Research Progress Report for 1995

POTATO DISEASE STUDIES

Submitted to the

San Luis Valley Research Center Committee

and the

Colorado Potato Administrative Committee (Area II)

by

R.D. Davidson and J.L. Whitworth

San Luis Valley Research Center

ANNUAL REPORT
1995

POTATO DISEASE STUDIES

Submitted by:

R.D. Davidson and J.L. Whitworth
Department of Horticulture and Landscape Architecture
SLV Research Center, Colorado State University

Introduction:

Potato disease recognition and management strategies are becoming increasingly important when trying to produce a high quality, high yielding potato crop. The unique environmental conditions found in the San Luis Valley further complicate an already difficult picture for many diseases, requiring that much of the disease research be done in the SLV area. Over the past several years a great deal of effort has been expended to reduce the impact of four major potato disease problems; potato leafroll (PLRV), blackleg (*Erwinia* spp.), bacterial ring rot (BRR) and PVY mosaic. Research has focused on improving certified seed lots for sale and recertification, understanding the epidemiology of these diseases under SLV conditions and improved screening/testing methods to detect problems before they become major. In 1995, a fifth disease problem, early blight tuber decay (*Alternaria solani*), was added to this mix. This report summarizes the results from 1995. Three objectives; 1) clonal evaluation for PLRV and BRR symptom expression, 2) latent PVY expression in certain cultivars and 3) control strategies for early blight tuber decay will be covered.

Results and Discussion:

Objective 1) Twenty seven (BRR) and ten (PLRV) advanced clones and several established cultivars were screened for symptom expression to PLRV and BRR. Table 1 lists the clones and leafroll reactions tested in 1995. One clone, AC88356-1, had no leafroll reaction and will be testing again in 1996. CO86051-3, which had no reaction in 1994, will also be retested. Leafroll reaction on all other clones was acceptable. Five clones showed high levels of natural in-field leafroll spread (Table 2) with three showing spread greater than 25%.

Table 3 lists the field expression to BRR, while Table 4 lists the daughter tuber expression to BRR. Previously tested clones fared reasonably well with all but two clones having marginal to adequate expression of BRR. CO86030-1 showed no symptoms in any of the three years of testing. CO86153-2 showed no symptoms in 1993 or 1994 and light symptoms in 1995. Both of these clones appear to have a latent reaction to BRR and should not be allowed to continue into the general program. If there is a real push for either of these clones, further study dealing with their BRR

reactions should be undertaken. COTX86146-2R appears to have light, but adequate expression of BRR after three years of testing. Several clones were tested for the second year. The following clones had mild symptoms or a low percentage of the plants expressing BRR after two years of testing and should be retested for a third and final year: AC87123-4, AC82363-3 and CO87140-3. Of the clones being tested for the first time in 1995, AC88162-4, CO88043-3 and BC1145-1 were the only ones to demonstrate mild symptoms or a low percentage of plants expressing BRR. Other clones showed reasonable reactions and a high percentage of the plants expressing BRR by 100 DAP.

Table 1. Leafroll Symptom Expression in Advanced Clones and Standard Cultivars. Center, Colorado, 1995.

Clone/Cultivar	PLRV reaction (0-3+)	PLRV Symptoms
AC87313-3	3+	LL, CC, WP
AC88042-1	3+	LL, CC, WP
AC88165-3	3+	LL, CC, WP
AC88357-3	3+	LL, CC, WP
AC88070-3	3+	LL, CC, WP
AC88162-4	3+	LL, CC, WP
AC88356-1	0	
BC1145-1	3+	WP, CC
CO88043-3	3+	LL, CC, WP
NDC4069-4	3+	LL, CC, WP
Centennial Russet	3+	LL, CC, WP
Russet Burbank	3+	LL, CC, WP
Sangre	3+	LL, CC, WP
Russet Nugget	3+	LL, CC, WP

Key - Rating for the symptom expression is 0 for no symptoms to 3 for strong typical symptoms. WP = whole plant involvement, LL = lower leaf rolling, CC = good color change evident (yellowing or bronzing) and P = some purpling on leaf margin

Table 2. Natural-in-field Spread of Leafroll to Advanced Clones and Standard Cultivars. Center, Colorado, 1995.

