Research Report: Overwintering Onions, 2014-15

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Background & Objectives

In 2011-12 and 2012-13, we performed experiments with fall-planted onions seedlings overwintered in low tunnels for spring harvest. The results of these preliminary reports are described here: https://extension.unh.edu/resources/files/Resource003239_Rep4688.pdf. Based on good success with some varieties (primarily yellow), we wanted to expand our understanding of what works in this overwintering system. The goals of this study were to:

1) Evaluate performance of **several onion varieties** in a fall-planted, overwintering system, with a focus on short-day and red varieties.
2) Compare bolting and growth of overwintered onions at **several planting dates**.
3) Evaluate overwintered onions in **high tunnel** as well as **low tunnel** conditions.

What we did

We evaluated eighteen (18) onion varieties at Woodman Farm in Durham NH (Zone 5B).

Variety	Color	Type*	Seed Source (s)
Cabernet	Red	LD/ID	Johnny's Selected Seeds
Pinot Rouge	Red	SD	Twilley Seeds
Chianti	Red	SD	Twilley Seeds
Desert Sunrise	Red	SD	Johnny's Selected Seeds
Red Coach	Res	SD	Johnny's Selected Seeds
Electric	Red	LD, OW	Bejo Seeds
Walla Walla	Yellow	ID, sweet spanish	Johnny's Selected Seeds
Candy	Yellow	ID, sweet spanish	Twilley Seeds
Century	Yellow	SD	Twilley Seeds
Pontiac	Yellow	LD, storage	Johnny's Selected Seeds
Bridger	Yelllow	LD/ID, OW	Johnny's Selected Seeds
Gatekeeper	Yellow	OW	American Takii
Keepsake	Yellow	OW	American Takii
T-448	Yellow	OW	American Takii
T-440	Yellow	OW	American Takii
Hi-Keeper	Yellow	OW	American Takii
Tough Ball	Yellow	OW	American Takii
Forum	Yellow	Sets, OW	Bejo Seeds

** LD = long-day, ID = intermediate-day, SD = short-day, OW = overwintering*

We did the same experiments in high and low tunnels because we hypothesized that we might be able to harvest short-day onions much earlier from a high tunnel than from low tunnels. Further, we could plant sets much later than we could in low tunnels, where access is limited by frozen ground.

Our high tunnel was a 30x48 Rimol 'Rolling Thunder' moveable tunnel, with a single layer of AG-19 agribon rowcover (0.55 oz/yard) suspended at a height of 30" over the entire planting inside the tunnel. Rowcover was applied on Dec 5 and removed on April 8.

Low tunnels were constructed of Typar Xavan 5131 (1.25 oz/yard) in the fall (applied on Nov 14, removed on May 4), with a layer of 6mil greenhouse polyethylene for winter protection (applied on Dec 5, removed on Apr 4), supported by 10' pieces of ½" PVC slipped over 16" long rebar "groundposts".

Low tunnels (foreground) and high tunnel (background) in December

During the winter of 2014-15, the minimum air temperature outdoors was -9°F. At the same time, the high tunnel temperature was -2°F, and the low tunnels were 6°F. Good snowcover insulated the low tunnels from very low temperatures during much of the winter.

Young onion seedlings under rowcover in the high tunnel in December (left), and mature onions that were overwintered in low tunnels showing variability in bolting in late May (right).

Planting Dates. We used four planting dates for transplants in low tunnels and five planting dates in high tunnels. At the first planting date, seeds for some varieties were not available, so they were not included. Sets were not planted until we received them, on Nov 15. It was possible to plant much later in the high tunnels than in low tunnels, which were difficult to access after the ground was frozen.

		Low Tunnel		High Tunnel	
Seed	**Transplant**	**Seedlings**	**Sets**	**Seedlings**	**Sets**
Aug 17	Sep 16	X (not all varieties)			
Sep 2	Oct 1	X		X	
Sep 17	Oct 15	X		X	
Sep 17	Oct 30	X		X	
Sep 17	Nov 15		X	X	X
Sep 17	Dec 1			X	X
-	Dec 15				X
-	Jan 1				X
-	Jan 15				X

Cultural Details. Fertilizers were applied based on soil tests. Plants were spaced 6 inches apart in 6 rows on 42-inch inch raised beds covered with black plastic embossed mulch. The experiment was replicated four times. Plants were seeded in 98-cell plug trays into ProMix BX and transplanted into the field 4 weeks later. Onions were grown in a randomized complete block design with four reps, 6 plants per rep.

Data Collection. Beginning on April 29, we evaluated survival and counted bulbs that had bolted. We monitored bolting and measured neck and bulb diameter every two weeks throughout the spring. Bolted plants were considered unmarketable, and bulbs were not measured or harvested from those plants. Bulb size increased through the spring, but we did not harvest bulbs until the tops had fallen, a sign of maturity. The first harvest was on June 3. On June 24, any plants that had not bolted but had not yet fallen were harvested and measured. (***note*** onions could have been harvested for market 2 weeks or more before our harvests, because we were waiting for the tops to fall prior to harvest). After the onions were dried down on greenhouse benches, their photos were taken and the total number was counted and weighed.

