

Systematic Classification of *Acer*

A Survey of the genus in accordance with *The Maple Society Accepted Species Names*

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Introduction

At the sixth International Maple Symposium in Roscoff, France in 2017, the Maple Society [1] tasked its newly formed Species Group to perform a survey of current taxonomy and release a list of accepted names for the genus, *Accepted Names for the Genus Acer*, Camelbeke et al, 2020 [2]. This ongoing work, released as an initial version in 2020, was the first attempt to rationalize the names in *Flora of China* [3], other *Floras* (accessible through Tropicos [4]), *Maples of the World*, van Gelderen et al, 1994 [5] and de Jong, *Proceedings of the International Maple Symposium*, 2002 [6].

The Maple Society Species Group, along with the *Global Conservation Consortium for Acer* [7], has now become part of the *World Flora Online Taxonomic Expert Network* [8], and so informs the baseline of the globally accepted taxonomy of *Acer*.

P.C. de Jong's 2002 paper on Worldwide Maple Diversity [6] presented a survey and classification of the genus, expanding on his classification in [5] and including new species and phylogenetic investigation. As far as we know this is the last such classification; but many of the species names have been updated by Camelbeke [2], some have exhibited modified sectional affinities in the further phylogenetic work of Li et al [9][10], Tian et al [11], Harris et al [12], and others, or have sunk into synonymy. *Flora of China* [3] gives a systemic treatment and lists species found in China, while D. Crowley (2020) [13] presents an account of the classification though without a full listing of species. Crowley [13] follows de Jong 2002 [6] with appropriate modifications for more recent research. This work is based on Crowley [13] and the morphological descriptions prefacing the Sections are drawn from it directly. Crowley [13] is also informed by *The Red List of Acer, revised and extended* [14]. For a full accounting and justification of the classification, as well as additional references, please see Crowley [13].

This article summarizes the species of the genus *Acer* according to the names accepted in Camelbeke [2], following the classification of de Jong [6] as expanded by Crowley [13].

Classification of *Acer* and Survey of Species

The classification is presented in alphabetical order rather than by phylogenetic or morphological affinity. The brief morphological descriptions in each Section are from Crowley [13], for further description and references please see that account. Note that while the names of species in *Accepted Names* [2] agrees with *Flora of China* [3], Crowley's [13] classification followed here has differences at the Sectional level. Notably *Flora of China* adopts Section *Oblonga* Delendick which mostly absorbs Section *Pentaphylla* Series *Trifida* Pax. It is to be hoped that these sectional differences will be resolved so that a unified systemic classification of the genus *Acer* will be possible.

CLASSIFICATION

SECTION *Acer* L.

Trees of all sizes and shrubs, characterized by buds with 5 to 13 pairs of imbricate scales, leaves generally three or five-lobed with margins entire, dentate, crenate or serrate, and flowers held in corymbs, 5-merous with the stamens inserted in the middle of the nectar disc. The wings of the fruits tend to spread obtusely or somewhat more broadly, though not horizontally.

Series *Acer*

- A. caesium* Wallich ex Brandis (1874) subsp. *caesium*
- A. caesium* subsp. *Giraldii* (Pax) Murray (1969)
- A. heldreichii* Orphanides ex Boissier (1856) subsp. *heldreichii*
- A. heldreichii* subsp. *trautvetteri* (Medvedev) Murray (1982)
- A. pseudoplatanus* L. (1753)
- A. sosnowskyi* Duloch (1948)
- A. velutinum* Boissier (1846)
- A. velutinum* var. *vanvolxemii* (Masters) Rehder (1938)
- A. yangbiense* Chen & Yang (2003) [after Li et al 2019]