Clone#/Cultivar	#pos/#emerged	% spread (sd)		Risk
		1995	7 yr. avg.	
AC87313-3	2/66	3.0		Low
AC88042-1	2/54	3.7		Low
AC88165-3	9/56	16.1		High
AC88357-3	3/63	4.7		Low
AC88070-3	9/51	17.6		High
AC88162-4	2/36	5.6		Medium
AC88356-1	0/69	0.0		---
BC1145-1	15/54	27.8		High
CO88043-3	22/69	31.9		High
NDC4069-4	11/42	26.2		High
Green Mountain	15/57	26.3	13.7 (10.4)	High
Houma	7/63	11.1	2.6 (4.6)	Low
Katahdin	1/69	1.4	2.8 (4.9)	Low
Keswick	3/12	6.3	5.2 (4.3)*	Medium
Penobscot	0/72	0.0	0.2 (0.6)	Low
Russet Burbank	0/51	0.0	4.5 (6.0)	Low
Sangre	2/51	3.9	7.1 (12.3)	Medium
Centennial	0/39	0.0	1.6 (2.4)	Low
WNC230-14	0/57	0.0	0.0 (0.0)	Low
Ute Russet	6/42	14.3	9.3 (11.3)	Medium
Russet Nugget	12/66	18.2	13.0 (16.6)	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%+.

* 6 yr average

Table 3. 1995 Clonal Evaluation for Symptom Expression to BRR - Field

	CLONE # AND/OR NAME	DATE OF FIRST SYMPTOMS	# OF REPS +	# OF PLANTS +	PERCENT PLANTS +	DATE 50% OR MORE +	PERCENT PLANTS + 100 DAP	SUMMARY OF SYMPTOMS OVER SEASON
*	CO87140-3	7/10	1	2	9.5	-----	38.1	ED,R,MN,IVC,IVN
**	CO86153-2	7/18	1	1	4.8	-----	14.3	ED,R,IVC
**	COTX86146-2R	7/18	1	4	20.0	-----	20.0	ED,R,IVC
	AC88162-4	8/25	1	2	9.5	-----	9.5	W,MN,IVC,IVN
	CO87017-5	8/25	3	16	76.2	8/25	76.2	W,MN,IVC,IVN
*	AC82359-1	7/10	2	2	9.5	8/25	71.4	ED,R,MN,IVC,IVN
*	CO87106-5	8/25	2	8	38.1	-----	38.1	W,MN,IVC,IVN
	AC88357-3	7/18	1	1	4.8	8/25	61.9	ED,W,MN,IVC,IVN
	AC88070-3	7/10	2	6	28.6	8/4	90.5	ED,R,W,IVC,IVN
**	CO86030-1	NONE	0	0	0	-----	0	-----
	CO88043-3	7/10	1	2	10.5	-----	15.8	ED,R,W,IVC,IVN
	AC88165-3	7/10	1	1	4.8	8/25	71.4	ED,R,W,MN,IVC,IVN
	AC88042-1	7/18	1	4	19.0	-----	28.6	ED,R,MN,IVC, IVN
	BC1145-1	8/25	1	2	9.5	-----	9.5	W,MN,IVC
	NDC4069-4	7/18	2	8	44.4	-----	44.4	ED,R,W,IVC
*	AC87084-3	7/10	2	4	19.0	-----	47.6	ED,R,W,MN,IVC,IVN
*	AC87123-1	7/10	1	1	5.0	8/25	100.0	ED,R,W,MN,IVC,IVN
*	AC87123-4	7/18	1	1	5.0	-----	15.0	ED,R,W,IVC,IVN
	AC88356-1	8/25	3	19	95.0	8/25	95.0	W,MN,IVC,IVN
*	CO87062-6	7/10	1	1	4.8	8/4	57.0	(2 REPS DEAD) ED,MN,W,IVC,IVN
*	AC87313-3	7/18	1	1	4.8	8/25	71.4	ED,R,W,MN,IVC,IVN

