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Processing Tomato Breeding and Genetics Research 2001.

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Introduction

The Ohio State University/OARDC tomato breeding and genetics research program is focused on variety and breeding line development for the processing industry in the Mid-West and Mid-Atlantic states. Our germplasm has shown excellent adaptation to humid growing environments and is used in Australia, Canada, Brasil, and Italy. The long-term sustainability of plant breeding efforts requires the identification of new sources of genetic variation and new traits. My research therefore devotes efforts to developing new populations to expand our base of useful genetics. Developmental research has centered on structuring populations for simultaneous trait identification, genetic mapping, and breeding. Three-year trial data concluding in 2001 demonstrate the first success of this approach with the recent release of Ohio 9816 and Ohio 9834, breeding lines with tolerance to race T1 of bacterial spot.

Breeding New Varieties and Parental Lines for the Great Lakes Tomato Industry

The 2001 growing season was marked by early rains followed by over six weeks of lower than normal precipitation. Harvest was conducted under conditions of higher precipitation than desirable. These weather conditions lead to small fruit and fruit cracking at harvest. Despite adverse conditions, varieties in the OX three hundred series continue to perform well in plot trials and in limited strip trials. Based on 2001 results, OX329 will likely be dropped from consideration. Varieties OX328, OX323, OX325, and OX327 remain strong candidates for release.

Table 1. Summary statistics and rank for selected breeding lines, varieties, and checks (combined analysis 2000 and 2001, three locations per year). More detailed results and statistics will be posted under "current research" at www.oardc.ohio-state.edu/tomato.

	Yield		Color		Unif. Clr		size		disease				%	
Variety	T/A	Rnk	Hue	Rnk	Huedif	Rnk	oz.	Rnk	index	Rnk	solids	Rnk	Cracked	Rnk
OX325	40.8	4	40.9	5	5.5	6	2.2	3	1.1	1	5.0	10	8	3
OX327	37.7	9	40.3	2	5.6	7	2.2	6	1.3	3	5.0	14	0	1
OX333	38.5	8	40.5	3	5.8	9	2.1	11	1.3	3	5.4	2	10	4
9242	27.2	22	39.5	1	4.2	1	2.3	2	1.3	3	5.3	4	50	20
TR12	32.9	18	43.4	9	5.1	5	2.0	12	1.4	10	5.1	8	33	18
981670.2-2	39.0	6	44.6	15	6.0	10	2.0	18	1.1	1	5.1	7	10	4
OX331	40.0	5	41.4	6	6.3	12	2.1	8	1.4	10	4.9	16	10	4
FG98-52	42.5	1	45.3	17	7.0	18	2.1	8	1.3	3	5.2	5	15	10
H9423	28.7	21	40.8	4	4.5	2	2.4	1	2.2	22	5.0	13	23	14
OX332	35.9	13	42.4	7	5.7	8	2.2	5	1.3	3	5.5	1	33	18
7983	28.7	20	44.2	14	6.5	13	2.2	3	1.6	17	5.3	3	50	20
OX23	38.6	7	43.4	10	4.7	3	2.0	17	1.4	10	5.0	12	23	14
R9812	37.5	10	43.5	11	5.1	4	2.0	14	1.6	17	5.1	9	53	22
OX328	42.0	3	43.0	8	6.0	11	1.9	20	1.5	15	4.7	20	23	14
8245	36.1	11	43.7	12	7.0	17	2.1	10	1.3	3	5.2	6	13	8
PS696	42.2	2	46.8	21	7.7	21	2.1	7	1.5	15	5.0	11	18	11
OX323	35.8	14	45.6	19	7.6	20	2.0	13	1.4	10	5.0	15	3	2
OX329	31.2	19	43.9	13	6.8	15	1.9	20	1.4	10	4.8	18	10	4
OX52	33.2	17	44.8	16	6.6	14	1.9	19	1.6	17	4.7	19	23	14
987034-1	34.6	15	47.4	22	7.4	19	2.0	14	1.3	3	4.8	17	13	8
OX150	33.5	16	45.7	20	7.8	22	2.0	14	1.6	17	4.7	21	20	13
OX264	36.0	12	45.5	18	6.8	16	1.8	22	1.7	21	4.6	22	18	11

In addition to promising new hybrids, breeding lines from the first phase of our bacterial spot resistance trials have preformed well in the multi-year yield and quality trials and in inoculated nurseries. Lines carrying the Rx3 locus from Hawaii 7998 have demonstrated tolerance to the T1 race of bacterial spot. Lines 987034.1 and 981670.22 have clearly demonstrated potential for use as parents in developing new hybrids and have been approved for released as Ohio 9816 and Ohio 9834.

Table 2. Three year field performance data based on once-over mechanical harvesting in Fremont, OH.

Genotype	Yield (T/A)	% Ripe	% Green	% Cull	Weight (ounces)	Disease Index (0-3)
7983.0	28.7	81.2	13.7	4.7	2.2	1.3
8245.0	39.0	85.2	8.9	6.1	2.2	1.3
9242.0	30.6	76.3	13.6	9.6	2.4	1.3
9816	43.8	82.9	11.5	5.7	2.0	1.1
9834	37.9	79.3	8.9	11.9	2.0	1.3
H9423	27.7	76.4	16.9	6.4	2.4	1.8
OX150	38.4	81.2	13.4	5.3	2.1	1.5
OX23	38.6	79.6	12.7	6.3	2.0	1.5
OX323	39.8	84.1	11.9	4.0	2.1	1.4
OX324	38.7	75.6	20.4	3.9	2.4	1.0
OX325	43.8	79.6	15.8	4.6	2.3	1.2
OX327	38.7	74.2	20.7	5.1	2.2	1.3
OX328	44.0	81.6	11.5	6.9	2.0	1.4
OX331	44.0	81.8	12.8	5.4	2.2	1.3
OX52	33.2	80.0	15.6	2.3	1.9	1.3
PS696	42.3	82.2	10.9	6.5	2.2	1.3
TR12	32.9	79.8	14.7	5.0	2.0	1.3
Mean	37.8	80.1	13.8	5.9	2.1	1.3
LSD (0.05)	8.3	ns	5.4	5.1	0.2	0.4
LSD (0.30)	4.2	3.6	2.8	2.7	0.1	0.2

Table 3. Disease ratings from field trials inoculated Xanthomonas campestris pv. vesicatoria Race T1 strains.

Three year data		Two Year data	
Variety	Rating	Variety	Rating
Ohio 88119	7.7	Ohio 981205	8.0
Ohio E3259	5.1	Ohio 88119	7.3
Ohio 9834	4.6	Ohio 9242	6.2
Ohio 9816	4.3	PetoSeed 696	6.0
		Ohio E3259	5.7
		Ohio OX 323	5.3
		Ohio 8245	4.8
		Ohio OX 329	4.5
		Ohio OX 328	4.3
		Ohio 9834	4.2
		Ohio 9816	3.7
Mean	5.43		5.45
P	0.0089		0.0062
LSD 0.05	2.45		2.18

Past progress and future improvement goals

Over the past several years the breeding program has made progress in developing varieties with improved color (measured by L and Hue) and color uniformity (measured by Hue difference). More recently we have improved firmness, field storage, and harvest handling of varieties. Results from our Observation Harvest trial (72 varieties and lines that are considered for advancement to the multi-location trials) suggest that we are also making improvements in yield and fruit size. These improvements seem to have come at the expense of Brix, and future selection efforts must aim to increase soluble solids.

Development of new disease resistance

Bacterial Canker

Gitta Coaker, a graduate student, is pursuing resistance to bacterial canker using germplasm developed by Eileen Kabelka (a previous graduate student). Gitta's work has helped us understand how we can incorporate resistance into the breeding program by helping us understand the action of resistance discovered by Dr. Kabelka. The gene on chromosome two will be of most benefit due to its additive to dominant gene action. We must still overcome a small fruit size (~1.5 oz) associated with resistance. The highest resistance will come from pyramiding genes on chromosome two and five. Combining resistance in breeding lines that have acceptable fruit size and quality will require time and effort, as all material developed to date has failed our yield and quality trials.

Bacterial Spot

The successful development of resistance from Hawaii 7998 is being followed by a project that aims to develop a broader based resistance from PI114490. Populations have been screened and we are moving into the second phase of this effort. If this second phase is successful new lines with resistance or tolerance to race T2 will be in yield and quality trials by 2005. Lines that combine tolerance to race T1 and resistance to bacterial speck will enter trials in 2003.

Managing Quality in Tomatoes for Processing

The breeding program has begun efforts to help growers manage new varieties for optimum quality. We are devoting most of our efforts to the management of color disorders through variety choice, soil tests to select growing locations, and nutrient management. Internal white tissue, yellow eye, yellow shoulder, and green shoulder represent a range of symptom severity for a single problem which I will refer to as Yellow Shoulder Disorder (YSD). Developmental abnormalities include a reduction in cell size and a more random arrangement of cells in the sectored tissue. The green chloroplasts in YSD tissue fail to develop into red chromoplasts. These alterations are triggered very early in fruit development and are not reversed by delaying harvest.

