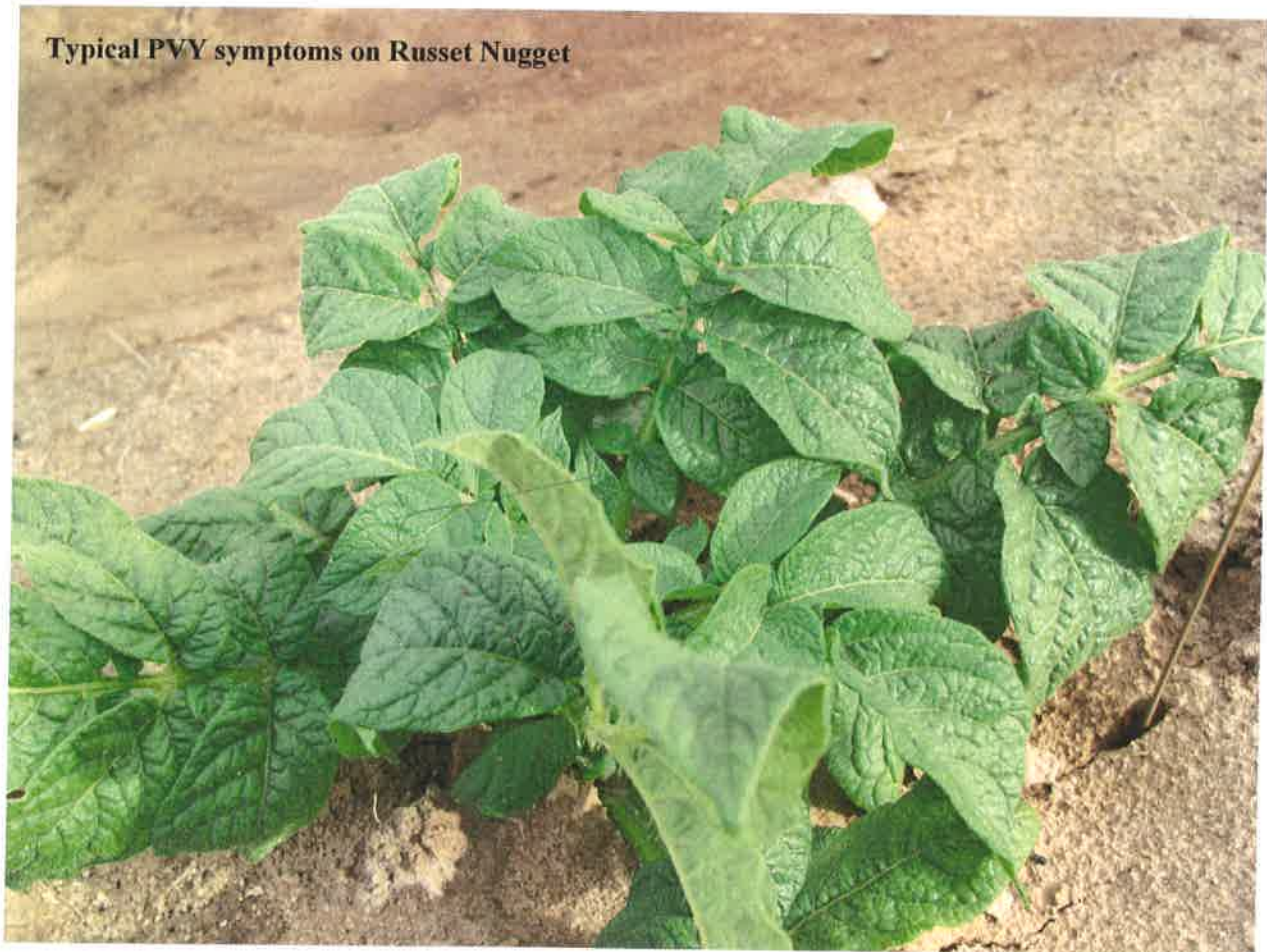


**2011**

**Potato Research Report**

**Potato Disease Control Project**



**Robert Davidson, Andrew Houser and Richard Haslar**

**Colorado State University SLV Research Center**

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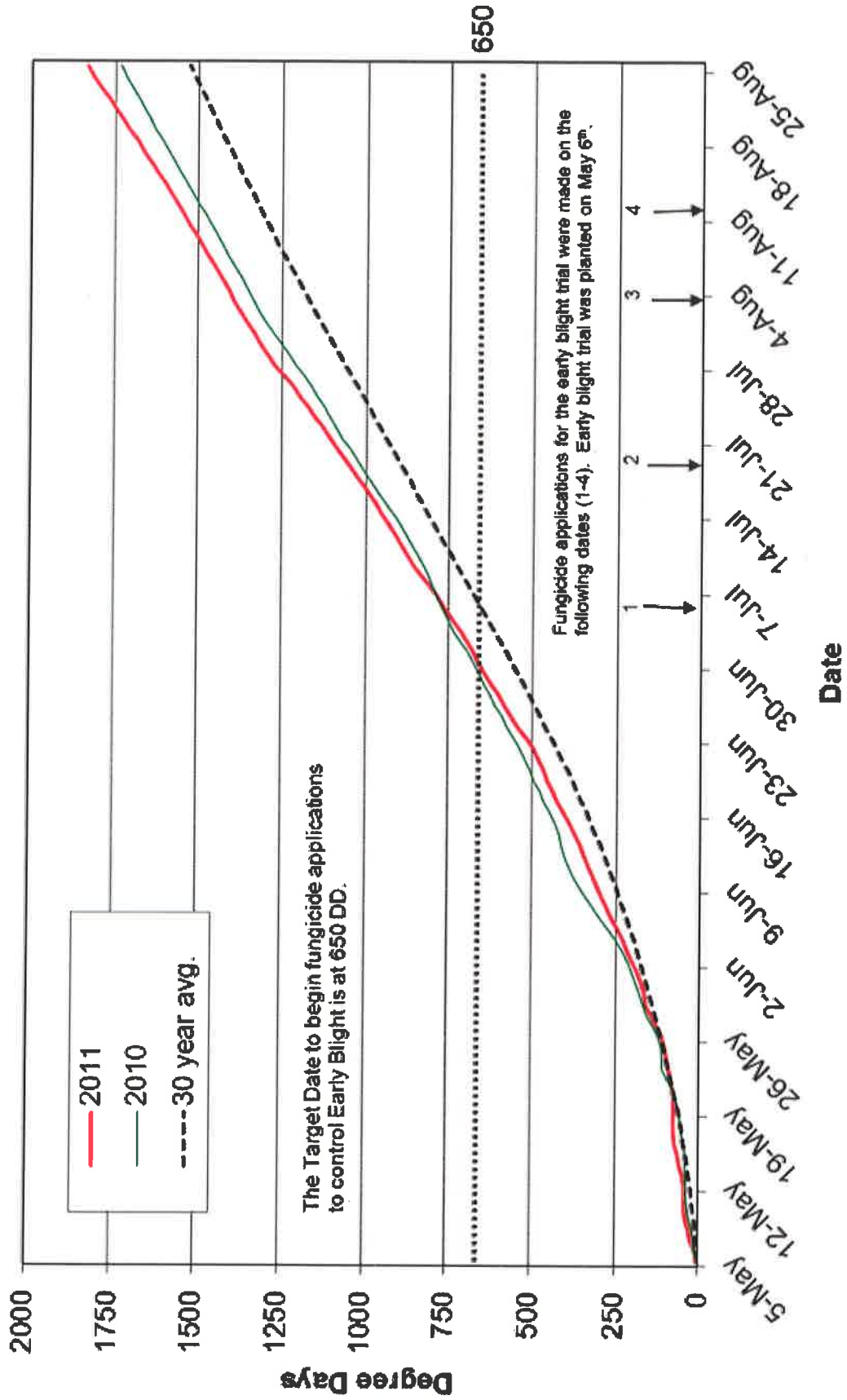
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# Early Blight Fungicide Trials

Spraying schedules that include two or three fungicide applications during the season (with at least one of the fungicides being a strobilurin), starting once degree days for early blight have been reached and continuing fungicide applications every 14 to 21 days, have worked well in the San Luis Valley. Other products such as Endura, Bravo, Dithane, Polyram, Super Tin, and various numbered compounds have also had success in controlling early blight, depending on application timing and which of the additional fungicides were used.

When yields (cwt/A) are analyzed for the early blight trial, a significant difference is typically not observed between the untreated control and the different treatments within a given year, even when disease levels are significantly lower in the treatments than in the control. However, when three or more years of early blight trial data are analyzed, the yields from the untreated controls are significantly less than several of the fungicide combination treatments. This indicates that when an effective fungicide program is used to control foliar early blight, yields are improved.

# Early Blight Degree Days for the San Luis Valley



## 2011 POTATO – EARLY BLIGHT FUNGICIDE TRIAL #1

**Researchers:** Rob Davidson and Andrew Houser, Colorado State University, SLVRC

**Location:** Two locations: one under solid set irrigation system (site #1) and one under center pivot irrigation system (site #2), San Luis Valley Research Center, Center, CO

**Cultivar:** Russet Norkotah Selection 8, cut seed, 2-4 oz.

**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 5; July 18; August 1; August 12

**Planted:** May 6, 2011

**Plot Design:** Randomized complete block

**Plot Size:** Two - 15 foot rows per treatment per replication.

**Plant Spacing:** 12 inches

**Row Spacing:** 34 inches

**Replications:** Four

**Irrigation:** Solid set sprinkler (site #1); Center pivot (site #2) - rate based on ET for both.

**Fertilizer:** 80N-60P-40K-25S-2.5Z, preplant (both sites), 70N (site #1) & 40N (site #2) through sprinkler after tuber set.

**Herbicide:** Dual Magnum @ 1.6 pt./A

**Insecticide:** None (site #1); Fulfill @ 2.75oz./A & Endigo @ 4oz./A (site #2)

**Vine Killer:** Rotobeat vines on September 8, 2011 (both sites)

**Harvested:** September 27, 2011 (both sites)

### DATA:

**Disease:** Early blight disease incidence based on percent leaves infected, readings taken weekly starting August 4, 2011 (site #1), August 8, 2011 (site #2).

**AUDPC:** Area Under the Disease Progress Curve (AUDPC) is a measure of the progression of Early Blight, starting on August 4<sup>th</sup> and ending with the last reading on September 7<sup>th</sup>. 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 2011.

<u>Program</u>	<u>Products</u>	<u>Rate</u>	<u>Application Schedule<sup>a</sup></u>
1	Untreated Control	-	-
2	Endura	3.5 oz./A	1,5
	Headline	6.0 oz./A	3
	Dithane F-45	1.2 qt./A	7
3	Endura	3.5 oz./A	1,5
	Cabrio Plus	2.0 lb./A	3
	Dithane F-45	1.2 qt./A	7
4	Priaxor	4.0 oz./A	1
	Cabrio Plus	2.0 lb./A	3
	Endura	3.5 oz./A	5
	Dithane F-45	1.2 qt./A	7
5	Pristine	7.0 oz./A	1
	Cabrio Plus	2.0 lb./A	3
	Endura	3.5 oz./A	5
	Dithane F-45	1.2 qt./A	7
6	Priaxor	4.0 oz./A	1
	Endura	3.5 oz./A	3
	Cabrio Plus	2.0 lb./A	5
	Dithane F-45	1.2 qt./A	7
7	Endura	3.5 oz./A	1
	Priaxor	4.0 oz./A	3
	Cabrio Plus	2.0 lb./A	5
	Dithane F-45	1.2 qt./A	7
8	Quadris Top	8.0 oz./A	1
	Quadris Opti	1.6 pt./A	3
	Revus Top	5.5 oz./A	5
	Dithane F-45	1.2 qt./A	7

<sup>a</sup> Schedule for applying treatments on a weekly basis, schedule started on July 5 (i.e. 1 = week 1, 2 = week 2).

**Table 2.** Early Blight Trial #1 (site #1) - Effect of fungicide programs on the incidence of early blight in the cultivar Russet Norkotah Selection 8, San Luis Valley, Colorado, 2011; No Late Blight occurred within the trial.

Treatment	Percent Leaves Infected <sup>a</sup> (with one or more lesion)					AUDPC <sup>c</sup>
	August 4 <sup>b</sup>	August 11	August 22	August 29	September 6	
1	2.3	12.3 a	48.8 a	89.8 a	95.4 a	1011.2 a
2	0.8	3.3 b	11.2 bc	45.0 b	77.5 b	542.5 c
3	0.7	4.0 b	11.3 bc	45.0 b	84.2 ab	571.2 c
4	0.7	4.0 b	8.8 c	41.7 b	75.8 b	512.5 c
5	1.0	3.3 b	10.4 bc	40.8 b	80.0 b	533.6 c
6	1.0	4.2 b	10.0 bc	51.3 b	80.8 b	574.0 c
7	0.7	3.2 b	10.3 bc	51.7 b	80.8 b	572.8 c
8	0.8	5.4 b	19.2 b	76.7 a	93.2 a	767.2 b
LSD(P=0.05)	NS	2.5	9.4	15.5	11.4	123.1

<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> Readings were taken from only two replications due to the low levels of Early Blight present.

<sup>c</sup> AUDPC is the Area Under the Disease Progress Curve, accumulated weekly from August 4 through September 6.

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

**Table 3.** Early Blight Trial #1 (site #2) - Effect of fungicide programs on the incidence of early blight in the cultivar Russet Norkotah Selection 8, San Luis Valley, Colorado, 2011; No Late Blight occurred within the trial.

