2005 ONION VARIETY TRIALS

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Introduction

The objective of the onion variety trials was to evaluate yellow, white, and red onion varieties for bulb yield, quality, and single centers. Five early season yellow varieties were planted in March and were harvested and graded at the end of August. Thirty-five full season varieties (27 yellow, 4 red, and 4 white) were planted in March, harvested in September 2005, and evaluated in January 2006.

Materials and Methods

The onions were grown on a Greenleaf silt loam previously planted to wheat. In the fall of 2004, the wheat stubble was shredded and the field was irrigated and disked. Soil analysis indicated the need for 200 lb sulfur/acre and 1 lb boron/acre, which were broadcast in the fall of 2004 after disking. In early March 2005 the field was moldboard-plowed, groundhogged, roller-harrowed, and bedded.

A full season trial and an early maturing trial were conducted adjacent to each other. Both trials were planted on March 15 in plots 4 double rows wide and 27 ft long. The early maturing trial had 5 varieties from 2 seed companies (Table 1) and the full season trial had 35 varieties from 8 seed companies (Table 3). The experimental design for each trial was a randomized complete block with five replicates. A sixth nonrandomized replicate was planted for demonstrating onion variety performance to growers and seed company representatives.

Seed was planted in double rows spaced 3 inches apart at 9 seeds/ft of single row. Each double row was planted on beds spaced 22 inches apart with a customized planter using John Deere Flexi Planter units equipped with disk openers. The onion rows received 3.7 oz of Lorsban 15G® per 1,000 ft of row (0.82 lb ai/acre), and the soil surface was rolled on March 20. The field was irrigated on March 18. Onion emergence started on April 11. On May 4, alleys 4 ft wide were cut between plots, leaving plots 23 ft long. From May 24 through 28, the seedlings were hand thinned to a

plant population of two plants/ft of single row (6-inch spacing between individual onion plants, or 95,000 plants/acre). The field was sidedressed with 100 lb of nitrogen (N)/acre as urea and cultivated on June 8. On July 11, the field was sidedressed with 100 lb N/acre as urea.

The onions were managed to avoid yield reductions from weeds, pests, and diseases. These factors were not all avoided in 2005. Due to high rainfall in April and May, Bravo® at 2.25 lb ai/acre was applied on May 20 for preventive fungal disease control. Weeds were controlled with an application of Prowl® at 0.83 lb ai/acre, Goal® at 0.13 lb ai/acre, Buctril® at 0.19 lb ai/acre, and Poast® at 0.21 lb ai/acre on June 4. After lay-by the field was hand weeded as necessary. Thrips were controlled with aerial applications of the following insecticides: June 16, Warrior® plus Lannate®; June 24, Warrior; July 10, Warrior plus Lannate; July 18, Warrior plus Lannate; July 26, Warrior plus MSR®; August 3, Warrior plus Lannate; August 10, Warrior plus MSR; August 14, Warrior plus Lannate; August 20, Warrior plus MSR. Warrior was applied at 0.03 lb ai/acre, Lannate at 0.45 lb ai/acre, and MSR at 0.5 lb ai/acre.

The trial was furrow irrigated when the soil water potential at 8-inch depth reached -25 kPa. Soil water potential was monitored by six granular matrix sensors (GMS, Watermark Soil Moisture Sensors Model 200SS, Irrometer Co. Inc., Riverside, CA) installed in mid-June below the onion row at 8-inch depth. The sensors were automatically read three times a day with an AM-400 meter (Mike Hansen Co., East Wenatchee, WA). The last irrigation was on August 30.

Onions in each plot were evaluated subjectively for maturity by visually rating the percentage of onions with the tops down and the percent dryness of the foliage. The percent maturity was calculated as the average percentage of onions with tops down and the percent dryness. The early maturing trial was evaluated for maturity on August 22 and the full season trial on August 30 and September 9. The number of bolted onion plants in each plot was counted.

Onions in each plot were evaluated subjectively for damage from iris yellow spot virus on August 19. Each plot was rated according to the number of leaves with symptoms per plant: 0 = no symptoms, 5 = at least 3 leaves with symptoms per plant.

