ONION PRODUCTION FROM SETS, 2010

Clint Shock, Erik Feibert, and Monty Saunders, Malheur Experiment Station, Oregon State University, Ontario, OR

Bob Simerly, McCain Foods, Fruitland, ID

Introduction

Increased interest in an earlier start for the onion harvest season has led to interest in over-wintering onions, transplants, and set production. Through 2009 transplants had to be grown locally as required by the local onion white rot quarantine, which prohibited importation of onion transplants from areas outside the Treasure Valley. Our earlier research showed that onions can be harvested in July when grown from transplants started in the winter in a greenhouse (Shock et al. 2004). Greenhouse transplant production in the Treasure Valley is relatively expensive due to the need for heated greenhouse production during the winter. Transplants produced in unheated "low tunnel" cold frames have had inferior performance compared to transplants produced in a heated greenhouse (Shock et al. 2008, 2009). Recently, a new rule that allows importation of onion transplants from outside of the Treasure Valley was approved. However, interest in onion production from sets continues, because, as opposed to transplants, set planting is easy to mechanize.

Transplants produced from field-grown over wintering varieties have performed inconsistently (Shock et al. 2006b, 2007b). Also, onion production from fall direct-seeded over-wintering varieties has been inconsistent (Shock et al. 2005, 2006a, 2007a). In addition, the available over-wintering varieties do not have adequate bulb quality and appearance.

An alternative to early onions from transplants is to produce onions from sets. Onion sets are produced by sowing seed very thickly one year, resulting in plants with very small bulbs. These sets are harvested, stored over the winter, and planted the following spring. Our earlier research screened 48 long-day varieties for bulb production from sets (Shock et al. 2006c). Of the 48 varieties screened, some produced sets and had high yields with low bolting, demonstrating the feasibility of bulb production from sets for six sweet Spanish long-day varieties. In 2009, we tested bulb production from sets of 15 varieties that we grew in 2008.

Due to the widespread incidence of Iris yellow spot virus (IYSV) in the Treasure Valley, sets for the 2009 and 2010 production trials were grown in Cow Valley, Oregon at 4,000 ft elevation, approximately 50 miles northwest of Vale, Oregon. In 2010, bulb production from sets of 11 varieties (Table 1) that were produced in 2009 was evaluated.

Materials and Methods

Set Production

For each variety, onion seed was planted at 10 seeds/inch of row on April 29, 2009. Onion seed of each variety was planted in 6 rows spaced 7 inches apart on a 64-inch bed. Two drip tapes spaced 14 inches apart were laid at 4-inch depth prior to planting (each drip tape irrigated 3 rows). The field was drip irrigated as necessary to maintain soil water tension at 8-inch depth no drier than 25 cb. Soil water tension was monitored by six granular matrix sensors (GMS, Watermark Soil Moisture Sensors Model 200SS, Irrometer 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). Emergence started on May 14, 2009. The last irrigation was on August 3, 2009. The sets were under cut with a rod weeder on August 20, 2009. The sets were harvested on September 16, 2009, placed in nylon mesh bags and stored over the winter. The storage was maintained at 65°F and 70 percent relative humidity. Air flow around the bags was maintained by pumping air through ducts underneath the stored bags.

Bulb Production from Sets

In March, 2010, the sets of each variety were sorted into four categories based on set diameter: less than ½, ½ - ¾, ¾ - 1, and greater than 1 inch. The sets of each size from each variety were divided into five equal parts to allow for five replications. On March 18, the sets were planted manually in double rows spaced 3 inches apart on 22-inch beds. The sets were planted at 2 sets/ft of single row (6-inch spacing between individual onion plants, or 95,000 plants/acre). The experimental design was a randomized complete block with set size as a split-plot within each variety main plot. Each main plot had 4 double rows 25 ft long. The four set sizes were planted in each variety main plot The total number of sets of each diameter for each split plot was divided by four to allow planting all four rows the same length.

On April 9, Prowl® at 2 pt/acre and Select® at 10 oz/acre were broadcast for weed control. On May 14, Goal® at 10 oz/acre, Buctril® at 12 oz/acre, and Select at 10 oz/acre were broadcast for weed control. Lannate® at 48 oz/acre and Movento® at 5 oz/acre were applied on May 25 for thrips control. On June 7, Dithane® at 3 lb/acre for fungus control and Movento at 5 oz/acre for thrips control were applied. On May 25, uran (urea ammonium nitrate solution) at 50 lb N/acre was injected through the drip tape.

The field was irrigated as necessary to maintain soil water tension at 8-inch depth at 20 cb. Soil water tension was monitored by six granular matrix sensors (GMS, Watermark Soil Moisture Sensors Model 200SS, Irrometer 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).

On July 19 and 26, one of the two border rows in each split plot was harvested. On August 3, the middle two rows in each split plot were harvested. Prior to each harvest, the length of the individual row or rows to be harvested in each split plot was measured. The onions were topped by hand, bagged, and placed in a shed. The onions were graded soon after harvest. During grading, bulbs were separated according to quality: bulbs without blemishes (No. 1s), split bulbs (No. 2s), neck rot (bulbs infected with the fungus *Botrytis allii* in the neck or side), plate rot (bulbs infected with the fungus *Fusarium oxysporum*), and black mold (bulbs infected with the

fungus *Aspergillus niger*). The No. 1 bulbs were graded according to diameter: small (<2.25 inches), medium (2.25-3 inches), jumbo (3-4 inches), colossal (4-4.25 inches), and supercolossal (>4.25 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, 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.

Bulbs from each split plot from the August 3 harvest were rated for single centers. In each split plot, 25 onions ranging in diameter from 3.5 to 4.25 inches were rated. The onions were cut equatorially through the bulb middle and, if multiple centered, the long axis of the inside diameter of the first single ring was measured. These multiple-centered onions were ranked according to the inner diameter of the first single ring: “small” had diameters less than 1.5 inches, “medium” had diameters of 1.5-2.25 inches, and “large” had diameters greater than 2.25 inches. Onions were considered "functionally single centered" for processing if they were single centered or had a small multiple center.

