

2006



Stanislaus County Processing Tomato Variety Trial Report



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The processing tomato industry in California depends on the availability of consistently dependable varieties that provide maximum yield and quality, yet conform to the demands of mechanical harvest and handling. In recent years, great emphasis has been placed on developing varieties with improved processing qualities as well as horticultural characteristics, including field vine storage, disease and nematode resistance, transportability and early plant emergence under cool climatic conditions. Breeding programs (public and private) are attempting to provide varieties with high soluble solids, better consistency (viscosity of juice and puree), improved firmness and color, jointlessness, easier peelability, better flavor, improved foliar cover to reduce losses from sunburn/scald, insect, nematode and disease resistance. Tomato variety trials provide a good opportunity to realistically evaluate and make side-by-side comparisons of various new and standard lines under actual grower field conditions. Standardized procedures for variety trials in a number of counties allow for greater variety comparisons over a wider geographical area. This greatly improves the value of variety trials and the information derived from them.

The 2006 season did anything but favor processing tomato production. Spring rains delayed the planting (and harvesting) of many north San Joaquin Valley fields. As these plantings entered bloom the July heat wave set in and caused an array of pollination problems including split sets and hollow fruit. These conditions also favored root knot nematode activity, and Fusarium diseases and additional production losses were incurred as a result. In September, harvests were further delayed because fruit ripening slowed in response to the cooler, shorter fall days and fruit that were already ripe were beginning to show signs of blackmold. The last loads of processing tomatoes were delivered the week of November 11. These events culminated in an estimated 1.5 million ton loss of tomatoes and the lowest inventories in 10 years.

Stanislaus County Mid-maturity Variety Trial Procedures:

The 2006 variety trial was established in Vernalis with Bill Alderson (Alderson Farms). There were 16 replicated and 6 observational midseason maturity entries in the trial representing 8 seed companies (Table 1). The replicated test used a randomized complete block design having 4 blocks. The observational, or non-replicated lines were planted adjacent to the replicated test. A replicate was one bed wide and 100 ft in length. Tomatoes were seeded at California Transplants, Inc. on March 22. On May 19th, the transplants were set into raised, 60"-wide beds using equipment and labor kindly provided by the grower. The field variety was H 9665. The transplants were established in the first 6 weeks by sprinkler irrigation. Furrow irrigation was used from early July until mid-September. On September 19th, members of Dr. Diane Barrett's laboratory collected a sample of red ripe fruit from each plot in 2 replicated blocks and from each observational line. The samples were returned to the laboratory located in the Department of Food Science and Technology at UC Davis for determining fruit °brix, pH, Bostwick, titratable acidity, color, predicted past Bostwick, predicted paste yield, and predicted catsup yield. Using the grower's equipment and crew, fruit were mechanically harvested from each plot on October 16, conveyed to a GT cart for weighing and then loaded onto a trailer for processing. While harvesting, a sample of red ripe fruit was again collected from each plot and submitted to the Processing Tomato Advisory Board at Panella Trucking Inc. for determining fruit brix, color, and pH.

RESULTS

Stanislaus County replicated midseason-maturity trial (Table 2A)

Fruit yield and brix did not differ significantly between the varieties according to the analysis of variance. The average yield for this trial was 36.2 tons/A and ranged from a low of 29.5 ton/A for Sun 6374 to a high of 45.2 tons/A for DRI 8058. Production exceeding 40 ton/A was also achieved by AB 2 and DRI 4610. Fruit brix for all varieties but Sun 6374 was between 4.8% (PS 345 and H 9780) and 5.9% (Sun 6368 and H 8004) Sun 6374 had an impressive 6.6% soluble solids content. Varieties differed significantly for fruit color. Ten varieties formed the best color group that was led by U 886 (21.3), DRI 4610 (21.5) and H 8004 (21.5). PS 345 and PX 384 fruit had the highest (worst) color readings. Acid production was unremarkable in this year's trial (pH=4.50). Fruit of AB 2 and H 8004, however, were significantly more acidic than H 2005, H 2601, H 9780, Sun 6368, HMX 4802, or U 567.

Midseason maturity observational trial (Table 2B)

Of the 6 lines evaluated, NDM 4464 had the best yield (39.6 tons/A) and the most acidic fruit (pH=4.45) but the fruit had poor color and low brix. The variety U 892 produced the reddest fruit with the highest brix followed by HMX 5893, BOS 212 and U 898, and finally NDM 4464.

