

2014 ONION VARIETY TRIALS

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Introduction

The objectives of the onion variety trials were to evaluate yellow, white, and red onion varieties for plant disease, maturity, bolting, bulb single centers, yield, and grade out of storage. Four early-season yellow varieties were planted in March and were harvested and graded in mid-August. Forty-six full-season varieties (36 yellow, 5 red, and 5 white) were planted in March, harvested in September, and graded out of storage in December 2014. Each year, growers and seed industry representatives have the opportunity to examine the varieties at our annual Onion Variety Field Day in late August and during onion grading in early January. Varieties are evaluated objectively for bolting, onion thrips, yield, grade, single centers, and storability. Varieties are evaluated subjectively for maturity, iris yellow spot virus, bulb shape, bulb shape uniformity, flesh brightness, and skin color and retention.

Methods

Onions were grown on an Owyhee silt loam previously planted to wheat. In the fall of 2013, the wheat stubble was shredded and the field was irrigated. A soil analysis showed a pH of 7.5, 1.4% organic matter, 20 ppm nitrate-N, 3 ppm ammonium-N, 21 ppm phosphorus (P), 394 ppm potassium (K), 16 ppm sulfur (S), 2543 ppm calcium (Ca), 600 ppm magnesium (Mg), 206 ppm sodium (Na), 3.5 ppm zinc (Zn), 1.7 ppm copper (Cu), 7 ppm manganese (Mn), 19 ppm iron (Fe), and 1.2 ppm boron (B). Based on the soil analysis, 87 lb of phosphate/acre, 100 lb of K/acre, 100 lb of S/acre, 1 lb Mn/acre, and 1 lb of B/acre were broadcast. The field was then disked, moldboard plowed, groundhogged, fumigated with Vapam[®] at 17 gal/acre and bedded at 22 inches.

The experimental designs for the full-season trial and the early-maturing trial were randomized complete blocks with five replicates. A sixth nonrandomized replicate was planted for demonstrating onion variety performance to growers and seed company representatives. The six replicates of the two trials were furrow irrigated. In addition to the six replicates, two additional randomized replicates of the full-season trial were planted adjacent to the other replicates and were drip irrigated. All trials were planted on March 21 in plots 4 double rows wide and 27 ft long. The early-maturing trial had 4 varieties from 2 seed companies and the full-season trial had 46 varieties from 8 seed companies.

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. Planting was done with customized John Deere Flexi Planter units equipped with disc openers. Immediately after planting, the field received a narrow band of Lorsban 15G[®] at 3.7 oz/1,000 ft of row (0.82 lb ai/acre) over the seed rows and the soil surface was rolled. Onion emergence started on April 7. On May 12, alleys 4 ft wide were cut between plots, leaving plots 23 ft long. On May 13-15, the seedlings were hand thinned

to a spacing of 4.75 inches between individual onion plants in each single row, or 120,000 plants/acre.

The onions were managed to minimize yield reductions from weeds, pests, diseases, water stress, and nutrient deficiencies. For weed control, the following herbicides were applied: on April 21, Prowl H₂O[®] at 0.83 lb ai/acre (2 pt/acre) was broadcast; on May 8, GoalTender[®] at 0.09 lb ai/acre (4 oz/acre), Buctril[®] at 0.25 lb ai/acre (16 oz/acre), and Poast[®] at 0.38 lb ai/acre (24 oz/acre) were broadcast; on June 3, GoalTender at 0.09 lb ai/acre (6 oz/acre), and Buctril at 0.25 lb ai/acre (16 oz/acre) were broadcast.

For thrips control, the following insecticides were applied: Movento[®] at 5 oz/acre on May 16 and May 27 by ground application; Radiant[®] at 10 oz/acre on June 5 and July 12 by ground applications; Agri-Mek[®] at 16 oz/acre on June 19 by ground application and on June 30 by aerial application; Lannate[®] at 0.9 lb ai/acre on July 6 and July 13 by aerial application; and Radiant at 10 oz/acre on July 22 and July 27 by aerial application.

Urea treated with Nutrisphere[®] (SFP, LLC, Leawood, KS) at 120 lb nitrogen (N)/acre was sidedressed to the furrow area on May 22. Uran at 20 lb N/acre was applied through the drip tape on May 19 and May 29. Starting on June 4, root tissue samples from the drip and furrow areas were taken every 2 weeks and analyzed for nutrients (Table 1). Nutrients were applied based on the tissue analyses (Table 2). In the drip-irrigated area, nutrients were injected through the drip tape. In the furrow-irrigated area, nutrients were water-run during irrigations. Starting on June 4, soil samples from the drip-irrigated area were sent weekly to Western Laboratories, Inc. (Parma, ID) for soil solution analysis. Soil samples consisted of a composite of 7 soil cores to 9-inch depth from the center of nonharvested onion double rows in the drip-irrigated area. Soil solution analysis is a proprietary analysis developed by Western Laboratories, Inc. that uses a weak acid extraction of the soil nutrients to simulate the extraction capacity of plant roots. Soil solution analysis estimates the amount of each nutrient that the soil can supply to the crop per day.

The trial was furrow irrigated when the soil water tension at 8-inch depth reached 25 cb (1 cb = 1 kPa) (Shock et al. 2005, 2006, 2010) and drip irrigated when the soil water tension reached 20 cb. Starting in early June, soil water tension was monitored by six granular matrix sensors (GMS, Watermark Soil Moisture Sensors Model 200SS, Irrrometer Co. Inc., Riverside, CA) centered at 8-inch depth below the onion row in both the drip- and furrow-irrigated areas. The sensors were automatically read by a datalogger (Irrrometer Monitor Model 950 R1). The last furrow irrigation was on August 21 and the last drip irrigation was on August 24.

Onions in the early-maturing trial were evaluated for maturity, severity of symptoms of iris yellow spot virus (IYSV), and bolting on August 13. Onions in the full-season trial were evaluated for maturity and severity of symptoms of IYSV on August 12 and August 28. 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. For IYSV, each plot was given a subjective rating on a scale of 0 to 5 of increasing severity of IYSV symptoms. The rating was 0 if there were no symptoms, 1 if 1-25% of foliage was diseased, 2 if 26-50% of foliage was diseased, 3 if 51-75% of foliage was diseased, 4 if 76-99% of foliage was diseased, and 5 if 100% of foliage was diseased. The number of bolted onion plants was counted in each plot.

At harvest, 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 3½ to 4¼ inches were rated.

The onions were cut equatorially through the bulb middle and separated into single-centered (bullet) 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 inside diameter of the first entire single ring: small had diameters less than 1½ inches, medium had diameters from 1½ to 2¼ inches, and large had diameters greater than 2¼ inches. Onions were considered "functionally single centered" for processing if they were single centered or had a small multiple center.

Onions from the middle two double rows in each plot in the early-maturity trial were topped by hand, bagged, and graded on August 14.

The onions in the full-season trial were lifted on September 10 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 16. The bags were put in storage on September 22. The storage shed was ventilated and the temperature was slowly decreased to maintain air temperature as close to 34°F as possible. Onions from the full-season trial were graded out of storage December 15-18, 2014.

During grading, bulbs were separated according to quality: bulbs without blemishes (No. 1s), split bulbs (No. 2s), bulbs infected with the fungus *Botrytis allii* in the neck or side, bulbs infected with the fungus *Fusarium oxysporum* (plate rot), bulbs infected with the fungus *Aspergillus niger* (black mold), and bulbs with sprouts. 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 super colossal (>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. Marketable yield consists of No.1 bulbs larger than 2¼ inches.