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

Results and Discussion

On July 19, ‘Pulsar’ and ‘Talon’ had more than 500 cwt/acre marketable yield (Table 2). Varieties ‘Kalahari’, ‘Gunnison’, and Pulsar had less than 10 percent bolted bulbs on July 19. On July 26, Gunnison, ‘Montero’, Pulsar, and ‘Swale’ had more than 500 cwt/acre marketable yield (Table 3). Kalahari and Pulsar had less than 10 percent bolted bulbs. On August 3, all varieties except ‘Golden Spike’ and ‘Marquette’ had more than 500 cwt/acre marketable yield (Table 4). Montero and Pulsar had more than 600 cwt/acre marketable yield on August 3. Kalahari and Pulsar had less than 10 percent bolted bulbs on August 3. Gunnison, Talon, Montero, Pulsar, ‘Sabroso’, and Swale had more than 90 percent single-centered bulbs on August 3 (Table 6). Averaged over varieties and harvest dates, the ½ - ¾ inch and ¾ - 1 inch sets were among the sizes that had the highest marketable yield (Table 5). Averaged over varieties and harvest dates, bolting increased with set size.

At the July 19 harvest, the short-day and intermediate varieties had 15 percent or higher tops down (Table 7). On July 19, the long-day varieties had 10 percent or less tops down.

After 2 weeks of storage at ambient air temperature, Gunnison, Talon, Pulsar, and Swale from the July 19 harvest had 10 percent or less of decomposed or sprouted bulbs (Table 8). Two weeks after the July 26 harvest, Gunnison, Montero, Pulsar, Sabroso, and Swale had 10 percent or less of decomposed or sprouted bulbs. Two weeks after the August 3 harvest, Pulsar, and Swale had 10 percent or less of decomposed or sprouted bulbs.

Conclusions

Variety Pulsar yielded well on all 3 harvest dates, with less than 10 percent bolting on all 3 harvest dates, more than 90 percent single-centered bulbs, and 10 percent or less of decomposed or sprouted bulbs 2 weeks after each harvest. All varieties had increased bolting with increasing set size. There was no clear trend for increasing yield with increasing set size. Averaged over varieties and harvest dates, the two intermediate set sizes had the highest marketable yield. These results are different from the 2009 set trial results. In 2009, the long-day varieties showed a trend for increasing yield with increasing set size, but did not have increased bolting with increasing set size (Shock et al. 2010).

References

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Acknowledgments

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Table 1. Onion varieties evaluated for production from sets, maturity type (season length), and bulb external appearance after grading.

Variety	Company	Maturity
Kalahari	Nunhems	short-day
Exacta	Seminis	intermediate
Golden Spike	Seminis	intermediate
Gunnison	Bejo	long-day
Talon	Bejo	long-day
Montero	Nunhems	long-day
Pulsar	Nunhems	long-day
Sabroso	Nunhems	long-day
Swale	Nunhems	long-day
Vaquero	Nunhems	long-day
Marquette	Seminis	long-day

Table 2. Yield and grade of onion varieties grown from sets and harvested on July 19, 2010. Malheur Experiment Station, Oregon State University, Ontario, OR. Continued on next page.

Company	Variety	Set diameter	Total yield	Marketable yield by grade					Bulb counts >4¼ in	Small	No. 2s	Bolting
				Total	>4¼ in	4-4¼ in	3-4 in	2¼-3 in				
		inches	---------- cwt/acre ----------						#/50 lb	--- cwt/acre ---		%
Nunhems	Kalahari	>1	546.1	445.8	0.0	0.0	226.4	219.5	0.0	100.2	0.0	27.8
		0.75-1	485.4	454.6	0.0	203.9	171.6	79.2	0.0	30.8	0.0	6.3
		0.5-0.75	346.3	339.0	0.0	208.3	117.7	13.1	0.0	0.5	6.7	0.8
		<0.5	294.8	277.1	0.0	0.0	224.1	53.0	0.0	17.7	0.0	0.0
		average	418.1	379.1	0.0	103.0	184.9	91.2	0.0	37.3	1.7	8.7
Seminis	Exacta	>1	378.5	225.7	0.0	35.4	79.4	110.9	0.0	76.3	76.5	86.6
		0.75-1	410.5	368.4	0.0	26.2	205.7	136.4	0.0	36.8	5.3	64.3
		0.5-0.75	486.6	469.7	0.0	29.8	387.8	52.2	0.0	14.5	2.3	16.7
		<0.5	385.6	382.8	0.0	54.2	283.2	45.4	0.0	2.8	0.0	8.1
		average	415.3	361.6	0.0	36.4	239.0	86.2	0.0	32.6	21.0	43.9
Seminis	Golden Spike	>1	267.0	198.5	0.0	37.7	92.7	68.1	0.0	64.3	4.2	89.1
		0.75-1	418.5	384.3	0.0	115.5	212.6	56.2	0.0	25.7	8.5	56.7
		0.5-0.75	360.3	323.7	0.0	170.9	119.7	33.0	0.0	20.6	16.1	33.3
		<0.5	525.6	525.6	0.0	402.6	116.5	6.5	0.0	0.0	0.0	0.0
		average	392.9	358.0	0.0	181.7	135.4	41.0	0.0	27.6	7.2	44.8
Bejo	Gunnison	>1	555.8	507.5	0.0	326.5	138.7	42.3	0.0	40.0	8.3	18.2
		0.75-1	517.2	506.1	0.0	124.0	306.6	75.6	0.0	11.1	0.0	4.7
		0.5-0.75	454.2	437.8	0.0	78.4	301.4	58.0	0.0	16.4	0.0	1.7
		<0.5	382.2	363.7	0.0	36.7	173.3	153.7	0.0	18.5	0.0	0.0
		average	477.3	453.8	0.0	141.4	230.0	82.4	0.0	21.5	2.1	6.2
Bejo	Talon	>1	702.4	681.7	0.0	0.0	292.9	388.8	0.0	20.7	0.0	42.9
		0.75-1	349.3	349.3	0.0	0.0	317.2	32.1	0.0	0.0	0.0	0.0
		0.5-0.75	477.2	477.2	0.0	0.0	387.2	90.0	0.0	0.0	0.0	0.0
		<0.5			0.0							
		average	509.6	502.7	0.0	0.0	332.4	170.3	0.0	6.9	0.0	14.3
Nunhems	Montero	>1	495.8	452.3	0.0	0.0	396.9	55.4	0.0	43.3	0.2	42.5
		0.75-1	464.4	428.6	0.0	19.7	349.2	59.6	0.0	16.9	19.0	23.9
		0.5-0.75	513.9	502.3	0.0	12.1	437.5	52.7	0.0	11.5	0.0	0.0
		<0.5	417.4	372.0	0.0	0.0	284.7	87.3	0.0	45.4	0.0	0.0
		average	472.9	438.8	0.0	8.0	367.1	63.7	0.0	29.3	4.8	16.6

Table 2. (continued) Yield and grade of onion varieties grown from sets and harvested on July 19, 2010. Malheur Experiment Station, Oregon State University, Ontario, OR.

