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Reading 32
Classification of Citrus

The genus Citrus contains many kinds or types that differ as to their fruits, flowers, leaves, and twigs. The arranging of the kinds of Citrus into groups (as indicated by features such as looseness of peel, size, shape, and color) is termed classification. The naming of these groups with valid names is termed nomenclature.

There are definite international rules of nomenclature but not of classification. Several persons have placed the various kinds of Citrus into groups (classified them) and given them valid names. The classification one accepts is one of personal choice, based on utility, common usage and natural relationships.

Currently, there are 2 outstanding systems of classification for Citrus. They are those of Walter T. Swingle, a USDA scientist who did much of his work in Florida, and Tyosaburo Tanaka of Japan.

Swingle's system is relatively simple, containing 16 species. He is commonly referred to as a "lumper" because he lumps a large number of kinds into a relatively small number of groups. Tanaka's system initially included 145 species and he is known as a "splitter" because he has split the genus Citrus into many small groups. He has continued to add to this list.

From the standpoint of the grower, most horticulturists and other plant scientists, Swingle's system appears the most useable. Tanaka's system has Some features that are more reasonable than some of Swingle's; however, it is not in total a very convenient or botanically sound system. Until someone develops a better system, horticulturists will probably use Swingle's with some modification. Some portions of Tanaka's system have wide acceptance.

It is well to understand that neither Swingle nor Tanaka classified horticultural varieties, such as 'Duncan' grapefruit and 'Pineapple' orange. These names have been established by usage in the industry and do not always agree. For example, the 'Key' lime of Florida is the 'Mexican' lime of Texas and the 'West Indian' lime of the West Indies.

Outlined below is Swingle's classification of Citrus species with some comparisons with Tanaka's system, some points of interest concerning them and examples of horticultural varieties contained in the various species.

This summary is brief and designed only to acquaint the reader with the kinds of Citrus and how they are classified and named.

- ***Citrus*** (Genus)
    - ***Eucitrus*** (Subgenus) includes all those species with edible fruits, pulp vesicles not containing drops of acrid or bitter oil. Contains the following species:
        - ***C. medica*** (the citrons)
            - *C. medica* var. *sarcodactylis*. The fingered citron.
            - *C. medica* var. *ethrog*. The citron of the Mediterranean and the 'Etrog' of the Hebrews.
                - The citrons are used mainly for their peel, which is candied. The citron is also used in certain religious ceremonies by Hebrews.
                - More recently, the citron has been shown to have use as an indicator plant for exocortis (symptoms expressed in a few months versus several years when trifoliate orange is used).

- ***C. limon*** (the lemons, including rough lemons).
  - Includes the lemons of commerce, such as 'Lisbon' and 'Eureka'.
  - The 'Meyer' is considered by Swingle to be a lemon hybrid of unknown parentage.
  - Of significance to Florida growers is the rough lemon, which is considered a separate species, *C. jambhiri*, by Tanaka. It is frequently referred to by the latter name.
  - *C. limonia* or the 'Rangpur' lime is considered close to the lemon by Tanaka. It is used as a rootstock but is susceptible to both exocortis and xyloporosis.
  - *C. volkameriana* is a lemon type being used in citrus rootstock breeding programs.
  - The 'Ponderosa' leirion is considered a lemon hybrid by Swingle but is classified as *C. pyriformis* by Tanaka.
  - Sweet lemon—see sweet lime.
  - The lemon has been hybridized to form such kinds as:
    - Lemonage (lemon × sweet orange)
    - Lemonimes (lemon × limes)
    - Lemandarins (lemon × mandarins)
    - Eremolemon (*Eremocitrus* × lemon)
- ***C. aurantifolia*** (the sour limes).
  - Includes the 'Key' or 'Mexican', and 'Tahiti' or 'Persian' horticultural varieties.
  - Tanaka classifies the 'Tahiti' lime as *C. latifolia*.
  - Tanaka lists a lime-like fruit called *C. macrophylla* that is not treated as such by Swingle. *C. macrophylla* has shown considerable promise in California as a rootstock.
  - The limes have been hybridized with other species to form such kinds as:
    - Lemonimes (lime × lemon)
    - Limequats (lime × kumquat)
- ***C. limetta*** (sweet limes).
  - There is much confusion among writers regarding this species, many calling these fruits sweet lemons. Tanaka lists *C. limetta* as the sweet lime or lemon of the Mediterranean.
  - This species is the one used by the English to prevent scurvey, the sailors eating them for their vitamin C content.
  - Sweet limes are used as a rootstock in Palestine. It has much promise as a rootstock in Florida but its susceptibility to the xyloporosis virus has reduced interest in it for rootstock purposes.
  - Tanaka lists *C. limettiodes* as Palestine sweet lime. This is the sweet lime of India and not the same as the sweet lime *(C. limetta)* used as a rootstock in Palestine.
- ***C. aurantium*** (the sour orange). This includes the common sour orange and many forms and variants of unknown origin, such as: Bittersweet, Oklawaha,

