

## 2013 POTATO - EARLY BLIGHT FUNGICIDE TRIAL

**Researchers:** Robert D. Davidson and Andrew J. Houser, Colorado State University, SLVRC  
**Location:** San Luis Valley Research Center, Center, CO  
**Cultivar:** Russet Norkotah sel. 8  
**Objective:** To evaluate the efficacy of various fungicides for the management of early blight.  
**Application:** All treatments applied using an R & D CO<sub>2</sub> charged tractor mounted plot sprayer with four XR 8002VS nozzles spaced seventeen inches apart at 60 psi pressure and applying 40 gallons/acre as a broadcast application.  
**Spray Dates:** July 11, July 15, July 22, July 26, August 8, August 16, August 22

**Planted:** May 7, 2013  
**Plot Design:** Randomized complete block  
**Plot Size:** 2-15 foot rows per treatment per replication  
**Plant Spacing:** 12 inches  
**Row Spacing:** 34 inches  
**Replications:** Four  
**Irrigation:** Solid set sprinkler, rate based on ET  
**Fertilizer:** 80N-60P-40K-25S-2.5Z, preplant, 60N through sprinkler after tuber set.  
**Herbicide:** Matrix @ 1.5 oz/A + Eptam @ 4.5 pt/A  
**Insecticide:** None  
**Fungicide:** None  
**Vine Killer:** Vines chopped on September 5, 2013  
**Harvested:** Septemeber 10, 2013

### DATA:

**Disease:** Early blight disease incidence based on percent leaves infected, readings taken weekly starting August 7, 2013.

**AUDPC:** Area Under the Disease Progress Curve (AUDPC) is a measure of the progression of Early Blight, starting on August 7th and ending with the last reading on August 28th. AUDPC gives a better idea of the total amount of Early Blight in a plot during this time period, rather than just looking at the weekly percent incidence. The total AUDPC for the control plot (1) indicates the total amount of Early Blight that was present if no fungicides were used to suppress disease. The other treatments should be compared with the control to determine the effectiveness at reducing the disease. AUDPC is based on total percent leaflets infected with Early Blight, with readings taken on a weekly basis.

**Yield:** 2-15 foot rows per treatment per replication, total yield expressed as cwt/A.

**Grade:** By hand, percent tubers by weight in kilograms < 4 oz., 4-10 oz., > 10 oz., US # 2's, and culls.

**Table 1.** Fungicide programs evaluated for early blight control, San Luis Valley, Colorado 2013

<b>Program</b>	<b>Products</b>	<b>Rate</b>	<b>Application Schedule<sup>a</sup></b>
<b>1</b>	Untreated Control	-	-
<b>2</b>	Quadris	6.2 floz/A	1
	Bravo WS	1.5 pt/A	3
	Endura	2.5 oz./A	5
<b>3</b>	Quadris Top	11 floz/A	1
	Bravo WS	1 pt/A	3
	Revus Top	5.5 floz/A	5
<b>4</b>	Quadris Top	11 floz/A	1
	Bravo WS	1 pt/A	3
	Omega Top	7.0 floz/A	5
<b>5</b>	Quadris Top	11 floz/A	1
	Bravo WS	1 pt/A	3
	Luna Tranquility	11.2 floz/A	5
<b>6</b>	Quadris Top	11 floz/A	1
	Bravo WS	1 pt/A	3
	Endura	5.5 oz./A	5
<b>7</b>	Echo ZN	2.0 pt/A	1
	Luna Tranquility	8.0 oz/A	3,7
	NIS	0.5 %v/v	3,7
	Scala	7.0 oz/A	5
	Echo ZN	2.0 pt/A	5
<b>8</b>	Luna Tranquility	8.0 oz/A	1,5
	NIS	0.5 %v/v	1,5
	Scala	7.0 oz/A	3,7
	Echo ZN	2.0 pt/A	3,7
<b>9</b>	Echo ZN	2.0 pt/A	1
	Endura	2.5 oz/A	3,7
	Headline	9.0 floz/A	5
<b>10</b>	Echo ZN	2.0 pt./A	1,5
	Dithane Rainshield	2.0 lb/A	3,7
<b>11</b>	Quadris	6.2 floz/A	2
	Bravo WS	1.5 pt/A	4
	Endura	2.5 oz./A	6

<sup>a</sup>Schedule for applying treatments on a weekly basis, schedule started on July 11 (1 = week 1, 2 = week 2).

**Table 2.** Early Blight Trial - Effect of fungicide programs on the incidence of early blight in the cultivar Russet Norkotah Selection 8, San Luis Valley, Colorado, 2013; No Late Blight occurred within the trial.

Treatment	Percent Leaves Infected (with one or more lesions) <sup>a</sup>				AUDPC <sup>b</sup>
	August 7	August 15	August 21	August 28	
1	65.4 a	98.7 a	99.2 a	100.0 a	1254.7 a
2	34.2 bc	92.5 ab	97.1 a	99.2 a	1101.0 b
3	28.8 bcd	85.0 abc	95.4 a	99.6 a	1052.5 b
4	23.8 b-e	83.8 bc	95.4 a	96.7 ab	1018.6 b
5	21.2 cde	56.7 d	72.5 b	89.2 bc	820.7 c
6	36.3 b	87.9 ab	92.1 a	97.5 a	1072.3 b
7	16.3 de	37.9 e	63.8 bc	87.1 c	706.8 c
8	14.2 e	27.9 e	57.5 c	60.9 d	554.6 d
9	32.5 bc	72.9 c	91.7 a	97.9 a	1012.3 b
10	28.3 bcd	86.3 abc	90.8 a	92.9 abc	1015.2 b
11	32.5 bc	94.8 ab	96.7 a	97.9 a	1095.5 b
LSD(P=0.05)	13.23	13.96	10.62	8.18	121.5
CV	30.2	12.9	8.49	6.1	8.7
F value	0.0001	0.0001	0.0001	0.0001	0.0001

<sup>a</sup>Percent of leaflets with Early Blight lesions per plant (3 plants evaluated per treatment/rep, mean of four replications).

<sup>b</sup>AUDPC is the Area Under the Disease Progress Curve, accumulated weekly from August 7 through August 28.

Means followed by the same letters are not significantly different at P=0.05.

**Table 3.** Early Blight Trial - Effect of fungicide programs on tuber yield and quality in the cultivar Russet Norkotah Selection 8, San Luis Valley, Colorado, 2013.

Treatment	Percent <sup>a</sup>			US # 2's	Culls	Cwt/A <sup>b</sup>	Cwt/A w/o
	< 4 oz	4-10 oz	> 10 oz				US # 2's & culls <sup>c</sup>
1	36.9	47.1	14.0	0.6	1.4	357.1	349.7
2	35.4	44.7	16.3	1.6	2.1	332.2	319.5
3	31.3	43.3	20.7	0.7	4.1	341.7	325.3
4	30.7	51.1	15.5	0.2	2.6	338.6	329.6
5	31.7	47.5	16.0	1.3	3.5	323.7	308.4
6	30.9	47.9	16.7	2.3	2.2	355.5	339.6
7	28.4	50.8	15.7	0.4	4.7	332.2	316.3
8	30.5	43.5	22.6	0.4	3.0	348.6	337.0
9	34.4	43.5	19.3	0.2	2.7	298.4	289.9
10	33.1	51.0	12.2	0.7	3.1	316.3	305.2
11	36.6	45.0	15.8	0.5	2.2	326.4	317.9
LSD(P=0.05)	NS	NS	NS	NS	NS	NS	NS
CV	-	-	-	-	-	-	-
F value	-	-	-	-	-	-	-

<sup>a</sup>Based on tuber weight in kilograms, mean of four replications.

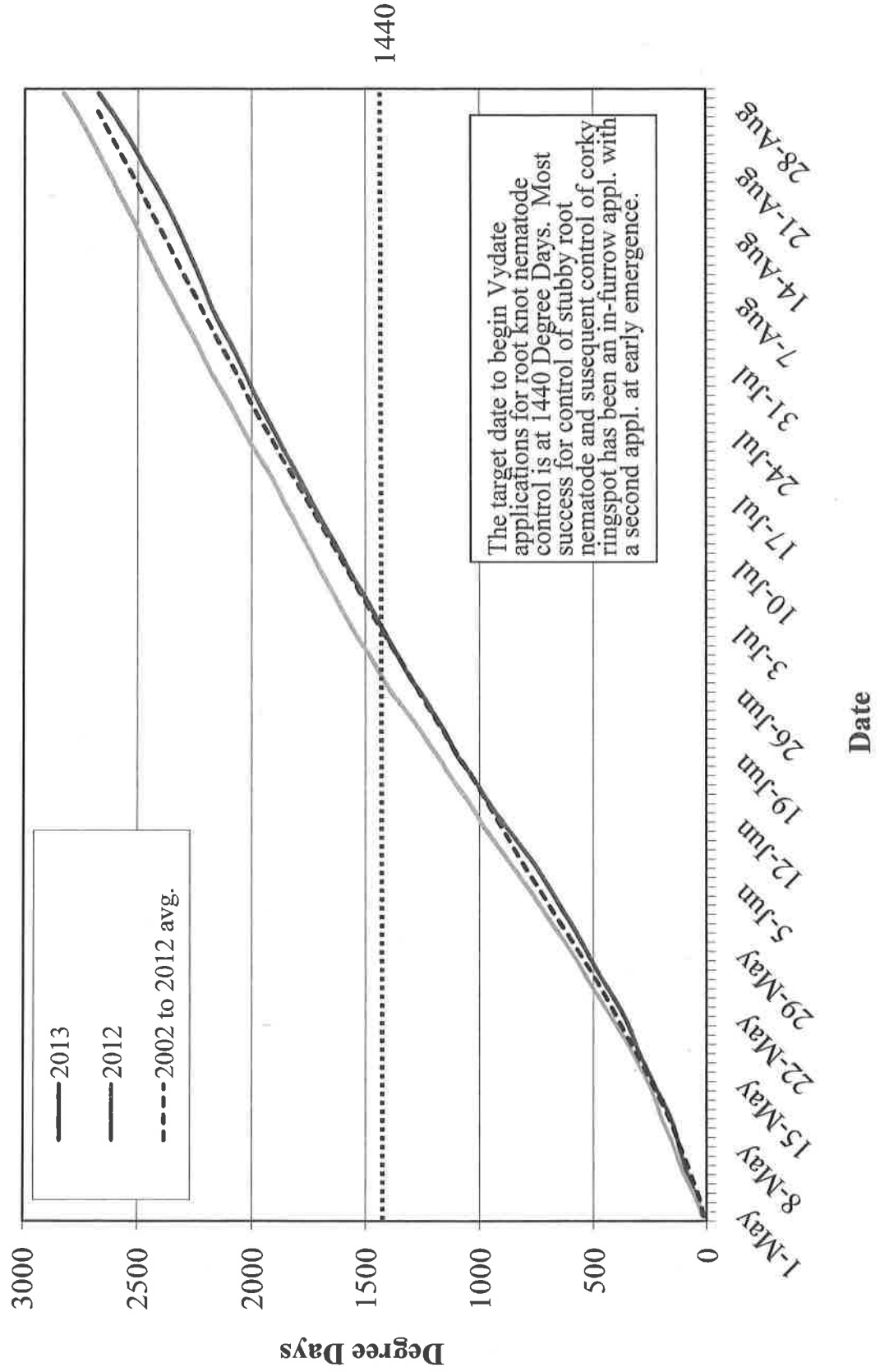
<sup>b</sup>Total yield expressed as hundred weight per acre, 2-15 foot rows per treatment per replication, mean of four replications.

<sup>c</sup>Total yield expressed as hundred weight per acre (culls are removed from the cwt/A), 2-15 foot rows per treatment per replication, mean of four replications.

Means followed by the same letters are not significantly different at P=0.05.

# Root Knot Nematode Degree Days

**Root Knot Nematode Degree Days for the San Luis Valley, 2013  
Soil Temperature collected at the SLV Research Center, Center, CO**

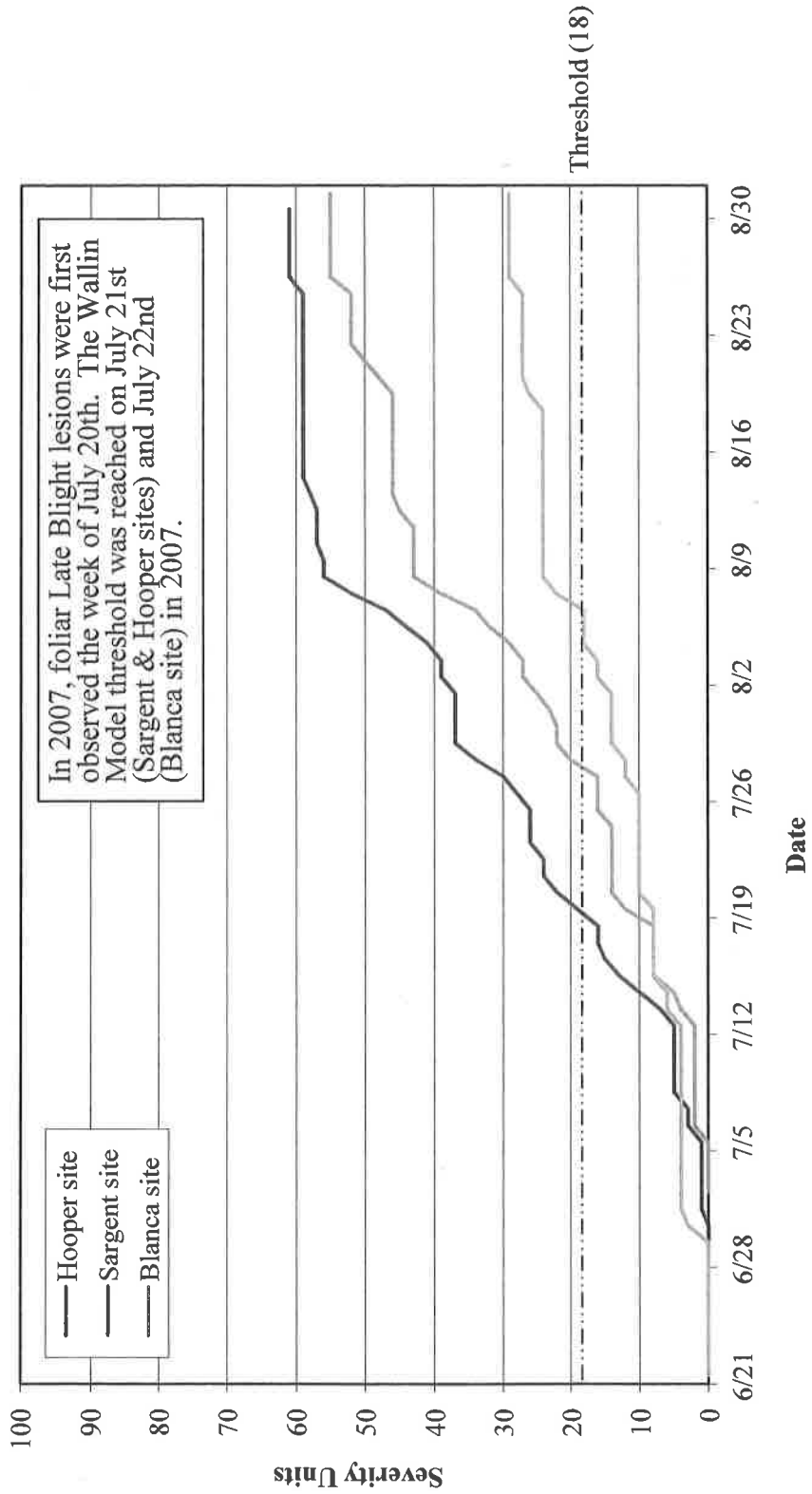


# SLV Late Blight Forecasting

Over the last several years weather stations have been positioned at three locations around the San Luis Valley (Blanca, Hooper, & Sargent) in order to determine late blight severity units. This was continued in 2013 in order to determine the potential risk we have for late blight here in the valley.

