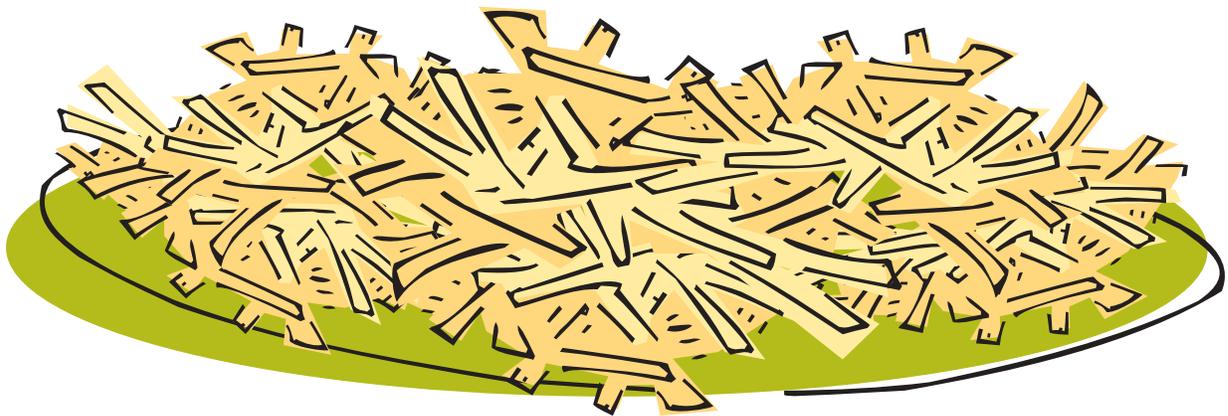


Storage Management for Umatilla Russet Potatoes



Introduction

Storage management is an important factor in the successful utilization of new potato varieties. As new varieties are released to growers, information on how to grow and store them must be provided to maximize production efficiency. Historically, Russet Burbank has been the most common potato variety maintained in storage in the northwest United States. Many years of research and practical experience have gone into the development of best storage management practices for this potato variety. However, as with the cultural management of new varieties in the field, storage management guidelines also need to be cultivar specific.

Umatilla Russet, the result of a cross made by Dr. J.J. Pavék, was named by Oregon and jointly released by Oregon, Washington, Idaho, and the ARS/USDA in 1998. This cultivar has attributes that make it an excellent choice for frozen processing. These attributes include high specific gravity, good fry color, uniform tuber shape, and good resistance to internal physiological disorders. This publication provides critical information on optimizing storage conditions for Umatilla Russet.

Umatilla Russet was stored and evaluated over a three-year period at the Kimberly Research and Extension (R&E) Center Potato Storage Research Facility. Potatoes were grown at Aberdeen, ID (1998), or Kimberly, ID (1999 and 2000). After harvest, potatoes were cured for 14 days at 55°F and then the temperature was decreased by 0.5°F per day to final holding temperatures of 42°F, 45°F, or 48°F. Relative humidity was maintained at 95 percent throughout the duration of 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.

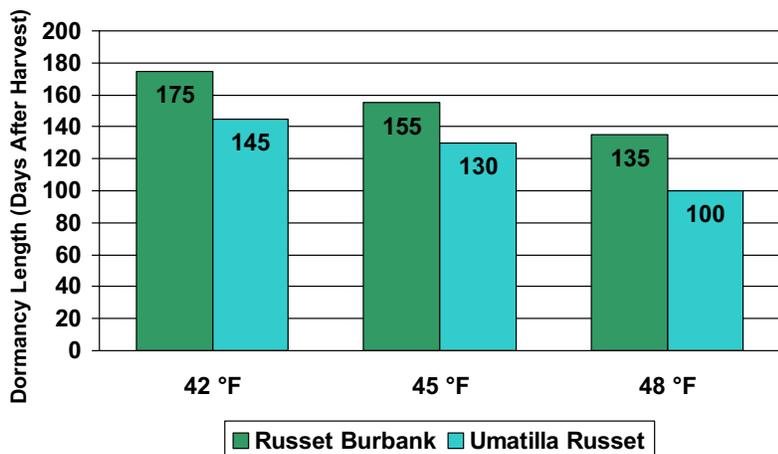


Fig 1. Relative dormancy length (in days after harvest) for Russet Burbank and Umatilla Russet potatoes at three storage temperatures.

Dormancy

Dormancy length for Umatilla Russet is shorter than for Russet Burbank (Table 1). Three years of data at three storage temperatures of 42°F, 45°F, and 48°F were used to estimate dormancy length (Fig. 1). The end of dormancy is defined as the number of days after harvest until 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 kept the Umatilla Russet potatoes from sprouting for 10 months (the duration of the test). Sprouting in Umatilla Russet occurs from multiple eyes, indicating less apical dominance than is typical of Russet Burbank.

