five and one-half pints/acre of Eptam 7-E were incorporated into the soil on May 18, 1987. An Iron Age assisted feed potato planter was used to band 800 pounds/acre of 10-20-20-5 (NPKS) fertilizer prior to planting. The potato planter was used to open the rows and all seed was hand planted in tuber units.

On May 21 and 22, 1987, 30 tuber units (six seedpieces each) of each regional and statewide clone, and 15 tuber units of each preliminary clone were planted. Individual seedpieces were planted 10 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 foot alley for tractor access. The blank rows/tractor alleys provided space for sprinkler laterals, roguing, and spraying with minimal vine contact.

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. In addition to weekly roguing, one pound per acre of Orthene 75S and a one percent solution of a paraffin based mineral oil were applied each week by ground sprayer at 250 psi.

Eight leaves from each of three tuber units from each regional and statewide clone were collected immediately prior to vine kill and tested for PVX, PVY, and PLRV using ELISA. The tubers were hand dug from tuber units which tested free of any viruses. These tubers will be winter eye-indexed and become planting stock for 1988 seed increases.

The seed increase block was dessicated on September 15, 1987, using one pint/acre of Diquat H/A. The ELISA tested tuber units were dug by hand September 30 and October 1, 1987; the remaining seed was harvested by machine and sacked October 13-15, 1987. All seed was shipped to Klamath Experiment Station in Klamath Falls for storage.

Selection Trials/Increases. First and second field generation material for which less than five total tubers existed were planted in a combination selection/increase trial.

Five hundred ninety-two clones selected from seedling tubers planted at Powell Butte in 1986 and 62 clones selected from seedling tubers planted at Ontario in 1986 were planted at Powell Butte on May 20, 1987. Approximately 18 seedpieces (three tuber units of six 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 used for regional and statewide increases.

The selection trials/increases were harvested on October 16, 1987, by lifting with a level bed potato digger. Selection was based on appearance, shape, malformities, skin color and type, and size and shape uniformity. Clones selected were bagged and all non-selected clones were left in the field.

Approximately 25,630 seedling tubers (small tubers produced in greenhouses from true potato seed) were planted. These tubers were produced from genetic crosses made in Idaho, Colorado, and North Dakota. Individual tubers were planted 27 inches apart in 36 inch rows on May 27 and 28, 1987. Fertility, herbicides, and management practices were identical to the seed increases above.

Variety Trials. Two variety trials were grown at Redmond in 1987. Forty varieties/clones were entered in the statewide variety trial and 160 varieties/clones 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 11, 1987. The plots were planted May 13, 1987, and 1,100 lbs/acre of 19-14-15-6 (NPKS) fertilizer was banded to the sides and slightly below the seedpieces at planting time. On July 7, 1987, 0.25 lbs. ai/acre of metribuzin was applied when plants were four to five inches high. The field was irrigated with one-half inch of water after the metribuzin application.

The variety trials were arranged in randomized block designs; the statewide trial had four replications, the PYT2 trial two replications. Seedpieces were placed nine 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 25 feet long (27 seedpieces) and the PYT2 plots were 15 feet long (16 seedpieces). The trials were sprinkler irrigated twice weekly according to demand. Nearly three and one-half inches of rainfall occurred between July 20 and July 25, 1987. The unusual amount of rainfall flooded completely one replicate of the PYT2 trial and moderately damaged the remaining replicate. The statewide trial was not adversely affected by the rains.

Potato vines were dessicated naturally by frost on September 16 and 17, 1987, and the vines were removed with a flail mower prior to harvest. The statewide trial was harvested on October 19, 1987 and graded the following day. One replicate only of the PYT2 trial was harvested on October 21, 1987; the PYT2 plots were graded October 22, 1987. For each plot the total number of tubers was recorded and the total weight was recorded for each of six categories: under four ounces, culls, twos, four to six ounce US number ones, six to twelve ounce ones, and over twelve ounce ones. A 10

pound sample from each plot was taken for french frying, specific gravity determination, and internal defect grading.

