

## STORAGE OF NEW POTATO VARIETIES

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The percentage of potato acreage in Idaho devoted to Russet Burbank has declined over the last several years and this acreage is being replaced by newer russet-skinned cultivars. These newer cultivars are not only being grown, but also are being stored for later use in processing and fresh markets. Research at the University of Idaho potato storage research facility at Kimberly, Idaho is being conducted in order to determine storage management guidelines for these newer cultivars.

This research involves a great deal of both laboratory and storage evaluations. Here is how we evaluate each cultivar to help ascertain best storage management practices as well as how the cultivar compares to Russet Burbank. Processing quality assessments include glucose, sucrose, USDA fry color measurements and sprout ratings assessed over a nine-month storage period on potatoes grown at Kimberly. In general, the higher the glucose level, the darker the fry color. When percent glucose fresh weight exceeds 0.10 percent, then fry color is often considered unacceptably dark. Samples of each cultivar are cured at 55°F for two weeks at 95 percent relative humidity. Storage temperatures are ramped (0.5°F/day) to final holding temperatures of 42°F, 45°F and 48°F and treated with CIPC (22 ppm) to control sprouting on half of the samples. The other half of the samples are also stored at the same three temperatures, but without CIPC for dormancy length determination. An assessment of susceptibility to Fusarium dry rot is also conducted by bruising, inoculating and storing tubers at 45°F. Data collected from these studies are then used to develop storage recommendations. Evaluation results for seven “newer” cultivars including: Alturas, Bannock Russet, Gem Russet, Ranger Russet, Summit Russet, Umatilla Russet and A9014-2 are described.

### DISCUSSION

Dormancy length is an important consideration when storing potatoes. Decisions on the length of time one chooses to store and, when used, the timing of application of sprout inhibitors are critical to successful storage. Dormancy length of the seven cultivars at three storage temperatures is shown in Table 1. Summit Russet has a longer dormancy period than Russet Burbank when stored at 42°F, and a slightly shorter dormancy when stored at 45 or 48°F. Alturas and Ranger have relatively short dormancy lengths.

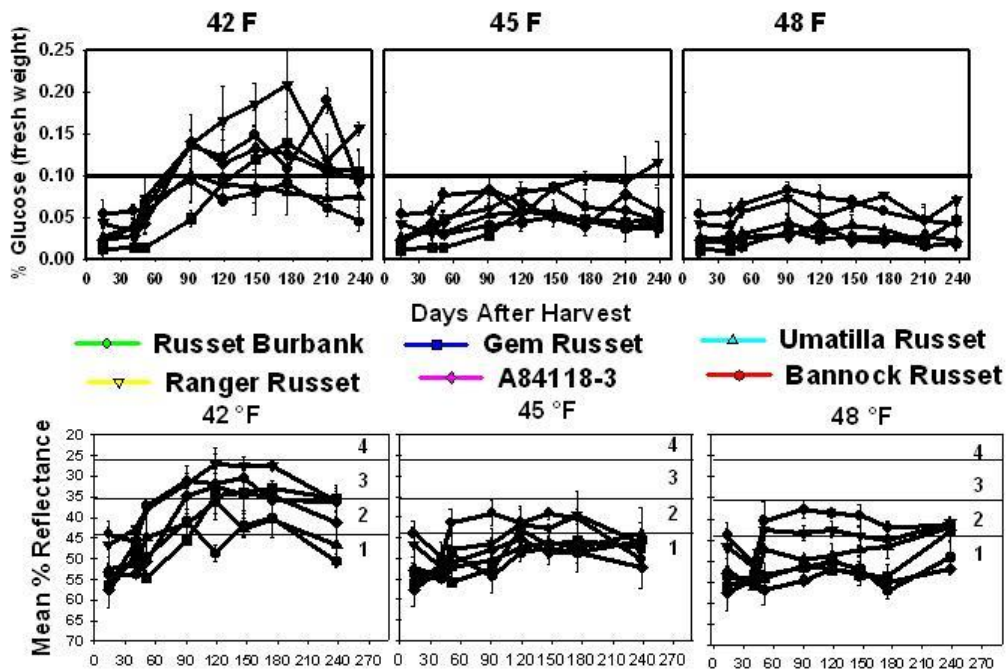
Table 1. Approximate dormancy length of eight potato varieties.

