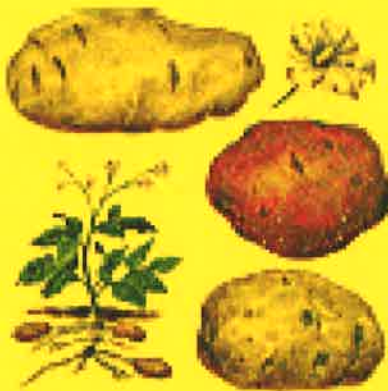


2007
RESEARCH REPORT
Extension Potato
Disease Control Project



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&
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Colorado State University
SLV Research Center

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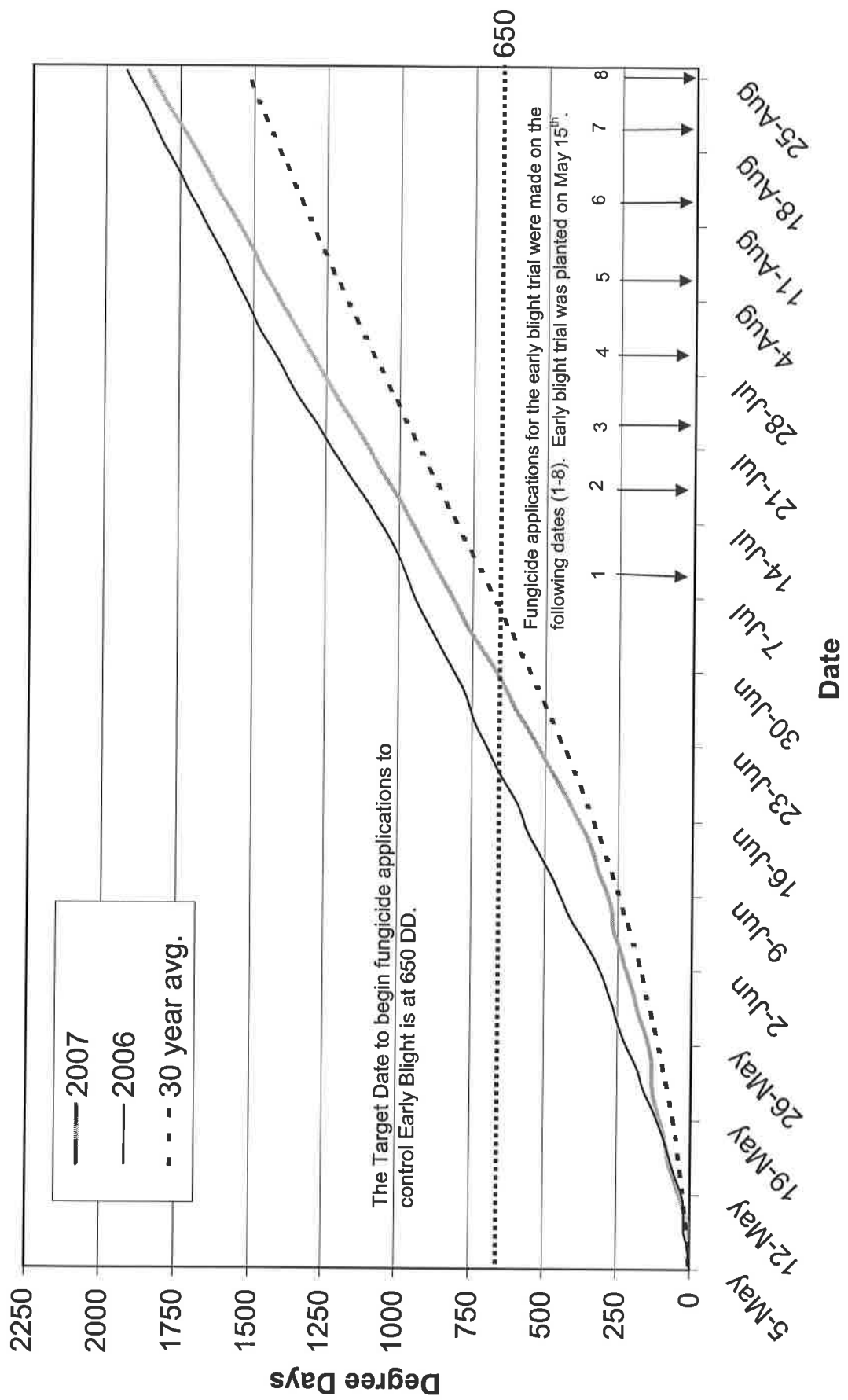
Early Blight Fungicide Trials

Research in previous years has shown that strobilurin products (i.e. Amistar, Headline, Quadris) worked well in controlling early blight. 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.

All of the treatment schedules that were evaluated this year used chemicals that are currently available to producers. Each of these schedules used products with different chemistries to determine the effectiveness of combinations of chemistries for early blight control. Additionally, these schedules should decrease possible resistance to a particular chemistry. Also, several schedules limit fungicide applications (2-4) during the season. The goal is to identify good early blight control with a reduction in total cost per acre. Several treatment schedules have reduced early blight levels with limited applications, which also result in a lower cost to the grower.

Based on previous work with the DACOM/Plant-plus system, fungicide applications were made later in the season. As in the previous two years, these late applications (Trt. #'s 10-12) performed very well when compared to the applications starting at the 650 DD threshold. This practice, however, will not be applicable if growers are interested in protecting foliage against potential late blight infections. It will be important for growers to review the spray practices, chemical list, etc. as outlined in the 2008 late blight management guidelines.

Early Blight Degree Days for the San Luis Valley



The Target Date to begin fungicide applications to control Early Blight is at 650 DD.

Fungicide applications for the early blight trial were made on the following dates (1-8). Early blight trial was planted on May 15th.

- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8

2007 POTATO – FOLIAR EARLY BLIGHT FUNGICIDE TRIAL

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 CO₂ 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 9; July 16; July 23; July 30; August 6; August 13; August 20; August 27

Planted: May 15, 2007

Plot Design: Randomized complete block

Plot Size: 4 - 20 foot rows per treatment per replication, treatments applied to center two rows and data was taken on center two rows.

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, 20N through sprinkler after tuber set

Herbicide: Matrix, 1.5 oz./A + Eptam, 4.5 pt./A

Insecticide: None

Vine Killer: Rotobeat vines on September 4, 2007

Harvested: September 26, 27 & 28, 2007

DATA:

Disease: Early blight disease incidence based on percent leaves infected, readings taken weekly starting August 8, 2007. Due to high Early Blight incidence at the date of the last two disease readings (August 23rd and August 30th), a vigor reading was also taken (1-5, 1 = low vigor & 5 = high vigor).

AUDPC: **Area Under the Disease Progress Curve (AUDPC) is a measure of the progression of Early Blight, starting on August 8th and ending with the last reading on August 30th. 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: 2-20 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 2007.

<u>Program</u>	<u>Products</u>	<u>Rate</u>	<u>Application Schedule^a</u>
1	Untreated Control	-	-
2	Scala	4.0 fl oz./A	1,5
	Echo 720	1.0 pt./A	1,5
	Echo 720	1.5 pt./A	3,7
3	Bravo WS	1.5 pt./A	1
	Quadris	6.1 fl.oz./A	3
	Scala	4.0 fl oz./A	5
	Bravo WS	1.5 pt./A	7
4	Quadris	6.1 fl.oz./A	2
	Bravo WS	1.5 pt./A	4
	Endura	2.5 oz./A	6
5	Echo 720	1.5 pt./A	1
	Echo 720	1.0 pt./A	3,5,7
	Scala	7.0 fl oz./A	3,7
	Reason	4.0 fl oz./A	5
	Bond	0.1% v/v	5
6	Endura	2.5 oz./A	1
	Headline	6.1 fl oz./A	4
7	Headline	6.1 fl oz./A	1,5
	Endura	2.5 oz./A	3
	Dithane Rainshield	2.0 lbs./A	7
8	Bravo WS	1.5 pt./A	1
	Quadris	6.1 fl.oz./A	3
	Dithane Rainshield	2.0 lbs./A	5
9	Quadris	6.1 fl.oz./A	1
	Bravo WS	1.5 pt./A	3
	Endura	2.5 oz./A	5
	Dithane Rainshield	2.0 lbs./A	7
10	Dithane Rainshield	2.0 lbs./A	4,6
	Bravo WS	1.5 pt./A	5
11	Headline	6.1 fl oz./A	4,7
	Endura	2.5 oz./A	5,8
	Dithane Rainshield	2.0 lbs./A	6
12	Quadris	6.1 fl.oz./A	4,7
	Bravo WS	1.5 pt./A	5,8
	Dithane Rainshield	2.0 lbs./A	6

^a Schedule for applying treatments on a weekly basis, schedule started on July 9 (i.e. 1 = week 1, 2 = week 2).

Table 2. Effect of fungicide programs on the incidence of early blight in the cultivar Russet Norkotah Selection 8, San Luis Valley, Colorado, 2007; No Late Blight occurred within the trial.

Treatment	Percent Leaves Infected (with one or more lesion)				AUDPC ^a	Vigor ^b	
	August 8	August 15	August 23	August 30		August 23	August 30
1	82.9 a	99.6 a	100.0	100.0	1338.6 a	0.4 h	0.0 e
2	14.6 d-g	66.7 ef	99.8	100.0	983.7 f	2.3 cd	0.8 bc
3	22.5 bc	90.7 ab	100.0	100.0	1096.0 b	1.1 g	0.1 de
4	17.9 c-f	82.5 bc	99.9	100.0	1051.2 c	2.6 bc	1.0 ab
5	14.3 efg	69.9 def	100.0	100.0	994.7 ef	1.8 def	0.3 cde
6	10.8 g	81.3 bc	100.0	100.0	1022.0 c-f	1.9 def	0.1 de
7	12.3 fg	72.1 c-f	100.0	100.0	995.3 ef	1.6 efg	0.3 cde
8	16.2 c-g	80.4 bcd	100.0	100.0	1038.3 cd	1.4 fg	0.3 cde
9	20.2 b-e	63.3 f	99.9	100.0	992.2 ef	2.1 cde	0.4 cde
10	26.7 b	67.9 ef	99.4	100.0	1028.9 cde	3.0 ab	1.5 a
11	21.1 bcd	67.9 ef	99.4	100.0	1009.5 def	3.4 a	1.5 a
12	20.6 b-e	77.1 cde	99.8	100.0	1041.1 cd	2.5 bc	0.6 bcd
LSD(P=0.05)	6.66	10.80	NS	NS	41.60	0.58	0.51

^aAUDPC is the Area Under the Disease Progress Curve, accumulated from August 8 until August 30.

^bVigor readings were taken on August 23rd and 30th with a rating of 1 to 5 (1 = poor and 5 = healthy). Means followed by the same letters are not significantly different at P=0.05 for AUDPC.

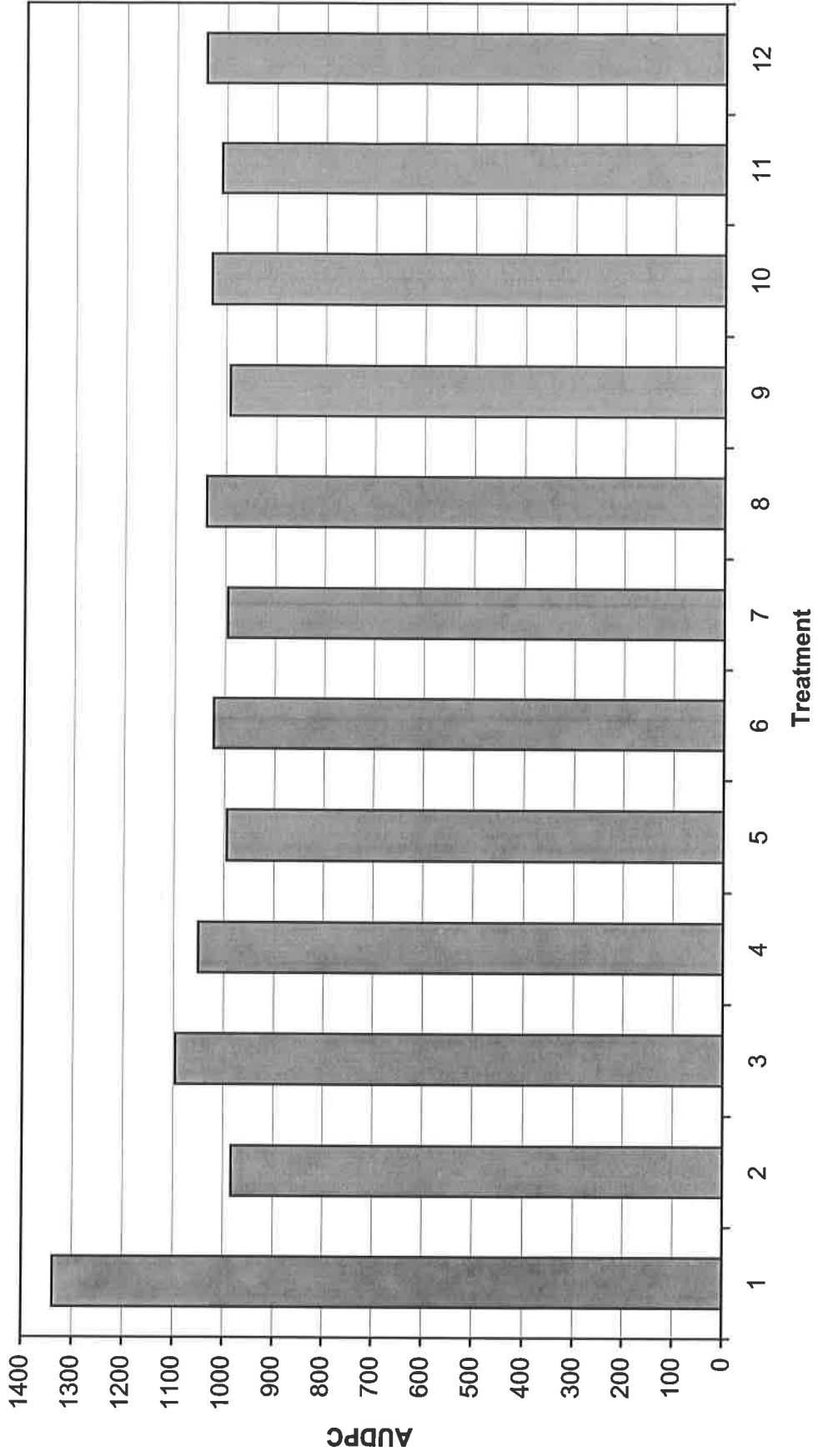
Table 3. Effect of fungicide programs on tuber yield and quality in the cultivar Russet Norkotah Selection 8, San Luis Valley, Colorado, 2007.

Treatment	Percent ^a					
	< 4 oz.	4-10 oz.	> 10 oz.	US No 2's	Culls	Cwt/A ^b
1	21.4	59.4	16.1	1.8	1.4	355.3
2	13.3	52.7	27.3	3.0	3.6	349.4
3	18.2	57.7	19.5	2.6	2.0	353.2
4	15.0	55.5	23.4	3.3	2.8	377.6
5	17.7	50.4	26.1	2.4	3.4	366.8
6	14.4	55.0	25.2	3.4	2.1	356.4
7	17.2	63.1	16.0	1.6	2.2	375.0
8	18.0	56.3	21.3	1.1	3.4	327.2
9	14.3	60.6	19.4	1.8	4.0	406.6
10	14.4	55.8	24.7	1.9	3.2	369.7
11	15.0	60.6	19.5	1.5	3.5	392.2
12	15.0	60.5	20.2	1.5	2.8	369.1
LSD(P=0.05)	NS	NS	NS	NS	NS	NS

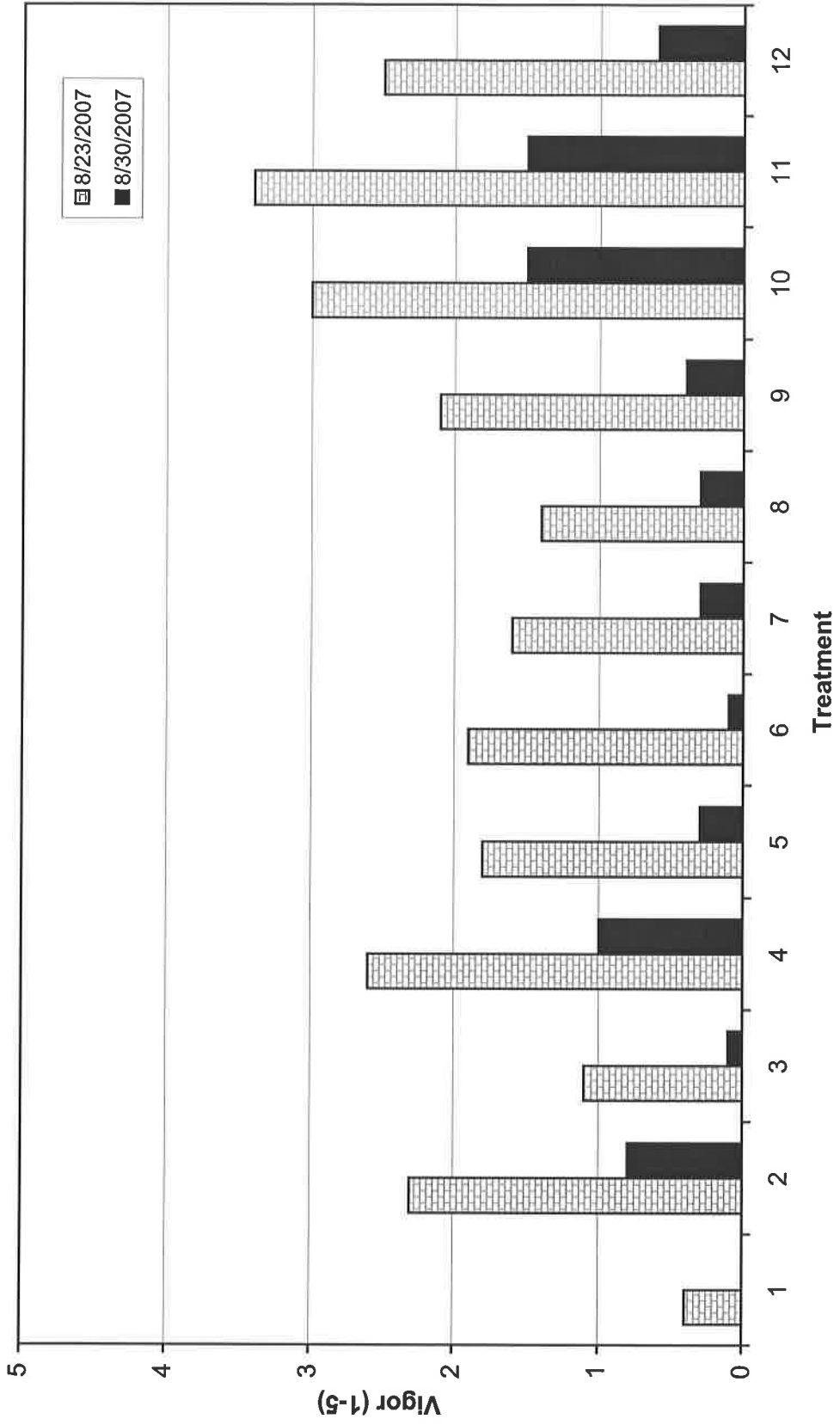
^a Based on tuber weight in kilograms, mean of four replications.

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

**Area Under the Disease Progress Curve for Early Blight
2007 Foliar Fungicide Trial, Colorado State University
San Luis Valley Research Center, Center, CO
Total Amount of Accumulated Early Blight - Final Readings Taken on August 30, 2007**



Plant Vigor Reading
2007 Early Blight Foliar Fungicide Trial
Colorado State University, San Luis Valley Research Center, Center, CO
Vigor Readings Taken on August 23rd & 30th, 2007



2007 POTATO – FOLIAR 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 and Keystone Russet, cut seed, 2-4 oz.

Application: All treatments applied using an R & D CO₂ 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 9; July 16; July 23; July 30; August 6; August 13

Planted: May 15, 2007

Plot Design: Randomized complete block

Plot Size: 4 - 20 foot rows per treatment per replication, treatments applied to center two rows and data was taken on center two rows.

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, 20N through sprinkler after tuber set

Herbicide: Matrix, 1.5 oz./A + Eptam, 4.5 pt./A

Insecticide: None

Vine Killer: Rotobeat vines on September 4, 2007

Harvested: September 27, 2007

DATA:

Disease: Early blight disease incidence based on percent leaves infected, readings taken weekly starting August 8, 2007. Due to high Early Blight incidence at the date of the last two disease readings (August 23rd and August 30th), a vigor reading was also taken (1-5, 1 = low vigor & 5 = high vigor).

AUDPC: Area Under the Disease Progress Curve (AUDPC) is a measure of the progression of Early Blight, starting on August 8th and ending with the last reading on August 30th. 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: 2-20 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 foliar and post harvest early blight control, San Luis Valley, Colorado 2007.

<u>Program</u> ^a	<u>Products</u>	<u>Rate</u>	<u>Application Schedule</u> ^b	<u>Est. total cost/A</u> ^c
1 (K)	Untreated Control			-
2 (K)	Dithane Rainshield Quadris	2.0 lb./A 6.1 fl.oz./A	1,5 3	\$24.41
3 (K)	Headline Bravo WS Endura	6.1 fl.oz./A 1.5 pt./A 2.5 oz./A	1 3 5	\$34.03
4 (K)	Dithane Rainshield Quadris	2.0 lb./A 6.1 fl.oz./A	4,6 5	\$24.41
5 (K)	Headline Bravo WS Endura	6.1 fl.oz./A 1.5 pt./A 2.5 oz./A	4 5 6	\$34.03
6 (N)	Untreated Control			-
7 (N)	Dithane Rainshield Quadris	2.0 lb./A 6.1 fl.oz./A	1,5 3	\$24.41
8 (N)	Headline Bravo WS Endura	6.1 fl.oz./A 1.5 pt./A 2.5 oz./A	1 3 5	\$34.03
9 (N)	Dithane Rainshield Quadris	2.0 lb./A 6.1 fl.oz./A	4,6 5	\$24.41
10 (N)	Headline Bravo WS Endura	6.1 fl.oz./A 1.5 pt./A 2.5 oz./A	4 5 6	\$34.03

^aTreatments 1 through 5 were planted with the cultivar Keystone Russet. Treatments 6 through 10 were planted with the cultivar Russet Norkotah selection 8.

^bSchedule for applying treatments on a weekly basis, schedule started on July 9 (i.e. 1 = week 1, 2 = week 2).

^cThese prices do not include application costs. Prices based on fungicide costs in 2007.

Table 2. Effect of fungicide programs on the incidence of early blight in the cultivars Keystone Russet (treatments 1-5) and Russet Norkotah Selection 8 (treatments 6-10), San Luis Valley, Colorado, 2007; No Late Blight occurred within the trial.

Treatment ^a	Percent Leaves Infected (with one or more lesion)				AUDPC ^b	Vigor (Aug. 23) ^c	Vigor (Aug. 30) ^c
	August 9	August 15	August 23	August 30			
1	37.5 a	92.9 a	99.9 a	100.0	1156.2 a	2.8 c	1.3 c
2	9.8 b	72.5 b	99.6 ab	100.0	986.6 b	3.3 b	2.1 b
3	5.9 b	47.9 d	98.3 c	100.0	882.3 c	3.5 ab	2.6 ab
4	8.3 b	59.2 c	98.4 bc	100.0	930.3 c	3.8 a	2.9 a
5	6.0 b	51.0 cd	97.8 c	100.0	891.5 c	3.6 ab	2.9 a
6	66.7 a	99.4 a	100.0 a	100.0	1281.1 a	0.6 c	0.0 c
7	22.5 b	72.1 b	99.9 a	100.0	1030.8 b	2.1 b	0.5 b
8	16.7 b	61.7 c	99.3 b	100.0	971.6 c	2.4 b	0.8 b
9	21.0 b	69.2 bc	100.0 a	100.0	1015.6 bc	2.3 b	0.5 b
10	15.6 b	70.0 b	98.6 c	100.0	994.5 bc	3.3 a	1.4 a
LSD(P=0.05) ^a	12.79	9.38	1.25	NS	51.89	0.44	0.52
LSD(P=0.05)^a	9.63	8.03	0.53	NS	48.50	0.55	0.40

^aThis trial was analyzed in two separate sets, based on potato cultivar. Due to differences between cultivars, each treatment that was planted to the same cultivar was analyzed against the other treatments planted to that cultivar. Russet Norkotah selection 8 treatments are in bold and Keystone Russet treatments are not in bold.

^bAUDPC is the Area Under the Disease Progress Curve, accumulated from August 9 until August 30.

^cVigor readings were taken on August 23 & 30th with a rating of 1 to 5 (0 = dead plant, 5 = healthy).

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

Table 3. Effect of fungicide programs on tuber yield and quality in the cultivars Keystone Russet (treatments 1-5) and Russet Norkotah Selection 8 (treatments 6-10), San Luis Valley, Colorado, 2007.

