

Project Title: UC Division of Agriculture and Natural Resources Statewide Processing Tomato Variety Evaluation Trials, 2002

Project Leaders:

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Summary:

Four early- and 9 mid-maturity variety tests were conducted throughout major processing tomato production regions of California during the 2002 season. An additional mid-maturity test (Colusa County) was lost due to poor seedling emergence. All of the major production areas, from Kern to Sutter/Colusa Counties, had one or more field tests to identify tomato cultivars appropriate for that specific region.

Increasing industry interest in the use of transplants has led us to incorporate this production technique into our variety evaluation program, where appropriate. Three of the mid-season test sites (Colusa, San Joaquin and Yolo Counties) utilized transplants. Two of the locations conducted both direct-seeded and transplant mid-season tests.

The highest yielding early- maturing replicated varieties, across all locations, were H1100, H9997, H1400, H9280 and APT410. The overall highest yielding mid-maturing replicated varieties when the Fresno1 and Kern locations are also included for a total of nine locations were H9780, PX849, H8892, SUN6324, H9665 and CXD222. However, these two locations did not receive seed of the varieties AB2 and AB5 in time to include in the tests. When the seven locations including those varieties are evaluated, the highest yielding variety is AB5.

Objectives:

The objectives have remained the same since this program was initiated over 26 years ago: to conduct well-designed, replicated varietal performance field tests throughout major California processing tomato production regions. The primary way of accomplishing that is the evaluation of recently-developed and industry standard cultivars. Parameters of particular interest include fruit quality (soluble solids, pH and color), fruit yields, disease resistance/tolerance and plant architecture. These tests are designed and conducted with input or collaboration from seed companies, processors, producers and other industry partners, and are intended to generate information useful for making intelligent variety selection management decisions.

Procedures:

Tests were established in commercial production fields with grower cooperators. The tests included 6 observational and 10 replicated early-maturity entries and 20 observational and 17 replicated entries in the mid-maturity tests (Tables 1A and 1B).

Early-maturing tests were planted during February and mid-maturity tests were planted from February to early May. New varieties usually were screened one or more years in non-replicated, observational tests before being selected for testing in replicated trials. Tests are primarily established in commercial production fields with grower cooperators. A common set of varieties are utilized in all of the tests, and individual Farm Advisors have the latitude to add to this core-group, to meet specific local unique needs.

Each variety is usually planted in a one-bed wide by 100 foot long plot. The replicated varieties are planted in four randomly selected plots and the observational varieties in one non-replicated plot. The plots are seeded/transplanted by the researcher, separately from the remainder of the field outside of the test area. All cultural operations, with the exception of planting and harvesting, are done by the grower/cooperator and are consistent with what is done to the remainder of the field.

All variety trials were furrow irrigated after seedling establishment, except the Sutter test, which was sprinkler irrigated the entire season. The early maturity Contra Costa and mid season San Joaquin and Yolo County tests received ethephon applications to hasten ripening.

A field day, or arrangements for interested persons to visit the plots, occurred at all of the tests. Shortly before or during harvest, fruit samples were collected from all plots and submitted to PTAB for soluble solids, color and pH determinations.

The plots were harvested with commercial harvest equipment (except the San Joaquin trial and the early and one mid maturity trial at the Westside Field Station in Fresno), using GT wagons, equipped with weigh cells, to obtain plot weights.

The data were statistically analyzed using analysis of variance procedures and reports of results will be disseminated to all factions of the California processing tomato industry through individual newsletters, regional production meetings, CTRI Director meetings, media and other methods.

Results

Results are presented in the following tables for the combination of all locations and for individual trials:

Table 2: A,-E Early-Maturity Observational: Yield, Brix, Brix-Yield, Color, pH

Table 3: A,-E Early-Maturity Replicated: Yield, Brix, Brix-Yield, Color, pH

Table 4: A-E Mid-Maturity Observational: Yield, Brix, Brix-Yield, Color, pH

Table 5: A-J Mid-Maturity Replicated: Yield, Brix, Brix-Yield, Color, pH

Early-Maturing Observational Varieties

The average fruit yield for all observational varieties across the 4 trial locations was 39.6 tons/acre. Yields were not significantly different among varieties (Table 2A), although there was an 8 ton/acre difference between the highest and lowest yield.

