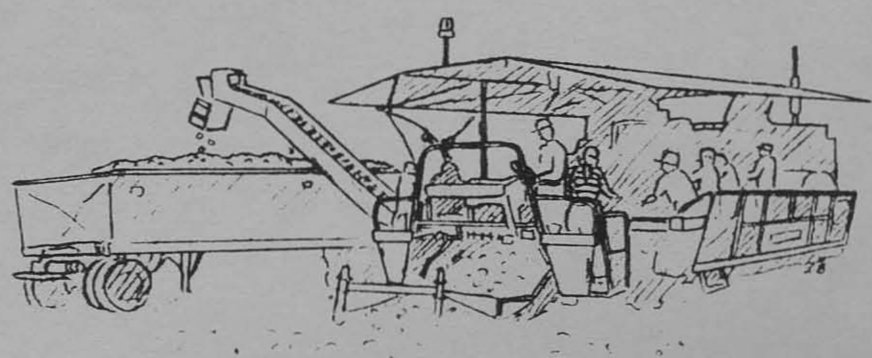
1990
PROCESSING TOMATO MANAGEMENT RESEARCH

AGRICULTURE CANADA
RESEARCH STATION
HARROW, ONTARIO



R.W. GARTON
W.R. BALKWILL

1990 PROCESSING TOMATO MANAGEMENT RESEARCH

TABLE OF CONTENTS

FORWARD

The information contained in this report is a summary of research conducted at Harrow Ontario, during the summer of 1990. The trials were grown on a Fox sandy loam soil, which is representative of the soil types used for much of the processing tomato crop in this area. All the trials were grown on spring-made raised beds. Details of cultural practices used are included in each trial report. Herbicide and pesticide applications were made according to Ont. Ministry of Agriculture and Food, Publication 363 recommendations.

The plots were treated with Ethrel and harvested at the appropriate stage of maturity. Treatments were replicated three times and statistical analysis of yields are included in the results.

Climatic conditions for the 1989 season are summarized on pages 3 and 4. Growing conditions during the 1990 season were fair for most vegetable crops. The month of May and early June were cooler than normal which delayed maturity of processing tomatoes. Higher than normal winds during this time period caused some damage to young transplants. A period of drought from mid June to mid July, further delayed the progress of many crops. Cooler than normal temperatures, and adequate rainfall during the rest of the season promoted good fruitset, and yields in most crops were at, or above normal levels.

We wish to thank the Ontario Vegetable Growers Marketing Board for their support of this research. Also thanks to the companies who contributed seed samples and other supplies. We hope the information contained in this report will be beneficial to the Ontario Tomato industry.

Ron Garton and Bill Balkwill

Agriculture Canada
Harrow, Ontario
(519) 738-2251

TEMPERATURE AND PRECIPITATION DATA

Harrow, Ontario
1990

	APRIL				MAY				JUNE		
Date	High (°C)	Low (°C)	Precip (mm)	Date	High (°C)	Low (°C)	Precip (mm)	Date	High (°C)	Low (°C)	Precip (mm)
1	8.0	5.0		1	18.5	8.0		1	24.0	12.0	
2	5.5	4.0	0.4	2	15.0	3.5		2	25.0	19.0	14.4
3	2.0	-1.0	0.4	3	15.0	8.0		3	24.0	17.0	3.0
4	12.5	0.0		4	10.5	7.5	32.5	4	14.5	7.5	
5	7.5	0.5	2.6	5	16.5	6.5	2.4	5	17.0	9.5	
6	5.0	-4.0	0.6	6	16.0	6.5		6	23.5	14.0	
7	4.0	-5.0		7	22.0	8.5		7	25.0	14.0	12.0
8	11.5	-3.5		8	25.0	14.5		8	25.0	15.5	0.8
9	15.5	4.0		9	23.0	15.5	4.4	9	27.0	19.5	
10	9.5	5.5	21.0	10	11.5	7.5	0.4	10	21.0	15.0	
11	7.0	0.0		11	15.0	3.5		11	24.0	12.5	
12	4.0	-2.5		12	11.5	5.0	3.6	12	21.0	12.5	
13	10.0	-1.0	9.2	13	15.0	8.0	6.4	13	30.0	13.0	
14	11.0	-5.0	0.5	14	15.5	3.5		14	26.5	21.5	
15	11.5	3.0		15	21.0	11.5	20.6	15	29.0	15.5	
16	13.0	-1.0	1.0	16	20.5	13.5	7.8	16	28.0	13.5	
17	6.0	1.0		17	18.0	11.5	2.4	17	32.0	20.0	
18	10.0	-3.5		18	n/a	n/a		18	29.5	23.5	
19	16.0	1.5	0.2	19	17.0	7.5	1.2	19	21.5	13.5	
20	17.0	10.5	26.0	20	23.0	10.5	0.8	20	22.5	15.5	2.4
21	17.5	8.0		21	13.0	9.0		21	28.5	18.5	
22	15.5	6.0		22	17.0	6.5		22	24.0	17.0	11.2
23	20.5	6.0		23	18.5	4.5		23	17.0	15.5	
24	26.0	7.5		24	18.0	12.5		24	22.0	12.5	1.6
25	28.5	14.5		25	19.0	8.5	8.0	25	24.5	9.5	
26	28.5	14.5		26	20.5	13.0		26	27.0	17.0	0.4
27	28.0	14.5		27	22.0	10.5		27	24.5	17.0	3.2
28	27.5	14.5		28	23.0	10.0		28	22.5	16.5	0.2
29	20.5	12.5		29	23.0	13.0		29	28.5	17.0	
30	22.0	10.5		30	18.5	9.5		30	31.0	20.0	9.6
				31	21.5	7.0					
Mean	14.0	3.9	61.9*		17.5	8.5	90.5*		24.7	15.5	58.8*
Norm	13.3	2.9	74.3**		19.6	8.6	69.9**		25.5	14.3	77.7**

