



Ghent University Botanical Garden

Tilia L. (Malvaceae)

VEGETATIVE KEY TO SPECIES IN CULTIVATION

Jan De Langhe

(8 August 2005 - 06 July 2021)

Vegetative identification key.

Introduction:

This key is based on vegetative characteristics, and therefore also of use when flowers and fruits are absent.

- Use a 10x hand lens to check leaf margin incisions, pubescence and venation pattern in general.
- Look at the entire plant. Avoid young specimens, shade- and strong shoots as these give an atypical view.
- Beware of hybridisation, especially with plants raised from seed other than wild origin.

Abbreviations used in this key:

- **L/W** = length/width
- **LS** = lower surface
- **US** = upper surface

Taxa treated in this key: see page 7.

Synonymy: see page 7.

References:

- JDL herbarium and [illustrations](#)
- living specimens, in various arboreta, botanic gardens and collections
- literature:

Bean, W.J. - (1981) - *Tilia* in Trees and Shrubs hardy in the British Isles V, p. 593-611.
Clarke, D.L. - (1988) - *Tilia* in Trees and Shrubs hardy in the British Isles supplement, p. 513-518.
de Jong, P. - (1991) - Studiedag van het geslacht *Tilia* BDB.
Grimshaw, J. & Bayton, R. - (2009) - *Tilia* in New Trees, p. 853-864. And [Trees and Shrubs Online](#)
Krüssmann, G. - (1978) - *Tilia* in Handbuch der laubgehölze, p. 416-423.
Lancaster, R. (2019) – *Tilia* in The Hillier Manual of Trees & Shrubs 9th Edition, p. 460-465.
Maes & van Vuure - (1989) - De Linde in Nederland, 166 p.
More, D. & White, J. - (2003) - *Tilia* in Trees of Britain & Northern Europe, p. 676-701.
Muir, N. - (1984) - A survey of the genus *Tilia* in The Plantsman, p. 206-242.
Muir, N. - (1988) - Additional notes on hybrid Limes (*Tilia*) in The Plantsman, p. 104-127.
Pigott, C.D. - (1997) - *Tilia* in The European Garden Flora 5, p. 205-212.
Pigott, C.D. - (2012) - Lime-trees and Basswoods. A Biological Monograph of the Genus *Tilia*, 395 p.
Rehder, A. - (1940) - *Tilia* in Manual of cultivated trees and shrubs hardy in North America, p. 622-627.
Tang, Y., Gilbert M.G. & Dorr, L.J. - (2007) - *Tilia* in Flora of China, VOL.12, p.240-248. - and [online edition](#)

I am particularly grateful to Wolfgang Bopp, Koen Camelbeke, Dan Crowley, Dirk De Meyere, Paul Goetghebeur, Tom Hudson, Eike Jablonski, David Jewell, Isabel Larridon and Frédéric Tournay for extra help with constructive comments.

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, Arboretum Wespelaar, Ghent University Botanical Garden, Hillier Gardens and Arboretum, Royal Botanic Gardens Kew/Wakehurst Place, Tregrehan Garden and Westonbirt National Arboretum.

Copyright © 2005-2021 **Jan De Langhe**

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

[Plantentuin Universiteit Gent](#)

[Arboretum Wespelaar](#)

KEY TO GROUPS

- 01 a Lamina LS glabrous, OR pubescent with single hairs - vein axils disregarded (10× LENS). 02
- b Lamina LS pubescent with a layer of stellate hairs. 03
- 02 a Lamina with apex acumen often $\geq 1/6$ midvein length AND/OR with at least in part of the leaves 1 remarkable 5-10(-more) mm large tooth or lobe. **Group A1:** →page 2
- b Lamina with apex acumen predominantly $1/6$ - $1/10$ midvein length, remarkable large teeth and lobes absent. **Group A2:** →page 3
- 03 a Current year shoot pubescent with stellate hairs (10× LENS). **Group B1:** →page 4
- b Current year shoot glabrous, OR +/- pubescent with single hairs. **Group B2:** →page 5

GROUP A:
Lamina LS glabrous, OR pubescent with single hairs (10× LENS).

GROUP A1:
Lamina with apex acumen predominantly $\geq 1/6$ midvein length
AND/OR with at least in part of the leaves 1 remarkable 5-10(-more) mm large tooth.

