

Botanical monographs

THE MONUMENTAL ARBORETUM

The Botanic Garden of Universitat de València

Manuel Costa
José Plumed

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Manuel Costa and José Plumed

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Platanus orientalis L.

Foreword

The publication of a third volume of Botanical Monographs is tangible proof of the consolidation of this series of books devoted to explaining the plant collections at the Valencia University Botanic Garden. On this occasion we have dedicated the book to the special trees and other notable plants that, although not trees in the strict sense, are unique elements of our Botanic Garden. It is, without a doubt, the most important collection in this garden because it gives the JBUV its character.

The trees are the great masters of the forest. We are impressed by the size and longevity of the great redwoods, which can reach 100 m in height and live 3000 years. Many old trees have their own names because of their large size and uniqueness; thus Hyperion, an example of a redwood in the National Redwood Park, reaches 115 m in height, 25 m more than the Statue of Liberty, and is considered to be the largest living thing on Earth. Several specimens of yew, cypress, larch, or chestnut are thousands of years old and are older than the Cheops pyramid. Among them Methuselah, a *Pinus longaeva* specimen in the Californian White Mountains that, at 4,848 years (in 2016), is considered to be among the oldest known living specimens on Earth, although the Norway spruce Old Tjikko in Dalarna (Sweden) could legitimately challenge this age: even though its visible part measures some 4 metres and is “only” 600 years old, its roots are at least 9,550 years old; in other words, it has been with us since the Palaeolithic era was ending. Closer to the JBUV, the Asturian *Tejo de la Iglesia* (Church Yew; Bermiego, Asturias) is thought to be around 1000 years old and the age of the *Carbayón de Valentín* (Tineo, Asturias) is estimated at some 850 years. In the Valencian territory, some Spanish juniper specimens in the Los Serranos region, or olive trees grown in the Valencian Community, exceed a millennium, and perhaps a few witnessed the passage of the Roman legions. The respect that such longevity garners explains why, since ancient times, locals have met under the branches of some trees in order to make important decisions, thus rendering them living witnesses to their agreements and promises.



Aerial view of the Valencia University Botanic Garden.

But it is not only a question of age or size. Trees play a key role in rainwater retention, preventing mountains from losing their soil, as well as constituting the habitat of many other species of living beings, thus making them essential for the maintenance of biodiversity. To give an idea of what this implies, it suffices to say that an estimated third of forest biodiversity lives in the branches, leaves, nooks in the trunks, and in the roots, of a forest's trees.

Fulfilling one of the fundamental roles of any botanical garden, demonstrating the diversity of plants, the Valencia University Botanic Garden cultivates tree species from every geographical area on Earth, native to Africa, Asia, North America, South America, and Oceania, as well as a wide variety of European species. In this monograph we have chosen 65 of the most outstanding examples from our garden, which represent species from diverse gymnosperm genera such as *Araucaria*, *Cupressus*, *Podocarpus*, *Cephalotaxus* and, of course, several pine and *Cycas* species. A very interesting group is constituted by the



monocotyledons such as *Beaucarnea* and *Nolina*, the large *Yucca filifera* specimen, probably the oldest plant in the garden, and the giant bamboo *Dendrocalamus giganteus*, without forgetting the palms, whose diversity was the reason the first volume of these Monographs was published.

But the greatest diversity is found in the dicotyledons, which includes a citron specimen already discussed in the Monographs volume dedicated to citruses, impressive magnolia specimens, and several *Quercus* species, such as the Virginia oak located at the entrance of the garden. The *Ceiba speciosa* specimen is one of the largest and oldest in Europe, and the two *Zelkova carpinifolia* specimens are exceptional for different reasons. One because, after being knocked down by hurricane Hortensia, it re-rooted after being raised, and the other for its impressive structure, which supports hundreds of tons of weight.

These venerable specimens, which have survived the many vicissitudes endured by this Botanic Garden, and despite circumstances that have not always been hopeful or favourable, are still standing with admirable tenacity. They have survived the great flood which ravaged Valencia in October 1957, hurricanes such as the previously mentioned Hortensia and, equally devastating as these natural phenomena, the long periods of neglect that this garden suffered in its more than two-century history, mainly following the Civil War and the difficult circumstances that followed. Some of these specimens are already senescent, and it is very probable that they will die in the not so distant future. Each plant that disappears, even more so if it is a living monument, is an irreparable loss, but we must accept that this is the cycle of life. Our mission is not to make them live eternally, but rather, to replace absences with new examples that allow our tree grove to remain the biggest attraction in this Botanic Garden.

Esteban Morcillo

Chancellor of Valencia University

Isabel Mateu-Andrés

Director of the Valencia University Botanic Garden



Pinus pinea L.

Introduction

The Valencia University Botanic Garden originates from the mid-sixteenth century, when the Faculty of Medicine needed a simple garden to study medicinal plants. The garden was housed at different locations throughout the city, until it found its last and definitive location in 1802 in the so-called *Huerto de Tramoyeres*, in *Calle Quart*, outside the city walls. The Botanic Garden belongs to Valencia University and is a centre for research, education, and conservation. It is now one of the oldest and most important botanical gardens in Spain, both for the number of collections and species it holds and for their age, monumentality, originality, and quality.

Among the collections housed at the garden, the trees stand out; they constitute one of the garden's most important and valuable components, given the diversity of families, genera, and botanical species represented, as well as the presence of monumental trees protected by the *Comunidad Valenciana* (hereon in referred to as the Valencian Community, comprising Valencia, Alicante, and Castellón) Monumental Tree Heritage law (*Ley 4/2006 de Patrimonio Arbóreo Monumental de la Comunidad Valenciana*).

Although the history of the Botanic Garden is well known, the same cannot be said of the woody plant collection, because of the many unforeseen events the garden has endured over time. In 1811, shortly after its inauguration, it was virtually destroyed by the Spanish war of Independence. Its restoration began in 1829, and was oriented towards systematic botany and plant acclimatisation, a tendency that was maintained until the late nineteenth century. A large part of the garden's trees and adult monocotyledons come from this period, although some specific specimens can be traced back to the original *Huerto de Tramoyeres*.

One of the first records we have about the tree collection – or arboretum – is from 1849. It is a citation by Pascual Madoz in his *Diccionario geográfico-estadístico-histórico de España y sus posesiones de Ultramar* (Historical-Statistical-Geographic dictionary of Spain and its overseas possessions), in which he describes the Botanic Garden as “a garden with a broad representation of fruit trees, both local and exotic, that in some cases overreach the limits and

perimeter of the different spaces destined to be housed by the Botany School. Nor do they lack forest and ornamental trees or other useful plants such as vegetables, forage and industrial crops.”

In 1856, the then director, José Pizcueta, published the first catalogue of the garden's plants, which included more than 6,000 species. A good number of these were woody or arboreal monocots, some of which have survived to today and are splendidly mature.

The twentieth century began for the garden with a slow decline caused by the loss of its status as a centre for teaching. The deterioration progressed as the century continued, in line with the economic downturn affecting the country which was caused by its loss of influence abroad. The Spanish Civil War and its aftermath aggravated the situation, and even more so the flood that covered the city in 1957. The water and mud destroyed herbariums, part of the archives, and the library; it affected the buildings and left the remaining living plant collections badly damaged. Those who were best able to withstand this great catastrophe were the big trees and palms, but the specific information about each of the individuals was lost. In 1984, cyclone “Hortensia” seriously affected many trees, and some, such as the Caucasian elm, *Zelkova carpinifolia*, located in block 7, were completely uprooted. After a severe pruning and with the help of a crane, we were able to lift it up again and it survives to this day.

The garden was therefore in a terrible state of degeneration at the end of the twentieth century and so the University took the decision to fully restore it, placing value on infrastructure, buildings, installations, and plant collections. But they were not starting from scratch: all of the previously-described circumstances had already had a negative influence in the tree collection, which thereafter responded better or worse depending on the species, the severity of the damage, and their regenerative capacity. During the restoration of the garden between 1989 and 1991, arboriculture work was done on the many specimens that were in very bad condition; the dead or dangerous trees were taken down and the rest were pruned, and at the same time the species required to complete the collections were planted.

At that time, knowledge of arboriculture in Spain was scarce, if not inexistent, making the Botanic Garden one of the first centres to introduce the specialised training, techniques, and materials required for arboriculture into the country. To do this numerous courses were run in collaboration with other Valencian institutions, such as the Provincial or City councils, and associations, both national and in the rest of Europe.

Once the restoration was complete, a research building was built which was inaugurated in the year 2000, consolidating the scientific, educational, and cultural activities that the garden was developing, regaining its public vocation as a service to society, in environmental education in particular.

The garden currently cultivates some 450 trees, of these 64 are gymnosperms and 386 angiosperms, which are grouped into 55 families, 130 genera, and 250 species. Among these, 18 examples are included in the Valencian Community Monumental and Singular Tree Catalogue, via the Monumental Tree Heritage law 4/2006, passed 19 May by the Valencian autonomous-region government.

This grove forms a unique set of monumental trees of extraordinary cultural, botanical, and scenic value. For this reason the Valencia University Botanic Garden would like to give it more exposure through this guidebook, in which the most significant or relevant tree species in the collection are described.

Without a doubt, one of the most important challenges for the Botanic Garden in the twenty-first century will involve determining how to best preserve, improve, and hand down this unique collection of trees to future generations for the benefit, knowledge, and enjoyment of society.



Zelkova carpinifolia (Pall.) K. Koch, Valencia University Botanic Garden.

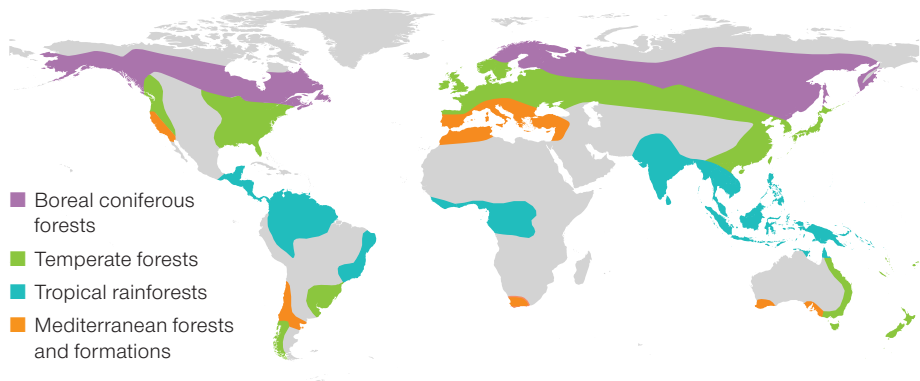


Beech forest, *Fagus Sylvatica* L.

The world's forests

Introduction

The word forest is derived from the Latin word *boscus*, which means an area populated by trees and shrubs. In general these are spaces where trees dominate and are found at a high density. The forests that populate the Earth correspond to the potential vegetation of the different forest biomes, in other words, formations referred to as 'climatophiles' (the climatic climax community, i.e. climatophilous forests representing the natural potential vegetation which is primarily produced by the climate conditions), which depend on the climatic conditions of the territory they are found in (boreal conifer, tropical and subtropical, Mediterranean, broadleaf forests, etc.). In different parts of the world, but in the same climate, these forests have similar appearance; however their floristic composition varies based on the land they occupy, as occurs in Mediterranean climate, coniferous boreal, temperate broadleaf, or tropical forests.



Map of the distribution of the main forest formations on Earth.



Boreal conifer forests (*Rubo chamaemori-piceetum marianae*). Alaska.

The similarity is caused by the convergence of floristic-component characteristics, such as the response to the same climatic conditions, even though the territories they occupy are very far from each other. Other types of tree formations depend not on the climate, but rather on the soil characteristics: these edaphophilous forests (the permanent climax plant community produced primarily by soil conditions) include riparian and gallery forests. These forests represent 40% of the Earth's potential vegetation, occupying some 4,500 million hectares of land area. However, man has altered and deforested large expanses of these areas, changing its use for agriculture and other activities.

Coniferous forests

The best examples of coniferous forests are found in boreal areas. They represent one of the largest wooded areas on Earth, occupying some 1,500 million hectares spread across Northern Europe and Asia, as well as in Northern USA, between the 45°N and 71°N and 49°S and 55°S latitudes. These forests correspond to a Boreal macrobioclimate and support some hard climate conditions with extreme photoperiod variations and modest solar radiation, meaning the average daily



Abies pinsapo formations in Grazalema. (Cádiz, Spain).

temperature above 10°C lasts only about 120 days a year. The summers are very short and winters are very long, lasting more than six months. Broadleaf trees cannot develop under these conditions. However, this general climate typology can vary, especially in relation to the nature of different continents. Its average annual temperature (T) oscillates between 5°C and 0°C.

With regard to soil, they are usually podzolic, with a raw humus horizon, a pallid horizon, and a dark and hardened B horizon, in which permafrost (permanently frozen soil) is rare. Boreal flora, which is the same as Circumarctic Region flora, is relatively recent, hence the scarcity of endemic species in these formations. The American and East Asian conifer forests are the most biodiverse, with the Eurosiberian Region conifer forests being the least rich. The most significant elements in these types of forest are the species belonging to the *Picea*, *Abies*, *Larix*, *Pinus*, and *Betula* genera, among others. These types of boreal coniferous forest formation are commonly known by the name *taiga*.

In northern Europe the dominant tree is *Picea abies* with its two subspecies, the *abies* which are more western and European, and *obovata* which are more Siberian and Eastern. There are also plenty of *Pinus sylvestris* in these formations, especially in sandy soils with a glacial (morainic) origin. *Abies sibirica* appears in



Dolomitic *Pinus longaeva* pine in the White Mountains (California).

the east, past Lake Onega, with *Picea obovata*, *Larix sibirica*, *L. daurica*, and *Pinus sibirica*, among others, forming the Siberian coniferous forests. Conifers can live with some deciduous trees such as *Betula pendula*, *B. exilis* and *Populus tremuloides*. In North America, the dominant trees in the taiga are *Picea glauca*, *P. mariana*, *Abies balsamea*, *Larix laricina*, *Betula papyrifera*, *Populus tremuloides*, *Pinus banksiana*, and *P. contorta*. In north Asia, some conifers of interest include *Larix gmelinii*, *Picea jezoensis*, *P. koraiensis*, and *Abies nephrolepis*.

Outside boreal zones other types of natural coniferous forests are found, especially in mountains with particular climate conditions. This happens at the subalpine level, between 1,900 and 2,300 m, in high European mountain ranges (The Alps, Pyrenees, Carpathians, Apennines, etc.), where *Pinus cembra*, *P. uncinata*, and *Larix decidua* forests are common. Underneath these forests, in the montane belt, some conifers such as *Picea abies* and *Abies alba* may appear. The most spectacular coniferous forests outside the Circumboreal Region are found in North America. There, in the deep and humid valleys of the eastern slope of the Sierra Nevada lie incredible *Sequoiadendron giganteum* forests, a spectacular tree that can grow up to one-hundred meters tall. These giants are accompanied by different conifers such as *Abies lowiana*, *Pinus*



ponderosa, *P. lambertiana*, and *Calocedrus decurrens*, among others. Although they are severely depleted because of fires, good examples of these formations can be found in Sequoia National Park and in Kings Canyon. In these xeric Great Basin Region areas in the Supra- and Oromediterranean levels, conifers such as *Juniperus occidentalis*, *J. osteosperma*, and *Juniperus monosperma* dominate the landscape, along with some pines such as *Pinus edulis* and *P. flexilis*. The original, and very important, relict *Pinus longaeva* formations in the Oromediterranean level, the semiarid top of the White Montanans in California, that close off Death Valley towards the west, also live in Nevada and Utah. In the Rocky Mountains there are magnificent Pleistocene conifer formations. These formations include large trees such as *Tsuga heterophylla*, *Thuja plicata*, *Picea sitchensis*, and *Pseudotsuga menziessi* (Douglas fir). In very humid, high-mountainous oceanic areas the *Abies amabilis* and *Picea sitchensis* (sitka spruce) forests are spectacular. When the climate becomes more continental, the forests enrichen with other conifers such as *Picea engelmannii*, *Abies procera*, *A. bifolia*, and *Pseudotsuga menziessi*. In the very humid and extremely humid levels, shaped by the Oromediterranean zone climate, *Chamecyparis nootkatensis* and *Tsuga mertensiana* appear. At the most basal positions on the mountains *Pinus ponderosa* arises.

There are also different types of conifer forests in the east of Asia that, in the north are related to the Siberian taiga and are made up of *Larix gmelinii*, *Picea jezoensis*, *P. obovata* ssp. *Korainsis*, and *Abies nephrolepis*, among others. In the mountainous zones a subalpine level occupied by conifers appears, which is very well represented in the Changbai-Shan Mountains on the border between China and North Korea. This level is occupied by *Pinus koraiensis*, *Picea komarovi*, and *Abies nephrolepis*; above them *Juniperus sibirica* and *Larix gmelinii* can be found. Towards the south, past the Yellow River, very old formations appear that are very rich in relict flora, and there is no shortage of endemic families and genera. Among the conifers there are diverse species from the *Pseudotaxus*, *Pseudolarix*, and *Metasequoia* genera. In south-east China the Changbai Mountains rise with spectacular *Pinus taiwanensis* formations on the ridges and walls. Towards the south-west, in the great Himalayan mountain chain, forests with broadleaf trees and some conifers including *Abies spectabilis*, *Picea smithiana*, *Pinus roxburghii*, and *P. wallichiana* appear from the mist. Above this vegetation and up to 3,400 m there is a belt of conifers mainly comprising *Cedrus deodara*, *Pinus excelsa*, and *Abies pindrow*.

In the southern hemisphere the *Araucaria* forests found in South America, central-southern Chile, Argentina, Uruguay, meridional Brazil, and east Paraguay are very interesting. *Araucaria araucana* and *A. angustifolia* are some of the American species, but this type of forest also appears in Oceania where, in New Caledonia, more than ten endemic araucaria species live, including *A. cooki* and

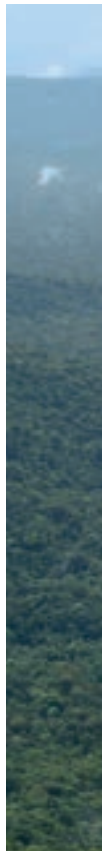
A. columnaris. Endemic trees can also be found in eastern Australia, on Norfolk Island (*A.heterophylla*), and in Queensland (*A.bidwillii*) and New Guinea (*A. hunsteinii*). In New Zealand the altitude delimits *Podocarpus* forests, including *Podocarpus nivalis* and *P. alpinus*.

In the south of Europe, in the Mediterranean Region Mountains, there are conifer formations that occupy the Oromediterranean level, in which the most important species are *Pinus sylvestris*, *Juniperus hemisphaerica*, *J. alpina*, and *J. sabina*, among others. A very special case are the *Juniperus thurifera* (Spanish juniper) forests that extend through the Castilian-Aragonese high moorlands of the Iberian Peninsula. In the more temperate zones (Thermo- and Mesomediterranean or Lowland and Submontane zones) other pines like *Pinus halepensis*, *P. brutia*, *P. pinea*, and *P. pinaster* are found.

Tropical and subtropical forests

Tropical forests can be found in a Tropical Macrobioclimate, occupying territory between the 0° and 35° parallels to the north and south. They come into contact with subtropical forests, which are situated between the 25° and 35° parallels north and south. The average annual temperature ranges between 25°C and 27°C, and so in this macrobioclimate rainfall determines the different ombrotypes, from extremely wet to desert-like, with the existence of rainforests, pluviseasonal (tropical seasonal forests), savannah woodlands, and desert.

Tropical rainforests occupy some 1,000 million hectares, spread across Africa, Asia, and South America. In Africa they are limited to the Guinean-Congolian Region, to the north of Ecuador. In the Asiatic continent, these rainforests are found in India, Sri Lanka, Indonesia and the Pacific Islands, New Guinea, and the Malay Archipelago Islands: territories that form part of the Paleotropical Kingdom (Paleotropis). In America they occupy the vast Amazonian basins, Alto Orinoco, and part of Mesoamerica. From a climatic point of view, the average annual temperature range is very small, not reaching a 2°C-difference between the hottest and coldest months. Precipitation is high, usually above 1,500 mm, and in some areas it can be more than 2,000 mm, even sometimes reaching 5,000 mm. The rainfall is distributed over the whole year, making humidity very high, at around 85%. They sit upon ancient soils that are left nutrient-poor and acidic by the abundant rain which washes basic ions and silicates into the deeper layers, leaving iron and aluminium sesquioxides in the higher horizons that, by laterization, results in poor soils with a reddish colour. The forest structure is also very complex, with an upper layer of trees that can reach 50 or 60 m in height. These are the emergent trees, which protrude in isolation above the dense canopy standing at 30 m high, among which vines searching for light by climbing up the trunks are





Tropical rainforest. *El Abismo* (Venezuela).

very common; epiphytes are also abundant. Underneath this layer there are a number of low-density shrubs because of the minimal levels of light reaching them. Another feature of these rainforests is their high biodiversity: an estimated 20% of the plant species in the world come from the Amazon rainforest.

African rainforests, although very biodiverse, are the poorest in comparison to the Amazon and Asian rainforests. They occupy Guinean-Congolian Region and have been severely depleted by wood extraction (wood which, in some species, is very good quality). Certain trees in these forests can reach more than 60 m in height, and among the most important are those belonging to the *Mimusops* genus, some of which can also be found in Asian forests. Other important trees in these tropical forests are the African mahoganies including *Khaya ivorensis*, whose wood is also known as red khaya or grand bassam mahogany, and *Entandrophragma cylindricum*, which provides sapele or sapelii wood, as well as *Aucoumea klaineana*, which known as the okoumé, angouma, or gaboon. *Triplochiton scleroxylon* is



Dry tropical formation in Sahel (Mali).

another of the highly prized African wood trees (also known as obeche, abachi, wawa, ayous, or samba) and, along with *Pentaclethra eetveldeana*, it marks the transition into pluviseasonal rainforests. Gabon is very rich in *Scyphocephalum ochocoa* forest, a tree also known as sorro, sogho, or ossoko.

The Amazonian rainforest, which Alexander von Humboldt called Hylaea, is also known as bush or jungle. It represents the most extensive tropical forest in the world, with some 6 million km² spread over eight countries, of which Brazil and Peru have the largest Amazonian areas, followed by Bolivia, Colombia, Ecuador, Guyana, Venezuela, and Suriname. It is one of the most biodiverse areas in the world given that it concentrates a fifth of all known plant species; it has been calculated that some 80,000 species live in these rainforests, and between 40 and 100 different tree species can be found in only one hectare. Among the most important in the American jungle formations are *Swietenia macrophylla* and species of the mahogany (Meliaceae) family in central and south America; among other trees of interest are *Cedrelinga catenaeformis*, *Parkia gigantocarpa*, *Mora paraensis*,



Huberodendron ingens, *Bertholletia excelsa*, and *Theobroma subincanum*, as well as the leguminous *Denizia excelsa* in Brazil and Venezuela, which stands at around 60 m in height. *Calophyllum brasiliense*, *Ocotea rodiaei*, *Psidium guajaba*, *Sapindus saponaria*, *Cedrela odorata*, and different species in the *Cordia*, *Leucaena*, and *Erythrina* genera also stand out. Among the palms it is worth noting *Astrocaryum chambira* and *Leopoldinia piassaba*, as well as different *Attalea*, *Oenocarpus*, and *Euterpe* species, among others.

In areas near blackwater-flooded rivers (*igapós* in Portuguese) the species richness is reduced; here *Ceiba pentandra*, which can reach 60 m in height, and different species of *Cecropia* and *Inga* stand out. *Calycophyllum spruceanum*, whose red bark peels off and thus prevents the growth of epiphytes on its trunk, is an interesting species. There is no shortage of spiny palms like *Bactris* and *Astrocaryum murumu*. In marshy areas the *Mauritia flexuosa* palm dominates, and in the large lagoons and areas with little water back-filling, floating plants such as *Victoria amazonica*, *Eichhornia*, *Salvinia*, and *Wolffiella*, among others, are typical.

As for the Asian tropical forests, they represent one of the biggest centres of biodiversity on the planet, and include the Regions of Hindustan, Indochina, Malaysia, Indonesia, and the Philippines, and Papua New Guinea and the islands of Micronesia, Melanesia, and Polynesia in the Pacific (Indo-Malayan Subkingdom). Apart from their floristic richness, with more than 25,000 identified species, their high number of endemic species is also noteworthy; this is due to the insular isolation and the volcanic origin of many of the islands that form these Asian and Pacific island groups. Thus, the Malay Peninsula, with 181,847 km², has around 2,500 tree species and some 8,000 vascular plant species. In addition, the whole territory homes 16 endemic families; most of them belong to the Dipterocarpaceae, Podostemaceae, Acanthaceae, and Plagiopteraceae families, among others. The Pacific Islands combine isolation, volcanism, and orophytism in one area, with mountains such as Puncak Jaya (4,884 m) in the Sudirman mountain range (Indonesia), considered to be the highest isolated mountain in the world. Puncak Trikora, at 4,730 m is in the same mountain chain; others include the Ngga Piliisit, at 4,717 m in Papua New Guinea, and Mauna Kea, at 4,205 m, in Hawaii. All of these conditions contribute to the formation of endemic species as demonstrated in the case of the Hawaiian Islands, with 32 endemic genera and some 2,700 native species, forming part of a flora of around 30,000 species.

Among the most significant trees in the Asian tropical forests it is worth mentioning different species in the *Durio* genus of the Bombacaceae family, such as *Durio zibethinus*, *D. lamanus*, and *D. testudinarumis*, a very rare tree that is on the IUCN's (International Union for Conservation of Nature) Red List as plant that should be protected. Another genus with trees of interest is *Syzygium* in the Myrtaceae family, with different species like *Syzygium aqueum*, whose fruits are prized as edible, *S. jambos*, and *S. samarangense*, among others. Large examples

of Fabaceae such as *Koompassia excels*, which can reach between 90 and 100 m in height, and *K. malaccensis* also appear. Dipterocarpaceae is one of the most represented families in these areas, with more than 357 species, among which *Shorea negrosensis* and *S. contorta* can be found in the Philippines, and *S. albida* in Borneo. Some of them are of commercial interest, for example, an edible fat similar to (and used as a substitute for) cocoa butter is produced from the seeds of *S. macrophylla*, also from Borneo. This fat is very easily absorbed by the skin, and so it is also used directly in dermatological applications and as a carrier for applying other substances to the skin. In addition it is used for making soap, candles, polishes, and cosmetics. However, *S. macrophylla* is a protected tree and appears on the IUCN's Red List as a vulnerable plant. Another very important tree of commercial interest is *Dryobalanops aromatica*, which gives the valued Borneo camphor, widely used in perfumery, and whose wood is also of high quality. Other significant Dipterocarpaceae are *Hopea ponga*, *H. papuana*, and different species of *Dipterocarpus* and *Vatica*, as well as several Ebenaceae of the genus *Diospyros*, among them *D. malabarica* and *D. rhodocalix*, which is widely used in medicine.

Pluviseasonal forests, characterised by the seasonality of the precipitation and not by the quantity of rainwater collected, appear in tropical areas with seasonal rain. As a consequence, these forests are not made up of trees that are always green: deciduous trees appear among them, which become more dominant with increasing periods of drought, therefore the ratio of perennial to deciduous trees varies according to the dryness conditions. These are called monsoon forests in Southeast Asia; they are also known as tropophilous forests for their changing appearance and function. Precipitation can be between 1,500 and 2,000 mm, even reaching 3,000 mm, but this rain falls in the summer and alternates with periods of dryness that can be as long as five or six months. The rainforest transitions to pluviseasonal forest, and from there to savannah woodlands, spiny forests, and desert as the periods of drought continue. This sequence is evident in some areas, like at the intersection between the Guinea-Congo rainforest and the Sahelian and Saharan zones in Africa, which is well represented in the Namibian-Zambezi and Sahelian-Sudanian Regions, and which also represent important speciation centres with a high rate of endemism (54%). Its flora, while numerically less on paper than its rainforest neighbours, is more original. Trees including *Azelia africana*, *Aningeria altissima*, *A. robusta*, *Chrysophyllum perpulchrum*, *Cola gigantea*, *Khaya grandifolia*, and *Mansonia altissima* are typical of these forests. Among other relevant species are *Triplochiton scleroxylon*, *Celtis mildbraedii*, *Holoptelea grandis*, *Sterculia* spp., *Trilepisium madagascariense*, and *Chlorophora excelsa*. As the dryness increases, as previously mentioned, the number of deciduous trees increase, and they become sparser, which is a characteristic of drought adaptation; in these conditions different species of



Baobab (*Adansonia digitata*) in Sahel (Mali).

Acacia (*A. senegal* and *A. tortilis*, for example) appear, as well as *Balanites aegyptiaca*, *Faidherbia albida*, *Adansonia digitata* (baobab), etc. These formations also integrate some species of *Commiphora*, which contain aromatic resins from which incense, perfumes, and medicines are obtained, among them *Commiphora myrrha*, which gives rise to myrrh, and *C. opobalsamum*, which gives the Balsam of Mecca. Different species of the genera *Crotalaria* and *Indigofera* are also present in these types of formations. In the savannahs *Brachystegia* and *Hypparrhenia* dominate.

In Southeast Asia monsoon forests in contact with rainforests can also be found. Very characteristic are the *Tectona grandis* (teak) jungles, a plant with excellent-quality wood, which means that this tree is now cultivated throughout the tropical world. Other trees in these South Asian formations are *Gmelina arborea*, and several species of the genera *Xylia*, *Lagerstroemeia calyculata*, *Bombax malabaricum*, and *Terminalia tomentosa*, among others. Examples of shrubby plants are *Vitex pedunculatus*, *V. pubescens*, *Croton oblongifolius*, *Dalbergia latifolia*, etc.

In Australia, forests of this type also exist when precipitation falls to between 600 and 1,000 mm with a pluviseasonal distribution, some of them dominated by

different species of *Eucalyptus* such as *E. marginata*, known as jarrah, a big tree that can reach 40 m in height. These are multilayer formations in which *Eucalyptus calophylla* and different species of the genera *Xanthorrhoea* and *Adenanthus*, among others, also appear. With dryer climates, *Acacia wandoo* formations appear, which are accompanied by other trees such as *Eucalyptus redunca*, *Acacia pulchella*, *Callytrix brevifolia*, and *Melaleuca uncinata*, among others. If the climatic conditions become sufficiently xeric, the eucalyptuses disappear and are succeeded by *Acacia aneura* (mulga), *A. acuminata*, and *A. crasbii*, among others.

In the American neotropic ecozone different types of tropophilous multi-seasonal forests also exist; these are very well represented in the Brazilian-Paranaense territory and Los Llanos in Venezuela. These isolated semi-evergreen rainforest plains can be recognised by their *Attalea butyracea* and *Spondias mombin* trees, accompanied by *Albizia saman*, *Sterculia petala*, *Pouteria reticulata*, *Guarea Guidonia*, and occasionally, *Pachira quinata*. When the climate becomes dryer, chaparrals (scrub bush thickets) of *Curatella Americana* appear, although these formations can also occur when these pluviseasonal forests experience continuous fires. These chaparrals form savannahs which also integrate *Byrsonima crassifolia* and *Bowdichia virgilloides*, along with some Gramineae including *Hypahrenia rufa*, *Trachypogon spicatus*, *Axonopus canescens*, and *A. purpusii*. The semi-deciduous forests with *Albizia niopoides*, *A. saman*, *Pterocarpus acapulcensis*, *Luehea speciosa*, *Guazuma ulmifolia*, *Ceiba pentandra*, *Melicococus bijagutus*, and *Coccoloba caracasana* are also very characteristic; in certain situations *Lecythis ollaria*, *Hura crepitans*, *Hymenaea courbaril*, and *Handroanthus serratifolius* can also appear in these forests. The most common palms are *Acrocomia aculeata* and *Bactris* sp.

If the climate becomes dry for more prolonged periods isolated dry forests with *Pterocarpus acapulcensis*, *Swietenia macrophylla*, *Guazuma ulmifolia*, *Spondias mombin*, *Albizia guachapele*, *Sterculia apetala*, *Cedrela odorata*, *Crataeva tapia* and *Clavija ornate* form. The dry deciduous forests are typical of more arid formations, which are partly formed by spiny plants and cacti. The former is constituted by *Caesalpinia coriaria*, *Copaifera officinalis*, and *Acacia tamarindifolia* among others; and the latter by *Acanthocereus tetragonus*, *Pereskia guamacho*, and *Cereus hexagonus*. In Brazil *cerrados* – open savannahs with trees that extend into the Mato Grosso and Goias States, dominated by Fabaceae – are characteristic. The most typical genera in the *cerrados* are *Bombax*, *Miconia*, *Annona*, *Byrsonima*, *Annona*, and *Eugenia*. Another characteristic dry formation with spines is known as *caatinga*, which extends to the north of Brazil and the south of Venezuela; it often contains cacti of the genera *Cereus*, *Cephalocereus*, *Pilocereus*, and *Melocactus*, among others. Among the spiny trees in these formations are *Annona spinosa*, *Acacia glomerosa*, *Ziziphus joazeiro*, *Erythroxylon*



Temperate beech forest (*Fagus sylvatica* L.). Navarra, Spain.

macrochaetum, etc. The dry forests of the Chaco Region (*Chaqueño* Forest), which extend from the south of Bolivia to the north of Argentina, are also very typical, however they are now very degraded. This is because the archetypal trees in the Chaco, *Aspidosperma quebracho-blanco* and *Schinopsis balansae* (the latter being known as quebracho colorado), have been heavily exploited to extract their excellent quebracho wood. These trees are accompanied by different shrubs such as *Ziziphus mistol*, *Cesalpinia paraguayensis*, and *Jodina rhombifolia*, among others.

Temperate or broadleaf forests

These forests are characteristic of territories with a Temperate Macrobioclimate, in general formed by broadleaved trees that are deciduous in winter, such as beech (*Fagus*), oak (*Quercus*), ash (*Fraxinus*), maple (*Acer*), etc. It is a type of vegetation that extends across every continent, and is most represented in the northern hemisphere, although some examples can also be found in southern Chile and Argentina. It has been calculated that they occupy an area of more than

800 million hectares. Its deciduous nature in the winter is an adaptation to long, cold winter months, although there may also be some evergreens that have adapted to these climatic conditions, such as *Ilex aquifolium* and *Hedera helix* growing in these regions. In Europe, the dominant species in these climatophilous forests are the oaks *Quercus robur* and *Q. petraea*, which can live with the beech *Fagus sylvatica*, in richer soils and in a more continental climate. In poorer soils, oaks live with the birch *Betula pubescens*, which dominates and becomes more obvious when the oakwoods are degraded. In alluvial and silty soils oak is associated with European Hornbeam, *Carpinus betulus*, while in flood-prone areas edaphophilous vegetation forms with *Fraxinus excelsior*, *Prunus padus*, and *Corylus avellana*. Towards the south these forests come into contact with Mediterranean vegetation in a well-defined band of *Quercus pubescens*. In the Eurosiberian Region elevations, oaks in the montane belt are succeeded by beeches, which in the upper-montane are associated with *Picea abies* and *Abies alba*. Towards Eastern Europe, deciduous forests are enriched with different species that survived after the glaciations, among them *Quercus aegylops*, *Q. castaneifolia*, and *Q. infectoria*, as well as the maples *Acer trautvetteri* and *A. velutinum* and some other beeches such as *Fagus orientalis* and *F. taurica*. The deterioration of these forests usually results in the formation of heath, shrubland dominated by different species of the genus *Erica*.

