LeBoeuf

ULTRA HIGH DENSITY TRAY PROCESSING TOMATO SEEDLING PRODUCTION

(Plug Transplants)

1986

FINAL REPORT

The Ontario Seedling Growers' Marketing Board

In co-operation with:

Canada Agriculture

Ontario Ministry of Agriculture & Food

H.J. Heinz Co. of Canada Limited

Ontario Vegetable Growers' Marketing Board

PLUG PLANT TRIAL EVALUATIONS

PROJECT TITLE: **1986 TOMATO TRANSPLANT TRIALS A,B,C,D**

OBJECTIVES: The objectives of this project, conducted in 1986, were as follows:

(1) To evaluate a potential earliness advantage which can be obtained at harvest from locally grown containerized tomato transplants, over that of good quality southern tomato transplants.

(2) To evaluate hardiness of these plants when planted early in the planting season.

(3) To determine optimum tray density, transplant age, and planting date.

(4) To evaluate the economic feasability of growing local transplants in trays, using soil-less mix, at populations exceeding double that under which transplants are currently grown.

(5) To evaluate the tomato growers' overall response to tray transplants.

METHOD: All local tomato transplants for this project were grown at Williams' Plant Farm. The southern transplants were sourced from several growers in Georgia, U.S.A. Only the variety H-2653 was tested this year, to reduce the total number of variables evaluated.

The soil-less mix used in 1986 was provided by Williams. The recipe is, as follows:

2 parts peat fine grade
1 part vermiculite
1 part perlite
30 pounds feed grade B lime
40 ounces 20-20-20 fertilizer (Peters)

The seed was variety H-2653, lot No. 6824-1, provided by H.J. Heinz, Fremont, Ohio. Coated size 7/64", and contained an estimated 48,352 seeds per pound. Estimated germination of this seed lot - 93%.

Seeding was initiated March 18, and continued through May 5, therefore providing continuous source of plants for planting May 5 to June 2. Plants were germinated in a greenhouse until plants reached first true leaf stage. Then plants were moved to an outside plastic house. No temperature recordings were made in either greenhouse during the growth period. All trays were grown on either wooden benches or wire support systems. Fungicides were applied on a weekly basis. Only M-45, Copper and Bravo, were used. All treatments were watered only when dried out, and at 3 weeks, fertilizer applications were made with the waterings. A rate of 300 p.p.m. of 20-20-20 fertilizer was used.

Each plot was planted using a conventional transplanter. The Epp and Gyori plots were planted on 3 separate occastions, May 8, 18, and June 2 for Gyori, and May 8,26, and June 2 for Epp. Each plot consisted of rows 5' wide x 105' long. Each treatment was replicated 4 times and randomized. Plots at Epps were twin rows. Once planted, all treatments were grown similar to commerical plantings.

Lonsbery and Kudroch plots were planted on May 31 and May 26 respectively. Each plot was approximately 1 acre in size. All plots were planted at approximately 9,500 plants per acre. Lonsbery and Kudroch harvested plots on September 2 and September 14 respectively. The Gyori and Epp plots were harvested in 3 periods, August 18, August 20, and September 14. All yield data for this project is summarized in Tables 1 to 3, following this report.

RESULTS: The results of this trial are summarized, as follows:

(1) Yield data shows that locally produced tray plants produce yields equal to good quality southern tomato transplants.

(2) There was no statistical yield differences when comparing plant densities.

(3) There was no statistical yield differences between treatments when comparing planting dates.

OBSERVATIONS: The following observations were made in the course of conducting this project:

(1) Growing transplants in trays requires extensive monitoring of soil moisture and nutritional status. There must be a total commitment on the part of the plant grower.

(2) Optimum quality tray plants can only be achieved when watering is held to an absolute minimum, while maintaining a good level of nutrition.

(3) Greenhouses, for growing these plants, require a good ventilation system to keep day temperatures as close to optimum as possible (80°F to 90°F). It is extremely important not to exceed this temperature.

(4) Germination of seed in trays should be carried out in a temperature and moisture controlled environment. Either a separate room or grouped under plastic cover. At optimum temperatures, trays in germination stage should be removed before 4 days, and placed in greenhouse.

(5) Greenhouses with plastic coverings should be twin layered to avoid dripping from condensation formed on cool sunny mornings or warm sunny days.

