

1999
POTATO PATHOLOGY RESEARCH REPORT

Colorado State University
San Luis Valley Research Center
Center, Colorado

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FINAL REPORT
1999 POTATO – PINK ROT FUNGICIDES TRIAL

Researchers: Richard T. Zink, Extension Potato Specialist, and Coleen Golden, Research Associate, Colorado State University, San Luis Valley Research Center, Center, CO 81125

Location: San Luis Valley Research Center, Center, CO

Objective: To evaluate the efficacy of various fungicides for the prevention of pink rot in potatoes.

Acknowledgements: We gratefully acknowledge the cooperation and support of Agtrol International and Novartis Crop Protection, Inc.

Cultivar: Sangre cut seed

Treatments:

1. Control, no treatment
2. Ridomil Gold EC at planting, 0.42 oz/1000 feet of row
3. Ultra Flourish at planting, 1.6 oz/1000 feet of row
4. Ultra Flourish in season, 6.4 oz/acre when tubers were ½ inch to ¾ inch diameter

Planted: May 20, 1999

Plot Design: Randomized complete block

Plot Size: 2 – 20 foot rows/treatment/replication

Plant Spacing: 12 inches

Row Spacing: 34 inches

Replications: Four

Irrigation: Solid set sprinkler, rate based on ET

Fertilizer: 90 lb/A N, 100 lb/A P, preplant

Herbicide: Matrix and Dual

Fungicide: Bravo alternated with Quadris for blight control

Vine killer: Sulfuric acid

Harvested: By hand, September 17, 1999

DATA:

Disease: Percent tubers by weight showing pink rot symptoms in the field at harvest and pink rot severity index, post harvest tuber inoculation, assays conducted by Dr. Neil Gudmestad at North Dakota State University-Fargo, North Dakota

Yield: 2 – 20 foot rows per treatment per replication expressed as cwt/A

Grade: By hand, percent tubers by weight under 4 oz, 4-10 oz, over 10 oz, misshapen and pink rot

Table 1. Effect of Ridomil Gold EC and Ultra Flourish on Tuber Yield and Quality in the Variety Sangre- 1999 San Luis Valley, Colorado

Treatment	Percent ^a						cwt/A ^d
	under 4 oz	4-10 oz	over 10 oz	misshapen	Pink rot ^b	Pink rot ^c	
Control	28.2	55.9	11.8	3.4	0.7	70.0	470
Ridomil Gold EC in furrow at planting	22.6	58.2	15.6	3.6	0.0	1.3	480
Ultra Flourish at planting	25.3	58.7	11.1	4.9	0.0	0.0	480
Ultra Flourish in season	27.0	53.8	13.5	5.5	0.3	32.5	460
LSD, P=0.05	NS	NS	NS	NS	NS	2.33	NS

^a Based on tuber weight, mean of four replications

^b Tubers by weight showing any degree of pink rot at harvest

^c Pink rot severity index, post harvest tuber inoculation, assays conducted by Dr. Neil Gudmestad at North Dakota State University - Fargo

^d Total yield in hundred weight per acre based on 40 feet of row, mean of four replications

1999 – On farm Ridomil Gold trials for control of pink rot in potato

Mountain Valley Seed

Sample Tag	Treatment
MVS-1-A	6 oz/A Ridomil Gold at planting
MVS-1-B	6 oz/A Ridomil Gold at planting
MVS-2-A	3 oz/A Ridomil Gold at planting
MVS-2-B	3 oz/A Ridomil Gold at planting
MVS-3-A	Control, no Ridomil
MVS-3-B	Control, no Ridomil
MVS-3-C	Control, no Ridomil
MVS-3-D	Control, no Ridomil
MVS-4-A	*Ridomil Gold applications through sprinkler
MVS-4-B	*Ridomil Gold applications through sprinkler
MVS-4-C	*Ridomil Gold applications through sprinkler
MVS-4-D	*Ridomil Gold applications through sprinkler

3S Farms

Sample Tag	Treatment
21W	6 oz/A Ridomil Gold at planting
11	6 oz/A Ridomil Gold at planting
8	6 oz/A Ridomil Gold at planting
20	*Ridomil Gold applications through sprinkler

* Sprinkler applications were at label rate using Ridomil-Bravo prepack. Two applications were made in each instance.

Final Report

1999 Potato – Early Harvest Seed Piece Treatment and Foliar Application Trial

- Researchers:** Richard T. Zink, Extension Potato Specialist and Coleen Golden, Research Associate, Colorado State University, San Luis Valley Research Center, Center, Colorado
- Objective:** To evaluate the efficacy of Early Harvest as a seed piece treatment and as a foliar application in preventing disease and increasing the quantity of small tubers in the San Luis Valley of Colorado.
- Acknowledgements:** We gratefully acknowledge the cooperation of Aithel McMahon of McMahon BioConsulting, Inc., and Griffin L.L.C.
- Location:** San Luis Valley Research Center, Center, CO
- Treatments:** Foliar treatments were applied with twenty gallons of water per acre with a CO2 Backpack sprayer at 20psi. Seed piece treatments were applied directly to fresh cut 4 ounce seed pieces and planted within six hours.
1. Control, no treatment
 2. EH Seed Treatment, 0.5 oz/cwt
 3. EH Seed Treatment, 0.5 oz/cwt and Foliar spray, 3.2 oz/A at tuber initiation (hooking) and 14 days after hooking
 4. EH Foliar spray, 3.2 oz/A, at tuber initiation (hooking) and 14 days after hooking
- Spray Dates:** 7/9/99 and 7/23/99
- Plot Design:** Randomized complete block
- Planted:** May 20, 1999
- Plot Size:** 1 - 35 foot row per treatment per replication
- Plant Spacing:** 12 inches
- Row Spacing:** 34 inches
- Replications:** Four
- Cultivar:** Sangre cut seed
- Irrigation:** Solid set sprinkler, rate based on ET
- Fertilizer:** 90 lb/A N, 100 lb/A P, preplant
- Herbicide:** Matrix and Dual
- Fungicide:** Bravo, Quadris
- Harvested:** 9/29/99 – 9/30/99
- Vine killer:** Sulfuric acid

DATA

- Stand:** 1 – 35 foot row/treatment/replication, counts taken about 30 days after planting
- Seed Piece Decay:** Soft-rot and dry-rot combined rated 1-100, 0 = no decay and 100 = complete decay; 5 seed pieces/treatment/replication
- Rhizoctonia stem canker:** Percent stems infected; 5 plants/treatment/replication
- Blackleg:** Percent stems infected; 5 plants/treatment/replication
- Plant vigor:** Rated 1-4; 1 = poor and 4 = good; 5 plants/treatment/replication
- Stems:** Average number of stems per plant; 5 plants/treatment/replication
- Yield:** 1 – 30 foot row per/treatment/replication expressed as cwt/A
- Grade:** By hand, number of tubers and percent tubers by weight under 4 oz, 4-6 oz, 6-12 oz, over 12 oz, #2's and culls

1999 Early Harvest Trial Summary

The use of Early Harvest Seed Piece Treatment (treatments 2 and 3) correlated significantly to an increase in the number and percent of tubers under four ounces and a decrease in the number and percent of tubers in the four to six ounce, six to twelve ounce, and over twelve ounce ranges, as compared to the untreated control. The same treatments significantly increased the percent and number less than four ounces and decreased the number of tubers in the four to six ounce and six to twelve ounce ranges, as well as the percent tubers in the six to twelve ounce range, over the treatment involving only the foliar application of Early Harvest (treatment 4).

Treatment 4 did not result in significant differences from the control in any categories except number under four ounce, which was increased by the treatment, and number and percent over twelve ounce, which were decreased by the treatment.

There were no significant differences in the number or percent of #2's or culls in any of the treatments. Also, there were no significant differences between treatments 2 and 3 in any categories. Both treatments used Early Harvest Seed Piece treatment, and treatment 3 involved foliar application in addition to the seed piece treatment. Yield was not significantly changed by any of the treatments as compared to the control, but yield in treatment 4 (foliar application of Early Harvest) was significantly higher than in treatments 2 and 3.

There was a significant increase in stems per seed piece in the plots where Early Harvest seed piece treatment was used over the untreated control and the plot where Early Harvest was used as a foliar application. There were no significant differences in stand or in the Rhizoctonia observed. Vigor was rated as significantly less for the plots using the seed piece treatment. This is attributed to the occurrence of a low degree of phytotoxicity. The phytotoxicity observed may be a varietal response. Future trials should involve different rates of Early Harvest seed treatment across three or four varieties. Decay was significantly less in treatment 2 (Early Harvest Seed Piece treatment only) than in the control or the Early Harvest foliar application.

Table 1. Effect of Early Harvest seed piece treatment on plant development and incidence of disease in the variety Sangre- 1999 San Luis Valley, Colorado

Treatment ^a	Stand ^b	Stems ^c	Vigor ^d	Rhizoctonia ^e	Decay ^f
Control	89.4	4.25	3.25	26.5	4.3
EH Seed	85.7	7.60	2.00	5.2	0.0
EH Seed & Foliar	92.9	9.55	2.20	12.1	0.5
EH Foliar	94.3	4.20	3.35	18.7	4.5
LSD _{0.05}	NS	2.68	0.67	NS	4.11

- a. All treatments were applied according to manufacturers recommendations. Treatments were applied directly to fresh cut 4 oz seed pieces and planted within six hours.
- b. Percent of plants emerged 31 days after planting, mean per plot, four replications.
- c. Mean number of stems per seed piece 42 days after planting, five seed pieces/treatment/replication.
- d. Plant growth rated 1 – 4, 1 = poor, 4 = good; five plants/treatment/replication, 42 days after planting.
- e. Mean percent stems with Rhizoctonia canker 42 days after planting; five plants/treatment/replication.
- f. Mean percent incidence of disease combined soft –rot and dry rot 42 days after planting; five seed pieces/treatment/replication.