Glucose and Sucrose Development

Glucose (a reducing sugar) and sucrose concentrations are important considerations in potatoes stored for use in the frozen processing industry. 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 percent glucose (by fresh weight) is the upper

limit for glucose concentration in the tuber tissue. In general, Umatilla Russet has less glucose and sucrose accumulation in storage compared to that in Russet Burbank (Fig. 2 and 3). Both glucose and sucrose concentrations increased slowly and consistently over the storage season in all three years for Umatilla Russet. There appears to be a sharp increase in both glucose and sucrose concentrations after approximately 200 days following harvest. The degree of increase is higher, indicated by the slope of the curve, at the 42°F storage temperature than at 45°F and 48°F. Compared with Russet Burbank (black line in figures), Umatilla Russet has a lower percentage of glucose, particularly at the 42°F storage, until late in the season. Even at 42°F, glucose

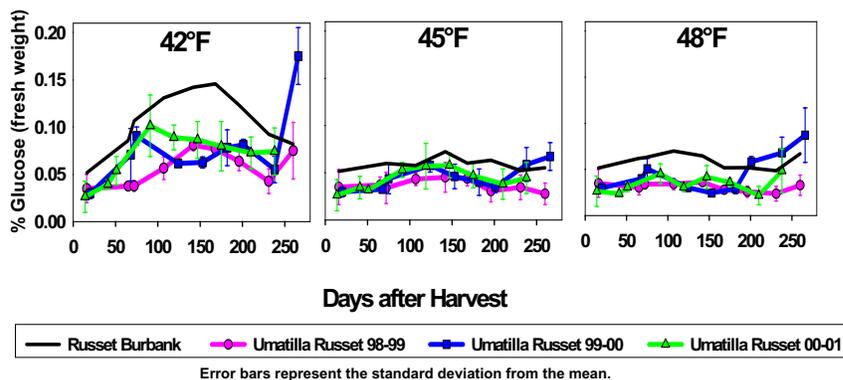


Fig. 2. Percent glucose in Umatilla Russet potatoes in three storage seasons at three storage temperatures compared with Russet Burbank potatoes (average year).

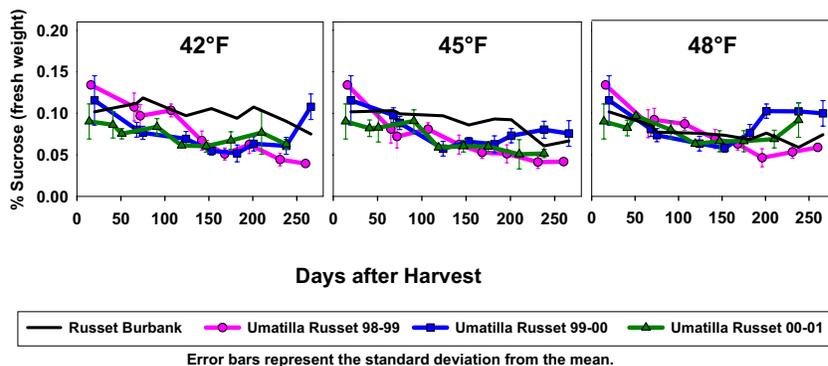


Fig. 3. Percent sucrose in Umatilla Russet potatoes in three storage seasons at three storage temperatures compared to Russet Burbank potatoes (average year).

stays below the 0.1 percent level until 220 days after harvest, and longer if the potatoes are stored at 45°F or 48°F.

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 on fried planks (.12" x .03") from the same tubers as those used in the reducing sugar analyses. Usually when variation in fry color occurs within a potato, it is 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 Fig. 4. The reflectance readings are presented together with the corresponding USDA fry color according to method described by Kincaid, Westermann and Trout, 1993. Average fry color stayed below a USDA 3 in Umatilla Russet at all storage temperatures, and thus remained acceptable. However, at 42°F, fry color approached a USDA 3 at approximately 120 days after harvest. Fry color was lower in Umatilla Russet than Russet Burbank at all three temperatures throughout the 210 days in storage.

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 was much lower in Umatilla Russet than Russet Burbank at all three temperatures (Fig. 5). The percentage of off-color in Umatilla Russet was very low at 45°F and 48°F.

