2017 POTATO VARIETY TRIALS

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Introduction

New potato varieties were evaluated in 2017 for their productivity and their suitability for fresh market and processing. Potatoes in Malheur County, Oregon, are grown under contract for processors to make frozen potato products for the food service industry and grocery chain stores. There is very little production for fresh pack or open market, and very few growers store potatoes on their farms. There is also no local production of varieties for making potato chips.

The varieties grown for processing in Malheur County are mainly 'Ranger Russet', 'Shepody', and 'Russet Burbank'. Harvest begins in July and potatoes arrive at processing plants for storage or processing directly from the field.

Prolonged vine health supports increased potato yield, but the "early die" syndrome can limit tuber bulking later than mid-August. Early die causes early senescence of the vines of susceptible varieties such as Shepody and Russet Burbank. A complex of soil pathogens, including bacteria, nematodes, and fungi, particularly Verticillium wilt, causes early die in Malheur County. Early die is worse when the crop rotation between potato crops is shorter.

Small acreages of new varieties or advanced selections are sometimes grown under contract to study the feasibility of expanding their use. To replace an existing processing variety, a new potato variety must have numerous outstanding characteristics. The yield should be at least as high as the yield of the currently contracted varieties. The tubers need to have low reducing sugars for light fry color, and high specific gravity. A new variety should be resistant to tuber defects or deformities caused by disease, water stress, or heat. It should begin tuber bulking early and grow rapidly for early harvest. Late-harvested varieties resistant to early die can continue bulking into September.

Potato variety development trials at the Malheur Experiment Station in 2017 included the Tristate Russet Trial with 14 entries, the Oregon Statewide Russet Trial with 12 entries, the Preliminary Yield Russet Trial with 73 entries, the Oregon Statewide Specialty Trial of 5 colored skin and/or flesh potato varieties, the Western Region Specialty Trial of 11 colored skin and/or flesh potato varieties, the Preliminary Yield Specialty Trial of 7 colored skin and/or flesh potato varieties, the Oregon Statewide Chip Trial with 7 entries, and the Preliminary Yield Chip Trial with 18 entries. Through these trials and active cooperation with other scientists in Oregon, Idaho, and Washington, promising new lines are bred and evaluated. Eventually, the lines may be released as new varieties.

Materials and Methods

The potato variety trials were grown in 2017 on Greenleaf silt loam, following winter wheat using sprinkler irrigation. Based on a soil test, 166 lb potassium/acre, 175 lb sulfur/acre, 9 lb manganese/acre, 3 lb copper/acre, and 4 lb boron/acre were broadcast in the fall of 2016, prior to planting of the wheat. The field was fumigated with 20 gal/acre of Telone® II and bedded on 36-inch row spacing in the fall of 2016. On April 11, 2017, 100 lb nitrogen/acre and 20 oz/acre of Admire® (imidacloprid) were shanked in the bed center.

Seed of all varieties was cut by hand into 2-oz seed pieces, treated with Maxim MZ dust, and stored briefly to suberize. Potato seed pieces were planted in single-row plots using a 2-row assist-feed planter with 9-inch seed spacing in 36-inch rows. Red potatoes were planted at the end of each plot as markers to separate the potato plots at harvest, except in the specialty trials where russeted potatoes were used as markers.

The Oregon Statewide Chip Trial, State Russet Trial, and the TriState Russet Early Trial were planted on April 13. The Regional Specialty Trial, Chip Preliminary Yield Trial, and the Russet Preliminary Yield Trial were planted on April 17. The State Specialty Trial and the Specialty Preliminary Yield Trial were planted on April 18.

All trials, except the preliminary yield trials, had plots that were a single bed wide with 30 seed pieces (23 ft long) replicated 4 times. The preliminary yield trials had unreplicated plots that were two beds with 20 seed pieces (15 ft long).

After planting, hills were re-formed over the rows with a Lilliston rolling cultivator. The herbicides Prowl® H_2O at 0.95 lb ai/acre, Dual Magnum® at 1.27 lb ai/acre, and Roundup® at 2 pt/acre were applied as a tank mix for weed control on April 25. The herbicides were incorporated by sprinkler irrigation with approximately 0.5 inch of water. Roundup at 2 pt/acre was applied again on May 8. Matrix® at 0.25 oz ai/acre was applied on June 9 through the sprinkler system. On June 17 and August 6, Bravo® at 1 pt/acre (0.75 lb ai/acre) was broadcast aerially.

Emergence started on May 20. Irrigation scheduling was based on a soil water tension criterion of 50-60 cb. Soil water tension was measured at seed piece depth (8-inch depth) using 6 Watermark soil moisture sensors (Model 200SS, Irrometer Co., Inc., Riverside, CA) connected to a datalogger. Irrigations were managed to maintain the soil water tension below 60 cb. Irrigation decisions were based on the average of all six sensors. The last irrigation was on September 5.

Fertilization during plant growth was based on petiole and soil solution tests taken on July 4, 11, 17, and 31. Based on the tissue and soil tests, a total of 60 lb nitrogen/acre and 53 lb potassium/acre were applied during the growing season. Fertilizer was injected into the sprinkler system during irrigation.

The vines in the Tristate Russet trial were flailed on August 16 and on August 23 the potatoes were harvested. For the other trials, the vines were flailed on September 19. The harvest dates for the other trials were September 25 for the Oregon Statewide Specialty and Preliminary Yield Specialty, September 27 for the Oregon Statewide Russet and Oregon Statewide Chip, and September 28 for the Preliminary Yield Russet Trial and the Preliminary Yield Chip Trial. At harvest, potatoes in each plot were lifted with a two-row digger that laid the tubers back onto the soil in each row.

At harvest, visual evaluations were made that included observations of desirable traits (i.e., high yield of large, smooth, uniformly shaped and sized, oblong to long, attractively russeted tubers, with shallow eyes evenly distributed over the tuber length). Observations were also taken of the external tuber defects including growth cracks, knobs, thumbnail cracks, curved or irregularly shaped tubers, pointed ends, stem-end decay, attached stolons, heat sprouts, chain tubers, folded bud ends, scab, rough skin due to excessive russeting, and pigmented eyes. A note was made for each plot to keep or discard the clone based on the overall appearance of the tubers.