Series *Monspessulana* Pojarkova

- A. granatense* Boissier (1838)
- A. hyrcanum* Fischer & Meyer (1837) subsp. *hyrcanum*
- A. hyrcanum* subsp. *intermedium* (Pancic) Bornmuller (1894)
- A. hyrcanum* subsp. *keckianum* (Pax) Yaltirik (1967)
- A. hyrcanum* subsp. *reginae-amaliae* (Orphanides ex Boissier) Murray (1970)
- A. hyrcanum* subsp. *sphaerocarpum* Yaltrick (1967)
- A. hyrcanum* subsp. *stevenii* (Pojarkova) Murray (1969)
- A. hyrcanum* subsp. *tauricolum* (Boissier & Balansa) Yaltirik (1967)
- A. iranicum* Mohtashamian & Rastegar (2020)
- A. mazandaranicum* H. Zare & Assadi (2008)
- A. monspessulanum* L. (1753) subsp. *monspessulanum*
- A. monspessulanum* subsp. *assyriacum* (Pojarkova) Rechinger f. (1969)
- A. monspessulanum* subsp. *cinerascens* (Bossier) Yaltirik (1967)
- A. monspessulanum* subsp. *ibericum* Yaltirick (1967)
- A. monspessulanum* subsp. *microphyllum* (Bossier) Bornmuller (1914)
- A. monspessulanum* subsp. *oksalianum* Yaltirick (1967)
- A. monspessulanum* subsp. *persicum* (Pojarkova) Rechinger f. (1969)
- A. monspessulanum* subsp. *turcomanicum* (Pojarkova) Murray (1969)
- A. obtusifolium* Sibthorp & Smith (1809)
- A. opalus* P. Miller (1768) subsp. *opalus*
- A. opalus* subsp. *obtusatum* (Willdenow) Gams (1925)
- A. sempervirens* L. (1767)
- A. undulatum* Pojark (1976)

Series *Saccharodendron* (Rafinesque) Murray

- A. binzayedii* Vargas-Rodriguez (2017)
- A. floridanum* (Chapman) Pax (1886)
- A. grandidentatum* Nutt. in Torrey & Gray (1838)
- A. leucoderme* Small (1895)
- A. nigrum* (Michaux f.) Desmarais (1952)
- A. saccharum* Marshall (1785) subsp. *saccharum*
- A. saccharum* subsp. *ozarkense* Murray (1978)
- A. saccharum* subsp. *saccharum* var. *rugelii* (Pax) Rehder (1900)
- A. saccharum* subsp. *saccharum* var. *schneckii* Rehder (1913)
- A. skutchii* Rehder (1936)

SECTION *Arguta* (Rehder) Pojárkova

Shrubs and trees, characterized by buds with two or three pairs of valvate scales, leaves unlobed or three to five-lobed, inflorescences of male flowers axillary from leafless buds and inflorescences of female flowers terminal and axillary from mixed buds, flowers 4-merous, with four to six stamens (where present) inserted in the middle or on the outside of the nectar disc.

- A. acuminatum* Wallich ex D. Don (1825)
- A. argutum* Maximowicz (1867)
- A. barbinerve* Maximowicz (1867)
- A. stachyophyllum* subsp. *betulifolium* (Maximowicz) de Jong, comb. & stat. Nov. (1994)
- A. stachyophyllum* Hiern in J. Hooker (1875) subsp. *stachyophyllum*

SECTION *Ginnala* Nakai

Deciduous shrubs and trees, notable for their small, 5 to 10 paired bud scales, serrated leaves, corymbose inflorescences with distinct bracts, 5-merous flowers with eight stamens inserted in the middle of the nectar disc and somewhat flat, strongly veined nutlets.

- Acer tataricum* subsp. *aidzuense* (Franchet) de Jong (1994)
- Acer tataricum* subsp. *ginnala* (Maximowicz) Wesmael (1890)
- Acer tataricum* subsp. *semenovii* (Regel & Herder) Murray (1982)
- Acer tataricum* L. (1753) subsp. *tataricum*

SECTION *Glabra* Pax

A single, browse-adapted, polymorphic species, separable from other sections by the combination of stems often faintly striated, buds with two to four pairs of valvate scales, leaves with coarsely serrated margins and inflorescences racemose or corymbose with 5-merous flowers with eight stamens.

