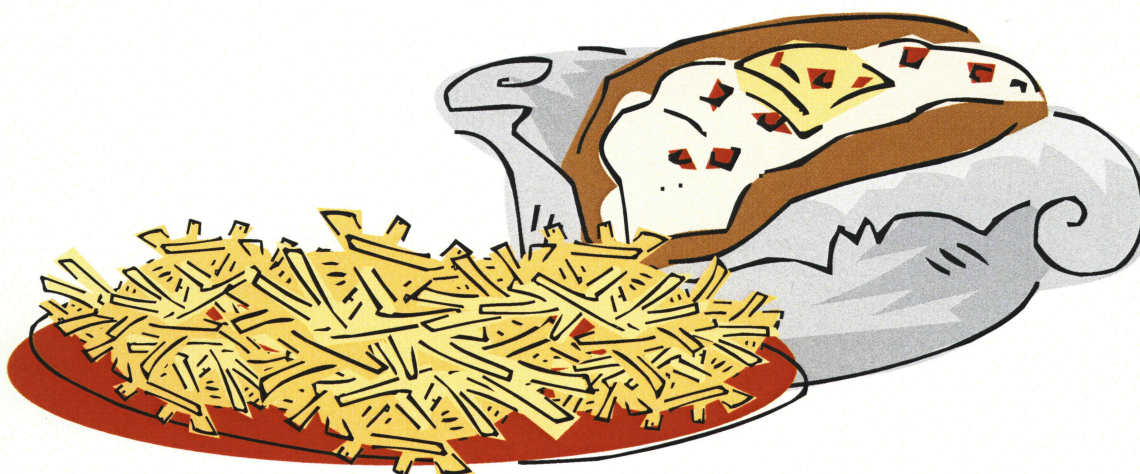


Storage Management for Gem Russet Potatoes



Introduction

The percentage of potato acreage in Idaho devoted to Russet Burbank has declined over the last several years. One of the varieties replacing it is a new cultivar—Gem Russet—which is also being stored for use in both processing and fresh markets. Research at the University of Idaho Potato Storage Research Facility, Kimberly Research & Extension Center, was conducted to determine storage management guidelines for this new cultivar. This publication outlines information on optimizing storage conditions for Gem Russet.

Gem Russet is a russet-skin potato cultivar released in 2000 by the USDA/ARS and by state agricultural experiment stations of Idaho, Oregon, and Washington. This medium- to late-maturing potato has oblong to long tubers with medium russet skin and high specific gravities—qualities that make it acceptable in both fresh and processing markets.

Gem Russet potatoes grown in Idaho at Aberdeen (1998), and Kimberly (1999 and 2000) were tested over a three-year period. After harvest, potatoes were placed in storage and cured at 55°F for 14 days. Then the temperature was decreased by 0.5°F per day to final holding temperatures of 42°F, 45°F, and 48°F. Relative humidity was maintained at 95 percent throughout the studies. Potatoes used for data collection on dormancy length were not treated with a sprout inhibitor.

Samples used for sugar, fry color, mottling, and disease analysis were treated with chlorpropham (CIPC) at a rate of 22 ppm using a thermal aerosol applicator at approximately 60 days after harvest.

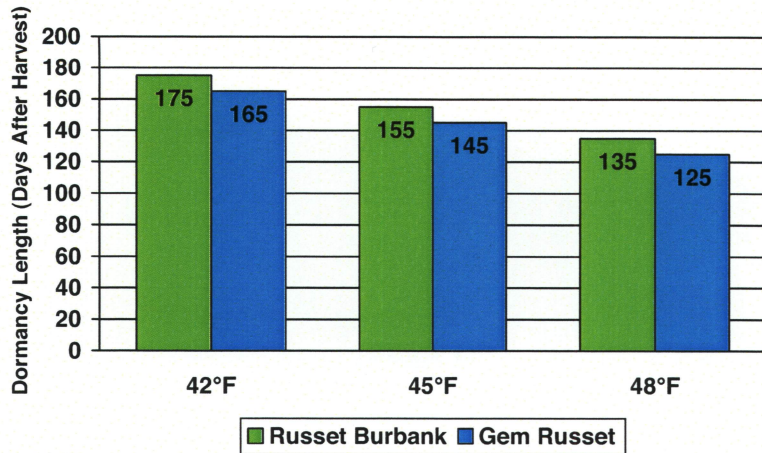


Fig 1. Relative dormancy length (in days after harvest) for Russet Burbank and Gem Russet potatoes at three storage temperatures. Values are means from three years (1998-2000)

