2001
RESEARCH REPORT

Extension Potato Disease Control Project

Richard Zink, Robert Davidson and Andrew Houser

Colorado State University

SLV Research Center

CONTENTS

2001 PROTOCOL FOR EVALUATION OF FUNGICIDES FOR CONTROL OF EARLY BLIGHT ON POTATO

Researchers: Richard T. Zink, Associate Professor, and Andrew Houser, Research Associate, Department of Horticulture and Landscape Architecture, Colorado State University

Location: San Luis Valley Research Center, Center, CO

Acknowledgements: We gratefully acknowledge the cooperation and financial support of BASF Corporation, Colorado Potato Administrative Committee (Area II), DuPont Ag Products, Griffin L.L.C., Rohm and Haas Company, Syngenta, and United Agri Products.

Cultivar: Russet Nugget, cut seed, 2-4 oz

Applications: All treatments applied using an R & D CO_2 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 & 10; July 16 & 17; July 23 & 24; July 30 & 31; August 6 & 7; August 13 & 14; August 20 & 21; August 27 & 28

Planted:	May 17, 2001
Plot Design:	Randomized complete block
Plot Size:	4 - 20 foot rows per treatment per replication, treatments applied to center two rows and data 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, preplant, 40N through sprinkler after tuber set
Herbicide:	Dual Magnum, 1.33 pt./A + Matrix, 1.5 oz./A
Insecticide:	Leverage 2.7, 3.75 fl.oz./A
Vine Killer:	Killed by frost, September 9, 2001
Harvested:	September 19 - 21, 2001

DATA:

Disease:	Early blight disease incidence based on percent leaves infected, readings taken weekly starting August 2, 2001.
Yield:	2-20 foot rows per treatment per replication, total yield expressed as cwt/A.
Grade:	By hand, percent tubers by weight in lbs < 4 oz., 4-10 oz., > 10 oz., US #2's, and culls.

Summary of Results for Foliar Fungicide Trials, 2001

Thanks to the generous support of the Colorado Potato Administrative Committee (Area II) and several agricultural companies, full season comprehensive fungicide efficacy trials were conducted this past summer at the San Luis Valley Research Center (see protocol). Over the course of the growing season twenty-three different fungicide programs were assessed for blight control (Table 1). The trials depended on natural infection, early blight (*Alternaria solani*) developed within the trial, however, late blight (*Phytophthora infestans*) did not.

The incidence of early blight within the trials was natural and similar to what occurred in commercial potato production across the San Luis Valley. At the time of final disease readings on September 7, early blight incidence had reached 100 percent in the untreated control. AUDPC values provide clear separation among fungicide programs. In general, disease suppression by fungicide program can be grouped into four categories. Early blight disease development was significantly reduced by all treatments over the untreated control. Treatments 2, 3, 16, 17, 18, 20, and 21 reduced disease by less than 25%. Treatments 4, 5, 7, 19, and 22 reduced disease from 25-40%. Treatments 6, 8, 9, and 20 reduced disease from 40-70%. Treatments 10, 11, 12, 13, 14, 15, and 23 reduced disease incidence by more than 70%. In general the highest degree of early blight control was achieved in programs where Quadris was utilized (Table 2). Post harvest evaluation of tubers, however, showed that in this study foliar applications of Quadris did not reduce the incidence of black scurf on tubers (Table 4).

Suppression of foliar early blight did not, however, translate directly to increased tuber yields (Table 3). The lack of effect of fungicide program on yield is common in small replicated trials. This is likely due to the late onset of disease and the long season cultivar Russet Nugget. Early blight is a disease of senescence and generally has a much greater impact on an early maturing cultivar 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 an additional three to four week period for fungicide program evaluation.

Table 1. Fungicide programs evaluated for early blight control, San Luis Valley, Colorado, 2001

Program	Products	Rate	Itinerary/Week	Est. total cost/A*
1	Control, no treatment			
2	Kocide 2000	3.0 lb./A	1,2,3,4,5,6,7,8	$72.00/A
3	Bravo Ultrex	0.7 lb./A	1,2,3,4,5,6,7,8	$39.12/A
4	F500 (Headline)	6.1 fl.oz./A	2,4,6	NA
	Bravo Ultrex	0.7 lb./A	1,3,5,7,8	
5	F500 (Headline)	6.1 fl.oz./A	2,4	NA
	Bravo Ultrex	0.7 lb./A	1,3,5,6,7,8	
6	F500 (Headline)	9.2 fl.oz./A	2,4,6	NA
	Bravo Ultrex	0.7 lb./A	1,3,5,7,8	
7	F500 (Headline)	9.2 fl.oz./A	2,4	NA
	Bravo Ultrex	0.7 lb./A	1,3,5,6,7,8	
8	F500 (Headline)	6.1 fl.oz./A	2,4,6	NA
	Polyram	2.0 lb./A	1,3	
	Polyram + Super Tin	2.0 lb./A + 2.5 oz./A	5,7,8	
9	F500 (Headline)	9.2 fl.oz./A	2,4,6	NA
	Polyram	2.0 lb./A	1,3	
	Polyram + Super Tin	2.0 lb./A + 2.5 oz./A	5,7,8	
10	Polyram 80DF	2.0 lb./A	1,3,5,7,8	$69.27/A
	Quadris	6.2 oz./A	2,4,6	
11	Polyram 80DF	2.0 lb./A	1,3	$81.30/A
	Quadris	6.2 oz./A	2,4	
	Polyram 80DF+ Super Tin	2.0 lb./A + 2.5 oz./A	5,6,7,8	
12	Polyram 80DF	2.0 lb./A	1,3	NA
	Quadris	6.2 oz./A	2,4	
	Polyram 80DF + Acrobat 50WP	2.0 lb./A + 6.4 oz./A	5,6,7,8	
13	Dithane Rainshield	2.0 lb./A	2,4,6	NA
	Quadris 2.08F	6.2 oz./A	1,3,5	
	Gavel 75DF	2.0 lb./A	7,8	
14	Gavel 75DF	2.0 lb./A	2,4,6,7,8	NA
	Quadris 2.08F	6.2 oz./A	1,3,5	
15	Bravo Ultrex	0.7 lb./A	2,4,6,7,8	$64.92/A
	Quadris 2.08F	6.2 oz./A	1,3,5	
16	Curzate + Manzate	3.33 oz./A + 24 oz./A	1,2,3,4,5,6,7,8	$88.08/A
17	Curzate + Bravo Ultrex	3.33 oz./A + 1.4 lb./A	1,2,3,4,5,6,7,8	$136.08/A
18	Equus DF	0.7 lb./A	1,2,3,4,5,6,7,8	$39.84/A
19	GX – 687	1.5 pt./A	1,2,3,4,5,6,7,8	NA
20	Rovral 4	1.5 pt./A	1,2,3,4,5,6,7,8	$283.04/A
21	Manex II	1.6 qt./A	1,2,3,4,5,6,7,8	$48.08/A
22	Manex II + Super Tin	1.6 qt./A + 2.5 oz./A	1,2,3,4,5,6,7,8	$87.60/A
23	Dithane Rainshield	2.0 lb./A	1,3,6	$41.89/A
	Quadris 2.08F	6.2 oz./A	2,4	
24	Dithane Rainshield	2.0 lb./A	3,7	$36.92/A
	Quadris 2.08F	6.2 oz./A	1,5	

*These prices do not include application costs.

Table 2. Effects of fungicide programs on the incidence of early blight in the cultivar Russet Nugget, San Luis Valley, Colorado, 2001; No Late Blight occurred within the trial.

	Percent Leaves Infected						
Treatment #	Aug. 2-3	Aug. 8-9	Aug. 16-17	Aug. 23-24	Aug. 29-30	Sept. 6-7	AUDPC[a]
1	9.2	50.5	97.2	97.9	100.0	100.0	2833 a
2	5.6	27.2	69.2	93.1	97.0	99.5	2392 b
3	4.0	18.9	57.3	71.2	85.7	87.1	1964 c
4	3.1	9.8	17.7	35.2	36.7	62.9	936 gh
5	3.4	10.1	18.7	40.0	52.9	74.2	1136 efg
6	2.8	10.3	22.4	33.6	42.1	59.2	985 fgh
7	2.7	9.0	21.7	51.7	50.0	73.8	1204 ef
8	3.8	9.9	13.4	15.8	27.2	39.2	627 i
9	3.1	10.5	19.9	38.9	28.4	54.6	896 h
10	3.0	6.5	4.8	8.8	8.3	27.5	316 j
11	2.5	6.6	5.0	7.9	8.3	18.0	275 j
12	2.6	6.5	4.9	8.0	7.5	22.5	285 j
13	2.2	4.9	5.1	8.1	9.0	18.1	268 j
14	2.0	5.1	4.9	9.1	8.9	25.4	298 j
15	1.8	5.9	6.6	10.7	11.0	19.6	320 j
16	5.2	27.8	64.2	84.6	92.4	99.0	2265 b
17	2.8	12.7	35.7	47.9	66.7	84.3	1456 d
18	4.1	19.0	48.3	60.0	78.8	89.2	1783 c
19	3.3	9.4	30.5	54.2	57.5	71.7	1334 de
20	3.2	8.8	28.0	59.6	62.9	84.3	1433 d
21	4.5	17.3	51.3	72.1	77.9	91.3	1880 c
22	3.6	11.0	20.9	47.5	42.5	70.8	1127 efg
23	3.0	6.5	5.3	9.7	13.7	29.2	369 j
24	2.1	10.3	15.8	21.7	35.8	57.9	802 hi
LSD(P=0.05)	1.33	6.59	9.94	14.28	8.50	15.70	226.28

[a]AUDPC is the Area Under the Disease Progress Curve.
Means followed by the same letters are not significantly different at P=0.05 for AUDPC.

Table 3. Effects of fungicide programs on tuber yield and quality in the cultivar Russet Nugget, San Luis Valley, Colorado, 2001

	Percent[a]					
Treatment	< 4 oz	4-10 oz	> 10 oz	US #2s	Culls	cwt/A[b]
1	15.8	62.4	17.6	1.9	2.3	299.2
2	16.7	68.1	12.9	1.4	0.8	311.6
3	14.6	68.3	14.4	1.3	1.3	326.6
4	12.3	67.1	18.4	0.8	1.4	337.4
5	14.2	68.0	16.0	0.9	0.8	343.4
6	11.9	65.0	19.3	2.2	1.6	320.2
7	13.8	64.4	19.1	1.8	0.8	360.8
8	15.5	57.0	23.4	2.4	1.6	340.2
9	12.7	65.8	18.2	2.1	1.1	340.5
10	14.2	62.1	19.4	2.7	1.6	341.3
11	11.4	56.6	29.0	1.9	1.1	352.6
12	13.5	61.9	22.1	1.1	1.4	325.9
13	12.9	57.4	26.9	1.4	1.5	324.5
14	13.8	60.8	22.4	1.5	1.5	343.8
15	12.1	65.8	19.0	1.7	1.4	332.4
16	12.2	63.6	21.6	1.7	0.8	337.4
17	13.2	62.8	19.8	3.2	1.0	333.5
18	11.9	65.6	18.1	2.5	1.8	333.4
19	13.5	63.0	20.7	1.4	1.3	361.0
20	11.7	67.1	18.7	0.8	1.7	346.3
21	12.0	64.8	20.3	1.4	1.6	345.5
22	11.3	59.4	25.6	2.0	1.6	368.9
23	12.1	65.9	19.9	1.6	0.4	353.1
24	12.3	62.0	22.5	1.4	1.8	359.2
LSD(P=0.05)	NS	NS	NS	NS	NS	NS

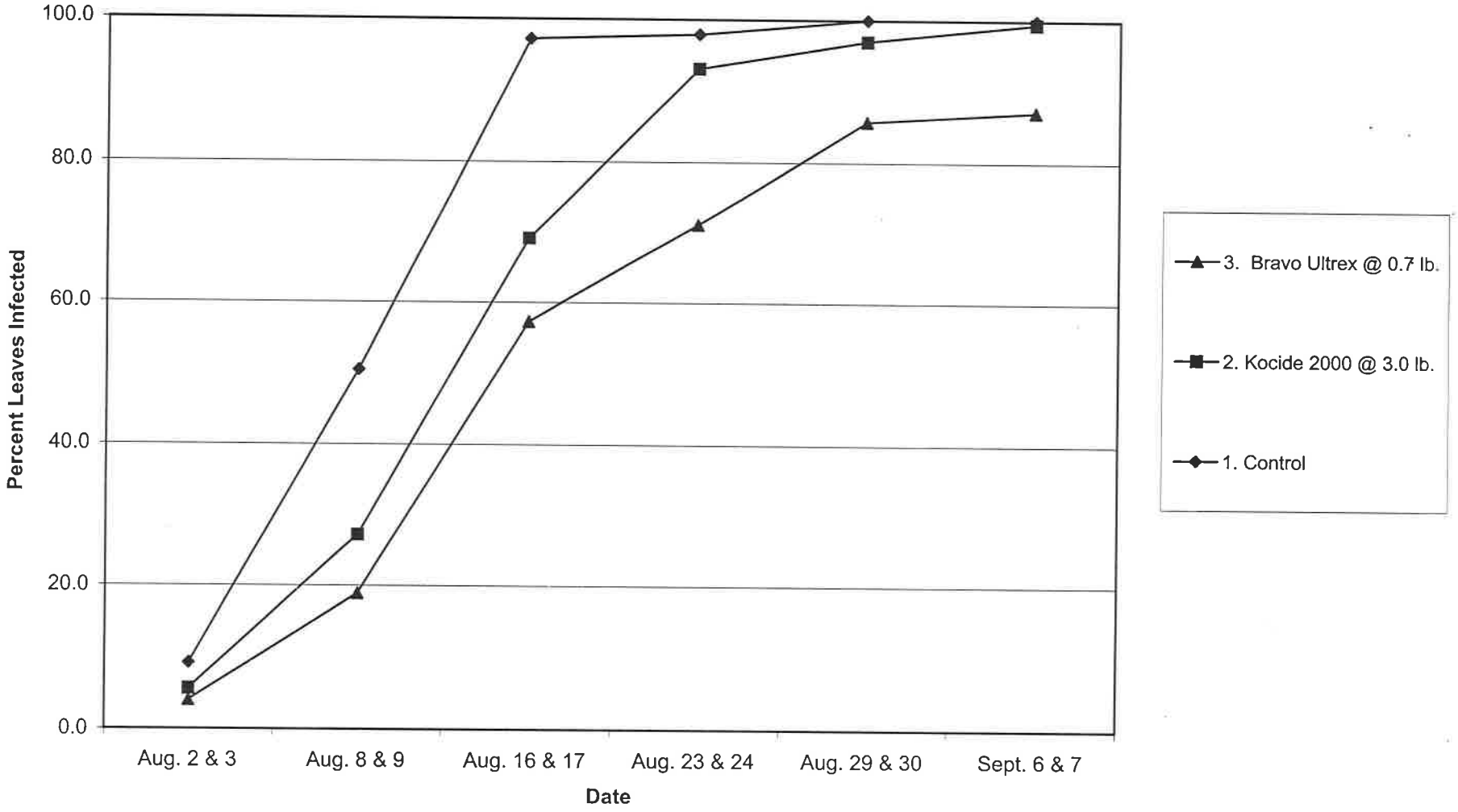
[a] Based on tuber weight in pounds, mean of four replications.
[b] Total yield expressed as hundred weight per acre, 2-20 foot rows per treatment per replication, mean of four replications.

