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REPORT to the California Tomato Commission
Tomato Variety Trials: Postharvest Evaluations for 2005

Responsible:

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Location: UC Davis Mann Lab and Field Trials in cooperating growers' fields.

A. Objectives of Research:

To evaluate the color, firmness and compositional quality of table-ripe fresh market tomatoes (round and roma types) from established varieties and new experimental lines.

B. Executive Summary

In 2005 we evaluated 13 **round** fresh market tomato varieties from the Fresno and Merced replicated trials, and 12 varieties from the San Joaquin Trial. There were 12 varieties in common among the 3 trials. We evaluated fruit for color, firmness and composition at the table-ripe stage. Fruit were harvested as mature-greens (MG) and vine-ripes (VR, 30-40% color) in Fresno and Merced Trials and only as MG in the San Joaquin Trial. Seven **Roma** fresh market tomato varieties were harvested as MG from the San Joaquin Trial only. A description of the color, firmness and composition quality measurements carried out on fruit at the table-ripe stage are described in **Tables 1-3.**

Results for **round** tomato variety trials are presented in **Tables 4 – 6** for the individual trials and all MG results are summarized in **Table 8** and all results for VR-harvested are in **Table 9**. An overall rating for the 13 round varieties is presented in **Table 10**. All varieties tested in 2005

developed good red color, whether harvested as MG or VR. Many varieties had very firm fruit, a few had firm fruit and 1 variety (AT-37) had consistently low firmness values. Composition was generally similar among the 13 varieties for a given trial. It was abundantly evident that fruit from the Fresno trial developed excellent color, had the highest firmness values and also had the best composition (average of 4.8% soluble solids and 0.38% titratable acidity). Round fruit from the Merced and San Joaquin trials had similar average composition, color and firmness. The seven Roma cultivars evaluated in the San Joaquin trial (MG only) had good red color, similar firmness values, but % soluble solids and % titratable acidity varied significantly (**Table 7**).

C. Experimental Procedures

Fruit Sampling. We harvested mature-green (MG) fruit from the 3 variety trials for 13 replicated varieties. For 2 trials, vine-ripe (VR) fruit were harvested with 30-40% color. Typically 80 MG fruit or more were harvested in buckets, placed in plastic trays for transport to the lab, and well-formed large (5x5 or 5x6) fruit were selected for ripening and evaluation. A minimum of 45 fruit (3 reps of 15 each) were ripened under standard conditions: 3-4 days 100 ppm ethylene at 20°C (68°F) and high relative humidity followed by placement on plastic-wrapped trays to complete ripening at 20°C. Fruit that did not show color change within 3-4 days of ethylene treatment were discarded. Fruit were evaluated when they reached the **table-ripe stage (**color stage 6 on USDA scale ± 1-2 days) based on visual assessment.

Quality Measurements. Quality evaluation of different tomato varieties should include data on firmness, color and composition at the table-ripe stage (**Table 1**). Flavor can be estimated measuring soluble solids (sugars) and acid contents. Table 1 describes the measurements useful to assess the postharvest potential of different fresh market tomato varieties. Typical values for color and firmness measurements are described in **Table 2** and **Table 3**.

Table 1. Ripe tomato quality measurements for 2004 variety trials.

Attribute	Measurement	Additional Information
1. Color	1a. Objective color values using a Minolta Color meter	Data reported as Hue; this is the most useful single value to compare tomato color; see **Table 2** for typical values. Hue values from 35-40 usually indicate good red color.
	1b. Lycopene	Pericarp discs are extracted in hexane and determined spectrophotometrically.
2. Texture	Compression test: the force to compress the fruit a distance of 5 mm	Computerized texture analyzer equipped with a 25 mm flat cylinder moving at 0.5 mm/sec. Typical range 15-25 N (**Table 3**). 1 N =9.81 kg-force or 4.45 lb.-force.
3. Composition	3a. Soluble solids (SS) are measured on a refractometer	Fruit are quartered, blended. The juice is filtered and used. 5 min per fruit for sample preparation and measurements of SS and TA. Values can range from 3.5-7.0%.
	3b. Simple sugars	The filtered juice is analyzed for simple sugars by a spectrophotometric method using glucose for calibration.
	3b. Titratable acidity (TA); 10 mL juice are titrated with NaOH	pH of the juice is taken as a part of these measurements. Generally there is an inverse relationship between pH and T.A. Values can range from 0.2-0.6%.

Table 2. Example of color changes during the ripening of fresh market tomato fruits.