Tubers were placed into burlap sacks and placed in a barn where they were kept under tarps until grading. Tubers were graded by market class (U.S. No. 1 and U.S. No. 2) and weight (<4 oz, 4-6 oz, 6-12 oz, and >12 oz). Tubers were graded as U.S. No. 2 if any of the following conditions occurred: growth cracks, bottleneck shape, abnormally curved shape, or two or more knobs. Marketable tubers are U.S. No. 1 and U.S. No. 2 larger than 4 oz. A 20-tuber sample from each plot was placed into storage. The storage temperature was gradually reduced to 45°F.

After 6 weeks in storage, a 10-tuber sample from each plot of the Tristate Russet Trial, Oregon Statewide Russet Trial, the Preliminary Yield Russet Trial, the Oregon Statewide Chip Trial, and the Preliminary Yield Chip Trial was evaluated for tuber quality traits for processing. Ten tubers per plot of the Tristate Russet Trial, Oregon Statewide Russet trial, and the Preliminary Yield Russet Trial were cut lengthwise and the 10 center slices were fried for 2.5 min in 375°F soybean oil. For the Oregon Statewide Chip Trial, 10 tubers per plot were cut into 0.06-inch slices and fried for 2.5 min in 375°F soybean oil. Percent light reflectance was measured on the stem and bud ends of each slice for the russet varieties and in the slice center for the chip varieties. Percent light reflectance was measured using a Photovolt Reflectance Meter model 577A (Photovolt Instruments, Inc., Minneapolis, MN), with a green tristimulus filter, calibrated to read 0% light reflectance on the black standard cup and 77.1% light reflectance on the white porcelain standard plate. Specific gravity of all varieties was measured from a 10-tuber sample from each plot using the weight-in-air, weight-in-water method. All varieties were evaluated for internal tuber defects from a 10-tuber sample from each plot.

Data from all trials were analyzed with the General Linear Models analysis of variance procedure in NCSS (Number Cruncher Statistical Systems, Kaysville, UT). Means comparisons were made using Fisher's protected LSD (least significant difference) at the 95% confidence level.

Results and Discussion

Due to excessive precipitation in the winter of 2016-2017, the potatoes were planted 1 week to 10 days later than the ideal planting date of April 7. Excessive heat in July was detrimental to the crop, with daily maximum and minimum air temperatures higher than average.

Tristate Russet Trial

The clones Russet Burbank, AO7098-4, AO7088-6, AOR07821-1, AO7705-4, and AO8422-2Vrsto were among those with the highest total yields (Table 1). The clones AO7088-6, AO8422-4Vrsto, AO7098-4', AO8422-2Vrsto, and AOR07821-1 were among the clones with the highest U.S. No. 1 yields.

A07088-6 and AO71012-4BF were among the clones with the highest specific gravity (measure of tuber solids) in this trial (Table 1). The tuber internal defects encountered were hollow heart and black spot bruise (Table 2). Observations on visual appearance at harvest can be found in Table 3.

Oregon Statewide Russet Trial

The clones OR12133-10, AOR10633-1, and AOR10140-1 were among those with the highest total yields (Table 4). AOR10633-1, OR12133-10, and AOR10140-1 were among the clones with the highest U.S. No. 1 yields.

AOR11018-2, AOR11217-3, and AOR10633-1 were among the clones with the lightest tuber fry color in this trial (Table 4). The tuber internal defects encountered for each clone are listed in Table 5. Observations on visual appearance at harvest can be found in Table 6.

Preliminary Yield Russet Trial

Some of the varieties had significantly higher yield and grade and better processing quality than the three commercial varieties in the trial (Table 7). Of the 70 clones tested, 13 were selected for further testing based on visual observations at harvest (Table 8). Some of the clones had better visual appearance at harvest than 'Russet Norkotah', Ranger Russet, and Russet Burbank. Tuber internal defects for the clones are listed in Table 9.

Colored Flesh Potato Trials

Potato tubers with red to yellow carotenoid or red, blue, and purple anthocyanin pigments are of interest because of the anti-oxidant properties of these pigments in human nutrition. Three trials tested specialty potato varieties in 2017: Oregon Statewide Specialty, Preliminary Yield Specialty, and Western Region Specialty.

Oregon Statewide Specialty Trial

The clones 'Red LaSoda' and POR14PG14-5 were among those with the highest total yield (Table 10). Red LaSoda had the highest yield of tubers over 14 oz, an undesirable trait. POR14PG22-3KK had the highest yield of tubers under 4 oz, followed by POR14PG14-5. POR14PG14-1 had the highest yield of cull tubers, due to sprouting. The three experimental clones had substantial sprouting at harvest (Table 12).

Clones POR14PG14-1 and POR14PG14-5 were among those with the highest tuber specific gravity. Tuber internal defects for the clones are listed in Table 11.

Preliminary Yield Specialty Trial

The variety Red LaSoda was among those with the highest total yield and yield of tubers over 14 oz (Table 13). Clones POR15PG036-3, POR15PG015-3, and POR15PG009-1 had high yields of cull tubers due to sprouting at harvest (Table 15). Clones POR15PG036-3, POR15PG034-1, and POR15NCKY021-2 had high yields of tubers under 4 oz. 'Yukon Gold' and two of the clones had internal brown spot (Table 14). Exterior appearance observations can be found in Table 15.

Western Region Specialty Trial

The clones Red LaSoda, 'Chieftain', AC03534-2R/Y, and CO05035-1PW/Y were among those with the highest total yield (Table 16). Red LaSoda had the highest yield of tubers over 14 oz, an undesirable trait. Clone AC03534-2R/Y had the highest yield of tubers under 4 oz.

All varieties and clones had the internal defect internal brown spot, except COA07365-4RY (Table 17). Exterior appearance observations can be found in Table 18.

Oregon Statewide Chip Trial

Clone AOR11470-1 had the highest total yield (Table 19). Clone AOR11470-1 also had the highest yield of tubers over 10 oz, an undesirable trait. Clone AOR11470-1 also had the highest specific gravity. Tuber internal defects for the clones are listed in Table 20. Clones AOR11470-1 and AOR12197-2 had substantial sprouting at harvest (Table 21).

Preliminary Yield Chip Trial

Clones AOR13136-4, NYOR14Q9-5, and 'Snowden' were among those with the highest total yield (Table 22). Snowden and NYOR14Q9-5 were among those with the highest yield of tubers more than 10 oz. Snowden, 'Atlantic', and AOR13125-9 were among the clones with the highest specific gravity. Tuber internal defects for the clones are listed in Table 23. Exterior appearance observations can be found in Table 24.

