

# 2022 Colorado Potato Breeding and Selection Report



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**Summary:**

The Potato Breeding and Selection program at Colorado State University develops new potato cultivars with traits critical for sustainable and profitable potato production in Colorado and around the world. In 2022, seed from 2016 parental combinations were obtained. In the field, 89,245 single plants were evaluated for the first time and 448 were selected to advance. Nearly 800 more clones which represent preliminary, intermediate, and advanced stage selection material were evaluated. The program also participated in the Southwest Regional trials and the Western Regional trials for all market classes, and material was submitted to the National Chip Processing Trial (NCPT) and the National Fry Processing Trials (NFPT). Three new selections were submitted for Plant Variety Protection and three additional selections are currently in the process of being protected. The CSU Potato Breeding and Selection program hosted its annual Open House on November 30, 2022. Thirty-five people were in attendance which included growers, warehouse managers, consultants, and other industry stakeholders. Feedback was collected from all attendees to capture their impressions of the clones on display and any other thoughts they wished to share.

Collaborations with stakeholders at every level help to determine breeding objectives that address important challenges including disease resistance, storability, and consumer preference. The CSU Potato Breeding program participated in several grower trials, obtaining necessary feedback on clone performance. The NCPT and NFPT trials also included growers and processors in the evaluation of potato clones to further guide the selection process. Trialing CSU breeding material with other potato grower/producers will continue to be a major goal of the breeding program.

**2022 Program Activities:**

The Colorado Potato Breeding and Selection Program intercrossed 95 parental clones in 2022 in two separate crossing blocks. The emphasis of the first crossing block was russet (fresh and processing) and chip cultivar development with emphasis on PVY resistance. The second crossing block also emphasized russet (fresh and processing) and yellow cultivar development again with an emphasis on incorporating PVY resistance. Seed from 216 combinations was obtained.

A subset of 160 crosses from 2018-2021 were planted in the greenhouse in 2022 to produce seedling tubers. These seedlings will undergo initial field selection in 2023. These families represent crosses segregating primarily for russets, yellows, reds, along with PVY resistance. Second- through third-size seedling tubers will be distributed to Idaho (USDA-ARS), Maine, Oregon, Texas, Minnesota, and Agriculture Agri-Food Canada.

Colorado grew 89,245 single-hills in the field representing 531 families in 2022, with 448 selected for subsequent planting, evaluation, and increase in future years. A portion of these seedlings were obtained from the USDA-ARS (Aberdeen, Idaho), Texas A&M University, Oregon State University, and the University of Maine.

Another 780 clones were in 12-hill, preliminary, and intermediate stages of selection. At harvest, 152 were saved for further increase and evaluation in 2023.

Twenty-four advanced selections were saved and will be increased in 2023 pending further evaluation. Another 159 selections and cultivars were maintained for germplasm development, breeding, and other experimental purposes including seed increases/maintenance.

Field trials conducted in 2022 included: Preliminary Trial, Intermediate Yield Trial, Intermediate Yield Chip Trial, Intermediate Red Trial, Intermediate Specialty Yield Trial, Advanced Yield Trial, Southwestern Regional Russet Trial, Southwest Regional Chip Trial, Southwest Regional Red Trial, Southwest Regional Specialty Trial, Western Regional Russet Trial, Western Regional Red Trial, Western Regional Specialty Trial, Western Regional Chipping Trial, PVP Trial, Kemin Variety Trial, Higgins Variety Trial, and the San Luis Valley Chipping Trial. All trials are grown under “low input” conditions, primarily for reduced nitrogen and fungicide.

During the 2022 growing season, 1,128 clones including 12-hills through advanced selections and germplasm, were genotyped using Intertek’s Kasp marker panel. The panel included markers for resistance to PVY (Ry<sub>adg</sub> and Ry<sub>sto</sub>) and late blight. Markers M6F1R4\_817 (linked to Ry<sub>adg</sub>) and Yes3\_b (linked to Ry<sub>sto</sub>) co-segregated with resistance based on field phenotypic observations. Of the clones tested, 136 were found to have PVY resistance (102 containing Ry<sub>sto</sub> and 34 containing Ry<sub>adg</sub>) and were validated with field disease observations. There were 438 clones that have the potential for late blight resistance as indicated by markers linked to the R2 gene. The marker panel also included two markers linked to Sli which segregated in the material.

