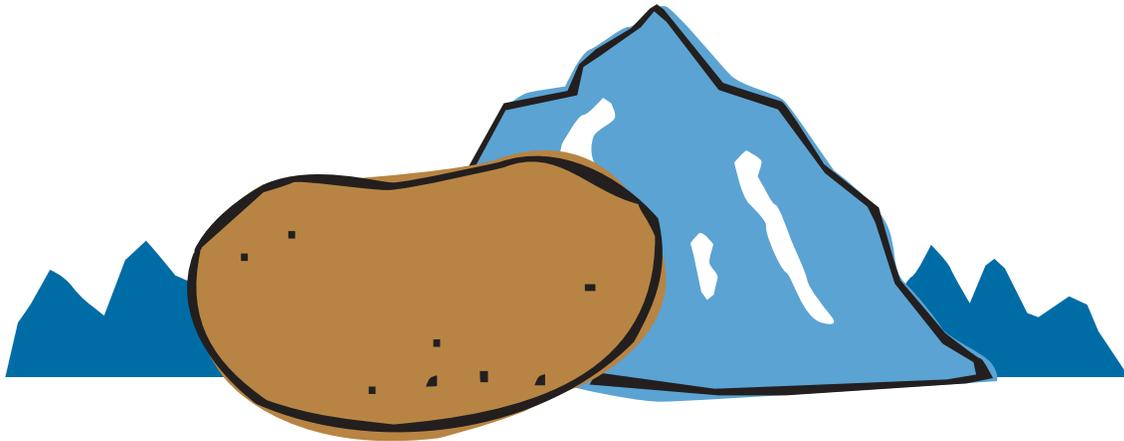


Storage Management for Summit Russet Potatoes



Introduction

An ongoing research program at the University of Idaho Potato Storage Research Facility at Kimberly, Idaho, examines the storability of newer potato cultivars. This program provides growers with information not only on how to plant, fertilize, and harvest new cultivars, but also on how best to store them. This is a vital part of Idaho's potato production guidelines because over 70 percent of the crop is put into storage. Each year, five varieties are grown alongside Russet Burbank then harvested, cured, and stored at three temperatures (42°, 45°, and 48°F), with and without a sprout inhibitor. These samples are then subjected to a series of monthly quality tests over a 9-month storage period. Each cultivar is tested for 3 years and the data utilized to develop storage management recommendations. This bulletin details storage characteristics and recommendations for Summit Russet.

Summit Russet is a russet-skin potato cultivar released in 2002 by the USDA Agricultural Research Service and the state agricultural experiment stations of Idaho, Oregon, and Washington. It is late maturing, with oblong to long tubers, medium russet skin, and a very high percentage of marketable tubers. It is resistant to blackspot bruise, early dying, tuber and foliar early blight, pink rot, and powdery and common scabs. Summit Russet requires less nitrogen fertilizer than Russet Burbank. Its high tuber specific gravity makes it suitable for fried, baked, and boiled products as well as an excellent all-purpose potato. Prior to its release, Summit Russet was tested in regional trials under the number A84118-3.

Summit Russet potatoes grown at Kimberly were tested for three storage seasons (1999, 2000, and 2001). Potatoes were placed in storage and cured at 55°F for 14 days after which temperatures were reduced at a rate of 0.5°F per day to final holding temperatures of 42°, 45°, or 48°F. Relative humidity was maintained at 95 percent. Potatoes used for data collection on dormancy length were not treated with a sprout inhibitor. Samples used for sugar, fry color, mottling, and disease analyses were treated with chlorpropham (CIPC) at a rate of 22 ppm using a thermal aerosol applicator approximately 60 days after harvest.