Acknowledgements

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Table 1. Tristate Russet Trial potato yield, grade, and processing quality, Malheur Experiment Station, Oregon State University, Ontario, OR, 2017.

			U.S. No. 1														
Variety	Percent No. 1	Total yield	Total	>20 oz	10 to 20 oz	6 to 10 oz	4 to 6 oz	U.S. No. 2	Marketable	<4 oz	Cull	Average tuber weight	No. of tubers /plant	Length/width	Specific gravity	Average fry color, light reflectance	Sugar ends
	%	cwt/acre										oz		ratio	g cm^{-3}	------- % --------	
Ranger Russet	64.2	417.0	270.9	2.0	69.5	152.6	46.7	106.2	377.1	34.9	5.0	5.9	5.9	2.0	1.093	45.9	0.0
Russet Burbank	44.7	503.0	226.9	5.5	29.4	104.6	87.3	187.0	413.9	76.6	12.6	5.1	8.1	2.1	1.077	37.4	2.5
Russet Norkotah	76.0	393.3	300.3	2.3	76.7	144.4	76.9	26.6	326.9	63.1	3.4	5.3	6.1	1.9	1.075	37.7	2.5
A07088-6	83.7	478.2	400.3	0.0	77.7	225.6	97.1	25.0	425.2	50.0	2.9	5.8	6.8	1.6	1.097	50.6	0.0
A07098-4	73.4	492.3	357.8	0.0	46.7	189.8	121.4	56.0	413.8	67.4	11.2	5.4	7.6	1.9	1.080	41.4	0.0
A071012-4BF	74.1	412.7	309.1	0.0	60.8	159.2	89.1	23.8	332.9	61.8	18.1	5.4	6.3	1.6	1.102	43.9	0.0
A07705-4	57.0	447.9	257.5	0.0	2.2	88.0	167.3	12.0	269.5	167.1	11.4	3.4	11.0	1.6	1.081	40.0	0.0
A07769-4	78.2	393.2	308.7	0.0	47.2	154.4	107.0	18.9	327.6	63.4	2.2	5.3	6.1	1.6	1.090	41.2	0.0
A08422-2Vrsto	78.1	438.3	342.2	0.0	35.0	199.4	107.8	15.7	357.9	75.1	5.3	4.9	7.4	1.6	1.087	44.2	0.0
A08422-4Vrsto	90.4	410.6	371.8	0.0	119.2	182.1	70.6	7.3	379.1	29.1	2.4	6.4	5.3	1.6	1.090	49.4	0.0
A08510-1LB	54.0	261.2	142.3	0.0	2.6	48.2	91.5	10.6	153.0	100.8	7.5	3.3	6.6	1.5	1.095	48.9	0.0
A10021-5TE	72.1	409.5	296.0	7.2	103.6	130.9	54.3	51.7	347.6	50.5	11.3	6.0	5.6	2.0	1.090	50.5	0.0
AOR06576-1	71.0	409.5	291.1	0.0	15.1	146.5	129.4	28.6	319.7	84.2	5.7	4.1	8.3	1.8	1.086	46.3	0.0
AOR07821-1	74.3	448.0	332.6	2.1	60.1	156.7	113.9	28.3	360.9	86.2	1.0	4.5	8.4	1.7	1.094	43.8	0.0
Mean	70.8	422.5	300.5	1.4	53.3	148.7	97.2	42.7	343.2	72.2	7.1	5.1	7.1	1.7	1.0884	44.4	0.4
LSD (0.05)	9.2	77.9	75.1	NS	36.3	44.5	36.8	35.1	74.5	28.0	NS	0.7	1.5	0.1	0.0050	1.6	NS

Table 2. Tristate Russet Trial tuber internal defects, Malheur Experiment Station, Oregon State University, Ontario, OR, 2017.

Variety	Vascular discoloration	Hollow heart	Internal brown spot	Black spot bruise
	---------- % ----------			
Ranger Russet	0.0	0.0	0.0	0.0
Russet Burbank	0.0	0.0	0.0	0.0
Russet Norkotah	0.0	0.0	0.0	0.0
A07088-6	0.0	0.0	0.0	0.0
A07098-4	0.0	0.0	0.0	0.0
A071012-4BF	0.0	0.0	0.0	0.0
A07705-4	0.0	0.0	0.0	0.0
A07769-4	0.0	0.0	0.0	0.0
A08422-2Vrsto	0.0	0.0	0.0	0.0
A08422-4Vrsto	0.0	2.5	0.0	0.0
A08510-1LB	0.0	0.0	0.0	5.0
A10021-5TE	0.0	0.0	0.0	0.0
AOR06576-1	0.0	0.0	0.0	0.0
AOR07821-1	0.0	0.0	0.0	0.0
Average	0.0	0.2	0.0	0.4
LSD (0.05)	NS	NS	NS	NS

Table 3. Tristate Russet Trial tuber visual observations at harvest, Malheur Experiment Station, Oregon State University, Ontario, OR, 2017. Tuber defect observations are from four plots for each clone. K = clone should be saved, D = clone should be discarded. Capital letters denote a higher intensity of an observation compared to lower case letters. Since there were four replicates, a clone could be scored for the same attribute up to four times.

Clone	K or D	Description
Ranger Russet	3D, 1d	3 curved, 1 Curved, 2 Irregular, 2 irreg., 1 Pointed, 3 bottleneck, 1 Bottleneck, 2 dumbbell, 1 growth cracks, 1 sprouts, 1 jelly end rot
Russet Burbank	4 D	3 Pointed, 1 pointed, 1 sprouts, 1 heart, 3 growth cracks, 1 knobs, 4 Irregular, 3 Dumbbell, 1 dumbbell, 1 Bottleneck, 1 bottleneck
Russet Norkotah	2k, 2K	3 irregular, 1 pointed
A07088-6	4K	2 folded bud end, 2 irregular, 2 growth cracks
A07098-4	3k, 1K	3 heart, 1 growth cracks, 3 irregular, 1 swollen lenticels, 1 bottleneck, 1 sprouts
A071012-4BF	3k, 1K	1 knobs, 2 irregular, 1 Pointed, 1 heart
A07705-4	3D, 1?	2 sprouts, 2 small, 2 pointed
A07769-4	2K, 2k	1 small, 1 pointed, 1 growth cracks
A08422-2Vrsto	1d, 2K,1k	2 heart, 1 irregular, 2 wedge shape, 1 pointed
A08422-4Vrsto	2k, 2K	1 heart, 2 growth cracks, 3 pointed, 1 wedge shape, 1 folded bud end
A08510-1LB	2d, 1D, 1?	4 small
A10021-5TE	2k, 2d	1 irregular, 2 alligator hide, 2 rough skin, 1 growth cracks, 2 folded bud end, 1 heart, 1 sprouts, 1 curved
AOR06576-1	3k, 1?	1 irregular, 2 pointed, 1 small
AOR07821-1	2k, 1D, 1d	3 pointed, 1 Pointed, 1 small, 1 irregular, 2 heart, 1 alligator hide

Table 4. Oregon Statewide Russet Trial potato yield, grade, and processing quality, Malheur Experiment Station, Oregon State University, Ontario, OR, 2017.

