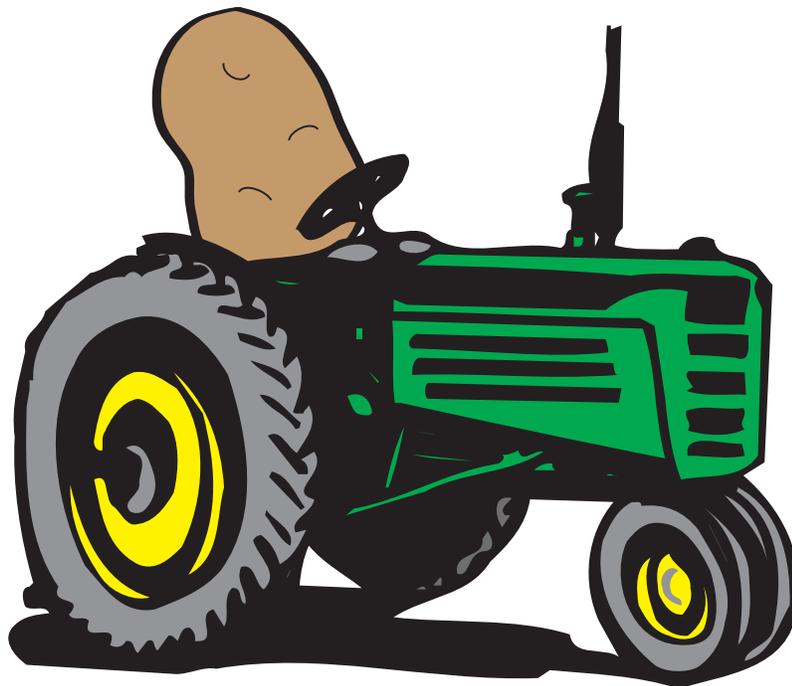


# Storage Management of **Classic Russet** Potatoes



## Introduction

Classic Russet is an early- to mid-season russet potato variety that produces a high proportion of U.S. No. 1 tubers. Storage characteristics of Classic Russet potatoes—A95109-1—were studied for 3 storage years—2003-'04 to 2006-'07—at the University of Idaho Kimberly Research and Extension Center Potato Storage Research Facility. Study results are detailed in this publication along with storage management recommendations. Thanks to the Idaho Potato Commission, funders of this research.

Released in 2008 by the USDA-ARS and the agricultural experiment stations of Idaho, Oregon, and Washington, Classic Russet produces high yields of attractive tubers with moderate specific gravity and resistances to sugar ends, tuber malformations, and most internal and external defects.

Its excellent culinary qualities are comparable to Russet Burbank, and it shows good potential for early processing and fresh market use.

Classic Russet is moderately resistant to common scab and dry rot and displays moderate susceptibility to foliar and tuber early blight plus corky ringspot. It is considered susceptible to all other potato diseases.

## About the study

Classic Russet potato crops were produced at the University of Idaho's Kimberly Research and Extension Center from G2 seed in the years 2004, 2005, and 2006. After harvest, the potatoes were placed in storage and allowed to cure at 55°F and 95% relative humidity for 14 days.

The temperature was then decreased at a rate of 0.5°F per day to holding temperatures of 42°F, 45°F, and 48°F. Potatoes used in assessing dormancy length were NOT treated with a sprout inhibitor. Samples used for sugar, fry color, mottling, and disease analysis were treated with a thermal aerosol application of chlorpropham (CIPC) at 22 ppm at approximately 60 days after harvest.

Weight loss was collected on sub samples, 3 reps of approximately 10 pounds each in mesh bags, by weighing samples monthly throughout the storage season. Weight loss is presented on a percentage basis.

## Study results—dormancy

Dormancy length in Classic Russet is shorter than in Russet Burbank (Table 1). Dormancy break is defined as the point at which sprout elongation—at least 0.2 inches—begins to occur in 80% of tubers in the sample. This definition is used because the length of time between initial sprout development (peeping) and sprout elongation varies greatly among potato varieties.

In the absence of sprout inhibitors, dormancy length of Classic Russet is 20 to 30 days shorter than for Russet Burbank. Since dormancy of Classic Russet is relatively short, it is important to apply proper sprout inhibitors early if the intended storage duration is longer than the indicated dormancy length.

Table 1 compares mean dormancy length (days after harvest) of Russet Burbank and Classic Russet potatoes at 3 storage temperatures. Values are means of 3 years—2004 through 2007.