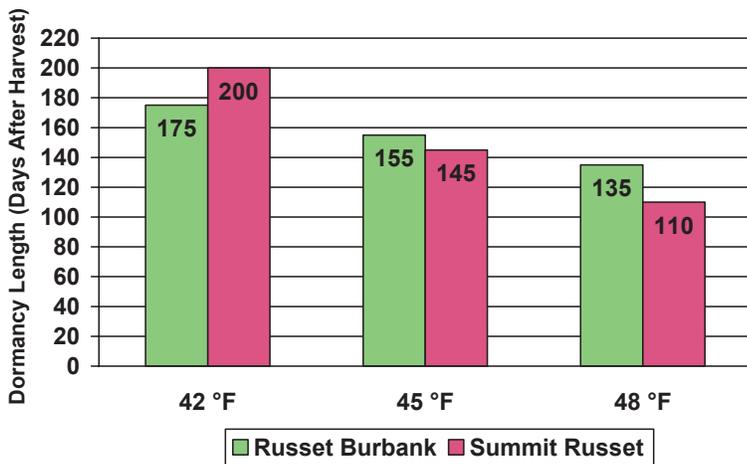


Figure 1. Dormancy length (days after harvest) for Russet Burbank and Summit Russet potatoes at three storage temperatures.

Dormancy

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 specified label rate of 22 ppm CIPC applied one time arrested sprout development for 10 months (the duration of the test).

A compilation of three years of dormancy data at storage temperatures of 42°, 45°, and 48°F are presented in figure 1. Dormancy length for Summit Russet is about 200 days at 42°F, which is 25 days longer than Russet Burbank. At the higher storage temperatures, however, dormancy length is shorter in Summit Russet than in Russet Burbank (by 10 days at 45°F and 25 days at 48°F).

Glucose and Sucrose Development

Glucose (a reducing sugar) and sucrose concentrations are important considerations in potatoes stored for use in the frozen processing industry. Elevated levels of

reducing sugars are involved in the development of darker fry color at high cooking temperatures. These darkened fried potato products are undesirable to consumers. Thus, processors seek potatoes with low

concentrations of reducing sugars. A concentration of 0.1 percent glucose in the tuber tissue, by fresh weight (fw), often is considered the upper limit for acceptable French fries. Summit Russet had lower glucose concentrations than Russet Burbank when stored at 48°F (fig. 2). At 45°F, glucose concentrations were similar or lower (depending on the year) than in Russet Burbank. At 42°F, glucose levels were similar to or higher than in Russet Burbank.

Sucrose concentrations varied from year to year in Summit Russet potatoes more than in most other varieties tested in this program (fig. 3). In 1999-'00, sucrose concentrations in Summit Russet at harvest were much lower than in the other years. This variation in sucrose concentrations across years

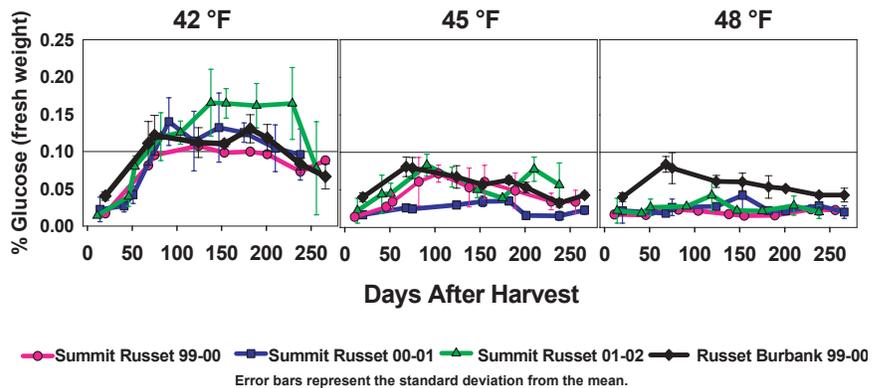


Figure 2. Percentage glucose in Summit Russet potatoes in three storage seasons at three storage temperatures compared with Russet Burbank potatoes in an average year.

