Project Title: **UCCE Statewide Processing Tomato Variety Evaluation Trials, 2009**

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Summary:

UCCE farm advisors conducted seven mid-maturity tests in 2009, however only 5 locations were harvested. This year, there were no early maturity varieties submitted, a decision that was made by the processors because of a lack of suitable new entries. Seed companies submitted 16 replicated and 14 observation entries for the mid maturity trial. Spring weather was warm and dry across most locations, and all the trials with the exception of the late-planted Fresno location (Fresno #2) had no significant stand establishment problems because of weather or pests. Insect pest pressure was generally low this season, but some of the locations were impacted by high powdery mildew pressure again in 2009, similar to what occurred last year. The Stanislaus County and Merced County trials were accidentally harvested early and no yield data were measured, though fruit were sampled at Stanislaus for PTAB analysis. This year, all locations utilized transplants and drip irrigation.

The mid maturity observational trial yielded well in all locations except Fresno #2, where stand establishment difficulties, virus diseases, and powdery mildew reduced yields to 15 to 40 tons per acre. When test locations were combined, significant differences in yield were found between varieties, with N6385 (Nunhems), H 5508, H 5608, UG 19406 (United Genetics), and BQ 205 (Woodbridge Seeds) having statistically better overall yields as compared to the other entries. No differences were found between °Brix and color between varieties, which averaged 5.2% and 24.1, respectively. Fruit pH, which in general appears to be increasing over time across all varieties, ranged from 4.35 for UG 19406 to 4.56 for BOS 8800 and BQ 172. In the replicated mid-maturity trial, best yields occurred with H 8504, CXD 255 (Campbells), HM 7883 (Harris Moran), PX 650 (Seminis) and PX 002 (Seminis); HM 7883 also had greater Brix than many other varieties, at 5.3. Significant differences were also seen for color and pH. Similar to the early maturity trial, pH was elevated, averaging 4.46.

Objectives:
The major objective is to conduct processing tomato variety field tests that evaluate fruit yield, Brix, color, and pH in replicated plots in various statewide locations of early commercial release lines. The data are combined from all test locations to analyze variety adaptability under a wide range of growing

conditions. These tests are designed and conducted with input from seed companies, processors, and other allied industry and are intended to generate unbiased, third-party information to assist in making variety choice decisions.

Procedures:
Seven (7) mid-maturity tests were conducted in 2009. Participating counties and Farm Advisors are shown in Table 1. Variety entries and their disease resistances are listed in Table 2. No early-maturity trial was conducted this year because of a lack of entries. Variety selections were made in the fall of 2008 based on input from tomato processors. Changes and/or additions were made by the seed companies based on seed availability.

Test locations were transplanted from late March (Kern Co) through May 22 (Fresno #2). New varieties were usually screened one of more years in non-replicated observational trials before being selected for testing in the replicated trials. Tests were primarily conducted in commercial production fields with grower cooperators (the Fresno trials were located at the UC West Side Research and Extension Center (WSREC) near Five Points).

Each variety was planted in a one-bed by 100-foot long plot. Plot design was a randomized complete block with four replications for the replicated trial. The observational trial consisted of one non-replicated plot directly adjacent to the replicated trial. The Farm Advisor organized transplanting at the same time that the rest of the field was planted. All cultural operations, with the exception of planting and harvest, were done by the grower cooperator using the same equipment and techniques as the rest of the field. All test locations used transplants, and five locations this year were drip irrigated (Merced, Stanislaus, San Joaquin, Kern, and Yolo). A field day or arrangements for interested persons to visit the plots occurred at most locations. Farm Advisors were also responsible for taking soil samples and documenting growth and development.

Shortly before or during harvest, fruit samples were collected from all plots and submitted to an area PTAB station for soluble solids (reported as °Brix, an estimate of the soluble solids percentage using a refractometer), color (LED color), and pH determinations. These samples were hand picked ripe fruit directly off the plants or the harvester. The tomatoes in each plot were harvested with commercial harvest equipment, conveyed to a GT wagon equipped with weigh cells, and weighed before going to the trailers for processing.

Data were analyzed using analysis of variance procedures with SAS, both for each individual location and combining locations. In the combined analysis, the block effect was nested within each county. Significant difference tests were performed using Fisher's protected LSD at the 5% level. Stanislaus County had no yield data for the over-location analysis, however, PTAB data were included. Merced yield and PTAB results were not available. Occasional missing plots occurred in the other trial locations, resulting in an unbalanced design and variable LSD values depending on what was being compared.

Results:
Results are presented in the following order and include combined county, yield, °Brix, color, and pH for each trial: mid-maturity observational (Table 3 a – f), and mid-maturity replicated (Table 4 a – e).

Mid observational. Mid-maturity observational results combining all locations are shown in Table 3a, and individual counties in Tables 3 b – e. Stanislaus County PTAB data are shown, but not yields. Because of missing plots at some locations, multiple LSD values were calculated to compare varieties and are shown below each table as appropriate. When all counties were combined, significant differences were found among varieties only for yield and pH (Table 3a). Even with relatively high variability (CV

14.0%), significantly best yields occurred with Nunhems N 6385, Heinz H 5508, H 5608, United Genetics UG 19406, and Woodbridge Seeds BQ 205, which all yielded more than 50 tons per acre. °Brix and color were slightly better this year than 2008, at 5.2 and 24.1, but there were no significant differences between varieties when location data were combined. Fruit pH was again elevated, and ranged from 4.35 to 4.56 (Table 4e). Because there was no replication in this test, variety by location interactions could not be performed.