The average brix level across all locations and varieties was 4.9%. The varieties with the highest brix levels were Highpeel45, SUN6358, APT410 and AP957 (Table 2B).

The average brix-yields were 1.93 tons/acre (Table 2C). There was no statistical separation among the varieties. The average PTAB color across locations/varieties was 25.8 (Table 2D). There was no statistically significant separation among the varieties.

The pH levels were not significantly different between observational varieties (Table 2E). The average fruit pH for all locations and varieties was 4.34. Fruit pH was not measured at the Contra Costa location.

Early-Maturing Replicated Varieties

The average fruit yield for all replicated varieties across the 4 trial locations was 43.5 tons/acre. Highest yielding varieties included H1100, H9997, H1400, 9820 and APT410 (Table 3A). Note there was a significant interaction among varieties and locations, meaning that the relative ranking of varieties differed significantly among locations.

The average soluble solids (brix) level across locations and varieties was 5.0%. The varieties with the highest brix levels were H9888, HyPeel45, PS816, H1400 and CTRI1056 (Table 3B). Brix levels were consistent between locations.

The highest brix-yields were obtained with H1400, PS816, H1100, Hypeel45 and H9888 (Table 3C). The average brix-yields were 2.17 tons/acre.

Varieties with the lowest PTAB color were H9997, CXD224, H9888, APT410 and H1400 (Table 3D). Fruit color averaged 26.3 across all varieties and locations.

Varieties with the lowest fruit pH were CTRI1056, PS816, H1400 and Hypeel45(Table 3E). The average fruit pH for all locations and varieties was 4.30. pH was not measured at the Contra Costa location.

Mid- Maturity Observational Varieties

Yield data from observational varieties were analyzed for 8 locations. The average fruit yield for all observational varieties across the 8 trial locations was 38.8 tons/acre. The two highest yielding varieties were U729 and BOS24675, but there were an additional 9 varieties grouped with these two leaders (Table 4A).

The average brix level across all locations and varieties was 5.2%. The two varieties with the highest brix levels were PS296 and CXD207, but again an additional 6 varieties were in this group (Table 4B).

The highest brix-yields were obtained with H9995, U729, PS296 and ENP113, but included 8 others (Table 4C). The average brix-yields were 1.93 tons/acre.

The two varieties with the lowest PTAB color readings were CXD207 and H1300, but an additional 6 were also in the group (Table 4D). The average across locations and varieties was 23.3.

Varieties with the lowest pH were PS296, H9995 and Hypeel347 (Table 4E). The average fruit pH for all locations and varieties was 4.38.

Mid-Maturity Replicated Varieties

There are two sets of data tables for the mid maturity replicated variety results. One set includes all nine test locations, including two (Fresno1 and Kern) that did not contain two varieties that were in the remaining seven tests. The other data set excludes the Fresno1 and Kern data but includes the two additional varieties. This was done because one of the varieties not tested in Fresno1 or Kern was the highest average yielding variety for the other seven sites.

The average fruit yield for all replicated varieties across the 9 trial locations was 37.9 tons/acre. The highest yielding varieties were H9780, PX849, H8892, SUN6324 and H9665 (Table 5A). There was a significant variety by location interaction, meaning that the relative ranking of varieties differed among locations.

The average fruit yield for all replicated varieties when the Fresno1 and Kern sites are excluded was 42.0 tons/acre. The highest yielding variety was AB5 (Table 5B). There was a significant variety by location interaction, meaning that the relative ranking of varieties differed among locations.

The average brix level across the nine locations and varieties was 5.2. The varieties with the highest brix level were CXD221, AP938 and CTRI1056 (Table 5C). A significant variety times location interaction was found for fruit brix.

The average brix level across the seven locations and varieties was 5.1. The variety with the highest brix level was CXD221 (Table 5D). A significant variety times location interaction was found for fruit brix.

The highest brix-yields (nine locations) were obtained with H9780, SUN6324, PX849, CXD222 and H8892 (Table 5E). The average brix-yields were 1.93 tons/acre.

