HS1125

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Florida Subtropical Peaches: General Concepts and Cultivars Recommended for Grower Trials[1]

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The University of Florida has developed high quality, low chilling, early maturing peach and nectarine cultivars that can be grown from the panhandle to as far south as Immokalee. Low chilling cultivars can grow and produce fruit under Florida conditions that are much warmer in winter than in northern states. Furthermore, ripening of these cultivars during April and May ensures an early spring market window for tree-ripe fresh fruit in Florida before production from other southeastern states and California comes to market.

The peach industry in central Florida is now developing at the same time that historical production areas in north and north central Florida are replanting. Given this renewed interest in Florida peaches and nectarines, our purpose here is to discuss general concepts of subtropical peach production for commercial growers and homeowners and to recommend cultivars for grower trials.

Peaches and nectarines are the same species, *Prunus persica,* but nectarines differ from peaches in that they lack “peach fuzz.” Therefore the following discussion applies to both peaches and nectarines, but in most cases reference will be made only to peaches. Plums, the only other stone fruit for which we have suitable Florida cultivars, are covered in “Growing Plums in Florida,” another fact sheet available at http://edis.ifas.ufl.edu/HS250

Many peach cultivars or varieties have been developed by plant breeders for California and the southeastern US. However, plant breeding is an ongoing process with newly developed cultivars continuously replacing older cultivars due to better growth and yield, fruit appearance, shelf life and flavor, disease and pest resistance, and other factors. Furthermore, Florida peach trees, on average, come into commercial production in 2-3 years and have about a 7- to 10-year life span because diseases and pests eventually weaken trees and decrease fruit production. In addition, newer cultivars with improved qualities are released frequently to replace older cultivars with problems that were not evident when they were first released.

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Geographic Areas, Chilling Units and Average January Temperatures

Depending on the crop, Florida can be divided into production regions. For peach production, Florida can be divided into north, north central, and central Florida down to Immokalee and Ft. Pierce, each region having a characteristic range of chilling hours (Figure 1). Peaches of currently available varieties cannot be grown successfully south of Immokalee because of insufficient chilling.

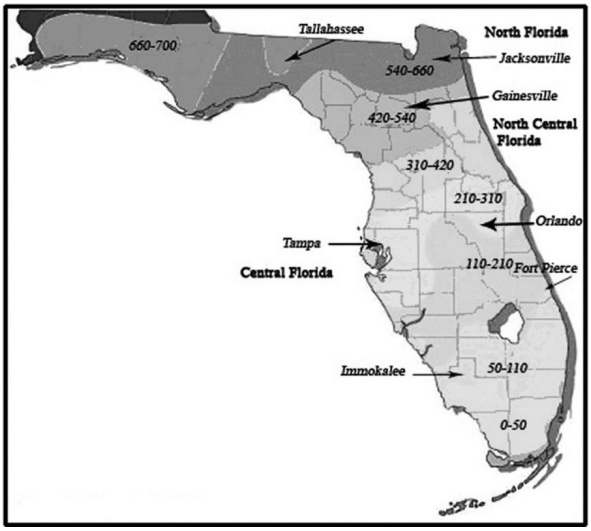

Figure 1. Map shows hours below 45 degrees received to February 10th in 75% of winters.

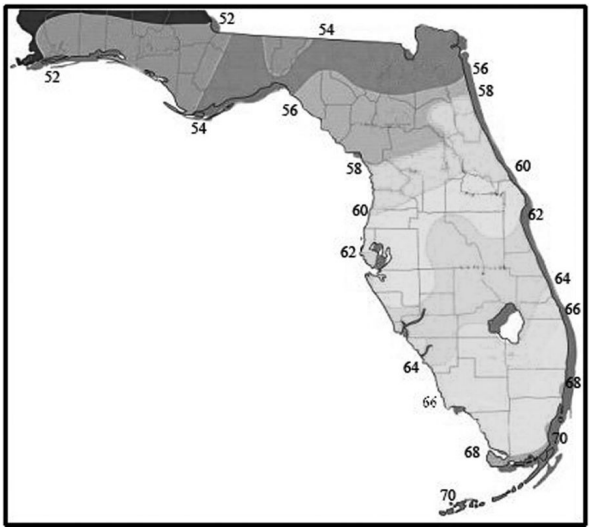

Figure 2. Minimum average January temperatures in Florida.

