

**SUMMARY RESEARCH PROGRESS REPORT FOR 1999
AND RESEARCH PROPOSAL FOR 2000**

Submitted to:

San Luis Valley Research Center Committee

and the Colorado Potato Administrative Committee (Area II)

TITLE: Cultural and Physiological Studies

PROJECT LEADER: Asunta (Susie) Thompson, Research Horticulturist, San Luis Valley Research Center

PROJECT JUSTIFICATION:

The primary aims of the current research program include development of cultivar specific management profiles for advanced selections and new cultivars, providing cultural management guidelines for nuclear seed producers and investigation of physiological factors related to potato production. Trials are designed to address production requirements and needs of producers in the San Luis Valley. However, findings may be applicable to other growing areas, such as providing a starting point when trying a selection or new cultivar developed in Colorado for the first time.

Development of cultivar specific management profiles may result in a more successful experience for producers and industry when trying a new cultivar. In the evaluation process and during the development process, shortcomings of selections and cultivars may be recognized and appropriate management strategies explored and identified. Management profiles provide information related to nutrient management, plant population, pest susceptibilities, water requirements and storage considerations. Pending improvements to the older greenhouse complex, work addressing the needs of nuclear seed producers and development of management profiles for their use will be emphasized more. Aspects learned during investigations of physiological or biochemical factors provide basic information regarding potatoes and potato production, but may also impact management considerations. Such findings are assimilated into appropriate management guidelines.

PROJECT STATUS: Ongoing

SIGNIFICANT ACCOMPLISHMENTS FOR 1999:

Abbreviated highlights for several trials are summarized in the narrative below. In most cases, yields were typical of those of local growers. The internal pinking syndrome did not manifest itself to any degree in the trials, however it has been more frequently noted in tubers from guard rows saved for eating.

Alpha Production – Eight production scenarios were evaluated in 1999. A double cropping scenario was not included due to misplaced seed. The marketing scheme for Alpha utilizes a grading system with a 60 mm top. Total yields ranged from 232 cwt./acre for the early kill treatment, to 384 cwt./acre for the 6 inch within row spacing treatment. Treatments producing the most tubers over 60 mm resulted in yields ranging from 20 to 76 cwt./acre, for the early kill treatment and chitting treatments respectively. There were few culls resulting from any of the scenarios (2-6%). Yields of tubers in the saleable category of 25 to 60 mm ranged from 199 cwt./acre for the defoliation treatment to 340 cwt./acre for the 6 inch within row spacing scenario.

Boron Rate - Two cultivars, Russet Norkotah and Russet Nugget, were produced at 3 rates of boron, 0, 1 or 2 pounds pre-plant incorporated. Yield was significantly different for the clones, but not across boron treatments. Yields ranged from 299 cwt./acre to 312 cwt./acre, for the 2lb./acre and 1 lb./acre applied boron rates. There were no significant differences for yield nor percent US No. 1 yield for boron rate across clones. Similarly, oversized and undersized tuber category yields and percents were not significantly different and few US No. 2s and culls resulted from the treatments. Percent hollow heart ranged from 0 to 2%, and specific gravity levels were not significantly different for the boron rates. Internal purpling was highest for the check treatment at 7%, and least for the 1 lb. per acre application rate at 2%; differences were not statistically significant. For Russet Norkotah, as in 1998, performance was best with no added boron. Total yield ranged from 289 cwt./acre to 337 cwt./acre for the 2 lb. per acre rate and the check, respectively. US No. 1 yield ranked the same, however differences were greater. The 2 lb. per acre rate resulted in production of 209 cwt./acre, 71%, compared to 275 cwt./acre which was 81% for the control treatment. Little hollow heart was evident in US No. 1 tubers cut, however internal purpling ranged from 0 to 10% for the 1b./acre rate and the check, respectively. For Russet Nugget, yields ranged from 277 cwt./acre to 308 cwt./acre for the 2 lb. rate and the control, respectively. Percent US No. 1 yield was not different between treatments, although yields had a broad range. A high percentage of undersized tubers resulted from all treatments, averaging 48%. No hollow heart was evident when US No. 1 tubers were cut, however all treatments produced tubers with internal pinking, with a mean of 3%. Results indicate that despite low soil boron levels, that adequate boron is being supplied through the irrigation water.

