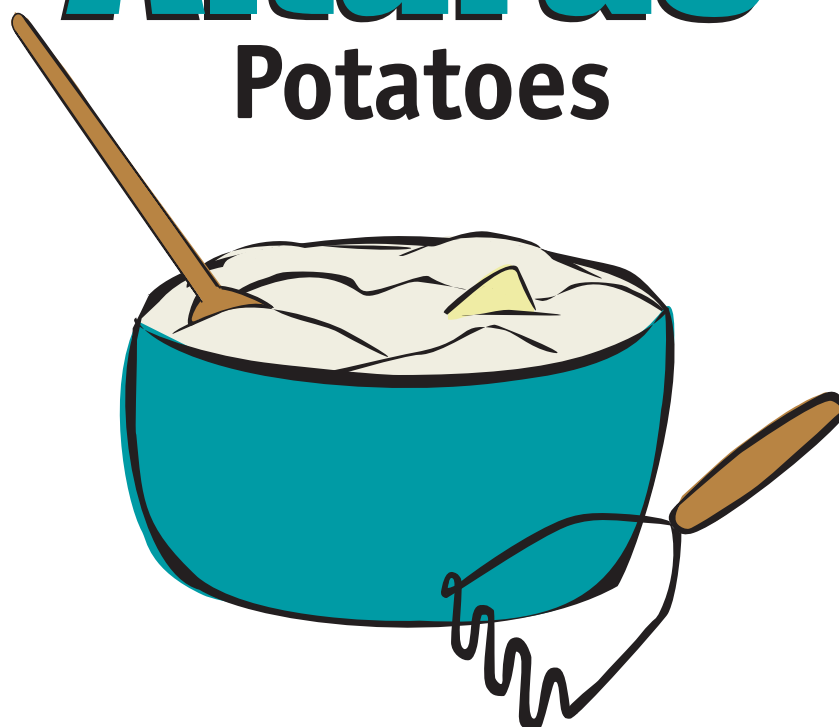


# Storage Management of **Alturas** Potatoes



## Introduction

The storage characteristics of Alturas potatoes were studied for 3 years at the University of Idaho Kimberly Research and Extension Center Potato Storage Research Facility in a project funded by the Idaho Potato Commission. Results of those studies are detailed in this publication along with storage management recommendations.

Alturas is a multi-purpose potato variety released in 2002 by the USDA-ARS and the agricultural experiment stations of Idaho, Oregon, and Washington. This variety is late-maturing and high-yielding, producing russeted tubers with high specific gravity. It was originally selected for dehydration processing but has characteristics that make it useable in frozen processing and fresh pack markets. More detailed information concerning the characteristics of Alturas may be found in its 2003 release publication in *American Journal of Potato Research*, volume 80, pages 295-301.

Alturas potato crops were produced at Kimberly, Idaho, from G2 seed in the years 2001, 2002, and 2003. 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°, 45°, and 48°F. 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 a thermal aerosol application of chlorpropham (CIPC) at 22 ppm at approximately 60 days after harvest (DAH).

## Dormancy

Dormancy length in Alturas is much shorter than in Russet Burbank (table 1). Dormancy break is defined as the point at which sprout elongation (at least 0.2 inch long) is beginning to occur in 80% of the tubers in the sample. This definition is utilized because the length of time between initial sprout development (peeping) and sprout elongation varies greatly among potato varieties.

Our data indicate that Alturas breaks dormancy between 55 and 75 days earlier than Russet Burbank, depending on the storage temperature. At 42°F, Alturas breaks dormancy at 100 DAH, whereas Russet Burbank potatoes break dormancy at 175 DAH. At 45° and 48°F, Alturas breaks dormancy at 90 and 75 DAH, respectively, while Russet Burbank breaks at 155 and 130 DAH, respectively.

## Glucose and Sucrose Development

Reducing sugar concentrations are critical to the eventual utilization of stored potatoes. Potatoes used for any frozen or dehydration processing must meet reducing sugar criteria specific to the end user. High concentrations of glucose (a reducing sugar) produce dark coloration when exposed to high temperatures during frying.

Glucose concentrations in Alturas at three temperatures and three years as compared with those in Russet Burbank are shown in figure 1. Glucose concentrations varied in Alturas according to the environmental conditions of the growing season. Glucose concentrations in Alturas were quite similar to those in Russet Burbank during storage at 45° and 48°F. At 42°F, glucose concentrations in Alturas were higher in 2001-02 and

2002-03 approximately 170 DAH than in Russet Burbank.

Sucrose concentrations in Alturas are quite similar to Russet Burbank at harvest and throughout the storage season (fig. 2). At 42°F, sucrose concentrations in Alturas remain between 0.10 and 0.20% of fresh weight (fw) for the storage season. At 45° and 48°F, sucrose concentrations in Alturas remain between 0.05 and 0.16% fw for the storage season.

