

ONION PRODUCTION FROM TRANSPLANTS IN 2016

Clinton C. Shock, Erik B. G. Feibert, Alicia Rivera, and Lamont D. Saunders, Malheur Experiment Station, Oregon State University, Ontario, OR

Bob Simerly, McCain Foods, Fruitland, ID

Introduction

Interest in an earlier start for onion harvest and marketing has led to interest in transplanting onions. Previous Treasure Valley research showed that when onions are grown from transplants they can be harvested starting in July (Shock et al. 2004, 2007-2009, 2011-2016). This trial evaluated onion varieties grown from transplants in 2016. Six varieties were grown from transplants produced in Arizona and two varieties were grown from transplants produced in a greenhouse at the Oregon State University Malheur Experiment Station (MES), in Ontario, Oregon. Seven of the varieties were evaluated in a replicated trial and one variety was grown in a single observation plot.

Materials and Methods

Transplants were grown at MES in a heated greenhouse with minimum air temperatures during the day of 65°F and 45°F at night. Onion seed was planted in the greenhouse on January 21, 2016 in flats with a vacuum seeder at 72 seeds/flat. Variety ‘Avenger’ (Crookham Seed Co., Caldwell, ID) had 28 flats planted for the replicated trial. Variety ‘Vanguard’ (Crookham Seed Co.), had 6 flats planted for a nonreplicated observation plot. The seed was sown on a 1-inch layer of Sunshine general purpose potting mix. The seed was then covered with 1 inch of the potting mix. The trays were watered immediately after planting and were kept moist. Onion seedlings began emerging on January 30. Transplants were grown without supplemental light. Bare-rooted transplants of ‘Scout’, ‘Avalon’ (Crookham Seed Co.), ‘Montero’ (Nunhems, Parma, ID), SV2102NG, SV0106NG, and ‘Chancellor’ (Seminis Seed Co., Payette, ID) were grown in Arizona during the winter of 2015-2016.

Onions were grown at MES on an Owyhee silt loam previously planted to wheat. In the fall of 2015, the wheat stubble was shredded and the field was irrigated. The field was then disked, moldboard plowed, and groundhogged. A soil analysis taken in the fall of 2015 showed a pH of 7.6, 3.1% organic matter, 8 ppm nitrogen (N) as nitrate, 2 ppm N as ammonium, 36 ppm phosphorus (P), 437 ppm potassium (K), 13 ppm sulfur (S), 2,873 ppm calcium, 724 ppm magnesium, 305 ppm sodium, 1.6 ppm zinc (Zn), 7 ppm manganese (Mn), 1.0 ppm copper (Cu), 25 ppm iron, and 0.3 ppm boron (B). Based on the soil analysis, 44 lb of P/acre, 42 lb of K/acre, 180 lb of S/acre, 1 lb of Mn/acre, 1 lb Cu/acre, 9 lb Zn/acre, and 2 lb of B/acre were broadcast before plowing. After plowing, the field was fumigated with Vapam® at 15 gal/acre and bedded at 22 inches.

Drip tape was laid at 4-inch depth between pairs of onion beds before planting. The drip tape had emitters spaced 12 inches apart and an 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.

Varieties Scout, Avalon, Avenger, Vanguard, and Montero were planted on March 30. Varieties Chancellor, SV2102NG, and SV0106NG were planted on April 4. The onions were planted on four 22-inch beds in double rows 3 inches apart. The spacing between plants in each row was 4.8 inches, equivalent to 120,000 plants/acre. Plots of each variety were 20 ft long by 4 double rows wide. The experimental design for varieties Scout, Avalon, Avenger, Chancellor, SV2102NG, SV0106NG, and Montero was a randomized complete block with five replicates. Vanguard was planted in a preliminary observation plot without replication.

