LONG-TERM STORAGE OF ONION CULTIVARS, 2010

Mike Thornton and Bill Buhrig, University of Idaho

Bob Simerly, McCain Foods

Clinton Shock, Oregon State University

Background

Processing accounts for a significant portion of onion crop usage in the Treasure Valley region of western Idaho and eastern Oregon. Extending the current storage season beyond May would increase the amount of local onions that could be grown for processing. However, there is currently no information available on onion cultivars that have resistance to common onion decay pathogens, and thus potential for extended storage life. This study was initiated in 2007 to evaluate new onion cultivars and pre-commercial lines for weight loss, decay, and sprouting under refrigerated storage conditions.

Methods

2010 Trial

Bulbs of nine yellow onion cultivars and precommercial lines were collected from grower fields in Idaho and Oregon. The onions had been cured in the field for at least 14 days following undercutting. The bulbs were topped by hand, split into 6 50-lb-bag replicates and then weighed. The samples were brought to the Parma R&E Center, Parma, Idaho where they were cured in commercial ambient air storage. The samples were then placed in a small controlled-temperature room and held at 36°F. Hobo recorders placed in the room indicated that temperatures fluctuated by no more than 0.05°F, while relative humidity fluctuated between 70 and 90 percent.

On March 10, May 26, and June 29, the samples were removed from storage, weighed, and evaluated for external defects and sprouting. If a bulb had both sprouting and decay, it was scored for decay. Bulbs that were sprouted but not decayed were considered usable. At the final sample date, all bulbs were sliced diagonally and observed for internal decay. External decay was scored as "usable" if it impacted only the outer rings that would normally be removed during processing. Bulbs scored as unusable had external decay that was too extensive to be removed during processing.

Data were analyzed by ANOVA using the SAS® (SAS Instit. Inc., Cary, CA) statistical program. When the *F*-test was significant, means were separated using an LSD at the 5-percent level.

2007-2009 Trials

Bulbs of yellow onion varieties and pre-commercial lines were collected from research trials and grower fields during the fall of 2007-2009. The varieties were selected based on reported

resistance to storage decay and potential for processing (i.e., high percentage of single-centered bulbs). The variety 'Vaquero' was included each year as it accounts for most of the planted acreage in the region. The onions had been cured in the field for at least 14 days following undercutting. The bulbs were topped by hand, split into 6 50-lb-bag replicates, and then weighed. The onions were cured under ambient air storage conditions and then placed in a small controlled-temperature room and held at 36°F. The samples were removed from storage in March and again in early to late June each year, weighed, and evaluated for external defects and sprouting as described above. Data for the three storage seasons were combined and analyzed to determine correlation between incidence of decay in March compared to June.

Results and Discussion

2010 Trial

There were small yet significant differences in the level of usable decay, unusable decay, and non-decayed onion bulbs on the first evaluation date during March (Table 1). This date was chosen as it is near the end of the storage period for onions under ambient temperature conditions in this region. All cultivars had relatively high proportions of nondecayed bulbs on this evaluation date except 'Joaquin' and 7015. Vaquero, Joaquin, and 7015 had significantly greater weight loss (% shrinkage) at this point in the season than the other cultivars and lines.

By May 26, only 'Sabroso' and 'Crockett' had more than 90 percent nondecayed bulbs. Weight loss increased significantly between the first and second evaluation dates.

By the final evaluation on June 29, none of the cultivars and noncommercial lines in this study had over 80 percent nondecayed bulbs (Table 2). Varieties Joaquin, 7015, and Crockett, all had at least 26 percent internal decay. 'Swale' had slightly over 12 percent translucent scale. Weight loss continued to increase between the second and third evaluation dates, as we expected.

2007-2009 Trials

The onion varieties and precommercial lines evaluated in this study exhibited significant differences in proportion of nondecayed bulbs in all 3 years. Most of the external and internal decay was typical of shoulder and neck rot caused by *Botrytis allii*. There was a strong relationship between the proportion of nondecayed bulbs measured during the March evaluation and the proportion of nondecayed bulbs when the samples were re-evaluated in late June (Fig. 1). This indicates that onion varieties that currently store well up to the March marketing window for fresh onions will probably also have the highest potential for long- term storage under refrigerated conditions for processing. It should also be noted that some cultivars exhibited considerable variation in losses due to decay between years. Vaquero, the current industry standard, performed much better in 2009 than in previous years, maintaining over 90 percent usable bulbs after 10 months in storage (Fig. 2). Both Crockett and 'Grand Coulee' showed exceptional bulb quality out of long-term storage compared to other cultivars (Fig. 3).

