

California Tomato Research Institute – Final Report 2004

Project Title: Evaluation of EFS Varieties over Time of Harvest

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Objectives:

- 1) Evaluate EFS lines over harvest dates that span several weeks.
- 2) Determine yield and quality differences within and between the EFS varieties.

Summary: Certain processing tomato varieties have been bred for Extended Field Storage (EFS). Some of these are included in the UC statewide variety trials, however under that protocol the EFS lines are only harvested one time and this procedure does not adequately address or evaluate a variety's potential for extended field storage. It is well documented that yields of processing tomatoes decrease during periods when high-sustained air temperatures occur and disrupt fruit set. Previous work by others has investigated planting EFS varieties early and letting ripe fruit store in the field for long periods before harvesting. This was not the aim of this project.

The results from this one study showed that under some field conditions fruit yield (T/A) decreased fairly fast (within 7 days) for all tested varieties and quality of yield was not maintained. Some varieties performed better than others, but more field tests are needed.

Procedures:

A field study was established at the UC WSREC in Five Points, Fresno County on May 26, 2004. Five EFS varieties were selected to compare with a standard tomato variety, Halley 3155 (Halley). Seedlings were hand transplanted on 12-inch spacing and grown with typical commercial practices under furrow irrigation. Irrigation cutoff was on August 20, 2004. Plot size was 45' of row on a 66' tomato bed. The trial was arranged in a split plot design for three separate harvest dates without disrupting the growth of tomatoes on neighboring beds. Each variety was replicated five times within each harvest date. At harvest time tomato roots were undercut by machine and a portion of the plot was hand harvested for fruit yield and quality. The three harvest dates were Sept 15 (111 days after transplanting (DAT), Sept 22 (118 DAT), and Oct 5 (131 DAT). PTAB data was collected at each harvest and samples were sent to Diane Barrett's food science lab on the UC Davis campus to gather cooked tomato data. There was virtually no insect or disease pressure in the field, however weeds were an issue. In spite of fumigation with vapam prior to planting and two herbicide applications, several hand weeding were needed to remove nightshade and patches of dodder from the field. The last weeding was timed with irrigation cutoff, which seemed to intensify vine breakdown and sunburn.

Results:

Harvest date affected tonnage, quality of yield, PTAB parameters, and cooked analysis of tomato fruit. For yield and quality of yield at harvest all varieties responded similarly to delayed harvest. With each successive harvest date:

- Tonnage decreased
- Lbs/ 50 fruit decreased
- % green fruit decreased
- % rotten fruit increased
- % sunburned fruit increased

PTAB results were less consistent and did not follow as clear a trend over harvest date.

- Color decreased slightly for each EFS variety, but not for Halley.
- °Brix increased slightly for each EFS variety, but not for Halley.
- pH did not follow a trend.

Cooked analysis is presented in tables 4 and 5 and in figure formats to facilitate data viewing, but has not been statistically analyzed for treatment differences. More trials are needed before real conclusions can be drawn about specific trends and varieties.

Table 1. YIELD Results - EFS Varieties x Harvest Date 2004

Variety	AVG.	YIELD T/A			AVG.	Lbs/50 Fruit		
		H1	H2	H3		H1	H2	H3
U 886	26.1 a	36.6 a	24.9	16.8 ab	9.8 a	10.6 a	9.9 ab	9.0 a
PS 849	25.1 a	34.0 a	21.4	19.8 a	9.8 a	11.0 a	9.4 ab	9.0 a
U 027	24.9 ab	37.7 a	21.7	15.3 abc	9.5 a	10.4 a	9.5 ab	8.5 ab
H 9665	23.5 ab	31.3 a	23.3	16.0 abc	8.8 b	9.1 b	9.2 b	8.1 b
Halley*	21.4 bc	31.7 a	21.8	10.6 c	9.7 a	10.4 a	10.2 a	8.6 ab
H 9780	18.8 c	24.4 b	19.2	14.0 bc	9.8 a	10.5 a	9.8 ab	9.1 a
average	23.3	32.6	22.1	15.4	9.6	10.3	9.7	8.7
LSD Var	3.6	6.8	ns	5.8	0.5	1.1	0.9	0.8
LSD H	5.2				0.7			
LSD H x Var	ns				ns			
CV %	21.2				7.3			