## Glucose and sucrose development

Reducing sugar concentration is critical to the use of stored potatoes for eventual processed products. Potatoes used for frozen or dehydration processing must meet reducing sugar criteria specific to the end user. High concentrations of glucose (a reducing sugar) in potato tubers produce dark coloration in processed products when exposed to high processing temperatures. Sucrose potentially serves as a pool for future glucose formation in stored tubers and therefore is monitored throughout storage.

Glucose concentrations of Classic Russet tubers are compared with those of Russet Burbank in Figure 1.

**Glucose at harvest.** Glucose concentrations at harvest were consistent across the 3 years ranging from 0.02% fresh weight (FW) in 2004 to 0.03% FW in 2006.

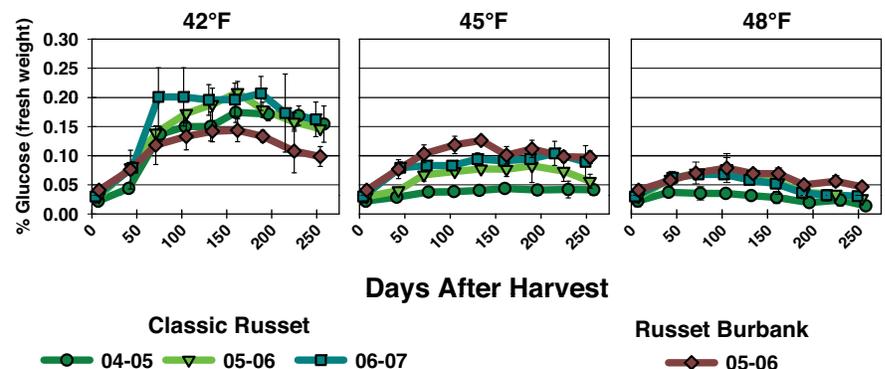
**Glucose in storage.** Glucose concentrations of Classic Russet are generally lower than Russet Burbank at both 45°F and 48°F storage temperatures. However, at 42°F glucose concentrations are generally higher in Classic Russet than in Russet Burbank.

Classic Russet glucose concentrations were consistently lowest when stored at 48°F, ranging from 0.01% FW at 251 days after harvest (DAH) in 2005 to a high of 0.08% FW at 105 DAH in 2005 to 2006.

**Table 1 compares mean dormancy length** (days after harvest) of Russet Burbank and Classic Russet potatoes at 3 storage temperatures. Dormancy break is the point at which sprout elongation—at least 0.2 inches long—begins to occur in 80% of tubers in the sample. Dormancy evaluations are performed on tubers NOT treated with a sprout inhibitor. Values are means of 3 storage years.

Variety	42°F	45°F	48°F
Russet Burbank/days	175	155	130
Classic Russet/days	155	130	100

**Figure 1 compares the mean percentages of glucose** (fresh weight) in Classic Russet potatoes stored at 3 temperatures during 3 storage seasons (2004 through 2007) with Russet Burbank potatoes similarly stored 2005 to 2006.



Glucose concentrations above 0.10% FW are often considered too high for frozen processing.

- At 45°F, glucose concentrations of Classic Russet remained at or below 0.10% FW throughout the nine month storage season during 3 years of testing.
- At 42°F, glucose concentrations
  - At about 50 DAH exceeded 0.10% FW;
  - At 102 DAH reached a peak of 0.21% FW; and
  - At 250 DAH, decreased over time in storage to 0.15%.

Although these glucose concentrations at 42°F exceed the maximum acceptable for frozen processing, they are acceptable in premium dehydration products.

**Sucrose concentrations** of Classic Russet at harvest ranged from 0.12% (2004) to 0.18% (2006) FW and were similar to Russet Burbank in 2005 (Fig. 2). In general, the seasonal pattern of sucrose concentrations in Classic Russet was similar to Russet Burbank, decreasing slightly over the storage season. A peak in sucrose concentrations (~0.16%) was observed in both Classic Russet and Russet Burbank potatoes stored at 42°F at 76 days after harvest in the 2005 to 2006 storage season.

### Fry color

Glucose concentrations in potato tubers are a good indicator of fry color. However, in the processing industry, fry color determinations are generally made on samples of fried potato strips, discs, or planks to assess fry quality.

In this study, fry color determinations were made by performing reflectance measurements with a Photovolt Reflection Meter Model 577 (Photovolt Inc., Indianapolis, IN) on fried planks (1.2" x 0.3")

Figure 2 compares mean percentages of sucrose (fresh weight) concentration in Classic Russet potatoes stored at 3 temperatures during 3 storage seasons with Russet Burbank potatoes similarly stored during one season.

