

Research Proposal for 1989

Rob Davidson
CSU Extension Seed Potato Specialist

- 1) To continue with the leafroll evaluation program on the new clones being developed by the Cultivar Development program. In-field inoculations with viruliferous aphids and follow-up growout and testing of the daughter tubers in Oceanside, Ca. and the San Luis Valley will be utilized.
- 2) To continue examining natural in-field spread of leafroll in those clones and cultivars selected for growth in the San Luis Valley. The results from these plots should give an indication of intensity and timing of leafroll symptom development in the clones and an overall potential for in-field leafroll spread as compared to cultivars currently being grown in the San Luis Valley.

Budget Request

Labor and supplies 1) \$250.00
2) \$500.00

Total \$750.00

CLONAL EVALUATION FOR REACTION TO POTATO LEAFROLL INFECTION

Rob Davidson

CSU Extension Seed Potato Specialist

Situation statement

Disease management strategies in the San Luis Valley are of critical importance to the potato crop in any given year. Over the past few years there has been a great deal of effort put forth in controlling potato leafroll virus infection in the seed potato crop and ultimately in the commercial potato crop. The success of this effort has been outstanding. The reason for working with leafroll control stems from the fact that infection with this virus can result in serious yield losses and quality problems as well as provide a focal point for infection of other potato fields. Potato cultivars which act as symptomless hosts for the virus can provide a reservoir of inoculum which can have serious implications for those cultivars which are susceptible to infection.

Major objectives

The Potato Certification program in conjunction with the Cultivar Development program is very interested in screening all new clones for their reaction to leafroll infection. If a clone shows weak or latent symptoms for leafroll after infection, it is of great importance that we know about it before its release to the general potato industry in the San Luis Valley. In this way, strategies for working with the clone can be developed which should benefit any growers intent on raising it for seed and eventual commercial production.

Current status

This program has been in existence for several years. Each year up to 15 clones are screened for their reaction to leafroll infection. The program has been instrumental in recognizing clones which may act as reservoirs for the leafroll virus. Two such clones are the WNC230-14 and AC77652-1. While there is still some question whether this lack of reaction to leafroll is due to non-infection or a natural immunity by the plant, there is more than enough evidence to suggest that these clones could have been leafroll reservoirs under San Luis Valley conditions.

Current years results

Table 1 describes the results from the growout in Oceanside, Ca. As this table indicates, there is very good leafroll expression evident in all clones except CO8138-6. This clone expressed very mild to non-existent symptoms. This may have been due to the fact that infection did not take place or that the clone is simply a mild expressor. Further work and a growout of the tubers in the San Luis Valley will take place in 1989 to verify this.

Future plans

To continue with the evaluation of new clonal material from the Cultivar Development program.

Table 1: Clonal symptom expression for leafroll in Oceanside, Ca.

1988 readings

<u>Clone #</u>		<u>Symptom expression (0-3)</u>
A74212-1	3	CC, WP
AC7869-17	3	CC, LL
AC81198-11	3	CC, WP
BC0169-12	3	CC, WP (purpling at the leaf margins)
BC0224-3 on leaves)	3	CC, LL early, WP later (heavy bronzing
CO7918-11	3	CC, LL early, WP later
CO8138-6	0-1	Light CC, Light LL
CO8182-1	3	CC, LL early, WP later
CO8190-1 later)	3	Heavy CC, WP (plant turns very yellow
CO8195-4	2	Light CC, LL
CO81103-1	3	CC, WP (leaf margin necrosis)
NDTX9-1068-11R	3	CC, WP
Centennial	3	CC, WP
Russet Burbank	3	CC, WP
Sangre	3	CC, WP
Ute Russet	3	CC, WP

Rating for the symptom expression is 0 for no symptoms to 3 for good typical symptoms. WP indicates whole plant involvement, LL indicates only lower leaf rolling, and CC indicates good color change evident as compared to the healthy control in each case.

Ratings for the clones did not change from the first to the second reading dates indicating that all should show leafroll early to medium under SLV conditions (by mid July).

CLONAL EVALUATION FOR NATURAL IN-FIELD SPREAD OF LEAFROLL

Rob Davidson
CSU Extension Seed Potato Specialist

Situation statement

Understanding the nature of leafroll spread in the San Luis Valley provides us with a very important tool in managing the disease. One important aspect in the study of leafroll spread concerns the extreme variability between different clones and cultivars to this spread. There has been research in the last few years which would indicate that potato cultivars differ dramatically in their ability to become infected with leafroll and spread this infection from one plant to the next even when adequate numbers of leafroll vectors are present. By learning the leafroll spread potential of the clones and cultivars grown in the San Luis Valley, management of the disease, especially in regards to field increase, should be realistic.