Specific gravities were determined by weighing approximately 10 pounds of tubers in air and water. Sixteen tubers from each plot were sliced longitudinally and internal defects were recorded as percent of tubers with a given defect. Four tubers from each plot were stored for two months at 50 F for french frying. Four one-quarter inch square strips from each of four tubers were fried for four minutes at 350 F. Each strip was evaluated for color and dark ends. Color was scored from 0-4 based on the "USDA Standard Color Chart for Frozen French-fried Potatoes".

RESULTS AND DISCUSSION

Seed Increases. Seed of 864 clones/varieties was produced for statewide, tri-state, and regional testing. Only 0.05% of all plants were rogued due to PVX or PVY infection. Leaves from 206 clones were sampled and ELISA tested for PVX, PVY, and PLRV prior to vine kill. Among the regional and statewide regional clones ELISA tested, 0.16% tested positive for leafroll, 0.16% tested positive for PVY, and 1.78% tested positive for PVX. Over one-half of the positive PVX samples were collected from two clones, HiLite and CO083021-4. HiLite will be grown in the 1988 trials only and C0083021-4 was dropped from further evaluation and seed production.

Because of the large numbers 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 and prior to vine kill, intensive roguing, and high pressure aphicide/oil spraying have kept viral infection relatively low as compared with the early days of the variety development program.

Selection Trials/Increases. Over 25,600 seedling tubers from 277 genetic crosses were planted in 1987. These single-hill selections were dug on October 6, 1987, and evaluated by a team of potato researchers, breeders, and processors from several western states. The evaluation team selected 348 clones to be advanced to 1988 second field generation selection trials. The selections were based on visual criteria, such as relative yield, tuber size, shape, uniformity and overall appearance.

The 629 clones selected from 1986 Powell Butte single-hills plus 62 clones selected from single-hills grown at Ontario were planted at Powell Butte. Also, 25 blue-skinned clones were included in this trial. This trial was dug October 16, 1987, and 87 clones were advanced to the 1988 PYT2 trial.

The clones were field selected using the same criteria as for the single-hills, but were also evaluated for internal and processing quality. Eight blue-skinned clones were retained for further fresh market evaluation. A small but increasing market for specialty clones has sprung up and blue-skinned varieties commanded premium prices in 1987-88 specialty markets.

Statewide Variety Trial. Yield and quality data for the 1987 statewide advanced yield trial are shown in Table 1. Russet Burbank produced 65% US No. 1 potatoes; every other clone in the trial produced a larger percentage of US No. 1 tubers than Russet Burbank. Also, 22% of the Russet Burbank tubers had either hollow heart or brown center. Black spot was found in 35% of the Lemhi tubers sliced. The majority of the clones evaluated had higher marketable yields and better internal quality than Russet Burbank and Lemhi, respectively. Russet Norkotah was added as an internal quality check variety in the 1987 trial and will also be included as a check variety in future trials.

Eleven clones were retained for further evaluation in 1988 regional, tri-state, and statewide trials. ND01496-1, a round, white chipping clone, was advanced to the 1988 regional chipping trial. This clone produces well, has a high specific gravity, and makes excellent chips. It will also be evaluated for storage quality in 1988. A081216-1, an oblong russet, will be evaluated for a second year in the tri-state trials. Clones A082260-8, A082283-1, A082611-7, and A082616-18 were selected for tri-state evaluation in 1988. These clones are oblong russets with excellent processing potential and high specific gravities. The clones that were retained but not entered into regional or tri-state trials in 1988 have fresh market potential. HiLite, a privately owned variety, was included in the trial for comparison purposes only.

Fresh market selection A74212-1 was evaluated for the seventh year. A74212-1, an oblong, medium-light russet, has excellent potential for the fresh market. It produces a high percentage of US No. 1 potatoes and has excellent internal quality. Large commercial trials were conducted in the central Columbia basin, the Hermiston area, and also in the Klamath basin. Some growers experienced a problem with seed rotting prior to emergence; research to explore this problem is planned for 1988. No other serious problems were encountered in production, handling, or marketing. A74212-1 will likely be named and released in the fall of 1988.

