

**Colorado Potato Administrative Committee, Area II
Proposals for 2013-2014**

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Executive summary (2012-2013 funding cycle*)

Storage guidance for new cultivars

- We are in the process of identifying organic and conventional sprout inhibitors for specialty cultivars to extend short term dormancy.

Variety specific pressure bruise management guidelines and Pressure Bruise management

- We are in the process of developing and validating at harvest tests for pressure bruise susceptibility.
- Results for cultivar specific pile height recommendations will be available at the end of storage season
- Role of irrigation after vine kill in pressure bruise susceptibility is still being investigated

Enhanced nutritional benefits for added market value

- Identification and quantification of flavor compounds in Colorado cultivars
- For the first time we identified metformin like compounds (biguanides) in potato and other medicinal plants.
- Mitigation of acrylamide using vanadium salt in French fries and chips
- We identified Purple Majesty and Rio Grande Russet accumulates more Selenium than other Colorado cultivars tested.

External grants leverage: NPC and NRCS

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

External grants applied this year

- ❖ Two National Potato Council-USDA ARS

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

Most relevant funding source: CPAC

Nature and scope of proposed research:

Pressure flattening (or pressure bruise) accounts for a substantial portion of economic losses due to potato bruising each storage year. It limits the storage duration and reduces grade as potatoes are stored longer. Pressure bruise is caused by the weight of the pile but physiological factors play a role in affecting the structure of tubers on the bottom portion of the bin.

The proposed research program will focus on understanding the effects of

- a. Tuber moisture loss, after vine kill and during harvest and its impact on pressure bruise incidence.
- b. Tuber shrink, and texture on potato tuber quality in the long-term potato storage
- c. Cultivar specific water management for optimum maturity and skin set
- d. Developing cultivar specific pile height recommendations

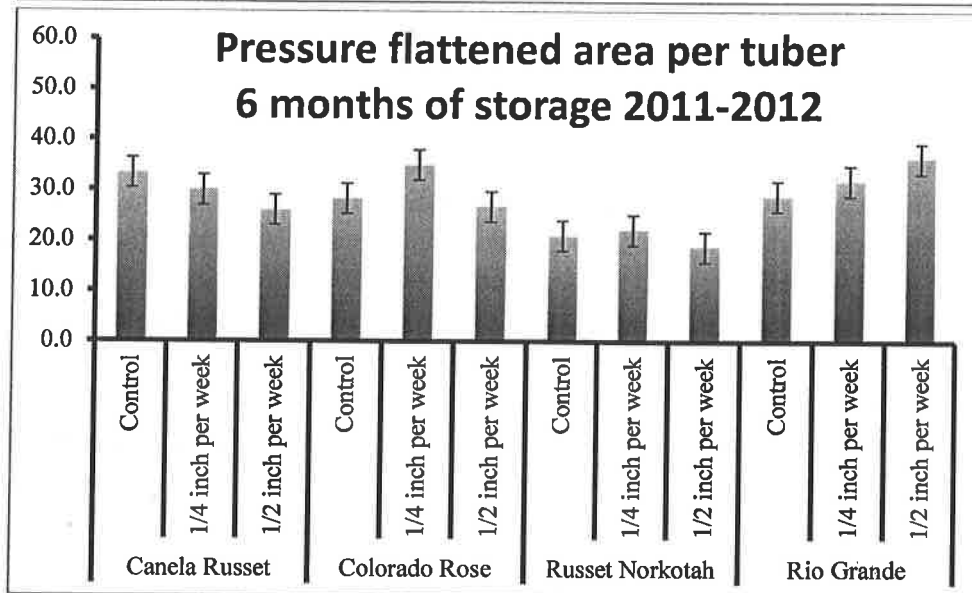
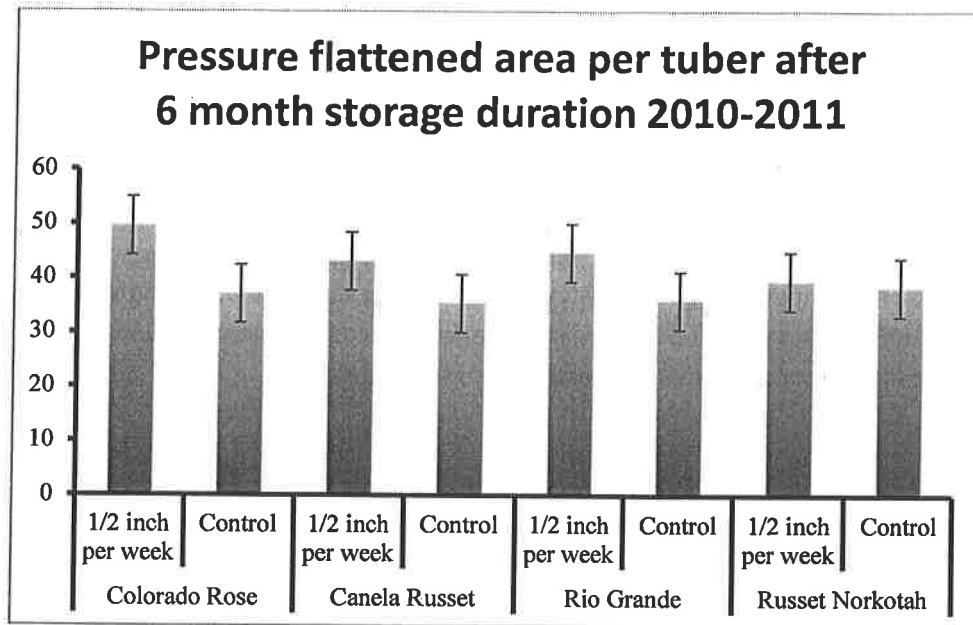
Tuber moisture loss causes further economic losses due to increased susceptibility to pressure bruising of potatoes stored for the fresh market. Water loss occurs by evaporation from the periderm, and rates of water loss can be rapid before skins are fully suberized. Rehydration of tubers in soil possible 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. However, earlier we showed experimental data to define relationships between tuber hydration status and pressure bruise incidence (Henry Castleberry and Sastry S. Jayanty* (2012). American Journal of Potato Research 89:269-276). New tests will be developed 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 using ventilated container design.

