LOW CHILL PEACH AND NECTARINE CULTIVARS FROM THE UNIVERSITY OF FLORIDA BREEDING PROGRAM: 50 YEARS OF PROGRESS

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Abstract. Forty low chill peach [Prunus persica (L.) Batsch] and nectarine cultivars have been named and released from the University of Florida breeding program since 1950 and many additional clonal selections have been named in other countries. These peaches and nectarines ripen early and target a market window between 15 April and 1 June. The fruit of the more recent releases have significant advantages over earlier releases in terms of earlier ripening, increased size and firmness, rounder shape, and more attractive skin color. Peaches and nectarines can be categorized based on melting and non-melting fruit types. The new generation of peaches and nectarines are the non-melting flesh types. They can be harvested and shipped at physiological maturity since the flesh is firm and it resists bruising. The most recent non-melting flesh peaches from the University of Florida breeding program are ‘UFGold’, ‘UF2000’, ‘UFO’, and ‘Gulfprince’; ‘UFQueen’ is the first non-melting flesh nectarine. All the aforementioned cultivars are patented. The melting and non-melting flesh peaches from the University of Florida that are suitable for trial in Florida are as follows: central Florida—‘Flordaprince’, ‘Flordaglo’, ‘Tropicbeauty’, and ‘Tropicalsnow’; north central Florida—‘Flordawm’, ‘Flordaking’, ‘Flordacrest’, ‘UFGold’, ‘UF2000’, and ‘UFO’; and northern Florida—‘Flordawm’, ‘Flordaking’, ‘Flordacrest’, and ‘Gulfprince’. ‘Sunraycer’ and ‘UFQueen’ are nectarine cultivars for north central Florida, while ‘Suncoast’ nectarine is worthy of trial in northern Florida.

The most commonly known peach and nectarine cultivars such as ‘Elberta’ or ‘Redhaven’ cannot be grown successfully in mild climates like Florida because they are high-chill cultivars and do not receive enough winter chilling to satisfy dormancy requirements. In fact, prior to 1970 the major impediment toward peach production in subtropical or tropical locations has been the lack of cultivars with adaptation in winter chilling. Hutchins (1932) suggested that hours below 45°F (7.2°C) could be used in calculating cold requirements to match peach cultivars with location that would result in normal flowering and leafing in spring. Richardson et al. (1974) developed a predictive model for budbreak of Prunus persica cultivars based upon the accumulation of chilling units (cu). Although the accumulation of cu as defined by Richard son et al. (1974) can be calculated, the cu of peach and nectarine cultivars can also be estimated based on the timing of bloom and foliation compared to standard cultivars. Alternatively, mean Jan. temperature can be used to match area climate with peach cultvar adaptability (Richardson et al., 1974; Weinberger, 1956), according growers a quick indicator of peach tree and nectarine tree adaptability.

A breeding program was initiated at the University of Florida in the early 1950s to produce early ripening, low-chill, high fruit quality cultivars for adaptability in Florida (Sherman et al., 1986, 1988; Sherman and Rodriguez-Alcazar, 1987). Peach and nectarine production in Florida has good potential for expansion because of an excellent market window for fresh fruit during the early to mid-spring. All recent University of Florida cultivars produce fruit that ripen from late Apr. to early June. Peach cultivars are now available from the University of Florida breeding program that ripen at least 2-3 weeks earlier than peaches from other regions of the United States. The period of fruit development (Mar. to June) is historically a dry period that enhances sugar accumulation and the development of red over-color while suppressing high humidity or wet weather diseases.