*	TC1412-5	7/10	1	1	5.3	8/25	78.9	ED,R,W,MN,IVC,IVN
*	AC84437-2	7/18	1	2	9.5	8/25	57.1	ED,R,W,MN,IVC,IVN
*	TC1406-1	8/4	3	6	28.6	8/25	66.6	ED,R,W,MN,IVC,IVN
*	CO87062-5	7/18	2	2	10.0	8/25	70.0	W,MN,IVC,IVN
*	AC82363-3	8/4	1	1	5.0	-----	10.0	ED,R,MN,IVC,IVN
*	CO87009-4	7/10	2	7	33.3	8/25	81.0	ED,R,W,MN,IVC,IVN
	CENTENNIAL	8/25	2	3	14.3	-----	14.3	W,MN,IVC,IVN
	R. BURBANK	7/10	2	6	28.6	7/18	52.4	ED,R,IVC
	WNC230-14	7/18	2	3	14.3	-----	14.3	ED,R,IVC
	SANGRE	8/4	1	2	9.5	-----	33.3	MN,IVC,IVN

KEY TO SYMPTOMS: ED-early dwarf, R-rosette, IVC-interveinal chlorosis, IVN-interveinal necrosis, MN-marginal necrosis & W-wilt. Planting date - 5/19/95. Last reading taken on 8/25/94, approx. 100 DAP. ** & * Indicates clones previously tested for two or one years, respectively.

Table 4. 1996 Clonal Evaluation for Tuber Symptoms to BRR - **Field**

CULTIVAR	STEM SQUEEZE	REP 1	REP 2	% INFECTED
CO87140-3	-	0	0	
CO86153-2		0	0	
COTX86146-2R		0	0	
AC88162-4		0	0	
CO87017-5	+	1 (E)	0	5%
AC82359-1	-	1 (E)	1 (E)	10%
CO87106-5		0	0	
AC88357-3	+	0	0	
AC88070-3	-	0	0	
CO86030-1		0	0	
CO88043-3	-	3 (E)	0	15%
AC88165-3	+	0	0	
AC88042-1		0	0	
BC1145-1		0	0	
NDC4069-4		0	0	
AC87084-3	+	1 (I)	0	5%
AC87123-1	-	1 (I)	0	5%
AC87123-4		1 (I)	0	5%
AC88356-1	-	4 (E)	3 (E)	35%
CO87062-6	+	2 (E)	0	10%
AC87313-3	-	0	2 (E)	10%
TC1412-5	+	0	0	
AC84437-2		0	0	
TC1406-1	+	0	1 (I)	5%
CO87062-5	+	0	0	
AC82363-3		0	0	
CO87009-4	+	2 (E)	1 (I)	5%
CENTENNIAL		0	0	
R. BURBANK	+	1 (I)	0	5%
WNC230-14		0	0	
SANGRE	+	0	2 (I)	10%

The total number of tubers harvested was twenty from each lot.
E = external symptoms and I = internal symptoms to BRR.

Objective 2) The major goal of this study is to determine if different rates of nitrogen mask or delay the timing of PVY mosaic expression in Russet Norkotah, Crestone Russet (CO80011-5), and Russet Burbank. Data collected in conjunction with this goal relate to the amount of yield loss due to PVY. The desired end result is to be able to recommend the optimum level of nitrogen to be applied in order to get earlier PVY symptom expression and not significantly reduce yield. This information should be helpful to a seed grower who has experienced rejection of a lot at the second inspection when there was no PVY expression during the first inspection. In 1996 the research will; a) determine the effect of nitrogen levels on timing of PVY mosaic symptom expression, and b) determine the amount of yield loss due to PVY.

ELISA tests for PVX, PVS, and PVY are currently being compiled and analyzed for four dates throughout the season. Along with this, data was also collected on petiole nitrate levels. This data will confirm that nitrogen levels applied at planting and through the season correlate with plant nitrate levels.

