

## Nomenclature of the Meiwa and Changshou Kumquats, Intrageneric Hybrids of *Fortunella*

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The Meiwa and Changshou kumquats originally were described as species, bearing the names *Fortunella crassifolia* Swingle and *Fortunella obovata* Tanaka, respectively. Authoritative references of citrus taxonomy do not recognize a scientific name for these kumquats. Botanical names were rejected when data proposed that these two kumquats were intrageneric hybrids of *Fortunella*, not true species. Application of the *International Code of Botanic Nomenclature* indicates the correct name of the Meiwa kumquat should be *Fortunella* × *crassifolia* Swingle (pro sp.) and the correct name of the Changshou kumquat should be *Fortunella* × *obovata* Tanaka (pro sp.). A key is provided for the six taxa of *Fortunella*.

Taxonomy of *Fortunella*, the genus of kumquats, is a source of disagreement among citrus researchers. Morphological, cytological, and chemical data, plus the biological processes of apomixis provide evidence that leads to different conclusions. Should one follow the nomenclature proposed by Tanaka (9) or by Swingle (5)? Presently, this decision has been resolved. The *ASHS Publications Manual* (1) provides guidelines for citing correct scientific names of plants with *Hortus Third* (3) as the recommended reference. Swingle and Reece (7) is the recommended source for all genera of citrus plants. The purpose of this paper is to provide a brief nomenclatural history of *Fortunella*, to bring the proposed nomenclature of Swingle in agreement with the *International Code of Botanic Nomenclature* (4), and to provide the first key to all six recognized taxa.

*Hortus Third* (3) does not list "Meiwa kumquat" under *Fortunella* (p. 483), but does refer to the "Meiwa kumquat" as a potential hybrid under the heading of Citrus Fruits (p. 278). No scientific name is given. The "Changshou kumquat" is not included. Taxonomic treatment of citrus plants by

Swingle (6) and the revision of Swingle by Reece (7) cite these kumquats as intrageneric hybrids of *Fortunella*, treating each by common names, but lacking scientific names. Both taxa originally were described as species, but the names were rejected because of Swingle's conclusion that they were of garden origin. As a result, the vernacular name for these kumquats continues to be used despite the *International Code of Botanic Nomenclature* (4) providing rules for determination of the scientific name when the status of a taxon is altered from the rank of a species to an interspecific hybrid.

### Nomenclatural history of kumquats

Swingle (5) segregated kumquats from the genus *Citrus* and placed them in a new genus, *Fortunella*, named for Robert Fortune, the individual who introduced the kumquats into Europe from China on 6 May 1846. Swingle recognized four species. Subgenus *Eufortunella* included *F. margarita* (oval kumquat) and *F. japonica* (round kumquat), both names transferred from the genus *Citrus*, plus *F. crassifolia*, a newly described species known in Japan as the Meiwa kumquat. Subgenus *Protocitrus* included only *F. hindsii*, a kumquat growing apparently wild in the Hong Kong area whose name was transferred by Swingle from the genus *Sclerostylis*.

Tanaka (8) revised the subfamily of oranges, including a new species of kumquat, *F. swinglei* (Malayan kumquat), named in honor of Walter T. Swingle for his contributions in citrus taxonomy and the genus *Fortunella*. Later Tanaka (9) revised the genus *Fortunella*. A synonym, *Atalantia polyantra*, was noted for the name *F. swinglei*. Priority, according to the *International Code of Botanic Nomenclature* (4), changed the name of the Malayan kumquat to *F. polyantra*. This revision also included a new species of kumquat described as *F. obovata* (Changshou kumquat).

Swingle (6) provided a taxonomic treatment of citrus fruits, recognizing only four of the six species described for the genus *Fortunella*. These species included *F. hindsii* (Hong Kong kumquat), *F. japonica*, *F. margarita*, and *F. polyantra*. Both the Meiwa and the Changshou kumquats were treated as intrageneric hybrids. Swingle concluded that the Meiwa kumquat was of probable hybrid origin. Thus, he rejected his own scientific name because "I now consider it to

be a garden hybrid not entitled to rank as a species". Swingle (6) noted that the Changshou kumquat was named as a species by Tanaka (8), but concluded that "... specific names for forms suspected of being garden hybrids or mutations are of doubtful taxonomic validity and should not be accepted if proof is lacking that the plants are not mere garden hybrids, propagated only by man's help". Swingle's treatment was published within a two-volume set entitled *The Citrus Industry*, which became an authoritative reference for citrus nomenclature. His key included only the four species of *Fortunella* he recognized, excluding the two purported hybrids.

Reece (7) published a revised edition of *The Citrus Industry*. Swingle's treatment of the genus *Fortunella* was adopted with the same four species recognized and the Meiwa and Changshou kumquats treated as intrageneric hybrids, lacking scientific names but again described under their vernacular names. Swingle's key to *Fortunella* was reproduced. Hodgson (2) provided a treatment of horticultural cultivars in the same volume. Kumquats were listed by vernacular names with the original species name provided. Yet, as recognized hybrids, these names for the Meiwa and Changshou kumquats would be incorrect according to the rules of nomenclature (4).

Ye (10) cited the six kumquats as species and provided their Chinese names, using Jindan and Changshoujindan for the Meiwa and Changshou kumquats, respectively. His evidence for their recognition as species includes a sampling of the same characters cited by Swingle and Reece (6, 7), who provide stronger evidence that these characters are of hybrid origin.

### Application of nomenclatural rules

Swingle (6) provided evidence that the Meiwa kumquat may have resulted from a chance hybridization of *F. japonica* with *F. margarita*. He also provided evidence that the Changshou kumquat was a chance hybrid between *F. japonica* and another species of *Fortunella*. Revision of the citrus plants by Reece (7) reinforces Swingle's conclusion that these kumquats are of probable hybrid origin.