The highest brix-yield (seven locations) was obtained with AB5 (Table 5F). The average brix-yields were 2.16 tons/acre.

The varieties with the lowest PTAB color (9 locations) were H9998, H2501, SUN6324, CTRI1056 and H8892 (Table 5G). The average PTAB color across locations and varieties was 23.6

The varieties with the lowest PTAB color (7 locations) were H9998, CTRI1056 and H2501 (Table 5H). The average PTAB color across locations and varieties was 23.1

Varieties with the lowest fruit pH (9 locations) were H9780 and PX849 (Table 5I). The average fruit pH for all locations and varieties was 4.38.

Varieties with the lowest fruit pH (7 locations) were H9780, AB5, PX849, AB2 and H9665 (Table 5J). The average fruit pH for all locations and varieties was 4.38.

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Table 1A. Early-maturing test varieties.

<u>Company</u>	<u>Replicated</u>	<u>Varieties*</u>	<u>Observational</u>	<u>Varieties*</u>
Asgrow	APT410	\$VFFNP	APT410 AP957	\$VFFNP \$VFFNP
CTRI	CTRI1056	4VFFNP		
Campbell	CXD224	\$VFFNP		
Hazera			Calista	\$VFF
Heinz	H9280 H1100 H1400 H9888 H9997	\$VFFNP \$VFFNP \$VFFNP \$VFFNP \$VFFNP	H9280	\$VFFNP
Peto	HyPeel 45 PS 816	\$VFFNP \$VFFNP	HyPeel 45	\$VFFNP
Sunseeds			SUN6358	\$VFFNP

\$= Hybrid	FF= Fusarium Wilt Race I and II Resistant
4=open pollinated	FFF3 = Fusarium Wilt Race I,II, and III
V=Verticillium Wilt Race I	N = Root Knot Nematode Resistant
F=Fusarium Wilt Race I Resistant	P= Bacterial Speck Resistant

Bold = varietal standard

* *This information supplied by seed companies and accurate, to the best of our knowledge.*

Table 1B. Mid- maturing test varieties.

Company	Replicated	Varieties*	Observational	Varieties*
AB	AB2	\$VFFP	AB405	\$VFFNP
	AB5	\$VFFNP		
CTRI	CTRI056	4VFFN		
Campbell	CXD215	\$VFFF3NP	CXD207	\$VFFN
	CXD221	\$VFFF3NP	CXD208	\$VFFN
	CXD222	\$VFFNP		
Harris Moran	HM830	\$VFFN	HMX1851	\$VFFN
			HMX1852	\$VFFN
Heinz	H8892	\$VFFN	H1300	\$VFFNP
	H9665	\$VFFNP	H9995	\$VFFNP
	H9998	\$VFFNP	H2801	\$VFFNP
	H2501	\$VFFNP		
	H2601	\$VFFNP		
	H9780	\$VFFNP		
Lipton			U447	\$VFFN
			U729	\$VFFN
N Del Monte			NDM0098	\$VFFN
Orsetti	Halley 3155	\$VFF	BOS24675	\$VFFN
Rogers			La Rossa	\$VFF
Seminis	PS849	\$VFFNP	PS296	\$VFFNP
	AP938	\$VFFNP	Hypeel347	\$VFFNP
Sunseeds	Sun 6324	\$VFFNP	Sun6119	\$VFFN
			Sun 6340	\$VFFNP
United Genetics			ENP113	\$VFFNP

\$= Hybrid	FF= Fusarium Wilt Race I and II
4=open	FFF3 = Fusarium Wilt Race I,II, and III
V=Verticillium Wilt Race I Resistant	N = Root Knot Nematode Resistant
F=Fusarium Wilt Race I	P= Bacterial Speck

Bold = varietal standard

* This information supplied by seed companies and accurate, to the best of our knowledge.

Table 2A. Fruit Yield Data For Early Maturity Observational Varieties (Tons/Acre).