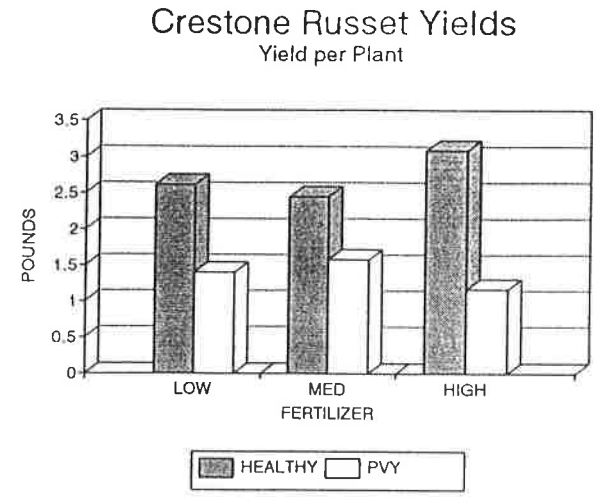
The graphs in Figure 1 show the yield per plant at the different nitrogen levels for fertilizer applied 100% at planting. All plants in this data set were serologically tested for PVY, PVX, and PVS just before harvest. PVX was not found in any plots. PVS was found throughout the plots. Yield from each plant was individually weighed and then placed in PVY or PVY-free categories.

Seed increase blocks (healthy and PVY inoculated) were grown in 1995 for use in 1996 plots. Inoculations of this material were very successful and plots were killed in early August before aphids were recorded in nearby traps. This experiment will be repeated and all data analyzed for report next year. Early results from the yield component show that no amount of fertilizer can compensate for the yield loss experienced when PVY is present.

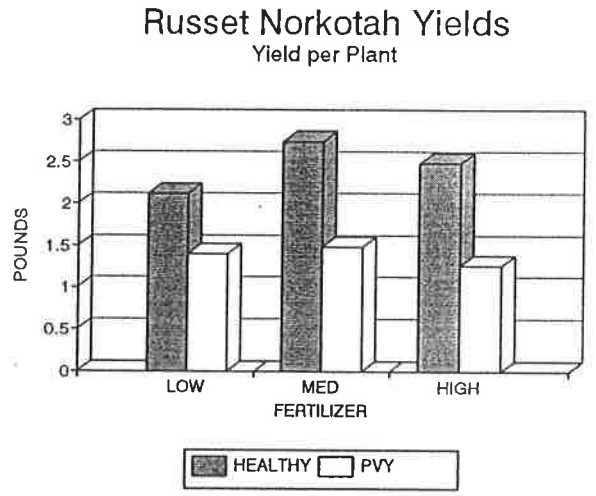
Objective 3) (In conjunction with R.T. Zink). *Alternaria solani*, or early blight of potato, is a troublesome disease both as a foliar pathogen during the growing season and as a tuber pathogen during the storage season. The tuber decay phase is particularly difficult to deal with because it is unpredictable and may have wide ranges of severity. Use of highly susceptible cultivars coupled with the loss of chemicals used to control blight on the tuber have greatly exacerbated the problem in the San Luis Valley. A comprehensive study was initiated in 1995 to examine several different aspects of this problem, including improved cultural and storage practices, the role of N level in the plant at the time of vine kill and the mix of SLV isolates of the fungus. Research being reported in this document primarily deals with two field studies relating to varietal/lot susceptibility. Isolates have been collected from several different operations and different cultivars, but have not been identified to a species level at this time.

Results from field trials (Table 5) indicate that there are variations in cultivar susceptibility to early blight tuber decay. There are demonstrated differences in early blight spore counts/gm of soil (inoculum available for tuber decay) between fields and growing operations. Within a given cultivar, there are substantial susceptibility differences when similar amounts of inoculum are used. Lots which are highly susceptible may be 2x or greater more susceptible than lots which have a low susceptibility. There appears to be virulence differences between *Alternaria* isolates with *Alternaria solani* more virulent than *Alternaria alternata* in the 1995 testing. Vine killing methods do have an impact on tuber decay found in the crop. Initial results indicate that sulfuric acid has a negative impact on either spore numbers or viability of the spores for infection and thus a positive impact on disease reduction. Propane vine killing may also act in a similar fashion. Rapid cooling of storages may be an effective method of maintaining lower tuber decay levels for a longer period of time, but it may not be an effective control measure for long term storage. Finally, levels of N left in the crop and/or soil at the time of vine kill may have large impacts on the susceptibility of the potatoes to early blight decay.