Company	Variety	Set diameter	Total yield	Marketable yield by grade					Bulb counts			
				Total	>4¼ in	4-4¼ in	3-4 in	2¼-3 in	>4¼ in	Small	No. 2s	Bolting
		inches	---------- cwt/acre ----------						#/50 lb	-- cwt/acre --		%
Nunhems	Pulsar	>1	575.0	564.4	0.0	4.9	506.6	53.0	0.0	10.6	0.0	0.8
		0.75-1	602.0	597.3	0.0	0.0	553.4	43.9	0.0	4.7	0.0	0.0
		0.5-0.75	537.2	532.0	0.0	0.0	466.1	65.9	0.0	5.2	0.0	0.0
		<0.5	471.9	467.0	0.0	0.0	327.7	139.3	0.0	4.9	0.0	0.0
		average	546.5	540.2	0.0	1.2	463.4	75.5	0.0	6.3	0.0	0.2
Nunhems	Sabroso	>1	461.0	458.9	0.0	250.5	165.6	42.8	0.0	2.0	0.0	59.4
		0.75-1	453.6	414.0	0.0	117.2	195.5	101.3	0.0	39.5	0.0	33.6
		0.5-0.75	393.0	383.2	0.0	111.7	149.0	122.5	0.0	9.8	0.0	4.8
		<0.5	371.5	369.3	0.0	24.2	256.9	88.3	0.0	2.2	0.0	0.0
		average	419.8	406.4	0.0	125.9	191.7	88.7	0.0	13.4	0.0	24.5
Nunhems	Swale	>1	436.4	432.9	0.0	59.4	306.1	67.5	0.0	3.5	0.0	92.3
		0.75-1	668.7	528.8	0.0	0.0	337.0	191.8	0.0	140.0	0.0	25.0
		0.5-0.75	658.0	658.0	0.0	0.0	658.0	0.0	0.0	0.0	0.0	20.0
		<0.5	406.6	374.7	0.0	0.0	277.7	97.1	0.0	31.9	0.0	0.0
		average	542.4	498.6	0.0	14.8	394.7	89.1	0.0	43.8	0.0	34.3
Nunhems	Vaquero	>1	459.1	457.7	0.0	298.3	138.2	21.2	0.0	1.5	0.0	63.0
		0.75-1			0.0							
		0.5-0.75			0.0							
		<0.5	351.7	330.6	0.0	0.0	244.7	85.9	0.0	21.0	0.0	0.0
		average	405.4	394.1	0.0	149.1	191.5	53.5	0.0	11.3	0.0	31.5
Seminis	Marquette	>1	367.8	322.1	0.0	35.8	182.3	104.0	0.0	39.4	6.4	68.9
		0.75-1	419.8	409.8	0.0	68.9	247.3	93.7	0.0	10.0	0.0	43.8
		0.5-0.75	446.8	440.7	0.0	87.0	266.7	87.0	0.0	6.1	0.0	8.0
		<0.5	422.2	418.5	0.0	52.6	251.5	114.5	0.0	3.7	0.0	0.0
		average	414.2	397.8	0.0	61.1	236.9	99.8	0.0	14.8	1.6	30.2
	Average	>1	450.5	398.2	0.0	87.8	223.1	87.3	0.0	40.7	11.6	52.1
		0.75-1	467.7	439.7	0.0	74.2	280.9	84.6	0.0	24.3	3.7	31.1
		0.5-0.75	458.4	445.3	0.0	73.3	310.3	61.7	0.0	10.4	2.6	8.6
		<0.5	415.6	404.1	0.0	54.2	247.2	102.7	0.0	11.5	0.0	0.9
LSD (0.05)												
Variety X date			57.7	60.5	7.7	66.9	59.5	NS	NS	NS	NS	NS
Set size X date			34.8	36.5	NS	35.9	20.6	6.5	NS	NS	NS	NS
Variety X set size X date			115.4	120.9	NS	NS	118.9	68.2	NS	21.6	NS	10.1

Table 3. Yield and grade of onion varieties grown from sets and harvested on July 26, 2010. Malheur Experiment Station, Oregon State University, Ontario, OR. Continued on next page.

Company	Variety	Set diameter	Total yield	Marketable yield by grade					Bulb counts >4¼ in	Small	No. 2s	Bolting
				Total	>4¼ in	4-4¼ in	3-4 in	2¼-3 in				
		inches	---------- cwt/acre ----------						#/50 lb	--- cwt/acre ---		%
Nunhems	Kalahari	>1	295.5	238.5	0.0	0.0	183.2	55.3	0.0	57.0	0.0	16.7
		0.75-1	673.2	624.9	0.0	0.0	605.2	19.7	0.0	48.3	0.0	0.0
		0.5-0.75	574.4	558.5	0.0	80.1	403.7	74.7	0.0	15.9	0.0	0.0
		<0.5	298.8	280.3	0.0	0.0	193.6	86.7	0.0	18.5	0.0	0.0
		average	460.5	425.5	0.0	20.0	346.4	59.1	0.0	34.9	0.0	4.2
Seminis	Exacta	>1	494.3	371.5	0.0	48.9	256.0	66.6	0.0	27.5	95.3	75.0
		0.75-1	517.7	473.1	30.4	135.1	243.6	64.1	31.3	20.4	24.2	58.1
		0.5-0.75	587.1	570.2	0.0	149.1	399.1	22.0	0.0	16.9	0.0	23.5
		<0.5	406.0	380.5	0.0	82.2	281.4	16.8	0.0	25.5	0.0	9.9
		average	501.3	448.8	7.6	103.8	295.0	42.4	0.0	22.6	29.9	41.6
Seminis	Golden Spike	>1	310.5	240.4	0.0	33.3	125.9	81.2	0.0	47.9	22.2	87.6
		0.75-1	411.8	363.5	0.0	23.6	240.1	99.9	0.0	36.5	11.8	57.0
		0.5-0.75	435.9	414.2	0.0	21.8	331.4	61.0	0.0	19.8	1.9	39.2
		<0.5	448.2	436.0	0.0	0.0	388.7	47.2	0.0	12.2	0.0	0.0
		average	401.6	363.5	0.0	19.7	271.5	72.3	0.0	29.1	9.0	45.9
Bejo	Gunnison	>1	594.1	550.4	0.0	13.2	400.9	136.3	0.0	21.4	22.3	22.5
		0.75-1	543.5	515.6	0.0	9.6	425.1	81.0	0.0	20.8	7.0	15.7
		0.5-0.75	518.1	503.3	0.0	0.0	422.4	80.9	0.0	14.8	0.0	3.9
		<0.5	447.0	436.2	0.0	14.6	282.5	139.1	0.0	10.8	0.0	2.0
		average	525.7	501.4	0.0	9.3	382.7	109.3	0.0	17.0	7.3	11.0
Bejo	Talon	>1	458.8	414.7	0.0	0.0	394.0	20.7	0.0	44.1	0.0	62.5
		0.75-1	698.6	698.6	0.0	0.0	602.3	96.2	0.0	0.0	0.0	0.0
		0.5-0.75	198.1	198.1	0.0	0.0	198.1	0.0	0.0	0.0	0.0	0.0
		<0.5			0.0							
		average	451.8	437.1	0.0	0.0	398.1	39.0	0.0	14.7	0.0	20.8
Nunhems	Montero	>1	427.5	374.0	0.0	0.0	311.4	62.5	0.0	53.6	0.0	66.0
		0.75-1	522.9	511.5	20.3	58.6	404.7	27.9	31.6	11.4	0.0	25.3
		0.5-0.75	912.2	891.7	0.0	345.8	518.1	27.8	0.0	13.8	6.7	8.3
		<0.5	589.5	568.9	0.0	0.0	259.5	309.4	0.0	12.7	7.9	4.2
		average	613.0	586.5	5.1	101.1	373.4	106.9	0.0	22.9	3.6	25.9