- Acer glabrum* Torrey (1828) subsp. *glabrum*
- Acer glabrum* var. *diffusum* (Greene) F. Smiley (1921)
- Acer glabrum* var. *douglasii* (Hooker) Wesmael (1890)
- Acer glabrum* var. *neomexicanum* (Greene) Kearney & Peebles (1939)

SECTION *Indivisa* Pax

Comprised of a single species, Section *Indivisa* is distinguished by its dioecy, abortive terminal buds, and undivided leaves with craspedodromous venation and doubly serrate margins. Its flowers, held in racemes, are 4-merous, often apetalous and usually have six stamens, inserted on the outside or inside of the nectar disc.

- Acer carpiniifolium* Siebold & Zuccarrini (1845)

SECTION *Lithocarpa* Pax

Buds with 8 to 10 pairs of scales (often square in cross-section), three to five-lobed leaves (rarely unlobed) with dentate to serrulate margins, racemose inflorescences emerging from leafless buds, carrying 5-merous flowers usually with eight stamens.

- A. amamiense* T. Yamaz (2000)
- A. diabolicum* Blume ex Koch (1864)
- A. leipoense* Fang & Soong (1966)
- A. lungshengense* Fang & Hu (1966)
- A. kungshanense* Fang & Chang (1966)
- A. sinopurpurascens* Cheng (1931)
- A. sterculiaceum* Wallich (1830)
- A. sterculiaceum* subsp. *franchetii* (Pax) Murray (1969)
- A. thomsonii* Miquel (1867)
- A. tsinglingense* Fang & C. C. Hsieh (1966)

SECTION *Macrantha* Pax

Deciduous shrubs and trees, often with striated bark, its members characterised by stipitate buds with two pairs of valvate scales (the outer pair entirely enclosing the inner pair) and racemose inflorescences carrying 5-merous flowers, with eight stamens inserted on the middle of the nectar disc.

- A. capillipes* Maximowicz (1867)
- A. chienii* Hu & Cheng (1948)
- A. crataegifolium* Siebold & Zuccarrini (1845)
- A. davidii* Franchet (1885)
- A. davidii* subsp. *grosseri* (Pax) de Jong
- A. forrestii* Diels (1912)
- A. hookeri* Miquel (1867)
- A. insulare* Makino (1910)
- A. kawakamii* Koidzumi (1911)
- A. komarovii* Pojark in Komarov (1949)
- A. laxiflorum* Pax in Engler (1902)
- A. maximowiczii* Pax (1897)
- A. metcalfii* Rehder (1933)
- A. micranthum* Siebold & Zuccarini (1845)
- A. morifolium* Koidzumi (1914)
- A. pectinatum* Wallich ex Nicholson (1881)
- A. pectinatum* subsp. *taronense* (Handel-Mazzeti) Murray (1977)
- A. pennsylvanicum* L. (1753)
- A. rubescens* Hayata (1911)
- A. rufinerve* Siebold & Zuccarini (1845)
- A. sikkimense* Miquel (1867)
- A. tegmentosum* Maximowicz (1857)
- A. tschonoskii* Maximowicz (1886)
- A. tschonoskii* var. *australe* Momotami (1962)

SECTION *Macrophylla* Pojárkova ex Momotani

Contains a single species, a large tree with buds with five to eight pairs of scales, deeply five-lobed leaves with lobulate to dentate margins and lactiferous petioles. Its corymbose infructescences are large, terminal and axillary and with 5–6-merous flowers.

- A. macrophyllum* Pursh (1814)

SECTION *Negundo* (Boehmer) Maximowicz

Buds with two to three pairs of scales, compound leaves, trifoliolate or pinnate, with margins entire to remotely dentate, inflorescences are racemose or compound racemose, with 4-merous flowers with four to six stamens.