Treatment	Percent Leaves Infected <sup>a</sup> (with one or more lesion)					AUDPC <sup>c</sup>
	August 8 <sup>b</sup>	August 12	August 23	August 30	September 7	
1	10.7	27.2 a	54.4 a	92.1 a	97.5 a	1084.6 a
2	4.0	4.3 b	10.3 b	50.0 bcd	79.1 bc	563.7 bc
3	2.2	3.2 b	10.2 b	37.9 cde	80.4 bc	520.4 c
4	1.2	2.7 b	6.3 b	26.7 e	67.9 c	406.8 c
5	1.3	3.3 b	8.8 b	35.0 de	77.0 bc	487.4 c
6	1.2	3.0 b	6.8 b	34.6 de	77.4 bc	476.3 c
7	1.2	2.5 b	11.7 b	53.7 bc	75.3 bc	560.4 bc
8	3.8	9.7 b	19.1 b	63.8 b	86.5 ab	700.2 b
LSD(P=0.05)	NS	14.0	21.4	17.6	12.7	176.3

<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> Readings were taken from only two replications due to the low levels of Early Blight present.

<sup>c</sup> AUDPC is the Area Under the Disease Progress Curve, accumulated weekly from August 8 through September 7.

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



**Table 4.** Early Blight Trial #1 (site #1) - Effect of fungicide programs on tuber yield and quality in the cultivar Russet Norkotah Selection 8, San Luis Valley, Colorado, 2011.

Treatment	Percent <sup>a</sup>			US No 2's	Culls	Cwt/A <sup>b</sup>	Cwt/A w/o culls <sup>c</sup>
	< 4 oz.	4-10 oz.	> 10 oz.				
1	15.3	51.9	28.8	2.0	2.0 ab	503.0	483.2
2	14.5	49.0	33.7	2.8	0.0 c	480.7	466.8
3	15.6	51.5	29.6	0.0	3.3 a	512.0	495.1
4	14.2	49.7	33.1	2.2	0.9 bc	484.6	469.4
5	15.8	47.5	34.0	1.0	1.7 ab	426.2	414.6
6	13.8	49.8	33.3	1.3	1.8 ab	490.3	474.5
7	13.7	52.1	30.6	2.4	1.3 bc	501.8	483.8
8	15.8	49.5	32.6	1.1	1.1 bc	505.8	494.5
LSD(P=0.05)	NS	NS	NS	NS	1.7	NS	NS

<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.

**Table 5.** Early Blight Trial #1 (site #2) - Effect of fungicide programs on tuber yield and quality in the cultivar Russet Norkotah Selection 8, San Luis Valley, Colorado, 2011.

Treatment	Percent <sup>a</sup>			US No 2's	Culls	Cwt/A <sup>b</sup>	Cwt/A w/o culls <sup>c</sup>
	< 4 oz.	4-10 oz.	> 10 oz.				
1	22.6	49.9	25.8	0.4	1.3	405.3	398.0
2	18.1	52.1	28.8	0.0	1.0	449.9	445.7
3	24.0	47.8	27.6	0.0	0.7	438.3	435.5
4	15.1	48.0	33.9	1.0	2.0	449.3	435.2
5	19.8	46.0	32.8	0.0	1.5	463.5	457.5
6	21.8	48.9	28.1	0.0	1.1	412.9	408.7
7	23.3	46.0	30.1	0.3	0.4	439.7	436.6
8	20.4	46.4	31.1	0.0	2.2	434.4	424.8
LSD(P=0.05)	NS	NS	NS	NS	NS	NS	NS

<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.

## 2011 POTATO – EARLY BLIGHT FUNGICIDE TRIAL #2

**Researchers:** Rob Davidson and Andrew Houser, Colorado State University, SLVRC

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

**Cultivar:** Russet Norkotah Selection 8, cut seed, 2-4 oz.

**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 5; July 18; August 1; August 12

**Planted:** May 5 & 6, 2011

**Plot Design:** Randomized complete block

**Plot Size:** Two - 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, 70N through sprinkler after tuber set.

**Herbicide:** Dual Magnum @ 1.6 pt./A

**Insecticide:** None

**Vine Killer:** Rotobeat vines on September 8, 2011

**Harvested:** September 28, 2011

### DATA:

**Disease:** Early blight disease incidence based on percent leaves infected, readings taken weekly starting August 5, 2011.

**AUDPC:** Area Under the Disease Progress Curve (AUDPC) is a measure of the progression of Early Blight, starting on August 5<sup>th</sup> and ending with the last reading on September 7<sup>th</sup>. 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 2011.

<b>Program</b>	<b>Products</b>	<b>Rate</b>	<b>Application Schedule<sup>a</sup></b>
1	Untreated Control	-	-
2	Echo ZN	2.0 pt./A	1
	Luna Tranquility	8.0 oz./A	3,7
	Reason	5.5 oz./A	5
3	Echo ZN	2.0 pt./A	1
	Luna Tranquility	8.0 oz./A	3,7
	Scala 60SC	7.0 oz./A	5
4	Echo ZN	2.0 pt./A	1
	Endura	2.5 oz./A	3,7
	Headline	9.0 oz./A	5
5	Echo ZN	2.0 pt./A	1,5
	Dithane Rainshield	2.0 lbs./A	3,7

<sup>a</sup> Schedule for applying treatments on a weekly basis, schedule started on July 6 (i.e. 1 = week 1, 2 = week 2).

**Table 2.** Early Blight Trial #2 - Effect of fungicide programs on the incidence of early blight in the cultivar Russet Norkotah Selection 8, San Luis Valley, Colorado, 2011; No Late Blight occurred within the trial.

Treatment	Percent Leaves Infected <sup>a</sup> (with one or more lesion)					AUDPC <sup>c</sup>
	August 5 <sup>b</sup>	August 11	August 22	August 29	September 7	
1	0.7	6.7 a	30.8 a	77.0 a	97.9 a	901.5 a
2	0.3	2.5 b	6.9 b	15.7 c	57.9 c	363.1 c
3	0.3	1.8 b	6.7 b	14.8 c	47.1 c	307.7 c
4	0.5	1.8 b	5.4 b	16.9 c	56.7 c	350.7 c
5	1.0	2.2 b	7.2 b	35.0 b	72.1 b	496.0 b
LSD(P=0.05)	NS	1.2	5.3	14.7	12.2	67.1

<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> Readings were taken from only two replications due to the low levels of Early Blight present.

<sup>c</sup> AUDPC is the Area Under the Disease Progress Curve, accumulated weekly from August 5 through September 7.

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

**Table 3.** Early Blight Trial #2 - Effect of fungicide programs on tuber yield and quality in the cultivar Russet Norkotah Selection 8, San Luis Valley, Colorado, 2011.

Treatment	Percent <sup>a</sup>			US # 2s	Culls	Cwt/A <sup>b</sup>	Cwt/A w/o culls <sup>c</sup>
	< 4 oz.	4-10 oz.	> 10 oz.				
1	30.3	56.1	10.9	2.5	0.3	254.0	247.0
2	24.7	61.7	11.9	1.0	0.8	259.1	254.3
3	28.2	59.0	11.1	1.3	0.5	253.5	248.9
4	24.4	54.6	19.4	0.6	1.1	273.8	269.6
5	20.5	59.1	19.2	0.7	0.6	280.3	276.9
LSD(P=0.05)	NS	NS	NS	NS	NS	NS	NS

<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.

### 2011 POTATO – EARLY BLIGHT FUNGICIDE TRIAL #3

**Researchers:** Rob Davidson and Andrew Houser, Colorado State University, SLVRC  
**Location:** San Luis Valley Research Center, Center, CO  
**Cultivar:** Russet Norkotah Selection 8, cut seed, 2-4 oz.  
**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 5; July 11; July 18; July 25; August 1; August 8; August 12

**Planted:** May 5 & 6, 2011  
**Plot Design:** Randomized complete block  
**Plot Size:** Two - 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, 70N through sprinkler after tuber set.  
**Herbicide:** Dual Magnum @ 1.6 pt./A  
**Insecticide:** None  
**Vine Killer:** Rotobeat vines on September 8, 2011  
**Harvested:** September 28, 2011

#### **DATA:**

**Disease:** Early blight disease incidence based on percent leaves infected, readings taken weekly starting August 4, 2011.

**AUDPC:** Area Under the Disease Progress Curve (AUDPC) is a measure of the progression of Early Blight, starting on August 4<sup>th</sup> and ending with the last reading on September 7<sup>th</sup>. 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 2011.

<u>Program</u>	<u>Products</u>	<u>Rate</u>	<u>Application Schedule<sup>a</sup></u>
1	Untreated Control	-	-
2	Quadris	6.2 floz/A	2
	Bravo WS	1.5 pt/A	4
	Endura	2.5 oz./A	6
3	Dithane Rainshield	2.0 lb./A	4,6
	Bravo WS	1.5 pt/A	5
4	Dithane Rainshield	2.0 lb./A	4,6
	Quadris	6.2 floz/A	5
5	Quadris	6.2 floz/A	4
	Bravo WS	1.5 pt/A	5
	Endura	2.5 oz./A	6
6	Dithane Rainshield	2.0 lb./A	1,5
	Quadris	6.2 floz/A	3
7	Quadris	6.2 floz/A	1
	Bravo WS	1.5 pt/A	3
	Endura	2.5 oz./A	5
8	Quadris Opti	1.6 pt/A	1
	Revus/Top	7.0 floz/A	3
	Bravo WS	1.5 pt./A	5
	Endura	2.5 oz/A	7
9	Quadris Top	8.0 floz/A	1
	Bravo WS	1.5 pt./A	3
	Quadris Opti	1.5 pt./A	5
	Revus/Top	7.0 floz/A	7

<sup>a</sup> Schedule for applying treatments on a weekly basis, schedule started on July 5 (i.e. 1 = week 1, 2 = week 2).



**Table 2.** Early Blight Trial #3 - Effect of fungicide programs on the incidence of early blight in the cultivar Russet Norkotah Selection 8, San Luis Valley, Colorado, 2011; No Late Blight occurred within the trial.

Treatment	Percent Leaves Infected <sup>a</sup> (with one or more lesion)					AUDPC <sup>c</sup>
	August 4 <sup>b</sup>	August 11	August 20	August 29	September 7	
1	1.7	9.3 a	27.1 a	90.0 a	97.9 a	915.7 a
2	1.0	3.8 bc	11.3 c	57.1 bc	86.7 bc	657.3 bc
3	0.7	3.5 bc	9.3 cd	57.9 bc	86.6 bc	648.6 bc
4	1.0	4.3 b	16.8 b	65.4 b	84.9 bc	705.2 b
5	1.2	3.2 bc	7.0 d	39.2 de	80.4 c	545.9 d
6	1.0	3.5 bc	11.2 c	64.2 b	91.5 ab	702.4 b
7	0.7	3.0 bc	6.9 d	44.6 cd	86.6 bc	589.6 cd
8	0.5	2.2 c	6.6 d	27.1 e	70.4 d	450.6 e
9	0.8	2.5 c	7.5 cd	46.7 cd	86.7 bc	598.8 cd
LSD(P=0.05)	NS	1.7	4.0	13.8	9.0	73.0

<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> Readings were taken from only two replications due to the low levels of Early Blight present.

<sup>c</sup> AUDPC is the Area Under the Disease Progress Curve, accumulated weekly from August 4 through September 7.

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

**Table 3.** Early Blight Trial #3 - Effect of fungicide programs on tuber yield and quality in the cultivar Russet Norkotah Selection 8, San Luis Valley, Colorado, 2011.

Treatment	Percent <sup>a</sup>					Cwt/A <sup>b</sup>	Cwt/A <sup>c</sup> (US # 1's)
	< 4 oz.	4-10 oz.	> 10 oz.	US # 2's	Culls		
1	22.9	59.4	15.4	1.1	1.3	280.8 cd	274.3 cd
2	17.7	56.3	23.3	1.4	1.4	359.3 ab	349.1 ab
3	17.1	53.7	28.2	0.0	1.0	351.7 ab	348.3 ab
4	18.9	54.5	25.7	0.2	0.7	366.9 a	363.5 a
5	20.6	56.1	21.8	0.2	1.3	324.6 abc	319.8 abc
6	20.8	53.1	24.7	0.0	1.5	346.0 ab	341.2 ab
7	23.9	60.6	13.7	1.0	0.9	273.8 d	268.7 d
8	24.6	58.5	14.8	0.7	1.5	313.6 bcd	307.1 dcb
9	18.6	53.8	24.3	0.2	3.2	338.7 ab	327.7 ab
LSD(P=0.05)	NS	NS	NS	NS	NS	49.7	50.6