A significant negative relationship was observed this year between Brix and yield for the observation lines (Figure 1): soluble solids decreased as yield increased, as would be expected.

Mid replicated. Mid-maturity replicated variety results combining all locations are shown in Table 4a, and individual counties in Tables 4 b – e. Stanislaus PTAB data were collected, but not yields.

Using combined data, significant differences were found for all parameters measured, though Fresno #1 trial did not have significant differences for Brix or pH. Averaged across all locations, significantly best yields occurred with H8504, CXD 255, HM 7883, PX 650, and PX 002 at ≥ 50 tons per acre. Yields were much better in the Yolo trial than the other locations, averaging 64 tons/A.

Significant differences were observed for Brix in the combined data and individual location data with the exception of Fresno #1, but overall there was little spread between the variety with the best average soluble solids (HM 6898, 5.5) and the least (CXD 282, 4.9). HM 7883 had both yield and °Brix that were in the top 5. Unlike for the observation trial, there was very little relationship between average yield and fruit soluble solids (Figure 2).

H4007 and PX 002 had the best fruit color with LED ratings of 22.5 and 23.3, respectively (Table 4 d). Fruit pH ranged from 4.38 to 4.56 (Table 4e), with HM 6898, H8504, H9780, and AB2 and having significantly lowest pH. These varieties also had better pH results in 2008.

Significant variety by location interactions occurred for yield, °Brix, color, and pH. This indicates that certain varieties performed differently at different locations. AB2, for example, yielded much better in Yolo compared to the other locations.

Acknowledgements:

Many thanks to CTRI and participating processors and seed companies for their continued support for this project. The cooperation from PTAB and support of the processors is also greatly appreciated. Many thanks to Gail Nishimoto for her help with the statistical analyses. And lastly, this project would not be possible without the many excellent grower cooperators who were involved with this project.

Table 1. 2009 UCCE mid-maturity processing tomato variety trial locations.

Advisor	Trial
Gene Miyao, Yolo Co.	Transplant April 24, drip irrigation. Good stand, good vine growth, *Verticillium* wilt pressure, double row. Cooperator: JH Meek and Sons. Harvest Aug 28.
Brenna Aegerter, San Joaquin County	Transplant May 8, drip irrigation. No stand problems this year. Cooperator: Hal Robertson. Harvest Sept 30.
Jan Mickler, Stanislaus County	Transplant May 15, drip irrigation. Single row. Cooperator: Leroy Deldon. Fruit samples September 20, no harvest.
Scott Stoddard, Merced County	Transplant May 11, drip irrigation. Single row. Good stand, good vine growth. Cooperator: A-Bar Ranch. No harvest, no PTAB samples.
Michelle Le Strange, Tom Turini Fresno County 1	Transplant May 1, sprinkler irrigation to set plants, drip thereafter. Single row, 66" beds. Powdery mildew pressure in August. WSREC. Harvest Sept 1.
Michelle Le Strange, Tom Turini Fresno County 2	Transplant May 22, sprinkler irrigation to set plants, drip thereafter. Establishment and disease and insect problems, especially powdery mildew. Single row 66" beds. WSREC. Harvest Sept 22.
Joe Nunez, Kern County	Transplant March 31, single row, drip irrigation. Cooperator: Stenderup Farms. Harvest Aug 10. Not all observation lines planted because of lack of space.

Table 2. 2009 UCCE Processing Tomato Regional Variety Trial

Processor & seed company entries .