ID	SNP_ID*	Description	Chr	Gene / QT
1	M6F1R4_711	Potato Virus Y, Ry <sub>adg</sub>	11	Ry <sub>adg</sub>
2	M6F1R4_817	Potato Virus Y, Ry <sub>adg</sub>	11	Ry <sub>adg</sub>
3	YES3_a	Potato Virus Y, Rysto	12	Rysto
4	YES3_b (backup)	Potato Virus Y, Rysto	12	Rysto
8	CPRISNP14	Potato Virus Y, Rysto	11	Ny(o,n)sto
5	S9_61261167	Late blight resistance	9	R8-QTL
6	solcap_snp_c2_56418	Late blight resistance R2 gene	9	R8-QTL
7	CPRISNP13	Late blight resistance R2 gene	4	R2
9	ST4_03ch12_58961580	Self-compatibility	12	Sli
10	ST4_03ch12_58962561	Self-compatibility	12	Sli

\*Ten markers from Intertek’s KASP SNP panel were used to screen the 1,128 clones during 2022.

Number of Clones Identified with PVY and LB Resistance Genes			
2022 Field year	PVY, Ry <sub>adg</sub>	PVY, Rysto	LB
2	16	33	242
3	5	17	45

<b>2022 Field year</b>	<b>PVY, Ryadg</b>	<b>PVY, Rysto</b>	<b>LB</b>
4	2	6	17
5	0	2	5
6	0	1	7
7	1	0	1
Other	10	43	121
Totals	34	102	438

A total of 162 samples were evaluated for two or more of the following postharvest characteristics: blackspot susceptibility, storage weight loss, dormancy, enzymatic browning, specific gravity, French fry color, French fry texture, and chip color. Advanced red selections were screened for red color retention in storage.

Several advanced and intermediate Colorado clones were evaluated in Regional Trials across the country, including russets, yellows, specialties, and chipping selections. The table below shows the different trials, number of locations, and number of Colorado clones evaluated in each.

<b>2022 Regional Trials</b>	<b>Locations</b>	<b>CO entries</b>
Southwest Regional Trial	5	3
Western Regional Trial	9	9
National Chip Processing Trial	10	3
Preliminary Chip Trial (EGSS)	2	19
National Fry Processing Trial	7	3

PVP for three selections have been accepted. They are AC05175-3P/Y (Columbine Gold), CO05068-1RU (Rocky Mountain Russet), and CO05037-3W/Y (Vista Gold). PVP for three selections are pending. They are CO00277-2R (Canada Rose), CO97087-2RU (Maritime Russet), and CO98067-7RU (Nonpareil Russet). We are in the process of protecting two russets and one chip selection. They are CO05189-3RU (Horizon Russet), CO08231-1RU (Crystal Russet), and AC03433-1W (Snowcap).

The CSU Potato Breeding and Selection program hosted its annual Open House on November 30, 2022. Thirty-five people were in attendance which included growers, warehouse managers, consultants, and other industry stakeholders. Feedback was collected from all attendees to capture their impressions of the clones on display and any other thoughts they wished to share.

One MS student, one PhD student, and one postdoctoral researcher joined the program in 2022. Student projects include identifying and improving genetic resources for disease resistance in potato. The postdoctoral researcher is focusing on health attribute traits of potato clones both in the program and commercially available. A previous MS student who has studied Vitamin C in potato is expected to graduate in 2023.

**2022 Data:**

<b>Field and Yield Data Summaries of Advanced Russet Selections</b>								
<b>Clone Name</b>	<b>Year</b>	<b>Total Yield (CWT/A)</b>	<b>% US No.1s</b>	<b>Marketable Yield* (CWT/A)</b>	<b>Vine Maturity</b>	<b>% Ext. Defects</b>	<b>% HH</b>	<b>PVY</b>
CO14371-3RU	6	346	81	279	Early	4.2	0.2	susc
CO15016-1RUsto	6	379	63	237	Early	1.1	0.0	resist
AC12090-3RU	8	372	84	311	Med	1.3	0.0	susc
CO13003-1RU	8	339	78	264	Med	1.2	1.0	resist
CO12378-1RU	9	336	62	216	Med	0.9	0.3	susc
CO11009-3RU	9+	425	83	351	Med	2.8	3.0	resist
CO10085-1RUsto	9+	363	79	286	Med	1.5	0.1	resist
CO10087-4RUsto	9+	290	86	253	Early	1.0	0.7	resist
CO10091-1RUsto	9+	307	79	252	Med	0.7	0.0	resist
Canela Russet		354	89	317	Med	1.4	0.1	susc
Russet Norkotah		352	81	292	Early	2.5	0.4	susc
<b>Field and Yield Data Summaries of Advanced Red Selections</b>								
CO15084-2R	6	415	38	158	Early	0.3	0.0	susc
CO15084-4R	6	408	39	165	Early	0.6	0.0	susc
CO15206-7RB <sup>+</sup>	6	365	17	63	Early	0.0	0.0	susc
CO15211-1R	6	482	63	305	Early	0.1	0.0	susc
CO15211-5R	6	336	60	205	Early	1.8	0.5	susc
CO14040-3R <sup>+</sup>	7	363	21	80	Early	0.3	0.0	susc
Colorado Rose		517	85	439	Med-Early	2.7	0.3	susc
Modoc		332	59	200	Early	0.9	0.1	susc
<b>Field and Yield Data Summaries of Advanced Yellow Selections</b>								
AC11573-3R/Y	6	344	54	184	Early	0.1	0.0	susc
CO14226-3Y	7	353	40	139	Early	1.0	0.0	resist
AC10376-1Y	9+	415	68	284	Med	2.8	0.0	resist
CO10064-1Y	9+	391	64	253	Med	1.8	0.0	susc
CO10098-5Y <sup>+</sup>	9+	283	28	85	Med	0.8	0.0	susc
CO11250-1Y	9+	437	69	302	Med	2.3	0.2	susc
CO11266-1Y	9+	395	59	237	Late	0.7	0.0	resist
Yukon Gold		379	86	330	Early	2.6	0.4	susc
<b>Field and Yield Data Summaries of Advanced Chip Selections</b>								
AC13125-4W	6	422	75	316	Med	4.4	0.0	susc
AC13125-5W	6	403	68	275	Med	2.7	0.0	susc
AC13126-1Wadg	7	309	82	251	Med	7.5	1.9	resist
CO13232-25W	7	425	83	351	Late	2.8	0.1	susc
AC11494-6W	9	416	71	302	Med	0.7	0.1	resist
CO12235-3W	9	327	75	246	Med	3.9	0.3	susc
CO12293-1W	9	443	86	379	Late	5.5	0.1	susc
Atlantic		433	85	369	Med	3.0	4.1	susc