(6) To maximize stands only good quality, uniform tomato seed should be used. Germination tests should be carried out before seeding begins. Pelletized seed is the preferred method of seeding, using automated equipment.

(7) Once seeded, the seed should be covered with a thin layer of peat mix or vermiculite. Uniformity is important here to assure uniform emergence of seed.

(8) Airflow in the greenhouse is very important. There should be no "dead spots or hot spots". The use of a fan would be advantageous when combined with a good venilation system.

(9) Alleyways should be minimized to tray surface area exposed to air, which are susceptible to drying out quickly.

(10) Trays should be raised on wires or pipes to allow a uniform flow of air under the trays. A maximum surface area should be exposed. Placing trays on the floor or on a wood surface prevents uniform drying and moisture up-take.

(11) Prior to distributing plants to growers, a thorough watering is advantageous, especially if fertilizing also takes place.

(12) Plants should be distributed after 5 weeks of growth to growers under cover to prevent drying and wind damage in transit.

(13) Should plants require storage before planting, growers should do so in a protected area. Plants must be watered as required until conditions for field planting are favourable.

(14) Plants should be planted in similar fashion to that of southern tomato transplants.

(15) Overall response from tomato growers to these plants was excellent.

RECOMMENDATIONS: We recommend the following tests be conducted in 1987 under this project:

(1) To confirm studies which show planting does not have a negative affect on yield. Only one tray density needs to be tested here, preferrably the 288 cell size.

(2) To evaluate pelletized seed for germination and vigour.

(3) To develop a practical fertility program for growing tray plants.

(4) To evaluate high density tray plants, up the 512 cell trays.

(5) To evaluate methods of automated transplanting of these plants.

(6) To expand commercial plantings of tray plants to gain experience in growing larger volumes commercially. Also to increase exposure to commercial tomato growers.

PLUG PLANT TRIAL EVALUATIONS

PROJECT TITLE: **1986 TOMATO TRANSPLANT TRIAL E**

OBJECTIVES: To test the field performance of plug transplants (ultra-high density tray plants) grown in Ontario seedling greenhouses.

BACKGROUND: A grant from the Ontario Vegetable Growers' Marketing Board research trust fund. Funding from Agriculture Canada's New Crop Development Fund, Ontario Ministry of Agriculture and Food's Crop Introduction and Expansion Program completed the funding support. The Ontario Tomato Seedling Growers' Marketing Board and the H.J. Heinz Company were the other partners in the over-all project.

METHOD: Ontario Greenhouse plug transplants were produced by ten (10) growers.

A total of 22 tomato field growers planted plug plants in comparison to southern U.S. bare rooted transplants. Several field growers had multiple plantings at different dates and varieties used.

These were planted between May 4th to June 6th in Essex and Kent County commercial tomato fields. All soil types were included. Different tray cell sizes were also evaluated.

RESULTS (TRIAL E): All field results are presented in the following eight (8) tables.

OBSERVATIONS & CONCLUSIONS:

(1) Southern U.S. produced bare root transplants in 1986 were generally above average in quality. Field performance of southern plants was excellent. Planting weather in Ontario was very favourable for field establishment.

(2) The quality of locally produced plug plants was fair to very good. Greenhouse growers did experience problems in growing plug plants. This is mainly due to their exposure to a new technology. They produced approximately two million plug plants.

(3) Growers reacted positively to tray plants. Especially those growers which planted greater volumes. Growers found that handling procedures were different and some minor difficulties were encountered. However once field workers became more familiar

with tray plants, their efficiency improved and they preferred to handle plug plants. One major exception was when larger 200 speedling plants were used. These plants were taller, spindlier with larger root plug size. These plants tipped out of transplanter pocket mechanisms.

(4) 288 celled tray plants were the best received by growers. They required no major transplanter equipment changes. The field results indicated comparable yield performance. As well, 288 trays are more economical to produce in greenhouses because of improved recovery per square foot.

(5) Plug plants, the majority of time, yielded as well as or slightly better than U.S. southern plants in 1986.

(6) An overwhelming majority of growers plan to try plug plants again in 1987. Several wish to increase their acreage of plug plants used.