## 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 Reflection Meter Model 577 (Photovolt Inc.,

Indianapolis, IN) on fried planks (1.2" x 0.3") from the same tubers used in 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, 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 the following reflectance ranges: USDA 1 > 44%, USDA 2 = 35-44%, USDA 3 = 26-34.9%, and USDA 4 < 25.9% reflectance.

In general, at all three storage temperatures, fry color is lighter in Alturas than in Russet Burbank. Fry color remained at or below a USDA 1 in Alturas stored at 48°F in the 3 years tested. The Alturas potatoes stored at 45°F reached a USDA 2 fry color at approximately

Table 1. Mean dormancy length (days after harvest) of Russet Burbank and Alturas potatoes at three storage temperatures. Values are means from three storage years (2001-02 through 2003-04).

Variety	42°F	45°F	48°F
Russet Burbank	175	155	130
Alturas	100	90	75

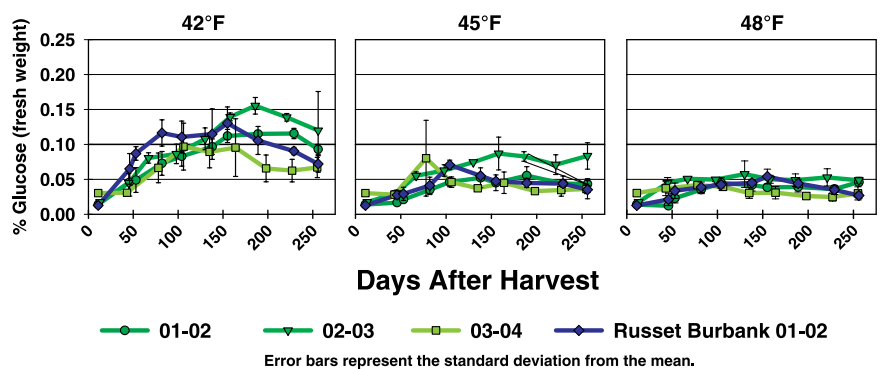


Figure 1. Percentage glucose in Alturas potatoes in three storage seasons (2001-2004) at three storage temperatures compared with Russet Burbank potatoes in an average year (2002-03).

140 DAH in 2002-03. In the summer of 2002, periods of high heat occurred that may account for the darker fry color. Except for one sampling date, 125 DAH in 2002-03, fry color was lighter in Alturas than Russet Burbank at 45 and 48°F. Alturas has consistent fry color within the fry strip; the bud end and stem end reflectance values are nearly equivalent.

Mottling, which is defined as thin, thread-like areas of dark coloration found in the cortex of the fried potato tissue, can occur in some varieties. Alturas showed practically no mottling in the tests. We evaluated each fry subjectively on a scale of 1-4, where 1=none, 2=mild, 3=moderate, and 4=severe mottling (fig. 4). Overall, mottling was highest at 42°F, but even then it was usually less than mild. The 2002-03 storage season had the highest severity of mottling, which was probably due to periods of high heat during the growing season. The potatoes produced under these more stressful growing conditions showed only mild symptoms of mottling.

### Fusarium Dry Rot

Because Fusarium dry rot is an important storage disease in potatoes, new varieties are screened for susceptibility to this disease. *Fusarium* (a fungus) infects tubers through cuts or openings in the skin. Potatoes, therefore, 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 2 weeks and then stored at 45°F. After approximately 3 months in storage, evaluations of dry rot decay and incidence were made (table 2).

Results averaged over 3 years indicate that the percentage incidence

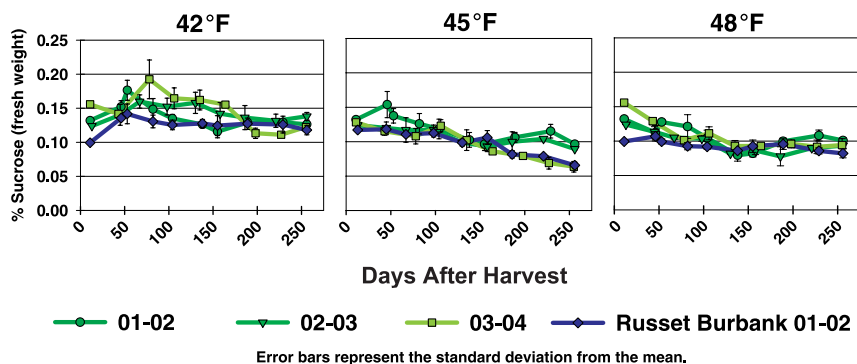


Figure 2. Percentage sucrose in Alturas potatoes in three storage seasons (2001-04) at three storage temperatures compared with Russet Burbank potatoes in an average year (2001-02).