At all three sites, a Watch Dog weather station was used to determine late blight severity. This unit uses the Wallin model for calculating late blight severity units. Humidity, air temperature, and rainfall are used to calculate severity units. Once the total number of severity units reaches 18, late blight can occur. This information may become critical in the future if late blight ever becomes established in the San Luis Valley.

## Potato Late Blight Severity Values - Wallin Model, San Luis Valley, Colorado, 2013



**Footnote:**

- The Sargent weather station began collecting data on June 21, 2013.
- The Hooper weather station began collecting data on July 2, 2013.
- The Blanca weather station began collecting data on June 21, 2013.



# Pink Rot Fungicide Trial

The fungicide Ridomil Gold has worked well at controlling pink rot in the San Luis Valley. However, in recent years the pink rot pathogen has become resistant in many potato growing regions across the United States. Due to the low level of disease pressure here at the station, resistance to Ridomil Gold has not yet been discovered. We have evaluated various fungicide treatments during the last several years and have found a few to be somewhat effective at controlling pink rot, but Ridomil Gold has had the most success. Even though we have had success with this product, the jury is still out on whether or not this product should be used in the San Luis Valley. Concern has focused on how quickly the pathogen obtains resistance and on the fact that resistant strains are more aggressive. Reducing any excess irrigation water in the latter part of the growing season can decrease the amount of disease in the potato field.

In 2013, several chemistries showed good to excellent results. Also, the biological agent Serenade was include in the trial with mixed results.

## EVALUATION OF PRODUCTS APPLIED TO POTATO SEED IN-FURROW AND FOLIAR FOR THE MANAGEMENT OF PINK ROT, 2013

**Researchers:** Robert D. Davidson and Andrew J. Houser, Colorado State University, SLVRC  
**Location:** San Luis Valley Research Center, Center, CO  
**Cultivar:** Sangre S10  
**Objective:** To evaluate the efficacy of various products on the management of pink rot. Additional data was collected on pink rot incidence, severity and overall yield.

**Application:** In-furrow (IF) treatments were applied using a CO<sup>2</sup> charged backpack sprayer with two XR8002VS nozzles (one per row) at 35psi with 10 gal. of water/A. Applications made at tuber initiation (TI) were made using a CO<sub>2</sub> charged backpack sprayer with two XR8002VS nozzles (two per row for better coverage) at 35psi with 20 gal. of water/A. IF applications were made on May 10th and TI applications were made on July 8th, 2013.

**Treatments:**

1. Untreated Control
2. Proprietary
3. Ridomil Gold @ 0.42 floz/1000 row ft (IF) & Phostrol @ 10.0 pt/A (TI)
4. Emesto Silver Red Pigmented @ 0.31 floz/cwt + Nubark Mancozeb @ 1.2 oz/cwt (seed trt)
5. Emesto Silver Red Pigmented @ 0.31 floz/cwt + Nubark Mancozeb @ 1.2 oz/cwt (seed trt) & Serenade Soil @ 4.0 qt/A (IF)
6. Emesto Silver Red Pigmented @ 0.31 floz/cwt + Nubark Mancozeb @ 1.2 oz/cwt (seed trt) & Serenade Soil @ 4.0 qt/A + Emesto Prime @ 0.4 oz/1000 row ft.(IF)
7. Untreated Control

**Planted:** May 10, 2013  
**Plot Design:** Randomized complete block  
**Plot Size:** 2-20 foot rows per treatment per replication  
**Plant Spacing:** 12 inches  
**Row Spacing:** 34 inches  
**Replications:** Four  
**Irrigation:** Solid set sprinkler, rate based on ET  
**Fertilizer:** 80N-60P-40K-25S-2.5Z, preplant, 60N through sprinkler after tuber set.  
**Herbicide:**  
**Insecticide:** None  
**Fungicide:** None  
**Vine Killer:** Vines were chopped on September 5, 2013  
**Harvested:** Septemeber 12, 2013

### DATA:

**Disease:** Mean percent of tubers with pink rot at harvest multiplied by disease severity rating of 1-5 (1 = less than 5% rotten, 5 = 100% rotten) per treatment per replication.  
**Yield:** 2-20 foot row per treatment per replication, total yield expressed as cwt/A.  
**Grade:** By hand, percent tubers by weight in kilograms < 4 oz., 4-10 oz., > 10 oz., US # 2's and culls.

**Table 1.** Effect of applied products, for control of pink rot, on tuber yield and quality in the cultivar Sangre S10, Colorado State University, San Luis Valley Research Center, Colorado, 2013.

Trt. #	Products/Timing	Percent <sup>a</sup>					Total CWT <sup>b</sup> w/o 2's & culls <sup>c</sup>	% rot <sup>d</sup>	% rot x severity <sup>e</sup>	
		<4 oz.	4-10 oz.	>10 oz.	US #2's	culls				
1	Untreated Control	38.2	52.8	8.4	0.7	0.5	442.0	438.8	2.0	9.0
2	Proprietary	34.6	57.8	7.5	0.1	0.4	479.6	479.0	0.7	3.5
3	Ridomil Gold @ 0.42 floz/1000 row ft (IF) & Phostrol @ 10.0 pt/A (TI)	38.4	48.9	12.2	0.5	0.4	430.9	428.8	1.5	7.0
4	Emesto Silver Red Pigmented @ 0.31 floz/cwt + Nubark Mancozeb @ 1.2 oz/cwt (seed trt)	30.9	52.4	16.5	0.3	1.0	433.9	432.8	6.4	30.1
5	Emesto Silver Red Pigmented @ 0.31 floz/cwt + Nubark Mancozeb @ 1.2 oz/cwt (seed trt) & Serenade Soil @ 4.0 qt/A (IF)	34.8	54.2	11.1	0.0	1.5	455.7	455.7	4.2	19.2
6	Emesto Silver Red Pigmented @ 0.31 floz/cwt + Nubark Mancozeb @ 1.2 oz/cwt (seed trt) & Serenade Soil @ 4.0 qt/A + Emesto Prime @ 0.4 oz/1000 row ft.(IF)	35.1	53.9	10.2	0.8	0.9	425.0	421.8	5.9	29.7
7	Untreated Control	39.5	52.2	8.1	0.3	0.2	432.4	431.1	5.8	26.0
LSD (P=.05)		NS	NS	NS	NS	NS	NS	NS	NS	NS
CV		15.3	11.6	43.5	105.0	150.8	12.2	12.3	109.0	116.7
F value		0.3599	0.6156	0.1490	0.1099	0.5992	0.8037	0.7788	0.3039	0.3602

<sup>a</sup>Based on tuber weight in kilograms, mean of four replications.

<sup>b</sup>Total yield expressed as hundred weight per acre, 2-20 foot rows per treatment per replication, mean of four replications.

<sup>c</sup>Hundred weight per acre – US #2s and culls, 2-20 foot rows per treatment per replication, mean of four replications.

<sup>d</sup>Mean percent of tubers with pink rot at harvest per treatment per replication (i.e. 0.86 = 0.86%).

<sup>e</sup>Mean percent of tubers with pink rot at harvest multiplied by disease severity from 1 to 5 (1 = less than 5% rotten, 5 = 100 % rotten). Means followed by the same letters are not significantly different at P=0.05 (LSD).

# Black Scurf Fungicide Trial

## EVALUATION OF SEED TREATMENTS APPLIED TO POTATO SEED FOR THE MANAGEMENT OF BLACK SCURF, 2013

- Researchers:** Robert D. Davidson and Andrew J. Houser, Colorado State University, SLVRC
- Location:** San Luis Valley Research Center, Center, CO
- Cultivar:** Crestone Russet
- Objective:** To evaluate the efficacy of various seed treatments. Additional data was collected on plant health, rhizoctonia severity, and overall yield.
- Application:** On seed treatments were applied directly to fresh cut seed on May 20, 2013. In-furrow(IF) and post emergence treatments were made using a CO<sub>2</sub> charged backpack sprayer with two XR8002VS nozzles at 35psi. In-furrow applications were made on May 20th and Post emergence applications were made on July 8, 2013.
- Treatments:**
1. Untreated Control
  2. CruiserMaxx@0.25 floz/cwt(Seed Trt)
  3. CruiserMaxx @0.25 floz/cwt + Vibrance@0.16 floz/A(Seed Trt)
  4. Quadris@8.7 floz/A(IF)
  5. CruiserMaxx @0.25 floz/cwt + Vibrance@0.16 floz/A(Seed Trt) & Quadris@8.7 floz/A(IF)
  6. Priaxor@8.0 floz/A(IF)
  7. Emesto Silver Red@0.31 floz/cwt + Nubark Mancozeb@12.0 oz/CWT(Seed Trt)
  8. Emesto Silver Red@0.31 floz/cwt + Nubark Mancozeb@12.0 oz/CWT(Seed Trt) & Serenade Soil@2 qt/A(IF)
  9. Emesto Silver Red@0.31 floz/cwt + Nubark Mancozeb@12.0 oz/CWT(Seed Trt) & Serenade Soil@2 qt/A + Emesto Prime@ 0.4 oz/1000 row ft(IF)
  10. Fontelis@24 floz/A(IF)
  11. Priaxor@6.74 floz/A(IF)
  12. Quadris@9 floz/A(IF)
  13. Moncut@ 12 floz/A(IF)
  14. Priaxor@8.0 floz/A(IF)
  15. Priaxor@8.0 floz/A(Post-emergence)
  16. Untreated Control
- Planted:** May 20, 2013
- Plot Design:** Randomized complete block
- Plot Size:** 2-14 foot rows per treatment per replication
- Plant Spacing:** 12 inches
- Row Spacing:** 34 inches
- Replications:** Four
- Irrigation:** Solid set sprinkler, rate based on ET
- Fertilizer:** 80N-60P-40K-25S-2.5Z, preplant
- Herbicide:** Matrix @ 1.5 oz/A + Eptam @ 4.5 pt/A
- Insecticide:** None
- Fungicide:** None
- Vine Killer:** Vines allowed to die naturally.
- Harvested:** Septemeber 26, 2013
- DATA:**
- Plant stand count:** % of emerged plants per treatment per replication.
- Seed piece decay:** Soft-rot and dry-rot combined rated 0-100, where 0 = no decay and 100 = complete decay; 2 seed pieces/treatment/replication.
- % Stem canker:** Percent stems infected with rhizoctonia; 2 plants/treatment/replication.
- Severity index:** Mean percent of stems infected with rhizoctonia, multiplied by the severity of damage, where 1 = small area of stem infected and 5 = entire stem infected.
- Black scurf:** % tubers with black scurf and black scurf severity post harvest, per treatment per replication. The sample evaluated contained the tubers in the 4-10 ounce size range.
- Yield:** 2-8 foot rows per treatment per replication, total yield expressed in cwt/A.
- Grade:** By hand, percent tubers by weight in kilograms < 4 oz., 4-10 oz., > 10 oz., US #2's, and culls.

**Table 1.** Effect of applied products for control of rhizoctonia, on tuber yield and quality in the cultivar Crestone Russet, Colorado State University, San Luis Valley Research Center, Colorado, 2013.

Trt. #	Products/Timing	Percent					CWT w/o US #2's & culls
		<4 oz.	4-10 oz.	>10 oz.	US #2's	culls	
1	Untreated Control	36.9	42.3	18.8	2.1	0.0	165.4 b-e
2	CruiserMaxx (On-seed)	41.6	40.9	13.4	1.0	3.2	98.2 e
3	CruiserMaxx (On-seed) Vibrance (On-seed)	22.3	43.6	29.6	1.3	3.3	190.0 a-e
4	Quadris (In-furrow)	33.5	46.0	19.4	0.9	0.4	231.7 abc
5	CruiserMaxx (On-seed) Vibrance (On-seed) Quadris (In-furrow)	30.1	36.6	32.1	0.0	1.3	137.5 cde
6	Priaxor (In-furrow)	19.7	43.9	32.9	1.6	2.0	261.9 ab
7	Emesto Silver Red (On-seed) Nubark Mancozeb (On-seed)	26.7	59.6	13.2	0.5	0.0	278.2 a
8	Emesto Silver Red (On-seed) Nubark Mancozeb (On-seed) Serenade Soil (In-furrow)	38.9	46.9	3.6	4.5	6.8	123.2 de
9	Emesto Silver Red (On-seed) Nubark Mancozeb (On-seed) Serenade Soil (In-furrow) Emesto Prime (In-furrow)	39.6	48.0	7.6	1.4	3.5	196.8 a-e
10	Fontelis (In-furrow)	33.6	36.8	29.6	0.0	0.0	206.6 a-d
11	Priaxor (In-furrow)	23.4	54.5	18.8	0.0	3.3	228.0 abc
12	Quadris (In-furrow)	38.4	42.5	17.6	0.8	0.8	219.3 a-d
13	Moncut (In-furrow)	26.5	49.2	22.7	0.0	1.5	223.5 a-d
14	Priaxor (In-furrow)	26	43.2	28.1	2.4	0.5	267.5 a
15	Priaxor (Tuber set)	24.9	46.3	23.4	3.4	2.3	266.4 ab
16	Untreated Control	28.5	42.6	21.7	1.7	5.5	239.9 ab
LSD (P=0.05)		NS	NS	NS	NS	NS	101.3
CV		-	-	-	-	-	33.8
F value		-	-	-	-	-	0.024

<sup>a</sup>Based on tuber weight in kilograms, mean of four replications.

<sup>b</sup>Total yield expressed as hundred weight per acre, 2-15 foot rows per treatment per replication, mean of four replications.

