



The Grapefruit ¹

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History

Grapefruit (*Citrus paradisi* Macf.) were first reported growing in Barbados about 1750, where they were known as "forbidden fruit." Only a few years later they were observed growing in Jamaica, but the term grapefruit was not used until 1814. It seems likely that the grapefruit originated in the West Indies since it was unknown in Europe or the Orient prior to its discovery in the New World. However, whether it arose as a mutation or by natural hybridization is uncertain.

Grapefruit are believed to have been introduced into Florida in 1823 by Count Odette Phillipe who settled near Safety Harbor on Tampa Bay. The first shipments of Florida grapefruit to New York and Philadelphia in 1885 signaled the beginning of the commercial grapefruit industry. The industry has since expanded markets to Europe and Japan. Florida, the world leader in grapefruit production, now produces almost two million metric tons of grapefruit annually.

Distribution

Grapefruit are grown throughout tropical and subtropical regions, particularly in the Western Hemisphere. The top five grapefruit-producing countries in order of importance are the United States, Israel, Cuba, Argentina, and South Africa. Grapefruit are widely grown throughout central and south Florida, primarily south of the line connecting Manatee, northern Polk, and southern Volusia counties (Figure 1).



(Figure 1) .

Importance

The United States is the undisputed leader in commercial grapefruit production, accounting for about 63 percent of the world supply, the vast majority of which is grown in Florida. In 1994-95, Florida produced 55,700,000 boxes of grapefruit on

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about 132,838 acres (53,630 hectares), with an estimated on-tree value of approximately \$122 million.

Description

Tree. The grapefruit tree is moderately large, often 22 to 30 feet (7 to 10 m) in commercial orchards, larger if unpruned. Trees are erect as seedlings, globose and slightly spreading as budded or grafted plants. Branches are strong and usually do not require pruning except for dead wood removal, tree shaping, and size control.

Leaves. Grapefruit leaves are light green at emergence, darken as they mature, and are approximately 3 to 5 inches (8 to 13 cm) long. The broad leaf blade is pointed at the apex and rounded at the base with a rather broadly-winged petiole overlapping the leaf base. Short spines are found in many leaf axils. The leaves are evergreen, usually persisting as much as two years.

Flowers. Grapefruit flowers are white and complete (containing all flower parts). Most cultivars (cultivated varieties) are self pollinated, but bees often assist the pollination process. Some cultivars may have little viable pollen and/or few or no fertile ovules. Such fruit develop into seedless or few-seeded fruit.

Fruit. The grapefruit is a modified berry, known botanically as a hesperidium. The peel is moderately thick and bright yellow at maturity. Internal quality is a function of heat units received, therefore grapefruit mature later in the northern citrus-producing areas of the state. Fruit shape is oblate to round. Over fertilization and severe pruning may stimulate tree growth and cause fruit to be pear shaped.

Flesh Color. Grapefruit are divided into two basic groups by flesh color: white or pallid, and pink or red. The pink-fleshed group is characterized by a pink or red color due to the presence of the pigment lycopene. The color is most intense early in the season and fades as fruit age.

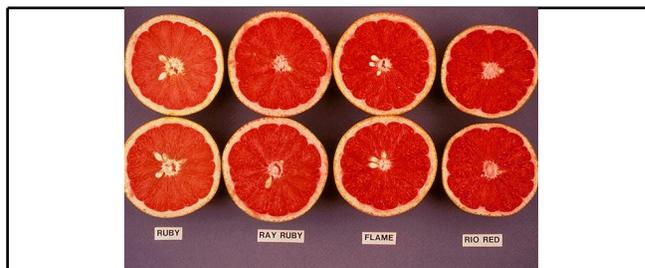
Seeds. Some cultivars are considered seedless for commercial purposes, having only 0 to 6 seeds. Others are quite seedy and may have 50 to 60 seeds.

Major seedy varieties include 'Duncan,' a white-fleshed cultivar, and 'Foster,' a pink-fleshed cultivar. Seedless cultivars include 'Marsh,' a white-fleshed fruit, and 'Thompson,' 'Burgundy,' 'Redblush,' 'Star Ruby,' 'Flame,' and 'Ray Ruby,' which are pink or red cultivars.

Season of Bearing. Grapefruit mature in Florida as early as October but are not considered to be of good eating quality until after Thanksgiving. Fruit can be "stored" on the tree for several months without appreciable loss of quality, extending the harvest season into the spring months. There is very little difference in dates of maturity among the several Florida cultivars, with the exception of 'Burgundy.' 'Burgundy' is a late-maturing cultivar that ripens in April-May in most years.