Currently, 24 peach and 16 nectarine cultivars have been named and released by the University of Florida (4 jointly with the Texas Agricultural Experiment Stations, 2 jointly with the USDA, and 1 jointly with the University of Georgia and USDA), and 11 peach and 3 nectarine clones have been tested and named in other countries. All recent cultivars have a low cu requirement (100 to 500 cu), a short fruit development period (60 to 110 d), and good fruit shape, firmness, taste, attractiveness, and resistance to bacterial spot [Xanthomonas campestris pv. pruni (Sm.) Young et al.]. Over the last 5 years there has been a major shift in emphasis toward the production of non-melting flesh peaches that resist bruising and can be picked at physiological maturity and therefore can be shipped more easily to distant markets. Internationally, the Florida breeding program is perhaps the best known and most productive of any low chill peach program. Researchers and growers from many countries correspond and visit regularly to seek new budwood and information. Commercial production now occurs in more than 16 countries as a result of this cooperative effort. Low and moderate chill cultivars recommended for grower trial in Florida are presented in Tables 1 and 2. Partial lists of these cultivars have been presented elsewhere (Andersen and Sherman, 1994; Sharpe, 1970; Sharpe et al., 1972; Sherman et al., 1986, 1988; Sherman and Rodriguez-Alcazar, 1987); however, our intent is to focus on the recent most promising fresh market cultivars. Information concerning the non-melting flesh peaches is particularly needed (Sherman et al., 1990). Following is a description of how the characteristics were evaluated.

Relative chilling requirements of clones presented in Table 1 were estimated as chill units (cu) for normal foliation (flowering and leafing) based on the standard cultivars. ‘Okinawa’ (150), ‘Sunred’ (250), Early Amber’ (350), ‘Sunlite’ (450), and ‘Sungold’ (550) were used as a basis for comparison. Comparing foliation dates of new selections with these "key" established cultivars provides estimates of their cu requirements. Although the cu estimates are not exact and may

change slightly with winter and spring temperatures of a given order, with the lower cu clones blooming first in all Florida locations. Estimated cu (Richardson et al. 1974) for each clone are related to mean January temperatures (Sherman and Rodriguez-Alcazar, 1987) for each area so that adapted clones may be chosen at each location. For example, chilling unit requirements of 250, 350, 450 and 550 correspond to mean January temperatures of approximately 61, 58, 56 and 54°F, respectively.

Tree, flower, and leaf characteristics of each cultivar is presented in Table 1. Bacterial spot, [Xanthomonas campestris pv. Pruni (Sm.) Young et al.], resistance refers to leaf resistance as the disease does not consistently appear on the fruit under Florida's climatic conditions (Horne et al. 1926; Sherman and Rodriguez-Alcazar, 1987). All recent cultivars are resistant to bacterial spot, and have a high degree of flower bud set. A high degree of flower bud set is important because spring frosts will often kill a percentage of flowers. Thus, high flower bud set increases the chances of full crops. Flower type and leaf glands at the base of the petiole are clone dependent and are useful for identification purposes.

Information concerning the fruit characteristics of each cultivar appears in Table 2. Early ripening is a function of earliness of bloom (cu requirement dependent) and a short fruit development period (FDP). Fruit development period, or the period of time from bloom to fruit ripening, will vary with the actual summation of temperature during the FDP. The FDP of recent melting flesh cultivars varies from 60 to 80 d for all cultivars except 'FlordaRio' (95 d), and 'Sunraycer' (85 d). The FDP of non-melting flesh cultivars varies from 80 d (UF Gold) to 110 d (Gulf Prince).

Fruit size is a function of genetic potential, crop load, climatic conditions, cultural and management, and soil type. Yield data was not taken since it is dependent on tree size and...
Table 2. Fruit characteristics of low-chill peach and nectarine cultivars from the University of Florida breeding program.

