

# Vine Kill and Long-term Storage of Ranger Russet Potatoes

*Lynn Woodell, Nora Olsen, Tina L. Brandt, Gale E. Kleinkopf*

**Ranger Russet** potatoes, the result of a 1977 cross made by Dr. J. J. Pavék, were released in 1991 by the ARS/USDA and Agricultural Experiment Stations of Idaho, Oregon, Washington, and Colorado. This cultivar has traits that make it an excellent choice for frozen processing. These traits include high yield, high product recovery rate, high specific gravity, uniform tuber shape, and good resistance to internal defects. Along with its positive attributes, Ranger Russet has characteristics that can lead to inferior product quality. Some of the quality concerns, following both short and long-term storage, are high glucose content, fry color darkening, and fried-product mottling.

Processors seek potatoes with low concentrations of reducing sugars. Glucose—a reducing sugar—reacts with amino acids when exposed to high cooking temperatures to develop dark fry color that is undesirable to consumers. Often 0.1% glucose (by fresh weight) is considered the upper limit for glucose concentration in Russet Burbank tuber tissue for acceptable processing. Uneven coloration within a french fry can also occur. This is termed “mottling” and is characterized by thin thread-like areas of dark color throughout the cortex and perimedullary tissue. Black spot bruise may also be a concern.

The in-field and storage management practices required for the best long-term storability of Ranger

Russet potatoes have not yet been completely determined. This publication provides information from a series of projects evaluating vine kill timing options and optimizing storage conditions for Ranger Russet.

## Green vine harvest may improve processing quality

The general recommendation for Russet Burbank is to vine kill 14 to 21 days prior to harvest. This time allows for proper “setting” of the skin and maturing of the tuber. Proper skin set helps minimize injury at harvest, reduces feathering of the skin, and subsequently reduces weight loss potential in storage. Vine kill can also influence chemical maturity. Proper chemical maturity is important for limiting reducing sugar accumulation and unacceptable fry color formation in storage.

When is the right time to kill Ranger Russet vines for the best processing quality? Optimal vine killing practices for Ranger Russet may not follow recommendations made for Russet Burbank. Some industry observations indicate that harvesting Ranger Russet potatoes under green vines actually improves processing quality compared to killing vines

prior to harvest. By not killing vines, the potential for greater early harvest yields may also be seen.

Killing Ranger Russet vines 4 weeks prior to harvest resulted in higher yields of smaller (6 to 10 ounces) tubers and lower yields of larger (greater than 12 ounces) tubers when compared to tubers from plants receiving no vine kill (Figure 1). Lower yields of US #1 potatoes (Figure 2) and lower specific gravity also occurred with vines killed four weeks prior to harvest. Although dependent upon the year, in general, yields were not impacted by killing vines 2 weeks before harvest.

Ranger Russet tubers harvested with no mechanical vine kill showed low glucose levels (data not shown) and acceptable fry quality throughout an extended period of storage at 48°F (Figures 3 and 4). Glucose levels and stem end fry color values resulted in the same conclusions, so only fry color data are shown. Tubers from plants with vines killed 2 weeks before harvest also demonstrated acceptable quality. Lower quality, as seen by dark fry color and mottling, can occur in tubers harvested from plants killed 4 weeks prior to harvest (Figures 3 and 4).

**Note:** This report is based on 3 years of studies conducted by University of Idaho scientists at Idaho’s Kimberly Research and Extension Center. Studies examine the effects of length of time intervals from vine kill to harvest and best storage management practices for long-term processing quality of Ranger Russet potatoes. Special thanks to the Idaho Potato Commission for funding this research.

## Conclusions

Two conclusions can be reached based on these data:

1. No vine kill produced potatoes with the best processing quality.
2. Two week dead vines produced potatoes with lower but still acceptable processing quality.