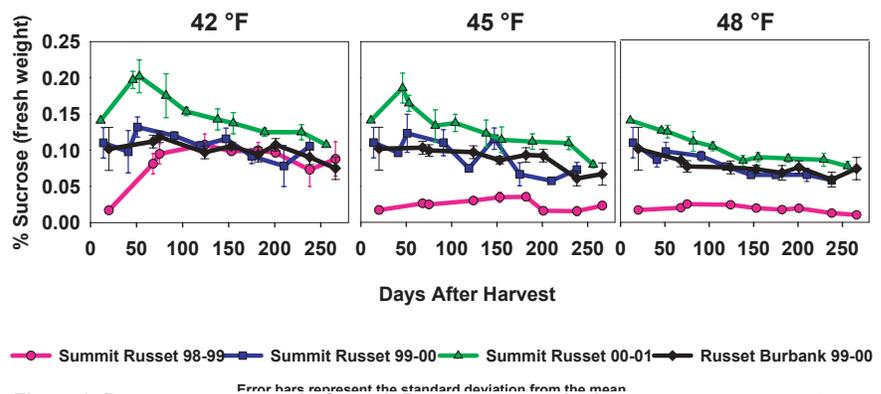


Figure 3. Percentage sucrose in Summit Russet potatoes in three storage seasons at three storage temperatures compared with Russet Burbank potatoes.

may be attributed to maturity differences in Summit Russet plants at harvest.

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 taking reflectance measurements with a Photovolt Reflection Meter Model 577 (Photovolt Inc., Indianapolis, IN) on fried planks (1.2 inch by 0.3 inch) from the same tubers that were used for the reducing sugar analyses. When variation in fry color occurs within a potato, it is generally the stem end of the potato that has the highest levels of sugar and darkest color.

Data from the most stringent test of fry color, stem end fry color (reflectance readings and corresponding USDA fry color), are presented in figure 4. Average fry color was a USDA 2 or less in Summit Russet potatoes stored at 45° and 48°F, and thus acceptable for processing. However, at 42°F, fry color reached an unacceptable USDA 3 at approximately 70 days after harvest. Fry color was lowest in Summit Russet stored at 48°F, well below USDA 1, while Russet Burbank fried at a USDA 2 at that same storage temperature. Summit Russet fry color was also at or below a USDA 1 at the 45°F storage temperature for the entire storage season and was generally lighter than Russet Burbank potatoes stored at 45°F. In these studies, it appeared Summit Russet was less susceptible to sugar end development than Russet Burbank.

The percentage of off-color (USDA 3 and 4) fries within a lot can be an important factor in processing. The off-color percentage was

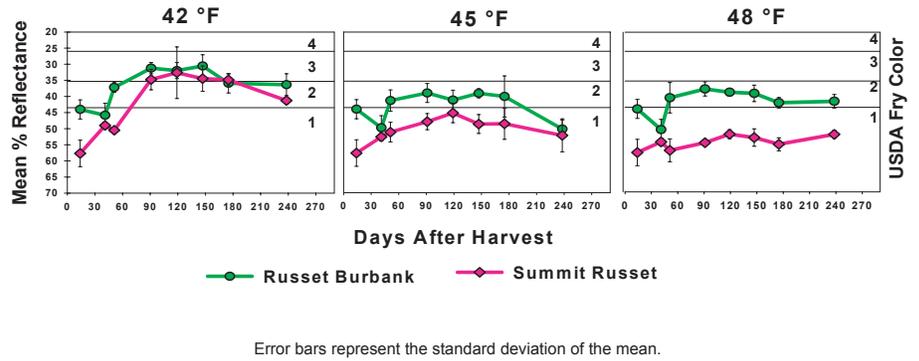


Figure 4. Stem end fry color in Russet Burbank and Summit Russet potatoes in one storage year (2000-'01) at three temperatures.