Seed Piece Spacing – Five advanced selections were evaluated at three within-row spacings, including 9, 12 and 15 inches. All selections were included in the 1998 trial. Cultural practices typical of the growing area were utilized, including planting on 34-inch rows and the utilization of sprinkler irrigation. Significant differences were obtained for clone in 1999, but not for spacing, for total yield or US No.1 yield. Grade components usually were significantly different for spacing, with the closer spacing providing a higher yield of smaller sized tubers than those planted farther apart. Grade parameters were significantly different for clones. AC87084-3, an attractive advanced russet, produced the highest yield and grade out of all clones. CO85026-4 had the lowest total yield and tended to have smaller tuber shape than other selections. Culls and US No.2 grade parameters were not significantly different for spacing, but were for clones. Silverton Russet yields were maximized at the mid- spacing, as were the larger grade

tubers. Quality parameters also tended to be superior at this spacing, except for percent hollow heart, which was higher. AC87084-3 produced nearly equal yields at all within-row spacings, however yields of grade components of larger tubers were higher at the 15-inch spacing. External quality parameters, such as growth cracks and second growth, tended to be exhibited more as plant spacing increased. The chipper, BCO894-2, had similar total yield and grade components at all spacings. Total yield and yield of US No.1 tubers was maximized at the 9 inch spacing for CO85026-4, an advanced russet selection. Internal and external quality factors tended to be relatively similar at the different spacings, although there was a propensity for slightly rougher tubers at the widest plant spacing. The advanced red selection, CO86218-2 produced the highest total yield at the 9-inch spacing. Tuber grade and quality components were most favorable at this spacing as well.

Cultivar Specific Management Profiles - Management profiles were developed and disseminated for Russet Norkotah and Selections 3 & 8, Silverton Russet (AC83064-1), Keystone Russet (AC83064-1) and Yukon Gold.

OBJECTIVES FOR 2000:

1. Continue development of cultivar specific management profiles for advanced selections and named cultivars. Profiles for completion in 2000 include Alpha, AC87084-3, BCO894-2, CO85026-4 and CO86218-2.
2. Begin more directed research toward cultural management guidelines specific to nuclear seed production, pending greenhouse renovation.
3. Continue investigations of physiological affects of production related factors. From research results obtained in 1996 through the present time, develop a chapter or section related to precutting for inclusion in the San Luis Valley Potato Production Manual.

FUNDING REQUEST:

1999 Allocation:	\$ 9,500
2000 Request:	
Supplies	\$ 1,000
Sample Analysis	3,000
Support Personnel	5,500
M.Sc. Stats. Intern	<u>6,000</u>
Total	\$15,500

1999 Potato Leafroll Clonal Evaluation

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

Treatments: PLRV infected and Healthy

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

Plant Date: 5/9/99

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

Cultivars:

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

Irrigation: Ground sprinkler; rate based upon ET

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

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

Harvest date: 9/14/99

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

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

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

1999 Potato Leafroll Natural In-field Spread

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

Treatments: Healthy with LR+ between treatments

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

Plant Date: 5/9/99

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

Cultivars:

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

Irrigation: Ground sprinkler; rate based upon ET

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

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

Harvest date: 9/14/99

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

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

Data is from two tubers/plant, 12 plants/replication, and three replications/cultivar for a total of 72 tubers planted per clone in each year. Advanced clones have been tested for one year only. Risk assessment - Low = 0-4.9%, Medium = 5.0-9.9%, and High = \geq 10.0%.
NDC5281-2 had no emergence in the plot.