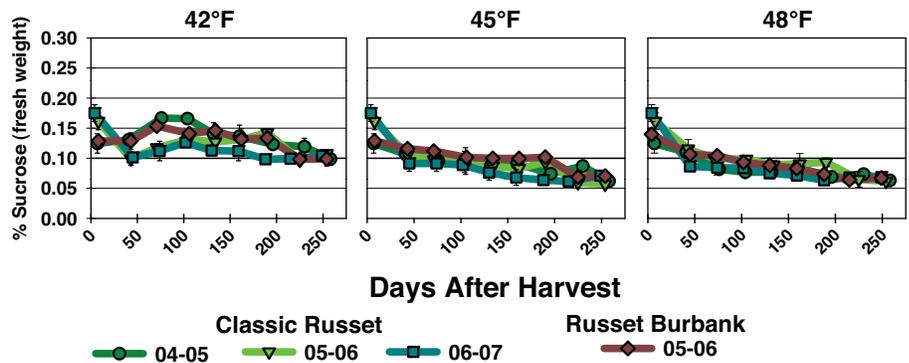


Figure 3 compares the mean percentage of reflectance of stem-end fry color in Classic Russet potatoes stored at 3 temperatures during 3 storage seasons with Russet Burbank potatoes similarly stored one season.

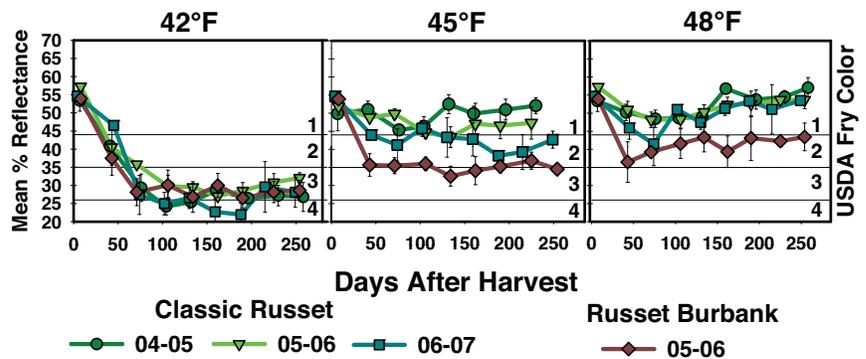


Figure 4 shows the mean severity of mottling in fried planks of Classic Russet potatoes at 3 temperatures during 3 storage seasons compared to Russet Burbank potatoes similarly stored from one season.

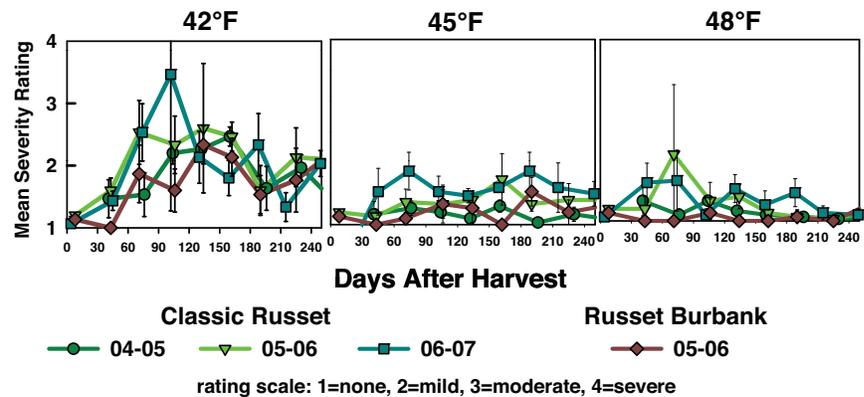


Table 2 compares infection severity (% decay) and incidence of potatoes with greater than 5% decay of *Fusarium dry rot* in bruised and inoculated lots of Russet Burbank and Classic Russet potato samples. Values are means of 3 years.

Variety	Decay (%)	Incidence (%) (potatoes with >5% decay)
Russet Burbank	10.2	54.8
Classic Russet	14.3	81.1
LSD ( $P < 0.05$ )	ns	8.9

from the same tubers 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. To represent the most stringent test of fry color, the stem-end fry color data are presented in Figure 3. Reflectance readings are presented together with the corresponding USDA fry color data. The USDA colors correspond to these reflectance ranges:

- USDA 1 = >44;
- USDA 2 = 35 to 44;
- USDA 3 = 26 to 34.9; and
- USDA 4 = <25.9 percent reflectance.

The higher the reflectance reading, the lighter the fry color.

Stem-end fry color of Classic Russet was very similar to Russet Burbank when stored at 42°F (Fig. 3).

