

# Evaluation of Eighteen Sweet Onion Cultivars in Southwest Michigan

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## Objective

Evaluate performance of 18 sweet onion cultivars planted by direct seeding or transplanting under southwest Michigan growing conditions.

## Summary

Eighteen onion cultivars were evaluated as transplants or in a direct seeded planting. Significant differences were found in all traits in both plantings. 'Monterro,' 'Desperado,' and 'Ovation' were among the leaders in total yield, jumbo and medium size bulbs in both trials. Harvest for the transplanted trial began late July while harvest of the direct seeded trial began late August. Bulb size in 2008 was lower than 2007. Weather conditions and effects from Poast herbicide may have adversely affected 2007 bulb size. 'Sweet Spanish' had the best soluble solid and pyruvic acid levels. Cultivars were identified for planting in Michigan. Michigan could potentially fill the demand for sweet onions from August to December, or longer, when onions are being shipped into the state from the western U.S. or Central and South America.

## Methods

### *Fertilizer*

Prior to planting, 0-0-60 and 34-0-0 were broadcast and incorporated at 400 and 60 pounds per acre, respectively. After planting, the trial was fertilized on May 23 and May 30 with Nitro Plus 18 (18-0-0-3(Ca) with micronutrients) from Widmer and Associates, and weekly applications of 4-0-8-2(Ca) from June 6 to August 1 for the transplanted trial, and June 6 to August 15 for the direct seeded planting. Nitro Plus and 4-0-8-2(Ca) were applied through the drip system. Nitro Plus supplied 20 pounds per acre nitrogen for both plantings and 4-0-8-2(Ca) supplied 63 pounds nitrogen per acre for the transplanted trial and 77 pounds nitrogen per acre for the direct seeded trial. Total nitrogen for the direct seeded trial was 117 pounds per acre and 103 pounds per acre for the transplanted trial.

### *Weed Control*

Weeds were controlled using hand hoeing and one application of Poast (1 pint/acre plus 1 quart COC) on June 11.

### *Planting*

Transplanted onions were started in a greenhouse in 288 cell trays on February 25 and planted to the field April 30 and May 1. Direct seeded onions were planted April 7. Both trials were planted in four-row beds, 5.5-foot on center with 12-inches between rows in the bed. In-row spacing was 4 inches between plants providing approximately 95,000 plants per acre. Transplants were set at 4 inches and direct seeded were thinned to 4 inches. Plots consisted of two rows, 10 feet long

each. The trials were planted as a completely randomized design with four replications. They were planted and analyzed as separate trials.

### ***Plant Care***

The trial was drip irrigated as needed. Lorsban was applied at one-quarter per acre on May 23. No fungicides were applied.

### ***Harvest and Data Collection***

Bulbs were harvested when tops were mostly dried down beginning the week of August 4 for the transplanted trial and the week of August 25 for the direct seeded trial. Bulbs were pulled and removed from the field and allowed to dry before being graded and weighed. Bulbs were graded into super colossal (4.5+ inches in diameter), colossal (4-4.5-inches), jumbo (3-4-inches), medium (2-3-inches), small (1-2-inches) and cull. A “curl” rating was taken June 18 after it was noticed the Poast application affected growth and differences between lines were apparent. Pyruvic acid and soluble solid levels were obtained from the better performing lines

### **Results**

In general, 2008 was not good for onion production. The planting season was cool and wet causing delays and slow growth. The direct seeded trial took 16 and 18 days to emerge. During germination, soil temperatures were 45°F to 61°F (51.6°F average). Cool temperatures continued through the season. The weather effect can be seen by comparing lines appearing in 2007 and 2008. There were no super colossal and colossal bulbs in 2008 (there was no direct seeded trial in 2007) while ‘Sweet Spanish,’ ‘Superstar,’ and ‘Mars’ all had bulbs in these categories in 2007. Total yields were lower in lines appearing both years and average size shifted downward one category in 2008 compared to 2007. Size could have been affected by the Poast application (Poast was not applied in 2007). Poast application came at a time of bulb growth and additional stress could have affected size. Production recommendations for Georgia indicate Poast can cause damage during hot weather. Temperatures following application reached 85°F, 88°F, and 83°F on June 11, June 12, and June 13, respectively.

