



Ghent University Botanical Garden

Alnus Mill.

(Betulaceae-Betuloideae)

VEGETATIVE KEY TO SPECIES CULTIVATED IN WESTERN EUROPE

Jan De Langhe

(24 October 2008 - 10 April 2013)

Vegetative key.

This key is based on vegetative characteristics, visible during the longest period of the year.

Taxa treated in this key: see page 6.

Taxa referred to synonymy in this key: see page 6.

Questionable/frequently misapplied names: see page 6.

To improve accuracy:

- Use a hand lens to judge pubescence in general.
- **Start counting veins at base of the lamina with first secondary vein and 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 gathered in collections.

Features based on:

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

Bean, W.J. - (1980) - *Alnus* in Trees and Shrubs hardy in the British Isles VOL.1, p.271-284.
Clarke, D.L. - (1988) - *Alnus* in Trees and Shrubs hardy in the British Isles supplement, p.70-74.
Furrow, J.J. - (1990) - The genera of *Betulaceae* in the southeastern United States in Journal of the Arnold Arboretum VOL.71 n°1, p.1 - 67.
Furrow, J.J. - (1979) - The systematics of the American species of *Alnus* (*Betulaceae*) in Rhodora VOL.81 (825), p.1-121.
Grimshaw, J. & Bayton, R. - (2009) - *Alnus* in New Trees, p.134-146.
Iwatsuki, K., Boufford, D.E. & Ohba, H. - (2006) - *Alnus* in Flora of Japan VOL.2b, p.26-31.
Krüssmann, G. - (1976) - *Alnus* in Handbuch der Laubgehölze VOL.1, p.138-146.
Ohwi, J. - (1965) - *Alnus* in Flora of Japan, p. 374-376.
Rehder, A. - (1940) - *Alnus* in Manual of cultivated trees and shrubs hardy in North America, p.134-139.
Peiqiong, Li & Skvortsov, A.K. - (1999) - *Alnus* in Flora of China VOL.4, p.301-304.

I am particularly grateful to Wolfgang Bopp, Koen Camelbeke, Tom Clark, Tom Hudson, Paul Goetghebeur, Jaime Morin, Jean Merret, Abraham Rammeloo and Paul Reader 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 their support goes to Arboretum Kalmthout, Arboretum Keracoual, Arboretum Wespelaar, Ghent University Botanical Garden, Hillier Gardens and Arboretum, Royal Botanic Gardens Kew, Polly Hill Arboretum and Tregrehan Garden.

Copyright © 2008-2013 **Jan De Langhe**

Non-commercial use with mentioning "Jan De Langhe - Ghent University Botanical Garden" please.

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

- 01 a Terminal bud sessile, when closed covered with 3(-more) unequally sized imbricate scales. **subgenus *Alnobetula*** 02
- b Terminal bud stipitate, when closed covered with 2 +/- equal sized (sub-)valvate scales, **OR** covered in pubescence. **subgenus *Alnus*** 08
- 02 a Lamina ovate to narrowly ovate or lanceolate; margin in apical half with 1-2 secondary teeth between the primary teeth. Secondary veins 12-26/side (include apical veins). 03
- b Lamina elliptic to (broadly) ovate or roundish; margin apical half with $\geq 4-6$ secondary teeth between the primary teeth. Secondary veins $\leq 12(-13)$ /side (include apical veins). . 06
- 03 a Secondary veins 18-26/side **AND** petiole 3-8 mm. ***A. pendula***
- b Secondary veins 12-18/side **AND/OR** petiole 8-15 mm at least in part of the leaves. 04
- 04 a Shoot and petiole glabrous. ***A. sieboldiana***
- b Shoot and petiole pubescent at least when young. 05
- 05 a Lamina base rounded. Petiole 8-12 mm. Secondary veins 12-18/side. ***A. firma***
- b Lamina base (broadly) cuneate. Petiole 8-16 mm. Secondary veins 12-18-more in part of the leaves/side. ***A. xpeculiaris***
- 06 a Lamina ovate to broadly ovate or (broadly) elliptic, with base cuneate to rounded (rarely subcordate in part of the leaves). Secondary veins varying from 4-10/side. ***A. alnobetula***
- Lamina apex obtuse or obtuse to (sub-)acute.
- Lamina ovate to elliptic. ***A. alnobetula* subsp. *crispa***
- Lamina broadly ovate or suborbicular. ***A. alnobetula* subsp. *suaveolens***
- Lamina apex acute to acuminate.
- Secondary veins 4-8/side. ***A. alnobetula* subsp. *alnobetula***
- Secondary veins 7-10/side.
- Apex predominantly acute. Base predominantly rounded. ***A. alnobetula* subsp. *sinuata***
- Apex predominantly acuminate. Base cuneate to rounded. ***A. alnobetula* subsp. *fruticosa***
- b Lamina predominantly broadly ovate to heart-shaped, with base (sub-)cordate to obliquely/unequally cordate. Secondary veins varying from 7-13/side. 07
- 07 a Lamina apex acute to acuminate **AND** base cordate to obliquely/unequally cordate. Petiole 10-30(-50) mm. ***A. maximowiczii***
- b Lamina apex acute **AND** base rounded to subcordate. Petiole 5-20 mm. ***A. mandshurica***
- 08 a Lamina LS with secondary veins predominantly 10-15/side (include apical veins). 09
- b Lamina LS with secondary veins predominantly 5-10/side (include apical veins). 23
- 09 a Lamina apex predominantly: abruptly acute, **OR** obtuse, **OR** variable obtuse to acute. . 10
- b Lamina predominantly apex acute, **OR** acute to acuminate or to caudate. 15
- 10 a Lamina ovate to (broadly) elliptic. Apex obtuse or (sub-)acute (vigorous shoots). 11
- b Lamina elliptic oblong to obovate. Apex abruptly acute. 13