Onions from the middle two rows in each plot in the early maturity trial were lifted on August 29, and topped by hand and bagged on August 31. On September 1 the onions were graded. The onions in the full season trial were lifted on September 12 to field cure. Onions from the middle two rows in each plot of the full season trial were topped by hand and bagged on September 20. The bags were put in storage on September 22. The storage shed was managed to maintain an air temperature as close to 34°F as possible. Onions from the full season trial were graded out of storage on January 5, 2006.

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. The red varieties were evaluated subjectively during grading for exterior thrips damage during storage. The bulbs from each red variety plot were rated on a scale from 0 (no damage) to 10 (most damage) for the damage that was apparent on the bulb surface, without removing the outer scales.

After grading of the early maturing trial, 10 randomly chosen bulbs from each plot were shipped via UPS ground to Vidalia Labs International in Collins, Georgia. The bulb samples were analyzed for pyruvic acid content on September 20. Bulb pyruvic acid content is a measure of pungency with the unit being micro mols pyruvic acid per gram of fresh weight (µmols/g FW). Onion bulbs having a pyruvate concentration of 5.5 or less are considered sweet according to Vidalia Labs sweet onion certification specifications.

In early September bulbs from one of the border rows in each plot of both trials were rated for single centers. Twenty-five consecutive 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 diameter of the first single ring: "small double" had diameters less than 1.5 inches, "intermediate double" had diameters from 1.5 to 2.25 inches, and "blowout" had diameters greater than 2.25 inches. Single-centered onions were classed as a "bullet". Onions were considered functionally single centered for processing if they were a "bullet" or "small double."

Varietal differences were compared using ANOVA and least significant differences at the 5 percent probability level, LSD (0.05). Sixteen full season varieties were in the variety trial in 2003, 2004, and 2005. The data for these varieties were compared over the 3 years.

Results and Discussion

Varieties are listed by company in alphabetical order. The LSD (0.05) values at the bottom of each table should be considered when comparisons are made between varieties for significant differences in performance characteristics. Differences between varieties equal to or greater than the LSD value for a characteristic should exist before any variety is considered different from any other variety in that characteristic.

A few experimental varieties were named in 2005. 'XP5646' was named 'Orizaba', 'XP5813' was named 'Affirmed', and 'EX5843' was named 'Monarchos'.

The 2005 season was unfavorable for the variety trial. Excessive rain in October of 2004 prevented fall fumigation and bedding. Bedding was done in the spring of 2005. Planting occurred on the target date of mid-March, but emergence was delayed for reasons unknown. Onion emergence in the variety trial in 2005 took 27 days, the longest since 1998 and substantially longer than the average of 19 days for the onion variety trial. Emergence between varieties was uneven. Excessive rain in May delayed cultivation and hand-thinning operations. Thinning is normally done in the first half of May. In 2005, thinning was delayed until late May. The high rainfall along with delayed cultivation and thinning resulted in high weed pressure until late May. April, May, and June had fewer growing degree days (50 to 86°F) than average. By the end of June there were 15 percent fewer accumulated growing degree days than the 19-year average. The growing degree days in July and August were close to average. The unfavorable growing conditions prior to bulbing resulted in smaller onion plants at the start of bulbing. The smaller onion plants may have been more susceptible to and more affected by thrips damage. Thrips pressure and iris yellow spot virus pressure were greater than normal during the season.

Early Maturity Trial, Five Yellow Varieties

The percentage of "bullet" single centers averaged 17.6 percent and ranged from 4 percent for 'Sequoia' to 52.8 percent for 'Montero' (Table 1). The percentage of onions that were functionally single centered averaged 50.4 percent and ranged from 27.2 percent for 'Renegade' to 88.8 percent for Montero. Montero had the highest percentage of bullet and functionally single-centered bulbs in this trial.

Total yield averaged 489 cwt/acre and ranged from 372.4 cwt/acre for 'Denali' to 590.9 cwt/acre for 'XON-0104' (Table 2). XON-0104, Renegade, and Montero were among the highest in total yield. Colossal-size onion yield averaged 19.5 cwt/acre and ranged from 1 cwt/acre for Sequoia to 52 cwt/acre for XON-0104. XON-0104 had the highest yield of colossal bulbs.