Stage of Development/Color	USDA Color Chart Stage	L*	a*	b*	chroma	hue
Mature-Green	1	62.7	-16.0	34.4	37.9	115.0
Breaker	2	55.8	-3.5	33.0	33.2	83.9
Pink-Orange	4	49.6	16.6	30.9	35.0	61.8
Orange-Red	5	46.2	24.3	27.0	36.3	48.0
Bright Red; Table-ripe	6	41.8	26.4	23.1	35.1	41.3
Dark Red	6+	39.6	27.5	20.7	34.4	37.0

L* indicates lightness (high value) to darkness (low value); a* changes from green (negative value) to red, b* changes from blue to yellow (high value). Chroma and hue are calculated $[(a^{*2} + b^{*2})^{1/2}$ and $\tan^{-1}(b^*/a^*)]$ and indicate intensity and color, respectively. The lower the hue value, the redder the tomato. Hue is the single most useful color value.

Table 3. Textural characteristics of tomatoes based on subjective and objective tests. One Newton-force = 9.81 kg-force or 4.45 pound-force.

Firmness Class	Description based on hand and finger pressure	Newtons-force
Very Firm	Fruit yields only slight to considerable pressure	>25
Firm	Fruit yields slightly to moderate pressure	18-25
Moderately Firm	Fruit yields moderately to moderate pressure	15-18
Moderately Soft	--	12-15
Soft	Fruit yields readily to slight pressure	8-12
Very Soft	Fruits yields very readily to slight pressure	<8

Measured by compressing fruit at the equator with a 25 mm flat cylindrical probe to a distance of 5 mm on a computerized texture analyzer. 1 Newton force = 9.81 kg-force or 4.45 pound-force.

D. Results

1. Round Fresh Market Tomato Variety Results

Fresno County Replicated Round Tomato Trial.

Thirteen cultivars from the replicated trial were evaluated from both MG and VR harvested fruit (**Table 4**). Final red color was very good in all fruit ripened from MG and VR stages with all values below 40 hue color units (see Table 2). The VR harvested fruit had lower average firmness than that of MG ripened fruit, although all fruit in this trial had firm to very firm fruit. Fruit in the Fresno trial were generally firmer than fruit from the other 2 trials. AT-37 had the lowest firmness, followed by Shady Lady. More than half the other cultivars were very firm. The average % soluble solids were higher in this trial than the other 2 variety trials and %soluble solids averaged the same at the table-ripe stage from the MG or VR harvested fruit. There was little variation among varieties in % soluble solids, pH or acidity. Average titratable acidity was the same for the MG and VR harvested fruit and was higher than that of fruit from the other 2 trials. Analysis of simple sugars from the juice extract used for determination of % soluble solids indicates that simple sugars comprise about 50% of the soluble solids reading.

Merced County Replicated Round Tomato Trial.
In the Merced County Trial, 13 cultivars were harvested at the MG and VR stages (**Table 5**). Red color values were good, hovering around the critical 40 hue value. Fruit were generally firm when ripened, but were on average notably less firm than in the Fresno trial. AT-37 and Shady Lady were the least firm cultivars. The % soluble solids were on the low side as were the average % titratable acidity values. There were few differences in ripe quality fruit between the MG and VR harvests based on these measurements.

San Joaquin County Replicated Round Tomato Trial.
In the San Joaquin trial, 12 cultivars were harvested at MG stage only (**Table 6**). Final red color was good, although average values were the least red among the 3 trials. Fruit were generally firm, with AT-37 and Shady Lady being the least firm. The % soluble solids were intermediate between the values of fruit from the Fresno and Merced trials. The % titratable acidity was on the low side and did not vary notably among the varieties. In this trial, sugars were also analyzed and results indicate that slightly less than half the % soluble solids reading is due to simple sugars. Lycopene (the carotenoid that is the red pigment in tomatoes) was also measured in this trial. **Figure 1** shows that there is the expected relationship between objective color values and lycopene concentrations. A higher correlation coefficient could be achieved with a much larger sample size, and we are re-examining the procedure and expect to get much better correlations in the future.

Overall Assessment of Round Tomato Quality from the 3 Trials
Tables 8 and 9 summarize average values for color, firmness and composition for the 13 varieties studied from the 3 trials. MG-harvested fruit from the 3 trials are compared in **Table 8**, while VR-harvested fruit are compared in **Table 9**. For the 3 trial locations, overall average values for the MG harvested fruit (Table 8) indicate that the fruit from Fresno County trial were redder, firmer and higher % soluble solids and % titratable acidity and were therefore the highest quality fruit among the 3 trials. The MG fruit from the San Joaquin County trial were, on average, the least firm with less red color at table-ripe stage, but the overall fruit composition did not vary from that of the fruits from the Merced Trial. The average results for the VR harvested fruit (Table 9) show that the fruit from the Fresno county trial were redder at the table-ripe stage, average firmness did not vary between the 2 trials, and that % soluble solids and % acidity were higher in fruit from Fresno trial. These trends in location differences were observed in almost all the varieties evaluated.

