LITERATURE CITED

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YIELD TRIALS OF TOMATO IN GREENHOUSES IN HAWAII:

Part I. Yield Trials of Cultivars at Three Locations
Part II. Cv. 'Tropic' Tomato Yield and Quality Changes with Time in the Greenhouse

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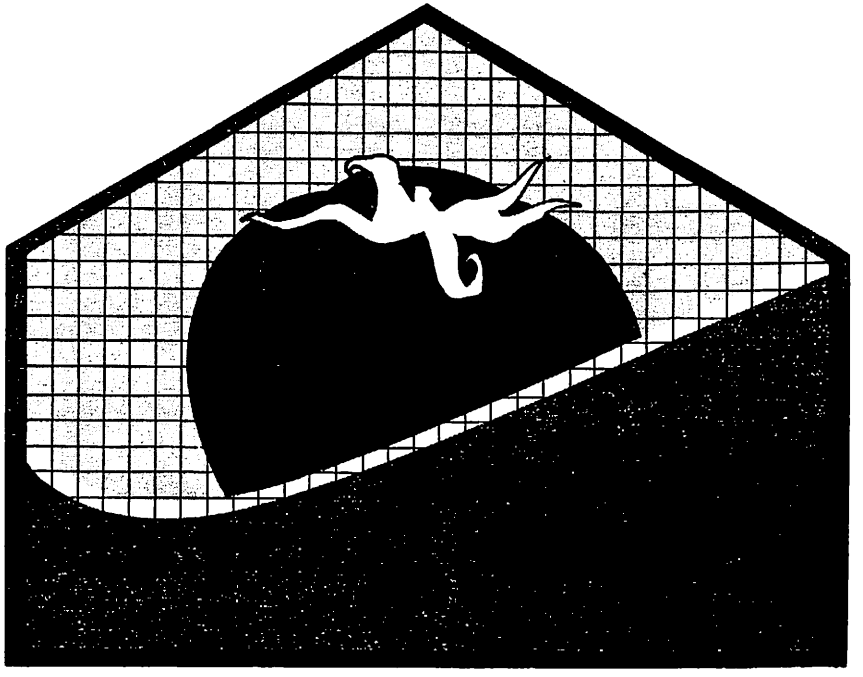

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YIELD TRIALS OF TOMATO IN GREENHOUSES IN HAWAII:

Part I. Yield Trials of Cultivars at Three Locations
Part II. Cv. 'Tropic' Tomato Yield and Quality Changes with Time in the Greenhouse

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INTRODUCTION

The importance of selecting the best tomato cultivar for highly intensive greenhouse production can be, indeed, staggering when one considers that every 1 pound of fruit per plant represents 10,000 to 12,000 pounds per acre per crop. Environmental and cultural techniques can greatly affect the performance of individual cultivars; in fact, optimal conditions for one cultivar may very often prove to be less than ideal for another cultivar.

Therefore, it is probable that yield results of various cultivars might be different if the plants were exposed to different cultural or environmental conditions. Since even unheated greenhouses increase air temperatures for about two-thirds of the day (*1*), the performance of cultivars growing in greenhouses will vary radically from those raised outside; in fact, in cool upper elevation sites like Volcano, on the Island of Hawaii, it is questionable whether an economical return could be obtained from field-grown tomatoes.

The objective of the research reported herein was to determine the yield and quality of various commercially available tomato cultivars for greenhouse production in three of the State of Hawaii's vegetable-producing areas. In addition, the yield and quality changes of the cultivar 'Tropic' will be observed over its time span in the greenhouse.

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MATERIALS AND METHODS

Cultural information follows each experiment. Temperature data are included in Table 6. Research sites included: Volcano Experimental Station, Island of Hawaii, elevation 4,000 feet, Manu silt loam soil; Kainaliu Experimental Station, Island of Hawaii, elevation 1,500 feet, Honuaulu clay loam soil; and Pulehu Experimental Substation, Island of Maui, elevation 2,000 feet, Hanalei silty clay loam soil.

Unfortunately, the grading standards were not uniform over the three locations. The major discrepancy occurred in the categories unmarketable, cull, and salable offgrade. Prevailing local grower standards were used as the primary references for these categories. Hawaii grades 1 and 2 were more or less comparable; in general, grading was, perhaps, stricter than practiced on commercial operations and, hence, the percentage of grade 1 fruit may appear lower than that found on commercial farms.