Summary

The onion varieties and precommercial lines evaluated in this study showed considerable differences in storage potential across a 4-year period. Cultivars with good disease resistance could significantly extend the market season for processing onions in this region, but they need to combine good agronomic characteristics (yield and bulb size) with resistance to storage decay. For example, commercial plantings of Crockett in this region have not consistently attained the bulb size required by local processors. Further research is needed to determine the best way to grow these cultivars to meet market requirements.

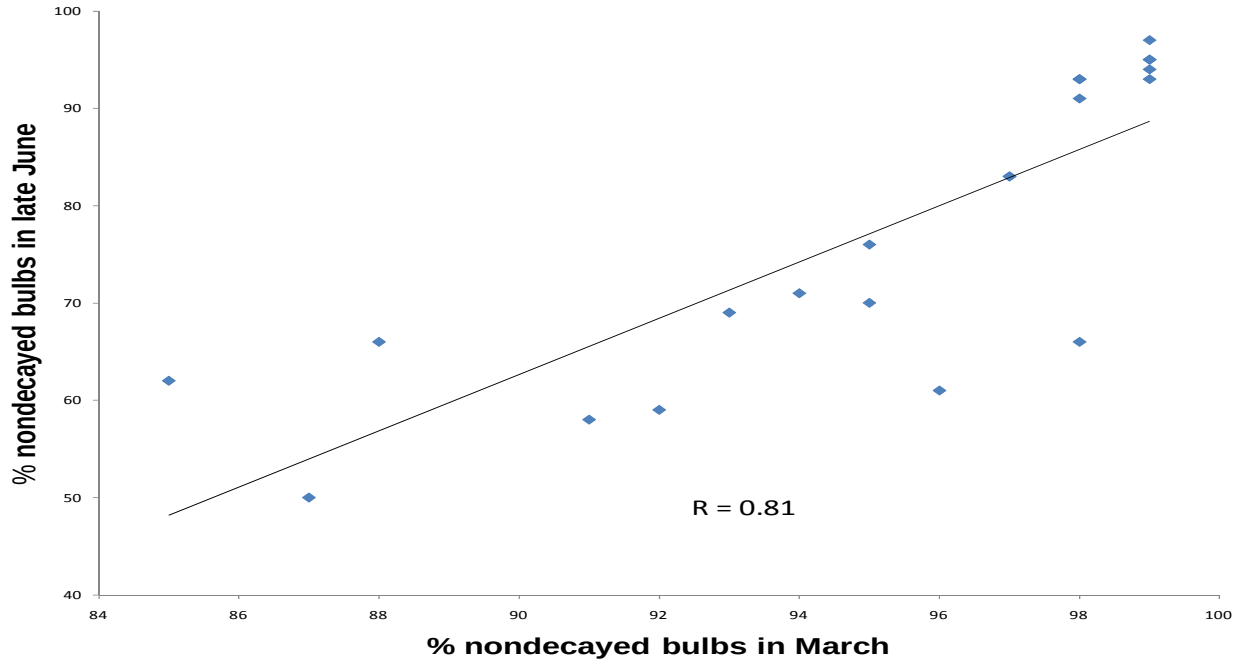

Figure 1. Correlation between the proportion of nondecayed bulbs evaluated in March and again in late June for onion cultivars and pre-commercial lines grown in Idaho and Oregon and stored at 36°F (n = 21). Data are combined over the 2008 and 2009 storage seasons.

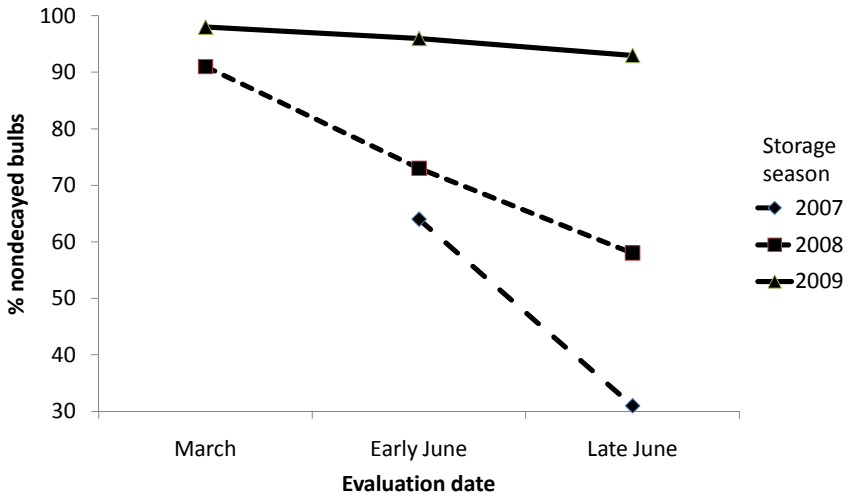

Figure 2. Proportion of nondecayed bulbs evaluated on three dates over the course of three storage seasons for the onion cultivar 'Vaquero' grown in Idaho and Oregon and stored at 36°. Values are the means of six replications.

