

**AGRICULTURAL EXPERIMENT STATION  
SAN LUIS VALLEY RESEARCH CENTER  
2004 PROPOSAL FOR POTATO RESEARCH FUNDED BY CPAC**

**Title:** Potato Disease Management

**Investigators:** Richard Zink and Robert Davidson  
Department of Horticulture and Landscape Architecture

**Nature and Objectives:**

This is a general proposal for funds to support approximately 50 percent of the cost of a range of research projects related to controlling diseases of potato specific to the San Luis Valley. These are ongoing long term projects designed to address evolving chronic disease problems limiting potato production. Funds being requested are for fixed expenses: primarily labor (full time and hourly), supplies, and land rent. Each year the scope of work done within this project expands, however the base level funding request remains unchanged.

The potato industry in the San Luis Valley continues to be faced with serious disease management challenges. Early blight continues to be damaging and difficult to control. Potato leafroll and potato virus Y are now epidemic in major cultivars. Seed-borne and soil-borne diseases such as powdery scab, pink rot, silver scurf, and *Rhizoctonia* require increasingly sophisticated management schemes. Although cultural practices and varietal resistance are of great value, these diseases will be controlled to a large extent by utilizing clean seed, good management techniques, and judicious use of chemicals.

Efficacy trials are a permanent component of the overall research effort at the San Luis Valley Research Center. 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. 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 new products have similar modes of action. Therefore, development of season-long fungicide programs for potato require more attention than ever in the past.

Evaluation of advanced clones from the Cultivar Development Program for reaction to several critical diseases is also a permanent component of the overall research effort. The increasing threat of several major disease problems and the advent of Plant Variety Protection for new cultivars makes this a major thrust for protecting the growers' and the University's interests. In addition, these evaluations can provide valuable information to the producer of new cultivars so that the threat from many diseases can be mitigated.

**Methods, Procedures and Facilities:**

- The research to be conducted under this proposal will occur in several locations. Fungicide efficacy trials for early blight, pink rot, seed piece decay and *Rhizoctonia* will be carried out on the southwest corner of the SLVRC under solid set irrigation.
- Evaluation of advanced selections from the potato breeding program for reactions to PVY, leafroll and ring rot will be done off station on the "Sam Selters" corner.

- Evaluation of advanced selection from the potato breeding program for reactions to early blight tuber rot, dry rot and soft rot will be done as post harvest tuber tests in the Potato Certification laboratory.
- Chemical and cultural control studies for powdery scab will be conducted off station on the potato farm of a cooperator where disease incidence is known to be high.
- Screening compounds for activity against *Spongospora subterranea* and large scale screening of new potato clones early in the selection process for resistance to powdery scab will be done in the new greenhouse at the Research Center.
- Evaluation of fungicides and application methods for control of pink rot will be done on station. An off station site will be developed for a long-term study on the biology of the pink rot fungus and the dynamics of resistance to Ridomil. New clones and cultivars will be ranked for susceptible to pink rot using laboratory techniques.
- New classes of fungicides for control of post-harvest diseases of potato tubers will be evaluated at the SLVRC in storage research units.

**Resource Needs at the SLVRC:**

All resources needed to carry out these projects are currently in place within the operations of the Research Center. No equipment purchases will be necessary.

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

The proposed research is driven by the compliment of disease problems that limit the efficiencies of potato production in the San Luis Valley. The specific components of this research effort have been identified and ranked by our 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 Grower Association, CSU AES, and USDA CSREES. In general terms, for each dollar of base level funding from the CPAC we have been able to leverage two dollars from outside, non-Colorado potato industry, sources. It is, however, only by virtue of consistent base level funding, assuring a full time Research Associate, that these outside sources of funds can be pursued.

**Time line of Proposed Research:**

These are ongoing projects. For efficacy trials, data are generated each year that are used in registration and labeling of new products and local use recommendations for existing and new products. Data from cultivar evaluation studies is accumulated from year-to-year and used by the potato breeding program in the long-term assessment of new releases. Research on powdery scab was formally started two years ago and is expected to continue for the coming three to five years. This is base level applied research into the biology and control of this disease in the San Luis Valley. It is difficult to know where this work on powdery scab will lead, only that as many approaches to control are being pursued as possible. Studies on the biology of the pink rot fungus and fungicide resistance will need to run for three to five years.