TRIAL	COMPANY	VAR	my CODE	UC code	Disease Resistance	days to maturity	processed use	Brix	std compared	vine size	fruit shape	trial years
Mid	AB Seeds	**AB 2**	1	**868**	VFFP	120	Multiuse	high	3155	med	sq	06, 07, 08,09
Replicated	AB Seeds	AB3 (DRI0303)	2	**971**	VFFNP	121	Multiuse	high	--	med	--	09
	Campbell's Seeds	CXD 255	3	**969**	VFFNP	125	Multiuse	5	P849	med	sq	09
	Campbell's Seeds	CXD 282	4	**976**	VFFFNP	125	Multiuse	5.4	--	med	sq	09
	Heinz Seed	**H 2601**	5	**865**	VFFNP	122	pear	5	STD	lg	pear	06, 07, 08,09
	Heinz Seed	H 4007	6	**966**	VFFNP	120	MultiUse	5.1	H9780	med/lg	blocky	08, 09
	Heinz Seed	H 8504	7	**972**	VFFNP	130	paste	5.2	H9780	lg	obal	09
	Heinz Seed	**H 9780**	8	**866**	VFFNP	138	MultiUse	5.5	STD	lg	blocky	06, 07, 08,09
	Harris Moran	HM 6898	9	**967**	VFFNP	122	MultiUse	high	AB2	lg	round	08, 09
	Harris Moran	HM 6903	10	**977**	VFFNP	125	Multiuse	high	AB2	med/lg	sq	09
	Harris Moran	HM 7883	11	**978**	VFNP	125	Multiuse	high	AB2	lg	sq	09
	Harris Moran	HMX 7885	12	**973**	VFFNBsp	122	Pear	med/high	2601	lg	pear	08, 09
	Nunhems USA	N 6390	13	**975**	VFFNP	130	Multiuse	v high	H 9665	lg	blocky	09
	Seminis	PX 002	14	**979**	VFFNSW	125	Multiuse	high	H8004	med/lg	sq/blocky	09
	Seminis	PX 650	15	**980**	VFFNP	135	Multiuse	high	H9780	med/lg	sq/blocky	09
	Nunhems USA	**SUN 6366**	16	**919**	VFFNP	118	Multiuse	high	AB2	med	sq/blocky	07,08,09 early trial
Mid	Orsetti Seed	BOS 8800	o17	**981**	VFFN	122	paste/dice	5.8	AB2	med-lg	blocky	09
OBSERVED	Woodbridge Seeds	BQ 163	o18	**982**	VFFNP	118	multiuse	5.5	H5004	small	blocky	09
	Woodbridge Seeds	BQ 172	o19	**983**	VFFNP	125	multiuse	5.3	H2401	lg	blocky	09
	Woodbridge Seeds	BQ 205	o20	**984**	VFFNP	118	multiuse	5.8	SUN6366	lg	blocky	09
	Campbell's Seed	CXD 269	o21	**970**	VFFNBsp	124	multiuse	5.4	AB2	med	blocky	08, 09
	AB Seeds	DRI 0309	o22	**985**	VFFNPSW	119	multiuse	high	--	med	--	09
	Heinz Seed	5508	o23	**986**	VFFNSW	128	paste	4.8	H9780	med/lg	oval	09
	Heinz Seed	5608	o24	**987**	VFFNPSW	128	multiuse	5.0	H9780	lg	blocky	09
	Hytec Seeds	HT1059	o25	**988**	VF TYLC	120	paste	5		med	sq round	08, 09
	Nunhems	N 6385	o26	**974**	VFFNBsp SW	125	Viscosity	med	H9665	med/lg	sq round	08, 09
	Nunhems	N 6393	o27	**989**	VFFN	124	multiuse	high	H9557	lg	sq blocky	09
	Nunhems	N 6394	o28	**990**	VFFNPSW	126	multiuse	high	AB8058	lg	sq blocky	09
	United Genetics	UG 4305	o29	**960**	VFFN	122	MultiUse	high	--	--	sq round	07, 08, 09
	United Genetics	UG 19406	o30	**961**	VFFN Bsp			high			sq round	09

Check with seed company to confirm disease resistance.

V = Verticillium Wilt race 1
FFF = Fusarium Wilt races 1 & 2 & 3
N = Root knot nematode
Bsp, P = Bacterial speck race 0
SW = Spotted Wilt
TYLC = tomato yellow leaf curl virus

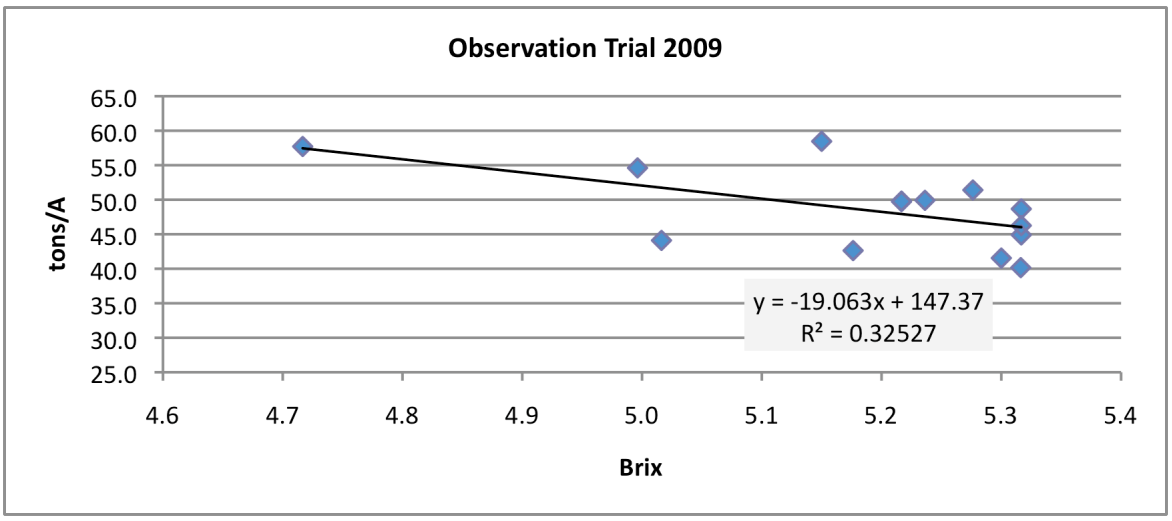

Figure 1. Relationship between tomato fruit yield and soluble solids for the varieties in the observation trial. Each point is the mean of 5 or 6 locations.