- 11 a Lamina margin +/- revolute (10x LENS). **A. rubra**
 b Lamina margin flat. 12
- 12 a Lamina margin with teeth finely acute. Base cuneate to (sub-)rounded. **A. rhombifolia**
 b Lamina margin with teeth rounded to obtuse, or +/- lobulate. Base broadly cuneate to rounded or (sub-)cordate. **A. incana** subsp. **tenuifolia**
- 13 a Lamina predominantly elliptic-oblong to obovate oblong (peduncle erect <3 cm).
 **A. ferdinandi-coburgii**
 b Lamina predominantly obovate (peduncle pendulous slender >3 cm). 14
- 14 a Lamina LS venation and petiole densely yellowish pubescent at least when young.
 **A. lanata**
 b Lamina LS venation and petiole glabrescent. **A. cremastogyne**
- 15 a Lamina base cordate, sometimes truncate to cordate. **A. subcordata**
 b Lamina base cuneate to rounded. 16
- 16 a Lamina LS +/- with numerous tiny resinous glands (10x LENS). 17
 b Lamina LS without resinous glands. 18
- 17 a Lamina LS +/- pale bluish green, secondary veins 10-15/side. **A. nepalensis**
 b Lamina LS +/- pale green, secondary veins 8-12/side. **A. nitida**
- 18 a Lamina apex acuminate to caudate, OR margin in apical half with 1-2 secondary teeth between two primary teeth. 19
 b Lamina apex acute to acuminate, OR margin lobulate, OR in apical half with ≥3-4 secondary teeth between two primary teeth. 21
- 19 a Lamina lanceolate to oblanceolate, length/width predominantly +/- 3/1. **A. xmayrii**
 b Lamina ovate lanceolate, length/width predominantly +/- 2/1. 20
- 20 a Lamina midvein length 10-16 cm and width 3-7 cm, petiole ≤2 cm. **A. trabeculosa**
 b Lamina midvein length 12-30 cm and width 5-10 cm, petiole 2-4 cm. **A. xspaethii**
- 21 a Lamina margin +/- revolute (10x LENS). **A. rubra**
 b Lamina margin flat. 22
- 22 a Lamina margin often lobulate; primary teeth dentate on both sides. **A. incana**
 - Lamina margin coarsely double serrate (only +/- lobulate on vigorous shoots). **A. incana** subsp. **rugosa**
 - Lamina distinctly lobulate.
 - Lamina LS and petiole (densely) pubescent, base cuneate to (sub-)rounded. **A. incana** subsp. **incana**
 - Lamina LS and petiole glabrous, base rounded or truncate to subcordate. **A. incana** subsp. **tenuifolia**
- b Lamina margin not to slightly lobulate; primary teeth predominantly with proximal teeth only. **A. acuminata**
 - Secondary veins 8-13/side. Lamina length/width predominantly +/-2/1. Petiole and lamina LS glabrous.
 **A. acuminata** subsp. **glabrata**

