

Colorado Potato Administrative Committee, Area II
Proposals for 2012-2013

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Executive summary (2011-2012 funding cycle*)

- **Variety specific pressure bruise management guidelines and Pressure Bruise management**
Over last three years of our research concluded that the tuber hydration is one of the most important and manageable factors among other aspects such as pile height and duration of storage in reducing pressure bruise incidence. We developed a ventilated crib design to induce pressure bruise in potato tubers under laboratory conditions. We identified texture analysis is the accurate way of measuring tuber hydration status and developed a correlation between pressure bruise incidence and texture.
(Journal article accepted for publication in American Journal of Potato Research)
- **Storage guidance for new cultivars**
Four different sprout inhibitors were tested (two organic and two conventional) to extend dormancy of Pinto and Purple majesty cultivars after removing from long-term commercial storage. Conventional sprout inhibitors, such as CIPC, have proven more effective than of all other sprout inhibitors available. The organic sprout inhibitor L-carvon was more effective than clove oil in reducing sprouting in Pinto and Purple majesty for 30 days. Conventional sprout inhibitor Dimethyl naphthalene (DMN) was as effective as organic inhibitors.
- **Quality loss during storage economic model**
This is still ongoing project. We are working with 3 different grower operations and collecting information on shrink, disease, pressure bruise incidence and pack out percentage. We are still in the process of collecting data from storages. The success of this project depends on grower willingness to share information.
- **Enhanced nutritional benefits for added market value**
 - For the first time we identified metformin like compounds (biguanides) in potato and other medicinal plants.
(Manuscript will be submitted to peer reviewed journal)
 - We identified Purple Majesty and Rio Grande Russet accumulates more Selenium than other Colorado cultivars tested.
(Journal article published in American Journal of Potato Research)
 - Identification and quantification of flavor compounds in Colorado cultivars
(Presented at PAA conference in Wilmington, North Carolina August, 2011)

External grants leverage: Total external grant money received is \$150,000 for 3 years

Funding sources: NPC, SARE, NRCS and State Specialty Crops Grants

External grants applied this year

- ❖ Two National Potato Council-USDA ARS
- ❖ Specialty Crop Research Initiative Planning Grant
- ❖ USDA-Organic Agriculture Research and Extension Initiative
- ❖ Department of Energy

Title: *Pressure bruise management and variety specific storage guidelines*

Most relevant funding source: CPAC

Nature and scope of proposed research:

The proposed research program will focus on understanding the effects of moisture loss, shrink, texture, pressure bruise incidence and stored potato quality of four russet potato cultivars (Russet Norkotah, Canela Russet, Centennial Russet, and Rio Grande Russet). These cultivars are among the most commonly grown russet cultivars in Southern Colorado and the Western United States, accounting for more than 70% of acreage (40,000 acres) in Colorado (NASS 2009).

Tuber moisture loss causes further economic losses due to increased susceptibility to pressure bruising of potatoes stored for the fresh market (Jayanty, 2009 Colorado typically ranks third or fourth in the U.S. in terms of acreage produced and value of production (NPC 2008 Potato Statistical Yearbook). This makes potato production a very important part of the overall agriculture picture in the state. Colorado predominantly raises fresh market potato tubers. Depending on the market conditions and price fluctuations these tubers are stored until June/July of the following year.

Water loss occurs by evaporation from the periderm, and rates of water loss can be rapid before skins are fully suberized. Rehydration of tubers in soil possible only when free water is available. As skins mature suberization of the periderm dramatically restricts the potential for water uptake by tubers and may prevent appreciable rehydration late in the year. Data documenting the influence of pre- and postharvest practices on tuber hydration and associated cellular turgor pressure, however, are lacking. Data are needed to define relationships between tuber hydration status and pressure bruise incidence and methods are needed to quantify the effect of pre harvest and postharvest management practices on tuber hydration and turgor pressure.

Research Objectives:

- Shrink analysis: Tubers will be weighed at harvest and subsequently every month in different commercial storages to record shrink.
- Texture Analysis: Finding a relation between Pressure flattening and texture
20 tubers at harvest and 20 tubers from 5 different locations in each commercial bin will be collected during storage season, every month and tuber texture will be measured with peel and without peel using CT3 Texture Analyzer. Texture is a measure of turgor pressure to resist pressure bruising and flattening.
- Pressure bruise analysis: Evaluate differences in pressure flattening for different cultivars with similar initial moisture loss levels.