Table 3. (continued) Yield and grade of onion varieties grown from sets and harvested on July 26, 2010. Malheur Experiment Station, Oregon State University, Ontario, OR.

Company	Variety	Set diameter	Total yield	Marketable yield by grade					Bulb counts			
				Total	>4¼ in	4-4¼ in	3-4 in	2¼-3 in	>4¼ in	Small	No. 2s	Bolting
		inches	---------- cwt/acre ----------						#/50 lb	-- cwt/acre --		%
Nunhems	Pulsar											
		>1	703.4	689.9	0.0	22.9	517.5	149.5	0.0	13.5	0.0	0.8
		0.75-1	637.1	631.6	0.0	29.6	517.2	84.8	0.0	4.4	1.0	2.8
		0.5-0.75	603.5	603.5	0.0	15.1	485.7	52.7	0.0	10.0	0.0	0.0
		<0.5	593.3	576.3	0.0	0.0	497.0	79.3	0.0	17.1	0.0	0.0
		average	634.3	625.3	0.0	16.9	504.4	91.6	0.0	11.3	0.2	0.9
Nunhems	Sabroso											
		>1	431.1	374.7	0.0	0.0	317.0	57.7	0.0	56.3	0.0	58.3
		0.75-1	572.9	567.1	0.0	0.0	501.8	65.4	0.0	5.8	0.0	11.6
		0.5-0.75	530.9	506.7	0.0	0.0	428.6	78.1	0.0	24.1	0.0	3.2
		<0.5	472.2	472.2	0.0	0.0	353.3	118.8	0.0	0.0	0.0	10.0
		average	501.8	480.2	0.0	0.0	400.2	80.0	0.0	21.6	0.0	20.8
Nunhems	Swale											
		>1	481.8	465.5	0.0	0.0	345.6	119.9	0.0	16.3	0.0	100.0
		0.75-1	616.9	616.9	0.0	0.0	492.5	124.4	0.0	0.0	0.0	66.7
		0.5-0.75	789.6	789.6	0.0	0.0	715.0	74.6	0.0	0.0	0.0	0.0
		<0.5	522.7	522.7	0.0	0.0	443.3	79.4	0.0	0.0	0.0	4.2
		average	602.8	598.7	0.0	0.0	499.1	99.6	0.0	4.1	0.0	42.7
Nunhems	Vaquero											
		>1	472.3	394.8	60.7	47.5	171.1	115.5	30.1	65.8	11.7	67.9
		0.75-1										
		0.5-0.75										
		<0.5	469.1	455.5	0.0	0.0	436.2	19.3	0.0	13.6	0.0	2.6
		average	470.7	425.2	30.3	23.8	303.6	67.4	0.0	39.7	5.8	35.2
Seminis	Marquette											
		>1	440.8	410.4	0.0	20.4	260.7	129.4	0.0	30.4	0.0	68.8
		0.75-1	507.5	493.5	0.0	16.8	406.1	70.5	0.0	14.0	0.0	48.4
		0.5-0.75	466.1	446.9	0.0	8.3	360.5	78.1	0.0	19.2	0.0	19.1
		<0.5	467.2	446.6	0.0	0.0	314.0	132.6	0.0	20.6	0.0	1.5
		average	470.4	449.3	0.0	11.4	335.3	102.7	0.0	21.1	0.0	34.5
	Average	>1	485.7	434.3	2.2	21.2	306.8	104.0	30.1	33.8	17.6	53.7
		0.75-1	543.0	519.1	6.1	34.1	408.1	70.9	31.4	18.1	5.8	31.7
		0.5-0.75	555.8	539.5	0.0	60.6	419.0	59.9	0.0	15.5	0.8	12.1
		<0.5	483.9	468.5	0.0	11.8	347.7	109.0	0.0	14.8	0.6	3.1
LSD (0.05)												

Variety X date	57.7	60.5	7.7	66.9	59.5	NS	NS	NS	NS	NS
Set size X date	34.8	36.5	NS	35.9	20.6	6.5	NS	NS	NS	NS
Variety X set size X date	115.4	120.9	NS	NS	118.9	68.2	NS	21.6	NS	10.1

Table 4. Yield and grade of onion varieties grown from sets and harvested on August 3, 2010. Malheur Experiment Station, Oregon State University, Ontario, OR. Continued on next page.