			U.S. No. 1														
Variety	Percent No. 1	Total yield	Total	>20 oz	10 to 20 oz	6 to 10 oz	4 to 6 oz	U.S. No. 2	Marketable	<4 oz	Cull	Average tuber weight	No. of tubers /plant	Length/ width	Specific gravity	Average fry color, light reflectance	Sugar ends
	%						cwt/acre					oz		ratio	g/cm^{-3}		%
Ranger Russet	71.6	507.4	361.7	15.8	113.1	156.7	76.2	105.1	466.8	40.5	0.0	7.4	5.7	1.8	1.0894	43.9	0.0
Russet Burbank	65.1	494.8	322.8	0.0	39.2	141.5	142.1	84.8	407.6	86.9	0.3	5.0	8.2	2.0	1.0803	36.9	12.5
Russet Norkotah	73.8	321.4	237.1	0.0	42.8	125.7	68.6	18.4	255.5	65.9	0.0	5.1	5.3	1.8	1.0853	39.4	0.0
AOR08540-1	73.3	508.7	374.6	0.0	64.1	184.7	125.7	37.3	411.9	94.3	2.5	5.0	8.4	1.8	1.0880	39.9	5.0
AOR11018-2	68.0	472.1	321.6	4.5	112.4	128.9	75.8	75.5	397.1	71.8	3.2	5.6	7.0	1.9	1.0873	48.5	0.0
AOR11141-2	72.3	438.8	317.2	0.0	46.5	134.9	135.7	18.8	335.9	94.8	8.1	4.4	8.2	1.5	1.0767	41.9	5.0
AOR10140-1	85.5	526.6	449.8	4.4	168.9	189.9	86.6	24.0	473.8	52.8	0.0	6.9	6.3	1.7	1.0800	42.3	0.0
AOR10204-3	64.2	449.0	292.3	2.1	59.4	134.9	95.9	97.2	389.5	59.5	0.0	5.7	6.5	1.8	1.0867	46.2	0.0
AOR11217-3	77.1	439.8	338.6	0.0	48.3	165.2	125.1	14.6	353.1	86.7	0.0	5.4	6.8	1.8	1.0810	48.1	0.0
OR12133-10	81.6	595.5	485.1	2.0	90.3	244.3	148.5	31.2	516.3	79.2	0.0	6.0	8.2	1.7	1.0814	41.3	0.0
AOR12144-1	45.7	294.8	134.0	0.0	0.0	34.1	100.0	5.5	139.5	154.9	0.3	3.1	7.8	1.7	1.0883	38.5	0.0
AOR10633-1	90.6	541.1	491.2	9.6	224.4	182.3	74.9	18.6	509.9	31.2	0.0	7.7	5.8	1.8	1.0850	46.9	2.5
Mean	72.4	465.8	343.8	3.2	84.1	151.9	104.6	44.2	388.1	76.5	1.2	5.6	7.0	1.8	1.0841	42.8	2.1
LSD (0.05)	7.9	81.1	73.1	NS	45.7	41.7	30.4	37.0	74.8	18.3	4.3	0.9	1.0	0.2	NS	2.5	NS

Table 5. Oregon Statewide Russet Trial tuber internal defects, Malheur Experiment Station, Oregon State University, Ontario, OR, 2017.

Variety	Vascular discoloration	Hollow heart	Internal brown spot	Brown center	Black spot bruise
	---------- % ----------				
Ranger Russet	0.0	0.0	0.0	0.0	0.0
Russet Burbank	0.0	0.0	0.0	0.0	0.0
Russet Norkotah	0.0	0.0	0.0	0.0	0.0
AOR08540-1	0.0	0.0	0.0	0.0	0.0
AOR11018-2	0.0	0.0	0.0	0.0	0.0
AOR11141-2	0.0	0.0	0.0	0.0	0.0
AOR10140-1	0.0	0.0	0.0	0.0	0.0
AOR10204-3	0.0	0.0	0.0	0.0	0.0
AOR11217-3	0.0	0.0	0.0	0.0	0.0
OR12133-10	0.0	0.0	0.0	0.0	0.0
AOR12144-1	0.0	0.0	0.0	0.0	0.0
AOR10633-1	0.0	0.0	0.0	10.0	5.0
Mean	0.0	0.0	0.0	0.8	0.4
LSD (0.05)	NS	NS	NS	NS	NS

Table 6. Oregon Statewide Russet Trial tuber visual observations at harvest, Malheur Experiment Station, Oregon State University, Ontario, OR, 2017. Tuber defect observations are from four plots for each clone. K = clone should be saved, D = clone should be discarded. Capital letters denote a higher intensity of an observation compared to lower case letters. Since there were four replicates, a clone could be scored for the same attribute up to four times.

Clone	K or D	Description
Ranger Russet	3d, 1D	2 knobs, 4 curved, 4 growth cracks, 2 heart shape, 1 bottleneck
Russet Burbank	4D	4 curved, 4 irregular shape, 4 knobs, 4 pointed, 4 growth cracks
Russet Norkotah	3k, 1d	low yield, irregular shape, knobs, heart shape
AOR08540-1	3k, 1?	bottleneck, pointed, knobs, 2 curved, 2 growth cracks, chain
AOR11018-2	3d, 1k	3 bottleneck, 1 heart shape, 3 irregular shape, 1 growth cracks, 2 knobs, 1 Knobs
AOR11141-2	3D, 1d	4 sprouts, 4 chain, 1 knobs
AOR10140-1	2k, 1K, 1d	sprouts , irregular shape
AOR10204-3	2k, 2d	pointed, heart shape, 2 bottleneck, 2 Bottleneck
AOR11217-3	3k, 1K	small, bottleneck, growth cracks
OR12133-10	2K, 1d, 1k?	2 curved, 2 irregular shape, heart
AOR12144-1	4d	4 small
AOR10633-1	1k, 2K, 1d	4 growth cracks, 1 curved, 1 bottleneck

Table 7. Preliminary Yield Russet Trial yield, grade, and processing quality for selected varieties, Malheur Experiment Station, Oregon State University, Ontario, OR, 2017.