In North America, temperate forests, with a very rich flora, extend to the North American Atlantic Region, a large territory that, from the east to the west, runs from the Atlantic to the Rocky Mountains, and from the north to the south, from Canada to the Gulf of Mexico. In the northernmost areas, the climatophilous vegetation consists of *Quercus rubra* and *Fagus grandifolia* forests, which also contain *Quercus alba*, *Acer saccharum*, and *Betula lutea*. In certain situations it is not uncommon to see some conifers like *Pinus strobus*, *P. resinosa*, *Tsuga Canadensis*, and *T. caroliniana*. In the areas closest to rivers, with waterlogged soils, the edaphophilous vegetation comprises *Fraxinus americana* and *Acer saccharinum*. Towards the south, with warmer more temperate thermotypes, and with a clearly tropical influence, the oaks give way to heat-loving trees as well as laurels such as *Liriodendron tulipifera*, *Tilia heterofila*, *Nyssa sylvatica*, *Aesculus octandra*, and different species of *Magnolia*, like *M. grandiflora* and *M. acuminata*. Towards the west, in the Rocky Mountain and Californian Regions the temperate vegetation is dominated by conifers, and of these the previously mentioned *Sequoiadendron* forests are the most important.

In East Asia, in the Sino-Japanese Region, a great variety of temperate deciduous forests, characterised by their floristic richness, are found; they contain more than 300 endemic genera and 20 endemic families. Floristically, these are the richest extratropical forests in the world because, in contrast to Europe, these



Lenga beech forest (*Nothofagus*) in Patagonia (Argentina).

territories did not suffer glacial devastation, and so tree genera exist here that have disappeared on the old continent. Thus, several dozen species of the genus *Quercus* appear in the temperate formations in the north, and some fifty or so different Magnoliaceae exist in the southernmost laurisilva (laurel forests) formations. In the northernmost areas, the deciduous forests are formed by, among others, *Quercus monopodica*, *Q. mongolica*, *Tilia amurensis*, and *Corylus mandshurica*, and where the soil is fresh and deep these forests are enriched with *Fraxinus mandshurica*, along with willow *Salix rorida*, to form ash and willow groves in edaphophilous communities. To the south of the Yellow River, the climate becomes warmer and a clearly tropical influence appears, with regular rainfall between 1,000 and 2,000 mm, while the average annual temperature ranges between 15 °C and 20 °C, and there are no frosts. The conditions in this part of East Asia mean that the broadleaved forests are very rich: the only genus in which more than ten species can be found is *Quercus*, among them *Q. gilva*, *Q. vibrayeana*, *Q. acuta*, and *Q. glauca*. It is not uncommon to find genera that have disappeared in other temperate Holarctic zones, such as *Castanopsis*, *Lithocarpus*, *Ciclobalanus*, *Ciclobalanopsis*, and *Cryptomeria*, among others. Some plants that are widely used in gardens appear in these



Eucalyptus forest in Tasmania.

forests, like *Aralia*, *Gardenia*, and *Paulownia*. Towards the mountains there is a warm evergreen level extending up to 500 m, made up of *Castanopsis heterophylla*, *Ciclobalanopsis glauca*, and *C. gracilis*, which marks the passage to a higher hillside-level with mixed formations of *Symplocos stellaris*, *Ilex latifolia*, *Quercus alleana*, *Q. glandulifera*, and *Fagus engleriana*; above this a montane belt, with deciduous trees such as *Acer palmatum*, *Platycaria strobilacea*, *Carpinus cordata*, *Castanea henryi*, *Toxycodendron trychocarpon*, and *Sapium sebiferum*, can be found. In this area the edaphoxerophilic formations of *Pinus taiwanensis*, *Rhododendron mairi*, and *Sorbus amabilis* are spectacular.

Forests in the Himalayan territories, all of which represent one unique biogeographic unit, are formed by young flora: as young as the whole territory itself. Its floristic background originates in the mountains of China, Burma, and Assam, to which it is strongly related. However, it appears that the ice glaciers did not sweep through all of the flora in this territory, which means another native floristic background exists here, which has a high number of endemic species such as *Milula*, *Smithiella*, *Edgaedia*, and *Paroxygraphis*. In the east there are laurel forests with different species of the genera *Altingia*, *Castanopsis*, *Cinnamomum*, *Engelhardtia*, *Exbucklandia*, and *Persea*, among others. In this mountain chain,

thriving in the fog, is a mixed forest containing broadleaved trees and conifers, in which species of the genus *Quercus* are well represented; here, *Quercus baloot*, *Q. leucotrichophora*, and *Q. semicarpifolia* appear, along with *Abies spectabilis*, *Picea smithiana*, *Pinus rosburghii*, and *P. wallichiana*. In the west, to the north of India, the vegetation clearly becomes zoned into floors, in such a way that one can recognise a tropical floor, reaching up 900 m and dominated by broadleaved trees, among which *Shorea robusta*, *Dendrocalamus strictus*, and different species of the genus *Terminalia* can be recognised. Above this vegetation and up to 1,400 m there is a temperate forest dominated by *Quercus incana* and *Rhododendron arboreum*, above which the coniferous forests appear.

In some areas in the southern hemisphere we can find examples of temperate forests with genera originating in Gondwana (the southernmost supercontinent that formed part of the Pangaea supercontinent approximately 300 to 180 million years ago) such as *Nothofagus*, *Agathis*, and *Dacrydium*, among others; these are usually mixed broadleaved and conifer forests. Thus, the forests of this type in the Austroamerican Subkingdom are very important in southern Chile and Argentina (Middle Chilean-Patagonian and Valdivean-Magellanian Regions). Here different species of *Nothofagus* characterise the landscape, making it very beautiful and colourful because of the contrast between deciduous and evergreen trees. Among the most characteristic species are *Nothofagus antartica*, *N. dombeyi*, *N. alessandri*, *N. alpina*, *N. betuloides*, *N. glauca*, and *N. pumili*. Variations of this type of forest also exist in Australia and New Zealand; in Tasmania *N. gunnii* and *N. cunninghami* can be found, which live alongside some *Eucalyptus* species. In New Zealand the conifer forests, which have some endemic species, are of great importance, in particular it is worth noting the formations of *Araucaria heterophylla* and *Agathis australis*, although *Dacrydium cupressinum*, *Podocarpus totara*, *Phyllocladus trichomanes*, and the lauraceous *Beilschmiedia tarairi* and *B. bancroftii* also form part of the New Zealandian forests. There is also no shortage of different *Nothofagus* species such as *N. fusca*, *N. menziesii*, and *N. solandri*, among others.

Sclerophyllous or Mediterranean forests

These forests occupy territories with noticeably irregular rainfall, with arid periods at least two months long that coincide with the warmest times (summer). These forests are of modest height, and have small and hard (sclerophyllous) evergreen leaves, which in some cases are tormentous (hairy) on the underside, all as a strategy to avoid excessive water loss given that this is the limiting factor in these climates. The degradation of these forests gives way to shrubland and thornscrub: the spinyness is an extreme adaptation to drought because the thorns are leaves

whose laminae have reduced down to the central vein, which forms the spike. In some cases of aphyllia (when leaves are reduced to a minimum) the branches and trunk of plants take on a green colour because of the presence of chlorophyll, which is required to supplement the lack of chlorophyll in the leaves. The fragility and the originality of the biota (endemic species richness) is another of the characteristics of these formations. These types of forest occupy territories with a Mediterranean Macrobioclimate, which are situated between the 23° and 52° latitude and parallels N and S. Here, there is a clear contrast in seasonal temperature that is accentuated by increased continentality. This macrobioclimate is spread across the five continents, occupying an area representing 1.2% of the emergent land area, with a total of 3,079,000 km², of which the Mediterranean basin (Mediterranean Region) occupies the largest surface area, with some 2,300,000 km² spread throughout the whole of Europe, Africa, and Asia. The rest of the Mediterranean areas are located to the west of the continents and are represented in the southwest of North America (Californian Region), with 320,000 km², and north-central Chile and south-central Argentina (Middle Chilean-Patagonian Region), with 140,000 km². In Africa this macrobioclimate occupies the south and west of South Africa (Cape Region), with 9,000 km², and in Australia it occupies the south west of the continent (Southwest Australian Region) taking up 310,000 km².

Floristic richness of the Mediterranean macrobioclimate

Areas with a Mediterranean climate	Area in Km ²	Floristic richness	% of endemic species
Mediterranean Region	2,300,000	19,000	21
California Region	320,000	4,500	48
Middle Chilean-Patagonian Region	140,000	3,500	45
Cape Region	9,000	13,000	60
Southwest Australian Region	310,000	8,000	70

The Eurasian territory, with a Mediterranean climate, occupies the whole of the basin containing the Mediterranean Sea, forming a biogeographical unit that, in the strict sense, is the Mediterranean Region, extending from the Iberian Peninsula to the Middle East, including the north of Africa, from north Morocco to Tunisia and Cyrenaica, but excluding the Libyan and Egyptian coasts that belong to the Saharo-Arabian Region. The Mediterranean climate comes inland towards the Caucasus until Afghanistan and central Asia; at this point, although Armenia and Uzbekistan have a Mediterranean climate, they belong to another biogeographical unit, the Iranian-Turanian Region.



Mediterranean *Quercus rotundifolia* forest. Extremadura, Spain.

With regard to the vegetation, the Mediterranean Region is characterised by the presence of evergreen sclerophyllous forests, dominated by tree species belonging to the *Quercus* genus, within the group with hard leaves (sclerophyllous). The most representative tree in this territory is the holm oak (also known as the evergreen or holly oak) *Quercus ilex*, with the ssp. *ilex* (known as *encina* in Spanish) in its optimum range in the central Mediterranean, while towards the west the ssp. *rotundifolia* (known as *carrasca* in Spanish and synonymous with *Q. rotundifolia* and *Q. ballota*), which is the most representative species on the Iberian Peninsula, becomes more common. Some laurisilva plants, like the namesake laurel (*Laurus nobilis*), the strawberry tree (*Arbutus unedo*), and laurustinus (*Viburnum tinus*) form part of these forests. When the soil becomes sandy and poorer, holm oaks coexist with cork oaks, *Quercus suber*, which can form cork oak groves under certain conditions. In the east Mediterranean *Quercus trojana* and *Q. infectoria* are common, living alongside *Arbutus andrachne*, among other plants. All of these trees form part of the climatophilous-series vegetation; when these forests are degraded bushes appear, commonly the kermes oak, *Quercus coccifera*, as well as the mastic *Pistacia lentiscus*, and other plants such as *Rhamnus alaternus* in the west Mediterranean. In the centre and east Mediterranean, these bush formations contain *Quercus calliprinos*, *Pistacia palestina*, and *Palyurus spina-christi*, among others. In these situations pines like *Pinus halepensis* in the west and *P. brutia* in the central and eastern areas are



Andalusian cork oak (*Quercus suber*) grove.

common; further degradation leads to formations of thyme and rosemary. Apart from the Mediterranean pines already mentioned, *P. pinaster* can also be found in poor substrates and *P. pinea* in sandy substrates.

In North America, the Mediterranean climate is well represented in the South California (USA) and Baja California (Mexico) Provinces, both territories in the Californian Region. The vegetation is made up of mixed oak woods (including many holm oaks) and chaparral scrub, which develop in any type of substrate and in a wide variety of thermotypes and ombrotypes. In the Mediterranean bioclimate, which is pluviseasonal, dry, oceanic, and subhumid in the thermo- and mesomediterranean levels, oakwoods containing many holm oaks appear at the mature climax vegetation stage; here one of the most representative trees is *Quercus agrifolia*, the California or coast live oak, known locally in Spanish as *encino*. In the more northern areas of California, with a strong ocean influence and high humidity, the coast live oak is associated with *Lithocarpus densiflorus* and *Arbutus menziesii*. Here, in very deep and rainy valleys, the holm oaks are substituted for *Sequoia sempervirens* formations. When the climate becomes more continental the oak woods become dominated by other types of oak such as the interior live oak *Quercus wislizenii*, which is accompanied by the blue oak *Quercus douglasii* and pines like *Pinus sabiniana* also form part of the vegetation, above all at the mesomediterranean level. In the cool valleys where some flooding can occur, the holm oak dominated oakwoods are replaced by *Quercus lobate*



Enclosed holm oaks cultivated on land exploited for pasture in Extremadura, Spain.

(known as the valley oak or roble). These mixed holm oak and roble forests are bordered with thickets of *Quercus dumosa*, *Q. durata*, *Q. turbinella*, *Arctostaphylos glauca*, *Ceanotus tomentosus*, *Ephedra californica*, *Pinus monophylla*, etc. in the first stages of succession.

In South America, the territories with a Mediterranean climate are found in Chile and Argentina. In Chile they are found in the Central Zone which is included in the Middle Chilean-Patagonian Region. This is an area between the xerophytic desert zones in the North (Coquimbo and Antofagasta territories), and the temperate zones of the Valdivia and Temuco municipalities in the South. The *Quillaja saponaria*, or soap bark tree vegetation, is the most characteristic in this area and is situated on the cooler slopes. Other trees that distinguish these formations are *Lithraea caustica*, *Cryptocarya alba*, *Escallonia pulverulenta*, *Schinus latifolius*, *Sophora macrocarpa*, *Azara petiolaris*, and boldo, *Peumus boldus*, among others. However, on sunnier and rockier slopes the edaphoxerophilous vegetation is formed by *Puya berteroaana* and *Echinopsis chiloensis* along with *Colletia spinosa* and *Colliguaja odorifera*, among others. *Acacia caven* is also often found in these dry Central Valley areas along with *Prosopis chilensis* and sclerophyllous trees from the zone. In ravines near water courses edaphophilous vegetation like *Persea lingue*, *Cryptocarya alba*, *Luma chequen*, *L. apiculata*, *Drimys winteri*, *Beilschmiedia miersii*, *Blepharocalyx cruckshanksii*, and *Crinodendron patagua* appears. Towards the Andes, in some enclaves the sclerophyllous vegetation is

enriched with different species of *Nothofagus*, among them, *N. macrocarpa*. In the Andes mountain range some *Austrocedrus chilensis* conifer forests can be found, accompanied, among others, by *Kageneckia oblonga*, which is one of the plants that marks the altitudinal limit of the tree and shrub vegetation.

In South Africa there is a small territory with a Mediterranean bioclimate which is of great floristic originality and which extends from the Olifants River on the Atlantic, to Port Elizabeth on the Indian Ocean, occupying a strip between the sea and the inland mountains: including Cedarberg, Wittenberg, Swartberg, Baviaanskloof Baviaans Kloof, and Groot Winterhoek. The South African territory is very floristically rich: it hosts 8,500 species, of which 6,200 (no less than 75%) are endemic. It is considered to be a biogeographic kingdom, but given the relationships between its flora and that of the surrounding territories – on one side Atlantic-Paleotropical (Namibian-Zambezian Region) and on the other Indian-Paleotropical (South-Eastern African Region) – it seems more logical to assign it to the biogeographical Region category. On the other hand, the Cape Region flora does bear a clear relation to that from Australia, New Caledonia, and temperate South America, for example, elements like *Cunonia capensis* are related to New Caledonian flora. Similarly, the floristic relationship to Australia is huge through the Proteaceae and Restionaceae families that they share with the Cape Region. The sclerophyllous vegetation in this territory was formed by an evergreen forest of *Rapanea melanophoeos*, *Podocarpus latifolius*, *Halleria lucida*, *Maytenus acuminata*, *Diospyros whyteana*, etc. These formations are now severely depleted because of repeated fires, and where the soil is sandy and nutrient-poor they have been replaced with heathland known as *fynbos*, which is physiognomically very similar to the Holarctic Mediterranean shrubland and heath. It comprises different species of the genus *Protea*, such as *P. laurifolia*, *P. mellifera*, and *P. cynaroides*, among others. Some species present in the *fynbos* belong to the well-represented genus *Erica*, including the spectacular *E. cerinthoides*, *E. baccans*, *E. versicolor*, etc. The genera *Aspalanthus*, *Agasthoma*, *Cliffortia*, *Muraltia*, and *Euryops*, among others, are also important. The only tree that appears in the scrubland is *Leucadendron argenteum*. Inland, the soils become increasingly clayey and precipitation decreases, and so the shrubs become more open, leading to the formation known as *renoster bush* (the Renosterveld vegetation type), which mainly comprises *Elytropappus rhinocerotis* that gives way to the semi-desert *karroo* towards the inland, and from there leads into the Atlantic deserts of Namibia.

In Australia, the Mediterranean Macrobioclimate is mainly located in the southeast, in the Mediterranean Australian Region, although another smaller core also exists in the south; both zones are separated by a territory formed by savannahs and subtropical semi-deserts. In the southeast of Australia, in the rainiest areas (with precipitation between 1,250 and 1,500 mm), forests of *Eucalyptus diversicolor*, known as *karri* still remain; these trees can reach 70 m in height and

live more than 300 years. Other trees accompany the *karri*, such as *Eucalyptus megacarpa* and *Casuarina decusata*, among others. If the precipitation decreases to under 1,000 mm or even 600 mm, *jarrah* forests appear which are dominated by *Eucalyptus marginata*, another large tree that forms multilayer forests in which species such as *Eucalyptus calophyla*, *Banksia grandis*, and different species of the genera *Xanthorrhoea* and *Adenanthus*, among others, appear. *Acacia pentademia* prefers the drier zones in the *jarrah* forest. When precipitation descends below 600 mm *wandoo* formations appear, which are dominated by *Eucalyptus wandoo*, accompanied by other trees such as *Eucalyptus redunca*, *E. salmonophloia*, *E. loxopleba*, *Acacia pulchella*, *Callytrix brevifolia*, and *Melaleuca uncinata*, among others. If precipitation drops below 300 mm, the eucalyptuses disappear, are instead substituted by more plants which prefer more xeric conditions to form the vegetation type called *mulga*, formed by *Acacia aneura*, *A. acuminata*, and *A. grasbyi*, among others. In the more arid zones open bushes which branch out from the base, known as *mallé* grow, and in which *Eucalyptus oleosa*, *E. dumosa*, and *E. gracilis* can be found. The Australian Mediterranean scrubland, known as *kwongan*, principally containing low-lying bushes, is dominated by Proteaceae like *Banksia*, *Hackea*, and *Dryandra*, or Myrtaceae including *Melaleuca* and *Agonis*. Fire is a constant in these formations; the tree-like monocotyledon *Xanthorrhoea* is the primary coloniser after fire, and facilitates the colonisation of other pyrophytes like *Banksia* and *Actinostrobos*.

Other Types of Forest

Apart from the forests described as climatophilous, there are other types that depend exclusively on the soil. This is the case of the riparian, gallery, tropical, and mangrove forests, some of which have already been discussed in the relevant climatophilous section.

Riparian or gallery forests

These forests, comprising edaphophilous vegetation, are situated along rivers, and sit in cool moist soils near water, which may even become flooded at times of high water levels. The riparian vegetation also comes into contact with the surrounding climatophilous flora. The major European rivers with a permanent course go through different changes in water level throughout the year, which means that when the level is high the areas surrounding the channel become flooded. In these temporary flood-zones the vegetation comprises hardwood trees such as *Fraxinus excelsior*, *Prunus padus*, and *Corylus avellana*. In contrast, towards the riverbed itself, softwood trees, including alders *Alnus incana* and poplars, *Populus nigra* and



Riparian formations on the Tera River (Zamora, Spain).

P. alba, form the vegetation. These formations come into contact with *Salix alba*, *S. purpurea*, and *S. triandra* willows that extend further into the water and which mingle with the reed beds and riparian grasslands. In East Asia, in the northernmost areas on the plains with cool and wet soils, the vegetation consists of *Fraxinus mandshurica*, in contact with *Alnus hirsuta* alders and *Salix rorida* willows.

In tropical countries, gallery forests are very complex and floristically rich, and are dominated by large trees, vines, epiphytes, and palms. The species forming these forests are adapted to different moisture conditions, given that some of them are in permanent contact with the water and others tolerate temporary flooding in periods when the river is high. The forest structure is similar in every tropical country, but is characterised by the species specific to each individual territory.

Swamp and mangrove cypresses

In the south-eastern United States the wetland zones are spectacular with bald cypress (*Taxodium distichum*) formations, that extend through Louisiana, South Carolina, Illinois, Mississippi, Florida, and Texas. This is a type of conifer is able to withstand permanent flooding and is sometimes also found living alongside the pin oak or swamp Spanish oak (*Quercus palustris*) in wet places which do not flood.



Mangroves (*Rizophora mangle*) in Los Roques archipelago (Venezuela).

The mangroves are very different. These are coastal forests that develop on the majority of non-rocky tropical coastal shores, although they can also be found in some extra-tropical nuclei such as in Egypt and Bermuda, as well as in the south of Brazil and the north of New Zealand. The largest and richest mangroves, with more than fifty tree species, are those in the Indian and Pacific oceans, especially those on the East African coast and those in the group of peninsulas and islands in Southeast Asia; it has been calculated that the Ganges delta mangroves occupy a million hectares. The Atlantic mangroves – that is, those on the West African, South American, and Caribbean coasts – are also formations of great interest, although they are less extensive and poorer in species, with only about ten different tree species.

The conditions that support mangrove trees are very particular. They develop in coastal areas, although they can penetrate inland, following river courses. This means that they tolerate variable salinity levels. They are very closed formations, with a height between 15 and 20 m, and at high-tide the level of the water can reach the base of their crowns. These very specific conditions mean that the trees have special roots, some form stilts and others, called pneumatophores, are aerial. Another feature of mangrove trees is that they are viviparous: the embryo continues developing while the seed is still attached to the parent plant, and so it detaches already at an advanced developmental stage, therefore rapidly sending out a tap root into the ground. The mangrove tree species belong, among others, to the genera *Rhizophora*, *Avicennia*, and *Bruguiera*.

The trees



They appeared on Earth some 370 million years ago, when life had just started to venture out of the water, and over this long period trees have witnessed the majority of their primitive evolutionary companions become extinct, many of which emerged after them. They have become the most competitive group in the plant kingdom, thanks to their plasticity and commitment to height. Trees are the clear winners in the struggle for light, essential for producing the nutritional substances they, and the vast majority of the Planet's inhabitants, need. Some trees, such as the giant sequoias, some eucalyptuses, and firs, are the oldest living things in existence. They are very complex organisms, and generous beings who welcome and give life to millions of other organisms.

Human beings have lived with trees since our beginning. Trees were the physical and spiritual refuge of our ancestors, their source of heat, suppliers of food and medicine for their illnesses, and they provided the raw material fundamental for our evolution. In combination with lightning, they gave our ancestors fire; they were their bows and their staffs, the houses that protected them, and the paper where they accumulated knowledge to pass on to future generations. Their wood allowed human mobility to increase, in the form of carts, boats, railway sleepers, and even the first aircraft. The most primitive wheels were made from wood, and from the sap of some trees, tyres.

Unfortunately, the human species has not always held itself up to the generous heights of trees. Like a senseless plague that kills the host that feeds it, humans have consumed huge areas of forests all over the Planet, and continue to do so as if they were inexhaustible. We are suffering the consequences of this irrational overexploitation that, together with other causes, is resulting in climate change, a decline in rainfall, desertification, and a bleak future for our survival if we do not change our ways. An Indian proverb sums up the importance of trees in a much more beautiful way: "trees are the pillars of the earth and if we cut them down the sky will fall on us".





Line of linden trees, *Tilia platyphyllos*, Coimbra, Portugal.

We have treated them like enemies when in fact trees are social beings. Their communities, the forests, generate the best conditions not only for them, but also for countless animal and plant species. Trees actively collaborate in the appearance of oxygen in the atmosphere and decisively contribute to maintaining an air composition which is the healthiest for us. They actively fight against global warming, capturing atmospheric carbon and accumulating it in their trunks and branches. They also trap and fix many contaminating particles, such as dust, soot, and ash. They attract rains, help to retain water and keep it clean, and protect the soil. Their crowns soften rainfall and allow water to slowly infiltrate into the ground, minimising flooding and the wearing-away of fertile ground. Their roots fix slopes and help to avoid erosion; the shade of their leaves favours a humid environment and when they accumulate in the soil they fertilise it.

In cities, trees also improve environmental conditions, and so too, the quality of the lives of their citizens. Underneath their crowns spaces for relaxation or gatherings are created; their branches filter solar radiation, reduce wind speed, and soften sudden changes in temperature. Urban trees noticeably reduce noise, generating a more comfortable environment in streets packed with cars. They even have psychological benefits: their form, size, colour, and smell stimulate our



The “San Cristobal Yew” in the Valdueza Mountains, *Taxus baccata* (León, Spain).

senses, and the changes in their foliage allows us to perceive the passing of the seasons in cities where every day is the same.

When they are mature, they form part of the living history of the place they inhabit, sometimes History in capitals, such as the Hundred Horse Chestnut or the *Gernikako Arbola* (the “Tree of Guernica” in Basque). Many have their own names and others are linked to customs and traditions which in many cases are still alive. For example, many small villages in Asturias celebrate “*Conceyu*”, an invocation which guarantees the promises and important decisions made in the community, under their many-centuries-old yew. In the Valencian town of Canals, residents of all ages usually meet underneath an enormous London planetree called *La Lloca*, which has become the town’s social and cultural emblem; it is an evocative name because it means ‘broody hen which sits on her eggs to protect them’. In Pelete, Pontevedra, they wet the trunk of the old oak tree, or O Pelete, with their best wine to celebrate the harvest. We could go on giving many more similar examples because almost every village or city has a tree that they honour.

We should care for and preserve the trees that we still have, as well as plant as many more as we can. Planting and looking after trees is one of the most effective things that each one of us can do to improve our community and help

the environment. Here, it seems appropriate to finish with another wonderful Indian proverb: “the world is not something that we inherit from our parents, but rather something that we borrow from our children”. The more trees the world contains, the better our legacy.

Tree classification

Although there are still many undiscovered species on the Planet, and the data are not conclusive or exact, it appears that around 1,000,000 plants are currently known, of which some 350,000 species have been classified and accepted as valid, 420,000 must still be resolved, and the rest are synonymous. Of all these plants, only about 30,000 species are considered to be trees.

In plant systematics spermatophytes or seed plants, among which trees are found, are divided into gymnosperms and angiosperms. Gymnosperms are vascular plants and produce unenclosed “naked” seeds, and include ginkgo, conifers, and cycads. Angiosperms are plants with eye-catching flowers and seeds encased in fruits that, in turn, are divided into liliopsida (monocotyledons), which include palms, yuccas, and nolinias, and magnoliopsida (dicotyledons) among which are broad-leaved trees and shrubs.

To help their classification, they are grouped into families, genera, and species. The latter can produce natural varieties and can be broken down into several smaller units such as subspecies. For example, *Acer opalus* ssp. *granatense*. They can also produce cultivated varieties (cultivars), such as *Platanus orientalis* var. *acerifolia*, or hybridisations between species, both natural and cultivated, which are distinguished with an x, as in the case of *Aesculus x carnea*.

What is a tree?

Defining a tree or a bush seems easy at first: according to botanists a tree is a woody perennial plant, more than 7 m in height, that has a single trunk and which becomes branched at the top. On the other hand, a shrub is a woody perennial plant, not exceeding 7 m in height, which continuously branches from its base into several trunks. They are two different strategies, one using a tall trunk with the branches occupying maximum airspace in order to capture sunlight, while the other concentrates its efforts on sprouting from the base and branching.

But when we try to apply these definitions in the field or in a forest, what seems obvious on paper becomes less so, there are many cases of intermediates between trees and shrubs in numerous species. Other plants, like climbers, cycads, dragos, yuccas, nolinias, and palms, among others, further complicate the issue. One day when debating the question the tropical botanist Francis Hallé,



The "Romanejo Oak", *Quercus pyrenaica*. Cáceres (Extremadura, Spain).

settled the matter with a joke: a tree is the type of plant that, if you crash your car into it, the car breaks.

We can divide trees into three parts that are clearly different but that are closely related to each other: the root system, the trunk, and the crown.

The root system

The roots anchor the tree to the ground, explore for and pump water containing mineral elements towards the crown, store reserves, produce hormones that regulate the growth of the crown, establish symbiotic relationships with fungi, bacteria, and other microorganisms in the soil, and even produce sprouts to reproduce the tree.

Initially, and for the first few years the system is pivotant (axonomorphic, i.e. a taproot) and progressively branches, but then it switches to instead extend horizontally. In the soil it occupies between 3 and 5 times the projection of the crown, although the roots are mainly concentrated in the first 30-40 cm and do not generally exceed 2 m in depth. The roots capture and absorb moisture through the root hairs. Any alterations in the place in which the tree develops



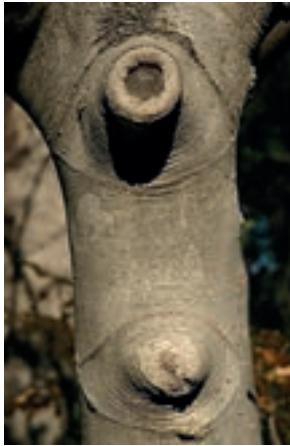
The "Father Beech", *Fagus sylvatica*, Tarragona, Spain..

– lifting, levelling out, flooding, excavation, compaction, etc. – adversely affects its development, in most cases leading to its death. Some species can send out aerial roots, like the genera *Ficus* or *Metrosideros*, and others can modify their roots, e.g. by producing pneumatophores, in order to breathe in swampy environments or where there is a lack of oxygen.

The trunk

The trunk is the support and the link joining the roots to the tree crown. If we make a transversal cut we can see a series of concentric rings in the cross-section.

– The wood or xylem, is formed by the alburnum (or sapwood) and the duramen (or heartwood), although this distinction is not present in every species. The xylem is the set of vessels responsible for transporting the raw, or xylem, sap (containing water and mineral salts) from the roots to the crown; they are coated with lignin and other substances to give them strength. When they stop



Woundwood, a "callus".



Maclura pomifera sap.
(Raf.) C.K.Schneid.

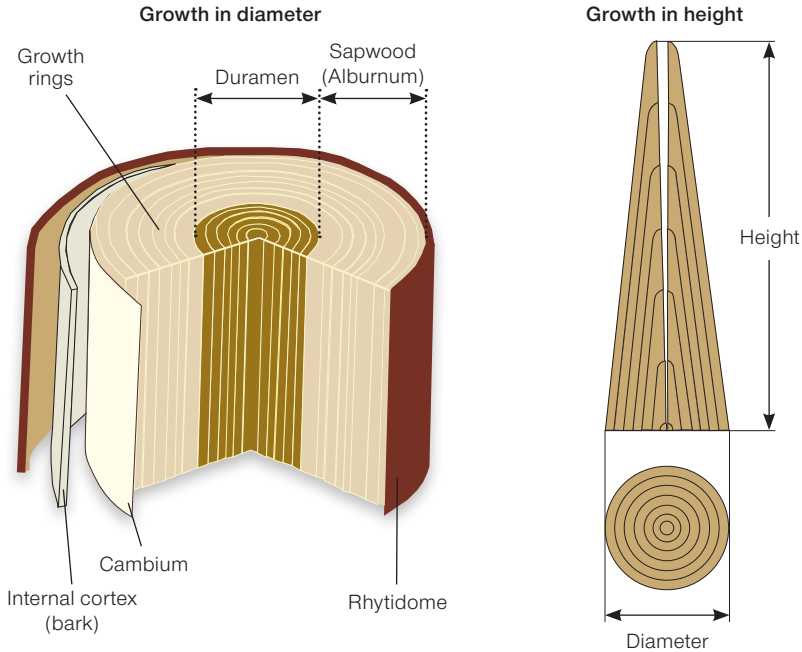


Betula albosinensis bark.
Burkill.

being functional because of obstruction, cavitation, or for any other reason, they form duramen; but it is not a dead element because it stores chemicals such as tannins and resins that, by forming a barrier, allows trees to defend themselves from outside attacks.

- The cambium is the tissue-generating zone that, located between the xylem and the phloem, allows annual growth in the tree's girth, generating xylem towards the interior and phloem towards the outside. The activity of the cambium depends on the environmental conditions where it develops; it is a tissue that constantly regenerates and so wounds can be progressively covered from the borders until they are completely closed (woundwood).
- The bast (known as liber or phloem) is generated by cambial activity pushing outwards. It comprises a set of shorter vessels than those in the xylem, which transfers the elaborated, or phloem, sap (containing organic nutrients, or, photosynthate) from the leaves towards the roots.
- The bark is the trunk's protection against external attacks. It is found immediately next to the phloem and is a thin layer of cells that differentiate towards the exterior, forming the bark. It contains suberin and sometimes tannins and other chemicals that make it impermeable and protect the tree from climatic agents and parasites; it is also equipped defence systems against herbivores, such as thorns, and spines, etc. The bark has small openings called lenticels that allow the gas exchange required with the exterior.

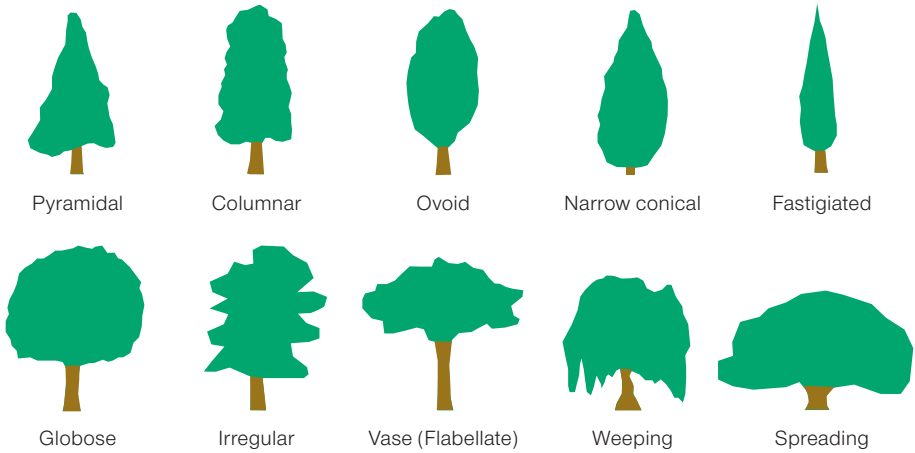
The amount trees grow every year, both in height and girth, is based on several factors, such as age, weather conditions, exposure, etc. For this reason, when we want to count a tree's growth rings it should be done close to the base, as the number of rings decreases with height.



The crown

The crown is the structure that allows sunlight to be captured through leaves; it also contains the reproductive elements of the tree, the flowers and fruits. It is formed by division of the trunk into the many branches which comprise it (primary, secondary, etc.), which become increasingly thinner until they reach the extremes, where the terminal buds, which cause growth in the height and length of the tree, are located; it also produces hormones, which govern root growth or inhibit the development of other shoots.

Tree crowns can take many different forms, both in function and terms of their architecture and growth model, under the influence of the environmental conditions surrounding them. The shape of the crown varies; thus, ginkgos have a pyramidal shape, oaks a globular shape, pinyon trees are flabellate (parasol-like), and some willows have a pendulous (drooping) appearance. It should also be kept in mind that trees go through several different phases or stages of growth that can alter their initial appearance: e.g. an American persimmon is pyramidal when young, but becomes globular with age.