## Storage management—48°F is recommended

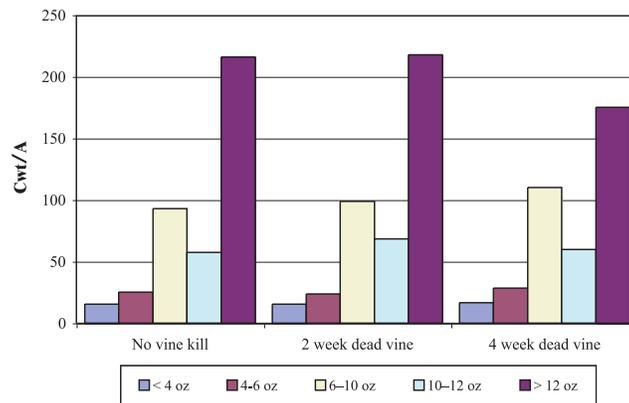
Maintaining processing quality is an important part of storage management. To maintain that quality, it is necessary to limit the conversion of starch to sugars and inhibit sprout development. Lower storage holding temperatures promote an elevation in reducing sugars and darker fry color, but these temperatures also help retard sprout development. The ability to store potatoes at cooler temperatures while maintaining fry quality would be a huge benefit to the potato industry. Unfortunately, this is not an option with Ranger Russet potatoes because exposure to temperatures of 45°F or less for more than one or two days results in higher glucose content, darker fry color and more severe mottling in the tubers (Figures 5 and 6). The recommended storage temperature is 48°F.

In addition to holding temperature, there are other storage management practices that can alter processing quality and storability. Curing temperature, CIPC applications, and airflow may also affect Ranger Russet quality in storage (Figures 5 and 6).

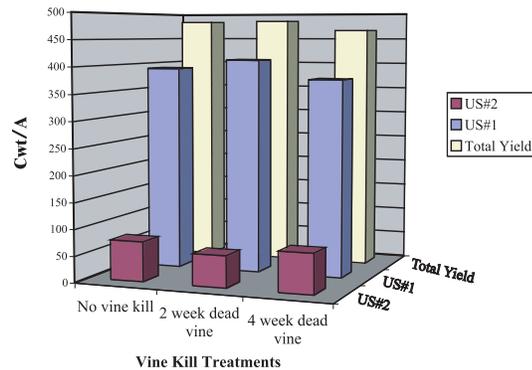
## Conclusions

Conclusions based on these data are as follows:

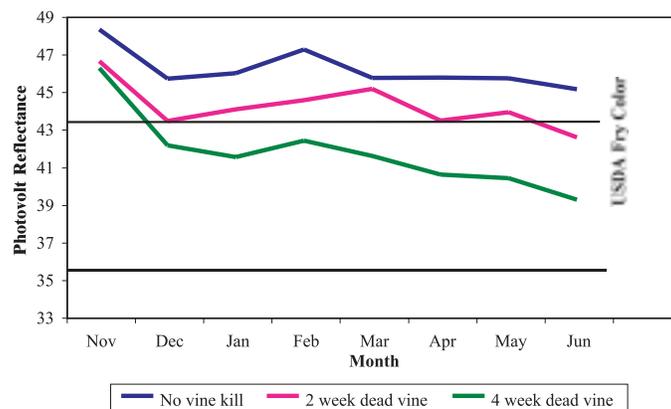
1. Curing at 60°F did not change processing quality when compared to curing at 55°F. Therefore higher curing temperatures (>55°F) are not recommended.
2. Avoid storage temperatures below 48°F; maintain 48°F holding temperatures.
3. The addition of a second CIPC application in late January caused a short-term increase in glucose



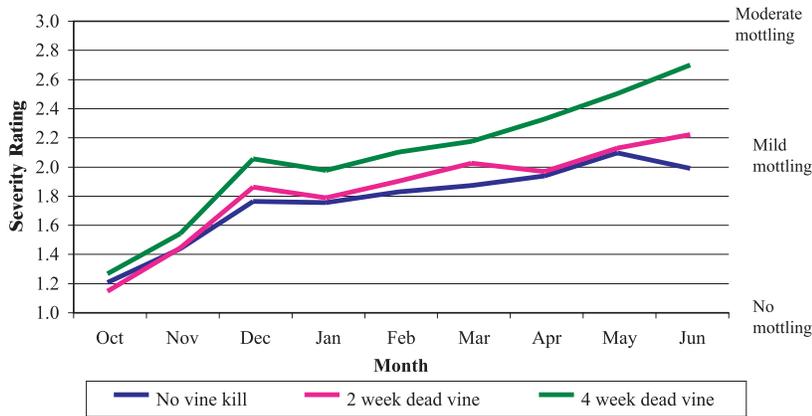
**Figure 1. Yield by size categories** of Ranger Russet potatoes with 3 vine kill regimes: Higher yields of smaller tubers and lower yield of larger tubers are seen with 4 week dead vines.