<sup>c</sup>Hundred weight per acre minus the US #2s and culls, 2-15 foot rows per treatment per replication, mean of four replications. Means followed by same letter do not significantly differ (P=0.05)

**Table 2.** Effects of seed treatments on in-season plant development and incidence of disease in the cultivar Crestone Russet, Colorado State University, San Luis Valley Research Center, Colorado, 2013.

Trt. #	Products/Timing	Stems & Seed Pieces evaluated in season										Tubers evaluated for rhizoctonia post harvest			
		7/5/2013					8/5/2013					%		%	
		% Stand <sup>a</sup>	% Stems w/rhizoc <sup>b</sup>	Severity Index <sup>c</sup>	% Seed Decay <sup>d</sup>	% Stems w/rhizoc <sup>b</sup>	Severity Index <sup>c</sup>	% Seed Decay <sup>d</sup>	% Stems w/rhizoc <sup>b</sup>	Severity Index <sup>c</sup>	% Seed Decay <sup>d</sup>	w/Rhizoc <sup>e</sup>	%	w/Rhizoc <sup>e</sup>	%
1	Untreated Control	63.4 abc	63.8	86.1 bcd	50.3	73.7	167.2	78.1	28.4	17.6	10.8	28.4	17.6	10.8	
2	CruiserMaxx (On-seed)	43.8 d	51.1	73.3 cd	71.1	58.6	114.2	93.8	13.3	10.5	2.8	13.3	10.5	2.8	
3	CruiserMaxx (On-seed)	57.1 bcd	67.7	78.3 cd	33.6	47.1	47.1	95.3	7.0	1.0	6.0	7.0	1.0	6.0	
4	Vibrance (On-seed)	66.1 abc	58.3	72.2 cd	56.5	62.6	95.9	81.3	26.2	22.8	3.4	26.2	22.8	3.4	
5	Quadrax (In-furrow)	42.0 d	49.5	71.7 cd	48.2	58.3	92.1	82.8	0.6	0.0	0.6	0.6	0.0	0.6	
6	Quadrax (In-furrow)	56.2 bcd	65.9	79.8 cd	39.9	66.7	89.0	87.5	2.7	0.9	1.8	2.7	0.9	1.8	
7	Emesto Silver Red (On-seed)	51.8 cd	79.1	106.9 abc	29.4	63.3	70.6	93.8	9.4	6.8	2.6	9.4	6.8	2.6	
8	Nubark Mancozeb (On-seed)	64.3 abc	40.3	44.5 cd	41.6	60.0	66.2	95.3	3.5	1.0	2.5	3.5	1.0	2.5	
9	Emesto Silver Red (On-seed)	67.0 abc	61.8	90.2 bcd	40.6	74.6	95.8	96.9	2.1	2.1	0.0	2.1	2.1	0.0	
10	Nubark Mancozeb (On-seed)	76.8 a	67.2	78.7 cd	37.5	70.8	118.8	89.1	10.2	2.2	8.0	10.2	2.2	8.0	
11	Serenade Soil (In-furrow)	73.2 ab	33.4	33.4 d	57.8	62.4	113.8	89.1	4.8	4.0	0.8	4.8	4.0	0.8	
12	Emesto Prime (In-furrow)	70.5 abc	61.0	83.5 bcd	43.8	47.4	53.6	85.4	2.3	1.0	1.3	2.3	1.0	1.3	
13	Moncut (In-furrow)	73.2 ab	36.5	49.2 cd	25.0	46.8	76.8	84.4	11.1	6.7	4.4	11.1	6.7	4.4	
14	Priaxor (In-furrow)	75.0 ab	54.0	75.8 cd	34.4	72.6	85.1	84.4	12.5	8.5	4.0	12.5	8.5	4.0	
15	Priaxor (Tuber set)	67.9 abc	70.5	162.9 a	50.0	76.1	121.9	96.9	18.5	10.0	8.5	18.5	10.0	8.5	
16	Untreated Control	72.3 ab	60.9	146.6 ab	54.7	69.6	162.3	87.5	26.3	10.9	15.5	26.3	10.9	15.5	
LSD (P=0.05)		19.1	NS	63.7	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	
CV		21.0	46.7	53.5	44.8	37.1	57.0	15.6	143.4	186.3	159.2	143.4	186.3	159.2	
F value		0.007	0.577	0.024	0.187	0.770	0.149	0.746	0.232	0.355	0.212	0.232	0.355	0.212	

<sup>a</sup>Percentage of plants emerged on July 5th, 2013; mean of 4 replications.

<sup>b</sup>Mean % of stems with rhizoctonia stem canker per plant; 2 plants/treatment/replication. Readings taken on July 5th & Aug. 5th; mean of 4 replications.

<sup>c</sup>Mean % of stems infected with rhizoctonia, multiplied by the severity of damage, where 1 = small area of stem infected and 5 = entire stem infected. Readings taken on July 5th & August 5th; mean of 4 replications.

<sup>d</sup>Mean % of seed piece decay per seed piece, collected at harvest. Harvested on September 26 and readings taken on December 20, 2014; mean of 4 replications.

<sup>e</sup>Mean % of tubers with black scurf, with less than 2% surface area covered by black scurf, collected at harvest; mean of 4 replications.

<sup>f</sup>Mean % of tubers with black scurf, with over 2% surface area covered by black scurf, collected at harvest; mean of 4 replications.

Means followed by same letter do not significantly differ (P=0.05)

# Powdery Scab Trials



## EVALUATION OF ADVANCED CLONES FOR SUSCEPTIBILITY TO POWDERY SCAB, 2013

- Researchers:** Robert D. Davidson and Andrew J. Houser, Colorado State University, SLVRC
- Location:** San Luis Valley Research Center, Greenhouse, Center, CO
- Objective:** To evaluate the susceptibility of advanced potato clones to powdery scab.
- Treatments:**
1. Mesa Russet
  2. Colorado Rose
  3. Russet Nugget
  4. Centennial Russet
  5. CO04067-8R/Y
  6. CO03202-1RU
  7. AC03452-2W
  8. CO04063-4R/R
  9. AC00206-2W
  10. CO04067-10W/Y
  11. CO04021-2R/Y
  12. CO04220-7RU
  13. CO03276-5RU
  14. CO04159-1R
  15. CO04099-3W/Y
  16. CO04056-3P/PW
  17. AC03534-2R/Y
  18. CO04233-1RU
  19. AC3433-1W
  20. CO03243-3W
- Planted:** August 9, 2013
- Plot Design:** Randomized complete block
- Plot Size:** Two 6" pots per treatment per replication.
- Seed:** Potato eyes were removed from seed tubers using a melon scoop and allowed to suberize for several days. One eyeball was planted per pot, two inches deep in the soil.
- Replications:** Four
- Irrigation:** Overhead irrigation, rate predetermined based on the optimal irrigation regime for powdery scab symptom development.
- Fertilizer:** 20N-20P-20K, applied six times
- Herbicide:** -
- Insecticide:** -
- Fungicide:** -
- Vine Killer:** Vines were removed at harvest time.
- Harvested:** November 20th, December 3rd and December 4th, 2013
- DATA:** Mean percent per pot showing galls on roots, rated 0 to 4; 0 = none, 4 = heavily infected.  
Mean percent of per pot showing one or more powdery scab lesions at harvest multiplied by the severity of the lesions, where 1 = very little or no disease and 5 = heavily infested.  
Mean percent of tubers per pot which are unmarketable due to powdery scab severity.  
Both root gall and tuber readings were taken on January 28, 29, and 30th, 2013.

**Table 1.** Evaluation of advanced clones for tuber susceptibility to powdery scab in a greenhouse environment, Colorado State University, San Luis Valley Research Center, Center, CO, 2013.

Treatment	Tuber Symptoms					Fresh Root Weight <sup>f</sup>	
	% Stand <sup>a</sup>	% Incidence <sup>b</sup>	% Healthy <sup>c</sup>	Severity Index <sup>d</sup>	% Unmarketable <sup>e</sup>		Root Gall Rating <sup>f</sup>
1. Mesa Russet	62.5 abc	0.0 g	100.0 a	0.0 f	0.0 g	0.0 j	0.8 fg
2. Colorado Rose	37.5 cd	83.3 ab	16.7 fg	366.7 a	76.7 a	4.0 a	0.6 fg
3. Russet Nugget	100.0 a	43.3 def	56.7 bcd	71.5 def	7.2 fg	1.5 e-i	14.1 a
4. Centennial Russet	87.5 ab	0.0 g	100.0 a	0.0 f	0.0 g	1.0 g-j	0.6 g
5. CO04067-8R/Y	37.5 cd	66.7 bcd	33.3 def	200.0 bcd	48.9 a-d	2.7 a-e	0.6 g
6. CO03202-1RU	87.5 ab	3.1 g	96.9 a	3.1 ef	0.0 g	1.3 f-j	5.0 cd
7. AC03452-2W	87.5 ab	64.4 bcd	35.6 def	198.8 bcd	26.5 c-g	3.0 a-d	7.0 bc
8. CO04063-4R/R	75.0 abc	79.2 abc	20.9 efg	137.5 cde	13.8 d-g	2.3 b-g	0.3 g
9. AC00206-2W	50.0 bcd	94.4 ab	5.6 fg	222.2 bc	33.3 b-g	1.3 e-j	6.2 bc
10. CO04067-10W/Y	12.5 d	50.0 cde	50.0 cde	200.0 bcd	50.0 abc	2.0 c-h	0.7 fg
11. CO04021-2R/Y	62.5 abc	78.3 abc	21.7 efg	260.0 abc	65.0 ab	4.0 a	1.6 efg
12. CO04220-7RU	100.0 a	2.5 g	97.5 a	2.5 ef	0.0 g	0.8 hij	1.3 efg
13. CO03276-5RU	100.0 a	15.9 fg	84.1 ab	23.0 ef	3.6 fg	2.0 c-h	6.9 bc
14. CO04159-1R	87.5 ab	100.0 a	0.0 g	325.0 ab	79.2 a	3.5 ab	2.1 efg
15. CO04099-3W/Y	100.0 a	84.4 ab	15.6 fg	325.0 ab	65.6 ab	3.3 abc	3.2 def
16. CO04056-3P/PW	50.0 bcd	72.2 a-d	27.8 d-g	233.3 abc	44.4 a-e	3.0 a-d	1.3 efg
17. AC03534-2R/Y	100.0 a	88.2 ab	11.8 fg	334.6 ab	59.2 abc	2.5 b-f	1.1 efg
18. CO04233-1RU	100.0 a	24.0 efg	76.1 abc	65.6 def	12.5 efg	0.5 ij	8.5 b
19. AC03433-1W	37.5 cd	83.4 ab	16.7 fg	250.0 abc	38.4 b-f	2.5 b-f	3.4 de
20. CO03243-3W	100.0 a	100.0 a	0.0 g	275.0 ab	55.0 abc	1.8 d-i	6.9 bc
LSD (P=0.05)	37.76	32.15	32.15	135.98	35.95	1.34	2.54
CV	36.2	39.7	51.9	54.5	74.1	44.0	49.4
F value	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001

<sup>a</sup>Percent Stand is based on the number of pots (four reps with two pots per rep) with growing plants that produced one or more tubers and/or a measurable amount of root mass for disease evaluation – if stand is less than 50%, the results are considered questionable.

<sup>b</sup>Percent Incidence = Mean percent of tubers with powdery scab lesions.

<sup>c</sup>Percent Healthy = Mean percent of tubers with no powdery scab lesions.

<sup>d</sup>Severity Index = mean percent of the number of affected tubers multiplied by the severity of the lesions, where 1 = very little or no disease and 5 = heavily infested.

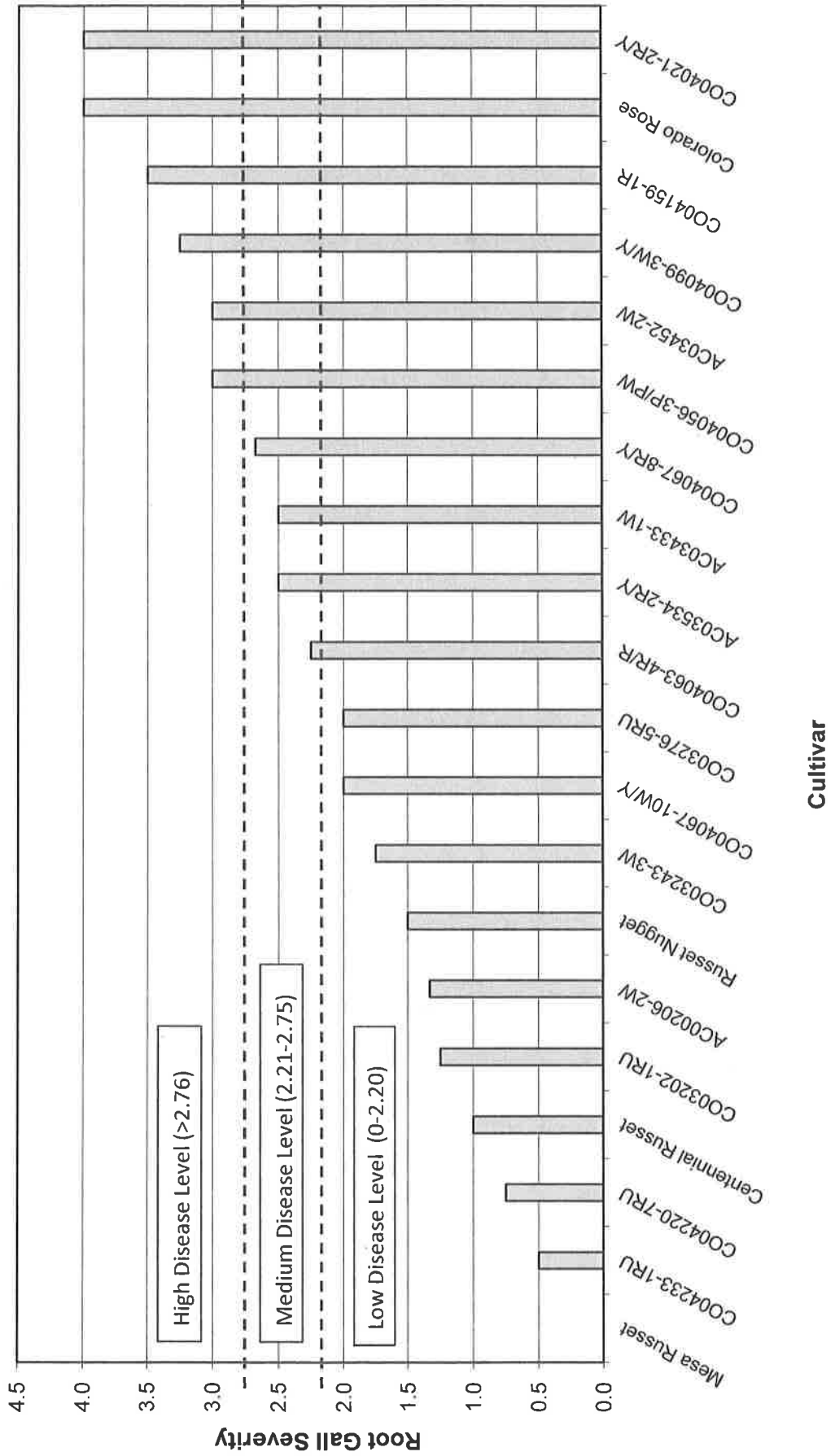
<sup>e</sup>Percent Unmarketable = Mean percent of tubers per pot which are unmarketable due to powdery scab severity (lesion severity >3).