The key to successful management strategies is to treat the problem before we see it in the field. Climate, field conditions, and variety all contribute to the occurrence and severity of YSD. Probable causes of weather related YSD are the effect of rain and temperature on root growth, the efficiency of nutrient mining, fruit development, and pigment development. There is very little that can be done to manage weather-related causes of YSD. Some contributing factors can be managed. Location effects that have been correlated with YSD are available potassium (K), available magnesium (Mg), available calcium (Ca), soil pH, and soil fixation capacity. Hartz and co-workers in California demonstrated that the incidence of YSD was lower in fields with high K status of both soil and plant. The measure of soil K availability most closely correlated with percent YSD was the K meq/100 gm / (Square root Mg meq/100 gm) ratio. Calculating this ratio requires adjusting soil test data in ppm or lb/A to meq/100 gm (cmol/Kg). In California, Fields with an extractable K greater than 0.7 cmol/kg and an exchangeable K/ (Square root Mg) ratio of greater than 0.25 had a low probability of YSD.

During the 2001 season, data were collected to test the applicability of the K/(sqrt Mg) ratio (Hartz ratio) to fields in Indiana, Ohio, and Pennsylvania. Our results suggest that the ratio has predictive value (Table 4), but the ratio cut-off of 0.25 used in California will need to be adjusted upward for the quality demands of the Mid-West Industry (Figure 1 and Table 5). In California, fields with an extractable K greater than 0.7 cmol/kg and an exchangeable K/ (Square root Mg) ratio of greater than 0.25 had a low probability of YSD. In our study, fields with a ratio of 0.35 or greater had a lower incidence of color problems (Figure 1).

Figure 1. Graphical representation of correlation between color uniformity and soil nutrients.

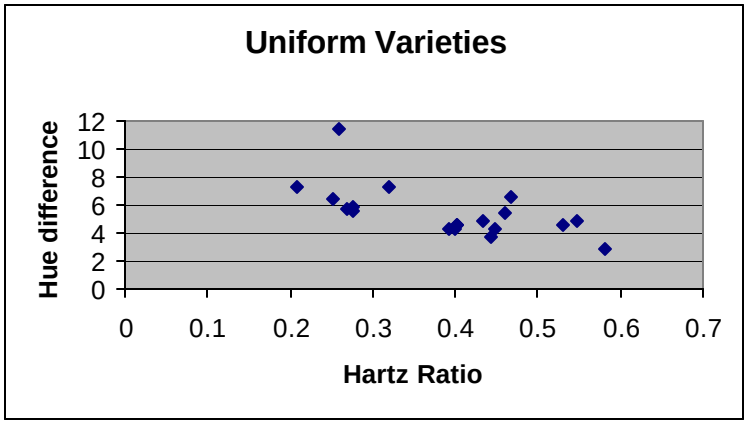

Table 4. Correlations between soil nutrients and color traits.

	All Varieties		Uniform varieties		Non-uniform varieties	
	K/sqrt(Mg)		K/sqrt(Mg)		K/sqrt(Mg)	
Trait	P-value	r^2	P-value	r^2	Significance	r^2
L	0.3195	0.0225	0.3131	0.0598	0.6982	0.0061
a	0.1064	0.0582	0.0427*	0.2201	0.8988	0.0007
b	0.0525^	0.0828	0.8938	0.0011	0.0324*	0.1702
Hue	0.0073***	0.1526	0.0185*	0.2851	0.2051	0.0634
L-diff	0.0597^	0.0783	0.0001***	0.5947	0.8213	0.0021
a-diff	0.0128*	0.1327	0.0018**	0.4467	0.5268	0.0162
b-diff	0.0847	0.066	0.021*	0.2756	0.9656	0.0001
Hue-diff	0.0838	0.0664	0.0036**	0.4008	0.7058	0.0058

Traits are objective color measurements. L, a, and b are coordinates of a color space. L is lightness to darkness, a is red to green and b is yellow to blue. Hue is a measure of color calculated from a and b. Traits labled "diff" are uniformity measurements. High diff values of L are due to internal white tissue. High diff values of hue are due to yellow or green sectors.

P-values indicate the strength of the linear relationship between the color trait and the ratio (K/sqrt(Mg). Low P-values indicate a significant linear correlation. Symbols following the P-value indicate ^ marginally non-significant, * marginally significant, ** significant, and *** highly significant.

The r^2 value indicates the proportion of color variation explained by the (K/sqrt(Mg).

Variety choice is important to management of color disorders

An interesting result from the 2001 studies was the fact that varieties that have proven to be uniform in our multi-year tests also showed a stronger correlation with the Hartz ratio (Table 2). The criteria that we use for classifying varieties as "uniform" or "non-uniform" correlate well with processor grades for a high percentage of number 1 tomatoes and low percentage of cull tomatoes. Varieties that are classified as uniform are less susceptible to YSD. We recommend that fields with a history of YSD should not be planted to varieties that are considered non-uniform (for example PS696, Ohio 8245, or H9035). Varieties such as Heinz 9423, TR12, and OX23 are "uniform" varieties and provide excellent alternatives.

Table 5. Summary of YSD management principles.

1) Management strategies must be aimed at prevention. The alterations in YSD fruit are triggered early in fruit development. It is too late to treat the problem once we see it in the field.
2) Know your soils. Pay close attention to exchangeable K^+, Mg^+, and Ca^{++}, fixation capacity, and pH. Soils at a low risk of YSD have the following characteristics: extractable K is greater than 0.7 cmol/kg, the Hartz ratio is greater than 0.35, K is at least 3-4% of CEC, and the Ca/Mg ratio (meq/100gm) should be at least 3:1.
3) Use varieties that are less susceptible to YSD when the ratio of K^+ to Mg^+ is unfavorable Varieties with more uniform color include Heinz 9423, TR12, and OX23.
4) Manage soil conditions to increase available K^+ and/or decrease available Mg^+. Soil application of either K or gypsum ($CaSO_4$) may help reduce YSD.
5) Uniform color requires more available K^+ than is necessary for maximum yield

References

Hartz,-T.K.; Miyao,-G.; Mullen,-R.J.; Cahn,-M.D.; Valencia,-J.; Brittan,-K.L. 1999. Potassium requirements for maximum yield and fruit quality of processing tomato. J-Am-Soc-Hortic-Sci. 124 (2): 199-204.