Major objectives

To create a field situation utilizing strategically placed leafroll infected plants within a specified number of plants to be tested which will mimic conditions conducive to leafroll spread under natural (SLV) conditions. This is done in a replicated, statistically usable manner so that each clone or cultivar screened may be compared with other known cultivars. In this manner, leafroll spread information can be generated which should give some idea of the potential of a given clone or cultivar to become infected and thus give the grower some ammunition for dealing with the disease prior to planting large acreages. This will have implications in insect control programs and roguing situations.

Current status

This program is four years old. Each year up to 20 clones and cultivars are screened against known standards for leafroll spread. These clones and cultivars tested are then rated for spread against the standards in a way that will allow the grower to make an informed decision about both the leafroll present in the crop and ways to control its spread. Previous year's data have shown that some clones released have spread rates very similar to Russet Burbank. This might have implications to a grower's program if he has been raising only Centennial or Sangre which demonstrate good resistance to leafroll spread in the field.

Current years results

Table 1 describes the results obtained from the growout in Oceanside, Ca. As this table indicates, 1988 was similar to 1987 in the amount of leafroll spread which was obtained. This was a relatively low aphid year and spread rates were overall quite low. It is interesting to note that three clones had fairly high leafroll spread rates (AC77101-1, AC79100-1 and Russet Nugget) which in a normal year would be quite comparable to Russet Burbank. It is hard to say whether or not Russet Burbank had a good spread in 1988 as there were some problems with its germination and

rotting in the ground. However, Green Mountain which is a cultivar placed in the same leafroll spread group as Russet Burbank had 8.5% spread which could act as a comparison. AC79100-1 is no longer in the Cultivar Development program, but did show spread rates similar to 1987. Russet Nugget showed a dramatic increase from 1987 moving from 0 spread to 18.1% in 1988. Under these conditions it should be understood that leafroll management in Russet Nugget may require a very rigorous insect control program and an intensive roguing effort when the window for roguing this cultivar is available.

Future plans

To continue to generate information of this nature in an effort to keep growers informed of the potential of new clones and cultivars for leafroll spread.

Table 1: Clonal Evaluation for natural in-field spread of leafroll

1988 readings

<u>Clone #</u>	<u># pos. PLRV/# tested</u>	<u>Percent spread</u>
A74212-1	0/54	0
AC77101-1	8/37	21.6
AC77226-13	0/50	0
AC77652-1	0/45	0
AC79100-1	6/43	14.0
AC80545-1	2/39	5.1
BC0038-1	2/44	4.5
BR7093-24	2/43	4.7
CO8011-5	2/44	4.5
Russet Nugget	8/44	18.1
WNC230-14	0/41	0
Centennial	0/56	0
Russet Burbank	0/39	0
Sangre	1/33	3.0
Ute Russet	0/42	0
Green Mountain	4/47	8.5
Houma	0/51	0
Katahdin	0/48	0
Keswick	0/39	0
Penobscot	0/49	0

These results represent the cumulative data collected from harvesting two tubers per plant, 12 plants per replication and three replications total. There is a possibility of 72 tubers within each clone or cultivar for testing.

Potato Leafroll evaluation of the clones near release by the variety development program.

Suggested guidelines to follow to answer the questions pertinent to seed potato certification in the San Luis Valley.

- 1) In the winter, plant and grow clones to be tested. Aphid inoculate these with Leafroll at an early stage of growth. Grow out to maturity and harvest the tubers. These tubers should be planted at Oceanside, California in the Potato Certification Winter Test Plots to observe Leafroll symptoms. This is the preliminary step upon receiving the clones for evaluation.
- 2) Plant and grow out the clones to be tested in the roguing plot at the SLVRC. Inoculate with aphids (viruliferous) at an early stage of growth and examine later in the season for current season symptoms. Harvest tubers and plant back the following season in the SLV and at the current Winter Test Plots to examine Leafroll symptoms.
- 3) Describe Leafroll symptoms with each clone. Compare the symptom development with known cultivars (Russet Burbank, Centennial Russet) and describe as early, medium, or late for symptom expression.

Take color slides of each clone, both healthy and infected, showing Leafroll symptoms, to place in the cultivar description upon release.

Other projects to consider in conjunction with the Leafroll evaluation of the new clones----

- 1) To examine the natural Leafroll field spread in a new clone and how this compares with other known cultivars such as Russet Burbank and Centennial Russet, it may be desirable to establish a series of plots. In these plots a known Leafroll source plant could be placed within a block of each clone, replicated at least 3 times. Hills adjacent to the known Leafroll plant would then be harvested and grown out to check on the natural Leafroll spread. When compared to a known cultivar such as Russet Burbank some indications may be drawn as to how much natural spread may occur in a given year.
- 2) To develop a sheet on each new clone released including descriptions of all the important diseases and color plates of typical disease reactions.