

ONION VARIETIES GRADED OUT OF STORAGE, 1996-1998

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Oregon State University
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Summary

Commercial varieties and experimental lines of yellow, white, and red onions were compared for yield, grade, and storability. Field observations were made for relative maturity and bolting. Yield and grade were determined out of storage in January. Total yield ranged only from 134 to 526 cwt/acre in 1998. Onion yields were significantly lower in 1998 compared to 1996 and 1997 because of a wetter and cooler than normal spring, a severe hail storm on July 4, and hotter than normal weather in July and August. Significant differences (LSD (0.05)) occurred between varieties in market grades, bolting, maturity, and decomposition in storage.

Introduction

The objectives of this trial were to evaluate varieties of yellow, white, and red onions for bulb yield and quality.

Methods

The 1998 trials were conducted on a Greenleaf silt loam soil with 2.3 percent organic matter and a pH of 6.6. The field had previously been planted to wheat. In the fall, before plowing, 100 lb P₂O₅/acre and 20 lb N/acre were broadcast. The wheat stubble was shredded, and the field was deep-chiseled, disked, irrigated, moldboard-plowed, roller-harrowed, fumigated with Telone C-17 at 20 gal/acre, and bedded.

Beds were knocked down March 30. On March 31 Dacthal at 4 lb ai/acre was applied on an 11-in band along the top of the bed. The Dacthal was incorporated the next day with a bed harrow.

Seed of 58 varieties from 16 companies was planted April 2. Participating seed companies were: American Takii, Aristogene, Asgrow, Bejo, Champion, Crookham, D. Palmer, Dorsing, Harris Moran, Petoseed, Rio Colorado, Rispens Seed, Seedex, Shamrock, Sunseeds, and Vilmorin. Plots were four rows wide and 27 feet long. The experimental design was a randomized complete block with five replicates. The onion seed was planted at 12 seeds per foot of row in single rows on beds spaced 22 in apart using four Almaco cone seeders mounted on a John Deere Model 71 Flexi Planter equipped with disc openers. On April 9, onion rows received 3.7 ounces of 'Lorsban 15G' per 1000 feet of row (0.82 lb ai/acre), and the soil surface was rolled. The soil surface was again rolled with hand rollers on April 14 because of crusting from rainfall.

On May 17, alleys 4 feet wide were cut between plots, leaving plots 23 feet long. From May 18 through 22 the seedlings were hand thinned to a plant population of four plants per foot of row (3-in spacing between individual onion plants, or 95,040 plants/acre).

On May 29, 32 lb N/acre as urea was broadcast and incorporated by rain on May 30. One hundred pounds of N/acre as urea were sidedressed on June 4 and July 13. The trial was managed to avoid yield reductions from weeds, pests, and diseases (Table 1). Weeds were controlled with cultivations and low-rate herbicide applications as needed until lay-by. After lay-by the field was hand weeded as necessary. Thrips were controlled with four aerial applications of Warrior and Lannate. Fungal diseases were controlled with four fungicide applications including an application on July 5 following the July 4 hail storm.

Table 1. Pesticides and quantities (ai/acre) applied after onion emergence. Onion variety trial, Malheur Experiment Station, Ontario, OR, 1998.

Date	Fungicides	Herbicides	Insecticides
May 23	Ridomil/Bravo 1.6 lb		
June 2	Ridomil MZ Gold 0.58 lb	Goal 1.2 oz, Buctril 3.3 oz, Poast 3.6	
June 18		Goal 1.2 oz, Buctril 3.3 oz, Poast 2.9 oz	
June 25			Warrior 0.3 oz, Lannate LV 0.49 oz
July 5	Dithane DF 2.3 lb, Kocide 4.5 LF 6.6 oz		
July 23			Warrior 0.3 oz, Lannate LV 0.49 oz
July 29			Warrior 0.3 oz, Lannate LV 0.49 oz
Aug. 24	Ridomil MZ Gold 1.5 lb		Warrior 0.3 oz, Lannate LV 0.49 oz

The trial was furrow irrigated as necessary to maintain soil water potential at 8-in depth above -20 kPa. Soil water potential was monitored by eight granular matrix sensors (GMS, Watermark Soil Moisture Sensors Model 200SS, Irrrometer Co., Riverside, CA) installed below the onion row at 8-in depth. The last irrigation of the season was on September 5. Bulb maturity ratings for each plot were recorded on August 26, September 3, and September 17, as visual estimates of the percentage of dry leaf material in each plot, and percentage of bulbs with necks collapsed and leaves on the ground. Those percentages for each date were averaged for maturity ratings. Bolted onions were estimated as the number of bulbs in the 4-row plot on September 17. The onion bulbs were lifted on September 17 to field-dry. Onions from the middle two rows of every plot were topped by hand on September 28 and placed into storage in

wooden crates on September 29. In early October, the storage shed was heated long enough to achieve an internal onion bulb temperature at 1 cm depth of 90 °F, to reduce storage rot. The storage shed was managed to maintain an air temperature of approximately 34 °F.

Onions were graded out of storage January 5 -7, 1999. 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*), black mold (bulbs infected with the fungus *Aspergillus niger*), and bulbs with translucent rings. The No. 1 bulbs were graded according to diameter: small (< 2¼ in), medium (2¼ to 3 in), jumbo (3 to 4 in), and colossal (4 in and larger). Varietal differences were compared using ANOVA and least significant differences at the 5 percent probability level, LSD (0.05).

Results and Discussion

Crops suffered from suboptimal growing conditions in 1998. The growing season started out cooler and wetter than normal. The month of May had 4.55 in of precipitation compared to the 50-year mean of 1.02 in. May had 29 percent fewer and June had 18 percent fewer growing degree days (50 -86 °F) than the previous 10-year mean. A severe hail storm on July 4 resulted in close to 100 percent onion leaf loss. Plants were reduced to 2-in high, injured stubs. The months of July and August were hotter than normal. Weather station data recorded 11 days with maximum air temperatures of 100 °F or higher compared to the 50-year mean of 5 days. There were far more degree days in the above optimal range (86 -104 °F) in 1998 compared to the previous 8-year mean; 70 percent more in July and 29 percent more in August. The hot weather in July and August was suboptimal for onions especially for the regrowth of hail-damaged onions where most of the soil surface was unprotected from solar heating. Average onion yields at the Malheur Experiment Station were substantially lower in 1998 compared to 1996 and 1997 (Figure 1).