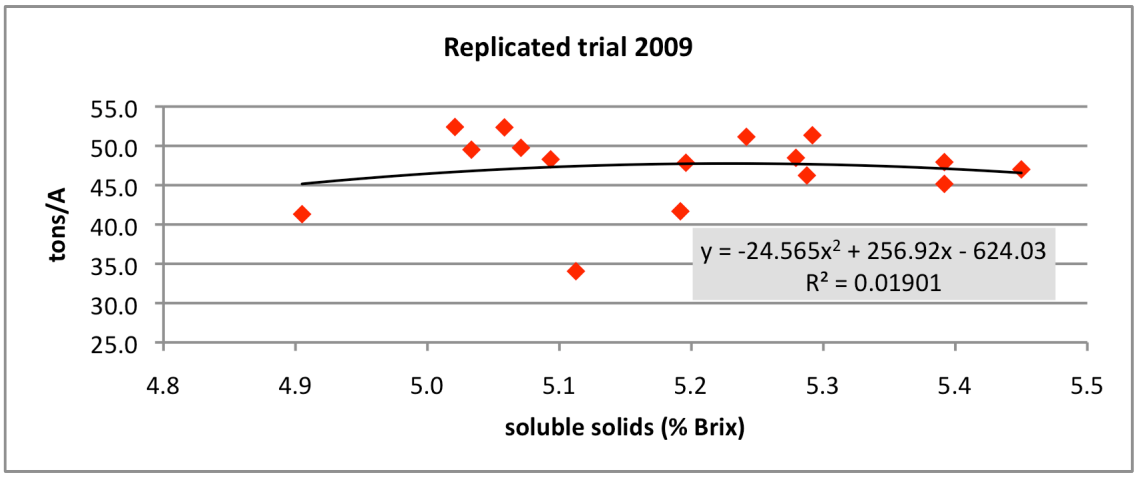

Figure 2. Relationship between tomato fruit yield and soluble solids for the varieties in the replicated trial. Each point is the mean of 20 – 24 data points.

Table 3a. 2009 Processing tomato mid-maturity observational combined analysis.

Variety	Yield tons/acre (5 locations)		Brix % 6 loc	Color 6 loc	pH 6 loc
974 N 6385	58.5 (01)	A	5.2 (11)	24.0 (05)	4.43 (05)
986 5508	57.7 (02)	A B	4.7 (14)	24.0 (05)	4.39 (02)
987 5608* [1]	54.6 (03)	A B C	5.0 (13)	23.1 (01)	4.44 (06)
961 UG 19406* [1]	51.4 (04)	A B C D	5.3 (06)	24.3 (09)	4.35 (01)
984 BQ 205* [1]	49.9 (05)	A B C D E	5.2 (07)	24.7 (12)	4.41 (04)
989 N 6393	49.8 (06)	B C D E	5.2 (08)	24.3 (10)	4.46 (08)
985 DRI 0309	49.7 (07)	B C D E	5.2 (08)	24.2 (08)	4.41 (03)
990 N 6394	48.7 (08)	C D E F	5.3 (01)	24.5 (11)	4.48 (10)
982 BQ 163	46.3 (09)	C D E F	5.3 (01)	23.5 (03)	4.49 (11)
970 CXD 269	44.9 (10)	D E F	5.3 (01)	24.0 (05)	4.47 (09)
988 HT1059** [1]	44.1 (11)	D E F	5.0 (12)	23.7 (04)	4.50 (12)
960 UG 4305* [1]	42.6 (12)	E F	5.2 (10)	24.7 (12)	4.45 (07)
981 BOS 8800	41.5 (13)	E F	5.3 (05)	26.0 (14)	4.56 (13)
983 BQ 172* [1]	40.2 (14)	F	5.3 (04)	23.3 (02)	4.56 (14)
Mean	48.3		5.2	24.1	4.45
% C.V.	14.0		6.9	6.7	1.2
LSD @ 0.05			NS	NS	

**** Yield mean adjusted for 1 missing plot***

***** Yield mean adjusted for 2 missing plots***

Stanislaus did not have yield data

[1] Brix, Color, pH mean adjusted for 1 missing plot

Yield: to compare 974, 986, 989, 985, 990, 982, 970, 981 with each other (5 locations per mean)

LSD @ 0.05 8.61

Yield: to compare 974, 986, 989, 985, 990, 982, 970, 981 (5 locations per mean) with 987, 961, 984, 960, 983 (4 locations per mean)

LSD @ 0.05 9.13

Yield: to compare 974, 986, 989, 985, 990, 982, 970, 981 (5 locations per mean) with 988 (mean composed of 3 locations per mean)

LSD @ 0.05 9.94

Yield: to compare 987, 961, 984, 960, 983 (4 locations per mean) with each other

LSD @ 0.05 9.63

Yield: to compare 987, 961, 984, 960, 983 (4 locations per mean) with 988 (mean composed of 3 locations per mean)

LSD @ 0.05 10.40

pH: to compare 986, 985, 974, 989, 970, 990, 982, 981 (6 locations per mean) with each other

LSD @ 0.05 0.063

pH: to compare 986, 985, 974, 989, 970, 990, 982, 981 (6 locations per mean) with 961, 984, 987, 960, 988, 983 (5 locations per mean)

LSD @ 0.05 0.066

pH: to compare 961, 984, 987, 960, 988, 983 (5 locations per mean) with each other

LSD @ 0.05 0.069

Numbers in parentheses (x) represent relative ranking within a column.

LSD = Least significant difference at the 95% confidence level. Means followed by the same letter are not significantly different. NS = not significant.

CV = coefficient of variation (%), a measure of the variability in the experiment.

Variety x location LSD = LSD when comparing varieties across locations.