Table 4. Effects of foliar fungicides on the severity of black scurf in the cultivar Russet Nugget, San Luis Valley, Colorado, 2001

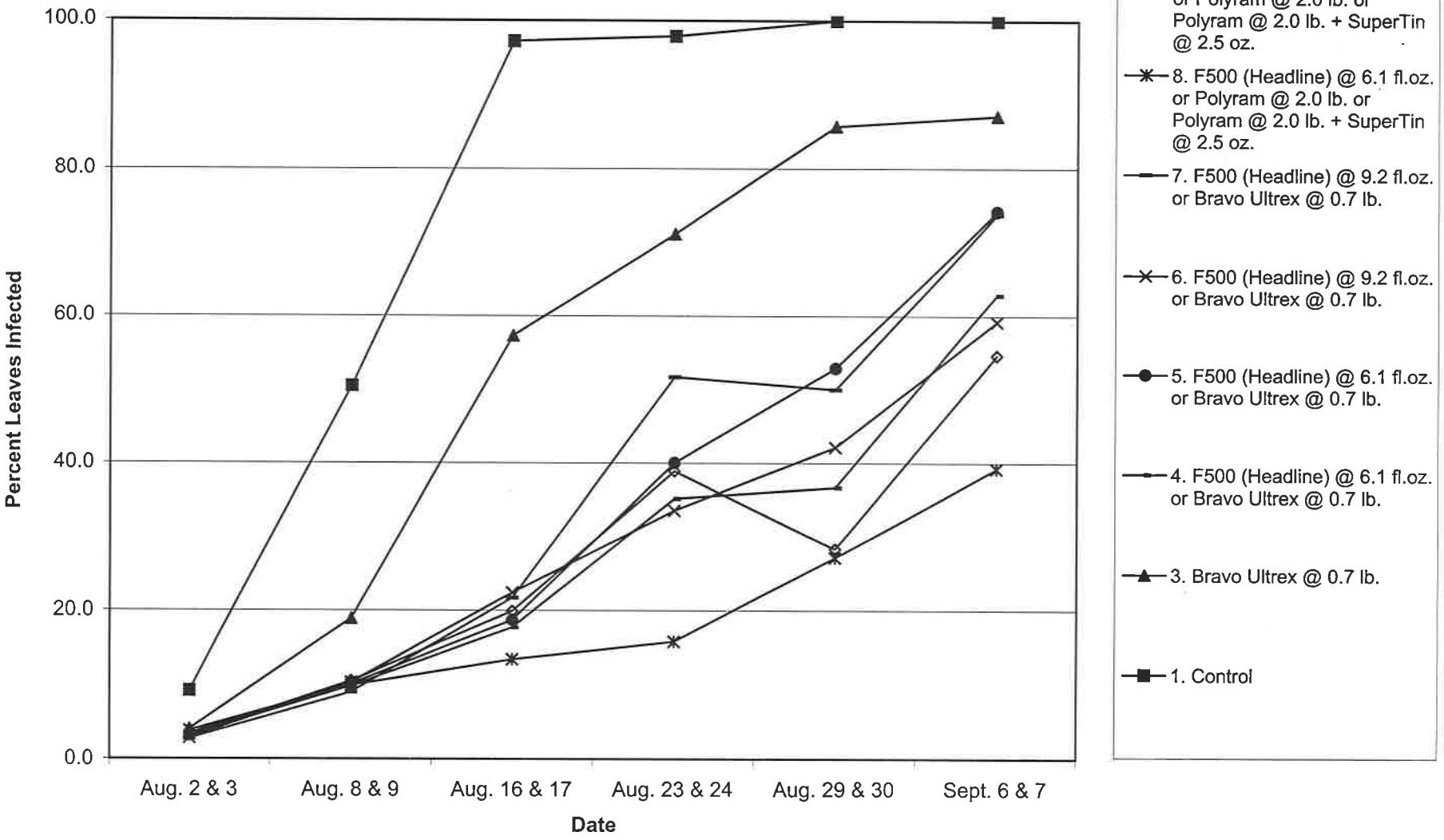
Treatment	Product	Rate	Week of application	Black scurf severity index[a]
1	Control	No treatment		15.9
3	Bravo Ultrex	0.7 lb./A	1,2,3,4,5,6,7,8	24.1
4	F500 (Headline) + Bravo Ultrex	6.1 fl.oz./A 0.7 lb./A	2,4,6 1,3,5,7,8	23.1
5	F500 (Headline) + Bravo Ultrex	6.1 fl.oz./A 0.7 lb./A	2,4 1,3,5,6,7,8	11.4
6	F500 (Headline) + Bravo Ultrex	9.2 fl.oz./A 0.7 lb./A	2,4,6 1,3,5,7,8	18.4
7	F500 (Headline) + Bravo Ultrex	9.2 fl.oz./A 0.7 lb./A	2,4 1,3,5,6,7,8	34.8
8	F500 (Headline) + Polyram + Polyram & Super Tin	6.1 fl.oz./A 2.0 lb./A 2.0 lb./A + 2.5 oz./A	2,4,6 1,3 5,7,8	19.6
9	F500 (Headline) + Polyram + Polyram & Super Tin	9.2 fl.oz./A 2.0 lb./A 2.0 lb./A + 2.5 oz./A	2,4,6 1,3 5,7,8	21.3
23	Dithane Rainshield + Quadris 2.08F	2.0 lb./A 6.2 oz./A	1,3,6 2,4	11.6
24	Dithane Rainshield + Quadris 2.08F	2.0 lb./A 6.2 oz./A	3,7 1,5	3.0
LSD(P=0.05)				NS

[a] Black scurf severity index = mean percent of the affected tuber surface area, 10 8-10 oz. tubers per treatment per replication multiplied by the severity of the sclerotia, where 1 = small sclerotia and 3 = large sclerotia.

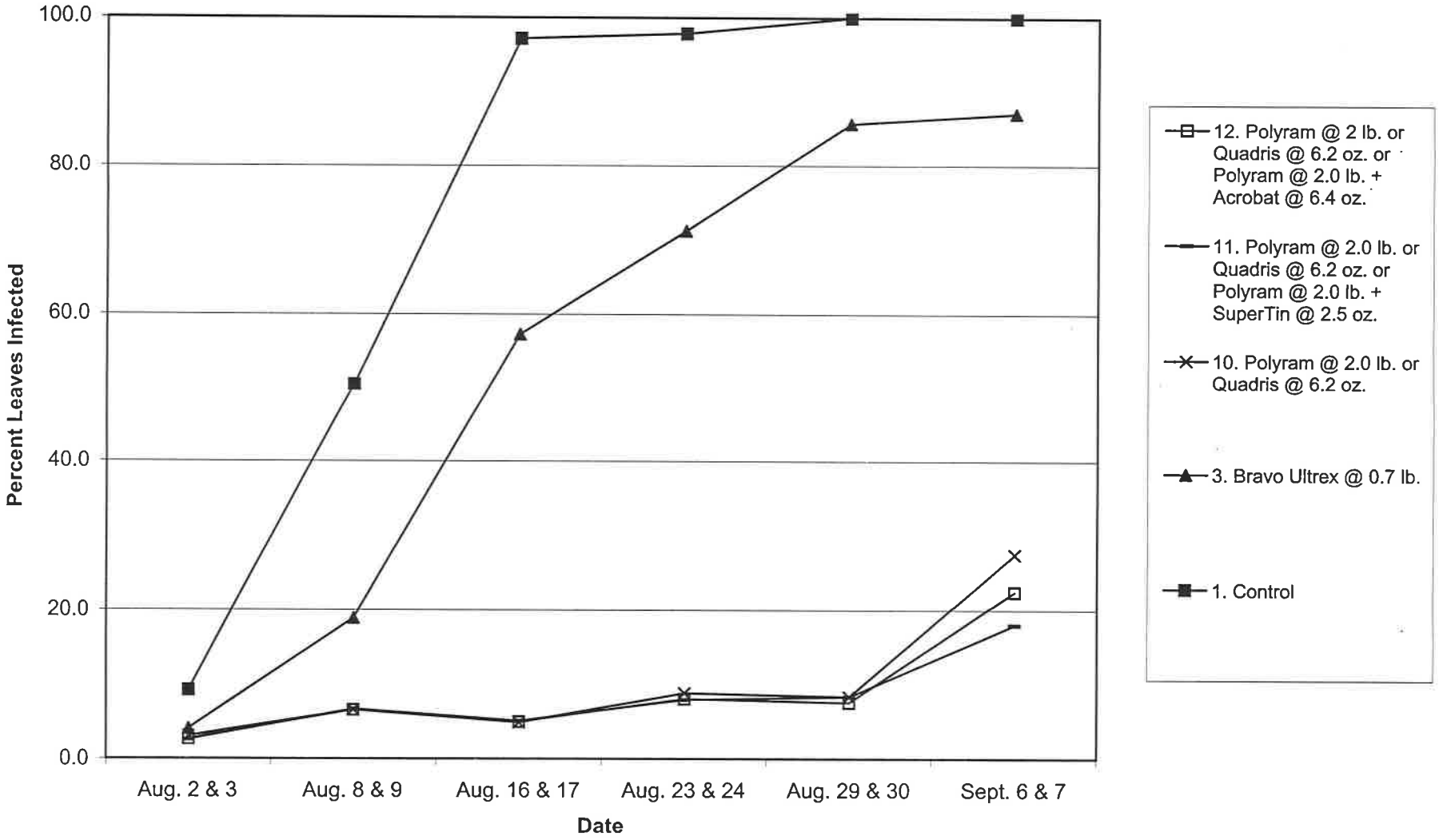
Disease Progress Curve for Early Blight
2001 Fungicide Trial, Colorado State University
San Luis Valley Research Center, Center, CO



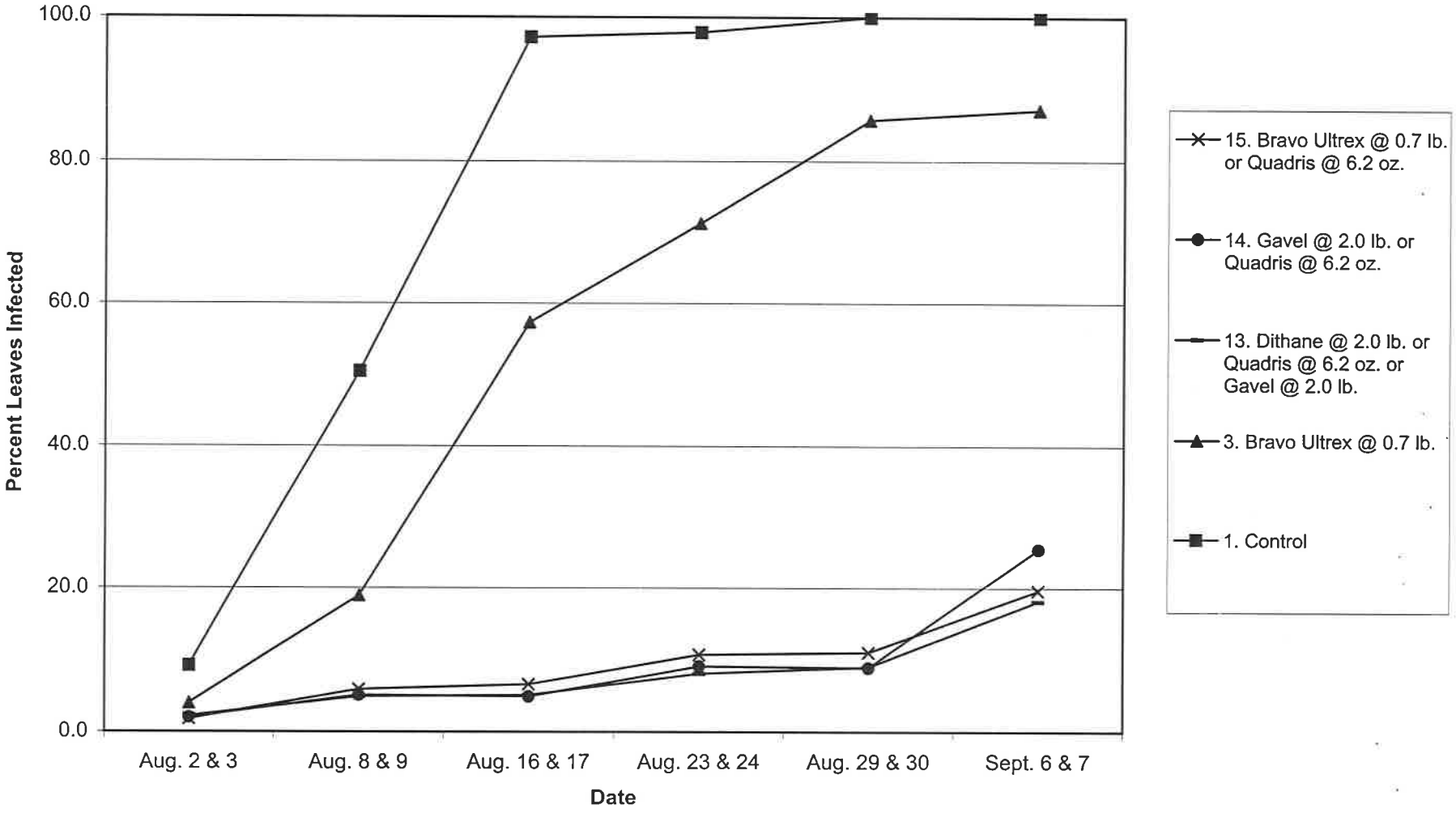
Disease Progress Curve for Early Blight
2001 Fungicide Trial, Colorado State University
San Luis Valley Research Center, Center, CO



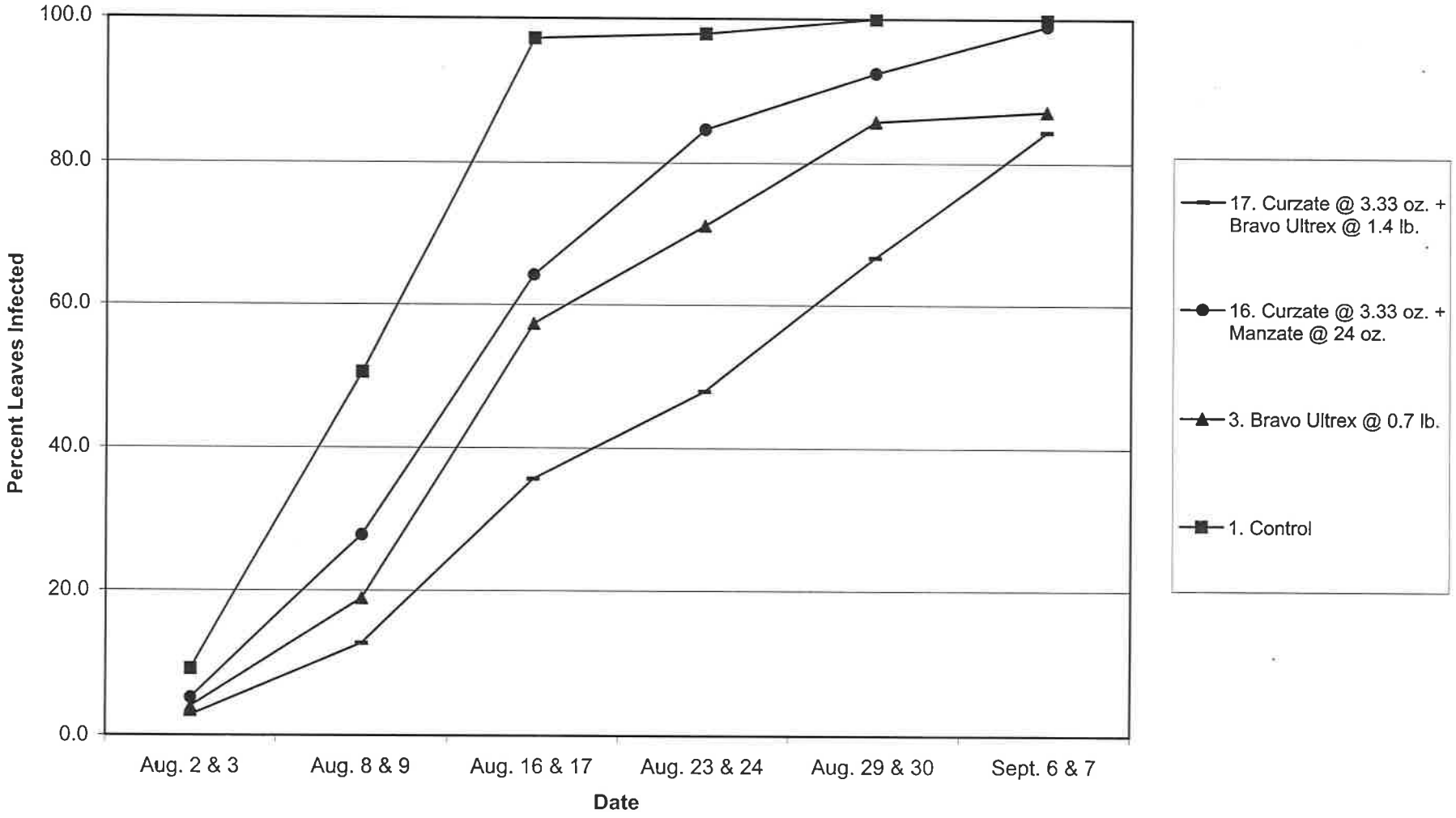
Disease Progress Curve for Early Blight
2001 Fungicide Trial, Colorado State University
San Luis Valley Research Center, Center, CO



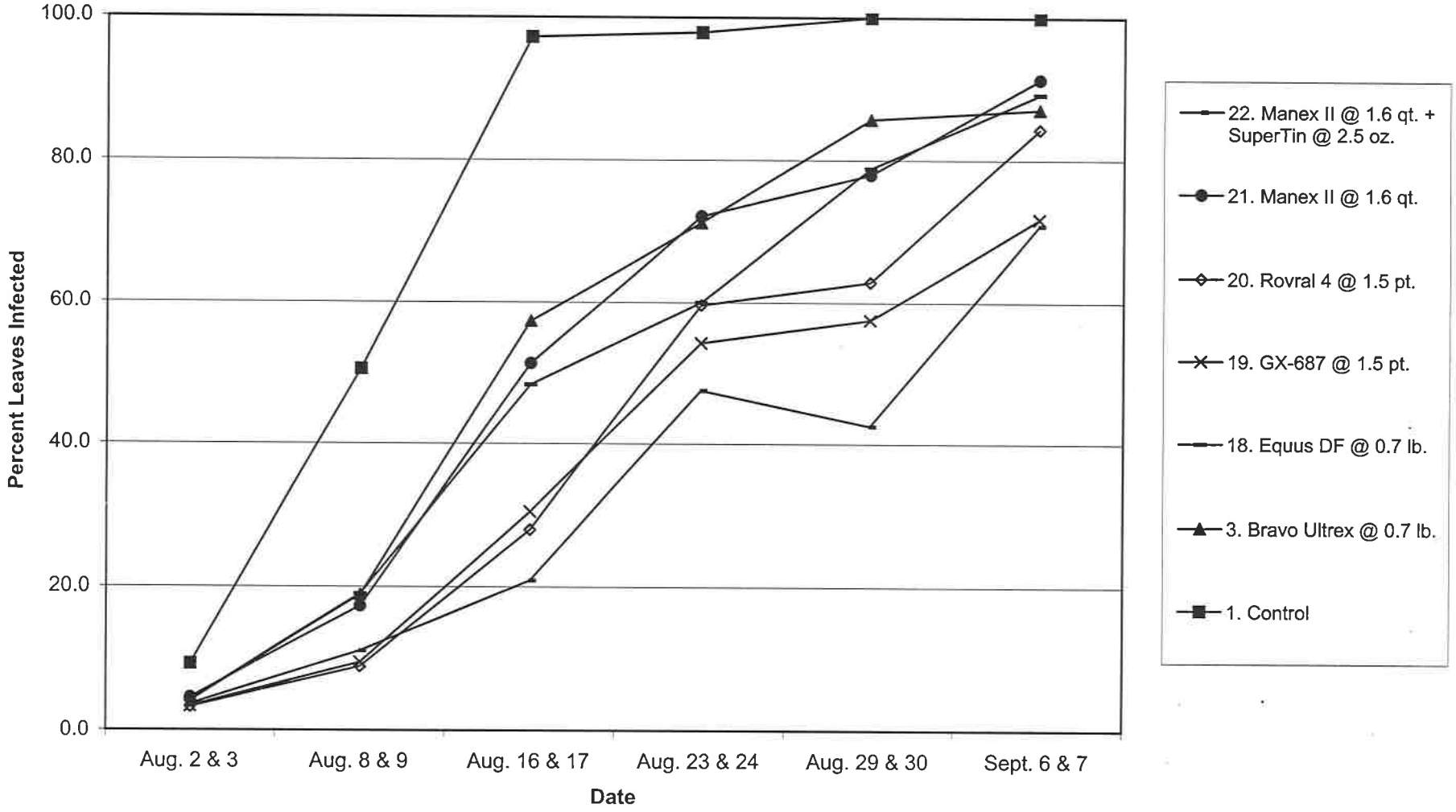
Disease Progress Curve for Early Blight
2001 Fungicide Trial, Colorado State University
San Luis Valley Research Center, Center, CO