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

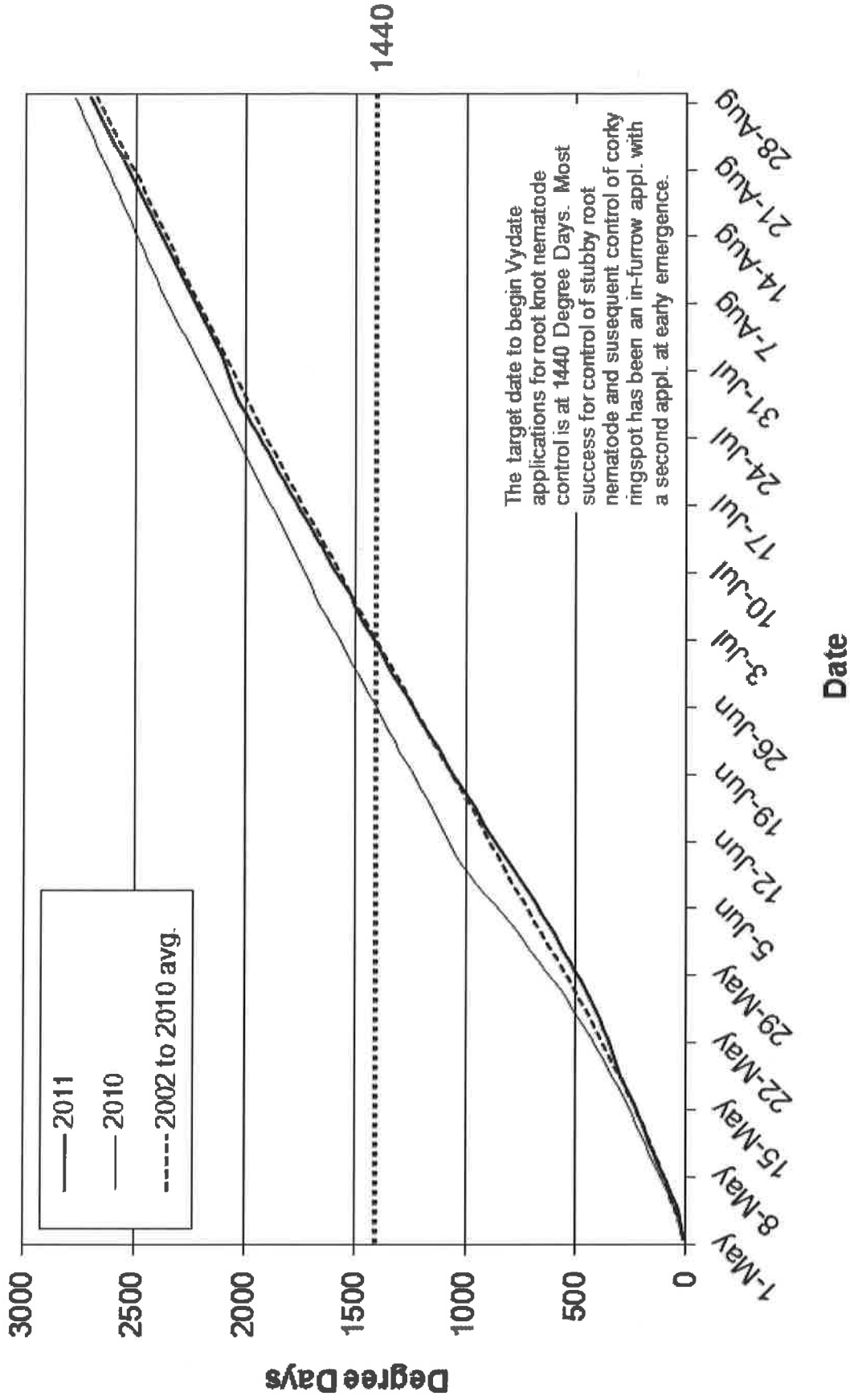
<sup>b</sup> Total yield of US #1 tubers expressed as hundred weight per acre, 2-15 foot rows per treatment per replication, mean of four replications.

<sup>c</sup> Yield of US #1 tubers expressed as hundred weight per acre, 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



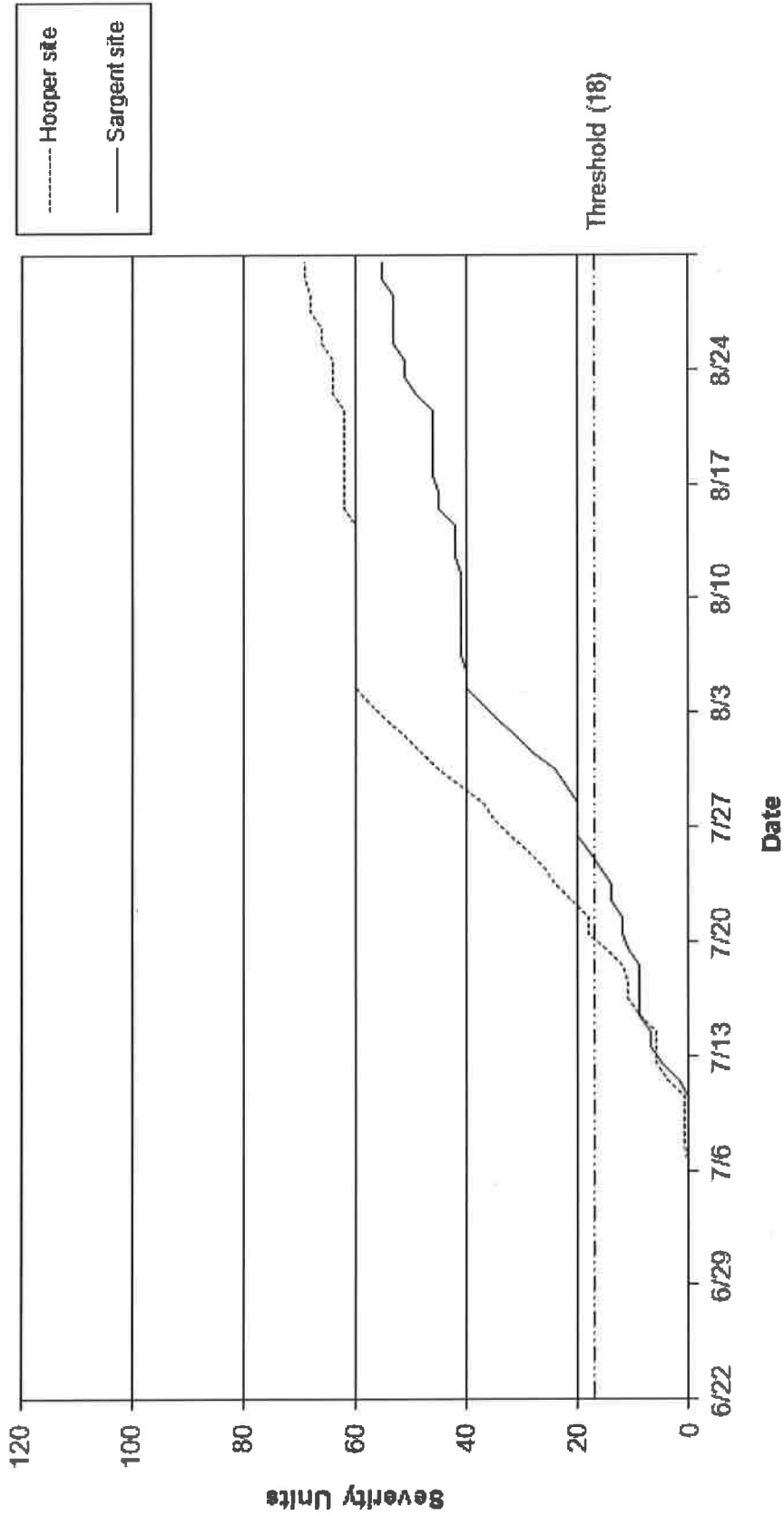
# SLV Late Blight Forecasting

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 2011 in order to determine the potential risk we have for late blight here in the valley.

A uMetos weather station was used at the Blanca and Hooper sites to determine late blight severity. This unit uses the Fry model and Negative Prognosis to calculate severity units (fry units). Humidity, air temperature, and leaf wetness are used to calculate severity units. Fry units accumulate differently depending of the level of susceptibility of a particular cultivar. Due to these differences, the severity units for a moderately susceptible cultivar has been recorded and graphed. Once the total number of fry units reaches 35 for a moderately susceptible cultivar, late blight can occur.

At the Sargent and Hooper site, 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.

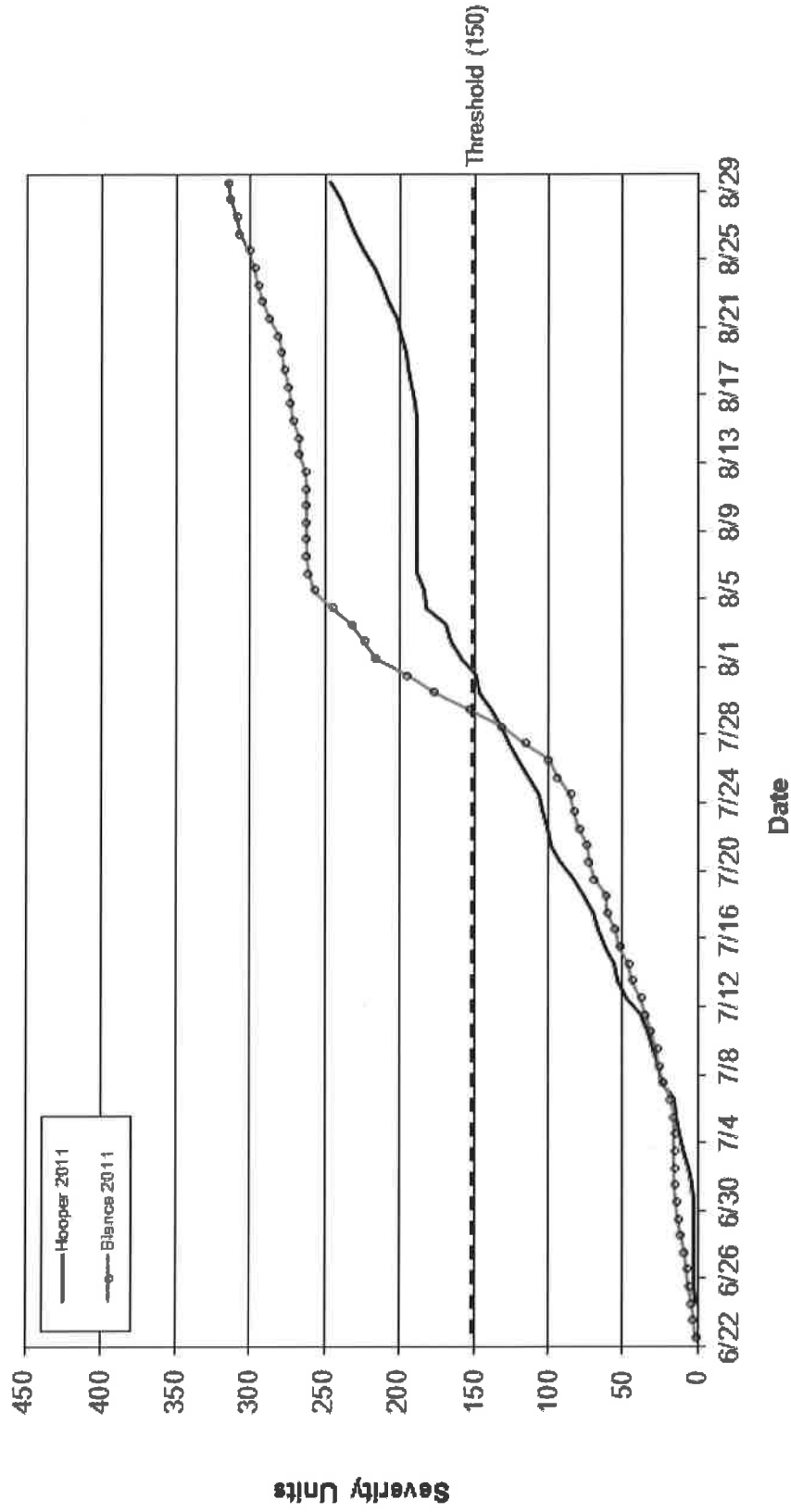
**Potato Late Blight Severity Values - Wallin Model,  
San Luis Valley, Colorado, 2011**



**Footnote:**

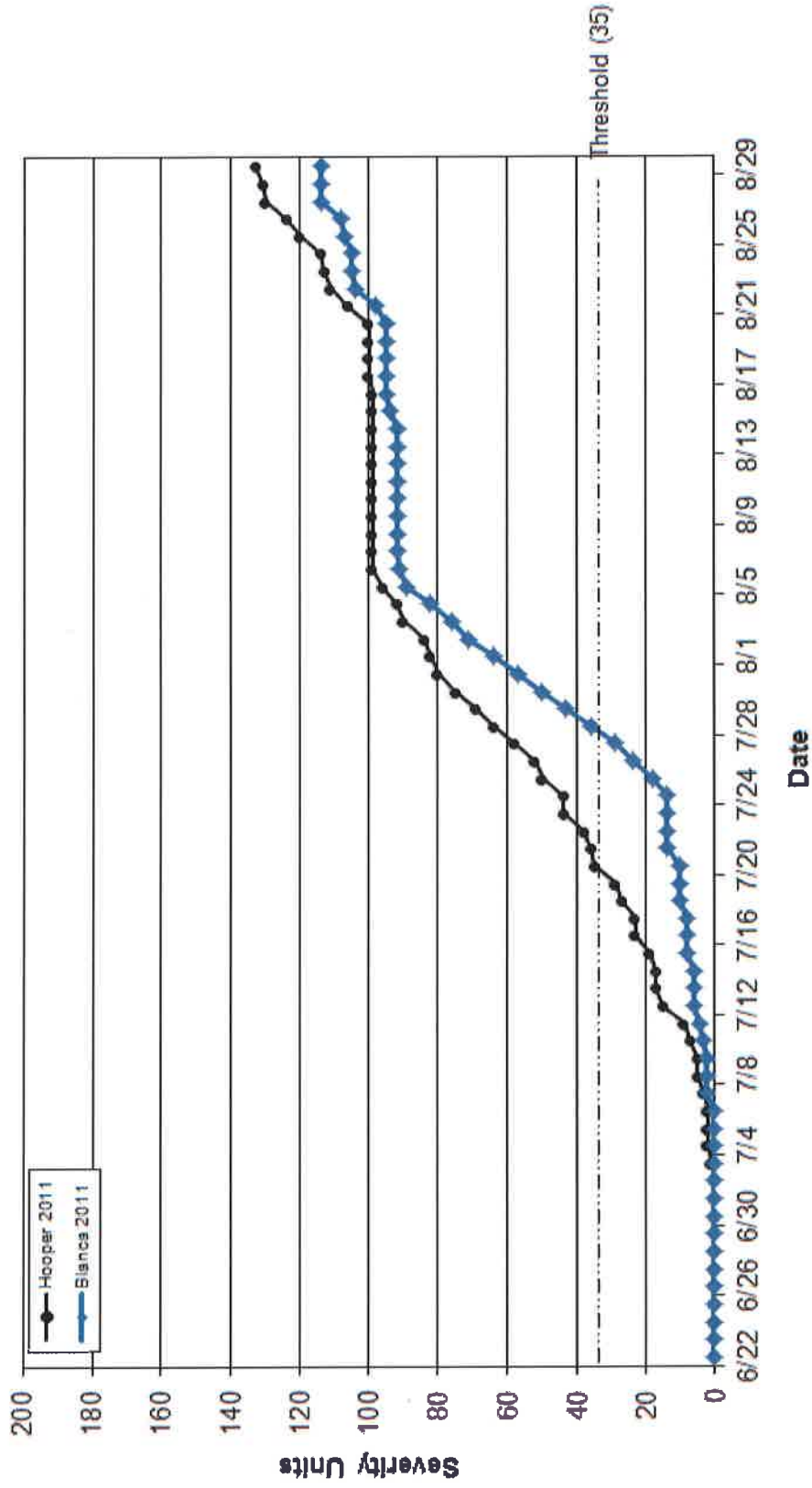
- The Sargent weather station began collecting data on June 27, 2011.
- The Hooper weather station began collecting data on June 24, 2011.
- The Blanca weather station began collecting data on June 22, 2011.

