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Storage Environment, Growing Season, and Variety Affect Long-Term Storability of Potato Crop

William H. Bohl

Abstract

How well potatoes store depends on several factors. Relative humidity is a critical factor that can be controlled by the storage manager. Storage facilities with a relative humidity of 80 percent will have up to 2 percent more shrinkage during the first month compared with 95 percent relative humidity. The other storage environmental factor controlled by the storage manager is temperature. Respiration losses from tubers are at a minimum with a storage temperature of about 45°F. Temperatures above and below 45°F can increase respiration rates. Another factor that can affect storage longevity, but not within the storage manager's control, is the growing season. Because of the extreme heat this summer, there's a risk that potatoes may not hold as well as in stress-free years. The dormancy period may be as much as 30 days shorter. This means a sprout inhibitor should be applied earlier to get the same results, but never before wound healing is completed. Lastly, work done at the University of Idaho has shown that varieties differ in the length of time they will store before breaking dormancy; so consider the variety when determining how long you will store the potatoes.

I keep a few eating potatoes in my basement where the temperature is relatively cool, and it's dark, which prevents greening. However, it's certainly not an ideal storage area because the relative humidity is much too low. Modern potato storage facilities can successfully keep a crop in marketable condition for many months, but only if the storage manager understands how the storage environment, growing season, and variety affect storage longevity.

The first step in successfully storing potatoes is to make sure the wounds are properly healed. With a temperature of 50 to 55°F, plenty of fresh air, and 95 percent or more relative humidity, the wound-healing process should be completed in three weeks or less. Wound healing will still occur below 50°F, but at a slower rate. The danger of having a wound-healing temperature above 55°F is that disease pathogens may overtake tubers before the wound-healing process is completed.

Humidity is an important storage environment factor that is within the control of the storage manager. About half of the total shrinkage for the entire storage season will occur during the first month. Storage facilities with a relative humidity of 80 percent will have up to 2 percent more shrinkage during the first month compared with 95 percent relative humidity. The higher loss in the first 30 days in storage is due to wound healing and loss of water through wounds. Less water is lost from the tubers after the wounds have healed, however, low relative humidity at any time can increase shrink loss.

Storage fans can be operated several hours per day to keep fresh air available and to keep the tubers at the proper temperature. Unless there is a serious rot problem, the humidification system should be operating whenever the fans are operating. Cell decks, foggers, spinners or pressure nozzles can all be used to effectively add humidity to the circulating air. Regardless of the system used, the water particles must be fine enough to be carried in the air. This is where some confusion may exist in determining if there is enough water in the air. Water puddles on the plenum floor or in the ducts do not indicate there is enough moisture in the air. This only indicates that the water particles are not fine enough to be suspended in the air stream. Consequently, the water falls out of the moving air and collects on the plenum floor. Water on the plenum floor can exacerbate the problem because the water is likely cooler than the plenum air. Therefore, the air cools as it passes over the puddles, and cooler air holds less moisture than warmer air causing even more water to be removed from the air.

The only way to accurately determine the relative humidity in your storage facility is to measure it. Check the percent relative humidity in the plenum with the system operating, not on top of the potato pile. Dry air moving through a potato pile will collect moisture, thus increasing the relative humidity at the expense of moisture lost from the tubers and giving you an inaccurate measurement.

Potato tubers are living organisms that respire giving off heat and carbon dioxide. During the winter with cold outside temperatures, it can be challenging to keep enough fresh air in the storage for respiration, and to keep the tubers cool. Regardless of how well you manage a storage unit, tubers will lose some weight due to respiration. Respiration losses are at a minimum with a storage temperature of about 45°F. Temperatures above and below 45°F can increase respiration rates. It is not

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uncommon to lose about 1.5 percent of the total weight in storage due to respiration alone during an eight-month storage period. To put this into perspective, this respiration loss is equal to 750 cwt. in a 50,000 cwt.-storage facility, or about $3,750 for a crop valued at $5.00 per cwt.

Table 1. Approximate dormancy length of five potato varieties grown in Idaho stored at 45°F and 48°F averaged over two years.

Variety	Days	
	45°F	48°F
Russet Burbank	150	135
Ranger Russet	85	75
Gem Russet	140	133
Summit Russet	148	115
Umatilla Russet	130	105

Temperature is certainly within the control of the storage manager. But, depending on the end-use of the potatoes, you may not be able to keep respiration at a minimum.

Regardless of how long potatoes are stored, what you do from the very beginning can affect quality and shrinkage. But, here's something else to consider. Because of the extreme heat the potato crop experienced this summer, there's a risk that stored potatoes may not hold as well as in previous years with less stress. The dormancy period may be shorter, and in some cases nearly 30 days shorter. This means a sprout inhibitor should be applied earlier in the season—maybe even in early November in some areas—to get the same results, but never before wound healing is completed. If you are storing your potatoes six months or more, carefully watch the stored crop to see if and when a second sprout inhibitor application may be warranted.

Here's one last thing to keep in mind. Work done by G. E. Kleinkopf and others at the University of Idaho potato storage research facility showed that varieties differ in the length of time they will store before breaking dormancy. In this study, dormancy break was defined as the number of days from harvest until 80 percent of the tubers had at least one sprout more than 5 mm (about 0.2 inches) in length (Table 1).

Note from this data that the dormancy period is shorter for all varieties when stored just three degrees warmer. For Russet Burbank, storing tubers at 48°F shortened the dormancy period by 15 days, and for Umatilla Russet the higher temperature caused an even greater decrease in the dormancy period, 25 days. Be sure to consider storage temperature when determining the necessity of applying a sprout inhibitor.

Did You Know?

One part per billion is equal to approximately 1 second in 32 years.

The ***SPUDVINE*** is published eleven times annually. All comments should be directed to the editor, William H. Bohl.

William H. Bohl, Ph.D.
Extension Educator-Potatoes
1600 Highland Dr., Suite 1
Blackfoot, ID 83221 (208) 785-8060
wbohl@uidaho.edu
www.if.uidaho.edu/~bingham

Associate Editor.....Phil Nolte, Ph.D.

Bingham County Extension Office
1600 Highland Dr. #1
Blackfoot, ID 83221