To Wash or not to Wash: Carrots in Storage

In response to increasing demand for local vegetables, growers are expanding their production of root vegetables for winter storage, and exploring ways to bring high-quality vegetables to farmers' markets throughout the winter. One long-standing debate is on the merits of washing carrots before placing them into storage. Some growers prefer to wash before storage, to keep carrots from being stained by soil, while others are concerned that increased moisture due to washing may lead to rot. In the 2012-13 season, we grew Bolero carrots at the UMass Research Farm in South Deerfield, and then placed them into an on-campus storage facility, hand-washed, barrel-washed, or dirty. We evaluated carrots for rot, staining, and other measures of quality throughout the winter months. In this article, we also compare our results with those from our 2011-12 trial, and results of this season's on-farm storage case studies.

METHODS

We fertilized with 100 lbs of chicken manure and 50 lbs of K Mag for two 290' double rows on July 9. We seeded Bolero carrots on July 11 at a rate of 10 per foot. We weeded and thinned carrots in the week of July 30, and weeded again in the week of August 6. Carrots were harvested November 5. We selected farmer's market quality carrots - unforked, well-shaped 6-12 inch carrots free of nicks or scars. We had three wash treatments. Barrel-washed carrots were run through the barrel washer. Hand-washed carrots were scrubbed in a bucket by hand, at a rate of 10 carrots per minute. Unwashed carrots were placed in bags dirty, and washed just before evaluation. We placed 10 carrots per perforated plastic bag, and stored bags in UMass storage (at 32 degrees, 95% RH). Through the winter months, we evaluated carrots for rot, staining and lenticel dirt, top sprouting, hair sprouting, water loss, flavor, and crunch. We evaluated flavor by measuring sugar content using the Brix test.

RESULTS & DISCUSSION

Rot – There was no effect of treatment on rot in our trial – washing did not lead to higher levels of rot in the UMass storage. Last year, when we compared across multiple varieties of carrot (Berlanda, Brest, Bolero, Carson, Deep Purple, Florida), we did find higher levels of rot in hand-washed versus unwashed carrots (35% versus 14%). However, in this case (2012-2013) , the level of rot was quite minor, even in late April, to the degree that it was unlikely to affect marketability. In on-farm trials this year, we did notice anecdotally that farms that stored their carrots washed in perforated plastic bags began to show slightly higher levels of rot (~10%) towards the end of the storage period, in late March, likely due to the higher humidity and lack of airflow under these conditions. However, the difference was again minor, and not statistically significant.

A Michigan study did find significantly higher levels of decay in washed carrots than those stored unwashed. However, other studies have noted that washing can be used to good effect in combination with grading to reduce diseased and split carrots going into storage and infecting other carrots. In addition, a Serbian study found that washing with hot water reduced water loss through the storage term, while using Na2OCl maintained levels of Vitamin C and B-carotene.

We saw only minor differences in staining across carrot washing treatments.

Staining – Some staining was apparent in unwashed treatments this year, manifesting as a slight brownish cast on some carrots. However, overall, staining was quite low, and difficult to distinguish from the off-color whitish cast that occurs in older carrots, no matter how they are stored. This result was in-keeping with our 2011-12 trial, in which we also saw higher rates of staining in carrots stored unwashed, but that the level of staining was quite low. When we took carrots stored on-farm to a nearby farmers' market, visitors to our taste-testing booth could not distinguish differences in appearance between carrots that had been stored washed or unwashed. In fact, carrots that had been stored unwashed at one facility were rated the highest in appearance at the February evaluation, and second highest in the January evaluation.

It is important to note that staining might vary based on soil types, soil conditions or handling. An on-farm trial in Vermont found that carrots stored unwashed for periods of a week or more began to show mottling with brownish pockmarks. Though this staining never covered more than 10% of the carrot surface, it was enough to render some carrots unmarketable (including all carrots that had been stored unwashed for the entire season, November to April). It is hard to determine based on photographs alone whether this was due to a difference in soil type (at the UMass farm, carrots were grown in fine silt loam soil, which washes off fairly easily), or whether it was due to rougher handling, leading to divots where dirt could accumulate and permanently stain the carrot. We used a typical ??? model barrel washer to clean our carrots, which produced few divots or pockmarks.

A Vermont study found that carrots stored unwashed (righthand photo) had significant staining, rendering them unmarketable, while carrots stored washed (lefthand photo) did not.

Other variables – We found no effect of washing treatment on water loss, flavor, lenticel dirt, or top sprouting of carrots. We did find higher rates of hair sprouting (white hairs growing along

the carrot) in the washed carrots in our final April sampling period. Twenty to 40% of hand and barrel-washed carrots showed this sprouting, while only 1 out of 40 unwashed carrots sampled had this issue. Hair sprouting is indicative of the carrot becoming biologically active, which will render it unfit to eat.

CONCLUSIONS

Our results, and those of other studies, suggest there is no "right" way to store a carrot. Carrots can be successfully stored unwashed without significant staining occurring. They can also be stored washed without rot occurring until late in the season. The best method for storage on a given farm is dependent on soil type, processing, end use, and other factors. To get the maximum duration out of storage carrots (avoiding rot and hairs sprouting), it is likely best to store unwashed, but if carrots are primarily stored for sale in January and February, rot may not be an issue. If there is a lot of disease in the field, it may be best to wash pre-storage to avoid bringing diseased carrots into the storage. It is also best to wash if your soil stains carrots, or if washing methods lead to pockmarks that accumulate dirt. Washing or not washing will also come down to convenience – are you in a rush to get vegetables into storage in the fall, with time for washing through the winter, or do you lack winter washing facilities, and want carrots conveniently washed and pre-bagged for your winter CSA?