



Ghent University Botanical Garden

THE GENUS

***Fraxinus* L. (Oleaceae)**

**VEGETATIVE KEY TO SPECIES
CULTIVATED IN WESTERN EUROPE**

Jan De Langhe

(20 November 2011 - 17 September 2013)

Vegetative key.

This key is based on vegetative characteristics, and therefore also usable beyond the flowering/fruitletting period.

Taxa treated in this key: see page 7.

Taxa referred to synonymy in this key: see page 7.

Frequently misapplied names: see page 7.

To improve accuracy:

- Bud colour; buds must be dry, take into account that colour appears much darker in rainy weather!
- Use a hand lens to judge pubescence in general.
- Start counting veins at base of the leaflet with first clearly ascending secondary vein, do not include veins ending in the apex.
- Look at the entire plant. Young specimens and strong shoots give an atypical view.
- Beware of hybridisation, especially with plants raised from seed other than wild origin.

Background information:

- JDL herbarium specimens
- living specimens, in various arboreta, botanic gardens and collections
- literature:

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Krüssmann, G. - (1977) - *Fraxinus* in Handbuch der laubgehölze VOL.2, p.84-95.
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Wallander, E. - (2008) - Key to the sections of *Fraxinus* in Plant Syst Evol 273, p.25-49, also on <http://www.oleaceae.info/>.
Wallander, E. - (2010) - Key to the 13 species of *Fraxinus* occurring in Mesoamerica, also on <http://www.oleaceae.info/>.

I am particularly grateful to Anthony Aiello, Dirk Benoit, Wolfgang Bopp, Mona Bourell, Peter Brownless, Koen Camelbeke, Tom Clark, Dirk De Meyere, Paul Goetghebeur, John Grimshaw, François Hachette, Jaime Morin, Pamela Olshefski, Paul Reader and Eva Wallander for extra help with constructive comments and specimens.
Also thanks to the responsible persons of various arboreta, botanic gardens and collections where I could collect herbarium specimens since 1982.

My explicit thanks for support goes to the Arboretum De Chèvreloup, Arboretum Wespelaar, Castle Howard Arboretum Trust, Ghent University Botanical Garden, Hillier Gardens and Arboretum, Morris Arboretum of the University of Pennsylvania, National Botanic Garden of Belgium, Pavia nursery, Polly Hill Arboretum, Royal Botanic Gardens Edinburgh, Royal Botanic Gardens Kew and San Francisco Botanical Garden.

Also thanks for the feedback given by the participants of the Belgian Dendrology Society *Fraxinus* study day on October 7th 2012.

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<http://www.plantentuin.ugent.be>