The onion crop was managed to avoid yield reductions from weeds, pests, diseases, water stress, and nutrient deficiencies. Prowl[®] H₂O at 2 pt/acre and Poast[®] at 32 oz/acre were broadcast for weed control on April 11. Thrips were controlled by ground application using the following insecticides: Aza-Direct[®] at 12 oz/acre and M-Pede[®] at 6 pt/acre on May 4, Movento[®] at 5 oz/acre and Aza-Direct at 12 oz/acre on May 13 and 20, Radiant[®] at 8 oz/acre on May 26 and June 3, and Lannate[®] at 3 pt/acre on June 14. Thrips were controlled by aerial applications using the following insecticides: Radiant at 10 oz/acre on June 25, July 2, and July 23 and Lannate[®] at 3 pt/acre on July 10 and 17.

A total of 80 lb N/acre was applied in 20-lb increments during the season as urea ammonium nitrate solution (URAN) injected through the drip tape. Forty pounds of K/acre was applied on June 20 as potassium chloride solution injected through the drip tape.

Onions were irrigated automatically to maintain the soil water tension (SWT) in the onion root zone below 20 cb (Shock et al. 2000). Soil water tension was measured with eight granular matrix sensors (GMS, Watermark Soil Moisture Sensors Model 200SS, Irrrometer Co. Inc., Riverside, CA) installed at 8-inch depth in the center of the double row. Sensors had been calibrated to SWT (Shock et al. 1998). The GMS were connected to the datalogger via multiplexers (AM 16/32, Campbell Scientific, Logan, UT). The datalogger (CR1000, Campbell Scientific) read the sensors and recorded the SWT every hour. The datalogger automatically made irrigation decisions every 12 hours. The field was irrigated if the average SWT of the eight sensors was 20 cb or higher. The irrigations were controlled by the datalogger using a controller (SDM CD16AC, Campbell Scientific) connected to a solenoid valve. Irrigation durations were 8 hours, 19 min to apply 0.48 inch of water. The water supply was well water maintained at a constant water pressure of 35 psi. The pressure in the drip lines was maintained at 10 psi by a pressure-regulating valve. The automated irrigation system was started on April 19 and terminated on July 28.

Bolted onions were counted in each plot on July 13. On July 14, 21, and 28, bulbs from 6 ft of the middle 2 double rows in each plot were topped and bagged. Decomposing bulbs were not bagged. At each harvest, onions in each plot were rated visually for the percentage of tops that were down and the percent dry leaves. 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 calculated for each plot of every variety by weighing and counting all supercolossal bulbs during grading.

After grading, a sample of approximately 100 No. 1 jumbo bulbs of each variety was placed in crates 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 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 multiple-centered onions had diameters under 1½ inch, medium multiple-centered onions had diameters from 1½ to 2¼ inches, and large multiple-centered onions 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 a protected Fisher’s least significant difference test at the 5% probability level, LSD (0.05).

Results and Discussion

July 14 Harvest

Marketable yield on July 14 averaged 818 cwt/acre and ranged from 692 cwt/acre for Avalon to 1022 cwt/acre for SV0106NG (Table 1). The percentage of functionally single-centered bulbs averaged 99.2% and ranged from 95.2% for SV2102NG to 100% for Avalon, Avenger, Montero, Chancellor, and SV0106NG (Table 2). The percentage of tops down at harvest averaged 25% and ranged from 0% for Avalon and Montero to 88% for Avenger (Table 3). Bulb decomposition or sprouting after 2 weeks of storage averaged 7% and ranged from 2.1% for SV2102NG to 11.6% for Montero. Bolting averaged 0.08% and ranged from 0% for Avalon, Montero, and SV2102NG to 0.3% for Avenger (Table 1).

July 21 Harvest

Marketable yield on July 21 averaged 1022 cwt/acre and ranged from 870 cwt/acre for Avalon to 1258 cwt/acre for SV0106NG (Table 1). The percentage of functionally single-centered bulbs averaged 92.7% and ranged from 78.4% for SV0106NG to 100% for Scout and Montero (Table 2). The percentage of tops down at harvest averaged 44% and ranged from 8% for Avalon to 90% for Avenger (Table 3). Bulb decomposition or sprouting after 2 weeks of storage averaged 2.0% and ranged from 0% for Scout and Montero to 10.3% for Chancellor.