Maturity on August 22 ranged from 16 percent for Montero to 70 percent for Denali. Pyruvate concentration ranged from 4.28 µmols/g FW for Denali to 6.80 µmols/g FW for Montero. Denali had bulb pyruvate concentration low enough (<5.5) to be classified as a sweet onion.

Full Season Trial, 27 Yellow Varieties

The percentage of "bullet" single centers averaged 49.1 percent and ranged from 4 percent for 'Calibra' to 88 percent for '6011' (Table 3). The percentage of onions that were functionally single centered averaged 78.4 percent and ranged from 34.4 percent for 'T-433' and Calibra to 96.1 percent for EX5843.

Maturity on September 9 averaged 47.6 percent and ranged from 17 percent for 'SR7008ON' to 72 percent for 'Talon'. SR7008ON and 'Charismatic' were among the least mature varieties on September 9.

Marketable yield out of storage in January 2005 ranged from 287.7 cwt/acre for 'King George' to 794 cwt/acre for 'Sweet Perfection' (Table 4). Sweet Perfection and SR7008ON were among the varieties with the highest marketable yield. Supercolossal-size onion yield ranged from 0 cwt/acre for many varieties to 21 cwt/acre for Charismatic. Charismatic, Sweet Perfection, and SR7008ON were among the varieties with the highest supercolossal yield. Not counting supercolossals, colossal-size onion yield ranged from 0 cwt/acre for Talon, King George, and 'SX7200ON' to 164.6 cwt/acre for SR7008ON. SR7008ON and Charismatic were among the highest in colossal bulb yields. Jumbo-size onion yield averaged 332 cwt/acre and ranged from 128.9 cwt/acre for Talon to 567.5 cwt/acre for Sweet Perfection.

Decomposition in storage ranged from 0.3 percent for '4014' to 6.1 percent for 'Harmony'. No. 2 bulbs ranged from 0 cwt/acre for many varieties to 5.2 cwt/acre for King George.

Full Season Trial, Four Red Varieties

The percentage of "bullet" single centers ranged from 40 percent for 'Red Fortress' to 92.8 percent for 'T-817' (Table 3). The percentage of functionally single-centered onions ranged from 64.8 percent for 'Salsa' to 98.4 percent for T-817.

Total marketable yield ranged from 73.2 cwt/acre for T-817 to 253.5 cwt/acre for Salsa (Table 4). Jumbo-size onion yield ranged from 0.9 cwt/acre for T-817 to 110.7 cwt/acre for Salsa. Decomposition in storage ranged from 0.7 percent for T-817 and 'Red Bull' to 3 percent for Red Fortress. No. 2 bulbs ranged from 0 cwt/acre for T-817, Red Bull, and Salsa to 2.4 cwt/acre for Red Fortress. Red onion yield was apparently seriously hurt by thrips pressure and iris yellow spot virus.

Subjective evaluation of thrips damage to red onions in storage was low for all varieties, averaging 0.1 from a rating of 0 to 10, with no difference among varieties.

Full Season Trial, Four White Varieties

The percentage of "bullet" single centers ranged from 24 percent for XP5646 to 30.4 percent for 'Brite Knight' (Table 3). The percentage of functionally single-centered onions ranged from 62.4 percent for Brite Knight to 71.2 percent for 'Gladstone'.

Total marketable yield ranged from 352.2 cwt/acre for Gladstone to 491.1 cwt/acre for XP5646 (Table 4). Colossal-size onion yield ranged from 1.1 cwt/acre for Gladstone to 20.1 cwt/acre for XP5646. Decomposition in storage ranged from 2.1 percent for Gladstone to 7.3 percent for 'EX7106'. No. 2 bulbs ranged from 0 cwt/acre for XP5646 and EX7106 to 6.2 cwt/acre for Brite Knight.

Iris Yellow Spot Virus Rating

Subjective rating of damage from iris yellow spot virus for the full season varieties, on a scale from 0 to 5, ranged from 0.7 for SR7008ON to 2.4 for Red Bull (Table 3).

