



Ghent University Botanical Garden

Tilia L. (Malvaceae)

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

Jan De Langhe

(8 August 2005 - 12 January 2012)

Vegetative key.

This key is based on vegetative characteristics visible during the longest period of the year. A few selections are also discussed, as these are frequently grown under another name (e.g. *T. japonica* 'Ernest Wilson', *T. tomentosa* 'Petiolaris').

List of taxa treated in this key: see page 7.

List of names referred to synonymy: see page 7.

To improve accuracy:

- Use a hand lens to judge pubescence in vein axils and pubescence in general.
- Start counting veins at base of the lamina with first clearly ascending secondary vein, do not include veins near apex <0,5 cm long.
- 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. - (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.

Hillier, J. & Coombes, A. - (2002) - *Tilia* in The Hillier Manual of Trees & Shrubs, p. 364-366.

Krüssmann, G. - (1978) - *Tilia* in Handbuch der laubgehölze, p. 416-423.

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.

Rehder, A. - (1940) - *Tilia* in Manual of cultivated trees and shrubs hardy in North America, p. 622-627.

I am particularly grateful to Koen Camelbeke, Dirk De Meyere, Paul Goetghebeur, Tom Hudson, Eike Jablonski, 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 during the years.

Copyright © 2005 - 2012 **Jan De Langhe**

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

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

- 01 a Lamina LS glabrous OR pubescence confined to single hairs on surface and veins, AND/OR tufts of hairs in secondary vein axils. Rarely simultaneously with very few stellate or fasciculate hairs on secondary veins or surface (LENS). 02
- b Lamina LS with layer of stellate pubescence on surface between veins, sometimes in a thin or scattered layer (LENS). 22
- 02 a Lamina LS midvein and secondary veins pubescent, with mainly perpendicular single hairs, AND/OR hairs in basal vein axils clearly perpendicular (LENS). 03
- b Lamina LS glabrous, OR IF pubescent, then hairs on secondary veins adpressed and/or directed forward, AND/OR hairs in basal vein axils interlaced (LENS). 09
- 03 a Lamina thick, midvein length 10-17 cm AND margin finely serrate, tooth height \leq tooth tip. *T. nobilis*
- b Lamina thin, midvein length <10 cm, OR IF >10 cm then margin +/- coarsely dentate, tooth height usually $>$ tooth tip. 04
- 04 a Shoot and petiole usually pubescent. Lamina LS venation with perpendicular hairs AND margin with teeth usually ≤ 1 mm long tipped. *T. platyphyllos*
- Lamina irregularly incised to lobed, often irregularly yellowish spotted. A group of variable cut-leaved limes. *T. platyphyllos* 'Laciniata'
- b Shoot and petiole glabrous or soon glabrescent. Lamina LS venation glabrous, OR IF pubescent then with hairs adressed to directed forward AND/OR margin with teeth often clearly >1 mm long tipped. 05
- 05 a Lamina +/- roundish, midvein length <10 cm. 06
- b Lamina ovate to ovate oblong, midvein length often >10 cm. 07
- 06 a Lamina base cordate. *T. dasystyla* subsp. *dasystyla*
- b Lamina base obliquely truncate to obliquely subcordate. *T. xeuclora*
- 07 a Lamina LS basal vein axils densely pubescent and $>$ other vein axils. *T. dasystyla* subsp. *caucasica*
- b Lamina LS basal vein axils +/- weakly pubescent and \leq other vein axils. 08
- 08 a Lamina LS venation glabrous. *T. americana*
- b Lamina LS venation scattered single pubescent, *T. platyphyllos* hybrid. *T. xflaccida*
- 09 a Lamina margin with teeth remarkable (+/- 5 mm) bristle-like tipped. *T. henryana*
- Mature leaves with lamina LS glabrous. *T. henryana* var. *subglabra*
- Mature leaves at least in part with lamina LS stellate pubescent. *T. henryana* var. *henryana*
- b Lamina margin without such teeth. 10
- 10 a Lamina midvein length between 10 and 20 cm or more. *T. americana*
- *T. platyphyllos* hybrid, lamina intermediate, LS secondary veins +/- single pubescent. *T. xflaccida*
- *T. tomentosa* 'Petiolaris' hybrid?, lamina intermediate, LS +/- stellate pubescent. *T. xmolitkei*
- b Lamina midvein length between 4 and 10(-12) cm (strong shoots excepted). 11