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Appendixes

2001 yield and raw product quality data

2001 Fremont Canning Trial: Color and Pressure Data *(Plots 601-672)*

	Genotype	L	rank	a	rank	b	rank	Chroma	rank	Hue	rank	Ldif	rank	adif	rank	bdif	rank	Cdif	rank	Hdif	rank	Force	rank	Force SD	rank
1	7983	44.1	26	25.2	31	24.5	31	36.1	32	44.6	12	6.2	33	5.9	31	4.2	33	2.7	13	11.0	32	4.5	14	0.9	17
2	8245	43.4	23	29.4	6	27.4	9	40.7	3	43.1	22	5.7	31	4.5	21	4.8	35	3.2	28	7.9	24	5.1	6	0.8	7
3	9242	41.7	12	27.5	17	24.3	32	37.2	26	41.7	29	4.2	13	4.6	22	3.5	19	4.2	35	4.7	10	4.2	23	1.3	34
4	981670.2-2	43.0	17	27.8	14	27.0	12	39.0	11	44.4	14	4.8	23	4.2	17	3.2	14	3.0	24	6.4	15	4.7	10	1.0	20
5	981670.2-6	41.6	9	29.5	5	26.8	13	40.0	4	42.4	27	3.3	4	3.4	7	2.6	6	3.1	26	4.4	6	4.4	15	1.0	22
6	987034-1	45.2	32	26.1	27	27.5	8	38.7	13	47.2	7	6.0	32	6.2	32	3.5	20	2.8	16	10.2	31	3.8	34	0.9	12
7	987034-5	42.7	15	26.8	20	26.1	18	38.0	21	44.5	13	4.2	14	3.9	12	3.4	16	2.3	6	6.5	16	4.7	9	0.8	9
8	99-3805	38.4	1	26.4	24	23.0	36	35.2	34	41.1	31	4.5	18	3.3	6	4.1	31	4.5	36	4.2	5	3.1	36	1.1	29
9	99-3825	40.3	6	28.4	11	24.5	29	37.8	24	40.9	32	3.3	5	2.9	5	2.5	4	2.8	20	3.5	4	3.2	35	0.9	15
10	FG98-52	43.3	21	22.8	35	25.5	19	35.4	33	48.5	3	4.9	25	5.1	26	4.7	34	2.8	17	9.5	29	4.2	24	1.0	26
11	FG99-15	38.5	2	29.6	4	23.3	35	37.8	23	38.2	36	3.4	8	3.4	8	3.0	10	4.2	34	2.7	2	3.8	33	0.8	6
12	FG99-19	43.3	20	24.2	32	25.3	21	36.1	31	46.9	8	5.5	30	6.8	33	3.8	24	3.2	29	11.3	33	4.3	20	1.1	31
13	FG99-45	39.9	3	30.5	3	25.5	20	39.8	7	40.0	35	3.0	1	2.4	2	2.4	3	2.8	14	2.5	1	4.3	21	0.9	16
14	H9423	44.9	31	31.0	1	28.5	5	42.3	2	42.7	26	4.2	15	3.5	9	3.2	12	2.3	5	5.8	11	5.2	4	1.3	35
15	H9553	47.9	36	25.9	28	28.7	1	40.0	5	48.7	2	4.8	24	5.4	29	3.8	25	2.5	10	9.1	28	4.8	8	1.0	25
16	H9704	45.4	34	31.0	2	28.6	3	42.7	1	42.9	24	4.7	22	4.3	20	3.6	22	1.9	1	7.2	19	5.5	1	1.0	23
17	OX150	44.7	30	22.3	36	24.5	28	34.7	36	48.2	4	6.3	34	7.2	35	4.0	28	3.7	33	11.6	34	4.4	16	0.8	10
18	OX23	42.7	14	26.6	22	25.0	25	37.0	28	43.5	21	5.0	26	4.1	14	3.4	17	2.8	18	6.9	17	4.0	30	1.2	33
19	OX264	44.3	28	26.4	23	27.6	7	38.6	14	46.2	11	4.4	16	4.1	16	3.2	13	3.1	27	6.0	13	4.3	17	0.9	11
20	OX323	46.5	35	23.3	34	28.6	2	38.6	16	51.9	1	7.0	36	10.2	36	3.6	21	3.7	32	15.6	36	5.1	5	1.0	27
21	OX325	41.2	8	28.6	9	25.2	23	38.5	17	41.8	28	4.5	17	3.9	13	3.9	26	2.8	19	7.4	21	4.7	12	0.9	14
22	OX327	41.6	10	28.6	8	24.0	33	37.9	22	40.7	33	4.1	12	3.7	11	2.8	8	2.2	4	6.0	12	4.6	13	1.0	28
23	OX328	41.7	11	26.8	19	25.3	22	37.6	25	43.8	20	4.0	10	4.1	15	3.4	15	2.9	23	7.0	18	4.1	25	0.6	2
24	OX329	43.4	22	26.3	25	27.1	10	38.3	19	46.3	9	5.2	27	4.3	18	4.2	32	3.3	31	7.4	20	4.3	19	1.0	21
25	OX331	45.3	33	26.1	26	28.6	4	39.8	8	48.0	5	6.8	35	6.9	34	5.0	36	2.6	11	12.2	35	5.5	2	0.7	4
26	OX332	40.0	4	28.8	7	25.2	24	38.4	18	41.3	30	3.4	6	2.4	1	2.2	2	2.6	12	3.1	3	4.2	22	0.7	3
27	OX333	42.4	13	27.6	16	26.5	15	39.3	9	44.4	15	5.2	29	4.8	24	4.0	30	3.1	25	8.1	25	5.4	3	1.2	32
28	OX52	44.7	29	23.9	33	24.5	30	34.8	35	46.2	10	4.7	21	5.4	30	3.5	18	2.8	15	9.5	30	4.0	29	1.1	30
29	PS213015	40.1	5	28.1	13	23.4	34	37.0	27	40.2	34	3.2	3	4.3	19	2.2	1	2.5	9	6.1	14	4.0	28	1.0	18
30	PS696	44.1	27	25.4	30	27.8	6	38.6	15	47.9	6	4.5	19	5.1	27	3.9	27	3.2	30	7.6	22	5.0	7	0.7	5
31	R9812	43.3	19	26.8	21	24.6	26	36.7	29	42.8	25	3.0	2	3.5	10	2.9	9	2.9	22	4.7	9	3.9	32	1.3	36
32	R9814	43.2	18	27.1	18	26.2	17	38.0	20	44.3	18	3.4	9	2.7	3	2.6	7	2.2	2	4.6	8	3.9	31	0.9	13
33	RG111	43.6	25	28.2	12	27.0	11	39.9	6	44.3	17	4.6	20	5.1	28	3.2	11	2.9	21	7.8	23	4.7	11	0.8	8
34	RG611	42.8	16	27.7	15	26.8	14	39.0	12	44.4	16	5.2	28	5.0	25	4.0	29	2.4	7	8.9	27	4.1	27	0.5	1
35	RG818	43.6	24	28.5	10	26.3	16	39.2	10	43.0	23	3.4	7	2.8	4	2.5	5	2.4	8	4.4	7	4.1	26	1.0	24
36	TR12	41.2	7	25.6	29	24.5	27	36.1	30	44.1	19	4.1	11	4.6	23	3.7	23	2.2	3	8.5	26	4.3	18	1.0	19
	Mean	42.9		27.1		26.0		38.2		44.2		4.6		4.6		3.5		2.9		7.2		4.4		0.9	
	LSD* (0.05)	3.2		3.1		2.8		1.9		5.7		1.8		2.7		ns		1.3		4.6		0.9			
	LSD* (0.30)	1.7		1.6		1.4		1.0		2.9		1.0		1.4		0.8		0.6		2.3		0.4			

ns - no significant overall differences at the indicated alpha level (0.05 or 0.30)

