

ANNUAL REPORT 1994

Submitted by:

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Introduction:

Potato disease management strategies under unique San Luis Valley conditions are becoming increasingly important. Producing a high quality, high yielding potato crop is instrumental in balancing cost of production with profit. 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. This report summarizes the results from 1994. Three objectives, clonal evaluation for PLRV and BRR symptom expression, BRR expression in infected field-grown microplants and latent PVY expression in certain cultivars, will be covered.

Results and Discussion:

Objective 1) Twenty five (BRR) and twenty two (PLRV) advanced clones and several established cultivars were screened for symptom expression to PLRV and BRR. Six clones that had no leafroll expression in 1993 were retested in 1994. All but one clone, CO86051-3, had excellent leafroll reactions (Table 1). CO86051-3 had no expression of symptoms in either 1993 or 1994. It would be beneficial to retest this clone in 1995 to verify potential immunity or tolerance to PLRV. Risk of in-field spread from infected to non-infected plants was quite high in 1994. There was heavy aphid pressure (green peach aphid) during the early part of August which undoubtedly led to increased PLRV spread. Several clones which have traditionally been low expressors of leafroll fell into the medium and high risk categories (Table 2). However, Penobscot and WNC230-14 still had zero readings for PLRV even with the high pressure. All new clones should be retested in 1995 to verify that the high risk of natural in-field spread of PLRV seen in 1994 is real!

Table 3 lists the field expression of BRR. Previously tested clones fared reasonably well with all but two clones having marginal to adequate expression of BRR. Clones CO86030-1 and CO86153-2 showed no symptoms in 1993 or 1994. Both of these clones should be retested to verify their potential latent reaction to BRR. Of the clones being tested for the first time in 1994 only two clones, AC87123-4 and CO87090-5, showed very weak or no reaction to BRR. Other clones were very mild early in the season, but did show reasonable reactions by 100 DAP. All of these clones will be tested an additional year.

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

Clone/Cultivar	PLRV reaction (0-3+)	PLRV Symptoms
CO85026-4	3+	LL, CC
TC1406-1	3+	LL, CC, WP
BC0894-2	3+	LL, CC, WP, P
CO86051-3	---	
TC1412-5	3+	LL, CC, WP
CO86142-3	3+	LL, CC, WP, P
CO86153-2	3+	LL, CC, WP
CO86218-2	3+	LL, CC, WP, P
AC87084-3	3+	LL, CC, WP
AC84123-1	3+	LL, CC, WP, P
AC87123-4	3+	LL, CC, WP
AC82359-1	3+	LL, CC, WP, P
AC82363-3	3+	LL, CC, WP
AC84437-2	3+	LL, CC, WP
AC87313-3	1+	LL, CC
CO87009-4	3+	LL, CC, WP, P
CO87017-5	3+	LL, CC, WP
CO87062-5	3+	LL, CC, WP
CO87062-6	2+	LL, CC
CO87090-5	3+	LL, CC, WP
CO87106-5	3+	LL, CC, WP
CO87140-3	3+	LL, CC
Centennial Russet	3+	LL, CC, WP
Russet Burbank	3+	LL, CC, WP
Sangre	3+	LL, CC, WP, P
Russet Nugget	3+	LL, CC, WP, P

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.

Clone#/Cultivar	#pos/#emerged	% spread (sd)		Risk
		1994	6 yr. avg.	
AC87084-3	15/61	24.6		High
AC87123-1	26/68	38.2		High
AC87123-4	21/56	37.5		High
AC82359-1	20/71	28.2		High
AC82363-3	5/65	7.7		Medium
AC84437-2	24/62	38.7		High
AC87313-3	2/64	3.1		Low
CO87009-4	34/72	47.2		High
CO87017-5	29/67	43.3		High
CO87062-5	9/42	21.4		High
CO87090-5	24/68	35.3		High
CO87106-5	6/68	8.8		Medium
CO87140-3	7/70	10.0		High
TC1406-1	3/69	4.3		Low
TC1412-5	5/65	7.7		Medium
CO87062-6	11/73	15.1		High
Green Mountain	15/64	23.4	11.5 (9.6)	High
Houma	5/71	7.0	1.2 (2.9)	Low
Katahdin	8/59	13.6	3.0 (5.3)	Low
Penobscot	0/60	0.0	0.3 (0.7)	Low
Russet Burbank	9/63	14.3	5.3 (6.2)	Medium
Sangre	17/49	34.7	7.7 (13.4)	Medium
Centennial Russet	2/68	2.9	1.8 (2.7)	Low
WNC230-14	0/69	0.0	0.0 (0.0)	Low
Russet Nugget	20/64	31.3	12.1 (18.0)	Medium
Ute Russet	33/72	45.8	8.5 (11.2)	Medium