- 11 a Petiole remarkable short $\leq 1(-2)$ cm. Lamina oblong ovate, L/W often 2/1. *T. kiusiana*
 b Petiole mostly >2 cm long. Lamina ovate to roundish, L/W always $<2/1$ 12
- 12 a Lamina margin coarsely dentate with at least in part of the leaves one remarkable large tooth 5-10(-more) mm where a basal secondary vein runs into margin. 13
 b Lamina margin more regularly dentate without such large tooth where a basal secondary vein runs into margin. 17
- 13 a Lamina coarsely dentate with (4-)11-16 teeth/side AND always 1 very large (+/- 1 cm) tooth/side where the basal secondary vein runs into margin. *T. mongolica*
 b Lamina with usually >20 teeth/side AND in part of the leaves 1 very large (+/- 1 cm) tooth/lamina or tooth/side. 14
- 14 a Lamina regularly serrate-dentate always with 30-40 teeth/side.
 *T. japonica* 'Ernest Wilson'
 b Lamina +/- irregularly sharply to coarsely dentate with 20-30 teeth/side. 15
- 15 a Leaves present with lamina LS scattered stellate pubescence (LENS: carefully investigation). *T. mongolica* \times *T. oliveri*
 b Lamina LS without stellate pubescence. 16
- 16 a Lamina LS with >10 vein axils prominently tufted pubescent. Lamina base truncate to +/- obliquely cordate. *T. xeuclora* \times *T. mongolica*
 b Lamina LS with +/- 5 vein axils tufted pubescent. Lamina base deeply cordate, sometimes +/- obliquely cordate. *T. 'Harold Hillier'*
- 17 a Lamina margin at least in part with several to most teeth slightly overlapping at base and sinuses partly hidden. Secondary veins 4(-5)/side. *T. japonica*
 b Lamina margin with teeth not overlapping, sinuses well defined, OR secondary veins ≥ 6 /side at least for the largest leaves. 18
- 18 a Lamina simultaneously with glossy US AND margin with remarkable ≥ 1 mm long pale tipped teeth (LS venation and surface often with very scattered single and fasciculate long hairs). *T. xeuclora*
 b Lamina not simultaneously with these characters. 19
- 19 a Lamina US with tertiary veins clearly impressed. 20
 b Lamina US with tertiary veins slightly visible, not impressed. 21
- 20 a Lamina base truncate to oblique. *T. xeuropaea*
 b Lamina base cordate. *T. amurensis*
- 21 a Lamina base truncate to slightly obliquely cordate. Secondary veins ≥ 6 /side.
 *T. paucicostata*
 b Lamina base cordate. Secondary veins (4-)5 (rarely 6)/side. *T. cordata*
 - *T. americana* hybrid, lamina +/- intermediate, midvein length ≤ 9 cm, LS < blue-green.
 *T. xflavescens*
 - *T. tomentosa* hybrid, lamina +/- larger and LS loosely stellate pubescent. *T. xjuranyiana*

- 22 a Lamina margin with teeth remarkable (+/- 5 mm) bristle-like tipped. ***T. henryana***
- Mature leaves with lamina LS glabrous. ***T. henryana* var. *subglabra***
 - Mature leaves at least in part with lamina LS stellate pubescent. ***T. henryana* var. *henryana***
- b Lamina margin without such teeth. 23
- 23 a Lamina LS secondary veins with axillary tufts or clearly defined domatia (LENS, examine several leaves). 24
- b Lamina LS vein without axillary tufts (LENS). 32
- 24 a Lamina margin with at least in part of the leaves one remarkable large tooth 5-10(-more) mm where a basal secondary vein runs into margin, OR with <15 teeth/side. .. 25
- b Lamina +/- regularly sharply dentate with >15 teeth/side, OR/IF sparsely dentate then all teeth <3 mm. 26
- 25 a Lamina thick (+/- leathery), ovate, midvein length >8 cm. Margin almost entire or with <15 teeth/side: often one to more large teeth 0,5-10 mm towards apex often ≥1 cm apart. ***T. endochrysea***
- b Lamina thin, broadly to roundish ovate, midvein length <8 cm. Margin +/- regularly sharply dentate (10-)15-30 teeth/side and at least in part of the leaves a larger tooth where a basal secondary vein runs into margin. ***T. mongolica* × *T. oliveri***
- 26 a Lamina midvein length usually ≤10 cm AND/OR shortest side usually with ≤30 teeth (rarely more). 27
- b Lamina midvein length 10-20 cm, shortest side usually with 30-70 teeth (smallest laminas excluded). 28
- 27 a Lamina margin often almost entire in basal third, OR minutely dentate with teeth (+/- 1 mm) often reduced to their tips. Fruits smooth! ***T. tuan***
- Shoot glabrous to loosely stellate pubescent. ***T. tuan* var. *tuan***
 - Shoot densely stellate pubescent and margin finely serrate-dentate. ***T. tuan* var. *chenmoui***
- b Lamina margin regularly serrate-dentate, IF teeth minute then >1mm and usually not reduced to their tips. Fruits angled! ***T. chinensis***
- Shoot loosely stellate pubescent. ***T. chinensis* var. *chinesis***
 - Shoot densely stellate pubescent.
 - Lamina LS clearly stellate pubescent. ***T. chinensis* var. *intonsa***
 - Lamina LS glabrescent, or +/- stellate pubescent on veins. ***T. chinensis* var. *investita***
- 28 a Petiole usually <5 cm. 29
- b Petiole usually 5-8 cm. 30
- 29 a Lamina US base and end of petiole with scurfy stellate pubescence. ***T. mexicana***
- b Lamina US and petiole without such pubescence. ***T. caroliniana***
- 30 a Shoots densely stellate pubescent. Lamina broadly or roundish ovate, largest width in the middle. ***T. maximowicziana***
- b Shoots glabrous or glabrescent. Lamina ovate, largest width below the middle. 31