\*Marketable yield is defined as yield over 4 oz, this does not take into account red and yellow markets for B size.

<sup>+</sup> Denotes a B size variety

Post-Harvest Data Summaries of Advanced Russet Selections					
Clone Name	Blackspot Bruise <sup>1</sup>	Dormancy (days @ 45F)	Specific Gravity	Harvest Fry Color <sup>2</sup>	Storage Fry Color <sup>2</sup>
CO14371-3RU	4.9	95	1.079	1.3	1.0
CO15016-1RUsto	4.4	74	1.082	2.3	2.0
AC12090-3RU	4.8	117	1.083	2.4	2.6
CO13003-1RU	4.4	94	1.087	1.2	0.4
CO12378-1RU	4.7	83	1.094	0.5	0.3
CO11009-3RU	4.4	82	1.098	0.4	0.3
CO10085-1RUsto	4.6	48	1.092	1.7	1.7
CO10087-4RUsto	4.7	78	1.093	1.5	1.2
CO10091-1RUsto	5.0	81	1.086	0.8	1.0
Canela Russet	4.7	138	1.095	1.8	2.0
Russet Norkotah	4.6	96	1.078	2.1	2.4

Post-Harvest Data Summaries of Advanced Red Selections			
CO15084-2R	4.7	95	1.079
CO15084-4R	4.7	71	1.083
CO15206-7RB	4.9	48	1.078
CO15211-1R	4.6	60	1.078
CO15211-5R	4.7	46	1.076
CO14040-3R	4.2	72	1.089
Colorado Rose	3.8	62	1.082
Modoc	4.5	85	1.076

Post-Harvest Data Summaries of Advanced Yellow Selections			
AC11573-3R/Y	4.5	55	1.086
CO14226-3Y	4.5	41	1.096
AC10376-1-2012Y	4.8	112	1.083
CO10064-1Y	4.3	89	1.096
CO10098-5Y	4.0	51	1.105
CO11250-1Y	4.3	40	1.097
CO11266-1Y	4.8	58	1.089
Yukon Gold	4.5	88	1.087

Post-Harvest Data Summaries of Advanced Chip Selections				Chip Color Ratings <sup>3</sup>			
				40	40R	50	50R
AC13125-4W	4.1	79	1.082	3.8	3.5	2.4	2.1
AC13125-5W	3.9	68	1.080	3.9	3.5	2.5	2.3
AC13126-1Wadg	3.5	78	1.094	4.0	3.6	2.5	2.3
CO13232-25W	4.3	88	1.085	2.7	1.9	2.1	2.3
AC11494-6W	3.0	63	1.091	3.6	3.0	2.5	2.5
CO12235-3W	4.3	83	1.088	3.9	2.9	2.3	2.4
CO12293-1W	4.8	82	1.084	4.2	3.3	2.6	2.5
Atlantic	3.1	82	1.098	4.2	3.6	2.8	2.7

<sup>1</sup> Blackspot Bruise: Ten tubers for each clone tested are bruised on the stem and bud ends with a 150 g weight dropped from a height of 60 cm. Tubers are stored at 40F prior to bruising and warmed up for 24 hours prior to bruising. After bruising, tubers are stored at room temperature for two days prior to evaluation. Blackspot susceptibility is evaluated by cutting the tubers in half longitudinally and rating the extent of damage. Blackspot is rated on a 1 to 5 scale, with 5 indicating no discoloration.