All recently released cultivars have low to moderate **chilling requirements** (100 to 525 chill units) and short **fruit development periods (FDP's)** (58 to 120 days), and good fruit size, shape, firmness, taste, color, and tolerance to bacterial spot (*Xanthomonas campestris pv. pruni*). Both **chilling requirement** and **chilling hours** are sometimes used interchangeably, but **chilling requirement** refers to the exposure to cool temperatures (between 32° to 55°F) necessary for the resumption of normal spring growth. The chilling requirement is expressed as the number of chilling units. **A chilling hour** is defined by the maximum amount of chilling that can be received by the plant in 1 hour.

Chilling usually occurs from about November 1 to February 1 in central Florida, but extends to February 10 in north Florida. Different models have been developed to estimate chilling.

The model most used in the SE United States is the total number of hours below 45°F and above 32°F. Temperatures from 40 to 50°F are most effective, with higher or lower temperatures being less effective. Unseasonal high temperatures greater than 60°F during November - February cancel or negate some of the accumulated chilling. The effect of higher temperatures on previously accumulated chilling has not been clearly defined and higher temperatures are thought to affect only recently acquired chilling.

The average January temperature is closely correlated with winter chilling, and can be used as a guide to identify peach cultivars that are suitable for a geographic area (figure 5). For example, an average January temperature of 58° can be matched with average chilling of 420 hours or (chill units) for Gainesville.

Recommended cultivars should have a chilling requirement less than the average chilling calculated for a given area so that their chilling requirement is met in almost all winters. By following this recommendation the grower would avoid the consequences of lack of chilling in winters with lower than normal chilling. Although the chilling hours estimates and average January temperatures may vary from year to year, the order of bloom of peach cultivars with different chilling requirements will remain the same with the lower chilling cultivars blooming first. Cultivars of the same age and height must be compared. Furthermore, during any year

warm temperatures during bloom can shorten the bloom period and cool temperatures can lengthen the bloom period. During the winter and spring of 2006-2007, trees in some areas bloomed in January and February after cool December temperatures. Cool February temperatures also extended the bloom period, almost like a second bloom, with trees in north central Florida still blooming by the middle of March. Temperatures affecting the duration of bloom will also affect the fruit development period and maturity dates.

The Florida Agricultural Weather Service (FAWN) at http://fawn.ifas.ufl.edu/data/chart_historical.asp also provides searchable data from 33 weather stations from Monticello in Jefferson county to Homestead in Miami-Dade county. For example, Table 1 contains average chilling hours (32° to 45°F) from November 1 to February 15 for 1999 to 2007 for weather stations located in or near Tallahassee (Monticello), Jacksonville (Macclenny), Alachua, Orlando (Avalon in Lake County), Tampa (Dover), Ft. Pierce and Immokalee.

Determining Chilling Requirements for New Cultivars

New cultivars are grown in different locations but close to older, “standard” cultivars with a clearly established chilling requirement. The chilling requirement of these new peach and nectarine cultivars can be estimated based on their bloom time and foliation (leaf development) relative to standard cultivars. Recommendations are then made to match new peach cultivars with locations that would result in normal flowering and leaf development in spring. Note that after the chilling requirement is satisfied, temperatures required for initial growth of flowers and leaves may differ among cultivars. That is, a tree may produce flowers and leaves at the same time or may produce flowers first and then produce leaves or vice versa, depending on the cultivar.

When a peach or nectarine cultivar is grown outside of its recommended area and has insufficient chilling, it may bloom late and not fruit normally. By contrast, if peach and nectarine cultivars have too low a chilling requirement for a given location, they tend to bloom early and can sustain fruit and tree damage during late winter freezes unless overhead irrigation is used to protect flowers and young fruit. For example, 'Tropicbeauty' (chilling requirement: 150 chilling units) and 'UFGold' (chilling requirement: 200 chilling units) have been grown successfully in a relatively warm (few spring frosts) site near Citra, Florida. Some freeze damage has occurred on this site during February and March, but overhead irrigation was sufficient to protect young fruit. Note also that when Florida peach breeders select new peach cultivars, they choose cultivars that have an extended bloom period (about 14 days). Therefore unopened blossoms, which are freeze hardy to about 20°F, can potentially survive late freezes that could kill opened blossoms (freeze hardy to about 26° to 28°F).