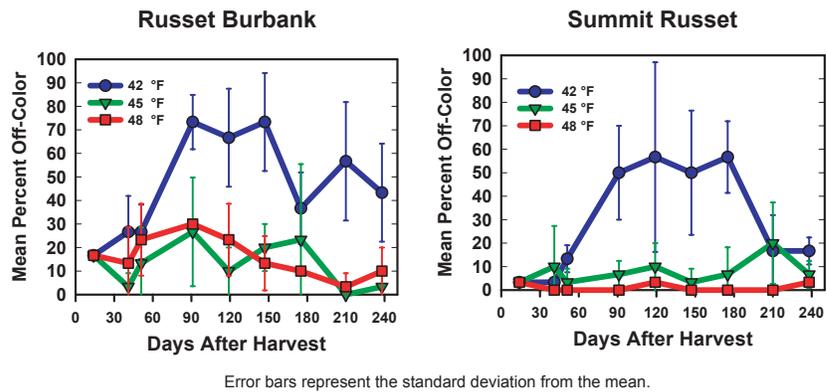


Figure 5. Percentage USDA 3 and 4 (off-color) Russet Burbank and Summit Russet fry planks (stem end) at three storage temperatures in one storage year (2000-'01).

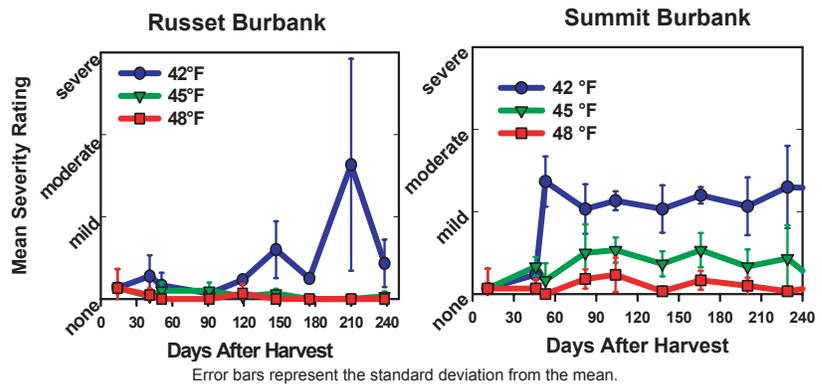


Figure 6. Mottling in Russet Burbank and Summit Russet fried planks at three storage temperatures in one storage year (2000-'01).

Table 1. Incidence of Fusarium dry rot and percentage decay in bruised and inoculated lots of two potato varieties.

	% Decay	% Incidence
Russet Burbank	15.6	44.4
Summit Russet	6.1	28.9
LSD (0.05)	3.8	16.0

Note: Data are the means of two successive storage seasons.

similar in Summit Russet and Russet Burbank at the 42°F storage temperature (fig. 5). However, at 45° and 48°F, Summit Russet had a very low percentage of USDA 3 or 4 fries.

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 dark stem end (sugar end) in that the darkening occurs in a thread-like or flecked pattern and can occur throughout the entire tuber, often emanating from the stem end. By comparison, dark ends (sugar ends) are characterized by dark fry color throughout the tissue at the stem end of the tuber. Mottling is also a quality concern for processors.

Virtually no mottling was observed in Summit Russet at the 48°F storage temperature (fig. 6). At 45°F, a minimal amount of mottling was observed. At 42°F, mottling was more prevalent. In more stressful growing seasons, it may be necessary to store Summit Russet at 48°F to minimize the occurrence of mottling.

Fusarium

Fusarium dry rot is an important storage disease in potatoes. An evaluation of Fusarium dry rot susceptibility was done by bruising, inoculating, curing, and storing tubers at 45°F in two successive storage seasons. The results indicated that Summit Russet has a relatively low level of susceptibility to Fusarium dry rot compared with Russet Burbank (table 1).

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 Summit Russet potatoes grown in southern Idaho.

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

Storage Conditions Maintain 95% relative humidity throughout storage

- **Processing** 45°F holding temperature. 48°F following a stressful growing season to mitigate potential mottling.
- **Fresh Pack** Not lower than 42°F

Sprout Inhibition Apply CIPC before dormancy break but after curing

- **Processing** Apply CIPC 14 to 145 days after harvest at 45°F or 14 to 110 days after harvest at 48°F
- **Fresh Pack** Apply CIPC 14 to 200 days after harvest

Duration of Storage High processing quality persists at least until approximately 260 days after harvest.

Mottling Less mottling as storage temperature increases. Mottling is generally low at 45°F; under more stressful growing conditions it may be best to store at 48°F.

Fusarium Low susceptibility (lower than Russet Burbank)

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