



Ghent University Botanical Garden

*Picea* A.Dietr. (**Pinaceae**)

**VEGETATIVE KEY TO SPECIES IN CULTIVATION**

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## Vegetative identification key.

This key is based on vegetative characteristics, and therefore also of use when cones are absent. Where relevant, some interesting cone characteristics are also mentioned to facilitate identification.

**Taxa treated in this key: see page 6.**

**Names referred to synonymy: see page 6.**

To improve accuracy:

- Use a 10x hand lens to judge stomata, buds and pubescence in general.
- Look at the entire plant and especially the most healthy shoots.  
Young specimens, shade and strong shoots give an atypical view.
- Beware of hybridisation, especially with plants raised from seed other than wild origin.

Background information:

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

**Bean, W.J.** - (1987) - *Picea* in Trees and Shrubs hardy in the British Isles VOL.3, p. 176-199.  
**Clarke, D.L.** - (1988) - *Picea* in Trees and Shrubs hardy in the British Isles supplement, p. 362-368.  
**Eckenwalder, J.E.** - (2009) - *Picea* in Conifers of the world, p. 370-398.  
**Farjon, A.** - (1990) - *Picea* in *Pinaceae*, p. 221-293.  
**Farjon, A.** - (2010) - *Picea* in A Handbook of The World's Conifers, p. 551-605.  
**Grimshaw, J. & Bayton, R.** - (2009) - *Picea* in New Trees, p. 562-578.  
**Hillier, J. & Coombes, A.** - (2002) - *Picea* in The Hillier Manual of Trees & Shrubs, p. 542-457.  
**Lockwood, J.D. et al.** - (2013) - A new phylogeny for the genus *Picea* in Molecular Phylogenetics and Evolution 2013, VOL.69/3, p. 717-727.  
**Mitchell, A.F.** - (1972) - *Picea* in Conifers in the British Isles, p. 149-183.  
**Krüssmann, G.** - (1977) - *Picea* in Handbuch der Nadelhölze, p. 192-230.  
**Liu, T.** - (1982) - A New Proposal for the Classification of the Genus *Picea* in Acta Phytotax. Geobot. VOL.33, p. 227-245.  
**Rehder, A.** - (1940) - *Picea* in Manual of cultivated trees and shrubs hardy in North America, p. 21-31.  
**Schmidt, P.A.** - (1991) - Beitrag zur Kenntnis der in Deutschland anbaufähigen Fichten (Gattung *Picea*) in Mitteilungen der DDG nr.80, p. 7-72.  
**Warren, R.** - (1982) - Spruces in the Arnold Arboretum, Arnoldia 42/3, p. 102-129.

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

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

## KEY TO GROUPS

- 01 a Healthy shoots with needles discolourous (surfaces clearly different in colour to the naked eye). ..... **GROUP A**
- b Healthy shoots with needles concolourous (surfaces similar in colour or almost so to the naked eye). ..... **GROUP B: see page 3**

### GROUP A

#### NEEDLE DISCOLOUROUS (surfaces clearly different in colour):

- 01 a Needle outer surface (= structurally the lower surface) without stomata lines (10× LENS). ..... 02
- b Needle outer surface at least in part of the needles, with 1-4 (sometimes incomplete!) stomata lines (10× LENS). ..... 10
- 02 a All lateral shoots pendulous, needles often 25-35 mm. .... 03
- b Lateral shoots spreading to pendulous in part, OR needles predominantly ≤25 mm. .... 04
- 03 a Pendulous shoot with needles predominantly pointing forward at +/- 45° to shoot. Needle apex acuminate and pungent. .... ***P. spinulosa***
- b Pendulous shoot with needles rather curved sideward at 45-90° to shoot. Needle apex +/- obtuse to acute. .... ***P. breweriana***
- 04 a Leafy lateral shoot predominantly long and slender: L/W ≥4/1. .... 05
- b Leafy lateral shoot predominantly short and wide: L/W ≤4/1. .... 07
- 05 a Needle outer surface green, inner surface (= structurally the upper surface) with stomata lines greyish green. .... ***P. linzhiensis***
- b Needle outer surface green to glaucous green, inner surface with stomata lines striking glaucous white. .... 06
- 06 a Mature needle width 1-2 mm (10× LENS). .... ***P. brachytyla***
- b Mature needle width 0,9-1,1 mm (10× LENS). .... ***P. farreri***
- 07 a Current year shoot pubescent (10× LENS). .... 08
- b Current year shoot glabrous (10× LENS). .... 09
- 08 a Needles 7-14 mm, above shoot +/- imbricate (covering/hiding shoot). .... ***P. purpurea***
- b Needles 10-22 mm, above shoot +/- raised. .... ***P. omorika***
- 09 a Needle Ø flattened, apex obtuse to acute. .... ***P. jezoensis***
- b Needle Ø rhombic to quadrangular, apex acute to acuminate and pungent. . ***P. sitchensis***