* check variety

H1 = Sept 15 H2 = Sept 22 H3 = Oct 5

LSD@ 0.05

ns = not significant

Table 2. QUALITY of Yield Results - EFS Varieties x Harvest Date 2004

Variety	% Green			% Rot			% Sunburn			% Rot + Sunburn		
	H1	H2	H3	H1	H2	H3	H1	H2	H3	H1	H2	H3
U 886	8.0	1.5	2.5	6.2	12.6	18.6	3.1	4.8	6.4	9.3	17.4	25.0
PS 849	4.0	3.1	2.3	4.6	9.8	15.8	4.7	3.6	7.6	9.3	13.4	23.4
U 027	2.8	2.0	0.2	3.7	13.3	15.6	4.5	6.7	21.9	8.2	19.9	37.4
H 9665	6.5	2.0	0.9	5.2	6.7	10.0	7.2	10.5	14.4	12.4	17.2	24.5
Halley*	5.1	3.3	1.2	5.7	10.1	20.5	1.5	4.0	12.8	7.2	14.0	33.3
H 9780	6.3	7.6	3.5	5.3	7.8	15.1	3.5	9.4	13.7	8.7	17.1	28.9
average	5.5	3.3	1.8	5.1	10.1	15.9	4.1	6.5	12.8	9.2	16.5	28.8
LSD H		0.6			3.5			3.7			4.7	
LSD Var		1.9			2.9			2.6			4.3	
LSD H x Var		ns			ns			ns			ns	
CV %		72.8			37.8			45.7			32.4	

* check variety

H1 = Sept 15 H2 = Sept 22 H3 = Oct 5

LSD@ 0.05

ns = not significant

Table 3. PTAB Results - EFS Varieties x Harvest Date 2004

Variety	Color			°Brix			pH		
	H1	H2	H3	H1	H2	H3	H1	H2	H3
U 886	23.6	23.6	22.6	4.48	4.72	4.80	4.40	4.42	4.38
PS 849	25.4	25.2	23.2	4.50	5.08	4.80	4.33	4.33	4.40
U 027	25.8	24.0	23.8	4.50	4.44	4.74	4.38	4.36	4.37
H 9665	25.2	23.8	22.0	4.36	4.58	4.94	4.32	4.35	4.35
Halley*	24.0	24.0	24.8	5.10	5.20	5.04	4.35	4.36	4.40
H 9780	25.4	24.4	23.4	5.00	4.98	5.14	4.32	4.30	4.39
average	24.9	24.2	23.3	4.66	4.83	4.91	4.35	4.35	4.38
LSD H		0.72			ns			ns	
LSD Var		1.1			0.28			ns	
LSD H x Var		ns			ns			ns	
CV %		6.12			8.26			1.37	

* check variety

H1 = Sept 15 H2 = Sept 22 H3 = Oct 5

LSD@ 0.05

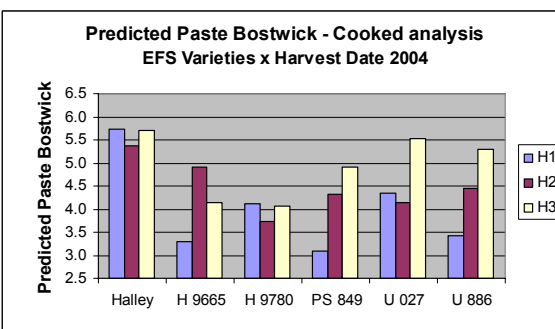
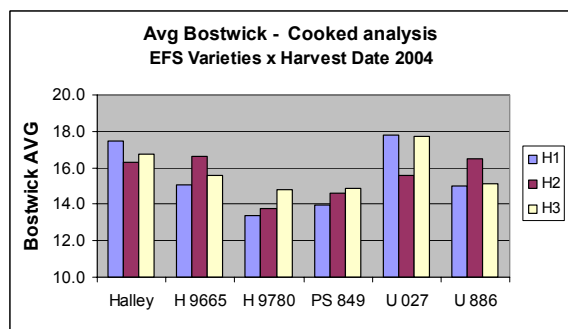
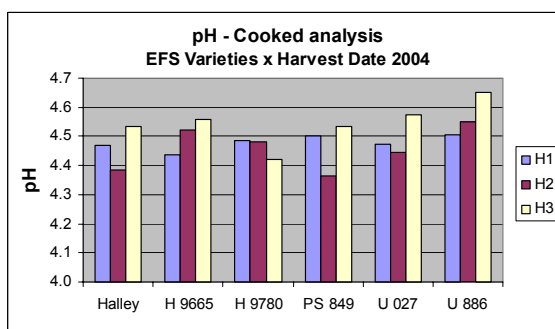
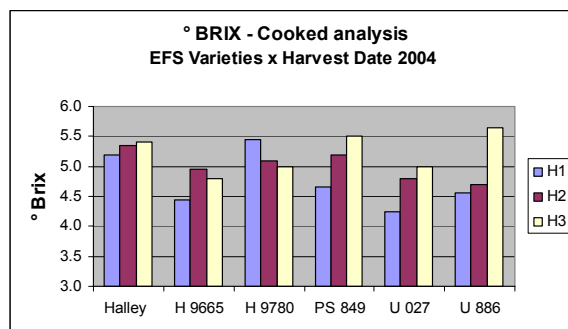
ns = not significant