Varieties are listed by company in alphabetical order and ranked by bulb yield for each company's varieties for 1996, 1997, and 1998 (Tables 2, 3, and 4). The LSD (0.05) values at the bottom of each table should be considered when comparisons are made between varieties for yield and grade. Differences equal to or greater than the LSD (0.05) value for a column should exist before any variety is considered different from any other variety in the category compared in that column.

Total yield out of storage averaged only 306 cwt/acre in 1998 with a wide range of yield and grade (Table 4). Total yield out of storage ranged from 134 to 526 cwt/acre and colossal size onion yield ranged from 0 to 42 cwt/acre, depending on variety. Significant varietal differences were recorded in all size classes.

Decomposition in storage averaged 3 percent of total yield (Table 4). Neck rot averaged 2 percent, plate rot averaged 0.6 percent, and black mold averaged 0.4

percent. Losses to plate rot could have been greater than the numbers recorded because onions with this defect usually lose most of their weight before being graded out of storage. Bulbs with translucent rings averaged 1.3 percent. The number of bulbs with translucent rings could have been higher since only suspected bulbs were cut during grading. Split bulbs averaged 11.6 percent. Varietal differences in bulb quality in terms of percent of total yield were only significant for plate rot, translucent rings, and split bulbs (No. 2s). Bolting averaged 0.5 bolted onions out of approximately 368 onions in each 4-row plot. The variety with most bolting had only 4 per plot, or just over one percent.

Average total, marketable, and colossal yields were highest in 1996 and lowest in 1998 (Table 5). There was on average 61 percent total yield reduction in 1998 compared to 1996. Total yield in 1997 was 17 percent lower than in 1996.

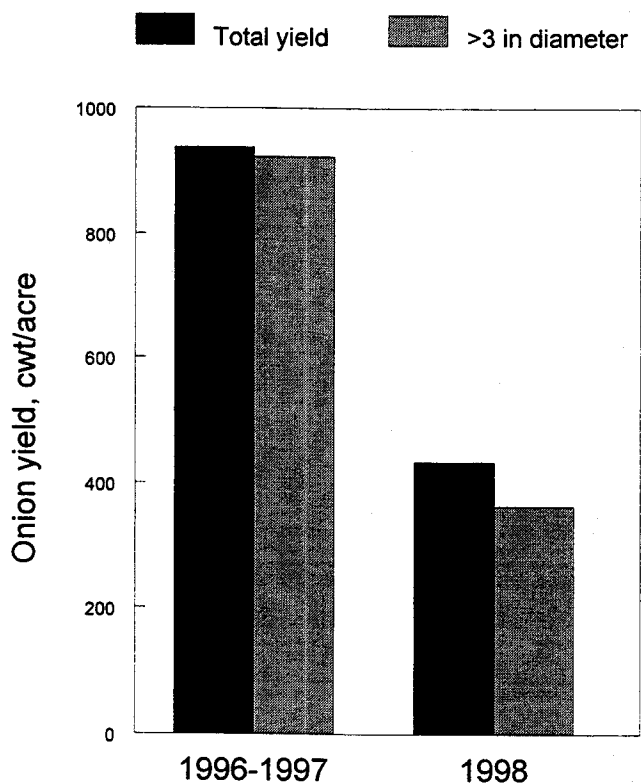


Figure 1. Onion yield reduction related to hail and unfavorable weather compared to the previous two years averaged over the five top yielding varieties, Malheur Experiment Station, Oregon State University, Ontario, OR, 1998.

Table 2. 1996 performance data for experimental and commercial onion varieties. Malheur Experiment Station, Oregon State University, Ontario, OR.

Seed company	Variety	Bulb color	Marketable yield by grade				Non-marketable yield				Maturity rating			Bolters			
			Total yield	Total	>4in	3-4in	2¼-3in	Total rot	Neck rot	Plate rot	Black mold	# 2s	Small	Aug 22	Aug 30	Sep 6	Sep 9
			cwt/acre				% of total yield				- cwt/acre-			----- % -----			No.
American Takii	9003C	yellow	1131.5	1004.1	630.1	499.5	1.5	4.8	3.4	1.3	0.2	72.6	0.4	0.0	2.5	19.0	0.0
	9003	yellow	988.2	852.1	376.9	605.6	5.7	9.4	7.6	1.7	0.2	43.2	0.0	0.0	0.5	5.0	0.6
	ATX 5-96	yellow	893.2	852.0	308.8	581.6	2.8	2.1	0.6	1.6	0.0	22.2	0.0	2.0	6.0	15.5	0.4
	ATX 5-89	yellow	868.6	813.7	351.4	513.8	3.5	3.2	1.1	2.0	0.0	28.2	0.0	1.5	3.0	12.5	1.4
	Condor	yellow	818.2	769.7	225.3	591.3	1.2	4.4	0.1	4.1	0.1	13.2	0.5	13.5	22.0	44.0	0.8
	Eagle	yellow	800.1	763.4	176.9	622.0	1.0	2.1	0.1	1.9	0.1	19.8	0.3	2.5	6.0	23.5	0.6
	T-432	yellow	698.9	637.3	295.3	399.5	4.1	5.7	1.0	4.7	0.0	21.1	0.0	2.0	11.0	19.5	0.0
	Frontier	yellow	503.1	482.4	18.1	467.3	12.7	3.5	0.0	3.5	0.0	8.4	4.9	63.9	75.0	88.5	0.0
	Aristogene	Seville	yellow	1092.6	1037.7	493.0	597.3	2.4	3.8	1.7	2.1	0.0	13.3	0.0	5.8	11.5	30.0
El Charro		yellow	1070.7	1000.7	467.0	600.6	2.9	5.5	2.5	2.9	0.2	11.0	0.3	4.0	8.5	21.0	2.6
El Padre		yellow	1040.3	1007.7	478.6	559.3	1.8	2.3	0.7	1.3	0.3	10.3	0.7	0.5	2.5	16.0	2.6
Bravo		yellow	1014.8	947.5	460.5	552.0	1.4	3.8	1.2	2.7	0.0	29.4	1.0	5.5	10.0	20.5	3.4
Maritime		yellow	910.3	876.0	199.0	707.0	2.3	2.9	0.0	2.9	0.0	10.6	2.0	25.0	40.0	53.4	1.4
Envoy		yellow	880.8	830.2	249.5	627.6	3.8	2.8	0.3	2.5	0.0	25.4	0.0	33.0	42.5	52.4	1.6
Asgrow	Viper	yellow	885.2	805.8	241.8	640.1	2.8	5.8	1.5	4.3	0.0	28.3	0.7	29.0	39.5	49.9	0.0
	Viceroy	yellow	807.0	773.6	155.4	645.4	5.8	1.9	0.0	1.9	0.0	18.6	0.4	21.5	38.0	51.5	0.0
	Regiment	yellow	775.3	727.8	241.4	533.5	0.4	4.1	0.5	3.4	0.2	16.0	0.0	36.5	48.0	50.5	2.0
	Fury	yellow	637.8	584.6	95.9	536.3	4.7	2.4	0.0	2.4	0.0	39.3	1.0	26.5	35.0	49.5	0.0
Bejo	Gladstone	white	765.9	733.5	101.6	653.6	9.7	2.0	0.0	2.0	0.0	18.8	1.0	1.0	3.0	12.5	0.6
	Altisimo	yellow	705.9	681.4	89.5	607.7	5.6	1.1	0.0	1.1	0.0	19.4	3.2	2.0	8.5	20.0	0.2
	Daytona	yellow	703.9	676.8	92.5	603.0	6.7	1.2	0.1	1.0	0.0	20.6	1.7	1.5	4.5	11.0	0.6
	Redwing	red	656.2	639.1	75.0	579.6	1.6	1.9	0.0	1.9	0.0	4.4	0.0	2.5	10.5	21.5	0.0
	Tamara	yellow	609.3	584.3	16.7	585.2	5.5	4.1	0.0	4.1	0.0	2.4	2.0	22.5	46.5	60.3	0.0
	Santana	yellow	533.8	504.4	34.2	493.3	6.3	4.0	0.0	4.0	0.0	8.2	0.0	22.5	38.5	55.0	0.0
Champion	PX 81892	red	498.1	454.4	120.9	368.4	5.4	6.3	0.0	5.9	0.4	15.6	3.3	10.5	13.0	18.5	0.0
Crookham	Sweet Amber	yellow	989.8	906.7	341.9	643.6	3.4	4.5	1.9	2.6	0.0	38.7	0.9	12.5	26.5	42.0	1.4
	Celebrity	yellow	984.7	903.9	425.7	553.0	4.5	4.4	2.9	1.5	0.0	39.5	1.5	0.8	5.5	17.5	2.8
	Sweet Perfection	yellow	969.7	899.5	438.8	528.1	1.8	3.0	0.5	2.4	0.0	42.1	1.0	11.5	17.5	30.0	1.4
	Sueno	yellow	707.8	664.7	118.3	581.4	7.1	3.2	0.4	2.8	0.0	20.5	1.0	9.5	22.0	42.5	2.6