Results and conclusions

Regardless of planting site (high vs. low tunnel), variety, or planting date, all onions showed very good (nearly 100%) winter survival.

Varieties. Some varieties showed unacceptably high percentages of bolting at early transplant dates: **Candy** (intermediate-day yellow), **Century** (short-day yellow), **Pontiac** (long-day yellow), **Cabernet** (intermediate-day red), **Red Coach, Pinot Rouge** and **Chianti** (short-day reds). At later transplant dates, they showed less bolting, but generally produced small bulbs (<4 oz). These are **NOT RECOMMENDED for overwintering.**

Walla Walla (intermediate-day yellow) showed a high percentage of bolting at the earliest transplant dates, but at later dates it showed no bolting and produced large attractive bulbs (>8oz). This is a riskier choice than some of the other varieties tested for overwintering.

The following varieties all showed excellent survival and very little bolting, even at earlier transplant dates: the yellow varieties **Bridger, Gatekeeper High Keeper, Keepsake, Tough Ball, T440 and T448**, and the red varieties **Desert Sunrise and Electric.** Of these varieties, Electric was the latest to mature, with most tops not falling by the end of June.

Photos of all varieties are shown on page 5 of this publication.

Very susceptible to bolting	Intermediate resistance	Very resistant to bolting
Pontiac	Walla Walla	Bridger
Century	Desert Sunrise	Gatekeeper
Candy		Hi-Keeper
Chianti		Keepsake
Red Coach		Tough Ball
Cabernet		T440
Pinot Rouge		T448
Yellow varieties shown in black text, red varieties in red		Electric

High tunnel vs. Low tunnel. The high tunnel onions from the same planting dates **did** mature earlier than comparable low tunnel onions – by about 2 weeks. In the high tunnel, onions from the earliest planting dates had bulbed and were harvestable by mid-May. The sizes of high tunnel and low tunnel onions were similar, and varieties performed similarly in both sites. There was a slightly higher frequency of bolting in the high tunnel, probably because onions were exposed to vernalization conditions during the longer fall and spring. The high tunnel required more irrigation in late winter/early spring than the low tunnels, which presented some challenges. 'Forum' sets planted as late as Jan 15 in the high tunnel matured as quickly as sets planted Nov 15 in low tunnels. While it was possible to get onions from transplants planted as late as Nov 15, those planted on Oct 1 produced the largest and most uniform bulbs. All in all, the advantages of planting in high tunnels did not appear to outweigh the cost of occupying valuable high tunnel space for this crop.

Planting Date. In general, the earlier the planting date, the higher percentage of bolting. Grown in low tunnels, varieties with good resistance to bolting did not bolt at all at the earliest transplant date (9/16). In the high tunnel, even these resistant varieties showed a small

percentage (<10%) of bolting at the earliest transplant date (10/1). Planting date also had a sizeable and significant effect on bulb size. **The earliest planting date resulted in the largest bulbs in both high and low tunnels.**

The 'Forum' sets did not bolt at all, but can't be compared with the transplants since they were planted much later. For sets, the later planting dates resulted in slightly smaller bulbs (see photos), but all sets matured into medium-large bulbs that weighed 4-6 oz., on average.

Photos of marketable bulbs taken from each variety planted at different planting dates are shown on pages 6-8 of this publication. Similar results were observed for other recommended varieties, but photos are shown for Bridger, T448, Electric, Desert Sunrise, Walla Walla and Forum.

Take home messages

Overwintering onions show good survival and growth in low tunnels. In 2014, low-tunnel onions planted about 2 weeks earlier than high-tunnel onions matured about 2 weeks later than high tunnel onions.

In 2014, the highest yields came from onions seeded mid-August and transplanted into low tunnels in mid-September, and from onions seeded Sept 1 and transplanted into high tunnels on Oct 1. Because fall weather is unpredictable, it may be wise to do multiple planting dates, aiming to transplant between Sept 15-Oct 1 in low tunnels and between Oct 1-Oct 15 in high tunnels. Our research farm is located in zone 5B; you will want to adjust these if you are in very different climate.

It is important to choose varieties that are resistant to bolting and that will produce bulbs of the desired size for your market. Several varieties have performed well over multiple years (Bridger, T440, T448, Hi-Keeper, Keepsake), and others performed well this year and should be tested further (Desert Sunrise, Electric, Gatekeeper, Tough Ball).

For additional information, please contact Becky Sideman (becky.sideman@unh.edu, 603-862-3203).

Recommended yellow varieties for overwintering


Bridger


T448


Gatekeeper


Tough Ball


T440


HiKeeper


Keepsake

Recommended red varieties


Desert Sunrise


Electric

Recommended with reservations


Walla Walla

Marketable bulbs from onions overwintered in low tunnels, transplanted Oct 1, 2014, Durham NH (zone 5B).