RESULTS:

PART I. YIELD TRIALS OF TOMATO CULTIVARS IN GREENHOUSES AT THREE LOCATIONS IN HAWAII

Volcano Trials I and II

Data from trials I and II are presented in Tables 1 and 2. Yields and quality (percent grade 1) of almost all the cultivars were lower in trial II. This may be at least partially explained by the cooler average low temperatures encountered in trial II (Table 6). 'Big Girl Hybrid' performed especially erratically between trials. In trial I, it performed the best, while in trial II, yield and percent grade 1 fruits were less than two-thirds of those of the best performing cultivars.

'Tropic' performed the best in the two trials; the salable yield per plant and the percent grade 1 were not significantly different from those of the best performing cultivars in both trials.

Among the cultivars tested in both trials, the following cultivars performed well: 'Bigset Hybrid', 'Big Girl Hybrid', 'Walter', 'Tuckcross 533 Hybrid', and 'Monte Carlo VFN Hybrid'. Cultivars with a fair performance in both trials included 'Ohio-Indiana Hybrid', 'Vendor', and '6718 VF Hybrid'. 'Michigan-Ohio Hybrid' yielded well in both trials but the percent grade 1 was low; 'Royal Flush' yielded poorly but maintained a percent grade 1 that was not significantly different from that of the best performing cultivar. Cultivars that were tested in only one trial and performed well include 'U.H. N-5' and 'Floramerica'.

Generally, the hybrids performed better than the nonhybrids, but three exceptions included 'Tropic', 'Vendor', and 'Walter'.

'Walter', 'Bigset Hybrid', and 'MH-1', all determinate cultivars, performed well in trial I when they were allowed a 2-foot spacing between plants to help accommodate their bushy habit. However, their yields dropped sharply in trial II; this was due to the time of planting and to the decreased spacing between plants that was cut to only 1 foot, which is an economic necessity for greenhouse tomatoes. The results of these trials indicate that while some determinate cultivars performed well, several indeterminate cultivars such as 'Tropic' performed better. This, combined with the difficulty of deciding how to prune determinate cultivars, will prevent most growers from using determinate cultivars.

Kainaliu Trial

The Kainaliu temperatures were higher than those at Volcano (Table 6), resulting in more rapid growth and an earlier first harvest. Yield data are presented in Table 3.

Although 'N-89' had the most clusters and the most fruit per cluster, its yield was not significantly higher than that of the other cultivars. In fact, 'N-89' had the lowest percentage of grade 1 fruits. It appears that, because of its rank growth, 'N-89' is not suited for greenhouse culture.

The cultivars 'N-91' and 'N-93' both yielded well and had a high percentage of grade 1 fruit. These cultivars began bearing fruit 1 week earlier than 'Tropic', and their vegetative growth was less rank than that of 'Tropic'. In addition, 'N-91' and 'N-93' have resistance to root-knot nematode, tobacco mosaic virus (TMV), common strain of spotted wilt virus, and other diseases. Under conditions where nematodes and TMV are present, 'N-91' and 'N-93' would be superior to 'Tropic', which is susceptible to both diseases. It appears that 'N-91' and 'N-93' offer a reasonable alternative to 'Tropic' for Kona greenhouse growers; in fact, the superior nematode and disease resistance of 'N-91' and 'N-93' may make these varieties very desirable in the immediate future.

Cultivars 'N-90' and 'N-92' were not tested adequately due to the lack of space. They were placed on border rows so that more sunlight was received; a higher yield might have been expected for this reason.

'Tropic' grafted on 'Kewalo' yielded slightly lower; this was probably due to a slower start. The purpose of grafting was to obtain nematode resistance.

Pulehu Trials I and II

Yield data are presented in Tables 4 and 5.

'Floradel' outyielded both 'U.H. N-53' and 'Tropic', but 'Tropic' did not differ significantly in the percentage of grade 1 fruits in trial I. The yields of both 'Tropic' and 'Vendor' were very good in trial II. Although the total salable yields were not significantly different, 'Tropic' provided more grade 1 fruits.

Considering the relatively favorable temperatures (Table 6), the time from transplanting to first harvest may appear slightly longer than expected; first harvest could have been hastened by planting older transplants.