<sup>f</sup>Root Gall Rating = visual analysis of roots for the presence of powdery scab root galls, where 0 = no root galls and 4 = extensive root galls.

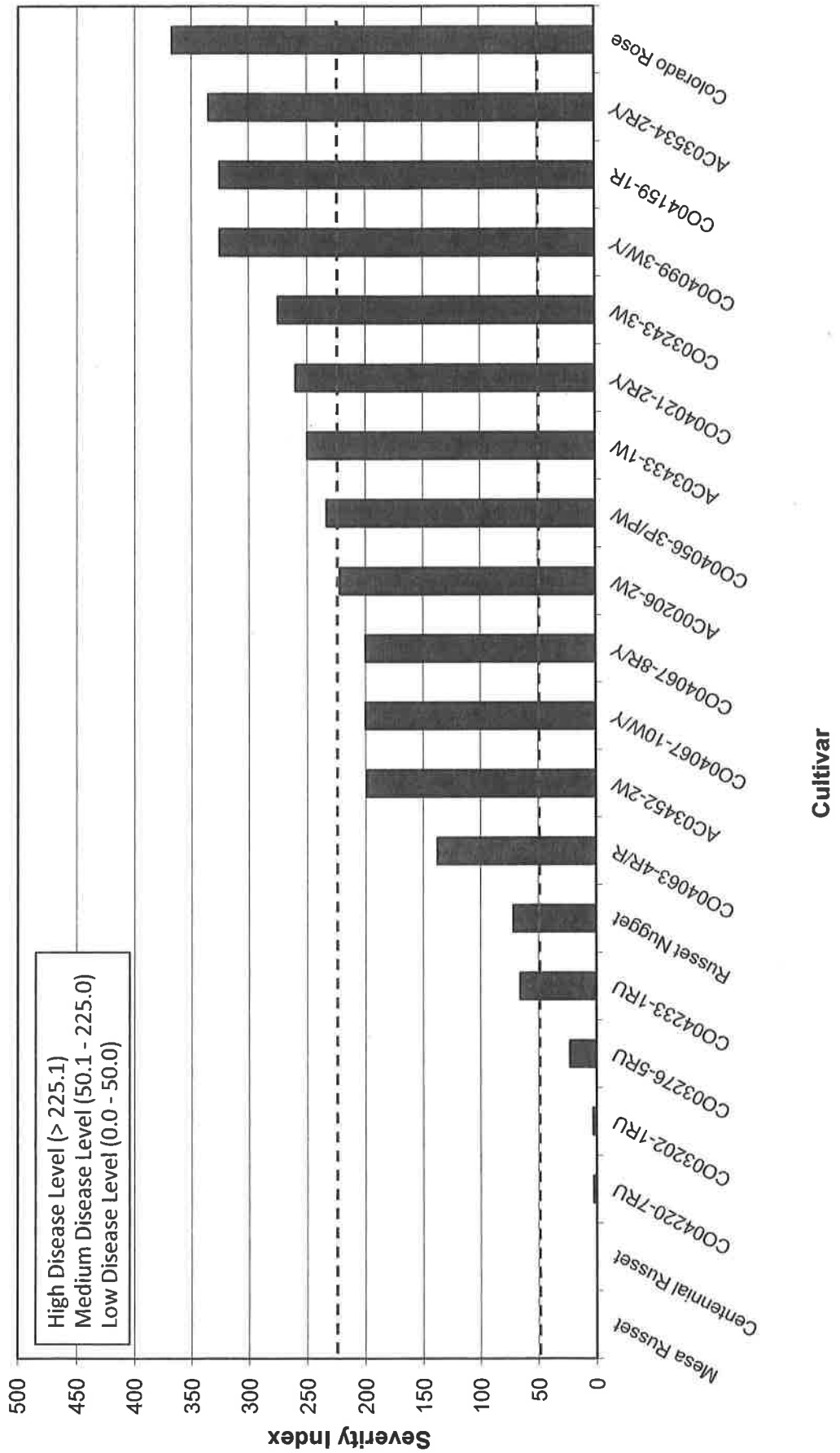
<sup>g</sup>Mean fresh root weight data was collected when disease readings were taken. Root weight varied in some cases due to disease severity, which had an impact on the root gall reading. Where root weights are low (i.e. < 1 gram), root gall readings are considered questionable.

Means followed by the same letters are not significantly different at P=0.05.

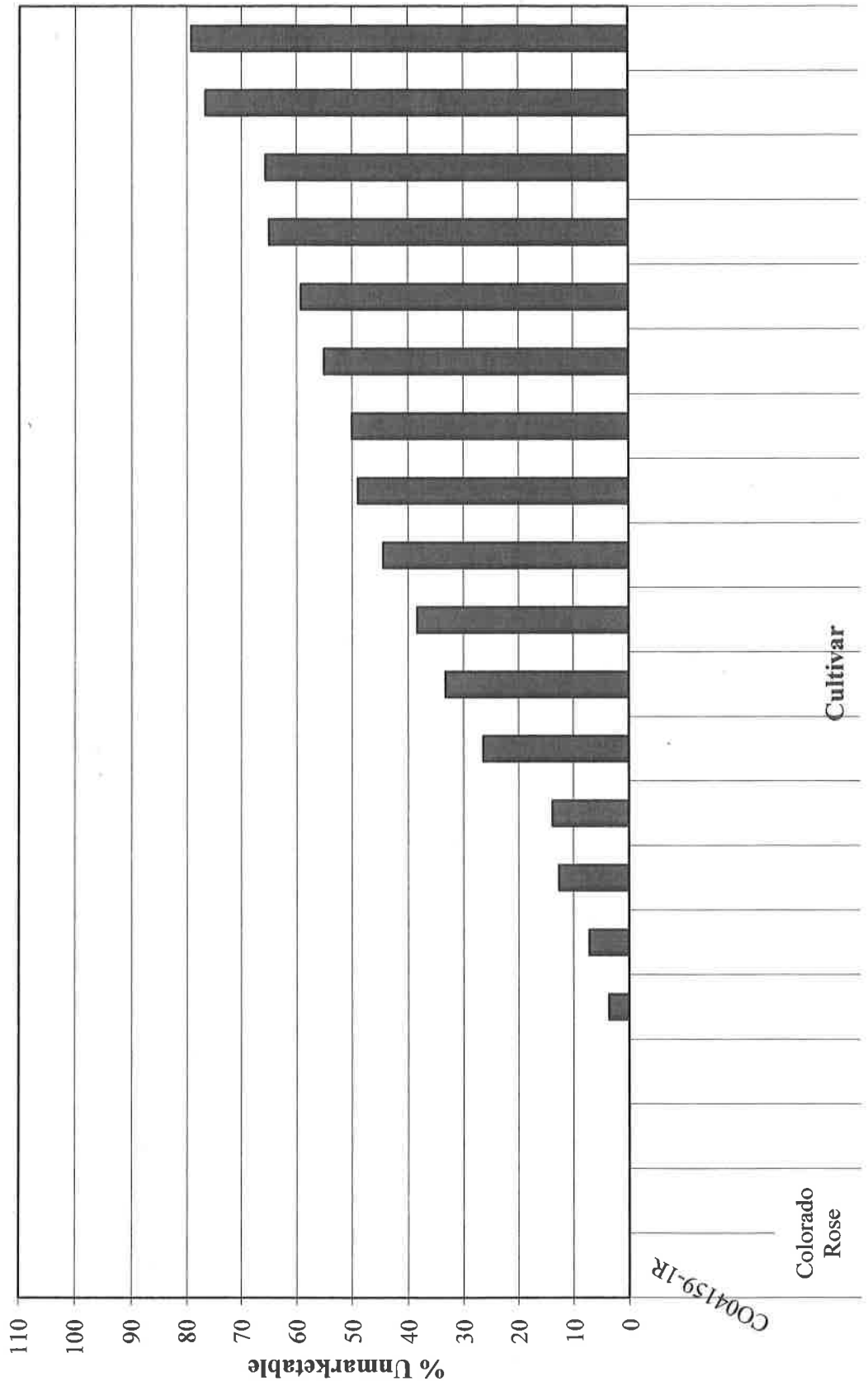
**Root Gall Severity Readings (0-4, where 0 = no galls & 4 = roots are heavily infested with root galls)  
 Evaluation of Advanced Clones for Susceptibility to Powdery Scab Root Galls  
 San Luis Valley Research Center, Greenhouse Trial, Colorado, 2013**



**Powdery Scab Severity Index - percent tubers with powdery scab x severity: 1 to 5**  
**Evaluation of Advanced Clones for Tuber Susceptibility to Powdery Scab**  
**San Luis Valley Research Center, Greenhouse Trial, Colorado, 2013**



**Percent Unmarketable - Based on Powdery Scab Severity (severity rating >3)  
 Evaluation of Advanced Clones for Tuber Susceptibility to Powdery Scab  
 San Luis Valley Research Center, Greenhouse Trial, Colorado, 2013**



# Potato Rotational Trial

## EVALUATION OF DIFFERENT CROP ROTATIONS FOR THE MANAGEMENT OF BLACK SCURF, SILVER SCURF, AND POWDERY SCAB ON POTATO, 2013

**Researchers:** Robert D. Davidson and Andrew J. Houser (in cooperation with Merl Dillon & Samuel Essah), Colorado State University, SLVRC

**Location:** San Luis Valley Research Center, Center, CO

**Cultivar:** Colorado Rose

**Objective:** To evaluate different rotational crops for the management of potato diseases (black scurf, silver scurf, powdery scab, blackleg & tuber soft rot caused by *Pectobacterium* sp.).

**Treatments:**

1. Potato/Barley (2 year rotation)
2. Potato-Rye/Sudan (2 year rotation)
3. Potato/Wet Fallow (2 year rotation)
4. Potato/Barley/Canola (3 year rotation)
5. Potato/Barley/Sudan (3 year rotation)
6. Potato/Barley/Camolina (3 year rotation)
7. Potato/Barley/Canola+Compost (3 year rotation)
8. Potato/Barley/Canola+Manure (3 year rotation)
9. Potato/Barley/Mustard (3 year rotation)
10. Potato/Barley/Cocktail (3 year rotation)
11. Potato-Rye/Cocktail/Sudan (3 year rotation)

**Planted:** May 24, 2013 (Andrew's PhD research)

**Plot Design:** Randomized complete block

**Plot Size:** 6-20 foot rows per treatment per replication

**Plant Spacing:** 12 inches

**Row Spacing:** 34 inches

**Replications:** Four

**Irrigation:** Solid set sprinkler, rate based on ET

**Fertilizer:** 80N-60P-40K-25S-2.5Z, preplant, 60N through sprinkler after tuber set.

**Herbicide:** Matrix @ 1.5 oz/A + Eptam @ 4.5 pt/A

**Insecticide:** None

**Fungicide:** None

**Vine Killer:** Vines were allowed to die naturally.

**Harvested:** October 4, 2013

### DATA:

**Disease:** Percent number of tubers, (sample was taken from the medium sized tubers collected at harvest), evaluated for black scurf, silver scurf, and powdery scab incidence. For the black scurf and powdery scab results, a severity rating was also determined for each tuber with disease symptoms.

**Disease Severity:** Severity rating for black scurf and powdery scab: 1 = < 1% surface area (SA) of tuber covered, 2 = 1-5% SA covered, 3 = 5-25% of SA covered, 4 = >25% SA covered.

**Severity Index:** For powdery scab, the total % of tubers with powdery scab lesions was multiplied by the overall severity rating.

**Pitting on CVP:** Percent of stem ends and lenticels from tubers which resulted in pitting on Crystal Violet Pectate(CVP) media. The stem ends from 40 tubers (four replications, 10 tubers per rep) were evaluated for the presence of *Pectobacterium* sp.

**Table 1.** EPA NRCS crop rotational project (disease results: Black scurf, Silver Scurf, and Powdery Scab), Colorado State University, San Luis Valley Research Center, Center, CO, 2013

Trt #	Treatment	Black Scurf (Rating 1) <sup>a</sup>	Black Scurf (Rating 2) <sup>a</sup>	Black Scurf (Rating 3) <sup>a</sup>	Black Scurf (Rating 4) <sup>a</sup>	Total % of tubers with black scurf	Total % of high black scurf rating <sup>b</sup>	Total % of tubers with Silver Scurf	Total % of tubers with powdery scab	Powdery scab severity index <sup>c</sup>
1	Potato/Barley (2 yr)	37.5	12.5	15.0	0.0	65.0	27.5	37.5	20.0	40.0
2	Potato-Rye/Sudan (2 yr)	40.0	12.5	15.0	0.0	67.5	27.5	20.0	17.5	42.5
3	Potato/Wet Fallow (2 yr)	17.5	25.0	2.5	0.0	45.0	27.5	37.5	0.0	0.0
4	Potato/Barley/Canola (3 yr)	42.5	27.5	10.0	0.0	80.0	37.5	35.0	0.0	0.0
5	Potato/Barley/Sudan (3 yr)	45.0	15.0	12.5	0.0	72.5	27.5	17.5	2.5	5.0
6	Potato/Barley/Camolina (3 yr)	32.5	17.5	2.5	2.5	55.0	22.5	35.0	0.0	0.0
7	Potato/Barley/Canola+Compost (3 yr)	35.0	22.5	12.5	0.0	70.0	35.0	30.0	0.0	0.0
8	Potato/Barley/Canola+Manure (3 yr)	37.5	12.5	5.0	0.0	55.0	17.5	40.0	0.0	0.0
9	Potato/Barley/Mustard (3 yr)	20.0	27.5	10.0	0.0	57.5	37.5	15.0	0.0	0.0
10	Potato/Barley/Cocktail (3 yr)	45.0	22.5	15.0	0.0	82.5	37.5	20.0	0.0	0.0
11	Potato-Rye/Cocktail/Sudan (3 yr)	25.0	20.0	2.5	0.0	47.5	22.5	20.0	0.0	0.0
LSD (P=0.05)										
CV										
F value										
		NS	NS	NS	NS	NS	NS	NS	NS	NS
		50.3	66.5	130.8	663.3	40.1	68.7	54.0	296.8	285.2
		0.305	0.609	0.679	0.465	0.495	0.890	0.162	0.078	0.054

<sup>a</sup>For the Black scurf and Powdery scab results, a severity rating was also determined for each tuber with disease symptoms. Severity rating for Black Scurf and Powdery Scab: 1 = < 1% SA of tuber covered, 2 = 1-5% SA covered, 3 = 5-25% of SA covered, 4 = >25% SA covered.