* Monthly total precipitation
** Monthly average precipitation

TEMPERATURE AND PRECIPITATION DATA

Harrow, Ontario
1990

JULY

Date	High (°C)	Low (°C)	Precip (mm)
1	23.0	18.0	
2	25.0	14.0	
3	28.5	13.5	
4	34.0	23.0	
5	26.5	20.5	
6	22.0	13.0	
7	24.0	10.0	
8	30.0	17.5	
9	31.0	22.0	
10	27.0	21.0	1.0
11	19.0	15.5	3.4
12	23.5	17.0	
13	20.0	15.5	10.6
14	21.5	15.5	8.8
15	23.5	17.0	
16	26.5	18.0	
17	28.5	20.5	
18	30.0	20.0	0.2
19	30.5	19.0	
20	23.5	21.0	2.6
21	26.0	18.5	
22	18.0	15.5	11.2
23	24.0	15.0	
24	25.5	15.0	
25	27.0	15.0	
26	27.0	15.5	
27	29.0	15.0	
28	30.5	17.0	
29	30.0	20.0	
30	28.0	21.5	11.0
31	22.0	14.5	
Mean	25.7	17.2	48.8*
Norm	27.8	16.9	71.4**

AUGUST

Date	High (°C)	Low (°C)	Precip (mm)
1	24.0	10.0	
2	26.0	12.5	
3	27.0	16.5	
4	24.0	19.0	6.6
5	25.5	20.0	
6	20.0	16.0	0.2
7	23.0	11.5	
8	24.0	11.0	
9	26.0	13.0	
10	27.5	13.0	
11	28.0	14.5	
12	27.5	13.5	46.0
13	24.5	17.5	
14	23.0	12.0	
15	25.5	14.5	
16	27.0	18.5	
17	27.5	17.5	3.4
18	26.5	21.5	45.2
19	23.0	19.0	4.6
20	20.0	15.0	7.8
21	20.5	17.5	
22	20.5	18.5	
23	23.0	19.0	
24	25.0	18.0	
25	26.0	16.0	
26	28.5	20.0	
27	30.0	22.0	
28	31.5	21.0	3.0
29	25.5	18.0	
30	24.5	15.5	
31	26.0	16.0	
Mean	25.2	16.4	116.8*
Norm	26.7	15.9	70.8**

SEPTEMBER

Date	High (°C)	Low (°C)	Precip (mm)
1	28.5	19.0	
2	27.5	19.5	
3	23.0	14.5	
4	26.0	14.0	
5	26.0	22.0	
6	30.5	17.5	112.6
7	25.0	19.0	
8	23.0	11.0	0.6
9	25.0	16.0	
10	25.5	18.5	1.4
11	25.0	15.5	
12	25.5	13.5	
13	25.0	16.5	
14	25.0	17.0	35.0
15	16.5	11.0	12.8
16	17.0	10.5	4.2
17	16.0	4.5	
18	16.0	3.5	9.4
19	18.0	11.0	5.6
20	19.5	9.0	
21	19.0	12.0	16.8
22	19.0	10.5	
23	12.0	7.0	
24	15.5	5.5	
25	21.0	11.5	
26	23.0	11.5	
27	21.5	8.5	
28	23.0	14.0	1.0
29	19.0	12.5	1.0
30	19.0	11.0	
Mean	21.9	12.9	200.4*
Norm	22.0	12.4	68.3**

* Monthly total precipitation
** Monthly average precipitation

PRE-TRANSPLANT CONDITIONING OF PLUG TRANSPLANTS

In recent years Ontario processing tomato growers have looked for alternatives to Southern grown bare-root transplants and have used more locally grown plug transplants to establish the crop. While the performance of these plug tray grown seedlings has generally been good, further refinements to the production system are needed to ensure consistent plant quality. Due to the small cell size and the high density of production, plug plants often tend to be slightly tender when moved from the greenhouse to the field. A method of conditioning these plants to withstand stressful environmental conditions after transplanting could result in more reliable stand establishment.

This was the third year of this experiment, designed to evaluate practices which may be done prior to planting to improve plug transplant quality, plant stands, and yield. Early and late transplanting dates were used to compare the effects of the conditioning treatments under different planting environments.

TREATMENTS:

All treatments were grown in 288 cell plug trays in ASB growing media. All except treatment #2 were fertilized daily with 20-8-20, at 100 ppm N.

1. Greenhouse Check - These plants were grown in a well ventilated greenhouse to produce a good quality seedling. They were transplanted immediately after removal from the greenhouse.

2. Reduced Fertilizer - Fertilizer was withheld for 10 days prior to transplanting. Seedlings were planted immediately after removal from the greenhouse.

3. Clipped - Plants were clipped to a uniform height of approximately 13 cm, 5 days prior to transplanting, and were transplanted directly from the greenhouse.

4. Ethrel - Ethrel (Ethephon) applied as a foliar spray at a concentration of 300 ppm, 10 days prior to field setting. Plants were transplanted directly from the greenhouse.

