

ONION PRODUCTION FROM TRANSPLANTS

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Introduction

Increased interest in an earlier start for onion harvest has led to interest in transplanting onions. Our earlier research showed that when onions are grown from transplants they can be harvested in July (Shock et al. 2004, 2007-2012). This trial evaluated the performance of four onion varieties in 2013 grown from transplants produced in a greenhouse at Malheur Experiment Station in Ontario, Oregon.

Materials and Methods

Onions were grown in 2013 on an Owyhee silt loam with a pH of 7.3 and 1.6% organic matter, previously planted to wheat. In the fall of 2012, the wheat stubble was shredded and the field was irrigated. The field was then disked, moldboard plowed, and groundhogged. Based on a soil analysis, 49 lb of phosphorus/acre, 200 lbs of sulfur/acre, and 1 lb of boron/acre were broadcast before plowing. After plowing, the field was fumigated with Vapam[®] at 15 gal/acre and bedded at 22 inches.

Transplants of four onion varieties were grown in a heated greenhouse (65°F day, 45°F night air temperatures) at Ontario, Oregon. Onion seed was planted in the greenhouse in flats with a vacuum seeder at 72 seeds/flat. Raw seed of varieties ON7406, 'Hendrix', and 'Pulsar' was planted on January 25, 2013. Pelleted seed of 'Ventura' was planted on January 28, 2013. The seed was sown on a 1-inch layer of Sunshine general purpose potting mix. The seed was then covered with 1 inch of potting mix. The flats were watered immediately after planting and were kept moist. Onion seedlings of varieties ON7406, Hendrix, and Pulsar began emerging on February 3. Onion seedlings of Ventura began emerging on February 9. Transplants were grown without supplemental light.

The field had drip tape laid at 4-inch depth between 2 onion beds before planting. The drip tape had emitters spaced 12 inches apart and emitter flow rate of 0.22 gal/min/100 ft (Toro Aqua-Traxx, Toro Co., El Cajon, CA). The distance between the tape and the center of each double row of onions was 11 inches.

The seedlings were transplanted on March 18. The seedlings were planted in 2 rows spaced 3 inches apart on the 22-inch beds. The spacing between plants in each row was 6 inches (every 3 inches in the double row), equivalent to 95,000 plants/acre. Plots of each variety were 20 ft long by 4 double rows wide arranged in a randomized complete block design with 5 replicates.

The onions were managed to avoid yield reductions from weeds, pests, diseases, water stress, and nutrient deficiencies. Prowl[®] H₂O at 2 pt/acre was broadcast for weed control on April 3. A

total of 100 lb nitrogen/acre was applied during the season as uran injected through the drip tape. For thrips control the following insecticides were applied: Movento[®] at 5 oz/acre on May 23 and 30, Agri-Mek[®] at 16 oz/acre on June 13, Radiant[®] at 8 oz/acre on June 20 and 27, and Lannate[®] at 3 pt/acre on July 5 and 12.

The field was irrigated as necessary to maintain soil water tension at 20 cb at 8-inch depth. Soil water tension was monitored by six granular matrix sensors (Watermark Soil Moisture Sensors Model 200SS, Irrrometer Co. Inc., Riverside, CA) centered at 8-inch depth below the onion row. The sensors were automatically read three times a day with an AM-400 meter (Mike Hansen Co., East Wenatchee, WA). The field was irrigated until the last harvest on August 6.

On July 23, bolted onions in each plot were counted. On July 23, July 30, and August 6, 6.7 ft of the middle 2 rows in each plot were topped and bagged. Decomposing bulbs were not bagged. At each harvest, the onions in each plot were visually rated for the percentage of tops that were down and leaf dryness. Following each harvest the onions were graded. Bulbs were separated according to quality: bulbs without blemishes (No. 1s), split bulbs (No. 2s), bulbs infected with neck rot (*Botrytis allii*) in the neck or side, plate rot (*Fusarium oxysporum*), or black mold (*Aspergillus niger*). The No. 1 bulbs were graded according to diameter: small (<2¼ inches), medium (2¼-3 inches), jumbo (3-4 inches), colossal (4-4¼ inches), and supercolossal (>4¼ inches). Bulb counts per 50 lb of supercolossal onions were determined for each plot of every variety by weighing and counting all supercolossal bulbs during grading.