**Potato Late Blight Negative Prognosis, San Luis Valley (Hooper & Blanca site), Colorado, 2011**  
 Moderate Susceptible Varieties



Footnote:  
 - The Fry Late Blight model was used to calculate severity units.  
 - The Hooper weather station was set up on June 24.  
 - The Blanca weather station was set up on June 22.

**Potato Late Blight Fry Units, San Luis Valley (Hooper & Blanca site), Colorado, 2011**  
 Moderate Susceptible Varieties



Footnote:  
 - The Fry Late Blight model was used to calculate severity units.  
 - The Hooper weather station was set up on June 24.  
 - The Blanca weather station was set up on June 22.



# Pink Rot Trials

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 2011, several chemistries showed good to excellent results. Also, the biological agent Serenade was include in the trial with mixed results.

## EVALUATION OF FUNGICIDES FOR CONTROL OF PINK ROT ON POTATO, 2011

**Researchers:** Rob Davidson and Andrew Houser, Colorado State University, SLVRC  
**Location:** Off-station, San Luis Valley, CO  
**Cultivar:** Russet Norkotah sel. 8, cut seed, 2-4 oz.  
**Objective:** To evaluate the efficacy of various fungicides in controlling pink rot in potato.

**Application:** In-furrow (IF), after hilling (AH) and tuber initiation (TI) treatments were applied using an R & D CO<sub>2</sub> charged backpack sprayer at 35 PSI, with one XR 8002VS nozzle, using 10 gallons of water/acre as a directed application. In-furrow treatments with two nozzles were applied using an R & D CO<sub>2</sub> charged backpack sprayer mounted to a potato planter at 35 PSI, with one XR 8002VS nozzle directed to spray the soil as it covered the seed piece (50% mix) and one XR 8002VS nozzle directed over seed piece (50% mix), using 10 gallons of water per acre. Applications were made on June 15 for AH treatments & July 8 for TI treatments.

**Planted:** May 3, 2011  
**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:** Center Pivot Irrigation  
**Fertilizer:** 220N, ½ applied preplant and ½ through sprinkler in season  
**Herbicide:** Matrix  
**Fungicide:** Headline, Phostrol, Endura, Revis Top, Supertin, and Bravo  
**Insecticide:** Perm-Up  
**Vine Killer:** Reglone was applied on September 11, 2011; Vines were chopped on September 16, 2011  
**Harvested:** September 20 and 21, 2011

### 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:** 2-15 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.** Fungicide programs evaluated for Pink Rot control, San Luis Valley, Colorado 2011.

<u>Program</u>	<u>Products &amp; Rate</u>	<u>Application Schedule<sup>a</sup></u>
1	Untreated Control	-
2.	Serenade Soil @ 2qt./A	In-furrow <sup>a</sup>
3.	Serenade Soil @ 4qt./A	In-furrow <sup>a</sup>
4.	Serenade Soil @ 2qt./A Serenade Soil @ 2qt./A	In-furrow <sup>a</sup> At-hilling <sup>b</sup>
5.	Serenade Soil @ 4qt./A Phostrol @ 8.0 pt./A	In-furrow <sup>a</sup> Tuber initiation <sup>c</sup>
6.	Ridomil Gold @ 0.42 floz./1000 row ft Phostrol @ 8.0 pt./A	In-furrow <sup>a</sup> In-furrow <sup>a</sup>
7.	Phostrol @ 8.0 pt./A	Tuber initiation <sup>c</sup>
8.	Ranman @ 0.42 floz./1000 row ft Silwet @ 0.32 floz./1000 row ft	In-furrow – 2 nozzle <sup>a</sup> In-furrow – 2 nozzle <sup>a</sup>
<sup>d</sup> 9.	Proprietary	-
<sup>d</sup> 10.	Proprietary	-
<sup>d</sup> 11.	Presidio @ 0.125 lbai/A Presidio @ 0.125 lbai/A	In-furrow <sup>a</sup> At-hilling <sup>b</sup>
<sup>d</sup> 12.	Proprietary	-
<sup>d</sup> 13.	Proprietary	-
<sup>d</sup> 14.	Ranman @ 0.42 floz/1000 row ft Silwet @ 0.32 floz./1000 row ft Ranman @ 2.75 floz/A	In-furrow – 2 nozzle <sup>a</sup> In-furrow – 2 nozzle <sup>a</sup> At-hilling <sup>b</sup>
<sup>d</sup> 15.	Ridomil Gold @ 0.42 floz/1000 row ft	In-furrow <sup>a</sup>
16.	Presidio @ 0.125 lbai/A Ridomil Gold @ 0.42 floz/1000 row ft	In-furrow <sup>a</sup> In-furrow <sup>a</sup>
17.	Proprietary	-

<sup>a</sup> In-furrow treatments were applied on May 3, 2011.

<sup>b</sup> After-hilling treatments were applied June 15, 2011.

<sup>c</sup> Tuber initiation treatments were applied on July 8, 2011.

<sup>d</sup> Belay insecticide was applied in-furrow to treatments 9-15.

**Table 2.** Effect of applied products, for control of pink rot, on tuber yield and quality in the cultivar Russet Norkotah sel. 3. San Luis Valley, Colorado, 2011.

Treatment #	% Stand <sup>b</sup>	Percent <sup>a</sup>					US #2's	culls	cwt/A <sup>c</sup>	cwt/A <sup>d</sup>	No. rot	% rot <sup>e</sup>	% rot x
		< 4 oz.	4-10 oz.	> 10 oz.									
1.	93	11.2	41.1	44.2	1.2	2.4	442.3	424.5	3.0 ab	1.0 ab	5.2 a		
2.	93	11.3	38.3	45.7	1.2	3.6	499.9	477.0	0.8 cd	0.3 cd	1.4 cde		
3.	96	12.0	39.2	44.6	1.4	2.8	479.6	459.2	3.0 ab	0.8 abc	3.9 a-d		
4.	92	12.4	40.7	43.7	0.8	2.5	459.8	444.6	4.3 a	0.8 abc	4.2 abc		
5.	93	10.8	40.1	47.6	0.1	1.4	502.1	494.8	2.3 a-d	0.2 cd	1.1 de		
6.	96	11.5	37.6	47.5	1.1	2.3	495.9	479.8	1.8 bcd	0.4 bcd	2.0 cde		
7.	82	13.9	40.3	44.4	0.3	1.1	447.7	440.9	1.0 bcd	0.1 d	0.6 e		
8.	73	14.0	40.8	42.2	0.3	2.6	449.1	435.5	2.0 bcd	0.3 cd	1.3 de		
9.	83	10.9	40.7	45.9	0.0	2.6	482.4	470.2	2.3 a-d	0.4 bcd	2.2 b-e		
10.	83	11.6	37.8	47.7	0.5	2.4	437.2	423.7	1.3 bcd	0.2 cd	1.0 e		
11.	97	13.2	36.3	47.8	0.2	2.6	455.9	444.3	2.8 abc	1.2 a	4.8 ab		
12.	84	11.0	35.4	49.2	0.8	3.6	522.2	497.1	2.0 bcd	0.6 a-d	2.5 a-e		
13.	93	9.8	40.0	48.0	0.4	1.9	507.5	495.9	0.5 d	0.1 d	0.5 e		
14.	78	13.4	39.7	42.9	1.2	2.9	467.1	448.8	0.5 d	0.1 d	0.3 e		
15.	81	10.5	38.6	43.8	0.7	6.4	432.2	401.7	1.0 cd	0.2 cd	1.2 de		
16.	87	11.0	39.9	46.4	0.0	2.8	491.7	477.8	2.0 bcd	0.2 cd	1.2 de		
17.	93	12.9	40.4	42.5	1.5	2.8	489.1	468.6	2.3 a-d	0.3 cd	1.6 cde		
LSD(P=0.05)	NS	NS	NS	NS	NS	NS	NS	NS	NS	2.0	0.7	2.8	

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

<sup>b</sup> Plant stand counts were taken on June 15, 2011, 2-20 foot rows per treatment per replication, mean of four replications.

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

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

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

<sup>f</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 for AUDPC.

# Powdery Scab Trials

This research effort is directed at gaining a better understanding of the factors that lead to root galling and powdery scab symptom development on tubers. These factors include (under SLV conditions): understanding the role of irrigation, timing of water application, role of soil temperature, conditions within the potato hill which foster infection and symptom development, current inoculum level and how the inoculum moves in the Valley (both soil and seed borne), screening various chemistries that might impact infection and symptom development, and the cultivar by rotation situation leading to increased disease levels.

Results from this project indicate that as the environment in many other potato regions is moving away from critical soil temperatures for powdery scab infection and symptom development, the soil temperatures in the SLV are becoming more conducive for infection. Rotating susceptible cultivars with cultivars less susceptible, especially where root galling is concerned, can help alleviate the disease pressure and help growers harvest a cleaner crop, regardless of cultivar susceptibility.

Soil temperature and soil moisture readings taken at two or three soil depths (6, 8, & 10 in.), give a better understanding of field soil dynamics and help to determine how powdery scab development in the SLV is affected by these two soil parameters. Early season excess moisture can increase powdery scab infection and development. Also, when dissecting individual hills at harvest, tubers which sit in the region of the hill with the highest soil moisture during the season have the highest numbers and severity of powdery scab lesions. Finally, work with Omega (Fluazinam) is finished. A 24LSC label was obtained in 2007 for commercial use of the product on potatoes to control powdery scab. Studies on the in-furrow placement of the chemical in the hill (over the seed piece and into the covering soil as a split application) have been successful. Ultimately, a successful management program will incorporate several factors including: soil surveys to predict spore loads (standard practice for the last three years at the SLVRC), cultivar selection, water management at the appropriate times during the season, and use of Omega when warranted.

## EVALUATION OF ADVANCED CLONES FOR SUSCEPTIBILITY TO POWDERY SCAB, 2011

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

**Location:** Greenhouse trial, San Luis Valley, CO

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

### Clones:

- |                       |                       |
|-----------------------|-----------------------|
| 1. Centennial L-1     | 13. TC02072-3P/P      |
| 2. Centennial L-1M    | 14. CO01399-10P/Y     |
| 3. Centennial L-2     | 15. CO00405-1RF       |
| 4. Centennial L-2M    | 16. CO99053-3RU       |
| 5. Centennial L-3M    | 17. CO99053-4RU       |
| 6. Russet Nugget L-1M | 18. CO99100-1RU       |
| 7. Russet Nugget L-2  | 19. Centennial Russet |
| 8. Russet Nugget L-2M | 20. Colorado Rose     |
| 9. AC00395-2RU        | 21. DT6063-1R         |
| 10. AC01151-5W        | 22. Russet Nugget     |
| 11. CO02033-1W        | 23. Mesa Russet       |
| 12. CO02321-4W        |                       |

**Planted:** June 24, 2011

**Plot Design:** Randomized Complete Block Design

**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:** Five

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

**Fertilizer:** 20N-20P-20K

**Insecticide:** Not Available

**Harvested:** August 18 & September 16

### DATA

**Disease:** Galls on roots rated 0 to 4, 0 = none, 4 = heavily infected, readings taken on November 17, 18 & December 2, 2011.  
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.  
Percent number of tubers per pot which are unmarketable due to powdery scab severity. Tuber readings were taken on November 17, 18 & December 2, 2011.

**Table 1.** Evaluation of advanced clones for tuber susceptibility to powdery scab in a greenhouse environment, San Luis Valley, Colorado, 2011.