Dormancy

Dormancy length for Gem Russet is typically 10 days shorter than for Russet Burbank when stored at 42°F, 45°F, and 48°F (Figure 1). Three seasons of data at these storage temperatures were used to estimate dormancy length. The end of dormancy is defined as the number of days after harvest when 80 percent of the tubers in a sample have one or more eyes producing sprouts 0.1 to 0.2 inches in length. If the desired storage period exceeds the dormancy length, then the application of a chemical sprout inhibitor is required. In our tests, the label rate of 22 ppm CIPC applied one time arrested sprout development for 10 months (the duration of each test).

Glucose and Sucrose Development

Glucose (a reducing sugar) and sucrose concentrations are important considerations in potatoes stored for use in the frozen processing industry. Fry strips with elevated reducing sugars develop dark color when exposed to high cooking temperatures. These darkened fried potato products are undesirable to consumers. Thus,

processors seek potatoes with low concentrations of reducing sugars. Often 0.1% glucose by fresh weight (fw) is the upper limit for glucose concentration in the tuber tissue for acceptable fries. Gem Russet

had lower glucose concentrations than Russet Burbank when stored at 48°F (Figure 2). At 42°F and 45°F, the initial glucose concentrations were similar to Russet Burbank, but they accumulated at a faster rate and eventually surpassed Russet Burbank over time in storage.

At harvest, sucrose concentrations in Gem Russet were slightly higher (0.14% fw) than in Russet Burbank (0.10% fw) and remained higher throughout the nine months of storage at 45°F and 48°F (Figure 3). However, at 42°F, sucrose concentrations in Gem Russet increased rapidly to a maximum at approximately 0.20% fw and then began to decline to about 0.13% at 260 days in storage.

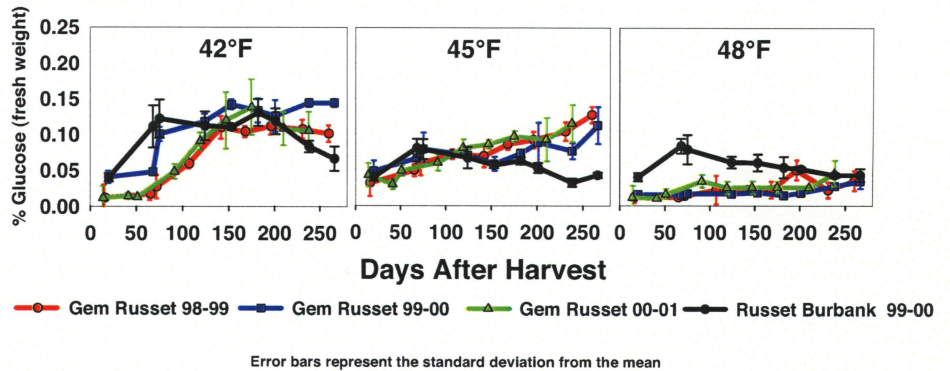


Fig. 2. Glucose (percent fresh weight) in Gem Russet potatoes in three storage seasons at three storage temperatures compared with Russet Burbank potatoes in an average year

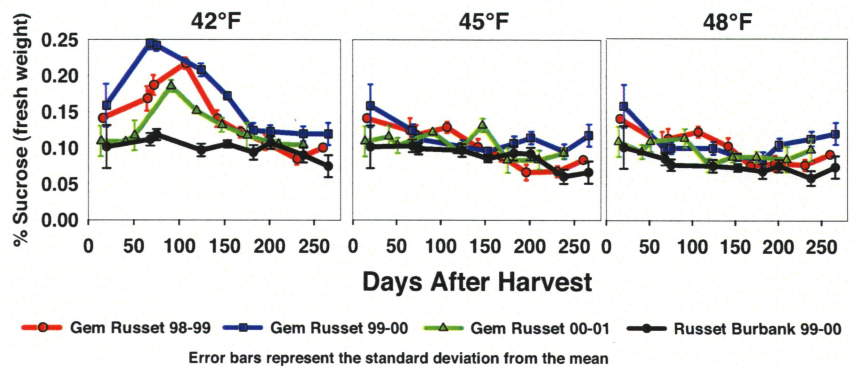


Fig. 3. Sucrose (percent fresh weight) in Gem Russet potatoes in three storage seasons at three storage temperatures compared to Russet Burbank potatoes in an average year