Table 10 attempts to provide an overall summary that takes into account the color, firmness and compositional quality of the MG and VR fruit ripened to the table-ripe stage. The criteria for the rating categories were the same as used in 2003, but are subjective based on experience of Marita Cantwell. Obviously the ratings could be different if the categories were defined differently. Based on the criteria used, the varieties that had the highest overall scores of 6.5 or 6.6 achieved those values because of their high firmness ratings. Almost all fruit could be considered on the low side for the 'flavor' score. Varieties BHN 580 and 654 had the highest flavor ratings. RFT 500-311 had the lowest flavor score but the highest firmness score. AT-37 ranked notably lower than other varieties mainly because it was consistently softer.

2. Roma Fresh Market Tomato Variety Results

San Joaquin Replicated Roma Tomato Trial.

Roma tomatoes were only evaluated in one variety trial in 2005. Seven cultivars of Roma tomatoes were harvested at the MG stage (**Table 7**) in a replicated Roma trial at the San Joaquin County trial. Final red color (hue color value) was good and was similar among varieties. Lower hue values corresponded to higher lycopene concentrations as expected. The ripened Roma fruits were all firm with only slight variation among the cultivars. The values of % soluble solids and % titratable acidity were in the moderate range. There were significant differences in % soluble solids, with cv BHNC9008 and Muriel having the highest values (4.7%) and WS4062 have the lowest values (4.0%). The cvs BHN C9008 and Muriel also had the highest titratable acidity levels. Presumably the combination of higher % soluble solids and higher % titratable aicity would translate into better tasting fruit compared with other cultivars.

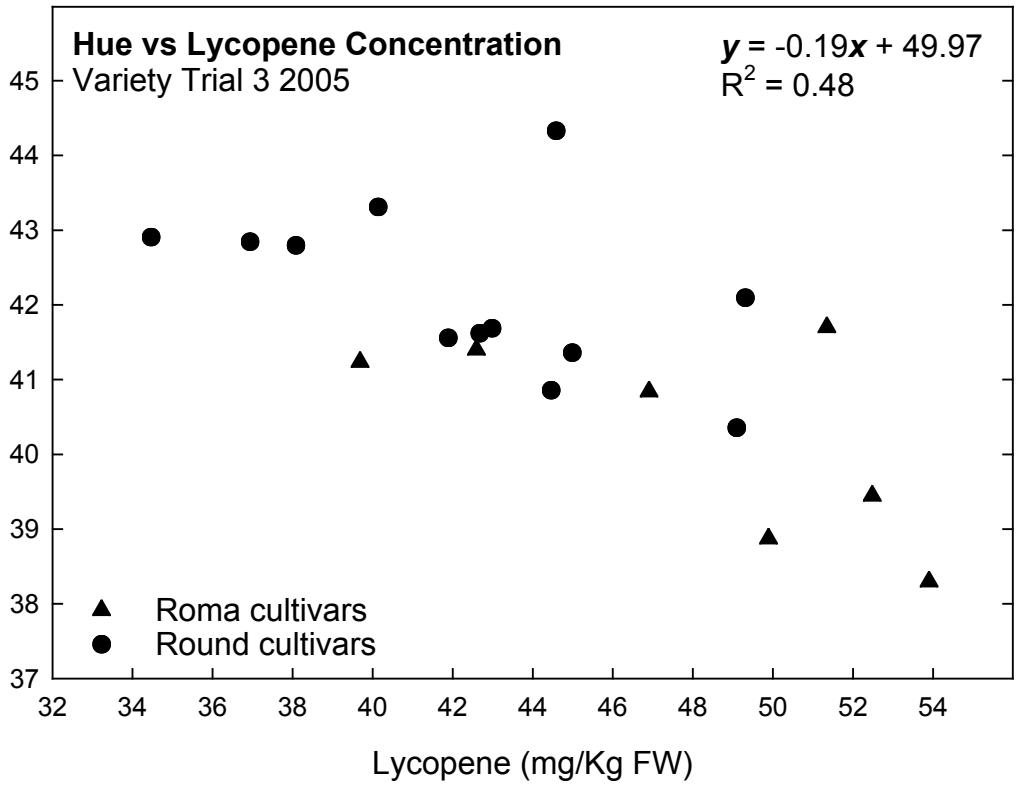

Figure 1. The relationship between average red color values (hue) and lycopene concentrations of pericarp discs of round and roma tomatoes from the 2005 San Joaquin Variety Trial.