- 31 a Lamina LS densely pubescent with small short-branched overlapping stellate hairs covering the surface (LENS). *T. heterophylla*
- b Lamina LS scattered stellate pubescent, visible greenish under layer (+/- like *T. americana*, LS without axillary tufts but +/- visible domatia). *T. x moltkei*
- 32 a Lamina margin (especially larger leaves) coarsely dentate with 1-2 teeth/cm sometimes +/- 1 cm apart, often <30 teeth/side. LS pubescent to glabrescent with +/- yellowish to rusty hue. *T. mandshurica*
- b Lamina margin, with $\geq 2-3$ teeth/cm never 1 cm apart, OR often >30 teeth/side. LS usually greyish pubescent. 33
- 33 a Shoot and petiole glabrous or soon glabrescent (LENS). 34
- b Shoot and petiole stellate pubescent at least in part (LENS). 39
- 34 a Lamina LS densely stellate pubescent with hairs interlaced. 35
- b Lamina LS scattered stellate pubescent with hairs apart. 36
- 36 a Lamina ovate, margin irregularly serrate, tooth where a secondary vein ends often obviously larger than others. *T. chingiana*
- b Lamina broadly ovate, margin regularly finely serrate. ... *T. oliveri*
- 36 a Lamina midvein length <8 cm. *T. x juranyiana*
- b Lamina midvein length >9 cm. 37
- 37 a Lateral branches upright. *T. platyphyllos* x *T. tomentosa*
- b Lateral branches pendulous at least in part. 38
- 38 a Lamina LS at least in part of the leaves with midvein at base sparsely and irregularly single pubescent. *T. platyphyllos* x *T. tomentosa* 'Orbicularis'
- b Lamina LS midvein without single pubescence (*T. americana* x *T. tomentosa* 'Petiolaris'?). *T. x moltkei*
- 39 a Lamina ovate, largest width clearly below the middle AND apex +/- gradually narrowing from the lamina middle. 40
- b Lamina broadly ovate to circular-ovate, largest width +/- in the middle AND/OR apex abruptly pointed. 41
- 40 a Lamina +/- triangular-ovate to ovate, petiole <4 cm long. *T. miqueliana*
- b Lamina ovate to broadly ovate AND/OR petiole >4 cm long. *T. 'Hillieri'*
- 41 a Crown broad. Lateral branches ascending to spreading, at the very most with pendent shoots. *T. tomentosa*
- Hybrids, usual with glabrescent shoots and scattered pubescence.
- Lamina LS with scattered layer of stellate pubescence AND at least in part of the leaves with midvein base sparsely and irregularly single pubescent. *T. platyphyllos* x *T. tomentosa*
 - *T. cordata* hybrid, with small lamina and LS loosely stellate pubescent. *T. x juranyiana*
- b Crown +/- (narrowly) columnar. Lateral branches at least partly strongly pendent, lower ones often reaching the ground. A group of pendulous silver limes. 42

- 42 a Lamina US +/- dull (olive-) green, midvein length \geq lamina width (margin often regularly dentate). *T. tomentosa* 'Petiolaris'
- b Lamina US dark glossy green, midvein length \leq lamina width (margin usually irregularly dentate). *T. tomentosa* 'Orbicularis'
- Similar: Narrowly columnar, fast growing selection with darker foliage. *T. tomentosa* 'Chelsea Sentinel'

List of taxa treated in this identification key.