5. Outside, 3 days - Plants were held outside on racks for 3 days prior to transplanting.

6. Outside, 7 days - Plants were held outside on racks for 7 days prior to transplanting.

Cultivar - FM 6203

Planting Dates: Early Planting - seeded March 19
transplanted May 7
Late Planting - seeded April 1
transplanted June 4

PRE-PLANT CONDITIONING OF TOMATO PLUG TRANSPLANTS - 1990 RESULTS

Early Planting (transplanted May 7, harvested August 28)

Treatment	Plant Stand (%)	Fruit Yield (tons/acre) Marketable	Green	Cull	Total
Outside 7 day	93	18.4	1.3	0.7	20.4
Outside 3 day	88	18.1	1.3	0.7	20.1
Reduced Fert.	85	16.3	0.9	1.0	18.4
Greenhouse Check	89	15.5	1.1	0.7	17.3
Ethrel	81	11.9	0.9	1.1	13.9
Clipped	63	10.5	1.6	0.5	12.6
LSD .05	NS	2.5	NS	NS	3.0

Late Planting (transplanted June 4, harvested September 12)

Treatment	Plant Stand (%)	Fruit Yield (tons/acre) Marketable	Green	Cull	Total
Greenhouse Check	98	21.9	1.3	0.6	23.8
Outside 3 day	97	19.5	1.3	0.8	21.6
Reduced Fert.	92	18.7	1.8	0.4	20.9
Outside 7 day	92	17.9	1.7	0.4	20.1
Ethrel	95	17.7	1.5	0.5	19.6
Clipped	93	17.3	0.9	0.7	18.9
LSD .05	NS	4.3	0.9	0.3	4.0

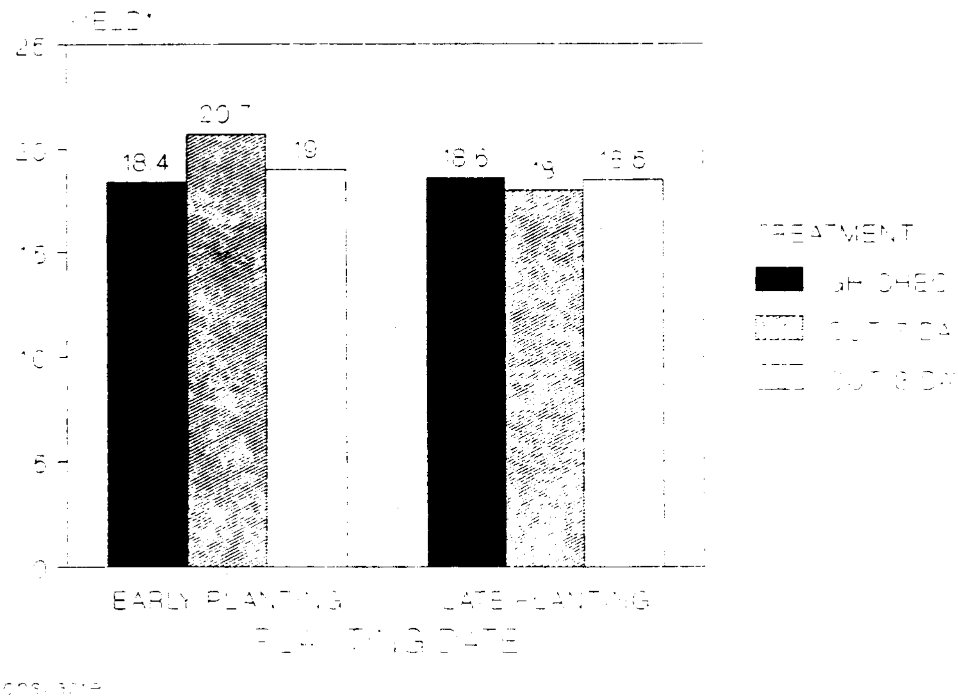
DISCUSSION:

In the early planting, transplants which were held outside for 3 or 7 days prior to field setting produced higher yields than those which were planted directly after removal from the greenhouse. Treatment of seedlings with Ethrel or clipping prior to transplanting reduced final yield. In the late planting, which was planted under more favorable conditions for plant establishment, conditioning treatments did not influence plant stand or fruit yield.

This was the third year of this trial, and the results were consistent with past trials. The three year yield average is illustrated in Figure 1. Conditioning plug transplants by holding them outside for 5 to 7 days prior to planting improved field performance of plug transplants when they were planted under stressful early season conditions. This process allows the transplant to become acclimated to outside conditions gradually, while still in the tray. A 3 day conditioning period does not appear to be long enough to provide a consistent benefit. Seedlings which are planted under conditions of better soil moisture and higher soil temperatures, later in the season, do not appear to respond to pre-plant conditioning.

While this method of conditioning plug transplants for field planting can improve plant establishment, it requires extra labour and close monitoring by the grower. Growers who are not prepared to put in this additional management should not attempt it.

Figure 1. 1988-90 Results: Pre-plant conditioning of tomato plug transplants



PLUG TRANSPLANT STORAGE TRIAL

INTRODUCTION

One of the major advantages of using local greenhouse-grown plug transplants for processing tomato crops is the increased flexibility growers have in holding plants when weather conditions do not permit field planting. However the management of plug plants during storage may affect plant performance in the field. The small cell size creates a greater potential for root binding and overhardening of seedlings if they are stored for long periods of time. Proper handling procedures will have to be developed in order to maximize plant establishment after storage.

This was the third year of an experiment designed to determine: a) how long plug transplants can be stored past their optimum planting date without a yield reduction and b) how transplants should be handled in storage to maximize plant quality.

TREATMENTS

Plug tray grown transplants were obtained from a commercial grower. These plants were grown in 288 cell trays and were approximately 6 weeks old at this time. The plants were then subjected to the following treatments:

1. Check - these seedlings were transplanted on the same day they were picked up from the greenhouse (May 18).

The remaining plants were then stored for 7 days or 14 days using the following methods:

2. * Greenhouse - plants were stored in a well ventilated glass greenhouse.

3. * Outside - plants were stored in a protected outdoor area, on racks supported 20 cm off the ground.

4. * Barn - plants were stored in a well ventilated shed, on racks supported 20 cm off the floor.

* During the storage periods, half the plants in each treatment were fertilized with 20-20-20 at 100 ppm N (+ fertilizer) and half were not fertilized (- fertilizer).