July 28 Harvest

Marketable yield on July 28 averaged 1163 cwt/acre and ranged from 1058 cwt/acre for Avenger to 1333 cwt/acre for SV0106NG (Table 1). The percentage of functionally single-centered bulbs averaged 94.8% and ranged from 81.6% for SV2102NG to 100% for Montero and Avalon (Table 2). The percentage of tops down at harvest averaged 62% and ranged from 28% for Avalon to 91% for Avenger (Table 3). Bulb decomposition or sprouting after 2 weeks of storage averaged 1.3% and ranged from 0% for Scout and SV2102NG to 3.8% for SV0106NG.

Overall

All varieties had yield increases until the last harvest (Table 3). Varieties Avenger, SV2102NG, and SV0106NG had less than 7% yield increase from the second (July 21) to the third (July 28) harvest. These three varieties had at least 77% tops down and at least 30% leaf dryness at the last harvest.

In 2016, the accumulated number of growing degree-days was substantially higher than average, but was lower than 2015 and higher than 2014 (Table 4). For comparison, performance data for varieties Avalon and Montero, which were in the transplant trials in 2014-2016 is presented in Table 5.

Performance of the Vanguard variety in a preliminary trial without replication can be found in Tables 6-8.

Acknowledgements

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Table 1. Bulb yield and grade for seven onion varieties grown from transplants over three harvest dates, Malheur Experiment Station, Oregon State University, Ontario, OR, 2016. Continued on next page.

Company	Variety	Total yield	Marketable yield by grade								Total rot	Bulb counts >4¼ in	Bolters
			Total	>4¼ in	4-4¼ in	3-4 in	2¼-3 in	Small	Doubles	Split root			
----- cwt/acre -----													
July 14 harvest													
Crookham	Scout	834	829	5.8	108.3	678.4	36.4	4.8	0.0	0.0	0.0	34.2	0.15
	Avalon	709	692	0.0	22.9	612.6	56.5	17.3	0.0	0.0	0.0		0.00
	Avenger	791	772	0.0	164.4	561.4	45.9	19.6	0.0	0.0	0.0		0.30
Nunhems	Montero	740	730	0.0	58.8	617.3	54.3	9.1	0.0	0.0	0.0		0.00
Seminis	SV2102NG	916	904	7.0	302.1	558.0	36.7	12.5	0.0	0.0	0.0	28.1	0.00
	Chancellor	789	775	11.5	125.4	570.0	68.3	13.6	0.0	0.0	0.0	34.5	0.10
	SV0106NG	1027	1022	5.9	388.9	613.4	13.9	5.3	0.0	0.0	0.0	33.3	0.05
Average		830	818	4.3	167.3	601.6	44.6	11.8	0.0	0.0	0.0	32.5	0.1
July 21 harvest													
Crookham	Scout	1028	1022	0.0	298.1	707.1	17.0	6.1	0.0	0.0	0.0		
	Avalon	881	870	0.0	210.7	617.0	42.1	11.6	0.0	0.0	0.0		
	Avenger	959	947	94.5	363.5	454.6	34.9	11.5	0.0	0.0	0.0	29.3	
Nunhems	Montero	938	931	0.0	171.6	730.9	28.3	7.1	0.0	0.0	0.0		
Seminis	SV2102NG	1116	1112	106.0	419.6	554.1	32.3	3.8	0.0	0.0	0.0	30.6	
	Chancellor	1027	1014	21.9	368.0	597.6	26.2	13.0	0.0	0.0	0.0	37.5	
	SV0106NG	1269	1258	146.6	559.2	543.9	8.3	2.9	5.9	0.0	0.2 ^b	30.8	
Average		1031	1022	52.7	341.5	600.7	27.0	8.0	0.8	0.0	0.0	32.0	
July 28 harvest													
Crookham	Scout	1170	1165	130.7	559.3	465.2	9.4	5.1	0.0	0.0	0.0	32.4	
	Avalon	1116	1115	100.3	493.8	507.9	12.6	1.0	0.0	0.0	0.0	30.0	
	Avenger	1076	1058	122.0	498.4	387.2	50.6	11.4	0.0	0.0	0.69 ^c	28.4	
Nunhems	Montero	1158	1154	112.4	421.5	611.5	8.3	4.7	0.0	0.0	0.0	33.9	
Seminis	SV2102NG	1182	1175	226.0	513.8	427.3	7.6	7.0	0.0	0.0	0.0	29.0	
	Chancellor	1150	1140	190.9	446.7	486.7	15.9	5.3	0.0	4.7	0.0	30.6	
	SV0106NG	1344	1333	431.7	550.2	339.7	11.9	4.1	0.0	6.1	0.0	29.4	
Average		1171	1163	187.7	497.7	460.8	16.6	5.5	0.0	1.5	0.0	30.5	

