

# Fla. 8153 Hybrid Tomato; Fla. 8059 and Fla. 7907 Breeding Lines

**John W. Scott<sup>1</sup>**

University of Florida, Gulf Coast Research and Education Center, 14625 CR 672, Wimauma, FL 33598

**Elizabeth A. Baldwin**

USDA, Agricultural Research Service, Citrus and Subtropical Products Laboratory, 600 Avenue S NW, Winter Haven, FL 33881

**Harry J. Klee and Jeffrey K. Brecht**

University of Florida, Horticultural Sciences, 1143 Fifield Hall, Gainesville, FL 32611

**Stephen M. Olson**

University of Florida, North Florida Research and Education Center, 155 Research Road, Quincy, FL 32351

**Jerry A. Bartz**

University of Florida, Plant Pathology, 1453 Fifield Hall, Gainesville, FL 32611

**Charles A. Sims**

University of Florida, 359 FSHN Building, Newell Drive, Gainesville, FL 32611

‘Fla. 8153’ is a fresh-market tomato (*Solanum lycopersicum* L.) hybrid that is being released for the premium tomato market. It has high lycopene content and an attractive, deep red interior color as a result of the crimson (*og<sup>c</sup>*) gene (Thompson et al., 1965). Flavor is superior to most commercially available tomato cultivars based on the results of seven experienced sensory panels, a consumer panel, and numerous samplings from field trials. Environmental conditions have a large impact on tomato flavor (Scott, 2001), and the strength of this hybrid is its ability to produce fruit with good flavor under a wide range of growing conditions. This feature, along with reliable yields of firm, large, marketable fruit, should allow for branding of vine ripe harvested fruit with consistent quality for the fresh market and will attract repeat purchasing in the supermarket. ‘Fla. 8153’ should also be popular in upscale restaurants. The parents, Fla. 8059 and Fla. 7907, are both crimson types that will be useful for tomato breeders interested in developing crimson and more flavorful cultivars.

## Description

‘Fla. 8153’ has a determinate (*sp*) vine that provides good fruit cover. It has early to midseason maturity with a moderate level of

heat tolerance (35 °C day/24 °C night). Fruit are borne on jointed pedicels and have a smooth, flat-round shape with only slight undulations in the uniform light green shoulders (*u* or *ug*). Blossom scars are stellate and do not enlarge and/or catface often. ‘Fla. 8153’ has been extensively tested in seven experienced sensory panels where it has always been in the most preferred group for overall flavor, and it has been rated significantly better than all commercially grown tomatoes to which it has been compared in six of the seven trials (Table 1). Flavor of ‘Fla. 8153’ was rated significantly better than its parents, Fla. 8059 and Fla. 7907, in the one season when all three were in the same trial. Consumers who ate tomatoes more than once a week also rated ‘Fla. 8153’ significantly better in flavor than the grocery store tomato to which it was compared (Table 2) and in appearance for all consumers who participated. ‘Fla. 8153’ tended to have higher soluble solids content, solids:acids ratio, sugar content, and sucrose equivalents (sweetness value) than the tomato genotypes to which it was compared in the sensory panels although differences were not always significant (Table 3). Fla. 8059 also tended to have higher values for the traits mentioned. The red fruit ripened well with a good external red color and gloss. Data averaged over four seasons showed that the exterior color of ‘Fla. 8153’ had a lower L\* value than four other Florida grown cultivars, indicating that the color of ‘Fla. 8153’ is darker (Table 4). ‘Fla. 8153’ also had a lower exterior hue angle than three of four cultivars, indicating a more red color. The exterior chroma value for ‘Fla. 8153’ was lower than the other four

cultivars indicating the color was less vivid. The internal flesh and locule color was deep red, typical of tomatoes with the *og<sup>c</sup>* gene. The internal L\* score was similar to that of three cultivars and less than that of ‘Sanibel’ (Table 4). The interior hue angle was similar to that of ‘Sebring’, also a crimson cultivar, and both were lower than the other three cultivars indicating ‘Fla. 8153’ and ‘Sebring’ were deeper red. The interior chroma score for ‘Fla. 8153’ was significantly higher than the other four cultivars to which it was compared, indicating the red color of ‘Fla. 8153’ was more vivid. The deeper red color of the crimson gene fruit was the result of higher lycopene levels. Lycopene increases in ‘Fla. 8153’ over ‘Florida 47’ were 29.6%