**Table 4. Analysis from Cooked Tomato Samples - Diane Barrett's Lab
EFS Varieties x Date of Harvest 2004**

Variety	Harvest Time	°Brix	pH	Bostwick a	(cm) b	Average	Pred. Paste Bostwick	28 Brix Paste Yield	Pred. Catsup Yield
U 886	H1	4.6	4.5	14.9	15.1	15.0	3.4	325.0	849.7
	H2	4.6	4.5	14.9	15.1	15.0	3.4	325.0	849.7
	H3	5.7	4.7	15.1	15.2	15.1	5.3	403.6	912.9
PS 849	H1	4.7	4.5	14.0	14.0	14.0	3.1	332.1	895.5
	H2	5.2	4.4	14.5	14.8	14.6	4.3	371.4	904.0
	H3	5.5	4.5	14.7	15.0	14.9	4.9	392.9	913.4
U 027	H1	4.3	4.5	17.8	17.9	17.8	4.3	303.6	737.1
	H2	4.8	4.4	15.5	15.7	15.6	4.1	342.9	846.6
	H3	5.0	4.6	17.7	17.8	17.7	5.5	357.1	794.6
H 9665	H1	4.5	4.4	14.9	15.2	15.1	3.3	317.9	846.3
	H2	5.0	4.5	16.7	16.7	16.7	4.9	353.6	823.2
	H3	4.8	4.6	15.6	15.7	15.6	4.1	342.9	846.2
Halley*	H1	5.2	4.5	17.5	17.5	17.5	5.7	371.4	815.4
	H2	5.4	4.4	16.5	16.1	16.3	5.4	382.1	858.0
	H3	5.4	4.5	16.6	16.9	16.8	5.7	385.7	848.6
H 9780	H1	5.5	4.5	13.3	13.6	13.4	4.1	389.3	962.3
	H2	5.1	4.5	13.7	13.9	13.8	3.7	364.3	929.2
	H3	5.0	4.4	14.8	14.8	14.8	4.1	357.1	886.5

* check variety

H1 = Sept 15 H2 = Sept 22 H3 = Oct 5



**Table 5. Color Analysis from Cooked Tomato Samples - Diane Barrett's Lab
EFS Varieties x Date of Harvest 2004**

Variety	Harvest	LED	Agtron		Hunter		USDA Color	Lycopene mg/gm fruit
	Time		E-5M	L	a	b		
U 886	H1	19	29.5	23.56	27.19	12.15	48.0	0.768
	H2	21	33.0	23.79	26.83	12.33	47.6	0.839
	H3	19	31.0	24.31	28.49	12.43	49.3	1.148
PS 849	H1	19	30.0	23.80	27.30	12.30	48.1	0.922
	H2	22	34.0	24.18	27.17	12.48	48.0	0.953
	H3	19	30.5	24.23	28.54	12.54	49.4	1.146
U 027	H1	20	31.5	24.09	26.76	12.41	47.6	1.180
	H2	21	34.5	24.49	27.24	12.50	48.1	0.999
	H3	20	32.0	24.57	27.87	12.67	48.7	0.955
H 9665	H1	20	31.5	24.80	27.48	12.77	48.3	0.774
	H2	20	33.5	24.43	27.28	12.58	48.1	0.974
	H3	20	33.5	24.91	28.03	12.93	48.8	0.939
Halley*	H1	20	31.0	24.26	27.21	12.58	48.0	0.901
	H2	21	33.0	24.21	27.34	12.49	48.2	1.124
	H3	20	32.5	24.07	27.61	12.66	48.5	0.926
H 9780	H1	19	33.0	25.32	28.38	12.75	49.2	0.955
	H2	21	33.5	24.31	27.41	12.38	48.2	0.844
	H3	20	31.8	24.35	28.10	12.56	48.9	0.954

* check variety

H1 = Sept 15 H2 = Sept 22 H3 = Oct 5