Melting versus Non-Melting Flesh, Clingstone and Freestone Peaches

Peaches and nectarines can be categorized as having either **melting** or **non-melting flesh**, terms referring originally to the condition of peach flesh after canning. Non-melting peaches do not bruise as easily as melting flesh peaches during harvest and remain firm after canning. All non-melting types released by the University of Florida are **clingstone**, meaning that the flesh adheres to the pit or stone when fruit is ripe. Melting flesh peaches become soft when canned, have ragged edges when sliced during processing and can be either clingstone or **freestone** (flesh does not adhere to the pit when the fruit is ripe). Many melting flesh peach cultivars have been developed for the fresh market. However, when these melting flesh cultivars are harvested ripe, the fruit bruise easily and have a short shelf life. One solution to this problem is to harvest melting flesh peaches when they were not fully ripe, so that they were firm enough to resist bruising and last longer in grocery stores. However, although peaches become sweeter as they ripen on the tree, they do not become sweeter after they are harvested, especially when they are harvested before they are ripe. Note that most peaches can become softer when you leave them in your fruit bowl because the walls of individual plant cells break down, but the fruit will not become sweeter. Consequently, peach breeders have developed non-melting-flesh peaches for the fresh market so that growers can harvest and ship tree-ripe

fruit with firm flesh that resists bruising and has a longer shelf life. Many of the recently released cultivars from the University of Florida peach breeding program have non-melting flesh.

All **melting flesh** peaches and nectarines released from the University of Florida breeding program begin with the prefix Florida and Sun, respectively. All **non-melting flesh** peaches and nectarines from the University of Florida share the prefix UF. Joint releases between University of Florida and the USDA and the University of Georgia have the prefix Gulf.

Ripening Peaches: Bloom Date and Fruit Development Period (FDP)

Early ripening depends on bloom date and fruit development period (FDP). Note that chilling requirement is not necessarily related to the fruit development period (number of days from bloom to fruit maturity (Table 2). For example, 'UFSun' requires 100 chilling units and an FDP of 80 days whereas 'Flordaking' peach requires 350 chilling units but has an FDP of only 68 days. The FDP of recent melting flesh cultivars varies from 60 to 85 days for all cultivars except 'Flordario' (95 days). The FDP of non-melting flesh cultivars varies from 80 ('UFGold') to 110 ('Gulfprince') days.

The FDP will vary with temperature during fruit growth and development with warmer temperatures resulting in shorter FDPs and cooler temperatures resulting in longer FDPs. Although FDPs are measured in days, this is not an exact measurement and cannot be projected for a specific harvest and marketing date. General Cultivar descriptions are represented in Table 4.

Fruit Grading

Fruit size can be affected by genetic potential, crop load, climatic conditions, cultural and related management practices, and soil type. Fruit yield per tree can also be affected by tree age and size and the degree of fruit thinning done after fruit set. It is especially difficult to breed cultivars that produce large fruit with a short FDP. It follows that cultivars that have a longer FDP will tend to have larger fruit size because they are on the tree longer. Florida peach fruit size can best be increased by adequate thinning at the earliest stage after frost danger is past and by supplemental irrigation, especially during final fruit swell.

Fruit Color refers to ground color (background color) and overcolor (red color). When fruit ripen, ground color changes from green to yellow. Changes in **ground color** are *not affected* by fruit position in the tree and exposure to sunlight and can therefore be used by harvesting crews to indicate fruit maturity. Changes in **overcolor** or red coloring in the fruit skin or flesh *are* affected by fruit position in the canopy and sunlight interception. A high percentage fruit red overcolor (i.e., >70%) and bright yellow ground color are most desirable for attractiveness and sales in U.S. markets. Percentage red overcolor is at least 50% for many recently released cultivars.

Fruit shape, firmness, taste, flesh browning, and overall attractiveness are also rated subjectively. Round to oblong fruit shape is desirable, and ratings are lowered by the degree of protruding tips and sutures. Fruit with high aroma, moderate acidity, and sweet taste are the most desirable. A high degree of rapid browning from cuts and bruises on soft ripe fruit is not desirable. Total attractiveness of fruit is related to shape, size, color, and flesh browning.