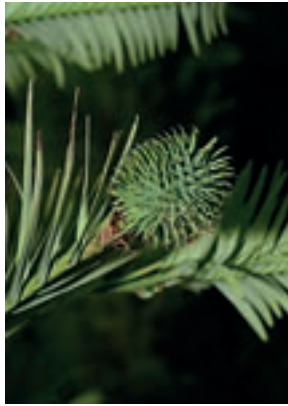
- The buds, protected from the outside by cataphylls (rudimentary scales), are organs that contain cells capable of dividing indefinitely, thus allowing them to grow each year. The rest of the tree's temporary aerial structures, including leaves, flowers, and fruits, originate from the development and differentiation of these cells. Different types of buds exist: terminal buds are located on the extremes of the branches, are larger, and house tissues that will develop by extension; lateral, or auxiliary, buds are usually located on the leaf axils,



Sprouting and flowering on a *Fagus sylvatica* beech.



Male *Wollemia nobilis* cone.
W.G. Jones.



Female *Wollemia nobilis* cone.
W.G. Jones.



Bisexual *Erythrina caffra*
flowers. Thunb.

can carry leaves or flowers, and their arrangement, or phyllotaxis, determines the branching structure and growth habits of the tree. There are also dormant buds, which can be latent for years and only develop when necessary.

- The leaves are responsible for processing and transforming, by photosynthesis, the raw sap into the elaborated sap required for proper growth of the tree. Gymnosperms usually have needle-like or scale-like leaves, while angiosperms, have simple leaves, with or without a petiole, which can take many forms, e.g. pinnate (leaflets arranged in rows along an axis), compound palmate (several leaflets arranged like the palm of a hand), etc. They are important elements for differentiating between some species, and so their description along the length of the sprout, the type and shape of the leaf, as well as the shape of its base and apex are taken into account. The margin and the type of venation must also be characterised, and it is equally important to check the colour of the leaf upper surface and underside, the texture, and any coatings it may have.
- Flowers are responsible for reproduction. Some species, such as alders, produce their first flowers early, between 10-15 years; in contrast, as in the case of some oaks, some do not produce flowers for at least 30-40 years. The flowers are usually small and discrete for trees that are wind-pollinated (anemophilous), such as conifers, poplar, and ash. When they are fertilised by insects (entomophilous), like the magnolias, lindens, and acacias, they have showy petals, subtle aromas, or nectar. Trees can be monoecious, with flowers of each sex found on the same tree, like many trees in the *Pinus*, *Zelkova*, and *Tilia* genera, or dioecious, such as ash and carob trees.



Alectryon tomentosum
capsules (F. Muell.) Radlk.



Crataegus intricata pomes
Lange.



Acer tataricum samara.

- Dioecious trees have flowers which are either male only or female only, such as yews, Osage orange trees, or ginkgos. Flowers can be unisexual – masculine or feminine – or bisexual, also called hermaphroditic, with both sexes on the same flower. Gymnosperms do not have true flowers; the pollen is formed in the microsporophylls and the ovules in the megasporophylls, which are normally protected by specialised leaves that are usually hard (a strobilus, i.e. pine cone). Tree flowers may be solitary, axillary, or terminal, although they are most commonly grouped into inflorescences, usually racemose, cymose, or compound.
- Gymnosperm plants do not produce true fruits because their seeds are not enclosed in an ovary. In conifers – such as pines, cypresses, etc. – these false fruits are called strobili or pine cones; they are hard in order to protect the seeds arranged in their interior. The angiosperm fruits carry seeds in their interior which result from the fertilization of the ovule, located inside the ovary, by pollen. Their function is to protect the seed and facilitate its dissemination. Many types of fruit exist: broad-leaved trees produce indehiscent nuts like walnuts, dehiscent fruits such as legumes, or capsular, follicular, or fleshy fruits, for example, drupes and berries.
 - Seeds use many diverse strategies to spread themselves. Some species, such as pine, maple, or rosewood, have alas (wings) so that the wind moves them; others, like poplar, have small seeds wrapped in cottony fibres. Yet other species use animals, usually birds or mammals, for dissemination and so they produce colourful, fleshy, or nutritious fruit to attract them, as, for example, in the case of cherry, olive, and oak fruits; others spread



The "Temblar" chestnuts, *Castanea sativa*, Cáceres (Extremadura, Spain).

themselves by adhering to animal fur, for instance, the fruit from beech trees. Still others, such as alders, which live next to the running water, prefer to use rivers to move their seeds and so contain an air chamber that allows them to float.

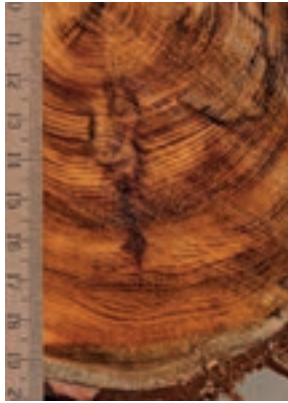
Determining the ages of trees

Two of the most common questions that arise when considering a mature tree regard the name of the species and its age. The first is easy to resolve with a key or the correct field guide which allow the differential characters of the trunk, leaves, flowers, and fruits to be searched for in order to arrive at the species name. The second question, that of age, is more complex because the tree is alive and thus we cannot count its growth rings; furthermore, as discussed below, numerous factors and variables affect ring formation.

Curiosity about the growth and age of trees is very old. In Greece, three-hundred years before Christ, Theophrastus already showed interest in the annual



Pressler probe.



Taxus baccata yew rings.



Quercus macrocarpa rings.
Michx.

growth of trees, in his *Historia plantarum*. Leonardo da Vinci, also insatiably curious, related the thickness of the rings to the rainwater available to the tree. But it was not until the beginning of the nineteenth century that the new area of study, dendrochronology, truly started. Since then the field has enormously evolved in line with the advancements brought by new technologies.

Dendrochronology, the science that studies the age of trees, is based on studying annual growth rings, both of living trees as well as of those of wood or fossil remains, allowing scientists to compile very valuable information about the climate of the past. In some species, such as *Pinus longaeva*, this science has been able to establish a chronology of more than 8,000 years.

Obtaining the samples is always invasive, by taking slices through the tree, or via a Pressler probe, in the latter case, several perforations and cortex (sample) extractions with the probe are required, until the centre of the tree is located. Because of the damage this technique causes and the possible negative impact it can have on the health of the tree, it should be limited only to scientific purposes and is prohibited in unique and monumental trees.

Finding out the exact age of an old tree is quite complicated, even by cutting it, because the centre of these trees is usually hollow and therefore an important part of its history is missing. We must also bear in mind that the growth rings vary according to several factors including:

- The age: young trees generate thick rings, which reduce in size as they age.
- The species: yew trees are slow growing and have very narrow rings; in contrast, poplars grow quickly and have very wide rings which are easy to observe.



The “avó” (grandfather of Chavín), *Eucalyptus globulus*, Lugo (Galicia, Spain).

- The environmental conditions, light, temperature, water, soil, etc. The more favourable, the wider the rings.
- With regard to the latter, trees that inhabit regions with a seasonal climate have wood in which the annual growth rings can easily be distinguished, with differences appearing between the wood laid down in spring, with wide cells, and that laid down in autumn, with narrower cells. In contrast, in places with a humid tropical climate the trees continually grow, constantly producing very similar cells, and so in the majority of tropical species, the growth rings cannot be discerned.

Estimating the approximate age of a tree is easier if using one of the following methods:

- There are growth tables for some species that empirically establish an estimated relationship between the girth of the trunk and the tree’s median age.
- Using historical data recorded in writing, paintings, and photographs.



The ficus at the “Parterre” (*Ficus macrophylla* Desf. ex Pers.), Valencia.

- The specific dates that trees were planted are sometimes known if they were planted for commemorative or celebratory reasons, such as Arbour Day, or the day of the Spanish Constitution of 1812 (nicknamed *La Pepa*).
- Using the date that foreign trees were introduced, both for forestry and ornamental use. An example of this is the eucalyptus, when seeds from several seed species were imported into Europe in 1770 from Australia. One example of this type is the *Eucalyptus globulus* Labill., which was planted in Spain after 1860, in the *Souto da Retorta (de Chavín)* gardens in Viveiro, Galicia, by a returning missionary. This tree, the “*O avó*” (meaning ‘grandfather’ in Galician), is one of the oldest and best known trees in Spain, and at some 155 years old, it is more than 60 m in height and has a trunk girth of 7.5 m. Similarly, the *Ficus macrophylla* Desf. ex Pers. was also introduced from Australia to Europe in 1807 as an ornamental tree, and was seeded put into cultivation in 1869. Thus, all of the huge *Ficus* with girths greater than 13 m that can be seen in the south of Europe, were planted at around this time, with very few surpassing 150 years.



Platanus orientalis L.

How to interpret the data sheets

The data sheets presented here provide general information about the 65 species that they describe, as well as the biometric specifics of the examples at the Valencia University Botanic Garden. We have included some species that are not trees in the strict sense, but because of their uniqueness, size, tree-like appearance, etc., we think that they deserve to form part of this book of monographs. The sheets are numbered: each one corresponds to a different series and a specific example in the Botanic Garden, and to help locate them, at the end of the book there is a plan showing their position.

Currently, as research and studies into systematics and plant classification advances, some families, genera, and species are changing. Therefore, we used the most current classification system available, The Plant List (2013), Version 1.1. Published on the internet at <http://www.theplantlist.org>. The sheets contain the scientific name of the family, genus, and species and its author, as well as the common name(s). In addition, the etymology of the genus and species is also given.

Distribution and ecology

General data about the origin and geographical distribution (map), and other phytosociological (the composition, development, and relationships in plant communities), ecological, edaphological (the influence of soils on living things), altitudinal, etc. data are provided.

Species description

The plants in general, and the trees in particular, are a series of living beings that are difficult to classify into rigid descriptions and therefore exceptions abound. For this reason, and because of space limitations, we have reduced the observations down to the bare minimum essentials, leaving out details about the size and dimensions of various specific structures and other similar information. We hope that these gaps can be filled with the photos that accompany each species, given that they show their most interesting features. We have also tried to use the simplest language possible, while still using basic botanical terminology that can be found in the glossary that we provide for this purpose. Finally, an ample bibliography is provided.



Aerial view of the Valencia University Botanic Garden

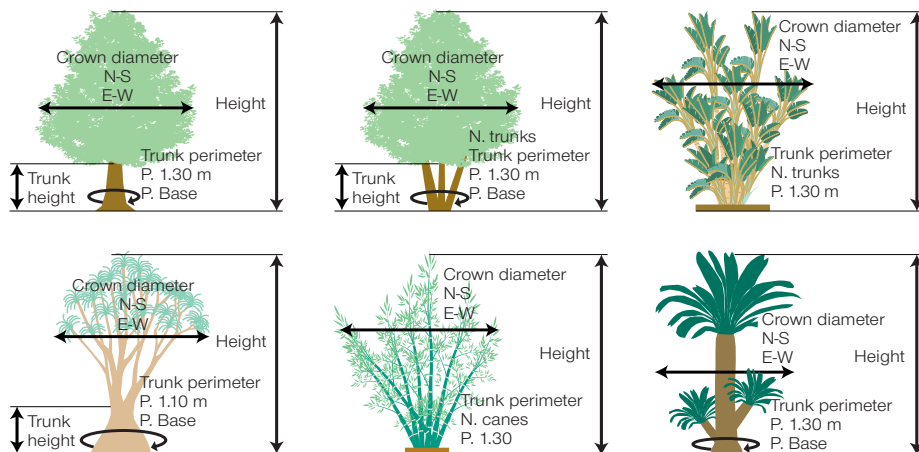
Some parameters require some further explanation to be properly understood:

- The height of the tree is estimated for the species in its distribution range.
- When it is stated that the trunk is cracked, creviced, furrowed, etc., we always mean lengthwise.
- In the description of the crown, or different parts or organs, if not otherwise indicated, we are always referring to the adult stage.
- With respect to longevity, we have divided the trees into: short-lived (up to two-hundred years), moderate lifespan (up to five-hundred years), long-lived (up to a thousand years), and very long-lived (more than a thousand years).
- The flowering period is that observed for the trees in the Valencia University Botanic Garden.

Uses

In this section information about the ethnobotany (the relationships that exist between peoples and plants) and about its most common uses is given.

Finally, to better understand the spectacular collection of remarkable trees and other plants of interest at the Valencia University Botanic Garden, we have taken several biometric measurements, which are shown on the drawing that appears on each data sheet. We used a measuring tape to measure the girth, crown width, etc. and an inclinometer to measure height.



Every species has a photo page to illustrate it, with a large image of an example and other smaller photos showing the most characteristic details. In dioecious species, to complete the information, we also show the flower or fruit from another an example of the tree.

The book of monographs serves as a guide while walking around the very special tree collection curated at the Valencia University Botanic Garden and we hope that its use provides greater enjoyment of the arboretum.

Systematic framework of the trees described

Gymnospermae

Class	Subclass	Superorder	Order
Cycadopsida			Cycadales
Ginkgopsida			Ginkgoales
Coniferopsida			Coniferales

Angiospermes

MONOCOTYLEDONEAE

Class	Subclass	Superorder	Order
Magnoliopsida	Liliidae	Asparaganae	Asparagales
		Commelinanae	Poales Zingiberales

DICOTYLEDONEAE

Class	Subclass	Superorder	Order	
Magnoliopsida	Magnolidae		Magnoliales	
	Ranunculidae		Ranunculales	
	Proteanae		Proteales	
	Caryophyllanae			Caryophyllales
				Polygonales
		Rosanae	Malpighiales Fabales	

Family	Species
Cycadaceae	<i>Cycas revoluta</i> Thunb.
Ginkgoaceae	<i>Ginkgo biloba</i> L.
Pinaceae	<i>Pinus brutia</i> Ten. <i>Pinus canariensis</i> C. Sm. <i>Pinus pinea</i> L.
Cupressaceae	<i>Cupressus funebris</i> Endl. <i>Cupressus sempervirens</i> L. <i>Cupressus torulosa</i> D. Don <i>Juniperus virginiana</i> L.
Araucariaceae	<i>Araucaria bidwillii</i> Hook.
Podocarpaceae	<i>Podocarpus neriifolius</i> D. Don
Cephalotaxaceae	<i>Cephalotaxus fortunei</i> Hook. <i>Cephalotaxus harringtonii</i> (Knight ex J. Forbes) K. Koch
Taxaceae	<i>Taxus baccata</i> L.

Family	Species
Asparagaceae	<i>Beaucarnea recurvata</i> Lam. <i>Nolina longifolia</i> (Karw. ex Schult. & Schult.) Hemsl. <i>Yucca filifera</i> Chabaud
Poaceae	<i>Dendrocalamus giganteus</i> Munro
Strelitziaceae	<i>Strelitzia nicolai</i> Regel & K. Koch

Family	Species
Magnoliaceae	<i>Magnolia grandiflora</i> L.
Menispermaceae	<i>Cocculus laurifolius</i> DC.
Platanaceae	<i>Platanus orientalis</i> L.
Phytolaccaceae	<i>Phytolacca dioica</i> L.
Polygonaceae	<i>Coccoloba peltata</i> Schoub
Euphorbiaceae	<i>Baloghia inophylla</i> (G. Forst.) P. S. Green
Fabaceae	<i>Erythrina caffra</i> Thunb. <i>Styphnolobium japonicum</i> (L.) Schott <i>Tipuana tipu</i> (Benth.) Kuntze



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Class	Subclass	Superorder	Order
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Rosales

Fagales

Rutanae

Malvales

Sapindales

Myrtanae

Myrtales

Ericanae

Ericales

Lamianae

Boraginales

Lamiales

Family	Species
Moraceae	<i>Broussonetia papyrifera</i> (L.) L'Her. ex Vent. <i>Maclura pomifera</i> (Raf.) C. K. Schneid.
Rosaceae	<i>Osteomeles schwerinae</i> C. K. Schneid. <i>Photinia serrulata</i> Lindl.
Quillajaceae	<i>Quillaja saponaria</i> Molina
Rhamnaceae	<i>Paliurus orientalis</i> (Franch.) Hemsl.
Ulmaceae	<i>Ulmus glabra</i> Huds. <i>Zelkova carpinifolia</i> (Pall.) K. Koch <i>Zelkova serrata</i> (Thunb.) Makino
Cannabaceae	<i>Aphananthe aspera</i> (Thumb.) Planch. <i>Celtis australis</i> L. <i>Celtis occidentalis</i> L. <i>Celtis sinensis</i> Pers.
Fagaceae	<i>Quercus cerris</i> L. <i>Quercus hartwissiana</i> Steven <i>Quercus ilex</i> L. <i>Quercus macrocarpa</i> Michx. <i>Quercus polimorpha</i> Schltldl. & Cham. <i>Quercus virginiana</i> Mill.
Casuarinaceae	<i>Casuarina cunninghamiana</i> Miq.
Juglandaceae	<i>Carya illinoensis</i> (Wangenh.) K. Koch
Malvaceae	<i>Brachychiton discolor</i> F. Muell. <i>Brachychiton populneus</i> (Schott & Endl.) R. Br. <i>Brachychiton x roseus</i> Guymmer <i>Lagunaria patersonia</i> (Andrews) G. Don <i>Ceiba speciosa</i> (A. St'-Hil.) Ravenna
Rutaceae	<i>Citrus máxima</i> (Burm.) Merr.
Sapindaceae	<i>Aesculus x carnea</i> Zeyh. <i>Koelreuteria bipinnata</i> Franch.
Myrtaceae	<i>Eucalyptus gomphocephala</i> A. Cunn. ex DC. <i>Melaleuca ericifolia</i> Sm. <i>Myrtus communis</i> L.
Ebenaceae	<i>Diospiros virginiana</i> L.
Boraginaceae	<i>Ehretia latifolia</i> Loisel. ex A. DC.
Oleaceae	<i>Fraxinus angustifolia</i> Vahl <i>Ligustrum lucidum</i> W. T. Aiton
Lamiaceae	<i>Vitex agnus-castus</i> L.





**Species
data sheets**



Aesculus x carnea Zeyh. (Sapindaceae)

Red horse-chestnut.

Etymology

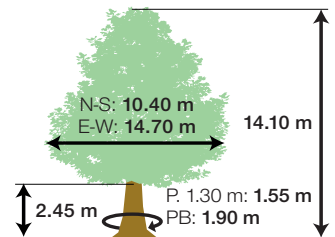
The generic name comes from the Latin *aesculus*, which means holm oak, an oak with edible acorns. The specific epithet *carnea*, from the Latin *carneum*, meaning flesh, or slightly pink coloured, refers to the colour of its flowers.

Distribution and ecology

It is a hybrid between *Aesculus hippocastanum* L., from the Balkan Peninsula and Bulgaria, and *Aesculus pavia* L. from the east of North America. This hybrid was obtained in the nineteenth century.

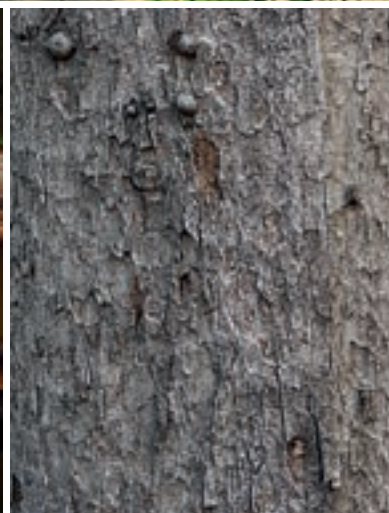
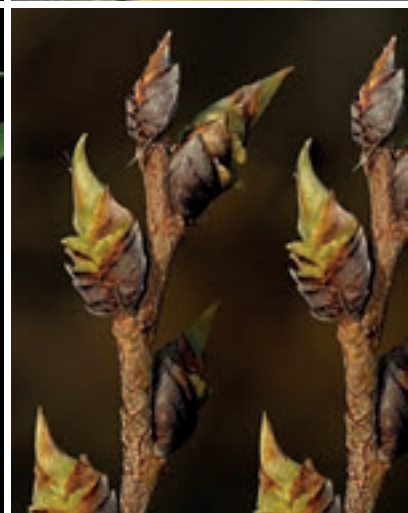
Description

This deciduous tree can exceed 20 m in height, with moderate growth speed and longevity. The trunk is straight, cylindrical, and has a slim, greyish, and longitudinally fissured bark, which gives glimpses of the tones reddish of the internal cortex. It has a leafy, pyramidal crown when young that becomes globose over time; it branches erecto-patently, and has greyish, glabrescent branchlets, with large ovoid buds, protected by brown-reddish glabrous scales. It has opposite, palmate-compound leaves with long petioles that are dark green on the upper surface, and lighter on the underside; the lamina is divided into five to seven obovate-elliptic leaflets, which are sessile or petiolulate, cuneate at the base, with a serrate margin and an acute apex. It is a monoecious species that flowers between March and May while the leaves open. The flowers are bisexual and tomentose, are a pink-reddish colour grouped on terminal panicles with pedicels. The fruits are enclosed in a globose, bristly or smooth capsule that houses two or three chestnuts, which are tawny in colour when ripe.



Uses

Very commonly cultivated in gardens because the habit of *A. hippocastanum* is combined with the beauty of the red flowers of *A. pavia*.



Aphananthe aspera (Thunb.) Planch. (Cannabaceae)

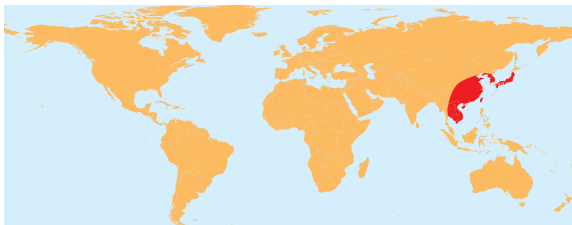
Muku Tree.

Etymology

The name of the genus is derived from the Greek *aphanes*, inconspicuous, and *anthos*, flower, which together means 'discreet flowers'. The specific epithet *aspera* refers to its rough and scabrous leaves.

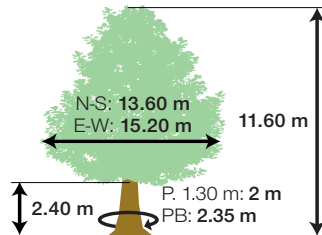
Distribution and ecology

It is from Southeast Asia, reaching Japan, Korea, and the Sino-Japanese Region. It lives on hills, slopes, valleys, and river banks at altitudes from 1,000 to 1,600 m.



Description

It is a deciduous tree that can exceed 20 m in height, and is fast-growing and moderately long-lived. It has a straight columnar trunk, with brown-greyish, longitudinally-fissured bark that is shed in thin plaques. The crown is dense and globose, with erecto-patent branching, and tawny coloured branchlets, covered with whitish lenticels, and with annual pubescent sprouting. The leaves are simple and alternate, with an intense green colour on the upper surface which is lighter on the underside, and with linear stipules and well-developed petioles; the leaf blades are ovate-elliptic, cuneate at the base, with serrate a margin and long acuminate apex. It is a monoecious species that blooms between March and April while the leaves open. It has small, greenish, unisexual flowers with pedicels, with the males grouped at the base of the shoots, and the solitary females towards the apex. It has ovoid-globose, pubescent, drupe fruits, which are initially green that become black-purplish when ripe.



Uses

In its distribution range it is a source of wood and fibre, the fruit is edible and the leaves are used for animal feed. It is also collected in autumn and used as fine sandpaper for wood. It is planted as an ornamental tree in Chinese gardens.



Araucaria bidwillii Hook. (Araucariaceae)

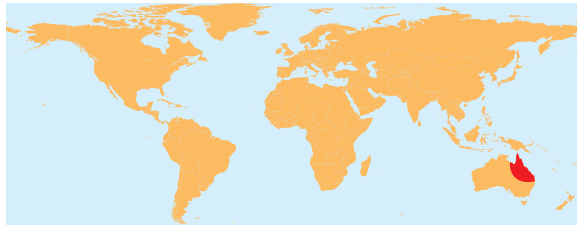
Bunya Pine.

Etymology

The name of the genus was taken from the Mapuche Indians who inhabit the Chilean region of Araucanía. The specific epithet *bidwillii*, comes from John Carne Bidwill, the British botanist and explorer who discovered several species in Australia.

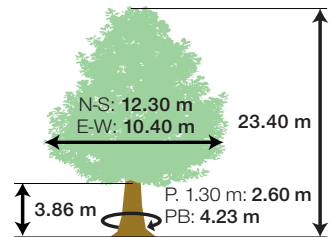
Distribution and ecology

It is from Australia, mainly in the humid mountains of the southeast and in Queensland (Tropical Australian Region in the New Zealandian-Australian Kingdom). It lives in basalts at altitudes between 150 and 1,000 m.



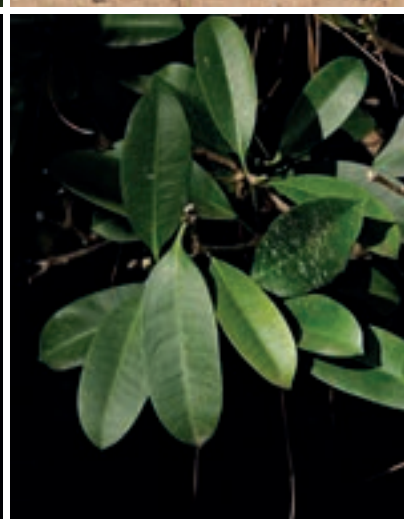
Description

It is a slow growing and long-lived resinous evergreen tree that reaches 50 m in height. It has a straight cylindrical trunk with thick brown-greyish and deeply-grooved bark covered with small protuberances. The oblong-shaped crown is frondose in mature specimens, and consists of branches arranged in regular extended or ascending spirals that curve with age. The leaves are lanceolate, flat, and coriaceous with a subdistichous or spiral arrangement, and an acute pointed apex. It is a monoecious species, with brown-reddish elongated, cylindrical male cones; and large, dark green, ovoid-subglobose female cones with thick oblong-ovate bracts, and triangular upcurved apices that are arranged on the upper branches. The seeds are ovate-elliptic, wingless, and wrapped in a light brown coriaceous integument.



Uses

This araucaria, known as the “Bunya-Bunya”, is a sacred tree to Aboriginal Australians, who regularly hold tribal meetings in forests of this species. Its seeds are edible; by grinding them a flour is obtained that can be cooked like bread. The wood is good quality and easy to work, and is prized by carpenters and cabinetmakers.



Baloghia inophylla (G. Forst.) P. S. Green. (Euphorbiaceae)

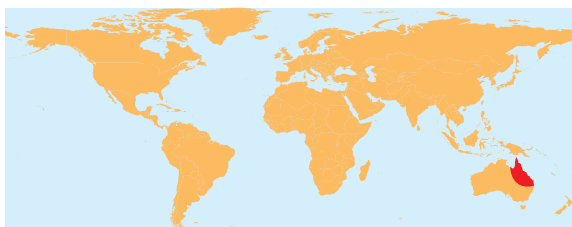
Brush Bloodwood, Ivory Birch.

Etymology

The generic name was dedicated to József Balogh, an eighteenth century Hungarian botanist. The specific epithet *inophylla* comes from the Greek *inos*, fibre, and *phylon*, leaf, alluding to its coriaceous leaves.

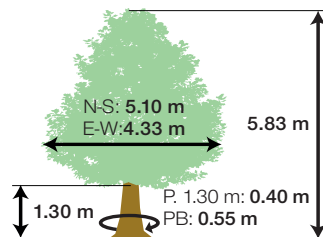
Distribution and ecology

It is native to Eastern Australia and New Caledonia (Tropical and Temperate Australian Regions) where it forms a part of the humid forests found in these territories.



Description

This evergreen tree can exceed 7 m in height; it is short-lived with a moderate growth speed. It has a single, short and straight trunk, which is usually cylindrical and ridged at the base; the bark is thin, creamy-greyish, rough, and lightly-fissured, and divides into small irregular plaques. The crown is dense and ovate to globose, with erecto-patent branches and brown-greyish branchlets. Its leaves are simple, opposite, coriaceous, and glabrous, and have petioles; the lamina is elliptic to oblong, with closed veins, an attenuate base, and an undivided margin; they are slightly revolute at the base and have an obtuse-acuminate apex. It is a monoecious species that blooms between January and July, with unisexual flowers grouped in small terminal raceme. The flowers are creamy-white, fragrant, and petiolate. The fruit is found in a globose capsule containing three cells; it is initially green and turns brownish when ripe. The seeds are ovoid and mottled dark brown.



Uses

Its sap is red, hence its name “brush bloodwood”, and provides a dye widely used for furniture and clothes. It is also an astringent. It is a little-known species which is only grown in botanical collections.



Beaucarnea recurvata Lem. (Asparagaceae)

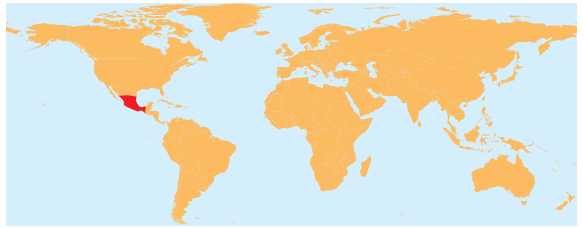
Elephant's Foot, Ponytail Palm.

Etymology

The name of this genus was dedicated to the Belgian Jean-Baptiste Beaucarne, a nineteenth century horticulturist and succulent plant collector. The specific epithet *recurvata* comes from Latin and refers to the shape of its leaves.

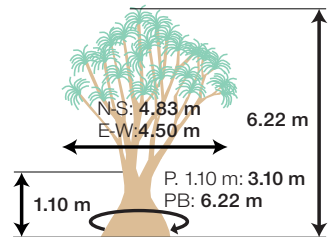
Distribution and ecology

It is a plant native to Mexico that spans the Mexican Xerophytic, Madrean, and Caribbean-Mesoamerican Regions, where it forms part of the xeric vegetation of these territories.



Description

It is a monocotyledonous, arborescent, perennial plant that can reach 15 m in height, and has a moderate growth speed and longevity. It has a conical-globose, robust, ligneous, and succulent trunk with dark grey, somewhat rough, lightly-fissured bark divided into plaques. The crown is globose and irregular, moderately dense, and dichotomously branching, with elongated, brittle, terminal branches that are flat at the base and cylindrical towards the apex, where the leaves are arranged forming a rosette. The light green leaves are linear, upcurving, deciduous, coriaceous, flat, and broadly deltoid at the base with the rest canaliculate and smooth; it has a yellowish-green, finely-serrulate margin, and a long acuminate apex. Dioecious species that flowers between July and August. It has terminal, bractate inflorescences on erect and tightly-elliptic panicles. The flowers are pedicellate, yellowish-white, and unisexual, or occasionally polygamous. The fruit is a globose-elliptic capsule with three yellowish alas that only carries one seed.



Uses:

Because of the uniqueness of its habit it is used as both an indoor and outdoor ornamental plant.



Brachychiton discolor F. Muell. (Malvaceae)

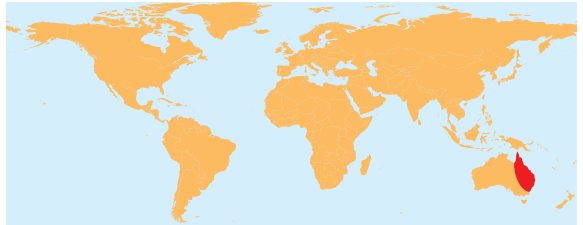
Scrub Bottle Tree, Lacebark Tree, Lace Kurrajong.

Etymology

The genus name comes from the Greek *brachys*, meaning short, and *chiton*, tunic, referring to the outer coating of the seeds. The specific epithet *discolor*, 'of several colours', alludes to the tonal difference between the upper surface and the underside of the leaves.

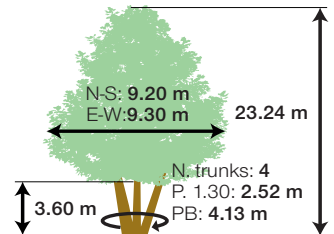
Distribution and ecology

It is a rainforest plant from Eastern Australia, although it also grows in drier areas. It is dispersed between the town of Paterson, New South Wales, to Mackay, Queensland, (Tropical Australian Region in the New Zealandian-Australian Kingdom).



Description

It is a fast-growing deciduous tree that can exceed 20 m in height. The trunk, or sometimes multiple trunks, is straight and cylindrical, and the smooth, green bark is spotted with brown markings, which becomes drabber and fissured over time. The crown is pyramidal and leafy. It has alternate, palmatifid leaves with long petioles and 5-7 undivided acute lobules; the upper leaf surface is an intense green and is scabrid, and the underside is a lighter colour and is canescent and tomentose. It is a monoecious species that blooms between June and September with flowers on axillary or terminal panicles. It has large, pink, campanulate, tomentose, unisexual flowers, which are sessile or on short pedicels. The fruit is found in a woody follicle on a short, orange-brown, elliptic peduncle; externally they are tomentose, but internally they are covered with a dense indumentum and contain numerous yellow, ovoid-elliptic seeds.



Uses

Its wood is used by the Australian Aborigines to make shields. The seeds are edible when toasted, are rich in proteins, and have a nutty taste. It is an ornamental tree, which is spectacular when it flowers, and is very commonly used in landscaping.



Brachychiton populneus (Schott & Endl.) R. Br. (Malvaceae)

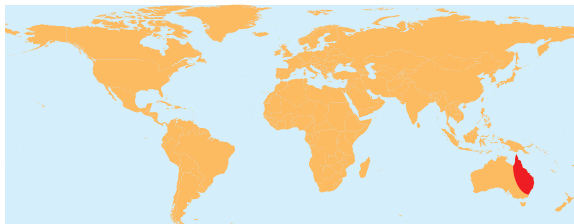
Kurrajong.

Etymology

The specific epithet *populneus*, refers to the resemblance of its leaves to those of some poplar, *Populus* L, trees.

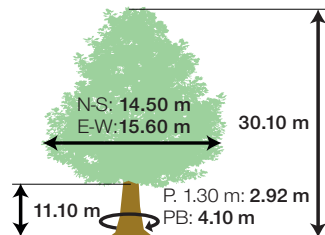
Distribution and ecology

The plant originates in Eastern Australia, from New South Wales to the south of Queensland (Tropical Australian Region in the New Zealandian-Australian Kingdom). It tolerates drought, which reaches far into the interior of Victoria, well. It inhabits the slopes of valleys and open forests, at altitudes between 50-1,000 m, and is associated with other species, such as *Callitris* and *Eucalyptus*, or forms small pure forests.



Description

This fast-growing, semi-deciduous tree can exceed 20 m in height. It has a straight and conical trunk, which is occasionally swollen at the base. The bark is green and striate in young specimens, and becomes brown-greyish with the age. The crown is frondose, and initially pyramidal, becoming globose when mature. It shows foliar dimorphism: the alternate and glabrous leaves, with long petioles, may be undivided, ovate-lanceolate, with an acuminate apex and a rounded base, or palmate with three to five lobules. It is a monoecious species that blooms between March and July with flowers on axillary panicles. The flowers are unisexual, campanulate, and sessile or with short pedicels; they are a creamy-greenish colour, glabrous, and have purple pits on the inside and are tomentose on the outside. The fruit is found in a glabrous, ovoid-elliptic, ligneous follicle which is blackish-brown when ripe. The numerous seeds are yellow and ovoid.