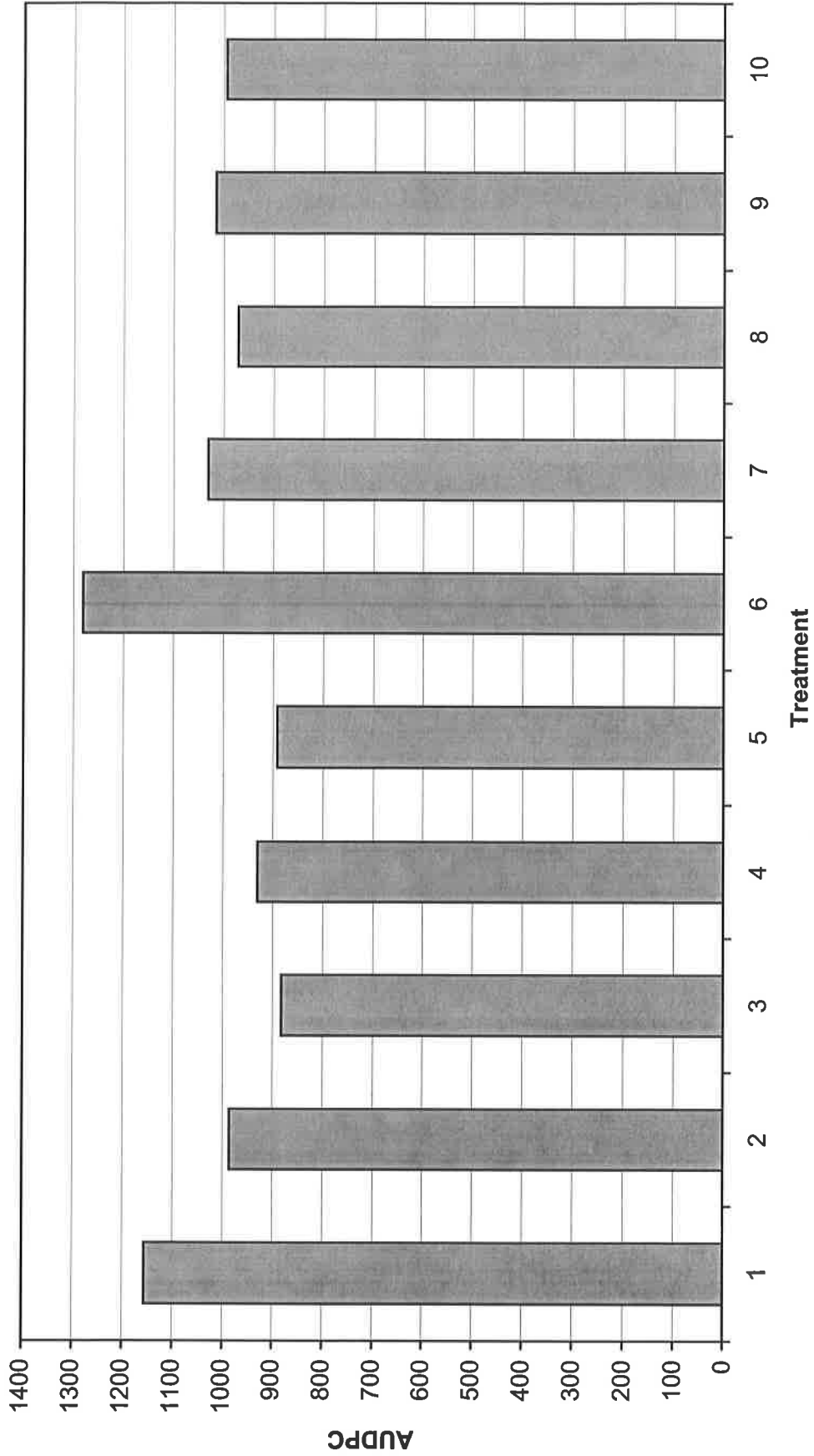
Treatment ^a	Percent ^b					
	< 4 oz.	4-10 oz.	> 10 oz.	US No 2's	Culls	Cwt/A ^c
1	29.9	61.0	5.9	2.1	1.1	379.9
2	22.8	65.2	9.0	2.4	0.7	379.7
3	21.3	66.4	9.4	1.8	1.1	416.3
4	25.3	61.9	9.8	2.1	1.0	382.0
5	22.0	65.8	9.3	1.6	1.4	401.9
6	17.5	57.5	20.3	2.5	2.1	328.2
7	14.2	55.1	27.7	1.8	1.2	318.1
8	14.6	56.0	22.6	4.3	2.4	347.7
9	17.9	51.8	23.7	3.9	2.7	330.8
10	14.5	55.4	26.6	2.0	1.4	349.4
LSD(P=0.05) ^a	NS	NS	NS	NS	NS	NS
LSD(P=0.05)^a	NS	NS	NS	NS	NS	NS

^a This trial was analyzed in two separate sets, based on potato cultivar. Due to differences between cultivars, each treatment that was planted to the same cultivar was analyzed against the other treatments planted to that cultivar. Russet Norkotah selection 8 treatments are in bold and Keystone Russet treatments are not in bold.

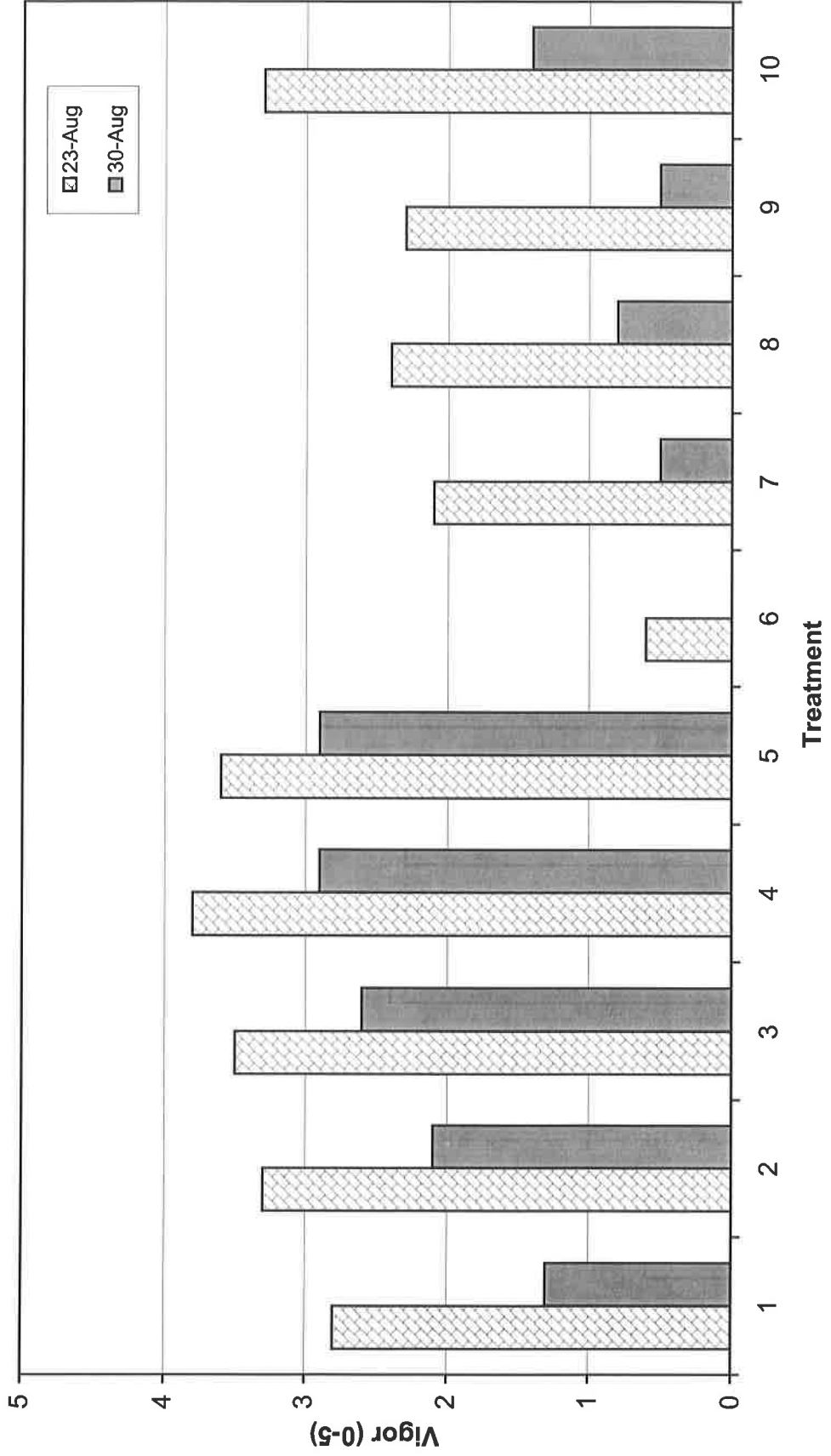
^b Based on tuber weight in kilograms, mean of four replications.

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

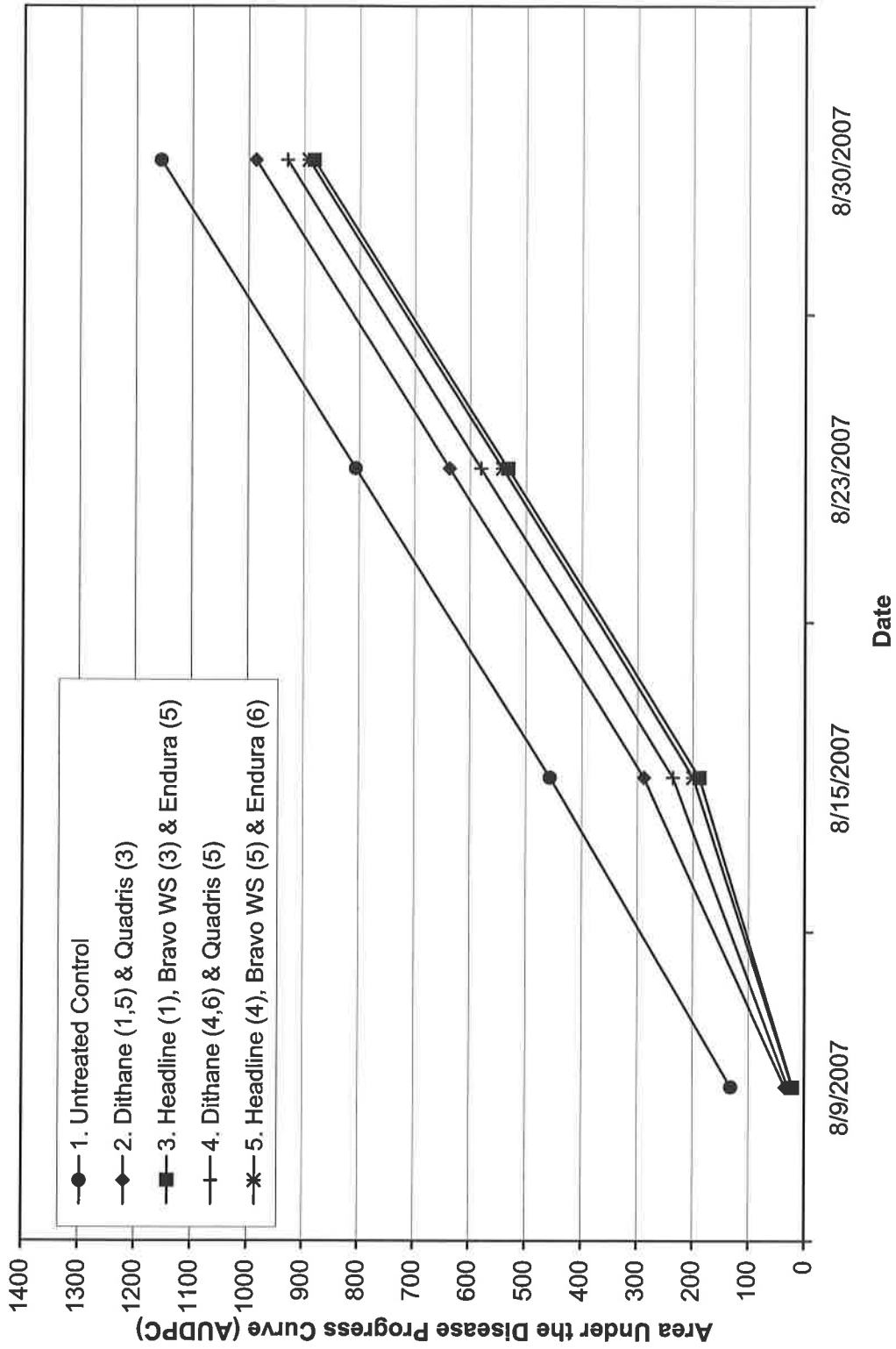
Area Under the Disease Progress Curve for Early Blight
2007 Post Harvest Early Blight Fungicide Trial, Colorado State University
San Luis Valley Research Center, Center, CO
Total Amount of Accumulated Early Blight - Final Readings Taken August 30, 2007



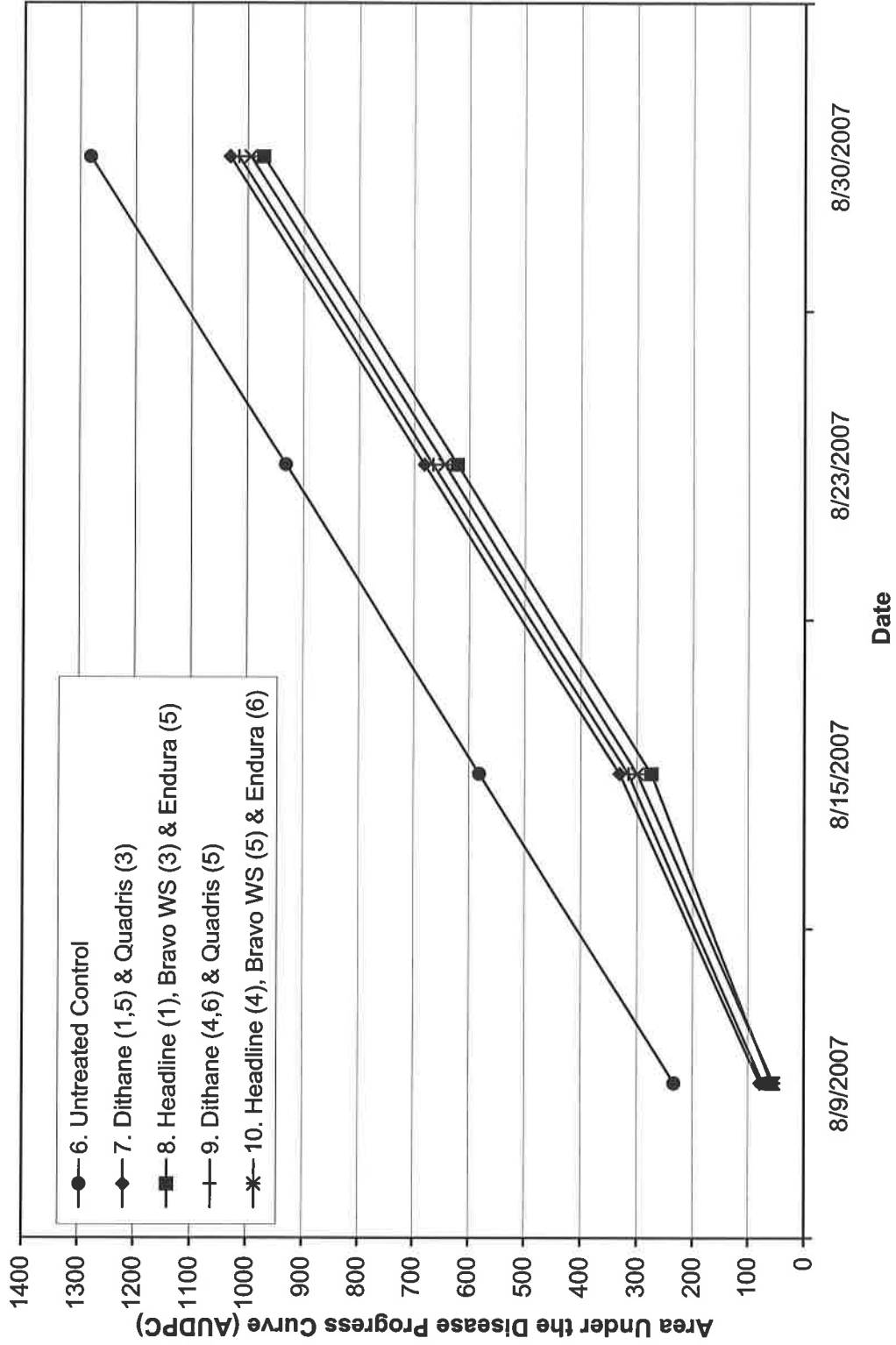
Plant Vigor Reading
2007 Post Harvest Early Blight Fungicide Trial
Colorado State University, San Luis Valley Research Center, Center, CO
Vigor Readings Taken on August 23 & 30, 2007



2007 Early Blight Post Harvest Fungicide Trial, Keystone Russet Treatments
Colorado State University
San Luis Valley Research Center, Center, CO



2007 Early Blight Post Harvest Fungicide Trial, Russet Norkotah Sel. 8 Treatments
Colorado State University
San Luis Valley Research Center, Center, CO



2007 POTATO - EARLY BLIGHT SYNGENTA DEMONSTRATION TRIAL

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

Location: San Luis Valley Research Center, Center, CO

Cultivar: Russet Norkotah Selection 3, cut seed, 2-4 oz.

Application: All treatments applied using an R & D CO₂ 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 13; July 16; July 23; July 30; August 6; August 13

Planted: May 16, 2007

Plot Design: Randomized complete block

Plot Size: 4 - 20 foot rows per treatment per replication, treatments applied to center two rows and data was taken on center two rows.

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, 20N through sprinkler after tuber set

Herbicide: Matrix, 1.5 oz./A + Eptam, 4.5 pt./A

Insecticide: None

Vine Killer: Rotobeat vines on September 4, 2007

Harvested: September 28, 2007

DATA:

Disease: Early blight disease incidence based on percent leaves infected, readings taken weekly starting August 2, 2007. Due to high Early Blight incidence at the date of the last two disease readings (August 23rd and August 30th), a vigor reading was also taken (1-5, 1 = low vigor & 5 = high vigor).

AUDPC: Area Under the Disease Progress Curve (AUDPC) is a measure of the progression of Early Blight, starting on August 2nd and ending with the last reading on August 30th. 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: 2-20 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 2007.

<u>Program</u>	<u>Products</u>	<u>Rate</u>	<u>Application Schedule^a</u>
1	Untreated Control	-	-
2	Quadris	6.0 fl.oz./A	1
	Bravo WS	1.5 pt./A	3
	Revus Top ^b	7.0 floz./A	5
	Induce pH	0.125% v/v	5
3	Revus Top	7.0 floz./A	1,3,5
	Induce pH	0.125% v/v	1,3,5
4	Quadris	6.0 fl.oz./A	2
	Bravo WS	1.5 pt./A	4
	Revus Top	7.0 floz./A	6
	Induce pH	0.125% v/v	6
5	Quadris	6.0 fl.oz./A	1,4
	Bravo WS	1.5 pt./A	2,5
	Revus Top	7.0 floz./A	3,6
	Induce pH	0.125% v/v	3,6

^a Schedule for applying treatments on a weekly basis, schedule started on July 13 (i.e. 1 = week 1, 2 = week 2).

^b Revus Top has not yet been labeled for use on Early Blight in Colorado.

Table 2. Effect of fungicide programs on the incidence of early blight in the cultivar Russet Norkotah Selection 3, San Luis Valley, Colorado, 2007; No Late Blight occurred within the trial.

Treatment	Percent Leaves Infected (with one or more lesion)					AUDPC ^a	Vigor ^b	
	August 2	August 10	August 16	August 23	August 30		August 23	August 30
1	2.8 a	18.8 a	87.4 a	99.9 a	100.0 a	1081.0 a	3.1 b	2.4 b
2	1.7 ab	3.9 b	40.8 bc	98.9 a	99.7 a	857.5 b	3.4 a	2.9 a
3	1.0 b	2.8 b	54.2 b	98.9 a	99.8 a	897.9 b	3.5 a	3.0 a
4	1.1 b	5.3 b	44.6 b	98.0 ab	99.7 a	870.3 b	3.5 a	3.1 a
5	0.7 b	2.2 b	24.2 c	96.0 b	98.8 b	776.4 c	3.5 a	3.3 a
LSD(P=0.05)	1.10	3.91	18.07	2.49	0.67	68.03	0.23	0.39

^aAUDPC is the Area Under the Disease Progress Curve, accumulated from August 2 until August 30.

^b Vigor readings were taken on August 23rd and 30th with a rating of 1 to 5 (1 = poor and 5 = healthy). Means followed by the same letters are not significantly different at P=0.05 for AUDPC.

Table 3. Effect of fungicide programs on tuber yield and quality in the cultivar Russet Norkotah Selection 3, San Luis Valley, Colorado, 2007.

Treatment	Percent ^a					Cwt/A ^b
	< 4 oz.	4-10 oz.	> 10 oz.	US No 2's	Culls	
1 ^c	18.5 a	54.2	22.5	3.2	1.6	356.2
2	14.4 b	50.7	30.4	1.4	3.1	430.9
3	18.2 a	44.2	35.3	1.5	0.9	426.9
4	15.8 ab	50.0	29.8	1.5	2.9	417.6
5	13.6 b	45.0	35.9	1.4	4.2	402.3
LSD(P=0.05)	3.57	NS	NS	NS	NS	NS

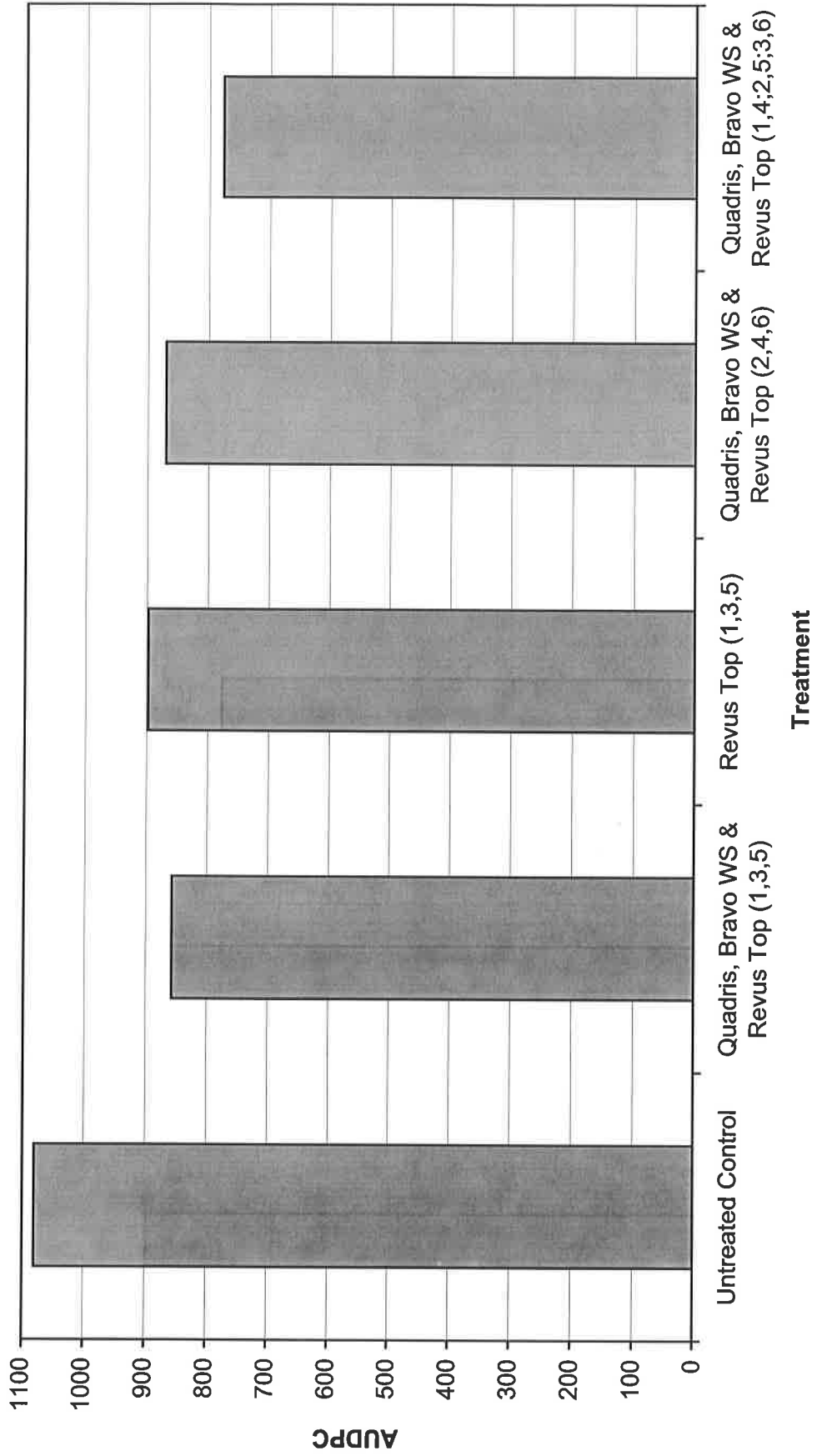
^a Based on tuber weight in kilograms, mean of four replications.