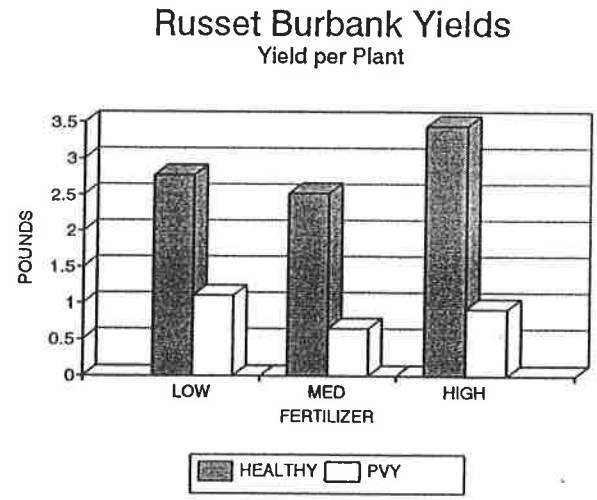
Figure 1. Yields of PVY and healthy plants at different nitrogen levels all applied pre-plant. Center, CO, 1995.



LOW 120-160-60
MED 170-160-60
HIGH 220-160-60



LOW 130-160-60
MED 180-160-60
HIGH 230-160-60



LOW 150-160-60
MED 200-160-60
HIGH 250-160-60

Table 5. Early Blight Screening of Tubers. 1995 Data (3 Rep Means)

Century Russet

	Vine Kill	Control %	Control Sev.	AS %	AS Sev.	AA %	AA Sev.
G1A-1	Acid	13	1.3	47	9.7	20	3.0
G1A-2		7	0.7	40	12.6	13	2.7
G1A-3		0	0.0	67	16.7	20	2.3
G1A-4		33	5.0	80	42.3	7	1.3
G1A-5		33	4.3	48	41.3	30	6.7
	AVG.	17	2.3	56	24.5	18	3.2
G1B-1&2	Champ. Diquat + Acid	39	8.7	50	15.7	22	4.3

Ranger Russet

	Vine Kill	Control %	Control Sev.	AS %	AS Sev.	AA %	AA Sev.
G2A-1	Champ Diquat + Acid	0	0	55	76.0	22	22.7
S1A-1&2	Diquat	73	45.3	96	194.0	87	79.7

Minimum severity score to drop grade approximately 10.

SUMMARY RESEARCH PROGRESS REPORT FOR 1996 AND RESEARCH PROPOSAL FOR 1997

Submitted to:
SLV Research Center Committee and the
Colorado Potato Administrative Committee (Area II)

Title: Potato Disease Studies

Project Leader: R. D. Davidson

Project Justification: Managing potato disease problems in the San Luis Valley is critical for growers with rising production costs and the potential for significant crop losses because of disease. A substantial effort has been put forth to reduce the impact of four major seedborne disease problems; potato leafroll (PLRV), mosaic viruses (PVX, PVS & PVY), blackleg - *Erwinia* spp. and bacterial ring rot (BRR) - *Clavibacter michiganensis* pv. *sepedonicus*. The certified seed potato program has initiated intensive programs designed to reduce or eliminate the threat from these disease problems. Success has been varied, but overall, there have been reductions in the percentage of seed lots with PLRV and BRR. However, there have been recorded increases in mosaic and blackleg problems. These diseases have not been eradicated in the San Luis Valley, primarily because of the presence of additional sources of recontamination and dealing with latent (non-visual) infections. Therefore, continued research of these diseases and others with potential impact in the future is warranted. Emphasis for this project is practical, grower oriented methods of control.

Project Status: This is an ongoing project which has been funded at various levels for the past several years. Since the early 1980's, leafroll and BRR screening of the newest numbered clones being released by Colorado's Cultivar Development program has been in place. Reaction to BRR and PLRV, including a rating of each clone for symptom development and potential susceptibility to these diseases, is completed each year. Reducing the impact and spread of bacterial diseases, specifically blackleg, and the mosaic virus PVY are also areas of focus. Research projects on seed cutting, use of vine dessicants to reduce tuber recontamination with Erwinia spp. and sources of inoculum have all been funded in the past few years.