Cultivar - Ohio 8245

Planting dates: Check - May 18
7 day storage - May 25
14 day storage - June 1

STORAGE PRACTICES FOR TOMATO PLUG TRANSPLANTS - 1990 RESULTS

Treatment	Plant Stand (%)	Fruit Yield (tons/acre)			
		Marketable	Green	Cull	Total
Check (Harvested Sept 6)	95	23.4	0.4	0.9	24.7
7-day Storage (Harvested Sept. 6)					
Greenhouse - fert	93	25.5	0.5	0.7	26.7
Barn - fert	87	23.2	0.6	0.5	24.3
Greenhouse + fert	92	23.1	0.5	0.7	24.3
Outside + fert	95	22.9	0.7	0.7	24.3
Barn + fert	90	22.5	0.7	0.4	23.5
Outside - fert	91	22.2	0.7	0.5	23.3
14-day Storage (Harvested Sept. 14)					
Greenhouse - fert	95	28.4	0.8	0.3	29.5
Barn - fert	92	26.3	1.3	0.4	28.0
Outside + fert	95	25.9	1.1	0.5	27.5
Greenhouse + fert	98	24.7	0.8	0.5	25.9
Outside - fert	96	23.6	0.9	0.4	24.9
Barn + fert	62	21.2	0.9	0.3	22.5
LSD .05	8	5.2	0.6	0.2	5.3

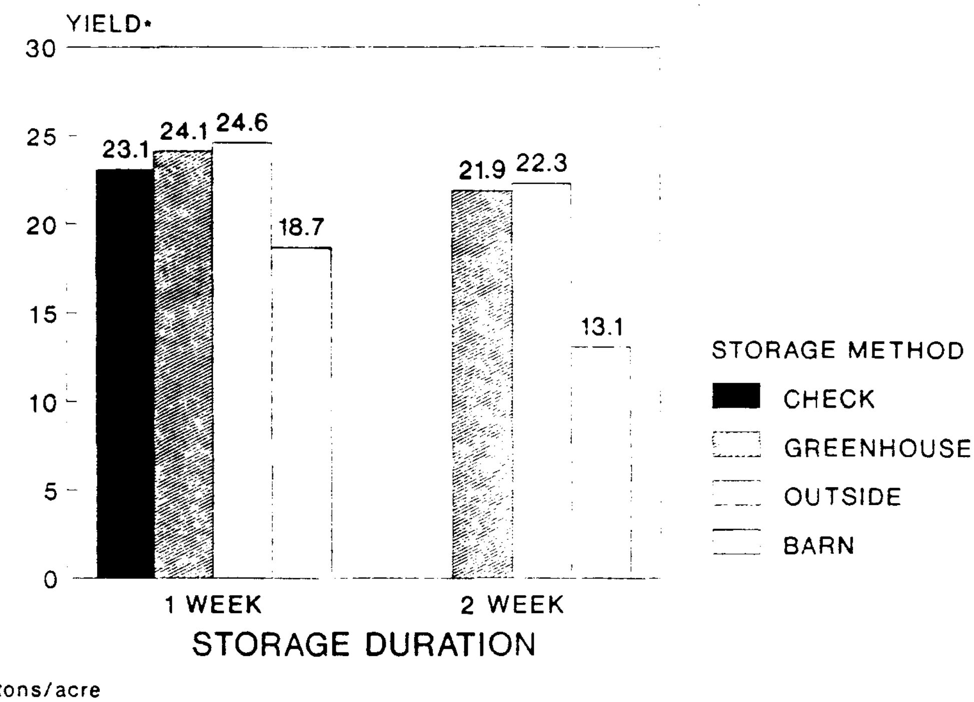
DISCUSSION:

Plug transplants were stored for 7 or 14 days past their intended planting date with no reduction in stand or loss of yield as compared to those planted at the optimum time. In this years trial, storage method did not have a major impact on plant performance, although the barn-stored, fertilized plants had reduced stand and yield after 14 days of storage. The plants in the barn storage treatment were elongated and of inferior quality at planting time, compared to the greenhouse or outside-stored plants.

Yield averages for the three years this trial was conducted are presented in Figure 2. Results over all three trials were fairly consistent. It appears that plug transplants can be stored successfully for as long as 14 days, either by holding the plants in a greenhouse or outside in a protected area. Fertilization of the seedlings during storage in the greenhouse or outside, did not improve establishment compared to seedlings which were not fertilized.

If plants are held in a greenhouse, close attention must be paid to ventilation and watering practices, to prevent excessive elongation. Outside storage may require less intense management and provide slightly better plant quality. The barn-storage treatment resulted in reduced stands and yields. Holding plug transplants in a covered barn or trailer for longer than 1 to 2 days will often result in reduced plant quality, and is not recommended.

Figure 2. 1988-90 Results: Storage methods for tomato plug transplants.



IMPROVING EARLINESS OF PROCESSING TOMATOES

INTRODUCTION:

Earlier production is important to the processing tomato industry. An earlier start to the harvest season would allow processors to open their factories earlier, and make better use of facilities. Earlier maturity would also allow growers to make more efficient use of harvesting equipment and harvest a larger portion of the crop under more favorable conditions.

While early varieties are the key to earlier harvests, there are also cultural practices which may be used to advance maturity of the crop. In fresh market tomatoes, larger transplants are known to promote earliness. Also, plastic mulches are used to warm the soil and improve early growth.

The purpose of this trial was to evaluate several cultural practices which may be used to promote earlier maturity of processing tomatoes. The additional cost of these treatments would range from $100 to $250 per acre. An early wholepack tomato variety (Ohio 7983) was used, since the wholepack industry may have the greatest requirement for earlier maturity.

TREATMENTS:

Transplant Size	- 128 cell tray (23 cc cell volume, 78 cells/sq. ft.) - 288 cell tray (7 cc cell volume, 175 cells/sq. ft.)
Spray Mulch	- Latex spray mulch (Polysar) applied to the soil in a 50 cm wide band under the plants. The mulch was applied as a directed spray, immediately after the crop was transplanted. - Bare soil check
Plant Population	- 13,000 plants/acre (twin rows at 16" between plants) - 17,400 plants/acre (twin rows at 12" between plants)

The 128 cell transplants were seeded on March 15, and the 288 cell plants on March 22. The trial was field transplanted on May 7, on a Fox Sandy Loam soil. The soil was fertilized with 80 kg/ha actual N. Treflan and Sencor p.p.i. at low rates, was used for weed control.