Uses

It is planted in pastoral areas for its shade and because its leaves can be used as livestock fodder in times of drought. The toasted seeds are edible, as are the roots of the young trees. It is widely grown as an ornamental tree.



Brachychiton x roseus Guymmer (Malvaceae)

Pink Kurrajong.

Etymology

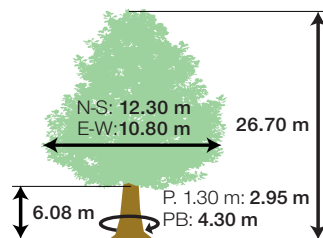
The specific epithet *roseus* refers to the reddish colour of the flowers.

Distribution and ecology

It is a hybrid between *Brachychiton acerifolius* (A. Cunn. ex G. Don) F. Muell. and *Brachychiton populneus* (Schott & Endl.) R. Br. It is not known in the wild, and is only found in cultivated gardens.

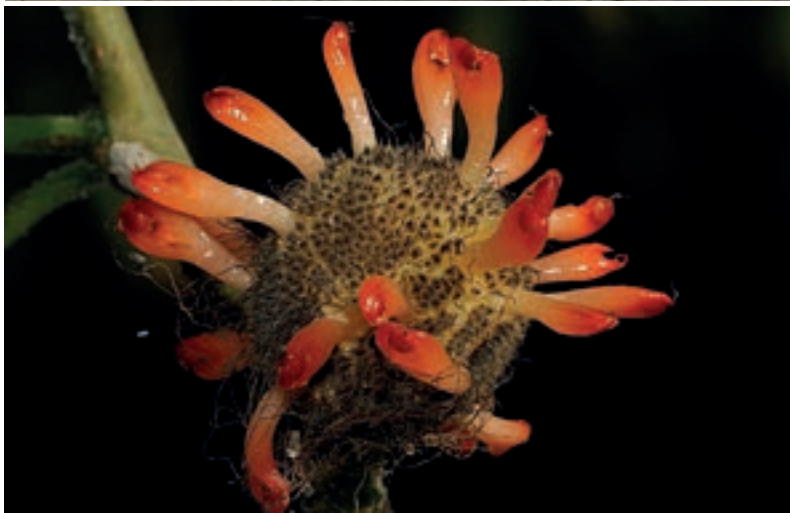
Description

This fast-growing evergreen tree can exceed 25 m in height. It has a straight and conical trunk, with bark that is initially greenish and striate, which becomes greyish and cracked over time, leaving dark horizontal scars as the branches fall off. The crown is leafy and pyramidal, and becomes globose with age. It presents foliar dimorphism, even on the same individuals; the leaves are alternate, glabrous, and petiolate, with a dark green upper surface and lighter underside; they are usually ovate-lanceolate, with a rounded base and pinnate venation visible on both sides; the margin is undivided and undulate-sinuate, and the apex acuminate. It is a monoecious species that blooms between June and September with flowers on large axillary or terminal panicles. They produce unisexual flowers, by aborting one of the sexes, on short pedicels that are campanulate with involute lobules; the external face is a reddish colour and the internal face is reddish with yellowish pits. The fruit is found inside a woody pendunculate follicle, which is brown when ripe, externally glabrous, and internally covered in a dense indumentum that surrounds the seeds and is irritating to the touch. The seeds yellow and ovoid.



Uses

This is an ornamental tree with spectacular flowers, which is very commonly used in gardens.



Broussonetia papyrifera (L.) L'Hér. ex Vent. (Moraceae)

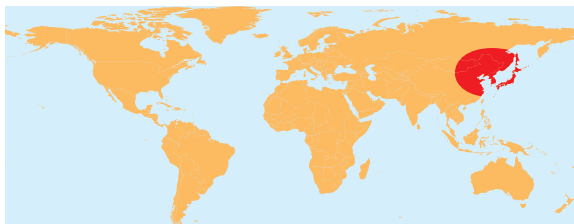
Chinese Mulberry, Paper Mulberry, Tapa Cloth Tree.

Etymology

Genus dedicated to Pierre Marie Auguste Broussonet, a French naturalist, doctor, and botanist, who was the director of the Montpellier Botanical Garden. The specific epithet *papyrifera* makes reference to the use of its internal cortex to make paper.

Distribution and ecology

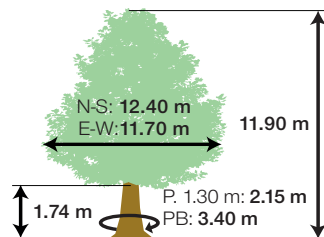
It is native to Eastern China (Sino-Japanese Region). Although indifferent to edaphic effects, it cannot withstand waterlogged soils, but can live near watercourses as long as they do not flood.



Description

It is a fast-growing deciduous tree that can reach 15 m in height. Its trunk is short and cylindrical, and occasionally tortuous; it has smooth, brown-greyish bark with shallow fissures. The crown is globose-extended and is moderately frondose. It has alternate leaves with petioles, with the upper surface being a dark green colour and the underside lighter and tomentose, although they are highly variable: they can be undivided, ovate, with an asymmetrical base; cordate, with a serrate margin and an acute apex; or palmatisect with three to five lobules. It is a dioecious species that blooms between April and June.

The flowers are unisexual: the males are a yellowish colour, have pedicels, and are grouped on cylindrical spikes; the females, have short pedicels, and are arranged on multifloral, globose heads. The infructescences are globose and tomentose, with sarcous, orange-red fruits.



Uses

Its internal cortex is traditionally used to make paper. It is also used in the textile industry to make fabrics called “masi”. The fruits, roots, and bark have applications in traditional Chinese medicine. Its wood is used to make furniture, boxes, pencils, and matches and baskets and hampers are woven from its branches.



Carya illinoensis (Wangenh.) K. Koch (Juglandaceae)

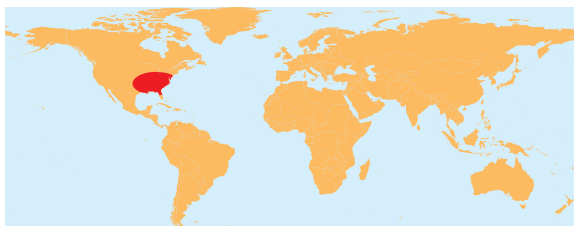
Hickory, Pecan, American Walnut.

Etymology

The name of the genus comes from the Greek *Káryon*, meaning nut. The specific epithet *illinoensis* refers to the area in which it naturally grows, the North American state of Illinois.

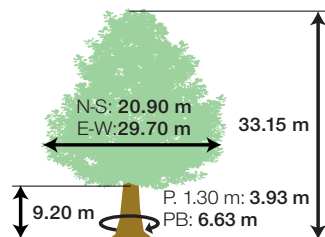
Distribution and ecology

It is native to the central and eastern North American territories (North American Atlantic Region) where it lives in deep and moist soils.



Description

It is a deciduous tree that can reach 50 m in height; it grows at a moderate speed and is long-lived. Its trunk is straight and cylindrical and develops strong buttresses at the base; the bark is brown-greyish, thick, irregular, and deeply cracked. Its crown is leafy and is widely ovoid to globose in shape. Its leaves are alternate, compound, and imparipinnate, without stipules but with petioles; they are tomentose when young, later becoming glabrous; the leaflets are sessile, except for the terminal foliole which is somewhat larger, oblong-lanceolate, asymmetric, sometimes falcate, and with a serrate margin and acute apex. It is a monoecious species that blooms between April and June. It has unisexual flowers: the males are grouped in long green-yellowish aments, and the females are found in short, green, pubescent terminal spikes. The fruits are drupe, oblong-ellipsoidal, and their outer shell separates into four valves when ripe, to reveal a nut which is smooth and ligneous on the exterior.



Uses

The pecan is widely cultivated in the east and south USA for the quality of its nuts, from which an oil is extracted, which is especially used in cosmetics. The wood is heavy and reddish; it is used to make tools and farming implements or for burning. Various parts of this plant have been used for medicinal purposes by the North American Kiowa Indians.



Casuarina cunninghamiana Miq. (Casuarinaceae)

Australian Pine.

Etymology

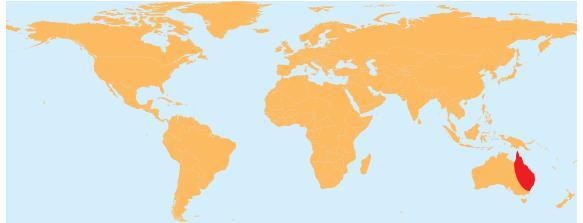
The generic name was taken from the Malayan word *Kassuwaris* which refers to the cassowary, a bird whose feathers resemble the branchlets of some casuarinas.

The specific epithet

cunninghamiana honours Allan Cunningham, the British explorer, botanist, and collector.

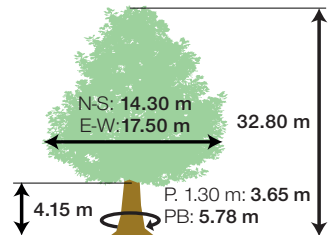
Distribution and ecology

It naturally lives in eastern and north-eastern Australia (Tropical Australian Region in the New Zealandian-Australian Kingdom). It extends from sea level to altitudes of 1,000 m, following river courses, and growing in poor, sandy, low fertility soils.



Description

It is a fast-growing evergreen tree that can reach 35 m in height. Its trunk is conical, straight, and thick, with brown-greyish, rough, and cracked bark that is shed in elongated strips. The crown is pyramidal and dense in young specimens, and becomes irregular in the adults. The branchlets are green and chlorophyllous, and comprise short segments slotted into each other, which are thin and flexible and have longitudinal stria; the true leaves are reduced down to six to ten small acute scales, arranged to form verticils around the joints. It is a dioecious species that flowers between July and February: the males appearing on green-yellowish spikes on terminal inflorescences and the reddish female flowers on short, lateral, oval shoots. It has small, subglobose infructescences with ligneous peaks, producing samara fruits.



Uses

This tree is used as a windbreak screen, as well as to fix the soil and control erosion, on occasions to consolidate river banks. The wood is strong and durable, and so it is used to fabricate furniture, flooring, and farming implements. The tannins contained in the foliage are used to dye wool.

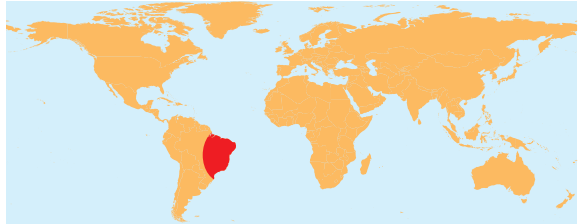


Ceiba speciosa (A. St.-Hil.) Ravenna (Malvaceae)

Drunken Tree, Silk Floss Tree.

Etymology

The name of the genus is derived from the local name *Cy-yba*, meaning 'mother tree'; in some regions, *Ceyba* also means canoe. The specific epithet comes from the Latin *speciosus-a*, which means beautiful or splendid, alluding to its flowers.



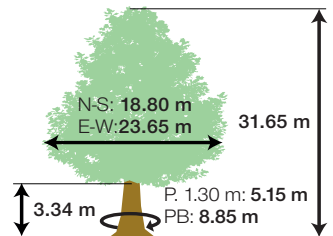
Distribution and ecology

Neotropical plant from the Brazilian-Paranian and Chaco

Regions. It forms part of semi-deciduous tropical forests and reaches altitudes of up to 1,400 m.

Description

It is a deciduous tree that can exceed 30 m in height; it is fast-growing and moderately long-lived. Its trunk is thick, straight, cylindrical, and sometimes barrel-like, and develops strong buttresses at its base; the bark is green-greyish in colour, smooth, striate, and covered with woody conical aculei. The crown is dense and irregularly globose, with alternate, compound-palmate leaves and long petioles; there are four to seven bright green, lanceolate, glabrous, leaflets with short petioles, dentate margins, and acute apices. It is a monoecious species that blooms in July to November with solitary or groups of two to three pink-yellowish flowers that are large, bisexual, and have short pedicels. The fruit is contained in a green, ovoid capsule that turns woody and opens in three valves; the inside is covered with cottony fibres and contains numerous black seeds.



Uses

Its wood is low quality and is used to make doors, boxes, small boats, and paper pulp. The silky fibres from the fruit are used to fill mattresses, pillows, and as thermal insulation. It is a very ornamental species which is widely used in landscaping.



Celtis australis L. (Cannabaceae)

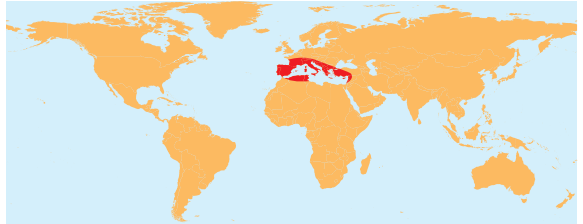
Mediterranean Hackberry, European Nettle Tree, Lote Tree, Honeyberry.

Etymology

The generic name comes from the Latin *celthis*, used by many Roman authors to refer to it and other trees with edible fruit, such as *Ziziphus lotus* (L) Lam, and coincides with the name that Linnaeus used for this genus. The specific epithet *australis*, 'of the south', alludes to its origin.

Distribution and ecology

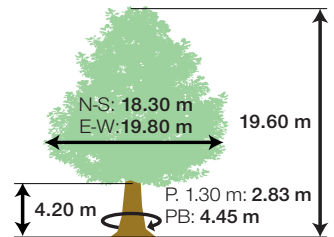
It extends through the whole Mediterranean Region. Indifferent to edaphic effects, it lives on river banks and it is common to find it on rocky ravines containing large boulders.



Description

This fast-growing and moderately long-lived deciduous tree can reach 30 m in height. It has a straight, columnar trunk with smooth greyish bark. The crown is dense, broad, and globose; its simple, alternate, petiolate leaves are dark green on the upper surface and are lighter, slightly glaucous, and pubescent on the underside. The leaf lamina is ovate-lanceolate, trinervate, asymmetrically rounded at the base, and has a serrate or dentate margin and long acuminate apex. This monoecious species blooms between March and April.

The flowers are bisexual or male, and the peduncle is bigger than the petiole; the males form groups of two or three at the base of the shoot; the bisexual flowers are solitary and appear towards the apex; they have a striking ovoid pistil capped with two stigmas like a moustache. The drupe fruit is small and globose, and is initially green but turns purplish-black when ripe.



Uses

In ancient times it was planted to provide shade to farmhouses. Its fruits are edible, and a sweet wine can be made from them. The wood is flexible and is used to make pieces for carts, walking sticks, handles, and pitchforks, with articles from the Ayora Valley in Valencia being famous. The leaves are used to feed silkworms.



Celtis occidentalis L.

(Cannabaceae)

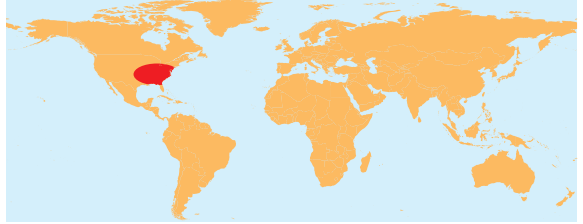
Virginia Hackberry, American Hackberry, Beaverwood.

Etymology

The specific epithet *occidentalis* indicates that comes from The West.

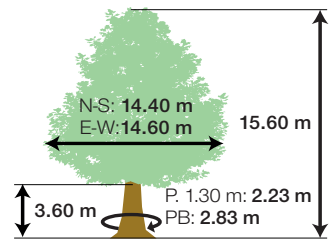
Distribution and ecology

Native to the centre and east of North America, its optimum territory is in the North American Atlantic Region, where it forms part of forests on mountain slopes and ridges. It is a plant with a wide ecological valence.



Description

It is a deciduous tree that can reach 35 m in height and is fast-growing and short-lived. The trunk is straight and cylindrical and the bark is greyish, rough, and has corky ridges and bumps. The dense crown is globose and irregular, and is formed by greyish, ascending arched branches, with hanging and pubescent sprouting branchlets. The leaves are simple, alternate, and petiolate, with a bright green upper surface and the underside a lighter colour, with pubescence only on the veins. The leaf blades are ovate and trinervate, with an asymmetrical and obliquely rounded base, a serrate margin except at the base, and an acuminate apex. It is a monoecious species that flowers between March and April. The flowers are polygamous, and the peduncle is as long as the petiole. The male flowers are arranged in groups towards the base of the shoots, and the female and bisexual flowers are arranged singly towards the apex, and have an eye-catching ovoid pistil capped with two stigmas like a moustache. The fruit is small and globose drupe, and is dark purple when ripe.



Uses

It is a medium-sized ornamental tree, with a beautiful golden autumn foliage. It is little used in Spain but is present in some botanical collections. The wood is heavy, pale yellow, and has a coarse grain; it is used to make paper, farm implements, poles, and boxes.



Celtis sinensis Pers. (Cannabaceae)

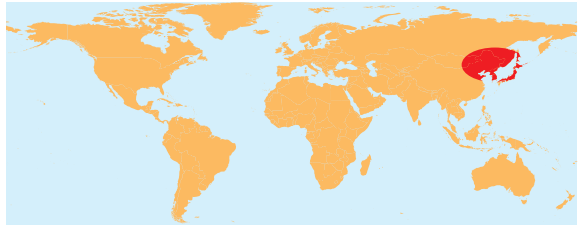
Chinese Hackberry.

Etymology

The specific epithet *sinensis* refers to its origin in China.

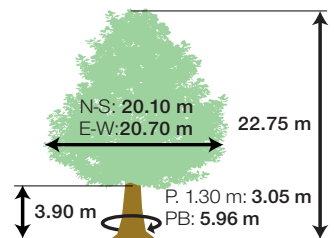
Distribution and ecology

It is native to Eastern Asia, in the Sino-Japanese Region. While indifferent to edaphic effects, it prefers cool, well-drained, sandy soils. It lives on slopes at altitudes between 100 and 1,500 m.



Description

This deciduous tree can reach 20 m in height and is fast-growing and moderately long-lived. It has a straight and columnar trunk, with greyish, thin and smooth bark, that with the time develops strong buttresses at the base. The crown is moderately dense, wide, and globose, its branches are erecto-patent, and it has extended, brown-greenish, branchlets with pubescent annual sprouting. The simple, alternate leaves have short petioles; the upper surface is an intense bright green, slightly scabrid, and is lighter on the underside. The lamina is ovate to ovate-elliptic, trinervate, somewhat asymmetrical, and rounded or widely cuneate at the base; they have undulate-sinuate margins that are serrate only in the upper half, and the apices are short and acuminate. It is a monoecious species that blooms during the annual sprouting between March and April. The flowers are male or bisexual; the males are located towards the base of the shoot and are grouped in feathery fascicles; the bisexual flowers are solitary and arranged towards the apex. The fruits are small, subglobose drupes that start out orange-coloured and turn blackish when ripe.



Uses

Its fruits are edible and feed many animals, especially birds and different mammals such as squirrels. It is an ornamental tree with beautiful golden autumn foliage, it is little-used in Spain but is present in some botanical collections. In Australia it has been catalogued as an environmental weed and invasive species.



Cephalotaxus fortunei Hook. (Taxaceae)

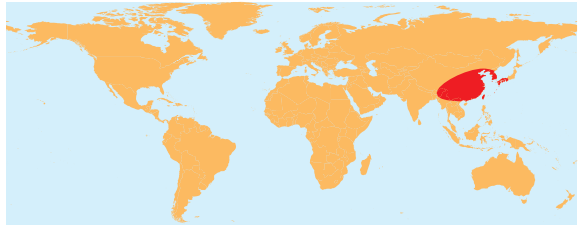
Chinese Cowtail Pine, Chinese Plum Yew.

Etymology

The name of the genus comes from Greek *Kephalé*, head, and *Taxus*, yew, indicating that it resembles a yew and that it carries a male cone that resembles a brain. The epithet *fortunei*, is dedicated to Robert Fortune, the Scottish botanist, collector, and explorer.

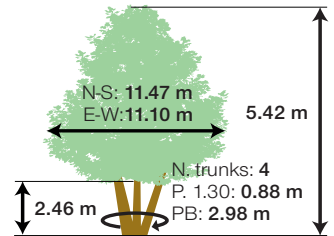
Distribution and ecology

It comes from central China (Sino-Japanese Region) where it forms part of the mountainous forests of Yunan and Kiangsu, among other areas, at altitudes ranging between 900 and 3,700 m.



Description

This evergreen tree can reach 20 m in height; it is slightly resinous, slow growing, and long-lived. It has multiple cylindrical trunks that may be straight or inclined and are somewhat arched. The bark is a brown-reddish colour, thin and cracked, and is shed in thin elongated plaques. The spirally-arranged leaves measure, are decurrent, flat, linear-lanceolate, with a cuneate, usually somewhat falcate, base; the margin is undivided, narrowly revolute at the border, and the apex is cuspidate; the upper surface is a bright dark green and the underside is lighter and glaucous, with two longitudinal bands of whitish stomata. It is a dioecious species that flowers from December to May. The male cones are axillary and are arranged in globose capitula; the green-greyish ovate female cones are solitary or form small pendunculate groups. The seeds are ovoid-elliptic and have a sarcous covering, while the inside is ligneous with a short mucronate apex, and are colour purplish when ripe.



Uses

It is a very ornamental species with an interesting habit and beautiful perennial foliage; it is little-used in gardening and is only present in some botanical collections. Its wood is not commonly used.



Cephalotaxus harringtonii (Knight ex J. Forbes) K. Koch (Taxaceae)

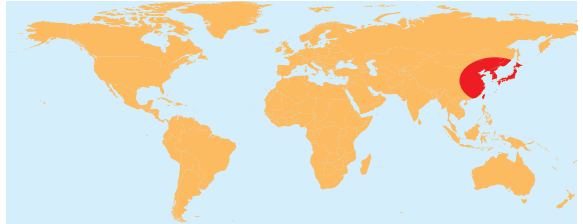
Japanese Cowtail Pine, Japanese Plum Yew.

Etymology

The epithet *harringtonii* was dedicated to the Earl of Harrington, British Secretary of State and patron of the sciences in the nineteenth century.

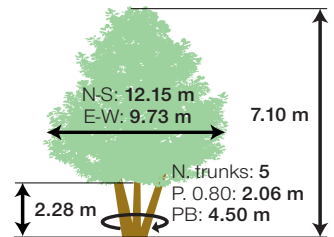
Distribution and ecology

It is native to Eastern Asia (Sino-Japanese Region).



Description

This evergreen tree that can reach 10 m in height; it is slightly resinous, slow-growing, and long-lived. It usually branches from the base forming multiple cylindrical trunks that are straight or inclined and somewhat arched; its bark is brown-reddish, thin and cracked, and sheds in thin elongated plaques. The crown is globose, becoming extended and irregular with the age. The leaves are arranged in spirals, measuring, although they appear to form two opposite rows only on one plane; are decurrent, flat, linear to linear-lanceolate, straight or somewhat falcate, undivided and slightly revolute at the margin, with a mucronate to long-acuminate apex. It is a dioecious species that flowers from December to March. The male cones are axillary, and form creamy-white globose capitula on short peduncles, which are naked except at the apex. The female cones are arranged singly or in small groups on short shoots between the bracts and the terminal bud; they are a green-greyish colour, pendunculate, and ovate. The seeds are ovoid-elliptic, with a cuspidate or mucronate apex, and are a red-purplish colour when ripe.



Uses

Its wood is excellent and has been exploited ever since ancient times. It is a very ornamental species with an interesting habit and beautiful perennial foliage; it is not commonly grown in Spanish gardens, although more so than *Cephalotaxus fortunei*.



Citrus maxima (Burm.) Merr. (Rutaceae)

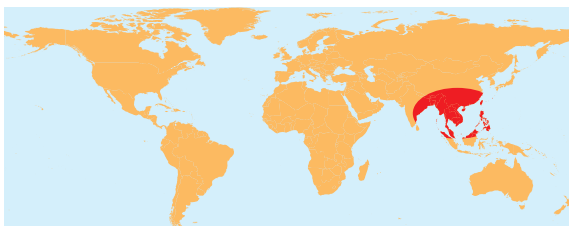
Shaddock, Pomelo, Pummelo, Pamplémousse.

Etymology

The generic name comes from the Latin *citrus*, used by the Romans to refer to citron, *Citrus medica* L., which was one of the first known types of citrus in The West. The specific epithet *maxima*, 'the biggest', alludes to the size of its leaves and fruits.

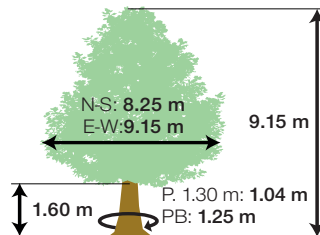
Distribution and ecology

It is a tropical pluviseasonal plant with its optimum range in the Indo-Malayan Sub-Kingdom.



Description

This evergreen tree can reach 10 m in height, and it is fast-growing and moderately long-lived. It has a single, short, straight, and cylindrical trunk, with dark brown, thin, and finely fissured bark. Its crown is globose and dense, and it has spiny, arching branches. The leaves are large, simple, and alternate, and have an articulated alate petiole; they are dark green on the upper surface and lighter on the underside, with a slightly pubescent central vein. The lamina is ovate to elliptic with pinnate veins; it is rounded at the base, the margin is undivided and wavy, and the apex is acute and rounded. This monoecious species flowers between April and May, usually on terminal raceme. The flowers are bisexual and are large, fragrant, and are pedicellate, with reflexed, white, scarious petals. They have large hesperidium fruit that can take several shapes depending on the variety, although they are usually globose with a flat or pyriform base; it has a thick pith layer, and is a pale yellow colour when ripe, with thick and succulent juice-vesicles and firm yellow-reddish pulp containing numerous seeds.



Uses

It is highly prized for its edible fruits that are rich in vitamin C and have an acidic-bitter flavour. Juice is extracted from them which can be used to make different types of drinks and marmalades. The specimen in the Valencia University Botanic Garden has a *Citrus aurantium* branch, grafted onto rootstock, which flowers and fruits.



Coccoloba peltata Schott (Polygonaceae)

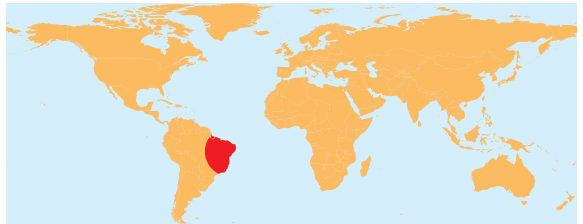
Coccoloba.

Etymology

The name of the genus comes from the Greek *Kokkolobis*, which was used in antiquity as a name for a vine, making reference to the raceme of *Coccoloba uvifera* L. The specific epithet *peltata* refers to the way the petiole joins with the lamina, further along the base.

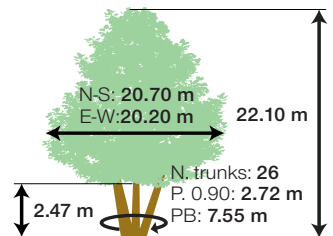
Distribution and ecology

It is endemic in Brazil, northeast of the state of Bahía and southeast of the states of Espírito Santo and Rio de Janeiro (Brazilian-Paranian Region), in dark restinga (sandy, acidic, and nutrient-poor soils close to the sea) forests.



Description

This tree is deciduous (but interestingly, it loses its leaves in spring); it is fast-growing, moderately long-lived, and can exceed 20 m in height. It usually roots from the base forming multiple cylindrical, straight or inclined trunks that are arched towards the apex, and that in mature examples, have dark brown, thin, rough, and cracked bark. The crown is frondose, globose-extended, and formed by numerous ascending branches that arc with age; they have hanging branchlets, and produce annual green, glabrous shoots that are initially covered with reddish-colour leaves, and which become green and nitid later. The leaves are alternate, simple, and peltate, and have membranous stipules joined to form a permanent amplexive ocrea (sheath); the leaf blades are ovate to suborbicular, with a cordate to rounded base, undulate-sinuate margin, and acute apex. It is a dioecious, polygamous species that blooms between May and July. The flowers are grouped on simple racemose inflorescences and are small and pedicellate, and have five greenish sepals but no petals; they are bisexual, or unisexual by abortion of one of the sexes, and produce small, ovate-elliptic, achene fruit that are red and wrinkled when ripe.



Uses

Used mainly as an ornamental plant.



Cocculus laurifolius DC. (Menispermaceae)

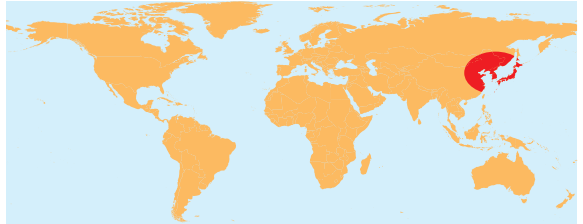
Laurel-Leaved Snail Tree.

Etymology

The name of the genus comes from the Greek *Kókkos*, coco, for its small fruits that are like coquito nuts (small coconut-like fruits). The specific epithet *laurifolius* alludes to the shape of its leaves which resemble that of laurel, *Laurus nobilis* L.

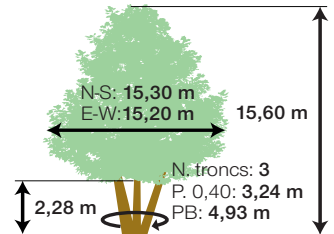
Distribution and ecology

It originates in Eastern Asia (Sino-Japanese Region), where it forms part of the evergreen understory of dry formations at altitudes between 1,200 and 1,600 m. It withstands low temperatures, down to -10 °C.



Description

This evergreen tree can exceed 15 m in height; it is slow growing and moderately long-lived. There may be one or multiple trunks, which are usually short and tortuous, with greyish, thin, slightly rough and fissured bark, spotted with small brown warts. The crown is leafy, globose-extended, and formed by numerous ascending and arching branches. It has simple, alternate, petiolate leaves, which are coriaceous and glabrous, and are a nitid dark green on the upper surface and lighter on the underside; the lamina is elliptic-lanceolate, trinervate, and has prominent veins on the underside; the base is cuneate, the margin undivided, and the apex acuminate. It is a dioecious species that blooms between April and June, with the flowers grouped on small axillary inflorescences called thyrsoids. The male and female flowers are similar; they are small and have pedicels, and start out green and turn yellowish with time. The fruit is a small, globose, drupe, which is slightly flattened and is black when ripe; it carries a single reniform seed.



Uses

Widely used as an ornamental plant. The bark contains alkaloids which are used as muscle relaxants (with effects similar to the poison curare which is derived from plants of the genus *Strychnos*). The plant also is used in China as a diuretic and vermifuge.



Cupressus funebris Endl. (Cupressaceae)

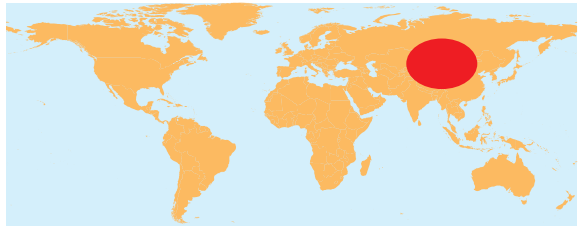
Mourning-Cypress, Chinese Weeping Cypress.

Etymology

The name of the genus may derive from the Greek *Kypárisos*, in Latin *Cupressus*, meaning 'cypress', or *Kýpros*, meaning Cyprus, where it grows naturally. It is also likely that it is derived from the Jewish word *Kóper*, meaning resin. The specific epithet *funebris*, 'funeral', comes from its relation with the dead in the place of its origin.

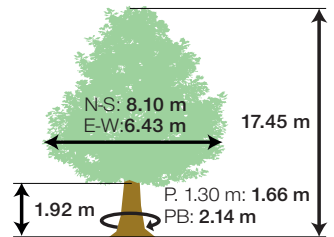
Distribution and ecology

It originates in central Asia (Sino-Japanese Region) where it is grown in monasteries and near tombs.



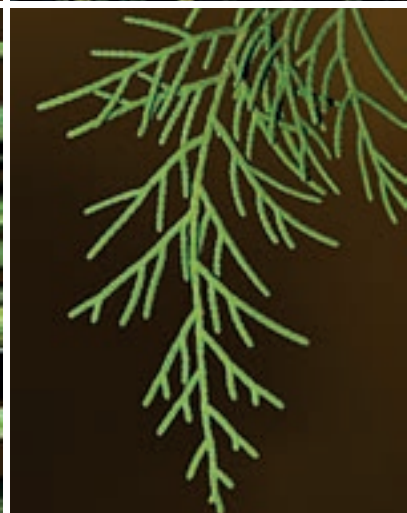
Description

An evergreen tree that can reach 35 m in height, it is resinous, slow growing and long-lived. It has a straight and cylindrical trunk, with thin, brown-greyish, fibrous, smooth or lightly-fissured bark. Its 'weeping' habit is very characteristic. It has a dense pyramidal crown comprising oblique ascending branches, with its alternate, flat, and pendulous branchlets arranged only on one plane. The leaves are light green, opposite, squamiform, decussate, and imbricate, with deltoid-ovate scales and acute apices. It is a monoecious species that flowers between January and April. Creamy-coloured microsporophylls are grouped on terminal, ovate-elliptic cones and solitary tan-coloured globose megasporophylls are located on short peduncles towards the base of the branchlets. The globose strobilus are small, and dark brown when they become ripe (in the second year); they have peltate scales, which are rough and depressed in the centre, where a conical tip with a curved apex forms. It has flat light brown seeds with narrow alas.



Uses

Its wood is good quality and is valued by carpenters and cabinetmakers. It is used in the construction of houses and boats as well as in the manufacture of furniture and farm implements.



Cupressus sempervirens L. (Cupressaceae)

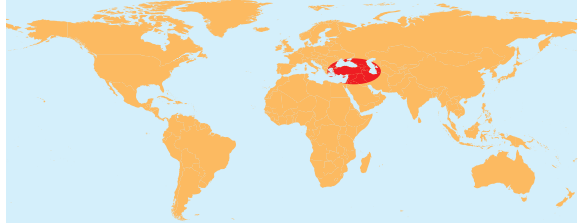
Mediterranean Cypress, Pencil Pine.

Etymology

The specific Latin epithet *sempervirens* means evergreen and alludes to perennial character of its foliage.

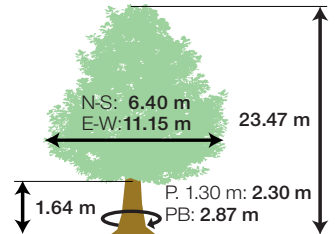
Distribution and ecology

It originates in the eastern Mediterranean (Iran, Cyprus, Syria, etc.), in the Greco-Aegean, Central Anatolian, and Armenio-Iranian Provinces. It forms part of the Eastern Mediterranean vegetation, especially in edaphoxerophilic locations.