After grading, two replicates of each yellow and red variety from the furrow-irrigated onions were evaluated for subjective quality characteristics on January 9, 2015. The quality characteristics were evaluated by a consensus of 10-15 people without knowing the variety identities. Evaluators included OSU, seed company employees, and others. The characteristics evaluated were: bulb shape, bulb shape uniformity, firmness, skin color and retention, and flesh brightness.

To compare the performance of the varieties under the two irrigation systems, regression analyses of the yield of the varieties under furrow irrigation were run against the yield of the varieties under drip irrigation. The average yield of each variety was used in the analysis.

Varietal differences were determined using analysis of variance. Means separation was determined using a protected Fisher's least significant difference test at the 5% probability level, LSD (0.05). The varieties from each of the early-maturity and full-season trials were compared for yield, grade, internal quality, and disease expression. The least significant difference LSD (0.05) values in each table should be considered when comparisons are made between furrow-irrigated 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. Variety performance will vary by year. Growers are encouraged to review performance over a number of years before choosing a variety to plant.

Results

The rate of accumulation of growing degree-days (50-86°F) in 2014 was higher than the 23-year average (Fig. 1).

Based on the root tissue nutrient sufficiency ranges used by Western Laboratories, Inc. (Table 1), the onions in the furrow- and drip-irrigated areas required substantial nutrient amendments during the growing season (Table 2). It was difficult to maintain root nitrates at the sufficiency level all season. It was difficult to maintain root K levels in the adequate range in July. From the soil samples taken from the drip-irrigated area and based on the soil solution nutrient sufficiency ranges used by Western Laboratories, Inc. (Table 3), all nutrients in the soil solution in the drip-irrigated area remained above the critical levels all season.

Early-maturing Trial

On August 13, all varieties had 25% or higher tops down. The percentage of onions that were functionally single centered averaged 80.6% and ranged from 72.0% for ‘Spanish Medallion’ to 92.0% for ‘Avalon’. The percentage of “bullet” single-centered bulbs averaged 64.2% and ranged from 51.2% for Spanish Medallion to 76.0% for Avalon (Table 4). Total yield averaged 962 cwt/acre, ranging from 950 cwt/acre for Avalon to 989 cwt/acre for ‘Scout’ (Table 5).

Full-season Trial

On August 12, most furrow-irrigated varieties had 10% or higher tops down with an average of 23% tops down (Table 6). Most drip-irrigated varieties had 20% or higher tops down with an average of 35% tops down.

For the furrow-irrigated onions, the percentage of single-centered bulbs averaged 70.8% and ranged from 16% for ‘Sugarloaf’ to 98.4% for OLYX08-640 (Table 7). Six varieties had 100% functionally single-centered bulbs. For the drip-irrigated onions, the percentage of single-centered bulbs averaged 64.5% and ranged from 8.0% for Sugarloaf to 98.0% for OLYX08-640.

For the furrow-irrigated onions, bolting averaged 1.2% and ranged from 0.0 for many varieties to 10.5% for SV6672 (Table 8). For the drip-irrigated onions, bolting averaged 0.6% and ranged from 0.0 for many varieties to 2.9% for ‘Lasso’ and ‘Dulce Reina’.

For the furrow-irrigated onions, IYSV severity on August 12 averaged 1.3 and ranged from 1.0 to 2.0 (Table 8). For the drip-irrigated onions, IYSV severity on August 12 averaged 1.4 and ranged from 1.0 to 2.0.

For the furrow-irrigated onions, marketable yield averaged 732 cwt/acre and ranged from 0.7 cwt/acre for Sugarloaf to 1,119 cwt/acre for Avalon (Table 9). Avalon was among the varieties with the highest marketable yield; Scout and 16000 were within one LSD (0.05) of Avalon.

For the drip-irrigated onions, marketable yield averaged 778 cwt/acre and ranged from 8.2 cwt/acre for Sugarloaf to 1,182 cwt/acre for Avalon (Table 10). Avalon was among the varieties with the highest marketable yield with 16000, SV6672, Scout, ‘Lasso’, ‘Joaquin’, ‘Pandero’, and ‘Ranchero’ were all within one LSD (0.05) of Avalon.

In comparing the performance of the varieties under furrow and drip irrigation using regression analysis, the drip-irrigated onions had slightly higher total and marketable yields and substantially higher colossal and supercolossal yields than the furrow-irrigated onions (Fig. 2-4).

Subjective Quality Evaluation

Subjective bulb quality ratings can be found in Table 13 and explanation of the rating system can be found in Figure 5 and tables 11 and 12. Significant variations were found between varieties in all the subjective characteristics except bulb shape.

Acknowledgements

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Table 2. Nutrients applied to drip- and furrow-irrigated onions. Malheur Experiment Station, Oregon State University, Ontario, OR, 2014.

Drip									
Date	N	P	K	B	Mg	Zn	Mn	S	Cu
----- lb/acre -----									
May 19	20								
May 29	20								
Jun 5	40								
Jun 13	20								
Jun 24	20								
Jun 25			10						
Jul 3			10	0.2		0.3			
Jul 11	25			0.2		0.3	0.3	10	
Jul 16			10	0.2	2	0.3			0.3
Jul 24			10			0.3			
Jul 30			10	0.2		0.3			0.3
Aug 8		10	10		2	0.3			0.3
Total	145	10	60	0.8	4	1.8	0.3	10	0.9

Furrow						
Date	N	P	K	B	Mg	Zn
----- lb/acre -----						
May 22	120*					
Jun 26	20			0.2		
Jul 2	20		20	0.2		0.3
Jul 16	20		20		5	0.3
Aug 7		10				
Total	180	10	40	0.4	5	0.6

*sidedress urea with Nutrisphere.

Table 3. Soil solution analysis for drip-irrigated area. Data show the estimated amounts of each plant nutrient per acre per day that the soil can potentially supply to the crop. Malheur Experiment Station, Oregon State University, Ontario, OR, 2014.

Nutrient	Sufficiency range	Jun 17	Jun 24	Jul 1	Jul 8	Jul 15	Jul 22	Jul 29	Aug 5	Aug 14
N	2 lb	7	15	13	5	31	20	36	25	32
P	0.7 lb	3.6	2.8	2.2	1.6	3.1	2.8	5.8	4.0	3.7
K	10 lb	62.9	56.0	55.4	60.3	55.1	74.9	50.6	54.9	60.3
S	4.5 lb	30.4	16.6	14.2	10.0	21.2	18.0	23.8	19.4	20.4
Ca	2 lb	36.5	25.4	24.5	37.3	25.1	35.3	29.3	26.8	43.8
Mg	1 lb	15.1	14.8	14.5	14.2	14.3	15.4	13.7	14.0	27.5
Zn	2 oz	4	4	3	3	3	4	3.0	4.0	4.0
Mn	2 oz	5	4	4	2	5	2	9.9	7.9	10.0
Cu	1 oz	2	6	5	3	6	3	2.0	2.0	9.0

Table 4. Maturity, single- and multiple-center bulb ratings, bolting, and iris yellow spot virus (IYSV) severity ratings for early-maturing varieties, Malheur Experiment Station, Oregon State University, Ontario, OR, 2014.

Seed company	Variety	Bulb color	Maturity Aug 13		Multiple center			Single center			IYSV
			Tops down	Leaf dryness	Large	Medium	Small	Functional*	Bullet	Bolting	
			----- % -----								0-5
Sakata	Spanish Medallion	Y	52.0	22.0	12.0	16.0	20.8	72.0	51.2	1.4	1.2
	Ovation	Y	44.0	26.0	11.2	14.4	15.2	74.4	59.2	0.8	1.6
Crookham	Avalon	Y	32.6	20.0	0.8	7.2	16.0	92.0	76.0	2.9	1.2
	Scout	Y	25.0	17.6	5.6	10.4	13.6	84.0	70.4	4.6	1.0
Average			38.4	21.4	7.4	12.0	16.4	80.6	64.2	2.4	1.3
LSD (0.05)			10.1	4.9	7.7	NS	NS	9.3	16.1	0.6	NS

*Bullet single + small double.