Table 1. Overall flavor, sweetness, and acidity ratings<sup>z</sup> from experienced sensory panels of 25 to 38 people, 2003 to 2005.

Genotype comparisons	Overall flavor	Sweetness	Acidity
I. Fla. 8153 <sup>y</sup>	5.61 a <sup>x</sup>	4.98 a	4.17 a
Florida 47	4.28 b	3.82 b	4.24 a
II. Fla. 8153 <sup>w</sup>	6.18 a	5.64 a	4.06 ab
Florida 47	4.42 c	4.04 c	4.45 a
Fla. 8059	5.14 b	5.04 b	3.72 b
Solar Set	4.78 bc	4.36 c	3.86 ab
III. Fla. 8153 <sup>v</sup>	5.62 a	5.23 a	4.12
Florida 47	3.88 b	3.92 b	4.44
Fla. 8059	4.35 b	4.23 b	3.92
Fla. 7907	4.58 b	4.38 ab	3.76
IV. Fla. 8153 <sup>u</sup>	5.49 a	4.93 a	4.21 a
Florida 47	4.34 b	3.79 c	4.42 a
Solar Fire	4.31 b	4.42 b	3.60 b

<sup>z</sup>Rated on a 1 to 9 scale where the larger number indicates the most preferred score for overall flavor and highest perceived intensity for sweetness and acidity.

<sup>y</sup>Mean of seven panels.

<sup>x</sup>Mean separation within groups (I to IV) in columns by Duncan’s multiple range test at *P* ≤ 0.1. No letters = no significant difference.

<sup>w</sup>Mean of two panels.

<sup>v</sup>Ratings from one panel.

<sup>u</sup>Mean of three panels.

Table 2. Survey of a nonexperienced panel (54 panelists) of grocery store shoppers in Spring 2006<sup>z</sup>.

Genotype	Appearance	Likability
Less than once-a-week consumers of tomatoes		
Fla. 8153	7.09 a <sup>y</sup>	6.43
Grocery tomato	5.67 b	6.14
More than once-a-week consumers of tomato		
Fla. 8153	7.77 a <sup>y</sup>	7.61 a
Grocery tomato	6.03 b	6.64 b

<sup>z</sup>Ratings on a 1 to 9 scale in which 1 = dislike extremely, 5 = neither like/nor dislike, 9 = like extremely.

<sup>y</sup>Mean separation in columns by Duncan’s multiple range test at *P* ≤ 0.1. No letters = no significant difference.

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<sup>1</sup>To whom reprint requests should be addressed; e-mail jwsc@ufl.edu

Table 3. Chemical measurements for selected tomato genotypes tested in sensory panels over several seasons using a refractometer, titrator, and high-performance liquid chromatography for soluble solids, citric acid, and sugars, respectively<sup>z</sup>.