Cultivar	% Stand <sup>a</sup>	Tuber symptoms					
		Percent Incidence	Percent Healthy	Severity Index <sup>b</sup>	% Unmarketable	Root Gall	Fresh Root
1. Centennial L-1	50 c	0.0 d	100.0 a	0.0 f	0.0 c	0.3 ef	0.7 e
2. Centennial L-1M	88 ab	83.1 ab	16.9 cd	119.8 d	0.0 c	0.0 f	1.2 e
3. Centennial L-2	88 ab	0.0 d	100.0 a	0.0 f	0.0 c	1.0 c-f	0.9 e
4. Centennial L-2M	75 abc	52.5 c	47.5 b	92.5 de	18.3 c	0.3 ef	0.4 e
5. Centennial L-3M	50 c	0.0 d	100.0 a	0.0 f	0.0 c	0.0 f	0.8 e
6. Russet Nugget L-1M	63 bc	0.0 d	100.0 a	0.0 f	0.0 c	1.8 bcd	4.8 cd
7. Russet Nugget L-2	88 ab	16.7 d	83.3 a	16.7 ef	0.0 c	1.8 bcd	8.1 ab
8. Russet Nugget L-2M	100 a	53.9 bc	46.1 bc	137.9 cd	20.0 c	1.3 c-f	9.9 a
9. AC00395-2RU	100 a	8.3 d	91.7 a	8.3 ef	0.0 c	0.8 def	9.7 a
10. AC01151-5W	63 bc	100.0 a	0.0 d	487.5 a	100.0 a	3.5 a	2.1 de
11. CO02033-1W	75 abc	93.3 a	6.7 d	373.3 b	55.0 b	2.7 ab	6.4 bc
12. CO02321-4W	63 bc	70.8 abc	29.2 bcd	212.5 c	62.5 b	1.3 c-f	1.3 e
13. TC02072-3P/P	100 a	100.0 a	0.0 d	375.0 b	95.0 a	1.0 c-f	2.1 de
14. CO01399-10P/Y	100 a	93.8 a	6.3 d	212.5 c	22.5 c	1.5 b-e	1.8 de
15. CO00405-1RF	75 abc	73.9 abc	26.2 bcd	126.2 cd	13.3 c	1.3 c-f	1.3 e
16. CO99053-3RU	100 a	0.0 d	100.0 a	0.0 f	0.0 c	1.0 c-f	2.2 de
17. CO99053-4RU	63 bc	12.5 d	87.5 a	12.5 ef	0.0 c	2.3 abc	0.9 e
18. CO99100-1RU	100 a	12.5 d	87.5 a	12.5 ef	0.0 c	2.0 bcd	1.9 de
19. Centennial Russet	100 a	10.4 d	89.6 a	10.4 ef	0.0 c	0.3 ef	0.7 e
20. Colorado Rose	88 ab	100.0 a	0.0 d	450.0 ab	100.0 a	1.3 c-f	1.3 e
21. DT6063-1R	88 ab	91.7 a	8.3 d	375.0 b	58.3 b	1.3 c-f	3.2 cde
22. Russet Nugget	75 abc	0.0 d	100.0 a	0.0 f	0.0 c	1.3 c-f	4.9 bcd
23. Mesa Russet	88 ab	0.0 d	100.0 a	0.0 f	0.0 c	0.0 f	1.1 e
LSD(P=0.05)	36.3	29.5	29.5	86.4	28.0	1.4	3.2

<sup>a</sup> Percent Stand is based on the number of pots (five 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.

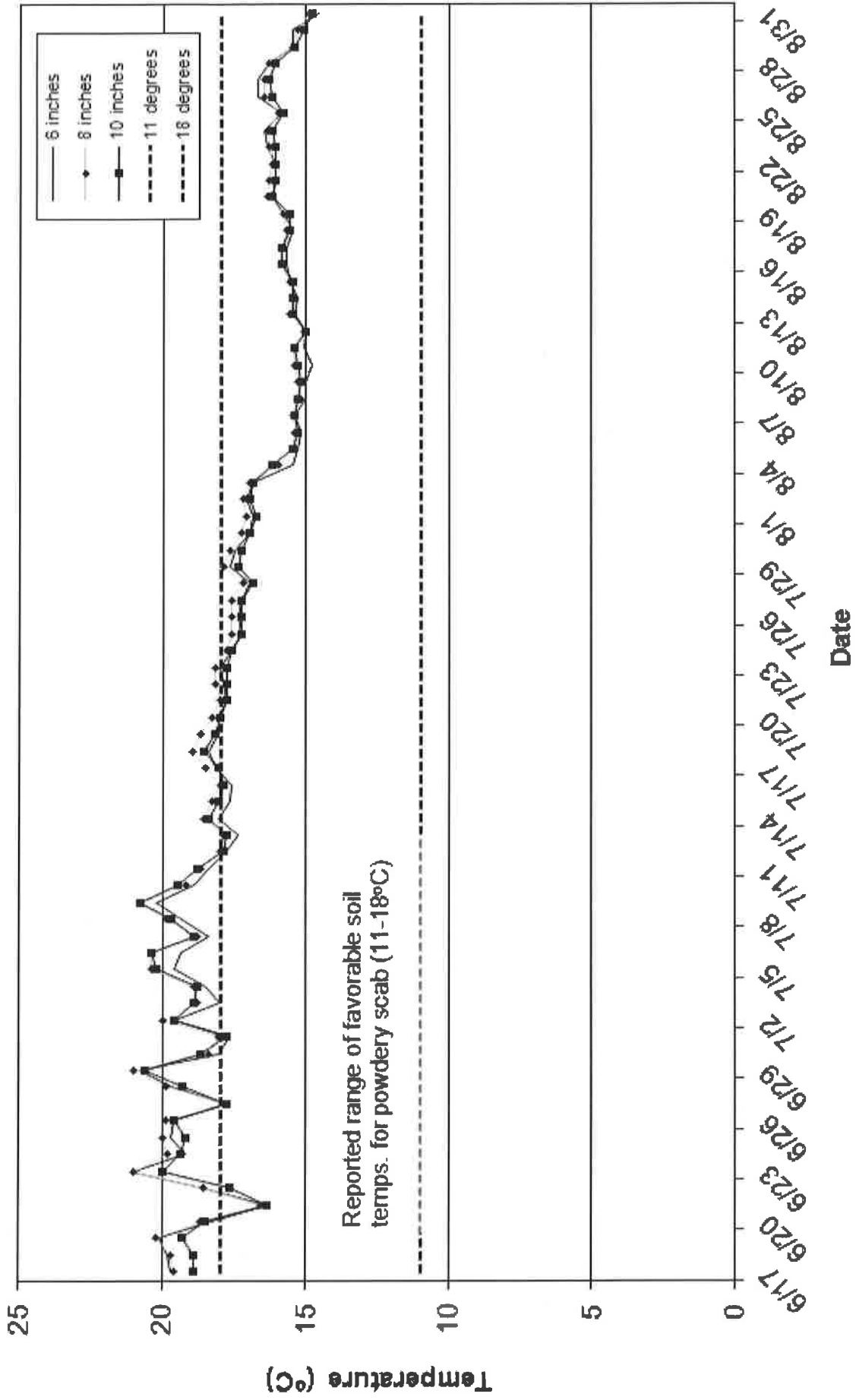
<sup>b</sup> Severity Index = mean percent of the number of affected tubers multiplied by the severity of the lesions, where 1 = very little or no disease and 5 = heavily infested.

<sup>c</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. All plants were rated.

<sup>d</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, root gall readings are questionable.

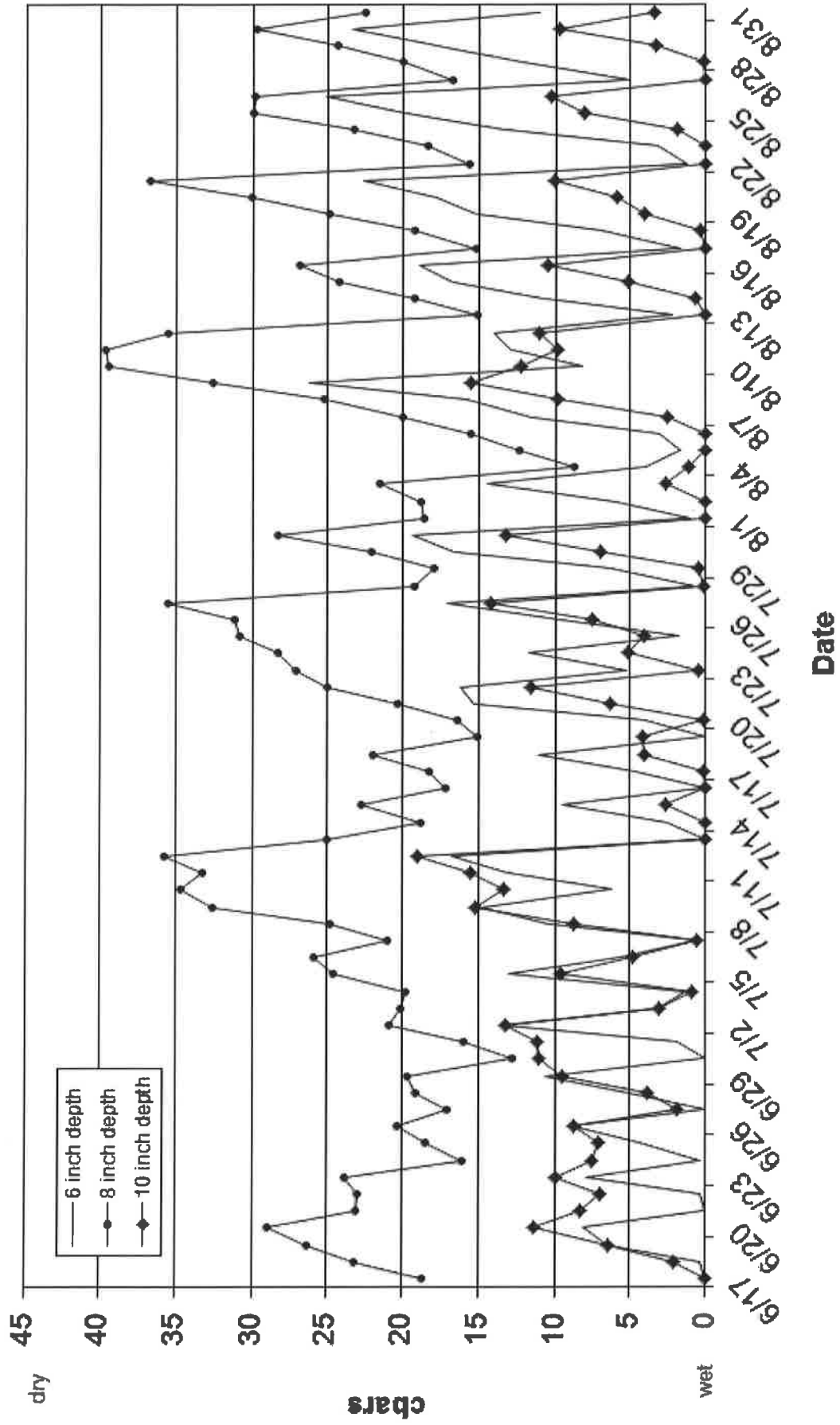
Means followed by the same letter are not significantly different at P=0.05.

**Average Soil Temperature Readings at 6, 8 & 10" Under Potato Plant Canopy,  
San Luis Valley, Sargent location, Colorado, 2011**





**Soil Moisture Readings (Daily Average) 6, 8 & 10 Inches Below Soil Surface,  
San Luis Valley, Sargent location, Colorado, 2011**



# ZEBA Soil Amendment Trial

Zeba is a soil amendment that allows for better water retention in the soil. We are continuing evaluations on this product, looking at three potato cultivars (Rio Grande Russet, AC99375-1RU, & Russet Burbank) with different water requirements. Three irrigation regimes have been utilized (one irrigation regime was based on ET recommendations, one was based on soil moisture readings taken from soil that was treated with Zeba, and the third was based on a 25% reduction of the Zeba irrigation regime).

Based on irrigation scheduling recommendations from all three regimes, irrigation levels were approximately three inches less over the course of the growing season in the Zeba plots (eliminating approximately one irrigation event every two weeks). Soil moisture was recorded and different recommendations were made starting mid-July, to correspond with tuber set.

Preliminary results indicate that the addition of Zeba increased the water retention of the soil, however major differences in yield were not observed in all potato cultivars. Cultivars that are less efficient at scavenging water from the soil may benefit from the application of Zeba. Additional evaluations need to be conducted on the effectiveness of ZEBA before recommendations can be made to the industry.

**EVALUATION OF ZEBBA PLANT AMENDMENT FOR INCREASED POTATO HEALTH AND YIELD ON THE CULTIVARS RUSSET BURBANK, AC99375-1RU, AND RIO GRANDE RUSSET, 2011**

**Researchers:** Rob Davidson and Andrew Houser, Colorado State University, SLVRC  
**Location:** San Luis Valley Research Center, Center, CO  
**Cultivars:** Russet Burbank, AC99375-1RU and Rio Grande Russet, cut seed, 2-4 oz.  
**Objective:** To evaluate the efficacy of using Zeba as a plant amendment for increasing the retention of soil moisture, plant health and yield in potato.  
**Application:** All Zeba treatments were applied by hand over the seed piece in-furrow.  
**Irrigation:** Solid set sprinkler for entire trial. All treatments were irrigated based on ET until July 5, at which time plots were irrigated using three different irrigation regimes: ET Irrigation - Irrigation based on SLV ET Report, Zeba Irrigation - Irrigation based on SM readings from Zeba Plots, & Deficit Irrigation - 75% of the Zeba Irrigation.

**Treatments:**

	<b>Deficit Irrigation</b>	<b>Zeba Irrigation</b>	<b>ET Irrigation</b>
<b>Untreated Control</b>	1. Russet Burbank	3. Russet Burbank	5. Russet Burbank
	7. AC99375-1RU	9. AC99375-1RU	11. AC99375-1RU
	13. Rio Grande Russet	15. Rio Grande Russet	17. Rio Grande Russet
<b>Zeba (10 lb./A)</b>	2. Russet Burbank	4. Russet Burbank	6. Russet Burbank
	8. AC99375-1RU	10. AC99375-1RU	12. AC99375-1RU
	14. Rio Grande Russet	16. Rio Grande Russet	18. Rio Grande Russet

**Planted:** May 5, 2011  
**Plot Design:** Randomized complete block  
**Plot Size:** 2 - 10 foot rows per treatment per replication  
**Plant Spacing:** 12 inches  
**Row Spacing:** 34 inches  
**Replications:** four  
**Fertilizer:** 80N-60P-40K-25S-2.5Z, preplant, 70N through sprinkler after tuber set.  
**Herbicide:** Dual Magnum @ 1.6 pt./A  
**Fungicide:** Quadris @ 12.4 floz./A  
**Vine Killer:** Rotobeat vines on September 8, 2011  
**Harvested:** September 22, 2011

**DATA**

**Yield:** 2-10 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.** Effects of Zeba soil amendment, applied in-furrow for increasing tuber yield and quality in the potato cultivar Russet Burbank, San Luis Valley, Colorado, 2011.