Table 1. Volcano trial I

Cultivar	Growth habit	Seed source[1]	Harvest dates	Number of pickings	Total salable yield/plant[2] Number of fruits	lb/plant	Percent Hawaii grade 1 (by weight)
Big Girl Hybrid	I	B	8/30-12/6	24	30.5 ef	13.41 a	61.5 a
U.H. N-5	I	UH	8/30-12/20	26	35.3 d	13.40 a	44.4 bcdef
Walter[3]	D	K	8/30-12/6	24	38.4 c	13.16 a	52.0 abcd
Tuckcross 533 Hybrid	I	P	9/2-12/20	25	38.9 c	13.06 a	39.7 def
875 Michigan-Ohio Hybrid	I	H	9/2-12/20	25	42.6 ab	12.65 a	37.1 ef
Bigset Hybrid[3]	D	P	8/25-12/6	25	34.7 d	12.54 a	48.8 bcde
Monte Carlo VFN Hybrid	I	P	8/30-12/20	26	33.2 de	11.99 a	39.9 cdef
Michigan-Ohio Hybrid	I	P	9/2-12/20	25	40.8 bc	11.85 a	38.2 ef
Ohio-Indiana Hybrid	I	P	8/25-12/20	27	35.5 d	11.62 a	42.1 cdef
Tropic	I	UH	8/30-12/13	25	17.1 i	11.60 a	56.8 ab
MH-1[3]	D	K	8/13-12/6	26	34.3 d	11.50 ab	46.0 bcdef
Vendor	I	S	8/25-12/20	26	28.8 fg	9.48 bc	43.4 cdef
Early Girl Hybrid	I	B	8/23-12/6	26	45.3 a	9.45 bc	10.8 h
6718 VF Hybrid	D	P	8/25-12/6	25	27.3 g	8.40 cd	41.2 cdef
U.H. N-93	I	UH	8/30-12/13	25	26.4 gh	8.37 cd	42.2 cdef
U.H. N-91	I	UH	8/25-12/6	25	27.3 g	8.13 cde	36.1 fg
Homestead	D	K	8/25-12/6	25	24.0 h	7.51 cde	38.9 ef
Royal Ace	D	FM	8/30-12/6	24	18.4 i	7.29 de	47.0 bcdef
662 VFM	D	P	8/25-12/6	25	18.8 i	6.94 de	40.6 cdef
U.H. Healani	D	UH	8/30-12/6	24	27.2 g	6.58 de	25.5 g
Royal Flush	D	FM	8/25-12/6	25	17.3 i	6.21 e	52.5 abc

Table 1. Volcano trial I–(Continued)

Cultivar	Grade 1		Grade 2		Offgrade	
	Number of fruits	lb/plant	Number of fruits	lb/plant	Number of fruits	lb/plant
Big Girl Hybrid	17.1 a	8.78 a	2.6 jklm	0.71 efg	10.9 ij	3.92 efghi
U.H. N-5	13.2 bc	5.95 abc	2.8 jkl	0.83 efg	19.3 bc	6.62 a
Walter[3]	16.7 a	6.92 ab	3.8 hi	1.64 c	18.0 cd	4.60 cdefgh
Tuckcross 533 Hybrid	12.3 c	5.14 bcd	6.1 e	1.73 c	20.4 b	6.19 abc
875 Michigan-Ohio Hybrid	12.7 bc	4.67 bcd	9.5 c	2.61 b	20.4 b	5.37 abcde
Bigset Hybrid[3]	14.2 b	6.10 abc	2.3 klm	0.64 fg	18.3 cd	5.80 abcd
Monte Carlo VFN Hybrid	10.4 d	4.81 bcd	2.9 jk	0.93 def	19.9 b	6.25 ab
Michigan-Ohio Hybrid	12.7 bc	4.56 bcde	11.0 b	2.98 b	17.1 def	4.31 defgh
Ohio-Indiana Hybrid	12.3 c	4.81 bcd	5.9 e	1.11 cdef	17.3 de	5.13 abcdef
Tropic	8.7 def	6.59 ab	2.1 lm	0.98 def	6.3 l	4.04 efgh
MH-1[3]	13.2 bc	5.31 bcd	4.9 f	1.33 cde	16.3 efg	4.87 bcdefg
Vendor	10.0 d	4.11 bcde	6.0 e	1.56 cd	12.8 h	3.80 efghi
Early Girl Hybrid	3.5 i	1.04 f	17.5 a	3.86 a	24.3 a	4.55 defgh
6718 VF Hybrid	9.2 de	3.44 cdef	3.1 ij	0.77 efg	15.1 g	4.19 defgh
U.H. N-93	9.1 de	3.61 cdef	4.2 fgh	1.19 cdef	13.0 h	3.56 fghi
U.H. N-91	7.4 efg	2.93 def	4.0 gh	1.15 cdef	15.8 fg	4.05 efgh
Homestead	7.3 fg	2.94 def	4.7 fg	1.31 cde	12.0 hi	3.25 hi
Royal Ace	6.9 g	3.45 cdef	0.9 n	0.27 g	10.6 j	3.57 fghi
662 VFM	5.9 gh	2.83 def	2.3 klm	0.74 efg	10.7 j	3.38 ghi
U.H. Healani	4.9 hi	1.68 ef	7.3 d	1.76 c	15.0 g	3.13 hi
Royal Flush	7.5 ef	3.24 cdef	1.9 m	0.56 fg	7.9 k	2.41 i

[1] Seed source: B = Burpee H = Harris P = Petoseed UH = University of Hawaii
FM = Ferry Morse K = Kilgore S = Stokes

[2] Any two numbers in the same column followed by the same letter(s) are not significantly different by the Duncan's new multiple range test (5% level).