Variety	Percent No. 1	Total yield	U.S. No. 1 Total	U.S. No. 1 >20 oz	U.S. No. 1 10 to 20 oz	U.S. No. 1 6 to 10 oz	U.S. No. 1 4 to 6 oz	U.S. No. 2	Marketable	<4 oz	Cull	Average tuber weight	No. of tubers /plant	Length/ width	Specific gravity	Average fry color, light reflectance	Sugar ends
	%	cwt/acre										oz		ratio	g/cm^{-3}	-------- % ---------	
Ranger Russet	80.0	500.9	401.0	46.5	149.8	162.0	42.7	72.7	473.7	27.2	0.0	8.6	4.8	1.80	1.0886	45.4	0.0
Russet Burbank	69.2	450.9	311.9	0.0	51.9	131.8	128.2	45.0	356.9	94.0	0.0	18.4	7.9	1.96	1.0785	37.9	0.0
Russet Norkotah	81.0	360.6	292.1	0.0	84.8	110.9	96.4	15.9	308.0	52.7	0.0	19.4	5.2	1.75	1.0714	42.0	0.0
AOR12145-3	84.2	435.0	366.0	0.0	88.7	202.3	75.1	21.6	387.7	41.5	5.8	20.2	6.2	1.79	1.1047	46.6	0.0
AOR12149-1	86.2	453.7	391.0	0.0	166.9	155.1	68.9	18.0	408.9	44.8	0.0	21.0	5.6	1.83	1.0855	48.8	0.0
AOR12342-2	91.2	498.3	454.4	0.0	204.4	186.9	63.0	16.0	470.4	27.9	0.0	22.3	5.4	1.72	1.0970	49.9	0.0
AOR12344-21	84.3	556.6	469.4	0.0	109.4	203.2	156.7	19.5	488.8	67.7	0.0	19.6	7.7	1.64	1.0909	48.7	0.0
AOR12350-5	88.4	411.4	363.6	6.7	111.7	172.3	72.9	5.8	369.3	42.0	0.0	20.8	5.1	1.76	1.0819	51.3	0.0
AOR13011-1	91.9	593.3	545.3	6.6	199.7	262.0	77.0	14.8	560.1	33.2	0.0	22.0	6.6	1.65	1.0846	47.5	0.0
AOR13011-2	91.2	583.7	532.4	13.6	254.0	194.1	70.8	3.2	535.6	48.0	0.0	21.8	6.6	1.62	1.0827	45.0	0.0
AOR13018-5	95.3	462.5	440.9	0.0	166.0	204.9	70.1	2.9	443.8	18.7	0.0	22.0	5.2	1.58	1.0769	49.4	0.0
AOR13038-1	86.3	477.5	412.0	0.0	132.4	188.0	91.7	32.1	444.2	33.3	0.0	21.1	5.7	2.14	1.0928	53.3	0.0
AOR13082-6	86.0	593.1	509.9	0.0	142.2	237.5	130.2	10.1	520.0	73.1	0.0	20.1	7.9	1.88	1.0806	54.9	0.0
AOR13343-16	78.5	599.7	470.6	0.0	70.9	246.8	152.9	17.9	488.6	111.1	0.0	5.4	6.9	1.60	1.0977	47.5	0.0
OR14SP016-3	87.4	589.3	515.2	0.0	141.3	253.7	120.2	6.7	521.9	63.2	4.3	6.3	5.8	1.92	1.0799	44.7	0.0
AOR13064-2	75.2	562.3	422.8	0.0	59.6	179.5	183.7	6.5	429.3	133.0	0.0	4.9	7.1	1.75	1.0942	49.9	0.0
Average	84.8	508.0	431.2	4.6	133.4	193.2	100.0	19.3	450.4	57.0	0.6	17.1	6.2	1.77	1.0868	47.7	0.0

Table 8. Preliminary Yield Russet Trial tuber visual observations at harvest for selected varieties, Malheur Experiment Station, Oregon State University, Ontario, OR, 2017. K = clone should be saved, D = clone should be discarded. Capital letters denote a higher intensity of an observation compared to lower case letters.

Clone	K or D	
Ranger Russet	d	growth cracks, Curved, heart shape
Russet Burbank	D	bottleneck, Curved, knobs, dumbbell
Russet Norkotah	k	heart shape
AOR12145-3	k	growth cracks
AOR12149-1	k	irregular shape
AOR12342-2	k	curved, irregular shaped
AOR12344-21	k	growth cracks, bottleneck
AOR12350-5	k	irregular shape
AOR13011-1	k	heart shape
AOR13011-2	K	heart shape
AOR13018-5	k	irregular shape, heart shape
AOR13038-1	k	heart shape, curved
AOR13082-6	K	small, pointed
AOR13343-16	k	small, irregular shape
OR14SP016-3	K	
AOR13064-2	k	pointed, irregular shape, bottleneck

Table 9. Preliminary Yield Russet Trial tuber internal defects, Malheur Experiment Station, Oregon State University, Ontario, OR, 2017.

Variety	Vascular discoloration	Hollow heart	Internal brown spot	Brown center	Black spot bruise
	---------- % ----------				
Ranger Russet	0.0	0.0	0.0	0.0	0.0
Russet Burbank	0.0	0.0	0.0	0.0	0.0
Russet Norkotah	10.0	0.0	0.0	0.0	0.0
AOR12145-3	0.0	0.0	10.0	0.0	10.0
AOR12149-1	0.0	0.0	0.0	0.0	0.0
AOR12342-2	0.0	0.0	10.0	0.0	0.0
AOR12344-21	0.0	0.0	0.0	0.0	0.0
AOR12350-5	0.0	0.0	0.0	0.0	0.0
AOR13011-1	0.0	0.0	0.0	0.0	0.0
AOR13011-2	0.0	0.0	0.0	0.0	0.0
AOR13018-5	0.0	0.0	0.0	0.0	0.0
AOR13038-1	0.0	0.0	30.0	0.0	0.0
AOR13082-6	0.0	0.0	40.0	0.0	0.0
AOR13343-16	0.0	0.0	0.0	0.0	0.0
OR14SP016-3	0.0	0.0	0.0	0.0	0.0
AOR13064-2	0.0	0.0	0.0	0.0	0.0
Average	0.6	0.0	5.6	0.0	0.6

Table 10. Oregon Statewide Specialty Trial yield and grade of colored flesh clones, Malheur Experiment Station, Oregon State University, Ontario, OR, 2017.