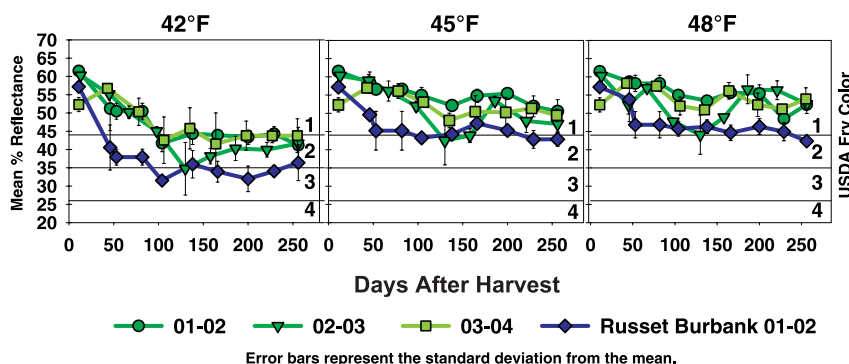


Figure 3. Stem end fry color in Alturas potatoes in three storage seasons (2001-04) at three storage temperatures compared with Russet Burbank potatoes in an average year (2001-02).

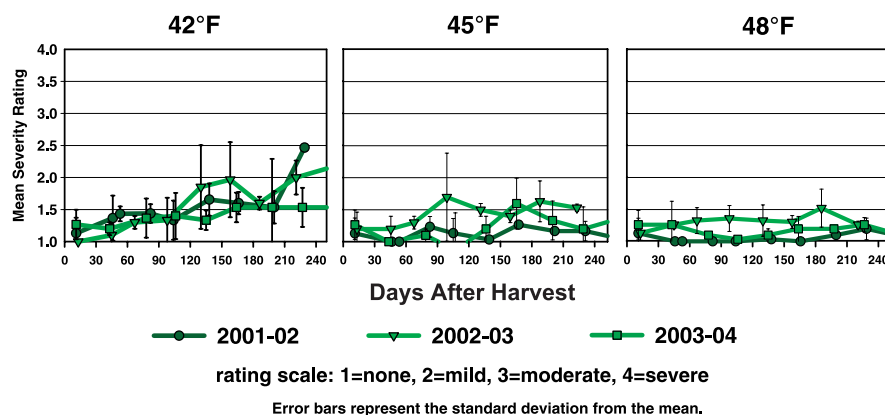


Figure 4. Severity of mottling in fried planks of Alturas potatoes in three storage seasons (2001-04) at three storage temperatures.

Table 2. Decay and incidence of Fusarium dry rot in bruised and inoculated lots of Russet Burbank and Alturas potato samples. Values are means from three storage years (2001-02 through 2003-04).

Variety	Decay (%)	Incidence (%)
Russet Burbank	9.1	64
Alturas	2.1	65
Note: LSD ( $P < 0.05$ )	3.9	ns

of dry rot in Alturas was not significantly different than in Russet Burbank, and the percentage of dry rot decay was significantly lower in Alturas than in Russet Burbank. Thus, Alturas is classified as having low susceptibility to Fusarium dry rot.

### Further Readings

Copies of this and other UI Extension publications are available from Educational Publications Warehouse, phone (208) 885-7982, fax (208) 885-4648, email calspubs@uidaho.edu. Final charges will include shipping and handling and Idaho sales tax.

*Commercial Application of CIPC Sprout Inhibitor to Storage Potatoes*, CIS 1059, \$1.25

*Diagnosis and Management of Potato Storage Diseases*, CIS 1131, \$3.00

*Organic and Alternative Methods for Potato Sprout Control in Storage*, CIS 1120, \$3.00

*Storage Management for Gem Russet Potatoes*, CIS 1118, \$3.00

*Storage Management for Summit Russet Potatoes*, CIS 1123, \$2.50

*Storage Management for Umatilla Russet Potatoes*, BUL 839, \$3.00

*Use of Chlorine Dioxide in Potato Storage*, BUL 825, \$1.00

*Vine Kill and Long-term Storage of Ranger Russet Potatoes*, CIS 1119, \$3.00

### Storage Recommendations

The following recommendations are based on data collected over a 3-year period at the University of Idaho Kimberly R&E Center on Alturas potatoes grown in southern Idaho.

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

**Storage Conditions** Maintain 95% relative humidity throughout storage.

- **Frozen Processing** 45°F holding temperature (48°F if crop subjected to heat or field stress).
- **Dehydration Processing** Not less than 42°F.

**Sprout Inhibition** Apply CIPC before dormancy break but after curing. Because Alturas is a shorter dormancy potato, CIPC residues should be checked to ensure long season sprout inhibition.

- **42°F** Apply CIPC between 14 and 100 days after harvest
- **45°F** Apply CIPC between 14 and 90 days after harvest
- **48°F** Apply CIPC between 14 and 75 days after harvest

**Duration of Storage** High processing quality persists at least until approximately 250 days after harvest at 45° to 48°F.

**Mottling** Minimal at 45° to 48°F throughout 250 days in storage; potential elevation in symptoms at 42°F after 100 days.

**Fusarium Dry Rot** Low susceptibility (lower than Russet Burbank)

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