

**Postharvest Research Program  
San Luis Valley Research Center  
Proposals for 2007**

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**Most Relevant Funding Source:** CPAC

The Postharvest research program at the San Luis Valley Research Center is designed to address some of the issues faced by the industry related to storage management and physiological disorders during storage. The research program caters to the unique needs of the industry in the valley. These projects are carried out in collaboration with other faculty at SLVRC and also at main campus. Detailed project descriptions are given below, describing methods and expected outcomes.

**Project 1**

**Title:** Studying the effects of 1, 4-Dimethyl naphthalene (1,4-DMN) (trade names 1,4-Seed and 1,4-Amplify) on sprout suppression in seed potatoes and pressure bruise control in potato storage.

**Nature, scope, objectives of proposed research**

Ethyl substituted naphthalenes are naturally occurring in potato tubers, provides short term sprout suppressant activity. 1, 4-DMN is marketed specifically to control sprouting in seed during storage and transit.

Objective 1: Cultivars with different levels of dormancy will be tested at different concentrations of 1, 4-DMN applied at various intervals. Tubers will be stored at 45°F to stimulate commercial seed storage conditions. Tubers, after five months of storage, will be regularly evaluated for sprouting. Seed will be planted and tested for emergence, stem number, tuber size and yield. This is a continuation of last year's project. The objective of this study is to find how different cultivars respond to 1, 4-DMN application in seed storage.

Objective 2: I initiated a project last year to study the effect of DMN on pressure bruise. We are in the process of collecting data from last year's study. This project will be repeated to get a reliable 3 years data.

**Relationship of proposed research to overall problem for potato growers**

Earlier studies show that treatment with this chemical can increase the stem number resulting reduced tuber size. The main advantage of 1, 4-DMN application is sprout inhibition during transit and allows the storing of potato seed at elevated temperatures. This study directly benefits the potato seed industry in the valley.

1, 4-DMN is widely used to suppress pressure bruise but the extent of its contribution is still under study.

**Timeline (1-2yr)**

1<sup>st</sup> year: a. Testing the sprout set, stem number, tuber size and yield with 1, 4-DMN treatment  
b. Testing the effect of 1, 4-DMN treatment, and variable speed fans on pressure bruise

2<sup>nd</sup> Year: Repeating the experiments on pressure bruise to confirm results.

## **Project II**

### **Title: Developing a disease monitoring tool in storage**

#### **Nature and scope of proposed research.**

Early detection of diseases in potato storages gives a number of options to the storage manager. Tubers can be marketed early to limit the losses. Remedial measures such as reducing the humidity and running dry air through the storage can reduce disease spread. Additionally, isolating the infected area can be effective in reducing the disease spread if marketing conditions are not economically viable.

By combining the sensitivity of GC-MS (Gas chromatography- Mass spectrometry) and PCR (polymerase chain reaction) detection technology, volatiles released from infected potatoes and DNA isolated from fungal spores will be used to monitor the conditions of potato storage. Our aim is to develop a simple, sensitive and cost effective detection tool, useful for commercial operations to detect a variety of soil-borne pathogens in potato storages prior to significant decay losses. In addition, newly developed detection tools will be utilized in ongoing studies evaluating the efficacy of various management options (e.g., cover crops) to control soil-borne pathogens both in the field and in potato storages.

#### **Objectives:**

1. Develop a tool to monitor diseases in potato storages based on characteristic volatiles.
2. Use PCR to amplify trapped spores on polycarbonate filters with highly specific primers.
3. Expand the technique for quantitative assessment for disease risk and predicting storability. Initially, specific volatile signatures will be collected from potato tubers infected with specific fungal and bacterial strains using GC/MS under laboratory conditions. This will be expanded to large potato storage rooms.

#### **Relationship of proposed research to overall problem for potato growers**

Postharvest losses mainly due to diseases in storage typically account for 8 to 30% overall in the potato industry, and sometimes even greater losses are reported. Poor handling of tubers during harvest leads to bruises and cuts offering easy avenues for infection in the field. This crop is more vulnerable to diseases and pests because many of these are transmitted with seed tubers. Minimizing these losses to diseases in storage greatly improves profitability.

#### **Timeline and expected short term (1 yr) and longer term (3-5 yrs) outcomes.**

1<sup>st</sup> year: Methods development

2<sup>nd</sup> year: Detection and identification of diseases laboratory scale model

3<sup>rd</sup> year: Expanding the technique to commercial storages

### **Project III**

**Title: Storage guidelines for new cultivars, Canela Russet and Rio Grande Russet**

**Nature, scope, objectives of proposed research:**

Canela Russet gained popularity among growers for its size and shape and long dormancy period. But this cultivar is daunted by storage disorders and some negative characteristics such as lower stem number and longer dormancy. The objective of this research is to find ideal storage regime for Canela Russet.