1. Round Fresh Market Tomato Variety Results

Table 4. Quality characteristics of fresh market **round** tomatoes harvested **MG** and **VR** from the 2005 Fresno County replicated trial and ripened at 20°C (68°F). Fruit were evaluated at the table-ripe stage as determined visually. See Tables 1-3 for explanation of measurements. Varieties are listed alphabetically by seed company.

Seed Company	Cultivar	Harvest Stage	Red Color, Hue	Firmness, Newtons	Soluble solids, %	Sugars, %	pH	Titratable acidity, %
American Takii	At-37	MG	36.0	16.5	5.0	2.6	4.39	0.37
BHN	BHN 580	MG	32.7	25.4	5.2	2.7	4.39	0.40
	BHN 654	MG	33.7	25.9	5.0	2.5	4.39	0.38
Nunhems	Shady Lady	MG	32.6	18.1	4.9	2.7	4.31	0.40
Rogers/Syngenta	QualiT21	MG	37.3	28.0	5.0	2.7	4.33	0.40
	QualiT 23	MG	34.3	24.7	5.1	2.4	4.31	0.38
	Bobcat	MG	33.4	28.0	4.8	2.2	4.35	0.39
	Catalyst	MG	33.2	27.7	4.6	2.1	4.37	0.37
	RFT500-305	MG	32.8	23.9	4.6	2.2	4.34	0.36
	RFT500-311	MG	34.8	29.5	4.7	2.4	4.37	0.37
	RFT500-312	MG	33.1	26.8	4.6	2.4	4.34	0.37
Sakata	STM 0115	MG	33.7	24.0	4.9	1.7	4.33	0.44
Seminis	SVR 2935	MG	32.9	29.4	4.6	2.1	4.45	0.33
	LSD.05		***1.6***	***3.1***	***0.3***	***0.5***	***0.06***	***0.04***
American Takii	At-37	VR	36.1	16.5	5.0	2.3	4.42	0.38
BHN	BHN 580	VR	33.9	20.3	5.3	2.7	4.39	0.41
	BHN 654	VR	34.2	20.9	4.8	2.6	4.44	0.38
Nunhems	Shady Lady	VR	33.9	16.3	4.6	2.5	4.35	0.39
Rogers/Syngenta	QualiT21	VR	33.5	21.7	5.0	2.8	4.36	0.40
	QualiT 23	VR	34.2	22.4	4.7	2.9	4.38	0.35
	Bobcat	VR	32.4	23.1	4.8	2.7	4.40	0.36
	Catalyst	VR	33.6	23.2	4.5	2.2	4.37	0.36
	RFT500-305	VR	33.0	22.2	4.7	2.6	4.37	0.38
	RFT500-311	VR	32.5	23.1	4.7	2.4	4.39	0.36
	RFT500-312	VR	33.8	22.9	4.6	2.1	4.37	0.38
Sakata	STM 0115	VR	33.2	18.4	4.8	2.3	4.41	0.38
Seminis	SVR 2935	VR	31.0	24.5	4.8	2.8	4.42	0.34
	LSD.05		***1.6***	***3.1***	***0.3***	***0.5***	***0.06***	***0.04***
	Average	**MG**	**33.9**	**25.2**	**4.8**	**2.4**	**4.36**	**0.38**
	Average	**VR**	**33.5**	**21.2**	**4.8**	**2.5**	**4.39**	**0.37**

Color and firmness data are from 3 replicates of 15 fruits for MG and VR harvested tomatoes; composition data are from 3 replicates of composite samples of 15 fruit per rep. Data were analyzed by ANOVA. Lower hue color values indicate redder fruits; lower firmness values indicate softer fruits.

Table 5. Quality characteristics of fresh market **round** tomatoes harvested **MG** and **VR** from the 2005 Merced County replicated trial and ripened at 20°C (68°F). Fruit were evaluated at the table-ripe stage as determined visually. See Tables 1-3 for explanation of measurements. Varieties are listed alphabetically by seed company.