Significant differences were found in both trials for all traits measured. As in 2007, harvest of the transplanted trial began late July. Harvest of the direct seeded trial began primarily a month later in late August. Total yield of transplanted onions ranged from 245.83 (‘Copra’) to 502.38 (‘Expression’) hundredweight per acre (Table 1). Eight other entries in the transplanted trial were statistically similar to ‘Expression’ in total yield. ‘Expression’ was also among the leaders in jumbo, medium, and cull bulbs. Total yield of the direct seeded trial ranged from 27.05 (‘Sequoia’) to 481.75 (‘Montero’) hundredweight (Table 2). ‘Desperado’ and ‘Ovation’ had similar total yields as ‘Montero.’ ‘Montero’ was also among the leaders in colossal, jumbo, medium, and cull bulbs. XON 550Y was the only other direct seeded entry to have colossal bulbs (5.11 hundredweight) but its yield was significantly lower than the leaders in all other categories. Only ‘Red Defender’ was similar to ‘Montero’ in jumbo yield.

Even though the same entries appeared in both 2008 trials, the trials were not designed to make a transplanted versus direct seeded comparison. However, the transplanted trial did appear better. Average total yield of the 18 entries was higher in the transplanted trial (337.41 hundredweight) compared to the direct seeded trial (250.77 hundredweight) (Tables 1 and 2). These differences could be due to plant stand since stand in a transplanted trial is better than a direct seeded trial

The average “curl” rating also differed between the two plantings with the transplanted onions appearing more affected than the direct seeded plants, 1.89 and 1.68, respectively on a 3-point scale (1 not affected; 3 severely affected). This could be due to difference in plant stage with the transplanted onions being somewhat larger when Poast was applied.

The three leaders in total yield in the seeded trial — ‘Montero,’ ‘Desperado,’ and ‘Ovation’ — were also among the leaders in the transplanted trial and had surprisingly similar total yields in both plantings.

More variation for total yield was observed in the direct seeded trial than the transplanted trial indicating some cultivars may be adapted for transplanting but not seeding. This is apparent in XON 670W where it was among the leaders in the transplanted but next to last in the seeded trial (Tables 1 and 2). Some direct seeded entries did not germinate well and had a poor plant stand. So even though they may be adapted from a bulb production standpoint, they may not be adapted to the cooler soil conditions experienced in Michigan.

Soluble solid and pyruvic acid levels were evaluated for the better performing lines (Tables 1 and 2). Pyruvic acid levels fell mostly into the medium (3-7 micromoles) pungency level in both trials. XON 670W and ‘Sweet Spanish’ had low pyruvic acid levels (0-3 micromoles) in the transplanted trial and ‘Ovation’ had low levels in the direct seeded trial. ‘Copra’ had the highest soluble solid levels in both trials. Ideally, sweet onions should be high in soluble solids and low in pyruvic acid. With these criteria, ‘Sweet Spanish’ had the best soluble solids to pyruvic acid levels in either trial.

The Michigan onion industry produces primarily a pungent cooking onion. Michigan onion production has decreased in recent years while U.S. onion consumption has increased. The U.S. increase has primarily been with sweet onions. Michigan has yet to enter the sweet onion market. Reasons that have been given are lack of adaptable cultivars (most sweet onions are short day onions), short growing season, increased disease susceptibility, no name recognition, and others. Although more research needs to be conducted, results from the 2007 and 2008 trials indicate there are cultivars adapted for Michigan’s climate and the harvest period would start in August from transplants and continue through September with direct seeded plantings. Supplies could be extended using common cold and/or controlled atmosphere storage. Michigan could be supplying a portion of the regional sweet onion market from August through December. This is at a time when sweet onions are shipped into the region from western states or Central and South America.

**Table 1.** Yield in hundredweight per acre of 18 **transplanted** onions at the Southwest Michigan Research and Extension Center, Benton Harbor, Michigan in 2008. Plant population was approximately 95,000 plants per acre.