Variety	42 °F	45 °F	48 °F
Summit	200	145	110
RB	175	155	130
Bannock	175	125	110
Gem	165	145	125
A9014-2	150	100	100
Umatilla	145	130	100
Alturas	100	90	75
Ranger	100	80	80

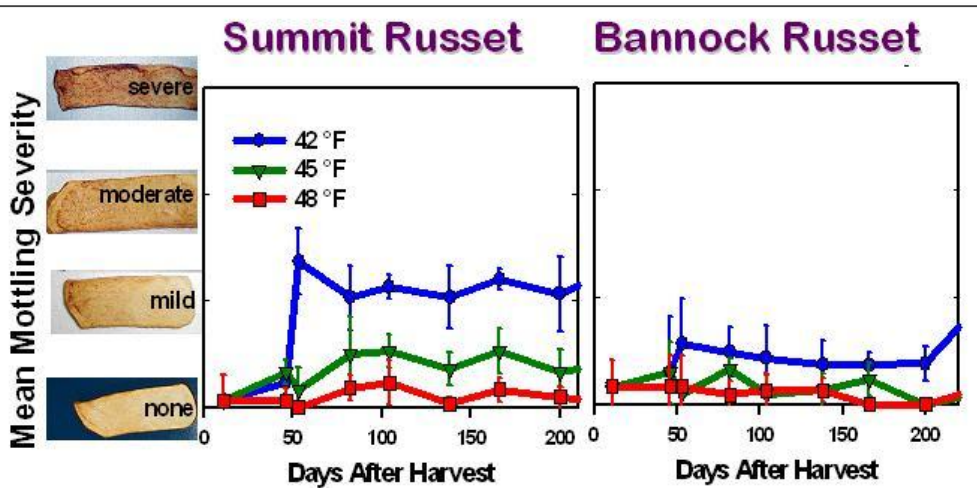
Fusarium dry rot is a common storage disease in our potato production area. We evaluate relative dry rot susceptibility in varieties at the 45°F storage temperature and then classify them as being a high, moderate or low dry rot susceptible variety. According to our tests, Bannock Russet and A9014-2 are both highly susceptible to dry rot. Russet Burbank, Gem Russet, Umatilla Russet and Ranger Russet are all moderately susceptible. Summit Russet and Alturas both tested as having a low susceptibility.

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, and thus, processors seek potatoes with low concentrations of reducing sugars. Often 0.1% glucose (by fresh weight) is the upper limit for glucose concentration in the tuber tissue. Generally speaking, the colder the storage temperature, the higher the glucose concentrations in the stored tubers and the darker the fry color in the resulting fried product. Also, in many cultivars, glucose concentrations increase over time in storage until they reach their peak, often at about 160 days in storage, at which time they level off or sometimes decrease (this is both variety and growing season dependent). Figure 1 depicts the relationships of glucose concentrations, and fry color for six varieties over 9 months of storage at three different storage temperatures. This is a general trend; however each variety must be investigated to ascertain the glucose concentrations over time and over years (or growing seasons). Although fry quality is directly related to glucose concentrations, there are other factors that can impact the processing quality of tubers. One such factor is uneven coloration within a french fry, which 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. Whereas, dark ends (sugar 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. In our tests, we rate mottling on a scale of 1 to 4; where 1=none, 2=mild, 3=moderate and 4= severe. In our experience, varieties tend to be either prone to mottling and the mottling can be attenuated by increasing the storage temperature or they are not prone to mottling to any appreciable degree (Figure 2). In our test, Russet Burbank, Bannock Russet, A9014-2 and Alturas showed minimal mottling. The following varieties; Gem Russet, Umatilla Russet, Ranger Russet and Summit Russet, exhibited some mottling but it could be minimized by adjusting the storage temperature.

The efficacy of CIPC on sprout control is assessed on all varieties at the three temperatures through the end of each storage season, which is generally early to mid June. CIPC is applied at 22 mg/kg in late November. We sample for residues usually in December, March and June. There is limited sprout growth occurring in May and June in the shorter dormancy varieties Ranger and Alturas. It is recommended that a second application of CIPC be made to those varieties if long-term storage is desired.



**Figure 1. Percent glucose and USDA fry color over time in six varieties when stored at 42, 45 or 48 °F.**



**Figure 2. Severity of mottling in two varieties at three temperatures over time in storage.**

## **STORAGE RECOMMENDATIONS**

Curing conditions utilized for these studies are 55°F, 95 % RH for 14 days. The storage temperature was ramped down to holding temperature at a rate of 0.5°F per day. It is important to assess each crop at harvest to watch for disease or quality problems that may warrant the use of alterations in these basic storage management recommendations. The following recommendations are given for use in frozen processing market. If your crop will be sold for fresh pack, then a storage temperature of 42°F is recommended. If your crop is intended for use as seed, then hold the potatoes at 38°F after curing.