Clone A082260-4 will be held out of 1988 trials because of a variety mixture. The two clones will be separated and seed produced of each clone in 1988.

Table 1. Yield, grade, fry color, and internal defects of statewide potato variety trial entries grown at Redmond, Oregon 1987

Variety	Yield-cwt/a Total	Yield-cwt/a No. 1	%[1] RB	Spec[2] grav	Fry[3] color	% HH	% BS	% BC	Disposition
R. BURBANK	608	398	100	1.089	1.50	9	6	13	CHECK
LEMHI	730	559	120	1.093	1.50	7	35	0	CHECK
NORGOLD	496	411	82	1.072	2.05	5	2	2	CHECK
NORKOTAH	582	483	96	1.069	2.25	0	0	0	CHECK
A74212-1	634	490	104	1.081	3.44	0	5	0	KEEP
AO81178-11	642	488	106	1.079	1.75	5	2	0	DROP
AO81178-12	698	598	115	1.086	2.94	2	4	0	DROP
AO81216-1	539	409	89	1.088	3.13	9	18	2	KEEP
AO81394-7	541	400	89	1.100	1.88	2	2	0	DROP
COO80152-1	613	476	101	1.085	1.69	0	6	2	DROP
COO8177-2	513	426	84	1.089	0.75	9	2	0	DROP
A81362-3	706	546	116	1.085	2.00	0	4	0	KEEP
A81727-9	462	394	76	1.078	1.00	0	9	0	DROP
AO81084-2	458	351	75	1.080	2.63	0	4	0	DROP
AO81509-1	643	511	106	1.083	2.06	9	2	0	DROP
AO81512-1	499	369	82	1.092	2.31	25	5	2	DROP
AO81522-1	590	535	97	1.082	1.94	0	2	0	DROP
AO81783-7	451	342	74	1.081	0.01	11	5	0	DROP
AO81794-9	528	427	87	1.081	1.06	11	0	2	DROP
AO82023-1	501	420	82	1.077	1.75	0	5	0	DROP
AO82254-24	695	582	114	1.078	2.94	0	10	0	KEEP
AO82260-4	600	509	99	1.077	1.50	0	3	0	HOLD
AO82260-7	279	212	46	1.073	0.50	9	0	0	DROP
AO82260-8	624	526	103	1.086	1.50	18	4	0	KEEP
AO82281-1	686	624	113	1.077	1.94	4	0	0	KEEP
AO82283-1	559	468	92	1.085	0.19	2	13	0	KEEP
AO82283-5	549	397	90	1.097	1.19	4	12	0	DROP
AO82283-9	479	408	79	1.088	1.38	2	23	0	DROP
AO82606-13	626	500	103	1.084	2.88	0	9	0	DROP
AO82611-7	677	466	111	1.090	1.50	0	7	0	KEEP
AO82616-12	543	423	89	1.094	1.69	0	23	0	DROP
AO82616-18	724	559	119	1.090	0.69	11	20	0	KEEP
COO82136-2	410	352	67	1.085	0.25	9	2	0	DROP
COO82063-3	591	537	97	1.077	1.81	0	2	0	DROP
NDO1062-1	553	447	91	1.091	1.00	2	2	0	DROP
NDO1496-1	594	426	98	1.095	0.01	0	0	0	KEEP
NDO1567-2	642	520	106	1.075	1.94	0	4	0	DROP
NDO2061-2	501	436	82	1.070	1.75	0	0	0	DROP
HILITE	648	579	107	1.075	2.00	0	2	0	KEEP
A7411-2	694	486	114	0.000	0.88	0	14	0	DROP
LSD 5%	146	148	---	0.006	0.81	12	11	2	----

1 % RB = total yield/total yield of Russet Burbank x 100
2 Air/water method
3 O = Lightest; 4 = darkest
4 HH = hollow heart; BS = black spot; BC = brown center

Preliminary Yield Trial (PYT2). Of 160 clones grown in the 1987 PYT2, the 40 clones retained for further evaluation are shown in Table 2. C0083098-1 and ND02382-4 are chipping clones and will be tested in the 1988 statewide chip trial, the remaining clones will be advanced to the 1988 statewide variety trial. C0082177-3, A083019-10, A083088-2, A0830932, and A083196-15 are fresh market selections; the remaining clones all produced acceptable french fries.

