'Carmine' Strawberry

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There is a need in west central Florida and other winter strawberry (*Fragaria ×ananassa* Duchesne) production areas for an early ripening cultivar to replace or be an alternative to 'Sweet Charlie' (Chandler et al., 1997a). 'Sweet Charlie' has benefited the Florida strawberry industry through its relatively high production of fruit early in the season, when market prices are generally high. But the texture of 'Sweet Charlie' fruit is often soft, making its shipment and shelf life problematic. Fruit of the early yielding cultivar Earlibrite (Chandler et al., 2000) are generally firmer than those of 'Sweet Charlie', but they are still prone to bruising, and the primary fruit from the main crop of 'Earlibrite' are often misshapen. 'Carmine' strawberry has produced high early-season (December through February) yields of firm, attractive fruit when grown in the annual hill, plasticulture system (Poling, 2003) at the University of Florida's Gulf Coast Research and Education Center in Dover (GCREC-Dover) and on several commercial farms in west-central Florida. It is recommended for trial in areas with mild winter climates. This strawberry genotype was named 'Carmine' because of the deep red color of its fruit.

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Origin

'Carmine' originated from a 1995 cross between 'Rosa Linda' (Chandler et al., 1997b) and FL 93-53 (Fig. 1). 'Rosa Linda', a 1996 release from the Florida Agricultural Experiment Station, was used as a parent because of its high early-season yield potential and desirable shape. FL 93-53, a 1994 selection, was used as a parent because of its ability to produce firm, attractive fruit. Based on the desirable appearance and firmness of fruit of 'Carmine' during the 1995–96 season, it was included (as FL 95-256) in replicated variety trials at GCREC-Dover during the 1997–98 and 2001–02 seasons. [It was not trialed from 1998 to 2001 because of a severe infestation of bud nematode (*Aphelenchoides* spp.) in the planting stock of this selection.] Ripe fruit were harvested, graded, counted and weighed twice a week from December through March 1998 and through February 2002. For post harvest quality analysis, ripe fruit were harvested 23 Feb. 1998 and 25 Feb. 2002, and transported to the University of Florida Food Science and Human Nutrition Department in Gainesville. Fruit were stored at 2 °C until analyzed for L value (an objective measure of lightness/darkness; Malacara-Hernandez, 2002), firmness (using an Instron machine, model 4411, Canton, Mass.), soluble solids, and titratable acidity. In addition, 72 untrained panelists rated a sample of the fruit harvested on 25

Description

'Carmine' is a short day cultivar. It has a more compact plant habit than 'Camarosa' (U.S. plant patent no. 8708), a standard cultivar grown in west central Florida. A compact plant habit and relatively long and stiff pedicels result in many flowers and fruit that are exposed, making the fruit easy to harvest but also vulnerable to rain and freeze damage. 'Carmine' has a mean fruit weight between 16 and 17 g (Tables 1 and 2). Fruit are mostly short to medium conic in shape, with some fruit being wedge shaped (<http://gcrec.ifas.ufl.edu>). External fruit color is deep red (1807C in the Pantone Color Formula Guide; www.pantone.com) and glossy. 'Carmine' fruit are darker than 'Sweet Charlie' fruit, but not significantly different in lightness than 'Camarosa' or 'Strawberry Festival' fruit (Table 3). The internal color of 'Carmine' fruit is a warm red (1795C in the Pantone Color Formula Guide). The calyx is generally medium in size and attractive. Fruit of 'Carmine' are firm (Table 3), yet juicy. We consider the flavor of the fruit to be acceptable, but it is not as highly regarded as that of 'Camarosa', 'Sweet Charlie', or 'Strawberry Festival' (Table 4). While generally sweet, the fruit, at times, can be slightly astringent.

Performance

Early season yields of 'Carmine' compared favorably to 'Sweet Charlie' and 'Earlibrite' during both the 1997–98 and 2001–02 seasons (Tables 1 and 2). Yield of 'Carmine' in December 2001 was over twice that of 'Sweet Charlie'. Yield during December can be important to a Florida grower's profitability. The average price per flat (4.65 kg) during the five seasons between 1995 and 2000 was \$17.38, \$11.57, \$10.51, and \$7.27 for December, January, February, and March respectively (Florida Agricultural Statistics, www.nass.usda.gov/fl). 'Carmine' is moderately resistant to the two most serious disease problems on strawberry in Florida: Botrytis fruit rot (caused by *Botrytis cinerea* Pers.:Fr.) and anthracnose

Fig. 1. Pedigree of 'Carmine' strawberry.

Table 1. Performance of strawberry cultivars at Dover, Fla., during the 1997–98 season².