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

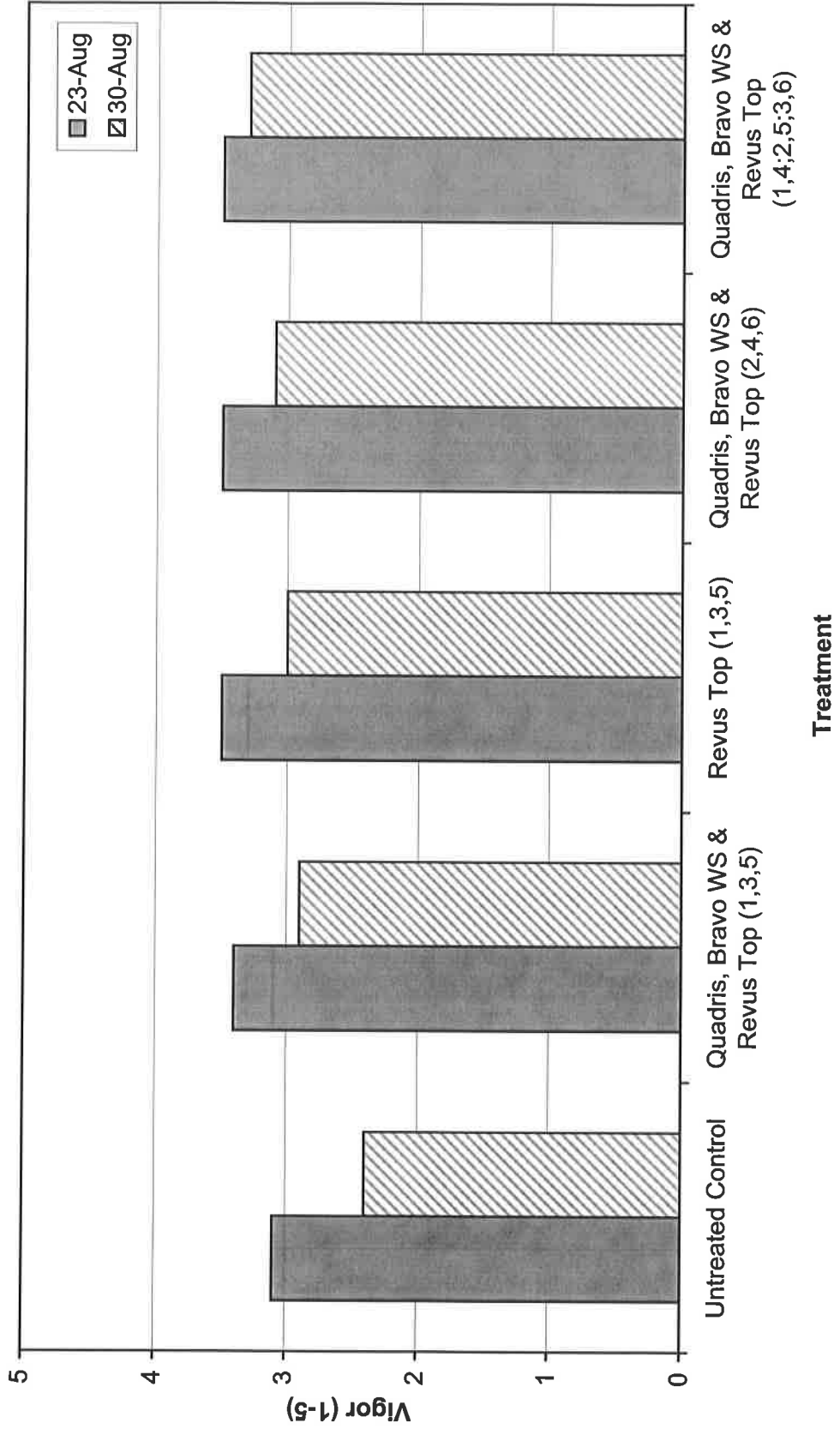
^c The yield data for treatment #1, rep II is missing. The overall mean is based on an average of the remaining three replications.

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

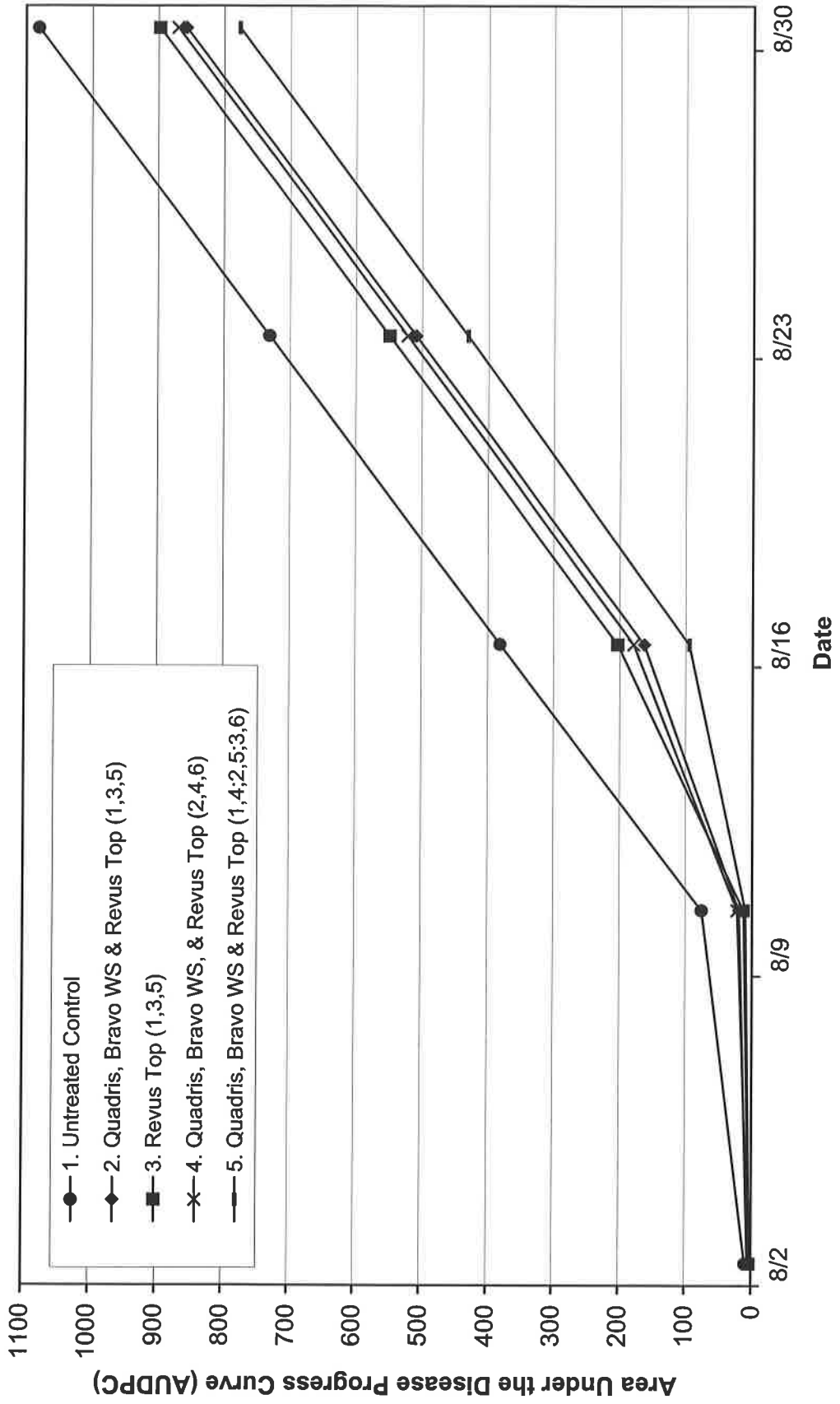
Area Under the Disease Progress Curve for Early Blight
2007 Foliar Fungicide Trial, Colorado State University
San Luis Valley Research Center, Center, CO
Total Amount of Accumulated Early Blight - Final Readings Taken on August 30, 2007



Plant Vigor Reading
2007 Early Blight Revus Top Fungicide Trial
Colorado State University, San Luis Valley Research Center, Center, CO
Vigor Readings Taken on August 23 & 30, 2007

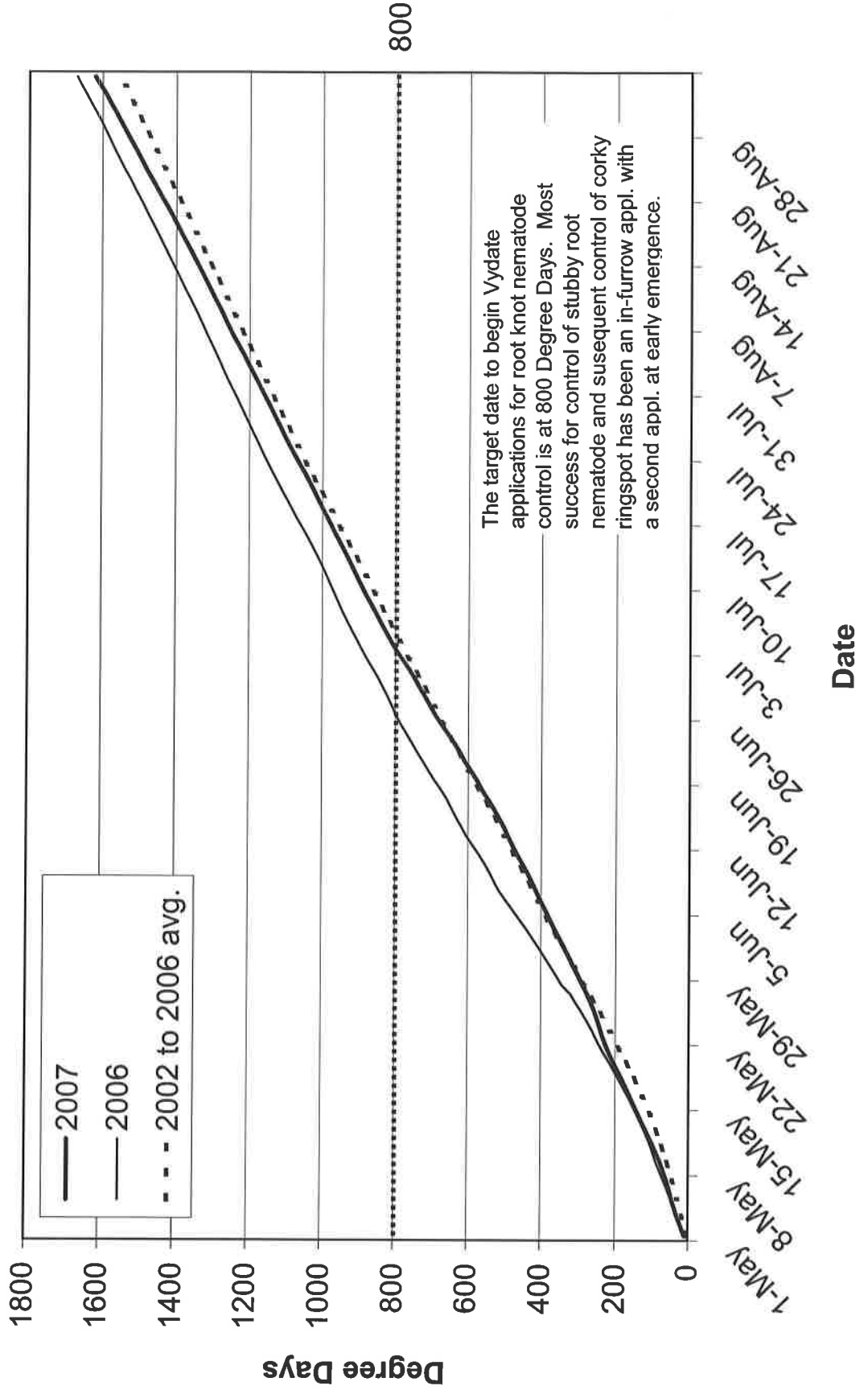


2007 Early Blight Fungicide Trial, Revus Top Treatments
Colorado State University
San Luis Valley Research Center, Center, CO



Root Knot Nematode Degree Days

Root Knot Nematode Degree Days for the San Luis Valley



SLV Late Blight Forecasting

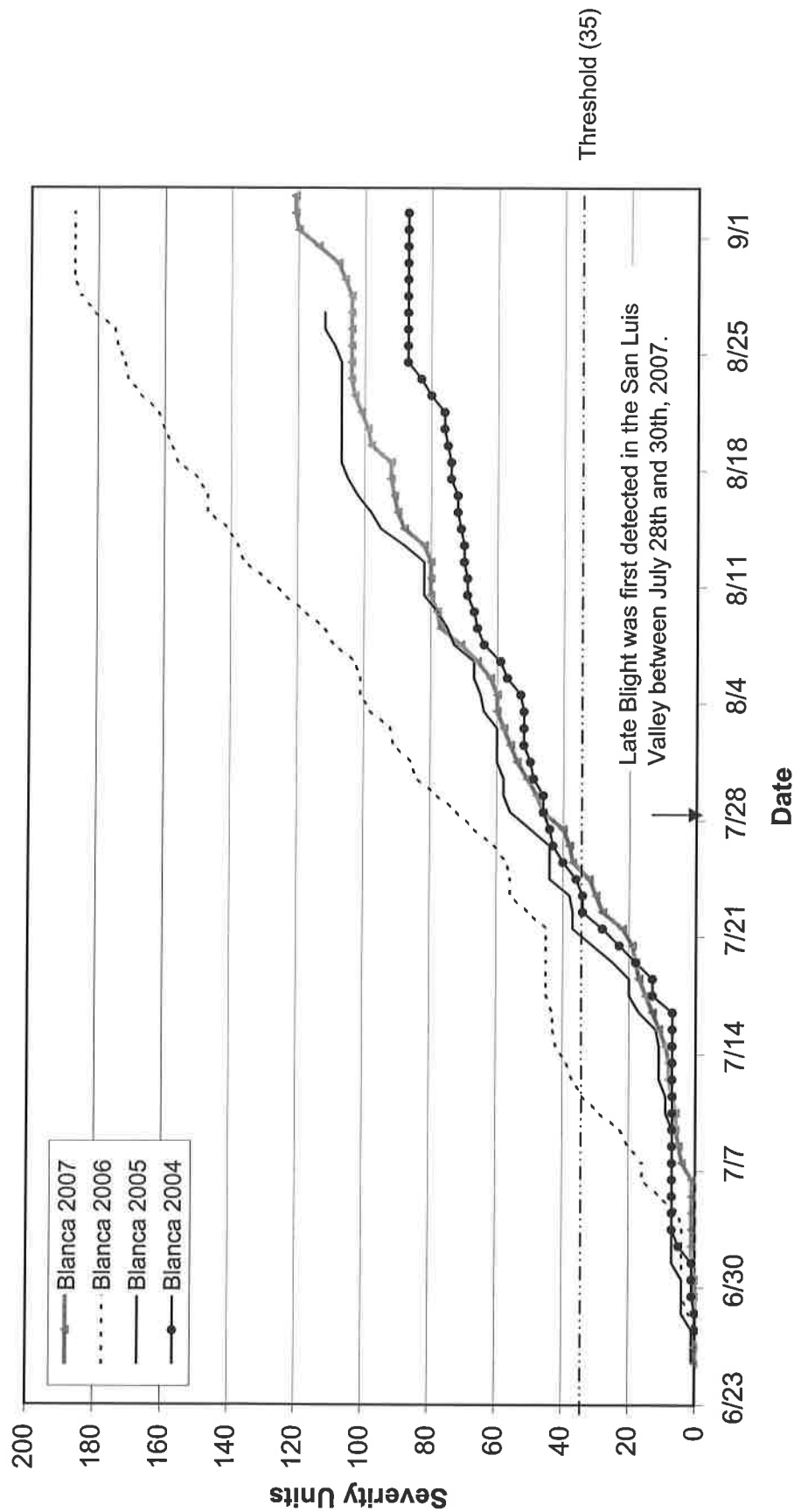
Over the last several years weather stations have been positioned at three locations around the San Luis Valley (Blanca, Hooper, & Sargent) in order to determine late blight severity units. This was continued in 2007 in order to determine the potential risk we have for late blight here in the valley.

A uMetos weather station was used at the Blanca and Hooper sites to determine late blight severity. This unit uses the Fry model 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, foliar late blight can occur.

At the Sargent site, a Watch Dog weather station was used to determine foliar 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.

In 2007, late blight was discovered near the Blanca site in the southern end of the San Luis Valley. Foliar symptoms were discovered on July 27-29, 2007. This coincided with in four days of the fry unit predictive threshold and within eight days of the Wallin model threshold. This indicates that these models are performing as expected with the Fry model being more accurate than the Wallin model.

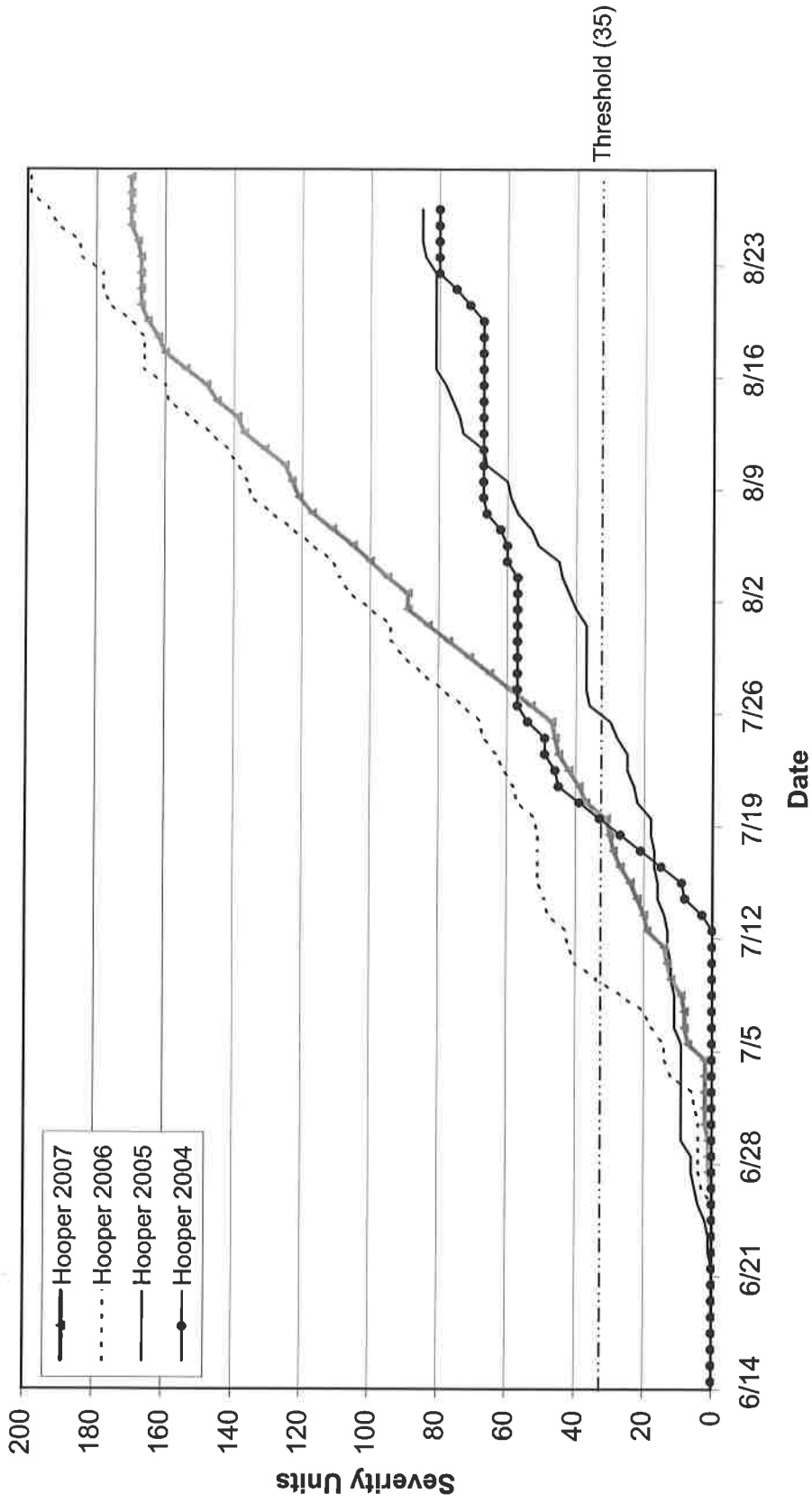
Potato Late Blight Fry Units, San Luis Valley (Blanca site), Colorado, 2004 - 2007
 Moderate Susceptible Varieties



Footnote:

- The Fry Late Blight model was used to calculate the severity units.
- The 2005 Blanca weather station was set up on June 17, 2005.
- The 2007 Blanca weather station was set up on June 22, 2007.
- The 2004 Blanca weather station was set up on June 25, 2004.
- The 2006 Blanca weather station was set up on June 23, 2006.

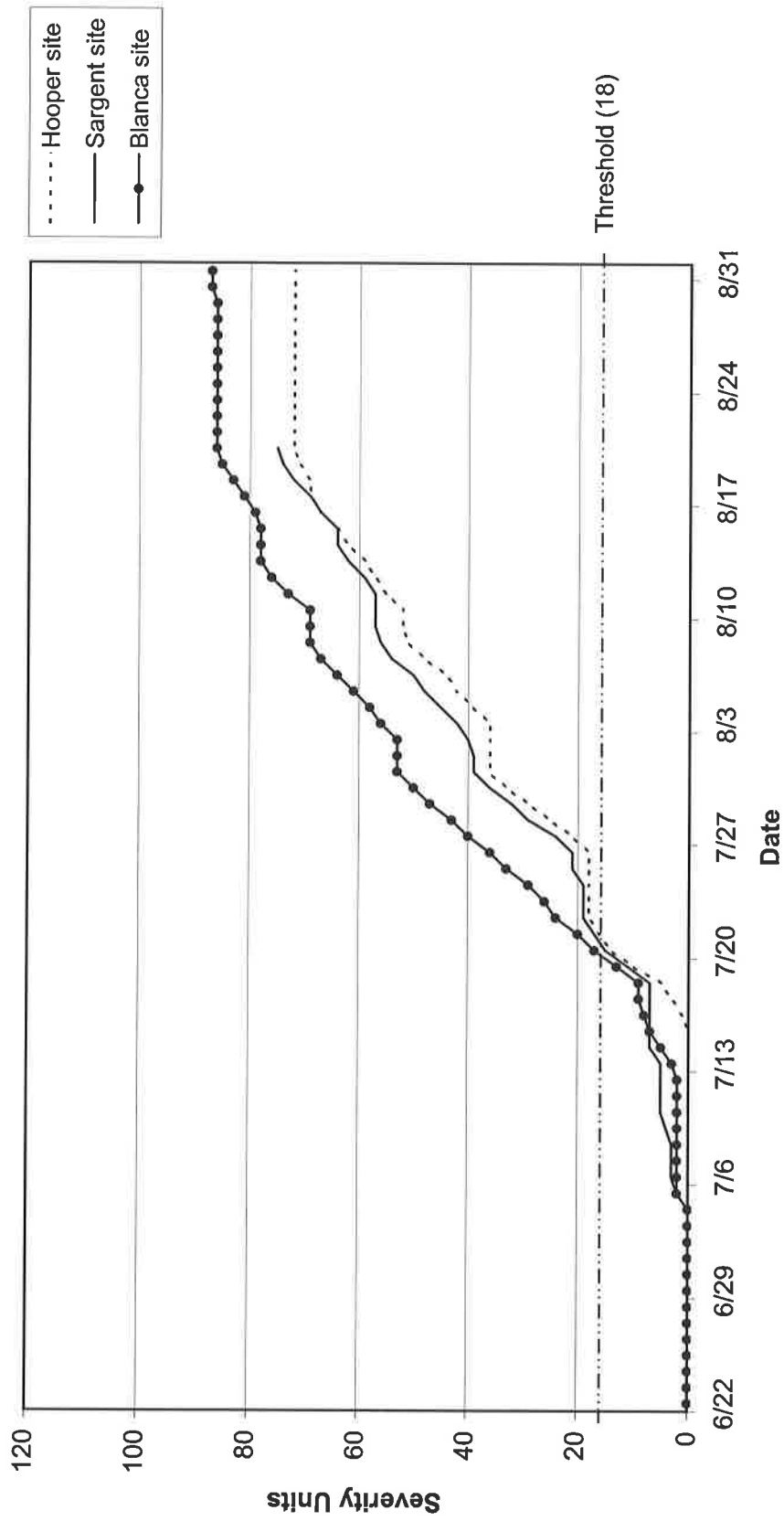
Potato Late Blight Fry Units, San Luis Valley (Hooper site), Colorado, 2004 - 2007
 Moderate Susceptible Varieties



Footnote:

- The Fry Late Blight model was used to calculate the severity units.
- The 2007 Hooper weather station was set up on June 18, 2007.
- The 2006 Hooper weather station was set up on June 14, 2006.
- The 2005 Hooper weather station was set up on June 8, 2005.
- The 2004 Hooper weather station was set up on June 14, 2004.

