**Tilia cordata, Tilia platyphyllos** and other limes in Europe: distribution, habitat, usage and threats

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**Tilia cordata**, known as small-leaved lime, and **Tilia platyphyllos** Scop., known as large-leaved lime, are very similar trees, both native to Europe and preferring warmer climates. Growing into large trees, they occur from southern Finland to southern Italy, and from the Caucasus to north-west Spain and Wales. Limes prefer lowlands to higher elevations, and have been a component of European woodlands for six millennia. Coppicing has been a common form of management for limes, as they produce long straight poles and can be very long-lived (>2000 years) in this form. Lime wood is much valued for carving, as it is soft and resistant to splitting.

Small-leaved lime (**Tilia cordata** Mill.) and large-leaved lime (**Tilia platyphyllos** Scop.) are large-sized deciduous broad-leaved trees. They are long-lived, able to survive more than 1000 years even if coppiced. T. cordata is the more common species in Europe, whilst T. platyphyllos extends farther south. Both species can reach 30-40m in height with straight trunks up to 1m in diameter which are largely free of suckers and epicormic growth, unlike their hybrid **Tilia x europaea** (common lime). Their crowns tend to be quite neat and narrow, becoming untidier as they age, although the high crown can allow a branch-free bole of 10-15m. Despite their common names, the leaves of these two species are very similar: both are often around 9cm long, with T. platyphyllos up to 15cm; pointed tips to the leaves are common to both, as are a cordate base, which is more irregular in form in T. platyphyllos, a finely-toothed leaf margin, and a dark green shiny upper surface with the underside paler. T. cordata has hairs in the vein axils on the lower surface of its leaves, whereas T. platyphyllos is only sometimes hairy on its underside. Both species flower profusely in June and July. The white or pale flowers, which are insect-pollinated, are fragrant and occur in clusters of 4 to 5. Seeds are first produced around 30 to 40 years of age, and every 2-3 years trees produce a reasonable crop of seeds. The seeds of T. cordata are smaller than those of T. platyphyllos: there are 7500 T. platyphyllos seeds per kilogram, compared to 29000 T. cordata seeds per kilogram.

**Distribution**

T. cordata and T. platyphyllos are native to much of Europe, with their ranges extending from southern Finland to southern Italy and the Caucasus. T. cordata is the more abundant of the two species and its core region is central and eastern Europe. It can be found as far north as southern Norway and Finland and at elevations up to 1500m in the central Alps. T. platyphyllos has a smaller range, reaching slightly farther south but only reaching southern Sweden at its northern extent and having a much more patchy occurrence in northern central Europe. Neither species is present in the far west of Europe, with the western extent in North-West Spain and Wales. In Europe, two other species of lime occur naturally: the silver lime (**Tilia tomentosa** Meach.) and the Caucasian lime (**Tilia dasystyla** Stev.) with two noticeable subspecies cucuscus and dasystyla. **T. tomentosa** especially occurs in the Balkans and Hungary, while **T. dasystyla** is peculiar to the regions around the Black Sea.

**Habitat and Ecology**

Both T. cordata and T. platyphyllos are trees of lowlands and the lower slopes of hills rather than higher elevations, and have been present in European woods for more than 10000 years. In Britain, limes are generally associated with oak and beech woodlands, and their presence is often taken as an indicator of ancient woodland (i.e. since before 1600 CE). In Central Europe and the Alps lime stands and forests were much more abundant before the expansion and intensification of agriculture 7000-5000 years ago. T. cordata can grow on calcareous soils, podzols, and brown earths, and can compete with oaks on stagno-gley soils, whilst T. platyphyllos is more usually found on rendzinas formed from limestone or basic igneous rocks. If the mean annual precipitation is greater than 850mm, T. cordata can also move onto more lime-rich soils, but it is quite drought tolerant. Neither species is much affected by spring nor autumn frosts, as flushing is relatively late and buds set early. However, both species require some warmth, being limited in the north of their ranges by temperature. This is particularly true for the production of fertile seed, as in colder regions (such as northern Britain) it is often too cold for the pollen tube to grow following pollination. As such, opportunities for limes to spread in such areas only occur following particularly warm summers. Given its relative drought-tolerance and its preference for warmer temperatures, the range of this species may increase in a warming climate. T. cordata and T. platyphyllos are both tolerant of shade and tend to grow in close proximity to other species in dense woodlands. Both species show substantial regenerative abilities and have been grown as coppice for millennia. Individual coppice stools may form rings 16m in diameter and may be up to 2000 years old, although precise dating is difficult as the heartwood may have rotted away long ago. Whilst neither T. cordata nor T. platyphyllos is as susceptible to aphid infestation as **Tilia x europaea**, it has been said that the soils underneath lime trees may receive up to 1 kg per square metre of sugars from honeydew. This nutrient input is thought to stimulate nitrogen-fixing bacteria in the soils, enriching them with nitrogen and phosphorus.