<sup>2</sup> Fry color is determined at or shortly after harvest and after a minimum of eight weeks of storage at 45F. Fries are cooked for 3 ½ minutes at 375F. Fry color is rated on a 0-4 scale using the USDA color standards. Color ratings of <2 are acceptable.

<sup>3</sup> Chip color is determined after an interval of storage at 40 and 50F and after reconditioning (R) for two weeks at 60F. Chips are cooked at 365F until bubbling slows. Chip color is rated using the Snack Food Association 1-5 scale. Ratings of <2.0 are acceptable.

The following tables are from the Western Regional Trials reporting chemical composition and disease testing:

**2022 Western Regional Russet Potato Variety Trial - Solids, Dextrose, Sucrose, Protein, Vitamin C, and Glycoalkaloids- Aberdeen, ID**

No.	Clone	Solids	Sugars		Protein (%DWB) <sup>1</sup>	Vitamin C (mg/100g FWB) <sup>1</sup>	Texas <sup>2</sup>		Glycoalkaloids <sup>5</sup> (mg/100g FWB) <sup>1</sup>
		Oven Dry %	Dextrose (%FWB) <sup>1</sup>	Sucrose (%FWB) <sup>1</sup>			mg Trolox equivalents/gfw <sup>3</sup>	AOA Levels <sup>4</sup>	
1	CLEARWATER R.	21.8	0.03	0.14	7.2	32.4	135.4	M	0.8
2	RANGER R.	22.7	0.05	0.17	5.5	44.8	158.5	M	3.4
3	R. BURBANK	18.6	0.11	0.14	5.5	32.0	143.1	M	2.2
4	R. NORKOTAH	18.7	0.06	0.10	5.1	27.7	154.2	M	0.9
12	AC12090-3RU	21.0	0.06	0.12	5.7	30.4	162.8	M	1.6
14	CO13003-1RU	20.7	0.02	0.11	5.2	27.5	145.0	M	1.8
15	CO10085-1RU	23.0	0.03	0.14	5.7	35.1	191.9	M	5.8
16	CO11009-3RU	22.9	0.01	0.10	7.1	38.2	134.3	M	0.5
<b>Mean</b>		<b>21.2</b>	<b>0.05</b>	<b>0.14</b>	<b>5.8</b>	<b>30.5</b>	<b>142.1</b>		<b>2.1</b>

<sup>1</sup> DWB = Dry Weight Basis; FWB = Fresh Weight Basis.

<sup>2</sup> The assay used at Texas A&M University was based on "Use of a Free Radical Method to Evaluate Antioxidant Activity" by Brand-Williams, et al. 1995, Levensm. Wiss. Technol. 28:25-30. Antioxidants soluble in methanol were extracted and allowed to react with the stable radical, 2,2,-Diphenyl-1-picrylhydrazyl (DPPH). This provided a rapid evaluation of the antioxidant properties of the potato extracts based on absorbance.

<sup>3</sup> µg Trolox equivalents/gfw - Absorbance was converted to trolox equivalents based on a standard curve using the following equation:  $y = -.272.42x + 292.13$

<sup>4</sup> VH=very high (>399), H=high (276-348), M=medium (134-259), L=low (67-127), VL=very low (<55) n=63 including ten check varieties.

<sup>5</sup> Glycoalkaloids: The 2022 Lenape check grown at Aberdeen was 64.95 mg/100g.

## 2022 Western Regional Red/Specialty Trial: Tuber Composition

Entry	Clone/Variety	Aberdeen						Texas <sup>5</sup>	
		Solids Oven Dry (%)	Sugars		Protein <sup>1</sup> (%DWB)	Vitamin C <sup>3</sup> (mg/100g FWB)	Glycoalkaloids <sup>4</sup> µg Trolox equivalents/g FWB	mg Trolox equivalents/gfw <sup>6</sup>	AOA Levels <sup>7</sup>
			Dextrose <sup>2</sup> (%FWB)	Sucrose <sup>2</sup> (%FWB)					
7	Yukon Gold	17.3	0.14	0.17	6.0	29.4	2.5	109.9	L
9	AC10376-2012-1W/Y	17.1	0.06	0.24	5.0	34.2	3.7	164.4	M
<b>Mean</b>		<b>17.2</b>	<b>0.10</b>	<b>0.21</b>	<b>5.5</b>	<b>31.8</b>	<b>3.1</b>	<b>137.2</b>	

<sup>1</sup> % Dry Weight Basis

<sup>2</sup> % Fresh Weight Basis (FWB)

<sup>3</sup> % Fresh Weight Basis (mg/100g FWB)

<sup>4</sup> % Fresh Weight Basis (mg/100g), Lenape Check 59.0 µg Trolox equivalents/g FWB

<sup>5</sup> The assay used at Texas A&M University was based on "Use of a Free Radical Method to Evaluate Antioxidant Activity" by Brand-Williams, et al. 1995, Lebensm. Wiss. Technol. 28:25-30. Antioxidants soluble in methanol were extracted and allowed to react with the stable radical, 2,2,-Diphenyl-1-picrylhydrazyl (DPPH). This provided a rapid evaluation of the antioxidant properties of the potato extracts based on absorbance.