One-third of each plot was harvested in a once-over harvest on three different days in order to better evaluate the rate of ripening of the crop. Harvests were done on August 15, August 22, and August 28.

IMPROVING EARLINESS OF MACHINE HARVEST TOMATOES

Treatment	Yield (tons/acre) by harvest date							
	August 15			August 22			August 28	
	Ripe Fruit	Breakers	% Ripe	Ripe Fruit	Breakers	% Ripe	Total Ripe Fruit	% Ripe
128; mulch; 17,400	12.0	5.0	44	19.2	2.5	57	22.2	90
128; 17,400	7.1	5.1	33	18.2	2.2	67	20.0	91
128; mulch; 13,000	11.3	4.5	43	18.2	5.4	58	19.2	92
128; 13,000	8.9	5.9	36	22.2	2.2	75	19.6	92
288; mulch; 17,400	5.0	4.7	24	20.0	3.6	63	20.8	89
288; 17,400	5.6	5.6	25	19.1	4.5	60	19.8	91
288; mulch; 13,000	6.5	6.0	30	13.9	3.5	57	17.4	90
288; 13,000	10.9	7.4	40	24.2	3.0	74	22.6	93
LSD .05	5.6	NS	17	NS	2.8	NS	NS	NS

DISCUSSION:

Due to the cool spring conditions, harvest was later than would normally be expected for this variety. None of the treatments tested were successful in advancing maturity. The larger transplants were slightly earlier at the first harvest, but as the crop matured and reached an economic yield level, there was no difference (Figure 3a). Similarly, there was no increase in earliness with spray mulch or higher plant population (Figure 3b).

It would appear from these results, that earlier varieties will be the best method to get earlier processing tomato harvests. This trial will be repeated to see if these cultural practices are more successful under different environmental conditions.

Figure 3A. Influence of transplant size on earliness and yield of tomatoes.

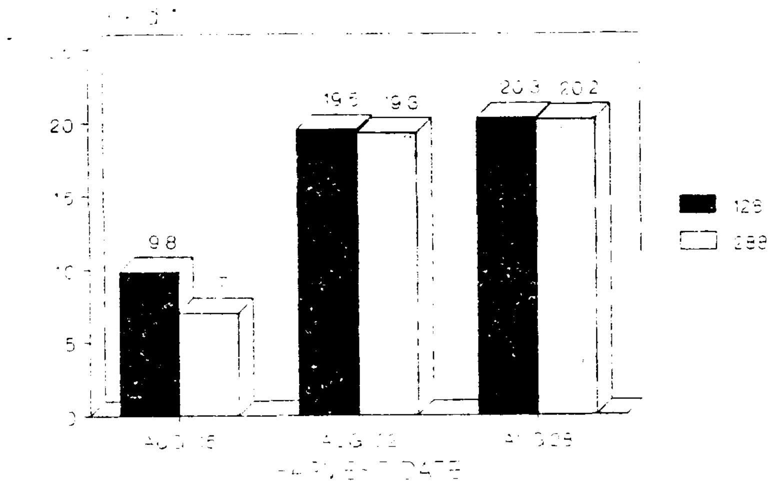
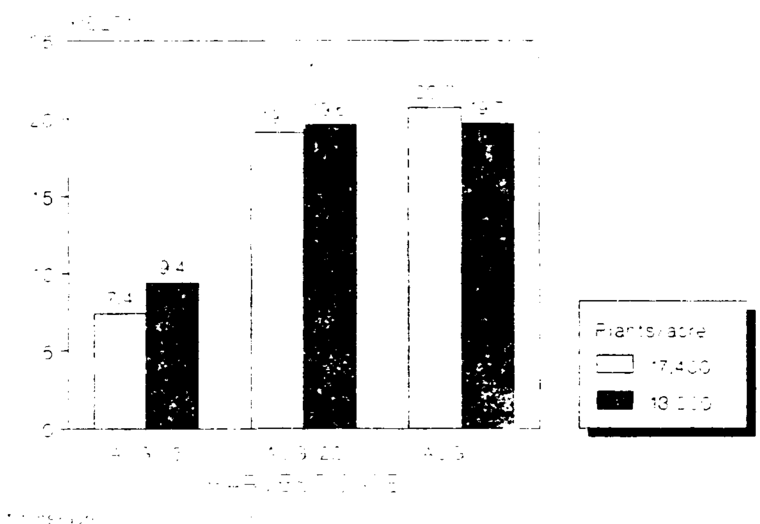


Figure 3B. Influence of plant population on early yield of tomatoes (Ohio 7983).



PLANT POPULATIONS FOR PROCESSING TOMATO CULTIVARS

Many of the machine harvest processing tomato cultivars currently used in Ontario are relatively low yielding at conventional single row plant populations. Most of these compact plant type cultivars have much greater yield potential when grown at higher populations using a twin row planting arrangement. However, many growers have been reluctant to switch to twin-row planting due to the extra cost and higher management requirement. It would be desirable to identify which plant populations are suitable to produce highest yields at a reasonable transplant cost.

These trials were conducted to determine the optimum plant populations for four tomato cultivars. The trial was grown on a Fox Sandy Loam soil. The soil was fertilized with 240 kg/ha of ammonium nitrate (80 kg/ha of N) broadcast before planting. Transplants were grown in 288 cell plug trays which were seeded on April 3 and field transplanted on May 15.