Data for standard cultivars represents an annual collection of two tubers per plant, 12 plants per replication and three replication for each 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. 1994 Clonal Evaluation for Symptom Expression to Bacterial Ring Rot - Field

CLONE# AND NAME	DATE OF FIRST SYMPTOMS	# OF REPS +	# OF PLANTS +	PERCENT PLANTS +	DATE 50% OR MORE +	PERCENT PLANTS + 100 DAP	SUMMARY OF SYMPTOMS OVER SEASON
** CO85026-4	8/29	2	3	14.3	-----	14.3	W,MN,IVC
* BC0894-2	8/18	2	6	28.6	-----	28.6	W,IVC
* CO86030-1	7/15	1	1	4.8	-----	0	ED,R
* CO86051-3	7/22	1	1	4.8	-----	19.0	R,MN,IVC,IVN
* CO86142-3	8/2	2	5	23.8	-----	28.6	W,MN,IVC
* CO86153-2	NONE	0	0	0	-----	0	
* CO86218-2	7/15	3	4	19.0	-----	42.9	ED,R,W,IVC
* ATX85404-8	7/15	1	1	4.8	8/29	57.1	ED,W,MN,IVC, IVN
* COTX86146-2	7/22	1	1	4.8	-----	4.8	R,W,MN,IVC
TC1406-1	7/15	2	5	23.8	8/18	81.0	ED,R,MN,IVC, W,IVN
TC1412-5	8/18	2	4	19.0	8/29	85.7	W,MN,IVC,IVN
AC87084-3	8/18	2	2	9.5	-----	38.1	W,MN,IVC,IVN
AC87123-1	7/22	1	2	9.5	-----	23.8	ED,R,MN,IVC, W,IVN
AC87123-4	8/2	1	1	4.8	-----	4.8	W,IVC
AC82359-1	8/29	1	2	9.5	-----	9.5	W,IVC
AC82363-3	7/22	1	6	28.6	-----	9.5	R,IVC,Ex.FIwr.
AC84437-2	7/22	2	8	38.1	-----	42.9	R,ED,W,MN,IVC
AC87313-3	8/18	2	6	28.6	-----	28.6	W,IVC
CO87009-4	7/22	2	8	38.1	8/29	52.4	ED,R,W,MN,IVC

CO87017-5	7/22	3	16	76.2	7/22	76.2	ED,R,MN,IVC, IVN,Ex.FIwr.
CO87062-5	7/22	2	3	14.3	8/18	66.7	W,MN,IVC,IVN
CO87062-6	7/22	1	1	4.8	8/18	90.5	W,MN,IVC,IVN
CO87090-5	7/22	2	12	57.1	7/22	71.4	ED,R,MN,IVC, W,IVN
CO87106-5	8/18	2	2	9.5	-----	38.1	W,MN,IVC
CO87140-3	NONE	0	0	0	-----	0	
CENTENNIAL	8/2	3	10	47.6	8/29	52.4	W,MN,IVC,IVN
R. BURBANK	7/22	2	7	33.3	-----	14.3	ED,R,IVC,W,MN
SANGRE	NONE	0	0	0	-----	0	
WNC230-14	8/29	2	2	9.5	-----	9.5	W,MN,IVC

KEY TO SYMPTOMS: ED-early dwarf, R-rosette, IVC-interveinal chlorosis, IVN-interveinal necrosis, MN-marginal necrosis & W-wilt. Planting date - 5/6/94. Last reading taken on 8/29/94, approx. 115 DAP. ** & * Indicates clones previously tested for two or one years, respectively.

Objective 2) BRR expression in microplants final report will be forthcoming.