- Secondary veins 10-16/side. Lamina length/width predominantly 2/1-1/1. Petiole and/or lamina LS pubescent.
 - Lamina margin with primary and secondary teeth predominantly subequal. *A. acuminata* subsp. *acuminata*
 - Lamina margin with primary teeth predominantly much larger. *A. acuminata* subsp. *arguta*
- 23 a Lamina base cordate, OR cordate to truncate AND margin crenate to (serrate) dentate. 24
- b Lamina base rounded to cuneate, rarely truncate and if so then margin +/- lobulate. 25
- 24 a Lamina ovate to heart-shaped, midvein length predominantly ≤ 10 cm. Petiole long, 1/2-1/3 midvein length. *A. cordata*
- b Lamina (broadly) ovate oblong, midvein length predominantly ≥ 10 cm. Petiole short, $< 1/4$ midvein length. *A. subcordata*
- 25 a Apex emarginate to truncate, or truncate to broadly rounded with a short abrupt tip (some hybrids exists with lamina matching this description only in part of the leaves). 26
- b Apex obtuse to acute, or acute to acuminate. 28
- 26 a Lamina LS vein axils glabrous, surface +/- greyish glaucous green. *A. matsumurae*
- b Lamina LS vein axils pubescent, surface (pale) green. 27
- 27 a Petiole deeply canaliculate, 5-15 mm. *A. fauriei*
- b Petiole flat to slightly canaliculate, 15-20(-30) mm. *A. glutinosa*
 - Lamina elliptic and/or apex acute at least in part of the leaves. Shoot, petiole and lamina LS +/- pubescent. *A. xpubescens*
 - Lamina (broadly) obovate to (sub-)orbicular. Shoot, petiole and lamina LS glabrous with exception of vein axils.
 - Lamina LS vein axils conspicuously pubescent. *A. glutinosa* subsp. *barbata*
 - Lamina LS vein axils +/- slightly pubescent. *A. glutinosa* subsp. *glutinosa*
- 28 a Lamina margin predominantly lobulate with primary teeth predominantly dentate on both sides. 29
- b Lamina margin serrate to dentate, not or sometimes slightly lobulate; primary teeth dentate on proximal side only. 35
- 29 a Lamina margin revolute (10x LENS). *A. rubra*
- b Lamina margin flat. 30
- 30 a Lamina (slightly) lobulate, especially on vigorous shoots or shoot ends. 31
- b Lamina predominantly lobulate. 32
- 31 a Lamina ovate to elliptic, margin finely double serrate. *A. rhombifolia*
- b Lamina broadly ovate to broadly elliptic, margin coarsely double serrate. *A. incana* subsp. *rugosa*
- 32 a Lamina broadly ovate to orbicular. *A. hirsuta*
 - Shoot and lamina LS glabrous or pubescence restricted to venation. *A. hirsuta* subsp. *sibirica*
 - Shoot and lamina LS pubescent.
 - Lamina midvein length predominantly ≤ 7 cm. *A. hirsuta* var. *microphylla*
 - Lamina midvein length > 7 cm. *A. hirsuta* subsp. *hirsuta*

- b Lamina (broadly) ovate to (broadly) elliptic. 33
- 33 a Shoot and lamina LS +/- pubescent, not glossy and sticky. *A. incana*
 - Lamina margin coarsely double serrate, only +/- lobulate on part of (vigorous) shoots. *A. incana* subsp. *rugosa*
 - Lamina distinctly lobulate. *A. incana* subsp. *incana*
- b Shoot and lamina LS glabrous, often glossy and sticky. 34
- 34 a Lamina secondary veins equidistant, intercalary veins absent. Apex +/- acute.
 *A. incana* subsp. *tenuifolia*
- b Lamina secondary veins not equidistant, intercalary veins present. Apex obtuse to rounded. *A. glutinosa* subsp. *betuloides*
- 35 a Lamina apex obtuse or obtuse to acute (only on strong/young shoots leaves with lamina apex acute may occur). 36
- b Lamina apex acute or acute to acuminate. 39
- 36 a Lamina margin serrulate with 1-5 secondary teeth between 2 primary teeth. 37
- b Lamina margin +/- distantly serrate with 0-1(-2) secondary teeth between 2 primary teeth.
 38
- 37 a Lamina LS with intercalary veins, base broadly cuneate to rounded. *A. serrulata*
- b Lamina LS without intercalary veins, base (broadly) cuneate. *A. rhombifolia*
- 38 a Lamina ovate to elliptic, base broadly cuneate to rounded; margin with coarse primary teeth. *A. orientalis*
- b Lamina elliptic to obovate, base cuneate; margin with fine, often excurrent primary teeth.
 *A. maritima*
- 39 a Shoot, petiole and lamina LS glabrous. *A. acuminata* subsp. *glabrata*
- b Shoot OR petiole OR lamina LS pubescent at least in vein axils (10x LENS). 40
- 40 a Lamina (broadly) ovate to broadly elliptic AND width >5 cm. *A. nitida*
- b Lamina elliptic to obovate elliptic, OR/IF ovate to ovate oblong then width ≤5 cm. 41
- 41 a Shoot AND petiole groove AND lamina LS venation pubescent. *A. xmayrii*
- b Shoot, lamina LS venation glabrous to slightly pubescent. 42
- 42 a Lamina vein pattern semicraspedodromous: LS with secondary veins predominantly anastomosing before margin. *A. formosana*
- b Lamina vein pattern craspedodromous: LS with secondary veins predominantly ending in teeth or margin. 43
- 43 a Lamina LS secondary veins with tiny adpressed delta-shaped membranous domatia - 10x LENS (fruiting aments few, 1-5). *A. japonica*
- b Lamina LS secondary veins without membranous domatia (fruiting aments numerous, 5-13). *A. henryi*