Significant Accomplishments for 1996: Seventeen (BRR) & twelve (PLRV) advanced clones and six established cultivars were screened for symptom expression to PLRV and BRR. One clone, AC88356-1, that had no leafroll symptom expression in 1995 was retested and again did not express any leafroll reactions. This clone will be tested for the last time this year. All other clones tested in the plot had adequate expression of leafroll symptoms. Risk of in-field spread from infected to non-infected plants was high for many clones in 1996. This is undoubtedly related to heavy aphid pressure during the season. BRR expression was marginal to adequate for the majority of the clones tested. Two clones, AC87340-2 and CO86030-1 showed no BRR symptoms during the season. First year clones will be retested in 1997. In addition, two clones, AC88042-1 and AC88162-4 will be tested for a third year. Three other clones, AC82363-3, CO86030-1 and CO86153-2 will be tested in plantlet form. Inoculating plantlets has been demonstrated to be more efficient for BRR spread, and treatments have a higher percentage of plants with BRR symptoms than found under the tuber inoculations.

1997 Objectives: I propose to continue screening new releases for BRR and PLRV symptom expression.

Funding:

1996 Allocation: $3,000

1997 Request: $2,000

ANNUAL REPORT
1996

Submitted by:

R.D. Davidson
Department of Horticulture
SLV Research Center, Colorado State University

Introduction:

Potato disease recognition and management strategies are becoming increasing important for growers trying to produce a high quality, high yielding potato crop. The unique environmental conditions found in the San Luis Valley further complicate an already difficult picture for many diseases, requiring that much of the disease research be completed in the San Luis Valley. Over the past several years, a great deal of effort has been expended to reduce the impact of five major potato disease problems; potato leafroll, tuber soft rot and blackleg (*Erwinia* spp.), bacterial ring rot, potato viruses causing foliar mosaic symptoms (PVX, PVS, PVY, PVM and PVA), and early blight tuber decay (*Alternaria solani*). Research has focused on improving certified seed lots for sale and recertification, understanding the epidemiology of these diseases under SLV conditions, and improved screening/testing methods to detect problems before they become serious. This report summarizes the results for 1996. Two objectives, clonal evaluation for BRR and PLRV symptoms and initial early blight tuber decay studies, will be covered.

Results and Discussion:

Objective 1) Seventeen (BRR) & twelve (PLRV) advanced clones and six established cultivars were screened for symptom expression to PLRV and BRR. Tables 1 and 2 show results from the PLRV clonal evaluations and the natural-in-field spread evaluations. One clone, AC88356-1, that had no leafroll symptom expression in 1995 was retested and again did not express any leafroll reactions. This clone will be tested for the last time this year. All other clones tested in the plot had adequate expression of leafroll symptoms. Risk of in-field spread from infected to non-infected plants was high for many clones in 1996. This is undoubtedly related to heavy aphid pressure during the season.

Tables 3 and 4 show results from the BRR clonal evaluations. BRR expression was marginal to adequate for the majority of the clones tested. Two clones, AC87340-2 and CO86030-1 showed no BRR symptoms during the season. First year clones will be retested in 1997. In addition, two clones, AC88042-1 and AC88162-4 will be tested for a third year. Three other clones, AC82363-3, CO86030-1 and CO86153-2 will be tested in plantlet form. Inoculating plantlets has been demonstrated to be more efficient for BRR spread, and treatments have a higher percentage of plants with BRR symptoms than found under the tuber inoculations.

Table 1. 1996 PLRV Symptom Expression in Advanced Clones and Standard Cultivars		
Clone/ Cultivar	**PLRV Reaction (0-3+)**	**PLRV Symptoms**
AC87079-3	3+	LL,CC,WP
AC87138-4	3+	LL,CC,WP
AC7210-2	3+	LL,CC,WP
AC7340-2	3+	LL,CC,WP
AC89047-1	3+	LL,CC,WP
CO89036-10	3+	LL,CC,WP
CO89037-7	3+	LL,CC,WP
CO89097-2	3+	LL,CC,WP,P
NDC4327-2	3+	LL,CC,WP
AC88356-1	--	--
CO86051-3	3+	LL,CC
C0083008-1	3+	LL,CC,WP
CENTENNIAL RUSSET	3+	LL,CC
RUSSET BURBANK	3+	LL,CC,WP
SANGRE	2+	LL,CC
RUSSET NUGGET	2+	LL,CC,WP

Key - rating for the symptom expression is 0 for no symptoms to 3 for strong typical symptoms. WP = whole plant involvement, LL = lower leaf rolling, CC = good color change evident (yellowing or bronzing) and P = some purpling on leaf margin.