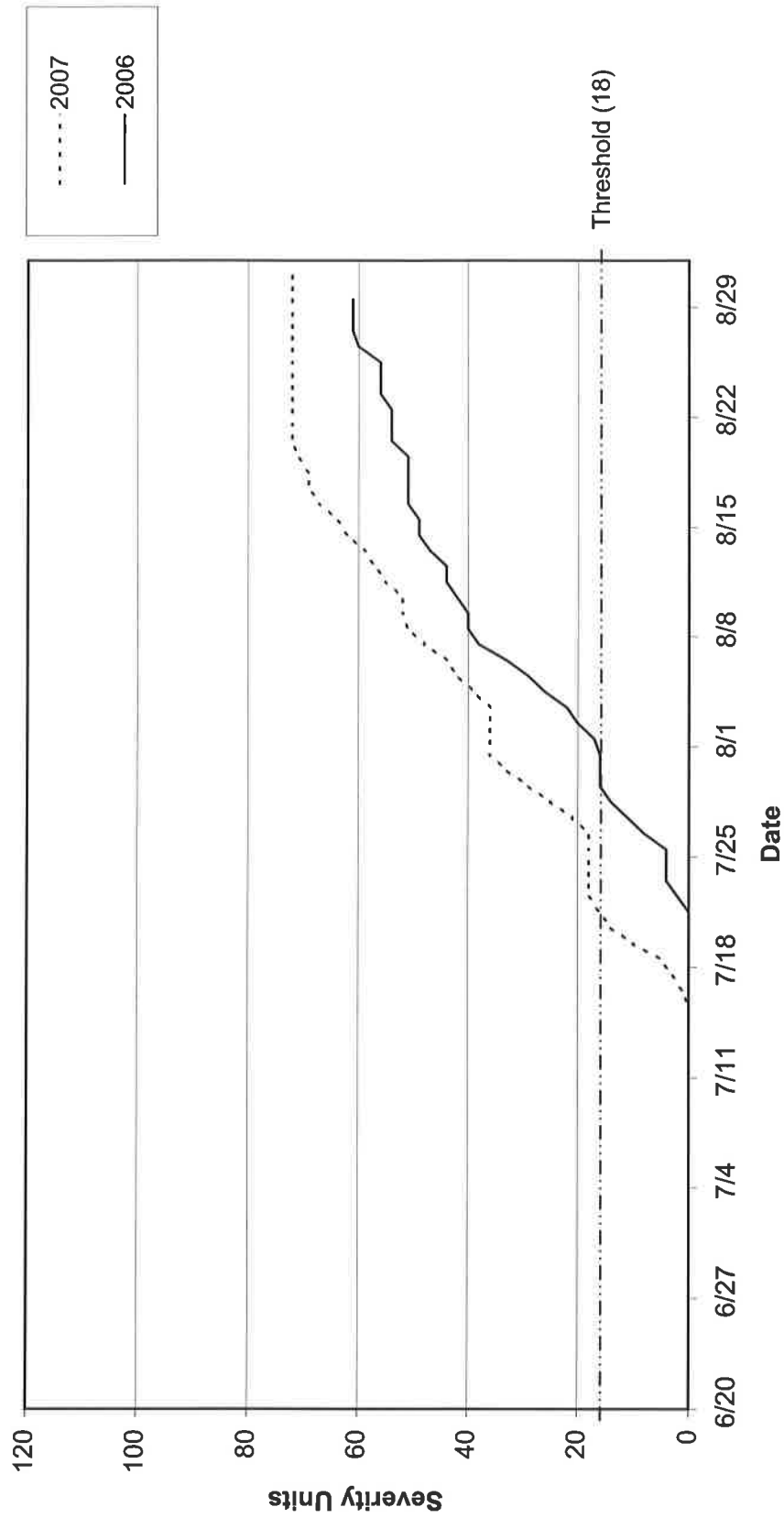
**Potato Late Blight Severity Values - Wallin Model,
San Luis Valley, Colorado, 2007**



Footnote:

- The Sargent weather station was set up on June 22, 2007.
- The Hooper weather station was set up on July 13, 2007.
- The Blanca weather station was set up on June 22, 2007.

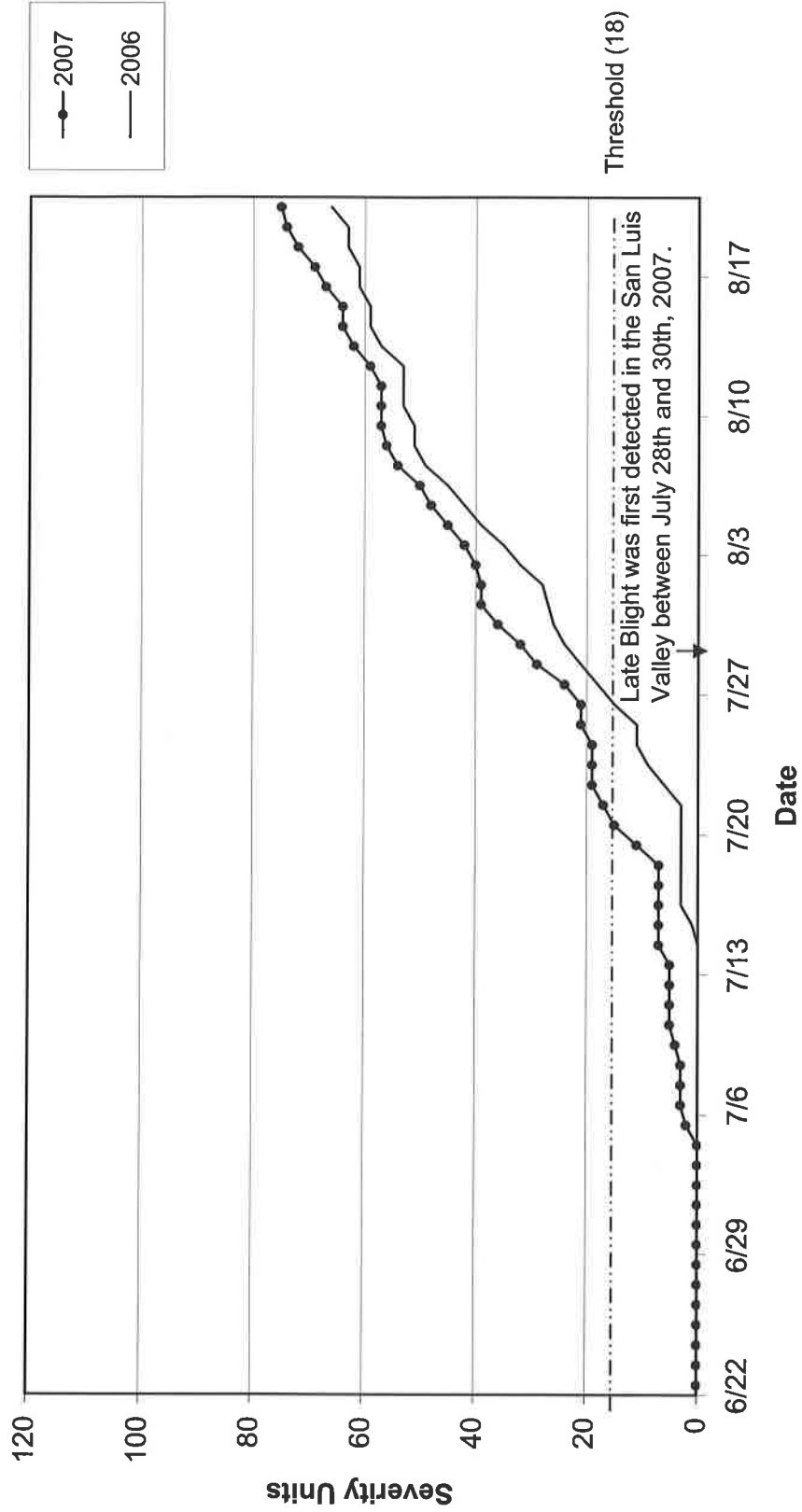
**Potato Late Blight Severity Values - Wallin Model, Hooper Site
San Luis Valley, Colorado, 2006 & 2007**



Footnote:

- The 2007 weather station was set up on July 13.
- The 2006 weather station was set up on June 14. However, severity values are missing from June 16th through July 18th. The threshold was more than likely reached prior to August 2nd.

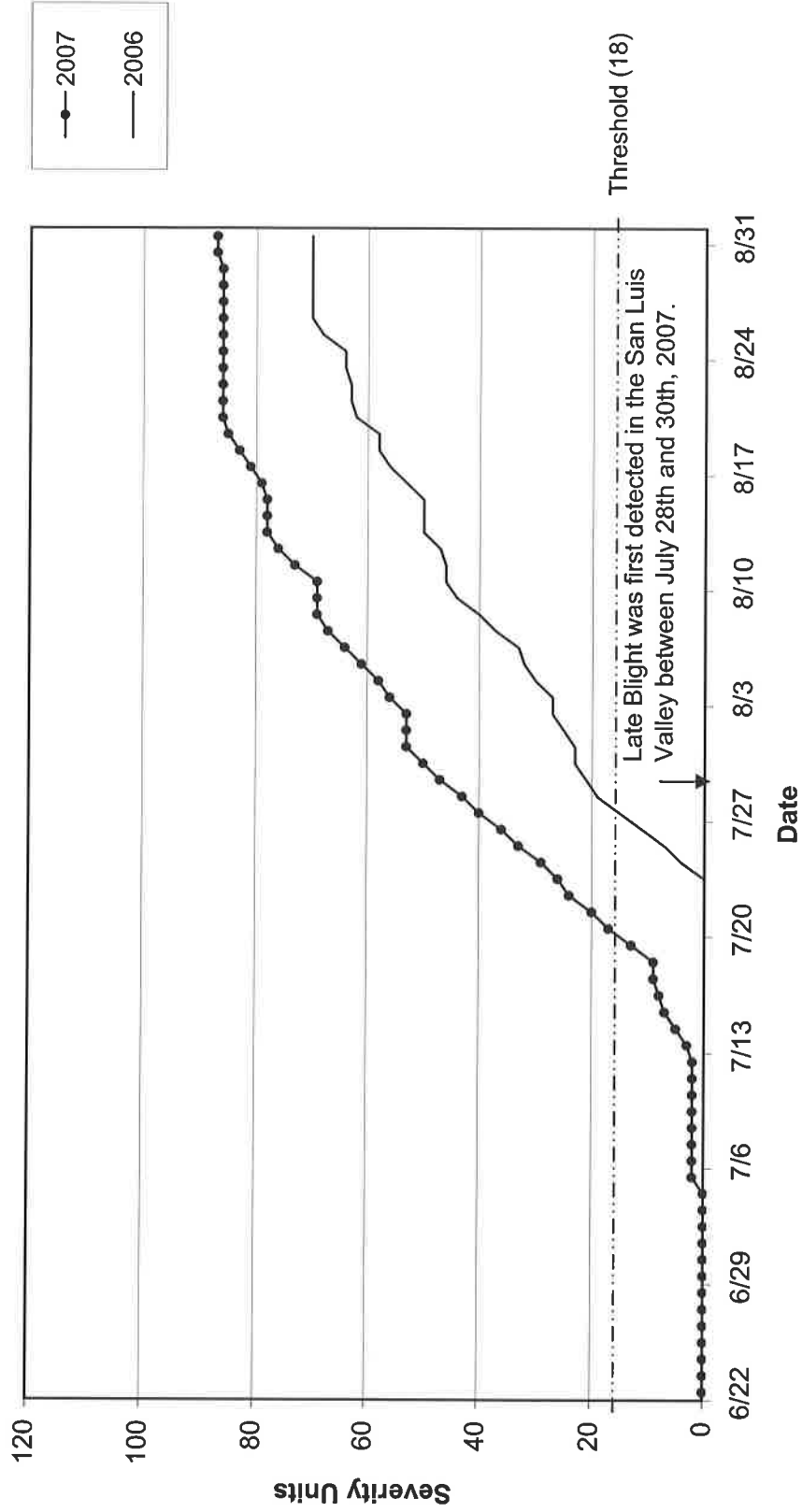
**Potato Late Blight Severity Values - Wallin Model, Sargent Site
San Luis Valley, Colorado, 2006 & 2007**



Footnote:

- The 2007 weather station was set up on June 22.
- The 2006 weather station was set up on June 21. However, severity values are missing from June 25th through July 13th. The threshold was more than likely reached prior to July 27th.

**Potato Late Blight Severity Values - Wallin Model, Blanca Site
San Luis Valley, Colorado, 2007**



Footnote:

- The 2007 weather station was set up on June 22.
- The 2006 weather station was set up on June 23.

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, there is documented widespread resistance to this fungicide found in many SLV fields. 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 2007, two grower cooperators were utilized to screen several chemistries and chemical combinations against pink rot. Results suggest that there are chemicals that are effective against pink rot, however, timing of application, chemical-wetting agent combinations, and placement in the soil are critical factors to consider. Additionally, the cultivar grown and water management in the mid to late season will be an essential part of any successful management plan.

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 situation 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. Additionally, Andrew Houser is completing an M.S. project to understand the various factors present in disease development in the greenhouse. His efforts try to mimic the field environment in terms of disease development leading to the effort for early greenhouse screening of all initial germplasm from the Cultivar Development program.

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 growers often harvest a cleaner crop, regardless of cultivar susceptibility.

Soil temperature and moisture readings, taken at three soil depths (4, 8, & 12 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 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 finishing. 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 shown great success. Growers using this technique with the rates recommended were quite successful in controlling powdery scab. Ultimately, a successful management program will incorporate several factors including: soil surveys to predict spore loads, cultivars grown, water management at the appropriate times during the season and use of Omega when warranted.

Russets with skin mutations (i.e. lacking a russet skin) are being evaluated for powdery scab lesion severity. Development of a russet skin confers some level of resistance to tuber infection and subsequent lesion development; presumably due to either impeding infection or the actual russet development. This work will continue with Dr. Sastry Jayanty as to the role and mechanism of russet development.

EVALUATION OF FUNGICIDES FOR CONTROL OF PINK ROT ON POTATO, 2007

- Researchers:** Rob Davidson and Andrew Houser, Colorado State University, SLVRC
- Location:** Two off-station sites: Site 1 (Sargent area); Site 2 (Hooper area), San Luis Valley, Center, CO
- Cultivar:** Russet Norkotah selection 8, cut seed, 2-4 oz.
- Objective:** To evaluate the efficacy of various fungicides in controlling pink rot in potato.
- Application:** In-Furrow treatments were applied using an R & D CO₂ charged backpack sprayer at 35 PSI, with one XR 8002VS nozzle, at 10 gallons/acre as a directed in-furrow application. Foliar treatments were applied using an R & D CO₂ charged backpack sprayer at 35 PSI, with two XR 8002VS nozzles, at 20 gallons/acre (Treatments applied At Hilling were made with one nozzle at 10 gallons per acre).
- Planted:** May 14, 2007 (Site 1); May 15, 2007 (Site 2)
- 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:** Center pivot irrigation system, rate based on ET
- Fertilizer:** Unavailable
- Herbicide:** Unavailable
- Insecticide:** Unavailable
- Vine Killer:** None
- Harvested:** September 13 & 17, 2007 (Site 1); September 19, 20 & 21, 2007 (Site 2)

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. Post harvest tuber evaluation was conducted on October 29, 2007 (Site 1) and on November 6, 2007 (Site 2).
- Yield:** 2-20 foot row per treatment per replication, total yield expressed as cwt/A.
- Grade:** By hand, percent tubers by weight in pounds < 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 2007.

<u>Program</u>	<u>Products</u>	<u>Rate</u>	<u>Application Schedule^a</u>
1	Untreated Control		
2	Ridomil Gold	0.42 floz./1000 row ft	In-Furrow (IF)
3	Ridomil Gold Phostrol	0.42 floz./1000 row ft 8.0 pt./A	IF IF
4	Ranman	0.42 floz./1000 row ft.	IF
5	Ranman Silwet L77	0.42 floz./1000 row ft. 0.315 floz./1000 row ft.	IF IF
6	Ranman Silwet L77 Ranman Silwet L77	0.42 floz./1000 row ft. 0.315 floz./1000 row ft. 2.75 floz./A 2.0 floz./A	IF IF At Hilling (AH) AH
7	Ranman Silwet L77 Phostrol	0.42 floz./1000 row ft. 0.315 floz./1000 row ft. 10.0 pt./A	IF IF Tuber Initiation (TI)
8	Ranman Silwet L77 Ranman Silwet L77 Phostrol	0.42 floz./1000 row ft. 0.315 floz./1000 row ft. 2.75 floz./A 2.0 floz./A 10.0 pt./A	IF IF AH AH TI
9	Ranman Reason	0.42 floz./1000 row ft. 4.0 floz./A	IF Foliar - 1,3,5 ^b
10	Reason	4.0 floz./A	Foliar - 1,3,5 ^b
11	Ranman Reason Quadris Dithane Rainshield	0.42 floz./1000 row ft. 4.0 floz./A 6.2 floz./A 2.0 lb./A	IF Foliar - 1 ^b Foliar - 3 ^b Foliar - 5 ^b
12	Quadris Ridomil Gold	0.62 floz./1000 row ft. 0.43 floz./1000 row ft.	IF IF
13	Proprietary	-	-
14	Proprietary	-	-
15	Proprietary	-	-
16	Proprietary	-	-
17	Proprietary	-	-
18	Proprietary	-	-
19	Omega	1.5pt./A	IF - 2 nozzles ^c
20	Proprietary	-	-
21	Proprietary	-	-
22	Untreated Control	-	-

^a Application Schedule Abbreviations (IF = In-furrow on May 14, 2007; AH = At Hilling on June 15, 2007; TI = Tuber Initiation on July 13, 2007).

^b Foliar fungicide applications were conducted on July 13 (week 1), July 30 (week 3) and August 21 (week 5).

^c Fifty percent of the solution was sprayed over the seed and fifty percent was applied to the covering soil.

Table 2. Effect of applied products, for control of pink rot, on tuber yield and quality in the cultivar Russet Norkotah Selection 8, 2 off-station sites, San Luis Valley, Colorado, 2007.

Program	Treatment	Percent ^b												cwt/A ^c	
		< 4 oz.			4-10 oz.			> 10 oz.			US #2's				
		Site 1	Site 2	Site 1	Site 2	Site 1	Site 2	Site 1	Site 2	Site 1	Site 2	Site 1	Site 2	Site 1	Site 2
1	Untreated Control	21.5	22.9 def	54.0	52.3 b-g	19.7	23.4	1.5	0.2	3.4	1.3	277.6	430.3		
2	Ridomil Gold @ 0.42 floz./1000 row ft. (IF)	27.0	24.9 c-f	53.3	56.0 a-f	13.9	15.8	2.8	1.0	3.0	2.4	216.6	484.9		
3	Ridomil Gold @ 0.42 floz./1000 row ft. (IF) Phostrol @ 8.0 pt./A (IF)	25.3	31.1 abc	56.5	50.3 d-g	15.4	16.3	0.5	0.5	2.2	1.8	217.1	460.6		
4	Ranman @ 0.42 floz./1000 row ft. (IF)	28.0	22.4 def	51.3	57.6 a-e	17.6	17.9	1.2	0.6	1.9	1.6	291.2	404.0		
5	Ranman @ 0.42 floz./1000 row ft. (IF) Silwet L77 @ 0.315 floz./1000 row ft. (IF)	23.5	22.5 def	51.5	56.1 a-f	19.0	18.9	2.1	0.8	4.0	1.7	239.5	368.3		
6	Ranman @ 0.42 floz./1000 row ft. (IF) Silwet L77 @ 0.315 floz./1000 row ft. (IF) Ranman @ 2.75 floz./A (AH) Silwet L77 @ 2.0 floz./A (AH)	20.4	22.2 ef	53.1	59.5 ab	25.0	14.9	0.0	1.0	1.5	2.4	265.3	427.7		
7	Ranman @ 0.42 floz./1000 row ft. (IF) Silwet L77 @ 0.315 floz./1000 row ft. (IF) Phostrol @ 10.0 pt./A (TI)	19.4	26.6 b-f	57.2	57.2 a-e	19.6	13.0	0.6	0.8	3.2	2.5	260.3	432.2		
8	Ranman @ 0.42 floz./1000 row ft. (IF) Silwet L77 @ 0.315 floz./1000 row ft. (IF) Ranman @ 2.75 floz./A (AH) Silwet L77 @ 2.0 floz./A (AH) Phostrol @ 10.0 pt./A (TI)	21.1	27.0 b-f	50.3	50.5 c-g	20.7	19.4	2.4	1.0	5.6	2.0	255.8	400.9		
9	Ranman @ 0.42 floz./1000 row ft. (IF) Reason @ 4.0 floz./A (Foliar - 1,3,5)	26.9	33.5 ab	47.8	44.5 g	17.5	18.9	1.9	1.2	5.9	1.9	261.1	464.0		
10	Reason @ 4.0 floz./A (Foliar - 1,3,5)	20.3	22.5 def	60.4	58.8 abc	16.3	17.3	1.5	0.4	1.5	1.0	273.8	384.0		
11	Ranman @ 0.42 floz./1000 row ft. (IF) Reason @ 4.0 floz./A (Foliar - 1) Quadris @ 6.2 floz./A (Foliar - 3) Dithane Rainshield @ 2.0 lb./A (Foliar - 5)	25.7	24.7 c-f	47.7	55.4 a-f	22.0	17.6	2.0	0.3	2.6	2.0	263.9	403.2		
12	Quadris @ 0.62 floz./1000 row ft. (IF) Ridomil Gold @ 0.43 floz./1000 row ft. (IF)	26.5	22.0 ef	49.5	60.3 ab	19.6	15.8	1.3	0.7	3.1	1.2	243.1	417.4		
13	Proprietary	22.4	26.5 b-f	50.7	54.0 a-f	18.2	17.1	3.0	0.4	5.8	2.1	274.2	430.5		
14	Proprietary	28.9	28.9 a-e	46.5	49.8 efg	18.7	18.5	2.1	1.3	3.8	1.5	244.2	418.8		
15	Proprietary	32.6	21.8 ef	44.1	56.3 a-f	17.6	19.2	2.4	1.7	3.3	1.0	251.3	448.5		
16	Proprietary	27.1	24.1 c-f	52.4	58.4 a-d	15.0	14.6	2.0	1.0	3.4	1.8	249.8	449.8		
17	Proprietary	23.5	26.1 b-f	53.1	55.9 a-f	18.4	16.4	0.8	0.4	4.3	1.2	278.0	419.9		
18	Proprietary	30.5	25.3 c-f	46.2	55.2 a-f	18.2	16.4	2.2	1.2	2.9	1.9	232.7	426.3		
19	Omega @ 1.5pt./A (IF) - 2 nozzles	24.1	36.1 a	52.3	48.0 fg	19.0	14.0	1.8	0.1	2.7	1.8	245.8	416.3		
20	Proprietary	23.9	30.0 a-d	52.2	52.0 b-g	17.4	16.8	1.4	0.2	5.2	1.0	265.1	483.8		
21	Proprietary	22.6	21.2 f	53.9	49.5 efg	17.9	27.4	1.9	0.4	3.7	1.5	274.2	448.9		
22	Control, No Treatment	21.7	20.8 f	56.9	61.8 a	16.7	15.1	1.2	0.0	3.5	2.5	246.5	421.8		
LSD(P=0.05)		NS	7.71	NS	8.35	NS	NS	NS	NS	NS	NS	NS	NS		

^a Application Schedule Abbreviations (AP = At Planting on May 15, 2007; AH = At Hilling on June 14, 2007; TI = Tuber Initiation on July 12, 2007).

^b Based on tuber weight in pounds, mean of four replications.

^c Total yield expressed as hundred weight per acre, 2-20 foot rows per treatment per replication, mean of four replications. Means followed by the same letter are not significantly different at P=0.05.

Table 3. Effect of applied products, for control of pink rot, on tuber yield and quality in the cultivar Russet Norkotah Selection 8, 2 off-station sites, San Luis Valley, Colorado, 2007.