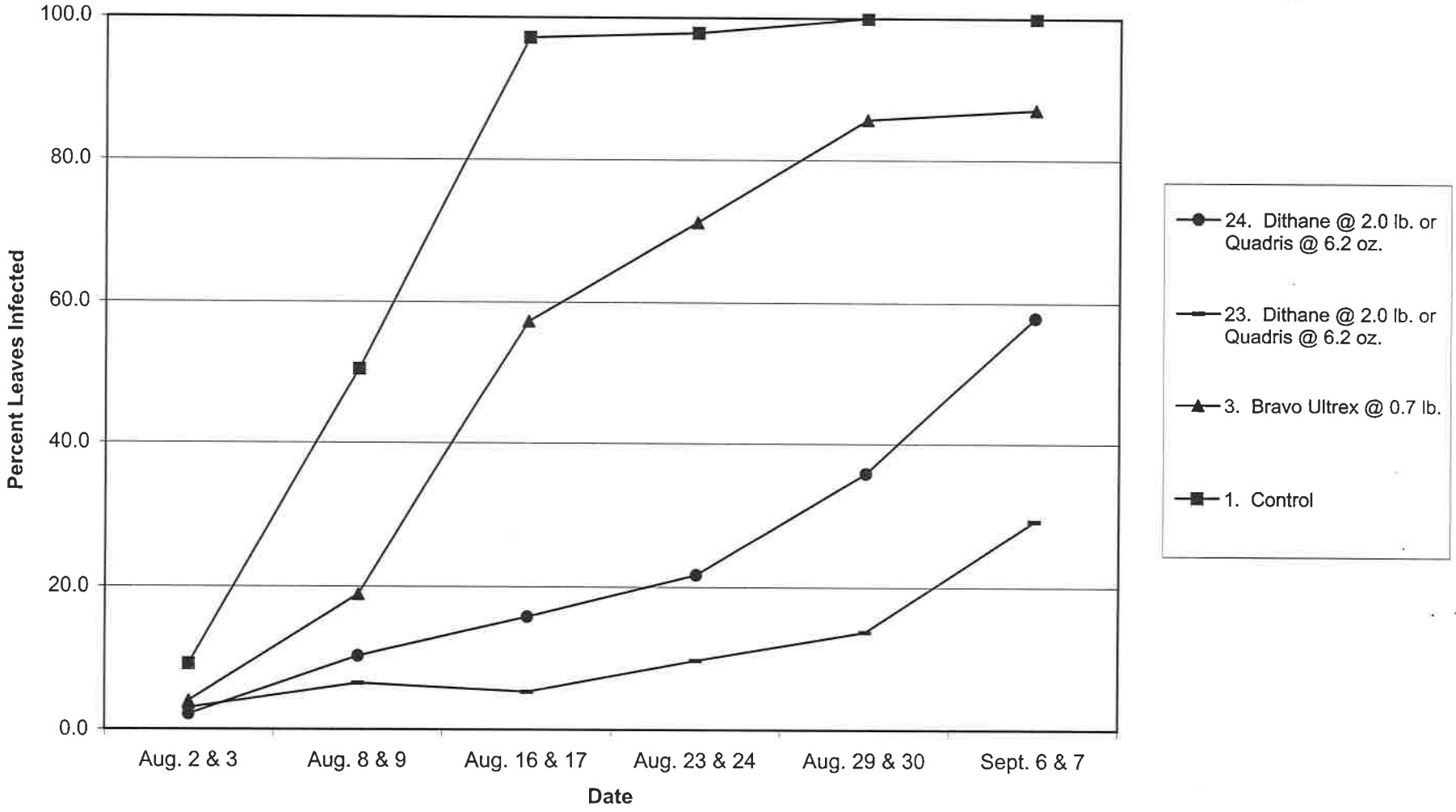
Disease Progress Curve for Early Blight
2001 Fungicide Trial, Colorado State University
San Luis Valley Research Center, Center, CO



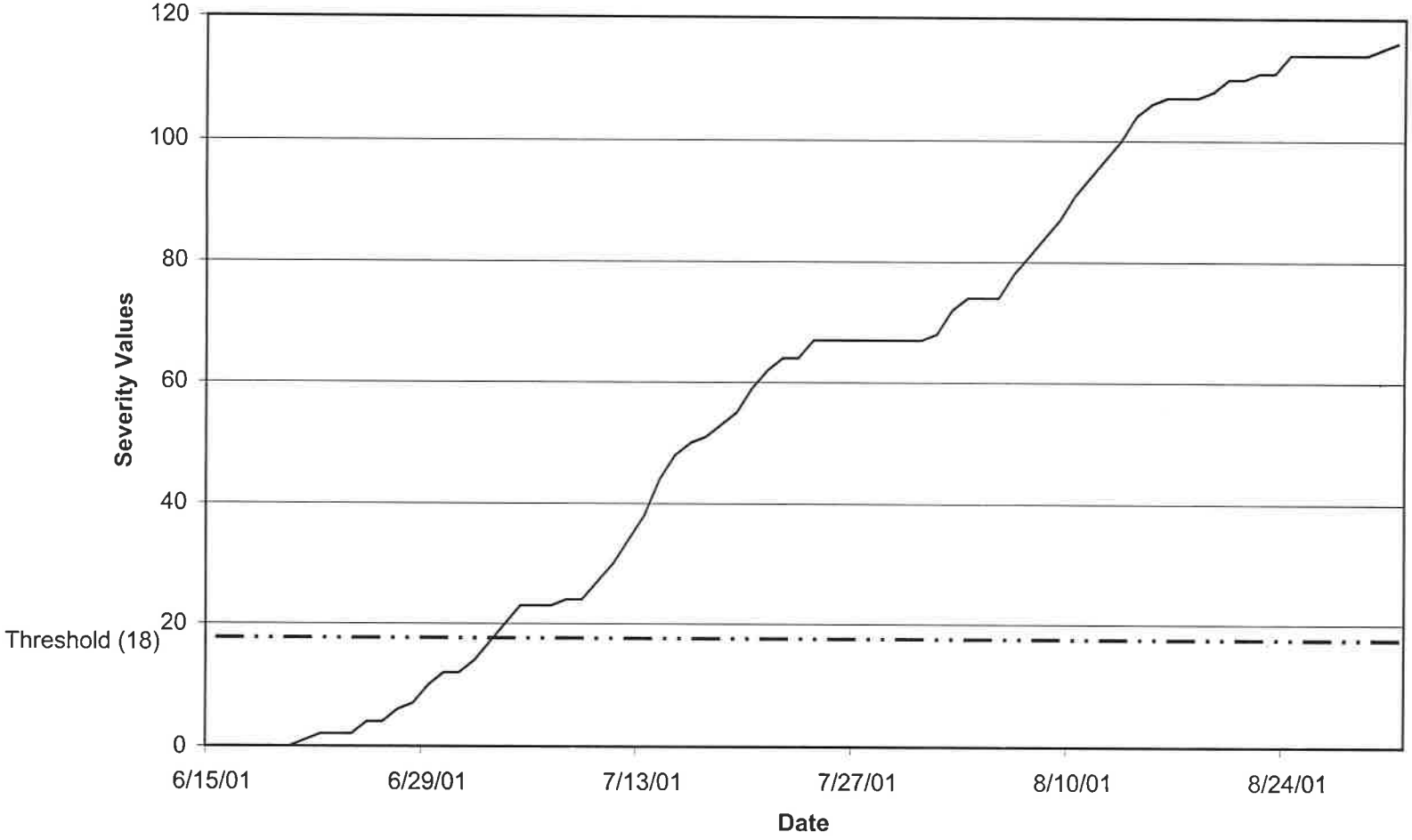
Disease Progress Curve for Early Blight
2001 Fungicide Trial, Colorado State University
San Luis Valley Research Center, Center, CO



Disease Progress Curve for Early Blight
2001 Fungicide Trial, Colorado State University
San Luis Valley Research Center, Center, CO



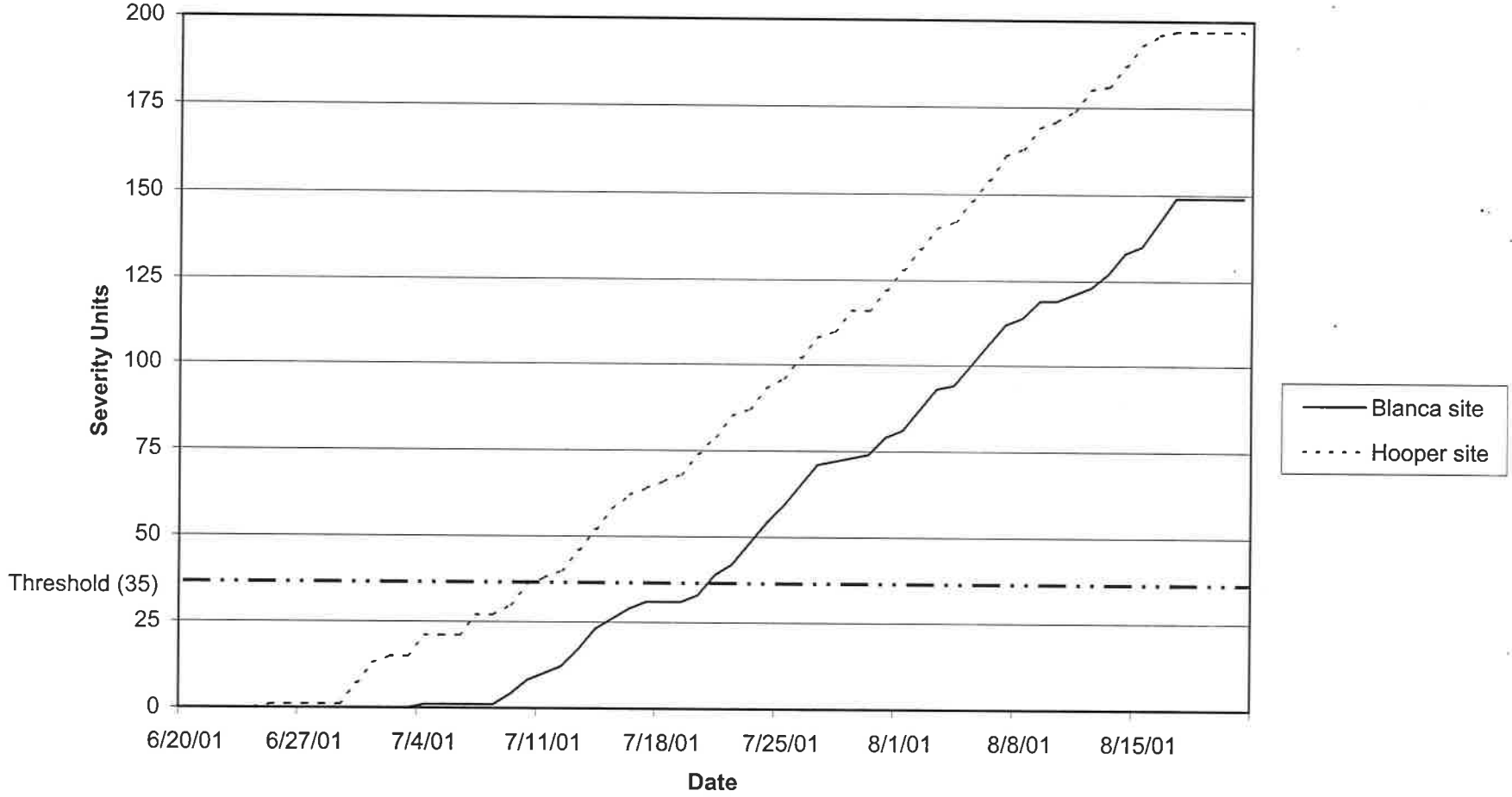
Potato Late Blight Severity Values - Wallin Model, San Luis Valley, Colorado, Sargent Site, 2001



Footnote:
-The Sargent weather station was set up on June 7.

Potato Late Blight Fry Units, San Luis Valley, Colorado, 2001

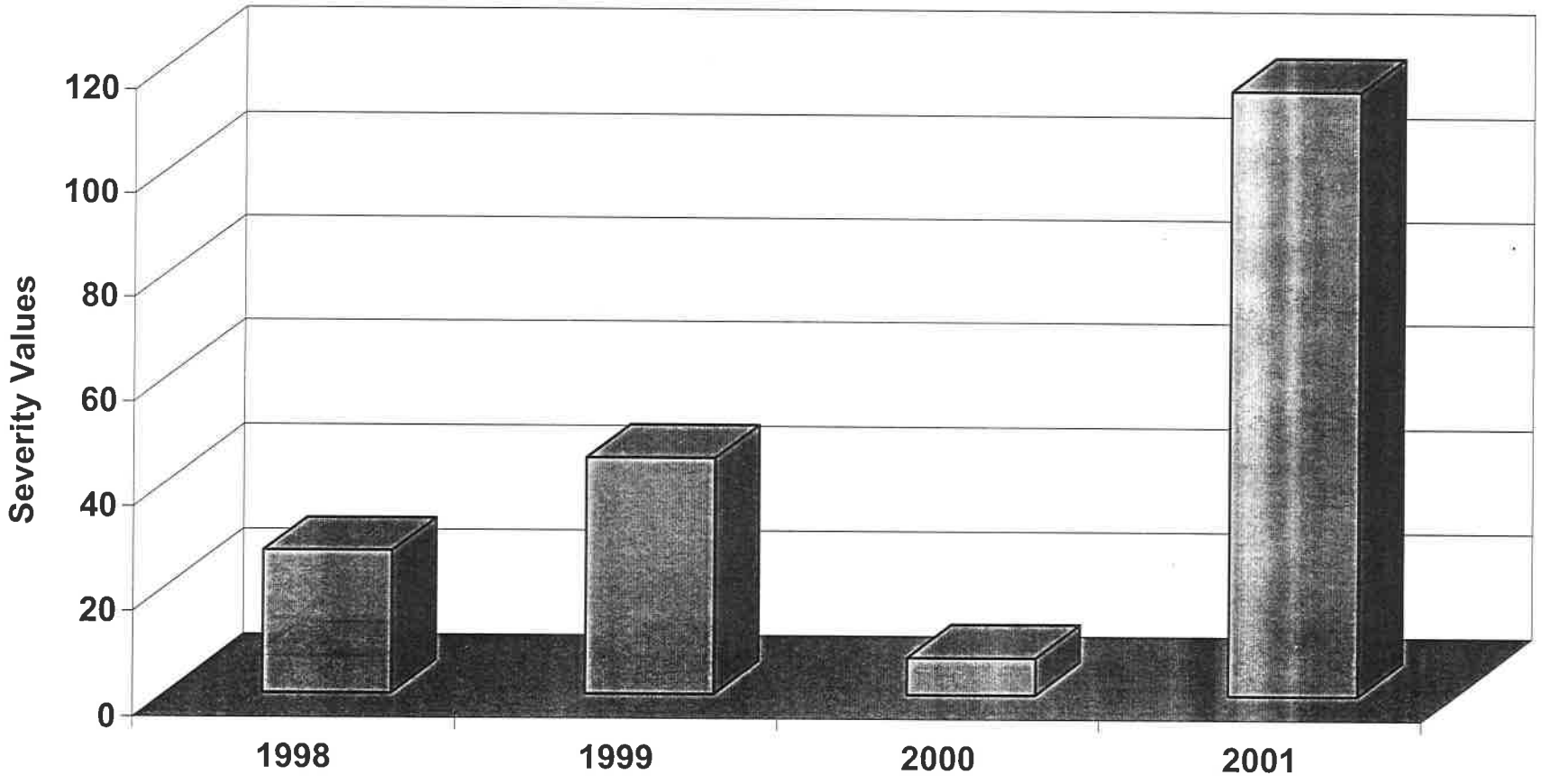
Moderately Susceptible Varieties



Footnote:

- The Fry Late Blight model was used to calculate the severity units.
- The Blanca weather station was set up on June 29, the Hooper weather station was set up on June 4; some differences between the sites may be a result of starting the data collection at different dates.