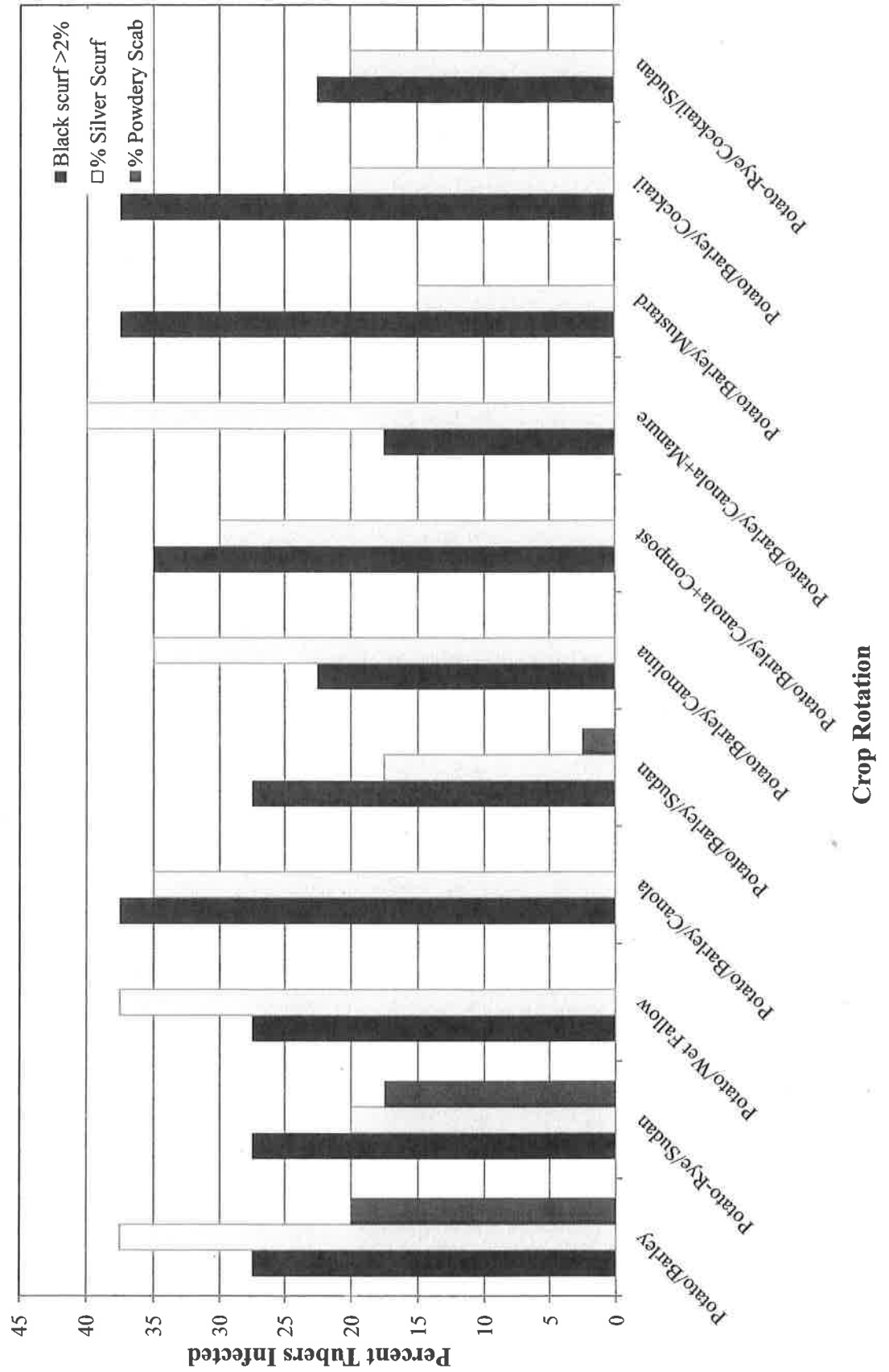
<sup>b</sup>Percent of tubers with a black scurf severity of 2, 3 and 4.

<sup>c</sup>For Powdery Scab, the total % of tubers with powdery scab lesions was multiplied by the overall severity rating.

**Sample collection:** A 10 tuber sample was evaluated after harvest from each plot  
**Disease Evaluation:** Diseases were evaluated on October 24, 2013 by Robert Davidson and Andrew Houser  
**Powdery Scab Note:** Based on the findings from this year, it appears that having a 3 yr rotation, with barley (yr 1) followed by a cover crop (yr 2), will greatly reduce powdery scab levels in the potato crop (yr 3). This may be the case, however, it is also of note that the location of the treatments may also explain the difference in powdery scab levels. The 2 yr rotational treatments (1,2,3) are grouped together in one area in the field, while the 3 yr treatments (4 - 11) are grouped together in a different area. The development of powdery scab is highly dependent on the presence of inoculum in the soil as well as having a favorable environment. An alternative explanation for the differences in powdery scab level between treatments could be that the 2 yr and 3 yr rotational treatments are located in different areas of the field.



**2013 NRCS EPA Trial Evaluating the Effect of Different Crop Rotations on Potato Disease Severity**  
**Potato Variety: Colorado Rose**



**Table 2.** EPA NRCS crop rotational project (Andrew's PhD project: Blackleg, tuber soft rot & *Pectobacterium* sp. levels), 2013  
Colorado State University, San Luis Valley Research Center, Center, CO

Trt #	Treatment	% Stem end		% Lenticel		% Total		Total number of		Total % tubers with soft rot <sup>f</sup>
		Pitting <sup>a</sup>		Pitting <sup>b</sup>		Pitting <sup>c</sup>		plants with blackleg <sup>d</sup>	tubers with soft rot <sup>e</sup>	
1	Potato/Barley (2 yr)	7.5		6.6		6.8		0.5	0.5	4.6
2	Potato-Rye/Sudan (2 yr)	7.5		6.9		7.0		1.5	1.5	9.3
3	Potato/Wet Fallow (2 yr)	12.5		4.1		5.8		0.8	-	-
4	Potato/Barley/Canola (3 yr)	7.5		10.3		9.8		1.0	1.0	1.7
5	Potato/Barley/Sudan (3 yr)	18.8		4.1		7.0		0.8	0.5	0.9
6	Potato/Barley/Camolina (3 yr)	5.0		7.5		7.0		1.3	0.8	1.2
7	Potato/Barley/Canola+Compost (3 yr)	17.5		7.8		9.8		2.0	-	-
8	Potato/Barley/Canola+Manure (3 yr)	13.8		14.7		14.5		0.3	-	-
9	Potato/Barley/Mustard (3 yr)	7.5		6.6		6.8		0.8	0.8	0.5
10	Potato/Barley/Cocktail (3 yr)	5.0		3.8		4.0		1.0	1.3	3.1
11	Potato-Rye/Cocktail/Sudan (3 yr)	21.3		10.3		12.5		1.0	0.5	0.5
LSD (P=0.05)		NS		NS		NS		NS	NS	NS
CV		100.46		63.25		63.10		104.25	102.33	200.68
F value		0.4235		0.0835		0.2260		0.5539	0.6257	0.3458

<sup>a</sup>Percent of stem ends from tubers which resulted in pitting on Crystal Violet Pectate(CVP) media. The stem ends from 40 tubers (four replications, 10 tubers per rep) were evaluated for the presence of *Pectobacterium* sp. This was done by using sterile toothpicks to puncture the stem end of each tuber. The end of the toothpick which punctured the stem end was then put on a CVP plate and was evaluated for the presence of pitting five days later. The higher the percentage of pitting indicates a higher level of pectolytic bacteria present in the stem end of the tuber.

<sup>b</sup>Percent of lenticels from tubers which resulted in pitting on Crystal Violet Pectate(CVP) media. Four lenticels from each of 40 tubers (four replications, 10 tubers per rep) were evaluated for the presence of *Pectobacterium* sp. This was done using the technique described above.

<sup>c</sup>Total percent of stem ends and lenticels from tubers which resulted in pitting on Crystal Violet Pectate(CVP) media. One stem end and four lenticels from each of 40 tubers (four replications, 10 tubers per rep) were evaluated for the presence of *Pectobacterium* sp. This was done using the technique described above.

<sup>d</sup>Total number of plants with blackleg observed in the 2013 field season (mean of four replications).

<sup>e</sup>Total number of tubers with soft rot observed at harvest (mean of four replications).

<sup>f</sup>Total percent of tubers with soft rot observed at harvest (mean of four replications).

# Clonal Evaluation from CSU Cultivar Development Program

## 2013 Bacterial Ring Rot Evaluation

**Location:** NW Corner, SLV East Circle, 9 North, ½ East of SLVRC

**Treatments:** 72 clones/cultivars - Non-inoculated controls consisted of 21 tubers cut lengthwise with no dipping. Inoculated treatments were obtained by placing 21 seed pieces (fresh cut lengthwise) into 2 liters of Ringer's solution (100 ml of 10x with 900 ml of cold water) for 5 minutes. Four Cms plates (Strain # CIC31) exhibiting good bacterial growth, with some agar, were scraped into the Ringer's. After four treatments were dipped, two more plates were added to the solution to finish out the last two treatments. Six clones were dipped per batch and the cold solution was not used for more than 45 minutes total time. Cms plates were 7-9 days old and inoculation took place on 5/18/12. Inoculated tubers were allowed to stay moist in paper sack overnight. After planting, tubers were immediately covered with soil.

**Plot Design:** Randomized complete block - 7 inoculated, 7 non-inoculated seed pieces/cultivar x 3 reps with non-inoculated controls planted north of inoculated treatments.

**Plant Date:** 5/14/13

**Cultivars:**

1. AC05039-2RU	36. CO04063-4R/R	45. A00188-3C
2. CO05030-5W/Y	27. CO05149-3RU	46. A02138-2
3. CO05035-1PW/Y	28. CO05152-5RU	47. A02507-2LB
4. CO05030-5PW/Y	29. CO05175-1RU	48. A03158-2TE
5. CO05030-8PW/Y	30. CO05189-2RU	58. Tebina Russet
6. CO05079-4P/PW	31. CO05189-3RU	49. AO02060-3TE
7. CO06024-7RU	37. CO04067-10W/Y	59. FL 1
8. CO06057-3RU	32. CO05211-4R	60. FL 2
9. CO05028-4P/PW	33. CO05228-4R	61. FL 3
10. CO05028-6P/PW	64. Kemin 1027	62. Kemin 10941
11. CO05058-11P/RW	65. Kemin 0969	63. Kemin 0694
12. CO06032-1RU	34. TC05276-7P/PW	52. WNC230-14RU
13. CO06062-3RU	35. AC00206-2W	53. Ute Russet
14. CO06215-2R	38. A02062-1TE	66. Kemin 0973
15. CO06215-11R	50. CO86030-1RU	67. Kemin India Clone
16. AC05153-1W	51. CO86153-2RU	68. Russet Nugget
17. AC05175-3P/Y	54. Centennial Russet	
18. CO05024-11RU	55. Russet Burbank	
19. CO05040-1RU	56. Sangre S10	
20. CO05037-2R/Y	57. Russet Norkotah	
21. CO05037-3W/Y	39. AO01114-4	
22. CO05061-2P	40. AOTX98152-3RU	
23. CO05061-6W	41. OR05039-4	
24. CO05068-1RU	42. POR06V12-3	
25. CO05110-6RU	43. NDTX5438-11R	
26. CO05132-2RU	44. A02267-1Y	

**Irrigation:** Solid set sprinkler: rate based on ET and ppt. Total water for season was 18".

**Fertilizer:** 80:60:40:25(S):2.5(Zn) with 30 N from irrigation water.  
Total for season: 110:60:40:25(S):2.5(Zn).

**Herbicide:** Ground rig application: Eptam (4.5pt/A) + Matrix (1.5oz/A).

**Fungicide/ Insecticide:** Bravo and Fulfill applied during season

**Harvest:** 9/16/13

**Table 1. Clonal Evaluation for Bacterial Ring Rot Foliar Symptom Expression (2013)**

Year	Clone	DAP to First Symptoms	# Reps Positive	# Plants Positive	% Plants Positive	Date 50% or More +	Total # Reps Positive	% Plants + 100 DAP	Summary of Symptoms	*Ave DAP to 1st Symptoms	Rating	SS
13	AC05039-2RU	91	2	3	17.6		2	17.6	All			
13	CO05030-5W/Y	91	3	4	23.5		3	23.5	IVC,IVN,MN,W			
13	CO05035-1PW/Y	60	1	2	11.1	91	3	55.6	All			
13	CO05035-5PW/Y	60	1	1	5.9	91	3	52.9	All			
13	CO05035-8PW/Y	60	1	2	10.5	91	3	63.1	All			
13	CO05079-4P/PW	60	1	1	5.3		3	36.8	All			
13	CO06024-7RU	91	2	2	12.5		2	12.5	All			
13	CO06057-3RU	60	1	1	5.0	91	3	55.0	All			
13	CO05028-4P/PW	74	1	1	5.5		2	44.4	All			
13	CO05028-6P/PW	60	1	1	5.5		3	22.2	All			
13	CO05028-11P/RW	91	3	9	47.3		3	47.3	All			
13	CO06032-1RU	60	1	1	4.8	91	3	57.1	All			
13	CO06062-3RU	60	1	2	11.1	91	3	50.0	All			
13	CO06215-2R	91	2	3	20.0		2	20.0	All			
13	CO06215-11R	---	0	0	0.0			0.0				
12	AC05153-1W	62	1	2	11.1	---	2	16.7	All			
13		74	1	1	4.8		3	33.3	All	68(+/- 5)	5	
12	AC05175-3PY	---	0	0	0.0			0.0				
13		91	1	1	6.7		1	6.7	IVC,IVN,MN,W	91	2	
12	CO05024-11RU	62	1	2	14.3	---	1	21.4	All			
13		74	1	1	3.2	91	2	62.5	All	68(+/- 5)	5	
12	CO05040-1RU	62	2	3	14.3	---	2	14.3	ED,R,IVC			
13		60	1	2	9.5		2	33.3	All	61	5	
12	CO05037-2R/Y	62	1	4	19.0	93	3	61.9	All			
13		74	1	1	4.8	91	3	66.7	All	68(+/- 5)	5	
12	CO05037-3W/Y	62	1	4	20.0	--	1	20.0	ED,R,IVC			
13		60	2	3	15.0	91	2	55.0	All	61	5	
12	CO05061-2P	62	3	6	33.3	---	3	33.3	ED,R,IVC			
13		74	2	2	12.5		3	25.0	All	68(+/- 5)	5	
12	CO05061-6W	---	0	0	0.0			0.0				
13		74	1	1	4.8		3	28.5	All	74	3	
12	CO05068-1RU	62	2	4	21.1	---	2	21.1	ED,R,IVC			
13		60	1	1	5.0	91	3	65.0	ED,R,IVC	61	5	
12	CO05110-6RU	62	2	2	10.0	---	2	10.0	ED,R,IVC			
13		91	2	3	14.3		2	14.3	All	77(+/-15)	3	
12	CO05132-2RU	62	1	2	15.4	---	1	15.4	ED,R,IVC			
13		60	2	3	14.3	91	3	47.6	All	61	4	