2003-2005 Data - Full Season Varieties

Onion yields were highest in 2003 and lowest in 2005 (Table 5). The percentage of functionally single-centered onions was lowest in 2003 and highest in 2005. Averaged over the 3 years, Sweet Perfection, Ranchero, T-433, and Harmony were among the varieties with the highest total yield (Table 5). Averaged over the 3 years, Ranchero and Sweet Perfection were among the varieties with the highest marketable yield. Averaged over the 3 years, 'Maverick' had the highest supercolossal onion yield. Averaged over the 3 years, 6011 and SR7004ON were among the varieties with the highest percentage of bullet single centered bulbs. Averaged over the 3 years, 6011, SR7004ON, Sabroso, and Montero were among the varieties with the highest percentage of functionally single-centered bulbs

Table 1. Onion multiple-center rating for early maturing varieties, Malheur Experiment Station, Oregon State University, Ontario, OR, 2005.

Seed company	Variety	Bulb color	Multiple center				Functionally single centered "bullet + small double"
			Blowout	Intermediate double	Small double	Bullet	
			---------- % ----------				
Sakata	XON-0104	Y	9.6	40.0	34.4	16.0	50.4
Nunhems	Denali	Y	8.8	39.2	39.2	12.8	52.0
	Montero	Y	0.0	11.2	36.0	52.8	88.8
	Renegade	Y	29.6	43.2	24.8	2.4	27.2
	Sequoia	Y	14.4	52.0	29.6	4.0	33.6
Average			12.5	37.1	32.8	17.6	50.4
LSD (0.05)			12.6	17.8	NS	14.3	16.1

Table 2. Performance data for early maturing onion varieties harvested on August 31 and graded on September 1, Malheur Experiment Station, Oregon State University, Ontario, OR, 2005.

Seed company	Variety	Bulb color	Total yield	Marketable yield by grade				Non-marketable yield			Maturity on Aug. 22	Pyruvate concentration
				Total	4-4¼ in	3-4 in	2¼-3 in	Total rot	No. 2s	Small		
			---------- cwt/acre ----------					%	-- cwt/acre --		%	µmols/g FW
Sakata	XON-0104	Y	590.9	562.8	52.0	428.4	82.5	0.0	0.5	27.1	33	6.24
Nunhems	Denali	Y	372.4	326.0	5.0	177.3	143.8	0.2	0.6	45.1	70	4.28
	Montero	Y	513.2	473.8	16.1	345.3	112.4	0.2	0.3	38.0	16	6.80
	Renegade	Y	543.1	500.8	23.5	367.8	109.5	0.0	1.2	40.8	48	5.60
	Sequoia	Y	425.6	383.2	1.0	247.6	134.7	0.2	0.0	41.9	44	6.46
Average			489.0	449.3	19.5	313.3	116.6	0.1	0.5	38.6	42.2	5.88
LSD (0.05)			102.9	97.4	27.6	95.1	NS	NS	NS	NS	8.1	0.42

Table 3. Onion multiple-center rating and iris yellow spot virus rating for long season varieties, Malheur Experiment Station, Oregon State University, Ontario, OR, 2005.