Table 2. Effect of Early Harvest Seed and Foliar Treatments on Tuber Number, Yield, and Quality in the variety Sangre- 1999 San Luis Valley, Colorado

Treatment	Percent ^a						Number of Tubers ^b						cwt/A ^c
	under 4 oz	4-6 oz	6-12 oz	over 12 oz	2's	culls	under 4 oz	4-6 oz	6-12 oz	over 12 oz	2's	culls	
1	27.2	31.9	29.1	6.1	2.0	3.7	141.3	84.0	50.5	5.5	4.0	6.5	408 ab
2	61.2	19.3	12.2	1.3	3.2	2.7	344.3	47.5	17.8	1.0	6.5	5.0	348 b
3	65.0	22.3	7.7	0.0	2.3	2.7	355.3	54.0	12.0	0.0	4.8	4.5	339 b
4	32.4	26.9	33.2	1.6	3.3	2.6	208.8	86.3	68.0	1.8	9.3	5.8	488 a
LSD _{0.05}	9.3	6.2	6.7	2.9	NS	NS	52.2	28.9	20.5	3.3	NS	NS	120

^a Percent of total yield based on tuber weight, mean of four replications

^b Number of tubers of each category in 30 feet of row, mean of four replications

^c Total yield in hundred weight per acre based on 30 feet of row, mean of four replications

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

FINAL REPORT - 1999 POTATO SEED PIECE TREATMENT TRIALS

- Researchers:** Richard T. Zink, Extension Potato Specialist, and Coleen Golden, Research Associate, Colorado State University, San Luis Valley Research Center
- Location:** San Luis Valley Research Center, Center, CO
- Objective:** To evaluate the efficacy of various seed piece treatments in preventing disease and seed piece decay.
- Acknowledgements:** We gratefully acknowledge the cooperation and support of Novartis Crop Protection, Inc. and Snake River Chemicals, Inc.
- Treatments:** All treatments applied directly to fresh cut seed and planted within six hours
1. Control, no treatment
 2. PST6 (Manzoceb 6%), 1.0#/100
 3. PST8 (Manzoceb 8%), 1.0#/100
 4. PCC553, 1.0#/100
 5. PCC555, 0.75#/100
 6. PCC561, 0.5#/100
 7. CGA293343, 1.5, 0.5#/100
 8. CGA293343, 1.7, 0.5#/100
 9. Maxim, 0.5, 0.5#/100
 10. NOA284, 0.75, 3.75 gm ai/100 kg
 11. NOA156, 1.00, 4.5 gm ai/100 kg

- Plot Design:** Randomized complete block
- Planted:** May 20, 1999
- Plot Size:** 1 - 35 foot row per treatment per replication
- Plant Spacing:** 12 inches
- Row Spacing:** 34 inches
- Replications:** Four
- Cultivar:** Sangre cut seed
- Irrigation:** Solid set sprinkler, rate based on ET
- Fertilizer:** 90 lb/A N, 100 lb/A P, preplant
- Herbicide:** Matrix and Dual
- Harvested:** 9/29/99 - 9/30/99
- Vine killer:** Sulfuric acid

DATA

- Stand:** 1 - 35 foot row/treatment/replication, counts taken about 30 days after planting
- Seed Piece Decay:** soft-rot and dry-rot combined rated 1-100, 0 = no decay and 100 = complete decay; 5 seed pieces/treatment/replication
- Rhizoctonia stem canker:** percent stems infected; 5 plants/treatment/replication
- Blackleg:** percent stems infected; 5 plants/treatment/replication
- Plant vigor:** Rated 1-4; 1 = poor and 4 = good; 5 plants/treatment/replication
- Stems:** Average number of stems per plant; 5 plants/treatment/replication
- Yield:** 1 - 30 foot row per/treatment/replication, total yield expressed in cwt/A

SUMMARY

There were no significant differences found between the untreated control and any treatment in the areas of stand, stems or vigor. Treatments 3,6,7,10, and 11 decreased seed piece decay significantly over the control. Treatments 2,4,5,8,9, and 10 significantly reduced the rhizoctonia observed over that in the control, with treatments 5 and 8 reducing disease by more than seventy-five percent. Yield was increased significantly in treatments 5 and 6.

Table 1. Effect of potato seed piece treatments on plant development and incidence of disease in the variety Sangre- 1999 San Luis Valley, Colorado

Treatment ^a	Stand ^b	Stems ^c	Vigor ^d	Rhizoctonia ^e	Decay ^f
Control	89.4	4.25	3.25	26.5	4.3
PST6	81.4	4.30	3.50	8.1	1.0
PST8	89.4	4.25	3.45	12.7	0.0
PCC553	99.4	4.25	3.50	5.0	0.5
PCC555	85.7	4.35	3.40	10.5	0.6
PCC561	92.3	4.80	3.45	18.2	0.0
CGA293343,1.5	92.9	4.40	3.45	19.5	0.3
CGA293343,1.7	85.7	4.55	3.65	1.0	0.5
MAXIM	93.3	4.13	3.37	7.0	1.0
NOA284,0.75	90.0	3.95	3.15	8.8	0.0
NOA156,1.00	95.7	4.30	3.10	12.3	0.3
LSD _{0.05}	10.1	NS	0.41	15.3	4.0

- a. All treatments were applied according to manufacturers recommendations. Treatments were applied directly to fresh cut 4 oz seed pieces and planted within six hours.
- b. Percent of plants emerged 31 days after planting, mean per plot, four replications.
- c. Mean number of stems per piece 42 days after planting, five seed pieces/treatment/replication.
- d. Plant growth rated 1 – 4, 1 = poor, 4 = good; five plants/treatment/replication, 42 days after planting.
- e. Mean percent stems with Rhizoctonia canker 42 days after planting; five plants/treatment/replication.
- f. Mean percent incidence of disease combined soft –rot and dry rot 42 days after planting; five seed pieces/treatment/replication.

Table 2. Effect of seed piece treatments on tuber yield and quality in the variety Sangre- 1999 San Luis Valley, Colorado

Treatment	Percent ^a						cwt/A ^b
	under 4 oz	4-6 oz	6-12 oz	over 12 oz	#2's	Culls	
Control	27.2	31.9	29.1	6.1	2.0	3.7	408 b
PST6	29.4	31.6	32.8	2.2	0.7	3.3	435 ab
PST8	33.4	29.9	30.0	3.0	2.1	1.6	423 ab
PCC553	29.1	30.0	31.4	4.3	1.2	4.0	483 ab
PCC555	28.4	31.7	30.1	3.4	4.0	2.4	505 a
PCC561	32.1	28.3	31.4	2.7	2.8	2.7	506 a
CGA293343, 1.5	28.3	28.2	35.3	3.4	2.0	2.8	490 ab
CGA293343, 1.7	29.8	30.5	33.2	2.3	1.7	2.5	497 ab
MAXIM	34.8	30.9	27.6	2.0	1.6	3.1	495 ab
NOA284, 0.75	29.3	31.9	31.2	4.4	2.0	1.2	496 ab
NOA156, 1.00	27.9	28.7	34.7	4.7	1.2	2.8	496 ab
LSD _{0.05}	-	-	-	-	-	-	96.6

^a Based on tuber weight, mean of four replications

^b Total yield in hundred weight per acre based on 30 feet of row, mean of four replications
Means followed by same letters are not significantly different at P = 0.05 for yield.

FINAL REPORT
1999 POTATO - EARLY BLIGHT AND LATE BLIGHT FUNGICIDE TRIALS

Researchers: Dr. Richard T. Zink, Extension Potato Specialist, and Coleen Golden, Research Associate, Colorado State University, San Luis Valley Research Center, Center, CO

Location: San Luis Valley Research Center, Center, CO

Acknowledgements: We gratefully acknowledge the cooperation and financial support of AgrEvo USA Company, DuPont Ag Products, American Cyanamid Company, Griffin L.L.C., Rohm and Haas Company, Novartis Crop Protection, Inc., and Zeneca Ag Products.

Treatments: All treatments applied using an R & D CO₂ charged tractor mounted plot sprayer with eight 8002VS nozzles spaced seventeen inches apart at 60 psi pressure and applying 40 gallons per acre water. Applications began July 5, 1999. See next page for products used.

Spray Dates: July 5, 6, and 7, July 12, 13, and 14, July 19, 20 and 21, July 26 and 27, August 2 and 3, August 9 and 10, August 16 and 17, August 23 and 24, August 30 and 31

Plot Design: Randomized complete block
Planted: May 19, 1999
Plot Size: 4 – 20 foot rows per treatment, treatments applied to all rows, data taken on two center rows
Plant Spacing: 12 inches
Row Spacing: 34 inches
Replications: Four
Cultivar: Russet Nugget
Irrigation: Solid set sprinkler, rate based on ET
Fertilizer: 90 lb/A N, 100 lb/A P, preplant
Herbicide: Matrix and Dual
Harvested: September 30 and October 1, 1999

DATA:

Disease: Early blight and late blight disease severity based on percent leaves infected, readings taken weekly starting August 1999

Yield: 2 – 20 foot rows per treatment per replication expressed as cwt/A

Grade: Percent tubers by weight under 4 oz, 4-6 oz, 6-12 oz, over 12 oz, U.S. no. 2, culls and rots

1999 FUNGICIDE TRIAL TREATMENTS
Center, Colorado
7 day intervals used for all treatments

<u>Treatment</u>	<u>Company/Products</u>	<u>Rate</u>	<u>Schedule</u>
1	Control		
2	Bravo Ultrex	0.7 lbs/A	Full season
3	Agrevo Tattoo C	1.3 pint/A	Full season
4	Agrevo Tattoo C Bravo Ultrex	2.3 pint/A 0.7 lbs/A	3,5,7,9 1,2,4,6,8
5	DuPont Curzate 60 DF Manzate 75 DF Bravo Ultrex	3.3 oz/A 2.0 lbs/A 0.7 lbs/A	1,2,4,5,7,8,9 1,2,5,7,9 3,4,6,8
6	DuPont Curzate 60 DF Manzate 75 DF Bravo Ultrex	3.3 oz/A 2.0 lbs/A 0.7 lbs/A	1,2,4,5,7,8,9 1,2,3,5,6,7,9 4,8
7	Cyanamid Acrobat MZ Bravo Ultrex Quadris 2.08F Polyram SuperTin 80WP	2.25 lbs/A 0.7 lbs/A 12.4 oz/A 2.0 lbs/A 2.5 oz/A	4 1,6 3 2,5,7,8,9 2,5,7,8,9
8	Cyanamid Acrobat MZ Bravo Ultrex Quadris 2.08F Polyram SuperTin 80WP	2.25 lbs/A 0.7 lbs/A 12.4 oz/A 2.0 lbs/A 2.5 oz/A	4,6 1,5 3 2,7,8,9 2,7,8,9
9	Griffin SuperTin 80WP Manzate 75DF	2.5 oz/A 2.0 lbs/A	Full season Full season

10	Griffin GX614001	1.5 qt/A	Full season
11	Griffin GX614002	1.5 qt/A	Full season
12	Rohm and Haas RH-141457 75DF Quadris 2.08F	2.0 lbs/A 6.2 oz/A	1,2,3,5,7,9 4,6,8
13	Rohm and Haas Dithane DF NT Quadris 2.08F	2.0 lbs/A 6.2 oz/A	1,2,3,5,7,9 4,6,8
14	Novartis CGA-279202 NU Film Dithane DF NT	0.25 lb/A 5 oz/A 2.14 lbs/A	1,3,5,7,9 1,3,5,7,9 2,4,6,8
15	Novartis CGA-279202 NU Film Dithane DF NT	0.13 lb/A 5 oz/A 1.07 lbs/A	Full season Full season Full season
16	Cyanamid Acrobat MZ Bravo Ultrex Quadris 2.08F Polyram SuperTin 80WP	1.69 lbs/A 0.7 lbs/A 12.4 oz/A 2.0 lbs/A 2.5 oz/A	4,6 1,5 3 2,7,8,9 2,7,8,9
17	Zeneca Fluazinam Bravo Ultrex	15.3 oz/A 0.7 lb/A	2,4,6,8 1,3,5,7,9
18	Zeneca Quadris 2.08F Bravo Ultrex	6.2 oz/A 0.7 lb/A	1,3,5,7,9 2,4,6,8
19	Zeneca Quadris 2.08F Bravo Ultrex	12.4 oz/A 0.7 lb/A	1,3,5,7,9 2,4,6,8

1999 Early Blight and Late Blight Fungicide Trial Summary

The incidence of early blight within the trials was similar to what occurred in commercial potato production across the San Luis Valley. At the time of final disease readings on September 9, early blight incidence had reached 100 percent in the UTC. AUDPC values provide clear separation among fungicide programs. In general, disease suppression by program can be grouped as follows.