The *International Code of Botanic Nomenclature* (4) provides a number of rules for naming of hybrids in Appendix I. Article H.3.1 states that the hybrid nature of a taxon

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is indicated by placing the multiplication sign  $\times$  before the epithet of an interspecific hybrid. All such taxa are designated northotaxa. Article H.3.2 states that a northotaxon cannot be designated unless at least one parental taxon is known or can be postulated.

With evidence of hybrid origin and a method of designating the hybrid status in the scientific name, what specific epithet should be used? This information is provided in Article 50, which states that when the taxon at the rank of species is altered to the hybrid category or corresponding rank, the name of the original author is cited and may be followed by an indication in parentheses of the original status. Subsequently, and if the context appears to permit it, the indication of the original status may be omitted.

Therefore, application of these rules of nomenclature indicates the following correct names for these proposed interspecific hybrids of *Fortunella*. The Meiwa kumquat is *Fortunella*  $\times$  *crassifolia* Swingle (pro. sp.). The Changshou kumquat is *Fortunella*  $\times$  *obovata* Tanaka (pro. sp.). Proponents of the Tanaka system of nomenclature, or those who propose recognition of *F. hindsii* as the only true species and the other taxa as hybrids or of some other taxonomic rank, are encouraged to provide evidence for a revisionary treatment of *Fortunella* to supplant Swingle as the recognized authoritative source for ASHS.

#### Modified key to *Fortunella*

- 1) Fruit small, 1 to 1.5 cm in diameter with three to four segments, brilliant scarlet-orange when fully ripe; seeds large, plump ..... *F. hindsii*
- 1) Fruit large, 1.8 to 3.5  $\times$  1.8 to 2.5 cm with four to seven segments, yellowish to dull orange-colored when ripe; seeds small.
  - 2) Leaves 10 to 15 cm long, bluntly acuminate with emarginate apex; flower 6-merous; stamens 24; fruit 1.8 to 2.5 cm in diameter with five to six sections ..... *F. polyandra*
  - 2) Leaves 5 to 10 cm long, subacute to obtuse; flowers 4- to 5-merous; stamens 16 to 20; fruit 2.5 to 3.5 cm in diameter with four to seven sections.
  - 3) Peel 5 to 6 mm thick; leaf palisade layer thick with four to five cell layers; fruit with six to seven segments, often nearly seedless; shrub to dwarf tree with nearly thornless twigs... *F.  $\times$  crassifolia*
  - 3) Peel 2 to 3 mm thick; leaf palisade layer thin with two to three cell layers; fruit with four to six (seven to eight) segments, commonly bearing seeds; tree with thorny twigs or thornless dwarf shrub
  - 4) Dwarf shrub, thornless; fruit 3  $\times$  3 cm with apical concavity; seeds often abundant, sometimes nearly absent, polyembryonic. *F.  $\times$  obovata*

- 4) Shrub or small tree with thorny twigs; fruit lacking apical concavity; seeds few, monoembryonic.
- 5) Style caducous; fruit globose to oblate, deep orange, four to six (seven) celled, 2 to 3 cm in diameter; seed apex blunt; petioles subsessile, winged; leaves elliptic to ovate, 2.5 to 7 cm long, veins obscure below; shrub ..... *F. japonica*
- 5) Style persistent; fruits obovate to oblong, orange-yellow, four- to five-celled, 2.5 to 3.5  $\times$  2 to 3 cm; seed apex acute; petioles stout, 6 to 16 mm, narrowly margined, not winged; leaves lanceolate, 3 to 10 cm long, veins inconspicuous below; tree... *F. margarita*

#### Literature Cited

1. American Society for Horticultural Science. 1985. ASHS Publications Manual. Amer. Soc. Hort. Sci., Alexandria, Va. p. 29.
2. Hodgson, R.W. 1967. Horticultural varieties of citrus, p. 431-590. In: H.J. Webber and L.D. Batchelor (eds.). The citrus industry: Vol. 1. history, botany, and breeding. 1st ed. Univ. of California Press, Berkeley.
3. Liberty Hyde Bailey Hortorium. 1976. Hortus third: a concise dictionary of plants cultivated in the United States and Canada. 3rd ed. Macmillan, New York. p. 277-279, 483.
4. Stafleu, F.A. (ed.). 1983. International code of botanical nomenclature. Junk, Boston.
5. Swingle, W.T. 1915. A new genus, *Fortunella*, comprising four species of kumquat oranges. J. Wash. Acad. Sci. 5:165-176.
6. Swingle, W.T. 1943. The botany of citrus and its wild relatives of the orange subfamily (family Rutaceae, subfamily Aurantioideae), p. 129-474. In: H.J. Webber and L.D. Batchelor (eds.). The citrus industry: Vol. 1. history, botany, and breeding. 1st ed. Univ. of California Press, Berkeley.
7. Swingle, W.T. and P.C. Reece. 1967. The botany of citrus and its wild relatives, p. 190-430. In: W. Reuther, H.J. Webber, and L.D. Batchelor (eds.). The citrus industry. Vol. 1. history, world distribution, botany, and varieties. (Rev.) Div. Agr. Sci., Univ. of California, Berkeley.
8. Tanaka, T. 1928. Revisio aurantiacearum, I. Bul. Soc. Bot. France 75:708-715.
9. Tanaka, T. 1933. General remarks on the genus *Fortunella*, (2). Stud. Citrol. 6:19-40.
10. Ye, Y. 1985. The status of *Fortunella* genetic resources in China. Fruit Var. J. 39(2):17-20.

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