2001 Fremont Canning Trial: Yield Data *(Plots 601-672)*

	Genotype	T/A (ripe)	rank	T/A (potential)	rank	% Ripe	rank	% Green	rank	% Cull	rank	Frt. Wt. (oz.)	rank	Disease Index (0-3)	rank	Frt. rot (0-3)	rank	B. End Rot (0-3)	rank	Stems (0-3)	rank	pH	rank	NaOH	Solids	rank
1	7983	26.5	36	34.5	31	75.0	35	22.6	34	2.4	5	2.5	3	0.8	1	1.0	1	0.0	1	0.0	1	4.37	12	5.75	4.80	5
2	8245	37.5	14	39.9	19	89.7	3	5.9	17	4.4	12	2.0	21	1.5	15	1.0	1	0.0	1	0.0	1	4.34	7	6.11	4.40	24
3	9242	34.4	23	37.3	24	85.0	18	7.2	21	7.9	23	2.3	8	1.5	15	1.0	1	0.0	1	0.0	1	4.33	4	5.62	4.65	12
4	981670.2-2	42.9	6	43.8	8	88.2	7	2.1	2	9.7	28	1.9	29	1.3	5	.		.		.		4.35	10	4.80	4.70	10
5	981670.2-6	42.3	8	43.6	9	82.5	22	2.7	3	14.8	33	1.8	32	1.0	3	.		.		.		4.40	19	4.60	4.65	12
6	987034-1	35.4	19	36.9	27	81.4	25	3.5	8	15.1	34	1.8	31	1.3	5	2.0	28	0.0	1	0.0	1	4.37	12	5.21	4.75	7
7	987034-5	34.3	24	36.1	29	82.7	21	4.2	10	13.1	31	1.7	35	1.3	5	2.3	30	0.0	1	0.0	1	4.33	4	4.87	4.55	19
8	99-3805	30.6	31	33.3	32	79.7	29	6.8	20	13.5	32	2.3	5	1.5	15	1.8	27	0.0	1	0.0	1	4.50	33	5.36	4.60	18
9	99-3825	46.8	3	51.3	2	84.5	20	7.6	22	7.9	22	2.4	4	1.5	15	1.0	1	1.0	30	0.0	1	4.34	7	5.67	4.75	7
10	FG98-52	43.0	5	46.3	6	88.0	11	6.7	19	5.3	16	1.9	28	1.3	5	1.0	1	0.0	1	0.0	1	4.46	30	4.49	4.90	4
11	FG99-15	34.8	22	39.9	18	80.5	27	12.2	28	7.3	21	2.5	2	1.3	5	1.5	22	0.0	1	0.5	22	4.51	35	5.71	4.95	3
12	FG99-19	44.8	4	49.5	3	85.6	15	8.8	24	5.6	17	2.3	6	1.8	31	1.0	1	0.0	1	0.0	1	4.48	32	4.53	4.10	33
13	FG99-45	39.5	12	40.2	17	80.7	26	1.6	1	17.7	35	2.1	18	1.3	5	.		.		.		4.45	29	4.65	4.15	30
14	H9423	28.2	34	29.9	35	86.8	13	5.2	13	8.0	24	2.2	11	2.3	35	1.0	1	0.0	1	0.0	1	4.37	12	6.52	4.50	21
15	H9553	35.5	17	43.6	10	79.1	30	18.4	31	2.5	6	1.9	30	1.3	5	1.0	1	0.0	1	0.0	1	4.32	3	5.19	4.75	7
16	H9704	32.2	26	36.8	28	84.9	19	12.4	29	2.7	8	2.2	13	2.3	35	1.0	1	0.0	1	1.5	30	4.40	19	6.28	4.15	30
17	OX150	32.0	27	42.4	14	74.6	36	29.9	36	1.4	1	2.2	12	1.5	15	1.0	1	0.0	1	0.0	1	4.38	17	5.01	3.95	34
18	OX23	42.6	7	46.4	5	88.2	8	8.3	23	3.5	10	2.2	10	1.3	5	1.0	1	0.0	1	1.0	27	4.50	33	5.57	4.35	26
19	OX264	35.0	21	39.5	20	79.8	28	10.1	26	10.0	29	1.7	33	2.0	34	2.0	28	0.0	1	1.0	27	4.42	25	5.44	3.95	34
20	OX323	41.4	9	42.9	12	89.5	4	3.4	7	7.1	20	2.0	23	1.3	5	.		.		.		4.40	19	5.10	4.35	26
21	OX325	37.0	15	38.9	22	89.1	5	4.5	11	6.4	19	2.1	17	1.5	15	1.0	1	0.0	1	0.0	1	4.43	26	5.73	4.65	12
22	OX327	35.4	18	44.6	7	77.6	32	20.7	33	1.6	4	2.1	16	1.8	31	1.0	1	0.5	28	1.0	27	4.33	4	5.62	4.15	30
23	OX328	38.7	13	41.2	15	85.2	17	5.8	15	9.0	26	1.7	34	1.5	15	1.0	1	0.0	1	0.0	1	4.46	30	4.73	4.40	24
24	OX329	36.9	16	38.4	23	77.2	33	3.2	6	19.7	36	1.6	36	1.5	15	.		.		.		4.55	36	4.20	3.85	36
25	OX331	40.3	10	43.0	11	88.9	6	5.9	16	5.2	15	2.0	22	1.8	31	1.5	22	0.0	1	0.0	1	4.41	24	5.35	4.20	29
26	OX332	53.8	1	57.7	1	82.1	23	6.0	18	11.9	30	2.5	1	0.8	1	.		.		.		4.40	19	5.15	5.40	1
27	OX333	40.1	11	42.7	13	88.2	10	5.7	14	6.1	18	2.0	24	1.5	15	1.5	22	0.0	1	0.0	1	4.35	10	5.94	5.00	2
28	OX52	31.2	29	39.2	21	78.2	31	20.3	32	1.5	3	2.1	14	1.5	15	1.0	1	0.0	1	0.0	1	4.43	26	5.50	4.50	21
29	PS213015	30.4	32	36.1	30	81.8	24	15.4	30	2.8	9	2.3	7	1.5	15	1.0	1	0.5	28	0.5	22	4.31	2	5.92	4.65	12
30	PS696	47.0	2	48.6	4	91.9	1	3.1	5	5.0	14	2.0	25	1.5	15	1.5	22	0.0	1	0.0	1	4.22	1	6.11	4.80	5
31	R9812	31.4	28	40.8	16	75.6	34	22.9	35	1.5	2	1.9	26	1.3	5	1.0	1	0.0	1	0.0	1	4.43	26	5.25	4.65	12
32	R9814	27.8	35	28.8	36	87.1	12	3.6	9	9.2	27	1.9	27	1.5	15	1.0	1	0.0	1	0.5	22	4.39	18	5.75	4.65	12
33	RG111	35.1	20	37.1	25	90.5	2	5.2	12	4.3	11	2.0	20	1.5	15	1.0	1	0.0	1	0.0	1	4.40	19	5.67	4.25	28
34	RG611	30.8	30	31.8	34	88.2	9	2.8	4	9.0	25	2.2	9	1.5	15	1.5	22	0.0	1	0.0	1	4.37	12	5.19	4.70	10
35	RG818	29.0	33	31.9	33	86.1	14	8.9	25	4.9	13	2.1	15	1.5	15	1.0	1	0.0	1	0.5	22	4.34	7	5.70	4.55	19
36	TR12	32.4	25	37.0	26	85.4	16	12.1	27	2.5	7	2.1	19	1.0	3	1.0	1	0.0	1	0.5	22	4.37	12	6.05	4.50	21
	Mean	36.6		40.3		83.9		8.9		7.2		2.1		1.4		1.2		0.1		0.2		4.39		5.40	4.52	
	LSD* (0.05)	ns		ns		0.10		0.08		0.08		0.31		ns		ns		ns		ns		ns		ns	0.61	
	LSD* (0.30)	7.0		7.3		0.05		0.04		0.04		0.16		ns		0.43		0.22		0.49		0.09		ns	0.32	

2001 Multi-Location Trials - Three Locations Combined (2 Reps per location)

Genotype	L	rank	a	rank	b	rank	Chroma	rank	Hue	rank	Ldif	rank	adif	rank	bdif	rank	Cdif	rank	Hdif	rank	Force	rank	std dev	rank
7983	42.9	26	26.0	33	25.1	23	36.6	31	44.2	29	4.1	25	3.8	21	3.3	27	2.5	24	6.9	25	5.2	13	0.8	5
8245	43.7	31	29.4	7	26.8	5	40.3	4	42.5	18	4.9	34	4.4	31	3.8	35	2.8	31	7.3	28	5.8	7	0.8	8
9242	39.9	8	28.9	12	22.9	34	37.2	28	38.5	3	3.5	12	3.2	8	2.8	9	2.9	35	4.1	3	4.7	32	0.9	19
981670.2-2	41.7	16	27.7	21	25.4	18	37.8	19	42.6	20	3.9	20	3.4	13	3.0	20	2.3	8	5.8	15	5.1	17	0.9	21
981670.2-6	42.3	19	27.1	24	25.6	16	37.6	24	43.7	25	4.1	24	4.1	25	2.7	7	2.8	30	6.2	18	5.0	21	0.8	12
987034-1	42.7	23	26.6	28	25.8	12	37.6	23	44.5	30	4.4	29	4.0	23	3.3	28	2.4	13	7.2	27	4.9	26	0.7	3
987034-5	41.6	15	26.7	27	25.2	22	37.2	27	43.6	22	4.2	26	3.3	11	3.5	32	2.4	15	6.4	20	5.0	22	0.8	7
99-3805	37.9	1	28.1	16	22.1	36	35.9	35	38.2	2	3.3	5	2.6	2	3.0	19	2.8	32	4.3	5	4.2	36	0.9	26
99-3825	39.1	3	28.6	14	22.8	35	36.7	30	38.7	4	3.4	10	2.9	5	2.8	12	2.8	33	4.3	4	4.3	35	0.8	9
FG98-52	40.8	12	26.1	32	23.9	29	36.0	33	42.6	19	3.6	13	3.6	19	3.0	21	2.4	17	6.1	17	4.8	28	1.0	27
FG99-15	38.3	2	30.3	4	23.0	33	38.1	13	37.1	1	2.8	1	2.8	4	2.5	3	3.0	36	3.1	1	4.4	34	0.9	18
FG99-19	39.7	6	26.6	30	23.5	32	36.0	34	41.6	14	3.7	14	4.0	24	3.2	25	2.8	34	6.8	24	4.8	29	1.0	28
FG99-45	40.2	10	28.6	13	23.8	30	37.4	25	39.9	9	3.4	8	3.1	7	2.4	2	2.5	21	4.7	7	4.5	33	0.8	10
H9423	44.0	33	31.9	1	27.6	3	42.4	2	40.9	11	3.9	18	3.2	10	2.7	6	2.1	5	5.0	9	6.1	2	1.0	33
H9553	46.1	36	27.7	20	28.8	1	40.8	3	46.7	34	4.3	28	4.6	32	3.4	29	2.4	16	7.9	33	5.8	5	0.9	23
H9704	45.3	35	31.2	2	28.4	2	42.7	1	42.7	21	4.2	27	4.1	28	3.2	26	2.1	6	6.5	23	6.5	1	1.0	35
OX150	43.8	32	24.1	36	25.3	19	35.9	36	47.1	36	5.1	35	5.3	35	3.5	31	2.6	27	9.2	36	5.1	14	1.0	31
OX23	41.9	17	28.0	17	25.3	20	38.0	16	42.3	16	3.7	15	3.1	6	2.9	18	2.3	11	5.3	11	5.1	16	1.0	36
OX264	42.8	25	26.5	31	26.1	9	37.6	22	44.7	31	4.0	23	3.9	22	3.4	30	2.4	19	7.0	26	5.1	18	0.9	25
OX323	42.5	21	27.7	22	25.8	11	38.7	10	43.6	23	4.4	30	5.4	36	2.9	16	2.6	26	8.5	34	5.8	6	1.0	29
OX325	41.2	13	29.0	10	24.8	24	38.4	11	40.8	10	3.9	21	3.4	16	3.2	23	2.3	9	6.4	21	5.3	11	0.8	4
OX327	40.3	11	30.6	3	24.3	25	39.3	7	38.7	5	2.9	3	2.8	3	2.5	5	2.0	1	4.6	6	6.0	3	0.9	17
OX328	40.1	9	28.0	18	24.1	26	37.3	26	41.0	12	3.3	6	3.3	12	2.8	10	2.5	22	5.5	12	4.9	25	0.7	2
OX329	42.2	18	26.6	29	25.2	21	37.1	29	43.8	26	4.5	31	4.1	26	3.6	34	2.7	28	7.4	29	5.1	15	1.0	32
OX331	41.3	14	28.5	15	25.6	15	38.9	8	42.0	15	4.6	32	4.3	30	3.6	33	2.1	3	7.7	31	6.0	4	0.9	20
OX332	39.7	7	29.1	9	23.9	28	37.8	18	39.3	7	2.8	2	2.4	1	2.1	1	2.2	7	3.5	2	4.9	24	0.9	16
OX333	39.7	5	29.3	8	24.0	27	38.4	12	39.5	8	3.8	17	3.6	18	2.9	14	2.3	12	5.7	13	5.6	8	1.0	34
OX52	43.4	28	25.3	35	25.5	17	36.3	32	45.6	33	3.9	19	4.1	27	3.1	22	2.5	20	7.5	30	4.7	30	0.9	22
PS213015	39.5	4	29.4	6	23.6	31	38.0	15	38.9	6	3.4	7	3.5	17	2.8	13	2.4	18	5.7	14	5.0	20	0.9	15
PS696	44.1	34	25.7	34	27.1	4	38.1	14	46.9	35	5.2	36	5.2	34	4.1	36	2.8	29	9.2	35	5.6	10	0.8	11
R9812	43.5	29	27.0	25	25.7	14	37.6	21	43.9	28	3.0	4	3.4	15	2.7	8	2.6	25	5.3	10	4.9	27	1.0	30
R9814	43.7	30	26.7	26	26.3	7	37.8	20	44.7	32	4.0	22	3.6	20	2.8	11	2.1	4	6.3	19	4.7	31	0.9	14
RG111	42.8	24	29.0	11	26.1	8	39.4	6	42.3	17	3.8	16	4.2	29	2.9	17	2.5	23	6.4	22	5.6	9	0.8	6
RG611	43.4	27	27.9	19	26.3	6	38.8	9	43.8	27	4.7	33	4.8	33	3.2	24	2.4	14	7.8	32	5.2	12	0.7	1
RG818	42.4	20	29.8	5	25.7	13	39.7	5	41.0	13	3.4	9	3.2	9	2.5	4	2.3	10	4.9	8	5.1	19	0.9	24
TR12	42.6	22	27.2	23	25.9	10	37.9	17	43.7	24	3.4	11	3.4	14	2.9	15	2.1	2	6.0	16	5.0	23	0.9	13
Mean	41.9		28.0		25.2		38.1		42.3		3.9		3.7		3.0		2.5		6.2		5.2		0.9	
LSD (0.05)	2.8		2.5		1.9		1.9		4.0		ns		ns		0.9		ns		ns		0.5		ns	
LSD (0.30)	1.5		1.3		1.0		1.0		2.1		0.7		1.0		0.4		0.4		1.8		0.3		ns	