SLV Late Blight Severity Values



2001 PROTOCOL FOR EVALUATION OF SEED PIECE TREATMENTS FOR CONTROL OF SEED PIEC DECAY ON POTATO

Researchers: Richard T. Zink, Associate Professor, and Andrew Houser, Research Associate, Department of Horticulture and Landscape Architecture, Colorado State University

Location: San Luis Valley Research Center, Center, CO

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

Objective: To evaluate the efficacy of various seed piece treatments in preventing disease and seed piece decay.

Treatments: All treatments applied directly to fresh cut seed and planted within twenty-four hours.

1. Control, no treatment
2. Maxim MZ
3. Tops MZ
4. Evolve
5. A12778
6. A12534
7. A12777
8. A12919
9. PCC553
10. PCC553-1
11. PCC553-2
12. PCC553-3

Planted: May 16, 2001
Plot Design: Randomized complete block
Plot Size: 1 - 25 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, preplant, 40N through sprinkler after tuber set
Herbicide: Dual Magnum, 1.33 pt./A + Matrix, 1.5 oz./A
Insecticide: Leverage 2.7, 3.75 fl.oz./A
Fungicides: Dithane DF, 2.0 lb./A + Bravo WS, 1.5 pt./A + Quadris, 15.4 fl.oz./A
Vine Killer: Sulfuric acid on August 31, 2001
Harvested: September 18, 2001

DATA

Stand: 1-25 foot row/treatment/replication, counts taken 40 days after planting.
Seed piece decay: Soft-rot and dry-rot combined rated 0-100, where 0 = no decay and 100 = complete decay; 4 seed pieces/treatment/replication.
Rhizoctonia stem canker: Percent stems infected; 4 plants/treatment/replication.
Blackleg: Percent stems infected; 4 plants/treatment/replication.
Plant vigor: Rated 1-5, where 1 = poor and 5 = good; 4 plants/treatment/replication.
Stems: Average number of stems per plant; 4 plants/treatment/replication.
Tuber set: Average number of tubers per plant at full set; 3 plants/treatment/replication.
Yield: 1-18 foot row per treatment per replication, total yield expressed in cwt/A.
Grade: By hand, percent tubers by weight in lbs. and tuber # < 4 oz., 4-10 oz., > 10 oz., US #2's, and culls.
Black scurf severity index: Mean percent of the affected tuber surface area, 10 8-10 oz. tubers per treatment per replication multiplied by the severity of the sclerotia, where 1 = small sclerotia and 3 = large sclerotia.

Table 1. Effects of seed treatments on plant development and incidence of disease in the cultivar Russet Norkotah, San Luis Valley, Colorado, 2001

Treatment[a]	Stand[b]	Vigor[c]	Stems[d]	Percent stems with Rhizoctonia[e]	Stolons[f]	Percent stolons with Rhizoctonia[g]	Seed piece decay[h]	No. tubers per plant[i]	Black scurf severity index[j]
1. Control	100	4.0	5.4	37.2	19.8	12.0	0.0	8.7	12.6 a
2. Maxim MZ	100	3.9	5.2	25.3	17.2	2.5	0.0	8.4	4.3 bc
3. Tops MZ	100	3.9	5.3	28.2	18.4	3.4	0.0	6.4	12.3 a
4. Evolve	100	4.1	5.1	39.5	18.7	3.7	0.0	7.2	8.8 ab
5. A12778	100	3.9	5.1	27.2	17.3	1.1	0.0	6.6	0.3 c
6. A12534	100	3.7	4.8	17.1	18.3	1.7	0.0	6.8	2.4 bc
7. A12777	100	4.0	4.6	17.8	19.1	4.6	0.0	7.8	1.6 c
8. A12919	100	3.9	5.2	6.0	21.1	0.0	0.0	7.8	0.6 c
9. PCC553	100	4.0	4.9	20.3	19.9	2.5	0.0	6.7	1.9 c
10. PCC553-1	100	4.0	4.4	8.5	17.3	1.8	0.0	7.6	2.1 bc
11. PCC553-2	100	3.8	4.4	2.8	20.1	0.9	0.0	5.4	0.4 c
12. PCC553-3	100	3.9	4.8	11.8	18.6	2.0	0.0	6.8	2.3 bc
LSD(P=0.05)	NS	NS	NS	NS	NS	NS	NS	NS	6.82

[a] All treatments were applied according to the manufacturer's recommendations. Treatments were applied directly to fresh cut 2-4 oz. seed pieces and planted within twenty-four hours.
[b] Percentage of plants emerged 40 days after planting; four replications.
[c] Mean percent vigor, where 1 = poor, 5 = good; 4 plants/treatment/replication.
[d] Mean number of stems per seed piece 41 days after planting; 4 plants/treatment/replication.
[e] Mean percent stems with Rhizoctonia canker 41 days after planting; 4 plants/treatment/replication.
[f] Mean number of stolons per seed piece 41 days after planting; 4 plants/treatment/replication.
[g] Mean percent stolons with Rhizoctonia canker 41 days after planting; 4 plants/treatment/replication.
[h] Mean percent incidence of disease combined soft-rot and dry-rot 41 days after planting; rated 0-100, where 0 = no decay, 100 = complete decay; 4 seed pieces/treatment/replication.
[i] Mean number of tubers per plant 71 days after planting; 3 plants/treatment/replication.
[j] Mean percent of the affected tuber surface area, 10 8-10 oz. tubers per treatment per replication multiplied by the severity of the sclerotia, where 1 = small sclerotia and 3 = large sclerotia.
Means followed by the same letters are not significantly different at P=0.05 for black scurf severity index.

Table 2. Effects of seed treatments on tuber yield and quality in the cultivar Russet Norkotah, San Luis Valley, Colorado, 2001

	Percent[a]										
Treatment	< 4 oz.	No.	4-10 oz.	No.	>10 oz.	No.	US #2s	No.	Culls	No.	cwt/A[b]
1. Control	10.3	26.1	48.3	51.2	32.5	17.4	7.4	4.4	1.5	0.9	419.5
2. Maxim MZ	9.3	23.5	51.8	54.2	33.0	18.3	3.9	2.6	2.0	1.3	418.3
3. Tops MZ	9.2	24.5	51.7	54.2	32.4	16.3	5.7	3.8	1.1	1.2	393.9
4. Evolve	6.7	18.8	51.7	57.0	37.3	21.2	2.5	2.0	1.8	0.9	398.2
5. A12778	10.1	24.8	48.0	52.4	35.3	19.0	5.3	3.2	1.2	0.7	471.6
6. A12534	9.4	23.6	45.5	50.2	38.3	21.6	5.9	3.8	0.9	0.7	431.5
7. A12777	11.2	27.0	55.3	56.6	28.0	13.3	3.6	2.2	1.8	0.9	385.8
8. A12919	10.8	26.0	55.2	55.8	29.0	15.3	3.8	2.2	1.1	0.6	421.5
9. PCC553	8.0	22.2	43.5	50.9	43.4	23.3	2.4	1.6	2.6	2.0	398.2
10. PCC553-1	10.9	26.7	54.0	55.9	30.6	14.6	3.7	2.3	0.8	0.6	471.4
11. PCC553-2	12.8	30.3	46.4	47.5	36.4	19.6	2.6	1.5	1.8	1.1	415.7
12. PCC553-3	12.4	28.3	53.8	54.3	31.0	15.7	2.1	1.1	0.7	0.6	433.4
LSD(P=0.05)	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

[a] Based on tuber weight in pounds and tuber number, mean of four replications.
[b] Total yield expressed as hundred weight per acre, 1-18 foot row per treatment per replication, mean of four replications.

2001 PROTOCOL FOR EVALUATION OF FUNGICIDES APPLIED AT PLANTING FOR CONTROL OF POWDERY SCAB ON POTATO

Researcher: Richard Zink, Robert Davidson, and Andrew Houser, Colorado State University

Location: Charlotte Howey Farm, Center, CO

Cultivar: Cherry Red, whole seed

Treatments:

1. Control, no treatment
2. Fluazinam, 7 pt./A In-furrow
3. Fluazinam, 7 pt./A 1/3 In-furrow, 1/3 over seed, 1/3 at row closing
4. Fluazinam, 7 pt./A on row top after closure at planting
5. Tops MZ on seed
6. Evolve on seed
7. Moncut 50W, 1.0 lb./A In-furrow
8. Moncut 50W, 1.5 lb./A In-furrow
9. Moncut 50W, 2.0 lb./A In-furrow
10. Manex 5 qt./A In-furrow
11. Super Tin 8 oz./A In-furrow
12. Quadris 4.5 pt./A In-furrow
13. Planting date May 17
14. Planting date May 25
15. Planting date June 1

Application: In-furrow treatments were applied using an R & D CO_2 charged backpack sprayer at 35 PSI, with one XR 8002VS nozzle, at 10 gallons/acre. Treatments 5 and 6 were applied directly to whole seed and planted within twenty-four hours.

Planted: May 17, 2001
Plot Design: Randomized
Plot Size: 1 - 20 foot row per treatment per replication
Plant Spacing: 12 inches
Row Spacing: 34 inches
Replications: Three
Irrigation: Center pivot sprinkler, rate based on ET
Fertilizer: 65N-200P-50K-10S-3Z, preplant, 60N and 130S through sprinkler
Herbicide: None
Insecticide: Pounce, 6 oz./A
Fungicide: Ridomil Copper, 1.9 lb./A + Bravo WS, 20 oz./A + Quadris, 6 oz./A + Champ, 4 oz./A
Vine Killer: Rotobeat vines on August 21, 2001
Harvested: By hand, September 14, 2001

DATA

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

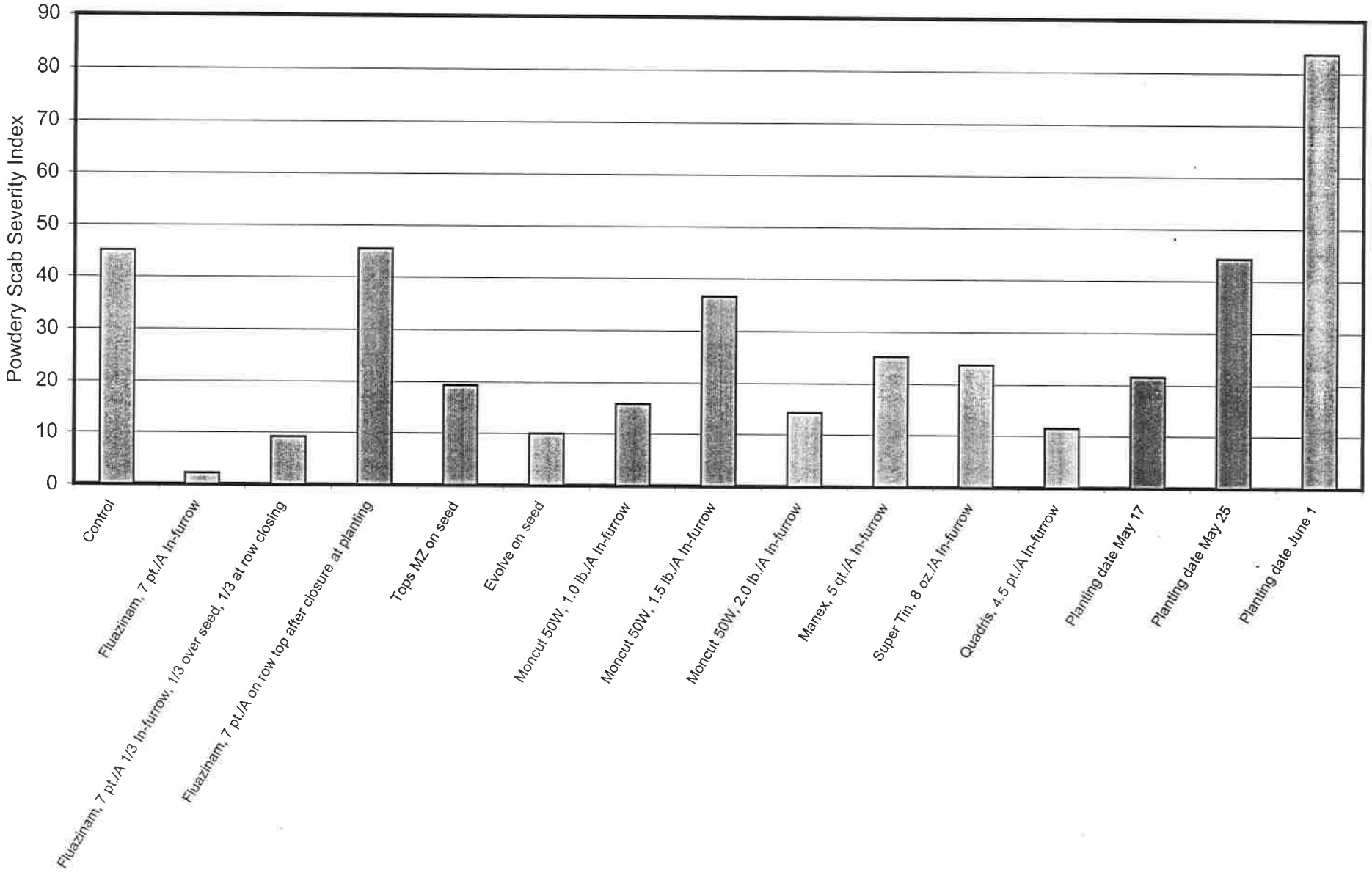
Table 1. Effect of fungicides applied at planting on the incidence of powdery scab on tubers in the cultivar Cherry Red, San Luis Valley, Colorado, 2001

Treatment and Rate	Percent Incidence	Percent Healthy	Severity Index[a]
1. Control	24.6	75.4	45.1 b
2. Fluazinam, 7 pt./A In-furrow	2.2	97.8	2.2 d
3. Fluazinam, 7 pt./A 1/3 In-furrow, 1/3 over seed, 1/3 at row closing	9.2	90.8	9.2 cd
4. Fluazinam, 7 pt./A on row top after closure at planting	29.5	70.5	45.5 b
5. Tops MZ on seed	19.4	80.6	19.4 bcd
6. Evolve on seed	10.0	90.0	10.0 cd
7. Moncut 50W, 1.0 lb./A In-furrow	10.7	89.3	15.9 bcd
8. Moncut 50W, 1.5 lb./A In-furrow	25.3	74.7	36.6 bc
9. Moncut 50W, 2.0 lb./A In-furrow	14.3	85.7	14.3 bcd
10. Manex, 5 qt./A In-furrow	17.0	83.0	25.3 bcd
11. Super Tin, 8 oz./A In-furrow	20.2	79.8	23.8 bcd
12. Quadris, 4.5 pt./A In-furrow	9.8	90.2	11.5 cd
13. Planting date May 17	14.4	85.6	21.6 bcd
14. Planting date May 25	31.4	68.6	44.3 b
15. Planting date June 1	37.6	62.4	83.6 a
LSD(P=0.05)	14.3	7.0	31.9

[a] Severity Index = mean percent of the number of affected tubers, 5 plants/treatment/replication multiplied by the severity of the lesions, where 1 = not severe and 5 = very severe.
Means followed by the same letters are not significantly different at P=0.05 for Severity Index.

Richard T. Zink, Associate Professor, Colorado State University

Effect of fungicides applied at planting on the incidence of powdery scab on tubers in the cultivar Cherry Red, San Luis Valley, Colorado, 2001



2001 PROTOCOL FOR EVALUATION OF ADVANCED CLONES FOR RESISTANCE TO POWDERY SCAB

Researcher: Robert Davidson, Richard Zink, and Andrew Houser, Colorado State University

Location: Charlotte Howey Farm, Center, CO

Clones:
1. Kennebec
2. Russet Burbank
3. AC91014-2RU
4. AC89536-5RU
5. AC89653-3W
6. AC87079-3RU
7. AC87138-4RU
8. CO85026-4RU
9. CO86218-2R
10. CO89097-2R
11. AC87340-2W
12. BC0894-2W

Planted: May 17, 2001
Plot Design: Randomized
Plot Size: 1 - 20 foot row per treatment per replication
Plant Spacing: 12 inches
Row Spacing: 34 inches
Replications: Three
Irrigation: Center pivot sprinkler, rate based on ET
Fertilizer: 65N-200P-50K-10S-3Z, preplant, 60N and 130S through sprinkler
Herbicide: None
Insecticide: Pounce, 6 oz./A
Fungicide: Ridomil Copper, 1.9 lb./A + Bravo WS, 20 oz./A + Quadris, 6 oz./A + Champ, 4 oz./A
Vine Killer: Rotobeat vines on August 21, 2001
Harvested: By hand, September 14, 2001

DATA

Disease: Galls on roots rated 0 to 3, 0 = none, 3 = heavily infected, readings taken August 15. Mean percent of the number of tubers showing one or more powdery scab lesions at harvest multipled by the severity of the lesions, where 1 = not severe and 5 = very severe.