The decision to retain or discard individual clones was based largely on data from Klamath Falls, Ontario, and Hermiston, as the Powell Butte trial was flooded as a result of heavy July rains.

Table 2. Yield, grade, fry color, and internal defects of clones retained from the preliminary variety trial, Redmond, Oregon 1987

Variety	Yield-cwt/a Total	Yield-cwt/a No. 1	%[1] RB	Spec[2] grav	Fry[3] color	% HH	% BS	% BC
R. BURBANK	596	405	100	1.088	1.00	7	0	29
LEMHI	645	540	108	1.087	1.50	0	36	0
NORGOLD	666	522	112	1.072	1.25	0	0	0
CO083008-1	640	550	107	1.089	1.00	0	0	0
CO083020-5	489	302	82	1.088	2.75	7	0	0
CO083021-1	645	526	108	1.096	2.00	0	7	0
CO083021-5	621	576	104	1.092	3.00	7	7	0
CO083023-9	639	518	107	1.082	1.25	0	0	0
CO083066-1	636	505	107	1.095	2.50	14	7	0
CO083067-3	626	525	105	1.080	1.56	0	0	0
CO083085-5	712	626	119	1.079	4.00	0	7	0
CO083098-1	598	501	100	1.085	1.00	0	0	0
CO083120-5	622	491	104	1.089	2.00	0	14	0
CO082177-3	620	434	104	1.070	4.00	36	0	7
AO83005-1	598	537	100	1.093	1.00	0	0	0
AO83010-7	554	485	93	1.076	0.01	14	0	0
AO83019-10	588	548	99	1.079	4.00	0	43	0
AO83026-3	701	595	118	1.089	2.00	0	0	0
AO83029-8	633	566	106	1.077	3.00	0	7	0
AO83037-6	535	443	90	1.087	3.00	0	7	0
AO83037-10	730	633	122	1.079	2.00	0	0	0
AO83065-2	488	378	82	1.082	1.00	7	0	0
AO83088-2	777	584	130	1.076	4.00	7	14	0
AO83093-2	618	483	104	1.072	3.00	0	0	0
AO83110-3	584	397	98	1.084	1.00	0	0	0
AO83119-2	590	379	99	1.087	2.00	0	7	0
AO83119-3	452	195	76	1.081	2.00	0	0	0
AO83148-1	426	300	71	1.090	1.00	0	0	0
AO83177-5	520	359	87	1.080	0.01	0	14	0
AO83177-6	620	431	104	1.081	1.00	0	0	0
AO83196-12	543	397	91	1.087	2.25	0	0	0
AO83196-15	502	374	84	1.074	2.00	0	0	0
AO83206-2	592	415	99	1.079	3.25	0	0	0
AO83218-10	586	388	98	1.084	1.00	0	0	0
AO83222-6	417	210	70	1.077	0.01	0	0	0
AO83222-7	446	267	75	1.081	2.00	0	0	0
AO81323-4	154	59	26	1.073	2.50	0	0	0
AO81323-20	28	4	5	1.080	2.00	0	0	0
AO82098-3	171	40	29	1.080	1.00	0	0	0
NDO2382-4	638	223	107	1.073	0.01	0	0	0

1 % RB = total yield/total yield of Russet Burbank x 100
2 Air/water method
3 0 = Lightest; 4 = darkest
4 HH = hollow heart; BS = black spot; BC = brown center