Vermillion Globe, Paraguay, Bergamot, Trabut, var. myrtifolia (Myrtle Leaf or Chinnoto), Daidai (Japanese name for sour orange).

- Swingle would include Tanaka's *C. taiwanica* in this species. *C. taiwanica* is a sour orange type originally reported as not susceptible to tresteza; however, recent evidence indicates it may be susceptible to some strains of tristeza. It survived the 1962–63 freeze at Gainesville, Florida with negligible damage (less than 10% leaf drop), even though adjacent 'Owari' satsumas were badly damaged.
- *C. anrantium* has been hybridized with the trifoliate orange to form citradias. The USDA has a citradia that is reportedly edible and extremely cold hardy.
- ***C. sinensis*** (the sweet orange).
    - This includes the many cultivated varieties, such as the navels, 'Hamlin', 'Parson Brown', Pineapple', 'Jaffa', 'Queen', and 'Valencia'.
    - The term orange has been used to denote many fruits that are not sweet oranges, such as:
        - 'Temple' orange
        - Satsuma orange
        - Trifoliate orange
        - 'Poormans' orange
        - 'Murcott' orange
        - Unshiu orange (Japanese name for satsuma orange). Recently, the 'Page' orange has been released by the USDA, not because it has any sweet orange parentage but because it reportedly resembles a sweet orange. As citrus breeding programs develop, this practice may become moro common.
    - The sweet oranges have been hybridized with many species and other genera to form:
        - Citranges (sweet orange × trifoliate orange)
        - Citrangors (sweet orange × citrange
        - Citrangequats (citrange × kumquat)
        - Citrangeremos (citrange × Eremocitrus)
- ***C. reticulata*** (the mandarins, satsumas and tangerines).
    - This species includes the commonly grown Florida varieties:
        - 'Dancy' tangerine
        - 'Ponkan' or 'Chinese Honey'
        - 'Clementine' or 'Algerian'
        - 'Owari' satsuma
        - 'Cleopatra' mandarin
        - 'King' orange
        - 'Temple' orange
        - 'Murcott' or 'Murcott Honey' orange
    - It also should be noted that 'King', 'Murcott' and 'Temple' are often classified as hybrids. However, the origins of all are unknown. They are also loosely called oranges. From the standpoint of flavor, color, and looseness of peel, they closely resemble *C. reticulata*.

- It is here that Swingle and Tanaka differ widely and examples or worth noting.

Common Name	Swingle	Tanaka
Satsumas	*C. reticulata*	*C. unshiu*
'Ponkan'	*C. reticulata*	*C. reticulata*
'Dancy'	*C. reticulata*	*C. tangerina*
'Cleopatra'	*C. reticulata*	*C. reshni*
'Clementine'	*C. reticulata*	*C. clementina*
'Willowleaf'	*C. reticulata*	*C. deliciosa*
'King'	tangor?	*C. nobilis*
'Temple	tangor?	*C. temple*
'Calamondin'	*C. reticulata* var. *austera*? × *C. ichangensis*	*C. madurensis*
Yuzu	(tangerine × *C. ichangensis*)	*C. junos*