<sup>6</sup> µg Trolox equivalents/gfw - Absorbance was converted to trolox equivalents based on a standard curve using the following equation:  $y = -225.36x + 242.65$

<sup>7</sup> VH=very high (>424), H=high (271-389), M=medium (141-242), L=low (86-137), VL=very low (<86). n=64 including nine check varieties

## 2022 Aberdeen Regional Chip Trial - Solids, Dextrose, Sucrose, Protein, Vitamin C, and Glycoalkaloids - Aberdeen, Idaho

	Clone	Solids	Sugars		Protein (%DWB)	Vitamin C (mg/100g FWB)	Glycoalkaloids (mg/100gFWB)
		Oven Dry (%)	Dextrose (%FWB)	Sucrose (%FWB)			
1	Atlantic	24.00	0.022	0.068	6.35	28.56	2.74
2	Lamoka	23.30	0.001	0.088	6.52	26.24	4.14
3	Snowden	22.16	0.007	0.047	6.27	28.95	4.23
6	CO11037-5W	22.88	0.002	0.058	7.90	26.37	1.84
7	CO12235-3W	21.63	0.001	0.060	7.92	27.57	3.39
8	CO12293-1W	22.08	0.002	0.073	7.49	25.81	2.33
9	CO13232-25W	19.97	0.002	0.031	8.77	29.74	3.93
<b>Means</b>		<b>22.36</b>	<b>0.006</b>	<b>0.068</b>	<b>7.22</b>	<b>28.96</b>	<b>3.68</b>

Lenape Check = 53.8



**2021 Western Regional Potato Variety Trial - Disease Evaluation and Metribuzin Reaction**

No.	Clone	Vert. Wilt/ Early Dying		Early Blight AB <sup>1</sup>		Late Blight Corvallis <sup>4</sup>			Common Scab AB <sup>1</sup>			Prosser		Pectobacterium		Metribuz. React. <sup>6</sup>			
		AB <sup>1</sup>		HRM <sup>2</sup>		Foliar		Foliar	Tuber	HRM	% Serious	Corky Ringspot		Fusarium	Soft				
		(0-9)	AUDPC	(0-9)	AUDPC	(0-9)	AUDPC	(1-9)	AUDPC	%	%PVY	Incid.	Defect	% Incid.	DSI <sup>5</sup>		Dry Rot <sup>1</sup> (0-5) F(sam)	Rot <sup>1</sup> (0-5)	AB
1	Clearwater R.	6.0	290	4.6	602	3.7	88	7.5	983	4	95	2	2	0	0	R	4.3	3.2	R
2	Ranger R.	7.0	666	5.8	848	3.7	90	8.5	1206	8	95	74	57	13	10	S	3.3	3.3	R
3	R. Burbank	8.7	1055	8.6	1841	3.0	68	9.0	1247	18	.	3	2	13	5	MR	4.0	3.9	MR
4	R. Norkotah	9.0	1315	7.8	1731	3.0	102	9.0	1301	6	40	11	4	8	2	MR	2.1	2.8	R
5	Shepody	7.7	733	.	.	4.3	168	9.0	1283	5	.	42	23	10	5	MR	3.5	2.6	.
8	CO10085-1RU	4.3	178	5.2	613	3.3	103	6.5	860	5	0	49	17	0	0	R	4.1	2.2	VS
9	CO11009-3RU	7.0	532	5.3	690	3.7	145	7.8	1008	3	50	36	13	4	3	MR	3.1	2.9	S
10	CO12378-1RU	6.7	486	5.2	917	4.7	235	8.0	1117	3	10	3	2	0	0	R	3.9	2.5	MS
<b>Entry Means</b>		7.0	617	5.7	897	3.8	125	7.5	993	5	56	25	12	5	3		3.7	3.2	
<b>LSD (.05)</b>								<b>1.0</b>	<b>260</b>	<b>9</b>		<b>24</b>	<b>17</b>				<b>0.8</b>	<b>1.3</b>	

<sup>1</sup> Evaluations made at Aberdeen, Idaho by Jonathan Whitworth; scale as indicated with highest number being most severe. For 0 to 9: 0=no symptoms; 1= trace; 2=1-5%; 3=5-10%; 4=10-20%; 5=25-40%; 6=40-60%; 7=60-70%; 8=75-90%; 9=90-100% dead or dying with typical disease symptoms. AUDPC: Area Under the Disease Progress curve based on foliar readings taken 103, 110, and 118 days after planting.