**Importance and Usage**

Both the main lime species in Europe produce a wood that is light in colour and soft enough to carve, but resistant to splitting. Some of the earliest uses of lime wood include bows and shields, as well as "bast", which is a tough fibrous material derived from the inner bark and used for rope and clothing. Coppicing of **Tilia** has long been practiced, as the trees are capable of producing long, straight poles. As the wood of both T. cordata and T. platyphyllos can be worked easily, it has been a highly favoured material for carving since the Middle Ages, as well as for musical instruments, clogs, beehives, and cuckoo clocks. Honey from the flowers of lime trees is also much valued, and a tea made from the flowers (**Tilisi**) has long been thought to have anti-inflammatory properties. One of the common uses of lime trees has been as a street tree in much of Europe, notably along Unter den Linden in the centre of historic Berlin.

**Threats and Diseases**

T. cordata and T. platyphyllos are generally quite disease resistant. Bleeding stem cankers caused by **Phytophthora cactorum** and **Phytophthora cinnamomi** have been recorded on limes. T. cordata is sensitive to **Phytophthora plurivora**. Aphids can be a problem, but to a much lesser extent with T. cordata and T. platyphyllos than with common lime in severe infestations the honeydew dripping onto lower leaves allows sooty moulds to grow, blocking light from reaching the leaf surface. In common with several woody plants, limes are susceptible to be attacked by the gypsy moth (**Lymantria dispar**) and the run moth (**Lymantria monacha**). In particular, T. cordata is highly

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**Map 1-A**: Plot distribution and simplified chorology map for **Tilia cordata**. Frequency of **Tilia cordata** occurrences within the field observations as reported by the National Forest Inventories. The chorology of the native spatial range for **T. cordata** is derived after EUFORGEN and Afonin et al.26, 27. Pendulous fruits of small-leaved lime (**Tilia cordata**). (Copyright AnRo0002, commons.wikimedia.org: CC0)

**Inflorescences of white-yellowish fragrant flowers arranged in clusters of 4-5**. (Copyright Giovanni Caudullo: CC-BY)

**Large-leaved lime (**Tilia platyphyllos**) on a karst plateau near Lokev village (Sežana, Slovenia). (Copyright Stefano Zerauschek, www.flickr.com: AP)

**Isolated small-leaved lime (**Tilia cordata**) in Laskena Dolina (South Slovenia). Copyright Goriano Jareuschke, www.flickr.com: AP

**Threats and Diseases**
vulnerable to the gypsy moth and *T. platyphyllos* is susceptible to the run n moth. Invertebrates to which limes play host include *Stigmella tiliae*, a leaf-mine, the lime hawk-moth, *Mimas tiliae*, and *Enoplytes tiliae*, the lime nail gall.3 Natural regeneration of limes rarely persists long, as it is very palatable to small browsing mammals, such as bank voles.4 Mature trees may have their bark stripped by browsing cattle.5

References

4. P. S. Savi, The macroflora of items used in bird feed (CABI, 2010).

Field data in Europe (including absences) Observed presences in Europe

This is an extended summary of the chapter. The full version of this chapter (original and peer-reviewed) can be found in the published atlas at https://w3id.org/mtv/FISE-Comm/v01/e010ec5. The purpose of this work is to provide an accessible dissemination of the related main topics. This QCA scale points to the linal oil element, where the most updated content may be freely accessed.

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