Genotype comparisons	Mean				
	Soluble solids (%)	Citric acid (%)	Solids/acids <sup>y</sup>	Total sugars (g/100 g fresh wt)	Sucrose equivalents
I. Fla. 8153 <sup>x</sup>	5.12 a <sup>w</sup>	0.38	13.7	2.86	3.57
Florida 47	4.67 b	0.38	12.7	2.45	3.05
II. Fla. 8153 <sup>v</sup>	5.50 a	0.39	14.2 a	2.66	3.34 a
Florida 47	4.65 b	0.40	11.8 b	2.20	2.75 b
Fla. 8059	5.15 ab	0.37	13.8 a	2.37	2.99 ab
Solar Set	5.05 ab	0.42	12.0 b	2.24	2.84 ab
III. Fla. 8153 <sup>u</sup>	5.50 a	0.39	14.2 a	2.66 a	3.34 a
Florida 47	4.65 bc	0.40	11.8 b	2.20 ab	2.75 bc
Fla. 8059	5.15 ab	0.37	13.9 a	2.37 a	2.99 ab
Solar Set	5.05 ab	0.42	12.0 b	2.24 ab	2.84 abc
Fla. 7907	4.43 c	0.30	14.6 a	1.80 b	2.27 c
IV. Fla. 8153 <sup>t</sup>	4.98 a	0.37 a	13.6	2.92 a	3.65 a
Florida 47	4.68 ab	0.37 a	12.9	2.53 ab	3.15 ab
Solar Fire	4.40 b	0.33 b	13.7	1.60 b	2.03 b

<sup>x</sup>Baldwin et al. (1998).

<sup>y</sup>Percent soluble solids/percent citric acid.

<sup>z</sup>Mean of samples from seven panels.

<sup>w</sup>Mean separation within columns in groups by least significant difference at  $P \leq 0.05$ . No letters = no significant difference.

<sup>v</sup>Mean of samples from two panels.

<sup>u</sup>Mean of samples from one panel.

<sup>t</sup>Mean of samples from three panels.

Table 4. Firmness, external color, and internal color of selected tomato hybrids averaged over four growing seasons at Bradenton and Balm, FL, 2003 to 2005.

Hybrid	Firmness <sup>z</sup> (mm deformation)	External fruit color <sup>y</sup>			Internal fruit color <sup>y</sup>		
		L*	Hue angle	Chroma	L*	Hue angle	Chroma
Fla. 8153	3.33	40.00 b <sup>x</sup>	44.26 b	39.22 c	41.18 b	39.37 b	31.36 a
Solar Fire	3.09	41.53 a	47.35 a	40.94 b	41.98 b	44.14 a	30.07 b
Sebring	2.88	41.64 a	47.78 a	41.07 b	41.19 b	40.28 b	27.86 d
Florida 47	2.96	41.76 a	47.63 a	41.17 b	42.57 ab	44.95 a	28.60 cd
Sanibel	2.77	41.93 a	45.03 b	43.35 a	44.09 a	44.07 a	29.70 bc

<sup>z</sup>Determined with a firmness tester using a 1-kg force applied to fruit intact for 5 s with a 1.5-cm diameter fruit contact plate. Pressure applied over a locule in equatorial plane.

<sup>y</sup>Data taken with a Minolta CR-300 chroma meter (Osaka Japan). L\* = Lightness: 0 = black, 100 = white; hue angle: 0° = red, 45° = orange, 90° = yellow; chroma value = larger values indicate more intense color.

<sup>x</sup>Mean separation in columns by Duncan's multiple range test at  $P \leq 0.05$ . No letters = no significant difference.

Table 6. Marketable yield and culls for selected tomato hybrids over three seasons.

Season	Hybrid	Marketable yield (11.4 kg cartons/ha)		Culls (% by wt)
		Total	Extra large	
Bradenton, Spring 2004	Solar Fire	3,753 a <sup>z</sup>	2,733 a	12
	Florida 91	3,292 ab	2,932 a	15
	Fla. 8153	3,257 ab	2,367 ab	17
	Fla. 7964	2,795 ab	2,172 ab	31
	Escudero	2,235 b	1,699 b	24
	Florida 47	1,900 b	1,660 b	25
	Quincy, Fall 2005	Phoenix	1,713 a <sup>z</sup>	1,346 a
Solar Fire		1,672 ab	928 ab	16.1
Florida 91		1,372 ab	1,036 ab	13.4
Sebring		1,267 ab	779 b	11.2
Florida 47		1,236 ab	634 b	17.7
Fla. 8153		1,084 ab	439 b	19.5
Fla. 7964		1,078 ab	614 b	23.3
Crista		930 b	587 b	19.0
Balm, Spring 2006	Solar Fire	3,414 a <sup>z</sup>	2,634	22 b
	Phoenix	3,932 ab	2,793	21 b
	Fla. 8153	3,163 ab	2,088	23 b
	Crista	3,086 ab	2,652	37 ab
	Florida 91	2,783 ab	2,480	33 ab
	Escudero	2,535 ab	1,847	23 b
	Florida 47	2,452 ab	1,959	38 ab
	Sebring	1,790 b	1,663	46 a

