

Overwintering onions for early spring market

Becky Sideman
UNH Cooperative Extension, 38 Academic Way, Durham, NH 03824
becky.sideman@unh.edu

Background & Objectives: Growers in the region have been experimenting with planting onion seedlings in the fall, covering them with low tunnels during the winter, and harvesting in the early spring. Some have reported good success, with an early harvest of beautiful bulbed onions, and others have reported challenges including poor survival and early bolting. In 2011-12, we planted seven varieties of onions in Durham at the NH Agricultural Experiment Station (zone 5B), to evaluate potential for overwintering and early spring harvest. In 2012-13, we broadened our study to include ten varieties in Durham and two varieties in North Haverhill NH (zone 4B). This study was done in collaboration with University of Massachusetts researchers, as part of NESARE project LNE10-297. This work was also supported by the New Hampshire Agricultural Experiment Station. The full report, with photographs, is available at http://extension.unh.edu/resources/files/Resource003239_Rep4688.pdf.

Cultural Methods: Onions were grown in a randomized complete block design with 4 replicates, 24 plants per rep. Seeds were provided by or purchased from Johnny's Selected Seeds, Seedway Seeds, and Territorial Seeds. Onions were seeded in 98-cell transplant trays and were transplanted outdoors at a spacing of 6" apart in three rows 6" apart on raised beds covered with embossed black plastic mulch. Low tunnels made of 10' PVC bows were installed over the onions in late fall. Plants were covered with heavy-duty rowcover (1.25 oz/yd²) and an additional layer of greenhouse poly (6mil) for the winter. Dates of cover application and removal are shown below. In 2012-13, half of the onions were grown under low tunnels, and half were not covered. In both years, we used two planting dates (A and B).

Table 1. Important Dates for Onion Trial

Activity	2011-12		2012-13			
	Durham		Durham		North Haverhill	
	A	B	A	B	A	B
Seeded:	Aug 18	Aug 18	Aug 25	Sep 15	Aug 25	Sep 15
Transplanted:	Sep 20	Sep 30	Sep 20	Oct 20	Oct 11	Oct 21
Added rowcover:	Oct 18	Oct 18	Oct 20	Oct 20	Nov 6	Nov 6
Added plastic:	Dec 16	Dec 16			Nov 6	Nov 6
Removed plastic:	Mar 14	Mar 14			Apr 7	Apr 7
Removed rowcover:	Apr 5	Apr 5	Apr 15	Apr 15	Apr 9	Apr 9
Assessed survival:	Mar 13	Mar 13	Apr 30	Apr 30	Apr 24	Apr 24
1st Harvest:	May 12	May 12	May 22	May 22	Jun 13	Jun 13
2nd Harvest:	May 24	May 24	Jun 3	Jun 3	Jun 22	Jun 22
3rd Harvest:	Jun 6	Jun 6	Jun 20	Jun 20	Jul 2	Jul 2
4th Harvest:	-	-	-	-	Jul 15	Jul 15

Data Collected: In early spring, plant vigor (number of intact leaves) and percentage of overwinter survival were measured. As soon as onions were sufficiently bulbed to be considered harvestable, subsamples of 6 plants were harvested from each plot. Subsequent harvests were made at 2-week intervals. Bolting and bulb size were measured at each harvest.

Results:

1. **Low Tunnel Environment.** The low tunnel covered with 1.25 oz/yd² rowcover and 6 mil plastic provided substantial temperature protection compared with outdoor temperatures. While air and soil temperatures fluctuated widely inside as well as outside the low tunnel, the minimum temperatures reached in the low tunnel were much warmer than outdoor temperatures. Notably, the soil temperature inside the soil tunnel never went below freezing.

In 2012-13, we grew overwintering onions outside the low tunnel (uncovered) as well as inside the low tunnel. While onions survived unprotected in both sites, the survival and spring vigor were much lower without the protection of the low tunnel. For example, in Durham, survival ranged from 30-44 % outside the low tunnel, and 62-88% inside the low tunnel. Unexpectedly, survival of unprotected plants was better in the colder site, N. Haverhill (80-85% outside vs. 93-98% inside the low tunnel). This may have been due to extended snowcover in this site.