Early blight disease development was significantly reduced by all treatments over the untreated control. Treatment 6 reduced disease by less than twenty-five percent, while treatments 2,3,4,5,10,11, and 17 reduced disease by twenty-five to fifty percent. Treatments 9,12,13,14,15 and 16 reduced disease by fifty to seventy-five percent, and treatments 7,8,18 and 19 reduced disease by over seventy-five percent. The highest degree of early blight control was achieved in programs where Quadris was utilized.

Suppression of foliar early blight did not, however, translate into statistically significant increases in tuber yields. The lack of effect of fungicide programs on yield is likely due to the late onset of disease and the long season variety Russet Nugget. Early blight is a disease of senescence and generally has a much greater impact on an early maturing short season variety such as Russet Norkotah. Russet Nugget was selected for these trials in anticipation of late blight developing some time in August. Had this been the situation, Russet Nugget would have provided a six to eight week period for fungicide program evaluation.

Table 1. Effect of Fungicides on Early Blight in the variety Russet Nugget – 1999 San Luis Valley, CO; no Late Blight occurred within the trial

Treatment	Percent Leaves Infected						AUDPC ^a
	Aug 5	Aug 12	Aug 19	Aug 26	Sept 2	Sept 9	
1	6.1	15.5	60.3	96.3	99.2	100	2290 a
2	2.9	4.5	18.3	70.8	92.5	98.0	1665 bc
3	3.0	4.5	12.3	64.5	87.0	98.3	1542 c
4	1.8	2.8	10.8	57.8	81.5	96.3	1419 cd
5	3.6	6.5	22.0	56.0	90.5	97.0	1590 c
6	4.5	7.5	28.8	86.0	97.9	99.0	1918 b
7	0.8	1.6	3.7	11.3	16.8	23.8	321 hi
8	1.1	1.9	3.9	17.0	24.5	39.0	475 ghi
9	1.8	3.0	8.9	23.5	36.5	80.3	796 efg
10	5.5	8.3	22.8	68.0	90.8	94.5	1698 bc
11	4.9	12.1	26.1	57.8	72.5	94.0	1542 c
12	3.0	5.8	8.7	22.3	29.8	63.8	709 fg
13	1.5	4.2	9.5	19.0	27.0	58.3	632 fgh
14	1.1	3.0	5.7	44.3	61.8	87.3	1115 de
15	1.8	3.4	7.3	28.8	43.5	83.5	885 ef
16	1.1	2.4	6.1	17.5	33.8	50.5	603 fgghi
17	2.8	4.2	19.8	65.3	93.0	94.8	1627 bc
18	1.3	1.4	4.2	13.3	22.5	49.8	472 ghi
19	0.7	0.9	2.8	9.6	13.3	32.0	302 ii
LSD _{0.05}	1.48	3.87	12.16	17.35	18.47	21.33	328

^a AUDPC is the Area Under the Disease Progress Curve

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

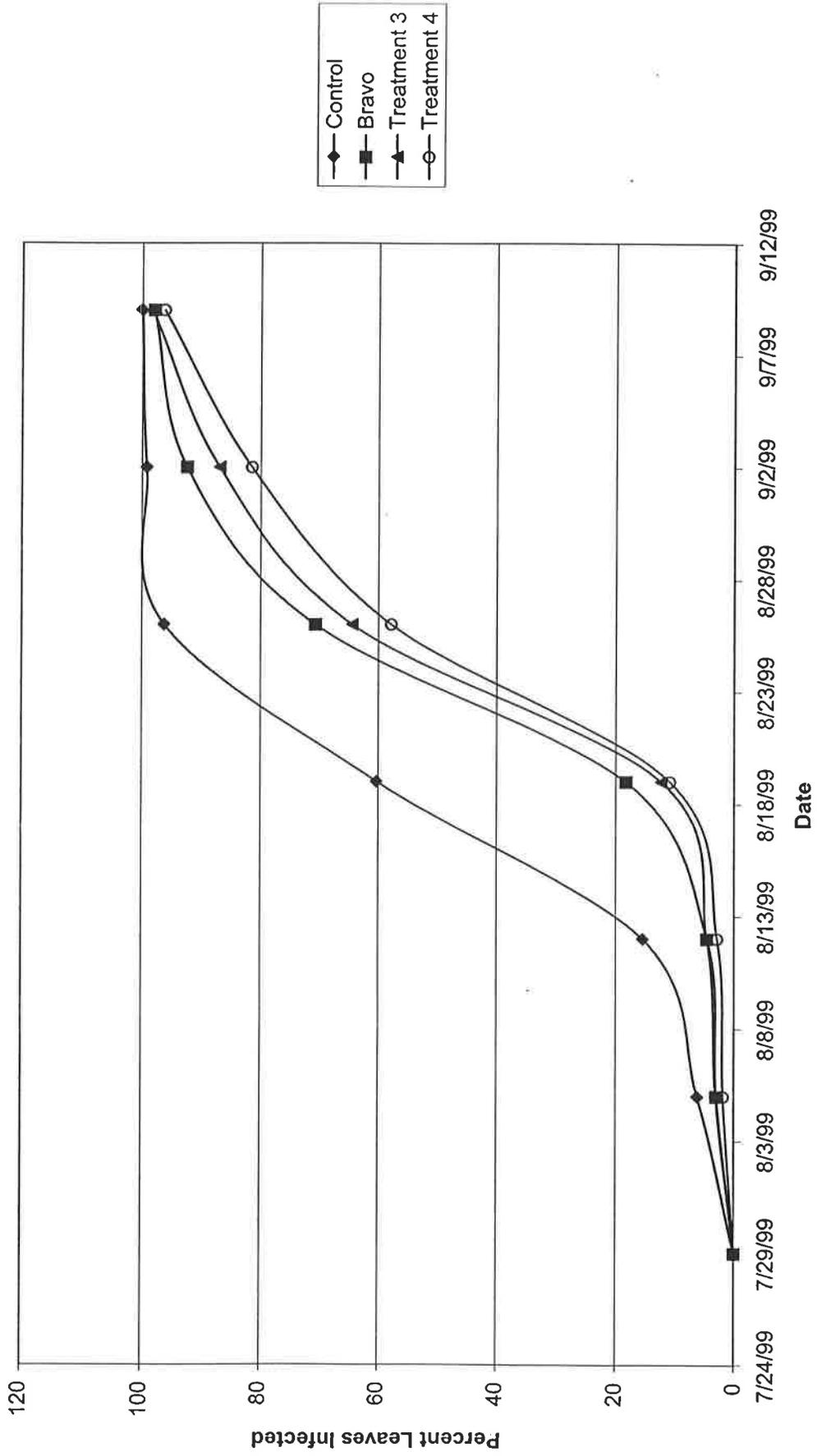
Table 2. Effect of Fungicides on Tuber Yield and Quality in the variety Russet Nugget- 1999 San Luis Valley, Colorado

Treatment	Percent ^a						cwt/A ^b
	under 4 oz	4-6 oz	6-12 oz	over 12 oz	#2's	Culls	
1	48.7	33.1	15.1	0.0	1.5	1.5	298 abc
2	36.1	31.5	25.9	1.3	2.2	2.9	331 abc
3	38.9	30.2	26.9	0.6	1.5	1.9	333 a
4	41.2	34.5	21.7	0.0	1.7	0.9	305 abc
5	41.3	34.6	20.2	0.8	1.3	1.8	293 c
6	44.0	30.2	20.1	2.8	0.9	2.1	294 bc
7	39.3	30.7	24.4	1.0	1.5	3.1	305 abc
8	40.8	33.4	20.1	0.8	2.1	2.7	331 ab
9	45.1	33.3	16.8	0.8	1.3	2.7	314 abc
10	45.1	36.3	15.3	0.0	2.0	1.2	307 abc
11	39.1	33.9	21.2	1.4	1.8	2.5	312 abc
12	42.4	30.6	20.0	0.5	2.6	4.0	331 abc
13	43.4	33.3	20.3	0.3	1.1	1.7	316 abc
14	41.8	33.9	21.3	0.3	1.3	1.4	318 abc
15	39.9	32.3	23.2	0.8	1.7	2.1	319 abc
16	39.9	35.2	20.9	0.3	1.5	2.3	293 bc
17	37.5	35.4	23.3	0.3	1.6	1.9	299 abc
18	43.4	31.8	20.9	0.0	2.4	1.5	312 abc
19	40.2	34.3	22.3	0.0	2.1	1.1	334 a
LSD _{0.05}	-	-	-	-	-	-	38.25

