

Weight loss in potatoes

Weight loss, or shrinkage, can reduce your returns by diminishing both the quantity and quality of salable potatoes. Shrinkage is often just accepted, but reducing shrink losses should be a top priority for those storing fresh-market, processing, and/or seed potatoes. Many components of the storage environment impact shrinkage, but the most critical is relative humidity (RH). Actively managing the RH within your building will allow you maximize the tonnage and quality of potatoes delivered following storage.

Understanding Relative Humidity

The first step to reducing shrinkage is to understand the concept of relative humidity. Simply defined, RH is the amount of moisture in the air at a given temperature, relative to the maximum amount possible at that same temperature. RH is temperature dependent, meaning that warmer air can hold more moisture than cooler air. For example, in order to achieve the same RH, more moisture would need to be added to the same volume of air at 48°F than would need to be added at 45°F. The RH should be routinely monitored as a part of good storage management. Condensation in the potato storage should be avoided. Free water, in the plenum or on the ceiling above your crop does not necessarily indicate that you have achieved the desired RH level for your storage.

Accurately measuring RH is more difficult than simply measuring temperature. A variety of portable sensors as well as those linked to the control panel can be used. RH should be measured in the plenum, but down-stream

from fans and any humidification equipment. Additional RH measurements can be made on top of the pile or in the return air, but those numbers should not be used as the criteria for humidification system control. The critical RH value is the plenum air before it is delivered to the potatoes.

Impact of Relative Humidity on Shrinkage

Stored potatoes lose weight by giving up water to the surrounding air (transpiration) and through the process of respiration. Weight loss due to respiration is far less than that from transpirational water loss. Transpirational water loss cannot be completely stopped, only slowed by maintaining as high a RH as possible. Current University of Idaho recommendations suggest that a plenum RH of at least 90%, and preferably greater than 95%, should be maintained throughout the duration of storage. This assumes that the crop is healthy, with a low presence of disease. Ventilation with high RH air is especially critical immediately following harvest and during curing. For example, our research indicates that with 'Shepody' potatoes under warm harvest conditions (average pulp temperatures of 77°F) indicated nearly half of the total shrinkage occurred within the first week following harvest. The higher the storage RH, the less water that is lost per unit time. Figure-1, illustrates the amount of shrinkage that could be expected from potatoes stored at 45°F and RH levels ranging from 80 to 98%. If weight loss is compared over six months of storage at various RH levels, potatoes stored at 90% RH could lose 9% in weight, or nearly twice as much weight as those stored at 95% RH. Given a storage capacity of 100,000 cwt, and a value of \$5.00 per cwt, the building maintained at 90% RH would

return \$22,000 less than the storage controlled at 95% RH. The impact of maintaining the proper RH cannot be overstated.

Storage Humidification

Several methods can be used to achieve the required plenum RH. These include cell-type humidification systems, spinners, and high-pressure nozzles. Recently constructed storages often include a humidification system consisting of both a cell and supplemental spinners to achieve the maximum plenum RH. Regardless of what equipment is used, it is critical that it be in operating condition prior to harvest. Plugged cell material or worn spinners may seriously limit the ability to supply enough water to maintain the necessary RH. Additionally, RH sensors should be tested annually, and calibrated or replaced by a ventilation system service provider.

Monitoring the plenum RH of the storage and actively working to achieve as high a RH as possible without excess condensation should be a major goal. It is clear from the example scenarios described that maintaining the desired RH is critical to maximize returns from the stored crop.

By Nathan Oberg, Ph.D. graduate student, University of Idaho, Nora Olsen, Extension Potato Specialist, University of Idaho, and Gale Kleinkopf, Research Professor, University of Idaho

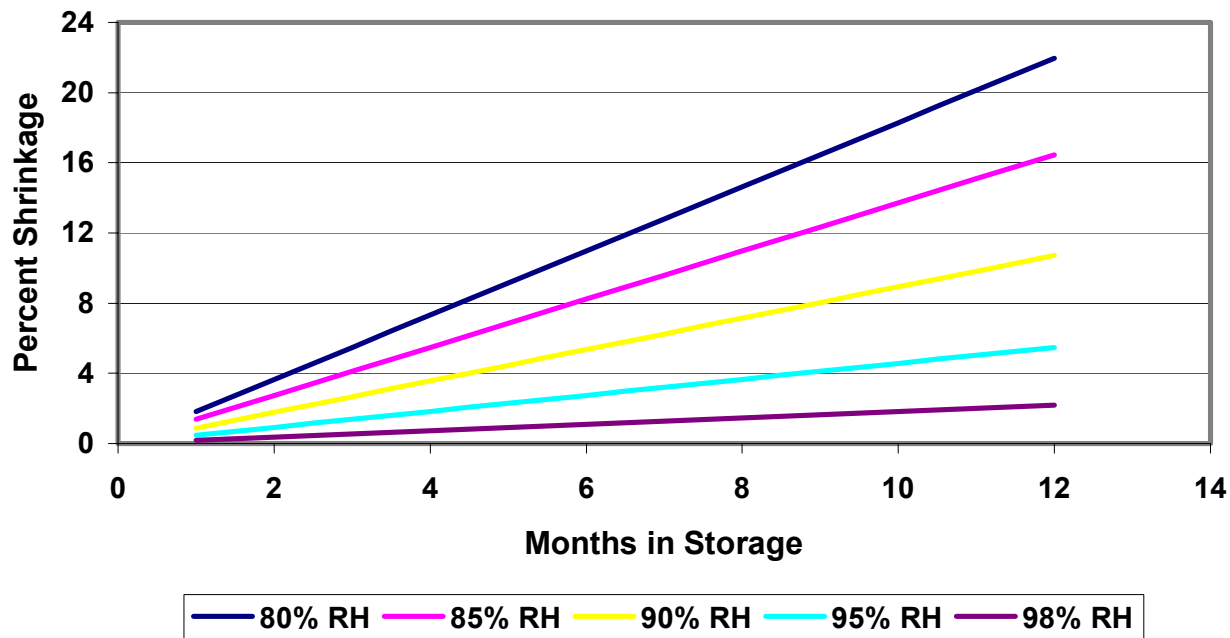


Figure 1. Affect of relative humidity on potato weight loss in storage (45°F)