The population treatments and tomato cultivars used were as follows:

CULTIVARS:

1. HY 9464 (early maturity, small plant type hybrid)
2. HY 9478 (early-midseason hybrid)
3. FM 6203 (midseason, standard product variety)
4. H 722 (late maturity, larger plant type)

TREATMENTS:

1. Single row - 1.5m (60") between rows, 30cm (12") between plants (8700 plants/acre)

2. Single row - 1.5m (60") between rows, 25cm (10") between plants (10,454 plants/acre)

3. Twin row - 50cm (20") between plants (10,454 plants/acre) @ 10,454

4. Twin row - 40cm (16") between plants (13,068 plants/acre) @ 13,068

5. Twin row - 30cm (12") between plants (17,424 plants/acre) @ 17,424 (all twin row treatments are on beds on 1.5m centres with 45cm (18") between the twin rows.)

PROCESSING TOMATO PLANT POPULATION TRIALS 1990 - RESULTS

HY 9464 (Harvested August 15)

Treatment	Fruit Yield (tons/acre)			
	Marketable	Green	Cull	Total
Twin Row @ 17,424 (12")	18.1	2.9	0.3	21.3
Twin Row @ 13,068 (16")	16.9	2.0	0.2	19.1
Twin Row @ 10,454 (20")	14.9	1.8	0.2	17.0
Single Row @ 10,454 (10")	12.3	3.3	0.4	15.9
Single Row @ 8,712 (12")	12.2	1.4	0.3	13.9
LSD .05	4.0	1.5	NS	6.7

HY 9478 (Harvested August 28)

Treatment	Fruit Yield (tons/acre)			
	Marketable	Green	Cull	Total
Twin Row @ 13,068 (16")	19.8	1.5	1.2	22.5
Twin Row @ 17,424 (12")	18.1	1.5	1.1	20.8
Twin Row @ 10,454 (20")	16.2	1.7	0.7	18.6
Single Row @ 10,454 (10")	14.1	1.3	0.6	16.0
Single Row @ 8,172 (12")	13.0	2.5	0.5	16.1
LSD .05	4.2	0.9	0.5	4.4

PROCESSING TOMATO PLANT POPULATION TRIALS 1990 - RESULTS

FM 6203 (Harvested Sept. 6)

	Fruit Yield (tons/acre)			
Treatment	Marketable	Green	Cull	Total
Twin Row @ 13,068 (16")	21.1	0.5	0.8	22.3
Single Row @ 10,454 (10")	17.9	0.4	0.5	18.8
Twin Row @ 10.454 (20")	17.6	0.5	0.4	18.5
Single Row @ 8.172 (12")	17.5	0.5	0.6	18.6
Twin Row @ 17,424 (12")	17.3	0.7	0.5	18.5
LSD .05	NS	NS	0.3	NS

H 722 (Harvested September 14)

	Fruit Yield (tons/acre)			
Treatment	Marketable	Green	Cull	Total
Twin Row @ 17,424 (12")	15.1	0.7	0.4	16.1
Twin Row @ 13,068 (16")	14.1	0.6	0.5	15.1
Single Row @ 10,454 (10")	13.1	0.5	0.5	14.0
Single Row @ 8,172 (12")	13.0	0.5	0.4	13.9
Twin Row @ 10,454 (20")	12.8	0.7	0.4	13.9
LSD .05	NS	NS	NS	NS

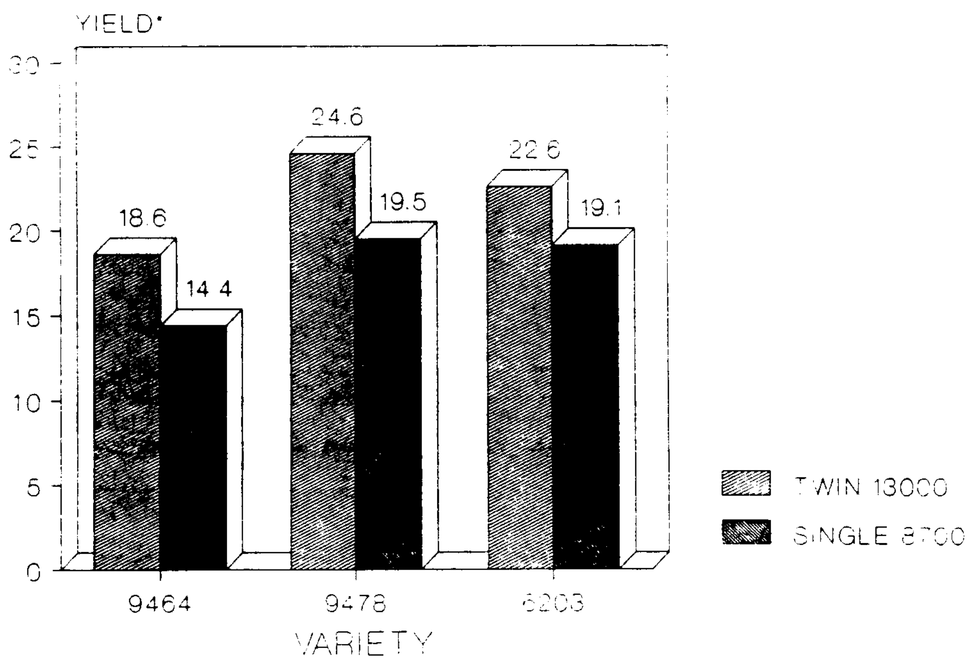
DISCUSSION:

This was the third year these plant population trials were conducted. In 1990, as in past seasons these tomato cultivars performed better when grown in twin row populations. All four of the varieties in this trial had highest yields when grown on twin rows. Three of the four produced higher yields on twin rows at 10,454 plants/acre compared to single rows at the same population.

The 13,068 plant per acre population, with twin rows planted 40 cm between rows and 40 cm between plants within the row, appears to be the optimum planting arrangement for most machine harvest tomato cultivars. Very small plant-type varieties, like HY 9464 may tend to produce higher yields on higher populations (17,400 plants/acre).