Alturas (A82360-7): This cultivar was selected for dehydration and French fry processing but has fresh pack potential. It is a late maturing, very high yielding selection with oblong lightly russeted tubers. It has a high tuber count, a low percentage of oversize tubers, and resistance to early die diseases. Fusarium dry rot in Alturas is significantly lower than in Russet in our tests. Storage temperature recommendations are 45-48°F, depending on the growing season. Use 48°F if it was a hot growing season and 45°F if temperatures were more moderate. Dormancy length is relatively short with this variety, only about 110 days at 48°F. This variety can be grown for use in dehydration processing or fresh pack, in such cases the holding temperature can be 42°F.

Bannock Russet (A81473-2): This is a late-maturing, oblong russet variety with potential use in fresh pack and processing markets. It is resistant to verticillium and other early die diseases. The incidence and severity of Fusarium dry rot in Bannock is higher than Russet Burbank in our tests and is classified as highly susceptible. Dormancy length is also similar to Russet Burbank at 42°F, and approximately 20 days shorter at 45°F and 48°F. As with Alturas, storage temperature recommendations are 45-48°F, depending on the growing season. Use 48°F if it was a hot growing season and 45°F if temperatures were more moderate. Mottling was not evident in this cultivar in any of the three years or at any of the three storage temperatures.

Gem Russet (A8495-1): This cultivar is a medium to late maturing potato with oblong to long tubers with medium russet skin. This cultivar possesses qualities that make it useful in both fresh and processing markets. Gem Russet is moderately susceptible to Fusarium dry rot. It has a slightly shorter dormancy period (10 days) than Russet Burbank at all three temperatures tested. Mottling occurs in this variety when stored at lower temperatures. The recommended storage temperature for Gem Russet is 48°F.

Ranger Russet (A7411-2): This variety is currently the second most popular processing variety in Idaho. It was released in 1991, but the amount of acreage grown has increased markedly in the last few years. Ranger is moderately susceptible to Fusarium dry rot. It has a very short dormancy length; it is only about 80 days when stored at the recommended storage temperature of 48°F. It is also susceptible to mottling. Recent work by Dr. Nora Olsen and Lynn Woodell shows that vine-kill methods in the field, temperature exposure in the field and curing temperature can all significantly impact storage quality in this variety. Their work suggests that minimizing the time between vine-kill and harvest (for example killing vines 2 weeks prior to harvest or not at all)

resulted in lower reducing sugars in the tubers. Low temperature exposure in the field, for example, 45°F for 6 days resulted in higher sugars in storage.

Summit Russet (A84118-3): This variety was released in 2002. Its field characteristics are late-maturity, moderate yield and medium russet skin. It has use in both fresh market and processing. It has high specific gravity, and is resistant to early blight, verticillium, and blackspot bruise. This cultivar appears to possess a low susceptibility to Fusarium dry rot, significantly lower than Russet Burbank. Dormancy in Summit Russet is quite long and nearly equivalent to Russet Burbank when stored at 45 and 48°F, but is much longer than Russet Burbank when stored at 42°F. Percent glucose in Summit Russet is comparable to the other varieties in the test at 45 and 48°F, but significantly higher at 42°F. Mottling can occur in Summit Russet when stored at 42°F. The recommended storage temperature for Summit Russet is 45°F.

Umatilla Russet (AO82611-7): This variety was released in 1998. Umatilla Russet has attributes that make it an excellent choice for frozen processing primarily for use in the frozen processing industry. These attributes include high specific gravity, good fry color, uniform tuber shape, and good resistance to internal physiological disorders. This variety is moderately susceptible to Fusarium dry rot. The dormancy length of Umatilla is slightly shorter than Russet Burbank, at about 130 days when stored at 45°F. Mottling occurs in this variety but is attenuated by higher storage temperatures. In general, glucose concentrations remain low throughout storage in Umatilla, even at 42°F, but mottling severity is elevated at this temperature, thus we recommend storage temperatures of 44-45°F.

Gem Star Russet (A9014-2): This is a medium maturing variety that is high yielding with heavy russet skin and an oblong shape. It has potential for processing and fresh market with a high specific gravity and good appearance. It is resistant to blackspot bruise but susceptible to hollow heart. Gem Star Russet appears to be more susceptible to Fusarium dry rot than Russet Burbank. Dormancy length is shorter than Russet Burbank; it ranges from 150 days at 42°F to 100 days at 48°F. Sucrose concentrations are higher at harvest compared to all varieties in this test but decrease during storage to levels similar to the other varieties after about 2 months. Glucose concentrations and fry color were acceptable for Gem Star Russet, in fact, were very low at 42, 45, and 48°F throughout the nine months of storage. Some mottling occurs at 42°F, so the recommended storage temperature is 45-48°F, depending on the field growing conditions.