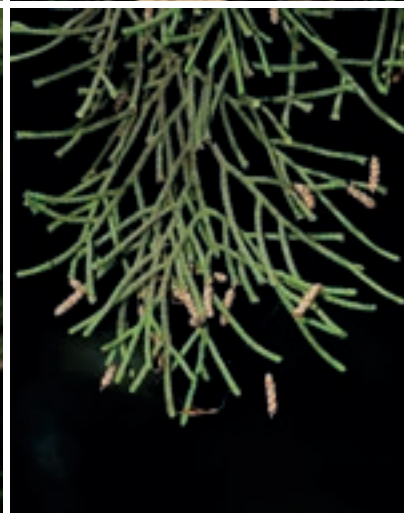
Description

This evergreen tree can reach 35 m in height, and is slow growing and very long-lived. It has a straight and cylindrical trunk, which is occasionally tortuous, and thin, brown-greyish, fibrous, lightly-fissured, and sometimes persistent bark. The crown is dense, columnar or pyramidal depending on the variety, and on occasions branched to the base; its branches are inserted obliquely or horizontally, with young brown-reddish branchlets; the last-order lateral branchlets are sub-cylindrical, smooth, and covered with small dark green, opposite, squamiform, decussate, imbricate leaves that persist for two to four years. It is a monoecious species that flowers between February and April. Microsporophylls are grouped in terminal, ovoid cones which are a yellowish colour when ripe; the megasporophylls are solitary or form small groups, and are globose and green with purple highlights. The brown-greyish strobilus are oblong-ellipsoidal, occasionally globose, woody, and coarse. The small brown-reddish seeds are oval and irregular, with a reduced ala on the crest.



Uses

Its use in gardening is very widespread. Its wood is hard and rot-resistant and has been used in both carpentry and naval ship building. Its leaves are expectorant, astringent, and diuretic.



Cupressus torulosa D. Don. (Cupressaceae)

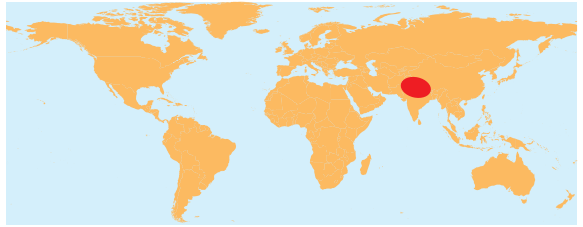
Himalayan cypress, Bhutan cypress.

Etymology

The specific epithet *torulosa* comes from the Latin and means 'elongated with narrowing', probably alluding to the shape of its crown.

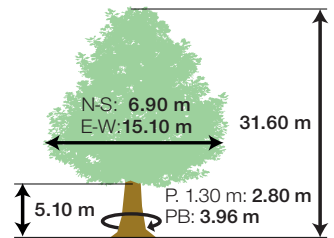
Distribution and ecology

It naturally lives in the Himalayas (Tibet-Himalayan Region), but also reaches China and Vietnam, at altitudes between 300 and 1,800 m, where it forms part of rainforests in calcareous soils.



Description

It is an evergreen tree that can reach 45 m in height and is moderately-fast growing and long-lived. It has a straight and cylindrical trunk, with thin, brown-greyish, fibrous, and longitudinally-fissured bark, that sheds in long strips. The crown is dense and oval to conical-pyramidal, with thin and pendulous branchlets; the last-order lateral branchlets are sub-cylindrical, smooth, and covered with small, dark-green, flat, opposite, squamiform, imbricate leaves, with obtuse apices. It is a monoecious species that flowers between January and May. The microsporophylls are grouped in terminal greyish-orange oblong cones, and the elliptic-globose megasporophylls are solitary or form small groups; they are initially a green colour but become black-violet when mature. The woody strobilus are subglobose and matte brown when mature; the seeds are small, brownish, flat, and smooth, and have a narrow ala.



Uses

Its wood is hard and good quality and is used in carpentry and construction. The wood and roots are aromatic, and an oil can be obtained by distillation that is used as an anti-inflammatory and antiseptic, as well as in cosmetics. Cupresses are virtually unknown in Spain and are rarely used as ornamental plants.



Cycas revoluta Thunb. (Cycadaceae)

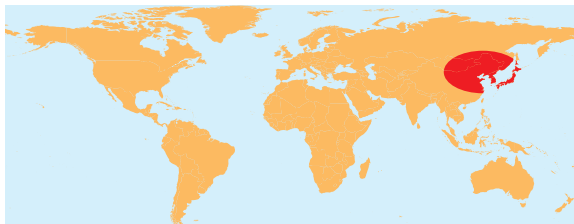
Japanese Sago Palm, Sago Palm, King Sago, Sago Cycad.

Etymology

The name comes from Greek *Kikas*, used by Theophrastus to refer to it as 'a type of palm' because of the similarities in its growth habit. The specific epithet *revoluta*, comes from the Latin *revolutus*, referring to the way the leaf margin rolls down towards the underside.

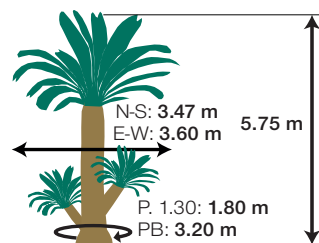
Distribution and ecology

It is native to China and Japan (Sino-Japanese Region), where it forms part of the forests, although it is also found in open areas. It is resistant to fire and is considered to be a living fossil.



Description

This evergreen gymnosperm can reach 8 m in height; it is slow-growing and very long-lived. The brown-black trunk is ligneous, straight, and slightly conical, and it branches with the age. Its crown is dense and globose; the brown, tomentose leaves are straight, pinnate, and reduplicate, with a widened petiole at the base, and are armed with thorns. The pinnae are coriaceous, rigid, linear or sub-falcate, and have a decurrent base; the margins are undivided, and revolute, with acuminate and pointed apices. It is a dioecious species, with the floral structures arranged at the apex of the trunk; the light yellow male cones are erect, pendunculate, ovoid-cylindrical, and densely tomentose; the female cones are globose, and comprise numerous fertile leaves, and are covered with a yellow-orange tomentum that carries the seminal rudiments, which are ovoid and slightly flat, and are a reddish-orange colour when ripe.



Uses

A starchy food substance, known as *Segú* in Japan, is obtained from the centre of the stem. Its seeds are also rich in starch and are edible, but must first be washed several times to eliminate some of their toxins. The plant is very ornamental, and is widely used in gardens.



Dendrocalamus giganteus Munro (Poaceae)

Giant Bamboo, Dragon Bamboo.

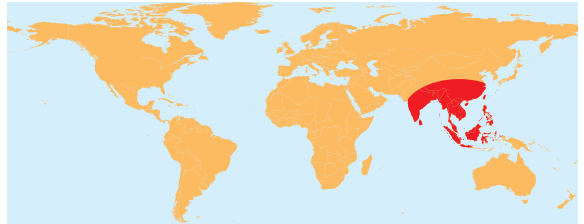
Etymology

The generic name comes from the Greek *Dendron*, tree, and *Kalamos*, cane, and means 'cane with an arborescent habit'. The specific epithet is derived from the Greek *giganteios*, in Latin *giganteus*, -a, -um, 'gigantic', alluding to its size.

Distribution and ecology

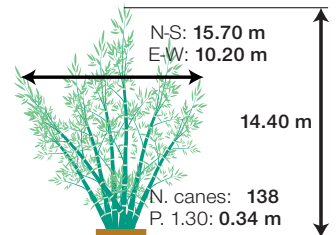
Its native area extends from India to China and the Philippines (Indochinean and Indonesian-Philippine Regions). There it forms

part of the humid forests at altitudes above 1,200 m; below these heights it seeks areas with alluvial soils and high humidity.



Description

This monocotyledonous cespitose plant, is fast-growing and moderately long-lived. It is the largest plant in the Poaceae family in the world, reaching over 35 m in height, and in optimum conditions, achieving growth between 35 and 40 cm daily. It has thickened rhizomes, which branch simpodially to form large macollas over time. It has straight, green, cylindrical canes, which arch towards the apex; they are hollow inside with a walls of up to three centimetres thick which are divided into several sections or nodes. The lanceolate leaves have amplexive sheaths, with two auricles and a small ligule; they have short petioles, a rounded bases, denticulate margins, and acuminate apices. It is a monoecious species that blooms every few years with compound inflorescences and the flowers grouped on spicules. The fruit is a monospermous, dry, oblong, and indehiscent caryopsis with an obtuse apex.



Uses:

Its tall and strong canes have several uses for making furniture, scaffolding, roof beams, rafts, buckets, and paper. It is cultivated on slopes to prevent soil erosion and as an ornamental plant in gardens.



Diospyros virginiana L. (Ebenaceae)

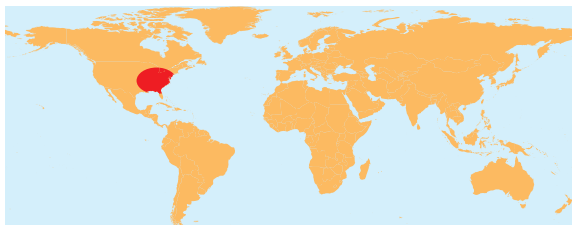
American Persimmon, Common Persimmon, Possumwood, Sugar-Plum.

Etymology

The name comes from Greek *Diós*, meaning 'Zeus' or 'God', and *pyrós*, 'wheat', and means 'divine food', alluding to the fruits of the tree. The specific epithet *virginiana*, indicates its origin in the state of Virginia, in the United States.

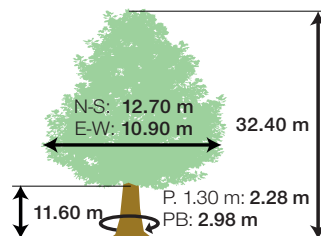
Distribution and ecology

It forms part of the forests in east and southeast North America (North American Atlantic Region), and prefers light and well-drained soils.



Description

It is a deciduous tree that can reach 30 m in height, and has a moderate growth speed and longevity. The root system is strong and extended, and often sends out new shoots. It has a tawny-black, straight, and columnar trunk, with thick, deeply-cracked bark which is irregularly divided into scaly, square blocks. The crown is an oval-globose shape; the leaves are simple, alternate, petiolate, and are dark green and shiny on the upper surface, and lighter and slightly pubescent on the underside; the lamina is ovate to elliptic, with pinnate veins, an attenuate base, undivided margin, and an acute apex. It is a dioecious species that blooms between May and June, with the male flowers arranged in small groups and the females being solitary. The flowers are axillary, with short pedicels; they are fragrant and have a whitish urceolate corolla, with an apex of yellowish and revolute petals. The fruits are globose berries that are yellow-orange when ripe. The seeds are brown, flat, and oblong.



Uses

Because of its good-quality wood, which has a fine texture, it has been used from ancient times in carpentry. When mature its fruits are edible and are used to make jams. When the fruits are still green they are rich in tannins and so are used as astringents.



Ehretia latifolia Loisel. ex A. DC. (Boraginaceae)

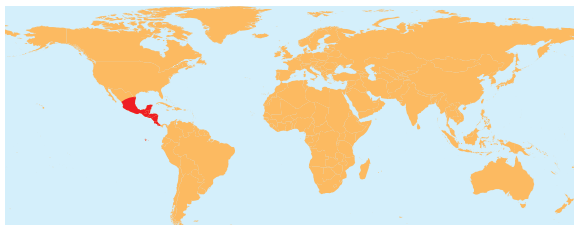
Raspaguacal, Field Azahar, White Capulin.

Etymology

This genus is dedicated to the German botanist, entomologist, and famed botanic illustrator Georg Dionysius Ehret. The specific epithet *latifolia*, comes from the Latin, *latus* –a -um, ‘wide’, and *folium*, ‘leaf’, and means ‘wide leaf’.

Distribution and ecology

Its natural area of distribution extends through Central America, from Mexico to Panama (Mexican Xerophytic, Madrean, and Caribbean-Mesoamerican Regions), located at altitudes between 1,200 and 2,000 m.

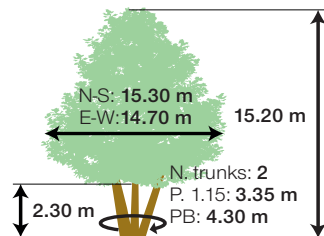


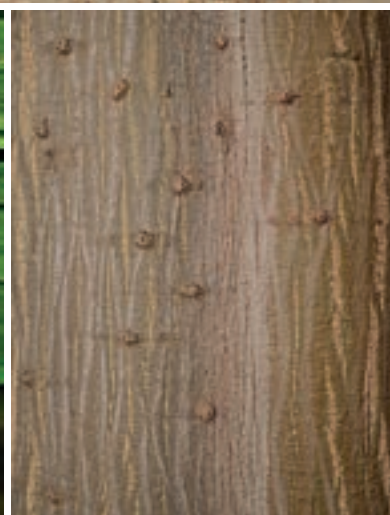
Description

This fast-growing and moderately long-lived deciduous tree can exceed 20 m in height. Its trunk may be single or branched to form multiple trunks, which are erect or inclined, and cylindrical and fluted; the bark is thin, brown-greyish, rough and fissured, and is shed in elongated plaques. The crown is frondose, with a globose-extended shape. The leaves are simple, alternate, and petiolate; the upper surface is dark green, warty and rough, and the underside is lighter in colour and is hirsute; the leaf blades are ovate-lanceolate, with cuneate bases, serrate margins, and acute to acuminate apices. It is a monoecious species that blooms between April and June. The flowers are bisexual, white, and campanulate and are grouped on small terminal panicles with short pedicels. The fruits are small, ovate-elliptic drupes, that are initially green, but become white later, and a bruised-blackish colour when ripe.

Uses

Pots used to be washed with the “raspaguacal” because of its scabrous leaves. The wood is hard and strong, and is used in construction and carpentry. It is planted as a living fence because of its high capacity for regrowth. It is a very ornamental species when in full bloom or fruiting, but is rarely cultivated, and is usually found only in botanical collections.





Erythrina caffra Thunb (Leguminosae)

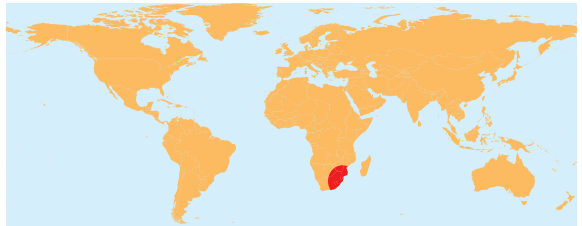
Coast Coral Tree, African Coral Tree.

Etymology

The name is derived from the Greek *erythros*, 'red', for the colour of its flowers and seeds. The specific epithet *caffra*, comes from Arabic, *kafir*, meaning 'infidel'; the tree takes its name from the part of Africa south of Ecuador, originally called Kaffraria (which is today part of the Eastern Cape of South Africa) which was populated by non-Muslim people.

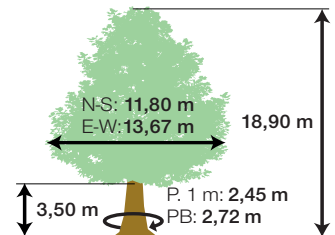
Distribution and ecology

Its natural range is in the southeast of Africa (South-Eastern African Region). It lives in pluviseasonal and Mediterranean areas with a tropical climate, in coastal forests reaching altitudes of up to 200 m.



Description

This semi-deciduous tree can reach 20 m in height; it is fast-growing and moderately long-lived. Its straight, cylindrical trunk, has greyish, lightly-fissured bark, with some thick and short spines. The crown is globose, with branchlets covered in sharp, black, conical thorns. The leaves are trifoliate, compound, alternate, and glabrous, with long petioles, the terminal leaflet being larger than the others; the lamina is widely ovate with a cuneate base, the margin is undivided, and the apex is acute to obtuse. This monoecious species flowers between March and June, before it puts out new leaves. The flowers are bisexual and are a scarlet-orange colour; they are grouped in zygomorphic, nectariferous, axillary inflorescences. The fruit is a dehiscent moniliform legume, which is glabrous and dark brown when ripe. The seed is elliptic, and is bright red with a black stripe.



Uses

This tree is considered to be sacred in its home countries. Its wood is soft, and is used to construct boats and domestic utensils. It contains active ingredients that are used as muscle relaxants. Because of the beauty of its flowers it is used as an ornamental tree and the seeds are used for counting and to make necklaces.



Eucalyptus gomphocephala A. Cunn. ex DC. (Myrtaceae)

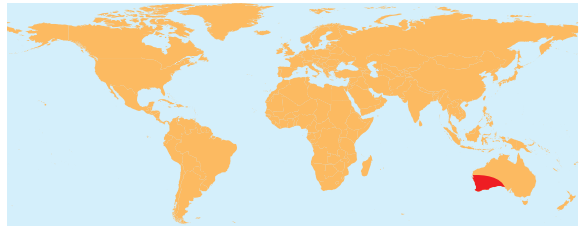
Tuart.

Etymology

The name of the genus is derived from the Greek *eû*, meaning 'well', and *kaliptós*, 'covered', 'protected', or 'hidden'. The specific epithet *gomphocephala*, is also derived from the Greek word *gomphos*, meaning 'nail' or 'tack', and *kephale*, for 'head', which both refer to the flower before it opens.

Distribution and ecology

It lives in the southwest of Australia, in the coastal zone with a Mediterranean climate (Mediterranean Australian Region), extending from sea level to altitudes of 200 m. It forms part of the vegetation of the Casuarina woods within the Swan Coastal Plain.

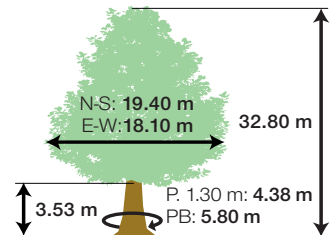


Description

This fast-growing and moderately long-lived evergreen tree can reach 40 m in height. It has a single, straight, and columnar trunk, and develops strong buttresses at the base over time; it has thick, brown-greyish, persistent, rough bark, which is somewhat fibrous and longitudinally cracked. The crown is ovoid-globose and dense. The leaves are alternate, petiolate, coriaceous, discolorous, and glabrous; the new shoots are a reddish colour, and the mature branchlets are lanceolate and arching, with an asymmetrical and attenuate base. The leaf veins are oblique, the margins undivided, and the apex acute. This monoecious species blooms in July to November on axillary, umbelliform inflorescences. It has conical flower buds that display numerous long and yellowish stamens upon opening. The fruit is contained in a campanulate, or nearly cylindrical, capsule with a short peduncle that carries small brown seeds.

Uses

It is used, along with Casuarina, as a wind barrier against salty sea winds. Its wood is used for road barriers and to for railway sleepers. It is also sometimes used in gardens.





Fraxinus angustifolia Vahl (Oleaceae)

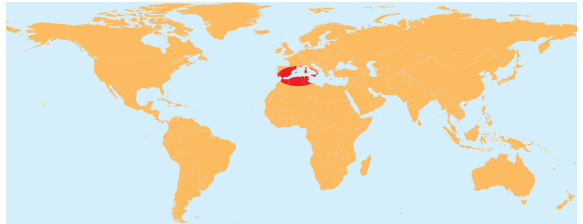
Narrow-Leafed Ash, Caucasian Ash, Syrian Ash.

Etymology

The generic name *Fraxinus -a -um*, means 'ash' and was the Latin term by which the Romans knew this species. The specific epithet *angustifolia*, refers to its narrow leaves.

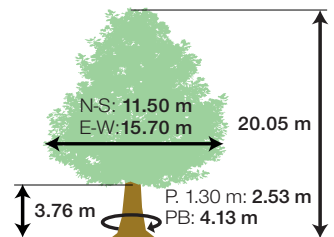
Distribution and ecology

This tree is from the Western Mediterranean (Western Mediterranean Subregion). It lives in moist soils bordering watercourses and in areas where groundwater levels are high, from sea level to altitudes of 1,000 m.



Description

This deciduous tree can exceed 20 m in height and has a moderate growth speed and longevity. The trunk is usually short, straight, and columnar, with dark grey, thick bark which is rough and cracked. The crown is dense, ovoid, and widely columnar or globose. It has opposite, compound, imparipinnate, and usually glabrous leaves with petioles; the upper surface is dark green and the underside is a lighter colour and the leaflets are opposite and sessile, except for the terminal pinna that is sometimes on a short petiolule; the bases are attenuate, the margins serrate but undivided at the base, and the apexes acute. It is a polygamous monoecious species that blooms between January and March. The unisexual or bisexual flowers are grouped on axillary inflorescences with pedicels and are a green-purple colour. The fruit is an oblong-lanceolate, flat samara with a petiole and is light brown when ripe.



Uses

Ashes have been used for (and cultivated for the purposes of) farming and grazing cattle because their leaves can be used for fodder. Its wood is hard and elastic and so it is used in carpentry and barrel-making, as well as for making various different tools like forks, hoe handles, etc. It is widely used in landscaping as an ornamental tree.



Ginkgo biloba L. (Ginkgoaceae)

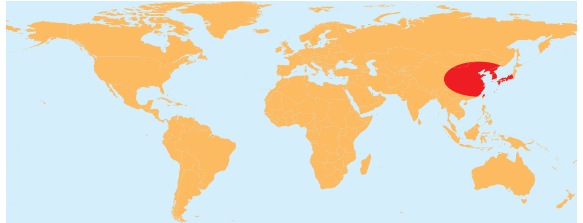
Ginkgo, Gingko, Maidenhair Tree, Tree of the 40 Shields.

Etymology

The generic name comes from the Chinese *Yin xing*, translated to Japanese as *Ginkyo*, 'silver apricot', which was erroneously transcribed by E. Kaempfer as *Ginkgo*. The specific epithet *biloba*, refers to the two lobules that some of the leaves divide into.

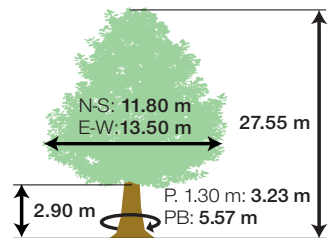
Distribution and ecology

It originates in Eastern China (Sino-Japanese Region), where it lives in valleys on loess sediments; although it is now a rare plant in the wild, it has spread all over the world in gardens.



Description

This deciduous tree can reach 40 m in height and is slow growing and very long-lived. It usually has a single (but occasionally multiple) straight and conical trunk, and thick, brown-greyish, smooth bark with deep grooves. The crown consists of monopodial branches, which take a pyramidal shape at first, but becomes widely ovoid and irregular when mature. The leaves are bright green, pendunculate and slightly sarcous, the leaf blade is flabellate and glabrous, with dichotomous veins and irregularly lobed margins which are occasionally cleft and divided into two lobules. It is a dioecious species that flowers between March and May. The male understock joins the sporangia, equivalent to stamens, in structures similar to aments and the female understock, the seminal primordia, has a peduncle and with two seminal rudiments at its extreme. The seeds are ovoid-globose, with a sarcous yellowish covering when ripe.



Uses

It is considered to be a sacred tree in China and Japan, where it often stands in monasteries. The seeds, which are rich in carbohydrates, are eaten toasted or cooked, after removing the outer shell which has a bad odour. Its wood is good quality and is sometimes used in carpentry. In medicine its leaves are used to alleviate circulatory problems.



Juniperus virginiana L.

(Cupressaceae)

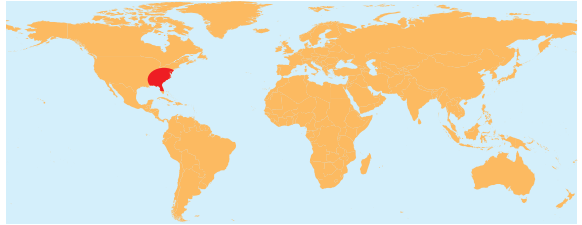
Red Cedar, Eastern Red-Cedar, Red Juniper, Pencil Cedar, Aromatic Cedar.

Etymology

The genus name is derived from the Latin *juniperus*, used by the Romans to refer to juniper and its wood. The specific epithet *virginiana*, refers to its origin, Virginia, on the Atlantic coast in the south of the United States..

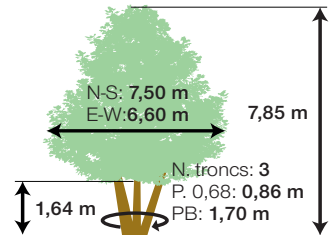
Distribution and ecology

It originates in the east of North America (North American Atlantic Region). It is a pioneer plant that grows on sandy soils, on slopes and spurs, but it is very sensitive to fire.



Description

This evergreen tree can reach 30 m in height and is slow growing and long-lived. It can have a single or multiple trunks which are straight and slightly conical, and the bark is greyish to brown-reddish, fibrous, lightly-fissured, and sheds in thin strips. Its habit is very variable. The crown varies between tightly ovate and conical, and becomes irregular as it matures. The leaves are squamiform and arranged in four lines; they are oval-lanceolate, undivided and acute, with a noticeable gland (without exudate) on the underside; they are intense green and turn brown in winter. This dioecious species flowers between January and March. The microsporophylls can be found grouped in tan-coloured cones, and the solitary megasporophylls are a green-orange colour. The fruit is an ovoid-globose, sarcous and indehiscent strobilus which is blue-green and pruinose; it matures in one year and houses one or two brown ovate seeds in its interior.



Uses

Its wood is good quality, is easy to work, and is aromatic; it is used in carpentry, to make pencils, and as fence posts, among other uses. It is a toxic plant and so its oil is not used. Its galbulus are used to make gin. It is also very commonly used in gardens.



Koelreuteria bipinnata Franch. (Sapindaceae)

Chinese Flame Tree, Bougainvillea Golden-Rain Tree.

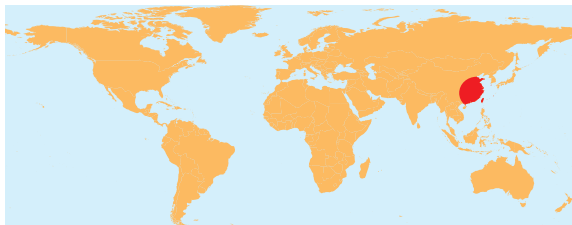
Etymology

This genus is dedicated to the German physician and botanist Joseph Gottlieb Kölreuter. The specific epithet *bipinnata*, 'twice pinnate', alludes to the double division observed in its leaves.

Distribution and ecology

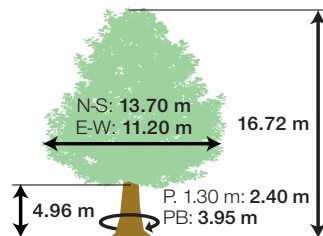
This plant has its origins in Asia, and is typical of the west of China (Sino-Japanese Region). It is very sensitive to cold, which makes it difficult to cultivate, but it adapts very well to Mediterranean

climates. It lives in poor, sandy, well-drained, and alkaline soils, and is resistant to salty winds, and is therefore used as a barrier.



Description

This deciduous tree can reach 20 m in height; it is fast-growing and short-lived. It has a straight and cylindrical trunk, with a thin, dark brown, rough, and fissured bark, forming small plaques. The crown is globose and dense, and the leaves large, compound, and bipinnate; the upper surface is glabrous and dark green and the underside is lighter, and slightly pubescent along the veins. The leaflets are alternate, with an ovate to elliptic shape and a slightly oblique base that is rounded to cuneate; the margin is undivided to serrate and the apex is acute or acuminate. This monoecious species blooms between July and October: the flowers are grouped in terminal, erect, and bushy inflorescences; they are bisexual and have four yellow petals which are stained red at the base. The fruit is a dehiscent, subglobose capsule which is swollen and papery, and has three ribs that start out as a reddish colour, and carry six subglobose black seeds.



Uses

It contains saponins, especially the seeds, from which soap can be made. Its flowers are used as a yellow dye, and have also been used to treat conjunctivitis. Necklaces are also made with the seeds.



Lagunaria patersonia (Andrews) G. Don (Malvaceae)

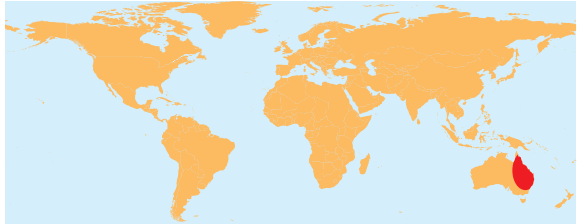
Pyramid Tree, Norfolk Island Hibiscus, Queensland White Oak,
Sally Wood.

Etymology

The genus is dedicated to the Spanish humanitarian physician, Andrés Theguna, the medical botany researcher, who translated *De Materia Medica* written by the Greek physician, pharmacologist and botanist Dioscorides. The specific epithet *patersonia*, is dedicated to William Paterson, the Scottish explorer and botanist.

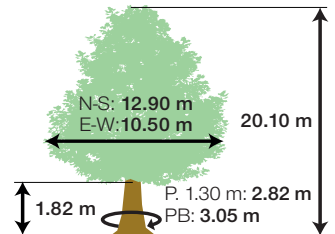
Distribution and ecology

It lives in the east of Australia, on the Norfolk and Lord Howe islands (Tropical Australian Region).



Description

This evergreen tree can reach 20 m in height and is fast-growing and short-lived. The trunk is cylindrical, ridged, and straight (but conical when young), and produces shoots at the base when mature; it has a thin, brown-greyish, somewhat rough and fissured bark. The crown is pyramidal and dense, and has erect peaks and oblique branches which are very closed, and produces annual canescent sprouting. The leaves are simple, alternate, and petiolate; they are olive green and slightly tomentose on the upper surface, and a greyish-silver colour and densely tomentose on the underside. The lamina is ovate to lanceolate, pinnate, and cuneate at the base; the margin is undivided, and the apex is obtuse. It is a monoecious species that blooms between May and July with solitary and bisexual axillary flowers, sitting on short and thick pedicels, with five narrow, waxy, reflexed mauve-pink-colour petals. The fruit is contained in a dehiscent and elliptic-globose capsule which start out green-greyish and tomentose, and turn light brown when ripe; the capsule has five cavities and the inside is covered with irritating hairs. The seeds are reniform, glabrous, and are a reddish colour.



Uses

Because of its closed habit and ability to re-sprout it is commonly used to make hedges and borders. It is widely cultivated as an ornamental tree for the beauty of its flowers.



Ligustrum lucidum W. T. Aiton (Oleaceae)

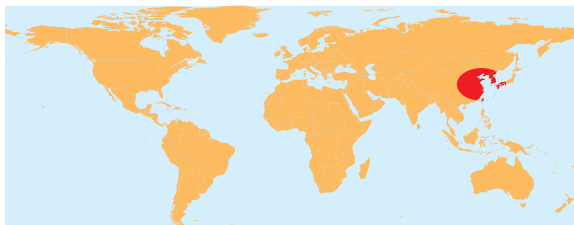
Chinese Privet, Wax-Leaf Privet, Glossy Privet.

Etymology

The generic name, *Ligustrum*, was used by the Romans to refer to privet. The specific epithet comes from the Latin, *lucidum*, meaning 'light' or 'bright', alluding to its nitid leaves.

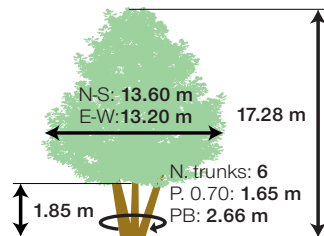
Distribution and ecology

It is native to the south of China (Sino-Japanese Region) where it forms part of the natural vegetation. It is indifferent to edaphic effects. In some countries it is an invasive plant.



Description

This fast-growing and short-lived evergreen tree can exceed 15 m in height. It can have a single or multiple trunks, which are straight and cylindrical; the bark is thin, smooth, greyish, and covered with lenticels, and becomes darker and fissured over time. The ovate-globose and frondose crown comprises numerous erect branches, and annual sprouting is green and glabrous. The leaves are simple, opposite, coriaceous, and petiolate; they are a glossy dark green on the upper surface and paler on the underside; the leaf blades are ovate to ovate-lanceolate, with yellowish pinnate veins; they are rounded to attenuate at the base, the margins undivided and translucent, and the apex acute or acuminate. This monoecious species blooms between June and August. The flowers are bisexual, fragrant, and have four white petals and reflexed lobules; they are grouped on terminal pyramidal panicles and have short pedicels. The fruits are small, ovoid-globose berries that are a bluish-black when ripe; they contain one or two brown, elliptic seeds that are flat on one side.



Uses

In traditional Chinese medicine its fruits are used as aphrodisiacs and stimulants. It was introduced into Europe in the Middle Ages. Some cultivars are very widely used in gardens.

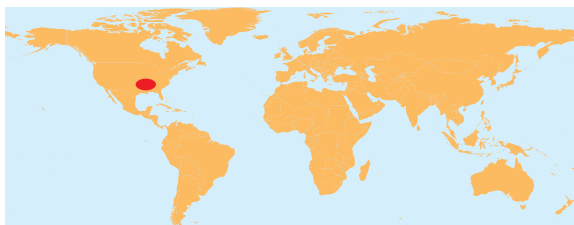


Maclura pomifera (Raf.) C. K. Schneid. (Moraceae)

Osage Orange, Hedge Apple, Horse Apple, Monkey Ball, Bois d'Arc, Bodark, Bodock.

Etymology

This genus is dedicated to the American, geologist, botanist, and educator, William James Maclure. The specific epithet *pomifera*, is from the Latin *pomiferus*, -a, -um, 'fruit producing', which alludes to its large infructescences which are similar to apples or oranges.

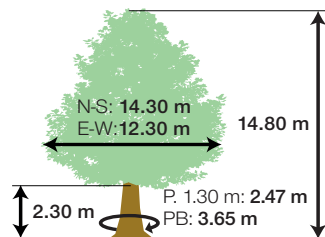


Distribution and ecology

It is a native species of southeastern North America (North American Atlantic Region), but is widespread all over the United States.

Description

It is an armed deciduous tree that can reach 20 m in height, grows moderately fast, and is long-lived. The trunk is short and cylindrical, and the bark is brown-orange, striate, and divided into plaques that, when damaged, exude a whitish and sticky sap. The crown is globose and the leaves alternate, simple, and petiolate; the leaf blades are ovate-lanceolate, attenuate or sub-cordate at the base, the margins undivided, and the apex acuminate. It is a dioecious species that flowers between April and June. The inflorescences are axillary: the males have yellowish flowers on subglobose raceme, and the females, bruised-whitish-colour flowers with yellowish papillose stigmas and long hairs on globose capitula. The large subglobose fruits are syncarpous, with a green-yellow verrucose surface that turns orange-coloured when ripe. The seeds are an oval-elliptic creamy colour.



Uses

The fruit not edible. The yellow-orange coloured wood is very dense and heavy, and is valued for making tool handles, fence posts, and for other applications requiring stable, strong, and rot-resistant wood. The Osage tribe in central and southern USA use its wood to make bows and arrows, and also extract an orange dye from its bark.



Magnolia grandiflora L. (Magnoliaceae)

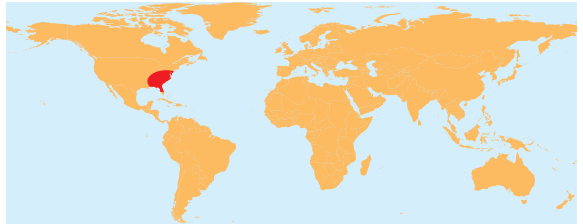
Southern Magnolia, Magnolia, Bull Bay.

Etymology

This genus was dedicated by Carl Linnaeus, to the French physician and botanist Pierre Magnol, who was director of the Montpellier Botanic Garden. The specific epithet *grandiflora*, is from the Latin *grandis* and, meaning large, and *flos*, 'flower', and alludes to its large flowers.

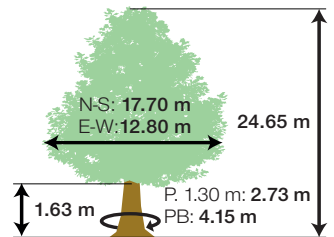
Distribution and ecology

It is native to the southeast of the United States (North American Atlantic Region) where it lives on deep, cool, acidic soils with good drainage. It forms part of the forests of eastern North America.