[3] Plant spacing–2 ft; all others spaced 1 ft. Growth habit: D = Determinate; I = Indeterminate.

Table 2. Volcano trial II

Cultivar	Growth habit	Seed source	Harvest dates	Number of pickings	Total salable yield/plant		Percent Hawaii grade 1 (by weight)
					Number of fruits	lb/plant	
Tuckcross 533 Hybrid	I	P	5/3-8/22	29	35.7 abc[1]	11.27 a	22.8 abc
Tropic	I	UH	5/16-8/22	28	27.3 abcde	10.29 ab	29.7 a
Big Early Hybrid	I	B	5/10-8/22	30	36.8 ab	9.71 ab	14.0 efg
Michigan-Ohio Hybrid	I	P	5/1-8/22	29	41.5 a	9.52 abc	14.2 defg
Monte Carlo VFN Hybrid	I	P	5/10-8/22	30	28.8 abcde	8.91 abcd	18.0 bcde
6718 VF Hybrid	D	P	5/10-8/22	30	30.5 abcde	8.85 abcd	17.7 bcde
VF Hybrid	I	B	5/3-8/22	29	26.7 bcde	8.71 abcde	11.9 efg
Vineripe Hybrid	D	P	5/10-8/22	30	25.8 bcde	8.66 abcdef	7.3 g
Vendor	I	S	5/10-8/22	30	29.6 abcde	8.44 bcdef	15.9 bcde
Ohio-Indiana Hybrid	I	P	5/16-8/22	28	30.5 abcde	8.24 bcdef	18.5 bcde
Floramerica Hybrid	D	P	5/10-8/15	29	26.6 bcde	7.96 bcdef	23.9 ab
Homestead	D	K	5/13-8/15	28	30.7 abcde	7.77 bcdef	13.9 efg
Bigset Hybrid	D	P	5/10-8/22	30	25.8 bcde	7.66 bcdefg	24.4 ab
Big Girl Hybrid	I	B	5/13-8/22	29	21.3 cde	7.16 cdefgh	18.8 bcde
Royal Flush	D	FM	5/10-8/15	29	21.0 de	6.55 defgh	22.1 abcd
Walter	D	K	5/10-8/22	30	24.6 bcde	6.40 defgh	24.3 ab
MH-1	D	K	5/10-8/15	29	25.3 bcde	6.13 efgh	15.1 cdef
Royal Ace VF	D	FM	5/13-8/22	29	19.1 de	6.08 fgh	12.9 efg
Royal Ace	D	FM	5/13-8/22	29	17.3 e	5.20 gh	7.9 fg
Roma VF[2]	I	K	5/16-8/14	14	32.4 abcd	4.84 h	

Table 2. Volcano trial II–(Continued)

Cultivar	Grade 1		Grade 2		Offgrade	
	Number of fruits	lb/plant	Number of fruits	lb/plant	Number of fruits	lb/plant
Tuckcross 533 Hybrid	6.3 a	2.54 ab	4.5 b	1.21 b	24.9 abcd	7.52 ab
Tropic	7.1 a	3.14 a	2.5 cd	0.69 cd	17.7 de	6.47 abcde
Big Early Hybrid	3.4 a	1.25 cde	2.5 cd	0.60 de	30.9 a	7.87 a
Michigan-Ohio Hybrid	3.5 a	1.37 cde	7.6 a	1.80 a	30.4 ab	6.34 abcde
Monte Carlo VFN Hybrid	4.0 a	1.63 bcd	1.9 def	0.50 def	22.9 abcde	6.77 abcd
6718 VF Hybrid	4.0 a	1.57 cd	2.0 def	0.54 def	24.5 abcde	6.74 abcd
VF Hybrid	2.6 a	1.07 cdef	1.0 defg	0.30 efgh	23.1 abcde	7.34 abc
Vineripe Hybrid	1.4 a	0.63 ef	0.5 fg	0.13 h	24.1 abcde	7.90 a
Vendor	4.4 a	1.64 bcd	3.6 bc	0.95 bc	21.6 cde	5.86 abcde
Ohio-Indiana Hybrid	4.0 a	1.51 cde	4.4 b	1.12 b	22.1 bcde	5.61 bcde
Floramerica Hybrid	4.9 a	1.89 bc	2.0 def	0.50 def	19.7 cde	5.57 bcde
Homestead	2.9 a	1.06 cdef	1.3 defg	0.36 defgh	26.5 abc	6.35 abcde
Bigset Hybrid	4.4 a	1.89 bc	2.1 cde	0.56 de	19.3 cde	5.21 cde
Big Girl Hybrid	3.4 a	1.36 cde	1.7 def	0.46 defg	16.4 de	5.34 bcde
Royal Flush	3.3 a	1.42 cde	0.7 efg	0.21 fgh	17.0 de	4.95 de
Walter	4.0 a	1.56 cd	2.1 cde	0.55 de	18.5 cde	4.29 e
MH-1	2.6 a	0.92 def	2.3 cd	0.57 de	20.4 cde	4.63 de
Royal Ace VF	1.9 a	0.83 def	0.5 fg	0.16 gh	16.8 de	5.12 de
Royal Ace	1.1 a	0.43 f	0.4 g	0.11 h	15.8 a	4.67 de
Roma VF[2]						