Seed company	Variety	Bulb color	Multiple centered					Iris yellow spot virus rating†
			Blowout	Intermediate double	Small double	Bullet	Bullet + small double*	
			%					0 - 5
A. Takii	T-433	Y	16.8	48.8	25.6	8.8	34.4	0.9
	T-817	R	0.0	1.6	5.6	92.8	98.4	2.1
Bejo	Calibra	Y	28.8	36.8	30.4	4.0	34.4	1.7
	Crocket	Y	2.4	12.8	34.4	50.4	84.8	1.2
	Sedona	Y	4.0	15.2	37.6	43.2	80.8	1.2
	Talon	Y	1.6	9.6	28.8	60.0	88.8	1.9
	Gladstone	W	8.8	20.0	42.4	28.8	71.2	1.4
	Red Bull	R	3.2	7.2	25.6	64.0	89.6	2.4
Crookham	Harmony	Y	13.6	11.2	31.2	44.0	75.2	1.0
	Sweet Perfection	Y	9.6	16.0	32.0	42.4	74.4	1.0
Rispens	King George	Y	15.2	17.6	33.6	33.6	67.2	1.4
	Brite Knight	W	12.8	24.8	32.0	30.4	62.4	1.5
	Red Fortress	R	14.4	12.8	32.8	40.0	72.8	1.6
Sakata	XON-550Y	Y	11.2	20.8	37.6	30.4	68.0	1.0
Seedworks	Maverick	Y	8.0	12.0	17.6	62.4	80.0	1.0
	Varsity	Y	4.0	15.2	28.8	52.0	80.8	1.7
	4001	Y	5.6	12.8	27.2	54.4	81.6	1.6
	4014	Y	11.2	23.2	36.8	28.8	65.6	1.9
	6011	Y	1.6	3.2	7.2	88.0	95.2	1.2
Seminis	Charismatic	Y	5.6	21.6	45.6	27.2	72.8	1.0
	XP5813	Y	0.8	6.1	28.2	64.9	93.1	1.1
	XP5819	Y	4.0	18.4	26.4	51.2	77.6	1.2
	EX5843	Y	0.8	3.1	16.0	80.1	96.1	1.4
	XP5646	W	4.8	28.8	42.4	24.0	66.4	1.3
	EX7106	W	10.4	24.0	36.8	28.8	65.6	1.2
Nunhems	Granero	Y	4.0	11.9	35.6	48.5	84.1	1.2
	Montero	Y	0.8	8.0	34.4	56.8	91.2	1.5
	Pandero	Y	2.4	16.8	31.2	49.6	80.8	1.2
	Ranchero	Y	0.8	16.0	34.4	48.8	83.2	1.1
	Sabroso	Y	0.8	3.2	46.4	49.6	96.0	1.7
	Vaquero	Y	0.8	14.4	20.8	64.0	84.8	1.1
	SX7004 ON	Y	0.0	8.8	16.8	74.4	91.2	1.2
	SR7008ON	Y	0.0	4.8	20.8	74.4	95.2	0.7
	SX7200ON	Y	0.8	4.8	18.4	76.0	94.4	2.0
	Salsa	R	9.6	25.6	22.4	42.4	64.8	1.3
Average			6.3	15.4	29.3	49.1	78.4	1.37
LSD (0.05)			8.1	12.0	37.9	21.9	16.7	0.50

*Functionally single centered.

†subjective rating: 0 = no damage, 5 = total damage.

Table 4. 2005 performance data for experimental and commercial onion varieties graded out of storage in January 2006, Malheur Experiment Station, Oregon State University, Ontario, OR.