Table 3b. 2009 MID SEASON OBSERVATIONAL COMBINED ANALYSIS: YIELD

Variety	Yield tons/acre							Fresno #1	Fresno #2	Kern	San Joaquin	Stan-islaus	Yolo
974 N 6385	58.5	A						58.4	30.8	67.3	64.3		71.5
986 5508	57.7	A	B					58.0	39.9	53.8	71.9		65.1
987 5608*	54.6	A	B	C				50.0	34.6		59.9		70.4
961 UG 19406*	51.4	A	B	C	D			35.9	27.6		69.0		69.6
984 BQ 205*	49.9	A	B	C	D	E		40.5	23.2		63.1		69.4
989 N 6393	49.8		B	C	D	E		47.7	16.6	56.9	62.8		65.0
985 DRI 0309	49.7		B	C	D	E		39.2	23.9	58.5	53.5		73.4
990 N 6394	48.7			C	D	E	F	49.9	35.3	34.0	52.6		71.6
982 BQ 163	46.3			C	D	E	F	36.6	20.7	55.2	56.2		62.6
970 CXD 269	44.9				D	E	F	43.1	20.5	53.0	44.3		63.6
988 HT1059**	44.1				D	E	F	45.7	24.0				52.7
960 UG 4305*	42.6					E	F	38.6	20.0		44.8		63.6
981 BOS 8800	41.5					E	F	44.4	18.3	46.2	35.9		63.0
983 BQ 172*	40.2						F	40.1	15.4		41.4		60.3

** Yield mean adjusted for 1 missing plot*

*** Yield mean adjusted for 2 missing plots*

Stanislaus did not have yield data

MEAN	48.3
% C.V.	14.0

To compare 974, 986, 989, 985, 990, 982, 970, 981 with each other (means composed of 5 locations)

LSD @ 0.05 8.61

To compare 974, 986, 989, 985, 990, 982, 970, 981 (means composed of 5 locations) with 987, 961, 984, 960, 983 (means composed of 4 locations)

LSD @ 0.05 9.13

To compare 974, 986, 989, 985, 990, 982, 970, 981 (means composed of 5 locations) with 988 (mean composed of 3 locations)

LSD @ 0.05 9.94

To compare 987, 961, 984, 960, 983 (means composed of 4 locations) with each other

LSD @ 0.05 9.63

To compare 987, 961, 984, 960, 983 (means composed of 4 locations) with 988 (mean composed of 3 locations)

LSD @ 0.05 10.40

Observation varieties were not replicated so the statistical analysis could be performed on the combined data only.

Table 3c. 2009 MID SEASON OBSERVATIONAL COMBINED ANALYSIS: BRIX

Variety	Brix %	Fresno #1	Fresno #2	Kern	San Joaquin	Stanislaus	Yolo
990 N 6394	5.3	5.2	5.9	5.6	5.1	4.7	5.4
982 BQ 163	5.3	5.5	5.6	4.9	5.2	5.0	5.7
970 CXD 269	5.3	5.2	5.4	5.6	5.4	4.6	5.7
983 BQ 172*	5.3	5.4	5.3		5.4	4.8	5.5
981 BOS 8800	5.3	5.6	5.0	5.5	5.0	5.0	5.7
961 UG 19406*	5.3	5.5	5.3		5.1	4.9	5.4
984 BQ 205*	5.2	5.3	5.6		5.3	5.3	4.5
989 N 6393	5.2	5.1	5.5	5.8	5.1	4.7	5.1
985 DRI 0309	5.2	5.6	4.4	5.8	5.4	5.0	5.1
960 UG 4305*	5.2	5.4	5.2		5.2	4.5	5.4
974 N 6385	5.2	6.5	5.2	4.9	4.5	4.7	5.1
988 HT1059*	5.0	5.4	5.4		4.3	5.1	4.7
987 5608*	5.0	5.4	5.0		4.8	4.8	4.8
986 5508	4.7	5.6	4.5	4.9	4.3	4.4	4.6

* ***Mean adjusted for 1 missing plot***

MEAN	5.2
% C.V.	6.9
LSD @ 0.05	NS

Not all varieties were planted at the Kern location.

Table 3d. 2009 MID SEASON OBSERVATIONAL COMBINED ANALYSIS: COLOR

Variety	LED Color	Fresno #1	Fresno #2	Kern	San Joaquin	Stanislaus	Yolo
987 5608*	23.1	24.0	24.0		21.0	21.0	25.0
983 BQ 172*	23.3	27.0	23.0		20.0	23.0	23.0
982 BQ 163	23.5	25.0	27.0	24.0	21.0	22.0	22.0
988 HT1059*	23.7	24.0	25.0		23.0	23.0	23.0
986 5508	24.0	24.0	27.0	25.0	22.0	23.0	23.0
974 N 6385	24.0	26.0	27.0	24.0	22.0	22.0	23.0
970 CXD 269	24.0	24.0	26.0	26.0	21.0	24.0	23.0
985 DRI 0309	24.2	24.0	27.0	24.0	22.0	24.0	24.0
961 UG 19406*	24.3	25.0	30.0		21.0	23.0	22.0
989 N 6393	24.3	25.0	29.0	25.0	22.0	22.0	23.0
990 N 6394	24.5	22.0	34.0	24.0	21.0	23.0	23.0
984 BQ 205*	24.7	26.0	27.0		22.0	24.0	24.0
960 UG 4305*	24.7	25.0	29.0		22.0	23.0	24.0
981 BOS 8800	26.0	24.0	33.0	27.0	23.0	26.0	23.0

* ***Mean adjusted for 1 missing plot***

MEAN	24.1
% C.V.	6.7
LSD @ 0.05	NS

Not all varieties were included in the Kern location.
Observation varieties were not replicated so the statistical analysis could be performed on the combined data only.