Table 5. Yield and grade performance of early-maturing varieties lifted and harvested August 14, 2014, Malheur Experiment Station, Oregon State University, Ontario, OR.

Seed company	Variety	Bulb color	Marketable yield by grade									
			Total yield	Total	>4¼ in	4-4¼ in	3-4 in	2¼-3 in	Small	No. 2s	Plate rot	Bulb counts >4¼ in
			----- cwt/acre -----								%	#/50 lb
Sakata	Spanish Medallion	Y	951.9	941.3	32.4	286.0	597.6	25.4	9.3	0.8	0.1	30.3
	Ovation	Y	956.0	948.6	11.2	219.5	687.8	30.1	4.1	2.9	0.1	32.3
Crookham	Avalon	Y	949.8	942.9	18.1	272.0	621.8	31.0	6.5	0.0	0.0	30.5
	Scout	Y	988.9	978.7	15.8	318.0	622.1	22.8	8.5	1.7	0.0	30.1
Average			961.6	952.9	19.3	273.9	632.3	27.3	7.1	1.3	0.0	30.8
LSD (0.05)			NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

Table 6. Maturity and bolting of furrow- and drip-irrigated full-season experimental and commercial onion varieties, Malheur Experiment Station, Oregon State University, Ontario, OR, 2014. Continued on next page.

Seed company	Variety	Bulb color	Maturity Aug 12				Maturity Aug 28			
			Furrow		Drip		Furrow		Drip	
			Tops down	Leaf dryness	Tops down	Leaf dryness	Tops down	Leaf dryness	Tops down	Leaf dryness
----- % -----										
A. Takii	TTA-747	Y	18	14	20	15	38	34	35	30
	T-866	Y	12	12	15	10	30	32	35	30
Bejo	Sedona	Y	18	16	35	10	42	36	70	40
	Calibra	Y	36	20	55	20	72	48	90	55
	Crockett	Y	18	16	25	20	30	34	60	40
	Legend	Y	22	20	30	25	46	40	75	55
	Delgado	Y	22	16	30	15	54	40	75	40
	Hamilton	Y	20	18	20	20	32	30	45	40
Crookham	Trigger	Y	10	10	15	20	32	28	35	35
	Avalon	Y	24	14	45	15	52	32	75	35
	Esteem	Y	28	20	25	20	60	44	75	40
	OLYX08-640	Y	34	24	60	30	78	52	90	50
	Oracle	Y	16	14	15	10	36	28	35	30
	Scout	Y	26	14	45	20	64	32	75	40
	Red Devil	R	28	28	35	20	74	66	85	70
	Purple Haze	R	34	26	50	35	76	62	85	75
Hazera	Cruiser	Y	26	16	45	30	58	48	80	50
	Frontino	Y	16	18	20	20	42	38	35	40
	Maverick	Y	20	20			40	38		
Nunhems	Anillo	Y	22	20	25	20	46	44	40	40
	Arcero	Y	22	20	30	20	40	42	50	50
	Campero	Y	14	10	25	10	44	30	65	30
	Joaquin	Y	8	10	15	10	30	24	35	25
	Pandero	Y	18	14	30	10	40	32	45	30
	Ranchero	Y	18	14	40	20	46	36	55	40
	Vaquero	Y	20	20	25	20	48	38	65	40
	Oloroso	Y	22	18	25	20	38	38	50	40
	Montero	Y	44	22	65	30	86	50	85	60
	Cometa	W	14	14	25	15	36	34	45	35
	NUN8003	W	18	12	40	15	56	32	75	30
	Countach	R	40	30	50	30	80	76	85	85
	Marenge	R	44	32	75	50	90	80	90	90

Table 6. Continued. Maturity and bolting of furrow- and drip-irrigated full-season experimental and commercial onion varieties, Malheur Experiment Station, Oregon State University, Ontario, OR, 2014.

Seed company	Variety	Bulb color	Maturity Aug 12				Maturity Aug 28			
			Furrow		Drip		Furrow		Drip	
			Tops down	Leaf dryness	Tops down	Leaf dryness	Tops down	Leaf dryness	Tops down	Leaf dryness
			----- % -----							
Sakata	Lasso	Y	28	16	45	20	54	36	75	30
	Aruba	Y	14	12	40	15	40	32	55	35
	Dulce Reina	Y	14	14	30	15	42	32	50	35
Seminis	Barbaro	Y	18	14	25	15	40	36	50	35
	Swale	Y	16	10	25	15	38	30	55	30
	SV6646	Y	18	14	20	15	40	32	55	35
	SV6672	Y	20	16	25	10	50	32	60	35
	SV4058	W	20	16	25	20	42	38	45	40
	16000	Y	18	12	35	10	46	28	80	30
D. Palmer	Saffron	Y	22	18	35	25	48	40	60	55
	Sugarloaf	W	92	62	95	60	94	92	100	100
	Diamond Swan	W	16	18	30	20	38	36	50	45
	Cherry Mountain	R	26	20	40	30	48	48	80	65
Average			23	18	35	20	50	41	63	45
LSD (0.05)			9	6	13	10	11	7	13	13

Table 7. Single- and multiple-centered bulb ratings for furrow- and drip-irrigated full-season varieties, Malheur Experiment Station, Oregon State University, Ontario, OR, 2014. Continued on next page.

Seed company	Variety	Bulb color	Furrow					Drip				
			Multiple center			Single center		Multiple center			Single center	
			Large	Medium	Small	Functional ^a	Bullet	Large	Medium	Small	Functional ^a	Bullet
----- % -----												
A. Takii	TTA-747	Y	2.4	16.0	29.6	81.6	52.0	16.0	22.0	24.0	62.0	38.0
	T-866	Y	19.2	18.4	30.4	62.4	32.0	54.0	26.0	12.0	20.0	8.0
Bejo	Sedona	Y	2.4	7.2	21.6	90.4	68.8	6.0	12.0	46.0	82.0	36.0
	Calibra	Y	12.0	24.0	40.0	64.0	24.0	26.0	22.0	44.0	52.0	8.0
	Crockett	Y	4.0	11.2	48.0	84.8	36.8	4.0	22.0	48.0	74.0	26.0
	Legend	Y	7.2	14.4	32.8	78.4	45.6	10.3	18.6	60.3	71.1	10.9
	Delgado	Y	8.8	22.4	35.2	68.8	33.6	16.0	14.0	44.0	70.0	26.0
	Hamilton	Y	4.8	12.0	11.2	83.2	72.0	14.0	6.0	20.0	80.0	60.0
Crookham	Trigger	Y	0.0	1.6	5.6	98.4	92.8	4.0	0.0	12.0	96.0	84.0
	Avalon	Y	3.2	16.8	24.8	80.0	55.2	12.0	8.0	14.0	80.0	66.0
	Esteem	Y	1.5	4.0	8.0	94.5	86.5	8.0	8.0	4.0	84.0	80.0
	OLYX08-640	Y	0.0	0.0	1.6	100.0	98.4	0.0	2.0	0.0	98.0	98.0
	Oracle	Y	2.4	4.0	12.0	93.6	81.6	2.0	6.0	10.0	92.0	82.0
	Scout	Y	12.0	13.6	10.4	74.4	64.0	8.0	6.0	20.0	86.0	66.0
	Red Devil	R	0.8	4.8	11.2	94.4	83.2	0.0	6.0	14.0	94.0	80.0
	Purple Haze	R	0.8	2.4	9.7	96.8	87.1	4.0	8.0	12.0	88.0	76.0
Hazera	Cruiser	Y	1.6	6.4	31.2	92.0	60.8	12.0	6.0	24.0	82.0	58.0
	Frontino	Y	2.4	2.4	5.6	95.2	89.6	2.0	0.0	10.0	98.0	88.0
	Maverick	Y	3.0	6.0	17.0	91.0	74.0					
Nunhems	Anillo	Y	0.0	0.0	3.2	100.0	96.8	4.0	4.0	8.0	92.0	84.0
	Arcero	Y	0.0	0.8	7.2	99.2	92.0	2.0	0.0	8.0	98.0	90.0
	Campero	Y	2.4	18.4	18.4	79.2	60.8	8.0	14.0	26.0	78.0	52.0
	Joaquin	Y	0.8	2.4	13.6	96.8	83.2	0.0	10.0	4.0	90.0	86.0
	Pandero	Y	2.3	2.9	32.9	94.8	61.9	8.0	4.0	14.0	88.0	74.0
	Ranchero	Y	4.8	4.8	23.2	90.4	67.2	14.0	4.0	16.0	82.0	66.0
	Vaquero	Y	0.0	5.6	8.8	94.4	85.6	6.0	10.0	6.0	84.0	78.0
	Oloroso	Y	0.0	0.0	3.2	100.0	96.8	0.0	2.0	2.0	98.0	96.0
	Montero	Y	0.0	0.0	8.8	100.0	91.2	0.0	0.0	8.0	100.0	92.0
	Cometa	W	0.0	0.0	8.0	100.0	92.0	0.0	6.0	14.0	94.0	80.0
	NUN8003	W	0.0	0.0	4.8	100.0	95.2	0.0	2.0	0.0	98.0	98.0
	Countach	R	4.8	8.8	21.6	86.4	64.8	8.0	12.0	30.0	80.0	50.0
		Marengo	R	9.6	10.4	13.6	80.0	66.4	18.0	16.0	18.0	66.0