				Marketable yield by grade					Bulb counts			
Company	Variety	Set diameter	Total yield	Total	>4¼ in	4-4¼ in	3-4 in	2¼-3 in	>4¼ in	Small	No. 2s	Bolting
		inches	---------- cwt/acre ----------						#/50 lb	--- cwt/acre ---		%
Nunhems	Kalahari	>1	700.0	654.8	0.0	0.0	560.4	94.4	0.0	45.2	0.0	11.5
		0.75-1	658.8	638.1	0.0	50.0	494.5	93.5	0.0	20.7	0.0	9.8
		0.5-0.75	470.2	458.2	0.0	36.2	363.8	58.2	0.0	12.0	0.0	0.0
		<0.5	485.9	474.7	0.0	0.0	410.0	64.7	0.0	11.2	0.0	0.0
		average	578.7	556.4	0.0	21.6	457.2	77.7	0.0	22.3	0.0	5.3
Seminis	Exacta	>1	461.8	424.6	12.5	67.6	276.2	68.3	27.5	29.4	7.8	75.9
		0.75-1	575.6	516.8	23.6	132.2	288.7	72.3	31.9	30.3	28.5	55.4
		0.5-0.75	699.0	694.2	35.6	274.6	352.4	31.6	32.7	4.9	0.0	22.5
		<0.5	641.7	621.4	33.0	246.2	271.7	70.6	34.0	20.3	0.0	2.3
		average	594.5	564.3	26.2	180.1	297.3	60.7	31.5	21.2	9.1	39.0
Seminis	Golden Spike	>1	334.3	251.6	11.2	10.7	121.2	108.5	22.1	49.6	33.1	86.5
		0.75-1	469.1	413.6	17.0	69.0	258.1	69.6	31.3	23.1	32.4	53.8
		0.5-0.75	539.2	520.0	0.0	122.2	353.7	44.1	0.0	11.4	7.9	27.4
		<0.5	498.6	488.7	0.0	119.2	285.9	83.6	0.0	9.9	0.0	7.1
		average	460.3	418.5	7.0	80.3	254.7	76.4	26.7	23.5	18.3	43.7
Bejo	Gunnison	>1	569.8	522.5	0.0	0.0	419.6	102.8	0.0	34.1	9.9	30.2
		0.75-1	566.6	555.5	0.0	9.6	487.1	58.8	0.0	11.1	0.0	17.4
		0.5-0.75	532.9	521.1	0.0	11.1	432.7	77.2	0.0	11.8	0.0	3.8
		<0.5	461.3	446.9	0.0	0.0	286.7	160.2	0.0	14.4	0.0	0.0
		average	532.7	511.5	0.0	5.2	406.5	99.7	0.0	17.9	2.5	12.8
Bejo	Talon	>1	575.9	516.6	0.0	0.0	349.0	167.6	0.0	59.3	0.0	41.7
		0.75-1	338.3	338.3	0.0	0.0	273.7	64.6	0.0	0.0	0.0	50.0
		0.5-0.75	844.7	794.8	0.0	106.9	518.6	169.3	0.0	49.9	0.0	0.0
		<0.5										
		average	586.3	549.9	0.0	35.6	380.4	133.9	0.0	36.4	0.0	30.6
Nunhems	Montero	>1	561.3	532.8	0.0	115.6	370.9	46.4	0.0	28.5	0.0	49.4
		0.75-1	717.8	707.7	0.0	80.2	609.1	18.4	0.0	10.1	0.0	10.4
		0.5-0.75	619.7	610.7	23.3	171.0	393.9	22.6	27.9	9.1	0.0	10.9

	<0.5	589.6	584.2	0.0	34.8	500.8	48.5	0.0	5.5	0.0	1.6
	average	622.1	608.9	5.8	100.4	468.7	34.0	27.9	13.3	0.0	18.1

Table 4. (continued) Yield and grade of onion varieties grown from sets and harvested on August 3, 2010. Malheur Experiment Station, Oregon State University, Ontario, OR.

				Marketable yield by grade					Bulb counts			
Company	Variety	Set diameter	Total yield	Total	>4¼ in	4-4¼ in	3-4 in	2¼-3 in	>4¼ in	Small	No. 2s	Bolting
		inches	---------- cwt/acre ----------						#/50 lb	-- cwt/acre --		%
Nunhems	Pulsar											
		>1	715.6	693.2	0.0	23.4	596.0	73.8	0.0	10.8	11.6	7.8
		0.75-1	680.8	674.0	0.0	35.0	623.0	16.0	0.0	6.8	0.0	2.2
		0.5-0.75	722.4	716.7	0.0	108.7	547.6	60.4	0.0	5.7	0.0	0.0
		<0.5	557.0	541.3	0.0	3.8	442.9	94.6	0.0	15.7	0.0	0.0
		average	668.9	656.3	0.0	42.7	552.4	61.2	0.0	9.8	2.9	2.5
Nunhems	Sabroso											
		>1	518.6	503.0	0.0	22.4	430.7	49.9	0.0	15.6	0.0	59.6
		0.75-1	606.7	601.4	0.0	6.4	543.7	51.4	0.0	5.3	0.0	18.4
		0.5-0.75	562.3	547.8	0.0	6.8	465.7	75.3	0.0	14.5	0.0	3.7
		<0.5	491.9	461.4	0.0	0.0	348.3	113.1	0.0	30.5	0.0	2.0
		average	544.9	528.4	0.0	8.9	447.1	72.4	0.0	16.5	0.0	20.9
Nunhems	Swale											
		>1	360.3	334.9	0.0	0.0	275.4	59.5	0.0	12.7	12.7	84.6
		0.75-1	503.7	503.7	0.0	147.3	320.8	35.6	0.0	0.0	0.0	40.0
		0.5-0.75	604.1	582.7	0.0	0.0	0.0	582.7	0.0	21.4	0.0	25.0
		<0.5	623.7	615.5	0.0	54.4	535.8	25.2	0.0	8.2	0.0	3.8
		average	522.9	509.2	0.0	50.4	283.0	175.8	0.0	10.6	3.2	38.4
Nunhems	Vaquero											
		>1	650.7	613.8	0.0	195.6	366.0	52.3	0.0	29.2	7.7	52.5
		0.75-1										
		0.5-0.75										
		<0.5	589.5	575.2	0.0	125.3	403.3	46.7	0.0	14.3	0.0	0.0
		average	620.1	594.5	0.0	160.4	384.6	49.5	0.0	21.7	3.9	26.2
Seminis	Marquette											
		>1	420.2	386.2	0.0	8.6	269.6	108.1	0.0	33.9	0.0	66.2
		0.75-1	498.1	482.5	0.0	34.2	390.0	58.3	0.0	15.6	0.0	46.6
		0.5-0.75	553.8	549.5	0.0	27.3	472.7	49.5	0.0	4.3	0.0	13.4
		<0.5	529.1	512.9	0.0	9.6	393.2	110.1	0.0	16.2	0.0	2.8
		average	500.3	482.8	0.0	19.9	381.4	81.5	0.0	17.5	0.0	32.3