ns - no significant overall differences at the indicated alpha level (0.05 or 0.30)

2001 Multi-Location Trials - continued

	Genotype	Avg Fruit Weight (oz)	rank	pH	rank	NaOH	Solids	rank
1	7983	2.12	9	4.38	13	6.19	5.38	9
2	8245	1.84	27	4.28	2	7.17	5.48	5
3	9242	2.18	6	4.41	21	6.59	5.43	7
4	981670.2-2	1.88	22	4.40	19	5.35	5.35	10
5	981670.2-6	1.70	35	4.44	27	5.09	5.08	21
6	987034-1	1.80	30	4.46	30	5.10	5.03	26
7	987034-5	1.77	32	4.38	14	4.87	4.97	29
8	99-3805	2.12	8	4.51	36	5.85	5.25	13
9	99-3825	2.17	7	4.45	28	6.18	5.45	6
10	FG98-52	1.87	24	4.46	31	5.05	5.48	4
11	FG99-15	2.24	3	4.50	35	6.25	5.27	11
12	FG99-19	1.99	16	4.46	32	5.32	4.90	31
13	FG99-45	1.95	20	4.46	33	5.58	5.00	28
14	H9423	2.23	4	4.31	4	7.23	5.02	27
15	H9553	1.84	26	4.31	5	6.14	5.52	2
16	H9704	2.19	5	4.33	7	6.95	4.88	33
17	OX150	1.86	25	4.37	11	5.36	4.67	36
18	OX23	1.96	19	4.39	17	6.54	5.03	25
19	OX264	1.75	34	4.42	24	5.92	4.72	35
20	OX323	1.96	18	4.40	20	6.43	5.12	16
21	OX325	2.26	2	4.39	18	6.52	5.13	15
22	OX327	1.99	15	4.38	15	6.38	5.08	20
23	OX328	1.75	33	4.47	34	5.18	4.78	34
24	OX329	1.62	36	4.43	25	5.28	4.88	32
25	OX331	1.98	17	4.43	26	5.88	5.03	24
26	OX332	2.10	11	4.41	22	5.91	5.78	1
27	OX333	1.91	21	4.41	23	6.47	5.48	3
28	OX52	1.79	31	4.38	16	5.92	4.93	30
29	PS213015	2.26	1	4.37	12	6.02	5.03	23
30	PS696	1.99	14	4.25	1	6.70	5.08	19
31	R9812	1.81	29	4.45	29	5.22	5.10	17
32	R9814	1.81	28	4.36	10	6.45	5.42	8
33	RG111	2.11	10	4.35	9	6.40	5.20	14
34	RG611	2.05	13	4.34	8	6.27	5.25	12
35	RG818	2.09	12	4.32	6	6.22	5.08	18
36	TR12	1.87	23	4.30	3	6.62	5.05	22
	Mean	1.97		4.39		6.02	5.15	
	LSD (0.05)	0.29		0.09		0.65	0.53	
	LSD (0.30)	0.15		0.05		0.34	0.28	