<table>
<thead>
<tr>
<th>Cultivar</th>
<th>FDP* (days)</th>
<th>Size (g)</th>
<th>Pit freeness</th>
<th>Flesh Overred (%)</th>
<th>Background</th>
<th>Shape</th>
<th>Firmness</th>
<th>Taste</th>
<th>Flesh browning</th>
<th>Attractiveness</th>
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<td>BY</td>
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<td>SC</td>
<td>DY</td>
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<td>DY,O</td>
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<td>White Robin</td>
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<td>SF</td>
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<td>Y,CW</td>
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</table>

Peach

- **Flordagold**
- **Flordadawn**
- **Flordakrest**
- **Flordaking**
- **Flordadawn**
- **Flordaglobe**
- **FloridaRio**
- **Gulf Prince**
- **UFGold**
- **UF 2000**
- **UF 0**
- **White Robin**

Nectarine

- **Sunred**
- **Sunripe**
- **Sungem**
- **Sunlite**
- **Sunfree**
- **Sunblaze**
- **Sundollar**
- **Sunraycer**
- **Summist**
- **Suncoast**
- **Sunsplash**
- **UFQueen**

*Days from 50% bloom to first commercial harvest.
* SC = semicling, SF = Semifree, F = freestone
* Y = yellow, W = white.
* BY = bright yellow, O = orange, DY = dull yellow, CW = cream white.

The degree of thinning is especially difficult to breed cultivars that produce large fruit with a short FDP. Fruit size can be increased best by adequate thinning at the earliest stage after frost danger is past and by supplemental irrigation, especially during final fruit swell. Fruit size is based on a crop that has been thinned to one fruit per 6-8 in of shoot and was representative of that for commercial harvest. Fruit size varied between 80 and 150 g (2-3 in). Fruit size generally increases with fruit development period. Thus, in late Apr. peach or nectarine cultivars with 80 g fruit are marketable, and minimum marketable size increase to 100 g by mid-May.

All of the melting flesh cultivars are genetically freestone, but some are anatomically clingy because they ripen before pit and flesh have time to separate. The flesh of most Florida peaches is known as 'semicling' as the flesh clings to the pit at soft ripe in contrast to 'semifree' fruit in which the flesh separates from the pit at soft ripe. 'Sunblaze' is categorized as semicling. The flesh in freestone fruit easily separates from the pit when firm ripe at the time of commercial harvest. Most of the non-melting flesh cultivars are clingy. 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 was at least 80% 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 are given low scores in relation to the degree of uneven ripening on tip, suture, or shoulder or if overall firmness is lacking at time of color break for commercial harvest. Fruit with high aroma, moderate acidity, and sweet taste receive the highest rating. A high degree of rapid browning from cuts and bruises on soft ripe fruit will result in a low rating because relatively non-browning fruit are desirable. Total attractiveness of fruit takes into account shape, size, color, and flesh browning, and a high rating is desired because it tends to be related to consumer demand and marketability.

Below a comprehensive list of peaches and nectarines originating from the University of Florida breeding program.
is presented. Peach and nectarine cultivars and clonal selections recommended for grower trial are underlined. For additional information consult Tables 1 and 2. By convention all melting flesh peaches from the University of Florida begin with the prefix 'Florda', while all melting flesh nectarines begin with the prefix 'Sun'. The new generation of non-melting flesh peaches and nectarines from the University of Florida Program begin with the prefix 'UF'. A * denotes a Florida selection named in another country.

**Peaches**

'Deserted' (7-11*)—highly susceptible to bacterial spot; high percentage of fused (twin) fruit

'Flordabeauty' (26-31*)—has green ground color

'Flordabelle'—improved version ('Newbelle'); has bright yellow ground color

'Flordacrest'—similar to 'Flordaking', but ripens 1 week later with more yellow ground color and few split pits

'Flordadaun'—early ripening with a protracted bloom period

'Flordagem' (7-1*)—attractive yellow ground color; firm; short fuzz; suture bulge may occur in some seasons; similar to 'Flordagold', but ripens 1 week earlier

'Flordagold'—large for season; firm, non-browning white flesh ripening a week after 'Flordaprince'

'Flordaglobe'—ripens with to 'Flordaking', but smaller and more round in shape; older trees lack vigor