<http://www.arboretumwespelaar.be/EN>

- 01 a Shoot at least in part with lateral buds in whorls of three. ***F. angustifolia***
- Shoot, petiole and rachis densely softly pubescent. ***F. angustifolia* subsp. *oxycarpa***
 - Shoot, petiole and rachis glabrous (or almost so).
 - Leaflet predominately 1, margin acutely serrate-dentate with 5-8 large teeth/side (teeth often >5mm). Sometimes lamina 1-2 lobed at base or with 2 small lateral leaflets at base. ***F. angustifolia* 'Monophylla'**
 - Leaflets predominately 3-5(1-7) and at least part of the shoot ends with short successive internodes $\leq 0,5-10$ mm. ***F. angustifolia* subsp. *syriaca***
 - Leaflets predominately 7-13, shoot ends with successive internodes >10 mm. ***F. angustifolia* subsp. *angustifolia***
- b Shoot with lateral buds (sub-)opposite. 02
- 02 a Current year shoot 4-ribbed. Second year shoot often with internodes 4-ribbed. 03
- b Current and second year shoot with internodes (sub-)terete or 4-ribbed only in upper part. 08
- 03 a Leaf reduced to 1 leaflet or variable with 1 **AND** 1-3 (rarely more) leaflets. ***F. anomala***
- b Leaf with 5-9 (3-11) leaflets. 04
- 04 a Leaflet margin entire (seedlings and juvenile plants uniquely short-prickly pubescent!). ***F. griffithii***
- b Leaflet margin serrate-dentate. 05
- 05 a Leaf including petiole predominantly ≤ 18 cm. 06
- b Leaf including petiole predominantly 20-30(-more) cm. 07
- 06 a Terminal leaflet L/W predominantly $< 2/1$. Leaflets 5-7 (3-9), midvein length < 5 cm. ***F. dipetala***
- b Terminal Leaflet L/W predominantly $> 2/1$. Leaflets 7-9, midvein length 3-8 cm. ***F. baroniana***
- 07 a Leaflet ovate to lanceolate (L/W $2/1-3/1$). Current year shoot and second year shoot distinctly 4-angled to winged (often also the older branches). ***F. quadrangulata***
- b Leaflet lanceolate to ovate oblong (L/W $\geq 3/1$). Only current year shoot +/- 4-angled (strong growth/young specimens). ***F. paxiana***
- 08 a Leaf with predominately 1 leaflet, **OR** variable with 1 leaflet and with 1-3 leaflets.
 - Bud black, length $<$ width. Leaflet midvein length > 15 cm. Leaflet margin with > 10 obtuse teeth/side or coarsely double serrate-dentate. ***F. excelsior* f. *diversifolia***
 - Bud brown and length $>$ width. Leaflet midvein length ≤ 14 cm. Leaflet margin with < 10 sharp teeth/side. ***F. angustifolia* 'Monophylla'**
- b Leaf with predominately 3-more leaflets. 09
- 09 a Petiole base remarkably swollen ($\geq 3-4 \times$ petiole width) **AND** partly clasping/covering its bud, often clustering at and hiding shoot end. ***F. platypoda* sensu lato**
- Leaflets 7-13 (usually < 35 mm wide), margin towards middle serrulate-dentate with 4-5 teeth/cm. Petiolule and leaf base purple. ***F. platypoda***
 - Leaflets 5-7(-11?) (often > 35 mm wide), margin towards middle serrate-dentate with (1-)2(-3) teeth/cm. Petiolule and leaf base green. ***F. spaethiana***
- b Petiole base not swollen, **OR/IF** swollen then in a lesser degree and with bud free. 10

- 10 a All leaves small, average size (including petiole) <5 cm. Leaflets 3-7, margin entire.
..... ***F. greggii***
- b Most of the leaves larger >5 cm, IF occasionally smaller then margin dentate. 11
- 11 a Leaflets predominantly ≤5 (only a few leaves occur with more than 5 leaflets). 12
- b Leaflets predominantly ≥5 (only a few leaves occur with less than 5 leaflets). 20
- 12 a Terminal leaflet midvein length <4 cm AND margin entire, or variable with (0-)1-4(-8) teeth/side. ***F. cuspidata***
- b Terminal leaflet midvein length >4 cm, margin variable but IF <4 cm then leaflet margin always dentate at least above the middle. 13
- 13 a Leaflet margin variable, at least in part of the leaves (almost) entire to distantly dentate above the middle. 14
- b All leaflets serrulate to dentate. 16
- 14 a Terminal bud grey. Basal leaflet base rounded to obliquely truncate. ***F. sieboldiana***
- b Terminal bud brown. Basal leaflet base (broadly) cuneate. 15
- 15 a Shoot, petiole, petiolule and leaflet LS densely pubescent. ***F. velutina***
- Leaflets (1-)3-5(-7), variably shaped, margin often minutely dentate. ***F. velutina* var. *velutina***
- Leaflets 3-5, +/- uniformly shaped, margin entire or irregularly and distantly dentate towards apex.
..... ***F. velutina* var. *toumeyi***
- b Shoot, petiole, petiolule and leaflet LS glabrous (or almost so). ***F. coriacea***
IF leaflet thin. ***F. velutina* var. *glabra***
- 16 a Leaf predominately 25-35 cm long AND terminal leaflet often >10 × 5 cm. ***F. chinensis***
- b Leaf predominately ≤20(-25) cm long. Terminal leaflet usually <10 cm long and 4 cm wide.
..... 17
- 17 a Leaflet margin at least in part of the leaves coarsely serrate-dentate with teeth >2 mm.
..... ***F. angustifolia* subsp. *syriaca***
- b Leaflet margin serrulate-dentate with teeth ≤1(-2) mm. 18
- 18 a Bud (rusty-)brown. Lateral leaflet apex predominately acute. ***F. caroliniana***
- b Bud greyish sometimes with some brown pubescence. Lateral leaflet apex predominately acuminate to caudate. 19
- 19 a Leaflet apex gradually acuminate. Margin acutely serrulate. ***F. lanuginosa***
- b Leaflet apex abruptly acuminate to caudate. Margin crenate-serrulate. ***F. longicuspis***
- 20 a Terminal leaflet midvein length <4 cm AND leaflet margin entire, or variable with (0-)1-4(-8) teeth/side. ***F. cuspidata***
- b Terminal leaflet midvein length >4 cm, IF <4 cm then leaflet margin always dentate at least above the middle. 21
- 21 a Leaflets 7-13. 22
- b Leaflets 5-7 or 7 or 5-9. 30