Common Scab and Net Necrosis serious defects are number of tubers with a 3 rating (0-5 scale) or higher, divided by total number of tubers examined. For 0 to 5: 0=0%/none; 5=100%/severe as a combination of tuber area and degree impacted by Fusarium and Pectobacterium inoculations.

<sup>2</sup> Evaluations made at Hermiston, Oregon; scale as indicated with highest number being most severe. Readings 120 days after planting. AUDPC based on foliar readings taken 91, 106, and 121 days after planting.

<sup>4</sup> Evaluations made at Corvallis, Oregon by Solomon Yilma; 6 = 40-60%; 7 = 60-75%; 8 = 75-90%; 9 = 90-100% injury. Percent of late blight infected tubers at harvest based on 10 randomly selected tubers per replication.

<sup>5</sup> Visual readings made at Prosser, Washington by Rich Quick and Launa Cimrhakl: tubers cut lengthwise, quartered and scored (0-8) based on the number of wedge sides affected. Disease Severity Index (DSI) was calculated for each replication by summing the scores (S) of each tuber evaluated (T) and dividing that number by the number of tubers evaluated multiplied by the worst possible score (8) and multiplying by 100.  $DSI = (\sum S)/(T*8)*100$

TRV Disease Rating Based on %DSI: R=Extreme Resistance (0-1%);MR=Moderate Resistance (1.1-5%);MS=Moderately Susceptible (5.1-10%);S=Susceptible (10.1+%)

<sup>6</sup> Evaluations made at Aberdeen, Idaho; R=Resistant, MR=Moderately Resistant, S=Susceptible, MS=Moderately Susceptible, VS=Very Susceptible

**2021 Western Regional Potato Variety Trial – Disease Evaluation and Metribuzin Reaction**

No.	Clone	Vert. Wilt/ Early Dying		Early Blight AB <sup>1</sup>		Late Blight Corvallis <sup>4</sup>			Common Scab AB <sup>1</sup>		Prosser		Fusarium		Pectobacterium		Metribuzin		
		HRM <sup>2</sup>		Foliar		Foliar	Tuber	HRM	% Serious	Corky Ringspot		Dry Rot <sup>1</sup> (0-5)		Soft Rot <sup>1</sup>	React. <sup>6</sup>				
		AB <sup>1</sup>		(0-9)	AUDPC	(0-9)	AUDPC	(1-9)	AUDPC	%	%PVY	Incid.	Defect	% Incid.	DSI <sup>5</sup>	F(sam)	(0-5)	AB	
1	CLEARWATER R.	6.0	290	4.6	602	3.7	88	7.5	983	4	95	2	2	0	0	R	4.3	3.2	R
2	RANGER R.	7.0	666	5.8	848	3.7	90	8.5	1206	8	95	74	57	13	10	S	3.3	3.3	R
3	R. BURBANK	8.7	1055	8.6	1841	3.0	68	9.0	1247	18	.	3	2	13	5	MR	4.0	3.9	MR
4	R. NORKOTAH	9.0	1315	7.8	1731	3.0	102	9.0	1301	6	40	11	4	8	2	MR	2.1	2.8	R
5	SHEPODY	7.7	733	.	.	4.3	168	9.0	1283	5		42	23	10	5	MR	3.5	2.6	.
8	CO10085-1RU	4.3	178	5.2	613	3.3	103	6.5	860	5	0	49	17	0	0	R	4.1	2.2	VS
9	CO11009-3RU	7.0	532	5.3	690	3.7	145	7.8	1008	3	50	36	13	4	3	MR	3.1	2.9	S
10	CO12378-1RU	6.7	486	5.2	917	4.7	235	8.0	1117	3	10	3	2	0	0	R	3.9	2.5	MS
<b>Entry Means</b>		7.0	617	5.7	897	3.8	125	7.5	993	5	56	25	12	5	3			3.2	
<b>LSD (.05)</b>								<b>1.0</b>	<b>260</b>	<b>9</b>		<b>24</b>	<b>17</b>					<b>1.3</b>	

<sup>1</sup> Evaluations made at Aberdeen, Idaho by Jonathan Whitworth; scale as indicated with highest number being most severe. For 0 to 9: 0=no symptoms; 1= trace; 2=1-5%; 3=5-10%; 4=10-20%; 5=25-40%; 6=40-60%; 7=60-70%; 8=75-90%; 9=90-100% dead or dying with typical disease symptoms.

AUDPC: Area Under the Disease Progress curve based on foliar readings taken 103, 110, and 118 days after planting.

Common Scab and Net Necrosis serious defects are number of tubers with a 3 rating (0-5 scale) or higher, divided by total number of tubers examined.