	Average	>1	512.5	470.8	3.2	32.0	347.2	88.4	24.8	31.6	9.7	52.9
		0.75-1	570.4	547.5	5.4	54.2	433.2	54.6	31.6	14.8	8.1	31.4
		0.5-0.75	604.1	592.8	6.4	92.0	421.7	72.7	31.1	10.3	1.0	10.7
		<0.5	537.8	522.4	3.7	47.9	372.2	98.6	34.0	15.5	0.0	1.7
LSD (0.05)												
Variety X date			57.7	60.5	7.7	66.9	59.5	NS	NS	NS	NS	NS
Set size X date			34.8	36.5	NS	35.9	20.6	6.5	NS	NS	NS	NS
Variety X set size X date			115.4	120.9	NS	NS	118.9	68.2	NS	21.6	NS	10.1

Table 5. Yield and grade of onion varieties grown from sets averaged over three harvest dates. Malheur Experiment Station, Oregon State University, Ontario, OR. Continued on next page.

				Marketable yield by grade					Bulb counts			
Company	Variety	Set diameter	Total yield	Total	>4¼ in	4-4¼ in	3-4 in	2¼-3 in	>4¼ in	Small	No. 2s	Bolting
		inches	---------- cwt/acre ----------						#/50 lb	--- cwt/acre ---		%
Nunhems	Kalahari	>1	513.9	446.4	0.0	0.0	323.3	123.0	0.0	67.5	0.0	18.7
		0.75-1	605.8	572.5	0.0	84.6	423.8	64.2	0.0	33.2	0.0	5.3
		0.5-0.75	463.6	451.9	0.0	108.2	295.0	48.7	0.0	9.5	2.2	0.3
		<0.5	359.8	344.0	0.0	0.0	275.9	68.1	0.0	15.8	0.0	0.0
		average	485.8	453.7	0.0	48.2	329.5	76.0	0.0	31.5	0.6	6.1
Seminis	Exacta	>1	444.9	340.6	4.2	50.6	203.9	81.9	27.5	44.4	59.9	79.2
		0.75-1	501.3	452.8	18.0	97.8	246.0	90.9	31.7	29.2	19.3	59.2
		0.5-0.75	590.9	578.0	11.9	151.2	379.8	35.3	32.7	12.1	0.8	20.9
		<0.5	477.8	461.6	11.0	127.5	278.8	44.3	34.0	16.2	0.0	6.8
		average	503.7	458.2	11.3	106.8	277.1	63.1	31.5	25.5	20.0	41.5
Seminis	Golden Spike	>1	303.9	230.2	3.7	27.2	113.3	85.9	22.1	53.9	19.8	87.7
		0.75-1	433.2	387.1	5.7	69.3	236.9	75.2	31.3	28.4	17.6	55.8
		0.5-0.75	445.2	419.3	0.0	105.0	268.3	46.0	0.0	17.3	8.6	33.3
		<0.5	490.8	483.4	0.0	173.9	263.7	45.8	0.0	7.4	0.0	2.4
		average	418.3	380.0	2.3	93.9	220.6	63.2	26.7	26.8	11.5	44.8
Bejo	Gunnison	>1	573.5	527.2	0.0	123.5	310.7	93.0	0.0	31.6	13.5	23.0
		0.75-1	542.4	525.7	0.0	47.7	406.3	71.8	0.0	14.3	2.3	12.6
		0.5-0.75	501.7	487.4	0.0	29.8	385.5	72.0	0.0	14.3	0.0	3.2
		<0.5	430.2	415.6	0.0	17.1	247.5	151.0	0.0	14.6	0.0	0.7
		average	512.0	489.0	0.0	54.5	337.5	96.9	0.0	18.7	4.0	9.9
Bejo	Talon	>1	579.1	537.7	0.0	0.0	345.3	192.4	0.0	41.4	0.0	49.0
		0.75-1	462.1	462.1	0.0	0.0	397.7	64.3	0.0	0.0	0.0	16.7
		0.5-0.75	506.7	490.0	0.0	35.6	367.9	86.4	0.0	16.6	0.0	0.0
		<0.5										

		average	515.9	496.6	0.0	11.9	370.3	114.4	0.0	19.3	0.0	21.9
Nunhems	Montero											
		>1	494.9	453.0	0.0	38.5	359.7	54.8	0.0	41.8	0.1	52.6
		0.75-1	568.4	549.3	6.8	52.9	454.3	35.3	31.6	12.8	6.3	19.8
		0.5-0.75	681.9	668.2	7.8	176.3	449.8	34.3	27.9	11.5	2.2	6.4
		<0.5	532.2	508.3	0.0	11.6	348.3	148.4	0.0	21.2	2.6	1.9
		average	569.3	544.7	3.6	69.8	403.1	68.2	29.8	21.8	2.8	20.2

Table 5. (continued) Yield and grade of onion varieties grown from sets averaged over three harvest dates. Malheur Experiment Station, Oregon State University, Ontario, OR.

				Marketable yield by grade					Bulb counts			
Company	Variety	Set diameter	Total yield	Total	>4¼ in	4-4¼ in	3-4 in	2¼-3 in	>4¼ in	Small	No. 2s	Bolting
		inches	---------- cwt/acre ----------						#/50 lb	--- cwt/acre ---		%
Nunhems	Pulsar											
		>1	664.7	649.2	0.0	17.1	540.0	92.1	0.0	11.7	3.9	3.1
		0.75-1	639.9	634.3	0.0	21.6	564.5	48.2	0.0	5.3	0.3	1.7
		0.5-0.75	610.8	603.8	0.0	41.3	499.8	62.7	0.0	7.0	0.0	0.0
		<0.5	540.7	528.2	0.0	1.3	422.5	104.4	0.0	12.5	0.0	0.0
		average	614.0	603.9	0.0	20.3	506.7	76.9	0.0	9.1	1.0	1.2
Nunhems	Sabroso											
		>1	470.2	445.6	0.0	91.0	304.5	50.1	0.0	24.7	0.0	59.1
		0.75-1	544.4	527.5	0.0	41.2	413.6	72.7	0.0	16.9	0.0	21.2
		0.5-0.75	495.4	479.2	0.0	39.5	347.8	92.0	0.0	16.1	0.0	3.9
		<0.5	445.2	434.3	0.0	8.1	319.5	106.7	0.0	10.9	0.0	4.0
		average	488.8	471.7	0.0	44.9	346.3	80.4	0.0	17.1	0.0	22.0
Nunhems	Swale											
		>1	426.2	411.1	0.0	19.8	309.0	82.3	0.0	10.8	4.2	92.3
		0.75-1	596.5	549.8	0.0	49.1	383.4	117.3	0.0	46.7	0.0	43.9
		0.5-0.75	683.9	676.8	0.0	0.0	457.7	219.1	0.0	7.1	0.0	15.0
		<0.5	517.7	504.3	0.0	18.1	418.9	67.2	0.0	13.4	0.0	2.7
		average	556.0	535.5	0.0	21.8	392.3	121.5	0.0	19.5	1.1	38.5
Nunhems	Vaquero											
		>1	527.4	488.8	20.2	180.5	225.1	63.0	30.1	32.1	6.5	61.1
		0.75-1										
		0.5-0.75										
		<0.5	470.1	453.8	0.0	41.8	361.4	50.6	0.0	16.3	0.0	0.9