Table 7. Continued. Single- and multiple-centered bulb ratings for furrow- and drip-irrigated full-season varieties, Malheur Experiment Station, Oregon State University, Ontario, OR, 2014.

Seed company	Variety	Bulb color	Furrow					Drip				
			Multiple center			Single center		Multiple center			Single center	
			Large	Medium	Small	Functional*	Bullet	Large	Medium	Small	Functional*	Bullet
----- % -----												
Sakata	Lasso	Y	3.2	1.6	16.0	95.2	79.2	4.0	8.0	10.0	88.0	78.0
	Aruba	Y	0.0	4.8	13.6	95.2	81.6	0.0	6.0	22.0	94.0	72.0
	Dulce Reina	Y	1.6	5.6	25.6	92.8	67.2	8.0	4.0	12.0	88.0	76.0
Seminis	Barbaro	Y	5.6	2.4	12.0	92.0	80.0	16.3	4.0	8.0	79.7	71.7
	Swale	Y	3.2	1.6	12.0	95.2	83.2	2.0	8.0	18.0	90.0	72.0
	SV6646	Y	1.6	4.0	21.6	94.4	72.8	6.0	2.0	6.0	92.0	86.0
	SV6672	Y	0.8	5.6	10.4	93.6	83.2	4.0	14.0	16.0	82.0	66.0
	SV4058	W	0.8	5.7	11.3	93.5	82.2	0.0	6.0	12.0	94.0	82.0
	16000	Y	1.6	6.4	17.6	92.0	74.4	4.0	8.0	8.0	88.0	80.0
D. Palmer	Saffron	Y	14.4	9.6	39.2	76.0	36.8	12.0	14.0	34.0	74.0	40.0
	Sugarloaf	W	37.6	20.0	26.4	42.4	16.0	44.0	26.0	22.0	30.0	8.0
	Diamond Swan	W	1.6	8.0	18.4	90.4	72.0	8.0	8.0	20.0	84.0	64.0
	Cherry Mountain	R	4.8	5.6	24.0	89.6	65.6	12.0	10.0	20.0	78.0	58.0
	Average		4.2	7.2	17.8	88.6	70.8	8.8	9.0	17.7	82.2	64.5
LSD (0.05)			5.4	8.1	10.4	8.7	12.4	14.0	13.2	19.6	16.1	23.0

*Bullet single + small double

Table 8. Bolting and iris yellow spot virus (IYSV) severity ratings of furrow- and drip-irrigated full-season varieties, Malheur Experiment Station, Oregon State University, Ontario, OR, 2014. Continued on next page.

Seed company	Variety	Bulb color	IYSV*					
			Bolting		Aug 12		Aug 28	
			Furrow	Drip	Furrow	Drip	Furrow	Drip
			----- %-----		----- 0-5 -----			
A. Takii	TTA-747	Y	1.8	0.6	1.0	1.0	2.0	2.0
	T-866	Y	0.5	1.3	1.0	1.5	1.8	2.0
Bejo	Sedona	Y	2.1	1.5	1.2	1.0	2.0	2.0
	Calibra	Y	0.3	0.0	1.8	1.5	2.0	2.0
	Crockett	Y	0.0	0.0	1.0	1.0	1.8	2.0
	Legend	Y	0.0	0.0	1.2	2.0	1.8	1.5
	Delgado	Y	0.3	0.8	1.4	1.5	2.0	2.5
	Hamilton	Y	1.2	0.1	1.2	1.0	2.0	2.0
Crookham	Trigger	Y	0.1	0.0	1.0	1.0	2.0	2.0
	Avalon	Y	3.2	1.4	1.2	1.0	1.8	2.0
	Esteem	Y	1.2	0.2	2.0	1.0	2.2	2.0
	OLYX08-640	Y	0.3	0.0	2.0	2.0	2.0	2.0
	Oracle	Y	0.2	0.2	1.0	1.0	2.0	2.0
	Scout	Y	5.5	1.2	1.0	1.5	1.8	2.0
	Red Devil	R	0.1	0.1	2.0	2.0	2.2	2.5
	Purple Haze	R	0.1	0.1	2.0	2.0	2.2	2.0
Hazera	Cruiser	Y	1.3	0.0	1.4	1.5	2.6	2.0
	Frontino	Y	0.2	0.0	1.4	2.0	2.6	3.0
	Maverick	Y	1.2		1.5		2.3	
Nunhems	Anillo	Y	0.7	0.0	1.8	1.5	2.8	2.5
	Arcero	Y	0.2	0.0	1.8	2.0	2.8	3.0
	Campero	Y	0.9	0.5	1.0	1.0	1.8	2.0
	Joaquin	Y	1.1	1.3	1.0	1.0	1.0	1.0
	Pandero	Y	0.7	0.8	1.0	1.0	1.8	2.0
	Ranchero	Y	1.6	0.9	1.2	1.5	2.0	2.0
	Vaquero	Y	1.2	0.3	1.8	1.5	2.2	2.5
	Oloroso	Y	0.2	0.0	1.8	1.5	2.4	1.5
	Montero	Y	0.6	0.0	1.8	2.0	2.0	2.0
	Cometa	W	1.2	2.0	1.0	1.0	1.8	2.0
	NUN8003	W	0.4	0.0	1.0	1.0	2.0	1.5
	Countach	R	0.0	0.0	2.0	2.0	2.2	2.0
	Marengo	R	0.0	0.0	2.0	2.0	2.2	2.0

Table 8. Continued. Bolting and iris yellow spot virus (IYSV) severity ratings of furrow- and drip-irrigated full-season varieties, Malheur Experiment Station, Oregon State University, Ontario, OR, 2014.