For 0 to 5: 0=0%/none; 5=100%/severe as a combination of tuber area and degree impacted by Fusarium and Pectobacterium inoculations.

<sup>2</sup> Evaluations made at Hermiston, Oregon; scale as indicated with highest number being most severe. Readings 120 days after planting. AUDPC based on foliar readings taken 91, 106, and 121 days after planting.

<sup>4</sup> Evaluations made at Corvallis, Oregon by Solomon Yilma;

6 = 40-60%; 7 = 60-75%; 8 = 75-90%; 9 = 90-100% injury. Percent of late blight infected tubers at harvest based on 10 randomly selected tubers per replication.

<sup>5</sup> Visual readings made at Prosser, Washington by Rich Quick and Launa Cimrhakl: tubers cut lengthwise, quartered and scored (0-8) based on the number of wedge sides affected. Disease Severity Index (DSI) was calculated for each replication by summing the scores (S) of each tuber evaluated (T) and dividing that number by the number of tubers evaluated multiplied by the worst possible score (8) and multiplying by 100.

$$DSI = (\sum S)/(T*8)*100$$

TRV Disease Rating Based on %DSI:R=Extreme Resistance (0-1%);MR=Moderate Resistance (1.1-5%);MS=Moderately Susceptible (5.1-10%);S=Susceptible (10.1+%)

<sup>6</sup> Evaluations made at Aberdeen, Idaho; R=Resistant, MR=Moderately Resistant, S=Susceptible, MS=Moderately Susceptible, VS=Very Susceptible

Both 2021 and 2022 Western Regional Russet disease evaluations are included, because several of the Colorado advanced selections were not evaluated in 2022.

**2022 Western Regional Red/Specialty Disease Evaluations and Metribuzin Reaction**

		Aberdeen			Prosser <sup>5</sup>		
		Vert. Wilt/ Early Dying <sup>1</sup> Foliar	Early Blight <sup>1</sup> Foliar	Metribuzin Reaction <sup>2</sup>	Corky Ringspot Evaluations		Designation
Entry Clone/Variety					Avg % w/int	Avg % DSI	
<b>Yellow Flesh</b>							
7	Yukon Gold	5.0	5.0	VR	47.4	32.8	S
9	AC10376-2012-1W/Y	4.8	5.0	MS	20.0	11.0	S
<b>Mean</b>		<b>5</b>	<b>5</b>		<b>34</b>	<b>22</b>	

<sup>1</sup>Evaluations made at Aberdeen, ID by Potato Variety Team; scale as indicated with lowest number being most severe. For 1 to 5 5=no symptoms; 1=90-100% dead or dying with typical disease symptoms.

<sup>2</sup>Metribuzin reaction measured at Aberdeen, ID. VR=very resistant, R=Resistant, MR=Moderately resistant, MS=moderately susceptible, S=susceptible VS=very susceptible

<sup>5</sup>Avg % w/int= Visual readings taken for 'internals' - tubers cut lengthwise, quartered, and scored (0-8) based on the number of sides of the wedges that were affected

Avg % DSI= Disease Severity Index (DSI) was calculated for each replication by summing the scores (S) of each tuber evaluated (T) and dividing that number by the number of tubers evaluated times the worst possible score (8) and multiplying by 100

$$DSI = (\sum S)/(T*8)*100$$

TRV Disease Rating Based on % DSI:

R = Extreme Resistance (0-1%); MR = Moderate Resistance (1.1-5%);

MS = Moderately Susceptible (5.1-10%); S = Susceptible (10.1+%)

2022 Western Regional Chipping Potato Variety Trial - Disease Evaluations and Metribuzin Reactions

No.	Clone	Vert. Wilt/Early Dying		Early Blight		Common Scab		Corky Ringspot			Metribuzin			
		AB <sup>1</sup>		AB <sup>1</sup>		AB <sup>1</sup>		PROS <sup>3</sup>			PVY %	Reaction		
		(0-9)	AUDPC	(0-9)	AUDPC	(0-9)	AUDPC	Incidence (%)	Serious Defects (%)	Incidence (%)	Serious Defects (%)	reaction	HERM <sup>4</sup>	AB <sup>5</sup>
1	Atlantic	7.0	593	8.2	1473	6	360	20.2	19.8	--	--	--	80	MS
2	Lamoka	7.3	636	8.8	1675	7	532	18.1	12.5	17.1	11.0	S	80	MR
3	Snowden	7.0	581	7.8	1319	6	258	29.5	10.7	23.0	11.7	S	95	R
6	CO11037-5W	--	--	7.7	1213	--	--	--	--	0.0	0.0	R	55	MS
7	CO12235-3W	--	--	8.7	1438	--	--	--	--	56.7	39.2	S	65	MR
8	CO12293-1W	--	--	7.7	1401	--	--	--	--	0.0	0.0	R	80	MR
9	CO13232-25W	--	--	8.2	1365	--	--	--	--	0.0	0.0	R	80	MS
<b>MEANS</b>		<b>7.1</b>	<b>603.3</b>	<b>8.2</b>	<b>1412.0</b>	<b>6.4</b>	<b>383.1</b>	<b>22.6</b>	<b>14.3</b>	<b>16.1</b>	<b>10.3</b>		<b>76.4</b>	
<b>LSD @ .05</b>		<b>NS</b>				<b>1.6</b>		<b>24.0</b>	<b>16.0</b>					
<b>Castle Russet</b>										<b>0.0</b>	<b>0.0</b>	<b>R</b>		