<sup>z</sup>Mean separation in columns within season by Duncan's multiple range test at  $P \leq 0.05$  based on a larger number of hybrids. No letters = no significant difference.

Table 5. High-performance liquid chromatography analysis of lycopene content of 'Florida 47' and 'Fla. 8153' over two seasons.

Variety	Spring 2004 (mg/kg FW)	Spring 2005 (mg/kg FW)
Florida 47	54 b <sup>z</sup>	98 b
Fla. 8153	70 a	162 a
Increase (%)	29.6	65.3

<sup>z</sup>Mean separation in columns by F test at  $P \leq 0.05$ . FW = fresh weight.

Table 7. Stem scar water uptake for selected tomato genotypes at Bradenton, FL, Spring 2004.

Genotype	Water uptake (g/fruit)
Solar Set	0.9317 a <sup>z</sup>
Fla. 8059	0.8885 a
Fla. 8153	0.5845 ab
Fla. 7907	0.4356 b
Escudero	0.3756 b
Solar Fire	0.3377 b
NC84173	0.3367 b

<sup>z</sup>Mean separation in columns by Duncan's multiple range test at  $P \leq 0.05$  based on a larger number of genotypes.

and 65.3% when tested over two seasons (Table 5). An earlier study found a crimson cultivar increased lycopene over a standard cultivar by 15.9% and 56.6% over two seasons (Thompson, et al., 1964). Both studies showed wide fluctuations in the increases. The fruit are usually free of internal white tissue, but white tissue can occur under stress conditions. The fruit have good firmness that is comparable to that of cultivars presently grown in Florida and elsewhere in the eastern United States (Table 4). Marketable yields have been comparable to cultivars presently grown in Florida over several years of testing (Table 6). Fruit sizes range from small to large with an average size of  $\approx 170$  g. The percentage of extra-large fruit is generally less than that of cultivars presently grown in Florida, although this was not always evident in Tables 6.

## Origin

The pedigree of 'Fla. 8153' hybrid is shown in Figure 1. The Fla. 8059 parent was developed in a breeding project to develop inbreds with high levels of firmness (termed ultrafirmness). Fla. 8059 is the source of the flat-round fruit shape for 'Fla. 8153'. It does have a high firmness level that traces to Fla. 7344 and Fla. 7402, the latter coming from a parthenocarp breeding project in which it has been difficult to combine firmness and parthenocarpic expression. Fla. 8059 is also somewhat prone to white tissue formation under stress conditions; however, it stood out as an ultrafirm tomato with good flavor, whereas many ultrafirm inbreds have a bland flavor. Fla. 7907 has globe-shaped fruit and is the source of the moderate heat tolerance and fusarium wilt race 3 resistance. The race 3 resistance traces to Fla. 7228, a sister line of Fla. 7481 (Scott and Jones, 1995). Fla. 7907 has outstanding interior color and is tolerant of white tissue formation. The fruit