Cultivars Recommended for Grower Trials

Peach and nectarine cultivars suggested for use or trial in Florida are presented in Tables 2 and 3. Estimated chilling requirements are included to help in choosing zone of adaptation, and fruit development periods to help in determining season of ripening for zone of adaptation, and flesh color. General cultivar descriptions are given in Table 4.

North Florida is roughly denoted by a line north of Perry to Jacksonville, and peaches and nectarines adapted to this region have chilling units from 350 to 600 hours and an average January temperature of 55 to 59°F. The north central region (Gainesville south to Ocala) is associated with 200 to 350 hours and an average January temperature of 62° to 58°F. Lastly, the central region of Florida below Ocala and south to Immokalee is associated with 100 to 200 chilling hours and an average January temperature of 64° to 65°F. Note that recommended cultivars are

slightly lower in chilling requirement than the average for the zone so that winter chilling is met most years.

Table 1. Chilling hours (32 to 45°F from Nov. 1 to Feb. 15. Based on Florida Automated Weather Network (FAWN) data*.

Year	Location						
	Tallahassee (Monticello)**	Jacksonville (Macclenny) **	Alachua	Orlando (Avalon) **	Tampa (Dover) **	Ft. Pierce	Immokalee
1999 - 2000	NA	NA	490	251	271	141	168
200-2001	NA	NA	609	388	394	223	217
2001-2002	NA	NA	407	156	170	95	88
2002-2003	NA	759	751	388	440	267	256
2003-2004	674	518	538	227	284	126	180
2004-2005	602	542	517	196	222	139	177
2005-2006	590	545	560	212	298	153	195
2006-2007	564	456	438	98	167	75	81

http://fawn.ifas.ufl.edu/data/chart_historical.asp
NA: Not Available.
**(Closest Weather Station)

Table 2. Flower, leaf and tree characteristics of low-chill peach nectarine cultivars from the University of Florida Breeding program.

Cultivar		January mean temperature[z]		Flower type[y]	Estimated chill units	Bacterial spot resistance[x]	Flower bud set[x]	Leaf glands[w]
		(°F)	(°C)					
Peach								
	Flordaking	58	14.4	N	350	10	6	G
	Flordaprince	64	17.8	S	150	4	8	R
	Flordabest	61	16.1	S	250	9	10	R
	Flordacrest	58	14.4	S	350	10	8	G
	Flordaglo	64	17.8	S	150	8	9	R
	Gulfcrest	54	13.6	S	525	10	9	G
	Gulfcrimson	56	13.5	S	400	10	9	R
	Gulfking	56	13.5	S	350	10	9	R
	Gulfprince	56	13.5	S	400	9	9	R
	Tropicbeauty	64	17.8	S	150	5	8	R

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Cultivar		January mean temperature[z]		Flower type[y]	Estimated chill units	Bacterial spot resistance[x]	Flower bud set[x]	Leaf glands[w]
		(°F)	(°C)					
Peach								
	UF2000	59	15.0	S	300	9	9	R
	UFBeauty	59	15.0	S	200	10	8	G
	UFBlaze	62	16.7	S	300	10	8	G
	UFSharp	59	14.9	S	325	9	9	G
	UFO	61	16.1	S	250	10	8	R
	UFSun	63.3	17.4	S	100	7	10	R
	Whiterobin	54	13.6	S	500	8	8	R
Nectarine								
	Sunbest	61	16.6	S	225	9	9	R
	Suncoast	58	14.0	N	375	10	9	R
	Sunraycer	61	16.1	N	250	10	8	R
	UFRoyal	61	16.1	S	250	10	9	R

[z] Areas with this average temperature or a lower one will provide sufficient chilling to grow this peach or nectarine successfully.
[y] S= Showy, N= Non-showy.
[x] 1 = least desirable, 10 most desirable.
[w] G= Globose, R= Reniform

Table 3. Fruit characteristics of low-chill peach and nectarine cultivars from the University of Florida breeding program.