(7) Tomato processors are extremely cautious of the greenhouse plants. They require further field scale testing. Southern plants have a proven track record. The structure exists to handle them, is well established, and convenient to use.

(8) The expansion of plug plants will be gradual. The seedling growers produced a total of 6.5 million plants of which 2 million were tray plants. The 6.5 million plants accounts for approximately 2% of the volume used by the processing tomato industry. The domestic plant industry has declined to become an insignificant plant source. In order to increase the volume of domestically produced plants, overall field performance will have to be better than southern plants.

(9) Growers commented that greenhouse plug plants offered greater planting flexibility during adverse spring planting weather. A potential cost savings.

(10) Secondly, tomato growers wondered about the potential cost savings in handling, planting and establishing plug plants in comparison to southern plants especially if southern plant quality is less than it was in 1986.

(11) 1986 experience indicated that plug plants are comparable to southern plants in the field.

RECOMMENDATION:

(1) The field evaluation should be continued for at least another two years to develop a more reliable and realistic data base.

(2) The cost of field establishment between the two plant sources must be studied. This aspect of the project will be more feasible in 1987, because growers will be more familiar and better prepared to handle plug plants. More reliable cost comparisons can be drawn.

TABLE 1. TRIAL "A"

TRAY DENSITY/AGE STUDY

Planting Date	Tray Type	Transplant Age (Days)	Yield - Tons Per Acre Gyori	Epp (twin row)
May 8	P-200	> 51	23.33	17.26
		45 - 51	25.15	17.05
		< 45	25.52	18.62
	B-200	> 51	19.75	12.54
		45 - 51	18.94	21.42
		< 45	22.26	20.88
	B-288	> 51	18.58	18.96
		45 - 51	21.37	14.12
		< 45	20.04	17.61
	B-406	> 51	21.36	-
		45 - 51	22.03	-
		< 45	23.31	-
	Southern	-	23.81	14.13

- no statistical difference was found between treatments.
- harvested August 13
- variety H-2653

TABLE 2. TRIAL "A"

TRAY DENSITY/AGE STUDY

Planting Date	Tray Type	Transplant Age (Days)	Yield - Tons Per Acre Gyori	Epp (twin row)
May 18 - Gyori May 26 - Epp	P-200	> 48	16.84	36.00
		40 - 48	18.54	32.27
		< 40	19.92	33.54
	B-200	> 48	16.84	35.91
		40 - 48	18.54	33.99
		< 40	19.92	33.27
	B-288	> 48	17.32	36.8
		40 - 48	17.68	34.91
		< 40	19.14	35.73
	B-406	> 48	15.68	-
		40 - 48	20.28	-
		< 40	19.93	-
	Southern	-	15.56	32.26

- no statistical differences were found between treatments.
- harvested August 30
- variety H-2653

TABLE 3. TRIAL"A"

TRAY DENSITY/AGE STUDY

Planting Date	Tray Type	Transplant Age (Days)	Yield - Tons Per Acre Gyori	Epp(twin row)
June 2	P-200	40 - 48	22.06	27.71
		< 40	20.04	29.90
	B-200	40 - 48	20.97	35.11
		< 40	22.38	34.82
	B-288	40 - 48	22.32	31.72
		< 40	23.30	32.81
	Southern		18.77	33.87

- variety H-2653
- harvested September 14
- no statistical difference was found between treatments.

TABLE 4. TRIAL"B"

ADVANCED TRIAL - TOMATO TRAY TRANSPLANTS

Tray Type	Yield-Tons Per Acre Lonsbery Harv. Sept. 2	Kudroch Harv. Sept.14
P-200	18.15	21.17
B-200	18.75	20.69
B-288	18.99	21.63
Southern	18.07	19.89

- no statistical difference was found between plots.
- variety H-2653
- planting dates - Lonsbery - May 31
  - Kudroch - May 27

- May 21 - intended planting date
- Planted June 02

TABLE 5. TRIAL "C" & "D""

TRAY DENSITY STUDY

Tray Type	Plants/Sq. Ft.	(twin row) Epp	Gyori
P-200	85	31.89	15.97
B-288	170	35.08	15.00
B-288/2	85	-	15.61
B-406	235	34.27	14.95
B-406/2	118	31.81	15.37
Southern	-	29.35	15.79