Table 1. (Continued). Bulb yield and grade for seven onion varieties grown from transplants over three harvest dates, Malheur Experiment Station, Oregon State University, Ontario, OR, 2016.

Company	Variety	Total yield	Marketable yield by grade								Total rot	Bulb counts >4¼ in
			Total	>4¼ in	4-4¼ in	3-4 in	2¼-3 in	Small	Doubles	Split root		
----- cwt/acre -----												
Average over harvest dates												
Crookham	Scout	1011	1005	45.5	321.9	616.9	20.9	5.3	0.0	0.0	0.0	32.7
	Avalon	902	892	33.4	242.5	579.1	37.1	10.0	0.0	0.0	0.0	30.0
	Avenger	933	916	68.6	330.9	473.5	43.3	14.4	0.0	0.0	0.0	28.8
Nunhems	Montero	945	938	37.5	217.3	653.3	30.3	7.0	0.0	0.0	0.0	33.9
Seminis	SV2102NG	1071	1064	113.0	411.9	513.1	25.6	7.8	0.0	0.0	0.0	29.6
	Chancellor	989	976	74.8	313.4	551.5	36.8	10.6	0.0	1.6	0.0	33.7
	SV0106NG	1213	1204	194.7	499.4	499.0	11.4	4.1	3.0	2.0	0.1	30.4
LSD (0.05) Variety		75.6	76.9	45.4	53.2	72.2	10.8	5.8	NS	NS	NS	NS
LSD (0.05) Date		31.8	30.9	27.9	34.5	37.1	8.0	3.5	NS	NS	NS	NS
LSD (0.05) Variety x date		70.2 ^a	81.9	73.7	91.4	98.2	21.1.	NS	NS	NS	NS	NS

^aLSD (0.10).

^bPlate rot.

^cSlippery skin.

Table 2. Single and multiple bulb centers, maturity at harvest, and bolting for seven onion varieties grown from transplants over three harvest dates, Malheur Experiment Station, Oregon State University, Ontario, OR, 2016.

Company	Variety	Multiple center			Single center		
		large	medium	small	functional ^a	bullet	bolters ^b
		----- % -----					
July 14 harvest							
Crookham	Scout	0	0.8	6.4	99.2	92.8	0.15
	Avalon	0	0	14.4	100	85.6	0.00
	Avenger	0	0	15.2	100	84.8	0.30
Nunhems	Montero	0	0	4.8	100	95.2	0.00
Seminis	SV2102NG	0	4.8	44	95.2	51.2	0.00
	Chancellor	0	0	7.2	100	92.8	0.10
	SV0106NG	0	0	52	100	48	0.05
Average		0.0	0.8	20.6	99.2	78.6	0.08
July 21 harvest							
Crookham	Scout	0.0	0.0	26.2	100.0	73.9	
	Avalon	0.0	3.2	25.6	96.8	71.2	
	Avenger	0.0	5.6	34.4	94.4	60.0	
Nunhems	Montero	0.0	0.0	8.8	100.0	91.2	
Seminis	SV2102NG	1.6	18.4	40.8	80.0	39.2	
	Chancellor	0.0	0.8	14.4	99.2	84.8	
	SV0106NG	4.8	16.8	44.8	78.4	33.6	
Average		0.9	6.4	27.9	92.7	64.8	
July 28 harvest							
Crookham	Scout	0.0	3.2	34.4	96.8	62.4	
	Avalon	0.0	6.4	29.6	93.6	64.0	
	Avenger	0.0	9.6	41.6	90.4	48.8	
Nunhems	Montero	0.0	1.6	12.8	98.4	85.6	
Seminis	SV2102NG	5.6	16.0	47.2	78.4	31.2	
	Chancellor	0.0	0.8	32.8	99.2	66.4	
	SV0106NG	5.7	22.4	50.8	71.9	21.1	
Average		1.6	8.6	35.6	89.8	54.2	
Average over harvest dates							
Crookham	Scout	0.0	1.3	22.3	98.7	76.4	
	Avalon	0.0	3.2	23.2	96.8	73.6	
	Avenger	0.0	5.1	30.4	94.9	64.5	
Nunhems	Montero	0.0	0.5	8.8	99.5	90.7	
Seminis	SV2102NG	2.4	13.1	44.0	84.5	40.5	
	Chancellor	0.0	0.5	18.1	99.5	81.3	
	SV0106NG	3.5	13.1	49.2	83.4	34.2	
LSD (0.05) Variety		2.0	5.4	9.1	6.8	8.9	0.17
LSD (0.05) Date		1.2 ^c	2.7	5.4	3.1	5.7	
LSD (0.05) Variety x date		NS	7.2	14.4	8.1	NS	