Table 3e. 2009 MID SEASON OBSERVATIONAL COMBINED ANALYSIS: pH

Variety	pH						Fresno #1	Fresno #2	Kern	San Joaquin	Stan-islaus	Yolo
961 UG 19406*	4.35	A					4.33	4.44		4.37	4.31	4.23
986 5508	4.39	A	B				4.44	4.44	4.38	4.41	4.34	4.32
985 DRI 0309	4.41		B	C			4.47	4.36	4.42	4.45	4.40	4.36
984 BQ 205*	4.41		B	C			4.33	4.39		4.47	4.46	4.35
974 N 6385	4.43		B	C	D		4.44	4.41	4.48	4.55	4.27	4.43
987 5608*	4.44		B	C	D	E	4.38	4.47		4.52	4.41	4.37
960 UG 4305*	4.45			C	D	E	4.41	4.44		4.52	4.38	4.47
989 N 6393	4.46			C	D	E	4.37	4.44	4.55	4.52	4.44	4.46
970 CXD 269	4.47			C	D	E	4.53	4.45	4.52	4.44	4.49	4.40
990 N 6394	4.48				D	E	4.42	4.36	4.57	4.58	4.49	4.46
982 BQ 163	4.49				D	E	4.51	4.43	4.59	4.48	4.54	4.36
988 HT1059*	4.50					E	4.53	4.40		4.55	4.45	4.51
981 BOS 8800	4.56					F	4.59	4.53	4.59	4.56	4.56	4.55
983 BQ 172*	4.56					F	4.52	4.58		4.58	4.53	4.56

* ***Mean adjusted for 1 missing plot***

MEAN	4.45
% C.V.	1.2

To compare 986, 985, 974, 989, 970, 990, 982, 981 (means composed of 6 locations) with each other

LSD @ 0.05 0.063

To compare 986, 985, 974, 989, 970, 990, 982, 981 (means composed of 6 locations) with 961, 984, 987, 960, 988, 983 (means composed of 5 locations)

LSD @ 0.05 0.066

To compare 961, 984, 987, 960, 988, 983 (means composed of 5 locations) with each other

LSD @ 0.05 0.069

Observation varieties were not replicated so the statistical analysis could be performed on the combined data only.

Table 4a. 2009 Prcessing tomato mid-maturity replicated combined analysis.

Variety	Yield tons/acre 5 locations		Brix % 6 locations	Color 6 locations	pH 6 locations
972 H 8504	52.4 (01)	A	5.0 (15)	23.5 (05)	4.38 (02)
969 CXD 255	52.3 (02)	A B	5.1 (13)	24.0 (12)	4.45 (07)
978 HM 7883	51.3 (03)	A B C	5.3 (04)	24.0 (13)	4.53 (15)
980 PX 650	51.1 (04)	A B C D	5.2 (07)	24.9 (15)	4.49 (12)
979 PX 002	49.8 (05)	A B C D E	5.1 (12)	23.3 (02)	4.46 (08)
966 H 4007	49.5 (06)	B C D E	5.0 (14)	22.5 (01)	4.51 (13)
919 SUN 6366	48.5 (07)	C D E F	5.3 (06)	23.7 (08)	4.51 (14)
973 HMX 7885 **	48.3 (08)	D E F	5.1 (11)	23.8 (09)	4.56 (16)
971 AB3 (DRI0303)	47.9 (09)	E F G	5.4 (02)	23.5 (06)	4.44 (05)
866 H 9780	47.9 (10)	E F G	5.2 (08)	24.1 (14)	4.40 (03)
967 HM 6898	47.0 (11)	E F G	5.5 (01)	23.3 (03)	4.38 (01)
868 AB 2	46.2 (12)	F G	5.3 (05)	23.8 (10)	4.42 (04)
975 N 6390	45.2 (13)	G	5.4 (02)	25.0 (16)	4.45 (06)
865 H 2601	41.7 (14)	H	5.2 (09)	23.9 (11)	4.48 (11)
976 CXD 282 *	41.3 (15)	H	4.9 (16)	23.4 (04)	4.47 (09)
977 HM 6903	34.1 (16)	I	5.1 (10)	23.6 (07)	4.48 (10)
* ***Missing 4 plots (Yolo)***					
** ***Missing 1 plot (Yolo)***					
Mean	47.2		5.2	23.8	4.46
CV=	9.8		6.0	5.7	1.3
LSD @ 0.05=	2.88		0.18	0.77	0.033
To compare all varieties except 973 and 976 with each other					
LSD @ 0.05	2.88		0.18	0.77	0.033
To compare all varieties except 973 with 976					
LSD @ 0.05	3.06		0.19	0.81	0.035
To compare all varieties except 976 with 973					
LSD @ 0.05	2.92		0.18	0.78	0.033
To compare variety 976 with 973					
LSD @ 0.05	3.09		0.19	0.82	0.035
Variety X Location mean separation					
To compare all interaction means except Yolo 973 with each other (4 plots/mean)					
Variety X Location LSD 0.05	6.45		0.43	1.90	0.081
plots/mean)					
Variety X Location LSD 0.05	6.97		0.47	2.05	0.087

LSD = Least significant difference at the 95% confidence level. Means followed by the same letter are not significantly different.
NS = not significant.
CV = coefficient of variation (%), a measure of the variability in the experiment.
Variety x location LSD = LSD when comparing varieties across locations.