1999 Bacterial Ring Rot Clonal Evaluation

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

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

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

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

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

Cultivars:

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

Irrigation: Ground sprinkler; rate based upon ET

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

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

Harvest date: 9/14/99

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

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

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

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

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

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

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

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

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

Results:

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

Percentage over 1% damage = 38%
Percentage over 5% damage = 9%
Mean rating = 1.24 or 2.0% of the surface area covered by sclerotia

No Undercut
Tuber readings = 1,1,1,1,1,1,1,1,1,1,1,2,2,2,2,2,2,2,2,2,2,2,3,3,3,4,4

Percentage over 1% damage = 62% with no zero damage
Percentage over 5% damage = 17%
Mean rating = 1.86 or 4.4% of the surface area covered by sclerotia

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

**1999 Tuber Survey (Internal pigmentation)
 Russet Norkotah Selection 3
 Harvest date 9/27/99**

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

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

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

Table 5: Tuber Observations by Plant for Internal Pigmentation

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

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

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

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

Table 5. 1999 Clonal Disease Evaluation

Clone	<i>Erwinia</i>	<i>Fusarium</i>	<i>Alternaria</i>	% Grade Loss
				<i>Alternaria</i>
AC87079-3*	3.2	3.2	0.1	0
AC87138-4*	1.7	2.8	0.1	0
AC87340-2*	2.7	2.7	0.1	0
CO89036-10*	2.1	3.5	0.5	0
AC89653-3	3.5	3.1	0.7	0
AC89536-5	3.7	4.0	0.3	0
CO89097-2*	1.7	4.5	0.3	0
NDC4655-1	2.2	3.5	0.1	0
AC90017-2	2.3	3.3	0.1	0
Chipeta*	1.6	2.8	0.3	0
Russet Burbank*	2.9	3.6	0.7	0
Russet Nugget*	2.3	4.5	0.1	0
Sangre*	2.9	4.1	0	0
Ranger Russet	1.7	3.1	0.7	7

*Clones or cultivars tested for more than one year. Results listed are the mean readings of three replications of five tubers/replication.

Rating scale for each pathogen; *Erwinia* = 1-5, *Fusarium* = 1-5 and *Alternaria* = 0-5
with 0 or 1 being no symptoms and 5 being 100% damage.

Grade loss due to *Erwinia* = 3+, *Fusarium* = 3+ and *Alternaria* = 4+.

0 or 1 = Resistant

2 = Moderately resistant

3 = Moderately susceptible

4 = Susceptible

5 = Very susceptible

Table 6. 1998/99 Clonal Disease Evaluation (Two year Average)

Clone	Mean Ratings per Tuber (3 reps x 5 tubers)			% Grade Loss
	<i>Erwinia</i>	<i>Fusarium</i>	<i>Alternaria</i>	<i>Alternaria</i>
AC87079-3	4.1	3.1	0.2	4
AC87138-4	1.9	2.8	0.1	0
AC87340-2	3.1	3.3	0.1	0
CO89036-10	2.0	3.4	0.5	0
CO89097-2	1.9	4.4	0.3	0
Chipeta	1.9	2.8	0.2	0
Russet Burbank	2.7	3.5	0.5	0
Russet Nugget	2.3	4.2	0.2	0
Sangre	3.5	3.3	0	0

Rating scale for each pathogen; *Erwinia* = 1-5, *Fusarium* = 1-5 and *Alternaria* = 0-5 with 0 or 1 being no symptoms and 5 being 100% damage.

Grade loss due to *Erwinia* = 3+, *Fusarium* = 3+ and *Alternaria* = 4+.

0 or 1 = Resistant

2 = Moderately resistant

3 = Moderately susceptible

4 = Susceptible

5 = Very susceptible

Table 6. 1997/98 Clonal Disease Evaluation (Two year Average)

Clone	Mean Ratings per Tuber (3 reps x 5 tubers)			% Grade Loss
	<i>Erwinia</i>	<i>Fusarium</i>	<i>Alternaria</i>	<i>Alternaria</i>
AC87084-3	1.8	4.0	1.5	27
AC88042-1	3.8	3.9	0.4	4
AC88165-3	1.7	4.3	2.0	40
BC0894-2	2.2	3.7	0.4	4
CO86218-2	2.2	3.0	0.9	10
Chipeta	1.7	3.4	0.1	0
Russet Burbank	1.8	4.1	0.7	7
Russet Nugget	3.4	4.5	0.2	0
Sangre	3.2	2.7	0.4	0

Rating scale for each pathogen; *Erwinia* = 1-5, *Fusarium* = 1-5 and *Alternaria* = 0-5

with 0 or 1 being no symptoms and 5 being 100% damage.

Grade loss due to *Erwinia* = 3+, *Fusarium* = 3+ and *Alternaria* = 4+.