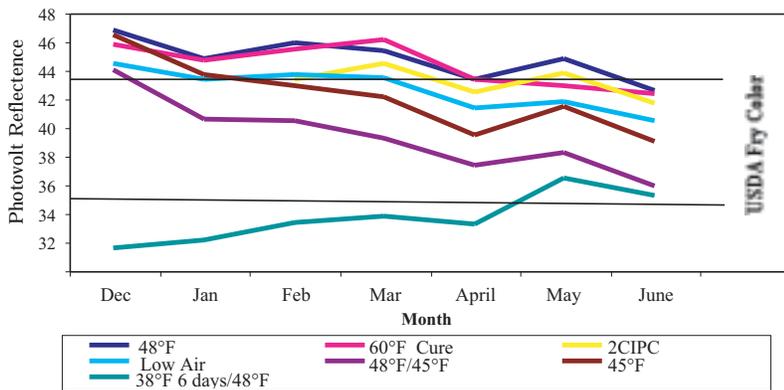
**Figure 2. Total yield and grade** of Ranger Russet potatoes with 3 vine kill regimes: Lower yields of US#1 potatoes occur with 4 week dead vines.



**Figure 3. Stem end fry color** in Ranger Russet potatoes with 3 vine kill regimes: Potatoes harvested with no vine kill maintain the best reflectance value and lightest fry color throughout 8 months of testing.

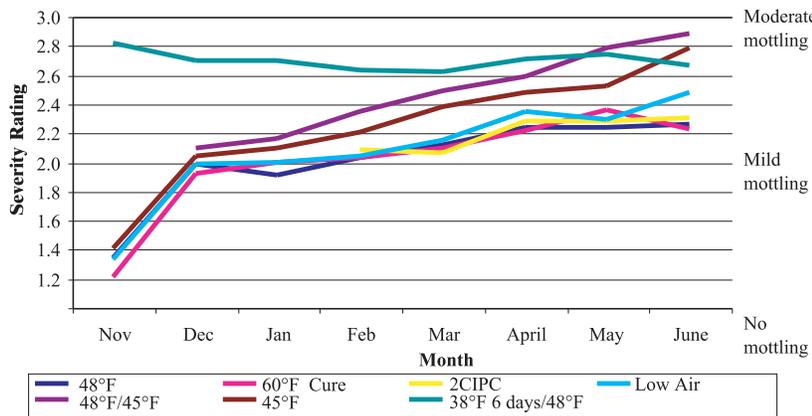


**Figure 4. Mottling severity** in Ranger Russet potatoes with 3 vine kill regimes: Mottling during 8 months of storage was the least evident in potatoes harvested with no vine kill regimes and most severe in potatoes harvested from vines dead for 4 weeks before harvest.



**Figure 5. Stem end fry color** in Ranger Russet potatoes under 7 storage regimes:

- **48°F**—Potatoes cured at 55°F, ramped 0.5°F/day to a final holding at 48°F
- **60°F**—60°F for 14 days, ramped down to 48°F for remaining storage season
- **2 CIPC**—2nd CIPC application made after 4 months in storage.
- **Low Air**—50% airflow
- **48°F/45°F**—Moved from 48°F to 45°F after 52 days in storage.
- **45°F**—55°F for 14 days, ramped down to 45°F for remaining storage season
- **38°F 6 days/48°F**—38°F for 6 days post harvest, then cured at 55°F, ramped 0.5°F/day to a final holding at 48°F.



**Figure 6. Mottling severity** in Ranger Russet potatoes under 7 storage regimes (described in Figure 5). Avoid storage temperatures below 48°F.

concentrations and stem end fry color. This indicates that a greater time lag between CIPC application and processing may be warranted.