Series *Negundo*

- A. negundo* L. (1793) subsp. *negundo*
- A. negundo* var. *arizonicum* Sargent (1919)
- A. negundo* subsp. *californicum* (Torrey & Grey) Wesmael (1890)
- A. negundo* subsp. *mexicanum* (DC.) Wesmael (1890)
- A. negundo* subsp. *negundo* var. *texanum* Pax (1886)

Series *Cissifolia* (Koidzumi) Momotani

- A. cissifolium* (Siebold & Zuccarini) K. Koch (1864)
- A. henryi* Pax (1889)

SECTION *Palmata* Pax

Taxa have abortive terminal buds, usually with four pairs of scales, unlobed or three to 13-lobed leaves, corymbose inflorescences with cincinni terminal or axillary, pedicels of male flowers often dropping after flowering, the flowers 5-merous, with eight stamens inserted on the outside of the nectar disc. Following de Jong [6] Series *Palmata* and Series *Sinensia* Pojárkova are combined here.

Series *Palmata* Pojárkova

- A. amoenum* (Carriere) Hara (1954) var. *amoenum*
- A. amoenum* var. *matsumurae* Koidzumi (1911)
- A. amoenum* var. *nambuanum* (Koidz) K. Ogata (1965)
- A. anhweiense* Fang & Fang f. (1966)
- A. calcaratum* Gagnepain (1948)
- A. campbellii* Hooker & Thomson ex Hiern in Hooker f. (1875)
- A. chingii* Hu (1930)
- A. circinatum* Pursh (1814)
- A. confertifolium* Merrill & Metcalf (1937)
- A. duplicatoserratum* Hayata (1911)
- A. elegantulum* Fang & Chiu (1979)
- A. erianthum* Schwerin (1901)
- A. fenzelianum* Handel-Mazzetti (1933)
- A. flabellatum* Rehder (1911)
- A. heptaphlebium* Gagnepain (1948)
- A. japonicum* Thunberg ex Murray (1784)
- A. kuomeii* Fang & Fang f. (1966)
- A. kweilinense* Fang & Fang f. (1966)
- A. miaoshanicum* Fang (1966)
- A. oliverianum* Pax (1889)
- A. osmastonii* Gamble (1908)
- A. palmatum* Thunberg ex Murray (1784)
- A. pauciflorum* Fang (1932)
- A. pseudosieboldianum* (Pax) Komarov (1904)
- A. pseudowilsonii* Y. S. Chen (2010)
- A. pubinerve* Rehder (1907)
- A. pubipalmatum* Fang (1932)
- A. serrulatum* Hayata (1911)
- A. shirasawanum* Koidzumi (1911)
- A. sieboldianum* Miquel (1865)
- A. sinense* Pax, Hooker's Icon. (1889)
- A. takesimense* Nakai (1918)
- A. tenuifolium* (Koidzumi) Koidzumi (1916)
- A. tonkinense* Lecompte (1912)

- A. tutcheri* Duthie (1908) var. *tutcheri*
- A. tutcheri* var. *shimadae* Hayata (1911)
- A. wangchii* Fang (1966)
- A. wilsonii* Rehder in Sargent (1905)

Series *Penninervia* Metcalf

- A. cordatum* Pax (1889) var. *cordatum*
- A. cordatum* var. *dimorpholium* (F.P Metcalf) Y.S.Chen (2008)
- A. crassum* Hi & Cheng (1948)
- A. erythranthum* Gagnepain (1948)
- A. fabri* Hance (1884)
- A. hilaense* Hu & Cheng (1948)
- A. kwangnanense* Hu & Cheng (1948)
- A. laevigatum* Wallich (1830) var. *laevigatum*
- A. laevigatum* var. *salweenense* (W. W. Smith) J. M. Cowan ex Fang (1939)
- A. oligocarpum* Fang & Hu (1979)
- A. pubipetiolatum* Hu & W.C. Cheng (1948) var. *pubipetiolatum*
- A. pubipetiolatum* var. *pingpienense* Fang & Hu (1966)
- A. sino-oblongum* Metcalf (1932)
- A. wangchii* Fang (1966)