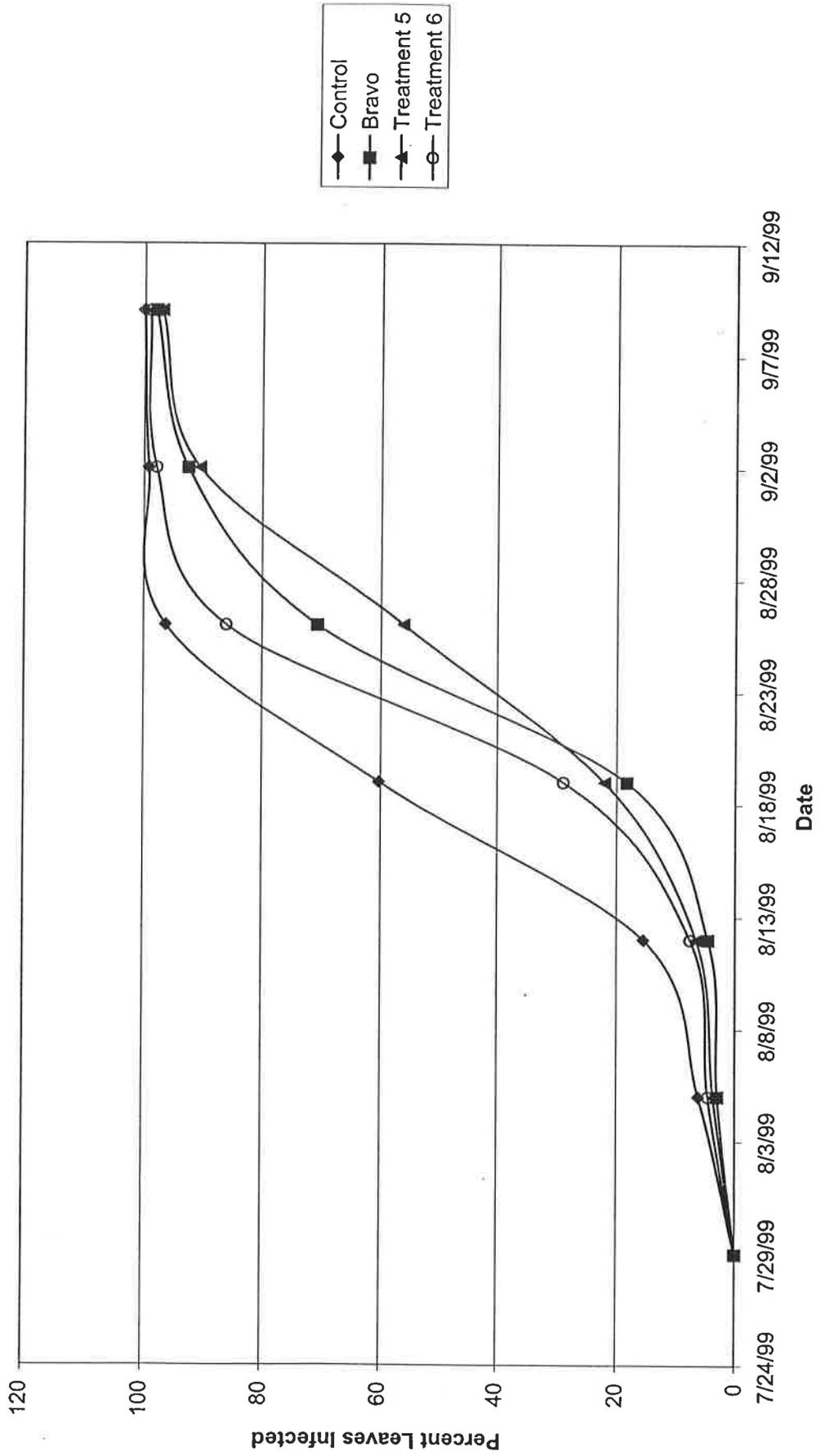
^a Based on tuber weight, mean of four replications

^b Total yield in hundred weight per acre based on 2-20 foot rows, mean of four replications
Means followed by same letters are not significantly different at P = 0.05 for yield.

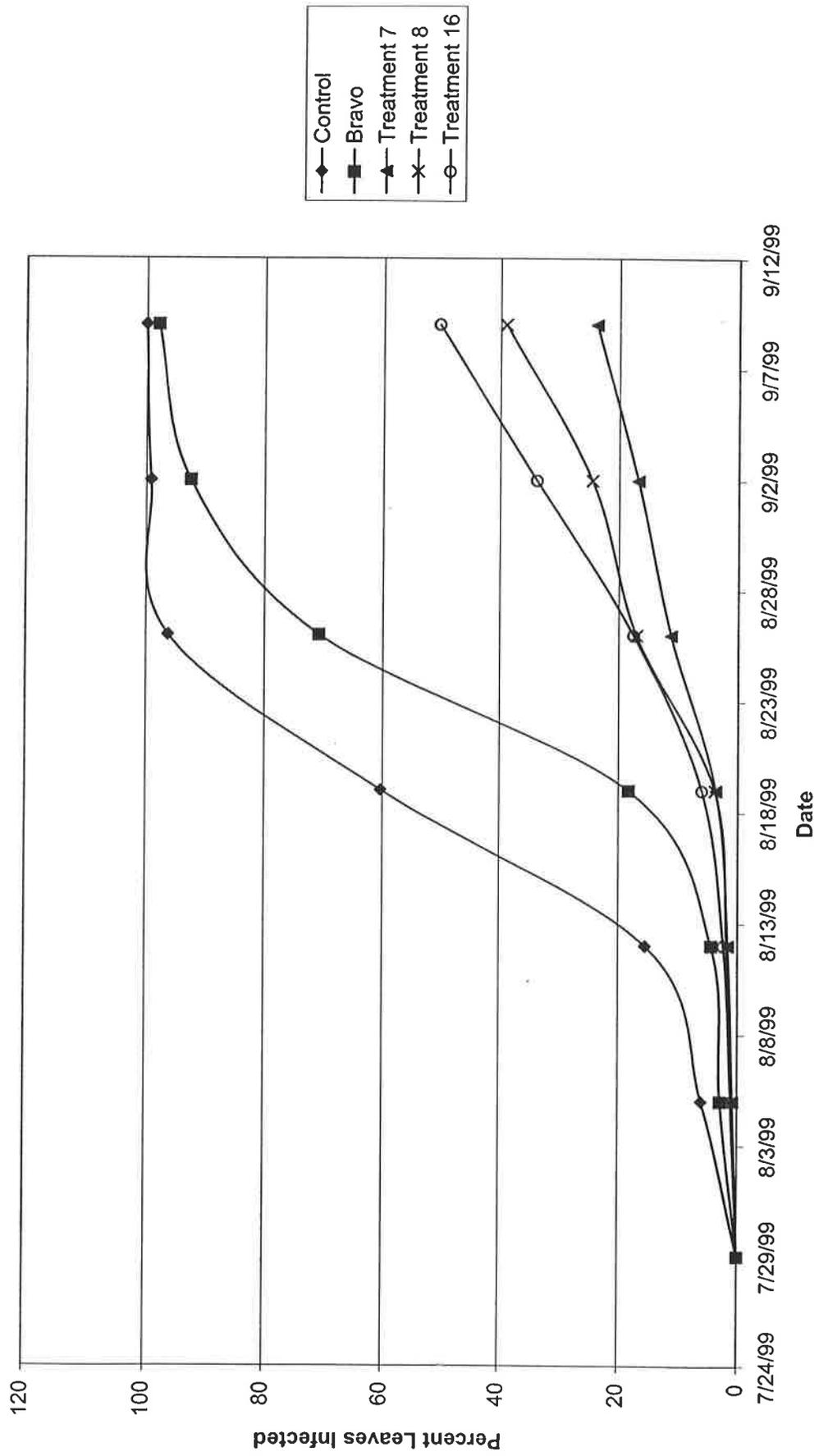
Disease Progress Curve for Early Blight
1999 Fungicide Trial, Colorado State University
San Luis Valley Research Center, Center, CO



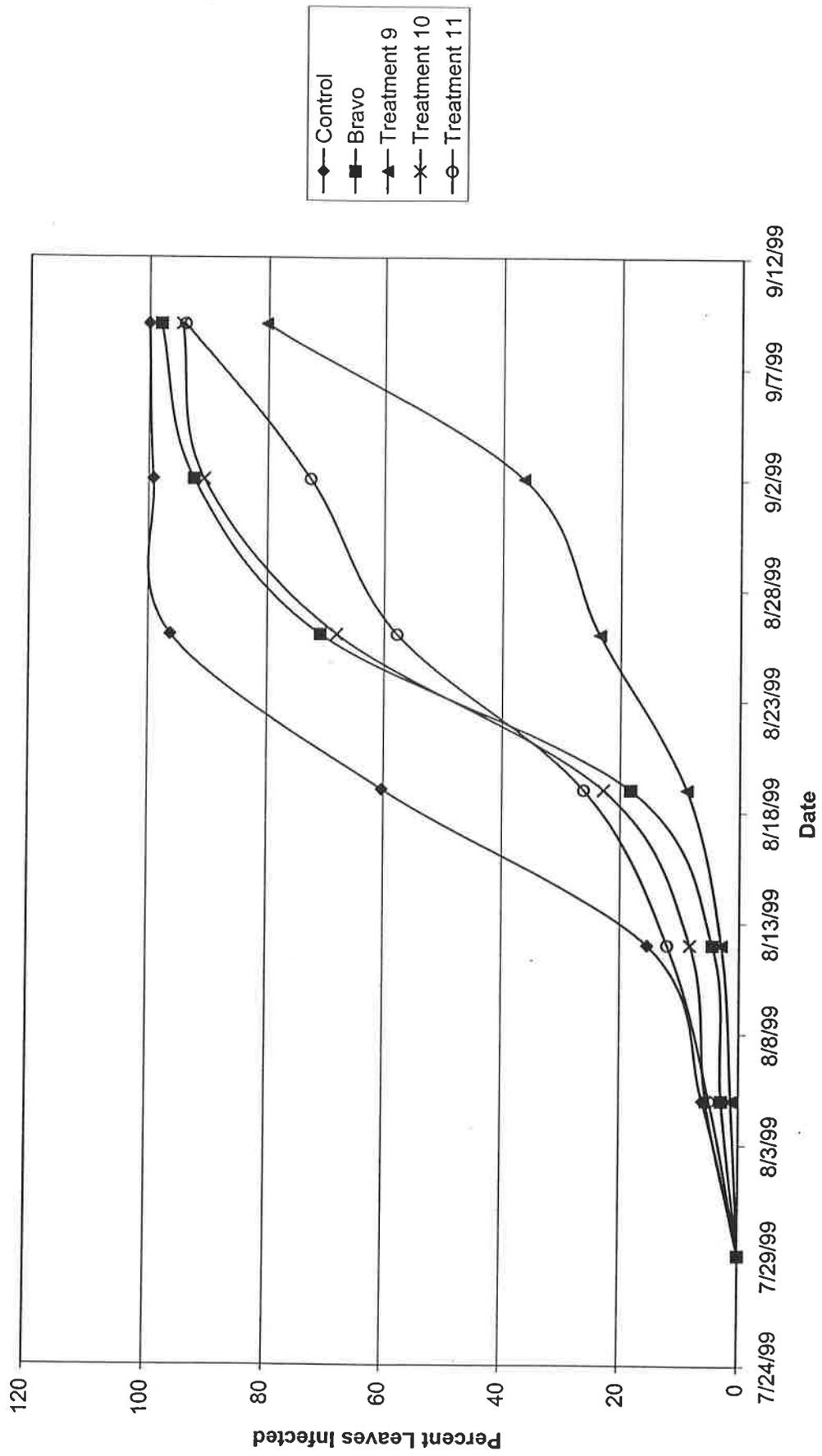
Disease Progress Curve for Early Blight
1999 Fungicide Trials, Colorado State University
San Luis Valley Research Center, Center, CO