			U.S. No. 1											
Clone/Variety	Total yield	<1¾ inch	<4 oz	4 to 6 oz	6 to 10 oz	10 to 14 oz	>14 oz	U.S. No. 2	Cull	Twos + culls	Average tuber weight	No. of tubers /plant	Length/ width	Specific gravity
	---------- cwt/acre ----------										oz		ratio	g cm^{-3}
Yukon Gold	369.6	1.0	60.3	78.5	116.8	69.8	29.8	13.9	0.4	14.3	5.4	5.6	1.1	1.0822
Red LaSoda	561.0	2.6	60.0	83.4	194.4	139.3	62.4	17.4	4.0	21.4	6.3	7.3	1.3	1.0759
POR14PG14-1	344.1	3.6	72.8	14.5	8.8	0.0	0.0	6.2	241.7	248.0	2.3	12.2	1.2	1.0879
POR14PG14-5	444.1	4.7	164.5	97.2	70.3	21.1	2.2	51.1	37.6	88.8	4.3	9.6	1.4	1.0912
POR14PG22-3KK	400.1	12.6	285.2	56.6	19.6	1.1	0.0	16.6	21.1	37.7	2.0	16.5	1.0	1.0817
Mean	423.8	4.9	128.6	66.1	82.0	46.3	18.9	21.0	61.0	82.0	4.1	10.3	1.2	1.0838
LSD (0.05)	131.9	5.8	47.8	28.3	54.3	46.5	29.6	20.6	40.2	31.6	1.6	2.9	0.2	0.0044

Table 11. Oregon Statewide Specialty Trial tuber internal defects of colored flesh clones, Malheur Experiment Station, Oregon State University, Ontario, OR, 2017.

Clone/Variety	Vascular discoloration	Hollow heart	Internal brown spot	Brown center	Black spot bruise
	---------- % ----------				
Yukon Gold	0.0	0.0	7.5	0.0	0.0
Red LaSoda	2.5	0.0	7.5	0.0	0.0
POR14PG14-1	0.0	0.0	0.0	0.0	2.5
POR14PG14-5	0.0	0.0	0.0	0.0	0.0
POR14PG22-3KK	0.0	0.0	7.5	0.0	0.0
Mean	0.5	0.0	4.5	0.0	0.5
LSD (0.05)	NS	NS	NS	NS	NS

Table 12. Oregon Statewide Specialty Trial tuber visual observations at harvest, Malheur Experiment Station, Oregon State University, Ontario, OR, 2017. Tuber defect observations are from four plots for each clone. K = clone should be saved, D = clone should be discarded. Capital letters denote a higher intensity of an observation compared to lower case letters. Since there were four replicates, a clone could be scored for the same attribute up to four times.

Clone	K or D	Description
Yukon Gold	3K, 1d	1 scab, 1 greening
Red LaSoda	4d	growth cracks
POR14PG14-1	2d, 2D	3 sprouts, 1 Sprouts, mixed variety
POR14PG14-5	D	1 Sprouts, 1 sprouts, irregular shape, 2 rough skin, nice yellow flesh
POR14PG22-3KK	4D	2 Sprouts, 2 sprouts, 1 nice

Table 13. Preliminary Yield Specialty Trial yield and grade of colored flesh clones, Malheur Experiment Station, Oregon State University, Ontario, OR, 2017.

Variety/Clone	Total yield	U.S. No. 1						U.S. No. 2	Cull	Twos + culls	Average tuber weight	No. of tubers /plant	Length/ width	Specific gravity
		<1.75	<4 oz	4 to 6 oz	6-10 oz	10 to 14 oz	>14 oz							
	cwt/acre										oz		ratio	g/cm^{-3}
Yukon Gold	331.0	1.6	67.0	86.2	107.0	58.1	11.8	0.9	0.0	0.9	5.4	5.1	1.10	1.0840
Red LaSoda	627.9	2.8	104.0	107.4	214.2	124.2	67.3	10.8	0.0	10.8	6.7	7.7	1.24	1.0805
POR15NCKY021-2	385.6	5.4	251.6	55.5	1.9	0.0	0.0	5.4	71.2	76.6	2.1	14.9	1.35	1.0890
POR15PG034-1	299.1	10.4	253.9	19.8	4.1	0.0	0.0	14.1	7.3	21.3	1.8	13.7	1.04	1.0840
POR15PG036-3	403.8	13.2	249.6	5.8	0.0	0.0	0.0	61.3	87.1	148.4	1.4	23.9	1.82	1.0667
POR15PG015-3	431.4	9.0	133.1	22.6	3.8	0.0	0.0	24.9	247.0	271.9	2.2	16.3	1.04	1.0725
POR15PG009-1	396.0	10.4	67.2	1.7	0.0	0.0	0.0	7.6	319.4	327.0	1.7	18.8	1.10	1.0955
Mean	410.7	7.5	160.9	42.7	47.3	26.0	11.3	17.8	104.6	122.4	3.1	14.3	1.24	1.0817

Table 14. Preliminary Yield Specialty Trial tuber internal defects of colored flesh clones, Malheur Experiment Station, Oregon State University, Ontario, OR, 2017.

Variety/Clone	Vascular discoloration	Hollow heart	Internal brown spot	Brown center	Black spot bruise
	%				
Yukon Gold	0.0	0.0	30.0	0.0	0.0
Red LaSoda	0.0	0.0	0.0	0.0	0.0
POR15NCKY021-2	0.0	0.0	30.0	0.0	0.0
POR15PG034-1	10.0	0.0	0.0	0.0	0.0
POR15PG036-3	0.0	0.0	0.0	0.0	0.0
POR15PG015-3	0.0	0.0	50.0	0.0	0.0
POR15PG009-1	0.0	0.0	0.0	0.0	0.0
Mean	1.4	0.0	15.7	0.0	0.0

Table 15. Preliminary Yield Specialty Trial tuber visual observations at harvest, Malheur Experiment Station, Oregon State University, Ontario, OR, 2017. K = clone should be saved, D = clone should be discarded. Capital letters denote a higher intensity of an observation compared to lower case letters.