Year	Clone	DAP to First Symptoms	# Reps Positive	# Plants Positive	% Plants Positive	Date 50% or More +	Total # Reps Positive	% Plants + 100 DAP	Summary of Symptoms	*Ave DAP to 1st Symptoms	Rating	SS
12	CO05149-3RU	62	1	1	4.8	---	1	4.8	ED,R,IVC			
13		91	3	7	36.8		3	36.8	All	77(+/-15)	3	
12	CO05152-5RU	---	0	0	0.0			0.0				
13		60	1	1	4.8		2	23.8	All	60	2	
12	CO05175-1RU	62	1	2	11.8	---	1	11.8	ED,R,IVC			
13		74	2	2	9.5		3	38.1	All	68(+/-5)	4	
12	CO05189-2RU	62	3	4	21.1	---	3	26.3	All			
13		60	2	5	23.8		2	42.9	All	61	5	
12	CO05189-3RU	---	0	0	0.0			0.0				
13		91	3	5	29.4		3	29.4	All	91	3	
12	CO05211-4R	62	3	13	65.0	62	3	65.0	ED,R,IVC			
13		60	1	1	5.3		3	15.8	All	61	4	
12	CO05228-4R	62	2	2	13.3	---	2	13.3	ED,R,IVC			
13		60	1	1	6.7		2	33.3	All	61	5	
12	TC05276-7P/PW	62	1	1	5.0	---	1	5.0	ED,R,IVC			
13		74	1	1	4.8		1	4.8	ED,R,IVC	68(+/-5)	3	
11	AC00206-2W	81	1	1	4.8		3	42.9	All			
12		62	2	7	35.0	---	2	40.0	All			
13		60	1	1	4.8		2	23.8	All	68(+/-10)	5	
11	CO04063-4R/R	61	1	2	9.5	81	2	57.1	All			
12		62	2	3	18.8		2	18.8	ED,R,IVC			
13		60	2	2	9.5	91	3	76.2	All	61	5	
11	CO04067-10W/Y	81	1	1	4.8		3	19.0	All			
12		62	2	3	20.0		3	33.3	All			
13		60	1	2	10.0		3	30.0	All	68(+/-10)	4	
13	A02062-1TE	100	1	3	15.0		1	15.0	W			
13	A001114-4	60	1	1	4.8		3	42.9	All			
13	A0TX98152-3RU	74	1	1	4.8		3	28.6	All			
13	OR05039-4	60	2	3	14.3		2	14.3	ED,R,IVC			
13	POR06V12-3	60	1	2	9.5	91	3	61.9	All			
13	NDTX5438-11R	60	1	1	6.3		2	12.5	All			
13	A02267-1Y	60	1	2	9.5	91	3	52.4	All			
13	A00188-3C	74	1	1	4.8		3	42.9	All			
12	A02138-2	62	2	3	15.8		3	42.1	All			
13		91	1	1	9.0		1	9.0	IVC,IVN,MN,W	77(+/-15)	4	
12	A02507-2LB	62	1	1	4.8		2	9.5	All			
13		74	1	1	6.3		2	31.3	All	68(+/-5)	5	
12	A03158-2TE	---	0	0	0.0			0.0				

Year	Clone	DAP to First Symptoms	# Reps Positive	# Plants Positive	% Plants Positive	Date 50% or More +	Total # Reps Positive	% Plants + 100 DAP	Summary of Symptoms	*Ave DAP to 1st Symptoms	Rating	SS
13		74	1	1	5.6	91	3	50.0	All	74	4	-
11	AO02060-3TE	81	1	1	4.8		3	47.6	All			-
12		62	3	6	28.6		3	38.1	All			
13		60	1	1	4.8	91	3	57.1	All	68(+/-10)	5	
12	CO86030-1RU	---	0	0	0.0			0.0				
13		74	1	2	10.0		3	45.0	All	74	2	
12	CO86153-2RU	62	1	1	5.9		1	5.9	ED,R,IVC			
13		91	3	8	40.0		3	40.0	All	77(+/-15)	3	
08	WNC230-14RU	61	2	2	9.5		3	14.2	ED,R,IVC			
09		58	1	1	6.7		2	13.3	ED,R,IVC			
10		73	2	3	14.2		2	14.2	All			
11		81	1	1	4.8		2	9.5	ED,R,IVC,MN,W			
12		62	1	1	5.0		1	5.0	ED,R,IVC			
13		60	1	1	5.0		2	15.0	All	66(+/-10)	4	+/-
08	Ute Russet	66	2	5	23.8		2	23.8	ED,R,IVC			
09		58	1	1	5.6	100	3	50.0	ED,R,IVC			
10		63	3	3	14.3	91	3	61.9	ED,R,IVC			
11		107	2	2	19.1		3	23.8	All			
12		62	2	5	23.8		3	33.3	All			
13		60	2	2	9.5		3	47.6	All	70(+/-20)	3	+
08	Centennial Russet	100	1	1	4.8		1	4.8	IVC,IVN,MN			
09		58	2	3	33.3		2	33.3	ED,R,IVC			
10		91	1	1	4.8		1	4.7	All			
11		107	2	6	28.6		2	28.6	All			
12		62	1	2	9.5		1	9.5	ED,R,IVC			
13		91	2	5	23.8		2	23.8	All	85(+/-20)	3	+
08	Russet Burbank	46	3	6	28.6	73	3	66.7	All			
09		58	2	4	28.6	82	2	57.1	ALL			
10		45	3	4	19.0		3	42.9	ALL			
11		51	1	1	4.8		3	23.8	All			
12		62	3	8	38.1		3	38.1	ALL			
13		60	2	3	14.3	91	3	57.1	All	53(+/-10)	5	+
08	Sangre	100	3	8	38.1		3	38.1	IVC,IVN,MN,W			
09		58	3	7	41.1		3	47.0	All			
10		73	1	1	4.8		2	23.8	All			
11		68	1	5	4.8	107	3	52.4	All			
12		62	1	1	4.8		1	9.5	All			
13		74	1	1	4.8		3	14.3	All	72(+/-15)	4	+

Year	Clone	DAP to First Symptoms	# Reps Positive	# Plants Positive	% Plants Positive	Date 50% or More +	Total # Reps Positive	% Plants + 100 DAP	Summary of Symptoms	*Ave DAP to 1st Symptoms	Rating	SS
08	Russet Norkotah	46	3	3	14.3	61	3	85.7	All			
09		68	2	4	33.3	82	3	58.3	All			
10		45	2	5	23.8		3	47.6	All			
11		61	2	2	9.5	107	3	57.2	All			
12		62	3	9	47.4	93	3	52.6	All			
13		60	1	1	4.8		3	47.6	All	57(+/-10)	5	+
13	Tebina Russet	91	3	4	19.0		3	19.0	All		3	
<p>NR=No results; NE=No emergence; A0008-1TE showed zero results for 2009 readings.  Planting dates - 5/12/08, 5/14/09, 5/14/10, 5/9/11, 5/17/12, 5/14/13. Key to symptoms: ED-Early Dwarf, R-Rosette, IV-Interveinal Chlorosis, IVN-Interveinal Necrosis, MN - Marginal necrosis, and W - Wilt. All - All symptoms seen during season. DAP-days after planting, SS-stem squeeze. BRR foliar rating 1-5 with 1 = no symptoms; 2 = mild symptoms which appear late, acceptable ?; 3 to 5 = acceptable with 5 best.  * Normal symptom expression for controls (compilation of several years) DAP to 1st symptoms (Rating) = WNC230-14RU, 90-100 DAP (4); Ute Russet, 100+ DAP (2-3); Centennial Russet, 90-100 DAP (2-3); Russet Burbank, 55-65 DAP (5); Sangre, 85-95 DAP (4); Russet Norkotah, 85-95 DAP (5). Critical dates for seed certification range around 90-100 DAP or near the date of final inspection. Any clone demonstrating symptoms within this time frame at a level above 15-20% of the infected plants vs. stand is considered a reasonable risk for BRR detection.</p>												



<b>Table 2. Clonal Evaluation for Bacterial Ring Rot Tuber Symptom Expression (2013)</b>					
<b>Year</b>	<b>Clone</b>	<b># Reps Positive</b>	<b># Tubers Positive</b>	<b>%Tubers Positive</b>	<b>Comments</b>
13	AC05039-2RU				
13	CO05030-5W/Y				
13	CO05035-1PW/Y	1	2	10 (E)	
13	CO05035-5PW/Y				
13	CO05035-8PW/Y				
13	CO05079-4P/PW				
13	CO06024-7RU	1	1	5 (I)	
13	CO06057-3RU	1	1	5 (I)	
13	CO05028-4P/PW	1	3	15 (E)	
13	CO05028-6P/PW				
13	CO05028-11P/RW	1	1	5 (E)	
13	CO06032-1RU				
13	CO06062-3RU				
13	CO06215-2R				
13	CO06215-11R				
12	AC05153-1W	1	1	5 (E)	
13					
12	AC05175-3P/Y				
13					
12	CO05024-11RU				
13		1	1	5 (I)	
12	CO05040-1RU				
13					
12	CO05037-2R/Y	1	1	5 (I)	
13					
12	CO05037-3W/Y				PS3
13					
12	CO05061-2P				PS3
13		1	1	5 (E)	
12	CO05061-6W				
13					
12	CO05068-1RU				
13					
12	CO05110-6RU				
13					
12	CO05132-2RU				
13		1	1	5 (I)	
12	CO05149-3RU				
13		1	1	5 (I)	
12	CO05152-5RU				
13					
12	CO05175-1RU				
13		1	3	15 (I)	
12	CO05189-2RU				PR1
13					
12	CO05189-3RU				PR3
13		1	1	5 (E)	
12	CO05211-4R				
13					
12	CO05228-4R				
13					
12	TC05276-7P/PW				

Year	Clone	# Reps Positive	# Tubers Positive	%Tubers Positive	Comments
13		1	1	5 (E)	
11	AC00206-2W	2	4	20	
12		1	3	15 (E)	
13		1	1	5 (E)	
11	CO04063-4R/R				
12					
13					
11	CO04067-10W/Y	2	2	10	
12		2	2	10 (I)	PS3
13		1	2	10 (E)	
13	A02062-1TE				
13	AO01114-4	1	1	5 (E)	
13	AOTX98152-3RU	1	1	5 (I)	
13	OR05039-4				
13	POR06V12-3				
13	NDTX5438-11R				
13	A02267-1Y				
13	A00188-3C	2	2	10 (E)	
12	A02138-2				
13		1	1	5 (I)	
12	A02507-2LB				
13					
12	A03158-2TE				
13					
11	AO02060-3TE				
12		1	1	5 (I)	PR2
13					
12	CO86030-1RU	1	1	5 (I)	
13		1	1	5 (E)	
12	CO86153-2RU				
13					
08	WNC230-14RU				
09		1	1	5	
10					
11					
12					
13					
08	Ute Russet				
09					
10					
11					
12					
13					
08	Centennial Russet				
09					
10					
11					
12		1	1	5 (I)	
13					
08	Russet Burbank				
09		1	1	5	
10					

Year	Clone	# Reps Positive	# Tubers Positive	%Tubers Positive	Comments
11					
12					PS3
13		1	1	5 (E)	
08	Sangre				
09					PS1
10		1	1	5.0	PS1
11		2	4	20	PS2/PR1
12					PR3
13					
08	Russet Norkotah				
09					
10					
11		2	3	15	
12					
13					
13	Tebina Russet	2	2	10 (I,E)	
Harvest dates - 9/12/08, 9/9/09, 9/9/10, 9/15/11, 10/15,12, 9/16/2013.					
10 tubers cut/treatment representing at least five plants/treatment with 2 of 3 reps tested (20 tubers total).					
NR=No results					
BRR tuber rating 1-5 with 1 = no symptoms and 5 = high % of tubers with good rot.					
Treatments with no values indicate zero tubers found with BRR symptoms.					
PS + = Powdery scab symptoms observed. Rating 1-3 with 1-light, 2-moderate, and 3-heavy scab symptoms.					
PR- = Pink rot number of tubers present in 20 tuber samples dug.					
I = Internal tuber symptoms; E = external tuber symptoms					

<b>Table 3. Clonal Evaluation for PVY symptom expression (2013)</b>				
<b>Year</b>	<b>Clone</b>	<b>PVY</b>		
		<b>% positive</b>	<b>Rating</b>	<b>Comments</b>
13	AC05039-2RU	10.4	5	
13	CO05030-5W/Y	0.0		
13	CO05035-1PW/Y	0.0		
13	CO05035-5PW/Y	11.9	3	
13	CO05035-8PW/Y	8.3	5	
13	CO05079-4P/PW	0.0		
13	CO06024-7RU	0.0		
13	CO06057-3RU	35.7	3	
13	CO05028-4P/PW	15.6	5	
13	CO05028-6P/PW	8.3	2	
13	CO05028-11P/RW	2.4	3	
13	CO06032-1RU	0.0		
13	CO06062-3RU	22.2	4	
13	CO06215-2R	3.3	2	
13	CO06215-11R	4.8	2	
13	AC05175-3P/Y		5	
13	CO05037-2R/Y		2	
13	CO05189-2RU		4	
13	CO05189-3RU		2	
13	Centennial Russet	11.1	2	
13	Russet Burbank	10.3	4	
13	Sangre S10	NE		
13	WNC230-14RU	5.1	2	
13	Russet Nugget	21.2	5	
<p>PVY symptoms include normal mosaic and some Hypersensitivity or LD - leaf drop (a severe reaction to PVY). Rating is 0-5+ with 0 equal to no symptoms and 5 equal to easily recognizable mosaic symptoms. NE = no emergence</p>				



**2013 Clonal Evaluation for Bacterial Ring Rot Expression**  
**Robert Davidson, Andrew Houser, and Richard Haslar,**  
**CSU, San Luis Valley, Colorado**

**Introduction:** *Clavibacter michiganensis* subsp. *sepedonicus* is the causal agent of the disease bacterial ring rot (BRR) of potato. This disease in potatoes is so serious that it rates a “zero tolerance” in certified seed. This is necessary since this particular disease is so difficult to control and can cause significant yield and quality losses during production. One way to reduce the impact from this disease is to verify that all clones released for growth by the potato industry are known to demonstrate adequate ring rot symptoms within a reasonable time frame. While lab testing for the pathogen can be effective in certain circumstances, most seed certification schemes rely on extensive field inspections to verify presence or absence of BRR symptoms. Seed lots which are found to be negative for the disease, can be released for further production with reasonable assurances that BRR will not cause significant damage within the next production cycle. A reasonable risk for BRR detection during normal field inspections for seed potato certification programs has been determined. The critical dates for detecting BRR symptoms range around 90-100 days after planting, at or near the final inspection. Any clone demonstrating symptoms within this time frame and at a level above 15-20% of the infected plants showing recognizable symptoms is considered a reasonable risk. A rating system developed for BRR should be utilized. In the case of foliar symptoms, a rating of 3-5 is acceptable with a rating of 2-3 marginal and a rating of 1-2 unacceptable. Regarding tuber symptoms, a rating of 1-3 is acceptable with 4-5 having the potential to cause havoc in the field at higher levels of BRR infection.