Seed company	Variety	Bulb color	Bolting		IYSV			
			Furrow	Drip	Aug 12		Aug 28	
			----- %-----		----- 0-5 -----			
Sakata	Lasso	Y	2.3	2.9	1.0	1.0	1.8	1.5
	Aruba	Y	2.1	1.5	1.0	1.0	1.8	1.5
	Dulce Reina	Y	2.5	2.9	1.0	1.0	1.8	2.0
Seminis	Barbaro	Y	0.3	0.1	1.2	1.0	2.0	2.0
	Swale	Y	0.6	0.1	1.0	1.0	1.6	2.0
	SV6646	Y	0.0	0.1	1.0	1.0	2.0	2.0
	SV6672	Y	10.5	1.1	1.0	1.0	1.8	2.0
	SV4058	W	1.6	0.6	1.2	1.5	2.6	2.5
	16000	Y	0.6	0.6	1.0	1.0	1.2	1.0
D. Palmer	Saffron	Y	0.2	0.1	1.8	2.0	2.8	3.0
	Sugarloaf	W	0.0	0.0	1.0	1.0	1.0	
	Diamond Swan	W	3.4	1.6	1.2	1.5	2.4	2.5
	Cherry Mountain	R	0.0	0.1	1.6	2.0	2.6	2.0
	Average		1.2	0.6	1.3	1.4	2.0	2.0
LSD (0.05)			3.2	1.3	0.4	0.6	0.5	0.7

*IYSV rating: 0 = no symptoms; 1 = 1-25% of foliage was diseased; 2 = 26-50% of foliage was diseased; 3 = 51-75% of foliage was diseased; 4 = 76-99% of foliage was diseased; 5 = 100% of foliage was diseased.

Table 9. Yield and grade of full-season experimental and commercial furrow-irrigated onion varieties graded out of storage in December 2014. Data are the average of five replicates. Malheur Experiment Station, Oregon State University, Ontario, OR. Continued on next page.

Seed company	Variety	Bulb color	Total yield	Marketable yield by grade							No. 2s	Small	Total rot	Neck rot	Plate rot	Sprouts	Bulb counts >4¼ in #/50 lb
				Total	>4¼ in	4-4¼ in	3-4 in	2¼-3 in	----- % of total yield -----								
----- cwt/acre -----																	
A. Takii	TTA-747	Y	846.7	821.5	1.5	153.2	635.0	31.9	7.0	6.8	1.3	0.4	0.9	0.0	34.2		
	T-866	Y	877.7	700.4	0.0	95.6	561.9	42.9	161.3	9.2	0.8	0.2	0.5	0.0			
Bejo	Sedona	Y	750.5	724.3	0.0	47.7	638.8	37.8	12.8	9.5	0.5	0.0	0.5	0.0			
	Calibra	Y	793.2	733.2	0.0	24.0	656.6	52.6	33.2	11.3	2.0	0.4	1.6	0.0			
	Crockett	Y	746.0	724.9	2.1	18.9	646.8	57.0	5.8	10.7	0.6	0.1	0.5	0.0	24.0		
	Legend	Y	735.4	685.3	0.0	25.9	615.4	44.0	17.7	9.5	3.2	0.3	2.9	0.0			
	Delgado	Y	831.4	786.5	1.4	75.9	669.8	39.4	29.3	7.9	0.9	0.2	0.7	0.0	35.7		
	Hamilton	Y	741.3	711.1	0.0	22.0	602.8	86.3	6.5	15.7	1.1	0.2	1.0	0.0			
Crookham	Trigger	Y	856.1	832.9	8.1	107.7	666.8	50.2	1.6	9.9	1.4	1.0	0.4	0.0	38.2		
	Avalon	Y	1167.3	1111.9	92.4	432.4	567.9	19.2	1.0	8.7	3.9	3.6	0.3	0.0	32.5		
	Esteem	Y	753.8	729.9	0.0	31.8	652.2	45.8	0.8	13.2	1.3	0.5	0.8	0.1			
	OLYX08-640	Y	647.8	623.2	1.7	13.9	508.1	99.4	4.1	14.4	0.9	0.5	0.4	0.0	30.1		
	Oracle	Y	835.2	807.8	9.8	163.8	586.4	47.7	5.3	9.1	1.5	0.8	0.5	0.1	36.7		
	Scout	Y	1078.7	1044.0	39.9	378.3	604.4	21.4	0.0	5.4	2.6	2.3	0.3	0.0	31.3		
	Red Devil	R	434.4	374.6	0.0	0.0	228.1	146.6	2.3	48.3	2.3	1.2	0.6	0.5			
	Purple Haze	R	415.6	365.9	0.0	0.0	186.6	179.3	0.0	44.9	1.3	0.1	1.2	0.0			
Hazera	Cruiser	Y	672.2	643.2	1.7	38.7	529.4	73.3	3.2	17.4	1.3	0.7	0.6	0.0	30.1		
	Frontino	Y	747.5	696.7	1.4	98.2	551.3	45.8	19.1	10.5	2.8	2.0	0.9	0.0	37.9		
	Maverick	Y	794.5	771.5	9.3	129.7	589.6	43.0	3.8	8.4	1.4	0.3	1.0	0.1	33.0		
Nunhems	Anillo	Y	718.6	693.3	3.2	27.9	603.0	59.2	0.0	11.4	1.9	0.7	1.3	0.0	32.5		
	Arcero	Y	823.4	808.2	0.0	73.5	691.1	43.6	1.1	7.4	0.8	0.6	0.1	0.1			
	Campero	Y	876.7	854.3	0.0	109.7	709.8	34.8	8.1	9.8	0.5	0.1	0.5	0.0			
	Joaquin	Y	891.2	874.2	12.0	164.3	666.8	31.1	0.0	7.6	1.1	0.3	0.6	0.1	33.7		
	Pandero	Y	828.1	802.9	3.3	77.5	685.2	36.9	9.1	7.0	1.1	0.2	0.9	0.0	30.9		
	Ranchero	Y	985.4	959.1	11.2	258.9	660.7	28.4	9.7	7.4	0.9	0.7	0.2	0.0	33.4		
	Vaquero	Y	865.3	833.7	14.1	123.3	657.0	39.3	4.0	10.6	2.3	1.6	0.7	0.0	29.1		
	Oloroso	Y	704.1	685.0	0.0	8.0	605.7	71.3	1.8	6.3	1.6	0.6	1.0	0.0			
	Montero	Y	792.1	771.0	0.0	56.4	650.1	64.5	0.0	7.5	1.8	1.2	0.6	0.0			
	Cometa	W	928.3	869.5	2.4	155.0	695.4	16.7	1.0	8.4	5.4	4.8	0.5	0.0	43.9		
	NUN8003	W	896.7	843.2	0.0	104.3	706.0	33.0	0.0	9.2	5.0	4.8	0.1	0.0			
	Countach	R	410.7	350.3	0.0	0.0	178.2	172.1	5.5	49.3	1.4	0.2	1.1	0.0			
	Marengo	R	369.3	288.3	0.0	0.0	172.4	115.9	20.3	50.6	2.9	1.7	0.9	0.2			

Table 9. Continued. Yield and grade of full-season experimental and commercial furrow-irrigated onion varieties graded out of storage in January 2014. Data are the average of five replicates. Malheur Experiment Station, Oregon State University, Ontario, OR.