THANK YOU THANK YOU THANK YOU

A big thank you to Bill Alderson for his participation and cooperation in this trial. Delays to normal operations are commonplace and I appreciate his willingness to accept these occurrences.

Thanks also to CTRI and the seed companies participating in this year's trial for contributing financial support.

Table 1. Description of replicated and observational midseason-maturing, hybrid varieties evaluated in 2006.

Seed Company	Replicated Entries		Observational Entries	
	Variety	Genetic Traits ^y	Variety	Genetic Traits
AB Seeds	AB 2^z	VFFP		
	DRI 4610	VFFN		
	DRI 8058	VFFNSW		
Harris Moran	HMX 4802	VFFFNP	HMX 5893	VFFNP
Heinz Seed	H 2005	VFFNP		
	H 2601	VFFNP		
	H 8004	VFFNP		
	H 9780	VFFNP		
Lipton/Unilever				
Bestfoods, N.A.	U 567	VFFNPSW	U 892	VFFN
	U 886	VFFN	U 898	VFFN
Nippon Del Monte Co.			NDM 4464	VFFNP
Nunhems USA, Inc.	RED SPRING	VFFNP		
	SUN 6368	VFFNP		
	SUN 6374	VFFNP		
Orsetti Seed Co., Inc.	BOS 67374	VFFNP	BOS 212	VFFNP
Seminis Vegetable				
Seeds, Inc.	PS 345	VFFNP		
	PX 384	VFFN		

^y V = Verticillium wilt race 1 resistance; F = Fusarium race 1 resistance; FF= Fusarium race 1 and 2 resistance; FFF= Fusarium race 1, 2, and 3 resistance; N= Nematode (*M. incognita*) resistance; P = bacterial speck (*P. syringae* pv *tomato*) resistance, SW = tomato spotted wilt resistance.

^z Varieties in bold are industry standards.

Table 2A. Fruit yield, °brix, color, and pH of replicated, midseason maturity hybrid processing tomato varieties evaluated in Stanislaus County in 2006.

Variety	Yield (tons/acre)	°Brix	Color	pH
DRI 8058	45.2	5.0	22.3 ef	4.50 cd
AB 2	40.5	5.2	23.3 cdef	4.41 e
DRI 4610	40.4	5.3	21.5 f	4.49 cd
PS 345	39.5	4.8	27.3 ab	4.51 cd
H 2601	37.5	5.2	22.5 def	4.47 ab
Red Spring	37.5	5.0	22.5 def	4.57 cd
PX 384	37.3	5.8	27.5 a	4.48 cd
H 9780	36.9	4.8	25.0 bc	4.52 bc
SUN 6368	36.4	5.9	24.8 cd	4.52 bc
U 886	35.2	5.4	21.3 f	4.50 cd
H 2005	34.7	5.8	22.5 def	4.59 a
H 8004	34.1	5.9	21.5 f	4.45 de
HMX 4802	33.2	5.2	25.0 bc	4.57 ab
BOS 67374	30.9	5.7	24.3 cde	4.48 cd
U 567	30.4	5.4	23.0 cdef	4.52 bc
SUN 6374	29.5	6.6	23.3 cdef	4.48 cd
Mean=	36.2	5.4	23.6	4.50
LSD @ 0.05=	NS	NS	2.5	0.06
C.V.=	24.3	13.0	7.4	1.0

Table 2B. Fruit yield, °brix, color, and pH of observational midseason-maturity hybrid processing tomato varieties evaluated in Stanislaus County in 2006.

Variety	Yield (tons/A)	°Brix	Color	pH
NDM 4464	39.6	4.9	24.0	4.45
U 898	30.4	5.1	22.0	4.53
BOS 212	29.0	5.7	24.0	4.56
U 892	23.0	6.7	19.0	4.53
HMX 5893	19.4	6.6	21.0	4.58
Mean=	28.3	5.8	22.0	4.53

2006 Statewide Variety Trial Report

Introduction

University of California farm advisors conduct variety trials in California's major processing tomato production regions to assist processors in identifying early- and midseason-maturing varieties that have improved processing quality and horticultural characteristics. This year, there were 3 early- and 7 mid-maturity trials conducted statewide. This report presents selected results of from the statewide trials. A complete report of the 2006 UCCE Statewide Processing Tomato Variety Trials can be obtained from your local UCCE farm advisor or from the Web at the following address