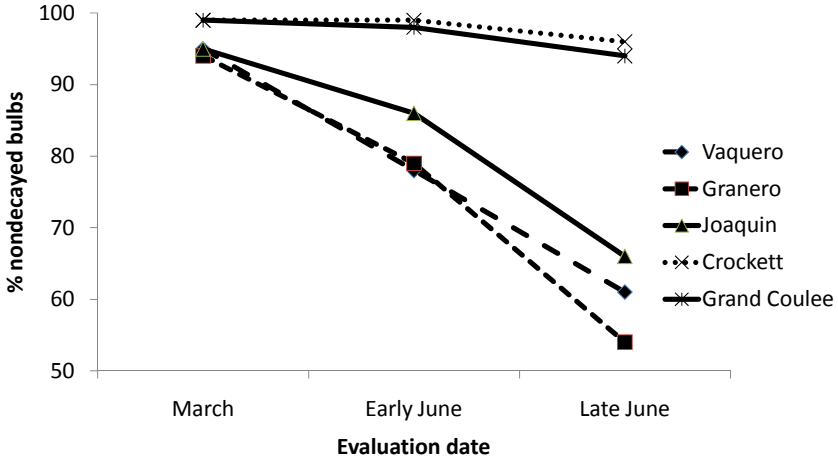

Figure 3. Proportion of nondecayed bulbs evaluated on three dates in five yellow onion cultivars grown in Idaho and Oregon and stored at 36°F. Values are the means of 2 years (Granero, Joquin) or 3 years (Vaquero, Crockett, Grand Coulee) and 6 replications.

Table 1. Incidence of shrink, external decay, and sprouting of nine yellow onion cultivars and precommercial lines on March 10 and May 26, 2010 after long-term cold storage at 36°F. Values are means of six replications.

	10 March						26 May					
Onion cultivar	% shrink	% unusable external decay	% usable external decay	% non-decayed bulbs	% totals	% of total sprouted	% shrink	% unusable external decay	% usable external decay	% non-decayed bulbs	% totals	% of total sprouted
Crockett	2.6	5.7	0.0	94.3	100	0	4.6	6.7	1.1	92.2	100	0
Sabroso	3.0	3.8	0.0	96.3	100	0	6.5	4.9	0.9	94.0	100	0
Vaquero	4.3	6.0	1.3	92.7	100	0	6.5	13.2	3.3	83.6	100	0
Swale	2.9	3.8	0.0	96.2	100	0	5.8	8.6	1.6	89.8	100	0
Barbaro	3.4	5.7	0.0	94.1	100	0	6.9	12.4	5.5	82.0	100	0
Joaquin	4.9	25.9	0.0	73.8	100	0	10.1	34.4	2.4	63.2	100	0
7015	4.1	13.9	0.0	85.7	100	0	8.2	20.6	3.3	76.2	100	0
7202	3.5	9.8	0.0	90.3	100	0	7.0	15.4	1.4	83.2	100	0
7203	3.6	15.4	0.0	84.3	100	0	7.7	24.3	2.1	73.6	100	0
LSD (0.05)	**1.57**	**10.24**	**2.22**	**10.37**			**1.85**	**14.04**	**2.72**	**13.63**		

Table 2. Incidence of shrink, external decay, sprouting, internal decay, and translucent scale in nine yellow onion cultivars and precommercial lines on June 29, 2010 after long-term cold storage at 36°F. Values are means of six replications.

	29 June							
Onion cultivar	% shrink	% unusable external decay	% usable external decay	% non-decayed bulbs	% totals	% of total sprouted	% internal decay	% translucent scale
Crockett	5.6	1.3	0.5	70.3	100	0.0	26.9	1.0
Sabroso	7.9	5.6	1.5	79.8	100	0.0	11.0	1.7
Vaquero	8.1	9.6	2.6	64.4	100	0.0	19.7	3.7
Swale	7.1	3.5	0.7	60.5	100	0.0	23.0	12.3
Barbaro	8.7	13.0	4.4	54.4	100	0.5	22.1	5.7
Joaquin	12.7	5.7	2.5	47.0	100	0.0	44.1	0.8
7015	9.8	3.5	1.3	63.5	100	0.0	31.8	0.0
7202	8.3	3.8	2.7	68.5	100	0.0	21.6	3.5
7203	10.0	5.7	2.2	58.7	100	0.0	31.7	1.5
LSD (0.05)	**2.59**	**6.35**	**ns**	**16.61**		**0.31**	**16.03**	**4.00**