'Flordagold'—good firmness, size, and attractiveness in its season; high flower bud set; susceptible to bacterial spot; poor shape with inadequate chilling

'Flordagrande'—lowest chilling requirement; not precocious

'Flordahome'—named for ornamental, multipetal flowers; has soft, white-flesh fruit

'Flordaking'—large size for an early peach; many split pits if crop load is not high; fruit are pointed if chilling is inadequate

'Flordaprince'—the standard for early ripening; susceptible to bacterial spot

'Flordaqueen'—lacks red overcolor, size, and firmness

'Flordared'—lacks firmness and red overcolor

'Flordahio'—ripens with 'Junegold', but rounder and on average smaller with short fuzz

'Flordastar'—early ripening; replaces 'Flordaprince' in areas where bacterial spot is a problem

'Flordasun'—lacks red overcolor, flavor, and size

'Flordawon'—lacks size, red overcolor, and firmness at tip

'Gulfprince'—large, attractive peach with non-melting flesh adapted to northern Florida; patented

'Hermosillo' (81-30*)—largest fruit; red overcolor tends to be purple-red, late season

'Maravilha' (13-72*)—lacks size and firmness at tip

'MrRed' (L8-112*)—lacks firmness; may have suture bulge and tip some years

'Opedepe' (1-3*)—lacks firmness and red overcolor

'Rayon' (1-11*)—high quality, large size, freestone; needs more firmness

'San Pedro' (16-33*)—lacks firmness and red overcolor

'Shermans Early' (3-1*)—lacks size and red overcolor

'Shermans Red' (2-2*)—lacks size

'Tropicbeauty'—very attractive in color, excellent shape, and very firm; very susceptible to bacterial spot

'Tropicflora'—large, firm, white flesh, non-browning; first freestone; light red overcolor; suture bulge most seasons

'Tropicglow'—very sweet with sugar speckles on the fruit giving dull appearance; moderately susceptible to bacterial spot

'Tropicgold'—the first non melting flesh peach released from the UF program; adapted south of Gainesville; patented

'Tropiclima'—large attractive non-melting peach adapted to the Gainesville area; patented

'Tropicmex'—a donut shaped non-melting flesh peach with a good flavor adapted for the Gainesville area; patented

White Robbin'—a white-fleshed peach for northern Florida; bruises easily, but may be suitable for U-Pic operations.

**Nectarines**

'Columbia' (19-37*)—lacks firmness

'Kaygold' (5-107N)—subject to fruit cracking

'Sunblaze'—an attractive medium-sized nectarine for the Gainesville area that has been replaced by 'Sunraycer'

'Suncrest'—a large, attractive nectarine with 90% red overcolor; currently the best for northern Florida

'Sundollar'—a medium-sized, early season nectarine for north Florida; replaced by 'Suncoast'

'Sundowner' (6-3N*)—thin skin subject to skin cracking

'Sunfire'—late season, large-size nectarine for northern Florida

'Sungem'—a round, brightly colored nectarine for northern Florida; high flower bud set; obsolete

'Sungold'—ripens too late for commercial shipping

'Sunhome'—named for ornamental red foliage and intended for dooryard fruit

'Sunlite'—late season, medium-size fruit for northern Florida; high flower bud set

'Sunmist'—a white fleshed, medium-sized nectarine adapted to the Gainesville area; patented

'Sunraycer'—a large-sized, early season nectarine adapted to the Gainesville region

'Sunred'—obsolete for shipping only because of small size; high quality; useful for roadside markets

'Sunrich'—ripens too late for commercial shipping

'Sunripe'—high quality, but subject to dull red overcolor related to sugar speckles

'Sunsplash'—a medium-sized nectarine similar to but higher chilling than 'Sungem'; adapted to northern Florida

'UFQueen'—the first non-melting flesh nectarine; adapted to Gainesville area; patented

**Literature Cited**