VARIETY	(4 Locations Combined)	Colusa	Contra Costa	Fresno	Yolo
AP957	44.5	39.2	60.2	25.5	53.1
H9280	39.9	38.0	45.5	31.1	45.1
Calista	39.1	37.7	36.4	36.1	46.2
SUN6358	38.9	35.9	56.4	20.9	42.2
Hypeel45	38.6	30.1	56.0	25.6	42.7
APT410	36.6	36.0	46.3	19.9	44.2
MEAN	39.6	36.2	50.1	26.5	45.6
LSD@0.05	N.S.				
CV=	15.7				

Table 2B. Fruit Brix For Early Maturity Observational Varieties (percent)

VARIETY	(4 locations combined)		Contra		
		Colusa	Costa	Fresno	Yolo
Hypeel45	5.2	5.2	5.2	5.5	4.9
SUN6358	5.2	5.2	4.9	5.4	5.1
APT410	5.1	5.0	5.0	5.6	4.9
AP957	5.1	---	4.7	5.5	5.0
Calista	4.6	4.4	4.7	4.7	4.5
H9280	4.5	4.7	4.3	4.4	4.4
MEAN	4.9	4.9	4.8	5.2	4.8
<u>LSD@0.05=</u>	0.3				
<u>C.V.=</u>	3.9				

* weighted mean due to missing value

Table 2C. Fruit Brix-Yield For Early Maturity Observational Varieties(Tons/Acre).

VARIETY	(4 locations Combined)	Colusa	Contra Costa	Fresno	Yolo
AP957	2.25	---	2.83	1.41	2.66
Hypeel45	2.00	1.57	2.91	1.41	2.09
SUN6358	1.98	1.87	2.76	1.13	2.15
APT410	1.85	1.80	2.32	1.11	2.16
Calista	1.79	1.66	1.71	1.70	2.08
H9280	1.76	1.79	1.96	1.37	1.98
MEAN	1.93	1.74	2.41	1.35	2.19
LSD@0.05=	N.S.				
C.V.=	15.8				

* weighted mean due to missing value

Table 2D. Fruit Color For Early Maturity Observational Varieties.

VARIETY	(4 locations combined PTAB data)	Contra			
		Colusa	Costa	Fresno	Yolo
APT410	24.0	26	23	23	24
SUN6358	25.5	30	24	23	25
Hypeel45	26.0	29	24	25	26
Calista	26.0	31	23	25	25
H9280	26.5	36	23	23	24
AP957	26.5	33	24	24	25
MEAN	25.8	30.8	23.5	23.8	24.8

*weighted mean due to missing value

Table 2E. Fruit pH For Early Maturity Observational Varieties.

VARIETY	(4 locations combined)	Contra		
		Colusa	Costa	Fresno Yolo
Hypeel45	4.29	4.46	4.30	4.12
H9280	4.30	4.41	4.29	4.20
AP957	4.32	4.37	4.38	4.21
SUN6358	4.34	4.47	4.39	4.16
APT410	4.38	4.41	4.50	4.22
Calista	4.38	4.53	4.39	4.22
MEAN	4.34	4.44	4.38	4.19
LSD@0.05 =	N.S.			
C.V.=	1.3			

*weighted mean due to missing values

Table 3A. Fruit Yield For Early Maturity Replicated Varieties.

VARIETY	4 locations		Yolo	Contra	
	YIELD	combined		Colusa	Fresno Costa
	tons/acre				
H1100	46.9	45.6	40.5	34.3	67.2
H9997	45.6	47.9	43.1	35.3	56.0
H1400	45.1	44.5	39.5	32.9	63.4
H9280	45.0	48.5	47.0	29.5	55.1
APT410	44.8	49.3	42.7	35.0	52.3
PS816	44.2	45.6	42.4	35.0	53.9
Hypeel45	41.8	44.3	36.1	30.4	56.6
H9888	41.6	44.6	40.9	28.2	52.8
CXD224	40.9	42.9	34.6	32.3	53.8
CTRI1056	39.4	41.0	31.5	30.9	54.3
MEAN	43.5	45.4	39.8	32.4	56.5
<u>LSD@0.05=</u>	2.6	2.6	4.2	4.2	8.5
C.V.=	8.5	4.0	7.2	8.9	10.4
Variety X	5.2				
Location LSD@ 0.05=					

Table 3B. Fruit Soluble Solids For Early Maturity Replicated Varieties (percent).