The dormancy period of Rio Grande Russet is shorter than Russet Norkotah and Russet Nugget. It is around 85 days when stored at 45 °F. The objective of this project is to find optimum harvest conditions to lengthen dormancy without any storage disorders. Optimum storage conditions will be studied by manipulating storage temperature and humidity.

**Methods and facilities, including any resource needs at the SLVRC**

Canela Russet and Rio Grande Russet will be harvested at different days after planting to get different levels of maturity. These tubers will be tested for their storability and dormancy at different temperature and humidity conditions. Tubers will be also evaluated for storage disorders periodically during storage.

During the second phase of our experiments, tubers will be treated with 1,4-DMN and ethylene to study the effect of these chemicals on increasing stem numbers. Application of chemicals and treatments will be carried out in sealed plastic barrels. The SLVRC has the necessary storage rooms to carry out the proposed study. Storage rooms need to be equipped with humidifiers.

**Relationship of proposed research to overall problem for potato growers:**

Canela Russet and Rio Grande Russet are the popular cultivars grown in the valley. Management information on storage will further benefit growers and help increase their returns on these two cultivars.

**Timeline and expected short term (1 yr) and longer term (3-5 yrs) outcomes**

1<sup>st</sup> year: Harvesting tubers at different maturity conditions and testing ideal storage temperatures.

These tubers will be placed also at commercial storages to get the data in real life situations.

Canela Russet will be treated with different chemicals to increase stem numbers.

2<sup>nd</sup> year: This study will be repeated with tubers grown at different management conditions.

## **Project IV**

### **Title: Testing different storage conditions to prevent spreading of silver scurf disease in storage**

#### **Nature, scope, objectives of proposed research**

According to the recently conducted survey, silver scurf is identified as the number one storage disease in the valley. Tubers are infected with the fungus during the growing season, and lesions become visible in 3 to 5 weeks. Lesions may be difficult to detect at harvest, particularly if the tubers are not washed. Primary infection takes place in the field when the tubers remain attached to the stolon and is usually seen on the skin (periderm) at the stem end of the tuber as a smooth, gray and silvery sheen. In severe cases primary lesions may shrivel and enhance shrinkage due to water loss.

The maximum infection and spread of this disease to new potatoes from any of these sources takes place during handling and the initial 2 to 3 weeks (curing period) of storage. Infection is also increased when pulp temperatures remain warm with relative humidity above 90% along with the re-circulation of the internal air. Subsequently, the infection spread may be slowed but not completely eliminated as storage temperatures are cooled to 45°F or below. At these temperatures the fungus will live and develop slowly. This is why symptoms from a new infection site on a tuber do not appear until after 4 to 5 months.

The aim of this project is to apply bioactive compounds during the curing process in such a way that these compounds won't inhibit new skin formation but only reduce the infection and subsequent spread in the storage.

#### **Methods and facilities, including any resource needs at the SLVRC**

Susceptible and resistant cultivars will be treated with methyl jasmonate and hexenal etc during the process of curing after harvest at different concentrations and with varying exposure times. These treated potatoes will be stored at different storage temperatures and conditions. Treated potatoes will be scored for disease incidence, weight loss and other visible symptoms after three months and five months.

#### **Relationship of proposed research to overall problem for potato growers**

Packing houses require more time for sorting and are faced with rejection of consignments infected with silver scarf. Processors have difficulty in peeling the skin off tubers when lesions on the exterior of the potato become excessive.

#### **Timeline and expected short term (1 yr) and longer term (3-5 yrs) outcomes**

1<sup>st</sup> year: Pilot scale study to identify compounds that have an impact on reducing disease spread  
2<sup>nd</sup> year: Expanding study by putting the treated potatoes in plastic mesh bags to place them in a commercial storage and evaluate the susceptibility of potatoes.

**Budget**

**Detailed annual budget (personnel, materials and supplies, travel, equipment, Services) and a budget justification. Indirect costs are not applicable**

**Previous funding (2007): \$38, 500**

During 2007, I initiated research projects on powdery scab and russet skin set and pressure bruise.

<b>Requested funding for 2007:</b>	<b>\$40,000.00</b>
Research Associate (50%)	18,000.00
Equipment and Laboratory supplies	10,000.00
Labor	5,000.00
Chemicals	5,000.00
Travel	2,000.00