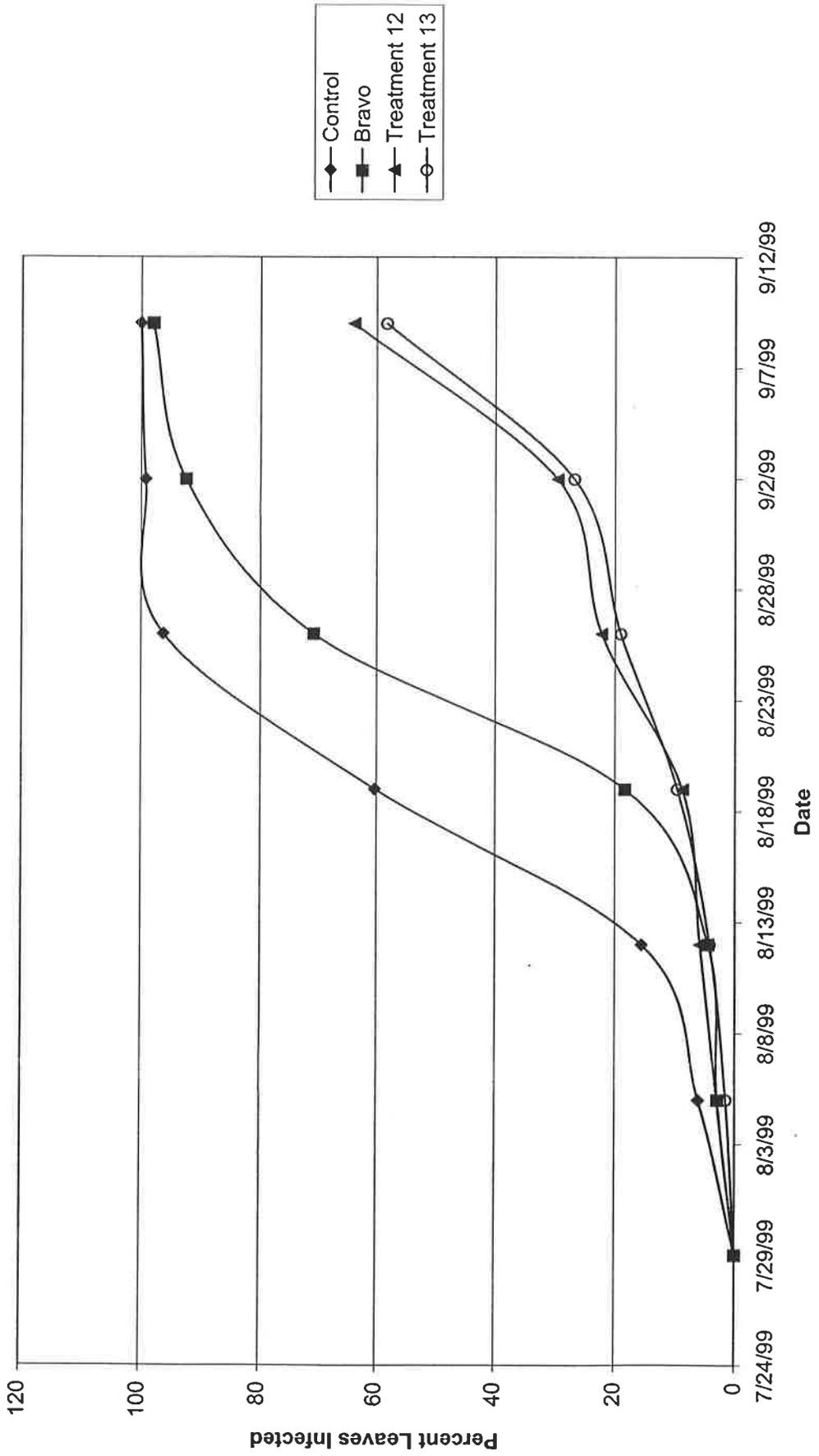
Disease Progress Curve for Early Blight
 1999 Fungicide Trials, Colorado State University
 San Luis Valley Research Center, Center, CO



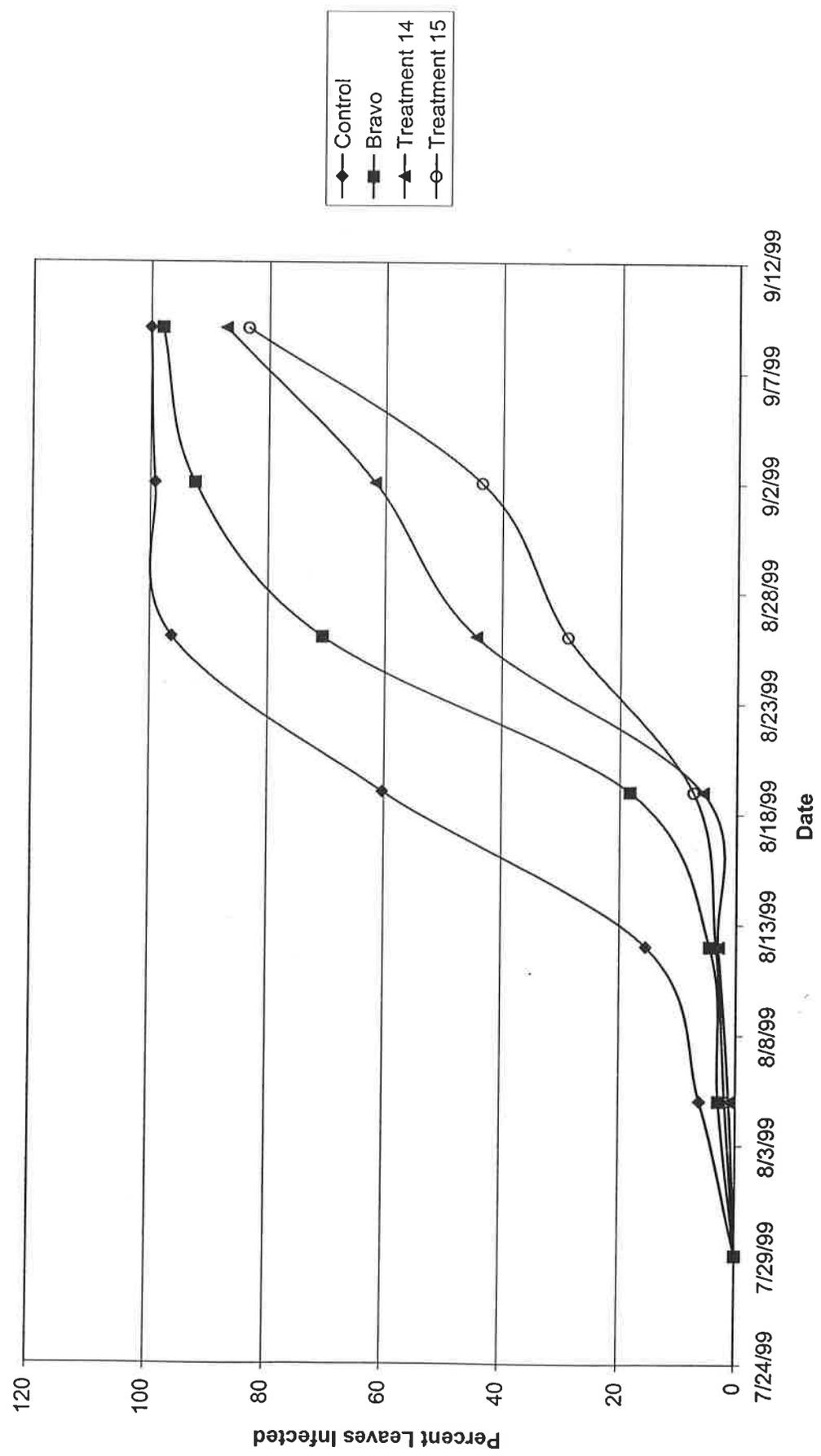
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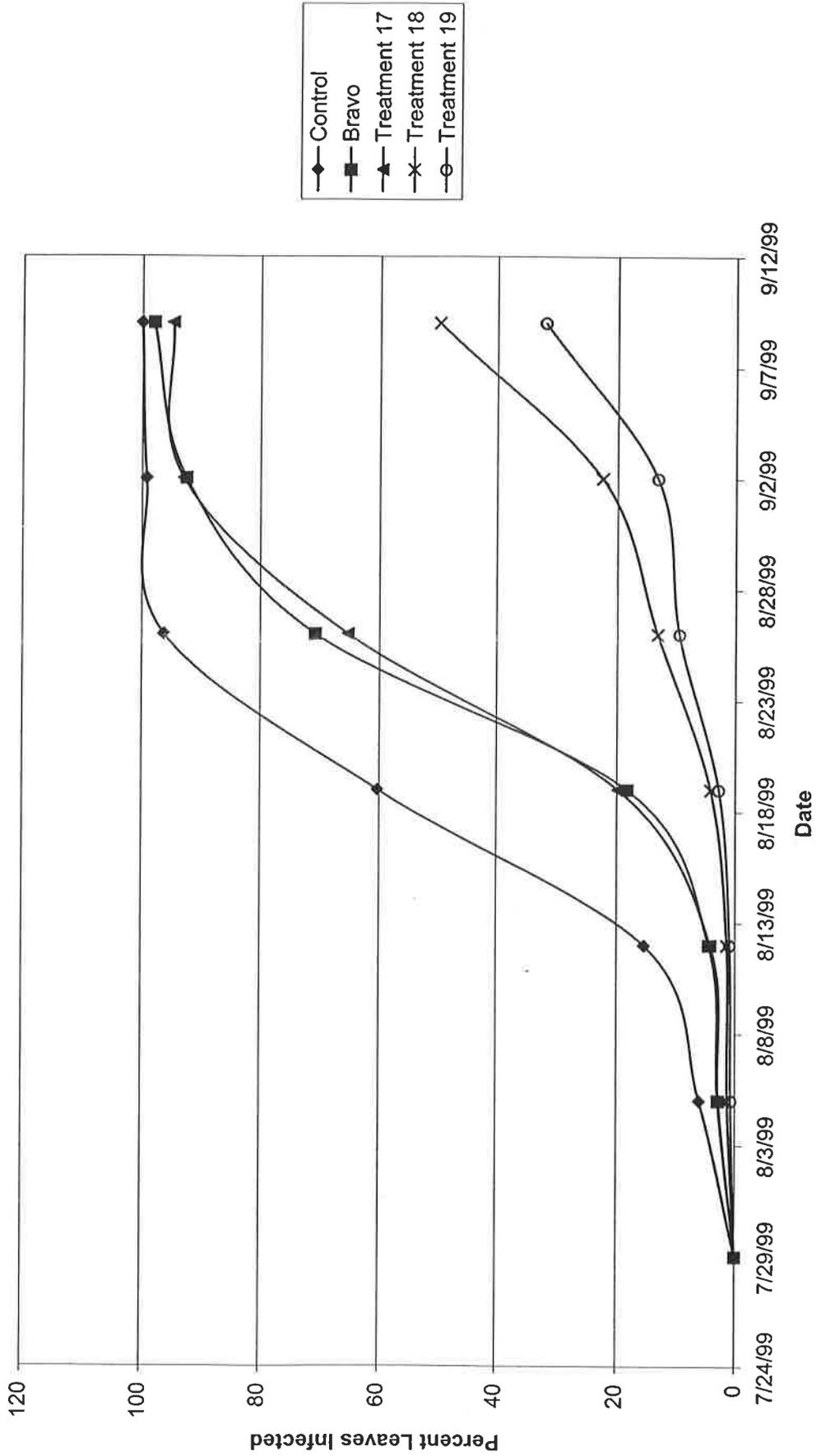
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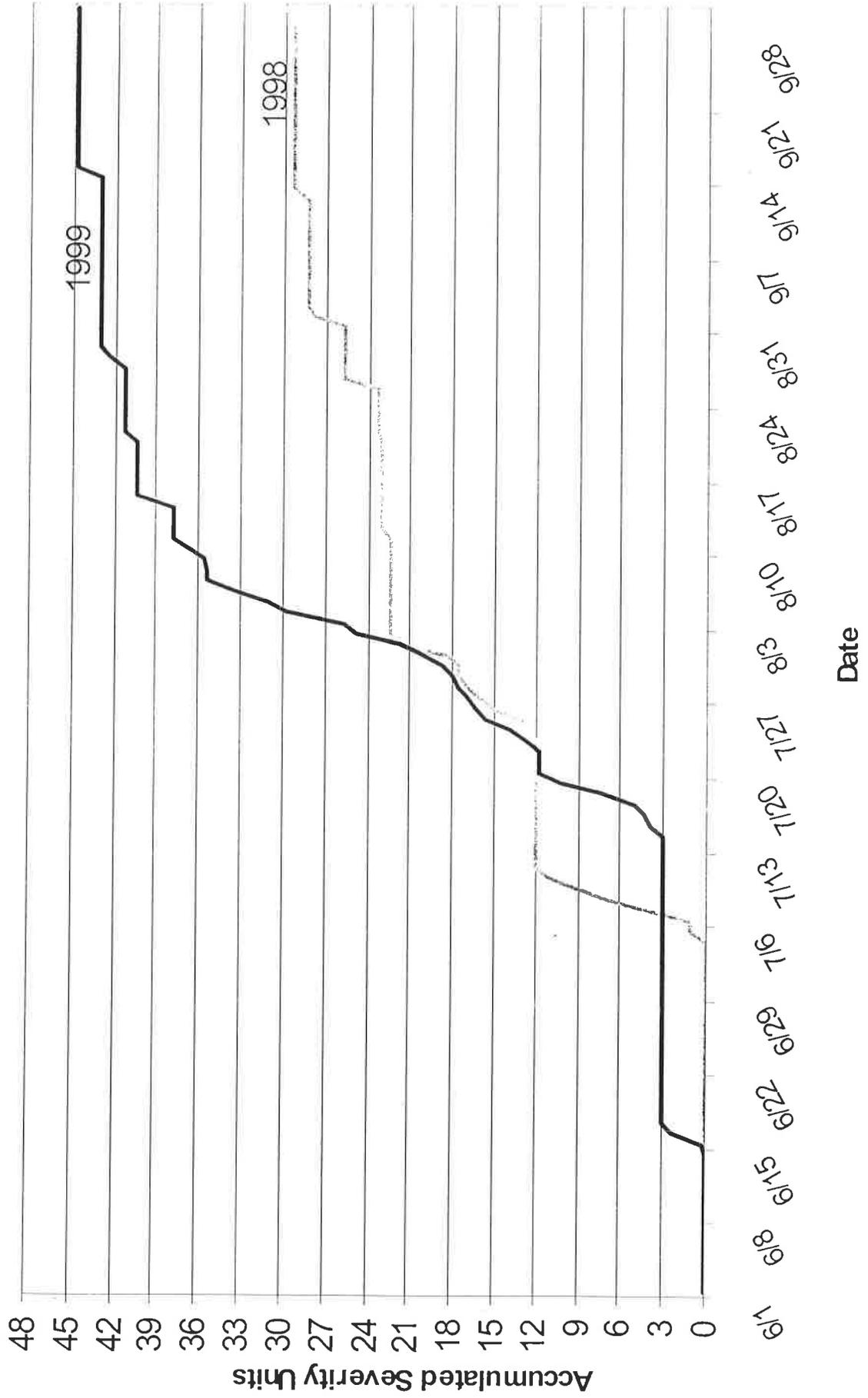
Disease Progress Curve for Early Blight
 1999 Fungicide Trials, Colorado State University
 San Luis Valley Research Center, CO