Seed Company	Cultivar	Harvest Stage	Red Color, Hue	Firmness, Newtons	Soluble solids, %	pH	Titratable acidity, %
American Takii	At-37	MG	40.0	12.6	4.2	4.48	0.26
BHN	BHN 580	MG	39.4	18.4	4.6	4.53	0.30
	BHN 654	MG	38.8	18.8	4.5	4.53	0.26
Nunhems	Shady Lady	MG	39.9	16.6	4.3	4.41	0.32
Rogers/Syngenta	QualiT21	MG	39.0	18.8	4.3	4.42	0.30
	QualiT 23	MG	37.7	20.2	4.2	4.42	0.28
	Bobcat	MG	39.5	21.0	4.1	4.43	0.26
	Catalyst	MG	39.6	21.4	4.1	4.44	0.29
	RFT500-305	MG	38.6	19.2	4.1	4.42	0.26
	RFT500-311	MG	39.9	20.9	4.2	4.51	0.24
	RFT500-312	MG	39.5	18.6	4.4	4.48	0.27
Sakata	STM 0115	MG	39.2	16.6	4.3	4.45	0.29
Seminis	SVR 2935	MG	40.6	25.8	4.1	4.55	0.23
	LSD.05		***1.4***	***2.3***	***0.2***	***0.06***	***0.03***
American Takii	At-37	VR	40.0	19.0	4.3	4.55	0.31
BHN	BHN 580	VR	41.0	19.3	4.5	4.56	0.31
	BHN 654	VR	40.4	20.1	4.6	4.57	0.29
Nunhems	Shady Lady	VR	40.4	19.9	4.5	4.48	0.33
Rogers/Syngenta	QualiT21	VR	40.7	18.8	4.2	4.47	0.30
	QualiT 23	VR	39.2	18.5	4.3	4.43	0.28
	Bobcat	VR	39.5	19.4	4.2	4.51	0.30
	Catalyst	VR	39.6	20.8	4.3	4.49	0.31
	RFT500-305	VR	39.3	20.5	4.2	4.45	0.28
	RFT500-311	VR	40.1	20.6	4.1	4.54	0.27
	RFT500-312	VR	40.2	20.7	4.1	4.51	0.30
Sakata	STM 0115	VR	40.1	19.4	4.5	4.48	0.33
Seminis	SVR 2935	VR	40.4	22.5	4.2	4.59	0.25
	LSD.05		***1.4***	***2.3***	***0.2***	***0.06***	***0.03***
	Average	**MG**	**39.4**	**19.2**	**4.3**	**4.47**	**0.27**
	Average	**VR**	**40.1**	**20.0**	**4.3**	**4.51**	**0.30**

Color and firmness data are from 3 replicates of 15 fruits for MG and VR harvested tomatoes; composition data are from 3 replicates of composite samples of 15 fruit per rep. Data were analyzed by ANOVA. Lower hue color values indicate redder fruits; lower firmness values indicate softer fruits.

Table 6. Quality characteristics of fresh market **round** tomatoes harvested **MG** from the 2005 San Joaquin County replicated trial and ripened at 20°C (68°F). Fruit were evaluated at the table-ripe stage as determined visually. See Tables 1-3 for explanation of measurements. Varieties are listed alphabetically by seed company.

Seed Company	Cultivar	Red Color Hue	Firmness Newtons	Soluble solids %	Sugars %	pH	Titratable acidity %	Lycopene mg/Kg
American Takii	At-37	44.3	13.6	4.3	2.3	4.25	0.30	44.6
BHN	BHN 580	41.6	20.0	4.6	2.1	4.32	0.29	42.7
	BHN 654	42.8	18.8	4.6	2.1	4.32	0.27	38.1
Nunhems	Shady Lady	40.4	16.1	4.5	1.9	4.28	0.30	49.1
Rogers/Syngenta	QualiT21	42.8	19.3	4.5	2.4	4.32	0.26	36.9
	QualiT 23	42.1	19.9	4.7	2.0	4.25	0.30	49.3
	Bobcat	41.4	20.4	4.2	2.0	4.27	0.28	45.0
	Catalyst	40.9	15.7	4.0	2.2	4.25	0.27	44.5
	RFT500-305	42.9	19.9	4.4	2.3	4.24	0.28	34.5
	RFT500-311	43.3	23.0	4.2	2.0	4.28	0.27	40.1
	RFT500-312	41.6	18.9	4.1	2.2	4.23	0.28	41.9
Sakata	STM 0115	41.7	20.0	4.4	2.0	4.29	0.28	43.0
	LSD.05	1.7	3.1	0.2	ns	0.04	ns	ns
	Average	**42.1**	**18.8**	**4.4**	**2.1**	**4.28**	**0.28**	**42.5**

Color and firmness data are from 3 replicates of 15 fruits; composition data are from 3 replicates of composite samples of 15 fruit per rep. Data were analyzed by ANOVA. Lower hue color values indicate redder fruits; lower firmness values indicate softer fruits.