4. Reduced airflow through the pile also caused some undesirable processing quality attributes.
5. Proper storage environment will allow good processing quality for 8 months.

### Dormancy—about 80 days

Length of dormancy period for Ranger Russet at a storage temperature of 48°F is approximately 80 days. Sprouting occurs from multiple eyes, indicating less apical dominance than is typical of Russet Burbank. If the length of the desired storage period exceeds the length of the dormancy period, then the application of a chemical sprout inhibitor is required. In our tests, a label rate of 22 ppm CIPC applied one time controlled sprouting in Ranger Russet potatoes for at least 10 months.

### Fusarium

Fusarium dry rot is an important storage disease in potatoes. Ranger Russet has a moderate level of susceptibility to Fusarium, similar to Russet Burbank. However, Ranger Russet's higher susceptibility to bruising at harvest may provide greater opportunity for Fusarium infection and disease.

### Additional resources

Love, S. L., J. J. Pavek, D. L. Corsini, J. C. Stark, J. C. Whitmore and W. H. Bohl. 1992. *Cultural Management of Ranger Russet Potatoes*. CIS No. 919. University of Idaho Agricultural Experiment Station, Moscow, ID.

Kleinkopf, G. and N. Olsen. 2003. Storage Management in *Potato Production Systems* (eds. J. Stark and S. Love). p. 363-380.

Stark, J.C. and S.L. Love. 2003. Tuber Quality in *Potato Production Systems* (eds. J. Stark and S. Love). p. 329-343.

## Summary recommendations

The following are recommendations for maintaining processing quality of Ranger Russet potatoes in storage:

### Harvest

- Harvest green or minimize the amount of time potatoes are left in the ground between vine kill and harvest. Remove vines as close to harvest as possible but early enough to facilitate the harvest operation and reduce stolon attachment.

### Temperatures

- Avoid tuber exposure to temperatures of 45°F or below in the field and in storage due to low temperature-induced elevated fry color, mottling, and glucose levels.
- Cure at 55°F for 2 weeks with 95% relative humidity. Ramp the temperature down 0.5 degree per day until it reaches 48°F.
- Store at 48°F with 95% relative humidity.

### CIPC application

- Apply CIPC after curing but before dormancy break (80 days after harvest at 48°F).
- A second application of CIPC may cause a short-term (less than 2 months) increase in glucose and darker fry color.

### Miscellaneous

- Variations in growing seasons and level of vine senescence at vine kill or harvest will cause variability in tuber response to storage conditions.
- Periodic glucose or fry color monitoring may be advantageous throughout the storage season.

## About the Authors

Lynn Woodell and Tina Brandt, both support scientists, and Gale Kleinkopf, a research professor of plant science, now emeritus, are at the UI Kimberly Research and Extension (R&E) Center. Nora Olsen is an extension potato specialist at the UI Twin Falls R&E Center. E-mails, respectively, are lwoodell@kimberly.uidaho.edu, brandt@kimberly.uidaho.edu, kleinkop@kimberly.uidaho.edu, and nora.o@uidaho.edu.

## For Further Reading

You may order this or other publications about potatoes in Idaho from the University of Idaho Extension office in your county, or from CALS Publications, PO Box 442240, University of Idaho, Moscow, ID 83844-2240, phone 208/885-7982, fax 208/885-4648, e-mail calspubs@uidaho.edu or order online at <http://www.info.ag.uidaho.edu>. Prices do not include state tax, shipping, and handling.

- Book        *Potato Production Systems*, edited by Jeffrey C. Stark and Stephen L. Love, 420 pages, over 350 color photos (\$89.95 soft cover; \$109.95 hard cover).
- Video #918    *Continuing to Manage Foreign Material For Quality Idaho Potatoes* (\$35).
- BUL 839      *Storage Management for Umatilla Russet Potatoes* (\$3).
- CIS 919      *Cultural Management of Ranger Russet Potatoes* (\$1).
- CIS 1059     *Commercial Application to CIPC Sprout Inhibitor to Storage Potatoes* (\$1.25).
- CIS 1118     *Storage Management for Gem Russet Potatoes* (\$3).
- WREP 11     *Integrated Pest Management for Potatoes in the Western United States* (\$17).



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