[1] Any two numbers in the same column followed by the same letter(s) are not significantly different by the Duncan's new multiple range test (5% level).

[2] Fruit is pear- to plum-shaped.

Table 3. Kainaliu trial

Cultivar	First harvest dates	Total salable yield/plant		Percent Hawaii grade 1 (by weight)	Number of clusters	Number of fruits/ cluster	Grade 1		Grade 2		Cull	
		Number of fruits	lb/plant				Number of fruits	lb/plant	Number of fruits	lb/plant	Number of fruits	lb/plant
Tropic	2/3/75	37.9 a[1]	13.0 a	72.8 a	8.1 a	4.7 a	22.5 a	9.5 c	6.4 a	1.8 a	9.0 a	1.7 a
Tropic (grafted onto Kewalo)	2/7/75	38.4 a	11.7 a	67.9 a	7.8 a	4.9 a	20.1 a	7.9 ab	6.9 a	1.9 a	11.5 a	1.9 a
N-89	1/27/75	49.4 c	12.4 a	53.8 b	9.3 a	5.4 a	19.1 a	6.7 a	11.4 c	2.7 b	19.0 b	3.0 b
N-91	1/27/75	44.4 bc	12.8 a	67.4 a	9.0 a	5.0 a	23.3 a	8.6 bc	9.0 b	2.2 a	12.2 a	2.0 a
N-93	1/27/75	43.1 ab	12.2 a	68.2 a	8.4 a	5.2 a	22.4 a	8.3 bc	8.3 ab	2.0 a	12.4 a	1.9 a
N-90[2]	2/3/75	48.6	13.6	58	9.3	5.2	21.5	8.0	9.3	2.3	17.9	3.3
N-92[2]	1/30/75	41.7	12.3	66	8.8	4.7	22.4	8.2	7.1	1.9	12.2	2.2

[1] Any two numbers in the same column followed by the same letter(s) are not significantly different by the Duncan's new multiple range test (5% level).

[2] Statistics were not conducted on N-90 and N-92 because there were only two replicates of each and, also, they were on the guard lines.

Table 4. Pulehu trial I

Cultivar	First harvest date[1]	Total salable lb/plant	Grade 1		Grade 2 lb/plant	Small lb/plant	Unmarketable lb/plant
			% by weight	lb/plant			
U.H. N-53	1/8/73	5.25 c	24 b	3.17 c	1.51 b	0.58 b	8.06 a
Floradel	1/15/73	9.00 a	37 a	5.66 a	2.24 a	1.10 a	6.13 b
Tropic	1/15/73	7.69 b	35 a	4.95 b	2.23 a	0.50 b	6.36 b

[1] Final harvested date: 4/9/73.

[2] Any two numbers in the same column followed by the same letter are not significantly different by the Duncan's new multiple range test (5% level).

Table 5. Pulehu trial II

Cultivar	Total salable lb/plant[1]	Grade 1		Grade 2 lb/plant	Small lb/plant	Unmarketable lb/plant
		% by weight	lb/plant			
Vendor	11.75 a[2]	42 b	6.89 b	2.58 a	2.27 a	4.84 a
Tropic	12.48 a	53 a	8.89 a	2.79 a	0.80 b	4.20 a

[1] Harvest period: 2/6/74–5/21/74.

[2] Any two numbers in the same column followed by the same letter are not significantly different by the Duncan's new multiple range test (5% level).