Table 4b. 2009 MID SEASON REPLICATED COMBINED ANALYSIS: TONS

Variety	Yield tons/acre 5 locations		Yolo	San Joaquin	Fresno # 1	Fresno # 2	Kern	Stanislaus (No Yield Data)
972 H 8504	52.4	A	63.3	65.6	47.8	21.9	63.4	
969 CXD 255	52.3	A B	76.5	57.8	47.1	21.0	59.4	
978 HM 7883	51.3	A B C	63.7	57.8	44.5	27.5	63.2	
980 PX 650	51.1	A B C D	70.5	55.7	43.1	23.7	62.7	
979 PX 002	49.8	A B C D E	77.2	46.1	44.5	28.7	52.3	
966 H 4007	49.5	B C D E	65.4	60.3	40.5	28.6	52.8	
919 SUN 6366	48.5	C D E F	69.7	53.0	46.8	19.8	53.1	
973 HMX 7885 **	48.3	D E F	57.5	57.7	46.0	19.6	60.7	
971 AB3 (DRI0303)	47.9	E F G	72.5	54.5	40.2	17.8	54.7	
866 H 9780	47.9	E F G	60.1	63.6	41.9	17.0	56.6	
967 HM 6898	47.0	E F G	53.5	58.8	43.3	25.3	54.2	
868 AB 2	46.2	F G	77.8	50.4	43.7	16.7	42.6	
975 N 6390	45.2	G	68.2	55.4	36.4	14.3	51.5	
865 H 2601	41.7	H	52.1	49.1	35.8	15.3	56.1	
976 CXD 282 *	41.3	H		51.9	44.2	20.8	48.3	
977 HM 6903	34.1	I	42.7	41.6	32.4	16.6	37.0	
**** Missing 4 plots (Yolo)***								
***** Missing 1 plot (Yolo)***								
MEAN	47.2		64.8	54.9	42.4	20.9	54.3	
CV	9.8		4.9	5.2	7.8	19.3	14.3	
LSD @ 0.05	2.88		4.55	4.10	4.72	5.747	11.066	

To compare all varieties except 973 and 976 with each other (20 plots/mean)
LSD @ 0.05 2.88

To compare all varieties except 973 (20 plots/mean) with 976 (16 plots/mean)
LSD @ 0.05 3.06

To compare all varieties except 976 (20 plots/mean) with 973 (19 plots/mean)
LSD @ 0.05 2.92

To compare variety 976 (16 plots/mean) with 973 (19 plots/mean)
LSD @ 0.05 3.09

Variety X Location mean separation
To compare all interaction means except Yolo 973 with each other (4 plots/mean)
Variety X Location LSD 0.05 6.45

To compare Yolo 973 (3 plots/mean) with all other interaction means (4 plots/mean)
Variety X Location LSD 0.05 6.97

Table 4c. 2009 MID SEASON REPLICATED COMBINED ANALYSIS: BRIX

Variety	Brix % 6 locations		Yolo	San Joaquin	Stanislaus	Fresno # 1	Fresno # 2	Kern
967 HM 6898	5.5	A	5.9	5.5	5.1	5.4	5.3	5.5
975 N 6390	5.4	A B	5.0	5.4	4.9	5.4	5.8	5.9
971 AB3 (DRI0303)	5.4	A B	4.9	5.2	5.2	5.4	5.8	5.9
978 HM 7883	5.3	A B C	5.3	5.2	4.6	5.8	5.5	5.3
868 AB 2	5.3	A B C D	4.9	5.1	5.3	5.4	5.5	5.7
919 SUN 6366	5.3	A B C D	5.1	5.1	4.8	5.5	5.4	5.9
980 PX 650	5.2	B C D E	5.3	5.4	4.7	5.5	5.4	5.2
866 H 9780	5.2	C D E F	5.4	5.0	4.9	5.6	5.3	5.2
865 H 2601	5.2	C D E F	5.4	5.0	4.8	5.7	4.9	5.4
977 HM 6903	5.1	D E F	4.9	4.9	4.9	5.5	5.2	5.3
973 HMX 7885 **	5.1	E F	5.2	5.0	4.3	5.7	5.4	5.0
979 PX 002	5.1	E F G	4.8	4.9	4.8	5.8	4.9	5.3
969 CXD 255	5.1	F G	5.1	4.9	4.6	5.4	5.2	5.3
966 H 4007	5.0	F G	4.8	4.9	4.5	5.4	5.4	5.3
972 H 8504	5.0	F G	5.2	4.7	4.8	5.5	4.8	5.1
976 CXD 282 *	4.9	G		4.8	4.5	5.3	4.8	5.1
**** Missing 4 plots (Yolo)***								
***** Missing 1 plot (Yolo)***								
MEAN	5.2		5.1	5.1	4.8	5.5	5.3	5.4
CV	6.0		7.4	4.3	5.8	5.8	7.1	5.0
LSD @ 0.05	0.18		0.54	0.31	0.39	NS	0.53	0.38

To compare all varieties except 973 and 976 with each other (24 plots/mean)
LSD @ 0.05 0.18

To compare all varieties except 973 (24 plots/mean) with 976 (20 plots/mean)
LSD @ 0.05 0.19

To compare all varieties except 976 (24 plots/mean) with 973 (23 plots/mean)
LSD @ 0.05 0.18

To compare variety 976 (20 plots/mean) with 973 (23 plots/mean)
LSD @ 0.05 0.19

Variety X Location mean separation

To compare all interaction means except Yolo 973 with each other (4 plots/mean)
Variety X Location LSD 0.05 0.43

To compare Yolo 973 (3 plots/mean) with all other interaction means (4 plots/mean)
Variety X Location LSD 0.05 0.47