At storage temperatures of 45°F and 48°F, however, fry color was lighter (higher reflectance) than Russet Burbank beginning approximately 50 days after harvest.

### Fry color test results

- **Stored at 48°F** – Fry color was lowest in Classic Russet when stored at this temperature, and the average fry color was less than or equal to a USDA 1, compared to a USDA 2 in Russet Burbank.
- **Stored at 45°F** – In Classic Russet samples, the USDA fry color was equal to a USDA 1 or 2, while fry color in Russet Burbank was a USDA 2 or 3.
- **Stored at 42°F**, fry color was no longer acceptable in Classic Russet approximately 60 days after harvest.

Fry color is considered acceptable at a USDA 2 or less, so at both 45°F and 48°F Classic Russet samples had acceptable fry color throughout all 3 storage seasons.

**Mottling**—defined as thin, thread-like areas of dark coloration found in the cortex of the fried potato tissue—can occur in some varieties. Each fry was subjectively evaluated on a scale of 1 to 4; where 1=none, 2=mild, 3=moderate, and 4=severe mottling (Fig. 4). Mottling in Classic Russet was similar to Russet Burbank during 3 years of testing. Mottling was mild to none at the warmer storage temperatures of 45°F and 48°F and mild to moderate at 42°F in both Classic Russet and Russet Burbank samples.

### Fusarium dry rot: Classic is moderately susceptible

Because Fusarium dry rot—a fungus—is an important storage disease in potatoes, new varieties are screened for susceptibility to it. Fusarium infects tubers through cuts or openings in the skin. In order to induce infection, potatoes were first bruised and then inoculated with *Fusarium* spp. to evaluate dry rot susceptibility. Potatoes were cured at 55°F and 95% relative humidity for two weeks, and then stored at 45°F. After approximately 3 months in storage, tubers were evaluated for the percentage of dry rot decay and incidence of the disease, expressed as the percentage of tubers evaluated having >5% decay (Table 2).

Results averaged over 3 years indicate that percentage of decay due to dry rot in Classic Russet was similar to that of Russet Burbank (Table 2). The mean decay for Russet Burbank was 10.2% while the mean for Classic Russet was 14.3%, and these means were not significantly different. The incidence of potatoes with at least 5% decay was significantly higher in Classic Russet (81%) than in Russet Burbank (55%). These results indicate that while Classic Russet may be more susceptible to initial Fusarium infection, further Fusarium decay development is similar to that of Russet Burbank. Thus, Classic Russet is classified as having moderate susceptibility to Fusarium dry rot.

### Weight loss

Percentage of weight loss was tracked in replications of 10-pound samples of Classic Russet and Russet Burbank potatoes throughout 3 storage seasons (Table 3). Classic Russet had significantly higher weight loss in storage across all 3 temperatures when compared to Russet Burbank. Average total weight loss in Classic Russet at the 3 storage temperatures was 57% greater than that observed in Russet Burbank.

Table 3 compares mean total percentages of weight loss after 250 days in samples of Russet Burbank and Classic Russet potatoes at 3 storage temperatures. Values are means of 3 storage years.

Variety	42°F	45°F	48°F
Russet Burbank	5.7%	4.3%	5.9%
Classic Russet	8.4%	7.1%	9.3%
LSD ( $P<0.05$ )	1.5	1.7	2.2

## Storage recommendations

Recommendations are based on data collected over a 3-year period at the University of Idaho Kimberly R&E Center on Classic Russet potatoes grown in southern Idaho.

**Curing** Cure at 55°F and 95% relative humidity for 14 days.

**Storage** Maintain 95% relative humidity throughout storage. Weight loss in Classic Russet is about 1.5 times higher than Russet Burbank.

- **Frozen processing** hold at 48°F
- **Fresh market** hold at 42° to 45°F
- **Dehydration processing** 42° to 45°F depending on intended product.

**Sprout inhibition** Apply CIPC before dormancy break but after curing.

- **42°F** Apply CIPC between 14 and 155 days after harvest
- **45°F** Apply CIPC between 14 and 130 days after harvest
- **48°F** Apply CIPC between 14 and 100 days after harvest

Because this is a shorter dormancy potato, CIPC residues should be monitored to ensure adequate sprout inhibition.

**Storage duration** High processing quality persists throughout 250 days after harvest at 48°F.

**Fry mottling** Mottling occurs in Classic Russet at lower storage temperatures. To minimize mottling, store at 45° to 48°F.

**Fusarium dry rot** Moderate susceptibility, similar to Russet Burbank.

## About the Authors

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