- 01 a Lamina margin +/- regularly serrate/dentate, large elongated tooth or lobe absent. 02
- b Lamina margin at least in part of the leaves with 1 remarkable large tooth or lobe 5-10(-more) mm. 04
- 02 a Lamina (narrowly) ovate, petiole <20 mm. ***T. kiusiana***
- b Lamina (sub)orbicular, petiole 20-50(-more) mm. 03
- 03 a Lamina margin predominantly with several to most teeth slightly overlapping the previous one at base: obscuring sinuses in part [flower with 5 elongated staminodes (10× LENS)]. ***T. japonica***
- b Lamina margin predominantly with teeth not to rarely overlapping the previous one at base: sinuses clearly visible [staminodes predominantly absent]. ***T. amurensis***
- 04 a Lamina coarsely dentate with 4-16 teeth/side AND always 1 conspicuously larger (+/- 1 cm) triangular tooth/side. ***T. mongolica***
- b Lamina with predominantly >16 teeth/side AND only in part of the leaves 1 large (+/- 1 cm) tooth or lobe 5-10(-more) mm/side or both sides. 05
- 05 a Lamina LS at least in part of the leaves scattered stellate pubescent (10× LENS!!!). ***T. mongolica* × *T. oliveri***
- b Lamina LS glabrous OR IF pubescent, then with single hairs. 06
- 06 a Lamina margin occasionally with 1 lobe (more lobes) L/W ratio $\leq 2/1$ 07
- b Lamina margin occasionally with 1 elongated teeth L/W ratio $>2/1$ 08

- 07 a Lamina LS moderately to densely pubescent along secondary veins with perpendicular hairs - vein axil pubescence disregarded (10× LENS). *T. platyphyllos*
- b Lamina LS glabrous OR/IF pubescent along secondary veins, then with forward directed hairs - vein axil pubescence disregarded. *T. ×europaea*
- 08 a Lamina regularly serrate-dentate, predominantly with 30-40 teeth/side.
..... *T. japonica* 'Ernest Wilson'
- b Lamina +/- irregularly sharply serrate to coarsely dentate with 20-30 teeth/side. 09
- 09 a Lamina base truncate to subcordate. *T. ×euchlora* × *T. mongolica*
- b Lamina base (obliquely) cordate. *T.* 'Harold Hillier'

GROUP A2:
Lamina predominantly with apex acumen 1/6-1/10 midvein length,
remarkable large teeth and lobes absent.

- 01 a Present year shoot thick, Ø predominantly 4-6 mm AND lamina LS secondary vein bases with short brush-like/perpendicular hairs (10× LENS). *T. nobilis*
- b Present year shoot slender to moderately thick Ø <4 mm, OR lamina LS secondary vein bases without such hairs. 02
- 02 a Lamina marginal teeth apiculi conspicuously (up to 5mm) bristle-like.
..... *T. henryana* var. *subglabra*
- b Lamina margin without such teeth. 03
- 03 a Lamina secondary veins 4-6/side. 04
- b Lamina secondary veins 6-10/side. 05
- 04 a Lamina LS transverse veinlets rather irregularly branching, and poorly visible (10× LENS). *T. cordata*
- b Lamina LS transverse veinlets often +/- straight, branching only in part, and quite visible to the naked eye. *T. amurensis*
- 05 a Lamina LS moderately to densely pubescent along secondary veins with perpendicular hairs - vein axil pubescence disregarded (10× LENS). *T. platyphyllos*
- Lamina US sparsely pubescent with single hairs (10× LENS). *T. platyphyllos* subsp. *cordifolia*
 - Lamina US glabrous (10× LENS).
 - Lamina width predominantly >8 cm. *T. platyphyllos* subsp. *platyphyllos*
 - Lamina width predominantly 6-8 cm. *T. platyphyllos* subsp. *corinthiaca*
- b Lamina LS glabrous OR/IF pubescent along secondary veins, then with forward directed hairs - vein axil pubescence disregarded. 06
- 06 a Current year shoot slender, Ø ≤2 mm. Petiole slender Ø ≤0,7 mm. *T. paucicostata*
- b Current year shoot thick, Ø 2-4 mm. Petiole thick, clearly Ø 0,8-1,5 mm. 07