2. Roma Fresh Market Tomato Variety Results

Table 7. Quality characteristics of fresh market **ROMA** tomatoes harvested **MG** from the 2005 San Joaquin County replicated trial and ripened at 20°C (68°F). Fruit were evaluated at the table-ripe stage as determined visually. See Tables 1-3 for explanation of measurements. Varieties are listed alphabetically by seed company.

Seed Company	Cultivar	Red Color Hue	Firmness Newtons	Soluble solids %	Sugars %	pH	Titratable acidity %	Lycopene mg/Kg
BHN	BHN C9008	41.2	18.6	4.7	2.8	4.20	0.34	39.7
Sakata	Monica	39.4	21.3	4.4	2.8	4.25	0.29	52.5
	Muriel	38.9	19.1	4.7	2.8	4.22	0.34	49.9
Syngenta/Rogers	Miroma	41.7	20.8	4.4	2.5	4.28	0.29	51.3
	RPT 8109	41.4	22.3	4.3	2.4	4.17	0.30	42.6
Western Seed	WS 4061	38.3	17.2	4.3	2.3	4.32	0.28	53.9
	WS 4062	40.8	21.5	4.0	1.9	4.24	0.29	46.9
	LSD.05	1.2	2.6	0.2	0.2	0.05	0.02	8.6
	Average	**40.2**	**20.1**	**4.4**	**2.5**	**4.24**	**0.30**	**48.1**

Color and firmness data are from 3 replicates of 15 fruits; composition data are from 3 replicates of composite samples of 15 fruit per rep. Data were analyzed by ANOVA. Lower hue color values indicate redder fruits; lower firmness values indicate softer fruits.

Table 8. Quality characteristics of fresh market **round** tomatoes harvested **MG** from the three 2005 replicated trials and ripened at 20°C (68°F). Fruit were evaluated at the table-ripe stage as determined visually. See Tables 1-3 for explanation of measurements.

Seed Company	Cultivar	Trial	Red Color Hue	Firmness Newtons	Soluble solids %	pH	Titratable acidity %
American Takii	At-37	Fresno	36.0	16.5	5.0	4.39	0.37
		Merced	40.0	12.6	4.2	4.48	0.26
		San Joaquin	44.3	13.6	4.3	4.25	0.30
		AVERAGE	***40.1***	***14.2***	***4.5***	***4.37***	***0.31***
BHN	BHN 580	Fresno	32.7	25.4	5.2	4.39	0.40
		Merced	39.4	18.4	4.6	4.53	0.30
		San Joaquin	41.6	20.0	4.6	4.32	0.29
		AVERAGE	***37.9***	***21.3***	***4.8***	***4.41***	***0.33***
	BHN 654	Fresno	33.7	25.9	5.0	4.39	0.38
		Merced	38.8	18.8	4.5	4.53	0.26
		San Joaquin	42.8	18.8	4.6	4.32	0.27
		AVERAGE	***38.4***	***21.2***	***4.7***	***4.41***	***0.30***
Nunhems	Shady Lady	Fresno	32.6	18.1	4.9	4.33	0.40
		Merced	39.9	16.6	4.3	4.41	0.32
		San Joaquin	40.4	16.1	4.5	4.28	0.30
		AVERAGE	***37.6***	***16.9***	***4.6***	***4.34***	***0.34***
Rogers/Syngenta	QualiT21	Fresno	37.3	28.0	5.0	4.33	0.40
		Merced	39.0	18.8	4.3	4.42	0.30
		San Joaquin	42.8	19.3	4.5	4.32	0.26
		AVERAGE	***39.7***	***22.0***	***4.6***	***4.36***	***0.32***
	QualiT 23	Fresno	34.3	24.7	5.1	4.31	0.38
		Merced	37.7	20.2	4.2	4.42	0.28
		San Joaquin	42.1	19.9	4.7	4.25	0.30
		AVERAGE	***38.0***	***21.6***	***4.7***	***4.33***	***0.32***
	Bobcat	Fresno	33.4	28.0	4.8	4.35	0.39
		Merced	39.5	21.0	4.1	4.43	0.26
		San Joaquin	41.4	20.4	4.2	4.27	0.28
		AVERAGE	***38.1***	***23.1***	***4.4***	***4.35***	***0.31***
	Catalyst	Fresno	33.2	27.7	4.6	4.37	0.37
		Merced	39.6	21.4	4.1	4.44	0.29
		San Joaquin	40.9	15.7	4.0	4.25	0.27
		AVERAGE	***37.9***	***21.6***	***4.2***	***4.35***	***0.31***

Table 8, cont.