- 22 a Leaflet apex obtuse or varying from acute to obtuse. Leaflets 7-11, margin finely dentate.
..... **F. xanthoxyloides**
- Shrub to small tree. Leaflet midvein length often >15 mm. **F. xanthoxyloides** var. **xanthoxyloides**
 - Small dense shrub with interlacing shoots. Leaflet midvein length <15 mm (strong shoots excepted).
..... **F. xanthoxyloides** var. **dumosa**
- b Leaflet apex acute to acuminate. 23
- 23 a Terminal bud greyish to yellowish brown or chocolate brown. 24
- b Terminal bud very dark brown to black. 27
- 24 a Lateral leaflet base cuneate, rarely broadly cuneate. **F. angustifolia**
- Shoot, petiole and rachis densely softly pubescent. **F. angustifolia** subsp. **oxycarpa**
 - Shoot, petiole and rachis glabrous (or almost so). **F. angustifolia** subsp. **angustifolia**
- b Lateral leaflet base broadly cuneate to rounded or obliquely truncate. 25
- 25 a Lateral petiolule ≤ 3 mm. **F. paxiana**
- b Lateral petiolule ≥ 3 mm (at least basal one). 26
- 26 a Rachis not grooved or slightly flattened. Leaflets ovate to ovate oblong, margin irregularly distantly serrulate to partly entire. **F. smallii**
- b Rachis narrowly grooved. Leaflets ovate oblong to lanceolate, margin regularly serrate to crenulate serrate. **F. floribunda**
- 27 a Terminal bud and first lateral buds distantly placed. **F. nigra**
- b Terminal bud and first lateral buds touching. 28
- 28 a Terminal bud predominantly length > width. **F. angustifolia**
- Shoot, petiole and rachis densely softly pubescent. **F. angustifolia** subsp. **oxycarpa**
 - Shoot, petiole and rachis glabrous (or almost so). **F. angustifolia** subsp. **angustifolia**
- b Terminal bud predominantly length \leq width. 29
- 29 a Base of petiolule LS glabrous or almost so. **F. excelsior**
- b Base of petiolule LS clearly dense to cushion-like rusty pubescent. **F. mandshurica**
- 30 a Lateral petiolule ≤ 2 mm. 31
- b Lateral petiolule ≥ 2 mm, at least in part of the leaflets (usual the basal ones). 37
- 31 a Lateral leaflet apex acute at least in part of the leaves (or partly abruptly acuminate).
..... **F. latifolia**
- b Lateral leaflet apex acuminate. 32
- 32 a Lateral leaflet base cuneate AND terminal leaflet ≤ 8 cm. **F. angustifolia**
- Shoot, petiole and rachis densely softly pubescent. **F. angustifolia** subsp. **oxycarpa**
 - Shoot, petiole and rachis glabrous (or almost so). **F. angustifolia** subsp. **angustifolia**
- b Lateral leaflet base variable: from broadly cuneate to rounded or obliquely truncate, OR terminal leaflet often >10 cm long. 33