^aFunctional single centers are the small multiple centers plus the bullet single centers.

^bBolted onions were counted in each plot on July 13.

^cLSD (0.10)

Table 3. Maturity at harvest and bulb quality 2 weeks after harvest for seven onion varieties grown from transplants over three harvest dates, Malheur Experiment Station, Oregon State University, Ontario, OR, 2016.

Company	Variety	Maturity at harvest			Bulb quality 2 weeks after harvest			
		tops down	leaf dryness	Yield increase	sprouted sprouted	decomposed decomposed	total sprouted or decomposed	
----- % -----								
July 14 harvest								
Crookham	Scout	4.0	0.0		10.4	0.0	0.0	10.4
	Avalon	0.0	0.0		8.1	0.0	0.0	8.1
	Avenger	88.0	12.0		1.3	1.3	0.0	2.6
Nunhems	Montero	0.0	0.0		9.3	2.3	0.0	11.6
Seminis	SV2102NG	24.0	10.0		1.0	1.0	0.0	2.1
	Chancellor	14.0	2.0		8.9	0.0	0.0	8.9
	SV0106NG	46.0	6.0		1.9	2.9	0.0	4.8
Average		25.1	4.3		5.9	1.1	0.0	6.9
July 21 harvest								
Crookham	Scout	20.0	10.0	23.5	0.0	0.0	0.0	0.0
	Avalon	8.0	3.0	25.8	1.0	0.0	0.0	1.0
	Avenger	90.0	24.0	22.7	0.0	0.9	0.0	0.9
Nunhems	Montero	16.0	12.0	27.4	0.0	0.0	0.0	0.0
Seminis	SV2102NG	74.0	20.0	24.3	0.9	0.0	0.0	0.9
	Chancellor	32.0	10.0	31.4	10.3	0.0	0.0	10.3
	SV0106NG	66.0	14.0	23.2	1.4	0.0	0.0	1.4
Average		43.7	13.3	25.5	1.9	0.1	0.0	2.1
July 28 harvest								
Crookham	Scout	36.0	20.0	13.9	0.0	0.0	0.0	0.0
	Avalon	28.0	16.0	29.0	1.1	0.0	0.0	1.1
	Avenger	91.0	36.0	4.0	0.0	2.1	0.0	2.1
Nunhems	Montero	58.0	20.0	24.7	0.0	1.2	0.0	1.2
Seminis	SV2102NG	90.0	30.0	6.1	0.0	0.0	0.0	0.0
	Chancellor	54.0	22.0	12.6	1.0	0.0	0.0	1.0
	SV0106NG	77.0	30.0	6.7	1.3	2.5	0.0	3.8
Average		62.0	24.9	13.9	0.5	0.8	0.0	1.3
Average over harvest dates								
Crookham	Scout	20.0	10.0		3.5	0.0	0.0	3.5
	Avalon	12.0	6.3		3.4	0.0	0.0	3.4
	Avenger	89.7	24.0		0.4	1.4	0.0	1.9
Nunhems	Montero	24.7	10.7		3.1	1.2	0.0	4.3
Seminis	SV2102NG	62.7	20.0		0.7	0.3	0.0	1.0
	Chancellor	33.3	11.3		6.7	0.0	0.0	6.7
	SV0106NG	63.0	16.7		1.5	1.8	0.0	3.3
LSD (0.05) Variety		12.0	3.0					
LSD (0.05) Date		4.0	2.0					
LSD (0.05) Variety x date		11.0	NS					

Table 4. Monthly growing degree-days (50-86°F) in 2014–2016, and the 23-year average, Malheur Experiment Station, Oregon State University, Ontario, OR.