Table 4d. 2009 MID SEASON REPLICATED COMBINED ANALYSIS: COLOR

Variety	LED Color 6 locations					Yolo	San Joaquin	Stanislaus	Fresno # 1	Fresno # 2	Kern
966 H 4007	22.5	A				21.8	20.3	21.3	23.0	24.3	24.8
979 PX 002	23.3	A	B			23.5	21.0	21.8	24.5	24.5	24.5
967 HM 6898	23.3		B			22.5	21.3	23.3	22.5	26.3	24.3
976 CXD 282 *	23.4		B	C			20.0	22.8	23.0	26.8	24.5
972 H 8504	23.5		B	C		24.3	21.3	22.5	22.3	25.5	25.3
971 AB3 (DRI0303)	23.5		B	C		24.3	21.3	22.8	21.8	26.8	24.5
977 HM 6903	23.6		B	C		23.5	20.8	23.5	23.0	26.8	24.0
919 SUN 6366	23.7		B	C		23.0	21.8	23.5	24.5	25.5	23.8
973 HMX 7885 **	23.8		B	C		22.3	22.0	25.0	24.3	24.3	24.8
868 AB 2	23.8		B	C		24.3	21.8	23.0	21.8	27.0	25.0
865 H 2601	23.9		B	C		24.0	21.8	24.0	21.5	27.8	24.5
969 CXD 255	24.0		B	C		24.5	22.0	24.0	21.5	26.5	25.3
978 HM 7883	24.0		B	C		22.8	22.3	24.0	24.0	26.0	25.3
866 H 9780	24.1			C	D	23.3	21.8	23.3	22.5	28.0	26.0
980 PX 650	24.9				D E	24.8	23.5	24.8	23.5	27.0	25.8
975 N 6390	25.0				E	25.3	22.8	22.8	22.5	30.3	26.3
MEAN	23.8					23.6	21.6	23.3	22.9	26.4	24.9
CV	5.7					5.3	3.0	5.1	4.1	8.9	4.7
LSD @ 0.05	0.77					1.79	0.93	1.68	1.34	NS	NS

**** Missing 4 plots (Yolo)***
***** Missing 1 plot (Yolo)***

To compare all varieties except 973 and 976 with each other (24 plots/mean)
LSD @ 0.05 0.77

To compare all varieties except 973 (24 plots/mean) with 976 (20 plots/mean)
LSD @ 0.05 0.81

To compare all varieties except 976 (24 plots/mean) with 973 (23 plots/mean)
LSD @ 0.05 0.78

To compare variety 976 (20 plots/mean) with 973 (23 plots/mean)
LSD @ 0.05 0.82

Variety X Location mean separation

To compare all interaction means except Yolo 973 with each other (4 plots/mean)
Variety X Location LSD 0.05 1.90

To compare Yolo 973 (3 plots/mean) with all other interaction means (4 plots/mean)
Variety X Location LSD 0.05 2.05

Table 4e. 2009 MID SEASON REPLICATED COMBINED ANALYSIS: pH

Variety	pH 6 locations		Yolo	San Joaquin	Stanislaus	Fresno # 1	Fresno # 2	Kern
967 HM 6898	4.38	A	4.33	4.37	4.33	4.47	4.45	4.32
972 H 8504	4.38	A	4.27	4.32	4.32	4.55	4.51	4.31
866 H 9780	4.40	A B	4.32	4.42	4.34	4.50	4.44	4.40
868 AB 2	4.42	B C	4.34	4.41	4.42	4.55	4.42	4.40
971 AB3 (DRI0303)	4.44	C D	4.41	4.47	4.43	4.47	4.44	4.41
975 N 6390	4.45	C D E	4.42	4.48	4.42	4.48	4.47	4.43
969 CXD 255	4.45	C D E	4.38	4.49	4.41	4.52	4.48	4.44
979 PX 002	4.46	D E F	4.45	4.49	4.45	4.47	4.45	4.47
976 CXD 282 *	4.47	E F		4.46	4.46	4.49	4.48	4.48
977 HM 6903	4.48	E F G	4.44	4.52	4.43	4.55	4.48	4.44
865 H 2601	4.48	E F G H	4.43	4.48	4.46	4.45	4.59	4.48
980 PX 650	4.49	F G H	4.43	4.53	4.47	4.48	4.54	4.52
966 H 4007	4.51	G H I	4.47	4.58	4.51	4.43	4.56	4.51
919 SUN 6366	4.51	H I	4.45	4.55	4.59	4.43	4.56	4.50
978 HM 7883	4.53	I J	4.50	4.61	4.55	4.45	4.54	4.56
973 HMX 7885 **	4.56	J	4.57	4.64	4.55	4.44	4.55	4.61
**** Missing 4 plots (Yolo)***								
***** Missing 1 plot (Yolo)***								
MEAN	4.46		4.41	4.49	4.45	4.48	4.50	4.45
CV	1.3		0.8	0.8	1.7	1.8	1.4	0.9
LSD @ 0.05	0.033		0.048	0.050	0.108	NS	0.088	0.056

To compare all varieties except 973 and 976 with each other (24 plots/mean)
LSD @ 0.05 0.033

To compare all varieties except 973 (24 plots/mean) with 976 (20 plots/mean)
LSD @ 0.05 0.035

To compare all varieties except 976 (24 plots/mean) with 973 (23 plots/mean)
LSD @ 0.05 0.033

To compare variety 976 (20 plots/mean) with 973 (23 plots/mean)
LSD @ 0.05 0.035

Variety X Location mean separation

To compare all interaction means except Yolo 973 with each other (4 plots/mean)
Variety X Location LSD 0.05 0.081

To compare Yolo 973 (3 plots/mean) with all other interaction means (4 plots/mean)
Variety X Location LSD 0.05 0.087