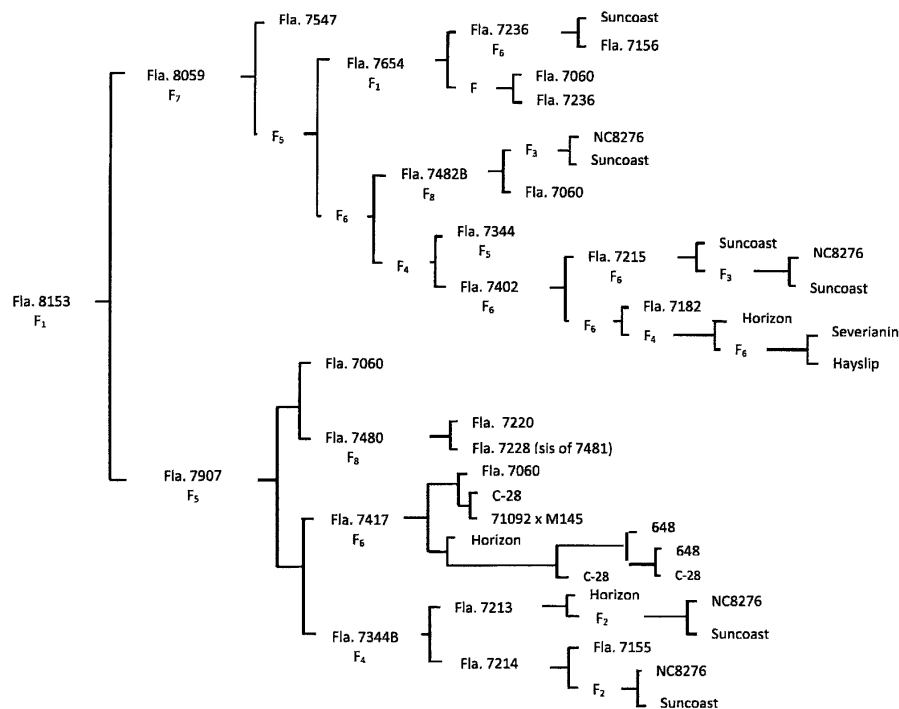


Fig. 1. Pedigree of Fla. 8153.

flavor is good with sweetness that originally stood out in a season when many breeding lines did not express much sweetness. This may have been the result of low acidity because the soluble solids and sugar levels were not high when tested but the solids:acid ratio was in the high group (Table 3).

#### Disease and Disorder Resistance

'Fla. 8153' is resistant to fusarium wilt races 1, 2, and 3 incited by *Fusarium oxysporum* f. sp. *lycopersici* (Sacc.) Snyder

& Hansen (*I*, *I-2*, and *I-3* genes); verticillium wilt race 1 incited by *Verticillium dahliae* Kleb. (*Ve* gene); and gray leafspot incited by *Stemphyllium* spp. Webber (*Sm* gene). Stem scar water uptake for 'Fla. 8153' appears to be intermediate (Table 7), indicating tolerance to bacterial soft rot incited by *Erwinia carotovora* Jones is intermediate (Smith et al., 2008). Fla. 7907 had low water uptake, whereas Fla. 8059 had high stem scar water uptake. 'Fla. 8153' is tolerant of most common fruit disorders but has some susceptibility to graywall under conditions that are

conducive to this disorder. Fla. 8059 is susceptible to graywall, whereas Fla. 7907 is tolerant. There is some zippering in both parents and the hybrid, but zippering expression is usually not excessive. 'Fla. 8153' has good tolerance to all types of fruit cracking and this has been evident in the high percentage of marketable fruit that was reported.

#### Availability

Seed of 'Fla. 8153' (Tasti-Lee™), Fla. 8059, and Fla. 7907 is being released through the Florida Foundation Seed Producers Inc., Greenville, FL 32443 (<http://ffsp.net>). A seed company will be solicited for exclusive rights to produce commercial seed of 'Fla. 8153'. Small quantities of seed for research purposes are available from J. W. Scott. If Fla. 8059 or Fla. 7907 is used in developing other commercial hybrids, users should contact Florida Foundation Seed Producers to discuss a royalty contract.

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