After grading the onions were placed in burlap bags and stored in a shed at ambient temperature for 2 weeks. After 2 weeks the samples were evaluated for the number of sprouted or decomposed bulbs.

Onion bulbs from all harvests were rated for single centers. Twenty-five onions ranging in diameter from 3½ to 4¼ inches from each plot were rated. The onions were cut equatorially through the bulb middle and separated into single-centered and multiple-centered bulbs. The multiple-centered bulbs had the the long axis of the inside diameter of the first single ring measured. These multiple-centered onions were ranked according to the diameter of the first single ring: small had diameters under 1½ inch, medium had diameters from 1½ to 2¼ inches, and large had diameters over 2¼ inches. Onions were considered “functionally single centered” for processing if they were single centered or had a small multiple center.

Variety differences were compared using repeated measures analysis of variance. Means separation was determined using Fisher’s least significant difference test at the 5% probability level, LSD (0.05).

Results and Discussion

July 23 Harvest

Marketable yield on July 23 averaged 697.2 cwt/acre and ranged from 644.7 cwt/acre for Hendrix to 745.3 cwt/acre for Ventura (Table 1). The percentage of functionally single-centered bulbs averaged 90.7% and ranged from 87.6% for Pulsar to 93.3% for ON7406 (Table 2). The percentage of tops down at harvest averaged 64.8% and ranged from 34.0% for ON7406 to 93.3% for Pulsar.

July 30 Harvest

Marketable yield on July 30 averaged 716.7 cwt/acre and ranged from 642.7 cwt/acre for Hendrix to 786.5 cwt/acre for Ventura. The percentage of functionally single-centered bulbs averaged 84.2% and ranged from 78.5% for Pulsar to 93.3% for Ventura (Table 2). The percentage of tops down at harvest averaged 84.9% and ranged from 65.0% for Ventura to 97.5% for Pulsar.

August 6 Harvest

Marketable yield on August 6 averaged 731.2 cwt/acre and ranged from 677.8 cwt/acre for Hendrix to 829.6 cwt/acre for Ventura. The percentage of functionally single-centered bulbs averaged 84.4% and ranged from 75.1% for ON7406 to 91.9% for Ventura (Table 2). The percentage of tops down at harvest averaged 97.3% and ranged from 90.0% for Ventura to 100% for Pulsar and Hendrix.

Overall

Averaged over harvest dates, Ventura had the highest yield of marketable and colossal bulbs. Bolting was very low in 2013, with Ventura averaging 0.4% bolting and the other varieties having none. No decomposition was observed on any variety after 2 weeks of storage of bulbs from each harvest date.

Yield gains between harvests were small or nonexistent for most varieties in 2013. The lack of yield increase over time could be related to the advanced maturity of the bulbs in 2013. Differences in leaf dryness at the first harvest (July 23) were small, averaging 16.4%. By the second harvest (July 30), leaf dryness averaged 35.0%, ranging from 22.5% leaf dryness for Ventura to 43.3% for Pulsar. At the last harvest (August 6), leaf dryness averaged 62.2% and ranged from 50.5% for Ventura to 78.0% for Hendrix. In 2012, the varieties were less mature with 9% average leaf dryness on July 23 and 39% average leaf dryness on August 6. In 2012, the varieties showed yield increases up to the last harvest.

References

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Table 1. Yield and grade at three harvest dates for four onion varieties grown from transplants, Malheur Experiment Station, Oregon State University, Ontario, OR, 2013.