Figure 4 represents the three year yield averages for three varieties (HY 9464, HY 9478, and FM 6203) grown on single rows at 8,712 plants per acre and twin rows at 13,000 plants per acre. Yield increases averaged from 3.5 to 5.1 tons per acre on these varieties. At this level of increased yield, twin rows would be economically justified.

Figure 4. 1988-90 Results: Effect of twin vs single rows on tomato yield.



*tons/acre

NITROGEN NUTRITION OF PROCESSING TOMATO CULTIVARS

Nitrogen nutrition is one of the most important considerations in the production of machine harvest processing tomatoes. Fine tuning of nitrogen application is important because N has a large influence on yield, and processed quality. Also, different cultivars tend to vary in their response to nitrogen fertilizer.

Tomato growers tend to apply relatively large amounts of nitrogen. However excessive nitrogen can cause tomato plants to remain in a vegetative growth stage at the expense of fruitset and yield. Excessive nitrogen has also been associated with fruit color defects. Also, the potential for nitrate leaching and groundwater contamination, is a factor growers will have to be concerned with more in the future.

These trials were conducted to develop recommendations for N rates to be used on sandy soils which will promote maximum yields without overapplication of nitrogen. Four tomato cultivars, representing a range of maturities and plant types, were used. The soil type was a Fox Sandy Loam. Soil tests indicated high levels of P and K, so no additional P K fertilizer was added. Transplants were grown in 288 cell plug trays. These were seeded on April 3, and transplanted to the field on May 22. All four cultivars were grown on raised beds, (1.5m centers) in twin rows with 40cm between the twin rows and 40 cm between plants within the row (13,068 plants/acre). The cultivars used,and N treatments were as follows:

CULTIVARS:

1. HY 9464 - early maturing hybrid, small plant type.
2. HY 9478 - early-midseason hybrid.
3. FM 6203 - midseason, standard product variety.
4. H 722 - late maturing, larger plant type.

TREATMENTS:

Preplant N rates: 0, 50, 100, or 150 kg/ha of actual N (N form was ammonium nitrate, banded into the beds 7 days prior to planting.)

Sidedress N rates: 0 or 35 kg/ha of actual N (N form was ammonium nitrate, sidedressed 21 days after planting.)

PROCESSING TOMATO NITROGEN NUTRITION 1990 - YIELD RESULTS

HY 9464 (Harvested August 20)

Treatment		Fruit Yield (tons/acre)			
Preplant	Sidedress	Marketable	Green	Cull	Total
100	35	12.3	2.1	0.3	14.6
50	0	11.2	1.8	0.4	13.4
150	0	11.2	1.9	0.3	13.3
0	35	11.1	1.5	0.5	13.1
150	35	10.5	3.2	0.4	14.1
100	0	9.1	1.9	0.3	11.2
0	0	8.5	1.0	0.3	9.8
50	35	7.3	1.5	0.3	9.1
LSD .05		NS	0.9	0.2	NS

HY 9478 (Harvested August 28)

Treatment		Fruit Yield (tons/acre)			
Preplant	Sidedress	Marketable	Green	Cull	Total
0	35	15.2	1.5	0.8	17.5
50	0	15.1	1.2	1.0	17.3
150	0	14.9	1.[illegible]	0.8	16.8
50	35	14.7	1.5	0.9	17.1
100	0	12.9	2.1	1.0	16.0
[illegible]	0	12.9	1.3	0.9	15.1
[illegible]	35	12.2	1.4	1.1	14.7
150	35	11.9	1.5	0.9	14.4
LSD .05		NS	NS	NS	NS

PROCESSING TOMATO NITROGEN NUTRITION 1990 - YIELD RESULTS

FM 6203 (Harvested Sept. 6)

Treatment		Fruit Yield (tons/acre)			
Preplant	Sidedress	Marketable	Green	Cull	Total
50	0	20.4	0.6	1.1	22.1
150	35	19.5	0.7	1.0	21.2
0	35	18.9	0.5	1.1	20.5
100	35	18.8	0.5	1.1	20.3
50	35	18.2	0.5	1.2	19.9
100	0	17.5	0.7	1.0	19.3
0	0	17.3	0.5	1.1	18.9
150	0	16.3	0.5	1.1	17.9
LSD .05		NS	NS	NS	NS

H 722 (Harvested September 12)

Treatment		Fruit Yield (tons/acre)			
Preplant	Sidedress	Marketable	Green	Cull	Total
150	35	16.3	0.8	0.5	17.7
100	35	15.9	0.6	0.5	17.0
100	0	15.2	0.5	0.7	16.3
50	35	14.9	0.4	0.6	15.9
150	0	14.4	0.7	0.6	15.7
50	0	14.1	0.3	0.8	15.1
0	35	11.9	0.4	0.6	12.9
0	0	11.1	0.3	0.6	12.0
LSD .05		3.6	0.4	NS	3.7

DISCUSSION:

Yields in this trial were low due to a severe infection of bacterial canker in the transplants. There was no consistent response to nitrogen application in any of the varieties. It is likely that if the plants were not stunted by the disease, a better response to the nitrogen treatments would have been seen.

PROCESSING TOMATO STARTER FERTILIZER TRIAL 1990

INTRODUCTION:

A great deal of research has been done on the effect of starter fertilizer on establishment of transplanted vegetable crops. Starter fertilizer has been demonstrated to improve stand establishment in crops, especially when transplanted into cold soils early in the season. However, there is still much uncertainty among tomato growers in Southern Ontario about the value of starter fertilizer, and the potential for injury to young transplants.

This trial was conducted to evaluate the influence of starter fertilizers and their potential for crop injury. The trial was done on locally grown plug transplants, and bare-root southern plants. Early and late planting dates were used to evaluate starter effects under cold and warm soil temperatures. The early planting of plug transplants was destroyed due to sandblasting damage. Two types of commercially available starter fertilizers were used, at three different concentrations.