SECTION *Parviflora* Koidzumi

Characterised by buds with two to three pairs of scales, unlobed or three to five-lobed leaves with crenate to doubly serrate margins, inflorescences paniculate-corymbose to racemose, with cincinni and 35–400 or more 5-merous flowers with eight stamens.

Series *Parviflora*

- A. nipponicum* Hara (1938)

Series *Dystila* (Ogata) Murray

- A. distylum* Siebold & Zuccarini (1845)

SECTION *Pentaphylla* Hu & Cheng

Buds with four to eight pairs of scales, corymbose inflorescences with distinct bracts, carrying 5-merous flowers with 8 stamens, inserted in the middle of the nectar disc.

Series *Pentaphylla*

- A. pentaphyllum* Diels (1931)

Series *Trifida* Pax

- A. albopurpurascens* Hayata (1911)
- A. buergerianum* Miquel (1865) var. *buergerianum*
- A. buergerianum* var. *formosanum* (Hayata) Murray & Lauener (1967)
- A. buergerianum* var. *horizontale* Metcalf (1942)
- A. buergerianum* var. *jiujiangense* Yu (1943)
- A. buergerianum* var. *kaiscianense* Fang (1939)
- A. buergerianum* var. *yentangense* Fang (1966)
- A. chiangdaoense* Santisuk (1992)
- A. coriaceifolium* Leveille (1912)
- A. gracilifolium* Fang & Fu (1981)
- A. lucidum* Metcalf (1932)
- A. oblongum* Wallich ex DC. (1824) var. *oblongum*
- A. oblongum* var. *itoanum* (Hayata) Li (1952)
- A. oblongum* var. *omeiense* Fang & Soong (1979)
- A. paihengii* Fang (1966)
- A. poliophyllum* Fang & Wu (1979)
- A. paxii* Franchet (1886)
- A. shihweii* Chun & Fang (1966)
- A. syscopseoides* Chun (1932)

- A. wangchii* Fang (1966)
- A. yinkunii* Fang (1966)
- A. yui* Fang (1934)

SECTION *Platanoidea* Pax

Buds with five to eight pairs of imbricate scales, lactiferous petioles, three to seven-lobed leaves (rarely unlobed), with entire margins, terminal inflorescences with flowers with eight stamens, and fruits usually with flattened nutlets