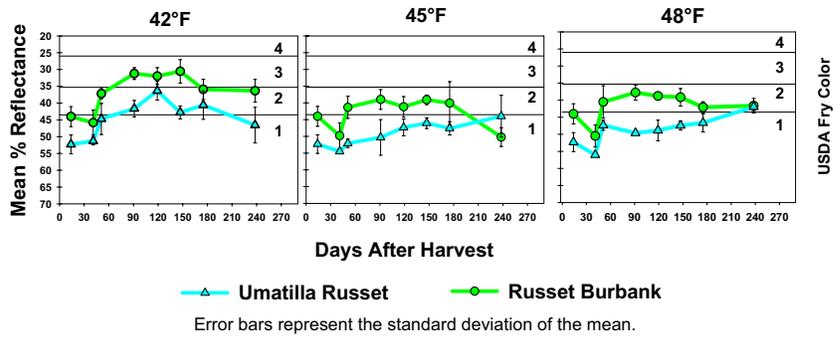


Fig. 4. Stem end fry color in Russet Burbank and Umatilla Russet potatoes in storage at three temperatures.

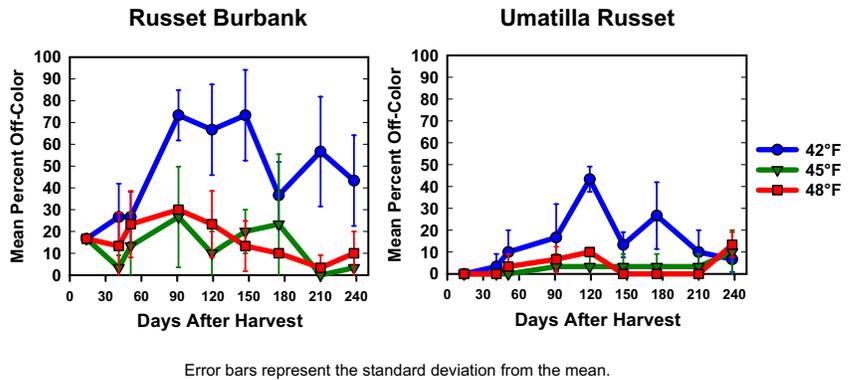


Fig. 5. Percent USDA 3 and 4's (off-color) in Russet Burbank and Umatilla Russet potatoes at three storage temperatures in one storage year.

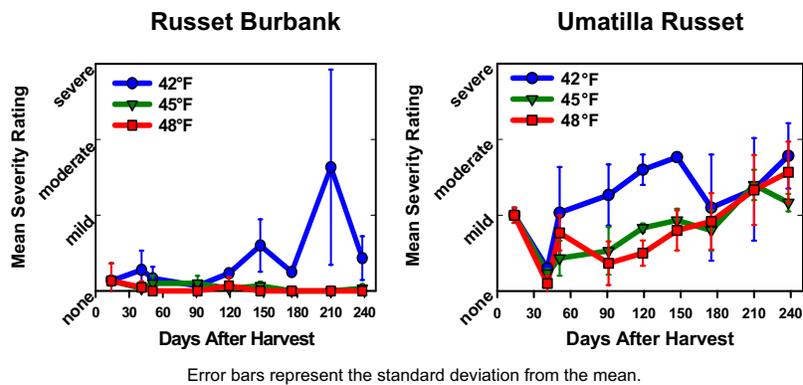


Fig. 6. Mottling in Russet Burbank and Umatilla Russet fried planks at three storage temperatures in one storage year.

Mottling

Uneven coloration within a french fry 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 potato, often emanating from the stem end. Dark stem ends are characterized by dark fry color throughout all the tissue at the stem end of the potato. Mottling is also a quality concern for processors. Mottling is present in Umatilla Russet and may be worse when stored at 42°F (Fig. 6). Mottling does appear to increase in storage over time in Umatilla Russet at all temperatures. In comparison, Russet Burbank does not exhibit extensive mottling in storage.

Fusarium

Fusarium dry rot is an important storage disease in potatoes. An evaluation of Fusarium dry rot susceptibility was done by severely bruising and inoculating tubers in two successive storage seasons. The results indicate that Umatilla Russet has a moderate level of susceptibility to Fusarium dry rot, and has similar or slightly higher susceptibility than Russet Burbank.

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 Umatilla Russet potatoes grown in Southern Idaho.

- Curing: 50°-55°F and 95% relative humidity for 14 days
- Storage: 44°-45°F holding temperature for processing
- Sprout Inhibition: Apply CIPC before dormancy break but after curing (14-130 days after harvest)
- Duration of Storage: High processing quality persists at least until approximately 200 days after harvest (April - May in Southcentral Idaho)

Further Reading

Mosley, A.R., S. R. James D. C. Hane, K. A. Rykbost, C. C. Shock, B.A. Charlton, J.J. Pavek, D.L. Corsini and R.E. Thornton. Umatilla Russet: A Full Season Long Russet for Processing and Fresh Market Use. 2000. *Am J of Potato Res* 77:83-87.

Kincaid, D.C., D.T. Westermann and T.J. Trout. 1993. Irrigation and Soil Temperature Effects on Russet Burbank Quality. *Am Potato J* 70:711-723.

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