Seed company	Variety	Bulb color	Total yield	Marketable yield by grade					Bulb counts >4¼ in	Non-marketable yield						Maturity		Thrips damage*
				Total	>4¼ in	4-4¼ in	3-4 in	2¼-3 in		Total rot	Neck rot	Plate rot	Black mold	No. 2s	Small	Aug. 30	Sept. 9	
			cwt/acre						#/50 lb	% of total yield				cwt/acre		%		
A. Takii	T-433	Y	677.2	633.9	0.0	47.4	490.9	95.5		2.5	1.5	1.0	0.0	0.0	25.5	15.0	35.0	0.0
	T-817	R	175.9	73.2	0.0	0.0	0.9	72.2		0.7	0.4	0.3	0.0	0.0	101.5	45.0	60.0	0.8
Bejo	Calibra	Y	430.4	374.7	0.0	0.8	246.6	127.3		1.1	0.0	1.1	0.0	0.0	50.8	45.0	67.0	0.0
	Crocket	Y	486.5	437.4	0.0	4.2	308.9	124.3		2.4	0.9	1.6	0.0	0.0	37.5	14.5	39.0	0.0
	Sedona	Y	529.3	506.1	0.0	25.7	399.1	81.3		0.9	0.8	0.0	0.0	1.9	16.6	21.0	44.0	0.0
	Talon	Y	324.3	263.7	0.0	0.0	128.9	134.8		1.6	1.2	0.4	0.0	0.0	55.7	41.0	72.0	0.0
	Gladstone	W	421.0	352.2	0.0	1.1	218.1	133.0		2.1	1.1	0.5	0.5	0.2	59.7	28.0	50.0	0.0
	Red Bull	R	212.6	129.9	0.0	0.0	22.0	108.0		0.7	0.6	0.2	0.0	0.0	81.1	32.0	48.0	1.0
Crookham	Harmony	Y	705.2	639.7	8.8	118.2	450.6	62.1	34.4	6.1	5.7	0.3	0.1	0.0	23.1	27.0	45.0	0.0
	Sweet Perfection	Y	872.9	794.0	19.3	118.7	567.5	88.5	38.3	4.4	4.1	0.3	0.0	0.0	41.5	19.5	38.0	0.0
Rispens	King George	Y	362.9	287.7	0.0	0.0	157.6	130.2		1.3	0.9	0.4	0.0	5.2	65.4	23.0	41.0	0.0
	Brite Knight	W	411.1	359.6	0.0	3.2	238.5	117.9		3.1	1.1	1.0	1.1	6.2	31.3	27.0	50.0	0.0
	Red Fortress	R	211.6	134.5	0.0	0.0	52.5	82.0		3.0	2.5	0.5	0.0	2.4	67.7	26.0	39.0	1.0
Sakata	XON-550Y	Y	669.0	623.0	1.9	67.5	478.6	74.9	27.3	3.5	2.9	0.5	0.1	0.0	21.2	21.5	45.0	0.0
Seedworks	Maverick	Y	654.6	615.9	9.2	105.6	431.8	69.2	33.5	2.9	1.7	1.2	0.0	0.0	20.9	18.0	43.0	0.0
	Varsity	Y	340.3	300.8	0.0	11.8	184.2	104.9		2.4	0.0	2.3	0.0	0.0	31.3	50.0	66.0	0.0
	4001	Y	383.1	331.3	1.2	10.4	225.1	94.6	42.0	2.5	0.9	1.6	0.0	0.0	42.1	41.0	59.0	0.0
	4014	Y	442.0	403.3	1.0	8.9	278.2	115.1	50.4	0.3	0.0	0.3	0.0	0.7	36.5	35.0	56.0	0.0
	6011	Y	624.6	587.8	7.2	101.5	438.8	40.3	44.7	2.5	2.3	0.3	0.0	0.0	20.4	18.0	45.0	0.0

Table 4. 2005 performance data for experimental and commercial onion varieties graded out of storage in January 2006, Malheur Experiment Station, Oregon State University, Ontario, OR.

Seed company	Variety	Bulb color	Total yield	Marketable yield by grade					Bulb counts >4¼ in	Non-marketable yield						Maturity		Thrips damage*
				Total	>4¼ in	4-4¼ in	3-4 in	2¼-3 in		Total rot	Neck rot	Plate rot	Black mold	No. 2s	Small	Aug. 30	Sept. 9	
			cwt/acre						#/50 lb	% of total yield				cwt/acre		%		
Seminis	Charismatic	Y	720.6	668.7	21.0	144.8	431.6	71.2	31.4	2.8	2.5	0.2	0.0	0.0	32.8	9.5	26.0	0.0
	XP5813	Y	658.5	631.5	1.2	85.3	492.4	52.6	42.8	1.7	0.9	0.8	0.0	0.0	16.4	24.0	46.0	0.0
	XP5819	Y	669.5	631.7	0.0	66.4	492.9	72.5		2.4	1.7	0.7	0.0	1.9	20.6	22.0	52.0	0.0
	EX5843	Y	583.8	545.6	0.0	19.8	441.2	84.6		1.4	0.8	0.5	0.0	0.6	29.4	17.0	38.0	0.0
	XP5646	W	545.0	491.1	1.3	20.1	376.6	93.0	39.1	3.1	1.9	1.2	0.0	0.0	37.8	24.0	47.0	0.0
	EX7106	W	501.8	406.1	0.0	4.3	255.0	146.8		7.3	2.5	1.2	3.6	0.0	58.3	23.0	39.0	0.0
Nunhems	Granero	Y	626.6	567.8	0.0	26.0	441.9	99.9		3.0	2.1	0.9	0.0	0.7	39.2	21.0	43.0	0.0
	Montero	Y	561.0	520.2	0.0	18.4	385.9	115.8		1.1	0.8	0.2	0.0	0.0	34.8	42.0	68.0	0.0
	Pandero	Y	622.8	562.4	1.5	36.9	443.5	80.5	35.4	4.9	4.7	0.2	0.0	0.0	30.8	19.0	39.0	0.0
	Ranchero	Y	685.1	645.8	3.4	86.2	476.2	80.0	30.6	0.9	0.6	0.3	0.1	0.0	32.6	34.0	54.0	0.0
	Sabroso	Y	427.9	369.9	0.0	3.4	199.4	167.0		0.6	0.1	0.5	0.0	0.0	55.4	28.0	48.0	0.0
	Vaquero	Y	666.3	617.6	1.7	70.7	467.0	78.1	29.8	2.1	1.9	0.0	0.1	0.0	33.6	21.0	49.0	0.0
	SX7004 ON	Y	714.1	677.5	0.0	72.8	530.4	74.3		1.2	1.0	0.1	0.0	0.0	28.1	19.5	43.0	0.0
	SR7008ON	Y	813.2	771.9	14.3	164.6	538.0	55.0	36.0	2.3	1.8	0.5	0.0	1.7	21.5	6.0	17.0	0.0
	SX7200ON	Y	480.2	410.8	0.0	0.0	217.4	193.4		0.6	0.3	0.3	0.0	0.0	66.3	39.0	62.0	0.0
	Salsa	R	345.9	253.5	0.0	0.0	110.7	142.8		1.1	0.6	0.5	0.0	0.0	88.5	30.0	54.0	1.0
Average			530.2	474.9	2.7	41.3	332.0	99.0	36.8	2.3	1.5	0.6	0.2	0.6	41.6	26.5	47.6	0.1
LSD (0.05)			94.9	98.5	7.7	221.9	95.4	38.3	NS	3.2	2.9	1.0	0.9	2.8	25.8	8.7	9.5	NS