- 33 a Bud dark grey or greyish with brown pubescence. 34
b Bud brown. 35
- 34 a Leaf predominately ≤ 15 cm (petiole included). Leaflet margin entire to minutely crenate.
..... *F. sieboldiana*
b Leaf 15-35 cm (petiole included). Leaflet margin crenate to serrate. *F. paxiana*
- 35 a Bud with outer scales spreading (Lateral leaflet lanceolate to narrowly oblong, margin finely serrulate-dentate). *F. apertisquamifera*
b Bud with outer scales adpressed, or naked. 36
- 36 a Leaflet margin almost entire to serrate-dentate often only above the middle.
..... *F. pennsylvanica*
b Leaflet margin finely serrate dentate from base to apex. *F. chiisanensis*
- 37 a Bud greyish or dark grey or greyish with brown pubescence. 38
b Bud brown to dark brown. 43
- 38 a Leaf generally ≤ 15 cm (petiole included) AND leaflet margin entire to minutely crenate.
..... *F. sieboldiana*
b Leaf generally > 20 cm (petiole included), OR leaflet margin crenate-serrate to serrate-dentate. 39
- 39 a Terminal leaflet with secondary veins ≤ 6 /side. *F. bungeana*
b Terminal leaflet with secondary veins > 6 /side. 40
- 40 a Shoot thin ≤ 2 mm \emptyset AND leaf generally ≤ 20 cm. *F. lanuginosa*
b Shoot > 2 mm \emptyset , OR leaf > 20 cm. 41
- 41 a Leaflets with secondary veins irregularly placed AND/OR at least some 10-15 mm apart.
..... *F. chinensis*
b Leaflets often with secondary veins regularly to +/- equidistantly placed $< 5(-7)$ mm apart.
..... 42
- 42 a Leaflets ovate to oblong elliptic AND apex obtuse to (abruptly) acute, BUT sometimes extremely variable on the same tree from obtuse to acuminate. *F. ornus*
b All leaves with leaflets oblong elliptic to lanceolate AND apex acuminate. *F. floribunda*
- 43 a Leaflets (1-3-)5-7 AND predominantly ≤ 9 cm long and ≤ 4 cm wide. 44
b Leaflets 5-7 (-9) AND at least in part of the laminas ≥ 10 cm long and/or ≥ 4 cm wide. 45
- 44 a Rachis, petiole, petiolule and leaflet LS densely softly pubescent. *F. velutina*
b Rachis, petiole, petiolule and leaflet LS glabrous. *F. coriacea*
- 45 a Leaf scar apex predominantly truncate, not enclosing lateral bud. 46
b Leaf scar apex predominantly clearly notched to concave and partly enclosing lateral bud. 48