		average	498.7	471.3	10.1	111.1	293.2	56.8	30.1	24.2	3.2	31.0
Seminis	Marquette	>1	409.6	372.9	0.0	21.6	237.5	113.8	0.0	34.6	2.1	68.0
		0.75-1	475.1	461.9	0.0	40.0	347.8	74.2	0.0	13.2	0.0	46.3
		0.5-0.75	488.9	479.0	0.0	40.8	366.6	71.6	0.0	9.9	0.0	13.5
		<0.5	472.9	459.4	0.0	20.7	319.6	119.1	0.0	13.5	0.0	1.5
		average	461.6	443.3	0.0	30.8	317.9	94.7	0.0	17.8	0.5	32.3
	Average	>1	482.5	434.0	1.8	47.2	291.7	93.3	26.6	35.4	13.0	52.9
		0.75-1	527.0	502.1	3.8	54.2	374.1	70.0	31.6	19.1	5.9	31.4
		0.5-0.75	539.4	525.9	2.1	75.3	383.6	64.8	31.1	12.1	1.5	10.5
		<0.5	479.1	465.0	1.2	38.0	322.4	103.4	34.0	13.9	0.2	1.9
		average	507.0	481.7	2.2	53.6	342.9	82.9	30.8	20.1	5.1	24.2
LSD (0.05)												
Variety			61.4	67.1	3.0	41.9	52.5	31.2	NS	9.0	9.3	13.9
Set size			37.0	40.5	NS	NS	31.7	NS	NS	5.4	NS	8.4
Var. X set size			122.8	134.3	NS	NS	NS	62.5	NS	18.0	NS	27.8
Date			17.4	18.2	NS	NS	17.9	NS	NS	NS	NS	NS

Table 6. Bulb multiple-center rating for onions grown from sets and harvested on August 3, 2010. Malheur Experiment Station, Oregon State University, Ontario, OR. Continued on next page.

			Multiple center			Single center	
Company	Variety	Set diameter	large	medium	small	functional[a]	bullet
		inches	---------- % ----------				
Nunhems	Kalahari	>1	0.0	16.0	0.0	84.0	84.0
		0.75-1	4.0	6.0	2.0	90.0	88.0
		0.5-0.75	4.0	18.0	14.0	78.0	64.0
		<0.5	16.0	24.0	20.0	60.0	40.0
		average	6.0	16.0	9.0	78.0	69.0
Seminis	Exacta	>1	8.3	19.5	8.5	72.2	63.7
		0.75-1	5.0	20.0	4.0	75.0	71.0
		0.5-0.75	2.0	19.3	4.3	78.7	74.3
		<0.5	4.9	20.0	10.2	75.1	64.9
		average	5.1	19.7	6.8	75.2	68.5
Seminis	Golden Spike	>1	11.8	45.5	0.0	42.7	42.7
		0.75-1	7.4	18.0	4.0	74.7	70.7
		0.5-0.75	4.6	12.1	8.0	83.3	75.3
		<0.5	0.0	27.3	0.0	72.7	72.7
		average	5.9	25.7	3.0	68.4	65.4
Bejo	Gunnison	>1	1.0	0.0	1.0	99.0	98.0
		0.75-1	0.0	0.0	0.0	100.0	100.0

		0.5-0.75	0.0	0.0	3.2	100.0	96.8
		<0.5	1.0	2.0	1.5	97.0	95.5
		average	0.5	0.5	1.4	99.0	97.6
Bejo	Talon	>1	0.0	0.0	0.0	100.0	100.0
		0.75-1	0.0	0.0	0.0	100.0	100.0
		0.5-0.75	0.0	5.9	0.0	94.1	94.1
		<0.5	0.0	0.0	0.0	0.0	0.0
		average	0.0	2.0	0.0	98.0	98.0
Nunhems	Montero	>1	0.0	2.0	0.0	98.0	98.0
		0.75-1	0.0	0.0	1.3	100.0	98.7
		0.5-0.75	0.0	0.0	2.7	100.0	97.3
		<0.5	0.0	0.0	0.0	100.0	100.0
		average	0.0	0.5	1.0	99.5	98.5

[a] bullet single center plus small multiple center.

Table 6. (continued) Bulb multiple-center rating for onions grown from sets and harvested on August 3, 2010. Malheur Experiment Station, Oregon State University, Ontario, OR.

			Multiple center			Single center	
Company	Variety	Set diameter	large	medium	small	functional[a]	bullet
		inches	---------- % ----------				
Nunhems	Pulsar	>1	0.0	0.0	0.0	100.0	100.0
		0.75-1	0.0	0.0	0.0	100.0	100.0
		0.5-0.75	0.0	0.0	1.6	100.0	98.4
		<0.5	0.0	0.8	1.6	99.2	97.6
		average	0.0	0.2	0.8	99.8	99.0
Nunhems	Sabroso	>1	0.0	8.0	0.0	92.0	92.0
		0.75-1	0.0	0.0	0.0	100.0	100.0
		0.5-0.75	0.0	0.0	2.7	100.0	97.3
		<0.5	0.0	2.0	4.0	98.0	94.0
		average	0.0	2.5	1.7	97.5	95.8
Nunhems	Swale	>1	0.0	0.0	0.0	100.0	100.0
		0.75-1	0.0	0.0	0.0	100.0	100.0
		0.5-0.75	0.0	12.5	0.0	87.5	87.5
		<0.5	0.0	0.0	8.0	100.0	92.0
		average	0.0	3.1	2.0	96.9	94.9
Nunhems	Vaquero	>1	12.0	8.0	16.0	80.0	64.0
		0.75-1	0.0	0.0	0.0	0.0	0.0