TREATMENTS:

Water Check - no starter added

10-34-0 - liquid fertilizer, used at concentrations of: 1 litre in 200 litre of water*, 1 l in 100 l (Recommended rate), and 1 l in 50 l.

10-30-20 - granular fertilizer, used at concentrations of 1 lb in 100 gallons of water*, 2 lb in 100 gals. (Recommended rate) and 3 lb in 100 gals.

* transplant water was used at a rate of approx. 280 imp. gallons per acre.

<u>Early Planting Results</u>

HY 9464, Southern Transplants, Planted May 3, Harvested August 20

	Plant	Fruit Yield (tons/acre)			
Treatment	Stand (%)	Marketable	Green	Cull	Total
10-30-20 @ 1:100	88	11.2	2.8	0.7	14.7
10-34-0 @ 1:100	85	10.5	2.6	0.9	13.9
10-34-0 @ 1:200	85	10.0	1.9	0.8	12.7
10-30-20 @ 2:100	78	9.7	2.9	0.6	13.2
10-30-20 @ 3:100	85	9.7	1.8	0.8	12.3
10-34-0 @ 1:50	76	9.1	2.3	0.7	12.0
Water check	87	8.4	2.1	0.9	11.4
LSD .10	NS	NS	0.8	NS	NS

Late Planting Results

H722, Southern Transplants, Planted May 29, Harvested Sept. 17

Treatment	Plant Stand (%)	Fruit Yield (tons/acre) Marketable	Green	Cull	Total
Water check	98	23.2	0.4	0.7	24.3
10-30-20 @ 3:100	95	20.7	1.0	0.7	22.3
10-30-20 @ 1:100	98	19.8	0.3	0.4	20.5
10-34-0 @ 1:200	95	18.7	0.3	0.7	19.7
10-30-20 @ 2:100	92	18.4	0.2	1.1	19.7
10-34-0 @ 1:100	85	17.0	0.9	0.6	18.5
10-34-0 @ 1:50	55	13.3	0.6	0.5	14.4
LSD .10	14	5.0	0.8	0.5	5.5

H722, Plug Transplants, Planted May 29, Harvested Sept. 17

Treatment	Plant Stand (%)	Fruit Yield (tons/acre) Marketable	Green	Cull	Total
10-34-0 @ 1:100	96	23.3	0.4	0.7	24.4
10-30-20 @ 1:100	96	21.3	0.3	0.7	22.3
10-30-20 @ 2:100	98	20.8	0.4	0.7	21.9
10-30-20 @ 3:100	94	20.0	0.2	0.8	21.0
10-34-0 @ 1:200	99	19.1	0.3	0.8	20.1
10-34-0 @ 1:50	77	17.7	0.4	0.5	18.6
Water check	94	17.7	0.3	0.5	18.5
LSD .10	4	4.6	NS	0.3	4.6

DISCUSSION:

Weather conditions early in the season were worse than usual for tomato plant establishment. The early planting of plug transplants was destroyed by high winds and sandblasting. Stands in the southern transplants were poor, and growth was stunted by the cool temperatures. Yields were low, and there were no significant differences in between any treatments. The highest concentrations of starter tended to reduce stand.

In the late planting, conditions for stand establishment were good, although soil temperature was cooler than normal. Plant stands in both plug and southern transplants were good. Stand was reduced in both types of transplants when 10-34-0 was used at twice the recommended concentration (1:50). In southern plants, the water check had a higher yield compared to the starter fertilizer treatments. In plug transplants, the treatments in which starter was used at recommended rates outyielded the water check.

These results indicate that plug plants respond more to the use of starter fertilizer than southern plants. Extra nutrients may be required to promote the growth of roots out of the plug media. Starter may be especially important if the plants were slightly rootbound, or if they had been fertilized with low phosphorus nutrition to control plant height.

This study will be repeated over several years to determine how starter fertilizer effects vary over a range of environmental conditions.

INFLUENCE OF FALL VS SPRING BEDDING AND DRIP IRRIGATION ON PROCESSING TOMATO YIELD

INTRODUCTION:

This was the first year of a long-term experiment involving several crop rotations and production systems for processing tomato production. During this first year the rotation crops were being established, so only the production system comparisons are presented here.

TREATMENTS:

Spring Bed: fall planted rye cover crop, spring plow, disk, shape beds spread fertilizer, spray herbicide, rework beds to incorporate, plant tomatoes

Fall Bed: fall disk previous crop, shape beds, spread oat cover crop, rework beds to incorporate cover crop. In spring, rework beds to incorporate cover crop, spread fertilizer and herbicide, rework beds to incorporate fertilizer and herbicide.

Fall Bed + Drip Irrigation: Tillage practices were the same as in the Fall bed treatment, except that after the cover crop was incorporated in the spring, drip irrigation tape was buried in the bed at a depth of 20 cm. The drip tape was Netafim Typhoon 16 (16 mil tubing, emitters spaced 40 cm apart). The drip irrigation system was operated 2 days per week for 5 hours each day.

RESULTS:

Treatment	Marketable	Green	Cull	Total
Fall Bed + Drip Irrig.	39.5	1.0	1.3	41.8
Fall Bed	38.6	1.1	0.9	40.6
Spring Bed	34.3	1.2	1.1	36.3
LSD .05	4.2	NS	0.4	4.0

DISCUSSION:

The fall bed treatments outyielded the conventional, spring bed treatment. This may have been due to less soil compaction in the fall beds, or better moisture conservation due to less spring tillage.

The addition of drip irrigation did not result in a significant yield increase as compared to the fall bed treatment. Moisture conditions were generally favorable for tomatoes this season, which may have reduced the effects of irrigation. Also the 20 cm depth at which the drip tape was installed may have been too deep to supply enough water to the crop to increase yields. Several different methods of using the drip system will be tested in future years to determine if drip irrigation has a place in processing tomato production.