2. **Onion Survival & Vigor.** In low tunnels, all varieties survived the winter equally well. In 2011-12, survival was over 97% for all varieties. Survival was a bit lower in 2012-13, ranging from 62-88% for all varieties in Durham, and 96-98% in N. Haverhill. We found that vigor was greater for the earlier fall planting than for the later planting, and for onions that had been under low tunnels than for those that had been outside.
3. **Varieties.** *Winter White Scallion* (T) is a hardy non-bulbing scallion, which was grown because of its hardiness, but was not expected to bulb. It did not produce bulbs, but instead produced long white leek-like shanks that had a slight enlargement on the bottom. It could be creatively marketed as an oversized scallion in the spring, but not as a typical bulbing onion.

Walla Walla (SW) is a long-day sweet onion that can be fall-planted in the Pacific Northwest as an overwintering onion. In the first year of our trial, it bolted quickly and did not produce large bulbs, perhaps because it bolted before our days reached the 14-16 hour daylength required to initiate bulbing. In the second year of our trial, Walla Walla produced very nice bulbs and did not show a high percentage of bolting.

Top-Keeper (T), *Hi-Keeper* (T), *T-420* (JSS), *Keepsake* (T) and *Bridger* (JSS) are yellow storage varieties that produced high quality bulbs in our production system. These varieties varied in their tendency to bolt and in overall bulb size, but all produced marketable early onions.

Red onions were included only in the second year of the evaluation, 2012-13. *Red Wing* (JSS) and *Red Bull* (JSS) are red storage onions, *Red Baron* (T) is a red scallion, and *Cabernet* (JSS) is an early summer red onion. Of these, Cabernet was the only one that produced marketable bulbs, but it exhibited a relatively high percentage of bolting (20%).

4. **Bolting.** Bolting is triggered by a vernalization period (exposure to prolonged cool temperatures) once the plant has reached 4-6 true leaves. By late April in both years, flower stalks (scapes) were evident on some plants. On bolted plants, scapes were evident in the center of the bulb as a small pithy core. For later harvest dates, bolting rendered bulbs unmarketable because it reduced bulb size and because the majority of the bulb was the large pithy scape.

The percentage of bolting was higher in the first year (2011-12) than in the second year (2012-13), across all varieties. In both years, the earlier fall planting showed a higher percentage of bolting than the later planting. Varieties differed greatly in their tendency to bolt.

Table 2. Percentage of bolted plants over two years in two locations.

Cultivar	Durham		North Haverhill
	2012	2013	2013
Bridger	33%	0%	0%
Cabernet	-	20%	-
Hi Keeper	69%	-	-
Keepsake	33%	0%	-
Red Baron	-	1%	-
Red Bull	-	28%	-
Red Wing	-	27%	-
T420	51%	1%	-
Top Keeper	50%	0%	-
Walla Walla	92%	5%	0%
Winter White	41%	1%	-

5. **Bulb Size.** In 2011-12, two varieties did not form large bulbs: Walla Walla and Winter White Scallion. For all other varieties, bulbs began to form in April. Average bulb diameters ranged from 2-2.5" on May 12, from 2.6-3" on May 24, and from 3-3.3" on Jun 6. Weight of trimmed bulbs for these varieties ranged from 4-5.5 oz on May 12, and from 5.5-7.5 oz on May 24.

In 2012-13, four varieties did not form bulbs >2.25 in: Red Baron, Red Wing, Red Bull and Winter White. The remaining varieties formed large bulbs, with weight of trimmed bulbs ranging from 6.6 to 10 oz by June 20. Average bulb diameters of these larger varieties ranged from 1.7-2" on May 22, from 1.8-2.5" on June 3, and from 2.6-3.1" on June 20. In North Haverhill (zone 4B), both Bridger and Walla Walla bulbed nicely, and large (3" diameter) bulbs were ready for harvest by June 13.

Conclusions: We experienced success overwintering onions in hardiness zones 4B and 5B in low tunnels, which provided a protected environment. With both mid-August and mid-September seeding dates, onions were ready for harvest in late May-early June. Bulbs continued to increase in size until late June. The varieties TopKeeper, Hi-Keeper, Keepsake, Bridger and T420 produced nice bulbs in both years; Walla Walla did well in one out of the two years. Of the red varieties evaluated, Cabernet produced nicer bulbs than the other varieties, but it did show a significant percentage of bolting. Planting later in the fall appears to reduce the chances of spring bolting, but there is a tradeoff - the bulbs are also smaller and slightly later to mature.