Disease Progress Curve for Early Blight
 1999 Fungicide Trial, Colorado State University
 San Luis Valley Research Center, Center, CO



Accumulation of Late Blight Severity Units San Luis Valley 1998 and 1999



**1999 PROTOCOL FOR EVALUATION OF MAXIM MZ PLUS BLOCKER
FOR SEED PIECE DECAY AND RHIZOCTONIA OF POTATO**

Researcher: Richard T. Zink
Extension Potato Specialist
Colorado State University
San Luis Valley Research Center
Center, CO 81125

Location: Summit Farms, Rd 2E, Center, Colorado

Cultivar: Russet Norkotah Selection 3

Seed: 8 oz. seed tubers cut by hand into 4-2oz. pieces

Treatment application: All treatments applied directly to fresh cut seed and planted within 6 hours.

Treatments:

1. Control, untreated
2. Maxim MZ (10.5), 0.5 oz/cwt
3. Maxim MZ (10.5), 0.5 oz/cwt plus Blocker (PCNB), 1.65 lbs/1000ft at planting
4. MZ Fir Bark (8%), 63.6 gm ai/100 kg, 1.0 oz/cwt

Plot Design: Randomized complete block

Plot Size: 1 – 20 foot row /treatment/replication

Plant Spacing: 12 inches

Row Spacing: 34 inches

Replications: Four

Irrigation: Center pivot

Fertilizer: 110 lb/A N, 50 lb/A P205, preplant

Herbicide: Sencor

Insecticide: Admire

Fungicide: Bravo/Quadris/Acrobat MZ

Vine Killer: Sulfuric acid

Plant: May 24, 1999

Harvest: September 8, 1999

DATA:

Stand: 1-20 foot row/treatment/replication, counts taken about 30 days after planting

Seed Piece Decay: Soft-rot and dry-rot combined rated 1-100, 0 = no decay and 100 = complete decay; 5 seed pieces/treatment/replication

Rhizoctonina stem canker: Percent stems infected; 5 plants/treatment/replication

Blackleg: Percent stems infected; 5 plants/treatment/replication

Plant vigor: Rated 1-4, 1 = poor and 4 = good; 5 plants/treatment/replication

Stems: Average number of stems per plant; 5 plants/treatment/replication

Yield: By hand, 1 – 15 foot row/treatment/replication expressed as cwt/A

Grade: By hand, percent tubers by weight under 4 oz, 4-10 oz, over 10 oz and misshapen

Table 1. Effect of Maxim MZ and Blocker on plant development and incidence of disease in the Variety Russet Norkotah Selection 3-1999 San Luis Valley Colorado

Treatment ^a	Stand ^b	Stems ^c	Plant Vigor ^d	%Stems with Rhizoctonia ^e	Blackleg ^f	Stolons ^g	% Stolons with Rhizoctonia ^h	Seed piece decay ⁱ
Control	20	2.7	3.9	47.6	0.0	14.4	26.3	61.5
Maxim MZ	20	2.9	4.0	10.8	0.0	16.3	4.6	6.2
Maxim MZ + Blocker	20	2.9	4.0	12.7	0.0	17.0	3.4	0.0
MZ	20	2.8	4.0	15.7	0.0	15.9	8.6	0.5
Mean	20	2.83	3.98	21.7	0.0	15.9	10.7	17.1

^a All treatments were applied according to the manufacturer's recommendations. Treatments were applied directly to fresh cut 2 oz seed pieces and planted within six hours.

^b Number of plants emerged 30 days after planting, mean per plot, four replications.

^c Mean number of stems per seed piece 30 days after planting, mean per plot, four replications.

^d Plant growth rated 1-4; 1 = poor, 4 = good; five plants/treatment/replication, 30 days after planting.

^e Mean percent stems with Rhizoctonia canker 30 days after planting; five plants/treatment/replication.

^f Mean percent diseased stems per seed piece 30 days after planting; five plants/treatment/replication.

^g Mean number of stolons per seed piece 30 days after planting, mean per plot, four replications.

^h Mean percent stolons with Rhizoctonia canker 30 days after planting; five plants/treatment/replication.

ⁱ Mean percent incidence of disease combined soft-rot and dry rot 30 days after planting; rated 1-100; 0 = no decay, 100 = complete decay; five seed pieces /treatment/replication.

Table 2. Effect of Maxim MZ and Blocker on Tuber Yield and Quality in the Variety Russet Norkotah Selection 3- 1999 San Luis Valley, Colorado

Treatment	Percent ^a				cwt/A ^b
	under 4 oz	4-10 oz	over 10 oz	misshapen	
Control	14.3	61.8	3.7	20.2	320
Maxim MZ	14.3	65.9	8.3	11.5	350
Maxim MZ + Blocker	12.3	68.1	14.8	4.8	330
MZ	16.7	60.7	16.7	5.9	320
Mean	14.4	64.1	10.9	10.6	330

^a Based on tuber weight, mean of four replications

^b Total yield in hundred weight per acre bases on 15 feet of row, mean of four replications

Yellow Potato Variety Trial, Center, Colorado

Harvested September 10, 1999

Variety	Percent ^a			Misshapen	Yield ^b	
	under 4 oz. (50mm)	4-10 oz. (50-65mm)	over 10 oz. (65mm)		total	Mt/Ha
Caesar	26.9	70.2	2.8	0.0	35.2	38.4
Concurrent	30.0	60.5	8.4	0.0	47.5	51.8
Dali	44.4	55.5	0.0	0.0	45.0	49.0
Gallia	31.0	63.5	6.0	0.0	50.0	54.5
Innovator	38.1	61.9	0.0	0.0	21.0	22.9
Latona	66.1	33.9	0.0	0.0	42.7	46.5
Morning Gold	35.2	58.2	6.6	0.0	53.2	58.0
Obelix	38.4	61.6	0.0	0.0	44.2	48.2
Symphonia	38.8	61.2	0.0	0.0	33.5	36.5
Victoria	34.1	60.7	5.2	0.0	52.7	57.4
Vivaldi	27.1	68.6	3.8	0.0	52.5	57.2
Divina	26.6	63.6	9.8	0.0	43.2	47.1
Fabula	6.1	47.9	46.0	0.0	53.2	58.0
Mondial	15.0	75.7	9.2	100.0	43.2	47.1
Yukon Gold	15.8	50.4	23.9	9.8	58.5	63.8

^aPercent tubers by weight of total yield

^bTotal is pounds of tubers from 15 feet of row, 2 replications. Mt/Ha is estimated total yield expressed as metric tons per hectare.

Planted: May 4, 1999
 Plant Spacing: 12 inches
 Row Spacing: 34 inches
 Irrigation: Center Pivot
 Fertilizer: 150 lbs/A N, 100 lbs/A P, 100 lbs/A K, 60 lbs/A S
 Herbicide: Sencor
 Fungicide: Chlorothalonil, Dithane and Ridomil/Copper
 Insecticide: Asana
 Harvest: September 10, 1999

Yellow Potato Variety Trial, Greeley, Colorado

Harvested August 13, 1999

Variety	Percent ^a				Yield ^b	
	under 4 oz. (50mm)	4-10 oz. (50-65mm)	over 10 oz. (65mm)	Misshapen	total	Mt/Ha
Morning Gold	18.3	21.5	5.0	0.5	45.3	49.4
Latona	22.5	28.0	3.0	0.0	53.5	58.3
Obelix	16.8	18.25	3.5	15.0	53.6	58.4
Symphonia	17.0	20.0	1.8	0.0	38.8	42.3
Victoria	15.0	26.5	0.0	0.0	41.5	45.2
Yukon Gold	7.0	23.5	10.0	0.0	40.5	44.1

^aPercent tubers by weight of total yield

^bTotal is pounds of tubers from 16 plants, approximately 15 feet of row. Mt/Ha is estimated total yield expressed as metric tons per hectare.