Taxa treated in this key.

- A. acuminata*
- subsp. *acuminata*
- subsp. *arguta*
- subsp. *glabrata*
- A. alnobetula*
- subsp. *alnobetula*
- subsp. *crispa*
- subsp. *fruticosa*
- subsp. *sinuata*
- subsp. *suaveolens*
- A. cordata*
- A. cremastogyne*
- A. fauriei*
- A. ferdinandi-coburgii*
- A. firma*
- A. formosana*
- A. glutinosa*
- subsp. *barbata*
- subsp. *betulooides*
- subsp. *glutinosa*
- A. henryi*
- A. hirsuta*
- subsp. *hirsuta*
- var. *microphylla*
- subsp. *sibirica*
- A. incana*
- subsp. *incana*
- subsp. *rugosa*
- subsp. *tenuifolia*
- A. japonica*
- A. lanata*
- A. mandshurica*
- A. maritima*
- A. matsumurae*
- A. maximowiczii*
- A. xmayrii* (*A. hirsuta* × *A. japonica*)
- A. nepalensis*
- A. nitida*
- A. orientalis*
- A. xpeculiaris* (*A. firma* × *A. pendula*)
- A. pendula*
- A. xpubescens* (*A. glutinosa* × *A. incana*)
- A. rhombifolia*
- A. rubra*
- A. serrulata*
- A. sieboldiana*
- A. xspaethii* (*A. japonica* × *A. subcordata*)
- A. subcordata*
- A. trabeculosa*

Taxa referred to synonymy in this key.

- A. firma* var. *multinervis* = *A. pendula*
A. firma var. *pendula* = *A. pendula*
A. firma var. *sieboldiana* = *A. sieboldiana*
A. fruticosa = *A. alnobetula* subsp. *fruticosa*
A. inokumae = *A. hirsuta* var. *microphylla*
A. kamtschatica = *A. alnobetula* subsp. *sinuata*
A. multinervis = *A. pendula*
A. rugosa = *A. incana* subsp. *rugosa*
- A. sitchensis* = *A. alnobetula* subsp. *sinuata*
A. tenuifolia = *A. incana* subsp. *tenuifolia*
A. viridis = *A. alnobetula*
A. viridis subsp. *crispa* = *A. alnobetula* subsp. *crispa*
A. viridis subsp. *fruticosa* = *A. alnobetula* subsp. *fruticosa*
A. viridis subsp. *sinuata* = *A. alnobetula* subsp. *sinuata*
A. viridis subsp. *suaveolens* = *A. alnobetula* subsp. *suaveolens*

Questionable/frequently misapplied names.

Several plants in collections named *Alnus jorullensis*, do not correspond with the descriptions (the lamina is ovate-oblong to elliptic with acute to acuminate apex, and not oblong to obovate with obtuse to acute apex), and usually belong to *A. acuminata*. Former taxon is not in the key because no typical specimens from wild origin have been seen.

At least one plant named *Alnus oblongifolia* also belongs to the former because the wide laminas do not correspond with the descriptions of this taxon not included in this key by lack of typical wild origin specimens in collections.

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