Clone	K or D	Description
Yukon Gold	K	
Red LaSoda	d	deep eyes, irregular shape
POR15NCKY021-2	D	sprouts
POR15PG034-1	k	mixed variety, white variety mixed in
POR15PG036-3	D	sprouts
POR15PG015-3	D	sprouts
POR15PG009-1	D	sprouts

Table 16. Western Region Specialty Trial yield and grade of colored flesh clones, Malheur Experiment Station, Oregon State University, Ontario, OR, 2017.

			U.S. No. 1											
Clone/Variety	Total yield	<1¾ inch	<4 oz	4 to 6 oz	6 to 10 oz	10 to 14 oz	>14 oz	U.S. No. 2	Cull	Twos + culls	Average tuber weight	No. of tubers /plant	Length/ width	Specific gravity
	cwt/acre										oz		ratio	g cm^{-3}
Chieftain	517.1	1.3	60.2	141.1	234.7	71.3	4.8	17.7	1.3	19.0	5.8	7.4	1.20	1.0775
Red LaSoda	569.5	2.3	58.6	92.2	205.4	142.4	55.6	35.1	0.0	35.1	6.4	7.4	1.24	1.0781
COTX00104-6R	314.0	1.4	31.8	55.6	108.3	94.8	18.2	13.1	0.0	13.1	6.6	3.9	1.22	1.0761
PORTX03PG25-2R/R	281.0	4.8	225.3	49.9	5.2	0.0	0.0	22.5	0.6	23.1	1.9	12.1	2.11	1.0733
AC03534-2R/Y	513.5	11.3	313.7	161.2	38.0	0.0	0.0	67.9	0.6	68.5	2.5	16.8	1.08	1.0721
CO05035-1PW/Y	506.7	3.3	128.1	132.8	165.6	38.4	17.9	20.9	20.9	41.8	4.2	10.0	1.32	1.0809
COA07365-4RY	327.8	5.7	196.1	96.9	33.1	1.1	0.0	32.9	0.2	33.1	2.7	10.2	1.21	1.0775
NDTX059759-3RY/Y Pinto	361.3	1.6	144.1	114.3	82.4	17.8	2.6	2.4	0.0	2.4	3.7	8.2	1.23	1.0843
Yukon Gold	378.0	1.9	69.0	89.8	139.3	65.9	6.9	25.3	0.0	25.3	5.2	6.0	1.15	1.0849
A06336-2Y	435.8	4.0	167.5	174.0	88.7	4.8	0.0	37.6	0.0	37.6	3.3	10.8	1.47	1.0647
A06336-5Y	416.9	9.8	269.1	104.0	20.5	1.2	0.0	22.0	22.0	44.1	2.3	14.9	1.09	1.0778
Mean	420.1	4.3	151.2	110.2	101.9	39.8	9.6	27.0	4.2	31.2	4.1	9.8	1.3	1.0770
LSD (0.05)	79.6	3.2	32.6	37.3	36.6	25.2	18.1	25.7	10.7	30.2	0.5	2.0	0.12	NS

Table 17. Western Region Specialty Trial tuber internal defects of colored flesh clones, Malheur Experiment Station, Oregon State University, Ontario, OR, 2017.

Clone/Variety	Vascular discoloration	Hollow heart	Internal brown spot	Brown center	Black spot bruise
	---------- % ----------				
Chieftain	0.0	0.0	15.0	0.0	0.0
Red LaSoda	0.0	0.0	12.5	0.0	0.0
COTX00104-6R	0.0	0.0	5.0	0.0	0.0
PORTX03PG25-2R/R	0.0	0.0	2.5	0.0	5.0
AC03534-2R/Y	0.0	0.0	7.5	0.0	0.0
CO05035-1PW/Y	0.0	0.0	5.0	0.0	0.0
COA07365-4RY	0.0	0.0	0.0	0.0	5.0
NDTX059759-3RY/Y Pinto	0.0	0.0	10.0	0.0	0.0
Yukon Gold	0.0	0.0	16.7	0.0	0.0
A06336-2Y	0.0	0.0	3.3	0.0	0.0
A06336-5Y	0.0	0.0	5.0	0.0	0.0
Mean	0.0	0.0	7.5	0.0	0.9
LSD (0.05)	NS	NS	NS	NS	NS

Table 18. Western Region Specialty Trial tuber visual observations at harvest, Malheur Experiment Station, Oregon State University, Ontario, OR, 2017. Tuber defect observations are from four plots for each clone. K = clone should be saved, D = clone should be discarded. Capital letters denote a higher intensity of an observation compared to lower case letters. Since there were four replicates, a clone could be scored for the same attribute up to four times.

Clone/Variety	K or D	Description
Chieftain	4 k	3 dull skin, growth cracks, irregular shape
Red LaSoda	3 D, 1 d	4 Irregular shape, 3 deep eyes, 2 folded bud end, growth crack
COTX00104-6R	4 d	2 oversize, 3 dull skin
PORTX03PG25-2R/R	3 K, 1 k	
AC03534-2R/Y	4 k	knobs, dull skin, 2 sprouts, chain tubers
CO05035-1PW/Y	2 D, 2 d	4 sprouts, 2 oversize, 2 scab, 2 greening, knobs
COA07365-4RY	3 k, 1 K	3 knobs, chain tubers
NDTX059759-3RY/Y Pinto	4 k	
Yukon Gold	2 k, 1 d	oversize, folded bud end, knobs, heart shape, growth cracks
A06336-2Y	2 d, 1 D	3 sprouts, greening, 2 chain tubers, irregular, folded, heart shape
A06336-5Y	4 D	4 Sprouts, chain tubers

Table 19. Oregon Statewide Chip Trial yield and grade, Malheur Experiment Station, Oregon State University, Ontario, OR, 2017.