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			Total yield	Total	>4in	3-4in	2¼-3in	Total rot	Neck rot	Plate rot	Black mold	# 2s	Small	Aug 22	Aug 30	Sep 6	Sep 9
			----- cwt/acre -----				----- % of total yield -----				- cwt/acre-		----- % -----			No.	
Ferry-Morse	FMX 2074	yellow	885.8	848.8	321.7	560.8	3.0	3.0	0.8	2.2	0.0	10.8	0.3	6.5	21.5	35.0	1.8
	Caesar	yellow	885.4	853.6	230.9	650.9	3.5	2.5	0.7	1.8	0.0	9.6	0.0	3.0	10.5	31.5	1.4
	Oro Grande	yellow	856.7	823.4	270.4	582.5	2.4	3.2	0.6	2.4	0.1	8.2	1.4	4.5	11.0	29.5	1.8
	Augustus	yellow	838.2	783.6	249.1	588.1	1.0	4.8	1.7	3.0	0.1	14.4	0.0	2.0	5.5	13.5	2.2
	Fabius	yellow	830.2	792.3	175.2	651.6	2.7	2.7	0.6	2.1	0.0	15.6	0.8	21.5	35.5	51.5	3.8
Harris Moran	Impact	yellow	597.9	566.1	25.7	566.3	5.5	1.8	0.0	1.8	0.0	21.9	0.4	47.0	54.0	67.3	1.0
	White Ivory	white	492.2	422.2	6.6	468.5	14.6	1.4	0.1	1.2	0.0	65.6	2.5	12.0	16.5	34.5	0.2
	Squire	yellow	477.9	436.8	36.0	431.2	10.2	5.4	0.3	5.1	0.0	15.8	0.5	35.0	48.5	56.5	0.0
Petoseed	Quest	yellow	939.4	882.7	579.2	359.4	0.9	4.6	1.6	3.0	0.0	14.3	0.0	2.0	4.5	20.0	1.0
	Atlas	yellow	925.2	842.9	627.1	295.8	1.3	5.0	0.4	4.6	0.0	37.3	0.9	5.5	16.5	31.0	1.4
	Vision	yellow	916.9	855.5	430.2	485.1	1.0	4.3	0.8	3.4	0.1	22.5	0.6	1.5	4.5	20.5	1.0
	Pinnacle	yellow	855.4	841.8	190.6	660.8	2.4	1.4	0.0	1.4	0.0	3.4	1.7	6.0	15.0	39.5	0.0
	Apex	yellow	827.6	799.9	157.0	667.5	2.6	1.4	0.0	1.4	0.0	16.5	0.6	2.5	5.5	24.0	0.0
	Teton	yellow	778.3	733.5	188.3	589.1	0.6	3.9	0.3	3.6	0.0	15.2	0.3	15.0	27.0	47.5	3.4
Rio Colorado	6077	yellow	850.7	767.5	277.2	571.2	2.3	2.2	0.1	2.0	0.0	64.9	0.0	13.0	22.5	35.5	1.0
	Challenge	yellow	845.7	774.2	262.3	581.3	2.1	3.5	0.3	3.2	0.0	42.0	0.0	13.5	21.5	39.5	1.8
	Rio Seco	yellow	800.5	747.8	112.4	683.3	3.4	4.5	0.4	4.0	0.0	18.9	1.5	50.0	52.8	54.5	0.4
	Discovery	yellow	732.5	676.0	155.7	566.7	9.8	4.0	0.7	3.3	0.0	27.6	0.3	26.5	38.0	44.5	0.6
	RNX 10090	yellow	670.3	633.8	71.4	597.6	1.2	4.2	0.0	4.2	0.0	7.9	0.0	36.0	45.0	52.5	1.0
	RCS 6171	yellow	654.6	578.1	112.7	536.3	3.7	6.3	0.2	5.7	0.4	36.8	1.9	44.0	47.4	51.9	1.0
	RNX 10001	white	550.5	524.7	27.6	508.9	11.9	2.8	0.6	2.2	0.0	12.4	2.1	20.0	25.5	43.0	0.2
	Golden Security	yellow	1021.8	935.6	466.9	552.7	2.3	3.7	1.2	2.6	0.0	47.6	0.0	1.5	2.5	17.0	2.0
Rispens	Victory	yellow	981.9	905.3	437.9	540.4	2.0	3.4	2.2	1.2	0.0	42.9	1.6	8.0	18.5	32.5	0.4
	Wrangler	yellow	786.0	749.1	161.1	585.7	36.0	2.2	0.2	2.0	0.0	23.6	3.2	2.7	12.0	29.0	0.4
	Great Scott	yellow	900.4	804.2	403.8	495.1	0.3	3.9	1.2	2.7	0.0	62.5	1.2	3.0	8.0	25.0	0.4
Shamrock	SSC 1992	yellow	787.8	725.2	165.3	614.1	7.3	3.0	0.8	2.2	0.0	39.8	1.1	8.0	18.0	27.5	0.6
	Impala	yellow	751.2	646.5	108.9	636.5	4.5	4.5	0.2	4.0	0.3	72.6	1.4	46.5	52.0	56.5	0.0
	SSC 3359	yellow	697.3	626.2	149.0	543.9	4.5	3.6	0.1	3.3	0.2	46.5	0.0	13.5	26.0	37.5	0.0
	SSC 9983	yellow	628.7	590.9	101.1	524.9	2.8	3.4	0.0	3.4	0.0	17.1	0.0	19.5	37.0	51.0	2.2