Table 1. Evaluation of advanced clones for tuber resistance to powdery scab, San Luis Valley, Colorado, 2001

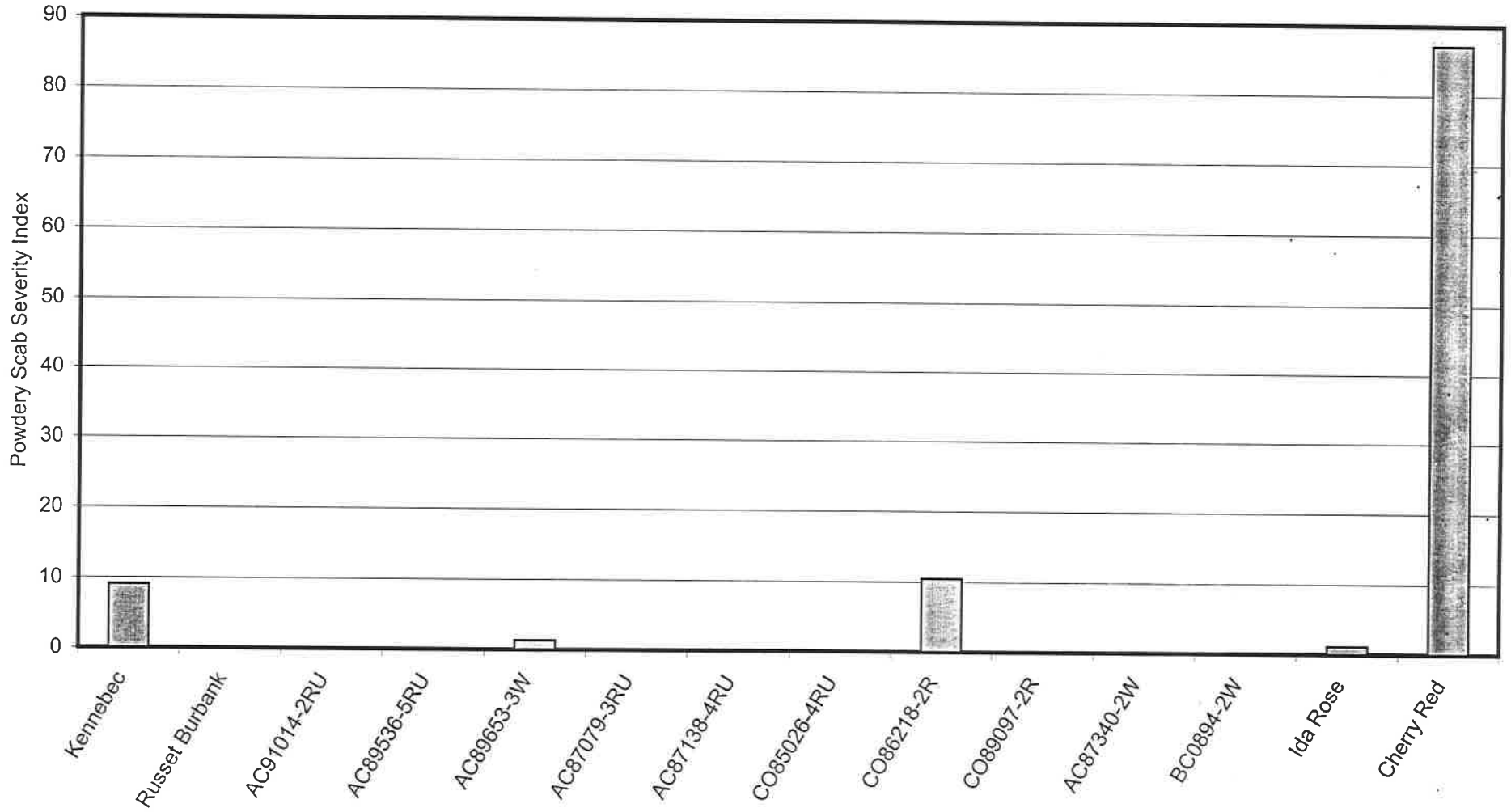
Cultivar	Tuber symptoms			
	Percent Incidence	Percent Healthy	Severity Index[a]	Root Gall Rating[b]
1. Kennebec	9.1	90.9	9.1	1.3
2. Russet Burbank	0.0	100.0	0.0	1.0
3. AC91014-2RU	0.0	100.0	0.0	0.0
4. AC89536-5RU	0.0	100.0	0.0	0.7
5. AC89653-3W	1.3	98.7	1.3	0.0
6. AC87079-3RU	0.0	100.0	0.0	0.7
7. AC87138-4RU	0.0	100.0	0.0	0.0
8. CO85026-4RU	0.0	100.0	0.0	0.7
9. CO86218-2R	5.3	94.7	10.5	0.0
10. CO89097-2R	0.0	100.0	0.0	0.0
11. AC87340-2W	0.0	100.0	0.0	0.0
12. BC0894-2W	0.0	100.0	0.0	0.0
13. Ida Rose	1.1	98.9	1.1	2.3
14. Cherry Red	33.1	66.9	87.1	0.7

[a] Severity Index = mean percent of the number of affected tubers, 5 plants/treatment/replication multiplied by the severity of the lesions, where 1 = not severe and 5 = very severe.

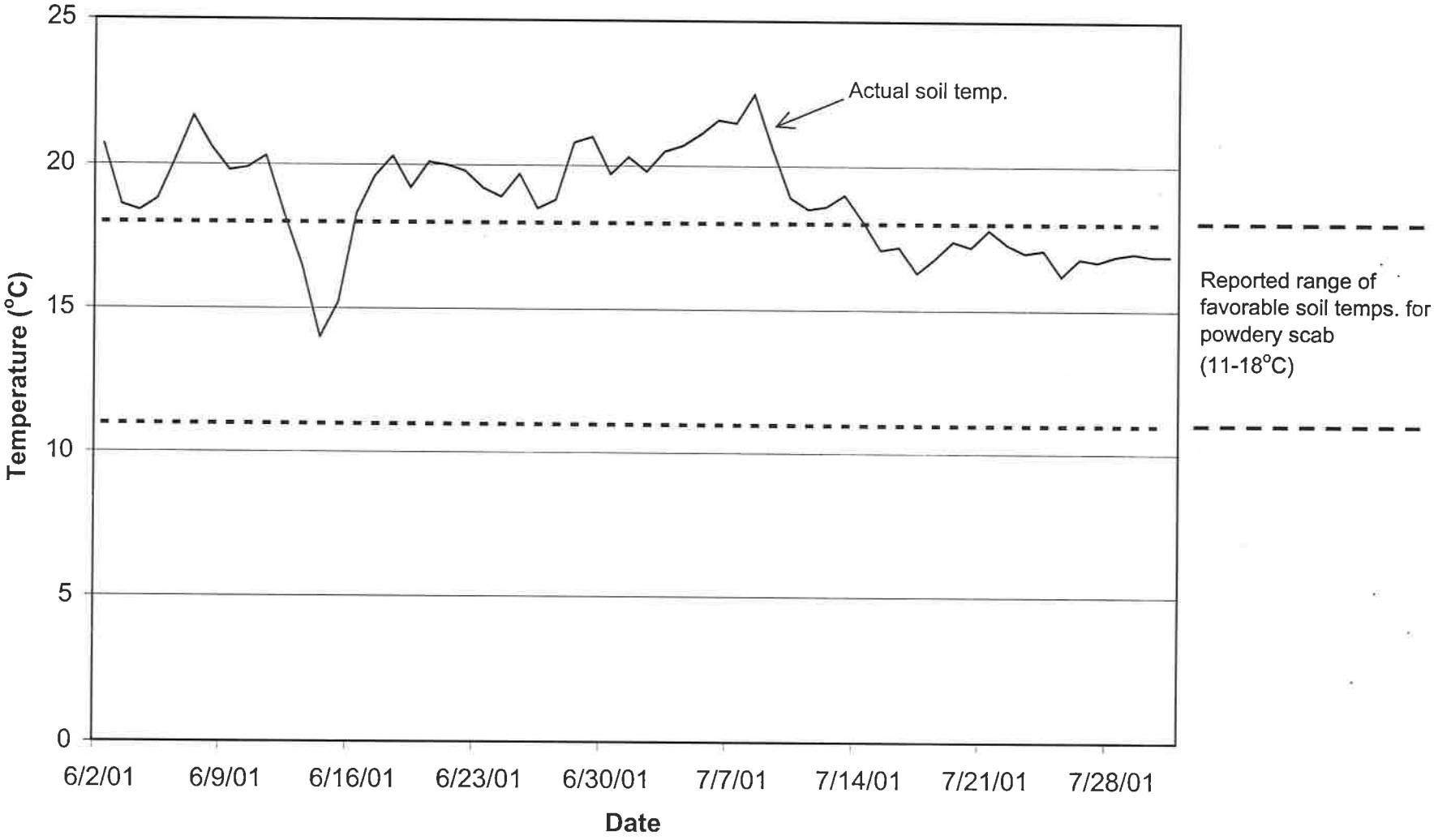
[b] Root Gall Rating = mean percent of plants infected with powdery scab root galls, where 0 = no root galls and 3 = extensive root galls.

Richard T. Zink, Associate Professor, Colorado State University

Evaluation of advanced clones for tuber resistance to powdery scab
San Luis Valley, Colorado, 2001



Soil Temperature Readings at 8" Under Plant Canopy, Powdery Scab Trial, San Luis Valley, Colorado, 2001



2001 PROTOCOL FOR EVALUATION OF FUNGICIDES APPLIED AT PLANTING FOR CONTROL OF RHIZOCTONIA ON POTATO

Researcher: Richard T. Zink, Associate Professor, and Andrew Houser, Research Associate, Department of Horticulture and Landscape Architecture, Colorado State University

Location: San Luis Valley Research Center, Center, CO

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

Treatments:
1. Control, no treatment
2. A12534 on seed + Quadris, 1.5 oz. a.i./A IF
3. A12777 on seed + Quadris, 1.5 oz. a.i./A IF
4. Moncut 50W, 1.0 lb./A IF
5. Moncut 50W, 1.5 lb./A IF
6. Moncut 50W, 1.0 lb./A + 5pt. Blocker IF
7. Blocker 10G, 25 lb./A IF + Firbark Mancozeb
8. Blocker 4F, 7.5 pt./A IF + Firbark Mancozeb
9. Blocker 4F, 10.0 pt./A IF + Firbark Mancozeb
10. Maxim MZ on seed
11. Tops MZ on seed

Application: Treatments were applied using an R & D CO_2 charged backpack sprayer at 35 PSI, with one XR 8002VS nozzle, at 10 gallons/acre as a directed in-furrow application. Treatments 10 and 11 were applied directly to fresh cut seed and planted within twenty-four hours.

Planted: May 16, 2001
Plot Design: Randomized complete block
Plot Size: 1 - 25 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, preplant, 40N through sprinkler after tuber set
Herbicide: Dual Magnum, 1.33 pt./A + Matrix, 1.5 oz./A
Insecticide: Leverage 2.7, 3.75 fl.oz./A
Fungicide: Dithane DF, 2.0 lb./A + Bravo WS, 1.5 pt./A + Quadris, 15.4 fl.oz./A
Vine Killer: Sulfuric acid on August 31, 2001
Harvested: September 18, 2001

DATA

Stand: 1-25 foot row/treatment/replication, counts taken 40 days after planting.
Seed piece decay: Soft-rot and dry-rot combined rated 1-100, where 0 = no decay and 100 = complete decay; 4 seed pieces/treatment/replication.
Rhizoctonia stem canker: Percent stems infected; 4 plants/treatment/replication.
Blackleg: Percent stems infected; 4 plants/treatment/replication.
Plant vigor: Rated 1-5, where 1 = poor and 5 = good; 4 plants/treatment/replication.
Stems: Average number of stems per plant; 4 plants/treatment/replication.
Tuber set: Average number of tubers per plant at full set; 3 plants/treatment/replication.
Yield: 1-18 foot row per treatment per replication, total yield expressed in cwt/A.
Grade: By hand, percent tubers by weight in lbs. and tuber # < 4 oz., 4-10 oz., > 10 oz., US #2's, and culls.
Black scurf severity index: Mean percent of the affected tuber surface area, 10 8-10 oz. tubers per treatment per replication multiplied by the severity of the sclerotia, where 1= small sclerotia and 3 = large sclerotia.

Table 1. Effects of products applied at planting on plant development and incidence of disease in the cultivar Russet Norkotah, San Luis Valley, Colorado, 2001

Treatment/Rate	Stand[a]	Vigor[b]	Stems[c]	Percent stems with Rhizoctonia[d]	Stolons[e]	Percent stolons with Rhizoctonia[f]	Seed piece decay[g]	No. tubers per plant[h]	Black scurf severit index[i]
1. Control	100	4.0	4.7	42.7	19.4	9.0	4.7	7.0	3.6 bc
2. A12534 on seed+Quadris, 1.5 oz.a.i./A IF	100	3.8	5.2	9.6	21.5	0.0	0.0	7.8	0.4 c
3. A12777 on seed+Quadris, 1.5 oz.a.i./A IF	100	4.0	4.4	28.2	20.6	0.9	0.0	7.8	0.8 bc
4. Moncut 50W, 1.0 lb./A IF	100	4.1	5.4	23.3	21.3	2.4	1.9	7.8	4.5 ab
5. Moncut 50W, 1.5 lb./A IF	100	4.1	4.9	19.2	21.8	1.1	1.9	7.4	0.8 bc
6. Moncut 50W, 1.0 lb./A+5pt Blocker IF	100	4.3	5.6	20.2	23.6	3.2	0.9	6.8	0.5 bc
7. Blocker 10G, 25 lb./A IF + Firbark Mancozeb	100	4.1	4.9	32.9	20.3	2.2	0.6	9.1	3.1 bc
8. Blocker 4F, 7.5 pt./A IF + Firbark Mancozeb	100	3.9	5.4	20.9	21.9	4.3	0.0	7.6	0.4 c
9. Blocker 4F, 10.0 pt./A IF +Firbark Mancozeb	100	4.1	4.9	17.7	22.6	2.8	0.0	9.2	1.4 bc
10. Maxim MZ on seed	100	4.3	5.6	21.3	22.3	2.8	0.3	7.5	0.8 bc
11. Tops MZ on seed	100	4.3	5.3	41.7	21.8	8.9	0.0	8.3	8.4 a
LSD(P=0.05)	NS	NS	NS	NS	NS	NS	NS	NS	4.06

[a] Percentage of plants emerged 40 days after planting; four replications.
[b] Mean percent vigor, where 1 = poor, 5 = good; 4 plants/treatment/replication.
[c] Mean number of stems per seed piece 41 days after planting; 4 plants/treatment/replication.
[d] Mean percent stems with Rhizoctonia canker 41 days after planting; 4 plants/treatment/replication.
[e] Mean number of stolons per seed piece 41 days after planting; 4 plants/treatment/replication.
[f] Mean percent stolons with Rhizoctonia canker 41 days after planting; 4 plants/treatment/replication.
[g] Mean percent incidence of disease combined soft-rot and dry-rot 41 days after planting; rated 0-100, where 0 = no decay, 100 = complete decay; 4 seed pieces/treatment/replication.
[h] Mean number of tubers per plant 71 days after planting; 3 plants/treatment/replication.
[i] Mean percent of affected tuber surface area, 10 8-10 oz. tubers per treatment per replication multiplied by the severity of the sclerotia, where 1 = small sclerotia and 3 = large sclerotia.
Means followed by the same letters are not significantly different at P=0.05 for black scurf severity index.

Table 2. Effects of products applied at planting on tuber yield and quality in the cultivar Russet Norkotah, San Luis Valley, Colorado, 2001

	Percent[a]										
Treatment/Rate	< 4 oz.	No.	4-10 oz.	No.	>10 oz.	No.	US #2s	No.	Culls	No.	cwt/A[b]
1. Control	12.5	30.7	50.6	50.2	29.6	14.9	6.2	3.4	1.1	0.8	417.4
2. A12534 on seed+Quadris, 1.5 oz. a.i./A IF	12.4	28.2	57.7	56.8	24.4	11.9	4.4	2.2	1.2	0.9	402.9
3. A12777 on seed+Quadris, 1.5 oz. a.i./A IF	13.5	28.2	58.5	57.3	23.2	11.8	3.1	1.6	1.7	1.1	375.8
4. Moncut 50W, 1.0 lb./A IF	11.4	26.0	50.1	51.9	28.4	14.8	8.6	6.2	1.4	1.0	434.9
5. Moncut 50W, 1.5 lb./A IF	9.6	26.1	48.8	51.1	34.1	18.7	5.7	3.1	1.8	0.9	401.8
6. Moncut 50W, 1.0 lb./A + 5pt. Blocker IF	10.2	22.9	57.2	60.8	26.7	12.8	4.5	2.5	1.4	1.0	436.4
7. Blocker 10G, 25 lb./A IF + Firbark Mancozeb	14.8	30.2	57.9	56.5	21.9	10.2	3.3	1.7	2.1	1.4	400.7
8. Blocker 4F, 7.5 pt./A IF + Firbark Mancozeb	17.0	34.9	52.8	49.1	22.9	11.7	5.0	3.0	2.3	1.2	390.5
9. Blocker 4F, 10.0 pt./A IF + Firbark Mancozeb	20.3	39.7	53.8	47.9	21.2	9.8	2.8	1.7	1.9	0.9	411.0
10. Maxim MZ on seed	11.6	26.6	50.2	52.6	31.0	16.4	4.3	2.5	2.9	1.9	416.1
11. Tops MZ on seed	14.0	31.8	51.3	50.3	25.6	13.4	4.8	3.0	4.4	1.6	413.1
LSD(P=0.05)	5.70	8.74	NS	NS	NS	NS	NS	2.53	NS	NS	NS

[a] Based on tuber weight in pounds and tuber number, mean of four replications.
[b] Total yield expressed as hundred weight per acre, 1-18 foot row per treatment per replication, mean of four replications.