<i>T. americana</i>	<i>T. japonica</i> 'Ernest Wilson'
<i>T. caroliniana</i>	<i>T. xjuranyiana</i> (<i>T. cordata</i> × <i>T. tomentosa</i>)
<i>T. chinensis</i>	<i>T. kiusiana</i>
<i>T. chinensis</i> var. <i>chinesis</i>	<i>T. mandshurica</i>
<i>T. chinensis</i> var. <i>intonsa</i>	<i>T. maximowicziana</i>
<i>T. chinensis</i> var. <i>investita</i>	<i>T. mexicana</i>
<i>T. chingiana</i>	<i>T. miqueliana</i>
<i>T. cordata</i>	<i>T. xmolkei</i> (<i>T. americana</i> × <i>T. tomentosa</i> 'Orbicularis')
<i>T. dasystyla</i>	<i>T. mongolica</i>
<i>T. dasystyla</i> subsp. <i>caucasica</i>	<i>T. mongolica</i> × <i>T. oliveri</i>
<i>T. dasystyla</i> subsp. <i>dasystyla</i>	<i>T. nobilis</i>
<i>T. endochrysea</i>	<i>T. oliveri</i>
<i>T. xeuchlora</i> (<i>T. dasystyla</i> × <i>T. platyphyllos</i>)	<i>T. paucicostata</i>
<i>T. xeuchlora</i> × <i>T. mongolica</i>	<i>T. platyphyllos</i>
<i>T. xeuropaea</i> (<i>T. cordata</i> × <i>T. platyphyllos</i>)	<i>T. platyphyllos</i> 'Laciniata'
<i>T. xflaccida</i> (<i>T. americana</i> × <i>T. platyphyllos</i>)	<i>T. platyphyllos</i> × <i>T. tomentosa</i>
<i>T. xflavescens</i> (<i>T. americana</i> × <i>T. cordata</i>)	<i>T. tomentosa</i>
<i>T. 'Harold Hillier'</i> (<i>T. japonica</i> 'Ernest Wilson' × <i>T. mongolica</i>)	<i>T. tomentosa</i> 'Chelsea Sentinel'
<i>T. henryana</i>	<i>T. tomentosa</i> 'Orbicularis'
<i>T. henryana</i> var. <i>henryana</i>	<i>T. tomentosa</i> 'Petiolaris'
<i>T. henryana</i> var. <i>subglabra</i>	<i>T. tuan</i>
<i>T. heterophylla</i>	<i>T. tuan</i> var. <i>chenmoui</i>
<i>T. 'Hillieri'</i> (? <i>T. cordata</i> × <i>T. tomentosa</i>)	<i>T. tuan</i> var. <i>tuan</i>
<i>T. japonica</i>	

List of taxa referred to synonymy in this identification key.

<i>T. alba</i> = <i>T. tomentosa</i>	<i>T. intonsa</i> = <i>T. chinensis</i> var. <i>intonsa</i>
<i>T. argentea</i> = <i>T. tomentosa</i>	<i>T. laetevirens</i> = <i>T. chinensis</i>
<i>T. begoniifolia</i> = <i>T. dasystyla</i> subsp. <i>caucasica</i>	<i>T. monticola</i> = <i>T. heterophylla</i>
<i>T. caucasica</i> = <i>T. dasystyla</i> subsp. <i>caucasica</i>	<i>T. neglecta</i> = <i>T. americana</i>
<i>T. chenmoui</i> = <i>T. tuan</i> var. <i>chenmoui</i>	<i>T. 'Orbicularis'</i> = <i>T. tomentosa</i> 'Orbicularis'
<i>T. glabra</i> = <i>T. americana</i>	<i>T. parvifolia</i> = <i>T. cordata</i>
<i>T. grandifolia</i> = <i>T. platyphyllos</i>	<i>T. petiolaris</i> = <i>T. tomentosa</i> 'Petiolaris'
<i>T. heterophylla</i> var. <i>michauxii</i> = <i>T. heterophylla</i>	<i>T. xspectabilis</i> = <i>T. xmolkei</i>
<i>T. insularis</i> = <i>T. amurensis</i>	<i>T. xvulgaris</i> = <i>T. xeuropaea</i>
<i>T. insularis</i> Hort. = <i>T. japonica</i> 'Ernest Wilson'	

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