

MSU 2016 Organic Processing Variety Trial

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Set up and management

An organic processing tomato trial was conducted at a farm in Unionville, Michigan. On 19 May 2016, 700 lb of Nature Safe fertilizer (13-0-0) was broadcast and incorporated prior to transplanting (90 lb actual N). Four varieties were transplanted at a density of 9504 plants per acre and watered in with 8 oz per 100 gallons of Essential Plus 1-0-1 100% Natural Plant & Root Stimulant through a Checchi e Magli two-unit transplanter. The trial area consisted of three beds, spaced 88 inches on center, with two rows of tomatoes spaced 22 inches on center within each bed, and 15 inches between plants in the rows. This bed-spacing was chosen to accommodate the cultivation equipment used for the other organic rotation crops grown at this operation, and is wider than the 60" spacing that is typically used for processing tomatoes. The four varieties were transplanted across the three beds in 640-foot lengths. The varieties were Heinz1301, Hypeel696, THS28, and THS39. Tomatoes were treated with a copper bactericide and foliar fertilizer three times, though the products and application rates were omitted by the grower.

Harvest and Data Collection

THS28 and Heinz1301 were harvested on 25 Aug 2016, and THS39 and Hypeel 696 were harvested on 7 Sept 2016. Five consecutive plants were selected in one row in each of the three beds, totaling 15 plants. Each plant was harvested completely, and sorted by Red, Breaker, Green, and Cull. The most common cull was from various soft rots around shoulder cracks, and anthracnose. I returned to the site on 21 Sept 2016 to check on the quality of fruit that were left on the vine.

Average fruit per plant at first harvest				
Variety	Red	Breaker	Green	Cull
Heinz1301	35.40	9.60	4.53	3.13
Hypeel696	34.13	5.13	9.07	3.53
THS28	24.60	2.60	7.40	3.60
THS39	23.40	4.40	16.33	3.73

Average fruit weight per plant (lb) at first harvest				
Variety	Red	Breaker	Green	Cull
Heinz1301	2.62	0.54	0.12	0.25
Hypeel696	3.00	0.32	0.35	0.24
THS28	2.40	0.21	0.28	0.24
THS39	2.89	0.42	0.75	0.47

Average fruit per plant on 21 Sept 2016				
Variety	Red	Green	Cull	Notes
Heinz1301	38.67	18.67	2.67	Regrowth, flowers, new grn fruit, few culls
Hypeel696	22.67	17.00	17.33	Regrowth, flowers, new grn fruit
THS28	0	0	0	Dead
THS39	20.67	28.33	16.00	Green foliage, little regrowth, more rots

At the suggestion of Tomato Hybrid Solutions seed breeder, I simulated a 60" bed spacing more typical of a processing tomato field if the fruit per plant and fruit weight data from this trial were held constant. If these assumptions are made, a 60" bed spacing could have resulted in roughly 14000 plants per acre and approximately 68% higher yield.

Average tons per acre with 88" bed spacing and 9504 plants/ac				
Variety	Red	Breaker	Green	Cull
Heinz1301	12.45	2.55	0.59	1.19
Hypeel696	14.24	1.50	1.68	1.12
THS28	11.40	1.01	1.35	1.12
THS39	13.73	1.98	3.56	2.22

<i>Simulated</i> average tons per acre with 60" bed spacing and 13939 plants/ac				
Variety	Red	Breaker	Green	Cull
Heinz1301	18.26	3.74	0.86	1.74
Hypeel696	20.89	2.21	2.46	1.65
THS28	16.73	1.49	1.97	1.65
THS39	20.14	2.90	5.23	3.25

Economic Feasibility

The table below shows conventional prices (in US dollars) from Canadian and American processors after a 15% cull and color deduction. A 2.5 multiplier was used to approximate an organic premium.

US Dollar per acre income, based on contract prices from Canadian and American processors				
Variety	Conventional US	Organic US	Conventional CA	Organic CA
	\$119.00 / ton	\$297.50 / ton	\$77.52 / ton	\$193.80 / ton
Heinz1301	\$1,481.58	\$3,703.95	\$965.14	\$2,412.86
Hypeel696	\$1,694.58	\$4,236.45	\$1,103.90	\$2,759.74
THS28	\$1,357.17	\$3,392.93	\$884.10	\$2,210.25
THS39	\$1,634.26	\$4,085.65	\$1,064.60	\$2,661.51

The grower wanted to know how much he must yield to earn \$9-10K per acre. Below is a table showing expected processing tomato net income (loss) per acre at selected price and yield combinations, excluding annualized costs of new transplanter, harvester, and trailers. This projection is based on 9504 plants per acre achieved from the trial.

Price per ton (US \$)	Yield, tons					
	12	18	24	30	36	42
\$120.00	\$(484.26)	\$235.74	\$955.74	\$1,675.74	\$2,395.74	\$3,115.74
\$140.00	\$(244.26)	\$595.74	\$1,435.74	\$2,275.74	\$3,115.74	\$3,955.74
\$160.00	\$(4.26)	\$955.74	\$1,915.74	\$2,875.74	\$3,835.74	\$4,795.74
\$180.00	\$235.74	\$1,315.74	\$2,395.74	\$3,475.74	\$4,555.74	\$5,635.74
\$200.00	\$475.74	\$1,675.74	\$2,875.74	\$4,075.74	\$5,275.74	\$6,475.74
\$220.00	\$715.74	\$2,035.74	\$3,355.74	\$4,675.74	\$5,995.74	\$7,315.74
\$240.00	\$955.74	\$2,395.74	\$3,835.74	\$5,275.74	\$6,715.74	\$8,155.74
\$260.00	\$1,195.74	\$2,755.74	\$4,315.74	\$5,875.74	\$7,435.74	\$8,995.74
\$280.00	\$1,435.74	\$3,115.74	\$4,795.74	\$6,475.74	\$8,155.74	\$9,835.74
\$300.00	\$1,675.74	\$3,475.74	\$5,275.74	\$7,075.74	\$8,875.74	\$10,675.74
\$320.00	\$1,915.74	\$3,835.74	\$5,755.74	\$7,675.74	\$9,595.74	\$11,515.74
\$340.00	\$2,155.74	\$4,195.74	\$6,235.74	\$8,275.74	\$10,315.74	\$12,355.74

Four improvements would help the yields and profitability for this venture.

- 1) A typical 60" plant spacing could increase yields and profitability if fruits per plant and weights can be assumed to be equal to the 88" bed spacing data. However, time or money would have to be invested to fitting current equipment to a narrower spacing, or purchasing additional equipment specifically for tomatoes.
- 2) Tomatoes need 120-150 lbs of N per acre. The standard fertility program for this grower is an autumn manure application following dry beans, totaling a 150 lb of actual available N from fertilizer and legume credits. In addition, the grower utilizes a foliar fertilization program on dry beans. This grower's standard fertility program could be adequate for tomatoes, but may create too much foliage when going beyond 150 lb/ac.
- 3) pH needs to be brought between 6.0 and 7.0 with elemental sulfur at 0.5 ton/ac.
- 4) Drip irrigation and fertigation should be considered as a risk-reducing and yield enhancing strategy.

Though some equipment and labor costs will be shared across other crops in the rotation (cultivators, hoeing teams, etc.), there are a number of new investments that should be considered. Those include the annualized costs of a new transplanter, harvester, trucking, irrigation and their association costs of operation. See attached Partial Budget for more information.