Program	Treatment	No. rot		% rot ^b		% rot x severity ^c		% rot		% rot x severity ^d	
		Site 1	Site 2	Site 1	Site 2	Site 1	Site 2	Site 1	Site 2	Site 1	Site 2
1	Untreated Control	5.8	1.5	2.6 a-f	0.4	11.8 a-g	1.7	0.0	0.0	0.0	0.0
2	Ridomil Gold @ 0.42 floz./1000 row ft. (IF)	5.8	4.3	4.0 a-e	0.8	19.6 a-e	3.5	0.0	0.0	0.0	2.5
3	Ridomil Gold @ 0.42 floz./1000 row ft. (IF)	4.8	4.0	4.1 a-d	0.6	19.1 a-f	3.1	0.0	0.0	0.0	2.5
4	Phostrol @ 8.0 pt./A (IF)										
5	Ranman @ 0.42 floz./1000 row ft. (IF)	8.8	3.7	4.3 abc	1.4	21.5 abc	7.2	0.5	2.7	2.5	13.3
6	Ranman @ 0.42 floz./1000 row ft. (IF)	3.3	2.5	1.6 c-f	0.7	7.9 b-g	3.3	0.0	0.0	0.0	0.0
	Silwet L77 @ 0.315 floz./1000 row ft. (IF)										
7	Ranman @ 0.42 floz./1000 row ft. (IF)	2.5	0.8	1.7 b-f	0.1	8.5 b-g	0.4	0.0	0.0	0.0	2.5
	Silwet L77 @ 0.315 floz./1000 row ft. (IF)										
8	Phostrol @ 10.0 pt./A (TI)	2.0	2.3	0.4 f	0.7	2.2 g	3.5	0.0	1.0	0.0	5.0
	Ranman @ 0.42 floz./1000 row ft. (IF)										
9	Silwet L77 @ 0.315 floz./1000 row ft. (IF)	2.5	0.8	1.9 b-f	0.4	9.4 b-g	1.9	0.0	0.0	0.0	0.0
	Ranman @ 0.42 floz./1000 row ft. (IF)										
10	Reason @ 4.0 floz./A (Foliar - 1,3,5)	4.0	1.0	1.3 c-f	0.3	6.6 c-g	1.4	0.0	0.0	0.0	0.0
	Reason @ 4.0 floz./A (Foliar - 1,3,5)										
11	Ranman @ 0.42 floz./1000 row ft. (IF)	4.0	1.0	1.7 b-f	0.3	8.4 b-g	1.3	0.0	0.0	0.0	0.0
	Reason @ 4.0 floz./A (Foliar - 1)										
	Quadris @ 6.2 floz./A (Foliar - 3)										
	Dithane Rainshield @ 2.0 lb./A (Foliar - 5)										
12	Quadris @ 0.62 floz./1000 row ft. (IF)	9.8	0.5	4.7 ab	0.2	22.8 ab	0.9	0.0	0.0	0.0	0.0
	Ridomil Gold @ 0.43 floz./1000 row ft. (IF)										
13	Proprietary	5.8	1.0	2.3 a-f	0.4	11.7 a-g	1.6	0.0	0.5	0.0	2.5
14	Proprietary	7.0	1.8	3.4 a-f	0.3	17.0 a-g	1.6	1.0	0.5	1.5	2.5
15	Proprietary	10.8	3.8	5.3 a	0.9	26.4 a	4.5	0.0	0.5	0.0	2.5
16	Proprietary	6.5	0.0	2.7 a-f	0.0	13.7 a-g	0.0	0.0	0.0	0.0	0.0
17	Proprietary	3.0	0.0	0.9 f	0.0	4.3 efg	0.0	0.0	0.0	0.0	0.0
18	Proprietary	7.8	1.0	4.1 a-d	4.1	20.6 a-d	16.2	0.5	0.5	2.0	2.5
19	Omega @ 1.5pt./A (IF) - 2 nozzles	1.0	1.3	1.0 ef	0.3	3.9 fg	1.7	0.0	0.0	0.0	0.0
20	Proprietary	2.5	0.5	1.1 def	0.1	5.3 d-g	0.7	0.5	0.0	2.5	0.0
21	Proprietary	2.3	1.5	0.9 f	0.3	3.9 fg	1.0	0.5	0.0	2.5	0.0
22	Control, No Treatment	5.3	1.3	2.1 b-f	0.3	10.5 b-g	1.2	0.5	0.0	2.0	0.0
LSD(P=0.05)		NS	NS	3.07	NS	15.39	NS	NS	NS	NS	NS

^a Application Schedule Abbreviations (AP = At Planting on May 15, 2007; AH = At Hilling on June 14, 2007; TI = Tuber Initiation on July 12, 2007).

^b Mean percent of tubers with pink rot at harvest per treatment per replication (i.e. 0.86 = 0.86%). Fifty tubers were evaluated post-harvest and the percent was based on the number of rotten tubers.

^c 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).

^d Mean percent of tubers with pink rot evaluated post-harvest multiplied by disease severity from 1 to 5 (1 = less than 5% rotten, 5 = 100 % rotten).

Several infected tubers were lost in the field (primarily in the untreated control) due to pink rot severity and rot and were not measured at harvest. This affects “% rot” and “% rot x severity” which may explain the non-significant results in these categories. Also, the “% rot” was taken from the weight of rotten tubers remaining at harvest. Due to the severity of rot, the actual rot weight was greater than the recorded rot weight. If this lost weight could have been recorded, a significant difference among treatments most likely would have been found. Fungicide programs that suppressed the spread of pink rot in the tuber did result in a higher rot weight because more of the infected tuber remained intact. The completely rotten tubers were not fully intact resulting in a lower measured weight.

EVALUATION OF FUNGICIDES FOR CONTROL OF PINK ROT ON POTATO, 2007

- Researchers:** Rob Davidson and Andrew Houser, Colorado State University, SLVRC
- Location:** Off-station site (Site 1 – Sargent Area), San Luis Valley, Center, CO
- Cultivar:** Russet Norkotah selection 8, cut seed, 2-4 oz.
- Objective:** To evaluate the efficacy of various fungicides in controlling pink rot in potato.
- Application:** In-Furrow treatments were applied using an R & D CO₂ charged backpack sprayer at 35 PSI, 10 gallons/acre with one XR 8002VS nozzle directed over the seed piece and one XR 8002 VS nozzle directed at the soil covering the seed piece. Fifty percent of the solution was sprayed over the seed and fifty percent was applied to the covering soil.
- Treatments:**
1. Control, No Treatment
 2. Ranman @ 0.42 floz./1000 row ft. (2 nozzles at planting)
 3. Ranman @ 0.42 floz./1000 row ft. + Silwett @ 0.315 floz./1000 row ft. (2 nozzles at planting)
- Planted:** May 18, 2007
- 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:** Center pivot irrigation system, rate based on ET
- Fertilizer:** 70N,120P,0K,36S - preplant
- Herbicide:** Unavailable
- Insecticide:** Unavailable
- Vine Killer:** None
- Harvested:** September 18, 2007

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. Fifty tubers/treatment/replication were evaluated post-harvest (October 30, 2007) for pink rot incidence and severity. No pink rot symptoms were observed.
- 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 Ranman, for control of pink rot, on tuber yield and quality in the cultivar Russet Norkotah Selection 8, Site 1, San Luis Valley, Colorado, 2007.

Treatment	Percent ^b								
	< 4 oz.	4-10 oz.	> 10 oz.	US #2's	Culls	cwt/A ^c	No. rot	% rot ^d	% rot x severity ^e
Untreated Control	28.3	49.3	16.0	1.8	4.5	289.7	6.3	3.1	15.4
Ranman @ 0.42 floz./1000 row ft. (2 nozzles AP) ^f	29.3	53.2	13.0	1.9	2.7	281.2	3.8	2.0	9.3
Ranman @ 0.42 floz./1000 row ft. + Silwett @ 0.315 floz./1000 row ft. (2 nozzles AP) ^f	31.5	44.8	18.8	2.3	2.6	298.1	3.8	1.0	4.8
LSD(P=0.05)	NS	NS	NS	NS	NS	NS	NS	NS	NS

^a Application Schedule Abbreviations (AP = At Planting on May 18, 2007).

^b Based on tuber weight in kilograms, mean of four replications.

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

^d Mean percent of tubers with pink rot at harvest multiplied by disease severity per replication (i.e. 0.86 = 0.86%).

^e 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).

^f At Planting treatments were applied using an R & D CO₂ charged backpack sprayer at 35 PSI, 10 gallons/acre with one XR 8002VS nozzle directed over the seed piece and one XR 8002 VS nozzle directed at the soil covering the seed piece. Fifty percent of the solution was sprayed over the seed and fifty percent was applied to the covering soil. **There was no significant difference found between treatments.**

Several infected tubers were lost in the field (primarily in the untreated control) due to pink rot severity and rot and were not measured at harvest. This affects “% rot” and “% rot x severity” which may explain the non-significant results in these categories. Also, the “% rot” was taken from the weight of rotten tubers remaining at harvest. Due to the severity of rot, the actual rot weight was greater than the recorded rot weight. If this lost weight could have been recorded, a significant difference among treatments most likely would have been found. Fungicide programs that suppressed the spread of pink rot in the tuber did result in a higher rot weight because more of the infected tuber remained intact. The completely rotten tubers were not fully intact resulting in a lower measured weight.

Table 2. Effect of Ranman application, for control of pink rot, on tuber yield and quality in the cultivar Russet Norkotah Selection 8, Site 1, San Luis Valley, Colorado, 2007.

Treatment	Percent ^b								
	< 4 oz.	4-10 oz.	> 10 oz.	US #2's	Culls	cwt/A ^c	No. rot	% rot ^d	% rot x severity ^e
Untreated Control	21.5	54.0	19.7	1.5	3.4	277.6	5.3	2.6	11.8
Ranman @ 0.42 floz./1000 row ft.(IF)	28.0	51.3	17.6	1.2	1.9	291.2	8.8	4.3	21.5
Ranman @ 0.42 floz./1000 row ft.(IF)	23.5	51.5	19.0	2.1	4.0	239.5	3.3	1.6	7.9
Silwet L77 @ 0.315 floz/1000 row ft. (IF)									
Untreated Control	28.3	49.3	16.0	1.8	4.5	289.7	6.3	3.1	15.4
Ranman @ 0.42 floz./1000 row ft. (2 nozzles AP) ^f	29.3	53.2	13.0	1.9	2.7	281.2	3.8	2.0	9.3
Ranman @ 0.42 floz./1000 row ft. + (2 nozzles AP) ^f	31.5	44.8	18.8	2.3	2.6	298.1	3.8	1.0	4.8
Silwet @ 0.315 floz./1000 row ft. (2 nozzles AP) ^f									

^a Application Schedule Abbreviations (IF = In Furrow on May 15, 2007; AP = At Planting on May 18, 2007).

^b Based on tuber weight in kilograms, mean of four replications.

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

^d Mean percent of tubers with pink rot at harvest per treatment by disease severity from 1 to 5(1 = less than 5% rotten, 5 = 100 % rotten).

^e 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).

^f At Planting treatments were applied using an R & D CO₂ charged backpack sprayer at 35 PSI, 10 gallons/acre with one XR 8002VS nozzle directed over the seed piece and one XR 8002 VS nozzle directed at the soil covering the seed piece. Fifty percent of the solution was sprayed over the seed and fifty percent was applied to the covering soil. There was no significant difference found between treatments.

This data was obtained from two separate plots, located in the same field. Comparisons indicate a two nozzle application at planting is more effective at controlling pink rot.

Several infected tubers were lost in the field (primarily in the untreated control) due to pink rot severity and rot and were not measured at harvest. This affects "% rot" and "% rot x severity" which may explain the non-significant results in these categories. Also, the "% rot" was taken from the weight of rotten tubers remaining at harvest. Due to the severity of rot, the actual rot weight was greater than the recorded rot weight. If this lost weight could have been recorded, a significant difference among treatments most likely would have been found. Fungicide programs that suppressed the spread of pink rot in the tuber did result in a higher rot weight because more of the infected tuber remained intact. The completely rotten tubers were not fully intact resulting in a lower measured weight.

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 situation 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. Additionally, Andrew Houser is completing an M.S. project to understand the various factors present in disease development in the greenhouse. His efforts try to mimic the field environment in terms of disease development leading to the effort for early greenhouse screening of all initial germplasm from the Cultivar Development program.

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 growers often harvest a cleaner crop, regardless of cultivar susceptibility.

Soil temperature and moisture readings, taken at three soil depths (4, 8, & 12 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 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 finishing. 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 shown great success. Growers using this technique with the rates recommended were quite successful in controlling powdery scab. Ultimately, a successful management program will incorporate several factors including: soil surveys to predict spore loads, cultivars grown, water management at the appropriate times during the season and use of Omega when warranted.

Russets with skin mutations (i.e. lacking a russet skin) are being evaluated for powdery scab lesion severity. Development of a russet skin confers some level of resistance to tuber infection and subsequent lesion development; presumably due to either impeding infection or the actual russet development. This work will continue with Dr. Sastry Jayanty as to the role and mechanism of russet development.

2007 EVALUATION OF FUNGICIDES APPLIED AT PLANTING FOR CONTROL OF POWDERY SCAB ON POTATO

Researchers: Robert Davidson and Andrew Houser, Colorado State University
Location: Off-station trial, San Luis Valley, CO
Cultivar: Cherry Red, cut seed, 2-4 oz.
Objective: To evaluate the efficacy of various fungicide treatments in controlling powdery scab on potato.
Application: In-furrow treatments were applied using an R & D CO₂ 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), at 10 gal./A. On-seed treatments were applied directly to whole seed and planted within 24 hours.

Treatments:

1. Control, no treatment
2. Maxim @ 0.08 floz./cwt, On Seed
3. Omega @ 1.5 pt./A (one nozzle directed over seed), At Planting
4. Omega @ 3.0 pt./A (one nozzle directed over seed), At Planting
5. Omega @ 1.5 pt./A (two nozzles), At Planting
6. Omega @ 3.0 pt./A (two nozzles), At Planting
7. Maxim @ 0.08 floz./cwt (On Seed) & Omega @ 1.5 pt./A (two nozzles), At Planting
8. Maxim @ 0.08 floz./cwt (On Seed) & Omega @ 3.0 pt./A (two nozzles), At Planting
9. Omega @ 1.5 pt./A (one nozzle dir. over seed), At Planting
Omega @ 1.5 pt./A (Applied just prior to hilling on June 14, 2007)
10. Omega @ 1.5 pt./A (two nozzles), At Planting
Omega @ 1.5 pt./A (Applied just prior to hilling on June 14, 2007)

Planted: May 10, 2007
Plot Design: Randomized
Plot Size: 2 - 20 foot rows per treatment per replication
Plant Spacing: 12 inches
Row Spacing: 34 inches
Replications: Four
Irrigation: Center pivot sprinkler, rate based on ET
Fertilizer: 0N-0P-45K (applied in fall of 2006), 70N (preplant), 72N in-season
Herbicide: Outlook @ 1.0 pt./A & Sencor @ 0.2 lb./A
Insecticide: Provado @ 3.75 oz./A & Leverage @ 3.75 floz./A
Fungicide: Ridomil EC @ 0.4 oz./A & Headline @ 7.0 oz./A & Bravo Ultrex @ 1.0 lb./A & Penncozeb @ 1.5 lb./A & Kocide @ 0.5 pt./A
Vine Killer: Vines killed with Reglone on August 20, 2007
Harvested: September 7, 10, & 11, 2007

DATA

Disease: Mean percent of the number of tubers showing one or more powdery scab lesions at harvest multiplied by the severity of the lesions, where 1 = not severe and 5 = very severe. Mean percent of the number of unmarketable tubers due to powdery scab lesion severity, multiplied by the severity rating, where 1 = not severe and 5 = very severe.

Yield: Total yield expressed as hundred weight per acre. A second cwt/A has also been calculated in which all unmarketable tubers (due to high powdery scab severity), have been removed from the total yield, 2-20 foot rows per treatment per replication, mean of four replications.

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

Table 1. Evaluation of fungicides on the incidence of powdery scab on tubers in the cultivar Cherry Red, San Luis Valley, Colorado, 2007

Treatment	Tuber symptoms					
	Percent Incidence ^a	Percent Healthy ^b	Severity Index ^c	Percent Unmarketable ^d	Severity Index (Unmarketable) ^e	Severity Index (Unmarketable) ^e
1. Untreated Control	44.4	55.6	98.8	15.9	60.1	60.1
2. Maxim @ 0.08 floz./cwt, On Seed	46.2	53.8	111.2	21.1	72.8	72.8
3. Omega @ 1.5 pt./A (one nozzle dir. over seed), At Planting	34.6	65.4	81.1	14.0	49.1	49.1
4. Omega @ 3.0 pt./A (one nozzle dir. over seed), At Planting	44.3	55.7	94.3	16.4	58.7	58.7
^f 5. Omega @ 1.5 pt./A (two nozzles), At Planting	33.9	66.1	55.2	10.7	32.0	32.0
^f 6. Omega @ 3.0 pt./A (two nozzles), At Planting	36.4	63.6	65.8	11.8	38.6	38.6
^f 7. Maxim @ 0.08 floz./cwt, On Seed	30.3	69.7	53.4	9.4	29.3	29.3
Omega @ 1.5 pt./A (two nozzles), At Planting						
^f 8. Maxim @ 0.08 floz./cwt, On Seed	40.9	59.1	93.5	13.3	48.7	48.7
Omega @ 3.0 pt./A (two nozzles), At Planting						
9. Omega @ 1.5 pt./A (one nozzle dir. over seed), At Planting	23.8	76.2	40.1	6.9	20.4	20.4
Omega @ 1.5 pt./A (Applied just prior to hilling)						
^f 10. Omega @ 1.5 pt./A (two nozzles), At Planting	26.1	73.9	49.7	7.0	21.7	21.7
Omega @ 1.5 pt./A (Applied just prior to hilling)						
LSD(P=0.05)	NS	NS	NS	NS	NS	NS

^a Percent incidence = mean percent of the total number of tubers with one or more powdery scab lesion at harvest. Mean of four replications.

^b Percent healthy = mean percent of the total number of tubers with zero powdery scab lesions at harvest. Mean of four replications.

^c Severity Index = mean percent of the number of infected tubers/treatment/replication multiplied by the avg. severity of the lesions, where 1 = very little or no disease and 5 = heavily infested.

^d Percent Unmarketable = mean percent of the total number of tubers with a lesion severity rating of three or higher at harvest. Mean of four replications.

^e Severity Index (Unmarketable) = mean percent of the number of unmarketable tubers due to powdery scab lesion severity/treatment/replication multiplied by the average severity of the lesions, where 1 = very little or no disease and 5 = heavily infested.

^f Where two nozzles are used, one nozzle is directed over the seed piece (50% of mix) and one nozzle is directed at the soil as it covers the seed piece (50% of mix).

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

Table 2. Evaluation of fungicide programs on tuber yield and quality in the cultivar Cherry Red, San Luis Valley, Colorado, 2007

Treatment	Percent ^a				US # 2's	culls	Cwt/A ^b	Marketable Cwt/A ^c	Est. total cost/A ^e
	< 4 oz.	4-10 oz.	> 10 oz.						
1. Untreated Control	20.5 a-d	58.5	21.0	1.8	1.3	356.2	297.7 cd	-	
2. Maxim @ 0.08 floz./cwt, On Seed	25.2 a	58.8	16.0	2.3	1.5	343.0	260.2 d	\$31.25	
3. Omega @ 1.5 pt./A (one nozzle dir. over seed), At Planting	17.1 cd	60.5	22.3	2.0	0.7	351.3	292.8 cd	\$76.19	
4. Omega @ 3.0 pt./A (one nozzle dir. over seed), At Planting	18.9 bcd	54.4	26.8	3.2	1.1	357.0	287.9 cd	\$152.39	
^d 5. Omega @ 1.5 pt./A (two nozzles), At Planting	22.3 abc	55.9	21.9	2.0	0.8	375.7	328.2 abc	\$76.19	
^d 6. Omega @ 3.0 pt./A (two nozzles), At Planting	17.1 cd	50.8	32.1	5.9	3.0	358.3	306.0 c	\$152.39	
^d 7. Maxim @ 0.08 floz./cwt, On Seed Omega @ 1.5 pt./A (two nozzles), At Planting	16.2 cd	62.1	21.7	1.3	0.2	402.0	361.0 a	\$107.44	
^d 8. Maxim @ 0.08 floz./cwt, On Seed Omega @ 3.0 pt./A (two nozzles), At Planting	20.5 a-d	55.5	23.9	1.8	0.7	359.6	303.2 cd	\$183.64	
9. Omega @ 1.5 pt./A (one nozzle dir. over seed), At Planting Omega @ 1.5 pt./A (Applied just prior to hilling)	14.4 d	57.7	28.0	1.6	0.5	383.9	354.8 ab	\$152.39	
^d 10. Omega @ 1.5 pt./A (two nozzles), At Planting Omega @ 1.5 pt./A (Applied just prior to hilling)	24.9 ab	55.3	19.9	3.4	0.3	343.9	314.4 bc	\$152.39	
LSD(P=0.05)	6.27	NS	NS	NS	NS	NS	44.64	-	

^a Based on tuber weight in kilograms, mean of four replications.

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

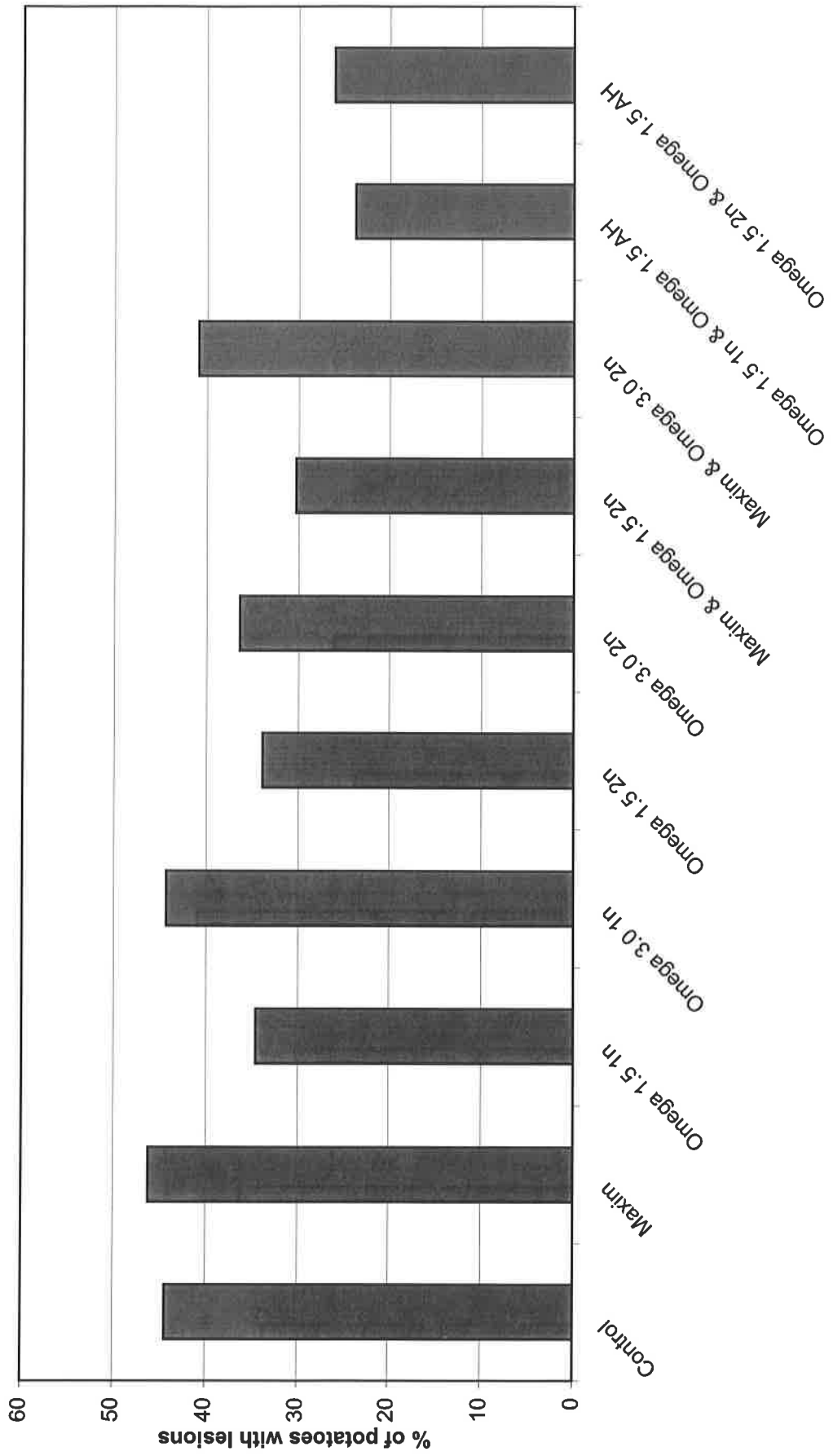
^c Total yield expressed as hundred weight per acre (All unmarketable tubers due to high powdery scab severity have been removed from the total yield), 2-20 foot rows per treatment per replication, mean of four replications.

^d Where two nozzles are used, one nozzle is directed over the seed piece (50% of mix) and one nozzle is directed at the soil as it covers the seed piece (50% of mix).