Table 6. Monthly average high and low outside temperatures (°F) for the five tomato trials at Volcano, Kainaliu, and Pulehu

Month	Volcano Trial I Avg high	Volcano Trial I Avg low	Volcano Trial II Avg high	Volcano Trial II Avg low	Kainaliu Avg high	Kainaliu Avg low	Pulehu Trial I Avg high	Pulehu Trial I Avg low	Pulehu Trial II Avg high	Pulehu Trial II Avg low
January			67.9	43.8	75.7	59.0	77.5	59.1	72.0	60.4
February			65.5	47.1	75.3	59.5	76.3	57.4	73.6	56.2
March			58.1	49.4	74.4	59.0	80.3	60.0	74.7	57.2
April			61.4	50.5	73.9	60.1	78.2	60.6	76.3	58.0
May	62.3	51.2	62.8	49.7	72.8	61.1			77.6	59.1
June	63.5	51.1	65.6	50.6						
July	65.7	52.8	65.2	52.4						
August	67.9	53.0								
September	69.6	52.6					85.1	65.4		
October	66.8	52.5			78.9	63.7	84.8	65.8	80.0	62.2
November	65.6	50.9			77.9	61.7	81.0	63.0	76.3	61.0
December	64.2	48.4	64.2	48.4	77.2	60.7	76.7	60.3	73.2	57.4

Cultural Information for Volcano Trials I and II

	Trial I	Trial II
Seed sowed in flats	5/5/76	12/23/76
Transplant into 4-inch pots	5/19/76	1/11/77
Transplant into greenhouse	6/17/76	2/9/77
Plants topped	10/7/76	6/14/77

Spacing

Between rows–4 ft

Between plants–1 ft except for cv. 'Walter', 'Bigset Hybrid', and 'MH-1' (2 ft) in trial I.

Pruning

Indeterminate plants were pruned to a single stem.

Determinate plants in trial I were pruned lightly to avoid excessive bushiness and in trial II to a single stem up until a height of 18 inches after which only light pruning was exercised.

Replications

There were three replications of all cultivars.

Fertilizer Program

Soil test prior to trial I[1]

pH	=	6.22	good
phosphorus	=	160 ppm	high
potassium	=	30 ppm	low
calcium	=	2160 ppm	good
magnesium	=	670 ppm	good

	Trial I	Trial II
Preplant, broadcast, and rototilled	(6/15/76)	(2/1/77)
Treble superphosphate	11 lb/1000 sq ft	11 lb/1000 sq ft
K Mag	11 lb/1000 sq ft	2.2 lb/1000 sq ft
Magnesium sulfate	(None)	4.5 lb/1000 sq ft

On 6/17/76 and 2/8/77, one pint of transplant solution (3 lb diammonium phosphate/100 gal water) was applied per plant.

Trial I: From 7/13 to 9/7/76, there were 9 weekly applications of Foliar 63 (21–21–21) through the drip irrigation line at the rate of 2.2 lb/1000 sq ft = 19.8 lb/1000 sq ft.

From 9/14 to 11/4/76, there were 8 weekly applications of potassium nitrate through the drip irrigation line at the rate of 2.2 lb/1000 sq ft = 17.6 lb/1000 sq ft.

[1] Test results from Y. N. Tamimi, Department of Agronomy and Soil Science, University of Hawaii.

Trial II: From 4/13 to 6/15/77, there were 10 weekly applications of Foliar 60 (20–20–20) through the drip irrigation line at the rate of 2.2 lb/1000 sq ft = 22 lb/1000 sq ft.

Irrigation

Drip irrigation was used.

Trial I: There were 40 irrigations lasting from 15 minutes to 2 hours. Total water consumption was approximately 30 gallons/plant.

Trial II: There were 19 irrigations lasting from 15 minutes to 5 hours. Total water consumption was approximately 23 gallons/plant.

Pesticide Application

	Number of applications	
Pesticide	Trial I 6/25/76–9/10/76	Trial II 2/16/77–6/24/77
Benlate	6	7
Cygon	3	2
Lannate	1	4
Manzate	7	9
M-45	1	1
Foliar fertilizer		
Calcium nitrate (4 lb/100 gal)	5	6

Cultural Information for Kainaliu Trial

Seeded: 10/25/74 (except for 'Kewalo', which was seeded 10/15/74)
'Tropic' grafted onto 'Kewalo' rootstock on 11/11/74
Transplanted into greenhouse: 11/21/74
Plants topped: 3/4/75
Final harvest date: 5/19/75

Spacing

Between rows: 4 ft
Between plants: 1 ft

Pruning

All plants were indeterminate.
All plants were pruned to a single stem.

Replications

There were four replications except for 'N-90' and 'N-92', which were replicated only twice.