- 07 a Lamina broadly ovate to orbicular, width > midvein length AND secondary veins predominantly curved. 08
- b Lamina often ovate to broadly ovate, width predominantly ≤ midvein length AND/OR secondary veins predominantly straight to slightly curved. 11
- 08 a Lamina LS often glaucous green, basal vein axils with tufts of crispy/curled hairs (10× LENS). *T. amurensis*
- b Lamina LS green, basal vein axils with tufts of stiff hairs. 09
- 09 a Lamina marginal teeth apiculi predominantly short and +/- blunt <0,8 mm (10× LENS).
..... *T. xeuropaea*
- b Lamina marginal teeth apiculi predominantly long and sharp: often 0,7-1,5 mm. 10
- 10 a Lamina US rather dull, base (deeply) obliquely cordate to truncate.
..... *T. dasystyla* subsp. *dasystyla*
- b Lamina US rather glossy, base obliquely truncate to rounded or shallowly cordate.
..... *T. xeuclora*
- 11 a Lamina LS largest ultimate basal secondary vein with 7-10 forks ending in teeth.
..... *T. americana*
- b Lamina LS largest ultimate basal secondary vein with 6-7 forks ending in teeth. 12
- 12 a Lamina LS secondary vein axils with small tufts of hairs (10× LENS). *T. chinensis*
- b Lamina LS secondary vein axils with large tufts of hairs. 13
- 13 a Lamina marginal teeth apiculi (almost) bristly (10× LENS). *T. dasystyla* subsp. *caucasica*
- b Lamina marginal teeth apiculi short. *T. xeuropaea*

GROUP B:
Lamina LS pubescent with a layer of stellate hairs (10× LENS).

GROUP B1:
Current year shoot pubescent with stellate hairs (10× LENS).

- 01 a Lamina margin predominantly with ≤30 teeth/side, sometimes minutely serrate to almost entire. 02
- b Lamina margin predominantly with >30 teeth/side - shortest side excluded, AND teeth clearly developed. 06
- 02 a Lamina marginal teeth apiculi conspicuously (up to 5 mm) bristle-like. *T. henryana*
- b Lamina margin without such teeth. 03
- 03 a Lamina margin finely serrate dentate to partly entire, sinuses tiny to (almost) absent. .. 04
- b Lamina margin partly entire to coarsely dentate or lobed, sinuses often large. 05

- 04 a Bud scales 2, +/- equal in length [inflorescence 5-15-flowered, fruits not ribbed]. *T. tuan*
- b Bud scales 3, basal one extending +/- to halfway (10× LENS) [inflorescence 3-5-flowered, fruits strongly ribbed]. *T. chinensis*
- 05 a Lamina ovate to triangular ovate: midvein length clearly > lamina width. *T. miqueliana*
- b Lamina broadly ovate to orbicular: midvein length predominantly ≤ lamina width. *T. concinna*
- 06 a Lamina predominantly ovate AND petiole predominantly ≤4 cm. *T. mexicana*
- b Lamina broadly ovate to orbicular AND/OR petiole 4-8 cm. 07
- 07 a Lamina largest width predominantly below the middle. 08
- b Lamina largest width predominantly in the middle. 09
- 08 a Shoot, bud and petiole sparsely stellate pubescent (10× LENS). *T. chingiana*
- b Shoot, bud and petiole densely stellate pubescent. *T. 'Hillieri'*
- 09 a Lamina marginal teeth with large +/- straight apiculi 1-2 mm (10× LENS). *T. mandshurica*
- b Lamina marginal teeth with small curved apiculi <1 mm. 10
- 10 a Lamina LS pale green, secondary vein and major fork axils often with rusty tufts of hairs. *T. maximowicziana*
- b Lamina LS greyish to whitish, secondary vein and major fork axils without such tufts of hairs. *T. tomentosa*

GROUP B2:
Current year shoot glabrous, OR +/- pubescent with single hairs (10× LENS).