Seed company	Variety	Bulb color	Total yield	Marketable yield by grade							No. 2s	Small	Total rot	Neck rot	Plate rot	Sprouts	Bulb counts >4¼ in
				Total	>4¼ in	4-4¼ in	3-4 in	2¼-3 in	Bulb counts >4¼ in								
				cwt/acre							% of total yield				#/50 lb		
Sakata	Lasso	Y	935.9	912.1	9.9	235.3	639.4	27.6	2.9	6.9	1.4	0.9	0.5	0.0	32.1		
	Aruba	Y	993.4	959.8	19.2	276.1	636.9	27.6	13.4	9.3	1.2	0.8	0.4	0.0	33.2		
	Dulce Reina	Y	920.1	886.9	17.6	211.0	620.6	37.7	4.7	10.5	1.9	1.3	0.6	0.0	34.7		
Seminis	Barbaro	Y	947.9	905.8	22.4	205.9	638.3	39.2	9.1	10.0	2.4	0.7	1.7	0.0	33.9		
	Swale	Y	896.7	874.7	6.1	155.2	681.3	32.1	3.1	5.9	1.5	0.5	0.9	0.0	35.0		
	SV6646	Y	874.9	849.7	4.8	125.6	672.5	46.7	4.6	8.9	1.3	0.6	0.7	0.0	32.9		
	SV6672	Y	1000.7	974.5	3.3	188.7	752.8	29.7	2.0	5.7	1.8	0.8	1.0	0.0	31.0		
	SV4058	W	852.6	584.9	0.0	70.7	486.9	27.4	0.0	8.3	30.7	30.3	0.1	0.3			
	16000	Y	1047.0	1028.0	31.6	390.7	590.2	15.6	1.9	5.3	1.1	0.5	0.7	0.0	32.6		
D. Palmer	Saffron	Y	599.2	546.5	0.0	8.4	430.9	107.2	21.2	22.0	1.6	0.6	1.0	0.0			
	Sugarloaf	W	290.8	0.7	0.0	0.0	0.0	0.7	8.2	3.3	95.9	23.3	0.4	72.2			
	Diamond Swan	W	770.8	543.3	0.0	39.8	454.8	48.7	9.9	9.0	26.1	25.4	0.4	0.2			
	Cherry Mountain	R	422.6	366.3	0.0	1.3	215.8	149.1	14.9	38.3	0.7	0.3	0.4	0.0			
	average		786.0	732.3	7.3	109.4	560.0	55.5	10.5	13.5	5.0	2.6	0.7	1.6	33.3		
LSD (0.05)			101.4	102.9	16.8	82.2	92.2	24.5	13.9	11.0	4.2	4.1	0.9	1.3	3.7		

Table 10. Yield and grade of full-season experimental and commercial drip-irrigated onion varieties graded out of storage in December 2014. Data are the average of two replicates. Malheur Experiment Station, Oregon State University, Ontario, OR. Continued on next page.

Seed company	Variety	Bulb color	Total yield	Marketable yield by grade							No. 2s	Small	Total rot	Neck rot	Plate rot	Sprouts	Bulb counts >4¼ in
				Total	>4¼ in	4-4¼ in	3-4 in	2¼-3 in	Bulb counts >4¼ in								
				cwt/acre							% of total yield		#/50 lb				
A. Takii	TTA-747	Y	980.0	945.4	83.5	309.8	527.7	24.4	4.7	7.6	2.4	0.0	2.3	0.1	32.9		
	T-866	Y	1045.8	820.2	22.8	259.1	523.8	14.5	208.1	9.3	0.7	0.0	0.7	0.0	30.0		
Bejo	Sedona	Y	886.4	854.9	6.9	171.9	651.6	24.5	12.7	4.8	1.6	0.8	0.8	0.0	33.3		
	Calibra	Y	808.3	783.6	0.0	46.9	692.4	44.4	8.6	9.0	0.9	0.0	0.9	0.0			
	Crockett	Y	744.2	723.2	0.0	48.8	632.5	41.9	5.5	5.5	1.3	0.4	0.5	0.5			
	Legend	Y	741.5	708.6	6.6	37.0	611.9	53.1	18.8	8.6	0.7	0.0	0.7	0.0	34.7		
	Delgado	Y	792.6	722.7	6.5	62.3	622.4	31.6	57.4	7.3	0.6	0.6	0.0	0.0	35.2		
	Hamilton	Y	792.1	771.6	0.0	17.6	719.5	34.6	10.3	8.4	0.2	0.0	0.2	0.0			
Crookham	Trigger	Y	763.1	741.2	3.4	168.5	534.4	35.0	0.0	12.5	1.2	0.0	1.2	0.0	38.5		
	Avalon	Y	1238.6	1182.3	59.5	498.1	603.8	20.9	0.0	15.2	3.3	3.2	0.1	0.0	29.9		
	Esteem	Y	907.8	891.5	5.8	114.6	739.4	31.7	0.0	6.2	1.2	0.9	0.3	0.0	39.7		
	OLYX08-640	Y	675.4	647.2	0.0	23.3	554.4	69.4	0.0	15.7	1.9	1.2	0.6	0.1			
	Oracle	Y	913.1	882.2	61.1	302.5	497.9	20.8	0.0	8.7	2.5	1.6	0.2	0.7	37.2		
	Scout	Y	1138.2	1081.7	60.3	435.6	570.5	15.3	8.9	10.9	3.3	3.2	0.0	0.1	28.5		
	Red Devil	R	544.1	510.6	0.0	4.7	390.2	115.8	3.5	18.2	2.2	1.8	0.0	0.4			
	Purple Haze	R	465.9	426.4	0.0	9.2	298.6	118.6	4.1	26.9	1.8	1.1	0.0	0.7			
Hazera	Cruiser	Y	667.7	655.3	0.0	0.0	582.8	72.6	0.0	6.2	0.9	0.6	0.3	0.0			
	Frontino	Y	659.5	512.0	6.3	92.9	397.3	15.5	31.6	8.7	18.3	17.7	0.3	0.4	41.3		
Nunhems	Anillo	Y	771.1	726.5	7.3	71.7	595.2	52.2	0.0	17.4	3.5	0.3	3.3	0.0	31.3		
	Arcero	Y	879.5	825.5	15.0	61.7	722.3	26.5	0.0	5.5	5.4	2.5	3.0	0.0	30.5		
	Campero	Y	919.5	880.5	0.0	132.6	714.6	33.3	8.2	12.5	2.1	1.2	0.9	0.0			
	Joaquin	Y	1090.2	1046.6	38.2	315.9	677.2	15.3	3.2	5.3	3.2	2.7	0.5	0.0	35.6		
	Pandero	Y	1026.2	1015.6	45.1	315.7	623.6	31.1	0.0	4.7	0.6	0.2	0.4	0.0	32.9		
	Ranchero	Y	1042.4	1007.1	20.6	296.5	659.1	30.9	8.4	9.1	1.7	0.7	0.6	0.4	30.2		
	Vaquero	Y	979.6	946.4	30.6	321.7	570.4	23.7	7.7	2.3	2.4	1.5	0.9	0.0	32.4		
	Oloroso	Y	763.8	726.4	0.0	55.6	621.5	49.3	3.1	10.1	3.2	2.3	1.0	0.0			
	Montero	Y	829.2	819.1	0.0	86.1	700.0	33.0	0.0	6.8	0.4	0.0	0.4	0.0			
	Cometa	W	874.0	816.0	12.4	148.1	627.6	27.9	0.0	6.1	6.0	5.0	1.0	0.0	30.1		
	NUN8003	W	949.3	906.4	0.0	200.0	683.6	22.8	0.0	9.4	4.0	4.0	0.0	0.0			
	Countach	R	437.4	378.2	0.0	0.0	204.1	174.1	11.3	43.7	0.9	0.0	0.9	0.0			
	Marengo	R	404.1	322.7	0.0	0.0	202.0	120.8	27.7	36.3	4.6	1.8	0.7	2.1			

Table 10. Continued. Yield and grade of full-season experimental and commercial drip-irrigated onion varieties graded out of storage in December 2014. Data are the average of two replicates. Malheur Experiment Station, Oregon State University, Ontario, OR.