Program	Treatment	Irrigation Regime <sup>d</sup>	Percent <sup>a</sup>					Culls	Cwt/A <sup>b</sup>	Cwt/A <sup>c</sup> (w/o culls)
			< 4 oz.	4-10 oz.	> 10 oz.	US #2				
1.	Untreated Control	DI	26.6	46.2	19.9	3.1	4.3	376.7 d	350.0 d	
2.	Zeba (10 lbs/A)	DI	27.9	44.8	21.5	0.6	5.3	401.7 cd	378.4 cd	
3.	Zeba (10 lbs/A)	ZI	27.5	36.0	31.6	0.6	4.4	458.8 bc	438.9 bc	
4.	Zeba (10 lbs/A)	ZI	33.9	38.3	24.6	0.0	3.2	456.7 bc	440.6 bc	
5.	Zeba (10 lbs/A)	ETI	27.0	42.8	25.7	0.5	4.0	546.0 a	519.8 a	
6.	Zeba (10 lbs/A)	ETI	29.8	44.6	21.2	1.4	3.1	514.7 ab	491.8 ab	
LSD(P=0.05)			NS	NS	NS	NS	NS	16.0	13.2	

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

<sup>b</sup> Total yield expressed as hundred weight per acre, 2-10 foot rows per treatment per replication, mean of four replications.

<sup>c</sup> Total yield – culls, expressed as hundred weight per acre, 2-10 foot rows per treatment per replication, mean of four replications.

<sup>d</sup> DI = 75% of the Zeba Irrigation, ZI = Irrigation based on SM readings from Zeba Plots, ETI = Irrigation based on SLV ET Report.

**Table 2.** Effects of Zeba soil amendment, applied in-furrow for increasing tuber yield and quality in the potato cultivar AC99375-IRU, San Luis Valley, Colorado, 2011.

Program	Treatment	Irrigation Regime <sup>d</sup>	Percent <sup>a</sup>					Cwt/A <sup>c</sup> (w/o culls)
			< 4 oz.	4-10 oz.	> 10 oz.	US #2	Culls	
7.	Untreated Control	DI	27.4	51.7	20.9	0.0	0.0	499.4
8.	Zeba (10 lbs/A)	DI	32.8	50.9	16.3	0.0	0.1	495.6
9.	Zeba (10 lbs/A)	ZI	30.9	55.3	13.8	0.0	0.0	519.3
10.	Zeba (10 lbs/A)	ZI	32.2	51.9	15.6	0.2	0.1	554.5
11.	Zeba (10 lbs/A)	ETI	33.2	49.4	15.4	1.4	0.5	545.1
12.	Zeba (10 lbs/A)	ETI	34.3	53.3	11.1	1.3	0.0	493.1
LSD(P=0.05)			NS	NS	NS	NS	NS	NS

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

<sup>b</sup> Total yield expressed as hundred weight per acre, 2-10 foot rows per treatment per replication, mean of four replications.

<sup>c</sup> Total yield – culls, expressed as hundred weight per acre, 2-10 foot rows per treatment per replication, mean of four replications.

<sup>d</sup> DI = 75% of the Zeba Irrigation, ZI = Irrigation based on SM readings from Zeba Plots, ETI = Irrigation based on SLV ET Report.

**Table 3.** Effects of Zeba soil amendment, applied in-furrow for increasing tuber yield and quality in the potato cultivar Rio Grande Russet, San Luis Valley, Colorado, 2011.

Program	Treatment	Irrigation Regime <sup>d</sup>	Percent <sup>a</sup>					Cwt/A <sup>c</sup> (w/o culls)	
			< 4 oz.	4-10 oz.	> 10 oz.	US #2's	Culls		Cwt/A <sup>b</sup>
13.	Untreated Control	DI	20.7	53.0	25.4	0.8	0.0	416.9	413.4
14.	Zeba (10 lbs/A)	DI	23.2	49.0	25.2	2.4	0.3	391.0	380.6
15.	Zeba (10 lbs/A)	ZI	24.6	49.8	24.5	0.4	0.8	458.4	453.7
16.	Zeba (10 lbs/A)	ZI	20.3	57.4	21.1	0.4	0.8	466.8	461.3
17.	Zeba (10 lbs/A)	ETI	26.8	49.3	23.1	0.0	0.8	483.8	479.5
18.	Zeba (10 lbs/A)	ETI	28.4	44.1	26.7	0.4	0.5	447.8	444.0
LSD(P=0.05)			NS	NS	NS	NS	NS	NS	NS

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

<sup>b</sup> Total yield expressed as hundred weight per acre, 2-10 foot rows per treatment per replication, mean of four replications.

<sup>c</sup> Total yield – culls, expressed as hundred weight per acre, 2-10 foot rows per treatment per replication, mean of four replications.

<sup>d</sup> DI = 75% of the Zeba Irrigation, ZI = Irrigation based on SM readings from Zeba Plots, ETI = Irrigation based on SLV ET Report.

## 2011 Bacterial Ring Rot Evaluation

**Location:** NW Corner, Selter's Farm, 9 North, ½ East of SLVRC

**Treatments:** 51 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 5/6/11. 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:** 5/9/11

**Cultivars:**

1. AC03300-1RU	27. AC03433-1W	53. A99331-2RY
2. AC03409-1RU	28. CO03027-2R/R	54. A99433-5Y
3. AC00206-2W	29. CO03094-5RF/RW	55. A01025-4
4. AC03452-2W	30. CO03187-1RU	56. A01143-3C
5. AC03534-2R/Y	31. CO03202-1RU	57. A020603TE
6. CO03134-4RF/RW	32. CO03243-3W	58. OR04131-2
7. CO03186-1RU	33. CO03276-4RU	59. AOTX96265-2RU
8. CO04029-3RW/Y	34. CO03276-5RU	60. ATTX01178-1R
9. CO04029-5W/Y	35. CO04013-1W/Y	61. ATTX98453-6R
10. CO04056-3P/PW	36. CO04021-2R/Y	62. ATTX98510-1R/Y
11. CO04056-7P/PW	37. CO04045-4P/P	63. COTX01403-4R/Y
12. CO04058-3RW/RW	38. CO04117-5PW/Y	64. FL (06)
13. CO04063-4R/R	39. WNC230-14RU	65. FL (07)
14. CO04067-8R/Y	40. Ute Russet	
15. CO04067-10W/Y	41. CO86030-1RU	
16. CO04099-3W/Y	42. CO86153-2RU	
17. CO04099-4W/Y	43. Centennial Russet	
18. CO04122-1RU	44. Russet Burbank	
19. CO04123-2RU	45. Sangre S10	
20. CO04159-1R	46. Russet Norkotah	
21. CO04188-4R/Y	47. A00324-1	
22. CO04211-4RU	48. A01010-1	
23. CO04220-7RU	49. AO00057-2	
24. CO04223-6R	50. AO02183-2	
25. CO04233-1RU	51. OR04036-5	
26. CO04287-1R	52. POR05PG56-1	

**Irrigation:** Solid set sprinkler: rate based on ET and ppt. Total water for season was 17".

**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:** Aerial applications: 7/20/09, 8/6/09 - Bravo Weatherstick (1.5pt/A)

**Harvest:** 9/15/11

**Table 1. Clonal Evaluation for Bacterial Ring Rot Foliar Symptom Expression (2011)**

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
11	AC03300-1RU	81	1	2	9.5	107	3	52.3	All			+
11	AC03409-1RU	61	1	3	14.3		2	23.8	IVC, IVN, MN, W			-
11	AC00206-2W	81	1	1	4.8		3	42.9	All			+
11	AC03452-2W	61	1	3	14.3	107	3	57.1	All			ND
11	AC03534-2R/Y	81	1	1	4.8		3	42.9	All			+
11	CO03134-4RF/RF	61	1	2	9.5		3	47.6	All			-
11	CO03186-1RU	61	1	1	4.8	81	3	52.4	All			+
11	CO04029-3RW/Y	81	1	1	4.8		3	19.0	All			+
11	CO04029-5W/Y	68	1	1	4.8	81	3	57.1	All			+
11	CO04056-3P/PW	61	1	1	4.8	107	3	61.9	All			+
11	CO04056-7P/PW	68	1	2	9.5		3	42.9	All			+
11	CO04058-3RW/RW	68	1	3	14.3		3	47.6	All			ND
11	CO04063-4R/R	61	1	2	9.5	81	2	57.1	All			ND
11	CO04067-8R/Y	96	1	3	14.3		3	38.1	All			ND
11	CO04067-10W/Y	81	1	1	4.8		3	19.0	All			ND
11	CO04099-3W/Y	61	1	1	4.8	81	3	90.5	All			-
11	CO04099-4W/Y	61	1	1	4.8		3	28.6	All			+
11	CO04122-1RU	61	1	1	4.8		3	42.9	All			+
11	CO04123-2RU	61	2	2	9.5	96	3	61.9	All			+
11	CO04159-1R	81	1	1	4.8	107	3	52.4	All			+
11	CO04188-4R/Y	81	1	1	4.8		2	14.3	IVC, IVN, MN, W			ND
11	CO04211-4RU	68	2	2	9.5		3	38.1	All			+
11	CO04220-7RU	61	1	1	4.8	107	3	66.7	All			ND
11	CO04223-6R	68	1	1	4.8		3	33.3	All			ND
11	CO04233-1RU	61	1	3	14.3	107	3	61.9	All			+
11	CO04287-1R	61	1	1	4.8		3	23.8	All			ND
10	AC03433-1W	91	1	1	4.7		1	9.5	IVC, IVN, MN, W			
11		68	1	1	4.8		2	19.1	All	80 (+/- 10)	4	+
10	CO03027-2R/R	101	1	4	19.0		1	19.0	IVC, IVN, MN, W			
11		68	1	1	4.8	107	3	52.4	All	85 (+/-15)	5	ND
10	CO03094-5RF/RW	45	1	1	4.7		3	28.6	All			
11		61	1	1	4.8	116	3	61.9	All	53 (+/-5)	5	ND
10	CO03187-1RU	45	2	2	9.5	84	3	81.0	All			
11		61	1	2	9.5		3	47.6	All	53 (+/-5)	5	+
10	CO03202-1RU	63	2	2	9.5		3	23.8	All			
11		68	1	1	4.8	107	3	52.4	All	65	5	-
10	CO03243-3W	45	1	1	4.7	91	3	57.1	All			



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
11		75	1	3	14.3	107	3	52.4	All	60 (+/-15)	5	+
10	CO03276-4RU	63	2	3	14.3	84	3	71.4	All			
11		61	2	3	14.3	107	3	52.4	All	62	5	+
10	CO03276-5RU	63	1	1	4.7		3	28.6	All			
11		61	1	1	4.8		2	33.3	All	62	5	-
10	CO04013-1W/Y	63	3	4	19.0		3	38.1	IVC, IVN, MN, W			
11		81	1	1	4.8	96	3	71.4	All	72 (+/-10)	5	+
10	CO04021-2R/Y	63	2	5	23.8		2	42.9	IVC, IVN, MN			
11		68	2	2	9.5		3	42.9	All	65	5	+
10	CO04045-4P/P	45	2	3	14.3	63	3	56.7	All			
11		81	1	1	4.8		2	28.6	All	63 (+/-15)	5	ND
10	CO04117-5PW/Y	45	1	1	4.7	73	3	81.0	All			
11		68	2	2	9.5	107	3	52.4	All	57 (+/-10)	5	ND
09	AOTX96265-2RU	NR										
10		45	2	3	14.3	91	3	85.7	All			
11		61	3	7	33.3	68	3	85.7	All	53 (+/-10)	5	+
11	AO0324-1	75	1	1	4.8	107	3	81.0	All			
11	AO1010-1	61	1	4	19.1	107	3	61.9	All			+
11	AO00057-2	68	1	2	9.5		3	47.6	All			+
11	AO02183-2	81	1	1	4.8	107	3	61.9	All			+
11	OR04036-5	68	1	2	9.5	96	3	61.9	All			+
11	POR05PG56-1	75	1	1	4.8		2	38.1	All			+
11	A99331-2R/Y	61	1	1	4.8	116	3	61.9	All			ND
11	A99433-5Y	61	1	3	14.3	107	3	61.9	All			+
11	AO1025-4	61	2	3	14.3		3	42.3	All			+
11	AO1143-3C	96	1	2	9.5		3	23.8	All			-
11	AO2060-3TE	81	1	1	4.8		3	47.6	All			-
11	OR04131-2	NR										
11	ATTX01178-1R	61	2	6	28.6	107	3	71.4	All			+
11	ATTX98453-6R	68	1	1	4.8	107	3	66.7	All			+
11	ATTX98510-1R/Y	NR										
11	COTX01403-4R/Y	61	1	1	4.8		3	33.3	All			ND
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	68 (+/-10)	4	ND
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			

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
10		63	3	3	14.3	91	3	61.9	ED,R,IVC			
11		107	2	2	19.1		3	23.8	ALL	74(+/-15)	4	+
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	89(+/-20)	4	-
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	50 (+/-5)	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	75(+/-20)	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	55(+/-10)	5	+
<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. 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.  * 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 (2011)**

Year	Clone	# Reps Positive	# Tubers Positive	%Tubers Positive	Comments
11	AC03300-1RU				
11	AC03409-1RU	1	1	5	
11	AC00206-2W	2	4	20	
11	AC03452-2W	2	2	10	
11	AC03534-2R/Y	1	1	5	
11	CO03134-4RF/RF	1	2	10	
11	CO03186-1RU				
11	CO04029-3RW/Y				
11	CO04029-5W/Y	1	1	10	1 REP
11	CO04056-3P/PW	1	1	5	
11	CO04056-7P/PW	1	1	5	
11	CO04058-3RW/RW	1	1	5	
11	CO4063-4R/R				
11	CO04067-8R/Y	2	2	10	
11	CO04067-10W/Y	2	2	10	
11	CO04099-3W/Y	1	1	5	
11	CO04099-4W/Y				
11	CO04122-1RU				
11	CO04123-2RU	1	1	5	
11	CO04159-1R	1	1	5	
11	CO04188-4R/Y	1	1	5	
11	CO04211-4RU				
11	CO04220-7RU				
11	CO04223-6R				
11	CO04233-1RU	1	2	10	
11	CO04287-1R				
10	AC03433-1W				
11					
10	CO03027-2R/R				
11					
10	CO03094-5RF/RW	1	1	5	PS2
11					PS3
10	CO03187-1RU				
11					
10	CO03202-1RU				
11					
10	CO03243-3W	2	2	10	PS1
11		2	3	15	
10	CO03276-4RU				
11		1	1	5	
10	CO03276-5RU				PR-1
11					
10	CO04013-1W/Y				PS1
11		2	4	20	
10	CO04021-2R/Y	2	2	10	PR-3
11		1	1	5	PS2
10	CO04045-4P/P				
11		1	1	5	
10	CO04117-5PW/Y				
11		2	2	10	
09	AOTX95265-1RU	NR			
10		1	1	5	

Year	Clone	# Reps Positive	# Tubers Positive	%Tubers Positive	Comments
11					
11	AO0324-1	1	1	5	
11	AO1010-1	1	2	10	
11	AO00057-2				
11	AO02183-2				
11	OR04036-5				
11	POR05PG56-1	1	1	5	
11	A99331-2R/Y	1	1	5	
11	A99433-5Y	1	1	5	PS2
11	AO1025-4	1	1	5	
11	AO1143-3C				
11	AO2060-3TE				
11	OR04131-2				
11	ATTX01178-1R				
11	ATTX98453-6R	1	2	10	
11	ATTX98510-1R/Y	2	2	10	
08	WNC230-14RU				
09		1	1	5.0	
10					
11					
08	Ute Russet				
09					
10					
11					
08	Centennial Russet				
09					
10					
11					
08	Russet Burbank				
09		1	1	5.0	
10					
11					
08	Sangre				
09					PS1
10		1	1	5.0	PS1
11		2	4	20.0	PS2/PR-1
08	Russet Norkotah				
09					
10					
11		2	3	15.0	

Harvest dates - 9/12/08, 9/9/09, 9/9/10.