Year	April	May	June	July	Total April-July
2014	227	424	544	779	1974
2015	241	427	674	716	2059
2016	305	405	576	680	1967
Avg 1993-2015	196	370	508	703	1777

Table 5. Percentage of tops down, leaf dryness, and marketable yield at three harvest dates for onion varieties Avalon and Montero grown from transplants in 2014, 2015, and 2016. Malheur Experiment Station, Oregon State University, Ontario, OR.

	Year	Avalon				Montero			
		Jul 14	Jul 21	Jul 28	Aug 4	Jul 14	Jul 21	Jul 28	Aug 4
% tops down	2014	–	16	30	64	–	12	40	76
	2015	36	46	68	–	18	54	80	–
	2016	0	8	28		0	16	58	
% dry leaves	2014	–	14	20	76	–	16	28	32
	2015	18	10	20	–	0	20	32	–
	2016	0	3	16		0	12	20	
Marketable yield cwt/acre	2014	–	1287	1387	1488	–	826	911	1024
	2015	1058	1124	1443	–	730	847	898	–
	2016	692	870	1115		731	931	1154	

Table 6. Nonreplicated bulb yield and grade for onion variety Vanguard (Crookham Seed Co.) grown from transplants over three harvest dates, Malheur Experiment Station, Oregon State University, Ontario, OR, 2016.

Total yield	Marketable yield by grade							Split root	Total rot %	Bulb counts >4¼ in #/50 lb
	Total	>4¼ in	4-4¼ in	3-4 in	2¼-3 in	Small	Doubles			
----- cwt/acre -----										
July 14 harvest										
742	729	0.0	89.9	542.5	97.0	12.3	0.0	0.0	0.0	
July 21 harvest										
907	894	0.0	217.4	611.8	64.5	13.5	0.0	0.0	0.0	
July 28 harvest										
1085	1054	91.6	488.6	451.6	22.1	5.0	0.0	0.0	2.4 ^a	29.2
Average over harvest dates										
911	892	30.5	265.3	535.3	61.2	10.2	0.0	0.0	0.8	29.2

^aSlippery skin.

Table 7. Nonreplicated data for single and multiple bulb centers for onion variety Vanguard (Crookham Seed Co.) grown from transplants over three harvest dates, Malheur Experiment Station, Oregon State University, Ontario, OR, 2016.

Single center		Maturity at harvest		
functional ^a	bullet	tops down	leaf dryness	Bolters
-----		----- % -----		
July 14 harvest				
100.0	80.0	50.0	20.3	0.25
July 21 harvest				
96.0	28.0	80.0	30.0	
July 28 harvest				
80.0	20.0	90.0	40.0	
Average over harvest dates				
92.0	42.7	73.3	30.1	

^a Small multiple center plus bullet single center.

Table 8. Nonreplicated maturity at harvest and bulb quality 2 weeks after harvest for onion variety Vanguard (Crookham Seed Co.) grown from transplants over three harvest dates, Malheur Experiment Station, Oregon State University, Ontario, OR, 2016.

Maturity at harvest		Bulb quality 2 weeks after harvest			
tops down	leaf dryness	sprouted	decomposed	sprouted and decomposed	total sprouted or decomposed
-----		----- % -----			
July 14					
50.0	20.0	3.2	0.0	0.0	3.2
July 21					
80.0	30.0	2.9	0.0	0.0	2.9
July 28					
90.0	40.0	0.0	0.0	0.0	0.0
Average over harvest dates					
73.3	30.0	2.1	0.0	0.0	2.1