Description

This fast-growing and moderately long-lived evergreen tree can reach 30 m in height. It has a single, straight, and cylindrical trunk, with brown-greyish, rough, and fissured bark divided into irregular plaques. Its crown is pyramidal, columnar, or ovoid depending on the variety. The leaves are simple, alternate, petiolate, and coriaceous with a glabrous, dark green upper surface and brown-reddish, pubescent underside; the lamina is elliptic to obovate, cuneate at the base, with undivided undulate-sinuate margins, and acute apices. This monoecious species blooms between May and August. The flowers are bisexual, large, creamy-white, solitary, and very fragrant. The fruits are grouped into follicles, and each one carries a seed which stays attached to it upon opening via a long funicle. The reddish seed is oblong, smooth, and flat.



Uses

Its wood is good quality and is used in carpentry and construction. Its bark is used as a stimulant and diaphoretic; some tribes (the Choctaw and Koasati) use it on the skin and for kidney ailments. Because of its large habit, perennial foliage, and showy flowers is very commonly used in gardens.



Melaleuca ericifolia Sm.

(Myrtaceae)

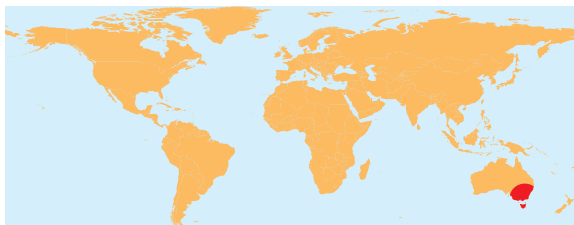
Swamp Paperbark Tree.

Etymology

The name of the genus comes from the Greek *melas*, meaning black, and *leukos*, meaning white, making reference to the colour contrast between the trunk and the branches seen in some species. The specific epithet *ericifolia*, from the Latin *Erica*, 'heather', and *folius -a -um*, 'leaf', refers to the similarity of its leaves to heather.

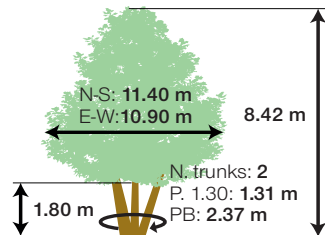
Distribution and ecology

This small tree is native to Eastern Australia, and reaches into Tasmania (Mediterranean-Australiana Region). It withstands salty soils and halophilous winds well.



Description

This is an evergreen tree that can reach 10 m in height; it is fast-growing and moderately long-lived. There may be a single or multiple, cylindrical, straight or somewhat inclined and flexuous trunks. The bark is greyish, suberose (corky), fissured, soft, and papery, and sheds in longitudinal strips. The crown is globose-flabellate, moderately frondose, and formed by long, sinuous, and extended branches; it has thin, greyish, glabrous and somewhat pendulous branchlets, and produces annual green-reddish sprouts covered with a whitish tomentum. The leaves are simple, alternate, and coriaceous, with short, nearly straight petioles; the lamina is dark green on both sides, tomentose at first, later becoming glabrous; the leaf blades are linear to tightly elliptical, flat, cuneate at the base, with an undivided margin, and acute apex. This monoecious species flowers between April and July. The inflorescences are bisexual, very numerous, and showy, producing short, cylindrical spikes with white sessile flowers. The fruit is contained in a small, woody capsule which is sessile, ovate, and greyish when ripe.



Uses

In Australia it is very commonly used to fix sand dunes and as a barrier against salty winds from the sea.



Myrtus communis L. (Myrtaceae)

Common Myrtle, True Myrtle.

Etymology

The name of the genus was taken of the Greek *myrtos*, in Latin *myrtus*, meaning myrtle. The specific epithet *communis* means common, because it is a common plant in the Mediterranean flora.

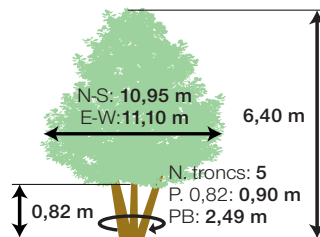
Distribution and ecology

This species is from the Mediterranean Region, where it forms part of scrubland (containing kermes oaks and mastics) on deep and moist soils, given that it does not withstand excessive summer droughts well. However, it does tolerate sandy soils well, and thus forms part of the coastal dune vegetation. It extends from sea level to altitudes of 1,000 m.



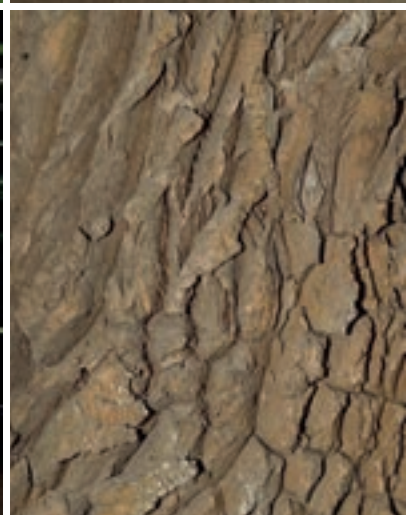
Description

This evergreen shrub can exceed 5 m in height, it is very aromatic, fast-growing, and moderately long-lived. It branches from the base forming multiple trunks that are cylindrical, straight, or inclined, and which arch with age; it has thin, grey-reddish, fissured bark, divided into irregular and deciduous plaques. The crown is globose-extended and frondose. It has simple, coriaceous, opposite leaves, with short petioles, and with glandular pits on both sides; the leaf blade is ovate-lanceolate with an attenuate base; the margin is undivided and the apex acute. It is a monoecious species that blooms between May and July. The flowers are solitary, bisexual, axillary, pedicellate, white, and fragrant. The fruit is a glabrous, ovoid or subglobose berry, which is slightly pruinose, and is a bluish-black colour when ripe. The creamy-white seeds are small and reniform.



Uses

It is used as a medicinal plant because of its tannins and essences, which give it astringent, antiseptic, and sedative properties. It is also used to cure leather because of its tannins. An alcoholic drink can be obtained from its fruits, myrtle liquor. Its thin and compact wood is also used in carpentry.



Nolina longifolia (Karw. ex Schult. & Schult. f.) Hemsl. (Asparagaceae)

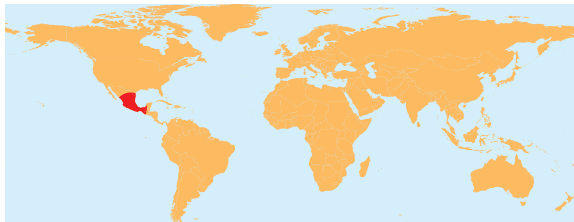
Beargrass, Oaxacan Nolina Tree.

Etymology

This genus was dedicated to the eighteenth century French botanist and soil science writer, C. P. Nolin. The specific epithet *longifolia*, comes from the Latin *longifolius*, which alludes to its long leaves.

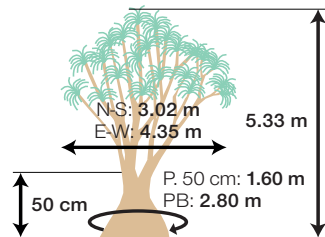
Distribution and ecology

It is native to Mexico, where it lives in the Oaxaca and Puebla states (Madrean and Caribbean-Mesoamerican Regions). It forms part of the natural vegetation of these territories at altitudes between 800 and 900 m.



Description

This is a monocotyledonous, arborescent, perennial plant that can exceed 5 m in height; it has a moderate growth speed and longevity. The trunk is widened at the base, ligneous, and succulent, and has thick, brown-greyish, suberose bark which is very rough and deeply fissured. The crown is globose and irregular, moderately dense, and is dichotomously branched after flowering. Its leaves are long, light green, glabrous, coriaceous, and marcescent, and are arranged forming rosettes at the branch apices. The leaf-blades are linear-lanceolate and arching, have a sharp, denticulate margin, and the apex is long, attenuated, and acute. It is a dioecious species that flowers between April and July. The inflorescences are terminal and bractate, and the flowers are grouped on panicles. The blooms are small, unisexual, pedicellate, and are a whitish-colour with green or brown blemishes. The fruits are dehiscent and are contained in swollen capsules, with three globose, green-yellowish lobules. The seeds are brown and ovoid-elliptic.



Uses:

The leaves are used locally to make baskets and hats. Because of the uniqueness of its habit it is used as an ornamental plant, although it is a little-known species in Spain and is only grown in some botanical collections.



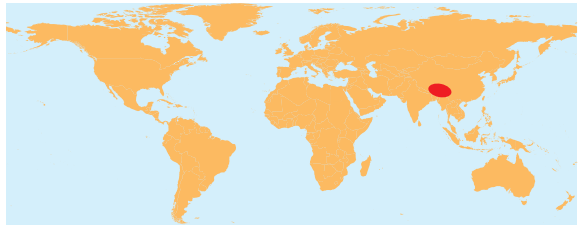
Osteomeles schwerinae C. K. Schneid. (Rosaceae)

Osteomeles.

Etymology

The name of the genus comes from the Greek *osteon*, meaning bone, and *melon*, 'apple tree', for its fruit which is almost without pulp and which has a very hard seed.

The specific epithet, *schwerinae*, recognises the work of Fritz Kurt Alexander von Schwerin, the German botanist, dendrologist, and writer.

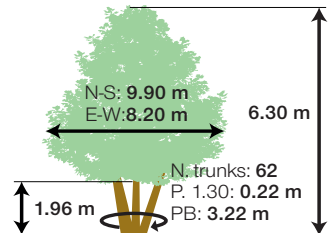


Distribution and ecology

It originates in southwest China (Sino-Japanese Region) where it lives in ravines and seasonal streams. It forms part of mixed forests at altitudes between 1,500 and 3,000 m.

Description

It is a fast-growing and short-lived evergreen shrub that can exceed 4 m in height. It branches profusely from the base, forming multiple thin, cylindrical trunks, that are somewhat inclined and sinuous, and which arch with the age; the bark is thin, smooth, and dark brown. Its crown is globose-extended, frondose, and highly branched. The leaves are alternate, petiolate, compound, and imparipinnate, and the rachis has narrow alas; the leaflets are short and can be petiolulate or sessile. The upper surface is dark green and the underside is a lighter colour, both being a pubescent grey; the lamina is elliptic to elliptic-oblong, with a wide cuneate or nearly rounded base, undivided margin, and acute or mucronate apex. It is a monoecious species that flowers between April and June with the flowers grouped in small terminal corymbs. The flowers are white, bisexual, actinomorphic, and tomentose and have pedicels. The fruits are small, ovoid-globose, glabrous pomes, with erect and persistent sepals, that are initially green but turn blue-blackish when ripe; they contain five seeds.



Uses

Its fruits are sweet and are edible raw but are also used to make jams. It is used as an ornamental plant.



Paliurus orientalis (Franch.) Hemsl. (Rhamnaceae)

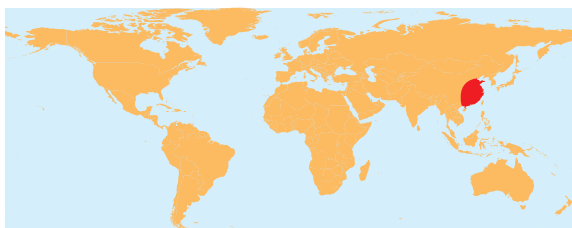
Chinese Money Tree.

Etymology

The generic name comes from the Greek *paliouros*, 'of unknown origin', used by the Greeks and Romans to refer to both *Paliurus spina-christi* and *Ziziphus spina-christi*. The specific epithet *orientalis*, 'of the east', is because the plant is native to China.

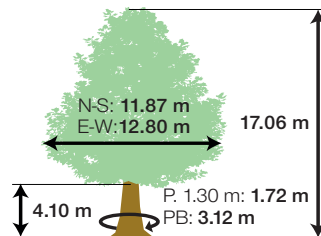
Distribution and ecology

This plant originates in Eastern China (Sino-Japanese Region) where it lives in mountain areas at altitudes between 900 and 2,000 m.



Description

This deciduous tree can exceed 17 m in height, and has a moderate growth speed and longevity. It has a straight and roughly cylindrical trunk, with thin, greyish, rough and cracked bark, which forms elongated plaques. The crown is tightly ovoid, has erecto-patent branching, comprising long, greyish, arching branches, with annual green sprouts covered with a whitish tomentum and with two thorny oblique stipules at their bases. Its leaves are simple, alternate, and papery, with tomentose petioles; the upper surface is a dark green colour and the underside lighter, pubescent, and glabrous. The leaf blades are ovate to widely elliptic, and trinervate; the base is slightly asymmetrical, cuneate, or nearly rounded, the margin is slightly serrate, and the apex acuminate. It is a monoecious species that flowers between April and June, with the flowers grouped on cymose axillary inflorescences. The flowers are bisexual, actinomorphic, have pedicels, and are a yellowish colour. The fruit is dry and glabrous, starting out green but becoming brown when ripe; they have a flattened disc shape, surrounded by a wide, papery, undulate-sinuate ala.



Uses

Some species of *Paliurus* are used as food plants. It is a rare species which is little-known in Spain and is only cultivated in botanical collections.



Photinia serrulata Lindl. (Rosaceae)

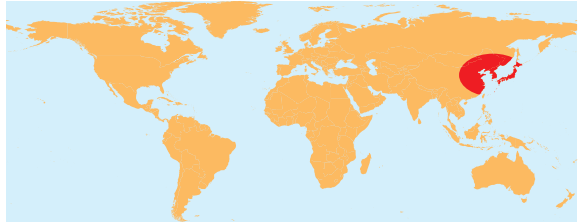
Taiwanese Photinia, Chinese Photinia.

Etymology

The name of the genus comes from the Greek *photeinós*, meaning light or bright, probably because of its bright green leaves. The specific epithet *serrulata* refers to its serrate leaf margins.

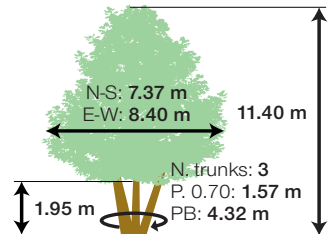
Distribution and ecology

It is native to China and Japan (Sino-Japanese Region) where it forms a part of the fringe between scrublands and forests, on spurs and crests, at altitudes between 300 and 1,300 m.



Description

This evergreen shrub, which when cultivated can exceed 10 m in height, has a moderate growth speed and is short-lived. It usually branches from the base, forming multiple trunks that are roughly cylindrical; the brown-reddish bark is thin, rough, and fissured and is divided into thin and elongated deciduous plaques. Its crown is irregularly globose, comprising numerous erect branches; the branchlets are glabrous, brown-reddish, and lightly covered with cream-coloured lenticels. The leaves are simple, alternate, coriaceous, glabrous, and have petioles; the central vein is initially tomentose but later becomes glabrescent. The upper lamina surface is a bright green colour, the underside green-yellowish, and the older leaves reddish; the leaf blades are elliptic to obovate, with cuneate or rounded bases, undulate-sinuate, undivided, or finely serrate margins, and acute to acuminate apices. This monoecious species blooms between March and May, with the flowers grouped on terminal corymbs. The flowers are bisexual, white, and pedicellate. The fruit is a globose pome, which is initially red but becomes brown-purplish when ripe.



Uses

It is prized by gardeners for its habit and its leaves that turn red before falling, as well as for its inflorescences and red fruits.



Phytolacca dioica L. (Phytolaccaceae)

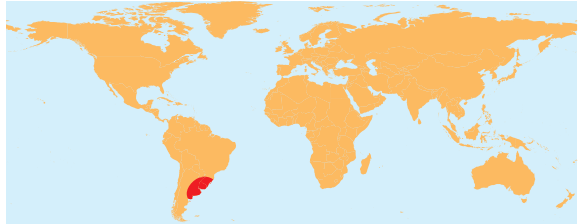
Belhambra, Bella Ombre, Ombú, Bella Sombra.

Etymology

The genus name *Phytolacca* comes from the Greek *phyton*, meaning plant, and from the Latin *lacca*, which means 'dye' or 'red resin', alluding to the reddish juice extracted from the fruits of some species of the genus. *Dioecious*, from the Greek *di*, 'two', and *oikos*, 'house', indicates that the flowers of each sex are found on different examples of the tree.

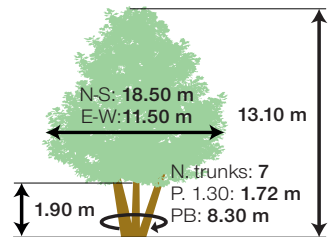
Distribution and ecology

It is a Neotropical-Austroamerican plant with its optimum range in the Pampas of Argentina and Uruguay. It forms part of the Pampas vegetation, but today very little remains of the *ombú* woodland because of deforestation in the territory.



Description

This is a very large, semi-evergreen tree that loses its leaves if the winter is cold. It grows quickly and reaches 15 m in height. It has a single or multiple trunks, which are usually short, with a very swollen base in old specimens; the bark is thick, brown-greyish, slightly rough, and somewhat fissured. Its crown is globose and extended. The leaves are simple, alternate, petiolate, and glabrous; its leaf blades are ovate-elliptic with a rounded or cuneate base, undivided margin, and a yellowish acute apex, which are occasionally mucronate. This species is dioecious and blooms between May and July. The flowers are unisexual and are grouped in small lateral raceme with pedicels and are a green-yellowish colour. The fruits are depressed-globose berries with creases, which are blackish when ripe. The seeds are ovoid, flat, and black.



Uses

In Argentina and Uruguay this tree forms part of the popular culture and is respected and planted as a shade tree. Gatherings and meetings are held under it and on its projecting roots. Its wood is soft, although it is used to make some utensils.



Pinus brutia Ten. (Pinaceae)

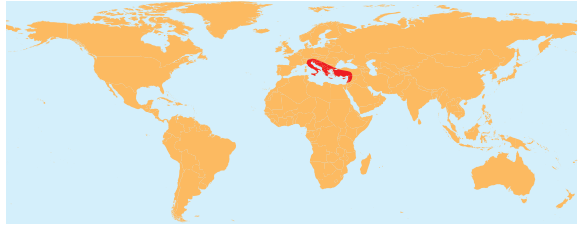
Turkish Pine, Calabrian Pine, East Mediterranean Pine, Brutia Pine.

Etymology

The word *Pinus* was used by the Romans to refer to several species of pines prized for their resin, wood, and fruits, especially the Stone Pine, *Pinus pinea* L. The specific epithet *brutia* comes from the Latin *Bruttii*, which means 'inhabitants of the Brucios', an ancient town in the south of Italy, in what is now part of Calabria.

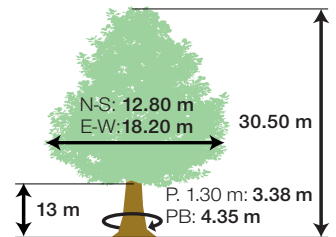
Distribution and ecology

It is characteristic of the Eastern Mediterranean Subregion (Calabria, Cyprus, Crete, and Turkey) where it forms part of thermo- and mesomediterranean forests and scrubland, in mountains reaching altitudes up to 1,200 m. It is Indifferent to edaphic effects.



Description

This evergreen tree can exceed 30 m in height and is fast-growing and short-lived. It has a straight and cylindrical trunk, which is occasionally tortuous; the bark is thick, brown-reddish, deeply cracked, and divided into large, elongated plaques. The crown, is initially pyramidal, and becomes globose and irregular with the time. The acicular leaves, are arranged on short stalks in groups of two, and are held at the base by a persistent membranous sheath; they are generally rigid, and have serrulate margins, with thin lines of stomata and several resinous canals. This is a monoecious species that flowers between February and May. The male cones are oblong and yellowish and the female cones are ovoid and are a red-violet colour. The strobilus are ovate-conical and are sessile or have a very short and straight peduncle. The seeds are ovoid, brown-greyish, and have a long articulated ala.



Uses

Its wood is used in carpentry. It is visited by melliferous insects which produce good quality honey known as "pine honey". It is used as an ornamental plant.



Pinus canariensis C. Sm. (Pinaceae)

Canary Island Pine.

Etymology

The specific epithet *canariensis* indicates that it originates in the Canary Islands.

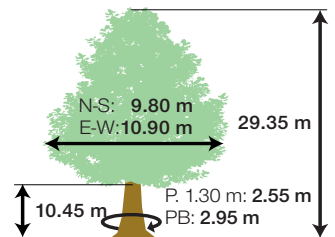
Distribution and ecology

It is native to the Canary Islands where it forms dry climatophilous thermomediterranean forests on basalt soils.



Description

It is an evergreen tree that can reach 40 m in height, and in some cases exceeding 60 m; it grows moderately fast and is long-lived. The trunk is straight and cylindrical, with glaucous, epicormic sprouts and is able to re-sprout from the stump; the bark is thick, brown-reddish, deeply cracked, and divided into large, greyish, elongated and irregular plaques. The crown is initially tightly pyramidal, but becomes somewhat globose and irregular as it reaches maturity. Its leaves are acicular, very long, thin, and flexible, and are green and glaucous in young trees, and light green in the adults; they are arranged on a short stalks in groups of three, and held at the base by a membranous and persistent sheath. This monoecious tree flowers between March and May. The male cones are grouped towards the apexes of the branchlets, and are sub-cylindrical and yellow-reddish when ripe; the female cones, located at the apexes of new shoots, are erect, tightly ovoid, and cardinal red. The strobilus are conical-ovate, tawny, and have a very short peduncle. The seeds are hard and oblong, and are greyish on one side and blackish on the other; they have a fixed and membranous wing.



Uses

In the past its leaves, which are very long, were used to pack bunches of bananas, as well as for bedding for animals. Its wood, among other uses, was used to make the railings on typical Canarian balconies. It is used in reforestation and in landscaping.



Pinus pinea L. (Pinaceae)

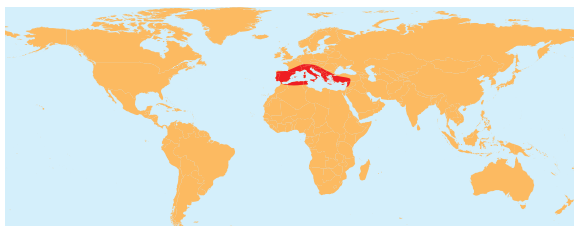
Stone Pine, Italian Stone Pine, Umbrella Pine, Parasol Pine.

Etymology

The specific epithet *pinea*, from Latin, means 'of pine', referring to its wood, resin, and pine nuts.

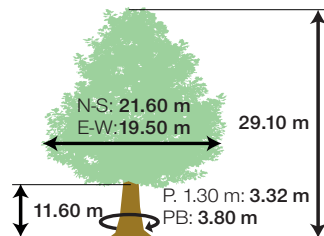
Distribution and ecology

This plant is native to the Mediterranean Region, and reaches into western Asia (Iranian-Turanian Region). It lives on sandy soils and prefers siliceous-origin sands, although it can survive on calcareous sands; it cannot tolerate clays.



Description

It is a fast-growing and moderately long-lived evergreen tree that can reach 30 m in height. Its trunk is straight and cylindrical, and the bark is thick, brown-greyish, deeply cracked and divided into thin overlapping plaques, which reveal a red-orange colour when they detach. The crown is dense and has branching verticils, which are globose on young trees, and flabellate on mature examples. The acicular leaves are intense green, long, thick, and somewhat rigid and pointed, are arranged on a short stalks in groups of two and held at the base by a membranous and persistent sheath. This monoecious tree flowers between February and May. The male cones are sub-cylindrical and yellow, and the female cones are ovoid-globose and a brown-reddish colour. The strobilus are large, ovoid to globose, brown-reddish, and have a short and thick peduncle. The seeds are brownish, oblong, and one face is flat; they have a very short articulated ala.



Uses

This species is widely planted both for its flabellate crown and its delicious pine nuts which were used as balsams, antitussives, and to fight bronchial diseases. Its wood, which is very resinous and hard, is moisture resistant, and is used in carpentry and for railway sleepers. Because of its richness in tannins it has also been used as a cure.



Platanus orientalis L. (Platanaceae)

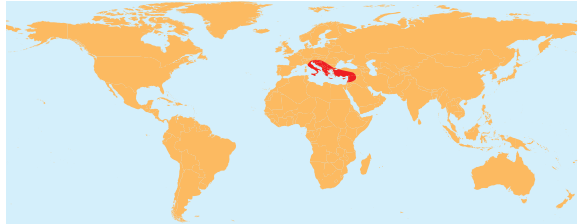
Oriental Plane.

Etymology

The generic name comes from Greek, *platys*, meaning 'wide' or 'ample', in reference to its crown and leaves, and was known in antiquity as *plátanos*, in Latin *platanus*. The specific epithet comes from the Latin *orientalis*, 'of the east', its place of origin.

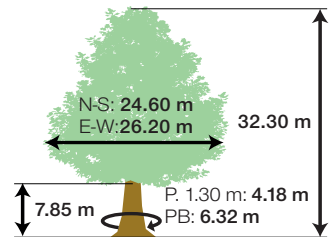
Distribution and ecology

It is distributed throughout the Mediterranean basin (Mediterranean Region). Its origin lies in the eastern Mediterranean, although it naturally reaches into East Asia (Iranian-Turanian Region). It lives in ravines with seasonal streams and in soils with some edaphic moisture.



Description

It is a fast-growing and long-lived deciduous tree that can reach 35 m in height. It has a straight and columnar trunk, with thin, grey-greenish bark, that is shed in irregular plaques, to reveal areas of creamy-yellowish bark underneath. The crown is initially oval, but becomes globose and very big with time. Its leaves are alternate, with long petioles; the lamina is plamatifid and very variable; the base is truncate, or long cuneate, and has three to seven lobules that penetrate to the middle of the leaf; they are ovate-triangular, undivided, or with large teeth. It is a monoecious species that flowers between March and April. The inflorescences are unisexual, with the flowers grouped on spherical aments, arranged in groups of two to four along the length of the thin peduncle. Its flowers are inconspicuous and tetrameric. The fruits are dry and indehiscent, in coriaceous and claviform achenes, and have a single seed.



Uses

It is very commonly used as a shade tree along walkways and avenues. Its wood is good quality and is used in carpentry and to make veneers. Its leaves, bark, and fruit were once used in folk medicine.



Podocarpus neriifolius D. Don (Podocarpaceae)

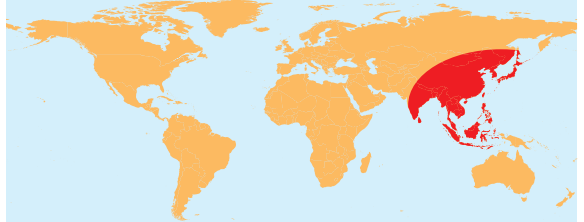
Brown Pine.

Etymology

The name of the genus is derived from the Greek *podós*, meaning ‘foot’ and *karpos*, ‘fruit’, indicating that its fruits are foot-shaped. The specific epithet *neriifolius* refers to the resemblance of its leaves to the rosebay, *Nerium oleander* L.

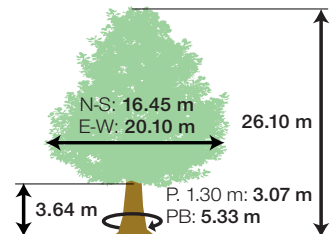
Distribution and ecology

This species is widespread in Asia and the Pacific, from the Holarctic Kingdom (Sino-Japanese Region) to the Paleotropical Kingdom (Indo-Malayan Region). It forms part of evergreen forests, at altitudes between 500 and 1,300 m, on deep and well-drained soils.



Description

It is an evergreen tree that can exceed 30 m in height; it is slightly resinous, slow growing, and long-lived. Its trunk is straight and conical, and the bark is thin, fibrous, and brown-greyish and sheds in long strips. The crown is dense, pyramidal at first, and becomes globose at maturity. The leaves are alternate, linear-lanceolate, glabrous, slightly falcate, and have a very short petiole; the base is cuneiform, the margin undivided, and the apex acute. It is a dioecious species that flowers between March and April. The male cones are solitary or form groups of up to three, and are short, sessile and light green; the female cones are solitary, with one, or occasionally two, seminal rudiments. The seeds are ovate to subglobose, with a sessile epimatium on a thick and sarcous peduncle that turns purple when ripe.



Uses

Because of its good quality wood this is a timber-yielding species. It is prized by carpenters and cabinetmakers, and is used in construction and for making furniture, musical instruments, and other objects. Its leaves are used in traditional medicine to treat arthritis and rheumatism. In Nepal, the sarcous base of the seeds are eaten raw.



Quercus cerris L. (Fagaceae)

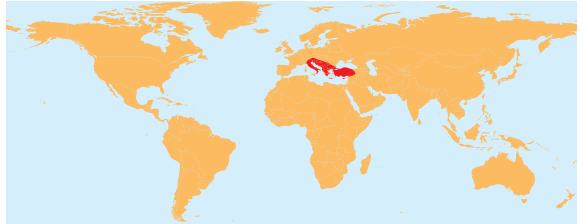
Turkey Oak, Austrian Oak.

Etymology

Quercus was the name used by the Romans to refer to trees that bear acorns, such as holm oaks (*Quercus ilex* ssp. *ilex.*) or valley oaks (*Quercus lobate*). The specific epithet *cerris* was the classic Latin name for this species.

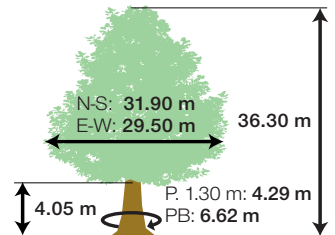
Distribution and ecology

It is native to the centre and east of the Mediterranean Region (Eastern Mediterranean Subregion), reaching western Asia (Iranian-Turanian Region). It is undemanding, but is at its optimum on siliceous-clay soils. It forms part of mixed forests, and reaches altitudes of up to 800 m.



Description

This deciduous tree can reach 35 m in height, has a moderate growth speed, and is long-lived. It has a straight and columnar trunk, with dark brown, thick, and deeply cracked bark. The crown is globose and big. The leaves are simple, marcescent, alternate, and petiolate; the lamina is sub-coriaceous, oblong-elliptic to obovate-oblong, has an asymmetrical rounded or truncate base, and a lobed margin with large, deep sinuses, and acute lobules. It is a monoecious tree species that flowers between March and May. It has unisexual flowers: the males are grouped on yellowish and tomentose hanging aments and the females are globose and are solitary or found in small groups. The fruit is dry and indehiscent, and contained in an oblong-ovoid nut with a rigid peduncle, which is a brown-reddish colour when ripe. It is pubescent and has a very striking bristly cupola that covers at least a third of the acorn.



Uses

This species has a beautiful habit, and is commonly used in gardening and as a wind-break barrier. The wood is rarely used because it is very prone to cracking and splitting. Its root system is associated with many mycorrhizal fungi, in Italy, specifically with *Tuber magnatum*, the white truffle. It secretes a white substance known as “oak manna” or “gaz” which is sold in Middle-Eastern bazaars, especially in Iran.



Quercus hartwissiana Steven (Fagaceae)

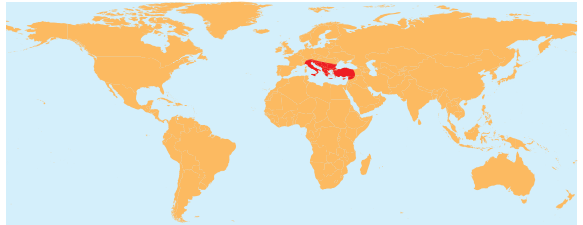
Hartwiss Oak.

Etymology

The specific epithet *hartwissiana* honours Nicolai Anders von Hartwiss, the Russian botanist with an interest in spermatophytes who explored Georgia and the Crimea.

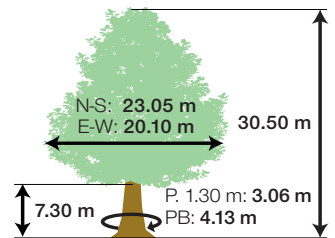
Distribution and ecology

This tree is native to the central and eastern Mediterranean basin (Mediterranean Region) reaching into West Asia (Iranian-Turanian Region). It is indifferent to edaphic effects, although it prefers moist soils. In edaphophilous locations it forms forests along with *Fraxinus oxycarpa* and *Ulmus laevis*.



Description

This deciduous tree can reach 30 m in height; it has a moderate growth speed and longevity. Its trunk is straight and cylindrical, and it has brown-greyish, thick bark, with deep vertical fissures, crossed by shallower transverse cracks. The crown is globose and diffusely branched with erecto-patent branches and glabrous, green-greyish branchlets, and is covered with whitish lenticels. The leaves are simple, alternate, petiolate, and are dark green and glabrous on the upper surface, and lighter with slightly pubescent veins on the underside. The leaf blades are obovate-oblong, with cordate bases, lobed margins, and with five to nine lobules with shallow sinuses and obtuse apices. It is a monoecious species that flowers between April and May while the leaves open. It has unisexual flowers, the males grouped on yellowish and pendulous aments, and the females found singly or in small groups. The acorns are found in groups of two to five on a common, sub-ovoid, and mucronate peduncle; they are a tawny colour when ripe, with a cupula that covers a third of their length.



Uses

Its wood is good quality and is valued in carpentry. It is used as an ornamental plant for its large habit and for the beauty of its orange-reddish sprouts.



Quercus ilex L. (Fagaceae)

Holm Oak.

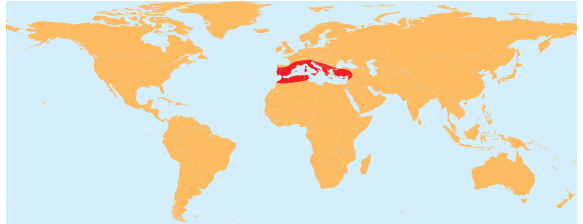
Etymology

The specific epithet *ilex* was the Latin name by which the Romans knew this species.

Distribution and ecology

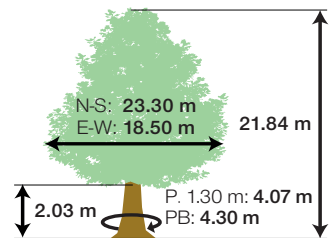
It is the most significant Mediterranean tree and is distributed throughout the Mediterranean basin (Mediterranean Region) where it is characteristic of sclerophyllous forests, from the thermo- to supramediterranean levels.

It is indifferent to edaphic effects and withstands dry environments well, but not arid climates. In Spanish, the *ilex* ssp. is known as *encina* whereas the *rotundifolia* ssp. (also known as *Q. rotundifolia* or *Q. ballota*) is known as *carrasca*.



Description

It is a slow growing and long-lived evergreen tree that can exceed 25 m in height. The trunk is usually short, straight, and cylindrical, with dark brown, slightly cracked bark divided into small elongated plaques. The crown is globose, large, dense, and dark. It has simple, alternate, coriaceous but flexible leaves with petioles; they are dark green and glabrous on the upper surface, and a lighter grey and tomentose on the underside; its lamina is very variable, and can be circular, ovate-oblong, or lanceolate, with a rounded or cuneate base; the margin is undivided, dentate, or serrate, and the apex is acute. It is a monoecious species that flowers between March and May. The flowers are unisexual, the males grouped on pendulous yellowish aments; the females are globose and tomentose. The fruits are pendunculate, and are solitary or found in groups of up to three, and have a hemispheric cupula that covers less than half of the long, ovoid acorn, which is dark brown when ripe.