  - The 'Clementine' and 'Temple' are used widely in breeding programs because they are monoembryonic and of high quality. All crosses (using these as mother plants) give hybrid seed and not nucellars.
  - There are several hybrids of tangerines with grapefruit that are good commercial varieties in Florida. Most of these are called tangalos.
    - 'Orlando' tangelo
    - 'Minneola' tangelo
    - 'Page' orange
    - 'Robinson' tangerine
    - 'Nova' tangelo
    - 'K-Early' tangelo. There are many more of these hybrids of little importance or promise of importance.
  - The 'Ortanique' is a very famous Jamaican cultivar that is much like the 'Temple' in flavor and appearance but often seedless. Moreover, it is nucellar rather than monoembryonic.
  - *C. reticulata* has also been hybridized with other species to form such hybrids as:
    - Tangors (tangerine × sweet orange)
    - Tangelo (tangerine × grapefruit)
    - Citrandarins (tangerine × trifoliate orange)
- ***C. grandis*** (the pummelo or shaddock).
  - Native to southeast Asia where it is widely used and distributed.
  - It is very similar to grapefruit but the fruits are much larger and thicker peeled than grapefruit. The pummelo is not as juicy as grapefruit and its pulp vesicles are larger. Typical grapefruit flavor is lacking.
  - The leaves of the pummelo are generally larger than grapefruit leaves and the twigs are pubescent.
  - Both contain naringin and both have white and red fleshed varieties.
  - Seeds of pummelos are monoembryonic and those of grapefruit polyembryonic.

- It is thought by some that the grapefruit originated as a mutant of *C. grandis*. This is largely on the similarity of their gross morphological features.
- *C. grandis* hybridizes easily with other species of citrus.
- Two of the better varieties grown in Florida (as dooryard fruits) are 'Thong Dee' and 'Tresca'.

▪ ***C. paradisi*** (the grapefruit).
- The origin of this species is unknown. It is not known in the wild state in either the Monsoon Region of the Orient or Africa.
- It includes several horticultural varieties—'Duncan', 'Marsh', 'Red-blush' and 'Thompson' are important varieties in Florida.
- Hybridized with the tangerine it has given some very fine quality fruits, some of which resemble sweet oranges more than either of the parents. See *C. reticulata*.
- It has been crossed with trifoliate orange to form citrumelos that are of little value.
- It is highly nucellar.
- An attempt was made to give grapefruit the common name of pomelo but it failed.
- There are some varieties of unknown parentage ('Triumph', 'Royal', 'Isle of Pine' and 'Silver' Cluster') that do not have typical grapefruit flavor. They are probably not true grapefruit.

▪ ***C. indica*** (the so-called Indian wild orange).
- An unpalatable loose-skinned fruit included in the *Metacitrus* subgenus by Tanaka.
- Found in the truly wild state northeastern India.

▪ ***C. tachibana*** (the Tachibana orange).
- A cold hardy type of loose-skinned fruit.
- Swingle thought the 'Shekwesha' to he a hybrid of this species but Tanaka calls the 'Shekwasha' *C. depressa*.
- *C. tachibana* is described by Tanaka as a very primitive type of native citrus of Japan.

o ***Papeda*** (subgenus). A group of *Citrus* species having inedible fruit with acrid oil droplets in the juice vesicles. The flowers and fruits are small and the petioles are very long and broad as compared with those in *Eucitrus*

▪ ***C. ichangensis***
- Probably the most cold hardy evergreen citrus.
- Is monoembryonic and hybridizes readily with other species of Citrus.
- Swinqle thought the Yuzu and Ichang lemons were hybrids of *C. ichangensis* but Tanaka gave them species status of *C. junos* and *C. willsonii*, respectively.
- Included by Tanaka in the *Metacitrus* subgenus and the *Acrumen* section.

- ***C. latipes***
  - Another cold hardy species similar to *C. ichangensis* but with a thicker peel and more variable leaves.
  - Tanaka placed this species in his *Archicitrus* subgenus and *Papada* section.
- ***C. micrantha*** (small fruited types found in the Philippines).
  - Includes a botanical variety, *C. micrantha* var. *microcarpa*, has the smallest fruit and flowers in *Citrus*
  - These are given separate species status by Tanaka in his Papeda section (*C. micrantha* and *C. westerii*, respectively).
- ***C. celebica*** (a small thick-peeled fruit of the *Papeda* type found in northeastern Celebes).
  - Contains a larger thin-skinned botanical variety, *C. celebica* var. *southwikii*.
  - Tanaka gives both species status (*C. celebica* and *C. southwikii*).
  - Swingle also lists a number of possible hybrids that Tanaka considers species.
- ***C. macroptera*** (inedible fruits with leaves 10–12 inches long and fruits as large as sweet oranges).
  - Here too, Swingle lists several botanical varieties and possible hybrids that Tanaka calls species.

Swingle	Tanaka
Webber's Philippine hybrid Kansi	*C. weberri*
C. macroptera var. *kerrii*	*C. kerrii*
C. macroptera var. *annomensis*	*C. combara*

- ***C. hystrix*** (a very bumpy or warty fruit of the *Papeda* type.