2001 Observation Harvest 1-2 *(Plots 301 - 444)*

	Genotype	L	rank	a	rank	b	rank	Chroma	rank	Hue	rank	Ldif	rank	adif	rank	bdif	rank	Cdif	rank	Hdif	rank	Force	rank	Force SD	rank
1	2K-3605	43.7	55	26.3	41	28.2	5	39.2	13	47.2	57	6.6	66	6.0	54	4.8	66	3.2	46	10.4	58	3.7	62	1.0	38
2	2K-3612	41.2	22	28.4	21	22.2	72	36.2	61	38.2	1	2.9	5	3.6	13	2.3	4	3.3	49	4.1	4	4.1	43	0.9	27
3	2K-3614	40.5	11	28.0	26	25.2	41	38.1	30	42.5	26	4.5	33	5.3	42	3.3	24	3.7	64	6.8	27	4.0	52	0.9	16
4	2K-3615	44.9	67	23.3	70	25.5	35	35.6	69	48.0	62	9.5	72	8.8	70	5.1	69	3.9	68	15.3	71	3.6	68	1.2	67
5	2K-3616	42.6	43	26.7	35	24.6	54	36.9	50	43.3	30	5.6	50	6.1	57	3.4	30	3.8	66	8.6	45	3.7	60	1.0	45
6	2K-3617	46.5	72	23.7	69	30.2	1	39.8	10	52.2	72	7.2	69	8.3	69	5.1	68	3.8	67	12.9	69	4.2	39	1.0	40
7	2K-3619	40.3	8	27.3	32	24.5	56	37.2	47	42.1	24	5.8	55	5.1	40	4.7	63	4.4	71	7.6	33	3.8	57	1.3	72
8	2K-3630	43.2	50	24.6	58	24.2	61	35.7	67	45.0	42	5.2	44	6.2	59	4.1	51	3.7	63	9.8	51	3.9	53	1.1	55
9	2K-3633	41.2	23	26.7	37	24.2	60	36.6	57	42.5	25	5.6	52	4.7	33	4.0	50	2.5	12	9.0	47	4.2	33	0.9	21
10	2K-3636	42.1	38	27.4	31	25.9	30	38.3	28	43.8	37	4.0	24	4.0	24	2.9	15	3.0	35	5.6	20	4.0	47	0.6	1
11	2K-3675	43.2	49	22.6	72	24.8	50	34.7	72	47.9	61	6.4	63	6.4	62	4.4	56	3.4	51	11.1	61	3.6	66	1.1	52
12	981670.2-2	43.8	57	23.8	68	26.3	24	36.3	60	48.8	68	6.2	61	6.2	60	3.8	43	3.4	50	10.1	56	4.8	14	0.8	15
13	987034.1	43.0	46	25.3	52	26.8	17	37.8	34	47.1	56	7.3	70	6.2	61	4.6	61	2.6	15	11.2	63	4.2	37	0.9	25
14	99-3825	38.9	2	28.1	23	23.2	70	36.7	55	39.7	7	4.3	27	3.8	18	3.3	26	2.8	21	5.5	19	3.2	72	1.2	65
15	AB746	43.6	53	26.4	40	29.9	2	42.4	2	49.6	71	7.4	71	10.3	72	7.0	72	2.2	7	17.5	72	5.3	6	1.2	63
16	E3259	40.4	9	28.8	16	23.8	65	37.7	37	39.8	8	3.3	13	3.7	14	2.8	12	2.9	30	4.9	14	4.3	30	1.0	46
17	FG00-115	45.4	71	23.8	66	25.9	28	36.4	58	48.0	63	6.4	62	6.7	65	4.8	64	3.5	60	12.3	67	4.2	36	0.6	3
18	FG00-116	43.9	60	25.3	53	26.7	19	37.5	40	46.9	55	5.2	46	5.4	45	4.2	55	3.4	52	8.7	46	4.0	49	1.0	36
19	FG00-117	41.7	30	24.5	60	25.4	36	36.1	62	46.3	51	4.8	40	5.7	47	4.0	49	3.5	59	9.3	49	4.2	38	0.8	13
20	FG00-118	41.3	25	29.2	9	24.3	59	38.4	26	40.1	11	2.7	1	2.8	2	2.2	3	2.2	5	4.2	6	5.1	9	1.2	68
21	FG00-119	43.0	45	25.4	50	25.4	37	37.0	49	45.3	45	5.7	54	6.6	64	4.1	53	2.8	24	11.6	65	3.6	65	1.0	48
22	FG00-120	41.7	33	25.5	49	24.1	62	35.6	68	43.7	35	4.6	34	4.1	28	3.9	46	3.5	56	6.9	29	4.5	25	0.9	30
23	FG00-124	41.5	26	24.4	63	25.1	47	36.6	56	46.4	52	5.1	43	7.1	66	4.7	62	3.5	57	11.4	64	3.7	63	0.9	24
24	FG00-125	38.3	1	28.9	14	23.1	71	37.1	48	38.7	3	3.2	10	3.1	7	3.1	22	3.4	54	3.9	3	4.2	35	1.0	39
25	FG00-126	42.4	40	27.8	27	24.8	51	37.6	39	42.1	23	3.8	21	4.4	30	2.8	14	2.4	9	6.9	28	3.7	61	0.7	8
26	FG00-127	40.9	18	28.4	22	24.3	58	37.7	36	40.9	16	3.0	8	3.6	12	2.7	9	3.0	32	5.0	17	4.7	19	1.0	41
27	FG00-128	44.4	62	23.1	71	25.6	33	36.4	59	48.2	65	6.9	67	8.9	71	5.4	70	3.6	62	14.9	70	4.0	51	0.9	18
28	FG00-129	42.2	39	26.7	39	25.1	45	37.4	42	43.6	34	4.6	35	5.0	39	3.6	38	2.8	22	8.4	44	3.9	55	0.9	22
29	FG99-11	43.9	58	23.8	67	27.6	9	37.6	38	48.9	69	7.1	68	6.1	58	5.7	71	4.5	72	9.4	50	3.8	59	0.6	4
30	FG99-16	40.8	14	28.6	18	23.5	67	37.3	45	39.6	6	3.8	22	3.8	19	3.1	20	3.1	38	5.0	16	4.0	45	1.3	69
31	FG99-21	44.7	66	24.1	65	26.7	20	36.7	54	48.7	67	4.9	41	5.2	41	3.1	21	3.2	43	7.6	35	4.1	40	0.8	14
32	FG99-24	41.5	27	25.4	51	23.3	68	35.2	70	42.9	28	4.6	36	4.8	36	3.0	17	2.4	10	8.1	41	4.6	22	1.3	71
33	FG99-25	40.6	12	26.1	42	23.8	64	36.0	63	42.7	27	5.6	53	6.0	51	4.6	59	3.1	41	11.2	62	3.6	70	1.1	57
34	FG99-26	41.0	20	25.7	45	23.9	63	35.7	66	43.4	32	2.9	6	4.1	29	2.7	11	2.2	4	7.6	34	4.1	44	0.7	5
35	FG99-27	43.0	47	24.1	64	25.1	44	36.0	64	46.8	54	5.2	45	5.8	48	3.4	28	2.7	17	9.9	52	4.2	32	1.0	34
36	FG99-30	42.0	36	27.6	29	26.0	25	38.5	24	43.7	36	5.0	42	4.9	37	3.9	48	3.4	53	8.0	40	4.7	17	1.0	44

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	Genotype	L	rank	a	rank	b	rank	Chroma	rank	Hue	rank	Ldif	rank	adif	rank	bdif	rank	Cdif	rank	Hdif	rank	Force	rank	Force SD	rank
37	FG99-35	43.9	59	24.5	61	27.1	12	38.0	32	48.5	66	5.3	47	6.0	52	4.5	58	3.0	33	10.5	59	3.3	71	0.9	29
38	FG99-36	44.5	64	24.6	59	28.1	7	38.7	18	49.2	70	6.1	58	6.0	53	4.9	67	3.6	61	9.9	54	4.0	46	1.0	50
39	FG99-4	45.4	70	26.0	43	27.0	14	38.6	21	46.3	50	5.9	56	6.0	55	4.5	57	2.9	26	10.1	57	3.9	54	1.0	33
40	FG99-42	40.0	6	30.3	4	26.0	26	40.3	8	40.7	14	3.8	20	3.9	23	3.6	39	3.3	47	5.2	18	4.3	29	0.9	17
41	FG99-44	42.5	42	25.6	46	25.1	43	36.8	52	45.2	44	3.9	23	4.1	27	3.1	19	2.1	3	7.5	32	4.7	20	1.0	43
42	FG99-46	41.7	31	28.6	17	24.4	57	37.8	33	40.7	13	3.1	9	2.8	1	2.4	5	2.1	2	4.6	10	3.6	67	1.0	47
43	FG99-5	43.3	52	25.0	54	27.2	11	37.7	35	47.7	59	5.5	49	5.9	50	3.9	47	2.9	29	10.1	55	3.6	64	1.0	49
44	H9423	45.2	68	30.2	5	26.7	18	40.8	6	42.0	22	3.4	18	3.8	17	2.6	7	2.0	1	5.7	21	4.8	15	1.3	70
45	H9706	44.5	63	29.0	11	28.6	4	41.2	5	44.9	41	4.4	29	3.9	21	3.4	32	2.6	14	6.0	24	5.7	1	0.9	19
46	H9776	42.8	44	31.9	3	27.6	8	42.6	1	41.3	20	4.8	39	4.9	38	3.4	29	3.0	36	7.0	30	5.5	4	1.0	42
47	H9996	40.7	13	32.4	2	25.5	34	41.4	4	38.3	2	3.3	14	3.0	4	2.8	13	2.2	6	4.6	11	5.6	2	1.1	58
48	H9997	41.7	32	32.6	1	26.4	23	42.3	3	39.3	5	2.8	3	3.0	5	2.0	1	2.3	8	3.8	2	5.4	5	1.1	60
49	OX150	43.3	51	24.9	56	24.9	49	35.8	65	45.3	46	6.0	57	6.0	56	3.4	33	3.7	65	8.4	43	3.8	58	1.0	35
50	OX261	43.0	48	26.7	38	27.0	13	39.2	14	46.1	49	4.4	30	5.4	44	3.9	45	2.8	25	9.2	48	4.6	23	1.0	37
51	OX268	44.6	65	25.0	55	25.9	29	36.8	53	46.5	53	5.6	51	5.9	49	3.6	40	3.0	34	9.9	53	4.0	50	1.1	54
52	OX323	40.2	7	29.1	10	24.7	53	38.5	25	40.5	12	3.2	12	3.5	11	3.3	25	3.1	37	4.7	12	5.5	3	1.1	53
53	OX324	40.4	10	28.5	19	25.2	42	38.6	20	41.8	21	4.1	25	5.3	43	3.5	34	3.2	44	7.6	36	5.1	10	0.7	6
54	OX325	40.9	17	26.9	34	25.2	39	37.3	43	43.4	33	4.3	28	3.9	22	3.5	35	2.8	20	6.7	26	4.8	16	0.8	12
55	OX327	43.8	56	25.6	48	27.5	10	38.6	19	47.8	60	6.5	65	7.2	68	4.6	60	2.9	27	12.4	68	5.2	8	0.7	7
56	OX328	44.2	61	24.5	62	26.8	16	37.4	41	48.1	64	6.5	64	6.5	63	4.8	65	2.9	31	12.1	66	4.1	42	0.8	9
57	OX329	42.1	37	25.6	47	26.0	27	37.2	46	45.7	47	6.2	59	4.7	35	4.1	54	3.5	55	8.1	42	3.6	69	0.8	10
58	OX331	39.1	3	29.6	8	24.6	55	38.9	16	39.9	9	3.5	19	4.0	25	2.9	16	2.7	18	6.1	25	4.7	18	0.9	23
59	Ohio 8245	45.3	69	27.2	33	28.9	3	40.6	7	47.3	58	6.2	60	7.1	67	4.1	52	3.3	48	10.8	60	5.3	7	1.2	64
60	Ohio 9242	39.5	4	28.5	20	24.7	52	38.0	31	41.1	18	4.2	26	4.0	26	3.5	36	4.2	70	4.3	7	4.1	41	0.9	28
61	PS31212	41.6	28	28.8	15	25.2	40	38.5	23	41.3	19	3.3	15	3.4	9	2.7	10	2.5	11	5.0	15	5.1	11	1.1	56
62	PS696	41.8	34	27.8	28	26.9	15	39.0	15	44.2	39	4.4	31	3.7	15	3.8	42	3.1	40	5.9	22	4.2	34	0.9	31
63	R001	41.2	24	28.9	13	24.9	48	38.6	22	41.0	17	3.4	16	3.9	20	3.1	23	2.8	23	5.9	23	4.5	26	1.2	62
64	R002	41.1	21	30.1	6	25.1	46	39.4	12	40.0	10	2.8	2	3.3	8	2.5	6	3.1	42	4.5	8	5.0	12	1.2	66
65	R003	39.7	5	28.9	12	23.2	69	37.3	44	39.0	4	2.8	4	2.9	3	2.2	2	2.6	16	3.6	1	3.8	56	0.9	26
66	R991	40.8	15	26.0	44	25.3	38	36.9	51	44.4	40	4.4	32	4.7	34	3.4	31	2.8	19	8.0	38	4.5	27	0.9	20
67	R996	41.0	19	24.6	57	23.7	66	34.7	71	44.1	38	4.6	38	4.7	32	3.6	37	3.5	58	7.1	31	4.0	48	0.8	11
68	RG31	41.9	35	28.1	24	26.5	22	38.8	17	43.4	31	3.2	11	3.4	10	3.0	18	3.1	39	4.5	9	4.3	28	0.6	2
69	RG32	41.6	29	28.0	25	25.7	31	38.4	27	42.9	29	2.9	7	3.0	6	2.6	8	2.9	28	4.2	5	5.0	13	1.1	61
70	RG46	42.5	41	26.7	36	26.6	21	38.2	29	45.2	43	4.6	37	5.7	46	3.8	44	4.0	69	7.7	37	4.6	21	1.1	59
71	SUN6333	40.9	16	29.8	7	25.6	32	39.6	11	40.8	15	3.4	17	3.7	16	3.3	27	3.2	45	4.7	13	4.3	31	1.1	51
72	SUN6352	43.6	54	27.5	30	28.1	6	40.1	9	46.0	48	5.4	48	4.5	31	3.8	41	2.6	13	8.0	39	4.5	24	1.0	32
	Mean	42.3		26.9		25.7		37.9		44.1		4.8		5.0		3.7		3.1		8.0		4.3		1.0	
	LSD* (0.05)	3.3		3.8		2.6		2.3		6.0		2.3		2.9		1.9		ns		5.4		0.8			
	LSD* (0.30)	1.8		2.0		1.4		1.2		3.2		1.2		1.5		1.0		0.7		2.8		0.4			