Seed company	Variety	Bulb color	Total yield	Marketable yield by grade							No. 2s	Total rot	Neck rot	Plate rot	Sprouts	Bulb counts >4¼ in	
				Total	>4¼ in	4-4¼ in	3-4 in	2¼-3 in	Small	% of total yield							
				----- cwt/acre -----													#/50 lb
Sakata	Lasso	Y	1091.9	1077.7	41.3	407.3	604.5	24.6	2.7	4.3	0.7	0.0	0.7	0.0	29.5		
	Aruba	Y	900.9	864.9	19.7	236.4	579.1	29.7	17.9	5.4	1.4	1.2	0.2	0.0	32.8		
	Dulce Reina	Y	1006.9	975.0	75.2	306.2	567.6	25.9	9.0	13.4	1.0	0.7	0.3	0.0	31.9		
Seminis	Barbaro	Y	942.1	903.5	48.5	227.4	586.9	40.7	14.1	5.4	1.9	0.1	1.8	0.0	33.4		
	Swale	Y	946.8	911.7	26.2	121.6	731.4	32.6	0.0	7.9	2.9	0.4	2.5	0.0	31.0		
	SV6646	Y	1022.0	963.4	25.4	260.1	660.1	17.8	0.0	11.4	4.7	3.5	1.2	0.0	27.0		
	SV6672	Y	1121.0	1091.3	87.3	450.7	531.3	22.0	2.3	8.3	1.7	0.5	1.2	0.0	32.8		
	SV4058	W	815.4	513.7	0.0	105.6	382.3	25.8	3.4	4.7	40.9	39.2	0.4	1.3			
	16000	Y	1110.6	1096.7	66.0	457.4	559.1	14.2	0.0	5.9	0.7	0.2	0.5	0.0	34.1		
D. Palmer	Saffron	Y	631.7	567.9	0.0	11.6	487.5	68.8	43.5	12.4	1.3	0.0	1.3	0.0			
	Sugarloaf	W	391.7	8.2	0.0	0.0	4.5	3.7	8.0	5.0	94.4	24.6	0.0	69.8			
	Diamond Swan	W	838.6	557.3	6.6	60.0	465.0	25.7	13.5	4.8	33.3	32.8	0.5	0.0	34.7		
	Cherry Mountain	R	491.7	434.0	0.0	15.8	296.3	121.9	30.6	26.4	0.2	0.2	0.0	0.0			
	average		841.9	778.2	20.2	165.2	550.2	42.7	13.4	10.8	6.1	3.6	0.8	1.7	33.0		
LSD (0.05)			135.6	203.3	51.2	147.4	199.1	37.3	29.6	11	15.9	15.6	NS	1.2	4.7		

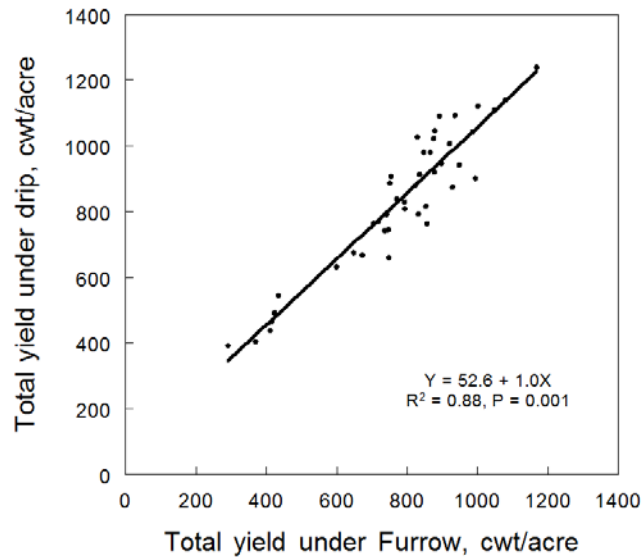


Figure 2. Relationship between the average total yields of furrow-irrigated and drip-irrigated onions. Each data point represents 1 of 49 varieties. Total yield for furrow-irrigated onions was based on the average of five replicates and total yield for drip-irrigated onions was based on the average of two replicates. Malheur Experiment Station, Oregon State University, Ontario, OR, 2014.

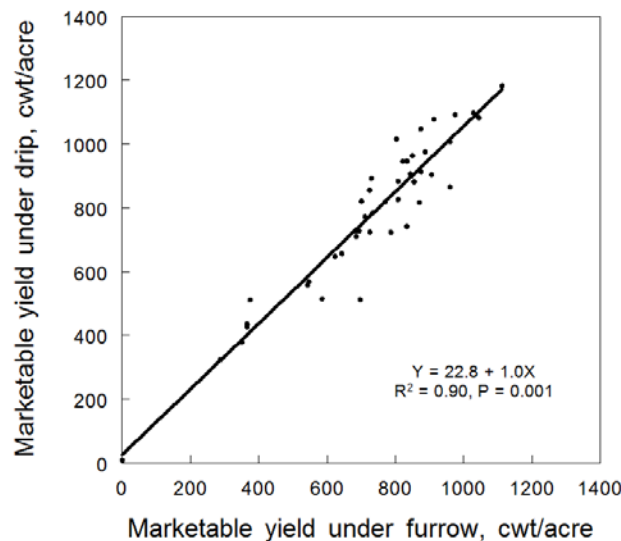


Figure 3. Relationship between the marketable yields of furrow-irrigated and drip-irrigated onions. Each data point represents 1 of 49 varieties. The marketable yield for furrow-irrigated onions was based on the average of five replicates and the marketable yield for drip-irrigated onions was based on the average of two replicates. Malheur Experiment Station, Oregon State University, Ontario, OR, 2014.

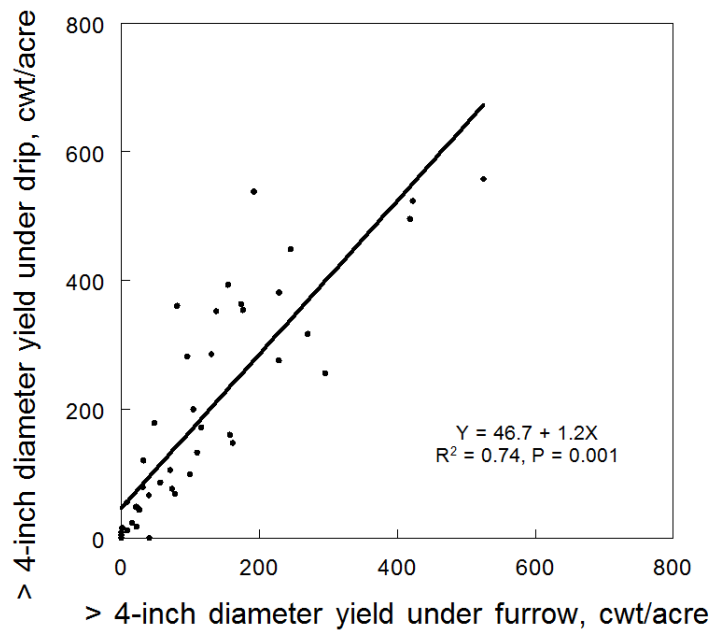


Figure 4. Relationship between colossal plus supercolossal yields (>4-inch diameter) of furrow-irrigated and drip-irrigated onions. Each data point represents 1 of 49 varieties. Colossal plus supercolossal yield for furrow-irrigated onions was based on the average of five replicates, while colossal plus supercolossal yields for drip-irrigated onions was based on the average of two replicates. Malheur Experiment Station, Oregon State University, Ontario, OR, 2014.