- no statistical difference was found between treatments.
- variety H-2653
- planted May 8
- harvested August 30

TABLE 6. TRIAL "E"

Plant stand, harvest date and yield evaluations

Planting Period - May 1-10
Cultivar - H2653

LOCATION		STAND % Planting	STAND % 21 days	HARVEST DATE	YIELD (tons/acre)	YIELD CHANGE (tons/acre)
Mailloux (2653)	(288)	95	91	8/20	11.0	- .5
	S	99	95	8/20	11.5	
Martin (2653)	(288)	96	89	8/18	17.3	+6.5
	S	94	92	8/18	10.8	
Serran (2653)	(288)	97	93	8/15	34.0	+7.0
	S	97	91	8/10	27.0	
Bicrel (7107)	(288)	96	90	9/15	19.0	-3.0
	S	97	95	9/15	22.0	

Average

2653 yield P - 20.8 t/a
S - 16.4 t/a

TABLE 7.

Planting Period - May 11-20

LOCATION		STAND % Planting	STAND % 21 days	HARVEST DATE	YIELD (tons/acre)	YIELD CHANGE (tons/acre)
De Lellis (2653)	(200)	98	97	8/12	24.0	+8.0+
	S	95	90	8/12	16.0	
Mailloux (832)	(288)	93	90	8/23	20.4	+ .8
	S	98	93	8/23	19.6	
Mailloux (7814)	(288)	98	94	9/3	20.9	+1.5
	S	99	99	9/1	19.4	
Tiessen (6203)	(200)	100	96	9/4	22.0	+3.0
	S	96	89	9/4	19.0	

TABLE 8.

Planting Period - May 21 - June 10

LOCATION		STAND% Planting	STAND% 21 days	HARVEST DATE	YIELD (tons/acre)	
Adamson (722)	(288)	98	94	10/1	20.0	Ave. Yield P 22.0
	S	99	98	10/1	25.0	S 21.2
DeLellis (722)	(200)	92	79	9/19	18.4	Ave. Yield change
	S			9/19	15.3	.8 ton/ac. yield adv. to plugs
Gyori (722)	(200)	99	97	9/30	27.2	
	S	100	97	9/30	25.1	
Wiper (722)	(200)	100	97	10/9	22.5	
	S	100	99	10/9	19.5	
Cilbulka (7107)	(Sp)	98	-	9/10	32.6	Ave. Yield Sp 27.9
	S	99	-	9/10	35.8	S 30.2
Luth (7107)	(Sp)	95	89	9/18	27.0	Ave. Yield change
	S	99	97	9/16	29.0	2.3 ton/ac. yield adv. to southern
Poppe (7107)	(Sp)	96	91	9/18	27.0	
	S	99	98	9/16	29.0	
Seliga (7107)	(Sp)	97	79	-	25.0	
	S	99	91	-	27.0	
Bicrel (7107)	(288)	100	85	9/23	19.0	
	S	100	81	9/23	22.0	
Mailloux (8243)	(288)	95	89	9/21	26.1	
	S	99	93	9/30	27.1	
Neal (7038)	(200)	97	95	-	15	
	S	97	60	-	13.5	

Sp - Speedling 200 tray
S - Southern
200- Blackmore 200 cells per tray
288- Sutton 288 cells per tray

TABLE 9.

Percentage plant stand bearing green fruit*

CULTIVAR	SOUTHERN	PLUG
2653	43.6	11.5
7814	17.0	1.0
6203	12.3	3.6

* Evaluated approximately 21 days after planting.

TABLE 10.

FIELD YIELD REPORT (Appendix)

Yield(tons/acre)

LOCATION (Cultivar)	PLANT TYPE			
	PLUG			SOUTHERN
	200	288	Speedling	
Bednairick (7107)			31.8	
Bicrel (7108)				22.0
DeLellis (6203)	18.3			
VanDeVelde (7107)			28	28
Kettle & Sherk (6203)		21.0		
Keller (6203)	22.9			
(722)	21.0			
Chauvin (2653)		20.0		
Gyori (6203)	37.0			
(9464)				16.0
Stallaert (7107)	-	-	-	-
Piacek (7107)	flooded			
Hoogsteen (6203)	flooded			
Martin (4135)				
(8243)		15.6		
(722)		23.5		

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