	Fruit Dev. (days)	Size (g)	Pit freeness[z]	Flesh type[y]	Flesh color[x]	Overred (%)	Background[w]	Shape[v]	Firmness[v]	Taste[v]	Flesh browning[v]	Attractiveness
Peach												
Flordaking	68	96	SC	M	Y	50	DY	7	7	7	9	5
Flordaprince	78	82	SC	M	Y	80	Y	9	8	8	8	8
Flordabest	82	138	C	M	Y	100	Y	9	9	8	9	7

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	Fruit Dev. (days)	Size (g)	Pit freeness[z]	Flesh type[y]	Flesh color[x]	Overred (%)	Background[w]	Shape[v]	Firmness[v]	Taste[v]	Flesh browning[v]	Attractiveness
Peach												
Flordacrest	75	92	SC	M	Y	80	BY	7	9	8	9	9
Flordaglo	78	94	SC	M	W	80	CW	9	9	8	9	8
Gulfcrest	78	106	SC	NM	W	90	Y	8	9	9	9	8
Gulfcrimson	92	135	SC	NM	Y	80	Y	8	9	8	8	8
Gulfking	75	120	SC	NM	Y	85	Y	9	9	9	8	8
Gulfprince	100	150	SC	NM	Y	50	DY, O	9	10	8	10	9
Tropicbeauty	89	100	SC	M	Y	80	BY	10	9	9	9	10
UF2000	97	150	SC	NM	Y	60	OY	9	10	8	10	10
UFBeauty	83	110	SC	NM	Y	95	Y	9	9	9	9	9
UFBlaze	83	110	SC	NM	Y	95	Y	9	9	10	9	9
UFSharp	102	160	SC	NM	Y	60	Y	8	9	9	9	8
UFO	95	70	SF	NM	Y	60	DY	----	10	9	10	--
UFSun	90	130	SC	NM	Y	30	OY	9	9	10	9	9
Whiterobin	90	120	SF	M	W	70	Y, CW	6	7	9	9	8
Nectarine												
Sunbest	83	95	SF	M	Y	95	Y	9	9	9	9	9
Suncoast	77	110	SC	M	Y	90	Y	8	9	9	8	9
Sunraycer	85	110	SC	M	Y	90	BY	9	9	9	8	9
UFRoyal	85	138	SC	NM	Y	100	Y	9	9	10	9	8

[z] SC = Semicling, SF = Semifree, F = Freestone
[y] M = Melting NM = nonmelting
[x] Y = Yellow W = White
[w] BY = Bright Yellow, Y = Yellow, DY = Dull Yellow, CW = Cream White, OY = Orange Yellow, Orange
[v] 1 = Least desirable to 10 = Most desirable

Table 4. Additional characteristics of some low-chill peach and nectarine cultivars from the University of Florida breeding program.

Cultivar	Characteristics
Peach	
Flordaking	Large size for an early peach. Split pits increase with lower crop load. Lacks red in skin.
Flordaprince	A standard for lowest chill and early ripening. High red skin color.
Flordabest	Firmest of melting flesh. Large size and full red skin.
Flordacrest	Excellent yellow ground color. Follows Flordaking in north Florida.
Flordaglo	The best of white flesh cultivars for central Florida
Gulfcrest	Variable in fruit size on the tree. Twiggy growth in tree.
Gulfcrimson	Excellent fruit size. Reliable crops in north Florida
Gulfking	Early variety with good shape, size and color in north Florida.
Gulfprince	Reliable cropper. Fruit browning in flesh associated with high nitrogen.
Tropicbeauty	A standard for lower central Florida and upper south Florida
UFbeauty	Cropping has been unreliable in south Florida
UFBlaze	Cropping has been unreliable south of Gainesville.
UFSharpe	Reliable cropping, excellent fruit size, shape and firmness.
UFO	A donut-shaped fruit with super flavor. Prune heaviest summer and less in winter for reliable crops.
UFSun	Very low chilling. Sets well in south Florida.
Whiterobin	A standard reliable cropper with white flesh for north Florida.
Nectarine	
Sunbest	Similar to Sunraycer, but slightly larger fruit and short intermediate length in stems.
Suncoast	Very large for season.
UFRoyal	Excellent firmness and flavor. Good fruit size and shape. Dark red skin.