2001 PROTOCOL FOR EVALUATION OF FUNGICIDES APPLIED AT PLANTING FOR CONTROL OF PINK ROT ON POTATO

Researchers: Richard T. Zink, Associate Professor, and Andrew Houser, Research Associate, Department of Horticulture and Landscape Architecture, Colorado State University

Location: San Luis Valley Research Center, Center, CO

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

Treatments:

1. Control, no treatment
2. Ridomil Gold 4EC, 3.23 oz. a.i./A (In-furrow)
3. Ridomil Gold 4EC, 3.23 oz. a.i./A (At hilling)
4. Ridomil Gold 4EC, 3.23 oz. a.i./A (In-furrow) + Ridomil Gold Bravo 76.5 WP, 1.5 lb. a.i./A (Foliar-50 days after planting)
5. Quadris 2.08 SC, 2.4 oz. a.i./A (In-furrow) + Ridomil Gold Bravo 76.5 WP, 1.5 lb. a.i./A (Foliar-50 days after planting)
6. A12425, 5.16 oz. a.i./A (In-furrow) + Ridomil Gold Bravo 76.5 WP, 1.5 lb. a.i./A (Foliar-50 days after planting)
7. A12425, 5.16 oz. a.i./A (At emergence)
8. Ridomil Gold 4 EC, 3.23 oz. a.i./A + Platinum 2 SC, 1.57 oz. a.i./A + Quadris 2.08 SC, 2.4 oz. a.i./A (In-furrow)
9. Ridomil Gold Bravo 76.5 WP, 1.5 lb. a.i./A (2 Foliar-50 days and 67 days after planting)
10. A12425, 5.16 oz. a.i./A + Quadris 2.08 SC, 2.4 oz. a.i./A (In-furrow)
11. Ridomil Gold 4 EC, 3.23 oz. a.i./A + Platinum 2 SC, 1.57 oz. a.i./A + Quadris 2.08 SC, 2.4 oz. a.i./A (At hilling)

Application: Treatments were applied using an R & D CO_2 charged backpack sprayer at 35 PSI, with one XR 8002VS nozzle, at 10 gallons/acre.

Planted: May 14, 2001
Plot Design: Randomized complete block
Plot Size: 1 - 25 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, preplant, 40N through sprinkler after tuber set
Herbicide: Dual Magnum, 1.33 pt./A + Matrix, 1.5 oz./A
Insecticide: Leverage 2.7, 3.75 fl.oz./A
Fungicide: Dithane DF, 2.0 lb./A + Bravo WS, 1.5 pt./A + Quadris, 15.4 fl.oz./A
Vine Killer: Sulfuric acid on August 31, 2001
Harvested: September 12, 2001

DATA

Disease: Percent tubers with pink rot at harvest and after harvest by challenge inoculation.
Yield: 1-25 foot row per treatment per replication, total yield expressed as cwt/A.
Grade: By hand, percent tubers by weight in lbs. < 4 oz., 4-10 oz., > 10 oz., US #2's, and culls.

Table 1. Effects of products applied at planting and in season for control of pink rot on tuber yield and quality in the cultivar Russet Norkotah, San Luis Valley, Colorado, 2001

Treatment/Rate	Percent[a]					cwt/A[b]
	< 4 oz.	4-10 oz.	> 10 oz.	US #2s	Culls	
1. Control	5.9	34.1	40.6	13.2	6.1	422.3
2. Ridomil Gold 4EC, 3.23 oz. a.i./A (In-furrow)	7.3	36.2	35.2	13.2	8.2	325.4
3. Ridomil Gold 4EC, 3.23 oz. a.i./A (At hilling)	7.4	39.5	37.9	8.0	7.2	339.1
4. Ridomil Gold 4EC, 3.23 oz. a.i./A (In-furrow) + Ridomil Gold Bravo 76.5WP, 1.5 lb. a.i./A (Foliar-50 days after planting)	4.8	37.3	40.7	13.4	3.7	441.0
5. Quadris 2.08SC, 2.4 oz. a.i./A (In-furrow) + Ridomil Gold Bravo 76.5WP, 1.5 lb. a.i./A (Foliar-50 days after planting)	5.2	41.1	37.9	9.8	6.0	400.3
6. A12425, 5.16 oz. a.i./A (In-furrow) + Ridomil Gold Bravo 76.5WP, 1.5 lb. a.i./A (Foliar-50 days after planting)	7.0	32.0	37.2	14.3	9.5	358.8
7. A12425, 5.16 oz. a.i./A (At emergence)	7.8	37.1	37.5	10.9	6.7	351.8
8. Ridomil Gold 4EC, 3.23 oz. a.i./A + Platinum 2SC, 1.57 oz. a.i./A + Quadris 2.08SC, 2.4 oz. a.i./A (In-furrow)	6.4	41.0	37.3	9.5	5.8	425.9
9. Ridomil Gold Bravo 76.5WP, 1.5 lb. a.i./A (2 Foliar-50 days and 67 days after planting)	7.6	34.7	41.3	9.0	7.4	400.2
10. A12425, 5.16 oz. a.i./A + Quadris 2.08SC, 2.4 oz. a.i./A (In-furrow)	6.3	37.1	45.0	9.3	2.4	445.7
11. Ridomil Gold 4EC, 3.23 oz. a.i./A + Platinum 2SC, 1.57 oz. a.i./A+Quadris 2.08SC, 2.4 oz. a.i./A (At hilling)	6.9	33.4	38.7	13.8	7.2	383.6
LSD(P=0.05)	NS	NS	NS	NS	NS	NS

[a] Based on tuber weight in pounds, mean of four replications.
[b] Total yield expressed as hundred weight per acre, 1-25 foot row per treatment per replication, mean of four replications.

Table 2. Effect of products applied at planting and in season for control of pink rot in the cultivar Russet Norkotah, San Luis Valley, Colorado, 2001

Treatment	Rate	Incidence of tuber rot[a]	Pink Rot[b]
1. Control		0.73	0.0
2. Ridomil Gold 4EC	3.23 oz. a.i./A (In-furrow)	0.83	0.3
3. Ridomil Gold 4EC	3.23 oz. a.i./A (At hilling)	0.54	0.5
4. Ridomil Gold 4EC Ridomil Gold Bravo 76.5WP	3.23 oz. a.i./A (In-furrow) 1.5 lb. a.i./A (Foliar-50 days after planting)	0.39	0.0
5. Quadris 2.08SC Ridomil Gold Bravo 76.5WP	2.4 oz. a.i./A (In-furrow) 1.5 lb. a.i./A (Foliar-50 days after planting)	0.28	0.0
6. A12425 Ridomil Gold Bravo 76.5WP	5.16 oz. a.i./A (In-furrow) 1.5 lb. a.i./A (Foliar-50 days after planting)	0.50	0.0
7. A12425	5.16 oz. a.i./A (At emergence)	0.11	0.3
8. Ridomil Gold 4EC Platinum 2SC Quadris 2.08SC	3.23 oz. a.i./A (In-furrow) 1.57 oz. a.i./A (In-furrow) 2.4 oz. a.i./A (In-furrow)	0.00	0.0
9. Ridomil Gold Bravo 76.5WP	1.5 lb. a.i./A (2 Foliar-50 days and 67 days after planting)	0.16	0.2
10. A12425 Quadris 2.08SC	5.16 oz. a.i./A (In-furrow) 2.4 oz. a.i./A (In-furrow)	0.00	0.0
11. Ridomil Gold 4EC Platinum 2SC Quadris 2.08SC	3.23 oz. a.i./A (At hilling) 1.57 oz. a.i./A (At hilling) 2.4 oz. a.i./A (At hilling)	0.11	0.0
LSD(P=0.05)		NS	NS

[a] Mean percent by weight of tubers showing water rot at harvest, 4 replications.
[b] Pink Rot severity index, post harvest tuber inoculation, assays conducted by Dr. Gary Secor at North Dakota State University- Fargo.

Utilization of Compost made from Agricultural and Forestry Wastes for Improving the Economic and Ecological Sustainability of Agronomic Crop Production on Low Organic Matter Soils in the San Luis Valley of Colorado.

Project Leaders: Richard Zink, Merlin Dillon, and Andrew Houser, CSU

Project Description: The main objective of this study is to improve water conservation and sustainability of crop production on the low organic matter soils of the San Luis Valley, Colorado. This will be accomplished through on-farm demonstrations that will examine the impact of field incorporated compost made from agricultural and forestry wastes has on: 1.) reducing the use of synthetic fertilizers and fungicides, by improving nutrient retention in the root zone and the health and diversity of the soil's biomass, 2.) improving water utilization, thereby reducing water and power use in center-pivot irrigation systems, 3.) crop yields and costs of production for potatoes, barley and alfalfa.

Two agricultural waste streams, sawdust and cull potatoes, being generated in the San Luis Valley have become problematic for their local industries. Logs harvested from the National Forests surrounding the San Luis Valley are milled locally, generating sawdust for which there are very few feasible uses. In a 1997 Colorado State University (CSU) survey of western Colorado mill operators, the second most mentioned problem was that of mill residues (sawdust). Most of this sawdust has been stockpiled at locations near the mills. Potatoes are the area's most economically important crop, and the foundation of the local economy. On average, about 9.6% of each year's potato crop is not marketable, due to size, appearance or presence of disease. This study looks at using cull potatoes in combination with sawdust to create a dry compost that can be used on agronomic crops in the San Luis Valley, Colorado.

This is a three-year study to evaluate applications of compost to potato, alfalfa, and barley crops. Rates of 0, 4, 8, and 12 tons of compost/acre were applied to six sites around the San Luis Valley in the fall of 2000. Four of the sites are located on two fields, one in the Sargent area and the other one in the Blanca area. The sites will be planted to potato rotated with barley. The two remaining sites are planted to alfalfa and are located in the Center and Monte Vista vicinities. Disease incidence, crop yield, and soil data were taken at each of the six sites during the summer of 2001(see following tables) to determine the effect of compost. Compost was applied a second time in the fall of 2001 for the 2002 growing season. This is the first year of a three-year project. Therefore, no conclusions or predictions can be made in such a study until data from all three years has been gathered and analyzed.

Table 1. Effects of different rates of compost on potato plant development and incidence of disease, San Luis Valley, Colorado, 2001

Field	Treatment[a]	Vigor[b]	Stems[c]	Percent Rhizoctonia[d]	Stolons[e]	Percent Rhizoctonia[f]	Black scurf severity index[g]
3A	0	4.1	5.0	21.5	26.4	5.3	0.0
	4	3.5	3.7	34.9	20.9	6.9	0.0
	8	4.2	4.2	28.4	25.6	3.0	1.0
	12	4.3	4.6	7.6	25.0	1.2	1.4
3B	0	4.0	4.9	31.2	24.1	5.0	0.0
	4	4.4	4.3	26.7	25.6	7.4	0.1
	8	3.9	3.9	20.4	18.9	3.5	1.0
	12	3.9	4.2	25.8	21.2	0.5	0.4
6A	0	4.5	3.9	12.0	27.4	0.4	3.8
	4	4.3	4.4	10.9	24.6	0.6	4.1
	8	4.2	4.2	22.1	25.2	0.7	1.3
	12	4.1	4.3	13.8	26.5	0.2	8.8
6B	0	3.6	3.0	4.2	23.8	6.1	-
	4	3.1	3.4	11.6	23.7	6.5	-
	8	4.0	3.5	6.0	26.0	2.3	-
	12	3.8	3.4	12.1	23.3	8.7	-
Overall Mean	0	4.1	4.2	17.2	25.4	4.2	1.3
	4	3.8	4.0	21.0	23.7	5.4	1.4
	8	4.1	4.0	19.2	23.9	2.4	1.1
	12	4.0	4.1	14.8	24.0	2.7	3.5
LSD(P=0.05)		NS	NS	NS	NS	NS	NS

[a]Rate of compost applied in tons/acre.
[b]Mean plant growth rated 1 – 5, where 1 = poor and 5 = good; five plants/treatment/replication.
[c]Mean number of stems per plant; five plants/treatment/replication.
[d]Mean percent stems with Rhizoctonia canker; five plants/treatment/replication.
[e]Mean number of stolons per plant; five plants/treatment/replication.
[f]Mean percent stolons with Rhizoctonia canker; five plants/treatment/replication.
[g]Black scurf severity index = mean percent of the affected tuber surface area, 10 8-10 oz. tubers per treatment per replication multiplied by the severity of the sclerotia, where 1 = small sclerotia and 3 = large sclerotia.
Field 6B was harvested before tuber samples could be taken to determine the black scurf severity index.

Table 2. Effects of different rates of compost on the incidence of potato early blight, San Luis Valley, Colorado, 2001

		Percent Leaves Infected	
Field	Treatment	August 22	August 30
3A	0	14.0	18.3
	4	11.9	19.2
	8	10.0	13.8
	12	11.8	14.0
3B	0	9.2	10.7
	4	9.5	10.6
	8	9.8	14.5
	12	9.8	12.1
		Percent Leaves Infected	
		August 17	August 27
6A	0	76.7	99.3
	4	67.1	98.3
	8	70.0	99.2
	12	69.2	99.3
6B	no data	--	--
Overall Mean	0	33.3	42.8
	4	29.5	42.7
	8	29.9	42.5
	12	30.3	41.8
LSD(P=0.05)		NS	NS

In Field 6B the potato vines were mechanically removed before disease readings for early blight could be taken.

Table 3. Effects of different rates of compost on potato tuber number, size, and quality, San Luis Valley, Colorado, 2001

		Percent[b]										
Field	Treatment[a]	< 4 oz.	No.	4-10 oz.	No.	> 10 oz.	No.	MS[c]	No.	Total lbs.	Total no.	cwt/A[d]
3A	0	19.5	45.0	57.9	46.2	19.4	7.5	3.3	1.3	38.6	121.5	395.7
	4	18.5	43.2	62.1	49.2	16.3	6.0	3.1	1.6	39.9	121.5	409.1
	8	16.2	38.8	63.3	52.3	19.0	8.1	1.5	0.9	41.3	117.3	423.5
	12	18.5	41.2	59.3	49.8	20.6	8.4	1.6	0.7	37.4	110.0	384.0
3B	0	21.9	42.0	68.2	54.3	8.8	3.2	1.1	0.5	35.1	113.3	359.7
	4	21.2	41.8	66.6	53.6	9.5	3.5	2.6	1.1	36.0	120.8	369.4
	8	18.6	38.3	67.4	55.9	12.6	5.2	1.4	0.7	34.9	110.0	358.5
	12	19.0	41.4	65.8	52.7	14.0	5.2	1.2	0.7	36.7	121.5	376.4
6A	0	13.4	36.9	62.3	52.8	21.0	8.0	3.4	2.3	44.3	134.8	454.6
	4	18.3	42.2	67.8	51.6	11.9	4.7	2.0	1.5	42.7	145.5	438.5
	8	15.0	38.2	74.1	57.7	9.8	3.6	1.1	0.5	45.0	146.3	461.4
	12	17.3	42.1	68.1	52.1	12.9	4.9	1.7	0.9	45.4	149.5	466.1
6B	no data	--	--	--	--	--	--	--	--	--	--	--
Overall mean	0	18.2	41.3	62.8	51.1	16.4	6.2	2.6	1.4	39.3	123.2	403.4
	4	19.4	42.4	65.5	51.5	12.6	4.7	2.6	1.4	39.5	129.3	405.7
	8	16.6	38.4	68.3	55.3	13.8	5.6	1.3	0.7	40.4	124.5	414.5
	12	18.3	41.6	64.4	51.5	15.8	6.2	1.5	0.7	39.9	127.0	408.8
LSD(P=0.05)		NS	NS	NS	2.9	NS	NS	NS	NS	NS	NS	NS

[a] Rate of compost applied in tons/acre.
[b] Based on tuber weight in pounds and tuber number, mean of four replications.
[c] Misshaped tubers.
[d] Total yield expressed as hundred weight per acre, 1-15 foot row per treatment per replication, mean of four replications.
Field 6B was harvested before tuber samples could be taken to determine tuber yield.

Soil Foodweb Inc.
1128 NE 2nd St. Ste 120
Corvallis, OR 97330
Phone: 541-752-5066
FAX 541-752-5142
E-Mail: info@soilfoodweb.com

Soil and Compost Foodweb Analysis

Client: Bob Wall
Monte Vista Coop 2
PO Box 111
Monte Vista, CO 81144

Sample Received: 10/30/01
Plant: None specified
Invoice # 3879
Grower: Louie Entz

Date Mailed: Nov 30, 2001
Equal Bacteria-Fungi plants
Fall

Organism Biomass Data

Sample #	Treatment	Dry Weight of 1 gram Fresh Material	Active Bacterial Biomass (µg/g)	Total Bacterial Biomass (µg/g)	Active Fungal Biomass (µg/g)	Total Fungal Biomass (µg/g)	Hyphal Diameter (µm)	Protozoa Numbers /g			Total Nematode Numbers (#/g)	Percent Mycorrhizal Colonization of Root
								Flagellates	Amoebae	Ciliates		
91234	1	0.92	52.2	**162**	18.3	**39.9**	2.5	**626**	**502**	**15**	**4.3**	55
91235	2	0.94	42.9	**142**	13.4	**87.5**	2.5	**609**	**489**	155	**1.0**	92
91236	3	0.91	42.6	**141**	20.4	**53.5**	2.5	**629**	**504**	**35**	**3.4**	90
91237	4	0.93	43.4	190	7.6	**71.3**	2.5	**1,487**	**2,975**	**34**	**1.0**	80
Bold means low		Dry, need to improve organic matter in order to hold moisture, build soil structure	Excellent bacterial growth	Too low in most areas. Possibly chemical impact? Need to maintain bacterial foods through summer	Excellent levels in most cases	Low in all cases, indicating in previous years, fungi were lost, but activites indicate return	OK	Protozoa low in number, which means that IF plants were present, plants would be stressed for nutrients, need fertilizers. At this time of year, no plants present, but next spring, protozoa will be too low to provide desired benefits. Need to improve protozoa by adding inoculum - good compost, hay infusion, compost tea are possible answers			Low numbers, decent diversity, but root-feeders and foliar feeders present	Good colonization on all
Desired Range		Field Capacity	1.0 - 5.0	175 - 300	1.0 - 5.0	175 - 300	(A)	5,000+	5,000+	50 - 100	10 - 20	40% - 80%

(A) Hyphal diameter of 2.0 indicates mostly actinomycete hyphae, 2.5 indicates community is mainly ascomycete, typical soil fungi for grasslands, diameters of 3.0 or higher indicate community is dominated by highly beneficial fungi, a Basidiomycete community.