Planted: March 18, 1999

Plant Spacing: 12 inches

Row Spacing: 34 inches

Irrigation: Surface

Fertilizer: 180 lbs/A N, 80 lbs/A P, 75 lbs/A K

Herbicide: Sencor

Fungicide: Chlorothalonil and Dithane

Harvest: August 13, 1999

FINAL REPORT
2000 POTATO – KOCIDE TUBER SOFT ROT TRIAL

- Researcher:** Richard T. Zink, Extension Potato Specialist, and Coleen Golden, Research Associate, Colorado State University, San Luis Valley Research Center, Center, CO 81125
- Location:** San Luis Valley Research Center, Center, CO
- Objective:** To evaluate the efficacy of Kocide for the prevention of soft rot caused by *Erwinia carotovora* in potatoes.
- Acknowledgements:** We gratefully acknowledge the cooperation and support of Griffin L.L.C.
- Cultivar:** Sangre whole tubers, 8 to 12 ounce size
- Treatments:**
1. Wounded, not dipped in *E. carotovora*
 2. Dipped in *E. carotovora* solution, then wounded
 3. Dipped in *E. carotovora* solution, then in a solution of 500 ppm
*Kocide in water, then wounded
 4. Dipped in *E. carotovora* solution, then in a solution of 1000 ppm
*Kocide in water, then wounded
 5. Dipped in *E. carotovora* solution, then in a solution of 2000 ppm
*Kocide in water, then wounded
- *Rates are active ingredient of Kocide by weight in parts per million*
- Replications:** Three replications/treatment, ten tubers/treatment/replication
- Method:** Tubers were taken from 40°F storage, washed in tap water and allowed to dry at room temperature. The tubers were then dipped in an aqueous solution containing 10^4 cells of *E. carotovora* and allowed to dry at room temperature for approximately three hours before being dipped in the appropriate Kocide suspension and allowed to dry at room temperature for one hour. Following one hour of drying, the tubers were poked with a sterile toothpick to a depth of approximately ten millimeters at fifty locations to create inoculation sites. The tubers were then wrapped in moist paper towels covered by plastic wrap and allowed to incubate at room temperature for four days before soft rot readings were taken.
- DATA:**
- Disease:** Percent inoculation sites developing soft rot

RESULTS:

The use of Kocide at 2000 ppm decreased the incidence of soft rot to zero in the tubers tested, thus providing a 100% decrease in disease over the inoculated control. The 1000 ppm and 500 ppm rates decreased the incidence of soft rot by 54.7% and 28.7% respectively over the inoculated control. The *E. carotovora* inoculant was shown to be effective, in that soft rot was more than eight times more severe in the inoculated control than in the non-inoculated control.

The results from this trial indicate that Kocide can be effective in the prevention of soft rot in potatoes when applied directly to tubers. Also, the data shows that 2000 parts per million of active ingredient was sufficient to completely eliminate the occurrence of soft rot in this trial. This rate is far less than the maximum concentration of over 12,000 ppm allowed on the Kocide label for foliar applications. Please see Table One below for results.

Table 1. Effect of Kocide on the percent of inoculation sites developing soft rot in the variety Sangre – 2000 San Luis Valley, Colorado

Treatment	Percent inoculation sites developing soft rot			
	Rep 1	Rep 2	Rep 3	Average
Wounded, not inoculated	7.5	0	0	2.5
Wounded, inoculated	27.0	15.2	24.8	22.3
Wounded, inoculated, dipped in 500 ppm Kocide in water	25.8	11.8	10.2	15.9
Wounded, inoculated, dipped in 1000 ppm Kocide in water	13.4	0.6	16.2	10.1
Wounded, inoculated, dipped in 2000 ppm Kocide in water	0	0	0	0

1999 Potato Leafroll Clonal Evaluation

Location: NW Corner, Selter's farm, 9 North, ½ mile East of SLVRC

Treatments: PLRV infected and Healthy

Plot Design: RCB - 5 seedpieces or reps/cultivar x two treatments

Plant Date: 5/9/99

Plot Size, etc: See plot map; 12" plant spacing x 34" row spacing

Cultivars:

AC92009-4	TC1682-1
CO92027-2	RC92003-2
CO92059-8	Russet Burbank
CO92077-2	Sangre
NDC5118-2	Centennial Russet
NDC5281-2	WNC230-14
NDC5372-1	Ute Russet
NDC5433-5	Russet Nugget
TC1675-1	Russet Norkotah

Irrigation: Ground sprinkler; rate based upon ET

Fertilizer: Planting fertilizer of approximately 90:100:0 using liquid fertilizer at 42 gal/acre. Soil test results indicated a total of 22#+ (N from the water equaled approximately 22# over the season when irrigating 18") + foliar application during the season on 7/20/99 for a total of 20# N, for a grand total of 132:100:0.

**Herbicide/
Fungicide/
Insecticide:** Eptam 4 pts/A, Matrix 1.5 oz/A applied on 6/9/99
1.5 pts/A Bravo-Ultrex on 7/9/99 & 7/31/99
No insecticides used during the summer.

Harvest date: 9/14/99

Table 1. 1999 PLRV Symptom Expression in Advanced Clones and Standard Cultivars

Cultivar/clone	PLRV Reaction (0-3+)	Symptoms
AC92009-4	3+ 50%	LL,CC
CO92027-2	3+ 75%	LL,CC,WP
CO92059-8	3+ 100%	LL,CC,WP
CO92077-2	3+ 100%	LL,CC,WP
NDC5118-2	3+ 43%	LL,CC,P
NDC5281-2	3+ 63%	LL,CC,WP
NDC5372-1	2+ 30%	LL,CC
NDC5433-5	3+ 70%	LL,CC,WP
TC1675-1	3+ 33%	LL,CC,WP
TC1682-1	3+ 89%	LL,CC,WP
RC92003-2	3+ 30%	LL,CC,WP
Russet Burbank	2+ 50%	LL,CC,WP
Centennial Russet	3+ 45%	LL,CC,WP
WNC230-14	0	-----
Russet Nugget	3+ 25%	LL,CC,WP,P
Ute Russet	3+ 70%	LL,CC,WP
Russet Norkotah	3+ 75%	LL,CC,WP
Sangre	3+ 38%	LL,CC,WP,P

Key - rating for the symptom expression is 0 for no symptoms to 3+ for strong typical symptoms. % based on the number of plants harvested versus the number positive for leafroll. LL = lower leaf rolling, CC = good color change evident (yellowing or bronzing), WP = whole plant involvement and P = purpling evident on leaf margins.

1999 Potato Leafroll Natural In-field Spread

Location: NW Corner, Selter's farm, 9 North, 1/2 mile East of SLVRC

Treatments: Healthy with LR+ between treatments

Plot Design: RCB - 12 seedpieces/cultivar x 3 reps with LR+ between treatments

Plant Date: 5/9/99

Plot Size, etc: See plot map; 12" plant spacing x 34" row spacing

Cultivars:

AC92009-4	TC1682-1	COO83008-1
CO92027-2	RC92003-2	Green Mountain
CO92059-8	Russet Burbank	Houma
CO92077-2	Sangre	Katahdin
NDC5118-2	Centennial Russet	Keswick
NDC5281-2	WNC230-14	Penobscot
NDC5372-1	Ute Russet	
NDC5433-5	Russet Nugget	
TC1675-1	Russet Norkotah	

Irrigation: Ground sprinkler; rate based upon ET

Fertilizer: Planting fertilizer of approximately 90:100:0 using liquid fertilizer at 42 gal/acre. Soil test results indicated a total of 22#+ (N from the water equaled approximately 22# over the season when irrigating 18") + foliar application during the season on 7/20/99 for a total of 20# N, for a grand total of 132:100:0.

Herbicide/
Fungicide/
Insecticide: Eptam 4 pts/A, Matrix 1.5 oz/A applied on 6/9/99
1.5 pts/A Bravo-Ultrex on 7/9/99 & 7/31/99
No insecticides used during the summer.

Harvest date: 9/14/99

Table 2. 1999 Natural-in-field Spread of Leafroll to Advanced Clones

Culivar/clone	# pos / # emerged	% Spread		Risk
		1999	11 yr. ave.	
AC92009-4	1/61	1.6		Low
CO92027-2	13/71	18.3		High
CO92059-8	39/56	69.6		Very High
CO92077-2	48/65	73.8		Very High
NDC5118-2	6/51	11.8		High
NDC5372-1	6/49	12.2		High
NDC5433-5	6/59	10.2		High
TC1675-1	18/57	31.6		Very High
TC1682-1	23/64	35.9		Very High
RC92003-2	9/60	15.0		High
Legend Russet	7/59	11.9		High
Russet Norkotah	11/69	15.9		High
WNC230-14	0/60	0.0	0.0	Very Low
Centennial Russet	2/73	2.7	3.0	Low
Russet Burbank	5/42	11.9	6.9	Medium
Russet Nugget	13/62	21.0	14.5	High
Sangre	1/32	3.1	5.6	Medium
Green Mountain	6/39	15.4	13.6	High
Houma	6/50	12.0	3.2	Low
Katahdin	9/60	15.0	3.5	Low
Keswick	2/52	3.8	5.2	Medium
Penobscot	0/54	0.0	0.5	Very Low
Ute Russet	13/62	21.0	12.8	High

Data is from two tubers/plant, 12 plants/replication, and three replications/cultivar for a total of 72 tubers planted per clone in each year. Advanced clones have been tested for one year only. Risk assessment - Low = 0-4.9%, Medium = 5.0-9.9%, and High = >= 10.0%.

NDC5281-2 had no emergence in the plot.

1999 Bacterial Ring Rot Clonal Evaluation

Location: NW Corner, Selter's farm, 9 North, ½ mile East of SLVRC

Treatments: 1) BRR inoculated: 6-7 plates of Cms scraped into 2 l of cold Ringer's solution. Tubers cut lengthwise and immersed in solution for 3 minutes. BRR suspension changed every five treatments and kept no longer than 30 minutes total.
2) Healthy control: Tubers cut lengthwise and planted.

Plot Design: RCB - 7 seedpieces/cultivar x 3 reps with healthy planted west of infected.