- 46 a Terminal bud apex obtuse **AND** length \leq width (shoot, petiole and petiolule pubescent).
..... **F. smallii**
- b Terminal bud apex acute **AND** length $>$ width (shoot, petiole and petiolule glabrous to pubescent). 47
- 47 a Terminal leaflet not obviously larger than lateral leaflets (if larger than only a few cm). Terminal bud brown. **F. pennsylvanica**
- b Terminal leaflet at least in part of the laminas obviously larger (sometimes 2x) than lateral leaflets. Terminal bud often greyish to greyish brown. **F. chinensis**
- 48 a Leaflet LS pubescent. **F. profunda**
- b Leaflet LS glabrous except +/- pubescent on basal midvein to weakly pubescent on midvein and secondary veins. 49
- 49 a Leaf rachis (narrowly) grooved. Terminal bud predominantly acute, length $>$ width.
..... **F. chinensis**
- b Leaf rachis not to slightly grooved or +/- flattened. Terminal bud predominantly obtuse, length \leq width. 50
- 50 a Leaflets 5(-7), texture thick. Leaflet midvein length often $<$ 9cm, L/W predominantly $<2/1$ = ovate to broadly ovate. **F. albicans**
- b Leaflets 5-9, often 7, texture thin. Leaflet midvein length often >9 cm, L/W usually $>2/1$ = broadly lanceolate to lanceolate oblong. 51
- 51 a Leaves deciduous, papery and US light to dark green, LS pale greyish green. Petiolule green. **F. americana**
- b Leaves semi-evergreen, (sub-)leathery and US very dark green, LS green. Petiolule often purplish at base. **F. uhdei**

Taxa treated in this identification key.

F. albicans
F. americana
F. angustifolia
- subsp. *angustifolia*
- subsp. *oxycarpa*
- subsp. *syriaca*
F. anomala
F. apertisquamifera
F. baroniana
F. bungeana
F. caroliniana
F. chiisanensis
F. chinensis
F. coriacea
F. cuspidata
F. dipetala
F. excelsior
F. floribunda
F. greggii
F. griffithii
F. lanuginosa

F. latifolia
F. longicuspis
F. mandshurica
F. nigra
F. ornus
F. paxiana
F. pennsylvanica
F. platypoda
F. profunda
F. quadrangulata
F. sieboldiana
F. smallii
F. spaethiana
F. uhdei
F. velutina
- var. *glabra*
- var. *toumeyii*
- var. *velutina*
F. xanthoxyloides
- var. *dumosa*
- var. *xanthoxyloides*

Taxa referred to synonymy in this identification key.

F. biltmoreana Hort. = *F. smallii*
F. densata ~ *F. chinensis* subsp. *rhyngophylla*
F. dimorpha = *F. xanthoxyloides* (1*)
F. elonza = *F. angustifolia* subsp. *oxycarpa*
F. formosana = *F. griffithii* (1*)
F. holotricha = *F. angustifolia* subsp. *oxycarpa*
F. insularis = *F. floribunda*
F. japonica = *F. chinensis*
F. mariesii = *F. sieboldiana* (1*)
F. obliqua = *F. excelsior* subsp. *coriariifolia*
F. obliqua Hort. (pro parte et non Tausch) = *F. angustifolia*
F. oxycarpa = *F. angustifolia* subsp. *oxycarpa* (1*)
F. oxycarpa var. *syriaca* = *F. angustifolia* subsp. *syriaca* (1*)

F. oxyphylla = *F. angustifolia* subsp. *oxycarpa* (1*)
F. pallisiae = *F. angustifolia* subsp. *oxycarpa* (1*)
F. potamophila = *F. angustifolia* subsp. *syriaca* (1*)
F. retusa = *F. floribunda*
F. rotundifolia = *F. angustifolia* subsp. *angustifolia* (1*)
F. sikkimensis = *F. paxiana* (1*)
F. sogdiana = *F. angustifolia* subsp. *syriaca* (1*)
F. suaveolens = *F. paxiana*
F. syriaca = *F. angustifolia* subsp. *syriaca* (1*)
F. texensis = *F. albicans*
F. tomentosa = *F. profunda*
F. velutina var. *coriacea* = *F. coriacea* (1*)

(1*) see literature page 1

Frequently misapplied names.

F. biltmoreana Hort. at least in some collections, is *F. smallii* fide Eva Wallander. The leaves are too small, basal petiolules too long and petiole base too narrow.

F. excelsior 'Aurea Pendula' = *F. angustifolia* 'Aurea Pendula'

Recent molecular studies have shown that *F. spaethiana* and *F. platypoda* are conspecific. For the time being, the two taxa are kept separate in the identification key based on some obvious vegetative characteristics.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	cm
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