Table 2. 1996 Natural-in-field Spread of Leafroll to Advanced Clones				
Clone#/Cultivar	#pos/#emerged	% spread (sd)		Risk
		1996	8 yr. average	
AC87079-3	5/62	8.1		Medium
AC87138-4	12/69	17.4		High
AC87210-2	3/57	5.3		Medium
AC87340-2	5/41	12.2		High
AC89047-1	7/69	10.4		High
CO89039-10	11/57	19.3		High
CO89037-7	7/57	12.3		High
CO89097-2	0/51	0.0		-
NDC4327-2	5/48	10.4		High
AC88356-1	0/67	0.0		-
CO86051-3	4/65	6.2		Medium
CO083008-1 (legend)	2/34	5.9		Medium
GREEN MT	12/68	17.6	14.2	High
HOUMA	0/18	0.0	2.3	Low
KATAHDIN	2/70	2.9	2.8	Low
KESWICK	3/62	4.8	5.2	Low - Med.
PENOBSCOT	0/60	0.0	0.2	Low
RUSSET BURBANK	12/50	24.0	6.9	Medium
SANGRE	3/48	6.3	7.0	Medium
CENTENNIAL	2/66	3.0	1.8	Low
WNC230-14	0/62	0.0	0.0	Low
UTE RUSSET	23/61	37.7	12.9	High
RUSSET NUGGET	18/63	28.6	15.0	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%

Table 3. 1996 Clonal Evaluation for Bacterial Ring Rot Foliar Symptom Expression

*	CLONE # AND NAME	DATE OF FIRST SYMPTOMS	# OF REPS POSITIVE	# OF PLANTS POSITIVE	% PLANTS POSITIVE	DATE 50% OR MORE +	% PLANTS + 100 DAP	SUMMARY OF SYMPTOMS
1	AC87079-3	8/10/96	2	9	42.9	-------	42.9	IVC,IVN,MN,W
1	AC87138-4	7/19/96	3	8	38.1	8/19/96	61.9	ED,R,IVC,MN,W
1	AC87210-2	7/19/96	2	2	9.5	8/19/96	57.1	IVC,MN,W
1	AC87340-2	--------	0	0	0.0	-------	0.0	---
1	AC89047-1	8/30/96	1	2	9.5	-------	9.5	W
1	CO89036-10	7/19/96	2	2	9.5	-------	33.3	ED,R,IVC,IVN,MN
1	CO89037-7	7/19/96	1	1	4.8	-------	38.1	ED,R,IVC,IVN,MN,W
1	CO89097-2	8/10/96	2	2	9.5	-------	38.1	IVC,IVN, MN,W
1	NDC4327-2	8/10/96	1	2	9.5	-------	9.5	IVC,MN
2	AC88042-1	7/19/96	1	1	4.8	-------	23.8	ED,R,IVC,IVN,MN
2	AC88162-4	7/19/96	1	1	4.8	-------	23.8	ED,R,IVC
2	AC88165-3	7/19/96	1	3	14.3	8/10/96	61.9	ED,R,IVC,MN,W
2	AC88357-3	7/19/96	2	7	33.3	7/26/96	95.2	IVC,IVN,MN,W
2	NDC4069-4	7/26/96	1	2	9.5	-------	9.5	ED,R,IVC,MN
3	AC82363-3	8/19/96	1	6	28.6	-------	28.6	IVC
4	CO86030-1	--------	0	0	0.0	-------	0.0	---
4	CO86153-2	7/19/96	1	1	4.8	-------	9.5	ED,R,IVC,W
	WNC230-14	8/19/96	1	1	4.8	-------	4.8	IVC,MN
	CENTENNIAL	8/10/96	1	2	9.5	-------	9.5	IVC,MN
	R. BURBANK	7/19/96	3	14	66.6	7/19/96	76.2	ED,R,IVC,MN,W
	R. NORK.	7/19/96	2	4	19.0	-------	47.6	ED,R,IVC,MN,W
	UTE RUSSET	8/19/96	2	2	9.5	-------	9.5	ED,R,IVC
	SANGRE	8/19/96	2	2	9.5	-------	9.5	IVC,IVN

