CSU - Cultivar Royalty Funds
Proposals – 2010

Sastry Jayanty
Potato Postharvest Physiology
San Luis Valley Research Center Department of Horticulture & LA

Title: *Studying the efficacy of synthetic and organic sprout inhibitors on Colorado potato cultivars for long-term storage.*

Most relevant funding source: *CCPGA royalties*

Nature, scope, objectives of proposed research:

Potatoes grown in summer months stored up to six to nine months based on market demand. To ensure constant supply from potato storage, tuber dormancy needs to be extended beyond the winter months. During an extended storage period, tubers age physiologically, break dormancy, and sprout. Sprouting causes increased weight loss, reduced tuber quality and impedes air movement through the potato pile in storage. This will lead to disease and loss of quality. Successful long-term storage of potatoes for fresh market distribution requires use of a sprout inhibitor in combination with proper storage management. The purpose of sprout inhibitors is to prevent sprouting in storage. There are number of sprout inhibitors available for both conventional and organic practices for long term potato storage. Each variety may react differently to different sprout inhibitor treatments.

Potatoes remain dormant for a set period of time after harvesting depending upon the cultivar. Length of dormancy is an economically important trait in potato tubers. Understanding the dormancy process and ability to manipulate these processes are important to increase storability and the availability of potatoes throughout the year. Dormancy is necessary for plant survival and development.

During an extended storage period, tubers age physiologically, break dormancy, and sprout. Major factors for deterioration in the processing quality of tubers in storage are: weight loss due to respiration; water and turgor loss due to in sprouting; an increase in reducing sugar concentration due to starch

Dormancy is regulated by variety of factors such as genotype, physiological age of the tuber and plant hormones. Dormancy-related mechanisms are controlled by four plant hormones (abscisic acid [ABA], cytokinin, gibberellic acid [GA], and ethylene) along with environmental factors and photosynthesis (Nooden and Weber 1978; Suttle 2000).

There is an increasing demand for better quality produce and improved postharvest handling practices. These measures can assist in satisfying some of these demands, as well as providing a greater window of time for marketing produce. Tuber dormancy, sprouting and wound healing are very important processes which influence postharvest storage conditions.

Sprouted tubers are not marketable and tend to lose water by evaporation which results in loss of weight. Potato processing plants require high quality tubers for year-round operations. To ensure constant supply from storage, tuber dormancy needs to be extended beyond the winter months. Physiological dormancy of the potato tuber is further extended with an artificial environment consisting of lowered temperature, high relative humidity, adequate oxygen and by application of chemical sprout inhibitors. The purpose of sprout inhibitors is to prevent sprouting in storage as tubers age. Sprout inhibitors work by inhibiting cell division within the eye region, therefore they should never be applied to seed potatoes. Sprouting causes reduction in the quality of the tuber. This leads to weight loss due to water loss and disease due to reduced air circulation (Afek et al 2000).

The more widely used sprout inhibitors are maleic hydrazide and chlorpropham (isopropyl *N*-(3-chlorophenyl) carbamate) (CIPC). Substituted napthalenes are also used as short term sprout suppressants on seed. Due to recent EPA standards and more awareness regarding these chemical suppressants, alternatives have been explored. Natural compounds, such as carvone and clove oil, have shown effectiveness in sprout suppression. Ethylene is also gaining popularity as a sprout suppressant in Europe and Canada for obvious health reasons.

Two to three cultivars and advanced selections will be selected with good agronomic and culinary characteristics for this study. Immediately after harvest tubers will be held at 55 °F for wound healing for 3 weeks. Subsequently for long term storage and tubers will be maintained at three different temperatures 38, 40 and 42°F with high relative humidity. Replicated trails will be conducted using organic and conventional sprout inhibitors at different temperatures with appropriate controls. Tubers will be evaluated for weight loss, sprout inhibition and sprout length, sprout weight and any other storage disorders

Methods and facilities, including resource needs at the SLVRC

Adequate storage facilities are available at SLVRC to conduct experiments.

Potential for results to leverage additional outside funding

Potato breeding and cultivar improvement program at San Luis Valley Research Center has developed a number of new cultivars some with long natural dormancy and others with short term dormancy. Most of these new cultivars have good market potential with excellent flavor and culinary attributes. Our idea is to extend the storage length of short term dormancy cultivars for both organic and conventional markets. This study will generate treatment and dosage guidelines and develop protocols for different sprout inhibitor treatments.

Expected outcomes of this project are to fully exploit the market potential of short term dormancy cultivars. There will be measurable increase in sales of these new cultivars by extending shelf life by timely and optimum sprout inhibitor applications. By extending dormancy they can ship long distances and find new markets and better price. This should position Colorado's potato industry to be more competitive, and enhance overall profitability by the increased sales and pricing of the niche cultivars.

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

Performance Measure	Baseline	Goal for Year 1	Goal for Year 2	Goal for Year 3
Acres of 1, 2, or 3 new cultivars in production	Zero acreage currently in production	Seed production or 1, 2 or 3 new chosen cultivars.	Commercial production trails in co-operators fields	Expansion of Commercial production in grower's fields.
Improved level of understanding concerning sprout suppression and effective storage management in short dormancy cultivars	Compile information on the typical pre and postharvest conditions and storage regimes.	Understanding the role of each conventional and organic sprout suppression chemicals and their effectiveness in laboratory scale storage trails	Test and validate information in large size storages.	Develop a cultivar specific set of best management practices after testing in commercial storages.
Publishing cultivar specific storage management guidelines on web and grower magazines	Current best storage management guidelines for cultivars	Reporting lab based tests on sprout suppressants	Improving and refining best storage management guidelines recommendation based on results	Comprehensive best storage management guidelines

Detailed annual budget (personnel, materials and supplies, travel, equipment, services) and a budget justification.

Budget: (Current year)

Requested funding for 2010:	**$16, 000.00**
Research Associate (50%):	$10,000.00
Materials:	$2000.00
Laboratory Analysis:	$1500.00
Chemicals Supplies and Services:	$2,500.00