Uses

The fruits (acorns) of this tree have been used for human consumption in times of famine, and are also excellent fodder for pigs. Interestingly, the acorns of the ssp. *ilex* are bitter tasting, while those of the ssp. *rotundifolia* are slightly longer and sweet tasting. Its bark is very rich in tannins, and has been used to cure leather and as an astringent. The wood, is very heavy and compact, and has been exploited in carpentry, construction, and especially as fuel, both directly as well as by transforming it into carbon.



Quercus macrocarpa Michx. (Fagaceae)

Bur Oak, Burr Oak, Mossycup Oak, Mossycup White Oak.

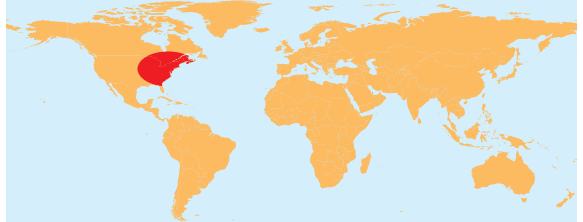
Etymology

The specific epithet *macrocarpa*, is from the Latin *macrocarpus*, which tells us that it has a large fruit.

Distribution and ecology

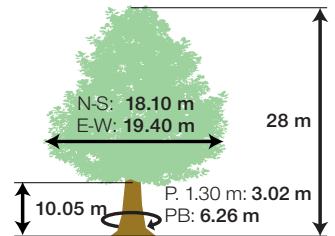
It has a wide distribution in North America, extending mainly through the North American Atlantic Region to reach the Great Lakes and Central Lowlands and Appalachian Provinces. It is indifferent to

edaphic effects and endures drought and freezing temperatures very well. It forms part of the central and eastern North American forests, where it is sometimes associated with other oaks.



Description

This deciduous tree can reach 50 m in height, with a moderate growth speed and longevity. It has a straight and columnar trunk, occasionally with a swollen base; the bark is dark grey, thick, rough, deeply grooved, and divided into elongated and persistent plaques. The crown is tightly pyramidal when young and becomes globose when ripe. Its leaves are alternate, simple, and petiolate, with large, obovate laminas, cuneate bases, and rounded apices; the margin is lobed, with five to seven pairs of ovate-obtuse lobules and the central sinuses are very deep. It is a monoecious species, with unisexual flowers, that blooms between March and May while the leaves open. The fruit (acorns) are large, widely ovoid, mucronate at the apex, and tawny when ripe; they ripen in one year. The cupula covers half or more of the acorn, with linear, reflexed, soft, and pubescent scales.



Uses

Its acorns are highly prized by squirrels, deer, mice, and bears. Its wood is good quality and is used in carpentry and construction. Because of its beautiful habit it is planted ornamentally in streets and gardens.



Quercus polymorpha Schltdl. & Cham. (Fagaceae)

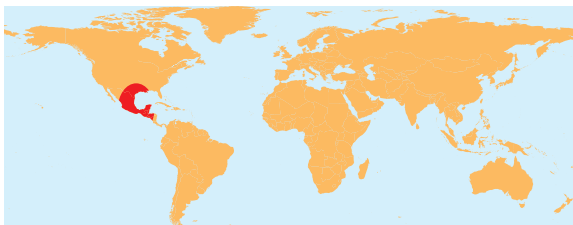
Mexican White Oak, Monterrey Oak, Netleaf White Oak.

Etymology

The specific epithet *polymorpha*, from the Latin *polymorphus*, 'with many shapes', alludes to the variety of shapes that the leaves present.

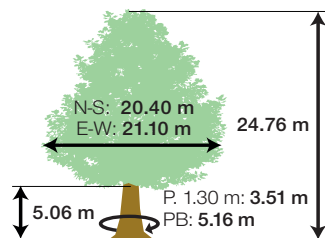
Distribution and ecology

It originates in Mexico, where it extends through the Mexican Xerophytic, Madrean, and Caribbean-Mesoamerican Regions, reaching towards the south to Guatemala and towards the north to southern Texas. It forms part of riparian and gallery forests, as well as dry tropical forests at altitudes between 400 and 2,100 m.



Description

It is a semi-deciduous tree that can exceed 20 m in height, and has a moderate growth speed and longevity. The trunk is straight and cylindrical, with brown-greyish, thick, and deeply grooved bark. Its crown is large and globose, with erecto-patent branching, and annual shoots that are initially tomentose, and later glabrescent. The leaves are marcescent, alternate, simple, and petiolate; the upper surface is dark green and glabrous, and the underside is lighter, somewhat glaucous, and with prominent yellowish hairs on the vein axils. The leaf blades are sub-coriaceous, elliptic to ovate and on occasions obovate, with rounded or sub-cordate bases; the margins are undulate-sinuate, revolute, and undivided or dentate in the last third, and the apex obtuse. It is a monoecious species, with unisexual flowers, that bloom between March and May. The acorns mature in one year, are solitary or paired, pendunculate, ovoid-elliptic, brown, and glabrescent, with a cupula that covers them halfway; the cotyledons are separate.



Uses

It is astringent because of its tannins. Its wood is used in construction, and occasionally as fuel or charcoal. Its acorns are a food source for domestic farm animals and to a large number of species of wild fauna.



Quercus virginiana Mill. (Fagaceae)

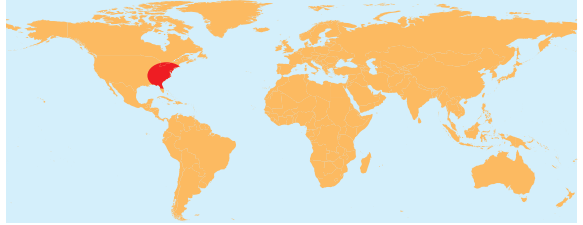
Southern Live Oak.

Etymology

The specific epithet *virginiana* refers to its place of origin, the state of Virginia, on the Atlantic coast in the south of the United States.

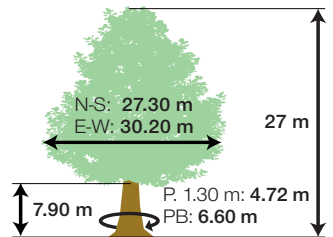
Distribution and ecology

It originates in the southeast of North America (North American Atlantic Region) where it lives on coastal plains, forming part of open evergreen forests. It develops on loams and clays from sea level to altitudes of 800 m, but is not found on the sands near the coast.



Description

This evergreen tree can exceed 20 m in height, is long-lived, and has a moderate growth speed. The trunk is usually short, straight, and cylindrical, with thick, rough, dark brown, cracked bark which is divided into persistent plaques. The crown is widely globose, the primary branches are thick and extended, with annual green and whitish-pubescent sprouting. The leaves are simple, alternate, petiolate, coriaceous and rigid; they are dark green and glabrous on the upper surface, and densely tomentose and whitish on the underside. The leaf blades vary between elliptic-oblong and obovate, with attenuate or rounded bases, margins that are undivided or with a few teeth at the upper end, and obtuse to acute apices. It is a monoecious species with unisexual flowers that bloom between March and May. The acorns mature in one year; up to five are carried on the same peduncle, and they are ovoid, dark brown, and glabrous, with the cupula covering a quarter of the fruit; it has connate (united) cotyledons.



Uses

It is now a protected plant. Its wood, which is very good quality, was used in construction and in the naval industry. Oil is extracted from its acorns, and its roots form edible tubers. It has been used in folk medicine to treat dysentery.



Quillaja saponaria Molina (Quillajaceae)

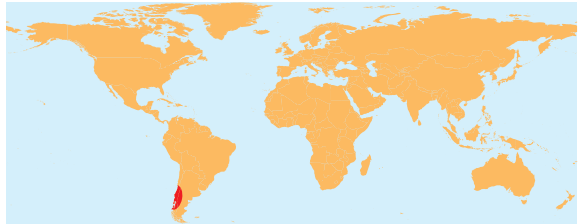
Soap Bark Tree, Soapbark.

Etymology

The generic name is derived from the popular Chilean name for this species, *quillay*, which in turn is probably taken from the Mapuche word *küllay*. The specific epithet *saponaria* comes from the Latin *sapo*, meaning soap, alluding to the saponins contained in its bark.

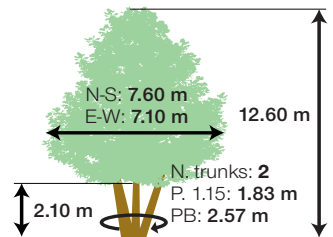
Distribution and ecology

It is a characteristic tree of the Mediterranean evergreen forests of the Central region of Chile (Middle Chile-Patagonian Region). It grows in poor, dry soils, and avoids edaphic moisture.



Description

This evergreen tree can reach 20 m in height and has a moderate growth speed and longevity. The trunk is usually single, short, straight, and cylindrical, with dark brown, cracked bark which is divided into small elongated plaques. The crown is tightly pyramidal in young examples, and oval-globose when mature; it has erecto-patent branching and pendulous branchlets. The leaves are alternate, simple, coriaceous, glabrous, and sub-sessile; they are bright green on the upper surface and lighter on the underside; the lamina is ovate to elliptic, with pinnate veins, rounded bases, undivided or regularly dentate margins, and obtuse to nearly acute apices. It is a monoecious species that blooms between May and June. The flowers are hermaphroditic, white, pentamerous, and actinomorphic. The fruit is a dry dehiscent, comprising five follicles arranged in a star shape; it is coriaceous, tomentose, and marcescent. The seeds are alate and brown.



Uses

The Mapuche Indians used the bark to make soap because of its high content of saponins. It is now used in the food industry as a natural foaming agent for beverages. It has insecticidal properties and so it has been used to combat moths.



Strelitzia nicolai Regel & K. Koch (Strelitziaceae)

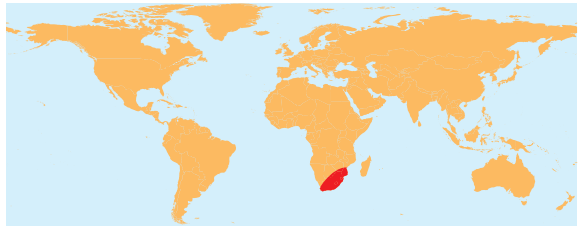
Giant White Bird of Paradise, Wild Banana.

Etymology

The genus takes its name from the German Duchess Charlotte Mecklenburg-Strelitz, queen consort of King George III of Great Britain. The specific epithet *nicolai* refers to the Grand Duke Nicolás Nikolaevich of Russia.

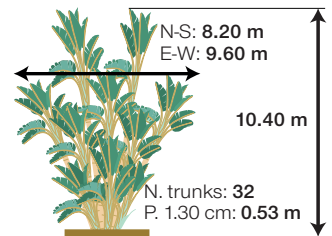
Distribution and ecology

This species is native to Eastern South Africa (Cape and South-Eastern African Regions) where it inhabits coastal evergreen forests and scrubland.



Description

It is an evergreen monocotyledonous plant with an arboreal habit that can exceed 10 m in height; it is fast-growing but short-lived. It forms macollas with many succulent, greyish, cylindrical, slender, smooth trunks, which are ringed from the scars left by fallen leaf sheaths. The crown is small and globose, with large, green intense, simple, alternate, distichous, coriaceous, and marcescent leaves with long petioles that sprout from the apex of the trunk. The leaf lamina is ovate-oblong, usually induplicate and horizontally torn by the wind, they have rounded bases, pinnate veins, undivided margins, and obtuse apices. It is a monoecious species that flowers throughout the year. The inflorescences are axillary, compound, and thyrsoïd. The flowers are large, blue, and zygomorphic, and are protected by bracts; the outer tepals are white and the internal ones form the shape of an arrow. The fruit is a woody capsule with three valves and loculicidal dehiscence. The seeds are elliptic, rough, and black, and have an orange woolly covering.



Uses

Fibres can be obtained from its leaves to make rope. The immature seeds are edible and are flavourful and nutritious. It is widely cultivated as an ornamental plant.



Styphnolobium japonicum (L.) Schott (Leguminosae)

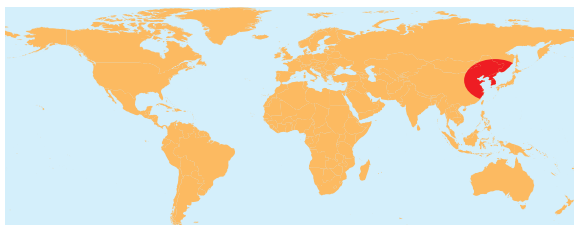
Pagoda Tree, Chinese Scholar, Japanese Pagoda Tree.

Etymology

The generic name comes from the Greek *styphno*, meaning 'sour' or 'astringent', and *lobion*, meaning 'sheath' or 'legume', alluding to the pulp of its fruits. The specific epithet *japonicum*, comes from the Latin *japonicus*, indicating its origin in Japan.

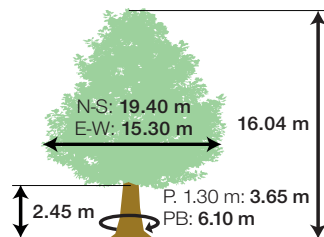
Distribution and ecology

It is native to Eastern Asia (Sino-Japanese Region), where it forms part of the vegetation on fertile and well-drained soils. Despite its specific name, it is not found in the wild in Japan. It was introduced into Europe in the eighteenth century.



Description

This fast-growing and moderately long-lived deciduous tree can reach 25 m in height. It has a straight and cylindrical trunk, with brown-greyish, rough, and striate bark divided into elongated plaques. The crown is globose and dense and its leaves are petiolate, alternate, compound, and imparipinnate and the leaflets papyraceous, with a short and somewhat hairy petiolule; the upper surface is a dark green colour and puberulent and the underside is lighter, glabrescent, and, on occasions, sericeous and glaucous; the lamina is ovate to lanceolate, with rounded or widely cuneate bases, the margins are undivided, and the apex acute and mucronate. It is a monoecious species that flowers between June and July on erect terminal inflorescences supported on panicles. The flowers are bisexual, butterfly-shaped, yellowish-white, and fragrant. The fruit is an indehiscent, moniliform legume that is initially green and glabrous, and turns yellowy-brown when ripe. The seeds are ovoid-globose and brownish.



Uses

In Chinese folk medicine its flower buds are used as haemostatics to slow or stop blood flow in small vessels. In fact, it contains bioflavonoids, sometimes referred to as "vitamin P", and is used to strengthen capillaries. The fruits have been used as laxatives, and an extract of its leaves has been used to adulterate opium.



Taxus baccata L. (Taxaceae)

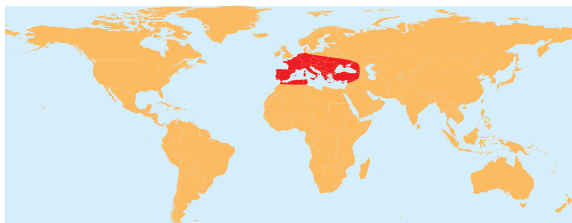
Yew, English Yew, European Yew.

Etymology

Taxus was the Latin name used by the Romans to refer to yews, and may be derived from the Greek *taxis*, meaning 'row', in reference to its leaves. The specific epithet *baccata*, comes from the Latin *baccatus*, meaning 'berry-shaped fruits'.

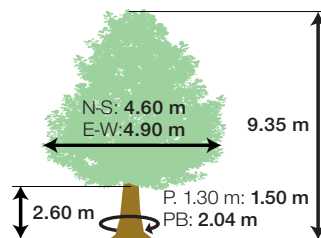
Distribution and ecology

This tree is widely distributed across nearly all of Europe (Circumarctic, Euro-Siberian, and Mediterranean Regions), reaching into north Africa and western Asia (Iranian-Turanian Region). It favours mountainous ravines, gorges, and canyons, preferably limestone, reaching altitudes of 1,500 m.



Description

It is an evergreen tree that can reach 20 m in height; it is slow growing and very long-lived. There is usually a single, short, columnar, and canaliculate trunk, with thin, brown-greyish, fissured bark, that is shed in sheets, revealing its reddish interior. The crown is pyramidal and wide or globose, dense, tangled, and very dark. Its leaves are arranged in spirals, although they have a distichous appearance; they are decurrent and have short petioles. The upper surface is dark green and the underside is lighter and has a prominent central vein with two stomatal bands. The leaf blade is linear and flat, with the margin revolute, and the apex acute. It is a dioecious species that flowers between December and April. The male cones are abundant, and yellowish, axillary, and globose; the female cones are ovoid, green, scaly, and only contain one ovule. The seeds are ovoid, surrounded by a sarcous aril, and are red when ripe.



Uses

This plant is very toxic due to its high taxine content, an alkaloid that acts on the nervous system and can cause death. Only its aril is red; it is viscous and has a sweet taste: it is edible and has been used to make pectoral syrups.



Tipuana tipu (Benth.) Kuntze (Leguminosae)

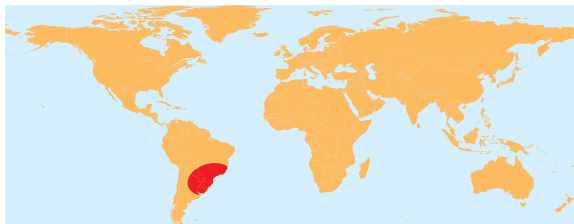
Rosewood, Pride of Bolivia.

Etymology

The generic epithet *Tipuana* comes from its popular South American name *tipu*, used by indigenous peoples in, and which has remained as a specific name.

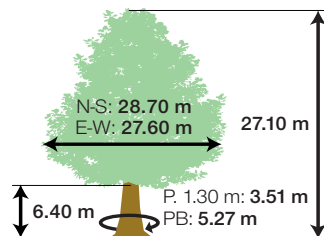
Distribution and ecology

It is a Neotropical-Austroamerican Kingdom plant that extends through the Tropical South-Andean, Brazilian-Paranian, and Chaco Regions where it forms part of the Neotropical forests of these territories.



Description

This fast-growing and moderately long-lived tree is deciduous and can exceed 25 m in height. The trunk is cylindrical and straight or somewhat inclined, and the bark is thick, dark grey, deeply cracked, and divided into large irregular and persistent plaques. If it is damaged, a reddish sap flows out of it. The crown is flabellate and dense, with erecto-patent branching, and pendulous branchlets. Its leaves are large, alternate to opposite, compound, and imparipinnate; the leaflets are light green on both sides; the underside is puberulent, with a prominent central vein, and short petiolules; they are elliptic-oblong, with rounded bases, undivided margins, and notched or emarginate apices. It is a monoecious species that blooms between May and July with the flowers grouped on terminal inflorescences, with pendulous panicles. The flowers are bisexual, pedicellate, butterfly-shaped, and a yellow-orange colour with reddish stria. The fruit is an indehiscent, alate legume, with an ovoid fertile base and a coriaceous grooved ala with arching stria. The seeds are oblong and brown-reddish.



Uses

Its wood is soft and easy to work and is used in carpentry. Its leaves are excellent fodder for livestock. The bark is used for tanning leather. It is widely used in landscaping, and it is frequently seen along streets and avenues.



Ulmus glabra Huds. (Ulmoideae)

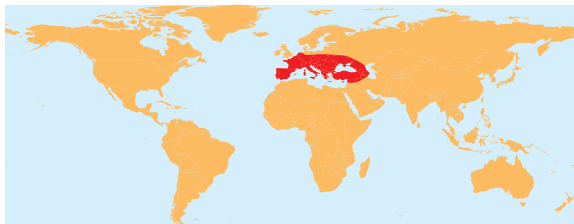
Wych Elm, Scots Elm.

Etymology

Ulmus is the Latin name used by the Romans to refer to elms and their wood. The specific epithet *glabrous*, from the Latin *glaber*, means 'without hairs', although it is not known why this word was used for this species.

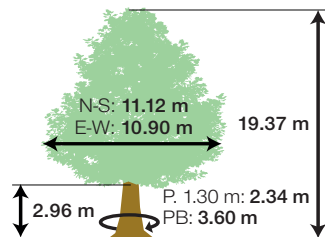
Distribution and ecology

It lives in mountains all over Europe, from the Iberian Peninsula to the Caucasus. In Spain it has its optimum range in the Pyrenees, although it reaches into the Cantabrian and Central System Mountains, arriving to the Cazorla and Segura Sierras. They form part of the humid mountain forests at altitudes between 1,000 and 1,800 m. They can also live close watercourses.



Description

It is a fast-growing and moderately long-lived deciduous tree that can reach 40 m in height. The root system is powerful and extended and usually sends out new shoots. It has a straight and cylindrical trunk, with brown-greyish, thick and cracked bark. The crown is ovoid-globose, and dense, with non-suberose branchlets. The leaves are simple, alternate, and have short petioles; the upper surface is rough and dark green, and the underside is lighter and pubescent, although sometimes only on the veins; its leaf blades are elliptic to obovate, with asymmetrical bases and the lower lobule covering almost up to the petiole; the margins are doubly-serrate, and the apexes are long acuminate. It is a monoecious species that flowers between March and April. The inflorescences are cymose, with inconspicuous sessile bisexual flowers. The fruit is an ovate-globose samara, with a wide, deeply-cut ala, and the seed is located in the centre.



Uses:

Its wood is hard and heavy and has been used variously for railway sleepers, cart axes, construction, and in shipbuilding. It is rich in tannins, and has an astringent effect. It is an excellent shade tree, and is used as an ornamental plant in gardens.



Vitex agnus-castus L. (Lamiaceae)

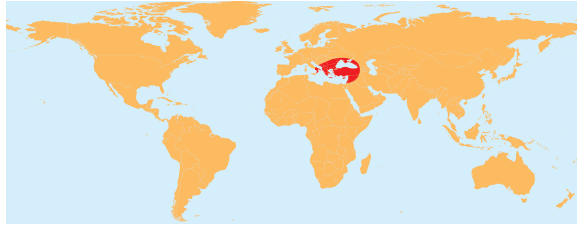
Vitex, Chaste Tree, Chasteberry, Abraham's Balm, Lilac Chastetree, Monk's Pepper.

Etymology

Vitex was the Latin name used by the Romans to refer to this tree, which they used to make baskets. The specific epithet *agnus*, 'lamb', and *castus*, 'chaste', makes reference to the anti-aphrodisiac properties of this species.

Distribution and ecology

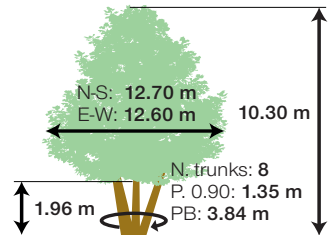
Although it is found throughout the Mediterranean basin, it originates in the Eastern Mediterranean. It requires soils with a high water table and so it lives in ravines and on the banks of rivers and streams.



Description

It is a fast-growing and short-lived deciduous shrub that can reach 10 m in height. It branches from the base forming multiple cylindrical trunks, and has thin, light brown-greyish, fissured bark that is divided into small deciduous plaques. The crown is globose-flabellate, and has a lot of long, flexible, and arching branches. The leaves are opposite, petiolate, and palmately compound, and are formed by five to seven short petiolulate, linear-lanceolate leaflets; the bases are cuneate, the margins undivided, and the apexes acute.

Their upper surface is dark green and glabrous, and the underside is pubescent and greyish. It is a monoecious species that flowers between May and July. The flowers are bisexual, usually sessile, bluish or pink, and fragrant. The fruit is a small, globose, and only slightly sarcous drupe, wrapped by the calyx halfway, and is brownish when ripe.



Uses

It was once a very important medicinal plant: its flowers and leaves have been used to treat menstrual and lactation problems, as well as neurodegenerative and anxiety disorders, for gastrointestinal spasms, and as a wound-healing agent. It is also considered to be calming, a digestive aid, as well as being diuretic. Its young branches are also used in basketry.

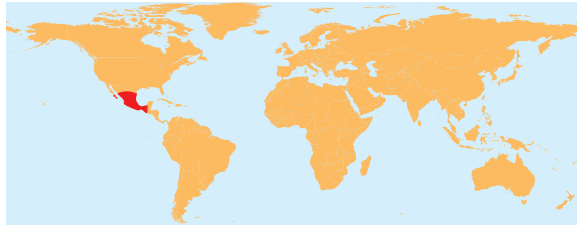


Yucca filifera Chabaud (Asparagaceae)

Palma China, Palma China Yuca, St. Peter's Palm.

Etymology

The name of the genus was taken from the Taíno (the language spoken by the people of the Caribbean at the time of Spanish colonisation) vernacular *yuca*, with one 'c', used to refer to *Manihot esculenta* Crantz (cassava), which Linnaeus attributed to this species by mistake. The specific epithet *filifera*, is from the Latin *filum*, 'thread', and *fero*, 'carry', in reference to the leaf filaments.

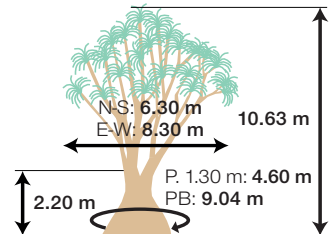


Distribution and ecology

This Neotropical-Austroamerican Kingdom plant is from the Mexican Xerophytic and Madrean Regions. In desert areas it forms part of the arboreal layer of undershrub formations. It lives in deep and well-drained soils, at altitudes between 500 and 2,400 m.

Description

This monocotyledonous plant is arborescent and perennial, can exceed 10 m in height, and has a moderate growth speed and longevity. The trunk is conical, woody, and succulent, and the bark is thick, brown-greyish, rough, fissured, and divided into elongated plaques. Its crown is globose and irregular, formed by numerous erect branches that arc towards the apex, with the oldest specimens acquiring a candelabra shape. The leaves are marcescent, linear-lanceolate, slightly tapered towards the base, rigid, and usually rough on both sides; the margins covered with white spiral filaments, and the apexes are acute. It is a monoecious species that flowers between May and June with the flowers grouped on large pendulous panicles. The flowers are bisexual, pedicellate, sarcous, and are a creamy-white colour. The fruits are indehiscent, oblong, sarcous, and hanging; the seeds are black, compressed and quite rough.



Uses:

The fruits and flowers are edible, and vegetable fibre can be obtained from its leaves. In addition, an alcoholic drink can be obtained via distillation of the young stems. The pharmaceutical industry extracts products used for making hormones and contraceptives from this plant.



Zelkova carpinifolia (Pall.) K. Koch (Ulmoideae)

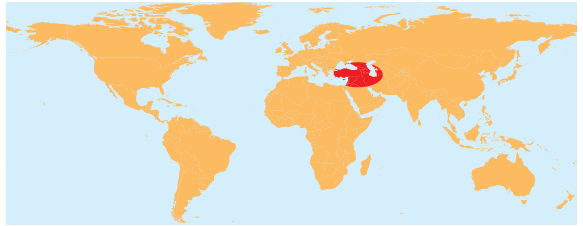
Zelkova, Caucasian Zelkova.

Etymology

Zelkova is derived from its vernacular name in Caucasus languages. In Georgian it is known as *Dzelkva*, where *Dzel* means 'beam' or 'crossbar', and *kva*, 'stone' or 'rock'. The specific *carpinifolia*, refers to the similarity of its leaves to that of hornbeams.

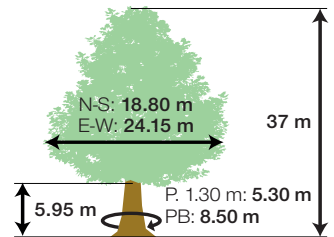
Distribution and ecology

It is native to western Asia (Iranian-Turanian Region), where it forms part of the mountain oak forests on deep soils, at altitudes between 900 and 1,550 m. It is a protected plant in its countries of origin.



Description

It is a slow growing and long-lived deciduous tree that can reach 40 m in height. It has a straight and short trunk, with smooth, greyish bark that cracks and breaks off in plaques over time, leaving orange-coloured markings. The crown is ovoid-elliptic, with erect branching and pubescent sprouting. The leaves are simple, alternate, and sessile or with short petioles; the upper surface is dark green and the underside is lighter and pubescent; the leaf blades are ovate-elliptic, with asymmetrical, rounded or sub-cordate bases, crenate-serrate margins, and acute apices. It is a monoecious and polygamous tree that blooms between March and April. The flowers are small and greenish and are sessile on the leaf axils; the males are arranged forming glomeruli towards the bases of the branchlets and the bisexual and female flowers are located towards the apex, singly or in pairs. The fruit is an ovoid and asymmetrical drupe with marked ribs which is a brownish colour when ripe.



Uses

The wood is good quality and is used in construction for beams, crossbeams, and rails; it is also used in cabinetmaking and carpentry, as well as for making musical instruments. It is an ornamental species, with golden autumn foliage and striking bark, although it is little-used in gardening.



Zelkova serrata (Thunb.) Makino (Ulmoideae)

Japanese Zelkova, Japanese Elm, Keyak.

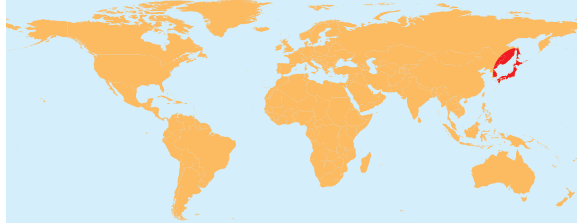
Etymology

The specific epithet *serrata*, meaning serrate or 'with teeth', refers to its leaf margins.

Distribution and ecology

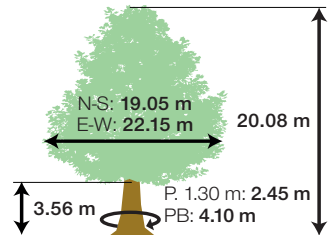
This tree originates in East Asia and Japan (Sino-Japanese Region).

It grows in mountains and valleys, at altitudes between 500-2,000 m, near streams and watercourses. It prefers deep, sandy or clay soils that are well-drained and moist.



Description

This deciduous tree can reach 40 m in height; it is slow growing and long-lived. The trunk is short, straight, and cylindrical, and the bark is smooth, greyish, and covered with reddish-brown lenticels that fall off in plaques leaving orange-brown markings. The crown is ovoid-ellipsoid to globose, and has erect and very dense branching. Its leaves are simple, alternate, and are sessile or on very short petioles; the upper surface is rough and dark green and the underside is lighter and glabrous; the lamina is ovate to ovate-lanceolate, with rounded or sub-cordate, slightly asymmetrical bases, the margins are serrate, and the apex acuminate. It is a monoecious and polygamous species that blooms between April and May. Its flowers are small and greenish, and are sessile on the leaf axils; the males are arranged forming glomeruli towards the base of the branchlets and the bisexual and female flowers are located towards the apex, singly or in pairs. The fruit is a globose, asymmetrical drupe that houses a single seed.

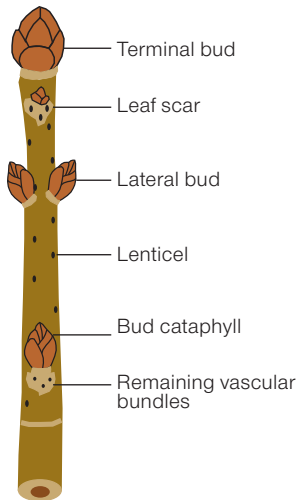


Uses

It is cultivated as a timber tree because of the quality of its wood, and as an ornamental for its spectacular reddish-orange autumn foliage. Its wood is highly prized in Japan in the furniture industry. Its bark and leaves are used in traditional medicine, and the tender leaves can also be cooked as vegetables.



Morphology: drawings of leaves, inflorescences, flowers, and fruits



Phyllotaxis



Opposite (Averse)



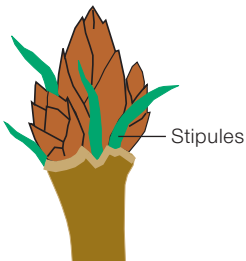
Subopposite



Distichous alternate



Spiral alternate



Types of bud



Ovoid



Acute-ovoid



Conical



Globose



Pyramidal



Pedicellate

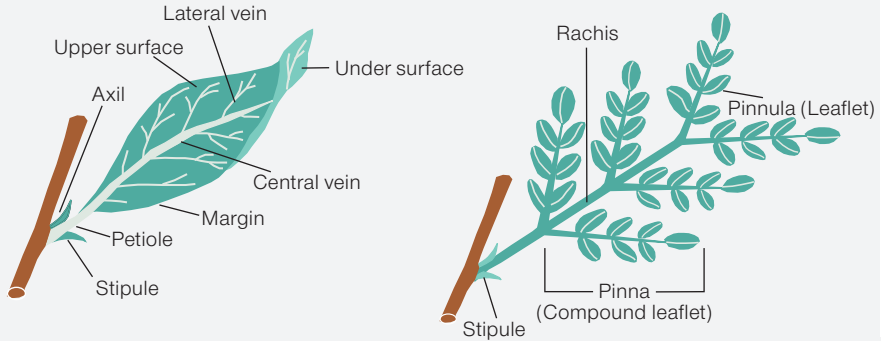


Acute-cylindrical

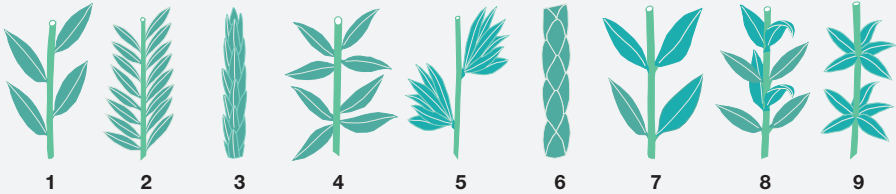


Fusiform

Leaf morphology

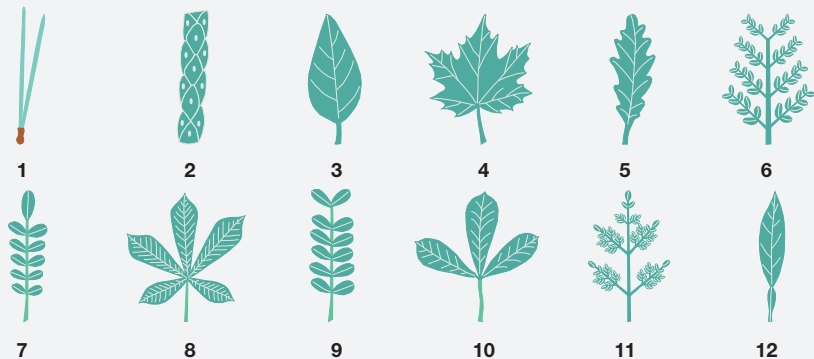


Leaf arrangements



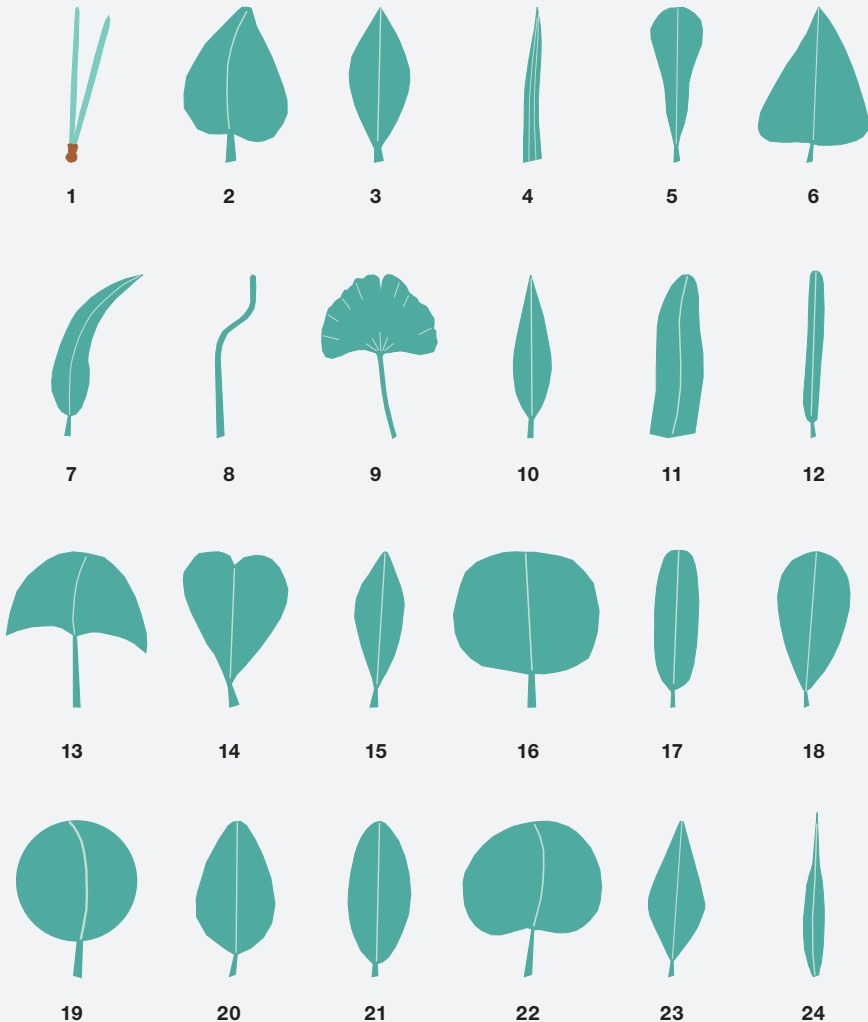
1 Alternate. 2 Distichous. 3 Spiral. 4 Pseudowhorled. 5 Fasciculate. 6 Imbricate. 7 Opposite. 8 Opposite and Decussate. 9 Whorled (Verticillate).