* Number of Years Tested, Planting Date - 5/14/96–Key to Symptoms: ED-early dwarf, R-rosette, IVC-interveinal chlorosis, IVN-interveinal necrosis, MN-marginal necrosis, and W-wilt.

Table 4. 1996 Clonal Evaluation for Bacterial Ring Rot Tuber Symptom Expression

*	CLONE # AND NAME	# TUBERS POSITIVE	# REPS POSITIVE	% TUBERS POSITIVE
1	AC87079-3	0	0	0
1	AC87138-4	0	0	0
1	AC87210-2	0	0	0
1	AC87340-2	1	1	2.3
1	AC89047-1	0	0	0
1	CO89036-10	1	1	2.3
1	CO89037-7	0	0	0
1	CO89097-2	0	0	0
1	NDC4327-2	0	0	0
2	AC88042-1	0	0	0
2	AC88162-4	0	0	0
2	AC88165-3	0	0	0
2	AC88357-3	0	0	0
2	NDC4069-4	0	0	0
3	AC82363-3	2	2	4.7
4	CO86030-1	0	0	0
4	CO86153-2	0	0	0
	WNC230-14	0	0	0
	CENTENNIAL	0	0	0
	R. BURBANK	2	1	4.7
	R.NORKOTAH	1	1	2.3
	UTE RUSSET	0	0	0
	SANGRE	0	0	0

Tuber Harvest Date 9/9/96, *Number of Years Tested, Planting Date-5/14/96, 2 Reps checked per variety with 21 tubers per rep

Objective 2) (In conjunction with Richard Zink and Susie Thompson-Johns) Results from the field trials conducted in 1996 (Table 5) indicate that there are variations in cultivar susceptibility to early blight tuber decay. This information is similar to that found in 1995. Again, there are differences between potato operations in terms of susceptibility of the harvested tubers to early blight tuber decay. One operation was involved with this research for both years. The first year, the lot of Ranger Russet potatoes was quite susceptible to early blight tuber decay. The second year, after discussion about some management factors which could help reduce the potential for tuber problems, the tuber susceptibility was quite low. This indicates that the disease is manageable.

These initial trials indicate that a full scale research effort is justified. This effort will focus on understanding the disease under SLV conditions, understanding the strains of the fungus found in the San Luis Valley, working with new clones to identify those with some early blight tuber resistance, and working on management solutions which growers can implement in their own operations. A proposal for this work is presented separately.

Table 5. Early Blight Tuber Screening; 1995 (95) & 1996 (96) Data.

	Vine Kill	Control %	Control Sev.	AS %	AS Sev.	AA %	AA Sev.
Century Russet							
G1A-1(95)	Acid	13	1.3	47	9.7	20	3.0
G1A-2(95)		7	0.7	40	12.6	13	2.7
G1A-3(95)		0	0.0	67	16.7	20	2.3
G1A-4(95)		33	5.0	80	42.3	7	1.3
G1A-5(95)		33	4.3	48	41.3	30	6.7
	AVG.	17	2.3	56	24.5	18	3.2
G1B-1&2 (95)	Champ. Diquat + Acid	39	8.7	50	15.7	22	4.3
Russet Norkotah							
R1 (96)	Acid	0	0	8	2.0		
Ranger Russet							
G2A-1(95)	Champ Diquat + Acid	0	0	55	76.0	22	22.7
S1A-1&2 (95)	Diquat	73	45.3	96	194.0	87	79.7
S1 (96)	Acid	5	2.0	15	7.7		
W1 (96)	Diquat	13	8.0	35	37.7		

Minimum severity score to drop grade approximately 10.

Additional testing was completed in 1996 with a new chemical control agent (tuber application). Results were disappointing with only slight control of early blight tuber decay observed.