Not recommended for overwintering


Cabernet


Century


Chianti


Pinot Rouge


Red Coach

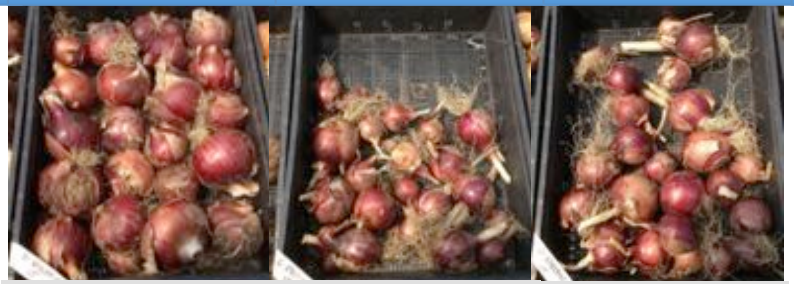
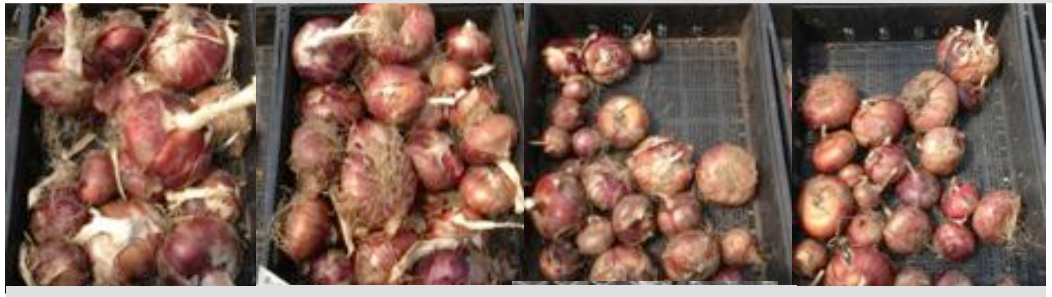
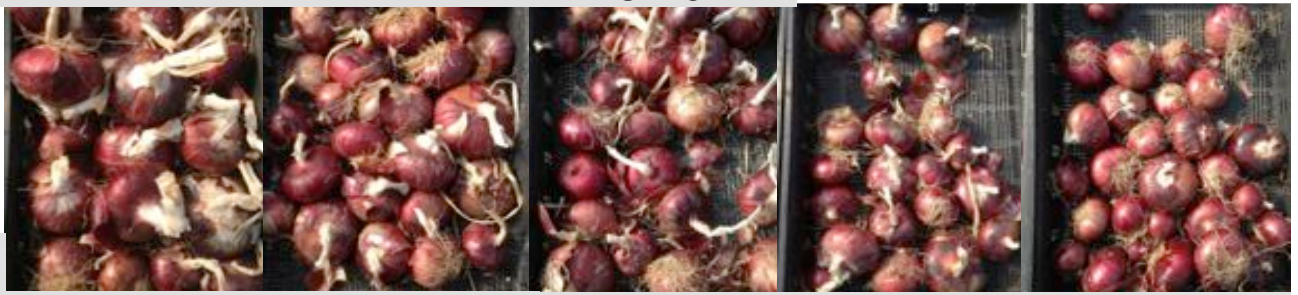
Photo not shown (no marketable bulbs):

Pontiac

Candy

Transplant date:	9/16	10/1	10/15	10/30	11/15	12/1
T448 *Low tunnel*		 7.4 oz		4.1 oz	2.7 oz	
T448 *High tunnel*		 7.4 oz		2.8 oz	3.2 oz	3.0 oz	2.1 oz
Bridger *Low tunnel*		 11.0 oz		8.2 oz	4.7 oz	3.5 oz	
Bridger *High tunnel*		 8.7 oz		3.0 oz	3.4 oz	3.6 oz	4.4 oz

Average bulb weight (oz) is given at the bottom of each photo.

Transplant date:	9/16	10/1	10/15	10/30	11/15	12/1
Electric	*Low tunnel*					
		7.0 oz	2.1 oz	3.5 oz		
	High tunnel					
		10.3 oz	3.6 oz	3.4 oz	3.4 oz	2.8 oz
Desert Sunrise	*Low tunnel*					
		10.0 oz	7.7 oz	2.7 oz	3.2 oz	
	High tunnel					
		8.4 oz	3.8 oz	3.4 oz	3.4 oz	2.8 oz

Average bulb weight (oz) is given at the bottom of each photo.

Forum (sets)

Plant date:	11/14	12/1	12/15	1/1	1/15
Low tunnel	 6.4 oz				
High tunnel	 5.9 oz	5.2 oz	4.2 oz	4.2 oz	4.5 oz

Walla Walla

Transplant date:	10/1	10/15	10/30	11/15	12/1
Low tunnel	 8.1 oz	4.5 oz	4.4 oz		
High tunnel	 8.7 oz	4.2 oz	5.1 oz	5.6 oz	4.5 oz

Average bulb weight (oz) is given at the bottom of each photo.