VARIETY	4 locations				
	combined	Yolo	Colusa	Fresno	Contra Costa
H9888	5.3	5.3	5.4	5.5	5.2
Hypeel45	5.3	5.3	5.1	5.3	5.6
PS816	5.3	5.0	5.0	5.6	5.5
H1400	5.2	5.1	5.2	5.1	5.2
CTRI1056	5.2	4.9	5.0	5.2	5.5
CXD224	4.9	4.8	4.8	5.1	5.0
H1100	4.9	5.0	5.0	4.8	5.0
APT410	4.9	4.4	5.0	5.1	4.9
H9997	4.7	4.6	4.7	4.8	4.6
H9280	4.4	4.3	4.3	4.5	4.4
MEAN	5.0	4.9	4.9	5.1	5.1
<u>LSD@0.05=</u>	0.2	0.3	0.3	0.6	0.2
C.V.=	5.5	4.0	4.9	8.2	3.3
Variety X	N.S.				
Location LSD @ 0.05=					

Table 3C. Fruit Brix-Yield For Early Maturity Replicated Varieties(Tons/Acre)

VARIETY	4 locations				
	combined	Yolo	Colusa	Fresno	Contra Costa
	tons/acre				
H1400	2.33	2.27	2.04	1.68	3.32
PS816	2.32	2.28	2.12	1.95	2.95
H1100	2.31	2.27	2.01	1.65	3.32
Hypeel45	2.23	2.32	1.85	1.61	3.14
H9888	2.20	2.36	2.19	1.53	2.74
APT410	2.16	2.18	2.14	1.76	2.56
H9997	2.12	2.20	2.00	1.70	2.58
CTRI1056	2.05	2.02	1.56	1.61	3.01
CXD224	2.01	2.04	1.67	1.65	2.70
H9280	1.97	2.10	2.02	1.31	2.44
MEAN	2.17	2.20	1.96	1.64	2.88
<u>LSD@0.05=</u>	0.15	0.15	0.23	0.26	0.49
C.V.=	9.9	4.6	8.2	11.1	11.7
Variety X	0.30				
Location LSD@ 0.05=					

Table 3D. Fruit Color For Early Maturity Replicated Varieties.

VARIETY	4 locations			Contra	
	combined	Yolo	Colusa	Fresno	Costa
	(PTAB)				
H9997	25.1	23.0	30.8	24.3	22.5
CXD224	25.7	24.0	32.0	23.3	23.5
H9888	25.8	24.5	30.5	25.0	23.3
APT410	25.9	24.5	32.0	23.5	23.5
H1400	26.1	25.5	29.5	24.8	24.8
PS816	26.4	24.8	32.3	24.8	23.8
Hypeel45	26.5	25.3	32.8	23.8	24.3
CTRI1056	26.6	25.0	33.3	24.8	23.5
H9280	26.9	24.3	32.8	26.0	24.5
H1100	27.8	26.0	33.5	26.3	25.5
MEAN	26.3	24.7	31.9	24.6	23.9
<u>LSD@0.05=</u>	1.2	0.8	N.S.	1.8	1.1
C.V.=	6.5	2.3	9.5	5.1	3.3
Variety X	N.S.				
Location LSD@					
0.05=					

Table 3E. Fruit pH For Early Maturity Replicated Varieties.

VARIETY	pH	4 locations			Contra
		combined	Yolo	Colusa	Fresno Costa
CTRI1056		4.26	4.14	4.36	4.28
PS816		4.26	4.18	4.36	4.25
H1400		4.27	4.17	4.35	4.29
Hypeel45		4.28	4.17	4.37	4.32
H1100		4.30	4.25	4.41	4.25
H9888		4.30	4.27	4.34	4.31
H9280		4.32	4.24	4.39	4.31
APT410		4.32	4.26	4.41	4.29
H9997		4.35	4.26	4.42	4.36
CXD224		4.35	4.28	4.43	4.34
MEAN		4.30	4.22	4.38	4.30
<u>LSD@0.05=</u>		0.04	0.04	N.S.	0.07
C.V.=		1.0	0.7	1.3	1.1
Variety X		N.S.			
location LSD@					
0.05=					