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Seed company	Variety	Bulb color	Marketable yield by grade				Non-marketable yield				Maturity rating			Bolters			
			Total yield	Total	>4in	3-4in	2¼-3in	Total rot	Neck rot	Plate rot	Black mold	# 2s	Small	Aug 22	Aug 30	Sep 6	Sep 9
			----- cwt/acre -----				----- % of total yield -----				----- % -----			No.			
Sunseeds	SXO 1430	yellow	1060.6	1043.5	448.9	610.7	1.1	0.9	0.1	0.7	0.0	8.0	0.0	16.0	36.0	45.5	0.4
	Vaquero	yellow	996.3	964.5	335.8	656.7	3.2	3.0	1.6	1.4	0.0	2.2	0.6	2.5	5.5	26.5	0.6
	Snow White	white	853.4	751.4	364.0	484.9	3.0	7.2	4.0	2.8	0.4	41.1	1.5	0.0	2.5	5.0	1.4
	Bullring	yellow	834.3	782.1	170.7	661.1	2.4	5.9	0.2	5.7	0.0	5.1	0.1	32.5	49.3	53.9	6.2
	Winner	yellow	779.1	698.6	386.3	389.0	3.3	9.4	1.5	7.9	0.0	9.9	0.6	18.5	32.5	42.0	5.0
	Tesoro	yellow	764.1	736.4	154.5	606.1	3.5	1.6	0.1	1.5	0.0	15.3	0.0	14.5	27.0	44.5	1.8
	Sabroso	yellow	744.2	714.4	98.6	639.3	4.5	2.2	0.0	2.2	0.0	15.5	1.8	5.5	22.0	46.0	0.0
	Valiant	yellow	721.0	681.9	122.0	592.5	5.1	4.1	0.0	4.0	0.1	11.1	1.4	10.5	22.0	49.0	2.6
	Blanco Duro	white	691.2	634.9	116.0	571.6	2.6	6.2	3.1	2.7	0.4	13.8	1.1	0.5	3.0	12.0	0.8
	Mambo	red	604.0	559.7	68.7	524.5	8.1	3.0	0.0	3.0	0.0	29.1	2.6	2.0	7.5	15.5	0.0
	Tango	red	493.5	468.6	18.1	465.3	7.1	3.7	0.0	3.7	0.0	8.7	3.0	13.0	24.0	40.0	0.0
Waldo Seeds	X 202	yellow	1003.7	883.4	385.4	614.9	3.5	9.6	7.2	2.5	0.0	23.5	0.0	1.4	1.5	12.0	2.8
	X 201	yellow	948.9	797.1	402.1	545.8	1.1	12.3	7.4	4.9	0.0	33.4	0.0	1.5	8.5	18.5	2.8
Mean			805.7	750.7	237.9	562.5	4.4	3.9	1.0	2.9	0.1	24.1	0.9	13.5	21.7	34.7	1.2
LSD (0.05)			73.5	84.4	81.0	101.5	10.3	3.9	3.0	3.3	0.3	19.4	2.3	8.1	8.7	9.2	0.8

Table 3. 1997 performance data for experimental and commercial onion varieties. Malheur Experiment Station, Oregon State University, Ontario, OR.

