

**Title:** Potato Disease Management – 2008 Proposal

**Investigators:** Robert D. Davidson and Andrew J. Houser  
Department of Horticulture and Landscape Architecture  
San Luis Valley Research Center

**Funding requested from:** CPAC

**Nature and Objectives:**

This is the annual general request for funds to support approximately 50% of the cost of a range of research projects related to control and management of potato diseases specific to the San Luis Valley. For the most part, these are long term projects designed to address evolving chronic disease problems which limit potato production. Funds being requested are for fixed expenses: primarily labor (full time and hourly) and land rent. Each year the scope of work accomplished within this project expands, however, the base level funding request has remained relatively flat.

The potato industry in the San Luis Valley continues to be faced with serious disease management challenges. These challenges have been made more difficult recently because of the water situation. Seed borne diseases such as powdery scab, pink rot, and silver scurf require increasingly sophisticated management schemes. While growers seem to have a handle on control of the foliar phase of early blight, the tuber phase continues to be damaging and difficult to control. Potato late blight was found in the Valley in 2007 and will complicate the control of these fungal diseases. Potato leafroll and potato virus Y are now epidemic in certain cultivars, particularly Russet Norkotah. In the short term, certified seed stocks of these cultivars will be quite limited. Long term, the potato industry will need to flush out the high mosaic/leafroll stocks and consider the use of more resistant cultivars to replace the acreage of these more problematic ones.

Efficacy trials are a permanent component of this overall research effort. These trials generate the basic information required by product manufacturers, the EPA and State Department of Agriculture for labeling and registration. Ongoing evaluation of products is essential to maintaining current labels as well as justifying Section 18, LSN24C, and Section 3 registrations for new products or established products with label variations. Availability of new crop care products to potato growers in Colorado is contingent upon scientifically valid data developed within the University on a regional basis. Resistance management among fungicides, both foliar and soil applied, is becoming even more critical as many products have similar modes of action. Therefore, development of comprehensive season-long fungicide programs for potato which rotate various chemistries with different modes of action will require more attention than in the past.

Finally, evaluation of advanced clones from the CSU Cultivar Development program for reaction to several critical diseases will continue as a permanent component of this research effort. The increasing threat of major diseases, especially from out-of-Valley sources, and the use of Plant Variety Protection for new cultivars make this work central to protecting grower and University interests. In addition, these evaluations provide valuable information to the producer of new cultivars so that the threat from many diseases is mitigated.

**Methods, Procedures and Facilities:**

Objective 1: *Efficacy trials:* Trials will occur at several locations. Early blight, pink rot, silver scurf, and seed piece treatment/decay trials will be conducted on station under solid set irrigation with at least one off-station site on a grower cooperator's land. Early blight trials will focus on the proper order for applying fungicides to maximize efficacy against early blight and late blight with consideration for appropriate rotations of the various chemicals and modes of action.

Objective 2: *Advanced selection disease evaluations:* Evaluation of advanced selections from the CSU Cultivar Development program for reactions to PLRV and PVY as well as reactions to ring rot will be conducted off-station with a cooperating grower. Evaluation for powdery scab, PVY, early blight tuber rot, dry rot, and soft rot will be conducted in the SLVRC Processing building or the isolation greenhouses.

Objective 3: *Powdery scab management*: Chemical and cultural control studies will be conducted off-station on a grower cooperator's land known to have a high incidence of disease. Additional work at this site will focus on better understanding of the various environmental and production practices that influence amount of scab in the crop. Screening compounds for activity against *Spongospora subterranea* will be conducted at the station in the isolation greenhouses. This will be the final year for development of the appropriate delivery system for placement of Omega (fluazinam) fungicide to control powdery scab. Additionally, screening environmentally friendly chemistries such as compost teas (as part of a larger EPA grant) will be conducted both on station and at off-station sites.

Objective 4: *Biological agent trials*: Evaluation of biological agents, compost teas, and products to increase plant defense systems and corresponding yield and quality will be evaluated on station.

**Resource needs at the SLVRC:**

All resources necessary to conduct these projects are currently available or will be purchased as needed.

**Relationship of Proposed Research to Overall Problem:**

The proposed research is driven by the compliment of disease problems that limit potato production and quality of the crop in the San Luis Valley. The specific components of this research effort have been identified and ranked by SLV potato growers through annual surveys and direct contacts.

**Potential for Leveraging Outside Funding:**

Historically, funds granted by the CPAC to the Potato Disease Management research project have been used to leverage outside funds from agricultural chemical companies, Colorado Certified Potato Growers' Association, CSU, AES, and USDA-CSREES. In general terms, for each dollar of base level funding from the CPAC, there have been two to three dollars leveraged from outside, non-Colorado potato industry, sources. It is, however, only by virtue of consistent base level funding that assures the presence of the project Research Associate, Andrew Houser, that these outside sources of funding can be secured.