- 10 a Needle long, predominantly (15-)20-35 mm. .... 11
- b Needle short, predominantly 8-15 mm. .... 14
- 11 a Shoot pendulous AND all needles pointing forward around shoot at +/- 45° to shoot.  
..... *P. spinulosa*
- b Shoot spreading to +/- pendulous. Needles above shoot pointing forward; and below  
shoot pointing sideward at 45-90° to shoot. .... 12
- 12 a Shoot glabrous AND needle apex acute to acuminate and pungent. .... *P. sitchensis*
- b Shoot pubescent, needle apex obtuse to acute, not pungent. .... 13
- 13 a Needle Ø flattened, outer surface of some of the needles with interrupted stomata lines.  
..... *P. omorika*
- b Needle Ø rhombic to quadrangular, outer surface of all needles with stomata lines.  
..... *P. likiangensis*
- 14 a Needles above shoot +/- imbricate (covering/hiding shoot). .... *P. purpurea*
- b Needles above shoot +/- raised. .... 15
- 15 a End bud not resinous, with basal scales remarkably acicular (10× LENS) [cones <7(-8)  
cm]. .... 16
- b End bud resinous, OR with visible basal scales triangular to ovate (10× LENS) [cones 7-15  
cm]. .... 17
- 16 a Needle remarkably slender, Ø ≤0,8 mm. Scent of bruised needles 'sage-like' [cones <3,5(-  
4) cm]. .... *P. mariana*
- b Needle stout, Ø 1-1,5 mm. Scent of bruised needles 'resinous-like' [cones 3,5-8 cm].  
..... *P. glehnii*
- 17 a Pulvini small: protruding only 0,5 mm beyond shoot (10× LENS). .... *P. alcoquiana*
- b Pulvini larger: protruding 1-1,5 mm beyond shoot (10× LENS). .... *P. likiangensis*
- Shoot sparsely pubescent. Needle outer surface with 2-4 stomata lines. .... *P. likiangensis* var. *likiangensis*
- Shoot densely pubescent. Needle outer surface with 0-2 stomata lines. .... *P. likiangensis* var. *rubescens*

**GROUP B**

**NEEDLE CONCOLOUROUS (surfaces similar in colour or almost so):**

- 01 a Needle short, predominantly  $\leq 15(-17)$  mm. .... 02  
 b Needle long, predominantly 15-25(-more) mm. .... 11
- 02 a Needle length rather constant 6-8(-10) mm AND apex obtuse (10x LENS). .... *P. orientalis*  
 b Needle length rather variable from (6-)10-15(-17) mm AND apex variable from obtuse to acute, sometimes pungent (10x LENS). .... 03
- 03 a Shoot lower surface very pale, +/- whitish AND needles above shoot +/- appressed to slightly raised (side view with part of needles directed downward). .... *P. morrisonicola*  
 b Shoot lower surface pale yellowish to brownish AND/OR needles above shoot at least in part +/- strongly raised to (strongly) assurgent. .... 04
- 04 a End bud not (to slightly) resinous, with basal scales remarkably acicular (10x LENS). .. 05  
 b End bud resinous, OR with visible basal scales triangular to ovate (10x LENS). .... 07
- 05 a Current year shoot needles green. .... *P. rubens*  
 b Current year shoot needles glaucous to greyish green. .... 06
- 06 a Needle remarkably slender,  $\varnothing \leq 0,8$  mm. Scent of bruised needles 'sage-like' [cones often persisting for years]. .... *P. mariana*  
 b Needle stout,  $\varnothing 1-1,5$  mm. Scent of bruised needles 'resinous-like' [cones quickly falling].  
 .... *P. glehnii*
- 07 a Current year and second year shoot slender,  $\varnothing \leq 2$  mm AND needles dark glossy green AND above shoot almost appressed to slightly raised. .... *P. maximowiczii*  
 b Current year and second year shoot stout,  $\varnothing 2-4$  mm AND/OR needles glaucous green to greyish green AND above shoot slightly to strongly raised, or assurgent. .... 08
- 08 a Needle  $\varnothing$  rhombic (10x LENS). .... *P. koraiensis*  
 b Needle  $\varnothing$  quadrangular (10x LENS). .... 09
- 09 a Bud not resinous. Scent of bruised needles 'sage-like' [cone 3-6(-7) cm]. .... *P. glauca*  
 b Bud resinous. Scent of bruised needles 'resinous-like' [cone 6-10 cm]. .... 10
- 10 a Needles above shoot straight and +/- imbricate to raised. .... *P. alcoquiana*  
 b Needles above shoot raised to assurgent (often densely so on 'foxtail-like' strong shoots). .... *P. koyamae*
- 11 a Shoot +/- pendulous AND all needles directed forward AND 25-50 x 1 mm. ... *P. smithiana*  
 b Shoot spreading, OR needles partly directed sideward, OR needle  $\leq 35 \times 1-1,5(-2)$  mm. . 12
- 12 a Current year and second year shoot upper surface conspicuously pale, sometimes almost ivory. .... 13  
 b Shoot upper surface soon yellowish to brownish or at least so the second year. .... 14