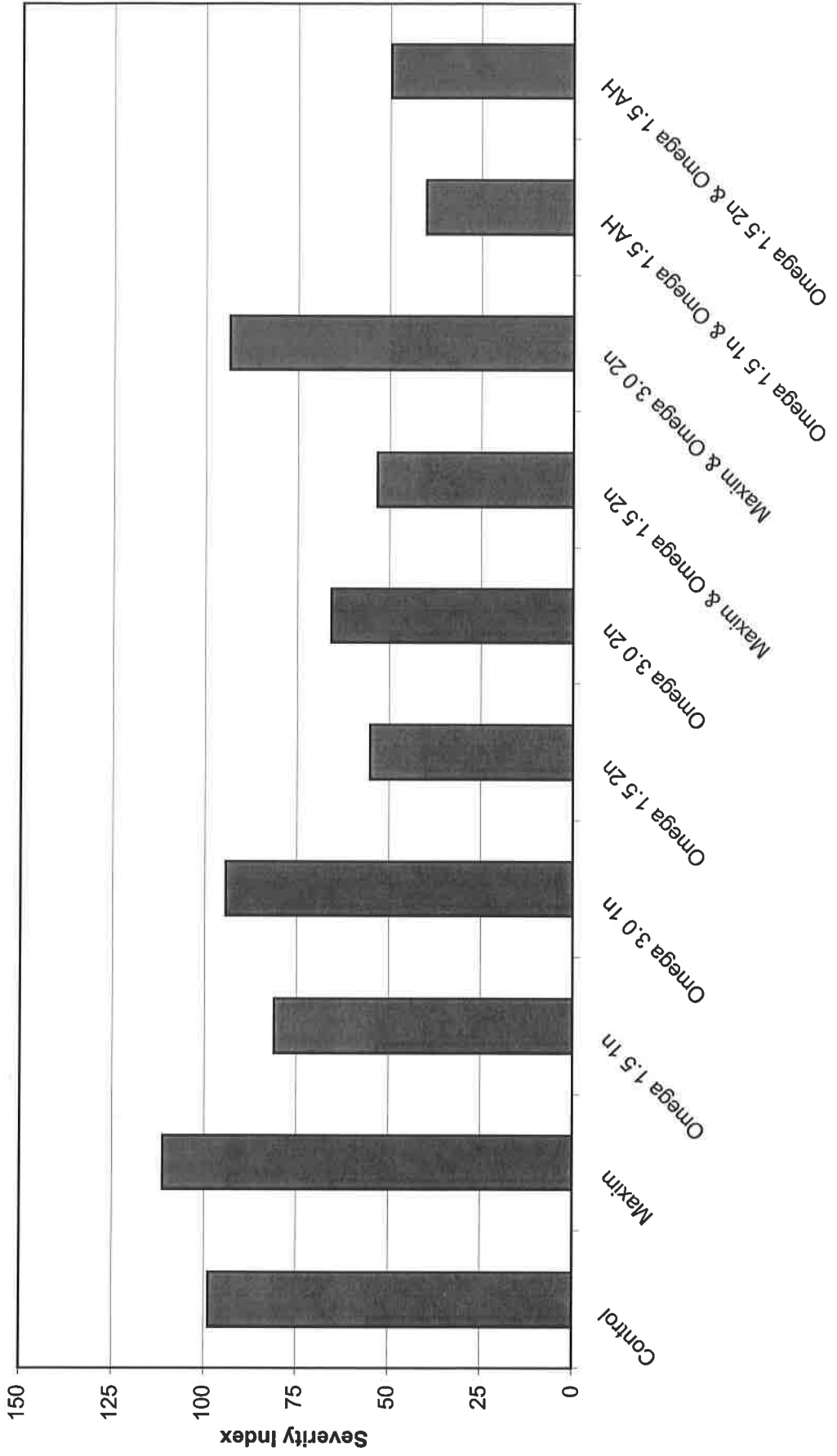
^e These prices do not include application costs. Prices based on product costs from 2007.

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

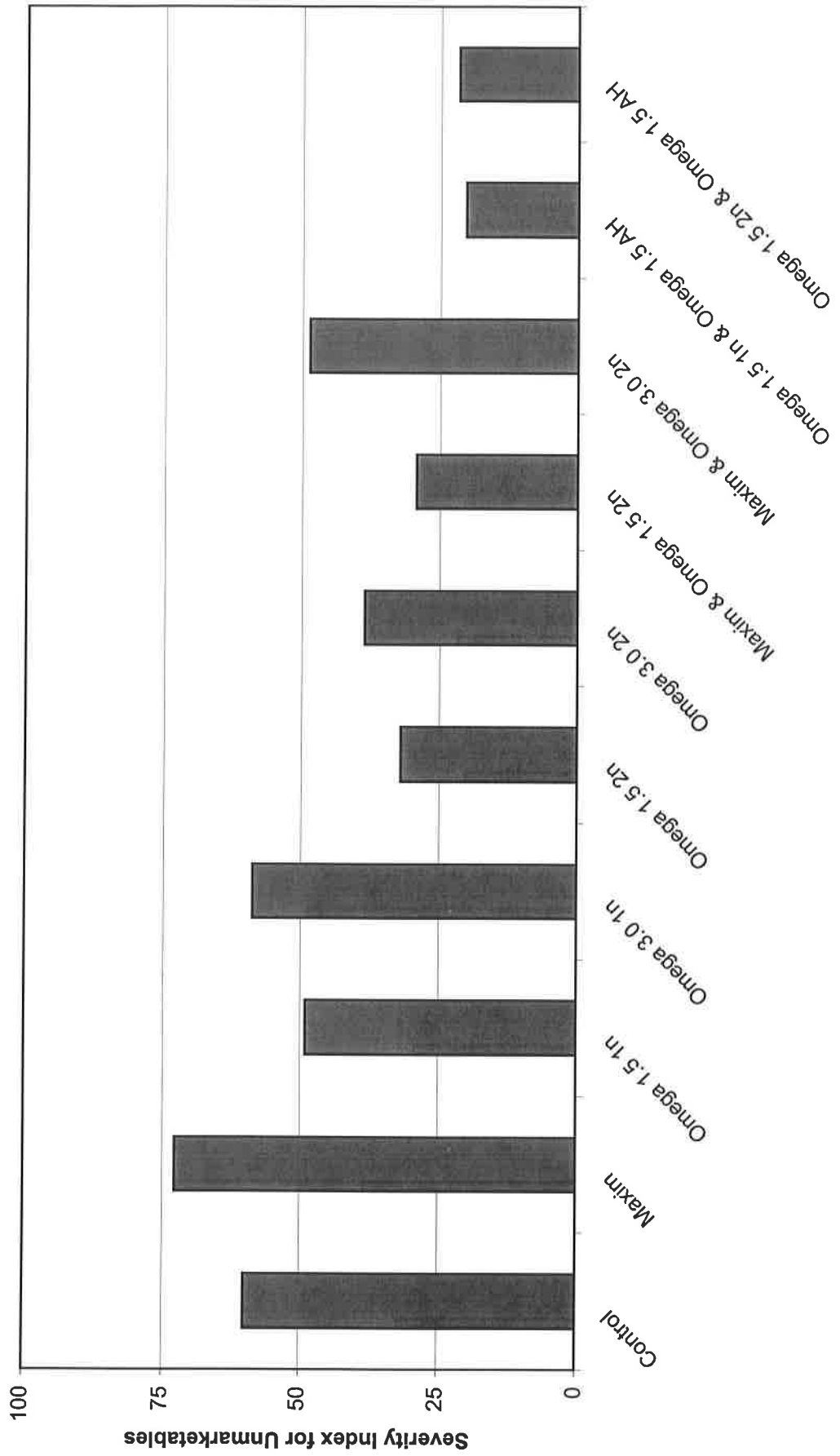
**Percent of Potatoes at Harvest with Powdery Scab Lesions
Evaluation of Fungicides for Control of Powdery Scab
San Luis Valley, Colorado, 2007**



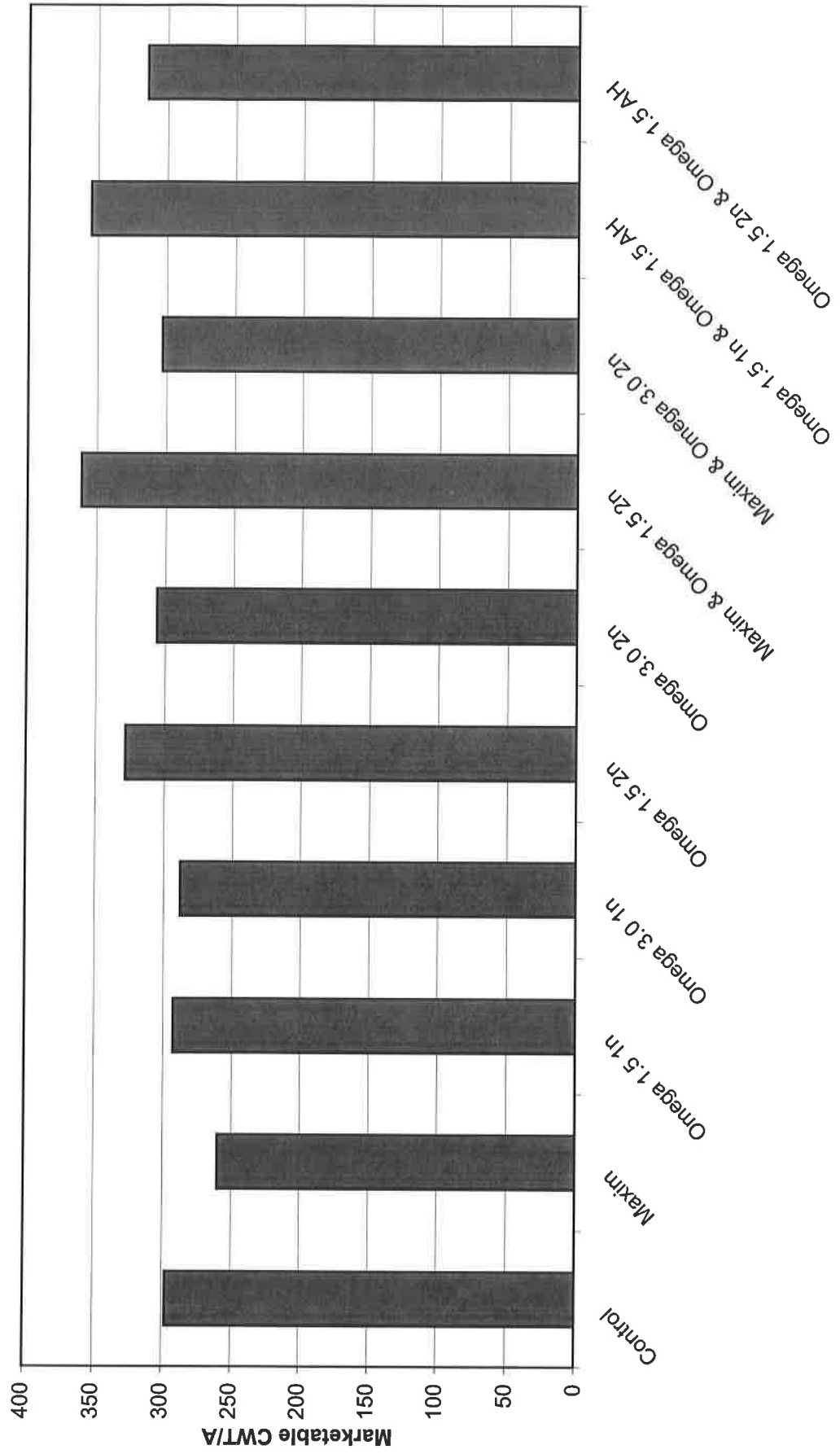
**Severity Index for Potatoes with Powdery Scab Lesions
 Evaluation of Fungicides for Control of Powdery Scab
 San Luis Valley, Colorado, 2007**



**Severity Index for Unmarketable Potatoes
Evaluation of Fungicides for Control of Powdery Scab
San Luis Valley, Colorado, 2007**



Marketable Yield (Potatoes with a Severity Rating Greater than Three have been Removed)
Evaluation of Fungicides for Control of Powdery Scab
San Luis Valley, Colorado, 2007



Evaluation of fungicides on the incidence of powdery scab on tubers in the cultivar Cherry Red, San Luis Valley, Colorado, 2006 & 2007

Treatments (Order based on effectiveness at reducing powdery scab severity)	Percent Incidence ^a		Overall Severity Index ^b		Severity Index (Marketable) ^c		Percent Unmarketable ^d		Severity Index (Unmarketable) ^e		CWT/A ^f		Marketable CWT/A ^g	
	2006	2007	2006	2007	2006	2007	2006	2007	2006	2007	2006	2007	2006	2007
^h Maxim @ 0.08 floz./cwt, On Seed	38.4 d	30.3	72.8 d	53.4	27.6 d	24.1	15.1 cd	9.4	45.2 b	29.3	434.8 ab	402.0	369.8	361.0 a
Omega @ 1.5 pt./A (two nozzles), AP	52.3 c	34.6	88.1 d	55.2	34.4 cd	23.2	17.9 bcd	10.7	53.8 b	32.0	407.6 b	375.7	334.8	328.2 ab
^h Omega @ 1.5 pt./A (two nozzles), AP	67.6 ab	34.6	150.3 bc	81.1	55.5 bc	32.0	27.5 b	14.0	94.9 b	49.1	378.0 b	351.3	275.9	292.8 bc
(one nozzle dir. over seed), At Planting (AP)														
^h Maxim @ 0.08 floz./cwt, On Seed	56.2 bc	40.9	122.7 cd	93.5	34.0 cd	44.8	22.2 bcd	13.3	88.8 b	48.7	420.4 b	359.6	328.2	303.2 bc
Omega @ 3.0 pt./A (two nozzles), AP	56.2 bc	36.4	109.8 cd	65.8	40.9 cd	27.3	23.0 bcd	11.8	68.9 b	38.6	431.8 ab	358.3	333.8	306.0 b
^h Omega @ 3.0 pt./A (two nozzles), AP	49.4 cd	44.3	96.3 cd	94.3	52.8 bc	35.6	14.5 d	16.4	43.5 b	58.7	362.7 b	357.0	310.4	287.9 bc
Omega @ 3.0 pt./A (one nozzle dir. over seed), AP														
Maxim @ 0.08 floz./cwt, On Seed	73.8 a	46.2	184.6 b	111.2	94.5 a	38.4	26.6 bc	21.1	90.0 b	72.8	414.7 b	343.0	302.2	260.2 c
Untreated Control	78.7 a	44.4	262.7 a	98.8	64.9 b	38.7	46.2 a	15.9	197.7 a	60.1	509.4 a	356.2	274.3	297.7 bc
LSD(P=0.05)	12.20	NS	61.30	NS	23.05	NS	11.86	NS	54.87	NS	80.31	NS	NS	43.85

^a Percent incidence = mean percent of the total number of tubers with one or more powdery scab lesion at harvest. Mean of four replications.

^b Overall Severity Index = mean percent of the total number of infected tubers/treatment/replication multiplied by the average severity of lesions, where a severity of one = very little disease and 5 = heavily infested.

^c Severity Index (Marketable) = mean percent of the number of infected marketable tubers/treatment/replication multiplied by the avg. severity of the lesions, where 1 = very little or no disease and 5 = heavily infested.

^d Percent Unmarketable = mean percent of the total number of tubers with a lesion severity rating of three or higher at harvest. Mean of four replications.

^e Severity Index (Unmarketable) = mean percent of the number of unmarketable tubers due to powdery scab lesion severity/treatment/replication multiplied by the average severity of the lesions, where 1 = very little or no disease and 5 = heavily infested.

^f Total yield expressed as hundred weight per acre, 2-20 foot rows per treatment per replication, mean of four replications.

^g Total yield expressed as hundred weight per acre (All unmarketable tubers due to high powdery scab severity, a rating of 3 or higher, have been removed from the total yield), 2-20 foot rows per treatment per replication, mean of four replications.

^h Where two nozzles are used, one nozzle is directed over the seed piece (45% of mix - 2006, 50% of mix - 2007) and one nozzle is directed at the soil as it covers the seed piece (55% of mix - 2006, 50% of mix - 2007).

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

EVALUATION OF ADVANCED CLONES FOR SUSCEPTIBILITY TO POWDERY SCAB, 2007

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. Colorado Rose (Not Inoculated) | 15. CO97232-2R/Y |
| 2. Colorado Rose (Inoculated) | 16. CO97233-3R/Y |
| 3. AC97097-14W | 17. CO98368-2RU |
| 4. AC97521-1R/Y | 18. CO98012-5R |
| 5. CO97043-14W | 19. CO98067-7RU |
| 6. CO97065-7W | 20. Centennial L-1 |
| 7. CO97087-2RU | 21. Centennial L-1M |
| 8. CO97138-3RU | 22. Centennial L-2 |
| 9. CO97138-7RU | 23. Centennial L-2M |
| 10. CO97215-2P/P | 24. Centennial L-3M |
| 11. CO97222-1R/R | 25. Russet Nugget L-2 |
| 12. CO97226-2R/R | 26. Russet Nugget L-1M |
| 13. CO97227-2P/PW | 27. Russet Nugget L-2M |
| 14. CO97232-1R/Y | |

Planted: August 16 & 21, 2007

Plot Design: Randomized

Plot Size: Four 6" pots per treatment per replication

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

Replications: Three

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

Fertilizer: 10N-30P-20K, applied six times

Insecticide: Marathon @ 1/3 tablespoons per pot & Conserve SC

Vine Killer: Vines were removed at harvest time on December 19, 20, & 21, 2007

Harvested: December 19, 20, & 21, 2007

DATA

Disease: Galls on roots rated 0 to 4, 0 = none, 4 = heavily infected, readings taken on January 2, 4, & 7, 2008. 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 of tubers per pot which are unmarketable due to powdery scab severity. Tuber readings were taken on January 2, 4, and 7, 2008.

Table 1. Evaluation of advanced clones for tuber susceptibility to powdery scab in a greenhouse environment, San Luis Valley, Colorado, 2007.

Cultivar	Tuber symptoms					Root Gall Rating ^c
	% Stand ^a	Percent Incidence	Percent Healthy	Severity Index ^b	% Unmarketable	
Colorado Rose (Not Inoculated)	75.0	0.0 i	100.0 a	0.0 f	0.0 c	0.1 l
Colorado Rose (Inoculated)	83.3	80.8 abc	19.2 ghi	235.8 a	43.3 a	3.1 ab
AC97097-14W	100.0	31.9 fgh	68.1 bcd	40.3 def	4.2 bc	1.4 c-i
AC97521-1R/Y	50.0	79.2 abc	20.8 ghi	130.6 bc	2.0 bc	2.4 a-d
CO97043-14W	8.3	50.0 def	50.0 def	100.0 bcd	0.0 c	2.0 b-e
CO97065-7W	100.0	72.5 a-d	27.5 f-i	133.5 bc	16.1 b	1.8 c-f
CO97087-2RU	75.0	0.0 i	100.0 a	0.0 f	0.0 c	0.4 i-l
CO97138-3RU	66.7	11.1 hi	88.9 ab	0.0 f	0.0 c	0.1 l
CO97138-7RU	100.0	4.2 i	95.8 a	4.2 f	0.0 c	0.1 l
CO97215-2P/P	8.3	0.0 i	100.0 a	0.0 f	0.0 c	0.0 l
CO97222-1R/R	41.7	62.6 bcd	37.4 fgh	118.2 bc	5.6 bc	1.3 d-j
CO97226-2R/R	91.7	31.4 fgh	68.6 bcd	31.4 ef	0.0 c	1.6 c-g
CO97227-2P/PW	91.7	57.6 cde	42.4 efg	74.3 cde	3.7 bc	1.3 e-k
CO97232-1R/Y	16.7	0.0 i	100.0 a	0.0 f	0.0 c	0.0 l
CO97232-2R/Y	83.3	93.1 a	6.9 i	229.2 a	43.1 a	3.5 a
CO97233-3R/Y	66.7	77.8 abc	22.2 ghi	158.3 b	8.3 bc	1.8 c-f
CO98368-2RU	91.7	0.0 i	100.0 a	0.0 f	0.0 c	0.2 kl
CO98012-5R	16.7	83.3 ab	16.7 hi	116.7 bc	0.0 c	2.5 abc
CO98067-7RU	100.0	0.0 i	100.0 a	0.0 f	0.0 c	0.8 f-l
Centennial L-1	100.0	0.0 i	100.0 a	0 f	0.0 c	0.8 f-l
Centennial L-1M	91.7	17.8 ghi	82.2 abc	20.6 ef	0.0 c	0.8 f-l
Centennial L-2	100.0	0.0 i	100.0 a	0 f	0.0 c	1.5 c-h
Centennial L-2M	100.0	37.1 efg	62.9 cde	37.1 def	0.0 c	0.8 f-l
Centennial L-3M	100.0	0.0 i	100.0 a	0.0 f	0.0 c	0.4 h-l
Russet Nugget L-2	58.3	0.0 i	100.0 a	0.0 f	0.0 c	1.0 e-l
Russet Nugget L-1M	50.0	0.0 i	100.0 a	0.0 f	0.0 c	0.5 g-l
Russet Nugget L-2M	91.7	2.2 i	97.8 a	2.2 f	0.0 c	0.2 jkl
LSD(P=0.05)		24.48	24.48	63.37	14.96	1.13

^a Percent Stand is based on the number of pots (three reps with four 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.

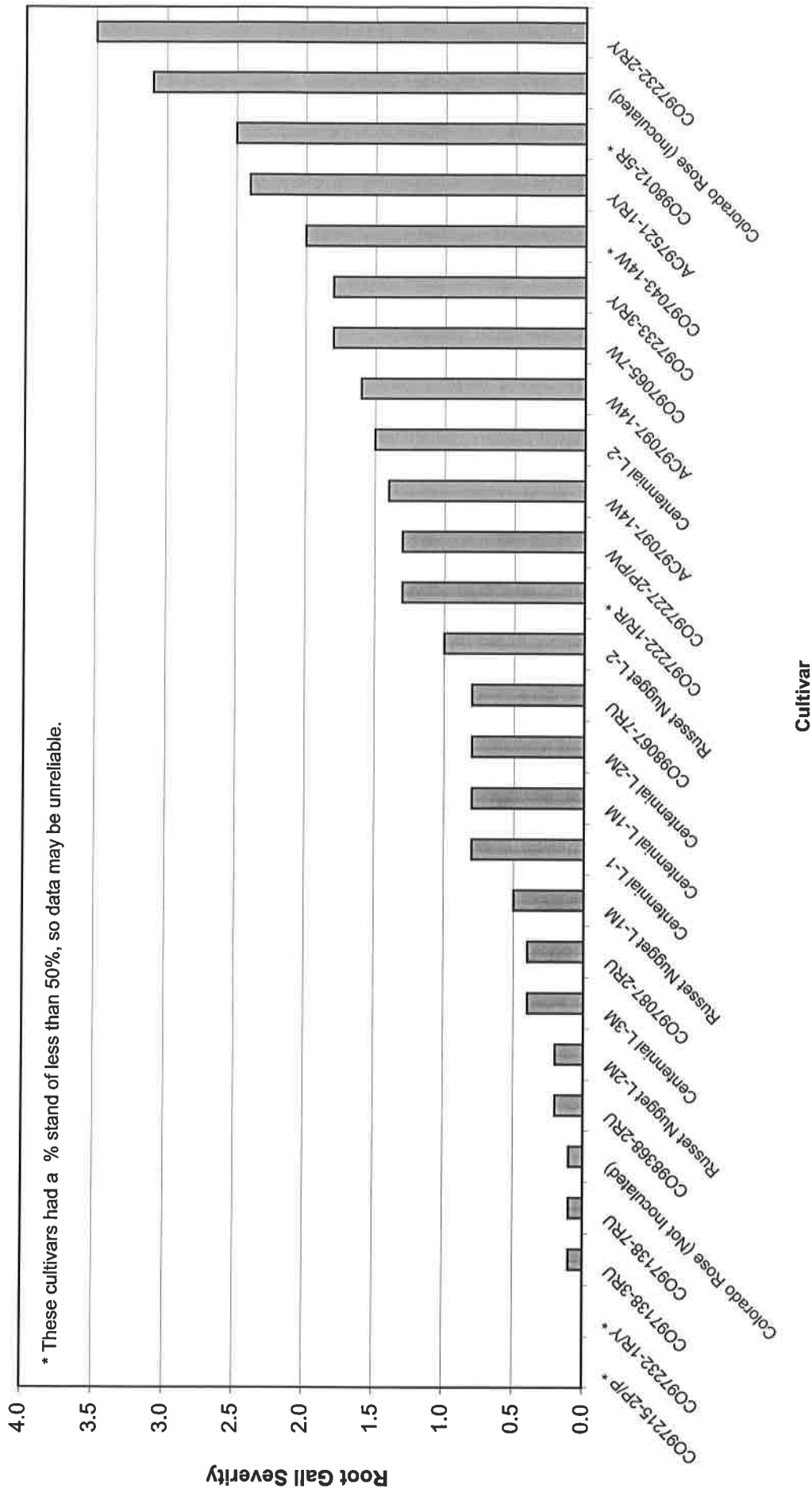
^b Severity Index = mean percent of the number of affected tubers multiplied by the severity of the lesions, where 1 = very little or no disease and 5 = heavily infested.

^c 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.