Grapefruit Cultivars

Descriptions are given for the most important Florida grapefruit cultivars which are listed below in Table 1 .



Florida grapefruit cultivars .

'**Burgundy**' is a patented cultivar arising from 'Thompson.' This cultivar is commercially seedless and has a much deeper and more uniform red flesh color than either 'Redblush' or 'Thompson.' The flesh color holds late into the season, as opposed to that of 'Redblush' and 'Thompson' which fade as the season progresses. 'Burgundy' does not attain good eating quality until April-May or later, and it was originally planted as a late-maturing type. Only a few hundred acres of 'Burgundy' have been planted, and it is not likely that it will become a popular commercial cultivar due to the late date of maturity.

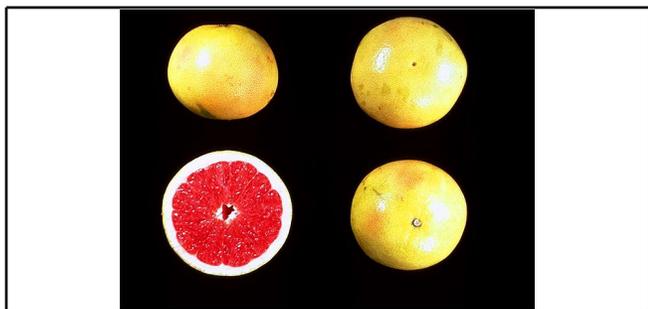
'**Duncan**' is the oldest grapefruit cultivar grown in Florida and is believed to have originated as a seedling about 1830 near Safety Harbor at the site of the original grapefruit planting established by

Count Odette Phillipe. Many other selections of seedy, white-fleshed grapefruit have been made, and cultivar names given to them. However, virtually all seedy, white-fleshed grapefruit are marketed as 'Duncan,' since there are no major differences among these cultivars. 'Duncan' fruit are large, oblate, pale to light yellow in color, and may contain up to 60 seeds. The buff-colored flesh is tender, juicy, and of excellent flavor. Its sections are firm, and 'Duncan' is the standard of excellence for processing as grapefruit sections. Seediness precludes its use as a fresh-market fruit.



Duncan .

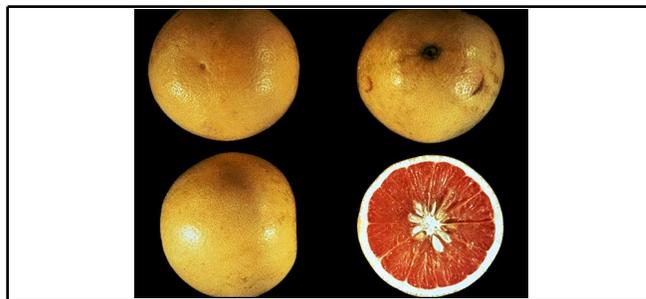
' **Flame** ' grapefruit was selected from 'Henderson' (a Texas cultivar) seedlings planted in 1973 at the A. H. Whitmore Foundation Farm near Leesburg. Fruit are commercially seedless, with internal color almost as deep red as that of 'Star Ruby,' and external blush comparable with 'Ray Ruby' but less than 'Star Ruby.' Flesh color of 'Flame' is noticeably darker than 'Ray Ruby' throughout the harvest season. Preliminary data suggest good internal and external quality, but no yield data are currently available for this cultivar. 'Flame' grapefruit is suggested for trial use in Florida.



Flame .

' **Foster,** ' a limb sport of 'Walters,' is the first pink-fleshed cultivar on record. However, its

popularity was short lived due to the 1924 release of 'Thompson,' a seedless pink-fleshed cultivar. Fruit are medium to large, very seedy, and have a pink peel blush. 'Foster' has not been planted to any appreciable extent in Florida for many years.



Foster, .

' **Marsh,** ' also known as 'Marsh Seedless' and 'White Marsh,' arose as a chance seedling planted near Lakeland about 1860. Soon after its introduction, 'Marsh' became the grapefruit cultivar most widely planted in Florida and throughout the world, a status it has retained to this day. The medium-sized fruit are oblate to spherical with a medium-thin, light yellow peel. The buff-colored flesh is juicy and of excellent quality, but sugar and acid levels may be slightly lower than 'Duncan.' Fruit contain 6 or fewer seeds, making 'Marsh' particularly well suited for fresh consumption. Fruit hold well on the tree but may acquire a bland flavor late in the season.



Marsh, .