Season, moisture, soil and organic matter must be considered in determining optimal foodweb structure. If sample information, such as pesticide, fertilizer tillage, irrigation are not included on the submission form, sender's locale is used. One report is sent to the mailing address on the submission form.

#1: 30% of roots necrotic. #2: 4% of roots diseased. #3: 19% of roots necrotic. #4: 16% of roots necrotic.

Unusual hollow, roughly oval-shaped protrusions on roots in all samples, took up stain completely. Not root-knot or cyst nematodes, may be galls or insect damage.

Soil Foodweb Inc.
1128 NE 2nd St. Ste 120
Corvallis, OR 97330
Phone: 541-752-5066
FAX 541-752-5142
E-Mail: info@soilfoodweb.com

Soil and Compost Foodweb Analysis

Client: Bob Wall
Monte Vista Coop 2
PO Box 111
Monte Vista, CO 81144

Sample Received: 11/15/01
Plant: None specified
Invoice # 3928
Grower: 3S Ranch

Date Mailed: 12-7-2001
Equal Bacteria-Fungi plants
Fall

Organism Biomass Data

Sample #	Treatment	Dry Weight of 1 gram Fresh Material	Active Bacterial Biomass (µg/g)	Total Bacterial Biomass (µg/g)	Active Fungal Biomass (µg/g)	Total Fungal Biomass (µg/g)	Hyphal Diameter (µm)	Protozoa Numbers /g			Total Nematode Numbers (#/g)	Percent Mycorrhizal Colonization of Root
								Flagellates	Amoebae	Ciliates		
91444	0-SW	0.96	17.1	**138**	15.8	**66.5**	2.5	4,460	6,020	61	**1.2**	**0**
91445	12-SW	0.96	12.4	**145**	4.1	**73.9**	2.5	**3,292**	**4,793**	**29**	**0.8**	**57**
91446	8-NE	0.98	12.6	**135**	5.0	**34.4**	2.5	**589**	**1,420**	**14**	**1.3**	**10**
91447	4-NE	0.99	12.7	175	6.5	**54.7**	2.5	**4,673**	**4,673**	59	**0.4**	**21**
91448	4-SW	0.97	20.1	**162**	3.5	**22.5**	2.5	**4,759**	**2,865**	**29**	**1.0**	**0**
91449	0-NE	0.98	14.1	**141**	6.8	**68.2**	2.5	**4,687**	**8,465**	59	**0.3**	**24**
91450	8-SW	0.97	11.8	**156**	9.3	**27.3**	2.5	5,960	**1,436**	**45**	**0.5**	**10**
91451	12-NE	0.97	26.4	**125**	12.1	**38.4**	2.5	**2,858**	**3,680**	**14**	**0.4**	**25**
Bold means low		Dry, need to improve organic matter in order to hold moisture, build soil structure	Excellent	Most too low What impacted bacteria? Need to maintain bacterial foods	Excellent	All low, indicates that in previous years, fungi were lost, but activites indicate return	OK	Protozoa low in number, which means that IF plants were present, plants would be stressed for nutrients, need fertilizers. Next spring, protozoa will be too low to provide desired benefits. Need to improve protozoa by adding inoculum - good compost, hay infusion, compost tea are possible answers			Low numbers, decent diversity, but root-feeders and foliar feeders present	Need inoculum on most, just fungal foods otherwise
	Desired Range	Field Capacity	1.0 - 5.0	175 - 300	1.0 - 5.0	175 - 300	(A)	5,000+	5,000+	50 - 100	10 - 20	40%- 80%

(A) Hyphal diameter of 2.0 indicates mostly actinomycete hyphae, 2.5 indicates community is mainly ascomycete, typical soil fungi for grasslands, diameters of 3.0 or higher indicate community is dominated by highly beneficial fungi, a Basidiomycete community.

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All samples: roots falling apart. 8-NE: hyphae growing on outside of root.

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Corvallis, OR 97330
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FAX 541-752-5142
E-Mail: info@soilfoodweb.com

Soil and Compost Foodweb Analysis

Client: Bob Wall
Monte Vista Coop 2
PO Box 111
Monte Vista, CO 81144

Sample Received: 10/30/01
Plant: None specified
Invoice # 3879
Grower: Lynn McCullough

Date Mailed: Nov 16, 2001
Equal Bacteria-Fungi plants
Fall

Organism Biomass Data

Sample #	Treatment	Dry Weight of 1 gram Fresh Material	Active Bacterial Biomass (µg/g)	Total Bacterial Biomass (µg/g)	Active Fungal Biomass (µg/g)	Total Fungal Biomass (µg/g)	Hyphal Diameter (µm)	Protozoa Numbers /g			Total Nematode Numbers (#/g)	Percent Mycorrhizal Colonization of Root
								Flagellates	Amoebae	Ciliates		
91222	1-A	0.91	34.3	193	**9.5**	72.1	2.5	**1,531**	9,186	51	**0.4**	**No roots.**
91223	1-B	0.91	35.4	187	**9.9**	80.9	2.5	**1,529**	15,298	64	**3.9**	**No roots.**
91224	2-A	0.90	46.1	**158**	22.7	81.2	2.5	**1,535**	6,372	64	**0.5**	**No roots.**
91225	2-B	0.90	34.4	**160**	14.8	60.9	2.5	**3,069**	5,097	51	**4.2**	**No roots.**
91226	3-A	0.91	39.4	**161**	**4.9**	68.0	2.5	9,142	15,237	304	**2.6**	**No roots.**
91227	3-B	0.91	30.8	**173**	**6.0**	51.6	2	6,326	15,241	153	**4.1**	**No roots.**
91228	4-A	0.90	25.0	**167**	12.4	40.7	2.5	6,382	**3,960**	64	**3.9**	**No roots.**
91229	4-B	0.91	39.3	**164**	16.3	36.8	2.5	6,307	6,307	**15**	**3.3**	**No roots.**
Bold means low		Dry, add organic natter in orde to build soil life, improve soil structure and increase water holding capacity	Good to high range.	Most are close to the good range, just need to let bacterial bloom finish (high activity)	Pairs of A-B samples are most similar. Need to add fungal foods so all winter can improve	All low, need 1 - 2 gal/ac of humic acid, or 1-2 tons/ac of AEROBIC fungal compost or tea.	OK except for 3-B, mostly actino-bacteria which can be detrimental to mycorrhizal fungi	Low nutrient availability to plants because protozoan populations are not present in high numbers. In fall numbers can be lower than other timesof year, but need these minimal numbers so in the spring, nutrient cycling can improve rapidly to supply the plant's needs. Need to find a protozoan inoculum for next spring.			Low numbers, decent diversity except foliar and root-feeders in all soils	Need to sample so that roots from tubers, and normal root system are sent. Potato is strongly VAM
Desired Range		Field Capacity	10 - 25	175 - 300	10 - 25	175 - 300	(A)	5,000+	5,000+	50 - 100	10 - 20	40%- 80%

(A) Hyphal diameter of 2.0 indicates mostly actinomycete hyphae, 2.5 indicates community is mainly ascomycete, typical soil fungi for grasslands, diameters of 3.0 or higher indicate community is dominated by highly beneficial fungi, a Basidiomycete community.

Season, moisture, soil and organic matter must be considered in determining optimal foodweb structure. If sample information, such as pesticide, fertilizer tillage, irrigation are not included on the submission form, sender's locale is used. One report is sent to the mailing address on the submission form.

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1128 NE 2nd St. Ste 120
Corvallis, OR 97330
Phone: 541-752-5066
FAX 541-752-5142
E-Mail: info@soilfoodweb.com

Soil and Compost Foodweb Analysis

Client: Bob Wall
Monte Vista Coop 2
PO Box 111
Monte Vista, CO 81144

Sample Received: 10/30/01
Plant: None specified
Invoice # 3879
Grower: Richard Ramstetter

Date Mailed: 11-20-2001
Equal Bacteria-Fungi plants
Fall

Organism Biomass Data

Sample #	Treatment	Dry Weight of 1 gram Fresh Material	Active Bacterial Biomass (µg/g)	Total Bacterial Biomass (µg/g)	Active Fungal Biomass (µg/g)	Total Fungal Biomass (µg/g)	Hyphal Diameter (µm)	Protozoa Numbers /g			Total Nematode Numbers (#/g)	Percent Mycorrhizal Colonization of Root
								Flagellates	Amoebae	Ciliates		
91230	1	0.87	47.3	194	23.0	**94.5**	2.5	**3,175**	6,588	528	**0.5**	100
91231	2	0.86	54.1	**167**	19.0	**58.3**	2.5	5,326	5,326	161	**1.5**	80
91232	3	0.88	57.3	**169**	17.7	**72.7**	2.5	**4,831**	9,427	358	**2.0**	96
91233	4	0.87	51.7	**171**	18.8	**68.2**	2.5	**3,172**	**952**	527	**3.2**	92
Bold means low		OK	All excellent range, all above minimal desired range	Most are close to desired range, high actives need to translate into higher totals	All in good range	All low - need to add 1 to 2 gal/ac humic acid, of 1 to 2 tons/ac aerobic fungal compost, or tea	OK	Low nutrient availability. Protozoa numbers lacking, need to inoculate with protozoa to bring nutrient cycling back to desired levels. Even though plant growth minimal now, need to maintain numbers of protozoa through winter, so build up in spring can be rapid, provide nutrients then.			Low numbers, foliar and root-feeders, but not high percent	Excellent colonization, good root protection
	Desired Range	Field Capacity	10-25	175 - 300	10 - 25	175 - 300	(A)	5,000+	5,000+	50 - 100	10 - 20	40%-80%

(A) Hyphal diameter of 2.0 indicates mostly actinomycete hyphae, 2.5 indicates community is mainly ascomycete, typical soil fungi for grasslands, diameters of 3.0 or higher indicate community is dominated by highly beneficial fungi, a Basidiomycete community.

Season, moisture, soil and organic matter must be considered in determining optimal foodweb structure. If sample information, such as pesticide, fertilizer tillage, irrigation are not included on the submission form, sender's locale is used. One report is sent to the mailing address on the submission form.

#2 roots 16% necrotic; #4 roots 28% necrotic.

Significant Accomplishments for 2001
Advanced Clone Disease Assessment Program

Sixteen advanced clones were evaluated for their reaction to potato leafroll virus, twenty five advanced clones and cultivars for their reaction to bacterial ring rot and, thirty five advanced clones were evaluated for storage rots caused by *Fusarium* spp., *Erwinia carotovora* and, *Alternaria solani*. All but two of the advanced selections, CO94019-1R and VCO967-2R/Y, demonstrated adequate symptoms to leafroll. The two selections will be in the trials in 2002. In field spread levels were much more realistic this year, given the low aphid vector population, with only one clone, NDC6084C-2W, demonstrating high levels of spread (26.8%). This was the highest level of spread showing among all of the treatments and may be of concern when the GPA populations are higher. Additionally, there were very few plants showing PVY infection, a sign that these clones may show less tendency to become infected by PVY during the season.

Several clones did not demonstrate adequate symptom expression to bacterial ring rot in 2001. Three clones are of concern; CO93037-6R, NDC5281-2R and TC1675-1RU. The first clone has been tested for two years and will be screened for a third and final year in 2002. While the timing of symptom expression is early (75 days after planting "DAP") and symptoms are visually easy to identify, the percent of plants infected 100 DAP is quite low (14.3% in 2000 and 0.0% in 2001). The latter two clones have been tested for three years and they also show similar problems with symptom expression early (75 DAP) and good, but percent of plants infected 100 DAP low (NDC5281-2R; 15.0% in 1999, 15.0% in 2000 and 0.0% in 2001, TC1675-1RU; 9.5% in 1999, 9.5% in 2000 and 14.3% in 2001). While this reaction to bacterial ring rot should not eliminate them from release to growers, there should be a strong note of caution at the time of release. One clone, NDC6084C-2W, demonstrated high levels of tuber decay (30%) which again might be cause for concern to potato growers.

Several advanced selections with resistance to *Fusarium* spp. and *Erwinia carotovora* were evaluated along with other selections moving through the normal breeding channels. There does appear to be a few selections which demonstrate good resistance to both pathogens among the clones. These will be tested for a final year to determine the actual level of resistance present and to finish evaluating tuber type and qualities.

Finally, the last phase of a study to determine if red color intensity and retention can be selected in the field was completed. Six cultivars and/or selections were evaluated for skin color. Tubers were selected in 1999 from Generation 2 plants grown in the field at the SLVRC. Tubers were divided into bright and control (light) skin color. They were initiated into tissue culture, grown in the greenhouse to produce minitubers and these minitubers were planted into the field in 2001. Throughout the two year process both foliage and tuber color were evaluated. The tubers harvested from these plants in 2001 were evaluated after two months in storage. Three of the cultivars showed distinct color improvements in the skin when comparing the controls with the bright tubers. The other three had varying results with the controls often having brighter skin color than the tubers selected originally as bright. It appears that selections can be made in the field favoring more intense red color in the skin which will be retained in storage. This technique will be used as one of the criteria for selecting the appropriate tubers for initiation into the certified seed tissue culture clone bank.

2001 Potato Leafroll Clonal Evaluation

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

Treatments: PLRV Infected and Healthy

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

Plant Date: 5/2/01

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

Cultivars:

1. CO94019-1R	9. CO94165-3P/P	17. Russet Burbank
2. CO94024-16RU	10. CO94183-1R/R	18. Sangre
3. CO94027-6W	11. CO94222-6RU/Y	19. Centennial Russet
4. CO94032-3W	12. NDC6084C-2W	20. WNC 230-14
5. CO94035-15RU	13. NDC6184-3R	21. Ute Russet
6. CO94055-8RU	14. VCO967-2R/Y	22. Nugget
7. CO94065-2RU	15. VCO967-5R/Y	23. Norkotah
8. CO94084-12RU	16. VC1002-3W/Y	

Irrigation: Ground sprinkler: rate based on ET. Total water for season: 35.60".

Fertilizer: Planting fertilizer chemigated 80:60:40 on 5/18/01 & 6/6/01; Chemigated 12-0-0-24 on 7/3/01; for a seasonal total of 131:60:40:72, with 12# N from irrigation water.

Herbicide: Chemigated Eptam, 4 pts/acre; and Matrix 1.5 oz/acre, applied on 5/31/01.

Fungicide: Polyram 8DF, 2.0#/acre (7/4/01), Dithane DF 2.0#/acre (7/22), Bravo Weatherstick 720, 1.0 pt./acre (8/3).

Insecticide: Aerial application of Monitor on 8/11/01.

Harvest: 9/11/01.

Table 1. Clonal Evaluation 2001 Leafroll Symptom Expression in Advanced Clones and Standard Cultivars

Cultivar/Clone	PLRV Reaction (0-3+)		Symptoms
CO94019-1R		0	N/A
CO94024-16RU	42%	3+	LL,CC,WP
CO94027-6W	25%	3+	LL,CC,WP
CO94032-3W	30%	3+	LL,CC,WP
CO94035-15RU	28%	3+	LL,CC
CO94055-8RU	33%	3+	LL,CC,WP
CO94065-2R	89%	3+	LL,CC,WP,P
CO94084-12RU	55%	3+	LL,CC,WP
CO94165-3P/P	20%+	2+	LL,CC,WP
CO94183-1R/R	7%+	3+	LL,CC,WP,P
CO94222-6RU/Y	25%+	2+	LL,CC,WP
NDC6084C-2W	38%+	3+	LL,CC,WP
NDC6184-3R	4%+	2+	LL,CC,WP
VCO967-2R/Y		0	N/A
VCO967-5R/Y	25%+	2+	LL,CC,WP
VC1002-3W/Y	4%+	3+	LL,CC,WP
Russet Burbank		3+	LL,CC,WP
Sangre		2+	LL,CC,WP,P
Centennial Russet		2+	LL,CC
WNC230-14		0	N/A
Ute Russet		2+	LL,CC
Russet Nugget		2+	LL,CC,WP,P
Russet Norkotah		3+	LL,CC,WP

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

2001 Potato Leafroll Natural In-Field Spread

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

Treatments: Healthy with LR+ between treatments

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

Plant Date: 5/2/01

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

Cultivars:

1. CO94019-1R
2. CO94024-16RU
3. CO94027-6W
4. CO94032-3W
5. CO94035-15RU
6. CO94055-8RU
7. CO94065-2RU
8. CO94084-12RU
9. CO94165-3P/P
10. CO94183-1R/R
11. CO94222-6RU/Y
12. NDC6084C-2W
13. NDC6184-3R
14. VCO967-2R/Y
15. VCO967-5R/Y
16. VC1002-3W/Y
17. Russet Burbank
18. Sangre
19. Centennial Russet
20. WNC 230-14
21. Ute Russet
22. Nugget
23. Norkotah
24. Green Mountain
25. Houma
26. Katahdin
27. Keswick
28. Penobscot

Irrigation: Ground sprinkler: rate based on ET. Total water for season; 35.57".