		0.5-0.75	0.0	0.0	0.0	0.0	0.0
		<0.5	4.0	0.0	0.0	96.0	96.0
		average	8.0	4.0	8.0	88.0	80.0
Seminis	Marquette	>1	2.4	7.2	0.8	90.4	89.6
		0.75-1	0.0	2.4	3.2	97.6	94.4
		0.5-0.75	0.0	5.6	4.8	94.4	89.6
		<0.5	1.6	4.0	8.8	94.4	85.6
		average	1.0	4.8	4.4	94.2	89.8
	Average	>1	3.7	11.6	1.8	84.7	82.9
		0.75-1	1.9	5.9	1.9	92.2	90.4
		0.5-0.75	1.0	6.3	4.3	92.6	88.4
		<0.5	1.9	5.9	5.0	92.2	87.3
LSD (0.05)							
Variety			2.2	4.2	1.9	4.3	3.9
Set size			NS	NS	NS	5.5	NS
Var. X set size			NS	NS	NS	NS	NS

[a] bullet single center plus small multiple center.

Table 7. Maturity at harvest for 12 onion varieties grown from sets harvested on three dates. Malheur Experiment Station, Oregon State University, Ontario, OR.

Company	Variety	Harvest date	Tops down	Drynes s
			----- % -----	
Nunhems	Kalahari	19-Jul	15.0	7.5
		26-Jul	25.0	20.0
		3-Aug	42.5	35.0
		average	27.5	20.8
Seminis	Exacta	19-Jul	17.5	10.0
		26-Jul	27.5	15.0
		3-Aug	47.5	30.0
		average	30.8	18.3
Seminis	Golden Spike	19-Jul	55.0	30.0
		26-Jul	100.0	50.0
		3-Aug	100.0	70.0
		average	85.0	50.0
Bejo	Gunnison	19-Jul	10.0	13.3
		26-Jul	16.7	23.3
		3-Aug	40.0	40.0
		average	22.2	25.6
Bejo	Talon	19-Jul	6.0	10.0

		26-Jul	12.0	22.0
		3-Aug	32.0	36.0
		average	16.7	22.7
Nunhems	Montero	19-Jul	6.7	16.7
		26-Jul	10.0	20.0
		3-Aug	30.0	33.3
		average	15.6	23.3
Nunhems	Pulsar	19-Jul	6.0	6.0
		26-Jul	94.0	20.0
		3-Aug	100.0	44.0
		average	66.7	23.3
Nunhems	Sabroso	19-Jul	6.0	20.0
		26-Jul	22.0	32.0
		3-Aug	40.0	46.0
		average	22.7	32.7
Nunhems	Swale	19-Jul	10.0	20.0
		26-Jul	20.0	20.0
		3-Aug	50.0	30.0
		average	26.7	23.3
Nunhems	Vaquero	19-Jul	10.0	10.0
		26-Jul	10.0	10.0
		3-Aug	30.0	20.0
		average	16.7	13.3
Seminis	Marquette	19-Jul	10.0	10.0
		26-Jul	10.0	20.0
		3-Aug	30.0	30.0
		average	16.7	20.0
	Average	19-Jul	12.1	12.9
		26-Jul	34.4	23.2
		3-Aug	51.2	39.1
LSD (0.05)	Variety		3.7	3.1
	Date		3.9	3.1
	Var. X date		12.9	NS

Table 8. Bulb quality 2 weeks after harvest for 11 onion varieties grown from sets harvested on three dates. Malheur Experiment Station, Oregon State University, Ontario, OR. Continued on next page.

		Bulb quality 2 weeks after harvest		
Company	Variety	sprouted	decomposed	total sprouted or decomposed
			%	
		July 19 harvest		
Nunhems	Kalahari	0.0	32.4	32.4
Seminis	Exacta	6.4	19.1	25.5
	Golden Spike	0.0	23.6	23.6
Bejo	Gunnison	1.0	8.7	9.7
	Talon	0.0	0.0	0.0
Nunhems	Montero	7.1	23.2	29.5
	Pulsar	0.0	4.2	4.2
	Sabroso	5.6	16.7	21.1
	Swale	0.0	0.0	20.0

	Vaquero	3.8	23.1	26.9
Seminis	Marquette	3.7	16.7	20.4
	Average	2.5	15.2	19.4
		July 26 harvest		
Nunhems	Kalahari	0.0	30.2	30.2
Seminis	Exacta	1.0	35.4	36.4
	Golden Spike	0.9	33.0	33.9
Bejo	Gunnison	0.0	4.4	4.4
	Talon	0.0	20.0	20.0
Nunhems	Montero	0.0	8.7	8.7
	Pulsar	0.0	4.9	4.9
	Sabroso	1.2	6.1	7.3
	Swale	0.0	7.3	7.3
	Vaquero	3.0	12.1	15.2
Seminis	Marquette	0.9	7.3	8.3
	Average	0.6	15.4	16.0

Table 8. (continued) Bulb quality 2 weeks after harvest for 11 onion varieties grown from sets harvested on three dates. Malheur Experiment Station, Oregon State University, Ontario, OR.

		Bulb quality 2 weeks after harvest		
Company	Variety	sprouted	decomposed	total sprouted or decomposed
		---------- % ----------		
		August 3 harvest		
Nunhems	Kalahari	0.0	37.6	37.6
Seminis	Exacta	0.0	27.0	27.0
	Golden Spike	0.0	45.3	45.3
Bejo	Gunnison	0.0	11.3	11.3
	Talon	na	na	na
Nunhems	Montero	0.0	19.1	19.1
	Pulsar	0.0	3.4	3.4
	Sabroso	0.0	11.1	11.1
	Swale	0.0	0.0	0.0
	Vaquero	0.0	34.4	34.4

Seminis	Marquette	0.0	15.8	15.8
	Average	0.0	20.5	20.5
		Average		
Nunhems	Kalahari	0.0	33.4	33.4
Seminis	Exacta	2.5	27.2	29.6
	Golden Spike	0.3	34.0	34.3
Bejo	Gunnison	0.3	8.1	8.5
	Talon	0.0	10.0	10.0
Nunhems	Montero	2.4	17.0	19.1
	Pulsar	0.0	4.2	4.2
	Sabroso	2.3	11.3	13.2
	Swale	0.0	2.4	2.4
	Vaquero	2.3	23.2	25.5
Seminis	Marquette	1.5	13.3	14.8
	Average	1.0	16.7	17.7