' **Ray Ruby** ' was first observed growing in a Texas grove of 'Redblush' grapefruit. 'Ray Ruby' is comparable to 'Redblush' in many respects. Juice and seed content, flesh texture, and maturity date are similar for these two cultivars. However, internal color holds better late in the season for 'Ray Ruby,' and greater blush is usually noted for this cultivar than for 'Redblush.' Texas trials suggest that yields

and growth characteristics are similar to 'Redblush.' However, no yield data are available for 'Ray Ruby' in Florida--it is recommended only for trial use.



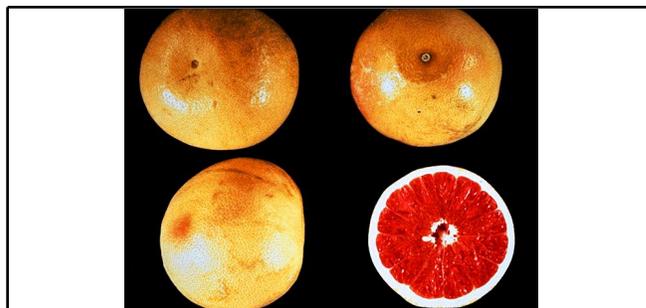
Ray Ruby .

'Redblush' and 'Ruby' are both believed to have originated as limb sports of 'Thompson' and are, for all practical purposes, indistinguishable and should be considered identical. 'Ruby' and 'Redblush' were discovered in separate Texas groves in 1929 and 1931 respectively. The name 'Redblush' is very descriptive of this fruit and has become the preferred cultivar name, although 'Ruby,' 'Ruby Red,' and 'Red Marsh' are sometimes used. Fruit are very similar to 'Thompson,' differing primarily in the intensity and distribution of red pigmentation in the fruit. Red flesh color is much deeper than for 'Thompson,' and a crimson blush not found in 'Thompson' often develops in the peel. A number of bud sports with red flesh color and peel blush have arisen over the years, but they are indistinguishable from the original mutation. Fruit are of excellent quality, although sugar and acid content may be slightly lower than 'Thompson.' Although fruit quality tends to increase through April, some fading of flesh color occurs late in the season. Seedlessness, high quality, and excellent coloration have placed 'Redblush' in great demand.



Redblush .

'Star Ruby' originated from the seed of 'Hudson' (a seedy, pink-fleshed cultivar), was treated with gamma rays at Texas A&M University and released in 1970. Short internodes, profuse branching, and a compact habit of growth characterize this cultivar. The medium-sized, seedless fruit have exceptional red flesh color and a distinctively smooth, thin peel with a pronounced red blush. Sugar and acid content are higher than that of 'Redblush.' Flesh is firm, uniform in color, and of excellent quality. Furthermore, juice is deeply colored even late in the season and may enhance the color of pink grapefruit juice. However, 'Star Ruby' is more difficult to grow in Florida than most other grapefruit cultivars. Foliage is often chlorotic. Trees are easily damaged by some herbicides and are susceptible to foot rot. Propagation of 'Star Ruby' in Florida peaked during the 1984-85 season and has since declined, presumably because of cultural problems associated with this cultivar.

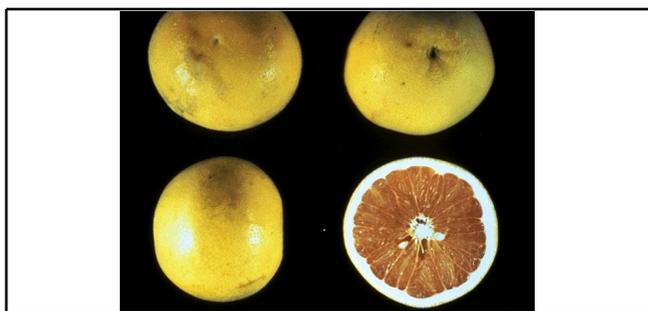


Star Ruby .

'Thompson,' aka 'Pink Marsh,' arose as a limb sport of 'Marsh' near Oneco, Florida. In 1924, 'Thompson' was introduced by a local nursery and, being the first pigmented seedless grapefruit cultivar, became quite popular. However, other seedless cultivars with superior flesh and peel color were soon discovered and planted in favor of 'Thompson.' Fruit characteristics are essentially identical to 'Marsh,' except the pink flesh color. Sugar and acid levels may be lower than 'Marsh,' but not meaningfully so. Fruit hold well on the tree, but flesh color fades as the season progresses.