<http://vric.ucdavis.edu/veginfo/commodity/tomato/2006TomatoVarietyTrial>

Statewide Variety Trial Procedures

Early maturity tests were planted in February, March, or late April and mid-maturity lines were planted from March to May usually in commercial production fields with grower cooperators. In replicated trials, experiments use a randomized complete block design with 4 blocks. Each variety is planted in a one-bed by 100-foot long plot. Varieties for observation are not replicated but are planted adjacent to the replicated trial. The farm advisor coordinates the trial's seeding and transplanting activities according to the grower cooperator's schedule for the larger field. The grower conducts all cultural operations between planting and harvest. Just prior to samples of red ripe fruit are collected from all plots and submitted to an area PTAB station for quality measurements (i.e., brix, color, and pH). The remaining fruit are harvested using commercial 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. Means were separated using Fisher's least significant difference test at the 5% level.

Results

Replicated, early season maturity varieties (Table 4 and 5):

When the data were combined, a significant variety x location interaction effect was observed for fruit yield but not fruit °brix, color, or pH. The average yield across all locations and varieties tested was 45.7 tons/A. Yields ranged from a low of 41.3 ton/A for U 462 to a high of 49.5 tons/A for H 5003. Significant production differences were observed between each of the trials. There was a 20.1 and 6.8 ton/A yield difference between the Contra Costa County trial and the Fresno and Yolo County trials. The statewide average fruit °brix was 5.2.

The fruit °brix leaders were Hypeel 45 (5.6), Sun 6366 (5.6), and PS 438 (5.5). The lowest solids-producing varieties were HMX 5883 (5.0), BOS 66509 (4.8), and H 9280 (4.8). BOS 66508, H 5003 and PS 438 fruit had excellent color as indicated by LED readings <24.0. Varieties with the poorest fruit color, or highest color reading, were HMX 5883 (27.9), Sun 6366 (27.4), and, U 250 (26.8). The combined locations fruit pH was 4.35. Hypeel 45 fruit were the most acidic and had a mean pH of 4.27. Fruit of PS 438 had the highest pH at 4.43 and were significantly less acidic than any other variety evaluated.

Replicated, mid-maturity varieties (Tables 6 and 7): Fruit yield, °brix, color, and pH were influenced by trial location. For this reason, the results from the individual trials should be used to make specific variety comparisons. The following general statements can, however, be made regarding the analysis of the combined locations data. The mean yield over all locations was 34.6 tons/A. DRI 8058 and Sun 6368 had the best yields, overall. The lowest combined yields were produced by HMX 4802 and U 567. The statewide average fruit °brix was 5.5 with all varieties producing fruit with at least 5% soluble solids. Varieties with excellent, statewide fruit brix were Sun 6374 (6.3), PS 384 (5.9), and Sun 6368 (5.8). Fruit soluble solids were lowest for PS 345 (5.0) and U 567 (5.0). None of the varieties demonstrated good acid production this year. Fruit pH for all varieties averaged 4.43. AB2 fruit were the most acidic with an average pH of 4.34. Varieties with low acid fruit included HMX 4802 (pH=4.50) and Red Spring (pH=4.52). The reddest fruit (color <23.0) were produced by U 886, DRI 4610, DRI 8058, and H 2005. PS 384 and PS 345 fruit had the worst color (>26.0).

Observational, mid-maturity varieties (Table 8):

Significant differences were found among varieties only for color and pH. High variability in this test prevented significant differences in yield, but, in general HMX 5893 performed well in all locations but Stanislaus County. Overall yields were much lower than the early trial, mainly due to the weather. °Brix was consistent between varieties ranging from 5.2 – 5.5. HMX 5893 was significantly less red than all the other lines. Fruit pH ranged from 4.40-4.48.

Table 3. Description of replicated, early-season maturing hybrid varieties evaluated in 2006.