Seed company	Onion variety	Bulb color	Total yield	Marketable yield by grade				Non-marketable yield					Maturity rating				Bolters
				Total	>4in	3-4in	2¼-3in	Total rot	Neck rot	Plate rot	# 2s	Small	Aug 22	Aug 29	Sep 5	Sep 9	No.
				cwt/acre				% of total yield					%				
American	9003C	yellow	943.7	861.2	424.2	427.2	9.8	0.7	0.7	0.0	74.3	1.1	5.8	20.8	43.0	0.0	
Takii	T - 433	yellow	886.3	868.1	352.3	534.5	2.0	1.1	0.7	0.4	10.6	0.9	3.8	21.3	35.2	0.8	
	407B	yellow	656.4	642.8	162.5	472.8	7.5	0.9	0.8	0.1	5.0	2.2	21.7	38.6	59.9	0.0	
	Condor	yellow	650.6	634.3	81.6	543.4	9.3	1.2	0.1	1.1	8.9	0.0	53.7	60.5	80.1	0.2	
	T - 406	yellow	642.7	636.7	47.3	582.8	6.5	0.7	0.5	0.2	1.2	0.0	38.5	51.0	67.3	0.0	
Aristogene	Seville	yellow	932.8	911.8	395.4	513.7	2.8	1.4	1.0	0.4	8.3	0.0	23.5	39.3	51.2	8.0	
	Bravo	yellow	930.8	887.7	368.9	514.9	3.9	2.0	1.9	0.1	24.7	0.3	28.3	45.8	53.4	6.8	
	Maritime	yellow	802.3	788.4	171.5	612.9	4.0	1.2	1.0	0.2	4.2	0.6	52.5	56.7	75.8	0.6	
	Envoy	yellow	679.3	659.3	80.0	568.9	10.3	1.7	0.6	1.1	7.0	1.0	50.6	56.5	66.7	0.0	
Asgrow	Vega	yellow	813.6	792.8	259.2	526.7	6.8	0.5	0.1	0.4	15.3	0.9	43.0	50.1	59.3	2.6	
	Viper	yellow	717.8	701.6	111.8	580.3	9.5	1.9	1.5	0.4	2.0	0.7	51.9	55.4	66.7	0.6	
	Viceroy	yellow	692.1	668.9	136.1	522.8	10.1	0.9	0.6	0.3	14.3	2.6	49.5	54.3	66.5	0.0	
	XPH 15040	yellow	679.9	673.0	105.1	554.7	13.2	1.0	0.8	0.2	0.0	0.8	53.2	56.6	69.4	0.0	
	Regiment	yellow	665.4	652.3	90.7	552.1	9.6	1.4	0.3	1.1	3.4	0.7	55.8	58.1	70.3	0.8	
	Fury	yellow	504.1	479.0	24.7	432.5	21.9	2.3	1.5	0.8	10.0	3.6	51.4	60.1	80.2	0.0	
Bejo	Castillo	yellow	716.0	631.1	117.0	508.1	6.0	0.5	0.5	0.0	81.3	0.0	0.0	3.3	7.4	0.4	
	Gladstone	white	638.1	600.2	61.4	524.8	14.0	3.1	2.8	0.3	14.3	2.9	27.3	39.1	53.3	0.2	
	Daytona	yellow	586.9	568.3	29.2	524.3	14.8	0.6	0.5	0.1	12.1	3.3	20.2	39.6	57.9	0.0	
	Altisimo	yellow	573.0	551.6	53.6	465.7	32.3	0.5	0.3	0.2	13.5	4.8	25.2	41.0	60.8	0.0	
	Redwing	red	521.7	512.2	19.7	477.3	15.2	1.0	0.0	1.0	2.3	2.4	37.5	48.7	65.4	0.0	
Champion	PX 81892	red	500.8	477.8	32.2	415.5	30.1	2.0	1.2	0.8	8.7	4.5	48.0	66.1	86.7	0.0	
Crookham	Sweet Perfection	yellow	846.0	824.1	265.1	553.6	5.5	0.8	0.6	0.2	15.1	0.2	38.6	48.3	55.6	0.4	
	Celebrity	yellow	810.2	772.7	243.5	522.0	7.2	1.2	0.8	0.4	26.9	1.1	25.7	38.8	53.0	2.8	
	XPH 95345	yellow	688.7	637.7	132.7	494.3	10.7	3.0	2.4	0.6	30.2	0.6	15.2	32.6	49.0	1.4	
	Sueno	yellow	582.6	568.7	61.7	467.6	39.5	1.4	0.8	0.6	3.1	3.0	45.7	53.7	71.6	0.4	
Ferry-Morse	FMX 2031	yellow	797.9	780.2	304.6	469.5	6.0	1.7	0.8	0.9	3.7	1.4	21.2	36.0	53.5	6.6	
	FMX 2015	yellow	754.1	727.7	190.3	531.9	5.5	1.7	1.3	0.4	12.6	1.0	21.2	36.0	53.4	2.4	
Harris Moran	HMX 4633	yellow	460.3	447.0	1.9	406.6	38.5	1.3	0.9	0.4	2.5	4.9	42.5	60.5	91.1	0.6	
	Impact	yellow	433.8	407.8	3.2	361.7	42.9	2.1	1.1	1.0	12.6	4.3	59.0	75.6	94.8	0.2	

Table 3. 1997 performance data for experimental and commercial onion varieties. Malheur Experiment Station, Oregon State University, Ontario, OR.

Seed company	Onion variety	Bulb color	Total yield	Marketable yield by grade				Non-marketable yield					Maturity rating			Bolters
				Total	>4in	3-4in	2½-3in	Total rot	Neck rot	Plate rot	# 2s	Small	Aug 22	Aug 29	Sep 5	Sep 9
				cwt/acre				% of total yield					%			No.
Petoseed	Quest	yellow	895.3	884.0	430.2	450.3	3.4	1.1	0.5	0.6	1.7	0.0	41.0	46.9	53.2	2.2
	Vision	yellow	838.5	825.6	276.2	544.8	4.6	1.1	0.7	0.4	3.7	0.0	25.0	34.9	53.6	0.6
	Payette	yellow	715.7	703.6	146.6	548.0	9.0	1.1	0.9	0.2	2.3	1.9	45.7	47.9	55.7	0.0
	Pinnacle	yellow	669.7	660.1	66.1	584.1	9.9	1.1	0.2	0.9	1.2	0.9	45.7	53.5	70.3	0.0
	Apex	yellow	654.8	625.3	102.5	512.6	10.2	2.0	1.7	0.3	15.9	0.0	25.2	39.0	55.0	0.2
	Teton	yellow	632.7	624.1	39.4	569.9	14.9	1.1	0.1	1.0	1.5	0.6	44.5	53.3	63.7	0.0
	PX 67691	yellow	545.9	537.2	26.5	494.2	16.5	0.8	0.0	0.8	2.3	1.8	54.7	57.8	73.4	0.0
Rio Colorado	RNX-10020	yellow	860.3	827.0	318.2	504.0	4.8	1.4	0.9	0.5	20.6	0.6	33.2	49.5	55.0	6.4
	RNX-10245	yellow	818.7	796.9	331.9	456.7	8.3	2.1	1.6	0.5	2.9	1.5	46.7	51.3	58.2	1.0
	RNX-10161	yellow	802.9	776.4	351.7	417.6	7.1	1.3	1.1	0.2	14.3	1.2	28.7	43.8	55.1	2.0
	RNX-10311	yellow	717.3	674.9	308.7	362.1	4.1	2.9	2.7	0.2	22.0	0.5	22.1	36.6	50.9	0.2
Rispens Seed	Goldstar	yellow	871.8	839.2	365.2	468.8	5.2	1.2	1.1	0.1	22.0	0.0	3.9	15.9	32.7	7.6
	Superstar	yellow	847.9	827.1	297.4	523.7	6.1	1.0	0.6	0.4	11.7	0.6	27.1	35.2	50.1	5.2
	Golden Security	yellow	734.5	680.5	176.7	493.5	10.4	2.5	2.2	0.3	36.4	0.3	22.5	37.2	52.0	0.4
	Wrangler	yellow	585.2	566.6	85.4	449.5	31.8	0.4	0.2	0.2	12.8	3.5	28.7	47.3	63.2	0.0
Scottseed	Great Scott	yellow	801.6	749.8	232.1	509.7	8.1	1.6	0.7	0.9	38.6	1.2	24.7	41.6	54.9	0.4
Seedex	Tenshin	yellow	422.4	415.3	7.2	375.8	32.2	0.7	0.2	0.5	1.1	2.5	73.2	88.8	97.4	0.0
Shamrock	SSC 0377	yellow	627.3	573.9	62.7	499.3	11.9	0.6	0.4	0.2	47.0	2.6	49.6	55.3	62.2	0.0
	VDH 89573	yellow	394.7	383.0	0.0	340.9	42.1	0.6	0.1	0.5	1.1	8.5	64.0	73.9	94.4	0.0
Sunseeds	Vaquero	yellow	737.5	727.2	155.4	565.3	6.5	0.8	0.7	0.1	3.5	0.0	44.0	52.2	59.6	0.8
	Valiant	yellow	700.0	695.9	122.5	567.3	6.1	0.4	0.0	0.4	0.6	0.6	43.5	55.8	64.6	1.4
	Tesoro	yellow	611.0	602.2	54.7	539.4	8.1	0.5	0.5	0.0	2.6	3.2	48.7	53.5	71.6	0.0
	Sabroso	yellow	588.9	584.1	24.5	545.2	14.4	0.4	0.1	0.3	0.8	1.9	29.8	43.4	66.4	0.0
	Mambo	red	478.1	443.5	8.4	398.2	36.9	1.4	0.1	1.3	21.4	6.8	48.8	62.5	85.0	0.0
	Flamenco	red	409.0	393.5	0.0	352.9	40.6	1.1	0.4	0.7	3.4	7.5	64.0	82.9	93.2	0.0
	Tango	red	381.5	356.7	5.6	311.2	39.9	3.5	1.9	1.6	5.7	5.5	60.0	81.7	92.7	0.0
Vilmorin	Santos	yellow	652.1	586.7	88.2	485.4	13.1	0.6	0.2	0.4	58.9	2.6	37.7	47.1	62.4	0.0
	Lorenzo	yellow	492.2	456.6	6.2	422.9	27.4	1.0	0.2	0.8	22.5	8.0	52.9	59.6	77.5	0.0
Mean			676.4	651.6	147.7	490.5	14.6	1.3	0.8	0.5	14.1	2.0	37.7	49.0	63.6	1.1
LSD (0.05)			53.0	57.3	79.3	76.6	9.3	3.8	1.2	0.8	15.1	3.0	10.2	9.0	6.7	2.3

