AGRICULTURAL EXPERIMENT STATION
SAN LUIS VALLEY RESEARCH CENTER
2005 PROPOSAL TO THE CPAC FOR POTATO RESEARCH

Title: Potato Disease Management

Investigators: Robert Davidson, Andrew Houser and Richard Zink
Department of Horticulture and Landscape Architecture, CSU

Nature and Objectives:

This is an ongoing general request 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 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) and land rent. Each year the scope of work done within this project expands, however the base level funding request has remained unchanged or decreased.

The potato industry in the San Luis Valley continues to be faced with serious disease management challenges. Seed-borne diseases such as powdery scab, pink rot, silver scurf, and *Rhizoctonia* require increasingly sophisticated management schemes. Early blight continues to be damaging and difficult to control. Potato leafroll and potato virus Y are now epidemic in major cultivars. Although cultivar resistance will be of great value, these diseases for now 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 this 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 comprehensive season-long fungicide programs for potato will require more attention than in the past.

Evaluation of advanced clones from the Cultivar Development Program for reaction to several critical diseases is also a permanent component of this research effort. The increasing threat of major diseases and the advent 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 on new cultivars so that the threat from many diseases is 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 northwest corner of the Research Center 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 biological agents and fungicides for control of pink rot will be done off station. A new off station site will be developed for long-term study of the biology of the pink rot fungus. New clones and cultivars will be ranked for susceptible to pink rot at this site.

- New classes of fungicides for control of post-harvest diseases of potato tubers will be evaluated at the Research Center in newly installed controlled environment 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 three dollars from outside, non-Colorado potato industry, sources. It is, however, only by virtue of consistent base level funding that assures a full time Research Associate, that these outside sources of funds can be secured.

Time Line for Proposed Research:

These are ongoing projects. 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 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 three years ago and is expected to continue for the coming three to five years. This is base level applied research on the biology and control of this disease in the San Luis Valley. It is difficult to know where this work will lead, only that as many approaches to control are being pursued as possible. Studies on the biology and control of the pink rot fungus will run for three to five years.

Progress in 2004:

- Evaluated three Omega chemigation timings for control of powdery scab.
- Evaluated four fungicide/insecticide programs for control of aphids and black scarf.
- Compared tuber quality in two fields for certified and common seed sources.
- Evaluated twenty one season-long fungicide programs for control of early blight.
- Evaluated thirteen treatments as in-furrow applications for control of *Rhizoctonia* on potato.
- Evaluated eight chemical treatments as in-furrow applications for control of powdery scab.
- Determined by PCR time and temperature of *Spongospora subterranea* infection of potato roots.
- Evaluated seventeen fungicide programs for control of pink rot.
- Assessed twenty three cultivars for susceptibility to powdery scab.
- Collected data from four weather stations in the San Luis Valley to predict late blight onset.
- Collaborated with Dr. Barbara Christ at Penn State University on powdery scab biology research.
- 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 fifty advanced clones and cultivars for reaction to bacterial ring rot.
- Evaluated thirty advanced clones and cultivars for reaction to storage rots.
- Evaluated twenty-two advanced clones and cultivars for reaction to potato leafroll virus and natural in field spread.

Milestones in 2004:

- 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.

- Elucidated by PCR time of root infection by *S. subterranea* and confirmed that soil temperatures in the SLV are ideal for development of powdery scab on tubers over the latter two thirds of the growing season during maximum 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 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 for 2005:

- 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.
- Establish cultural guidelines to reduce the potential for pink rot losses and help reverse the course of this disease in the San Luis Valley.
- Develop a multi component management regime for powdery scab for use where a determined 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.
- Generate information for potato growers, through efficacy trials, that can be used to reduce expenditures on pesticides based on specific data for crop care products addressing rates, combinations, sequences, rotations, season long programs and less costly generic alternatives.
- Develop a universal rating system for cultivar susceptible to powdery scab.

Funding History:

2000: $21,000
2001: $18,000
2002: $27,000
2003: $25,000
2004: $29,000

Budget for 2005:

Labor: Full time labor (50% Research Associate)	$20,000
Land Rent: Sam Selters' corner	$ 1,500
Powdery scab plot	$ 1,000
Total:	**$22,500***

*Our 2005 funding request has been reduced due to USDA ARS support for part this project.