Fertilizer Program

One pint of a diammonium phosphate solution was applied per plant at transplanting. The following fertilizer applications were made through the drip irrigation lines:

diammonium phosphate	229 lb/acre
potassium nitrate	564 lb/acre
calcium nitrate	1683 lb/acre

Applications were made in the following ratios: weeks 0 to 3 = 0, weeks 4 to 6 = 0.4X, weeks 7 to 9 = 0.7X, weeks 10 to 20 = 1.0X.

Irrigation

Drip irrigation was used.
Irrigation was applied when the tensiometer reading reached 20 centibars.

Pesticide Application

Cygon–twice per week until 1/25/75
Diazinon–once per week until termination of crop
Lannate–once per week from second week after transplanting
Bravo and M-45–alternated once per week
A methyl bromide fumigation was applied prior to the previous tomato crop.

Cultural Information for Pulehu Trials I and II

	Trial I	Trial II
Seeded:	9/19/72	10/9/73
Transplanted into greenhouse:	10/12/72	11/1/73

Spacing

Between rows: 2.0–3.7–2.0–3.7 ft
Between plants: 1.5 ft

Pruning

Plants were pruned to a single stem.

Replications

Twelve replications were derived from fertilizer treatment variables among which no significant differences were found.

Fertilizer Program

Preplant applications of the following were made:

borax	47 lb/acre
copper sulfate	20 lb/acre
magnesium sulfate	300 lb/acre
potassium sulfate	222 lb/acre
treble superphosphate	500–3500 lb/acre to adjust to 0.3 ppm P
zinc sulfate	30 lb/acre

Ammonium phosphate (1 lb/40 gal) was applied to the newly transplanted seedlings at the rate of 0.5 pint/plant.

Six replicates were fertilized with Osmocote (19–6–13) at N rates of 172–1029 lb/acre.

Six replicates were fertilized through the irrigation lines with calcium nitrate, 11–48, and urea at N rates 172–1029 lb N/acre as follows: weeks 4 to 6–0.4X, weeks 7 to 9–0.7X, and weeks 10 to 20–1.0X. A total of 500 lb/acre potassium sulfate was metered through the lines during weeks 7 to 20.

Irrigation

A drip irrigation system was used. Irrigation rate was maintained at a tensiometer range of 0.1–0.6 bar. Therefore, water was not a limiting factor.

Pesticide Application

Telone was applied at 30 gal/acre prior to trial I (9/6/72), and methyl bromide was applied prior to trial II (10/23/73).

	Number of applications	
	Trial I	Trial II
Pesticide	10/17/72-3/19/73	11/7/73-4/17/74
Botran	2	
Bravo	6	10
Cygon	20	24
Diazinon	21	7
Kocide		2
Lannate	1	17
Malathion	4	
M-45	15	7
Parathion	2	
Foliar fertilizer		
Calcium chloride		20
Calcium nitrate	11	3

RESULTS:

PART II. CV. 'TROPIC' TOMATO YIELD AND QUALITY CHANGES WITH TIME IN THE GREENHOUSE

The changes of yield and quality with time in the greenhouse are important factors that can aid a grower to decide when to terminate his crop. The cultivar 'Tropic' was chosen for this study since it was tested and performed well in the five trials at three locations described previously.

The performance of the cultivar 'Tropic' varied markedly (Figs. 1–5); this can be attributed to differences in soil, temperature, light, cultural procedures, and standards of grading the fruit. Generally, the trials all show an increase in offgrade or unmarketable fruit along with a decrease in the rate of grade 1 yield increase after 160 days in the greenhouse. In fact, excepting for Pulehu trial I, the weight of grade 1 fruit/day in the greenhouse (including the days from transplanting to first harvest) declines after 165 days for Volcano trial I, 173 days for Volcano trial II, 166 days for the Kainaliu trial, and 175 days for Pulehu trial II. The optimum time period for grade 1 fruit/day in the greenhouse would be extended somewhat if the time between crops is added to the days in the greenhouse.

This information can then be evaluated along with market conditions, ease of picking, pruning and spraying, and cost to clean out the old crop and establish a new crop to determine an optimum time to terminate the crop.

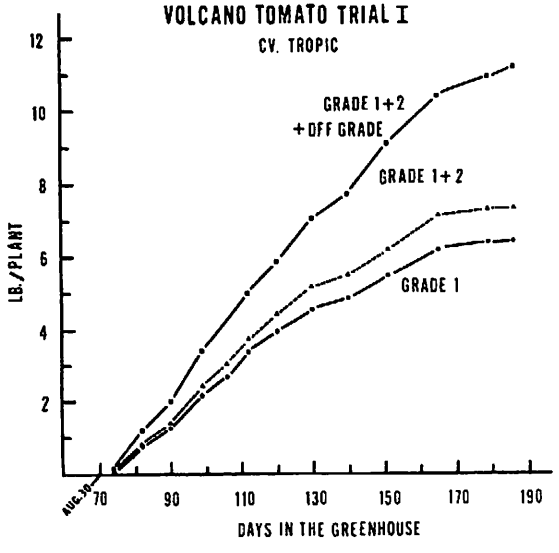

Figure 1. Accumulative yield of cv. 'Tropic' tomato over the time in the greenhouse in trial I at the Volcano Experimental Farm.