Table 4. 1998 performance data for experimental and commercial onion varieties. Malheur Experiment Station, Oregon State University, Ontario, OR.

Seed company	Onion variety	Bulb color	Marketable yield by grade					Non-marketable yield					Maturity rating				Bolters	
			Total yield	Total	>4in.	3-4in.	2¼-3in.	Total rot	Neck rot	Plate rot	Black mold	Translucent rings	No. 2s	Small	Aug 26	Sep 3	Sep 17	Sep 17
			cwt/acre					% of total yield					%				No.	
American Takii	T-434	yellow	420.6	353.2	4.2	312.7	36.3	2.0	1.2	0.2	0.5	1.2	51.5	2.4	8.7	12.5	43.0	0.0
	T-433	yellow	367.6	352.5	2.3	309.2	41.1	0.8	0.7	0.1	0.0	0.2	7.0	4.5	8.7	15.0	39.0	0.4
	Eagle	yellow	268.1	250.6	0.7	123.0	126.9	1.4	0.8	0.1	0.4	0.9	0.5	11.0	36.0	46.0	78.0	0.0
	T-439	yellow	267.2	237.8	0.0	127.5	110.2	3.1	1.3	0.7	1.1	2.3	3.4	11.3	38.0	48.0	74.0	0.2
	T-441	yellow	160.0	109.5	0.0	29.0	80.5	2.8	2.1	0.3	0.4	1.1	2.5	41.8	80.0	89.0	94.0	0.0
Aristogene	Bravo	yellow	526.4	462.1	42.0	372.4	47.6	3.1	2.7	0.2	0.2	1.4	35.9	4.4	9.0	14.2	43.0	3.4
	Seville	yellow	409.6	378.1	14.3	333.9	29.9	3.7	2.6	0.8	0.3	1.3	7.6	3.4	11.0	17.0	53.0	0.6
	Maritime	yellow	295.9	269.0	0.0	170.5	98.5	2.7	1.3	0.8	0.5	0.8	6.8	9.8	66.0	74.0	89.0	0.2
	Envoy	yellow	274.3	236.3	0.6	150.0	85.7	4.3	2.2	0.7	1.5	2.0	4.5	15.4	64.0	72.0	84.0	0.4
Asgrow	Vega	yellow	365.9	337.0	1.0	289.8	46.1	2.8	1.7	0.8	0.3	1.3	11.4	2.3	40.0	47.0	67.0	4.0
	XPH15225	yellow	354.4	311.5	8.2	267.3	36.0	4.3	3.4	0.5	0.4	3.8	9.8	4.5	22.0	31.0	51.0	1.0
	Viper	yellow	324.8	295.2	2.1	219.9	73.3	3.1	2.2	0.4	0.5	1.4	7.4	7.9	56.0	62.0	83.0	0.0
	Regiment	yellow	304.7	265.5	0.6	181.8	83.1	3.9	3.1	0.1	0.7	1.8	9.5	13.0	59.0	68.0	81.0	0.0
	XPH15113	yellow	264.1	230.4	1.5	155.5	73.5	2.5	2.0	0.3	0.3	0.6	13.3	11.9	36.0	48.0	74.0	0.0
	XPH15040	yellow	234.6	188.7	0.0	92.9	95.8	5.7	2.6	1.0	2.1	4.4	3.2	17.5	67.0	72.0	87.0	3.6
	XPH15042	yellow	200.0	175.7	0.0	80.5	95.2	2.7	1.4	1.1	0.2	1.5	0.5	15.4	60.0	69.0	90.0	0.4
Bejo	Legend	yellow	318.9	278.3	0.0	217.8	60.5	1.2	0.2	1.0	0.0	0.2	27.5	8.6	31.0	36.0	69.0	0.0
	Gladstone	white	314.5	264.7	5.3	176.6	82.8	2.3	1.8	0.4	0.1	1.2	22.0	16.3	13.0	20.0	54.0	0.2
	Daytona	yellow	278.3	256.9	0.0	158.4	98.5	0.8	0.7	0.0	0.0	0.3	11.4	7.0	20.5	26.0	63.0	0.2
	Redwing	red	264.6	247.7	0.0	152.9	94.7	1.1	0.7	0.3	0.2	0.4	7.2	5.2	40.0	47.0	70.0	0.0
	Festival	yellow	196.0	167.1	1.7	67.3	98.1	1.6	1.2	0.4	0.0	0.0	7.2	19.0	66.0	74.0	89.0	0.0
Champion	Flare	yellow	212.4	176.9	0.0	57.3	119.6	2.6	2.2	0.3	0.1	0.0	9.7	19.9	53.0	59.0	82.0	0.0
Crookham	Zorro	yellow	419.0	379.6	16.0	330.4	33.3	1.4	0.9	0.5	0.0	1.6	23.6	3.0	8.9	16.0	50.0	1.2
	Sweet Perfection	yellow	381.9	349.7	3.9	308.2	37.6	1.7	1.6	0.1	0.0	1.4	15.6	4.4	25.0	36.0	61.0	0.0
	Sueno	yellow	206.7	159.6	0.0	50.8	108.8	2.5	1.8	0.5	0.2	2.0	8.9	28.7	50.0	57.0	76.0	0.4
D. Palmer	DPS 1062	yellow	450.9	371.7	27.0	320.4	24.2	10.1	8.5	0.7	0.9	3.3	13.1	2.8	4.7	10.5	36.0	0.8
	DPS 1064	yellow	392.0	316.8	16.2	256.7	43.8	5.8	4.0	1.2	0.6	2.8	34.2	5.7	2.1	6.4	29.0	1.4
	DPS 1022	yellow	195.5	139.5	0.0	74.4	65.1	3.4	2.0	1.2	0.2	0.8	23.6	24.7	45.0	54.0	76.0	0.6
Dorsing	Harvest Moon	yellow	366.3	324.8	27.2	266.9	30.7	2.8	2.0	0.7	0.0	2.5	19.1	3.3	14.5	26.0	50.0	1.0
	Red October	red	141.5	82.5	0.0	10.4	72.1	5.3	3.9	0.5	1.0	0.7	17.6	32.7	75.0	88.0	91.0	0.0