Variety	Total yield	>10 oz	6 to 10 oz	4 to 6 oz	<4 oz	>4 inch	Two's	cull	Average tuber weight	No. of tubers /plant	Length/width	Specific gravity	Average fry color, light reflectance	Sugar end
	---------- cwt/acre ----------								oz		ratio	g/cm^{-3}	------- % -------	
Atlantic	430.2	44.0	70.1	166.0	139.8	42.1	7.3	2.9	6.4	5.5	1.04	1.0958	33.3	7.5
Snowden	551.4	83.7	161.9	223.8	65.1	16.7	14.2	2.6	5.3	8.6	1.04	1.0899	33.2	12.5
AOR11484-2	455.1	39.1	105.3	221.2	84.7	18.2	4.7	0.0	6.1	6.2	1.04	1.0846	32.1	5.0
AOR11488-1	477.2	157.0	155.5	137.7	3.5	0.0	12.2	11.1	3.8	10.3	1.06	1.0899	30.8	15.0
AOR11470-1	643.6	233.7	187.2	96.8	2.6	0.0	104.4	18.8	3.3	16.1	1.06	1.1113	35.2	0.0
AOR12197-2	466.4	142.2	108.1	72.7	3.7	0.0	76.6	63.2	3.5	11.0	1.08	1.0887	33.8	5.0
AOR12197-4	455.7	120.8	155.6	161.0	14.4	0.0	1.5	2.4	4.0	9.4	1.05	1.0848	34.5	7.5
Mean	497.1	117.2	134.8	154.2	44.9	11.0	31.6	14.4	4.6	9.6	1.05	1.0921	33.3	7.5
LSD (0.05)	69.5	23.0	36.2	58.4	39.8	20.0	35.3	33.0	0.6	1.2	NS	0.0034	NS	NS

Table 20. Oregon Statewide Chip Trial tuber internal defects for selected clones, Malheur Experiment Station, Oregon State University, Ontario, OR, 2017.

Variety	Vascular discoloration	Hollow heart	Internal brown spot	Brown center	Black spot bruise
	---------- % ----------				
Atlantic	0.0	0.0	2.5	0.0	0.0
Snowden	0.0	0.0	0.0	0.0	0.0
AOR11484-2	0.0	0.0	0.0	0.0	0.0
AOR11488-1	0.0	0.0	5.0	0.0	0.0
AOR11470-1	0.0	0.0	0.0	0.0	0.0
AOR12197-2	0.0	0.0	0.0	0.0	0.0
AOR12197-4	0.0	0.0	0.0	0.0	0.0
Mean	0.0	0.0	1.1	0.0	0.0
LSD (0.05)	NS	NS	NS	NS	NS

Table 21. Oregon Statewide Chip Trial tuber visual observations at harvest, Malheur Experiment Station, Oregon State University, Ontario, OR, 2017. K = clone should be saved, D = clone should be discarded. Capital letters denote a higher intensity of an observation compared to lower case letters. Since there were four replicates, a clone could be scored for the same attribute up to four times.

Clone/Variety	K or D	Description
Atlantic	2d, 2k	3 oversized, greening, folded, scab
Snowden	2k, 2K	1 oversized
AOR11484-2	2K, 2k	1 died early
AOR11488-1	1d, 2k, 1K	3 small, 1 few sprouts
AOR11470-1	4D	4 chain, 2 Sprouts, 2 sprouts
AOR12197-2	3k, 1D	3 sprouts, 2 knobs
AOR12197-4	4K	scab

Table 22. Preliminary Yield Chip Trial yield and grade, Malheur Experiment Station, Oregon State University, Ontario, OR, 2017.

Variety	Total yield	>10 oz	6 to 10 oz	4 to 6 oz	<4 oz	>4 inch	Two	Culls	Average tuber weight	No. of tubers /plant	Length/width	Specific gravity	Average fry color, light reflectance	Sugar end
	cwt/acre								oz		ratio	g/cm^{-3}	%	
Atlantic	545.8	246.3	190.5	56.4	44.8	105.1	0.0	7.8	7.7	5.9	1.03	1.0979	43.2	0.0
Snowden	606.2	172.9	237.0	125.3	71.0	65.7	0.0	0.0	6.5	7.7	1.03	1.0922	45.9	0.0
AOR13125-2	389.5	76.0	175.6	81.5	51.2	15.4	0.0	5.2	5.9	5.5	1.00	1.0852	45.1	0.0
AOR13125-9	483.1	62.0	163.9	138.6	118.6	0.0	0.0	0.0	4.7	8.5	0.97	1.1045	35.5	10.0
AOR13136-2	389.4	34.5	95.5	124.8	130.5	5.3	2.8	1.3	4.2	7.8	1.07	1.0756	34.5	10.0
AOR13136-4	614.8	136.0	201.9	143.2	112.1	73.7	14.4	7.2	5.2	9.8	1.21	1.0841	35.8	0.0
NYOR14Q9-5	602.0	263.6	197.7	78.3	52.0	73.4	3.2	7.1	7.3	6.9	1.03	1.0854	43.5	0.0
NYOR14Q9-9	575.6	88.7	216.4	182.0	88.5	18.9	0.0	0.0	5.2	9.1	1.07	1.0907	40.6	0.0
NYOR14Q12-1	505.1	49.7	167.9	127.2	140.7	5.7	19.5	0.0	4.3	9.7	1.03	1.0903	44.4	0.0
Mean	523.5	125.5	182.9	117.5	89.9	40.3	4.4		5.7	7.9	1.05	1.0895	40.9	2.2

Table 23. Preliminary Yield Chip Trial tuber internal defects for selected clones, Malheur Experiment Station, Oregon State University, Ontario, OR, 2017.

Variety	Vascular discoloration	Hollow heart	Internal brown spot	Brown center	Black spot bruise
	%				
Atlantic	0	0	0	0	0
Snowden	0	0	0	0	0
AOR13125-2	0	0	0	0	0
AOR13125-9	0	0	0	0	0
AOR13136-2	0	0	0	0	0
AOR13136-4	0	0	0	0	20
NYOR14Q9-5	0	0	0	0	0
NYOR14Q9-9	0	0	0	0	0
NYOR14Q12-1	0	0	0	0	0
Mean	0.0	0.0	0.0	0.0	2.2

Table 24. Preliminary Yield Chip Trial tuber visual observations at harvest, Malheur Experiment Station, Oregon State University, Ontario, OR, 2017. K = clone should be saved, D = clone should be discarded. Capital letters denote a higher intensity of an observation compared to lower case letters.

Clone	K or D	
Atlantic	k	oversize
Snowden	k	
AOR13125-2	k	greening
AOR13125-9	k	greening
AOR13136-2	k	
AOR13136-4	k	
NYOR14Q9-5	K	
NYOR14Q9-9	k	
NYOR14Q12-1	k	