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.



Data from the soil moisture sensors for the 2010-11 and 2011-12 study of post-vine kill irrigation effects on pressure flattening development are represented in above figures. These results indicate little or no difference in the percent of filled soil moisture capacity between the 1/2 inch per week and 1/4 inch per week irrigation treatments. For most of the period after vine kill, the percent of soil moisture capacity for the two treatments was between 67% and 72%. For the non-irrigated control, the soil moisture capacity steadily decreased and fell below 65% during the last week before harvest. Based on these results we conclude that a). No firm relationship based on a set amount/interval of irrigation applied b). We have seen negative results from soil water contents above 75%. This may be due to decreased skin set and reduced tuber maturity from too

much soil moisture. c). Additionally, we expect some dehydration of tubers, especially from smooth skin specialty varieties, if soil water content is below 60%.

d). It appears that there may be a variety specific optimal soil water content for after vine kill that can minimize pressure bruising, allowing for maturity and skin set, while avoiding tuber dehydration

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: 2013-2014

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.

2. 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.

We will be focusing mainly on two diseases, namely powdery scab and silver scurf. We will be testing with the help of Syngenta two different types of combination chemistry labels will be used as line sprays on tubers going into storage.

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: 2013-2014

Title: An Integrated Approach to Improving Colorado Russet Potato Quality by understanding and Reducing Skin Netting Loss from Russet Potatoes.