ns - no significant overall differences at the indicated alpha level (0.05 or 0.30)

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	Genotype	Tons per acre (ripe)	rank	Tons per acre (potential)	rank	% Ripe	rank	% Green	rank	% Cull	rank	Avg. Fruit Weight (oz.)	rank	Folliear Disease Index (0-3)	rank	Fruit Rot Index (0-3)	rank	Blossom End Rot (0-3)	rank	Stems (0-3)	rank	pH	rank	NaOH	Solids	rank
1	2K-3605	43.2	28	46.2	29	87.9	12	6.4	30	5.8	21	2.3	20	1.8	27	1.0		0.0		0.0		4.39	33	6.09	4.10	52
2	2K-3612	32.1	66	37.0	63	80.1	50	12.3	66	7.6	27	2.3	26	2.0	44	1.0		0.0		0.0		4.31	5	6.13	4.55	10
3	2K-3614	45.3	21	47.3	25	88.1	11	3.9	10	8.0	30	2.5	14	1.3	4	.		.		.		4.38	28	5.39	4.50	12
4	2K-3615	34.1	61	39.4	55	73.9	68	11.2	61	14.9	62	2.9	4	2.3	60	1.0		0.0		0.0		4.43	50	4.99	4.25	38
5	2K-3616	47.5	10	51.3	10	79.6	52	6.4	29	14.0	58	2.8	5	1.8	28	1.0		0.0		0.0		4.43	51	5.34	4.10	51
6	2K-3617	46.9	13	50.9	12	88.5	10	7.5	40	4.1	9	2.3	25	1.8	29	1.0		0.0		0.0		4.36	22	5.37	3.90	67
7	2K-3619	46.4	15	50.5	13	81.6	46	7.5	42	10.9	46	2.6	13	1.5	9	1.0		0.0		0.0		4.48	59	5.07	4.25	37
8	2K-3630	29.6	70	35.2	67	79.5	53	14.9	69	5.6	20	2.2	38	1.5	10	1.0		0.0		0.0		4.38	29	5.26	4.40	19
9	2K-3633	27.9	71	30.0	72	81.7	45	6.1	26	12.2	52	2.6	12	2.0	45	1.0		0.0		0.0		4.47	57	4.91	4.25	36
10	2K-3636	39.1	48	41.5	50	83.6	30	5.1	18	11.4	48	2.7	8	2.0	46	1.0		0.0		0.0		4.39	34	5.18	4.60	8
11	2K-3675	34.5	56	38.9	56	78.5	58	11.7	64	9.8	43	2.4	19	2.0	47	1.0		0.0		0.0		4.36	23	4.57	4.20	46
12	981670.2-2	60.3	1	66.7	1	82.4	43	8.6	52	9.0	34	2.2	41	1.0	1	1.0		0.0		0.0		4.44	54	4.44	4.35	24
13	987034.1	41.6	35	44.1	37	73.7	69	4.5	12	21.9	70	2.0	60	1.5	11	2.0		0.0		0.0		4.34	14	4.43	4.20	45
14	99-3825	40.8	39	45.6	30	77.9	59	9.0	57	13.1	55	2.2	32	1.5	12	1.0		0.0		0.0		4.60	72	4.70	4.45	15
15	AB746	36.9	51	41.3	51	64.4	72	8.6	53	27.0	72	3.7	1	2.3	61	2.0		0.0		0.0		4.41	42	5.23	4.30	31
16	E3259	34.2	59	37.7	61	83.8	28	8.5	49	7.7	28	2.1	57	1.8	30	1.0		0.0		0.0		4.48	60	5.34	3.80	71
17	FG00-115	43.2	27	48.9	21	83.1	36	11.7	63	5.3	16	2.2	37	2.0	48	1.0		0.5		0.0		4.49	63	4.69	4.00	61
18	FG00-116	42.0	32	45.2	34	74.1	67	5.6	19	20.3	68	2.2	45	1.5	13	1.0		0.0		0.0		4.53	69	3.78	4.00	60
19	FG00-117	44.7	24	46.8	27	73.4	70	3.2	4	23.4	71	2.3	29	1.3	5	2.0		0.0		0.0		4.42	46	4.65	4.25	35
20	FG00-118	47.5	11	52.3	6	87.4	16	8.9	56	3.8	7	1.9	67	1.8	31	1.0		0.0		0.0		4.35	16	5.57	4.30	30
21	FG00-119	46.3	16	49.0	20	87.7	14	5.0	17	7.3	26	2.1	52	2.0	49	1.0		0.0		0.0		4.40	39	4.99	4.40	18
22	FG00-120	45.1	23	48.5	22	77.4	60	6.1	25	16.6	66	2.0	63	2.0	50	1.0		0.0		0.0		4.55	70	4.20	4.10	50
23	FG00-124	34.3	58	37.6	62	79.4	54	7.6	43	13.0	53	2.3	22	1.5	14	1.0		0.0		0.0		4.50	65	5.17	4.10	49
24	FG00-125	35.3	55	38.2	59	84.1	26	6.8	34	9.2	36	2.2	43	2.0	51	1.0		0.0		0.0		4.40	40	5.45	4.25	34
25	FG00-126	31.1	67	33.6	68	83.4	32	6.8	35	9.8	44	2.1	58	2.3	62	1.0		0.0		0.0		4.47	58	5.03	4.00	59
26	FG00-127	40.8	41	45.2	33	85.2	22	9.3	59	5.5	19	2.2	31	1.8	32	1.0		0.0		0.0		4.39	35	6.22	4.30	29
27	FG00-128	33.3	63	40.4	53	79.6	51	16.4	70	4.0	8	2.2	36	1.8	33	1.0		0.0		0.0		4.52	68	5.01	4.45	14
28	FG00-129	33.2	64	36.6	65	81.3	47	9.3	58	9.4	40	2.1	56	1.8	34	1.0		0.0		0.0		4.42	47	5.71	4.20	44
29	FG99-11	41.3	37	43.3	44	82.0	44	3.5	7	14.5	59	2.1	47	1.8	35	2.0		0.0		0.0		4.43	52	4.99	3.90	66
30	FG99-16	40.6	42	43.5	43	82.5	40	5.9	23	11.6	49	2.1	51	2.3	63	1.0		0.5		0.0		4.45	55	5.51	4.35	23
31	FG99-21	45.6	20	47.7	24	82.5	41	3.8	9	13.8	57	2.1	46	1.5	15	1.0		0.0		0.0		4.58	71	3.65	4.30	28
32	FG99-24	34.1	60	43.1	45	74.5	66	20.3	72	5.3	17	2.2	35	1.3	6	1.0		0.0		0.0		4.37	26	6.30	4.45	13
33	FG99-25	46.0	17	49.4	19	84.1	25	6.2	27	9.7	41	2.3	24	1.5	16	1.0		0.0		0.0		4.50	66	5.43	4.35	22
34	FG99-26	41.3	38	46.8	26	81.2	48	10.9	60	7.9	29	2.0	66	1.3	7	1.0		0.0		0.5		4.35	17	5.82	4.30	27
35	FG99-27	41.5	36	45.5	31	87.8	13	8.5	50	3.7	6	2.0	64	1.5	17	1.0		0.0		0.0		4.32	10	5.80	4.75	3
36	FG99-30	35.5	54	38.3	57	85.4	20	6.6	32	8.0	31	1.8	71	2.3	64	1.0		0.0		0.0		4.32	11	6.10	4.25	33