* Thrips damage: 0 = least damage, 10 = most damage.

Table 5. Yield and single center rating for onion varieties in 2003-2005. Malheur Experiment Station, Oregon State University, Ontario, OR, 2005.

Seed company	Variety	Total yield	Marketable yield			Single centeredness	
			Total	>4¼ in	4-4¼ in	Bullet	Bullet + small double*
		cwt/acre				%	
2003							
A. Takii	T-433	1,289.7	979.5	324.9	451.2	2.4	13.6
Bejo	Gladstone	773.9	640.6	33.5	207.2	8.0	40.0
Crookham	Harmony	1,198.3	1,063.6	422.9	475.8	31.1	46.8
	Sweet Perfection	1,186.0	1,037.1	343.6	451.2	20.8	39.2
Rispens	Red Fortress	736.2	573.1	17.3	115.0	18.4	42.4
Seedworks	Maverick (6001)	1,178.8	1,105.9	499.9	453.8	21.6	47.2
	Varsity	854.2	826.4	39.0	362.7	40.0	65.6
	4001	851.0	810.8	51.1	309.6	23.2	57.6
	6011	1,151.2	1,089.4	312.9	532.2	74.4	94.4
Nunhems	Granero	1,153.5	1,130.4	295.8	607.6	41.6	60.8
	Montero (7002ON)	1,051.8	988.0	137.8	446.6	42.4	80.0
	Pandero	1,133.6	1,070.7	262.5	522.5	29.6	57.6
	Ranchero	1,264.3	1,198.9	443.3	529.8	32.0	52.0
	Sabroso	831.9	809.9	18.7	283.8	35.2	79.2
	Vaquero	1,111.4	1,052.0	263.5	537.7	40.8	58.4
	SR7004 ON	1,125.3	1,093.0	163.4	577.4	65.6	92.8
Average		1,055.7	966.8	226.9	429.0	32.9	58.0
2004							
A. Takii	T-433	984.2	821.3	167.9	421.7	8.0	24.8
Bejo	Gladstone	709.8	548.2	10.1	127.6	14.4	44.0
Crookham	Harmony	1,040.6	902.9	221.1	447.9	40.0	43.2
	Sweet Perfection	1,072.6	969.8	169.9	439.9	42.4	58.4
Rispens	Red Fortress	557.8	389.4	0.0	25.1	18.4	37.6
Seedworks	Maverick (6001)	925.0	835.8	228.4	410.1	37.6	62.4
	Varsity	655.5	616.0	30.3	195.5	58.4	88.0
	4001	683.6	638.9	10.7	140.0	46.4	80.0
	6011	867.7	803.0	130.3	418.0	80.8	93.6
Nunhems	Granero	913.1	861.1	71.8	429.1	64.0	91.2
	Montero (7002ON)	848.1	798.9	45.2	337.3	61.6	91.2
	Pandero	928.8	884.5	132.7	428.6	36.0	60.0
	Ranchero	1,115.0	1,025.7	205.8	500.8	36.8	64.0
	Sabroso	608.7	560.4	1.9	60.0	74.4	93.6
	Vaquero	916.8	847.6	53.9	386.8	66.4	84.8
	SR7004 ON	904.1	856.7	68.3	424.0	79.2	93.6
Average		858.2	772.5	96.8	324.5	47.8	69.4