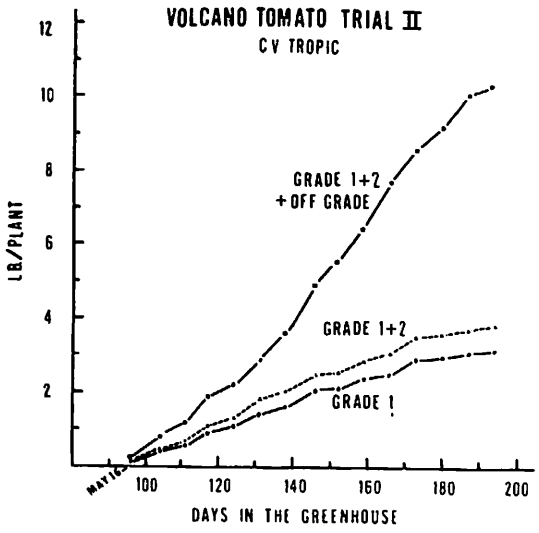

Figure 2. Accumulative yield of cv. 'Tropic' tomato over the time in the greenhouse in trial II at the Volcano Experimental Farm.

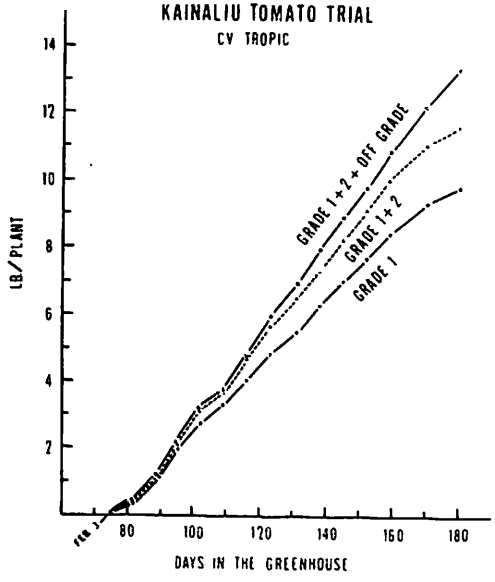

Figure 3. Accumulative yield of cv. 'Tropic' tomato over the time in the greenhouse at the Kainaliu Experimental Farm.

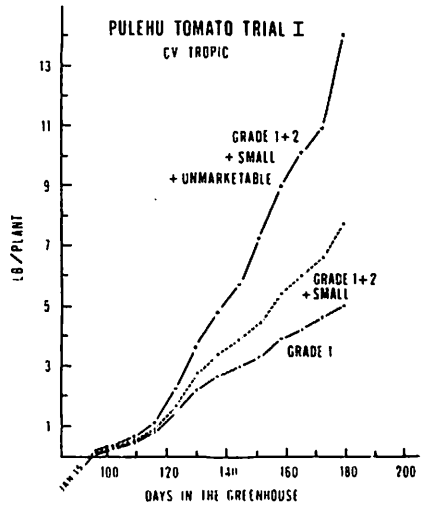

Figure 4. Accumulative yield of cv. 'Tropic' tomato over the time in the greenhouse in trial I at the Pulehu Experimental Farm.

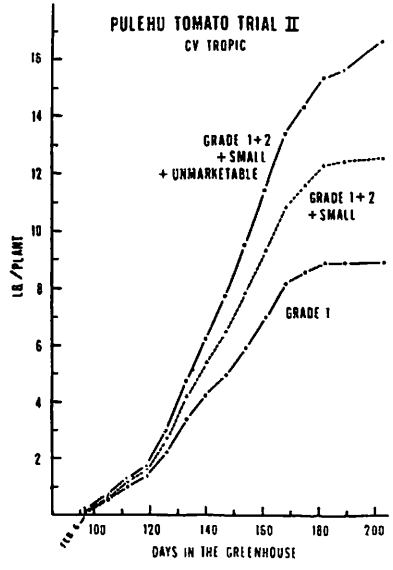

Figure 5. Accumulative yield of cv. 'Tropic' tomato over the time in the greenhouse in trial II at the Pulehu Experimental Farm.