Seed Company	Cultivar	Trial	Red Color Hue	Firmness Newtons	Soluble solids %	pH	Titratable acidity %
	RFT500-305	Fresno	32.8	23.9	4.6	4.34	0.36
		Merced	38.6	19.2	4.1	4.42	0.26
		San Joaquin	42.9	19.9	4.4	4.24	0.28
		AVERAGE	***38.1***	***21.0***	***4.4***	***4.33***	***0.30***
	RFT500-311	Fresno	34.8	29.5	4.7	4.37	0.37
		Merced	39.9	20.9	4.2	4.51	0.24
		San Joaquin	43.3	23.0	4.2	4.28	0.27
		AVERAGE	***39.3***	***24.5***	***4.4***	***4.39***	***0.29***
	RFT500-312	Fresno	33.1	26.8	4.6	4.34	0.37
		Merced	39.5	18.6	4.4	4.48	0.27
		San Joaquin	41.6	18.9	4.1	4.23	0.28
		AVERAGE	***38.1***	***21.4***	***4.4***	***4.35***	***0.31***
Sakata	STM 0115	Fresno	33.7	24.0	4.9	4.33	0.44
		Merced	39.2	16.6	4.3	4.45	0.29
		San Joaquin	41.7	20.0	4.4	4.29	0.28
		AVERAGE	***38.2***	***20.2***	***4.5***	***4.36***	***0.34***
	Average	Fresno	**33.9**	**25.2**	**4.8**	**4.36**	**0.38**
	Average	Merced	**39.4**	**19.2**	**4.3**	**4.47**	**0.27**
	Average	San Joaquin	**42.1**	**18.8**	**4.4**	**4.28**	**0.28**
		LSD.05	**1.8**	**3.3**	**0.2**	**0.06**	**0.04**
	OVERALL	**AVERAGE**	**38.5**	**21.1**	**4.5**	**4.37**	**0.31**

Color and firmness data are from 3 replicates of 15 fruits for MG and VR harvested tomatoes; composition data are from 3 replicates of composite samples of 15 fruit per rep. Data were analyzed by ANOVA. Lower hue color values indicate redder fruits; lower firmness values indicate softer fruits.

Table 9. Quality characteristics of fresh market **round** tomatoes harvested **VR** from the three 2005 replicated trials and ripened at 20°C (68°F). Fruit were evaluated at the table-ripe stage as determined visually. See Tables 1-3 for explanation of measurements.

Seed Company	Cultivar	Trial	Red Color Hue	Firmness Newtons	Soluble solids %	pH	Titratable acidity %
American Takii	At-37	Fresno	36.1	16.5	5.0	4.42	0.38
		Merced	40.0	19.0	4.3	4.55	0.31
		AVERAGE	***38.0***	***17.7***	***4.6***		
BHN	BHN 580	Fresno	34.0	20.3	5.3	4.39	0.41
		Merced	41.0	19.3	4.5	4.56	0.31
		AVERAGE	***37.5***	***19.8***	***4.9***		
	BHN 654	Fresno	34.2	20.9	4.8	4.44	0.38
		Merced	40.4	20.1	4.6	4.57	0.29
		AVERAGE	***37.3***	***20.5***	***4.7***		
Nunhems	Shady Lady	Fresno	33.9	16.3	4.6	4.35	0.39
		Merced	40.4	20.0	4.5	4.48	0.33
		AVERAGE	***37.2***	***18.1***	***4.5***		
Rogers/Syngenta	QualiT21	Fresno	33.5	21.7	5.0	4.36	0.40
		Merced	40.7	18.8	4.2	4.47	0.30
		AVERAGE	***37.1***	***20.3***	***4.6***		
	QualiT 23	Fresno	34.2	22.4	4.7	4.38	0.35
		Merced	39.2	18.5	4.3	4.43	0.28
		AVERAGE	***36.7***	***20.4***	***4.5***		
	Bobcat	Fresno	32.4	23.1	4.8	4.40	0.36
		Merced	39.5	19.4	4.2	4.51	0.30
		AVERAGE	***35.9***	***21.2***	***4.5***		
	Catalyst	Fresno	33.7	23.2	4.5	4.37	0.36
		Merced	39.6	20.8	4.3	4.49	0.31
		AVERAGE	***36.6***	***22.0***	***4.4***		
	RFT500-305	Fresno	33.0	22.2	4.7	4.37	0.38
		Merced	39.3	20.5	4.2	4.45	0.28
		AVERAGE	***36.1***	***21.4***	***4.4***		
	RFT500-311	Fresno	32.5	23.1	4.7	4.39	0.36
		Merced	40.1	20.6	4.1	4.54	0.27
		AVERAGE	***36.3***	***21.9***	***4.4***		

Table 9, cont.