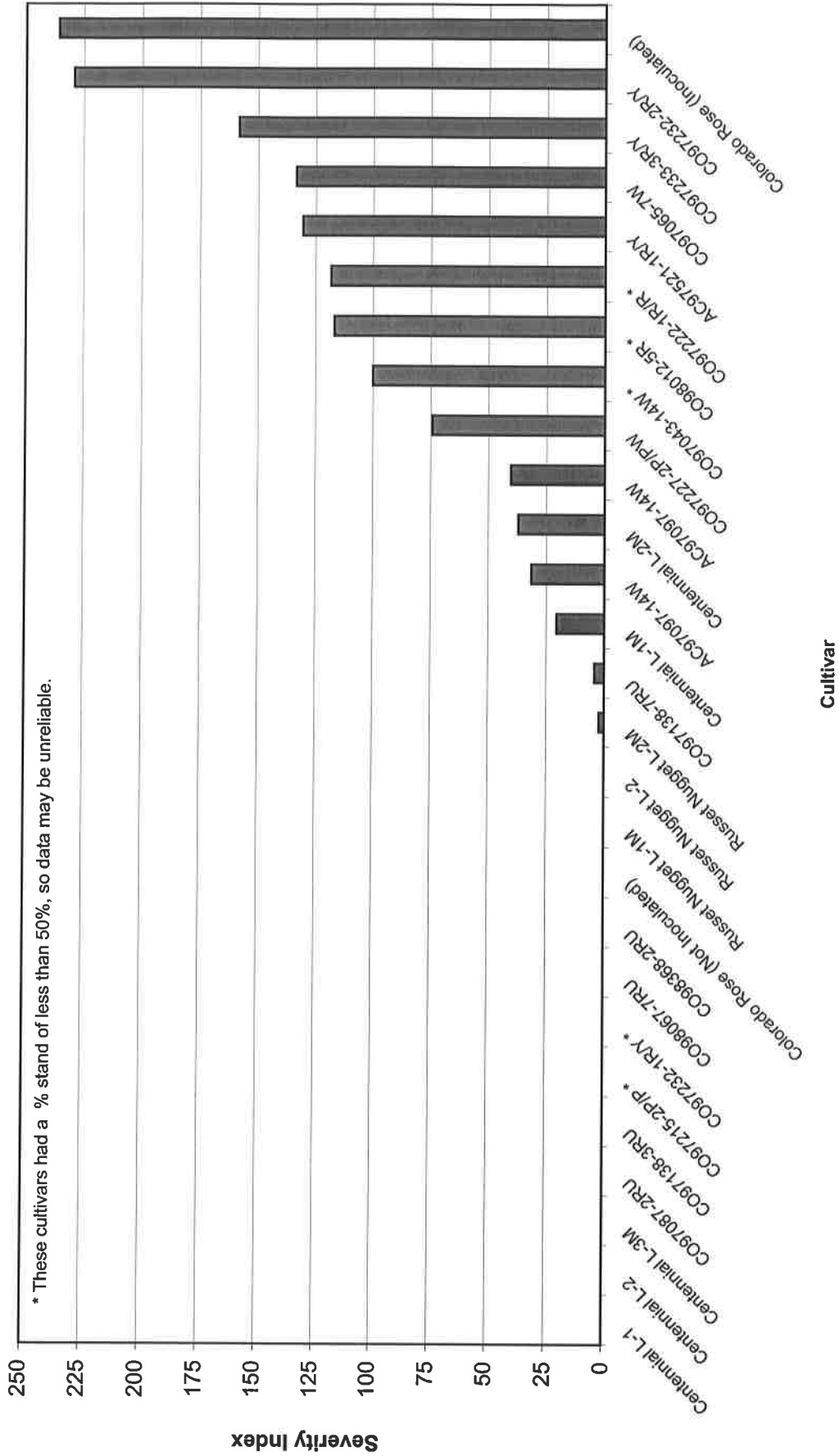
Means followed by the same letter are not significantly different at P=0.05.

Rob Davidson, Professor, Colorado State University

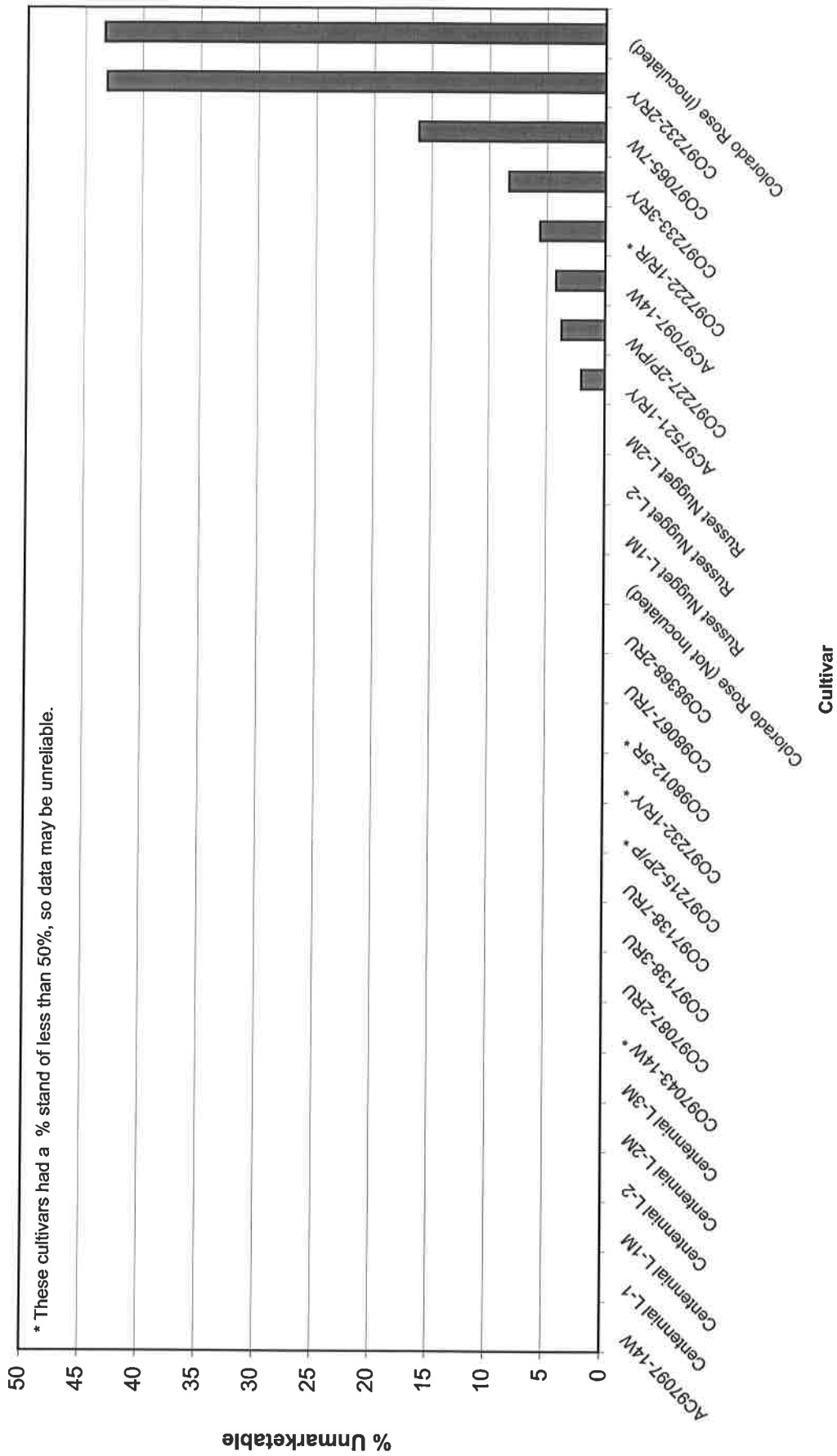
**Root Gall Severity Readings (0-4, where 0=no galls & 4 = roots are heavily infested with root galls)
 Evaluation of Advanced Clones for Susceptibility to Powdery Scab Root Galls
 San Luis Valley, Colorado, 2007**



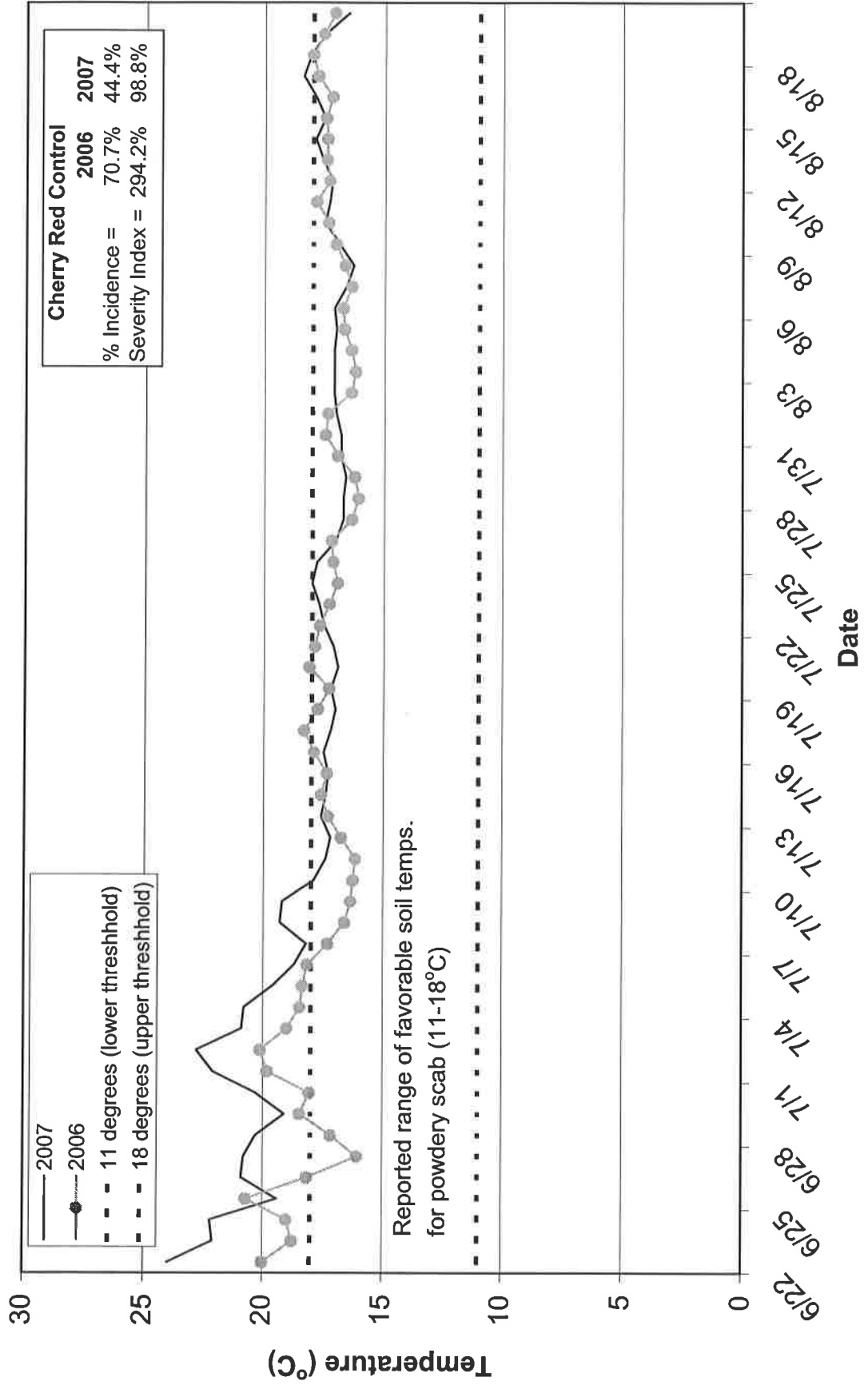
**Powdery Scab Severity Index (% potatoes with powdery scab multiplied by severity - 1 to 5)
 Evaluation of Advanced Clones for Tuber Susceptibility to Powdery Scab
 San Luis Valley, Colorado, 2007**



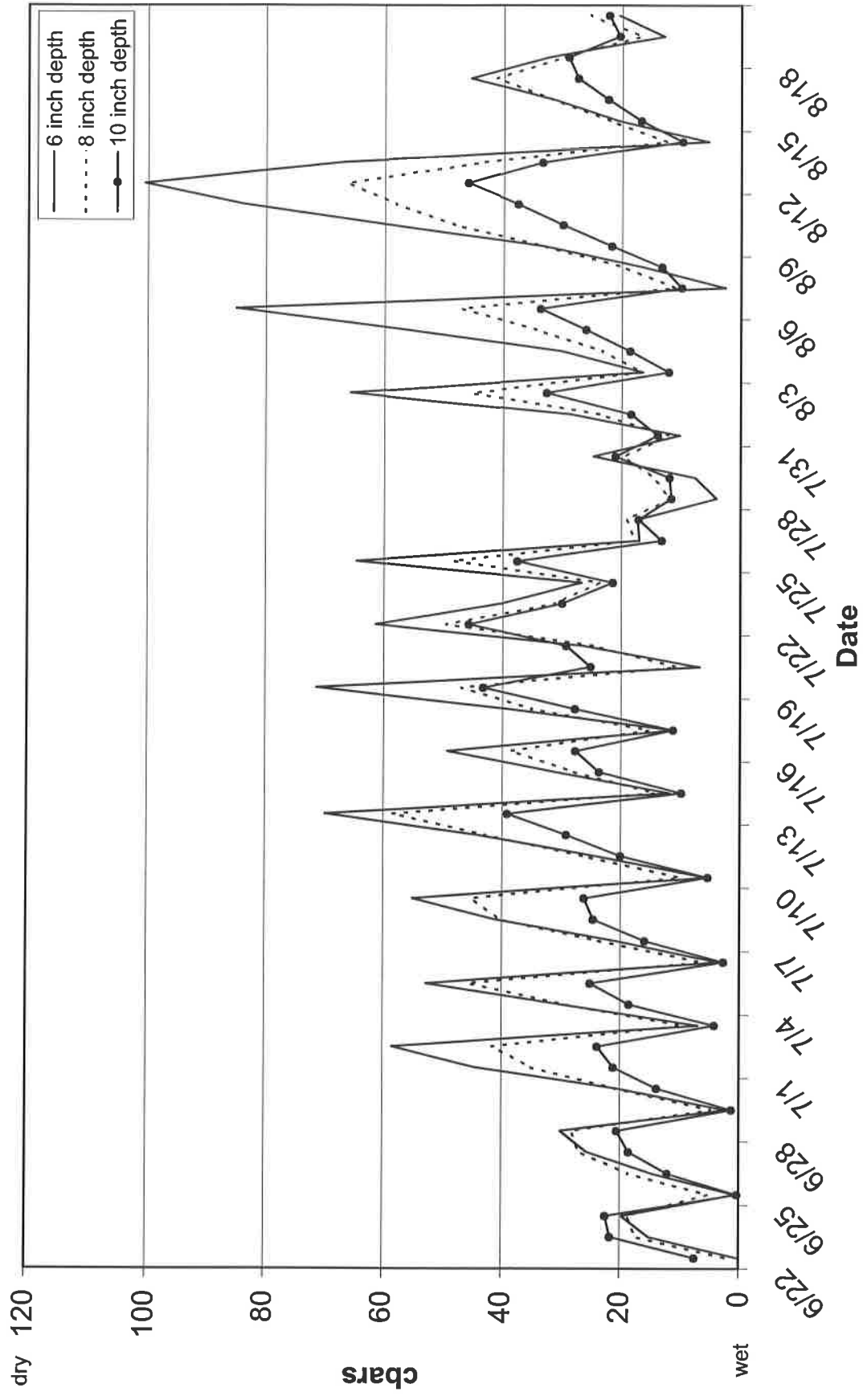
Percent of Potatoes at Harvest that are Unmarketable due to Powdery Scab Severity
Evaluation of Advanced Clones for Tuber Susceptibility to Powdery Scab
San Luis Valley, Colorado, 2007



Average Soil Temperature Readings 8" Under Potato Plant Canopy, Powdery Scab Trial, San Luis Valley, Colorado, 2006 & 2007



**Soil Moisture Readings (Daily Average) 6, 8 & 10 Inches Below Soil Surface,
Powdery Scab Trial, San Luis Valley, Colorado, 2007**



Soil Amendment Trial

EVALUATION OF PLANT AMENDMENTS FOR INCREASED POTATO HEALTH AND YIELD ON THE CULTIVARS RUSSET NORKOTAH AND YUKON GOLD, 2007

- Researchers:** Rob Davidson and Andrew Houser, Colorado State University, SLVRC
- Location:** San Luis Valley Research Center, Center, CO
- Cultivar:** Ranger Russet and Yukon Gold, cut seed, 2-4 oz.
- Objective:** To evaluate the efficacy of using Beyond and NuEarth plant amendments in increasing plant health and yield in potato.
- Application:** In-Furrow treatments were applied using an R & D CO₂ charged backpack sprayer at 35 PSI, with one XR 8002VS nozzle, at 10 gallons/acre as a directed in-furrow application. Foliar treatments were applied using an R & D CO₂ charged backpack sprayer at 35 PSI, with two XR 8002VS nozzles, at 20 gallons/acre.
- Treatments:**
1. Russet Norkotah selection 8, untreated control
 2. Russet Norkotah selection 8, Beyond @ 16 floz./A (applied In-furrow and at tuber initiation)
 3. Russet Norkotah selection 8, NuEarth @ 8.0 gal./A (applied In-furrow and at tuber initiation)
 4. Yukon Gold, untreated control
 5. Yukon Gold, Beyond @ 16 floz./A (applied In-furrow and at tuber initiation)
 6. Yukon Gold, NuEarth @ 8.0 gal./A (applied In-furrow and at tuber initiation)
- Planted:** May 22, 2007
- Plot Design:** Randomized complete block
- Plot Size:** 1 - 20 foot row per treatment per replication
- Plant Spacing:** 12 inches
- Row Spacing:** 34 inches
- Replications:** five
- Irrigation:** Solid set sprinkler, rate based on ET
- Fertilizer:** 80N-60P-40K-25S-2.5Z, preplant, 20N through sprinkler after tuber set
- Herbicide:** Matrix, 1.5 oz./A + Eptam, 4.5 pt./A
- Insecticide:** None
- Fungicide:** Quadris, 6.0 floz./A
- Vine Killer:** Rotobeat vines on September 4, 2007
- Harvested:** September 25, 2007

DATA

- Yield:** 1-20 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.
- Disease:** At harvest, pink rot was found and evaluated in the trial. Mean percent of tubers with pink rot at harvest was multiplied by a disease severity rating of 1-5 (1=less than 5% rotten, 5=100% rotten) per treatment per replication.

Table 1. Effects of Beyond (trts. 2 & 5) and NuEarth (trts. 3 & 6), applied at planting and in season for increasing tuber yield and quality in the cultivars Russet Norkotah selection 8 and Yukon Gold, San Luis Valley, Colorado, 2007.

Program	Treatment	Rate	Application Schedule	Percent ^a					No. rot ^c	% rot ^d		
				< 4 oz.	4-10 oz.	> 10 oz.	US #2's	Culls			Cwt/A ^b	
1.	Russet Norkotah sel. 8	Control, no treatment	-	23.2 a	40.2	34.1	2.5	0.0	342.53	4.0 ab	3.69	
2.	Russet Norkotah sel. 8	16 floz./A, In-furrow 16 floz./A, foliar	May 22, 2007 (At-planting) July 20, 2007 (At tuber set)	21.7 a	48.9	28.0	1.4	0.0	281.54	5.4 a	5.61	
3.	Russet Norkotah sel. 8	8.0 gal./A, In-furrow 8.0 gal./A, foliar	May 22, 2007 (At-planting) July 20, 2007 (At tuber set)	18.5 abc	50.6	29.4	1.5	0.0	357.77	3.2 abc	3.67	
4.	Yukon Gold	Control, no treatment	-	13.0 c	47.0	38.4	1.5	0.0	345.58	0.4 c	0.74	
5.	Yukon Gold	16 floz./A, In-furrow 16 floz./A, foliar	May 22, 2007 (At-planting) July 20, 2007 (At tuber set)	20.3 ab	43.0	36.2	0.5	0.0	308.31	0.8 bc	1.81	
6.	Yukon Gold	8.0 gal./A, In-furrow 8.0 gal./A, foliar	May 22, 2007 (At-planting) July 20, 2007 (At tuber set)	14.4 bc	51.8	32.8	0.9	0.0	314.07	0.6 bc	0.35	
LSD(P=0.05)				6.70	NS	NS	NS	NS	NS	NS	3.59	NS

^a Based on tuber weight in pounds, mean of four replications.

^b Total yield expressed as hundred weight per acre, 1-20 foot row per treatment per replication, mean of five replications.

^c Average number of rotten tubers found at harvest.

^d Percent of rotten tubers at harvest based on total tuber weight.

Seed Piece Trial

EVALUATION OF SEED TREATMENTS APPLIED TO POTATO SEED, 2007

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

Location: San Luis Valley Research Center, Center, CO

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

Objective: To evaluate the efficacy of various seed treatments. Additional data was collected on plant health, rhizoctonia severity, pink rot severity and overall yield.

Application: On seed treatments were applied directly to fresh cut seed. All seed was cut and treated on May 16.

Treatments:

1. Proprietary
2. Proprietary
3. Proprietary
4. Proprietary
5. Proprietary
6. Schall 8% Mancozeb
7. Control, no treatment

Planted: May 18, 2007

Plot Design: Randomized complete block

Plot Size: 2 - 20 foot row 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-2.5Zn, preplant, 20N through sprinkler after tuber set

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

Insecticide: None

Fungicide: Quadris @ 6.0 floz./A

Vine Killer: Rotobeat vines on September 4, 2007

Harvested: September 26, 2007

DATA

Plant vigor: Rated 1-5, where 1 = poor and 5 = good; 2 plants/treatment/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.

Stems: Average number of stems per plant; 2 plants/treatment/replication.

Tuber set: Average number of tubers and tuber size per plant at full set; 2 plants/treatment/replication.

Yield: 2-20 foot rows per treatment per replication, total yield expressed in cwt/A. In reps I, II, & III only 2-19 foot rows per treatment were harvested due to destructive harvests conducted on July 26th & August 10th. Also, in treatment #3 rep. IV, only 19 seed pieces per row were planted on May 18th.

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 seed treatments on plant development and incidence of disease in the cultivar Russet Norkotah Selection 8, San Luis Valley, Colorado, 2007. Readings were taken on July 26th and August 10th.

Treatment/Rate	Stems with Rhizoctonia					Seed piece decay after plant establishment ^e	Number tubers ^f	Average tuber size ^g	Number rotten ^h	Percent rotten ⁱ
	Vigor ^a	Stems ^b	Percent ^c	Severity Index ^d						
Proprietary	4.5	5.3	66.1	157.2	100.0	7.3	5.6	0.3	0.2	
Proprietary	4.8	3.8	63.9	127.8	66.7	7.2	6.6	1.0	0.5	
Proprietary	5.0	7.7	82.6	227.1	100.0	9.5	5.7	0.3	0.2	
Proprietary	5.0	4.2	88.1	235.7	100.0	7.5	5.8	1.3	0.5	
Proprietary	5.0	6.0	69.6	169.6	99.2	7.3	6.4	1.8	0.3	
Schall 8% Mancozeb	4.8	5.0	83.3	250.0	100.0	6.5	6.7	0.8	0.5	
Control, no treatment	4.8	6.0	50.3	82.8	93.3	10.7	5.8	2.0	0.8	
LSD(P=0.05)	NS	NS	NS	NS	NS	NS	NS	NS	NS	

^a Mean percent vigor, where 1 = poor, 5 = good; 2 plants/treatment/replication. Vigor readings taken on July 20.

^b Mean number of stems per seed piece; 2 plants/treatment/replication. Stem numbers taken on July 26 & August 10. Data was only collected in reps I, II, & III.

^c Mean percent stems with Rhizoctonia canker; 2 plants/treatment/replication. Readings taken on July 26 & August 10. Data was only collected in reps I, II, & III.

^d 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. Readings taken on July 26 & August 10. Data was only collected in reps I, II, & III.

^e Mean percent incidence of disease combined soft-rot and dry-rot; rated 0-100, where 0 = no decay, 100 = complete decay; 2 seed pieces/treatment/replication. Readings taken on July 26 & August 10. Data was only collected in reps I, II, & III.

^f Mean number of tubers per potato plant; 2 plants/treatment/replication. Tuber numbers taken on July 26 & August 10. Data was only collected in reps I, II, & III.

^g Mean tuber size (in ounces); 2 plants/treatment/replication. Readings taken on July 26 & August 10. Data was only collected in reps I, II, & III.

^h Mean number of tubers with pink rot at harvest per treatment per replication.

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

Table 2. Effect of seed piece treatments on tuber yield and quality in the cultivar Russet Norkotah Selection 8, San Luis Valley, Colorado, 2007.

Treatment/Rate	Percent ^a			US No 2's	Culls	Cwt/A ^b	Initial treatment amount (grams) ^c	Treatment on seed (grams) ^d
	< 4 oz.	4-10 oz.	> 10 oz.					
Proprietary	27.1	48.0	12.5	4.9	7.6	302.0	147.0	69.9
Proprietary	25.1	51.7	12.7	4.7	5.9	281.1	133.4	69.4
Proprietary	22.1	54.1	16.1	1.9	5.8	292.2	132.5	58.9
Proprietary	27.1	52.0	15.4	4.0	6.8	312.3	126.1	57.3
Proprietary	20.6	54.1	15.0	4.4	5.9	335.8	133.3	65.7
Schall 8% Mancozeb	20.2	53.0	17.8	5.0	4.0	326.3	131.5	57.2
Control, no treatment ^e	21.1	52.5	15.3	4.7	6.4	334.3	NA	NA
LSD(P=0.05)	NS	NS	NS	NS	NS	NS	NA	NA

^a Based on tuber weight in kilograms, mean of four replications.

^b Total yield expressed as hundred weight per acre, 2-20 foot rows per treatment per replication, mean of four replications. In reps I, II, & III only 2-19 foot rows per treatment were harvested due to destructive harvests conducted on July 26th & August 10th. Also, in treatment #3 rep. IV, only 19 seed pieces per row were planted on May 18th.

^c The initial amount of seed treatment applied to each treatment was based on the weight of the seed for all four replications.

^d The amount of seed treatment that adhered to the seed at planting for all four replications.

Advanced Clone Disease Assessment Program

Research is devoted to screening all new cultivars prior to release to growers for the following diseases: bacterial ring rot, potato leafroll virus, PVY, *Fusarium* seed piece decay, *Pectobacterium carotovora* spp. (seedpiece decay), early blight tuber decay, powdery scab, pink rot, and other diseases/pests as techniques become available or as warranted by SLV problems. Results from this research are presented annually in a report to the CPAC and, as cultivars are released, to the growers as cultivar management information sheets.