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.

## 2011/12 Clonal Evaluation for Storage Rots

**Treatments:** *Erwinia* - 50ul of  $7.0 \times 10^4$  cfu/ml into 3 inoculation sites, stem end.  
*Fusarium* - 50ul of 250 spores/tuber into 3 inoculation sites, stem end.

Tubers kept at 55-60°F after inoculation for 4 weeks.

**Inoculation/Reading:** Inoculation 12/11/2011; Readings: 2/22/12

### Cultivars:

AC03300-1RU	CO04122-1RU	CO03243-3W
AC03409-1RU	CO04123-2RU	CO03276-4RU
AC00206-2W	CO04159-1R	CO03276-5RU
AC03452-2W	CO04188-4R/Y	CO03308-3RU
AC03534-2/Y	CO04211-4RU	CO04013-1W/Y
CO03134-4RF/RW	CO04220-7RU	CO04021-2R/Y
CO03186-1RU	CO04223-6R	CO04045-4P/P
CO04029-3RW/Y	CO04233-1RU	CO04061-1R/RW
CO04029-5W/Y	CO04287-1R	CO04117-5PW/Y
CO04056-3P/PW	AC03433-1W	Canela Russet
CO04056-7P/PW	CO03017-2RU/Y	Rio Grande Russet
CO04058-3RW/RW	CO03027-2R/R	Russet Norkotah S3
CO04063-4R/R	CO03094-5RF/RW	Russet Nugget
CO04067-10W/Y	CO03187-1RU	Sangre S10
CO04099-3W/Y	CO03202-1RU	
CO04099-4W/Y		

**Evaluation:** Ranked by Score. Scores based upon 3 reps x 10 tubers/rep.  
 Tuber evaluations follow: Control will always equal 1 or 0.

### *Fusarium*

1 = No symptoms  
 2 = Localized damage  
 3 = 25-50% tuber damage  
 4 = > 50% tuber damage  
 5 = 100% tuber damage

### *Erwinia*

1 = No symptoms  
 2 = Localized damage  
 3 = 25-50% tuber damage  
 4 = > 50% tuber damage  
 5 = 100% tuber damage

### *Alternaria*

0 = No symptoms  
 1 = 1/8" dia./1 peel  
 2 = 1/4" dia./2 peels  
 3 = 1/2" dia./3 peels  
 4 = > 10% tuber damage  
 5 = 100% tuber damage

Grade loss occurs at 2+ for *Fusarium*, 3+ for *Erwinia* and at 4 for *Alternaria*  
*Alternaria* was not screened in 2009

Table 3. Clonal Evaluation for Storage Rot			<i>Fusarium</i>		
Inoculation	11/12/2008	1/28/2010	12/16/2010	12/12/2011	
Reading	12/12/2008	2/25/2010	1/26/2011	2/22/2012	
Clone	Avg Score	Avg Score	Avg Score	Avg Score	2/3 yr Avg
AC03300-1RU				3.10	
AC03409-1RU				3.90	
AC00206-2W				3.60	
AC03452-2W				4.30	
AC03534-2/Y				3.50	
CO03134-4RF/RW				4.80	
CO03186-1RU				2.90	
CO04029-3RW/Y				4.40	
CO04029-5W/Y				4.60	
CO04056-3P/PW				4.30	
CO04056-7P/PW				4.30	
CO04058-3RW/RW				4.00	
CO04063-4R/R				4.30	
CO04067-10W/Y				3.70	
CO04099-3W/Y				4.30	
CO04099-4W/Y				4.60	
CO04122-1RU				3.10	
CO04123-2RU				3.00	
CO04159-1R				4.40	
CO04188-4R/Y				4.30	
CO04211-4RU				4.10	
CO04220-7RU				3.30	
CO04223-6R				3.70	
CO04233-1RU				2.40	
CO04287-1R				2.40	
AC03433-1W			3.50	4.30	3.90
CO03017-2RU/Y			3.00	---	
CO03027-2R/R			3.00	3.70	3.35
CO03094-5RF/RW			2.30	2.60	2.45
CO03187-1RU			2.80	4.10	3.45
CO03202-1RU			2.90	4.30	3.60
CO03243-3W			4.00	3.90	3.95
CO03276-4RU			3.00	4.80	3.90
CO03276-5RU			2.80	3.20	3.00
CO03308-3RU			3.00	---	
CO04013-1W/Y			3.20	4.30	3.75
CO04021-2R/Y			3.00	4.70	3.85
CO04045-4P/P			3.00	4.50	3.75
CO04061-1R/RW			2.80	---	
CO04117-5PW/Y			3.50	3.40	3.45
Canela RU		3.00	3.50	4.50	3.67
Rio Grande RU	3.40	3.30	3.00	3.90	3.23
RU Norkotah 3	3.20	2.90			3.05
RU Nugget	3.80	3.30			3.55
Sangre 10	2.70	2.90			2.80

1 = No symptoms, 2 = Localized damage  
3 = 25-50% tuber damage, 4 = >50% tuber damage,  
5 = 100% tuber damage. Grade loss occurs at 2.00+.

Table 4. Clonal Evaluation for Storage Rot			<i>Pectobacterium</i>	
Inoculation	11/12/2008	1/28/2010	12/16/2010	12/12/2011
Reading	12/12/2008	2/25/2010	1/26/2011	2/22/2012
Clone	Avg Score	Avg Score	Avg Score	Avg Score
AC03300-1RU				2.20
AC03409-1RU				2.00
AC00206-2W				2.30
AC03452-2W				3.60
AC03534-2/Y				3.60
CO03134-4RF/RW				2.30
CO03186-1RU				2.90
CO04029-3RW/Y				3.10
CO04029-5W/Y				2.90
CO04056-3P/PW				3.80
CO04056-7P/PW				5.00
CO04058-3RW/RW				3.00
CO04063-4R/R				3.00
CO04067-10W/Y				3.10
CO04099-3W/Y				2.20
CO04099-4W/Y				2.20
CO04122-1RU				2.70
CO04123-2RU				2.10
CO04159-1R				2.70
CO04188-4R/Y				3.10
CO04211-4RU				2.90
CO04220-7RU				2.80
CO04223-6R				2.80
CO04233-1RU				2.20
CO04287-1R				3.70
AC03433-1W				2.80
CO03027-2R/R				2.90
CO03094-5RF/RW				2.90
CO03187-1RU				2.80
CO03202-1RU				2.70
CO03243-3W				2.90
CO03276-4RU				2.50
CO03276-5RU				4.10
CO04013-1W/Y				2.20
CO04021-2R/Y				2.40
CO04045-4P/P				4.30
CO04117-5PW/Y				3.50
Canela RU		1.40	3.50	2.10
Rio Grande RU	2.00	1.70	3.00	3.00
RU Norkotah 3	2.00	2.00		
RU Nugget	2.10	2.10		
Sangre 10	1.90	2.70		

1 = No symptoms, 2 = Localized damage  
3 = 25-50% tuber damage, 4 = >50% tuber damage,  
5 = 100% tuber damage. Grade loss occurs at 3.00+.

Table 5. Clonal Evaluation for PLRV and PVY - 2011 NIFS + symptoms							
Clone	PLRV			PVY			PLRV Risk
	#pos/Total (%)	Rating	Symptoms	#pos/Total (%)	Rating	Symptoms	
AC03300-1RU	36.1	3	All	2.8	5		High
AC03409-1RU	0 (0/2)			50.0	4		
AC00206-2W	54.5	3	All	0.0			High
AC03452-2W	18.8	3	All	0.0			High
AC03534-2/Y	48.9	3	All	11.1	5	LD	High
CO03134-4RF/RW	10.0	2	LL,WP,P	15.0	5		Medium
CO03186-1RU	27.3	3	All	0.0			High
CO04029-3RW/Y	11.9	3	All	9.5	5		High
CO04029-5W/Y	17.8	3	All	20.0	5		High
CO04056-3P/PW	37.5	3	All	0.0			High
CO04056-7P/PW	42.9	2	LL,WP,P	0.0			High
CO04058-3RW/RW	22.6	3	All	0.0			High
CO04063-4R/R	23.1	3	All	7.7	5		High
CO04067-8R/Y	18.8	3	All	3.1	5		High
CO04067-10W/Y	26.7	3	All	2.2	5		High
CO04099-3W/Y	5.4	2	LL,WP,P	18.9	5	LD	Low
CO04099-4W/Y	94.6	3	All	5.4	2		Very High
CO04122-1RU	68.1	3	All	0.0			High
CO04123-2RU	27.9	3	All	0.0			High
CO04159-1R	NE						
CO04188-4R/Y	56.1	3	ALL	0.0			High
CO04211-4RU	12.5	3	ALL	2.5	5		High
CO04220-7RU	27.0	3	ALL	2.7	5		High
CO04223-6R	20.0	3	ALL	11.1	5		High
CO04233-1RU	88.4	3	ALL	0.0			Very High
CO04287-1R	37.8	3	ALL	0.0			High
AC03433-1W	0 (0/40)			2.5	4		
CO03027-2R/R	36.0	3	ALL	0.0			High
CO03094-5RF/RW	12.5	2	LL,WP,P	16.7	4		Medium
CO03187-1RU	17.8	3	ALL	0.0			High
CO03202-1RU	28.6	3	ALL	14.3	5		High
CO03243-3W	8.6	3	ALL	0.0			Medium
CO03276-4RU	8.5	3	ALL	0.0			Medium
CO03276-5RU	46.3	3	ALL	0.0			High
CO03276-5RU	25.0	3	ALL	5.0	5	LD	High
CO04013-1W/Y	33.3	2	LL,WP,P	6.7	5		High
CO04021-2R/Y	9.3	3	ALL	16.3	5		Medium
CO04045-4P/P	31.7	3	ALL	9.8	5		High
CO04117-5PW/Y	8.9	3	ALL	0.0			Medium
AC00395-2RU	25.0	3	WP,LL,CC	0.0			High
AC01151-5W	19.5	2	WP,LL,P	2.4	3		High
CO02033-1W	8.1	3	ALL	16.2	5	LD	Medium



Clone	PLRV			PVY			PLRV Risk
	#pos/Total (%)	Rating	Symptoms	#pos/Total (%)	Rating	Symptoms	
CO02321-4W	9.3	3	ALL	0.0			Medium
TC02072-3P/P	22.2	3	ALL	4.4	5		High
CO01399-10P/Y	6.8	2	ALL	6.8	5		Medium
ATC00293-1W/Y	5.0	1	ALL	12.5	5	LD	Low
CO00270-7W	11.9	2	ALL	4.8	5		High
CO00291-5R	20.0	3	ALL	6.7	4		High
CO00405-1RF	26.6	3	ALL	0.0			High
CO97232-1R/Y	14.3	3	ALL	8.6	5		High
CO97232-2R/Y	52.0	3	ALL	4.0	4		High
CO97233-3R/Y	17.9	3	ALL	0.0			High
WNC230-14RU	0 (0/35)			5.7	5		Low
Ute Russet	17.9	2	WP,LL,P	0.0			High
Centennial Russet	8.3	3	ALL	0.0			Medium
Russet Burbank	25.0	3	ALL	10.0	5		High
Sangre S 10	NE						
Green Mountain	28.1	3	ALL	3.1	5		High
Houma	19.4	3	ALL	0.0			High
Keswick	10.3	2	WP,LL,P	20.5	5		High
Penobscot	7.3	2	WP,LL,P	4.9	3		Medium
Katahdin	4.7	1	WP,LL,P	0.0			Low
CO86051-3RU	3.3	2	ALL	16.7	5		Medium
Russet Nugget	3.8	2	ALL	3.8	3		Low