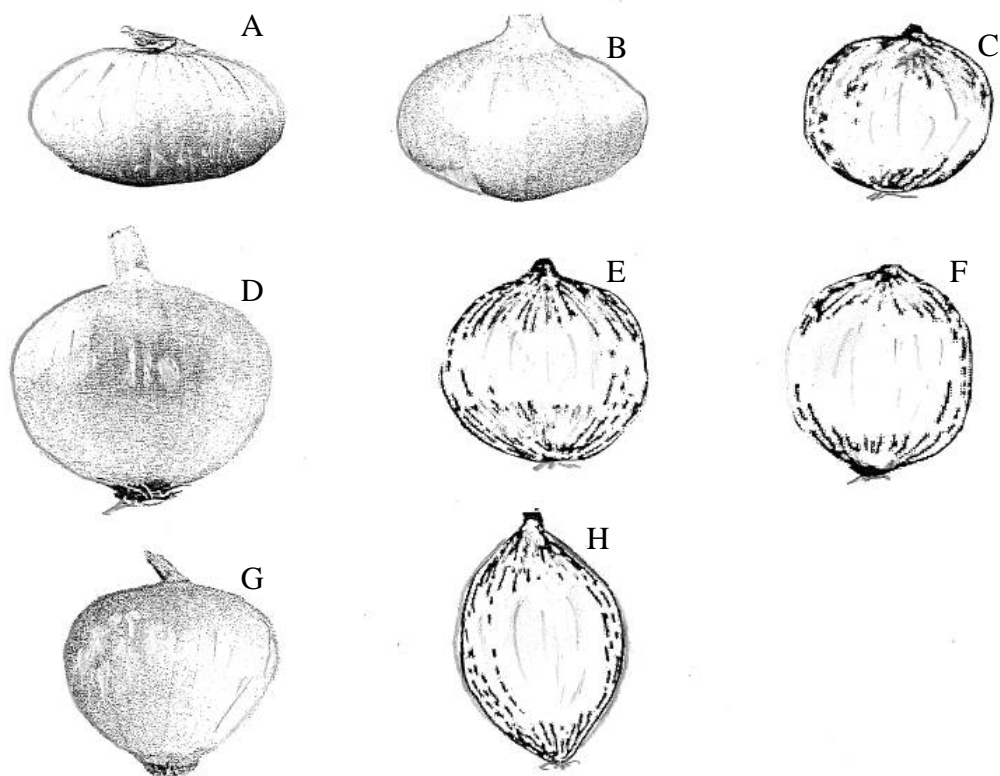


Figure 5. Onion bulb shape rating system. Malheur Experiment Station, Oregon State University, Ontario, OR.

Table 11. Description of bulb shapes.

Bulb shape	
Scale	Shape
A	Flat
B	Granex
C	Flattened globe
D	Globe
E	Blocky globe
F	Tall globe
G	Top
H	Torpedo

Table 12. Onion variety subjective quality evaluation rating system.

Characteristic	Scale	Description
Bulb shape	A-H	see Fig. 5
Skin color	1-5	1 = light, 5 = dark
Bulb shape uniformity	1-5	1 = disuniform shape, 5 = uniform shape
Firmness	1-5	1 = soft, 5 = hard
Skin retention	1-5	1 = bald, 5 = no cracks
Flesh brightness	1-5	yellow varieties: 1 = yellow, 5 = white red varieties: 1 = dark red, 5 = pale red white varieties: 1 = less white, 5 = very white

Table 13. Subjective evaluations of onion bulbs by variety on January 9, 2015, Malheur Experiment Station, Oregon State University, Ontario, OR. Continued on next page.

Company	Variety	Color	Bulb shape ^a	Skin color ^b	Bulb shape uniformity ^b	Firmness ^b	Scale retention ^b	Flesh brightness ^b
						----- 1 - 5 -----		
A. Takii	TTA-747	Y	d	3.0	3.0	4.0	4.0	3.5
	T-866	Y	d	3.5	3.5	4.0	4.5	3.0
Bejo	Sedona	Y	d	3.0	3.0	4.0	4.5	3.0
	Calibra	Y	d	4.0	4.0	4.8	5.0	2.5
	Crockett	Y	f	4.0	3.0	4.5	5.0	3.0
	Legend	Y	d	4.0	4.0	5.0	5.0	3.0
	Delgado	Y	d	3.8	4.0	4.0	4.8	3.0
	Hamilton	Y	d	3.5	4.0	5.0	5.0	2.5
Crookham	Trigger	Y	f	3.3	3.5	4.0	4.0	3.0
	Avalon	Y	c	2.0	3.0	2.5	2.0	3.5
	Esteem	Y	d	2.8	2.5	4.0	3.5	3.0
	OLYX08-640	Y	d	3.5	3.5	4.5	4.5	2.5
	Oracle	Y	e	3.5	4.5	4.0	5.0	3.5
	Scout	Y	d	2.0	4.0	3.0	2.5	3.0
	Red Devil	R	c	2.5	2.0	3.0	3.5	4.0
	Purple Haze	R	e	3.0	3.0	3.0	3.3	4.0
Hazera	Cruiser	Y	d	3.0	3.0	3.5	4.0	3.0
	Frontino	Y	e	3.5	3.0	3.5	3.5	3.5
	Maverick	Y	f	3.0	3.5	4.0	3.5	4.0
Nunhems	Anillo	Y	e	3.8	3.5	3.8	5.0	4.0
	Arcero	Y	d	3.8	4.3	4.0	4.5	4.0
	Campero	Y	e	4.3	4.3	4.0	4.5	2.0
	Joaquin	Y	d	3.5	3.5	4.0	4.5	3.0
	Pandero	Y	d	4.0	3.5	4.5	4.0	2.5
	Ranchero	Y	c	2.5	3.0	3.0	3.0	4.0
	Vaquero	Y	c	2.5	3.0	4.0	3.5	3.5
	Oloroso	Y	d	4.0	4.0	4.0	5.0	2.5
	Montero	Y	c	3.0	3.5	3.5	3.3	3.5
	Cometa	W	d	3.0	4.0	4.0	3.0	1.5
	NUN8003	W	d	3.5	4.8	3.5	3.5	2.5
	Countach	R	c	4.0	3.5	3.5	2.5	3.5
	Marengé	R	e	3.0	3.0	3.5	3.0	3.0

Table 13. Continued. Subjective evaluations of onion bulbs by variety on January 9, 2015, Malheur Experiment Station, Oregon State University, Ontario, OR.

Company	Variety	Color	Bulb shape ^a	Skin color ^b	Bulb shape uniformity ^b	Firmness ^b	Scale retention ^b	Flesh brightness ^b
						----- 1 - 5 -----		
Sakata	Lasso	Y	c	2.5	3.5	4.0	3.5	4.5
	Aruba	Y	d	2.0	3.3	3.0	3.0	5.0
	Dulce Reina	Y	e	2.8	3.0	3.5	4.0	4.0
Seminis	Barbaro	Y	e	3.1	2.5	3.5	3.0	3.0
	Swale	Y	c	4.0	4.0	5.0	4.0	3.0
	SV6646	Y	d	3.8	4.5	4.0	4.3	3.0
	SV6672	Y	d	3.0	4.3	4.0	4.0	3.5
	SV4058	W	d	2.5	3.0	3.3	3.0	1.5
	16000	Y	d	2.3	2.5	3.0	3.5	3.5
D. Palmer	Saffron	Y	d	4.3	3.3	4.5	4.0	2.5
	Sugarloaf	W	na ^c	na	na	na	na	na
	Diamond Swan	W	c	2.5	3.0	3.0	3.0	1.0
	Cherry Mountain	R	f	4.0	2.0	3.5	4.0	4.0
Average			d	3.2	3.4	3.8	3.9	3.1
LSD (0.05)			NS	0.8	1.0	0.8	1.2	1.0

^aBulb shape: see Figure 5.

^bSubjective ratings are described in Table 12.

^cNot available due to excessive storage decomposition.