Fertilizer: Planting fertilzer chemigated 80:60:40 on 5/18/01 & 5/29/01; Chemigated 12-0-0-24 on 7/3/01; for a seasonal total of 131:60:40:72, With 12N from irrigation water.

Herbicide: Chemigated Eptam 4 pts/acre, and Matrix 1.5 oz/a applied on 5/31/01.

Fungicide: Polyram 8DF, 2#/acre (7/4/01), Dithane DF 2#/acre (7/22), Bravo Weatherstick 720, .98 pt./acre (8/3).

Insecticide: Aerial application of Monitor on 8/11/01.

Harvest: 9/11/01.

Table 2. 2001 Natural In-Field Spread of Leafroll in Advanced Clones and Standard Cultivars

Cultivar/Clone	# pos/ # emerged	% Spread 2001	% Spread 12 yr avg.	Risk
CO94019-1R	0/50	0.0		Low
CO94024-16RU	1/64	0.0		Low
CO94027-6W	3/49	6.1		Medium
CO94032-3W	1/71	1.4		Low
CO94035-15RU	6/68	8.8		Medium
CO94055-8RU	1/11	9.1		Medium
CO94065-2R	3/56	5.3		Medium
CO94084-12RU	1/41	2.4		Low
CO94165-3P/P	1/55	1.8		Low
CO94183-1R/R	3/44	6.8		Medium
CO94222-6RU/Y	2/64	3.1		Low
NDC6084C-2W	15/56	26.8		High
NDC6184-3R	2/50	4.0		Low
VCO967-2R/Y	0/49	0.0		Low
VCO967-5R/Y	0/50	0.0		Low
VC1002-3W/Y	1/64	1.6		Low
Russet Burbank	4/68	5.9	6.8	Medium
Sangre	1/15	6.6	5.7	Medium
Centennial Russet	1/69	1.5	2.9	Low
WNC230-14	0/61	0.0	0	Very low
Ute Russet	0/82	0.0	11.7	High
Russet Nugget	4/72	5.5	13.8	High
Russet Norkotah	2/60	3.3		Low
Green Mountain	9/57	15.8	13.8	High
Houma	3/61	4.9	3.3	Low
Katahdin	1/64	1.6	3.3	Low
Keswick	2/56	3.6	5.1	Medium
Penobscot	3/53	5.6	0.9	Very low

Data is from two tubers/plant, 12 plants/rep, 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% and higher.

2001 Bacterial Ring Rot Evaluation

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

Treatments: 1) BRR inoculated: 6-7 plates of Cms scraped into 2 litres of cold Ringer's solution. Tubers cut lengthwise and immersed in solution for 5 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 south of infected.

Plant Date: Inoculation 5/2/01; Planting 5/3/01

Cultivars:

1. AC93026-9RU
2. AC93047-1RU
3. CO93001-11RU
4. CO93016-3RU
5. CO93024-2RU
6. CO93037-6R
7. NDC5281-2R
8. TC1675-1RU
9. CO94019-1R
10. CO94024-16RU
11. CO94027-6W
12. CO94032-3W
13. CO94035-15R
14. CO94055-8RU
15. CO94065-2R
16. CO94084-12RU
17. CO94165-3P/P
18. CO94183-1R/R
19. CO94222-6RU/Y
20. NDC6184-3R
21. NDC6184-3R
22. VCO967-2R/Y
23. VCO967-5R/Y
24. VC1002-3W/Y
25. Huckleberry
26. FL2027
27. FL1900
28. FL 2025
29. FL 2006
30. FL 2020
31. Russet Burbank
32. Sangre
33. Centennial Russet
34. WNC230-14
35. Ute Russet
36. Norkotah

Irrigation: Ground sprinkler: rate based on ET. Total water for season, 35.57".

Fertilizer: Planting fertilizer chemigated 80-60-40 on 5/18/01 & 6/6/01; Chemigated 12-0-0-24 on 7/13/01; for a seasonal total of 131:60:40:72, with 12N from irrigation water.

Herbicide: Chemigated Eptam, 4 pts/acre, and Matrix, 1.5 oz/acre on 5/31/01.

Insecticide: Aerial application of Monitor on 8/11/01.

Harvest: 9/19/01

Table 3. 2001 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
2	AC93026-9RU	7/11	1	1	4.8	-----	33.3	ED,R,IVC,MN,W
2	AC93047-1RU	7/25	1	3	14.3	-----	14.3	IVC,W
2	CO93001-11R	7/19	2	2	9.5	-----	33.3	ED,R,IVC,IVN,MN,W
2	CO93016-3RU	7/11	2	2	9.5	-----	47.6	ED,R,IVC,IVN,MN,W
2	CO93024-2RU	7/19	2	2	9.5	-----	38.1	ED,R,IVC,IVN,MN,W
2	CO93037-6R	-----	-----	-----	0.0	-----	0.0	-----
3	NDC5281-2R	-----	-----	-----	0.0	-----	0.0	-----
3	TC1675-1RU	7/11	1	2	9.5	-----	14.3	ED,R,IVC,IVN,MN,W
1	CO94019-1RU	7/11	1	1	5.3	-----	5.3	ED,R
1	CO94024-16RU	7/11	1	1	4.8	-----	9.5	ED,R
1	CO94027-6W	7/11	2	2	11.8	-----	35.3	ED,R,IVC,IVN,MN
1	CO94032-3W	7/11	3	6	28.6	----	38.1	ED,R,IVC,IVN,MN
1	CO94035-15RU	8/6	1	4	19.0	-----	28.6	IVC,IVN,MN
1	CO94055-8RU	7/11	2	2	10.0	-----	20.0	ED,R,IVC,IVN,MN,W
1	CO94065-2R	8/6	1	1	4.8	-----	4.8	IVC,IVN,MN
1	CO94084-12RU	8/6	3	4	19.0	-----	19.0	IVC,IVN,MN,W
1	CO94165-3P/P	7/11	1	1	4.8	-----	33.3	ED,R,IVC,IVN,MN,W
1	CO94183-1R/R	7/11	2	2	9.5	-----	19.0	ED,R,IVC,IVN,MN
1	CO94222-6RU/Y	7/11	3	6	28.6	8/6	52.4	ED,R,IVC,IVN,MN,W
1	NDC6084C-2W	7/19	1	1	4.8	-----	9.5	ED,R,IVC,IVN

^	Clone	Date of First Symptoms	# of Reps Positive	# of Plants Positive	% Plants Positive	Date 50% or More +	% Plants + 100 DAP	Summary of Symptoms
1	NDC6184-3R	7/19	2	3	21.4	-----	21.4	ED,R
1	VCO967-2R/Y	7/11	1	1	5.6	-----	33.3	ED,R,IVC,IVN,MN,W
1	VCO967-5R/Y	7/19	1	2	9.5	-----	9.5	ED,R
1	VC1002-3W/Y	8/6	1	1	6.3	-----	6.3	IVC,IVN,MN,W
2	Huckleberry	8/6	1	2	10.5	-----	21.1	IVC,IVN,MN,W
	Russet Burbank	7/11	3	6	28.6	8/6	57.1	ED,R,IVC,IVN,MN
	Sangre	8/6	3	7	33.3	8/15	52.4	IVC,IVN,MN
	Centennial Russet	8/6	1	1	4.8	-----	8.3	IVC,IVN,MN
	WNC230-14	7/11	3	4	19.0	-----	19.0	ED,R
	Ute Russet	7/11	1	1	4.8	-----	28.6	ED,R,IVC,IVN,MN,W
	Russet Norkotah	7/11	2	3	14.3	-----	42.9	ED,R,IVC,IVN,MN,W

^ Number of years tested. Planting date - 5/3/01; Harvest date - 9/19/01. Key to symptoms: ED - Early dwarf, R- Rosette, IVC - Interveinal chlorosis, IVN - Interveinal necrosis, MN - Marginal necrosis and W - Wilt. No stem squeezes were completed due to plant vigor.

Table 4. 2001 Clonal Evaluation for Bacterial Ring Rot Tuber Symptom Expression

Clone	# Reps +	# Tubers +	% Tubers+
AC93026-9RU	1	2	10
AC93047-1RU			
CO93001-11RU	1	1	5
CO93016-3RU	1	1	5
CO93024-2RU	1	1	5
CO93037-6R			
NDC5281-2R			
TC1675-1RU			
CO94019-1RU	1	1	5
CO94024-16RU			
CO94027-6W			
CO94032-3W	1	2	10
CO94035-15RU	1	1	5
CO94055-8RU			
CO94065-2R	1	1	5
CO94084-12RU	2	2	10
CO94165-3P/P	1	2	10
CO94183-1R/R	1	3	15
CO94222-6RU/Y	1	1	5
NDC6084C-2W	2	6	30
NDC6184-3R	1	1	5
VCO967-2R/Y	1	1	5
VCO967-5R/Y			
VC1002-3W/Y	1	1	5
Huckleberry	1	1	5
Russet Burbank			
Sangre	1	3	15
Centennial Russet	2	4	20
WNC230-14			
Ute Russet			
Norkotah	2	3	15

Clonal Evaluation for Storage Rots

Treatments:

Erwinia - 50ul of 1 x 10^4 cfu/ml
Fusarium - 50ul of 500-1000 spores/tuber
Alternaria - 10 spores/gm soil

Inoculation/Reading:

Erwinia (10/12/01; 11/27/01); *Fusarium (* 3/21/01; 5/1//01 & 11/19/01; 2/4/02) *Alternaria* (12/12/01; 11/27/01)

Cultivars:

1. CO93001-11RU
2. CO96049-6RU
3. Sangre 10
4. CO96197-3RU
5. CO96284-3W
6. Russet Norkotah 3
7. CO93016-3RU
8. CO96008-2RU
9. CO96339-7W
10. CO96050-3RU
11. CO96326-1RU
12. CO96021-1RU
13. AC93047-1RU
14. CO96320-2RU
15. AC93026-9RU
16. CO96320-1RU
17. NDC5281-2R
18. TC1675-1RU
19. CO96050-2RU
20. NDC5372-1RU
21. CO96324-3RU
22. CO92077-2RU
23. CO92027-2RU
24. AC92009-4RU
25. CO93037-6RU
26. CO96048-4RU
27. CO96211-2W
28. CO96339-4W
29. CO96332-3W
30. CO96284-1W
31. CO96049-4R
32. CO96332-1W
33. AC91014-2RU
34. CO96048-1RU
35. Russet Nugget
36. CO86051-3RU
37. CO86030-1RU
38. CO86153-2RU
39. CO96211-2W
40. CO96098-1RU

Evaluation: Ranked by Score. Scores based upon 3 reps x 15 tubers/rep.
Tuber evaluations follow: Control will always equal 1 or 0.

Fusarium	*Erwinia*	*Alternaria*
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: 2001 Clonal Evaluation for Storage Rots

Fusarium			Erwinia		Alternaria	
Inoc-Reading-	3/21/01 5/1/01	11/19/01 2/4/02	Inoc-Reading-	10/12/01 11/27/01	Inoc-Reading-	10/12/01 11/27/01
Clone	Avg Score	Avg Score	Clone	Avg Score	Clone	Avg Score
CO93001-11RU		1.87	NDC5281-2R	1.77	AC91014-2RU	0.00
CO96049-6RU	2.40	2.36	AC92009-4RU	1.80	AC92009-4RU	0.00
Sangre 10		2.47	CO96048-1RU	1.80	CO93001-11RU	0.00
CO96197-3RU	3.70	2.80	CO96284-1W	1.93	CO96008-2RU	0.00
CO96284-3W	3.50	2.80	AC93047-1RU	2.00	CO96021-1RU	0.00
Russet Norkotah 3		2.80	CO96339-4W	2.00	CO96048-1RU	0.00
CO93016-3RU		2.86	CO96050-3RU	2.07	CO96048-4RU	0.00
CO96008-2RU	2.40	2.86	CO96332-3W	2.07	CO96049-4RU	0.00
CO96339-7W	4.80	2.86	AC93026-9RU	2.13	CO96050-3RU	0.00
CO96050-3RU	4.10	2.87	CO93016-3RU	2.20	CO96284-1W	0.00
CO96326-1RU	3.60	2.87	CO96049-4RU	2.20	CO96284-3W	0.00
CO96021-1RU	4.00	2.92	CO96211-2W	2.20	CO96320-1RU	0.00
AC93047-1RU		2.93	NDC5372-1RU	2.21	CO96320-2RU	0.00
CO96320-2RU	3.90	2.93	CO96050-2RU	2.27	CO96326-1RU	0.00
AC93026-9RU		3.00	Russet Norkotah 3	2.27	CO96332-1W	0.00
CO96320-1RU	4.00	3.00	CO96048-4RU	2.33	CO96332-3W	0.00
NDC5281-2R		3.00	CO92037-2RU	2.40	CO96339-4W	0.00
TC1675-1RU		3.00	CO96021-1RU	2.40	Sangre 10	0.06
CO96050-2RU	4.00	3.06	CO96284-3W	2.40	AC93026-9RU	0.06
NDC5372-1RU		3.06	Russet Nugget	2.47	AC93047-1RU	0.06
CO96324-3RU	3.80	3.07	CO96008-2RU	2.60	CO93016-3RU	0.06
CO92077-2RU		3.20	Sangre 10	2.60	CO96049-6RU	0.06
CO92027-2RU		3.30	TC1675-1RU	2.60	CO96050-2RU	0.06
AC92009-4RU		3.33	CO96320-2RU	2.71	CO96197-3RU	0.06
CO93037-6RU		3.33	CO96320-2RU	2.80	CO96211-2W	0.06
CO96048-4RU	4.40	3.33	CO93001-11RU	2.87	CO96324-3RU	0.06
CO96211-2W	3.80	3.33	CO92077-2RU	3.13	CO96339-7W	0.06
CO96339-4W	4.00	3.33	CO93037-6RU	3.13	NDC5372-1RU	0.06
CO96332-3W	4.20	3.40	CO96324-3RU	3.27	Russet Norkotah 3	0.13
CO96284-1W	4.90	3.47	CO96332-1W	3.70	CO93037-6RU	0.13
CO96049-4RU	4.50	3.53	CO96326-1RU	3.80	Russet Nugget	0.20
CO96332-1W	4.30	3.73	CO96339-7W	3.93	CO92077-2RU	0.27
AC91014-2RU		3.87	AC91014-2RU	4.07	TC1675-1RU	0.33
CO96048-1RU		3.93	CO96197-3RU	4.33	NDC5281-2R	0.46
Russet Nugget		4.26	CO96049-6RU	2.67	CO92027-2RU	
CO86051-3RU		3.00				
CO86030-1RU		3.20				
CO86153-2RU		3.80				
CO96211-1W	4.30					
CO96098-1RU	4.00					

2001 Potato - Red Color Retention Study

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

Plot Design: CRD - 5 seed pieces/cultivar x 3 reps.

Plant Date: 5/15/01

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

Cultivars:

1. Dark Red Norland
2. Red LaSoda
3. Sangre 10
4. Sangre 11
5. Sangre 14
6. Sangre standard

Irrigation: Ground sprinkler: rate based on ET. Total water for season: 35.57".

Fertilizer: Planting fertilizer chemigated 80:60:40 on 5/18/01 & 6/6/01; Chemigated 12-0-0-24 on 7/3/01; for a seasonal total of 131:60:40:72, with 12N from irrigation water.

Herbicide: Chemigated Eptam, 4 pts/acre; and Matrix 1.5 oz/acre, applied on 5/31/01.

Fungicide: Polyram 8DF, 2#/acre (7/4/01), Dithane DF 2#/acre (7/22), Bravo Weatherstick 720, .98 pt./acre (8/3).

Insecticide: Aerial application of Monitor on 8/11/01.

Harvest: 9/11/01.

Project description: During harvest, 1999, the ten brightest tubers and the ten with average brightness (control) were selected from different red cultivars (15-50 hills each) that were grown in the Colorado certified seed program at the Generation 2 level. Tubers were scored for their skin color intensity either "bright" or "control". Several selections were placed into tissue culture in the fall of 1999 and increased. Plants were taken to the greenhouse in the fall of 2000 and minitubers were produced. Plates were rated for leaf color intensity (which should relate to tuber color). Minitubers produced were rated for color intensity and separated. In 2001, the treatments (representing given tubers originally identified) were planted in the Selter's corner, grown and harvested as hills. Tubers were rated after two months in storage (Table 6). Selections with the highest color intensity and retention will be moved into clone bank for future growth.

Table 6. 2001 Red Tuber Color Intensity and Retention

Cultivar	Treatment	Color Intensity Rating
Dark Red Norland	1	7
	2	6
	3 (Control)	5
Red LaSoda	4	8
	5	5
	6, 7(Control)	5
Sangre 10	8	7
	9	5
	10 (Control)	5
	11 (Control)	7
Sangre 11	12	5
	13	6
	14 (Control)	7
	15 (Control)	5
Sangre 14	16, 17, 18	5
	19 (Control)	5
	20 (Control)	8
	30	7
Sangre standard	21	5
	22	7
	23, 24 (Control)	5
	27, 28	6

20 to 25 tubers per treatment were evaluated from 5 plants/3 reps/treatment. Tubers were evaluated in direct sunlight with three observers on 11/27/01 after two months of storage. Ratings were taken by looking at the lightest red color from each cultivar's controls and giving it a 5. Then, other treatments were evaluated from this base level. Ratings move from a base level of 5 up to a 10 for the most intense red color.