Seed Company	Replicated Entries	Genetic Traits ^y
Harris Moran	HMX 5883	VFFFNP
Heinz Seed	H 5003	VFFNP
	H 9280^z	VFFN
Lipton/Unilever Bestfoods, N. A.	U 250	VFFNP
	U 462	VFFNP
Nunhems USA	SUN 6366	VFFNP
Orsetti Seeds	BOS 66508	VFFNP
	BOS 66509	VFFNP
	BOS 7026	VFFNP
Seminis Seeds	APT 410	VFFNP
	HYPEEL45	VFFNP
	PX 438	VFFFNP

^y V = Verticillium wilt race 1 resistance; F = Fusarium race 1 resistance; FF= Fusarium race 1 and 2 resistance; FFF= Fusarium race 1, 2, and 3 resistance; N= Nematode (*M. incognita*) resistance; P = bacterial speck (*P. syringae* pv *tomato*) resistance, SW = tomato spotted wilt resistance.

^z Varieties in bold are industry standards.

Table 4. Combined and individual location fruit yield, °brix, color and pH for replicated, early season maturity hybrid processing tomato varieties in 2006

Variety	Statewide Yield (tons/acre)		Brix	Color	pH
H 5003	49.5	A	5.4	22.9	4.35
Sun 6366	49.0	A	5.6	27.4	4.33
BOS 66509	48.5	A	4.8	24.8	4.34
BOS 66508	48.2	A	5.2	22.1	4.32
APT 410	47.9	A B	5.3	24.3	4.31
HMX 5883	45.6	B C	5.0	27.9	4.38
BOS 7026	45.6	B C	5.2	25.1	4.33
H 9280	44.9	C	4.8	25.7	4.32
U 250	43.2	C D	5.1	26.8	4.37
PS 438	42.4	D	5.5	23.6	4.43
HyPeel 45	42.3	D	5.6	25.8	4.27
U 462	41.3	D	5.1	25.0	4.39
Mean=	45.7		5.2	25.1	4.35
LSD _{0.05} =	2.4		0.3	1.8	0.03
CV=	6.5		6.4	8.9	1.0
Var X Loc LSD _{0.05} =	4.2		NS	NS	NS

Table 5..Combined and individual location fruit yield for replicated, early-season maturity hybrid processing tomato varieties in 2006.

Variety	Combined location yield			Yolo	Fresno	Contra Costa
	(tons/A)					
H 5003	49.5	A		52.4	38.4	57.7
Sun 6366	49.0	A		48.0	38.7	60.3
BOS 66509	48.5	A		52.6	36.4	56.4
BOS 66508	48.2	A		50.3	35.5	58.7
APT 410	47.9	A	B	52.7	34.2	56.7
HMX 5883	45.6		B C	48.5	30.4	57.9
BOS 7026	45.6		B C	47.8	34.3	54.5
H 9280	44.9		C	48.9	34.1	51.6
U 250	43.2		C D	45.8	33.4	50.3
PS 438	42.4		D	46.0	26.7	54.6
HyPeel 45	42.3		D	41.5	33.5	52.0
U 462	41.3		D	43.2	32.9	47.7
Mean=	45.7			48.1	34.0	54.9
LSD _{0.05} =	2.4			4.5	3.7	4.5
CV=	6.5			6.5	7.6	5.8
Var X Loc LSD _{0.05} =	4.2					

Table 6. Combined and individual location fruit yield, °brix, color and pH for replicated, midseason maturity hybrid processing tomato varieties in 2006.

Variety	Combined location yield (tons/acre)	°Brix	Color	pH
DRI 8058	40.7 A	5.1	22.9	4.46
Sun 6368	39.3 A B	5.8	24.7	4.44
PS 345	37.7 B C	5.0	26.4	4.40
U 886	36.8 B C D	5.3	22.4	4.47
H 8004	36.1 C D E	5.7	23.3	4.40
H 9780	35.0 D E F	5.4	24.2	4.40
PS 384	34.6 D E F	5.9	26.2	4.41
AB 2	34.2 E F	5.6	23.6	4.34
H 2005	34.1 E F	5.7	22.9	4.48
BOS 67374	33.6 F G	5.5	23.7	4.38
H 2601	33.5 F G	5.2	23.9	4.45
DRI 4610	33.4 F G	5.7	22.8	4.40
Sun 6374	32.6 F G H	6.3	24.5	4.39
Red Spring	32.5 F G H	5.1	23.2	4.52
HMX 4802	31.4 G H	5.2	24.9	4.50
U 567	30.6 H	5.0	23.6	4.46
Mean=	34.6	5.5	23.9	4.43
LSD _{0.05} =	2.5	0.2	0.7	0.03
C.V.=	13.8	7.2	5.2	1.2
Var X Loc LSD _{0.05} =	6.7	0.5	1.7	0.07

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