**Results:** Three Frito Lay clones and six control cultivars were screened for BRR expression and timing of this expression in 2013. A summary of the reactions to BRR are included with this report. For these clones as listed, however, since they were numbered (1), (2) and (3) rather than having the line designation listed, the number of years of testing is not certain. All clones demonstrated adequate symptom expression to BRR with symptoms evident within an average of 60 to 74 days after planting (Table 1). Overall percentages of plants showing symptoms 100 days after planting was adequate and above the 20% mark. This expression is well within the limits of other chipping cultivars tested over the years (i.e., Atlantic, Norchip, Chipeta, etc.). Foliar symptom expression ratings are at a 4-5 level after one year, indicating that BRR timing and expression is acceptable under Colorado environmental conditions. Tuber examination for BRR symptoms with all of the clones did not indicate any abnormal predisposition to tuber decay which is consistent with other cultivars tested (Table 2).

Typically, we would like to test each clone at least two years to verify that there are no hidden problems. For instance, when looking at the controls, it is obvious some clones like Ute Russet, Centennial Russet and Sangre are not consistent in their expression from year to year. Since we test these each year, we can generate reasonable conclusions about their reaction to BRR. The three clones submitted for testing in 2013 should be reviewed so that at least two years of testing can be performed.

**Table 1. Clonal Evaluation for Bacterial Ring Rot Foliar Symptom Expression (2013)**

Year	Clone	DAP to First Symptoms	# Reps Positive	# Plants Positive	% Plants Positive	Date 50% or More +	Total # Reps Positive	% Plants + 100 DAP	Summary of Symptoms	*Ave DAP to 1st Symptoms	Rating	
08	WNC230-14RU	61	2	2	9.5		3	14.2	ED,R,IVC			
09		58	1	1	6.7		2	13.3	ED,R,IVC			
10		73	2	3	14.2		2	14.2	All			
11		81	1	1	4.8		2	9.5	ED,R,IVC,MN,W			
12		62	1	1	5.0		1	5.0	ED,R,IVC			
13		60	1	1	5.0		2	15.0	All	66(+/-10)	4	
08		Ute Russet	66	2	5	23.8		2	23.8	ED,R,IVC		
09			58	1	1	5.6	100	3	50.0	ED,R,IVC		
10			63	3	3	14.3	91	3	61.9	ED,R,IVC		
11			107	2	2	19.1		3	23.8	All		
12			62	2	5	23.8		3	33.3	All		
13			60	2	2	9.5		3	47.6	All	70(+/-20)	3
08			Centennial Russet	100	1	1	4.8		1	4.8	IVC,IVN,MN	
09	58	2		3	33.3		2	33.3	ED,R,IVC			
10	91	1		1	4.8		1	4.7	All			
11	107	2		6	28.6		2	28.6	All			
12	62	1		2	9.5		1	9.5	ED,R,IVC			
13	91	2		5	23.8		2	23.8	All	85(+/-20)	3	
08	Russet Burbank	46		3	6	28.6	73	3	66.7	All		
09		58		2	4	28.6	82	2	57.1	ALL		
10		45		3	4	19.0		3	42.9	ALL		
11		51		1	1	4.8		3	23.8	All		
12		62		3	8	38.1		3	38.1	ALL		
13		60		2	3	14.3	91	3	57.1	All	53(+/-10)	5
08		Sangre		100	3	8	38.1		3	38.1	IVC,IVN,MN,W	
09			58	3	7	41.1		3	47.0	All		
10			73	1	1	4.8		2	23.8	All		
11			68	1	5	4.8	107	3	52.4	All		
12			62	1	1	4.8		1	9.5	All		
13			74	1	1	4.8		3	14.3	All	72(+/-15)	4
08			Russet Norkotah	46	3	3	14.3	61	3	85.7	All	
09	68			2	4	33.3	82	3	58.3	All		
10	45			2	5	23.8		3	47.6	All		
11	61			2	2	9.5	107	3	57.2	All		
12	62			3	9	47.4	93	3	52.6	All		
13	60			1	1	4.8		3	47.6	All	57(+/-10)	5

Year	Clone	DAP to First Symptoms	# Reps Positive	# Plants Positive	% Plants Positive	Date 50% or More +	Total # Reps Positive	% Plants + 100 DAP	Summary of Symptoms	*Ave DAP to 1st Symptoms	Rating
13	FL 1	74	1	1	4.8		2	28.6	ED,R,IVC		4
13	FL 2	60	1	1	5.9	91	3	64.7	All		5
13	FL 3	60	1	4	19.0	91	3	52.4	All		5
<p>NR=No results; NE=No emergence; A0008-1TE showed zero results for 2009 readings.</p> <p>Planting dates - 5/12/08, 5/14/09, 5/14/10, 5/9/11, 5/17/12, 5/14/13. Key to symptoms: ED-Early Dwarf, R-Rosette, IVC-Interveinal Chlorosis, IVN-Interveinal Necrosis, MN - Marginal necrosis, and W - Wilt. All - All symptoms seen during season. DAP-days after planting, SS-stem squeeze. BRR foliar rating 1-5 with 1 = no symptoms; 2 = mild symptoms which appear late, acceptable ?; 3 to 5 = acceptable with 5 best.</p> <p>* Normal symptom expression for controls (compilation of several years) DAP to 1st symptoms (Rating) = WNC230-14RU, 90-100 DAP (4); Ute Russet, 100+ DAP (2-3); Centennial Russet, 90-100 DAP (2-3); Russet Burbank, 55-65 DAP (5); Sangre, 85-95 DAP (4); Russet Norkotah, 85-95 DAP (5). Critical dates for seed certification range around 90-100 DAP or near the date of final inspection. Any clone demonstrating symptoms within this time frame at a level above 15-20% of the infected plants vs. stand is considered a reasonable risk for BRR detection.</p>											



**Table 2. Clonal Evaluation for Bacterial Ring Rot Tuber Symptom Expression (2013)**

Year	Clone	# Reps +	# Tubers +	%Tubers +	Comments
08	WNC230-14RU				
09		1	1	5	
10					
11					
12					
13					
08	Ute Russet				
09					
10					
11					
12					
13					
08	Centennial Russet				
09					
10					
11					
12		1	1	5 (I)	
13					
08	Russet Burbank				
09		1	1	5	
10					
11					
12					PS3
13		1	1	5 (E)	
08	Sangre				
09					PS1
10		1	1	5.0	PS1
11		2	4	20	PS2/PR1
12					PR3
13					
08	Russet Norkotah				
09					
10					
11		2	3	15	
12					
13					
13	FL 1				
13	FL 2				
13	FL 3				

Harvest dates - 9/12/08, 9/9/09, 9/9/10, 9/15/11, 10/15/12, 9/16/2013.  
 10 tubers cut/treatment representing at least five plants/treatment with 2 of 3 reps tested (20 tubers total). NR=No results  
 BRR tuber rating 1-5 with 1 = no symptoms and 5 = high % of tubers with good rot.  
 Treatments with no values indicate zero tubers found with BRR symptoms.  
 PS + = Powdery scab symptoms observed. Rating 1-3 with 1-light, 2-moderate, and 3-heavy scab symptoms  
 PR- = Pink rot number of tubers present in 20 tuber samples dug.  
 I = Internal tuber symptoms; E = external tuber symptoms

## EVALUATION OF FRITO LAY CLONES FOR SUSCEPTIBILITY TO POWDERY SCAB, 2013

**Researchers:** Robert D. Davidson and Andrew J. Houser, Colorado State University, SLVRC

**Location:** San Luis Valley Research Center, Greenhouse, Center, CO

**Objective:** To evaluate the susceptibility of Frito Lay potato clones to powdery scab.

**Treatments:**

1. Mesa Russet	21. CSU PSc 52
2. Colorado Rose	22. CSU PSc 53
3. Russet Nugget	23. CSU PSc 54
4. CSU PSc 1	24. CSU PSc 55
5. CSU PSc 2	25. CSU PSc 56
6. CSU PSc 6	26. CSU PSc 57
7. CSU PSc 9	27. CSU PSc 58
8. CSU PSc 12	28. CSU PSc 59
9. CSU PSc 19	29. CSU PSc 60
10. CSU PSc 28	
11. CSU PSc 32	
12. CSU PSc 36	
13. CSU PSc 39	
14. CSU PSc 41	
15. CSU PSc 43	
16. CSU PSc 44	
17. CSU PSc 46	
18. CSU PSc 49	
19. CSU PSc 50	
20. CSU PSc 51	

**Planted:** August 9, 2013

**Plot Design:** Randomized complete block

**Plot Size:** Two 6" pots per treatment per replication.

**Seed:** Potato eyes were removed from seed tubers using a melon scoop and allowed to suberize for several days. One eyeball was planted per pot, two inches deep in the soil.

**Replications:** Four

**Inoculation:** All soil was inoculated with the equivalent of 5 powdery scab sporeballs/gram of soil.

**Irrigation:** Overhead irrigation, rate predetermined based on the optimal irrigation regime for powdery scab symptom development.

**Fertilizer:** 20N-20P-20K, applied six times

**Herbicide:** -

**Insecticide:** -

**Fungicide:** -

**Vine Killer:** Vines were removed at harvest time.

**Harvested:** November 18th-20th, December 2nd & 3rd, 2013

**DATA:** Mean percent per pot showing galls on roots, rated 0 to 4; 0 = none, 4 = heavily infected.  
Mean percent of per pot showing one or more powdery scab lesions at harvest multiplied by the severity of the lesions, where 1 = very little or no disease and 5 = heavily infested.  
Mean percent of tubers per pot which are unmarketable due to powdery scab severity.  
Both root gall and tuber readings were taken on January 31, February 7th, 10th & 11th, 2013.

**Table 1.** Evaluation of advanced Frito Lay clones for tuber susceptibility to powdery scab in a greenhouse environment, SLV, CO 2013.

Treatment	Tuber Symptoms					Fresh Root Weight <sup>g</sup>	
	% Stand <sup>a</sup>	% Incidence <sup>b</sup>	% Healthy <sup>c</sup>	Index <sup>d</sup>	% Unmarketable <sup>e</sup>		Root Gall Rating <sup>f</sup>
1. Mesa Russet	100 a	0.0 g	100.0 a	0.0 i	0.0 i	0.3 h	1.8
2. Colorado Rose	50 cd	66.7 def	33.3 bcd	183.3 d-i	44.4 a-h	1.0 gh	0.5
3. Russet Nugget	100 a	12.5 g	87.5 a	12.5 kl	0.0 i	0.3 h	11.6
4. CSU PSc 1	88 ab	83.8 a-d	16.3 d-g	167.5 f-i	28.2 d-i	2.8 a-d	5.2
5. CSU PSc 2	88 ab	86.0 a-d	14.0 d-g	153.3 g-i	37.8 b-i	1.3 fgh	2.4
6. CSU PSc 6	63 bcd	100.0 a	0.0 g	300.0 abc	82.5 a	3.8 a	2.1
7. CSU PSc 9	63 bcd	87.8 abc	12.2 efg	147.8 g-i	16.7 f-i	1.7 d-g	5.8
8. CSU PSc 12	100 a	100.0 a	0.0 g	275.0 a-f	72.9 abc	2.8 a-d	5.3
9. CSU PSc 19	100 a	80.4 a-e	19.7 c-g	185.7 d-i	28.6 d-i	2.5 b-e	3.3
10. CSU PSc 28	63 bcd	100.0 a	0.0 g	300.0 abc	75.9 ab	3.0 abc	1.2
11. CSU PSc 32	88 ab	100.0 a	0.0 g	350.0 a	65.0 a-d	1.5 efg	4.9
12. CSU PSc 36	88 ab	100.0 a	0.0 g	225.0 b-h	37.5 b-i	3.8 a	1.1
13. CSU PSc 39	100 a	95.0 ab	5.0 fg	280.0 a-e	63.8 a-e	3.8 a	1.3
14. CSU PSc 41	88 ab	92.7 abc	7.3 efg	186.5 d-i	29.0 d-i	3.5 ab	2.9
15. CSU PSc 43	75 abc	100.0 a	0.0 g	325.0 ab	75.0 ab	3.0 abc	1.7
16. CSU PSc 44	75 abc	65.0 def	35.0 bcd	90.0 jkl	12.5 ghi	1.8 d-g	2.8
17. CSU PSc 46	88 ab	100.0 a	0.0 g	300.0 abc	57.9 a-f	3.3 abc	4.2
18. CSU PSc 49	100 a	76.4 b-f	23.6 b-f	152.9 g-i	9.8 hi	3.0 abc	3.5
19. CSU PSc 50	38 d	85.7 a-d	14.3 d-g	171.5 e-i	32.2 c-i	3.5 ab	3.6
20. CSU PSc 51	100 a	100.0 a	0.0 g	350.0 a	71.3 abc	3.0 abc	7.2
21. CSU PSc 52	100 a	55.7 f	44.4 b	114.6 h-k	22.3 e-i	2.5 b-e	4.4
22. CSU PSc 53	88 ab	73.3 c-f	26.7 b-e	113.3 ijk	16.3 f-i	2.3 c-f	5.0
23. CSU PSc 54	100 a	96.4 ab	3.6 fg	289.3 a-d	60.1 a-e	2.8 a-d	2.7
24. CSU PSc 55	100 a	96.9 ab	3.1 fg	218.8 b-i	40.8 a-i	2.3 c-f	3.5
25. CSU PSc 56	100 a	62.6 ef	37.5 bc	112.6 ijk	7.5 hi	1.8 d-g	7.5
26. CSU PSc 57	100 a	100.0 a	0.0 g	250.0 a-g	54.2 a-g	1.8 d-g	4.6
27. CSU PSc 58	75 abc	91.7 abc	8.3 efg	258.3 a-g	75.0 ab	1.5 efg	1.0
28. CSU PSc 59	75 abc	100.0 a	0.0 g	300.0 abc	66.7 a-d	3.0 abc	2.3
29. CSU PSc 60	100 a	92.7 abc	7.3 efg	208.2 c-i	41.5 a-i	2.8 a-d	13.2
LSD (P=0.05)	33.25	21.08	21.08	111.47	41.87	1.17	NS
CV	27.4	18.0	86.7	38.0	70.1	34.5	-
F value	0.0038	0.0001	0.0001	0.0001	0.0001	0.0001	-

<sup>a</sup>Percent Stand is based on the number of pots (four reps with two pots per rep) with growing plants that produced one or more tubers and/or a measurable amount of root mass for disease evaluation – if stand is less than 50%, the results are considered questionable.