<sup>1</sup>Evaluations made at Aberdeen, Idaho by Jonathan Whitworth, Hermiston, Oregon by Sagar Sathuvalli; scale as indicated with highest number being most severe.

For 0 to 9: 0=no symptoms; 1= trace; 2=1-5%; 3=5-10%; 4=10-20%; 5=25-40%; 6=40-60%; 7=60-70%; 8=75-90%; 9=90-100% dead or dying with typical disease symptoms.

Early Blight and Vert. Wilt AUDPC: Area Under the Disease Progress Curve based on foliar readings taken 3 separate days after planting.

Common Scab serious defects are the number of tubers with a 3 rating (0-5 scale) or higher, divided by the total number of tubers examined.

<sup>2</sup>For 0 to 5: 0=none, 5=severe as a combination of tuber area and degree impacted by *Pectobacterium* or *Fusarium sambucinum* inoculations done at Aberdeen

<sup>3</sup>Corky ringspot readings Prosser, WA by Rich Quick and Launa Cimrhakl

<sup>4</sup>PVY readings Hermiston, OR from tuber sprouts by Sagar Sathuvalli

<sup>5</sup>Metribuzin Reaction measured at Aberdeen, ID by Chelsey Lowder. VR=very resistant, R=Resistant, MR=Moderately resistant, MS=moderately susceptible,

S=susceptible VS=very susceptible

In 2022 we launched a Grower Variety Trial with the assistance of CPAC and several local growers. It is an incentive-based program to promote the evaluation of advanced Colorado potato selections and provide CSU with valuable feedback. For the first year, we had one russet (CO10087-4RUsto) and one yellow (AC10376-1W/Y) variety. Four different commercial growers participated, two grew each type. A third party, Agro Engineering, dug 10-foot test plots from each field and shared the results compiled in the tables below. All the test plots were dug after vine kill but prior to harvest. In the fields with the russet varieties, another russet check variety was grown and evaluated for a comparison. There was not a check variety planted with the yellow to compare with.

**2022 CPAC Grower Variety Trial Results:**

<b>Russet Variety</b>	<b>Total Yield (CWT/A)</b>	<b>Marketable Yield* (CWT/A)</b>	<b>Yield &gt;8oz (CWT/A)</b>	<b>Tubers/Plant</b>	<b>Seed Spacing (inches)</b>	<b>Days to vine kill</b>
<b>Location 1</b>						
CO10087-4RUsto	439	316	69	10	12.0	115
Reveille Russet	549	497	270	8	12.0	115
<b>Location 2</b>						
CO10087-4RUsto	280	231	27	7	11	107
Russet Norkotah 296	379	323	137	8	11	107
<b>Yellow Variety</b>	<b>Total Yield (CWT/A)</b>	<b>Yield 4-10 oz (CWT/A)</b>	<b>Avg. Tuber Diameter (inches)</b>	<b>Tubers/Plant</b>	<b>Seed Spacing (inches)</b>	<b>Days to vine kill</b>
<b>Location 1</b>						
AC10376-1W/Y	496	178	2.0	13	11	132
<b>Location 2</b>						
AC10376-1W/Y	428	262	2.3	13	11	119

\*Marketable yield is all yield over 4 oz.

We will continue this trial and add two more russet varieties in 2023: CO11009-3RU and CO13003-1RU. This program will eventually include local seed growers and seed storage evaluations to give the full picture of how these clones perform in a commercial setting. This information will help the Colorado Potato Breeding Program release commercially relevant varieties for our stakeholders.

**Cultural Information of 2022 Yield Trials at the San Luis Valley Research Center:**

Planting date: 5/12/22	Total Fertilizer applied: 160N-60P-40K
Vine Kill date: 9/9/22	Total Irrigation applied: 21.5"
Harvest date: 9/22/22	Seed spacing: 34" x 12"

<b>Herbicides</b>	<b>Insecticides</b>	<b>Fungicides</b>
Prowl H2O	Platinum 75 SG	Quadris Top
Tuscany	Leverage 360	Elatus
Clethodim 2E	Movento HL	Revus Top
	Sefina Inscalis	Luna Tranquility
		Agri Tin