2001 Observation Harvest 1-2 *(Plots 301 - 444)* **continued**

	Genotype	T/A (ripe)	rank	T/A (potential)	rank	% Ripe	rank	% Green	rank	% Cull	rank	Frt. Wt. (oz.)	rank	Disease Index (0-3)	rank	Fruit Rot (0-3)	rank	B. End Rot (0-3)	rank	Stems (0-3)	rank	pH	rank	NaOH	Solids	rank
1	FG99-35	46.7	14	50.1	15	79.3	55	5.7	22	15.0	63	2.4	18	2.3	65	1.0		0.0		0.0		4.39	36	5.18	4.00	58
2	FG99-36	48.6	7	49.9	16	91.1	3	2.4	2	6.5	23	2.2	30	1.8	36	.		.		.		4.25	2	5.62	4.25	32
3	FG99-4	41.8	34	43.9	39	90.4	6	4.6	14	5.0	13	2.2	34	2.3	66	1.0		0.0		0.0		4.32	12	5.44	3.95	63
4	FG99-42	39.9	43	42.3	49	83.2	34	5.0	16	11.8	50	2.9	3	1.5	18	1.0		0.0		0.0		4.48	61	4.90	4.70	5
5	FG99-44	39.3	47	42.6	48	83.9	27	6.9	36	9.2	37	2.0	62	2.3	67	1.0		0.0		0.0		4.31	6	6.18	4.20	43
6	FG99-46	37.4	50	43.1	46	82.7	38	12.6	67	4.7	12	2.3	23	2.0	52	1.0		0.0		0.0		4.50	67	5.74	3.85	69
7	FG99-5	39.4	46	43.9	41	75.2	65	8.6	51	16.2	65	2.2	33	1.3	8	1.0		0.0		0.0		4.42	48	5.11	4.00	57
8	H9423	25.8	72	32.5	69	76.9	62	19.9	71	3.2	3	2.6	9	1.5	19	1.0		0.0		0.5		4.36	24	6.64	4.20	42
9	H9706	55.3	2	59.2	2	91.0	4	6.7	33	2.3	1	2.1	50	1.5	20	1.0		0.0		0.0		4.31	7	4.73	4.60	7
10	H9776	29.7	69	32.5	70	72.6	71	7.0	38	20.4	69	3.1	2	2.3	68	2.0		0.0		0.0		4.39	37	5.21	4.05	55
11	H9996	42.5	30	46.5	28	78.6	57	8.4	48	13.0	54	2.4	17	2.3	69	1.0		0.0		1.0		4.35	18	5.24	4.20	41
12	H9997	32.8	65	36.0	66	76.8	63	8.6	54	14.6	61	2.7	7	2.0	53	1.0		0.0		1.0		4.38	30	5.83	4.10	48
13	OX150	39.9	44	43.9	40	82.7	39	8.3	46	9.0	33	2.2	40	2.0	54	1.0		0.0		0.0		4.32	13	5.06	4.05	54
14	OX261	47.0	12	50.2	14	82.5	42	5.7	20	11.9	51	2.3	27	1.5	21	1.0		0.0		0.0		4.34	15	5.63	4.40	17
15	OX268	34.4	57	39.6	54	80.8	49	12.2	65	7.0	25	1.5	72	1.8	37	1.0		0.0		0.0		4.48	62	4.75	4.00	56
16	OX323	47.6	9	49.7	17	90.8	5	4.0	11	5.1	15	2.0	61	2.0	55	1.0		0.0		0.0		4.41	43	5.94	3.85	68
17	OX324	45.8	18	53.4	4	83.1	35	13.8	68	3.1	2	2.5	15	1.5	22	1.0		0.0		0.0		4.41	44	5.61	4.50	11
18	OX325	41.9	33	44.9	36	87.5	15	6.0	24	6.6	24	2.2	42	1.8	38	1.0		0.0		0.0		4.35	19	4.49	3.90	65
19	OX327	44.0	25	48.5	23	86.1	18	8.8	55	5.1	14	2.1	54	1.5	23	1.0		0.0		0.0		4.35	20	5.25	4.30	26
20	OX328	48.5	8	52.2	7	78.9	56	6.5	31	14.6	60	1.9	69	2.0	56	1.0		0.0		0.0		4.40	41	4.65	3.80	70
21	OX329	49.3	4	52.8	5	77.3	61	5.7	21	17.1	67	1.8	70	1.8	39	1.0		0.0		0.0		4.49	64	4.15	3.45	72
22	OX331	48.8	6	53.5	3	86.3	17	8.4	47	5.4	18	2.3	21	1.8	40	1.0		0.0		0.0		4.39	38	5.88	4.35	21
23	Ohio 8245	43.6	26	45.2	32	93.4	1	3.5	6	3.2	4	2.1	53	2.0	57	1.0		0.0		0.0		4.42	49	5.23	4.20	40
24	Ohio 9242	42.0	31	42.7	47	85.3	21	1.4	1	13.4	56	2.5	16	1.8	41	.		.		.		4.43	53	4.97	4.05	53
25	PS31212	45.1	22	51.3	11	84.3	24	11.4	62	4.3	10	2.3	28	1.0	2	1.0		0.0		0.5		4.31	8	6.22	5.00	2
26	PS696	42.7	29	45.1	35	85.9	19	5.0	15	9.1	35	2.1	49	1.5	24	.		.		.		4.31	9	5.59	3.95	62
27	R001	36.5	52	37.7	60	88.7	8	3.1	3	8.2	32	2.2	39	2.0	58	1.0		0.0		0.0		4.20	1	7.11	5.00	1
28	R002	29.8	68	30.9	71	90.3	7	3.4	5	6.2	22	2.2	44	2.5	72	1.0		0.0		0.0		4.28	3	6.58	4.70	4
29	R003	45.7	19	49.6	18	88.5	9	8.2	45	3.3	5	1.9	68	2.3	70	1.0		0.0		0.5		4.38	31	5.59	4.60	6
30	R991	35.7	53	38.2	58	83.5	31	6.3	28	10.2	45	2.0	65	2.3	71	1.0		0.0		0.0		4.41	45	5.38	4.20	39
31	R996	37.6	49	41.1	52	83.3	33	7.3	39	9.4	39	2.0	59	1.5	25	0.5		0.0		0.0		4.30	4	5.75	4.35	20
32	RG31	50.0	3	52.0	8	92.0	2	3.7	8	4.3	11	2.1	55	1.5	26	1.0		0.0		0.0		4.35	21	6.23	3.90	64
33	RG32	40.8	40	44.1	38	83.7	29	6.9	37	9.4	38	2.1	48	1.8	42	0.5		0.0		0.0		4.38	32	6.46	4.30	25
34	RG46	39.9	45	43.5	42	82.8	37	7.5	41	9.7	42	2.6	11	2.0	59	1.0		0.0		0.0		4.36	25	5.02	4.15	47
35	SUN6333	33.4	62	36.7	64	76.1	64	8.0	44	16.0	64	2.8	6	1.8	43	1.5		0.0		0.0		4.37	27	5.43	4.40	16
36	SUN6352	48.9	5	51.4	9	84.5	23	4.5	13	10.9	47	2.6	10	1.0	3	.		.		.		4.45	56	4.50	4.55	9
	Mean	40.9		44.5		82.5		7.6		9.9		2.3		1.8		1.0		0.0		0.1		4.40		5.33	4.24	
	LSD* (0.05)	13.2		12.7		0.10		ns		0.09		0.37		0.81		0.52		ns		ns		ns		1.24	0.60	
	LSD* (0.30)	6.9		6.7		0.05		0.05		0.05		0.19		0.42		0.27		ns		ns		0.10		0.65	0.32