<sup>b</sup>Percent Incidence = Mean percent of tubers with powdery scab lesions.

<sup>c</sup>Percent Healthy = Mean percent of tubers with no powdery scab lesions.

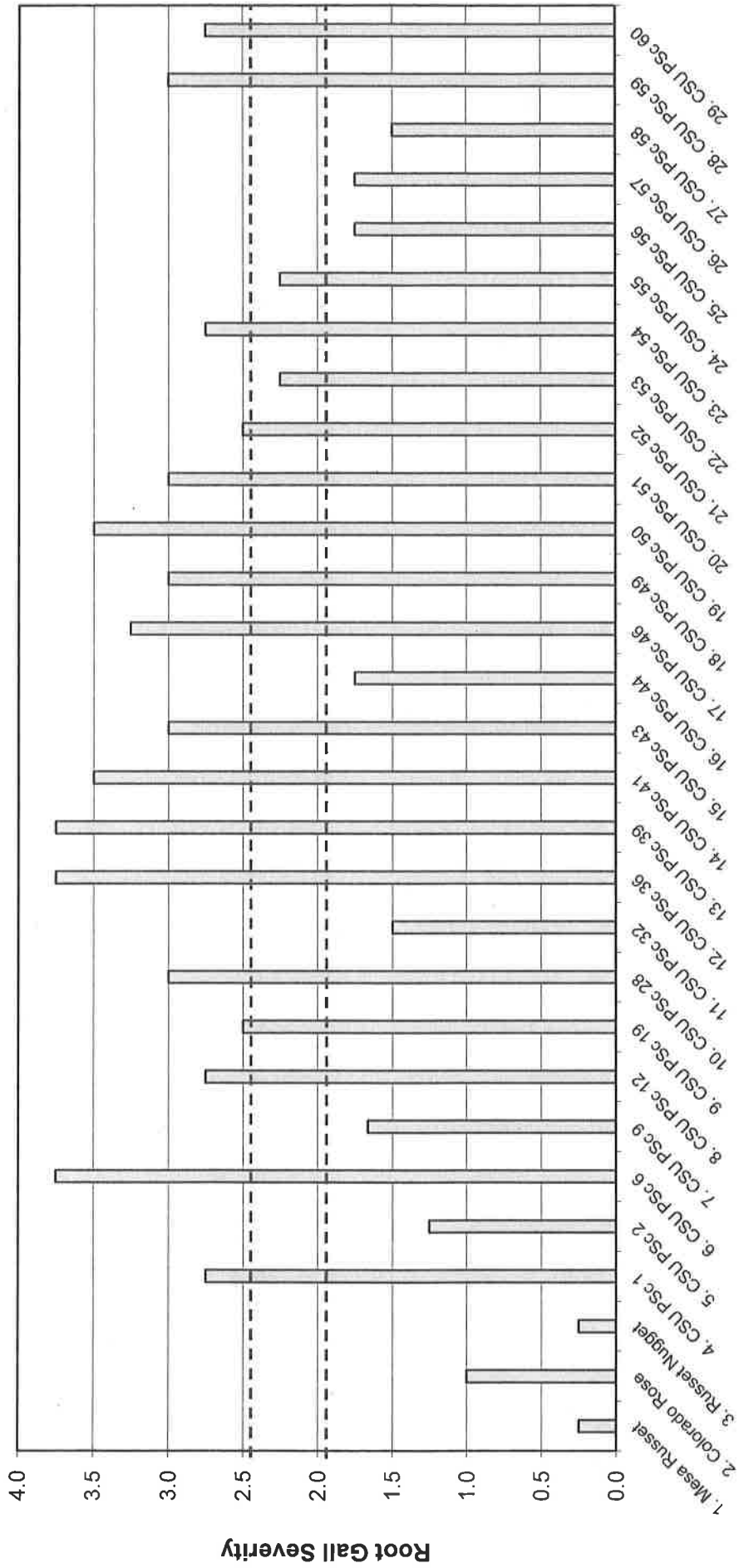
<sup>d</sup>Severity Index = mean percent of the number of affected tubers multiplied by the severity of the lesions, where 1 = very little or no disease and 5 = heavily infested.

<sup>e</sup>Percent Unmarketable = Mean percent of tubers per pot which are unmarketable due to powdery scab severity (lesion severity >3).

<sup>f</sup>Root Gall Rating = visual analysis of roots for the presence of powdery scab root galls, where 0 = no root galls and 4 = extensive root galls.

<sup>g</sup>Mean fresh root weight data was collected when disease readings were taken. Root weight varied in some cases due to disease severity, which had an impact on the root gall reading. Where root weights are low (i.e. < 1 gram), root gall readings are considered questionable. Means followed by the same letters are not significantly different at P=0.05.

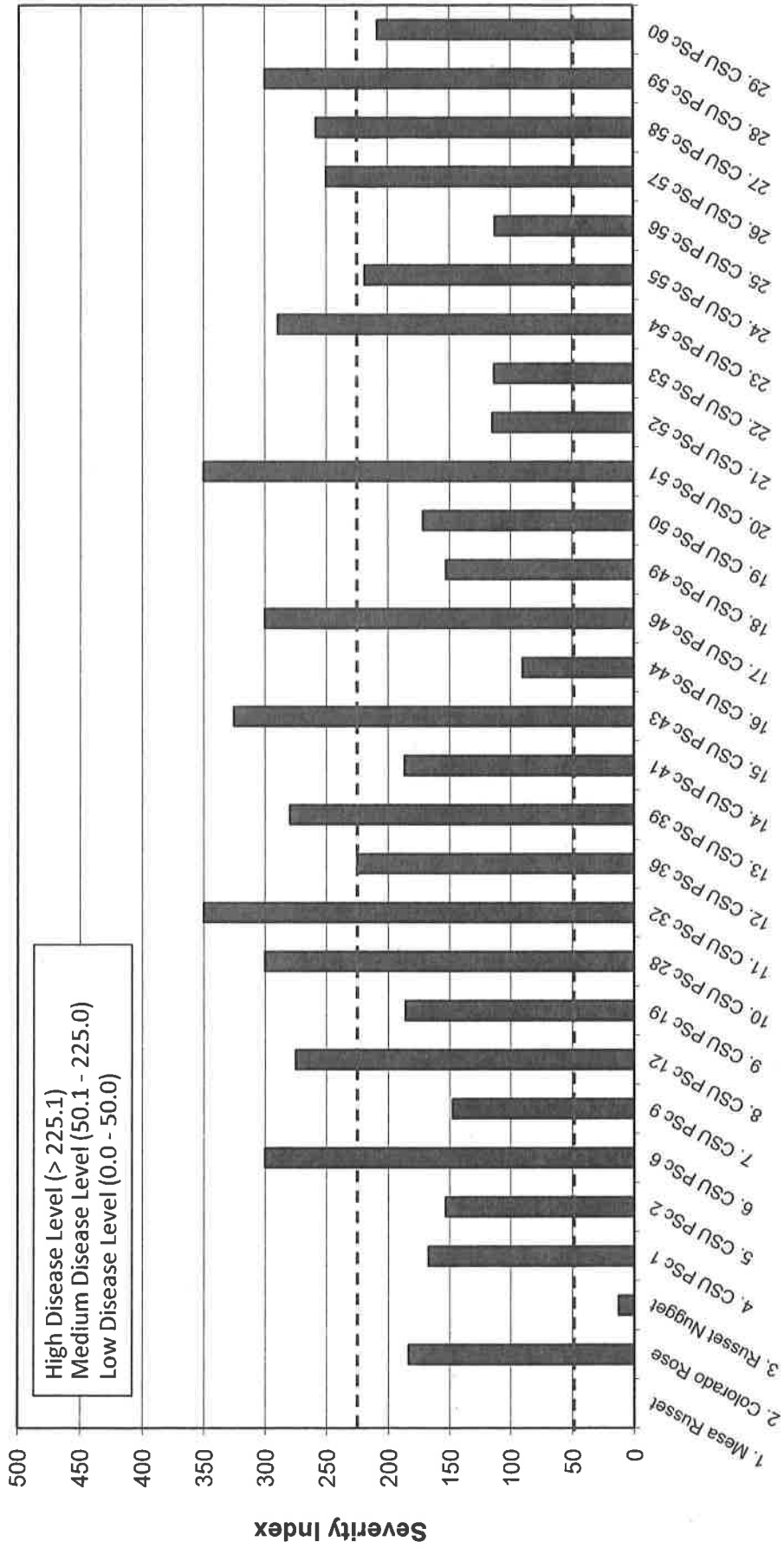
**Root Gall Severity Readings (0-4, where 0=no galls & 4 = roots are heavily infested with root galls)**  
**Evaluation of Frito Lay Clones for Susceptibility to Powdery Scab Root Galls**  
**San Luis Valley Research Center, Greenhouse Trial, Colorado, 2013**



High Disease Level (>2.76)  
 Medium Disease Level (2.21-2.75)  
 Low Disease Level (0-2.20)

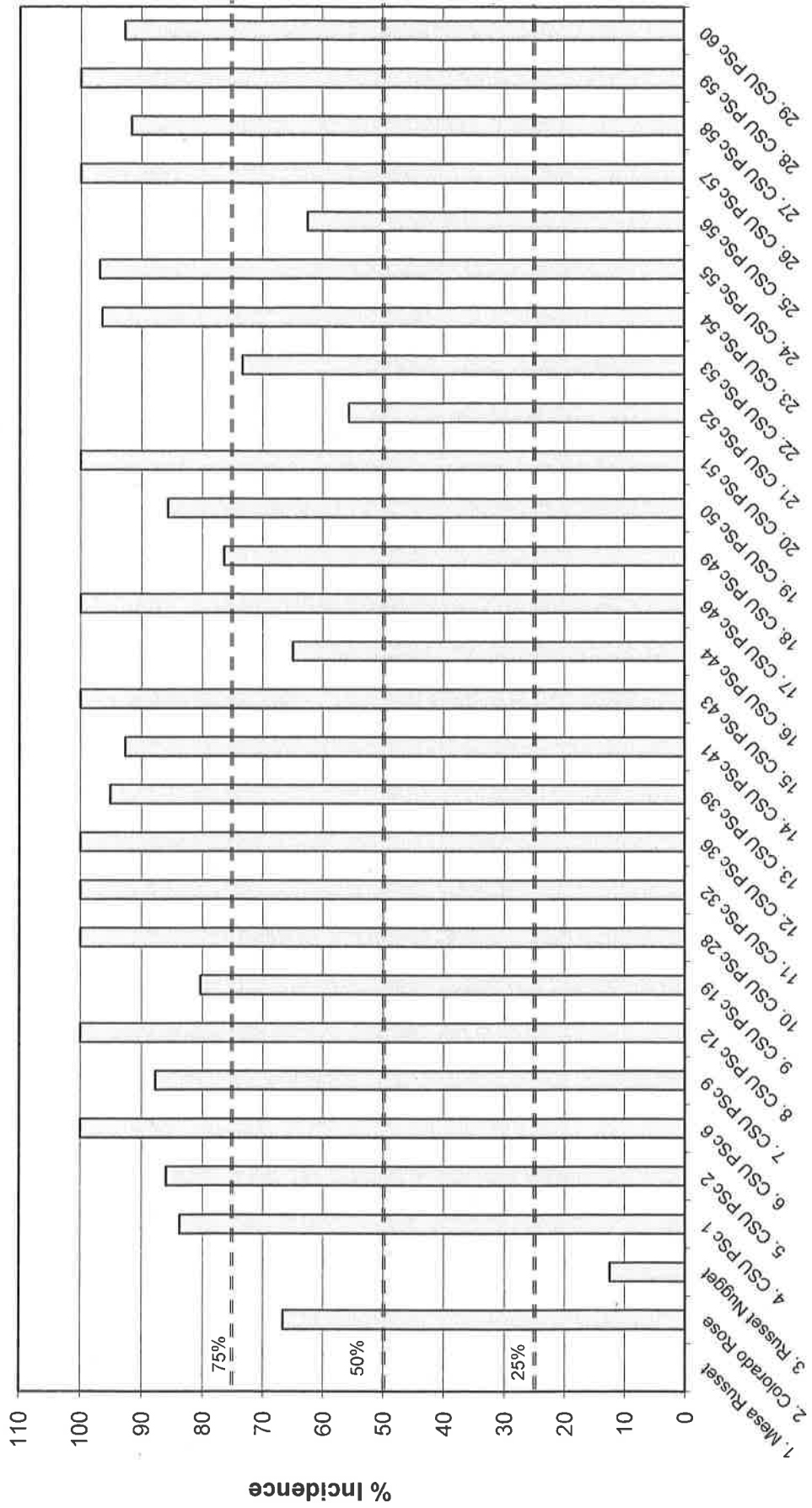
**Cultivar**

**Powdery Scab Severity Index - percent tubers with powdery scab x severity: 1 to 5  
 Evaluation of Frito Lay Clones for Tuber Susceptibility to Powdery Scab  
 San Luis Valley Research Center, Greenhouse Trial, Colorado, 2013**



Cultivar

**Percent Incidence - Tubers with Powdery Scab  
 Evaluation of Frito Lay Clones for Tuber Susceptibility to Powdery Scab  
 San Luis Valley Research Center, Greenhouse Trial, Colorado, 2013**



Cultivar

**2013**

**Potato Research Report**  
**Potato Disease Control Project**



Certified Seed Potato Field in San Luis Valley

**Robert Davidson, Andrew Houser and Richard Haslar**  
**Colorado State University, SLV Research Center**