Plant Date: Inoculation 5/10/99; FL 5/12/99 Planting 5/11/99; FL 5/13/99

Plot Size, etc: See plot map; 12" plant spacing x 34" row spacing

Cultivars:

AC92009-4	AC90636-3	FL1867
CO92027-2	AC91365-1	FL1889
CO92059-8	RC93007-2	FL1879
CO92077-2	NDC4069-4	FL1833
NDC5118-2	TXAV657-27	Russet Burbank
NDC5281-2	NDC4655-1	Sangre
NDC5372-1	NDC4438-1	Centennial Russet
NDC5433-5	COO83008-1	WNC230-14
TC1675-1	DT6063-1R	Ute Russet
TC1682-1	FL1831	Russet Norkotah
RC92003-2	FL1930	FL1851

Irrigation: Ground sprinkler; rate based upon ET

Fertilizer: Planting fertilizer of approximately 90:100:0 using liquid fertilizer at 42 gal/acre. Soil test results indicated a total of 22# + (N from the water equaled approximately 22# over the season when irrigating 18") + foliar application during the season on 7/20/99 for a total of 20# N, for a grand total of 132:100:0.

**Herbicide/
Fungicide/
Insecticide:** Eptam 4 pts/A, Matrix 1.5 oz/A applied on 6/9/99
1.5 pts/A Bravo-Ultrex on 7/9/99 & 7/31/99
No insecticide used during the summer.

Harvest date: 9/14/99

Table 3. 1999 Clonal Evaluation for Bacterial Ring Rot Foliar Symptom Expression

Clone	Date of First Symptoms	# of Reps Positive	# of Plants Positive	% Plants Positive	Date 50% or More +	% Plants + 100 DAP	Summary of Symptoms	Stem Squeeze
2 RC92003-2	7/19/99	2	2	9.5	8/6/99	66.7	IVC, IVN, MN, W	'+'
2 AC91014-2	7/13/99	2	3	14.2	8/6/99	81.0	ED, R, IVC, IVN, MN, W	'+'
2 AC90636-3	7/13/99	2	4	19.0	8/16/99	71.4	ED, R, IVC, IVN, MN	'+'
2 NDC4655-1	7/28/99	1	1	4.8	-----	28.6	IVC, IVN, MN, W	-
2 NDC4438-1	7/28/99	1	1	4.8	-----	42.8	IVC, IVN, W	'+'
2 AC91365-1	7/28/99	2	3	14.2	-----	23.8	ED, R, IVC	'+'
2 RC93007-2	7/28/99	1	2	9.5	8/24/99	52.4	IVC, IVN, MN, W	-
2 NDC4069-4	8/16/99	2	2	14.2	-----	14.2	IVC, MN, W	'+'
2 Stampede Russet	7/13/99	1	2	9.5	-----	28.6	ED, R, IVC, IVN, MN, W	-
1 Legend Russet	7/13/99	2	3	14.2	8/16/99	61.9	ED, R, IVC, IVN, MN	'+'
1 Cherry Red	7/19/99	1	1	4.8	-----	23.8	ED, IVC, MN	-
1 AC92009-4	7/13/99	2	3	14.2	7/28/99	76.2	ED, R, IVC, IVN, MN, W	'+'
1 CO92027-2	7/13/99	3	6	28.6	8/4/99	76.2	ED, R, IVC, IVN, MN	'+'
1 CO92059-8	7/28/99	1	1	4.8	-----	33.3	IVC, IVN, MN	-
1 CO92077-2	8/16/99	3	5	23.8	-----	23.8	IVC, IVN, MN, W	-
1 NDC5118-2	7/13/99	2	3	14.2	7/28/99	85.7	ED, R, IVC, IVN, MN, W	-
1 NDC5281-2	7/28/99	1	1	4.8	8/6/99	61.9	IVC, IVN, MN, W	'+'
1 NDC5372-1	7/13/99	2	5	23.8	7/28/99	85.7	ED, R, IVC, IVN, MN, W	'+'
1 NDC5433-5	7/13/99	1	1	4.8	-----	47.6	ED, R, IVC, IVN, W	'+'
1 TC1675-1	7/19/99	2	2	9.5	-----	28.6	IVC, MN, W	-
1 TC1682-1	7/28/99	2	4	20.0	-----	45.0	ED, R, IVC, MN, W	'+'
WNC230-14	7/28/99	2	3	14.2	-----	23.8	ED, R, IVC, IVN, MN, W	-
Centennial Russet	7/19/99	1	1	4.8	-----	38.1	IVC, IVN, MN, W	'+'
Russet Burbank	7/13/99	2	4	19.0	7/19/99	66.7	ED, R, IVC, IVN, MN, W	'+'
Russet Norkotah	7/19/99	2	6	28.6	7/28/99	90.0	ED, R, IVC, IVN, MN, W	'+'
Ute Russet	8/24/99	2	3	14.2	-----	14.2	IVC, IVN, MN, W	-
Sangre	8/16/99	3	3	14.2	-----	23.8	IVC, IVN, MN, W	'+'

^Number of years tested, Planting date - 5/11/98. Key to symptoms; ED-early dwarf, R-rosette, IVC-interveinal chlorosis, IVN-interveinal necrosis, MN-marginal necrosis, and W-wilt.

**Table 4. 1999 Clonal Evaluation for Bacterial Ring Rot
Tuber Symptom Expression**

^	Clone	# Reps +	# Tubers +	% Tubers +
2	RC92003-2	1	1	5
2	AC91014-2			0
2	AC90636-3	1	1	5
2	NDC4655-1			0
2	NDC4438-1			0
2	AC91365-1			0
2	RC93007-2			0
2	NDC4069-4			0
2	Stampede Russet			0
1	Legend Russet			0
1	Cherry Red			0
1	AC92009-4			0
1	CO92027-2	1	1	5
1	CO92059-8			0
1	CO92077-2	1	1	5
1	NDC5118-2			0
1	NDC5281-2			0
1	NDC5372-1			0
1	NDC5433-5			0
1	TC1675-1			0
1	TC1682-1			0
	WNC230-14			0
	Centennial			0
	Russet Burbank			0
	Russet Norkotah	1	3	15
	Ute Russet			0
	Sangre	1	1	5

^Number of years tested; Two or three reps tested, ten tubers/rep.

Cultural Management Options for Control of *Rhizoctonia solani* Scurf on Tubers

Objective: To compare levels of *Rhizoctonia solani* sclerotia on the surface of Viking tubers at harvest under two treatments; 1) undercutting of the vines after vine kill and 2) no undercutting.

Materials/Methods: Undercutting of the vines took place six to ten days after vine kill with a control plot (no undercutting of six rows x 50') being left for evaluation purposes. Harvest date: 9/17/99. Five representative hills from each treatment were dug with all tubers harvested from each hill. Tubers were washed and scored for levels of sclerotia present based upon the percentage of surface area covered... 0 = 0, 1 = 1%, 2 = 1-5%, 3 = 5-10%, 4 = 10-25%.

Results:

Undercut

Tuber readings = 0,0,0,0,0,1,1,1,1,1,1,1,1,1,2,2,2,2,2,2,3,3

Percentage over 1% damage = 38%

Percentage over 5% damage = 9%

Mean rating = 1.24 or 2.0% of the surface area covered by sclerotia

No Undercut

Tuber readings = 1,1,1,1,1,1,1,1,1,1,1,2,2,2,2,2,2,2,2,2,2,2,3,3,3,4,4

Percentage over 1% damage = 62% with no zero damage

Percentage over 5% damage = 17%

Mean rating = 1.86 or 4.4% of the surface area covered by sclerotia

Conclusions:

While the sample was too small to readily perform statistical analysis, it is very apparent that there is a positive effect due to undercutting on the levels of sclerotia found on the tuber surface. There is a full two-fold reduction on the levels found when undercutting is employed. Additional work should focus on the best methods/equipment for undercutting and the optimum time frame after vine kill for performing the operation. Also, emphasis should be on coupling this operation with other field operations currently in use (i.e., vine chopping or stem pulling).

1999 Tuber Survey (Internal pigmentation)

Russet Norkotah Selection 3

Harvest date 9/27/99

Objective: To examine tuber placement within the hill, size, and distance from the edge of the hill in regards to internal pigmentation occurring in the Russet Norkotah 3.

Materials/ Methods: Hills were individually selected and soil dug from around the tubers. Hill placement and distance from the edge of the hill were recorded. Each tuber was sized and then cut to verify presence or absence of internal pigmentation.

Observations: Three observations are pertinent with this data. First, it does not appear that if internal pigmentation (pink color) is found in one tuber it will be found in all of the other tubers in the hill. Second, there is an association with light and closeness to the edge of the hill in many cases, however, many other cases showed no association with light or closeness to the edge of the hill. Third, the bud end showed the most prevalent area of internal discoloration indicating an event during the growing season may have occurred which set up the process for internal pigmentation.

Table 5: Tuber Observations by Plant for Internal Pigmentation

Plant # - Tuber #	Depth of Tuber (cm)	Size of Tuber (oz)	Pink Color Rating (0-5)	Comments
1-1	6	3	0	
2	10	24	3	bud end
2-1	2	4	0	
2	2	1	0	
3	2	3	0	
4	2	3	0	
5	2	3	0	
6	3	5	0	
7	4	2	0	
8	4	1	0	
9	4	3	0	
10	7	4	0	
11	8	1	0	
12	8	10	2	bud end
3-1	2	2	1	mid-central
2	6	6	1	bud end
3	8	8	1	mid-central

4	13	10	1	bud end
4-1	1	4	0	
2	1	6	2	bud end
3	5	8	0	
4	8	2	0	
5	8	6	0	
6	13	3	1	bud end
5-1	3	4	0	
2	4	3	0	
3	8	6	0	
4	8	4	1	throughout tuber
5	9	6	0	
6	12	4	0	
7	12	6	1	bud end
6-1	1	1	5	greenhead
2	1	2	2	greenhead/bud end
3	4	4	0	
4	5	2	0	
5	7	6	0	
6	12	10	4	bud end
7-1	1	1	0	
2	6	12	2	bud end
3	11	24	4	bud end
4	13	12	2	bud end
8-1	1	1	4	greenhead/bud end
2	3	3	1	mid-bud end
3	3	2	0	
4	3	3	0	
5	4	4	1	mid-bud end
6	4	1	0	
7	6	2	1	mid-bud end
8	8	6	1	mid-central
9	13	1	0	
9-1	0	5	2	greenhead
2	3	2	0	
3	3	2	0	

4	4	3	0	
5	6	2	0	
6	7	4	0	
7	8	7	0	
8	9	11	2	throughout tuber
9	10	9	0	
10	10	4	1	throughout tuber
11	11	6	0	
12	13	6	2	throughout tuber
10-1	1	4	0	
2	1	3	0	
3	1	4	0	
4	2	2	0	
5	3	3	0	
6	5	3	0	
7	7	1	0	
8	11	5	0	
11-1	0	8	1	greenhead/bud end
2	0	1	4	greenhead
3	1	2	0	
4	3	4	1	throughout tuber
5	3	3	0	
6	4	1	0	
7	4	9	1	long stolon
8	5	2	0	
9	7	4	1	throughout tuber
10	7	2	0	
11	8	4	0	

Rating scale for internal pigmentation - 0 = none observed, 3 = light pink color fairly evenly spaced throughout the vascular tissue, and 5 = strong pink color throughout the vascular tissue.

