RESEARCH PROPOSAL FOR 1997

Submitted to:

SLV Research Center Committee
and the
Colorado Potato Administrative Committee (Area II)

TITLE: An Integrated Approach to Early Blight Management on Potato

PROJECT LEADERS: Robert D. Davidson, Extension Seed Potato Specialist and Associate Professor, Richard T. Zink, Extension Potato Specialist, Asunta Thompson-Johns, Research Horticulturist and Assistant Professor, and David G. Holm, Potato Breeder and Professor San Luis Valley Research Center.

PROJECT JUSTIFICATION:

Early blight, caused by the fungus *Alternaria solani* (Ell. & G. Martin) Sor., is an annual problem in Colorado, and may result in yield losses of 20-30%. Additionally, damage to stored tubers may be extensive, resulting in loss of grade at shipment. Foliar symptoms are characterized by dark brown to black lesions on stems and leaves, usually appearing in the lower canopy first. Typically lesions contain a series of concentric rings, giving them a target or bull's eye appearance. Tuber symptoms do not appear until potatoes have been stored. Tuber lesions are generally small, circular, dark brown to black. Lesions penetrating into the tuber flesh result in brown, dry, and grainy tissue. Lesion size may increase during storage and tubers with advanced infections may shrivel. Lenticel infections can occur and are frequently accompanied by an arc or crescent pattern. Tubers with lenticel infections frequently have a peppered appearance.

A. solani overwinters in the soil on potato vine debris. It can also survive on weed hosts, such as nightshade. Short rotations can increase levels of overwintering inoculum. Spores are carried by wind and are deposited on potato leaves, or may become contaminated by brushing infested soil. The foliar phase is more severe on stressed plants. Plants which are aged, weakened by hail, suffering nutrient deficiencies, or are infected with other diseases are more susceptible. Sprinkler irrigation provides a conducive environment for spread due to alternating wet and dry periods. Tubers, on the other hand, usually require a wound before infection can take place. The abrasive nature of most Colorado potato production soils lend themselves to microscopic wounds suitable for such invasion, particularly if harvest conditions are wet. Additionally, wet conditions provide a favorable environment for spore germination, and swollen lenticels on wet tubers are easily invaded.

Disease management guidelines include planting certified seed potatoes, producing potato cultivars which are not highly susceptible, and utilizing crop rotation. Volunteer management, elimination of culls, monitoring of environmental conditions, and use of disease forecasting models can be beneficial. It is essential to maintain proper crop nutrition and water availability and utilize timely applications of labeled fungicides. Achievement of optimal tuber maturity is an important control of the tuber blight phase. Vine desiccation and harvest procedures may include vine flaming to reduce soil inoculum levels, and must incorporate anti-bruising techniques. Maintaining high relative humidity, and curing temperatures of 50 to 55F to provide optimum wound healing conditions are current recommendations for storage management.

The manifestation of tuber early blight is the number one storage related problem SLV potato producers face. A survey of bulk shippers and packing sheds, conducted in early 1996, found the economic impact of early blight tuber decay on the San Luis Valley during the first three months of shipping the 1995 crop to be in excess of $3,273,000. It was estimated that 1,084,085 hundredweight were affected. This survey found that varieties, ranking from most to least affected, were Ranger Russet, CO80011-5 (Crestone Russet), Frontier Russet , Sangre, Century Russet, Russet Norkotah and Centennial Russet. Currently, no fungicides are labeled for post-harvest application to tubers intended for human consumption. Grower/packer input in recent weeks indicates problems in the 1996 crop may be as great, and perhaps even more severe, than during the previous shipping season, and that additional cultivars are affected.

Control of the foliar phase of *A. solani* costs the industry an estimated $1,365,000. Potato producers in northeastern Colorado have been experiencing earlier and more severe outbreaks of the disease, as well as the documented problems in the San Luis Valley. Control of the foliar phase does not guarantee freedom from the tuber phase in storage. Tuber problems are associated with the adequacy of skin set, physiological and/or chemical maturity of tubers, and bruising at harvest. Presence of inoculum, and temperature and moisture in storage are also important components. Near complete control of the foliar phase may actually result in more problems in storage, since vines and tubers may be in a more juvenile state at the time of vine desiccation and subsequently at harvest. If haulms are permitted to partially senesce prior to vine kill and harvest, skin set improves.

The potato industry and research personnel need a better understanding regarding the relation of nutrient management to time and quality of skin set for various cultivars, what germplasm is available with resistance to the tuber phase, and the virulence of isolates of the pathogen located in the SLV. The lack of good information on these topics, coupled with the lack of chemical controls for tubers intended for fresh consumption going into storage, and the fact that the San Luis Valley is unique in its environmental conditions and the diversity of varieties growers produce, make this proposal a critical area for research.

PROJECT STATUS: New

SIGNIFICANT ACCOMPLISHMENTS FOR 1996: Not Applicable

OBJECTIVES FOR 1997:

1. To assess and document the degree of early blight tuber decay in the SLV potato industry.

2. To determine the relationship between various production scenarios in the SLV to the incidence of early blight tuber decay. This will include development of appropriate cultural management strategies for foliar applications of fungicides, application of nutrients, irrigation, vine killing methods and temperature at time of harvest in relation to skin set development and tuber maturity.

3. To characterize the virulence of *A. solani* isolates for the SLV and compare with isolates from other production areas.

4. To compare storage regimes and develop a data base of information guiding appropriate management strategies related to curing period, rate of cooling, humidity levels, and final temperature for long-term storage.

PROPOSAL PROCEDURES/TIMELINE:

1. Survey producers for incidence of tuber blight, tied with production and storage practices. Summer 1997.

2. Initiate field trials at the San Luis Valley Research Center and in cooperator fields to assess fungicide application, nutrient and water management, and vine killing procedures. Skin set at time of vine kill and harvest, and incidence of tuber blight development in storage will be evaluated and compared to the different production scenarios. Early Spring 1997 through Early Spring 1998.

3. Obtain SLV isolates and screen for virulence and fungicide resistance. February through December 1997.

4. Evaluate germplasm for foliar and tuber infections under typical SLV production practices. July 1997 through December 1997.

5. Correlate storage management regimes to incidence and severity of early blight tuber decay. Fall 1997 through Summer 1998.

PROPOSAL HYPOTHESIS:

There are unique environmental conditions coupled with progressive cultural practices and the loss of chemical controls, which in concert, foster an unprecedented situation with early blight tuber decay in the SLV potato crop. The increased incidence and severity of early blight tuber decay in all potato varieties will only be mitigated by a comprehensive research approach utilizing several different components of potato production and developing a better understanding of the etiology of the disease.

PROPOSAL DURATION: Two years.

COLLABORATORS:

San Luis Valley potato producers (seed and commercial)
San Luis Valley potato bulk shippers and packing sheds
Area consultants and agribusinesses
San Luis Valley Research Center staff

FUNDING REQUESTED:

1996 Allocation: Not Applicable

1997 Request:

	1997	1998
Temporary Salary	$12,000	$12,000
Fringe (8.3% of temporary help)	1,000	1,000
Travel	3,000	3,000
Supplies	4,000	4,000
Grand Total	$20,000	$20,000

RELEVANT LITERATURE:

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