Cultivar	Marketable yield (g/plant)					Wt/ fruit ³ (g)
	December	January	February	March	Total	
Carmine	114 a ^x	85 a	246 ab	212 b	657 b	16.4 c
Camarosa	50 b	105 a	167 c	426 a	748 ab	20.0 a
S. Charlie	91 a	54 b	219 abc	257 b	622 b	17.6 b
Earlibrite	66 b	110 a	189 bc	280 b	645 b	20.7 a
S. Festival	58 b	108 a	255 a	426 a	847 a	17.6 b

²Transplants were obtained from the following nursery locations: ‘Camarosa’ from a commercial nursery in North Carolina; all other entries were from GCREC-Dover. ‘Camarosa’ was planted on 16 Oct.; all other cultivars were planted on 9 Oct.

³Mean fruit weight was determined by dividing total marketable fruit yield per plot by total marketable fruit number per plot.

^xMeans based on four replications. Mean separation within columns by Fisher’s protected LSD test, $P \leq 0.05$.

Table 2. Performance of strawberry cultivars at Dover, Fla., during the 2001–02 season².

Cultivar	Marketable yield (g/plant)				Wt/fruit ³ (g)
	December	January	February	Total	
Carmine	232 a ^x	62 b	204 a	499 a	17.0 b
S. Charlie	102 c	92 a	166 a	360 b	16.4 b
Earlibrite	205 ab	33 c	201 a	439 a	21.1 a
S. Festival	163 b	61 b	221 a	444 a	17.2 b

²All transplants were obtained from a commercial nursery in North Carolina, and planted on 9 Oct.

³Mean fruit weight was determined by dividing total marketable fruit yield per plot by total marketable fruit number per plot.

^xMeans based on four replications. Mean separation within columns by Fisher’s protected LSD test, $P \leq 0.05$.

Table 3. Physical and chemical characteristics of strawberry fruit harvested at Dover, Fla., 23 Feb. 1998 and 25 Feb. 2002.²

Cultivar	L value ³		Firmness ⁴		Soluble solids (%)		Titratable acidity (% citric acid)	
	1998	2002	1998	2002	1998	2002	1998	2002
Carmine	30.5 c	35.7 b	0.38 a	0.41 a	8.6 a	6.5 d	0.77 b	0.86 b
Camarosa	29.6 c	34.2 b	0.43 a	0.27 b	7.7 c	8.5 a	0.87 a	0.93 a
Sweet Charlie	35.1 a	38.2 a	0.22 b	0.30 b	8.0 b	7.3 c	0.65 c	0.75 c
S. Festival	32.6 b	35.6 b	0.38 a	0.42 a	7.7 c	8.0 b	0.77 b	0.84 b

²L and firmness values are the average of eight observations. Mean separation within columns by Duncan’s multiple range test, $P \leq 0.05$.

³L value is a measure of lightness and darkness, with 0 being totally black and 100 being totally white.

⁴Firmness is expressed as kilograms of force to penetrate the fruit to a depth of 10 mm with a 5-mm-diameter probe.

Table 4. Sensory characteristics of strawberry fruit harvested at Dover, Fla., 25 Feb. 2002².

Cultivar	Appearance	Firmness	Flavor	Sweetness
Carmine	7.2 a	7.1 b	5.3 c	4.8 c
Camarosa	6.7 b	7.0 bc	6.8 a	6.6 a
Sweet Charlie	6.2 b	6.6 c	6.2 b	6.0 b
S. Festival	7.5 a	7.5 a	7.2 a	6.8 a

²Means based on the ratings of 72 untrained panelists. Mean separation within columns by Duncan’s multiple range test, $P \leq 0.05$. Characteristics are rated on a 1 to 9 hedonic scale, with 1 = dislike extremely, 5 = neither like nor dislike, and 9 = like extremely.

fruit rot (caused by *Colletotrichum acutatum* Simmonds). In an unsprayed trial during the 2001–02 and 2002–03 seasons, 7.3% and 2.2% of the ‘Carmine’ fruit harvested from 19 Feb. to 15 Mar. showed symptoms of Botrytis fruit rot, compared to 18.7% and 6.8% for ‘Sweet Charlie’, the susceptible control. In another unsprayed trial during the 2001–02 and 2002–03 seasons, 9.6% and 9.3% of the ‘Carmine’ fruit harvested from 19 Feb. to 22 Mar. showed symptoms of anthracnose fruit rot, compared to 28.9% and 47.0% for ‘Strawberry Festival’, the susceptible control (D.E. Legard, unpublished data).

Availability

‘Carmine’ is licensed to the Florida Strawberry Growers Association by Florida Foundation Seed Producers, Inc. Information on nurseries sublicensed to propagate ‘Carmine’ can be obtained from the Florida Strawberry Growers Association, P.O. Drawer 2550, Plant City, FL 33564 (www.straw-berry.org).

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