2007 Clonal Evaluation: PLRV, PVY, and Natural In-field Spread-PLRV

Location: NW Corner, Selter's Farm, 9 North, ½ mile east of SLVRC
Treatments: PLRV and PVY Infected and Healthy + Natural In-Field Spread of PLRV
Plot Design: PVY and PLRV - ten seed pieces/cultivar.
 PLRV/PVY - Aphid inoculation for PVY CE was 7/13/07 to plants 9 & 10; PLRV CE was 7/20/07 to plants 1 and 2; Inside plants are controls.
 (numbered from the west)
 NIFS -12 seed pieces x 3 reps - (Leafroll spacer between each treatment)

Plant Date: 5/8/07 Aphid kill - (7/23/07)
Plot Size: 12" plant spacing x 34" row spacing

Cultivar:

1. AC00322-7RU	18. WNC230-14RU
2. AC97306-1RU	19. CO99256-3R
3. AC00170-2W	20. Ute Russet
4. CO00188-4W	21. CO99338-3RU/Y
5. CO00189-2W	22. Green Mountain
6. CO00197-3W	23. CO97232-1R/Y
7. CO00270-7W	24. Houma
8. CO00277-2R	25. CO97232-2R/Y
9. CO00278-4R	26. Keswick
10. CO00291-5R	27. CO97233-3R/Y
11. CO00339-4R	28. Penobscot
12. CO00379-2R/Y	29. Katahdin
13. CO00405-1R	30. Centennial Russet
14. CO00412-5W/Y	31. Russet Nugget
15. CO00415-1R	32. Sangre
16. ATC00293-1W/Y	33. Russet Norkotah
17. CO99045-1W/Y	34. Russet Burbank
	35. AC97044-4RU

LR CE = 1-18, 19-20, 23, 30-34; PVY CE = 1-16, 18, 20-21, 23, 25, 27, 30-35;
 NIFS = 1-16, 18, 20, 22, 24, 26, 28, 30-34

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

Fertilizer: 80:60:40:25(S):2.5:(Zn);10 N from irrigation water and 20 N during season.
 Total for season: 110:60:40:25(S):2.5(Zn).

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

Fungicide/ Insecticide: Aerial applications: 7/3/07 - Bravo WS (1.5pt/A); Quadris (6pt/A)

Harvest: 10/5/07

Table 1. 2007 Clonal Evaluation for PLRV and PVY Symptom Expression

Cultivar/Clone	PLRV (0-3+)	Symptoms	Cultivar/Clone	PVY (0-3+)	Symptoms
AC00322-7RU	3+	WP,LL,CC	AC00322-7RU	3+	
AC97306-1RU	0		AC97306-1RU	0	
AC00170-2W	3+	WP,LL,CC	AC00170-2W	3+	
CO00188-4W	3+	WP,LL,CC	CO00188-4W	3+	
CO00189-2W	3+	WP,LL,CC	CO00189-2W	3+	Hypersensitive
CO00197-3W	3+	ALL	CO00197-3W	3+	
CO00270-7W	3+	WP,LL,CC	CO00270-7W	0	
CO00277-2R	3+	ALL	CO00277-2R	3+	
CO00278-4R	3+	WP,LL,CC	CO00278-4R	0	
CO00291-5R	0		CO00291-5R	0	
CO00339-4R	0		CO00339-4R	2+	Purpling
CO00379-2R/Y	3+	WP,LL,CC	CO00379-2R/Y	0	
CO00405-1R	0		CO00405-1R	3+	
CO412-5W/Y	3+	WP,LL,CC	CO412-5W/Y	2+	
CO00415-1R	3+	WP,LL,CC	CO00415-1R	0	
ATC00293-1W/Y	0		ATC00293-1W/Y	0	
CO99045-1W/Y	3+	WP,LL,CC	CO97232-1R/Y	0	
WNC230-14RU	1+	WP,LL, Light CC	WNC230-14RU	3+	
CO99256-3R	0		CO97232-2R/Y	0	
Ute Russet	3+	ALL	Ute Russet	3+	
CO97232-1R/Y	0		CO97232-1R/Y	0	
Centennial Russet	1+	WP,LL,CC	Centennial Russet	3+	
Russet Norkotah	3+	WP,LL,CC	Russet Norkotah	3+	
Sangre	3+	ALL	Sangre	3+	
Russet Norkotah	3+	WP,LL,CC	Russet Norkotah	3+	
Russet Burbank	3+	WP,LL,CC	Russet Burbank	3+	
			CO97233-3R/Y	0	
			AC97044-4RU	3+	

All = WP - whole plant, LL - Lower leaf rolling, CC - color change; P = purpling along leaf margins.

Typical = mosaic type symptom with yellowing, vein burning, and stunting. Hypersensitive - severe stunting with leaf drop. Severe - showed extreme reaction.

Rating; 0 = no symptoms up to 3+ = typical symptoms which are easy to recognize visually.

Table 2. 2007 Clonal Evaluation for Leaf Roll Natural In-Field Spread					
Cultivar/Clone	# Pos/ # Emerged	% Spread	2007	17 Yr. Avg.	Risk
AC00322-7RU	2/24		8.3		High
AC97306-1RU	0/9		0.0		Low
AC00170-2W	1/30		3.3		Low
CO00188-4W	2/28		7.1		Medium
CO00189-2W	1/26		3.8		Low
CO00197-3W	5/40		12.5		High
CO00270-7W	9/30		30.0		High
CO00277-2R	0/36		0.0		Low
CO00278-4R	2/34		5.9		Medium
CO00291-5R	0/24		0.0		Low
CO00339-4R	0/18		0.0		Low
CO00379-2R/Y	0/27		0.0		Low
CO00405-1R	0/28		0.0		Low
CO412-5W/Y	5/27		18.5		High
CO00415-1R	0/26		0.0		Low
ATC00293-1W/Y	0/32		0.0		Low
WNC230-14RU	1/20		5.0	0.3	Very Low
Ute Russet	2/32		6.3		Medium
Green Mountain	0/28		0.0	16.2	High
Houma	0/32		0.0	4.3	Low
Keswick	0/26		0.0	4.8	Low
Penobscot	0/26		0.0	0.8	Very Low
Katahdin	0/28		0.0	3.1	Low
Centennial Russet	0/30		0.0	3.6	Low
Russet Nugget	3/25		12.0	12.7	High
Sangre	0/6		0.0	7.4	Medium
Russet Norkotah	0/29		0.0	20.0 (7 yr avg)	High
Russet Burbank	0/25		0.0	11.6	High

Data is generated using 12 tubers/rep, and 3 reps/cultivar for a total of 36 tubers/clone/yr. Advanced clones only have one year of testing (1-16). Risk assessment; Low = 0-4.9%; Medium = 5.0-9.9%; High = 10.0% and higher.

2007 Bacterial Ring Rot Evaluation

- Location:** NW Corner, Selter's Farm, 9 North, ½ East of SLVRC
- Treatments:** 60 clones/cultivars - Non-inoculated controls consisted of 21 seed pieces (fresh cut lengthwise with no dipping). Inoculated treatments were obtained by placing 21 seed pieces (fresh cut lengthwise) into 1½ liter of Ringer's solution (100 ml of 10x with 900 ml of cold water) for 5 minutes. Three Cms plates (Strain # CIC31) exhibiting good bacterial growth, with some agar, were scraped into the Ringer's. After four treatments were dipped, a fourth and fifth plate 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 5/5-6. 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 west of inoculated treatments.
- Plant Date:** 5/8/07, 5/11/07*
- Cultivars:**
- | | | |
|-------------------|---------------------|-----------------------|
| 1. AC00322-7RU | 23. CO99028-2RU | 48. MWTX2609-2RU |
| 2. AC97306-1RU | 24. CO99045-1W/Y | 49. MWTX2609-4RU |
| 3. AC00170-2W | 25. CO99053-3RU | 50. B0766-3T |
| 4. CO00188-4W | 26. CO99053-4RU | 51. WNC230-14RU |
| 5. CO00189-2W | 27. CO99076-6R | 52. Ute Russet |
| 6. CO00197-3W | 28. CO99100-1RU | 53. CO86030-1RU |
| 7. CO00270-7W | 29. CO99199-1RU | 54. CO86153-2RU |
| 8. CO00277-2R | 30. CO99256-2R | 55. Centennial Russet |
| 9. CO00278-4R | 31. CO99256-3R | 56. Sangre |
| 10. CO00291-5R | 32. CO99338-3RU/Y | 57. Russet Norkotah |
| 11. CO00339-4R | 33. VC1115-1RU | 58. Yukon Gold* |
| 12. CO00379-2R/Y | 34. FL 2137* | 59. Russet Burbank |
| 13. CO00405-1R | 35. FL 2126* | 60. Ambra |
| 14. CO00412-5W/Y | 37. A97289-6 | 61. Red Scarlett |
| 15. CO00415-1R | 39. AOTX95265-2ARU | 62. Rodeo |
| 16. ATC00293-1W/Y | 40. AOTX95265-3RU | 63. Mozart |
| 17. AC97044-4RU | 41. AOTX95265-4RU | |
| 18. AC99375-1RU | 42. AOTX95295-3RU | |
| 19. AC99178-2RU | 43. ATTX961014-1R/Y | |
| 20. AC99213-8W | 44. ATTX98500-2P/Y | |
| 21. AC99329-7PW/Y | 45. POR01PG20-12 | |
| 22. AC99330-1P/Y | 46. A96510-4Y | |
- Irrigation:** Solid set sprinkler: rate based on ET and ppt. Total water for season was approx. 18".
- Fertilizer:** 80:60:40:25(S):2.5:(Zn) with 10 N from irrigation water and 20 N during season. Total for season: 110:60:40:25(S):2.5(Zn).
- Herbicide:** Ground rig application: 6/7/07 Eptam (4.5pt/A) + Matrix (1.5pt/A).
- Fungicide/ Insecticide:** Aerial applications: 7/3/07 Bravo WS (1.5pt/A); Quadris (6pt/A)
- Harvest:** 10/5/07

Table 3. 2006/07 Clonal Evaluation for Bacterial Ring Rot Foliar Symptom Expression

Year	Clone	DAP to First Symptoms	# Reps Positive	# Plants Positive	% Plants Positive	Date 50% or More	Total # Reps	% Plants + 100 DAP	Summary of Symptoms	SS	*Ave DAP to 1st Symptoms	Rating
06	AC97044-4RU	59	2	3	14.3		3	38.1	ALL	+		
07		83	1	1	4.8		3	28.6	ALL		71 +/- 10	5
06	AC99375-1RU	100	2	2	9.5		2	9.5	IVC,IVN,MN,W	-		
07		49	1	1	4.8		3	14.3	ALL		75 +/- 25	3
06	AC99178-2RU	59	3	9	40.9	70	3	81.8	ALL	-		
07		73	2	3	14.3	110	2	57.1	ALL		66 +/- 5	5
06	AC99213-8W	59	3	7	33.3	87	3	61.9	ALL	+		
07		63	1	3	14.3	92	3	61.9	ALL		61	5
06	AC99329-7RW/Y	59	1	1	5.0		3	30.0	ALL	+		
07		92	1	1	4.8		3	28.6	IVC,IVN,MN,W		76 +/- 15	4
06	AC99330-1P/Y	59	1	1	4.8		3	33.3	ALL	+		
07		73	1	1	4.8		2	42.9	ALL		66 +/- 5	5
06	CO99028-2RU	59	1	2	10.5		3	31.6	ED,R,IVC,IVN,MN	-		
07		83	1	1	5.0		2	10.0	IVC,IVN,MN,W		71 +/- 10	4
06	CO99045-1W/Y	59	3	8	38.1		3	47.6	ALL	+		
07		49	2	2	9.5		2	42.9	ED,R,IVC		54 +/- 5	5
06	CO99053-3RU	59	1	4	19.0		2	28.6	ED,R,IVC,W	-		
07		63	1	1	4.8		3	33.3	ALL		61	5
06	CO99053-4RU	70	2	5	23.8	87	3	71.4	ALL	-		
07		49	2	2	9.5		3	28.6	ALL		60 +/- 10	5
06	CO99076-6R	59	2	2	11.1		3	44.4	ALL	-		
07		83	1	1	4.8		2	9.5	IVC,IVN,MN,W		71 +/- 10	4
06	CO99100-1RU	59	1	1	5.0		3	35.0	ALL	+		
07		49	1	1	4.8		3	28.6	ALL		54 +/- 5	5
06	CO99199-1RU	59	1	2	10.5	87	3	57.9	ALL	+		
07		73	1	1	4.8		3	47.6	ALL		66 +/- 5	5
06	CO99256-2R	59	2	4	19.0		2	28.6	ALL	-		
07		49	1	1	4.8		2	23.8	ALL		54 +/- 5	5
06	CO99256-3R	59	1	1	4.8		2	23.8	ALL	+		
07		49	1	1	4.8		2	19.1	ALL		54 +/- 5	5
06	CO99338-3RU/Y	59	1	1	5.0		3	33.3	ALL	+		
07		49	1	1	4.8	100	3	57.1	ALL		54 +/- 5	5
06	VC1115-1RU	87	1	1	4.8		1	4.8	IVC,IVN,MN,W	-		
07		83	1	1	4.8		3	14.3	ALL		85	3
06	MWTX2609-2RU	59	3	4	19.0	100	3	61.9	ALL	+		
07		73	2	3	14.3		3	42.9	ALL		66 +/- 5	5

Year	Clone	DAP to First Symptoms	# Reps Positive	# Plants Positive	% Plants Positive	Date 50% or More	Total # Reps	% Plants + 100 DAP	Summary of Symptoms	SS	*Ave DAP to 1st Symptoms	Rating
06	AOTX95265-2ARU	59	3	8	38.1	87	3	71.4	ALL	+		
07		83	2	5	23.8		3	33.3	ALL		71 +/- 10	5
06	AOTX95265-4RU	59	2	10	52.6	59	3	94.7	ALL	-		
07		73	1	1	4.8		3	28.6	ALL		66 +/- 5	5
06	MWTX2609-4RU	59	3	5	23.8		3	28.6	ALL	+		
07		49	2	2	10.5		2	21.1	ED,R,IVC		54 +/- 5	5
06	B0766-3T	59	1	2	9.5		3	38.1	ALL	+		
07		92	2	3	14.3		3	47.6	ALL		75 +/- 15	4
06	POR01PG20-12	59	2	4	19.0		3	42.9	ALL	+		
07		49	1	1	4.8		2	23.8	ED,R,IVC		54 +/- 5	5
07	AC00322-7RU	100	3	6	33.3		3	33.3	IVC,IVN,MN,W	+		
07	AC97306-1RU	73	2	4	19.0	100	3	71.4	ALL	+		
07	AC00170-2W	73	1	3	14.3		3	47.6	ALL	+		
07	CO00188-4W	83	1	1	4.7		3	28.6	ALL	-		
07	CO00189-2W	73	1	1	5.0		3	45.0	IVC,IVN,MN,W	-		
07	CO00197-3W	73	2	2	9.5		3	33.3	ALL	+		
07	CO00270-7W	63	1	3	15.0	110	3	50.0	IVC,IVN,MN,W	-		
07	CO00277-2R	63	2	3	15.0	83	3	60.0	ALL	+		
07	CO00278-4R	49	1	1	4.8		3	47.6	ALL	-		
07	CO00291-5R	83	1	1	5.5		2	11.1	ALL	-		
07	CO00339-4R	63	1	1	5.6		3	27.8	IVC,IVN,MN,W	-		
07	CO00379-2R/Y	83	1	2	9.5		3	38.1	ALL	+		
07	CO00405-1R	92	1	1	4.8		1	4.8	IVC,W	-		
07	CO00412-5W/Y	73	2	2	9.5	110	3	52.3	ALL	+		
07	CO00415-1R	73	3	3	14.3		3	14.3	ED,R,IVC,W	-		
07	ATC00293-1W/Y	49	1	1	4.8		2	9.5	ALL	-		
07	A97289-6	63	1	1	4.8		2	33.3	ALL	-		
07	AOTX95265-3RU	49	1	1	5.0		3	28.6	ALL	-		
07	AOTX95295-3RU	49	1	1	4.8	100	3	52.4	ALL	-		
07	ATTX961014-1R/Y	49	1	1	5.6		3	16.7	ALL	-		
07	ATTX98500-2P/Y	92	1	1	4.8		2	9.5	ALL	-		
07	A96510-4Y	49	1	1	4.8		1	9.5	ED,R,IVC	+		
07	CO86030-1RU	49	1	1	4.8		2	9.5	ED,R,IVC,IVN	-		2
07	CO86153-2RU	83	1	1	4.8		1	4.8	ED,R,IVC	-		1
07	Yukon Gold	49	1	1	5.0		3	30.0	ALL	-		
06	WNC230-14RU	59	1	2	9.5		3	28.6	ED,R,IVC,W	+		
07		73	1	1	5.0		1	10.0	ED,R,IVC	-	66 +/- 5	4

Year	Clone	DAP to First Symptoms	# Reps Positive	# Plants Positive	% Plants Positive	Date 50% or More	Total # Reps	% Plants + 100 DAP	Summary of Symptoms	SS	* Ave DAP to 1st Symptoms	Rating
06	Ute Russet	59	2	6	30.0	100	2	50.0	ALL	+		
07		63	1	1	4.8		3	33.3	ALL	-	61	5
06	Centennial Russet	77	1	3	16.7	87	3	61.1	IVC,IVN,MN,W	+		
07		73	2	2	9.5		3	23.8	ALL	-	75	5
06	Russet Burbank	59	3	11	55.0	59	3	85.0	ALL	+		
07		49	3	3	14.3	100	3	52.3	ALL	+	54 +/- 5	5
06	Sangre	87	2	7	35.0	100	3	55.0	ALL	+		
07		100	2	3	14.3		3	28.6	ALL	+	94 +/- 5	4
06	Russet Norkotah	59	3	9	42.9	87	3	76.2	ALL	+		
07		49	1	1	4.8	110	3	61.9	ALL	-	54 +/- 5	5
	Planting date - 5/11/07. Key to symptoms: ED-Early Dwarf, R-Rosette, IVC-Interveinal Chlorosis, VN-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).											
	CO86030-1RU and CO86153-2RU are considered latent expressors of BRR in most years with symptoms rarely seen, even though Cms is present in the plants											
	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.											

Table 4. 2007 Clonal Evaluation for Bacterial Ring Rot				
Tuber Symptom Expression				
Year	Clone	# Reps +	# Tubers +	%Tubers +
07	AC97044-4RU	1	2	10
07	AC99375-1RU	0	0	0
07	AC99178-2RU	0	0	0
07	AC99213-8W	0	0	0
07	AC99329-7RW/Y	0	0	0
07	AC99330-1P/Y	0	0	0
07	CO99028-2RU	0	0	0
07	CO99045-1W/Y	0	0	0
07	CO99053-3RU	0	0	0
07	CO99053-4RU	0	0	0
07	CO99076-6R	0	0	0
07	CO99100-1RU	0	0	0
07	CO99199-1RU	0	0	0
07	CO99256-2R	1	1	5
07	CO99256-3R	0	0	0
07	CO99338-3RU/Y	2	3	15
07	VC1115-1RU	0	0	0
06	MWTX2609-2RU	1	1	5
07		1	1	5
07	AOTX95265-2ARU	0	0	0
07	AOTX95265-4RU	1	1	5
07	MWTX2609-4RU	0	0	0
07	B0766-3T	0	0	0
07	AC00322-7RU	0	0	0
07	AC97306-1RU	0	0	0
07	AC00170-2W	2	2	10
07	CO00188-4W	1	1	5
07	CO00189-2W	1	1	5
07	CO00197-3W	0	0	0
07	CO00270-7W	0	0	0
07	CO00277-2R	0	0	0
07	CO00278-4R	0	0	0
07	CO00291-5R	0	0	0
07	CO00339-4R	0	0	0
07	CO00379-2R/Y	0	0	0
07	CO00405-1R	0	0	0
07	CO00412-5W/Y	0	0	0
07	CO00415-1R	0	0	0
07	ATC00293-1W/Y	1	1	5
07	A97287-6	0	0	0
07	AOTX95265-3RU	0	0	0
07	AOTX95295-3RU	1	1	5
07	ATTX961014-1R/Y	0	0	0
07	ATTX98500-2P/Y	0	0	0
07	POR01PG20-12	0	0	0
07	A96510-4Y	0	0	0
07	CO86030-1RU	0	0	0
07	CO86153-2RU	0	0	0
07	Yukon Gold	0	0	0
06	WNC230-14RU	0	0	0
07		0	0	0
06	Ute Russet	0	0	0
07		1	1	5

Year	Clone	# Reps +	# Tubers +	%Tubers +
06	Centennial Russet	0	0	0
07		0	0	0
06	Russet Burbank	2	4	20
07		1	1	5
06	Sangre	1	1	5
07		2	2	10
06	Russet Norkotah	0	0	0
07		1	1	5

2 of 3 reps screened with 10 tubers cut/treatment representing at least 5 plants.
 % tubers (+) is based upon #pos/#cut. Harvest = 10/5/07

2007 Clonal Evaluation for Storage Rots

Treatments: *Erwinia* - 50ul of 2.9×10^4 cfu/ml into 3 inoculation sites, stem end.
Fusarium - 50ul of 150-250 spores/tuber into 3 inoculation sites, stem end.
Alternaria - 40 spores/tuber in a 50-50 oil-water spray, after bruising.

Inoculation/Reading: *Erwinia* (11/14/07; 12/12/07) *Fusarium* (11/14/07; 12/12/07)
Alternaria (Not performed in 2007)

Cultivars:

1. AC99375-1RU	16. CO98012-5R
2. AC99178-2RU	17. CO98067-7RU
3. AC99213-8W	18. CO98368-2RU
4. AC99329-7PW/Y	19. CO97215-2P/P
5. AC99330-1P/Y	20. CO97222-1R/R
6. CO99028-2RU	21. CO97227-2P/PW
7. CO99045-1W/Y	22. Rio Grande Russet
8. CO99053-3RU	23. Russet Norkotah Sel. 3
9. CO99053-4RU	24. Russet Nugget
10. CO99076-6R	25. Sangre Sel. 10
11. CO99100-1RU	
12. CO99256-2R	
13. CO99256-3R	
14. CO99338-3RU/Y	
15. VC1115-1RU	

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

<i>Fusarium</i>	<i>Erwinia</i>	<i>Alternaria</i>
1 = No symptoms	1 = No symptoms	0 = No symptoms
2 = Localized damage	2 = Localized damage	1 = 1/8" dia./1 peel
3 = < 50% tuber damage	3 = < 50% tuber damage	2 = 1/4" dia./2 peels
4 = > 50% tuber damage	4 = > 50% tuber damage	3 = 1/2" dia./3 peels
5 = 100% tuber damage	5 = 100% tuber damage	4 = > 10% tuber damage
		5 = 100% tuber damage

Grade loss occurs at 3 for *Fusarium* and *Erwinia* and at 4 for *Alternaria*

Table 5. Clonal Evaluation for Storage Rot			
<i>Fusarium</i>			
Inoculation	11/14/2007		
Reading	12/12/2007		
Clone	Avg Score	Avg Score	2 Yr. Avg
AC99375-1RU	3.20		
AC99178-2RU	2.70		
AC99213-8W	3.10		
AC99329-7PW/Y	3.00		
AC99330-1P/Y	3.80		
CO99028-2RU	2.70		
CO99045-1W/Y	3.20		
CO99053-3RU	3.00		
CO99053-4RU	3.00		
CO99076-6R	2.10		
CO99100-1RU	3.00		
CO99256-2R	3.00		
CO99256-3R	3.10		
CO99338-3RU/Y	3.00		
VC1115-1RU	2.50		
CO98012-5R	3.20		
CO98067-7RU	3.00		
CO98368-2RU	3.00		
CO97215-2P/P	3.30		
CO97222-1R/R	3.00		
CO97227-2P/PW	3.00		
Rio Grande RU	2.90		
RU Norkotah 3	3.00		
RU Nugget	3.40		
Sangre 10	2.40		

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

Table 6. Clonal Evaluation for Storage Rot			
<i>Erwinia</i>			
Inoculation	11/14/2007		
Reading	12/12/2007		
Clone	Avg Score	Avg Score	2 Yr. Avg
AC99375-1RU	3.50		
AC99178-2RU	3.30		
AC99213-8W	3.00		
AC99329-7PW/Y	2.50		
AC99330-1P/Y	3.60		
CO99028-2RU	3.10		
CO99045-1W/Y	2.60		
CO99053-3RU	2.50		
CO99-53-4RU	2.40		
CO99076-6R	2.10		
CO99100-1RU	2.60		
CO99256-2R	2.70		
CO99256-3R	2.50		
CO99338-3RU/Y	2.20		
VC1115-1RU	2.80		
CO98012-5R	2.50		
CO98067-7RU	2.80		
CO98368-2RU	3.00		
CO97215-2P/P	3.10		
CO97222-1R/R	2.40		
CO97227-2P/PW	2.30		
Rio Grande RU	3.10		
RU Norkotah 3	2.30		
RU Nugget	3.20		
Sangre 10	2.30		

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