Cultivars Resembling Grapefruit

'Triumph,' also called 'Early Triumph,' originated as a seedling on the grounds of the Orange Grove Hotel in Tampa, Florida. The 'Triumph' fruit



Thompson, .

is quite seedy and somewhat rounder in shape than most standard grapefruit cultivars. It is white fleshed and of exceptionally high quality. Its lack of typical grapefruit bitterness and its apparent immunity to sour orange scab indicates that it is not a true grapefruit. The flavor suggests that it could be either a mutant resembling the pummelos or shaddocks or a hybrid. Some suggest that it could be a hybrid with orange, but it does not resemble the latter in flavor or other characteristics.

' **Royal** ' is a small, round, orange-yellow, seedy fruit which, like 'Triumph,' lacks the typical grapefruit bitterness. 'Royal' apparently originated in Cuba and was introduced into Florida in 1892.

Other grapefruit-like cultivars around the world are of little importance. One exception is the ' **Chironja** ,' which was found in Puerto Rico and is thought to be a grapefruit-orange hybrid. It is grown to an appreciable extent only in Puerto Rico.

Recommended Grapefruit Budlines

When purchasing trees, carefully select high quality trees from registered budlines of proven performance. The Florida Department of Agriculture and Consumer Services, Division of Plant Industry, has maintained and evaluated extensive plantings of budlines for many grapefruit cultivars. Budlines have been tested on a number of commercially important rootstocks, and in many cases old budlines have been compared with nucellar strains. Cumulative yields over a 10 year period have differed by as much as 20 percent between the highest and lowest yielding budlines for some grapefruit cultivars. Growers should become familiar with the higher yielding budlines and request them by number when purchasing trees. High yielding budlines for the

major grapefruit cultivars grown in Florida are given in Table 2 .

Propagation

Most grapefruit come true-to-type from seed; however, growing a citrus tree from seed is undesirable. Seedling trees are juvenile, which means the plants will be vigorous, thorny, and have an erect, upright growth habit. Juvenility may last 6 to 15 years, during which time the tree does not flower. Grapefruit can be propagated by budding, grafting, and cuttings, although the latter is least desirable. Budding and grafting are easily done and enable specific rootstocks and interstocks to be used. Budding is usually most easily done in the spring. Budded or grafted trees will usually produce some fruit within three years, if properly cared for. Specific, detailed information on citrus propagation is available from your local Cooperative Extension Office.

Climate and Cold Tolerance

Grapefruit is a cold-sensitive plant grown in tropical and subtropical regions of the world. Grapefruit, unlike temperate fruit trees such as apple and peach, do not enter a true state of dormancy during the winter. However, cooler temperatures do slow growth. Continued exposure to cool temperatures induces physiological changes which increase cold tolerance. These processes may be reversed by intermittent warm temperatures which, in turn, reduce cold tolerance.

Because cold tolerance of grapefruit constantly changes during the winter in response to temperature patterns, it is difficult to determine a critical minimum temperature at which damage will occur and above which cold injury is not likely. Site selection should be considered carefully in areas with a high probability of damaging winter cold. Planting citrus trees where they will be protected by over-growing larger trees may prove helpful but not completely satisfactory due to crowding or shading problems. Planting on the south side of and near buildings offers some cold protection during the winter. Information about other cold protection measures is available at local Cooperative Extension Service Offices.

Table 1.

Table 1. Grapefruit Cultivar Characteristics		
Variety	Flesh Color	Seeds/Fruit
'Duncan'	white	30-50
'Triumph'	white	30-50
'Royal'	white	30-50
'Walters'	white	30-50
'Marsh'	white	0-6
'Foster'	pink	30-50
'Thompson'	pink	0-6
'Redblush'	red	0-6
Star Ruby	red	0-6
'Flame'	red	0-6
'Ray Ruby'	red	0-6
'Burgundy'	red	0-6

Table 2.

Table 2. Suggested registered grapefruit budlines for commercial use.	
'Marsh'	'Redblush'
M-S-F-57-4-X-E ¹	R-S-F-53-14-X-E
M-S-F-58-6-X-E ¹	R-S-F-56-13c-X-E ¹
	R-S-F-58-39-X-E ¹
	R-S-F-53-16-X-E ¹
'Thompson': TOM-25-3-6-X(STG) ^{2,3}	

Table 2.

'Flame': FLM-S-DPI-800-1-26-71-X-E ¹
'Ray Ruby': RAY-DPI-103(STG)
¹ Denotes nucellar budlines.
² STG indicates shoot-tip grafting to eliminate one or more viruses.
³ Denotes old budlines.