- A. acutum* Fang (1932)
- A. amplum* Rehder in Sargent (1911) subsp. *amplum*
- A. amplum* subsp. *bodinieri* (H. Lev.) Y. S. Chen
- A. amplum* subsp. *catalpifolium* (Rehder) Chen (2008)
- A. amplum* subsp. *tientaiense* (C. K. Schneider) Y. S. Chen
- A. campestre* L. (1753)
- A. cappadocicum* Gleditsch (1785) subsp. *cappadocicum*
- A. cappadocicum* subsp. *sinicum* (Rehder) Handel-Mazzetti (1933)
- A. chunii* Fang (1937) subsp. *chunii*
- A. chunii* subsp. *dimorphophyllum* Fang (1979)
- A. divergens* Koch ex Pax (1886)
- A. fulvescens* Rehder in Sargent (1911)
- A. lobelii* Tenore (1819)
- A. longipes* Franchet ex Rehder (1905)
- A. miaotaiense* Tsoong (1954)
- A. miyabei* Maximowicz (1888) var. *miyabei*
- A. miyabei* f. *shibatai* (Nakai) Hara (1951)
- A. okamotoanum* Nakai (1917)
- A. pictum* Thunberg ex Murray (1784) subsp. *pictum*
- A. pictum* subsp. *dissectum* (Wesm) H. Ohashi (1993)
- A. pictum* subsp. *dissectum* f. *connivens* (G. Nicholson) H. Ohashi (1993)
- A. pictum* subsp. *dissectum* f. *piliferum* (K. Ogata) H. Ohashi (1993)
- A. pictum* subsp. *glaucum* (Koidz) H. Ohashi (1993)
- A. pictum* subsp. *macropterum* (W.P. Fang) H. Ohashi (1993)
- A. pictum* subsp. *mayrii* (Schwerin) H. Ohashi (1993)
- A. pictum* subsp. *mono* (Maximowicz) H. Ohashi (1993)
- A. pictum* subsp. *pictum* f. *pulvigerum* (K. Ogata) H. Ohashi (1993)
- A. pictum* subsp. *pubigerum* (W.P. Fang) Y.S. Chen (2008)
- A. pictum* subsp. *savatieri* (Pax) H. Ohashi (1993)
- A. pictum* subsp. *taishakuense* (Ogata) H. Ohashi (1993)
- A. platanoides* L. (1753)
- A. shenkanense* Fang ex Fu (1981)
- A. tenellum* Pax (1889) var. *tenellum*
- A. tenellum* var. *septumlobum* Fang & Soong (1979)
- A. tibetense* Fang (1939)
- A. truncatum* Bunge (1833)
- A. turkestanicum* Pax in Engler (1902)

SECTION *Pubescentia* (Pojárkova) Ogata

Small trees, with buds with six to ten pairs of scales, three-lobed leaves with margins coarsely serrate, corymbose inflorescences carrying 5-merous flowers with five or six stamens inserted on the middle of the lobed nectar disc, the fruits with flattened nutlets.

- A. pentapomicum* Stewart ex Brandis (1874)
- A. pilosum* Maximowicz (1880)
- A. pilosum* var. *stenolobum* (Rehder) Fang (1966)

SECTION *Rubra Pax*

Evergreen and deciduous trees with buds with 4 to 11 pairs of imbricate scales, unlobed, three or five-lobed leaves with glaucous lower surfaces and cuticular waxes on upper surfaces [10]. Its inflorescences are usually axillary and emerge from leafless buds in paniculate thyrses, racemes, or umbels. The flowers are 5-merous, though sometimes apetalous, with five to 12 stamens inserted on or outside the nectar disc, which may be reduced or absent.

- A. laurinum* Hasskarl (1843)
- A. pycnanthum* Koch (1864)
- A. rubrum* L. (1753) var. *rubrum*
- A. rubrum* var. *drummondii* (Nuttall) Sargent (1884)
- A. saccharinum* L. (1753)

SECTION *Spicata Pax*

Buds with two or three pairs of scales, three to five-lobed leaves with serrated margins, inflorescences dense, racemose and held upright. The flowers are 5-merous and have eight stamens inserted on the middle of the nectar disc [9].

- A. caudatum* Wallich (1830)
- A. spicatum* Lamark (1786)
- A. ukurunduense* Trautvetter & Meyer 1856

SECTION *Trifoliata Pax*

Buds with 11 to 15 pairs of scales, trifoliolate leaves with subentire to serrated margins, corymbose inflorescences bearing 5 or 6-merous flowers with 10 to 13 stamens inserted on the middle of the nectar disc.

Series *Grisea* Pojárkova

- A. griseum* (Franchet) Pax (1933)
- A. maximowiczianum* Miquel (1867)
- A. triflorum* Komarov (1901)

Series *Mandshurica* Pojárkova

- A. mandshuricum* Maximowicz (1867)

Series *Emeiensia* de Jong

- A. sutchuenense* Franchet (1894)

SECTION *Wardiana* (de Jong) de Jong

Containing only one species, distinguished by its paniculate-racemose inflorescence, with conspicuous bracts and small cincinni.

- A. wardii* W. W. Smith (1917)

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