- 13 a Shoot slender, Ø +/- 2 mm. Needles slightly curved, below shoot directed sideward to forward, apex obtuse to acute and not pungent. .... *P. wilsonii*
- b Shoot stout, Ø 2-4 mm. Needles curved, below shoot directed rather forward, apex acute and often pungent. .... *P. schrenkiana*
- 14 a Needle Ø +/- flattened AND apex painfully pungent to the touch. .... 15
- b Needles not simultaneously flattened with apex painfully pungent. .... 16
- 15 a Needles greyish green to glaucous green. .... *P. chihuahuana*
- b Needles green. .... *P. martinezii*
- 16 a Needles (very) rigid AND apex (painfully) pungent. .... 17
- b Needles +/- flexible AND/OR apex not/slightly pungent (leafy shoot rather easy to handle).  
..... 20
- 17 a Bud +/- obtuse AND shiny red brown. Needles very rigid and thick, and remarkably painfully pungent to the touch. .... *P. torano*
- b Bud conical AND dull pale brown to purplish with white resin. Needles +/- rigid and pungent if shoot is grasped. .... 18
- 18 a Bud not resinous [cone scale undulate, papery and irregularly dentate]. .... *P. pungens*
- b Bud resinous [cone scale smooth to striated, +/- leathery and entire to emarginate]. .... 19
- 19 a Needles greyish green to bluish green. .... *P. asperata*
- b Needles green. .... *P. retroflexa*
- 20 a Needles green (very variable taxa esp. concerning pubescence of shoot, colour and length of needles), cone 10-20 cm. .... *P. abies*
- Similar to preceding but cone 4-8 cm. .... *P. obovata*
- b Needles greyish green to glaucous green. .... 21
- 21 a Needles all strongly directed forward (weak shoots excluded). Scent of bruised needles 'sage-like'. .... *P. engelmannii*
- Needle thin 1-1,2 mm. .... *P. engelmannii* subsp. *mexicana*
- Needle thick >1,5 mm. .... *P. engelmannii* subsp. *engelmannii*
- b Needles above shoot directed forward, +/- steeply raised to assurgent AND below shoot at least in part +/- directed sideward or parted. .... 22
- 22 a Pulvini directed forward, small: 1 mm (10x LENS). .... 23
- b Pulvini erect (sometimes recurved), well developed: 1,5-2(-3) mm (10x LENS). .... 24
- 23 a Needles above shoot raised, Ø rhombic. Scent of bruised needles 'resinous-like'.  
..... *P. koraiensis*
- b Needles above shoot often assurgent, Ø quadrangular. Scent of bruised needles 'sage-like'. .... *P. glauca*
- 24 a Needles glaucous green, outer surface with 5-8 stomata lines. .... *P. meyeri*
- b Needles grey green, outer surface with 2-4 stomata lines. .... *P. crassifolia*

**Taxa treated in this identification key.**

*P. abies*  
*P. alcoquiana*  
*P. asperata* sensu lato  
*P. brachytyla*  
*P. breweriana*  
*P. chihuahuana*  
*P. crassifolia*  
*P. engelmannii*  
*P. farreri*  
*P. glauca*  
*P. glehnii*  
*P. jezoensis*  
*P. koraiensis*  
*P. koyamae*  
*P. likiangensis*  
*P. linzhiensis*  
*P. mariana*  
*P. martinezii*

*P. maximowiczii*  
*P. meyeri*  
*P. morrisonicola*  
*P. obovata*  
*P. omorika*  
*P. orientalis*  
*P. pungens*  
*P. purpurea*  
*P. retroflexa*  
*P. rubens*  
*P. schrenkiana*  
*P. sitchensis*  
*P. smithiana*  
*P. spinulosa*  
*P. torano*  
*P. wilsonii*

**Names referred to synonymy in this identification key.**

*P. asperata* var. *retroflexa* = *P. retroflexa*  
*P. balfouriana* = *P. likiangensis* var. *rubescens*  
*P. bicolor* = *P. alcoquiana*  
*P. gemmata* = *P. retroflexa*  
*P. mexicana* = *P. engelmannii* subsp. *mexicana*

*P. montigena* = *P. likiangensis* var. *montigena*  
*P. notabilis* = *P. asperata* var. *notabilis*  
*P. polita* = *P. torano*  
*P. pungsanensis* = *P. koraiensis* var. *pungsanensis*  
*P. watsoniana* = *P. wilsonii*