*Functionally single centered.

Table 5. Yield and single center rating for onion varieties in 2003 - 2005. Malheur Experiment Station, Oregon State University, Ontario, OR, 2005.

Seed company	Variety	Total yield	Marketable yield			Single centeredness	
			Total	>4¼ in	4-4¼ in	Bullet	Bullet + small double*
		cwt/acre				%	
2005							
A. Takii	T-433	677.2	633.9	0.0	47.4	8.8	34.4
Bejo	Gladstone	421.0	352.2	0.0	1.1	28.8	71.2
Crookham	Harmony	705.2	639.7	8.8	118.2	44.0	75.2
	Sweet Perfection	872.9	794.0	19.3	118.7	42.4	74.4
Rispens	Red Fortress	211.6	134.5	0.0	0.0	40.0	72.8
Seedworks	Maverick (6001)	654.6	615.9	9.2	105.6	62.4	80.0
	Varsity	340.3	300.8	0.0	11.8	52.0	80.8
	4001	383.1	331.3	1.2	10.4	54.4	81.6
	6011	624.6	587.8	7.2	101.5	88.0	95.2
Nunhems	Granero	626.6	567.8	0.0	26.0	48.5	84.1
	Montero (7002ON)	561.0	520.2	0.0	18.5	56.8	91.2
	Pandero	622.8	562.4	1.5	36.9	49.6	80.8
	Ranchero	685.1	645.8	3.4	86.2	48.8	83.2
	Sabroso	427.9	369.9	0.0	3.4	49.6	96.0
	Vaquero	666.3	617.6	1.7	70.7	64.0	84.8
	SR7004 ON	714.1	677.6	0.0	72.8	74.4	91.2
Average		574.6	522.0	3.3	51.8	50.8	79.8
3-year average							
A. Takii	T-433	983.7	811.6	164.3	306.8	6.4	24.3
Bejo	Gladstone	634.9	513.7	14.5	112.0	17.1	51.7
Crookham	Harmony	981.4	868.7	217.6	347.3	38.4	55.1
	Sweet Perfection	1,043.8	933.6	177.6	336.6	35.2	57.3
Rispens	Red Fortress	501.9	365.7	5.8	46.7	25.6	50.9
Seedworks	Maverick (6001)	919.5	852.5	245.8	323.2	40.5	63.2
	Varsity	616.7	581.1	23.1	190.0	50.1	78.1
	4001	639.2	593.7	21.0	153.3	41.3	73.1
	6011	881.2	826.7	150.1	350.6	81.1	94.4
Nunhems	Granero	897.7	853.1	122.5	354.2	51.4	78.7
	Montero (7002ON)	820.3	769.0	61.0	267.5	53.6	87.5
	Pandero	895.1	839.2	132.2	329.3	38.4	66.1
	Ranchero	1,021.5	956.8	217.5	372.3	39.2	66.4
	Sabroso	622.8	580.1	6.9	115.7	53.1	89.6
	Vaquero	898.2	839.1	106.4	331.7	57.1	76.0
	SR7004 ON	914.5	875.8	77.2	358.1	73.1	92.5
Average		829.5	753.8	109.0	268.5	43.8	69.1
LSD (0.05) Year		102.5	121.3	40.0	84.5	11.3	10.0
LSD (0.05) Variety		62.5	65.0	27.7	40.8	9.0	7.7
LSD (0.05) Var. X year		108.3	112.6	48.0	70.7	15.5	13.3

*Functionally single centered.