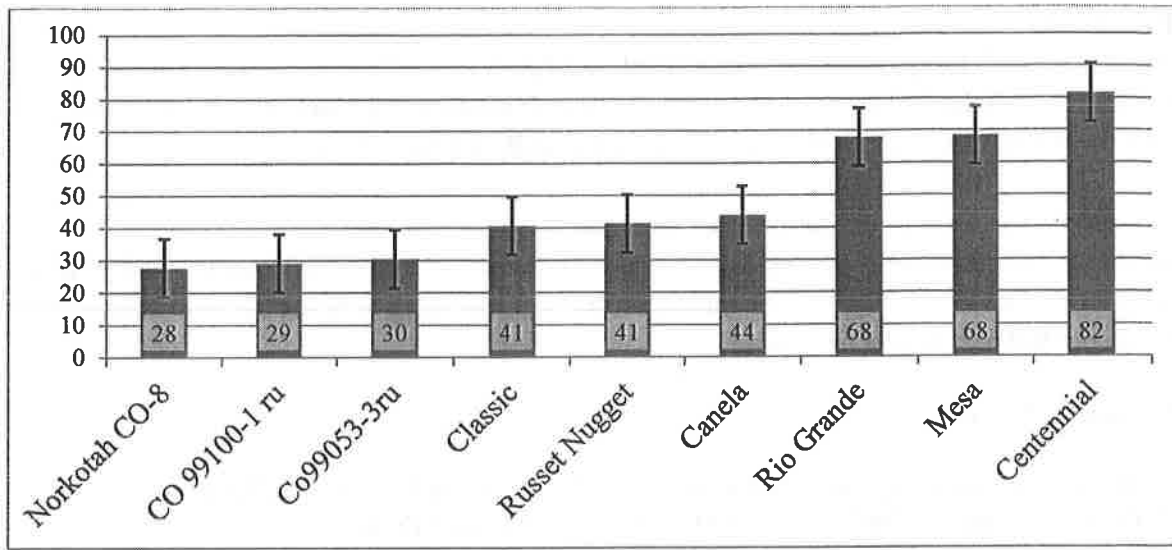
Nature, scope, objectives of proposed research

Russet potatoes sold on the fresh market have an established image in the minds of consumers as having a uniform oblong shape and uniform brown external color. During the current harvest season some San Luis Valley potato growers have experienced poor russet netting development or the development of russetting that is easily and unevenly removed during routine harvest and shipping operations. Poor development of the russet skin netting of potatoes can lead to appearance and quality problems resulting in potatoes that appear white with brown patches, or appear as lower quality white or yellow potatoes. This defect results in lower returns to growers, shippers, and retailers who may have loads rejected or be paid lower prices for the crop. Loss of russet netting can lead to quality problems from increased moisture loss and increased visual appearance of defects such as external bruises, small cracks, or minor harvest damage. Prolonged appearance and quality problems may create a negative reputation for Colorado grown russet potatoes compared to other growing areas.

Causes of russet netting loss are not well understood. Previous research has examined soil temperature, soil moisture, and soil chemistry issues such as acidity or salinity as potential causes for poor development of russetting. Colorado grown potatoes may be losing russet netting in response to other factors as well that may result from local growing practices. It is the goal of the project to understand local causes of netting loss and develop economically viable strategies to reduce the occurrence and severity of the problem.

Relationship of proposed research to overall problem for potato growers

Through improvement in the appearance and quality of russet potatoes, growers and distributors of fresh market potatoes will be able to offer better quality to their customers and receive better prices for their crop. The improved appearance and quality of the potatoes can maintain or improve the reputation of Colorado grown potatoes as viewed by large retailers and consumers.



Comparison of netting adherence of ten russet cultivars (2012). Results are in seconds required for removal of netting under high pressure water spray

The overall goals of the project are to 1.) to improve our understanding of factors related to poor development or loss of russet skin netting, and 2.) develop economically viable strategies to reduce the occurrence or severity of russet netting loss. The goals will be measured by evaluating whether there have been significant gains in the understanding of the problem and if potential solutions can be proven to reduce the losses caused by the defect. Success will also be determined by effective presentation of this information to the Colorado potato industry. Further testing needs to be done to establish a better correlation between pre-harvest moisture content of the soil and soil pH compared to netting loss susceptibility. Another attempt to evaluate soil moisture and soil pH using experiments with potted plants and /or greenhouse experiments should be undertaken.

Potential for results to leverage additional outside funding

Preliminary results obtained with this grant money will greatly help in preparing proposals to get state and federal funding mainly national potato council –ARS grants.

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
- Spuditem 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