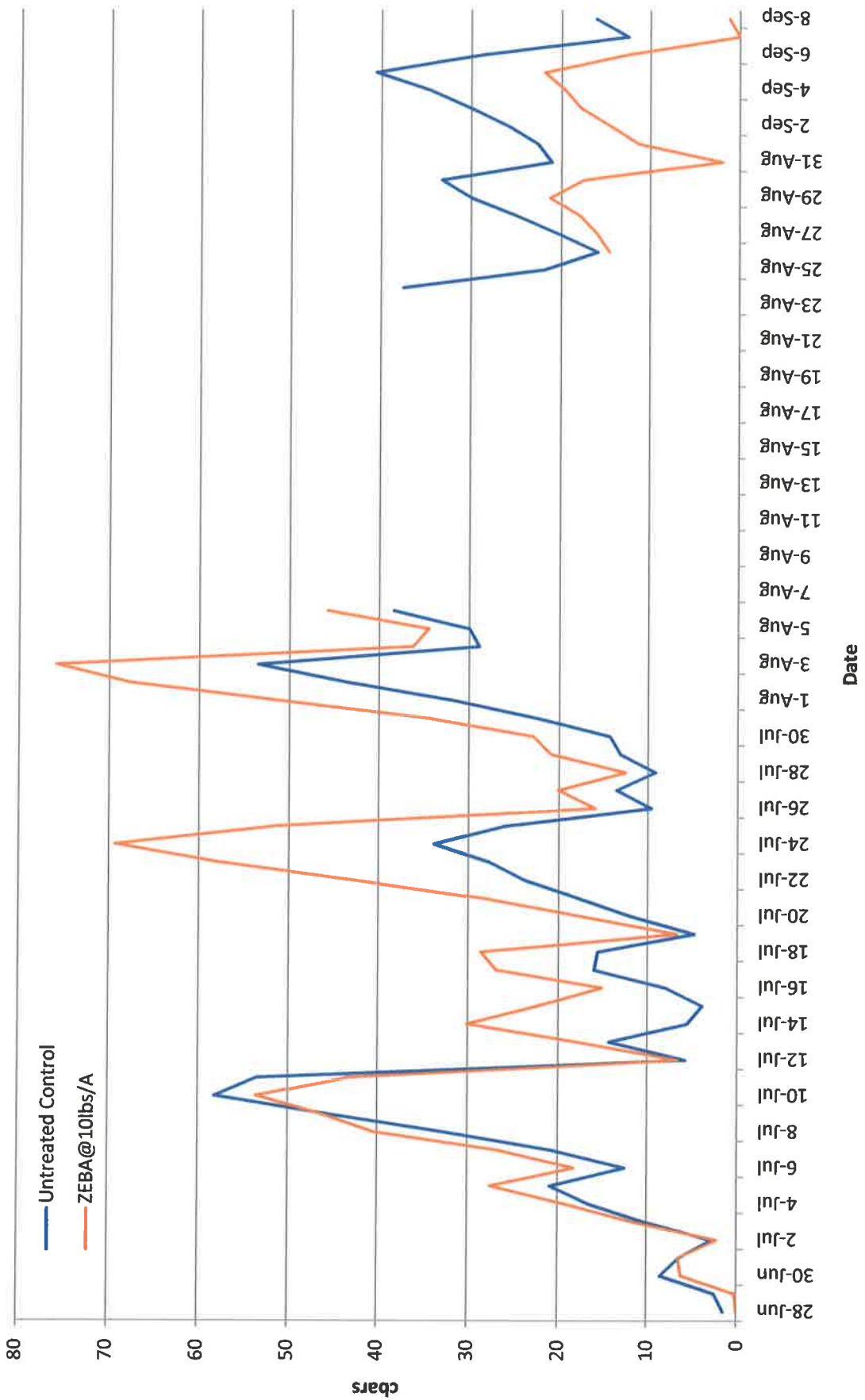
PLRV symptoms include WP - whole plant, LL - lower leaf rolling, CC - color change and P - purpling.

Rating is 0-3+ with 0 equal to no symptoms and 3 equal to typical leaf roll symptoms.

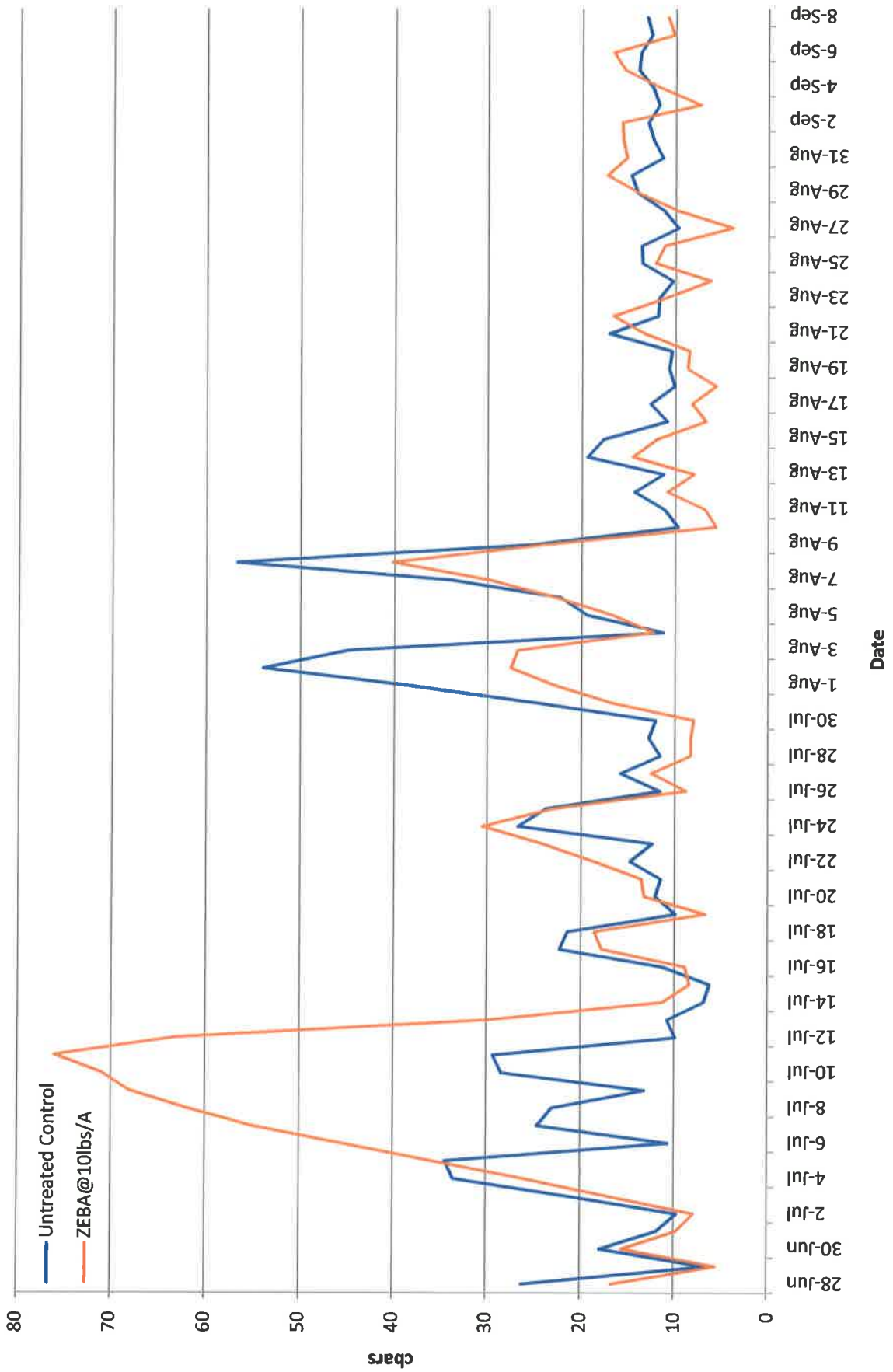
PVY symptoms include normal mosaic and some LD - leaf drop (a severe reaction to PVY). Rating is 0-5+ with 0 equal to no symptoms and 5 equal to easily recognizable mosaic symptoms.

PLRV risk is associated with in-field spread where 0-4.9% equals low risk, 5+-9.9% equals medium risk, and 10%+ equals high risk.

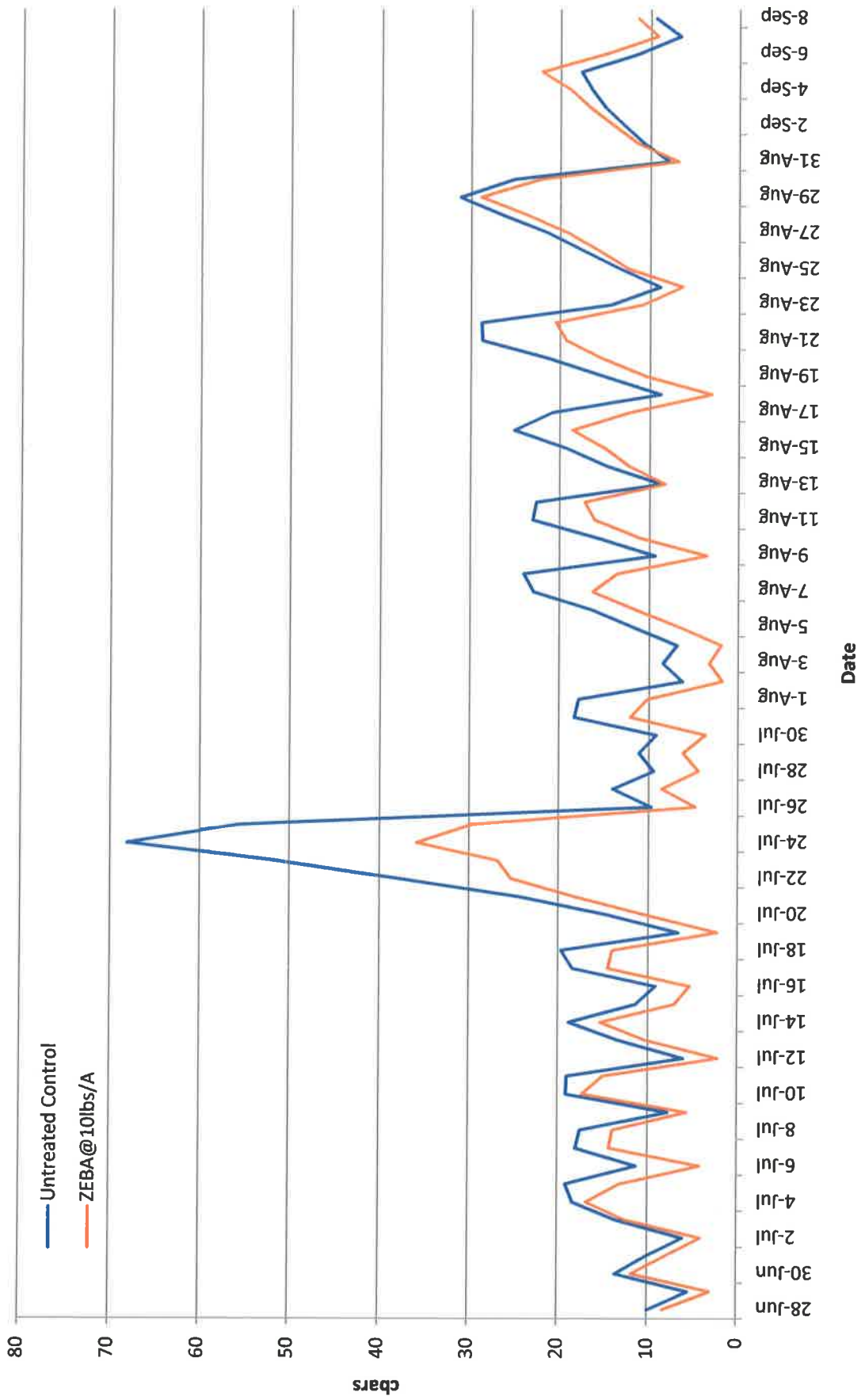
# Comparing Soil Moisture Levels in Untreated Control and ZEBA Applied In-Furrow in Russet Burbank, Deficit Irrigation (75% of irrigation required by ZEBA plots), SLVRC, 2011.



# Comparing Soil Moisture Levels in Untreated Control and ZEBA Applied In-Furrow in Russet Burbank, Irrigation Based on ET, SLVRC, 2011.



# Comparing Soil Moisture Levels in Untreated Control and ZEBA Applied In-Furrow in Russet Burbank, Irrigation Based on ZEBA Plot Readings, SLVRC, 2011.





**2012 Research Worksheet for CPAC Research Sub-committee**

Amount available CPAC \$  
 Royalties \$

Project	PI/Co-PI	Source	Proposed \$	Granted \$
Mgmt of CO potato for sustainable tuber yield and quality	Essah	CPAC	49,000	
Potato breeding and selection for Colorado	Holm/Gray	CPAC	63,000	
Potato postharvest physiology	Jayanty	CPAC	48,500	
Economic impact of the special subdistrict #1 assessment on potato growers in the SLV	Bond/Huber	CPAC	16,110	
Potato disease management	Davidson/Houser/Haslar	CPAC	33,000	
Rotational crop options from CRKN and for powdery scab mgmt in SLV potato cropping systems	O'Neill/Ingham	CPAC	52,950	
Crop production practices to optimize profitability through increased irrigation efficiency	Groeneveld/Agro Eng.	CPAC	30,397	

**Total CPAC 292,957**

Using soil amendments to improve soil health and optimize profitability in potato production	Essah/Vivanco	Royalty	19,500
Understanding factors involved in netting loss from Russet potatoes - Year 2	Jayanty	Royalty	25,000
Studying biguanide and related compounds in Colorado cultivars (2 years)	Jayanty	Royalty	24,000
Studying selenium and sulfur uptake and developing methods to enhance sulfur accumulation in SLV soils by CO potato cultivars (2 years)	Jayanty	Royalty	20,000
Increasing the nutrient and phytochemical status of CO grown potatoes	Reddivari/Holm	Royalty	17,212
	<b>Total</b>	<b>Royalty</b>	<b>105,712</b>