Table 4. 1998 performance data for experimental and commercial onion varieties. Malheur Experiment Station, Oregon State University, Ontario, OR.

Seed company	Onion variety	Bulb color	Marketable yield by grade				Non-marketable yield					Maturity rating			Bolters			
			Total yield	Total	>4in.	3-4in.	2¼-3in.	Total rot	Neck rot	Plate rot	Black mold	Translucent rings	No. 2s	Small	Aug 26	Sep 3	Sep 17	Sep 17
			cwt/acre				% of total yield					%			No.			
Harris Moran	FMX 2015	yellow	395.8	351.9	4.1	301.2	46.5	5.4	4.3	0.2	0.8	3.6	5.2	2.1	17.5	25.0	59.0	3.0
	FMX 2031	yellow	387.3	369.6	12.0	308.3	49.3	1.2	0.9	0.1	0.2	0.8	5.7	4.4	12.5	17.0	52.0	0.2
Petoseed	Quest	yellow	425.9	401.0	12.9	371.2	16.8	2.2	1.3	0.8	0.1	2.6	2.6	1.8	24.5	39.0	69.0	0.0
	Vision	yellow	425.3	397.2	5.8	354.3	37.1	2.2	1.7	0.3	0.1	1.8	8.8	2.1	18.0	24.0	58.0	0.0
	Teton	yellow	312.9	289.3	0.0	218.9	70.4	3.1	1.1	1.5	0.6	0.8	3.7	7.3	42.0	53.0	83.0	2.8
	Apex	yellow	312.2	281.9	2.1	202.9	76.8	2.1	1.7	0.3	0.1	0.4	13.2	9.3	25.0	33.0	62.0	0.0
	Vantage	yellow	277.9	265.5	0.0	195.3	70.2	1.0	0.4	0.6	0.0	0.5	1.4	6.8	66.0	70.0	86.0	0.0
	Pinnacle	yellow	259.9	237.9	0.0	140.7	97.2	1.2	0.6	0.4	0.2	0.1	5.0	13.7	58.0	65.0	85.0	0.0
	Ember	red	173.9	121.9	4.1	54.2	63.6	5.3	2.6	2.3	0.4	0.1	19.7	23.4	61.0	63.0	81.0	0.0
Rio Colorado	Rio Rita	yellow	346.9	309.6	4.0	257.3	48.3	5.0	3.1	1.0	0.9	1.8	8.3	5.4	40.5	53.0	77.0	1.6
	Rio Dulce	yellow	242.2	198.6	1.2	121.1	76.2	2.7	1.9	0.6	0.2	1.4	13.8	19.5	52.0	56.0	75.0	0.2
Rispens Seed	Ringstar	yellow	452.9	408.0	27.2	339.7	41.1	1.2	0.8	0.3	0.0	1.5	30.7	2.3	14.5	21.0	48.0	0.8
	Wrangler	yellow	449.7	403.3	25.5	331.0	46.8	3.0	2.7	0.3	0.0	1.5	24.5	1.4	9.0	15.5	49.0	1.0
	Superstar	yellow	419.0	389.3	19.9	335.5	34.0	2.1	1.8	0.2	0.1	1.3	11.7	3.8	16.0	23.0	50.0	0.8
Seedex	NN91	yellow	244.8	198.9	0.0	102.1	96.8	5.3	3.5	1.8	0.1	2.8	6.1	18.9	58.0	64.0	83.0	0.0
Shamrock	SSC0272	yellow	259.6	217.7	0.6	126.9	90.2	1.3	0.8	0.3	0.2	1.2	24.6	10.7	43.0	54.0	74.0	0.0
	SSC0241	yellow	240.9	172.7	0.0	97.2	75.5	3.7	3.0	0.5	0.2	1.7	42.7	12.4	36.0	44.0	70.0	0.0
	SSC1098	yellow	235.0	191.6	0.0	97.7	93.9	4.2	2.9	0.2	1.2	3.1	8.9	17.5	58.0	67.0	83.0	0.2
Sunseeds	Torero*	yellow	424.8	400.9	11.5	342.3	47.1	0.9	0.7	0.1	0.1	0.5	9.4	8.4	13.1	22.5	55.0	0.2
	Vaquero	yellow	387.5	367.0	1.5	319.7	45.9	2.3	13.6	0.3	1.9	1.0	4.9	2.7	19.5	31.0	68.0	0.2
	Valiant	yellow	304.2	285.4	3.4	204.0	78.1	1.0	0.5	0.4	0.0	1.4	1.8	9.3	53.0	61.0	83.0	0.8
	Tesoro	yellow	295.3	270.3	1.3	156.0	113.1	1.9	1.1	0.5	0.3	0.9	7.5	9.2	47.0	56.0	78.0	0.0
	Sabroso	yellow	230.0	206.1	0.0	95.7	110.4	1.1	0.9	0.2	0.0	0.7	4.1	15.5	41.0	52.0	78.0	0.0
	Mambo	red	199.6	151.4	0.0	49.8	101.6	2.5	1.8	0.7	0.0	0.1	22.5	20.4	52.0	57.0	80.0	0.0
	Tango	red	179.8	138.7	6.7	85.5	46.4	5.6	3.2	2.0	0.5	0.1	8.6	23.2	71.0	81.0	92.0	0.0
	Flamenco	red	134.4	78.6	0.0	17.8	60.8	4.3	3.0	1.3	0.0	0.0	9.3	41.4	75.0	83.0	90.0	0.0
Vilmorin	Santos	yellow	344.9	218.8	0.0	164.4	54.4	1.9	0.9	0.8	0.1	0.8	111.8	5.2	48.0	57.0	79.9	0.0
	Lorenzos	yellow	217.0	184.9	0.0	80.7	104.2	1.3	0.9	0.2	0.2	0.5	14.4	13.9	70.0	76.0	97.0	0.0
Mean			306.1	266.8	5.5	192.0	69.3	3.0	2.0	0.6	0.4	1.3	14.6	11.6	38.8	46.6	70.2	0.5
LSD (0.05)			54.7	55.1	8.6	55.3	26.0	NS	NS	1.11	NS	1.8	10.8	8.5	9.6	8.6	7.3	1.2