Company	Variety	Total yield	Marketable yield by grade					Small	Bulb counts >4¼ in #/50 lb
			Total	>4¼ in	4-4¼ in	3-4 in	2¼-3 in		
----- cwt/acre -----									
July 23 harvest									
Nunhems	ON7406	687.9	685.7	0.0	63.6	580.1	42.1	2.2	
	Hendrix	648.8	644.7	0.0	26.9	579.5	38.3	3.6	
	Pulsar	716.2	713.0	0.0	57.2	620.9	34.8	3.2	
Nickerson Zwaan	Ventura	745.3	745.3	0.0	173.0	540.4	31.9	0.0	
	Average	699.6	697.2	0.0	80.2	580.2	36.8	2.3	
July 30 harvest									
Nunhems	ON7406	720.2	718.7	0.0	102.2	607.7	8.7	1.6	
	Hendrix	648.7	642.7	0.0	16.5	608.4	17.8	6.0	
	Pulsar	719.5	719.1	0.0	73.2	629.1	16.8	0.4	
Nickerson Zwaan	Ventura	790.1	786.5	0.0	259.9	503.5	23.1	3.6	
	Average	719.6	716.7	0.0	112.9	587.2	16.6	2.9	
August 6 harvest									
Nunhems	ON7406	703.4	699.2	0.0	65.0	621.6	12.7	4.2	
	Hendrix	679.7	677.8	0.0	24.9	622.0	30.9	1.9	
	Pulsar	719.1	718.3	10.3	45.2	648.5	14.3	0.8	31.6
Nickerson Zwaan	Ventura	832.3	829.6	6.6	275.0	526.5	21.5	2.7	35.2
	Average	733.6	731.2	4.2	102.5	604.6	19.8	2.4	33.4
Average over harvest dates									
Nunhems	ON7406	703.8	701.2	0.0	76.9	603.1	21.1	2.6	
	Hendrix	659.1	655.1	0.0	22.8	603.3	29.0	3.8	
	Pulsar	718.2	716.6	3.6	57.7	633.1	22.3	1.5	31.6
Nickerson Zwaan	Ventura	789.2	787.1	2.2	236.0	523.5	25.5	2.1	35.2
LSD (0.05) Variety		NS	54.4*	NS	50.3	NS	NS	2.25*	NS
LSD (0.05) Date		NS	NS	NS	NS	NS	NS	NS	NS
LSD (0.05) Variety X Date		NS	NS	NS	NS	NS	NS	4.2	NS

*LSD (0.10)

Table 2. Bulb single and multiple centers for three harvest dates for four onion varieties grown from transplants, Malheur Experiment Station, Oregon State University, Ontario, OR, 2013.

Company	Variety	Maturity at harvest		Multiple center			Single center	
		tops down	leaf dryness	large	medium	small	functional ^a	single
----- % -----								
July 23								
Nunhems	ON7406	34.0	16.0	1.4	5.3	20.3	93.3	73.0
	Hendrix	83.0	22.0	3.6	5.6	13.3	90.8	77.5
	Pulsar	93.3	15.0	4.8	7.7	19.0	87.6	68.6
Nickerson Zwaan	Ventura	48.8	12.5	3.9	5.0	9.1	91.1	82.0
	Average	64.8	16.4	3.4	5.9	15.4	90.7	75.3
July 30								
Nunhems	ON7406	82.0	32.0	5.8	12.3	39.1	81.9	42.8
	Hendrix	95.0	42.0	7.2	9.6	19.3	83.3	64.0
	Pulsar	97.5	43.3	9.9	11.6	18.8	78.5	59.6
Nickerson Zwaan	Ventura	65.0	22.5	2.8	3.9	10.3	93.3	83.0
	Average	84.9	35.0	6.4	9.3	21.9	84.2	62.4
August 6								
Nunhems	ON7406	99.0	54.0	11.7	13.2	34.3	75.1	40.8
	Hendrix	100.0	78.0	7.1	8.2	13.4	84.7	71.3
	Pulsar	100.0	66.7	4.1	9.9	32.7	86.0	53.3
Nickerson Zwaan	Ventura	90.0	50.0	3.9	4.2	6.8	91.9	85.1
	Average	97.3	62.2	6.7	8.9	21.8	84.4	62.6
Average over dates								
Nunhems	ON7406	71.7	34.0	6.3	10.3	31.2	83.4	52.2
	Hendrix	92.7	47.3	6.0	7.8	15.3	86.3	71.0
	Pulsar	96.9	41.7	6.3	9.7	23.5	84.0	60.5
Nickerson Zwaan	Ventura	67.9	28.3	3.5	4.4	8.7	92.1	83.4
LSD (0.05) Variety		9.3	5.6	NS	NS	6.6	NS	9.0
LSD (0.05) Date		3.9	3.5	NS	2.5	NS	5.6	7.0
LSD (0.05) Variety X Date		7.9	6.9	NS	NS	11.8	NS	14.1

^a single center plus small multiple center.