### **Progress in 2003:**

- Evaluated Omega and Ridomil Gold fungicide programs applied through chemigation for control of pink rot.
- Evaluated three Omega Application timings applied through chemigation for control of powdery scab.
- Evaluated six fungicide and insecticide programs for control of aphids, early blight, and black scurf.
- Compared tuber quality in two fields by comparing certified and common seed sources.
- Evaluated sixteen season-long fungicide programs for control of early blight.
- Tested nine potato seed piece treatments for control of *Rhizoctonia*, *Fusarium* dry rot, and bacterial soft rot
- Evaluated ten treatments as in-furrow applications for control of *Rhizoctonia* on potato stems, stolons and tubers
- Evaluated nineteen chemical treatments as in-furrow applications and one seed treatment for control of powdery scab.
- Evaluated temperature on the incidence of *Spongospora subterranea* on roots and tubers.
- Evaluated seven fungicide application programs for control of pink rot.
- Data was collected from four weather stations in the San Luis Valley to predict late blight onset.
- Collaborated with Dr. Barbara Christ at Pennsylvania State University on powdery scab research and chemical control studies.
- Advanced powdery scab research effort through co-authoring two USDA funded projects with Dr. Barbara Christ, Penn State University, and Dr. Kathy Haynes, USDA/ARS, Beltsville.
- Evaluated thirty advanced clones for reaction to potato leafroll virus and PVY.
- Evaluated seventy-four advanced clones and cultivars for reaction to bacterial ring rot.
- Evaluated twenty-six advanced clones and cultivars for reaction to storage rots.
- Evaluated thirty advanced clones and cultivars for reaction to potato leafroll virus and natural in field spread.
- Evaluated Omega and Ridomil Gold fungicide programs applied through chemigation for control of pink rot.
- Evaluated three Omega Application timings applied through chemigation for control of powdery scab.
- Evaluated six fungicide and insecticide programs for control of aphids, early blight, and black scurf.
- Compared tuber quality in two fields by comparing certified and common seed sources in each field.

### **Milestones:**

- Confirmed the economic benefits of applying Quadris in-furrow at planting to control *Rhizoctonia* stem and stolon canker and tuber black scurf.
- Demonstrated the value and efficacy of Headline as an equivalent alternative fungicide to Quadris for control of foliar early blight on potato under San Luis Valley conditions.
- Confirmed equal control of pink rot with a less costly generic form of metalaxyl (FAC 321 2E) over the standard Ridomil Gold treatment.

- Elucidated that soil temperature in the San Luis Valley are ideal for development of powdery scab on tubers over the latter two thirds of the growing season during maximum tuber development. This is unlike most other potato production areas where soil temperatures are most conducive for disease in the first one third of the crop cycle.
- Confirmed that in the San Luis Valley manipulation of planting date cannot be utilized to avoid powdery scab.
- Confirmed that resistance to *Fusarium* and *Erwinia* in several advanced clones is real after two years of screening and these clones will be moving into the advanced trials for eventual release to growers.

**Expected Accomplishments:**

- Through efficacy trials we will generate information for potato growers that can be used to reduce expenditures on pesticides. This will be in the form of specific data on crop care products that addresses: rates, combinations, sequences, rotations, season long programs and less costly generic alternatives.
- Supply comprehensive data packages on the disease reactions of all new potato cultivars released from CSU. Reduce the potential for the release of pathologically problematic potato cultivars.
- Develop a multi component management regime for powdery scab for use where a high degree of control is economically justified.
- Develop general management guidelines for powdery scab to reduce long term potential build up of the pathogen across the San Luis Valley.
- Identify application methods that improve the efficacy of Ridomil for control of pink rot. Begin to understand the dynamics of Ridomil resistance. Establish use guidelines for Ridomil to reduce the potential for resistance development.

**Budget:**

Labor: Full time labor (80% of Research Associate)		\$25,000
Supplies:	Paper bags, flags, stakes, CO <sub>2</sub> , pesticides, fertilizers, custom applications, burlap sacks, gloves, seed, herbicides, plastic spray bottles, boxes, tyvek suits	\$ 1,500
Land Rent:	Sam Selters' corner	\$ 1,500
	Powdery scab plot	\$ 1,000
	<b>Total:</b>	<b>\$29,000</b>