*formerly SXO1436

Table 5. Yield and storage rot for onion varieties in 1996 -1998. Yields in 1998 were substantially lower due to severe hail on July 4 and other unfavorable weather related factors. Malheur Experiment Station, Oregon State University, Ontario, OR,1998.

Seed company	Variety	Bulb color	1996				1997				1998			
			Total yield	Marketable	Colossal	Storage rot	Total yield	Marketable	Colossal	Storage rot	Total yield	Marketable	Colossal	Storage rot
			cwt/acre			cwt/acre			cwt/acre			%		
American Takii	Eagle	yellow	800.1	763.4	176.9	2.1	642.7	636.7	47.3	0.8	268.1	250.6	0.7	1.4
Aristogene	Bravo	yellow	1014.8	947.5	460.4	3.8	930.8	887.7	368.9	2.0	526.4	462.1	42.0	3.1
	Envoy	yellow	880.8	830.2	249.4	2.8	679.3	659.3	80.0	1.8	274.3	236.3	0.6	4.3
	Maritime	yellow	910.3	876.0	199.0	2.9	802.3	788.4	171.5	1.2	295.9	269.0	0.0	2.6
	Seville	yellow	1092.6	1037.7	493.0	3.8	932.8	911.9	395.4	1.5	409.6	378.1	14.3	3.7
Asgrow	Regiment	yellow	775.3	727.8	241.4	4.1	665.4	652.3	90.7	1.4	304.7	265.5	0.6	3.9
	Viper	yellow	885.2	805.8	241.7	5.8	717.8	701.6	111.8	1.9	324.8	295.3	2.1	3.1
Bejo	Gladstone	white	765.9	733.5	101.6	2.0	638.1	600.2	61.4	3.2	314.4	264.7	5.3	2.3
	Redwing	red	656.2	639.0	75.0	1.9	521.7	512.2	19.7	1.0	264.6	247.7	0.0	1.1
	Daytona	yellow	703.9	676.8	92.5	1.2	586.9	568.3	29.2	0.6	278.3	256.9	0.0	0.8
Crookham	Sweet Perfection	yellow	969.7	899.5	438.8	3.0	846.0	824.1	265.1	0.8	381.9	349.7	3.9	1.7
	Sueno	yellow	707.8	664.7	118.3	3.2	582.6	568.7	61.7	1.4	206.7	159.6	0.0	2.5
Petoseed	Pinnacle	yellow	855.4	841.8	190.6	1.4	669.7	660.1	66.1	1.1	259.9	237.9	0.0	1.2
	Teton	yellow	778.3	733.5	188.3	3.9	632.7	624.1	39.4	1.2	312.9	289.3	0.0	3.1
	Vision	yellow	916.9	855.5	430.2	4.3	838.5	825.6	276.2	1.1	425.3	397.2	5.8	2.2
	Apex	yellow	827.6	799.9	157.0	1.4	654.8	625.3	102.5	2.1	312.2	281.9	2.1	2.1
	Quest	yellow	939.4	882.7	579.2	4.6	895.3	884.0	430.2	1.1	425.9	401.0	12.9	2.2
Rispens Seed	Wrangler	yellow	786.0	749.1	161.1	2.2	585.2	566.6	85.4	0.4	449.7	403.3	25.5	3.0
Sunseeds	Tango	red	493.4	468.6	18.1	3.7	381.5	356.7	5.6	3.5	179.8	138.7	6.7	5.6
	Sabroso	yellow	744.2	714.4	98.6	2.1	588.9	584.0	24.4	0.4	230.0	206.1	0.0	1.1
	Mambo	red	604.0	559.7	68.7	3.0	478.1	443.5	8.4	1.4	199.6	151.4	0.0	2.5
	Vaquero	yellow	996.3	964.5	335.8	3.0	737.5	727.2	155.4	0.9	387.5	367.0	1.5	2.3
	Tesoro	yellow	764.1	736.4	154.5	1.6	611.0	602.2	54.7	0.5	295.3	270.3	1.3	1.9
	Valiant	yellow	721.0	681.9	122.0	4.1	700.0	695.9	122.5	0.4	304.1	285.4	3.4	0.9
Mean			816.2	774.6	224.7	3.0	680.0	662.8	128.1	1.3	318.0	286.0	5.4	2.4
LSD (0.05) Variety within years			73.5	84.4	81.0	3.9	53.0	57.3	79.3	1.5	54.7	55.1	8.6	NS
LSD (0.05) Mean between Years							41.1	43.0	52.2	0.6				
LSD (0.05) Variety between Years							56.3	58.0	57.1	NS				