- 01 a Lamina margin predominantly with ≤25 teeth/side, OR lower most secondary vein forks not or only a part ending in minute teeth (10× LENS). 02
- b Lamina margin predominantly with >25 teeth/ side - shortest side excluded, AND lower most secondary vein forks all ending in teeth. 06
- 02 a Lamina marginal teeth apiculi conspicuously (up to 5 mm) bristle-like. *T. henryana*
- b Lamina margin without such teeth. 03
- 03 a Lamina margin finely serrate dentate to partly entire, sinuses tiny to (almost) absent. .. 04
- b Lamina margin partly entire to coarsely dentate or lobed, sinuses often large. 05
- 04 a Bud scales 2, +/- equal in length [inflorescence 5-15-flowered, fruits not ribbed]. *T. tuan*
- b Bud scales 3, basal one extending +/- to halfway (10× LENS) [inflorescence 3-5-flowered, fruits strongly ribbed]. *T. chinensis*

- 05 a Lamina broadly ovate to orbicular, margin coarsely dentate with 15-25 teeth/side. *T. mongolica* × *T. oliveri*
- b Lamina ovate, margin almost entire to finely dentate or lobulate dentate towards apex with <15 teeth/side. *T. endochrysea*
- 06 a Lamina LS secondary veins 7-9/side. 07
- b Lamina LS secondary veins predominantly 6-7/side. 08
- 07 a Lamina LS rather (very) scattered pubescent with 4 armed hairs (10× LENS).
..... *T. americana* var. *neglecta*
- b Lamina LS scattered to densely pubescent with (4-)8-16-armed hairs. *T. caroliniana*
- 08 a Lamina largest width +/- in the middle. 09
- b Lamina largest width clearly near base. 11
- 09 a Lamina midvein length predominantly <9 cm. *T. xjuranyiana*
- b Lamina midvein length predominantly >9 cm. 10
- 10 a Lamina LS pubescence also with single hairs near base and on midvein (10× LENS).
..... *T. xhaynaldiana*
- b Lamina LS pubescence without single hairs (10× LENS). *T. xmolkei*
- 11 a Lamina margin irregularly dentate with some secondary veins ending in clearly larger teeth. *T. chingiana*
- b Lamina margin regularly dentate. 12
- 12 a Buds pubescent (10× LENS). *T. concinna*
- b Buds glabrous (10× LENS). *T. oliveri*

Taxa treated in this identification key.

T. americana
 - var. *neglecta*
T. amurensis
T. caroliniana
T. chingiana
T. chinensis
T. concinna
T. cordata
T. dasystyla
 - subsp. *caucasica*
 - subsp. *dasystyla*
T. endochrysea
T. xeuchlora (? *T. cordata* × *T. dasystyla*)
T. xeuchlora × *T. mongolica*
T. xeuropaea (*T. cordata* × *T. platyphyllos*)
T. xhaynaldiana (*T. platyphyllos* × *T. tomentosa*)
T. 'Harold Hillier' (? *T. japonica* 'Ernest Wilson' × *T. mongolica*)
T. henryana
 - var. *subglabra*
T. 'Hillieri' (? *T. cordata* × *T. tomentosa*)

T. japonica
 - 'Ernest Wilson'
T. xjuranyiana (*T. cordata* × *T. tomentosa*)
T. kiusiana
T. mandshurica
T. maximowicziana
T. mexicana
T. miqueliana
T. xholtkei (?)
T. mongolica
T. mongolica × *T. oliveri*
T. nobilis
T. oliveri
T. paucicostata
T. platyphyllos
 - subsp. *cordifolia*
 - subsp. *platyphyllos*
 - subsp. *corinthiaca*
T. tomentosa
T. tuan

Taxa referred to synonymy in this identification key.

T. alba = *T. tomentosa*
T. argentea = *T. tomentosa*
T. begoniifolia = *T. dasystyla* subsp. *caucasica*
T. caucasica = *T. dasystyla* subsp. *caucasica*
T. chenmoui = *T. tuan* var. *chenmoui*
T. glabra = *T. americana*
T. grandifolia = *T. platyphyllos*
T. heterophylla = *T. caroliniana*
T. heterophylla var. *michauxii* = *T. heterophylla*

T. insularis = *T. amurensis*
T. insularis Hort. = *T. japonica* 'Ernest Wilson'
T. intonsa = *T. chinensis*
T. laetevirens = *T. chinensis*
T. monticola = *T. heterophylla*
T. 'Orbicularis' = *T. tomentosa* 'Orbicularis'
T. parvifolia = *T. cordata*
T. xpetiolaris = *T. tomentosa* Petiolaris Group
T. xvulgaris = *T. xeuropaea*