5
53
E322
no. 1118

Fry Color

Glucose concentrations in potato tubers are a good indicator of fry color but, generally, in the processing industry, fry color determinations are made on samples of fried potato strips, discs, or planks. In this study, fry color determinations were made by performing reflectance measurements with a Photovolt Model 577 reflectance meter (Photovolt Inc., Indianapolis, IN) on fried planks (1.2" x 0.3") from the same tubers that were used for the reducing sugar analyses. When variation in fry color occurs within a potato, it is usually the stem end of the potato that has the highest levels of sugar or darkest color.

To represent the most stringent test of fry color, the stem end fry color data are presented in Figure 4. The reflectance readings are presented together with the corresponding USDA fry color. Average fry color stayed below a USDA 3 in Gem Russet at 45°F and 48°F, and thus remained acceptable for processing. However, at 42°F, fry color became unacceptable (USDA ≥3) at approximately 95 days after harvest. Fry color was lowest in Gem Russet, at or below USDA 1, when stored at 48°F, while Russet Burbank fried at a USDA 2 at that same storage temperature.

The percentage of off-color (USDA 3 and 4) fries within a lot can be an important factor in processing. The percentage of off-color, measured at the stem end in Gem Russet was similar to Russet Burbank at the storage temperatures of 42°F and 45°F (Figure 5). However, at 48°F, Gem Russet was virtually void of any USDA 3 or 4 fries. The consistency of fry color in Gem Russet when stored at 48°F is noteworthy.

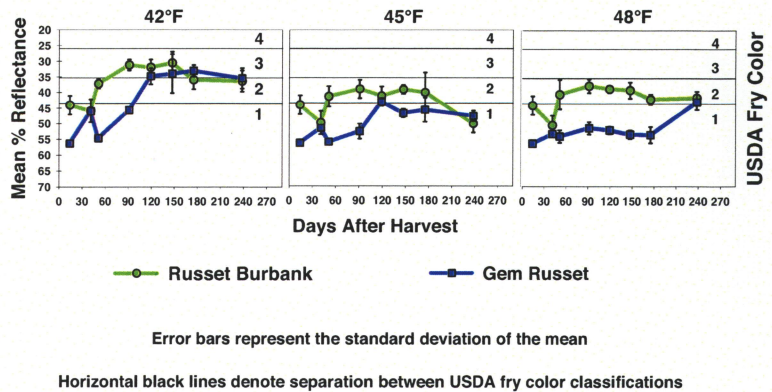


Fig. 4. Stem end fry color in Russet Burbank and Gem Russet potatoes in one storage year (00-01) at three temperatures

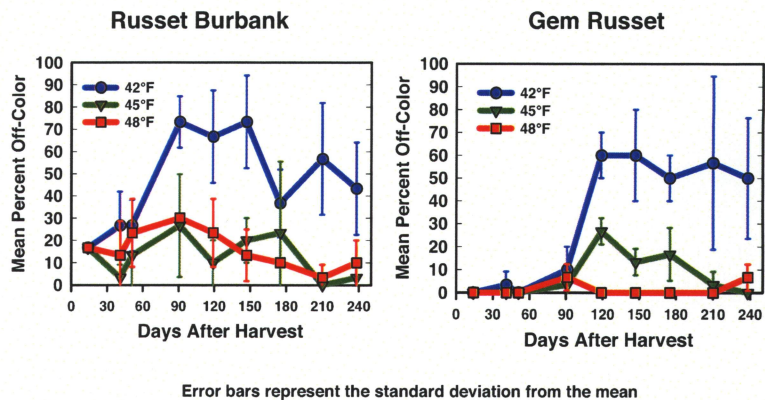


Fig. 5. USDA 3 and 4s (stem end off-color) percent in Russet Burbank and Gem Russet fry planks at three storage temperatures in one storage year (00-01)