**Time line for Proposed Research:**

These projects are in various stages of completion. For efficacy trials, data are generated each year and used in registration and labeling of new products and local use recommendations for existing and new products. Data from cultivar evaluation studies is derived year-to-year and used by the CSU Cultivar Development program and states in the Western Regional Cultivar Development Program in the long term assessment of new releases, development of cultural management sheets for each cultivar released, and in preparing application for Federal Plant Variety Protection. Research on powdery scab was formally started in 2001 and is expected to continue for the coming two years. Several approaches to control and management of this disease are being pursued. Studies on the control and biology of the pink rot fungus will continue for two to three years with clonal evaluation for symptoms being a priority. The drip vs. overhead irrigation studies are scheduled for one more year. The study of biologicals and compost teas will last from two to three years.

**Progress in 2007:**

- ▶ Confirmed the cost effectiveness and the ability to control foliar early blight disease when applying three fungicides at the proper time. Verified that the 650 DD model used for early blight is accurate and should be an excellent starting point for fungicide applications. Demonstrated that fungicide programs involving two to three applications, with one of the applications being a strobilurin class fungicide, reduced disease to acceptable levels. Also demonstrated that applying two to three fungicides later season was as effective as applying fungicides when timed with the early blight degree day model (650 DD) for disease control. Effect of these application intervals was correlated with early blight tuber decay and showed little difference in symptoms regardless of the timing.

- ▶ Confirmed the effectiveness of Omega in controlling powdery scab when applied in-furrow at planting. Confirmed that use of a split nozzle during application of in-furrow Omega (seed piece and surrounding soil) was more effective than use of only spraying over the seed piece. Earlier results from this project helped obtain a LSN24C label for commercial use of Omega on potatoes for the 2007 season. Overall grower success when using Omega was quite good (three growers participated in the evaluations).
- ▶ Provided a response to the finding of late blight in the San Luis Valley by timely communications, grower field visits, working with local fieldmen/consultants, and working with various chemical company representatives. Recorded late blight severity units at three valley locations (Blanca, Hooper, and Sargent), calculated and reported on the SLVRC web page and on phone message (at SLVRC) the early blight and nematode degree days throughout 2007 season to assist in timely, effective application of fungicides and/or insecticides. Found that the late blight forecast models used in Colorado (Fry and Wallin) were accurate within a week of finding the first late blight foliar symptoms.
- ▶ Evaluated russet cultivars and the same cultivars with skin mutations (i.e., lacking a russet skin) for powdery scab lesion development. Determined that development of a russet skin provides resistance to lesion development; presumably due to either impeding infection or the actual russet development. Work with Dr. Jayanty to identify the components of resistance in the russet cultivars will continue, but not be part of this project in the coming year. Continued to evaluate best greenhouse conditions for symptom development for powdery scab which matches field data (Andrew Houser, M.S. degree).

**Objectives and Expected Accomplishments for 2008:**

- ▶ Supply a comprehensive data package on the disease reactions of all new potato clones released from CSU. Reduce potential for the release of problematic cultivars. Conduct earlier screening of new germplasm for resistance to powdery scab and potato virus Y in the greenhouse.
- ▶ Work toward the development of a long term management strategy of pink rot in the San Luis Valley (in cooperation with Agro Engineering) using existing research information and supplementing with very focused research under SLV conditions.
- ▶ Develop a multi-component management regime for powdery scab for use where a determined degree of control is economically justified. Finalize research with the fungicide Omega; in-furrow placement in the hill, levels of control based upon soil potential, etc. Included in this effort is the development of long term management strategies to reduce potential build up of powdery scab in SLV soils. Work with Dr. Barb Christ and Dr. Sastry Jayanty to provide a PCR test for soil assay representing the potential spore population in the soils tested. Work with a new chemistry, Zonex, in combination with Omega, in a greenhouse setting to verify efficacy of these chemicals in combination in reducing powdery scab root gall and tuber symptoms.
- ▶ Generate information for potato growers, through efficacy trials, that can be used to reduce expenditures on fungicides based on specific data for crop care products addressing rates, combinations, sequences, rotations, season long programs, application timing, and less costly generic alternatives. Additionally, provide timely information about late blight potential in the Valley by coordinating an effort to inspect all out-of-state seed sources, pursue more aggressive fungicide spray programs, and provide consistent communication with the overall industry during the eradication efforts.
- ▶ Finish drip tape project in southeast corner of station.
- ▶ Evaluate for a second year biologicals, compost teas, and other products to increase plant defense systems and corresponding yield and quality.

**Funding History:** 2000, \$21,000; '01, \$18,000; '02, \$27,000; '03, \$25,000; '04, \$29,000; '05, \$20,000; '06, 25,000; '07, 25,000

**Budget for 2008:** \$30,000

Labor: Full time (50% Research Associate) + part time plot labor	\$25,000
Land rent (\$2,500) + supplies (\$2,500)	\$ 5,000