Objective 3) In 1994, seed blocks were started to provide virus infected and healthy planting stock for trails in 1995. Minitubers of CO80011-5, Russet Norkotah, and seed pieces of Russet Burbank were inoculated with PVY obtained from a San Luis Valley seed lot of CO80011-5. Plants were tested late in the season for potato viruses X, Y, and S. Potato virus X was not detected and plants with PVY were flagged and tubers harvested. Potato virus S was found in all stocks even if they were S free as minitubers. Visual mosaic symptoms were recorded and each plant was tested with a serological assay (DTBA) which is similar in principle and accuracy to ELISA.

Objectives:

1. Determine effect of nitrogen levels on timing of mosaic symptom expression.
2. Determine amount of yield loss from PVY.
3. Compare yield differences among healthy plants under different nitrogen levels.

Table 1. Percent virus from mechanical inoculation of cultivars with potato virus Y, Center, Colorado 1994.

	Number inoculated	Percent			
		Visual mosaic	PVY ¹	PVS	PVX
Russet Norkotah	92	15.2	14.1	23.9	0.0
CO80011-5	54	14.8	33.3	14.8	0.0
Russet Burbank	71	18.3	28.2	87.3	0.0

¹Virus detected with serological assay (direct tissue blotting assay).

COLORADO STATE UNIVERSITY
DIRECTORY OF CURRENT POTATO
RESEARCH AND EXTENSION PERSONNEL
AND AREAS OF EXPERTISE

The San Luis Valley Research Center, as part of the Colorado State University Agricultural Experiment Station system, provides local expertise and research capability in many facets of potato production. Several campus based faculty in various academic departments also conduct or interact with potato research and extension programs at the San Luis Valley Research Center.

Department of Horticulture - San Luis Valley Research Center

- *David G. Holm*, Superintendent and Associate Professor - Potato Breeding and Physiology; 719-754-3594.
- *Robert D. Davidson*, Assistant Professor, State Seed Potato Specialist and Manager of Potato Certification Service - Potato Diseases and Seed Production; 719-754-3496.
- *Asunta L. Thompson-Johns*, Assistant Professor - Potato Management and Physiology; 719-754-3594 (effective June 1, 1995).
- *Jonathan L. Whitworth*, Research Associate, Assistant Manager of Potato Certification Service - Potato Diseases and Seed Production; 719-754-3496.

San Luis Valley Area Cooperative Extension

- *Richard T. Zink*, State Potato Specialist - Production Management and Diseases; 719-754-3495.

Department of Biology

- *A. S. N. Reddy*, Assistant Professor - Biotechnology and Fungal Disease Resistance; 303-491-5773.

Department of Food Science and Human Nutrition

- *Joseph A. Maga*, Professor - Postharvest Quality Evaluations and Processing; 303-491-6705.

Department of Horticulture

- *Cecil Stushnoff*, Professor - Biochemistry; 303-491-7110.

Department of Plant Pathology and Weed Science

- *Carol A. Ishimaru*, Assistant Professor - Biotechnology and Bacterial Diseases; 303-491-7726.
- *Scott Nissen*, Assistant Professor - Weed Science; 303-491-5261.

Department of Soil and Crop Sciences

- *Nora Lapitan*, Assistant Professor - Biotechnology and Bacterial Disease Resistance; 303-491-1921.

POTATO DISEASES - RESEARCH PERSONNEL

The following is a list of researchers involved with the potato disease effort in Colorado. Researchers are listed under general disease/pest categories.

Bacterial	Robert Davidson, Carol Ishimaru, Jonathan Whitworth, Nora Lapitan and A.S.N. Reddy
Viral	Jonathan Whitworth and Robert Davidson
Fungal (Soil)	Richard Zink, Robert Davidson and A.S.N. Reddy
Fungal (Foliar)	Robert Davidson, Richard Zink and A.S.N. Reddy
Insects	Jonathan Whitworth
Nematodes	Richard Zink
Seed & Tissue Culture	Robert Davidson and Jonathan Whitworth
Chemicals	As needed by grower/researcher
Storage	As needed by grower/researcher

Other approaches to disease control include...

Cultivar Development

Potato Biotechnology

Production/Management and IPM

Affiliated programs: Seed Potato Certification and Water Quality/BMP's