Relationship of proposed research to overall problem for potato growers:

Pressure bruise rated as the most important problem faced by commercial storages in the SLV in number of grower surveys. Understanding the mechanism of pressure bruise susceptibility will greatly help the industry in reducing the losses.

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

Lab based and commercial storage studies will help in understanding physiological and genetic basis for pressure bruise susceptibility. This understanding will enable us to devise specific strategies for potato pre and postharvest operations in storages.

Timeline: 2012-2013

Long term (3-5years): Lab based and commercial storage studies will help in understanding physiological and genetic basis for pressure bruise susceptibility. This understanding will enable us to devise specific strategies in potato pre and postharvest operations.

Timeline: 2012-2013

2. Title: *Economic model on storage loss/efficiency*

Nature and scope of proposed research:

Huge losses are incurred by the potato industry due to diseases in the potato storage houses. These diseases are caused by both bacterial and fungal pathogens. Weather patterns during harvest time significantly affect the quality of tubers coming into storage. Early season frost and leaving little time for growers to harvest in ideal conditions are the main reasons for tuber bruising leading to infection and subsequent problems in storage.

Objectives:

Estimating losses due to disease and shrink during harvest, storage and pack out operations

Procedure:

Losses will be estimated in the grower cooperators fields and storages. Efforts will be made to document losses due to specific diseases and other reasons including equipment handling and transportation by visiting grower operations. A survey document will be sent to growers for their input.

Relationship of proposed research to overall problem for potato growers:

Estimating losses due to diseases and other storage disorders is necessary to measure importance of postharvest storage management. It will greatly help the industry in devising strategies to reduce losses.

3. Title: *Methods to prevent common storage diseases*

Nature, scope, objectives of proposed research:

Potato storage diseases are seldom curable, but there are ways to help prevent or limit the disease spread to healthy potatoes and to keep a problem with diseased tubers in storage from getting worse. The long-term storage of potatoes depends on how potato crop is produced and harvested. Storing the crop for several months is a crucial and potentially risky phase when growers can encounter numerous problems if management of the stored crop is not done right. Fields that are

prone to particular disease and knowing what tuber disease is causing the problem will also help in field management decisions for the following growing seasons. The major diseases that plague potato storages include: soft rot, pink rot, Pythium leak, late blight, dry rot, soft rot, silver scurf, and black dot. It is important to properly identify the major storage disease problem either before loading the storage or while the potatoes are in storage prior to making any changes to typical storage management procedures

Research Objectives:

Some cultivars are prone to specific disease either fungal or bacterial more than others. The objectives of this study are

- Identification of specific field management or harvesting conditions suitable for specific cultivar
- Testing different harvest temperatures for different disease susceptibility
- Effect of pulp temperature on disease susceptibility
- Effect of right temperature and duration for wound healing in reducing the disease incidence

Procedure:

There is limited storage resources are available at SLVRC. Mostly grower cooperation is required to complete this project. Researcher will visit number of grower operations immediately after the harvest and at the end of storage season to collect information.

Expected short term (1 yr) and longer term (2&3 yrs) outcomes

Lab based and commercial storage studies will help in understanding physiological and genetic basis for disease susceptibility. This understanding will enable us to devise specific strategies in potato pre and postharvest operations.

Timeline: 2012-2013

Extension-outreach plan for reporting project information to growers (for all proposed projects)

Results will be presented and reported to grower community and scientific community using following avenues

- Rocky Mountain Ag conference,
- Northern Colorado Potato Grower meeting
- Potato Association of America Annual meetings
- Field days,
- Open house,
- Tours,
- Annual Reports
- Spuditems or newsletter.
- And site visits to commercial storages

Detailed annual budget

Requested funding for 2011-12: \$48,500.00

Research Associate (50%):	\$25,000.00
Temporary Labor:	\$6,500.00
Equipment and laboratory supplies:	\$10,000.00
Chemicals Supplies and Services:	\$5,000.00
Travel:	\$2,000.00