Variety	Color	Source	Total Yield	Yield Jumbo <sup>1</sup>	Yield Medium <sup>2</sup>	Yield Small <sup>3</sup>	Yield Cull	Soluble Solids	Pyruvic Acid <sup>4</sup>	Curl Rating
Expression	Y	BE	502.38	291.97	131.87	0.00	78.54	5.4	3.08	1.75
Montero	Y	NH	447.03	279.73	157.68	1.26	8.36	5.4	4.83	2.50
XON 670W	W	SK	392.21	211.98	152.48	11.23	16.51	5.6	2.98	2.50
Desperado	Y	BE	385.22	193.97	154.71	12.82	23.72	6.5	5.08	2.75
Red Defender	R	RI	378.81	264.04	106.55	1.28	6.94	9.9	6.67	2.00
Ovation	Y	SK	375.97	226.81	100.22	0.89	48.05	4.2	3.99	2.50
Rosita	P	BE	374.34	168.61	190.06	3.06	12.61	7.3	3.75	1.00
Red Fortress	R	RI	363.27	203.57	110.32	3.05	46.33	8.6	5.71	1.75
Western Giant	Y	SK	350.19	110.59	148.90	9.28	81.42	--	--	2.00
Spanish Medallion	Y	SK	301.47	151.19	118.21	9.68	22.39	--	--	1.50
Mt. Whitney	W	SK	299.58	81.83	156.32	4.31	57.13	--	--	2.75
Sweet Spanish	Y	JU	290.58	58.42	192.89	2.17	37.10	6.0	2.96	1.50
Rumba	R	NH	289.11	56.99	199.47	3.82	28.83	--	--	1.25
Sequoia	Y	NH	283.92	33.29	214.68	21.08	14.88	--	--	2.00
Superstar	W	JU	280.55	65.27	121.51	9.38	84.39	--	--	1.75
Mars	R	JU	266.53	49.74	188.51	18.12	10.17	--	--	1.00
XON 550Y	Y	SK	246.31	79.16	117.93	25.61	23.62	--	--	1.75
Copra	Y	JU	245.83	3.98	225.44	16.41	0.00	10.4	5.48	1.75
<b>Lsd=0.05</b>			<b>176.86</b>	<b>144.3</b>	<b>98.13</b>	<b>24.19</b>	<b>50.99</b>			<b>0.75</b>

<sup>1</sup>3 to 4 inches in diameter.

<sup>2</sup>2 to 3 inches in diameter.

<sup>3</sup>1 to 2 inches in diameter.

<sup>4</sup>Micromoles/liter.

**Table 2.** Yield in hundredweight per acre of 18 **direct seeded** onions at the Southwest Michigan Research and Extension Center, Benton Harbor, Michigan in 2008. Plant population was approximately 95,000 plants per acre.

Variety	Color	Source	Total Yield	Yield Colossal <sup>1</sup>	Yield Jumbo <sup>2</sup>	Yield Medium <sup>3</sup>	Yield Small <sup>4</sup>	Yield Cull	Soluble Solids	Pyruvic Acid <sup>5</sup>	Curl Rating
Montero	Y	NH	481.75	8.51	324.85	106.58	13.50	28.33	7.1	5.25	1.75
Desperado	Y	BE	396.45	0	181.61	118.24	44.18	52.42	7.2	5.49	2.00
Ovation	Y	SK	372.25	0	175.78	146.37	21.53	28.57	5.4	2.78	1.75
Red Fortress	R	RI	360.42	0	149.74	148.00	25.56	37.13	9.1	4.29	1.75
Sweet Spanish	Y	JU	324.65	0	136.22	150.20	16.03	22.19	6.7	3.07	1.75
Expression	Y	BE	321.18	0	155.96	115.27	20.74	29.21	5.6	3.65	1.25
Red Defender	R	RI	308.88	0	224.69	55.24	1.35	27.61	8.5	5.81	2.25
Spanish Medallion	Y	SK	289.73	0	89.11	92.44	72.62	35.56	--	--	1.75
Rosita	P	BE	278.79	0	89.36	148.74	40.07	0.62	6.7	4.48	1.25
Rumba	R	NH	256.92	0	17.11	146.03	75.85	17.93	--	--	1.25
Copra	Y	JU	223.97	0	18.87	165.57	34.37	5.16	10.6	6.12	1.50
Western Giant	Y	SK	223.83	0	73.72	90.92	11.93	47.27	--	--	1.50
Mars	R	JU	197.26	0	54.58	115.67	23.64	3.37	--	--	1.00
Superstar	W	JU	177.97	0	47.97	69.29	32.81	37.48	--	--	1.75
XON 550Y	Y	SK	156.74	5.11	38.40	29.09	17.61	18.70	--	--	1.75
Mt. Whitney	W	SK	58.05	0	16.30	23.89	9.83	8.02	--	--	2.00
XON 670W	W	SK	58.05	0	47.97	10.07	0.00	0.00	7.6	4.83	2.00
Sequoia	Y	NH	27.05	0	2.47	14.46	5.54	4.58	--	--	2.00
<b>Lsd=0.05</b>			<b>117.95</b>	<b>6.69</b>	<b>104.20</b>	<b>85.33</b>	<b>37.87</b>	<b>30.07</b>			<b>0.96</b>

<sup>1</sup>4 to 4.5 inches in diameter.

<sup>2</sup>3 to 4 inches in diameter.

<sup>3</sup>2 to 3 inches in diameter.

<sup>4</sup>1 to 2 inches in diameter.

<sup>5</sup>Micromoles/liter.