Seed Company	Cultivar	Trial	Red Color Hue	Firmness Newtons	Soluble solids %	pH	Titratable acidity %
	RFT500-312	Fresno	33.8	22.9	4.6	4.37	0.38
		Merced	40.2	20.7	4.1	4.51	0.30
		AVERAGE	***37.0***	***21.8***	***4.4***		
Sakata	STM 0115	Fresno	33.2	18.4	4.8	4.41	0.38
		Merced	40.1	19.4	4.5	4.48	0.33
		AVERAGE	***36.6***	***18.9***	***4.6***		
Seminis	PX 2935	Fresno	31.0	24.5	4.8	4.42	0.34
		Merced	40.4	22.1	4.2	4.59	0.25
		AVERAGE	***35.7***	***23.5***	***4.5***		
	Average	Fresno	**33.5**	**21.2**	**4.8**	**4.39**	**0.37**
	Average	Merced	**40.1**	**20.0**	**4.3**	**4.51**	**0.30**
		LSD.05	**1.4**	**2.1**	**0.3**	**0.05**	**0.03**
	OVERALL	**AVERAGE**	**36.8**	**20.6**	**4.6**	**4.45**	**0.34**

Color and firmness data are from 3 replicates of 15 fruits for MG and VR harvested tomatoes; composition data are from 3 replicates of composite samples of 15 fruit per rep. Data were analyzed by ANOVA. Lower hue color values indicate redder fruits; lower firmness values indicate softer fruits.

Summary Table 10. Overall scores of ripe round tomato varieties (includes MG from all 3 trials and VR from 2 trials) evaluated in 2005. **Total score is based on the sum of the flavor, red color and firmness scores, and the higher the total score, the better the overall quality. Varieties are ordered based on total quality score (right column).**

Variety	Number Evaluations	%SS Score	% TA Score	**Flavor Score** (Max = 3)	**Red Color Score** (Max = 3)	**Firmness Score** (Max = 3)	**Total Quality Score** (Maximum =9)
RFT500-311	5	1.4	1.4	**1.4**	**2.2**	**3.0**	**6.60**
QualiT 23	5	1.8	1.6	**1.7**	**2.2**	**2.6**	**6.50**
Bobcat	5	1.4	1.6	**1.5**	**2.2**	**2.8**	**6.50**
Catalyst	5	1.4	1.6	**1.5**	**2.2**	**2.8**	**6.50**
PX 2935	4	1.5	1.5	**1.5**	**2.0**	**3.0**	**6.50**
BHN 580	5	2.4	2.0	**2.2**	**2.0**	**2.2**	**6.40**
BHN 654	5	2.0	1.6	**1.8**	**2.2**	**2.4**	**6.40**
RFT500-305	5	1.4	1.4	**1.4**	**2.2**	**2.6**	**6.20**
RFT500-312	5	1.4	1.6	**1.5**	**2.0**	**2.6**	**6.10**
STM 0115	5	1.6	1.8	**1.7**	**2.2**	**2.2**	**6.10**
Shady Lady	5	1.8	1.9	**1.8**	**2.2**	**2.0**	**6.00**
QualiT21	5	1.6	1.8	**1.7**	**1.8**	**2.4**	**5.90**
AT-37	5	1.4	1.8	**1.6**	**1.8**	**1.6**	**5.00**

Varieties are scored for each characteristic on a 3 point scale, where 1=low, 2=intermediate, 3=high. For red color, score 1= poor, with hue >40, 2= hue 35-40, and score 3 = high with hue <35. For firmness, score 1 = <15N force, score 2 = 15-20, and score 3 = >20. For soluble solids, score 1 = < 4.5 %SS, score 2 = 4.5-5.0 %SS, and score 3 = >5.0 %SS. For Acidity, score 1 = < 0.30 %T.A., score 2 = 0.30-0.40 %T.A., and score 3= >0.40 %T.A. Flavor Score is the average of the soluble solids and titratable acidity scores. The categories are the same as used in 2003.