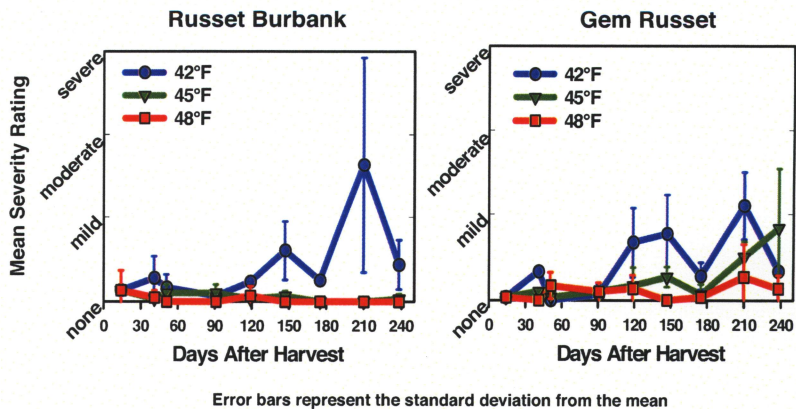


Fig. 6. Mottling in Russet Burbank and Gem Russet fried planks at three storage temperatures in one storage year (00-01)

Mottling

Uneven coloration within a fried strip can occur in some potato varieties. This is termed "mottling" and is characterized by thin thread-like areas of dark color throughout the cortex tissue. Mottling is different from the dark stem (sugar) end in that the darkening occurs in a thread-like or flecked pattern and can occur throughout the entire potato, often emanating from the stem end.

In contrast, dark stem ends are characterized by dark fry color throughout all tissue at the stem end of the potato. Mottling is also a quality concern for processors. Gem Russet is very similar to Russet Burbank in that it does not exhibit extensive mottling in storage (Figure 6). Mottling does increase slightly in Gem Russet after 180 days in storage at all three temperatures.

Fusarium

Fusarium dry rot is an important storage disease in potatoes. An evaluation of Fusarium dry rot susceptibility was done by bruising, inoculation, and storing tubers at 45°F in two successive storage seasons. The results indicate that Gem Russet has a moderate level (statistically equal to Russet Burbank) of susceptibility to Fusarium dry rot, both in terms of incidence and severity of decay.

Storage Recommendations

The following recommendations are based on data collected over a three-year period at the University of Idaho Kimberly R&E Center on Gem Russet potatoes grown in Southern Idaho.

Curing Conditions 50°F to 55°F and 95% relative humidity for 14 days

Storage Conditions Maintain 95% relative humidity throughout storage

- **Processing** 48°F holding temperature
- **Fresh Pack** Not less than 42°F

Sprout Inhibition Apply CIPC before dormancy break but after curing

- **Processing** 48°F apply CIPC between 14 & 125 days after harvest.
- **Fresh Pack** 42°F apply CIPC between 14 & 165 days after harvest.

Duration of Storage High processing quality persists at least until approximately 250 days after harvest at 48°F

Mottling Early in the season, similar to Russet Burbank, but increases slightly after 180 days in storage

Fusarium Moderate susceptibility (similar to Russet Burbank)

About the Authors

Tina Brandt, a research support scientist, and Gale Kleinkopf, a research professor of plant science, now emeritus, are at the UI Kimberly Research and Extension (R&E) Center. Nora Olsen is an extension potato specialist at the UI Twin Falls R&E Center. Stephen Love, a research professor of plant science, is also superintendent of the Aberdeen R&E Center.



University of Idaho
Extension

Issued in furtherance of cooperative extension work in agriculture and home economics, Acts of May 8 and June 30, 1914, in cooperation with the U.S. Department of Agriculture, Charlotte V. Eberlein, Interim Director of Cooperative Extension, University of Idaho, Moscow, Idaho 84844. The University of Idaho provides equal opportunity in education and employment on the basis of race, color, religion, national origin, age, gender, disability, or status as a Vietnam-era veteran, as required by state and federal laws.