Leaf types



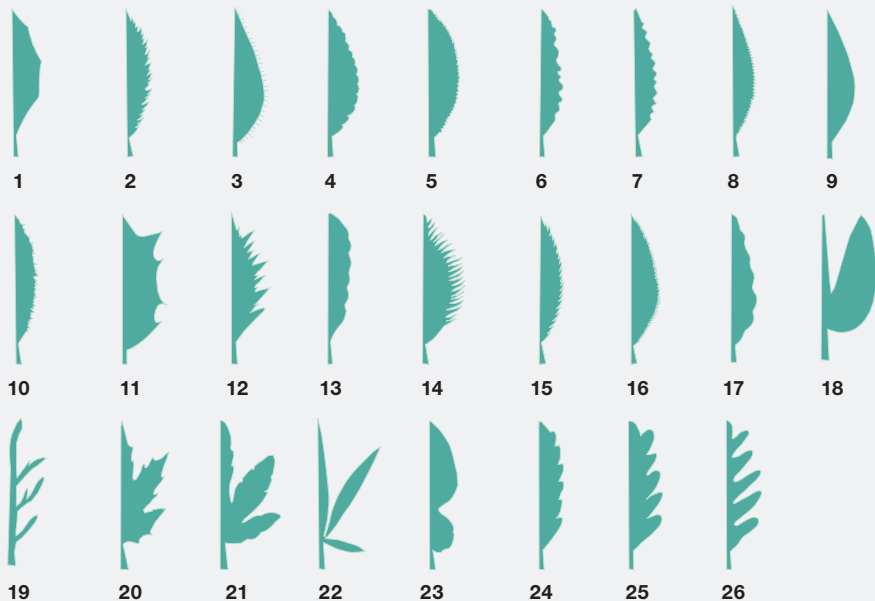
Simple leaves: 1 Acicular. 2 Squamiform (Scaled). 3 Entire. 4 Palmatifid. 5 Pinnately Lobed. Compound leaves: 6 Bipinnate. 7 Odd Pinnate. 8 Palmately Compound. 9 Even Pinnate. 10 Trifoliate (Ternate). 11 Tripinnate. 12 Unifoliate.

Leaf shapes



1 Acicular. 2 Cordate. 3 Elliptic. 4 Ensiform. 5 Spatulate. 6 Deltoid. 7 Falciform. 8 Filiform. 9 Flabellate. 10 Lanceolate. 11 Linguiform. 12 Linear. 13 Lunular. 14 Obcordate. 15 Oblanceolate. 16 Oblate. 17 Oblong. 18 Obovate. 19 Orbicular. 20 Ovate. 21 Oval. 22 Reniform. 23 Rhomboidal. 24 Subulate.

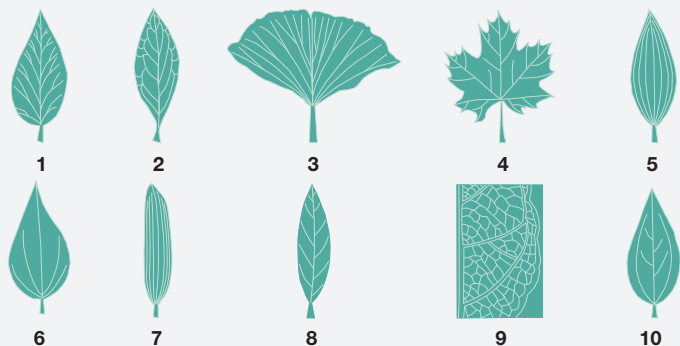
Margins



Leaf margins: 1 Angular. 2 Biserrate. 3 Ciliate. 4 Crenate. 5 Crenulate. 6 Crispate. 7 Dentate. 8 Denticulate. 9 Entire. 10 Erosc. 11 Spinose. 12 Incised. 13 Undulate. 14 Pectinate. 15 Serrate. 16 Serrulate. 17 Sinuate.

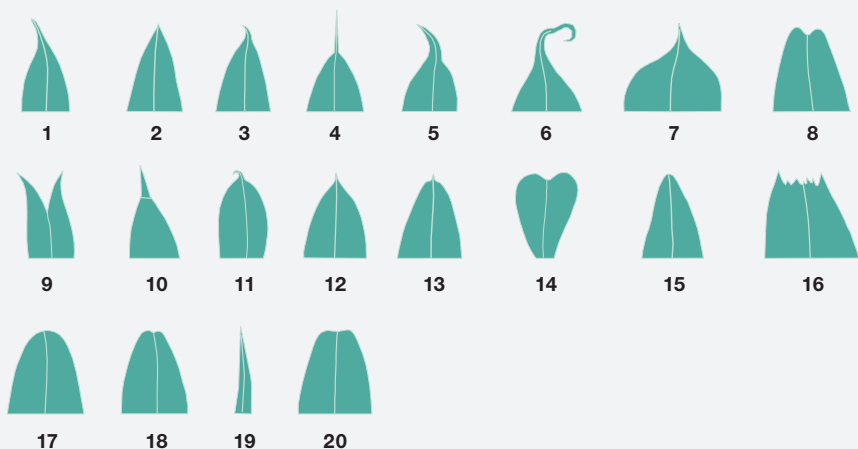
Divided leaves: 18 Bipartite. 19 Lacinate. 20 Palmatifid. 21 Palmatipartite. 22 Palmatisect. 23 Panduriform. 24 Pinnatifid. 25 Pinnatipartite. 26 Pinnatisect.

Venation



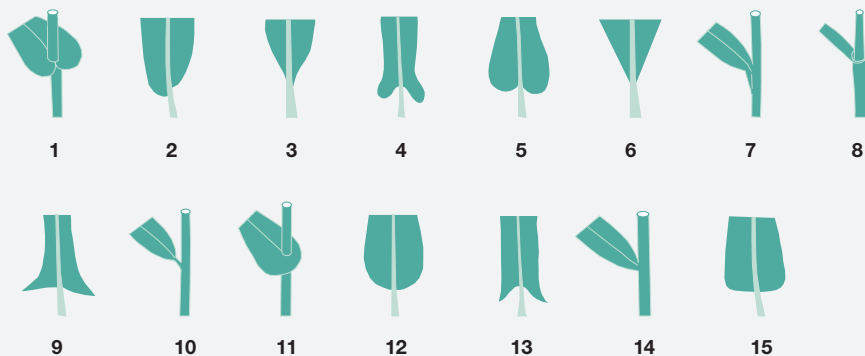
1 Open. 2 Closed. 3 Dichotomous. 4 On a palmate leaf with pinnate lobules. 5 Longitudinal. 6 Palmate. 7 Parallel. 8 Pinnate. 9 Reticulate. 10 Trinervate.

Apices



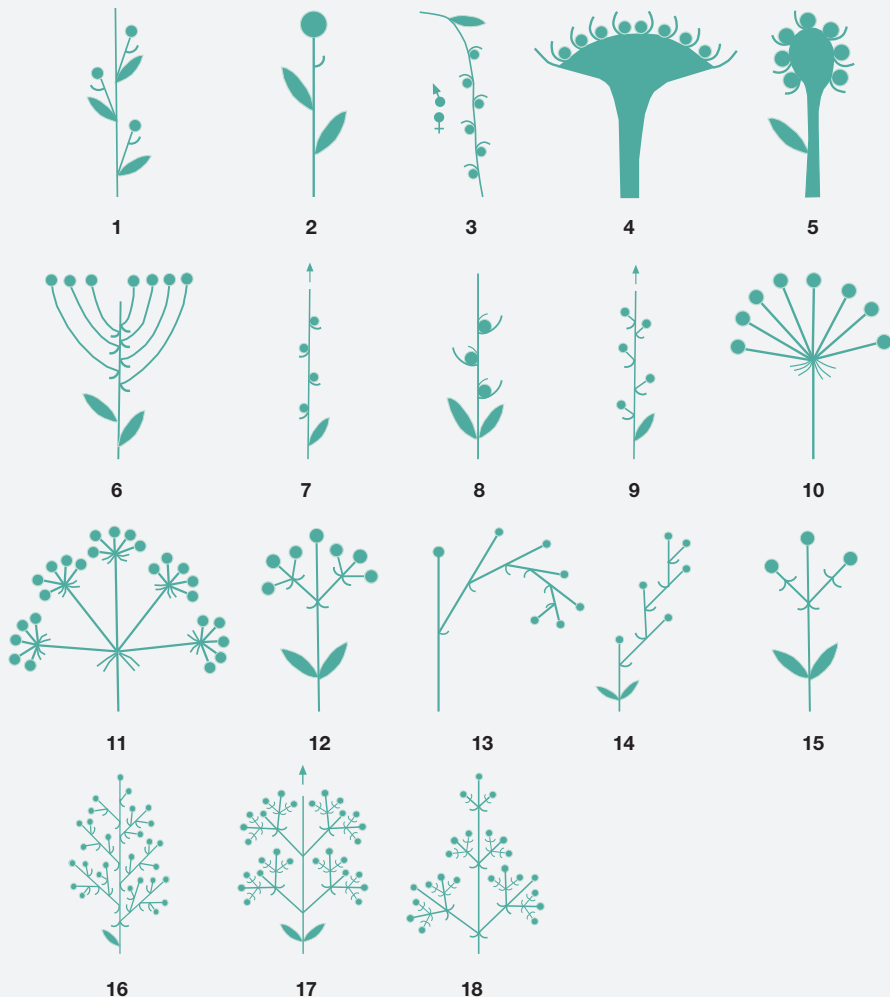
1 Acuminate. 2 Acute. 3 Apiculate. 4 Aristate. 5 Caudate. 6 Cirrhmose. 7 Cuspidate. 8 Emarginate. 9 Cleft. 10 Spiny. 11 Hooked. 12 Mucronate. 13 Mucronulate. 14 Obcordate. 15 Obtuse. 16 Premorse. 17 Rounded. 18 Retuse. 19 Subulate. 20 Truncate.

Insertion



1 Amplexicaul. 2 Asymmetrical. 3 Attenuate. 4 Auriculate. 5 Cordate. 6 Cuneate. 7 Decurrent. 8 Sheathing. 9 Hastate. 10 Petiolate. 11 Perfoliate. 12 Rounded. 13 Sagittate. 14 Sessile. 15 Truncate.

Inflorescences



Solitary Flowers: 1 Axillary. 2 Terminal.

Racemose inflorescences: 3 Ament. 4 Capitulum or head with expanded receptacle. 5 Capitulum or head with small receptacle. 6 Corymb. 7 Spike. 8 Spikelet. 9 Raceme. 10 Umbel. 11 Compound umbel.

Cymose inflorescences: 12 Dichotomous cyme. 13 Helicoid cyme. 14 Scorpioid cyme. 15 Dichotomous (dicasio).

Compound inflorescences: 16 Panicle. 17 Thyrse. 18 Thyrsoid.

Fruit types

Gymnosperm fructifications



Drupaceous seed



With aril



Galbulus



Strobilus



Pine cones

Simple fruits

Dry indehiscent fruits: Nuts



Nut



Acorn



Samaras

Winged (alate) nuts



Schizocarpic samara
(Paired samara / Disamara)



Dry dehiscent fruits



Legume

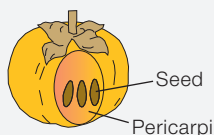


Capsule

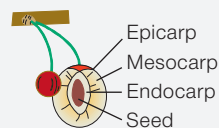


Follicle

Fleshy fruits



Berry



Drupe

Grouped Fruits



Samaras



Follicles

Multiple Fruits



Sorosis



Glossary of terms

A

Achene: Dry, indehiscent fruit with only one seed.

Achlamydeous: Flower that lacks petals and sepals.

Acicula: Very thin, elongated leaves, with a pointed apex. Needle-shaped spines or bristles that are not overly sharp.

Acicular: Having a needle-like shape.

Actinomorphic: Having two or more planes of (radial) symmetry; a line drawn through the middle of a regular flower will produce a mirror image on either side.

Aculeus (pl. aculei): A spine of epidermal origin without vascular bundles; a prickle growing from the bark, as in some brambles and roses.

Acumen: see Apex.

Acuminate: Organ, usually a leaf, which gradually narrows and ends in a long point with concave sides formed along the tip.

Acute: Tapering of an organ to terminate in an apex with straight sides; less tapering than acuminate.

Afilia: an adaptation to drought: the maximum possible reduction of leaves so as to form spines or thorns.

Ala: Wing-like structure; a thin and membranous sheet on one or more organs.

Alate: A winged structure.

Alburnum: see Sapwood; largely considered an obsolete word for sapwood.

Alternate: Leaves, branches etc. arranged singly and alternatively on either side of the parent axis but not opposite each other.

Ament: Catkin or amentum. Dense spiciform cluster of small inconspicuous inflorescences, which are usually pendulum-like or drooping, consisting of scale-like naked (apetalous), unisexual flowers.

Amplexive: Organ that effectively encircles and embraces the stem; twining or clasping, as an amplexant tendril.

Androecium: The male part of the flower comprising all the stamens.

Anemophilous: plants that are wind-pollinated

Angiosperm: Flowering plants that bear seeds (seminal rudiments or ovules) protected inside an ovary (fruit).

Angustifoliate: Narrow-bladed leaves

Annual: Plant that completes its life cycle in one year and then dies.

Anther: Upper fertile part of a stamen containing pollen.
Apex: Tip; extreme top or point furthest from the insertion of an organ; acumen.
Apical: Located at the tip, or apex, of an organ; *also* Terminal.
Apiculate: Ending abruptly in a short and slender soft point.
Arborescent: Tree-like; term used to define tall, usually woody, plants that resemble, but are not, trees.
Aril: An outgrowth, of varying consistency, that forms on certain seeds.
Armed: Describes plants with spines, thorns, or bristles.
Attenuate: Tapering; an organ that gradually narrows into a tip or base.
Auricle: An appendage that resembles an ear, often occurring at the base of a leaf.
Averse: see Opposite.
Axillary: Relative to the leaf axis. Derived from, or situated between, the upper angle between a stem and a leaf.

B

Bark: The protective outer layer of the root, stem, trunk, and branches of a plant or tree; *also* Cortex.
Basal: Organ located at or near the bottom of a plant stem.
Berry: Fruit in which the two internal layers (mesocarp and endocarp) are fleshy, although sometimes the endocarp is fibrous, membranous, cartilaginous, or papery, but never woody.
Biennial: A plant that completes its entire vegetative period over two years (or growing seasons).
Bifid: Organ divided into two parts, or lobes, in such a way that the cleft does not exceed half of the length of the organ.
Bifurcate: Divided into two forks or two branches; *also* Dichotomous.
Bilobate: Two-lobed; having two lobes.
Bipinnate: Doubly pinnate. Pinnate leaf in which the leaflets are also pinnate.
Bisexual: Carrying organs for both sexes (male stamens and female pistils) on the same plant or on the same flower; *also* Hermaphrodite.
Bloom: see Flower.
Bract: Modified leaf that develops at the base of inflorescences or, more commonly, of each flower.
Branch: Each of the woody extensions or subdivisions into which the trunk of a plant divides.
Branchlet: A very small branch; a final-division branch; a young woody stem; twig.
Bud: A stem rudiment (immature branch, leaf, or flower bud), usually formed on the leaf axils at the end of stems as a small swelling and protected by cataphylls; the process of budding or sprouting; *also* Flower Bud.
Buttress: A widening at the base of the trunk of some trees that provides structural support.

C

Caducous: Describes a short-lived body or organ.

Cambium: Regenerative zone of specialised cells that provide growth by dividing (lateral meristem) located between the xylem and the phloem and which produces secondary growth from the inside of the liber (bast) towards the exterior.

Cortex: see Bark.

Cotyledon: Each of the primordial leaves of the embryo inside the seed: two for dicotyledons and one for monocotyledons.

Crenate: Leaf margin with rounded or scalloped teeth that point forward.

Crown: The upper part of a plant, especially trees; all of the parts of the plant above the soil including the branches, leaves, flowers, and fruits of a tree.

Cuneiform: Wedge-shaped, triangular, tapered toward an acute base.

D

Deciduous: Caucifolious (seasonally dropping) leaves; plant that loses all of its leaves annually at the beginning of the dormant phase.

Decumbent: Stalk with a tendency to grow lying on the floor, or trailing, but with the apex turned upward.

Dehiscent: Fruit that spontaneously opens along definite lines at maturity, releasing its seed or spores.

Deltoid: Having a triangular shape.

Dendrology: The scientific study of trees.

Dentate: Having a leaf margin with sharp triangle-like teeth, like a saw.

Depressed: Compressed or flattened vertically from above; sunken to become concave.

Dichotomous: Forked into two; branching by repeated division at the point of growth into two equal branches; *also* Bifurcate.

Dicotyledoneae: Dicotyledons are one of the two major divisions in angiosperm plants, whose embryos have two cotyledons, usually opposite.

Digitate: Leaf with finger-like lobes at the end of an axis.

Dioecious: Plant with unisexual flowers, so that the pistils (female) and stamens (male) appear on different individual plants; *also* Unisexual.

Distichous: Leaves arranged in two opposite lines along an axis.

Drupe: A fleshy fruit where the innermost layer (endocarp) is hard, and the seed is enclosed within this woody layer (the pyrenocarp).

Duramen: See Heartwood.

E

Ecological valence: A plant that adapts well to environmental changes; ecological amplitude.

Edaphoxerophilic: relating to dry soil conditions.

Edaphic: Influenced by soil composition rather than climate.

Edaphophilous: the permanent climax plant community produced primarily by soil conditions.

Elliptic: Shaped like an oval; with the widest axis at the midpoint and symmetrically curved margins; with a small, or absent, point.

Elongated: Long and narrow.

Endocarp: internal part of a fruit pericarp, if the texture is different to the outer layer, as in a peach, the endocarp corresponds to the carpel epidermis.

Epicarp: The outermost part of a fruit pericarp.

Epidermis: The outer layer of tissue that surrounds and protects the plant from water loss and which is coated in a cutin layer called the cuticle.

Epimatum: An axial outgrowth, usually fleshy, covering the seminal rudiments (developing seeds) in some gymnosperms.

Epiphyte: plant growing harmlessly on another plant and deriving its moisture and nutrients from the air.

Erect: Standing upright, in a more or less vertical position.

Erecto-Patent: Upwardly inclined, forming an acute angle to the vertical; having a position intermediate between erect and patent, or a spreading habit.

Evergreen: Green throughout the whole year; plant which is always covered in leaves, bearing and losing them throughout the year, even in the period of vegetative dormancy.

F

Falcate: With a flat, curved shape, like a hook or a sickle.

Falciform: Sickle-like; having the curved shape of a sickle.

Fascicle: Bundle, cluster, or tuft of flowers or leaves growing crowded together.

Fibrous: Made of fibres, organic thread-like material, or is delicate like a fibre.

Filiform: Thread-like; with the shape of a filament; slender and of equal thickness from top to bottom.

Fissured: Deeply grooved, cracked, or split bark.

Flabellate: Parasol-like; with the shape of a parasol, umbrella, or fan.

Flexuous: Bent alternately in opposite directions.

Flower Bud: An unopened flower; an immature bud containing an undeveloped shoot rudiment that will only bear flowers; *also* Bud.

Flower: The set of plant organs related with reproduction in angiosperms; comprising the perianth (calyx of sepals and corolla of petals), the androecium (formed by the stamens and their filaments), and the pistil or gynecium (consisting of carpels); *also* Bloom.

Fluted: Channelled; having grooves or rib-like furrows.

Foliage: The set of leaves that a plant has.

Foliar: Pertaining to, or like, a leaf.

Foliolate: see Leaflet.

Follicle: A dry fruit that opens (dehisces) on one side when mature and has a single cavity that contains several seeds.

Furcate: To branch or fork; axis that divides into two equal parts.

G

Glabrous: Smooth; describes organs with very little, or no hair, scales, down, or fuzz; hairless.

Glaucous: Covered with a white or light blue-green powdery or waxy coating.

Globose: Round or spherically shaped.

Glume: One of a pair of enclosing scale-like membranous husks or bracts at the base of the spikelet of some plants, inserted below the ovary.

Gondwana: the southernmost supercontinent that formed part of the Pangaea supercontinent approximately 300 to 180 million years ago.

Grain: see Caryopsis.

Growth ring: Each of the concentric circles that forms a tree trunk, as seen in transverse section, corresponding to periods of xylem development, i.e. layers of wood laid down just under the bark, usually annually.

Gymnosperm: Group of plants whose seeds are not protected by an ovary, they are borne on the outside of an ovary or seed pod, e.g. on the surface of scales on strobili.

Gynecium: Set of carpels, pistils, or all of the female organs in a flower.

H

Habit: General external appearance of a plant, including size, shape, texture and orientation.

Heartwood: The heartwood; the dead part of wood that occupies the internal part of the trunk and has a harder consistency.

Hemispheric: Shaped like a half-sphere.

Hermaphrodite: Flower that has organs of both the male (stamens) and female (pistils) sex; *also* Bisexual.

Hesperidium: Fleshy berry-type fruit covered by a tough leathery skin and divided internally into separable pulpy cells, typical of citrus.

Hispid: Covered in coarse hairs, or very long bristles or spines.

Hybrid: Offspring resulting from crossing two parent plants from different species, of the same or different genera.

I

Imbricate: Leaves that cover and partially overlap each other, like the tiles on a roof.

Imparipinnate: Odd-pinnate; leaf with the leaflets arranged on both sides of the axis but with only one terminal foliole.

Indehiscent: Dry fruits that do not open along definite lines to release the seeds, even when mature.

Indumentum: Any hairy or scaly epidermal covering that covers the surface of the plant organs.

Induplicate: Describes any laminar organ (leaves, pinnae, segments, etc.) that has edges that fold inwards and may touch the margin of each adjoining structure so that the cross-section is shaped like a V.

Inermous: Unarmed; plant or organ that does not have prickles or spines.

Inflorescence: Flower cluster; an axis bearing flowers; a branching stem capable of producing and supporting a flower structure with more than a single flower, also including, where appropriate, the bracts.

Infrafoliar: Located underneath the leaves.

Infructescence: Mature inflorescence, where multiple fruits replace the flowers.

Integument: Seed coating; a natural covering which may be hard that protects structures and organs e.g. a shell, rind, husk, or capsule.

Interfoliar: Located between opposite leaves but placed alternately within them.

Internode: Portion of the stem located between two consecutive nodes or joints.

L

Lamina: A flat, sheet like structure; widest, and generally flattest, part of a leaf; *also* Leaf blade.

Lanceolate: Laminar organ (leaf, bract, petal etc.) with the shape of a spearhead; pointed at both ends.

Lanuginose: Cottony, with soft finely intertwined hair.

Lateral: Growth on the side of a structure e.g. developing from the main branches of a tree.

Leaf Blade: see Lamina.

Leaflet: Small leaf blades or pinnae; portion or segment of a compound leaf; *also* Foliole and Pinna.

Legume: a dry dehiscent fruit with an elongated pod that splits in two, typical of any plant in the pea family.

Leguminous: Pertaining to the family of plants bearing legumes.

Lenticel: a lens-shaped group of cells that form pores on the outer bark layer and permit atmospheric gas exchange with underlying tissues.

Ligneous: woody; lignified; pertaining to cells with large amounts of lignin deposited in their walls giving them a rigid, woody structure.

Ligule: A laminar or tongue-shaped appendix that appears in the zone where the sheath and the petiole of some species join.

Liliopsida: Monocotyledonous plant; See Monocotyledoneae.

Linear: Elongated leaf, usually laminar and narrow, which is much longer than wide, with margins that are mostly parallel throughout their development.

Lobed: Divided into lobes – deeply indented margins, but less than halfway to the midrib; divided into segments.

Lobule: A small lobe or a smaller subdivision of a lobe; round segment which is not very deep.

M

Macolla: Group of tillers (subterranean or basal shoots emerging from the original plant stalk) that are derived and grow from the same stand, clump, or tuft.

Magnoliopsida: Dicotyledonous plant; See Dicotyledoneae.

Marcrescent: Describes organs that, once dry, remain attached to the plant e.g. leaves that wither but do not fall off the plant.

Margin: The outer edge of leaves, petals, etc.

Medulla: The pith or central part of cylindrical stalks and roots, formed by cells and surrounded by primary fibrovascular bundles, around which wood is formed.

Megasporophyll: A modified fertile leaf (sporophyll) that bears one or more megasporangium, or ovules, on gymnosperm plants; see Sporangium and Microsporophyll.

Meliaceous: belonging to the Meliaceae genus, i.e. the mahogany family of plants.

Melliferous: Plants or flowers that produce a lot of nectar, and so attract pollinators.

Mesocarp: The central fleshy part of the fruit pericarp; located between the exocarp and the endocarp.

Microsporophyll: A modified fertile leaf (sporophyll) that bears microsporangium which give rise to male gametophytes in gymnosperm plants. See Sporangium and Megasporophyll.

Moniliform: Bead or necklace-like; comprising a series of roughly spherical segments, separated by constrictions; *also* Torulose.

Monocaulous: A plant that develops a single stem.

Monocotyledoneae: One of the two major divisions in angiosperm (flowering) plants, whose embryo only has one cotyledon.

Monoecious: Plant with unisexual flowers, borne on the same individual plant so that flowers with stamens (male) and pistils (female) both appear on the same stand.

Monopodial: Grows upwards from a single point (trunk or stem), adding leaves to the apex each year.

Monospermous: Having or producing a fruit that carries a single seed.

Multicaulous: Many-stemmed; plant that generates several stems from the same stand.

Mycorrhiza: Symbiotic connection between the roots of some higher plants with the hyphae of certain fungi.

N

Nerve: see Vein.

Nitid: Bright, shining, or lustrous; with a smooth polished surface.

Node: The place or joint on the stem or branch from which leaves and shoots grow.

Nut: Dry, indehiscent, monospermous fruit, with a lignified pericarp.

Nutlet: Indehiscent monosperm or polysperm fruit derived from the longitudinal division of the carpel leaf of a syncarpous (containing multiple carpels 'fused' into a single structure) gynecium in two or more parts.

O

Obconic: Having an inverted cone shape, with the apex wider than the base.

Oblong: Structure with the widest axis at the midpoint and mostly parallel margins.

Obovate: Egg-shaped outline; having an inverted oval shape, with the apex wider than the base.

Obtuse: Bluntly-tipped or with a rounded apex; straight to convex margins, and ending in a more than 90° angle.

Opposite: A leaf arrangement along a stem that occurs in pairs, directly across from each other; *also* Averse.

Orbicular: Disc-shaped; circular or round with flat body.

Orophytism: From orophyte, plants growing in, or limited to mountainous areas.

Ovate: Describes laminar organs (leaves, bracts, petals etc.) with the shape of an egg and with the broader end being the point of attachment.

Ovoid: Describes solid organs (fruits, seeds etc.) with an egg shape.

P

Palmate: Palm-like; type of leaf similar to an open hand.

Panicle: Compound raceme inflorescence in which the florets, growing from pedicels, decrease from the base to the apex, giving it a pyramid shape.

Pappus: Apical tuft of medium-long feathery hairs; bristles, scales, or hooks at the apex of the achene that carry some seeds.

Paripinnate: Even-pinnate; compound leaf with the leaflets arranged on both sides of the axis, terminating in two folioles.

Patent: Branch that forms a very open angle, close to 90°, with its axis; horizontal spreading, as branches of a tree.

Pectinate: Comb-like; closely-set, regularly-spaced segments, arranged only on one side, like the teeth of a comb.

Pedicel: A small stalk that supports a flower in an inflorescence.

Peduncle: Main stalk that supports a flower cluster, or common to several flowers in an inflorescence; also applies to fruit stalks.

Pendulous: drooping or hanging down loosely.

Perianth: Floral envelope formed from sterile parts, normally the petals (corolla) and sepals (calyx).

Pericarp: The walls of a ripened fruit of a flowering plant; fruit covering formed from the carpellar sheet and enclosing the seeds; a shell.

Persistent: Perennial, as opposed to deciduous; parts that remain attached after completing their function.

Petiole: Leafstalk; thin stalk that joins with the leaf lamina at the stalk or rachis (central vein); the transition between the stem and the leaf blade.

Petiolule: A leaflet stalk; a small or reduced petiole that attaches all of the leaflets to a compound leaf.

Phyllotaxis: The leaf arrangement relative to the stem.

Pine Cone: Conifer pseudocarp; see Strobilus and Cone.

Pinna: Each of the parts that a compound leaf is divided into or the primary division of a pinnate leaf; see Leaflet.

Pinnate: Type of compound leaf, with pinnae arranged as opposite (paripinnate) or alternates (imparipinnate) in two lines on each side of a rachis.

Pistil: The female, seed-producing reproductive organ comprising a style, stigma, and ovary; the set of fused or individual carpels of a flower; gynecium.

Pistillate Flower: Flower with a pistil; in the case of unisexual flowers, the female flower with no anthers.

Pluviseasonal: characterised by the seasonality of the precipitation and not by the quantity of rainwater collected.

Polygamous: Plant that produces some bisexual, and some unisexual flowers on the same individual; *also* Trimonecious.

Polymorphism: Phenomenon by which a plant species presents several leaf, flower, or fruit morphologies or traits which are not caused by newly-arising mutations alone.

Prophyll: One of the two first bracteole leaves (very small bracts) that emerge from any side shoot, independently of the place on the branch or inflorescence, and in some species subtending to the flowers.

Pruinose: Having a very fine whitish powder on a surface.

Pubescent: Describes any organ covered with fine and soft hairs.

Pyramidal: Having the shape of a triangular pyramid or a narrow, pointed cone.

Pyriform: Pear-shaped; having the shape of a pear.

R

Rachis: Midrib; main axis of an inflorescence – the axis that bears the flower. Central reinforced vein of pinnately compound leaves or fronds which branches out into secondary veins.

Reflexed: Organ that is directed downwards or backwards at a sharp angle towards the base of the stalk.

Regular Flower: Actinomorphic flower that has more than two planes of symmetry.

Reniform: Kidney-like; shaped like a kidney.

Revolute: Having margins rolled back and under.

Rhizome: Horizontal subterranean root-stock stem which is usually fleshy and serves for vegetative propagation and as a store for inter-seasonal survival.

Root System: The set of roots that a plant possesses.

Root: Downward-growing part of a plant, usually subterranean but sometimes aerial, by which plants anchor themselves to the ground, and absorb and accumulate nutrients.

Rosette: Very close foliole arrangement, so that they overlap each other in tight circular rings.

Rotate: Flat and circular wheel-shaped spreading.

S

Sagittate: Arrow-shaped – pointed with a barbed base, with the basal lobes directed downward.

Samara: Winged fruit; a dry indehiscent fruit that carries only one seed (achene) which has a wing-like extension of the pericarp membrane, favouring wind dispersal.

Sapwood: The white, softer portion of living trunk wood (xylem), located between the inner bark and the heartwood; *also* Alburnum.

Sarcous: Having enlarged, somewhat fleshy tissues.

Scabrid: Rough or coarse; scruffy.

Sciophilous: shade-loving; growing or living in the shade.

Seed: a mature ovule that contains the embryo of the future plant; a fertilised mature ovule capable of germinating into a plant similar to its parent.

Serrate: With sharp notches along the margin all pointing towards the apex.

Sessile: Refers to parts of a plant that grow directly from a peduncle; leaf blade that is directly joined to a shoot, without a petiole, peduncle, or pedicel.

Sheath: Tubular leaf base which may be enlarged so that it embraces at least part of the stem; can be fleshy and/or very fibrous. It tapers and extends into the petiole.

Sinuate: With very shallow undulations or wave-like indentations along the margin.

Spatulate: Narrow at the base and wider, and rounded, at the end, like a spatula or spoon.

Spicate: Having the shape and appearance of a spike but may not have the structure of a true spike.

Spike: An unbranched, indeterminate inflorescence with sessile flowers; like raceme but the flowers are attached directly to the stem, as in an ear of grain.

Spine: *see* Thorn.

Spiny: *see* Thorny.

Sporangium: a spore case or sac; also, the structure containing asexual spores. *See* Megasporophyll and Microsporophyll.

Squamiform: Having a scale-like form.

Stalk: see Stem.

Stamen: The male reproductive organ of a flower which produces the pollen.

Staminate Flower: Flower with stamens; in the case of unisexual flowers, the male flower with no pistils.

Staminode: Stamen lacking, or with sterile, anthers (part of the stamen where the pollen is) and which is therefore not functional. May be highly modified or reduced.

Stem: The ascending support and conducting structural axis of a plant which bears the leaves. It may be simple or branched, aerial, aquatic, or subterranean; the pedicle of a flower or petiole of a leaf; the peduncle of an inflorescence; *also* Stalk.

Sterile: Infertile; does not bear fruit.

Stipule: Small leaf-like appendages or membranes found at the base of some leaf stalks or petioles.

Stria: Furrow or groove; sunken longitudinal stripe.

Striate: Having fine longitudinal lines, grooves, ridges, or striations.

Strobilus: Set of fertile leaves (sporophylls) grouped around a central cone-like axis of woody scales located at the apex of a stem; *also* Cone and Pine Cone.

Sub-: Prefix that changes the meaning of the term attached to it: meaning 'without reaching', 'nearly', 'close to', 'under', 'below', 'beneath', 'resulting from further division' etc.

Suber: Cork; the outer cork-like bark of any tree; tissue with a protective function that substitutes the trunk epidermis once secondary-layer cork cambium growth has started.

Succulent: A xerophyte plant that is able to retain water in its leaves and stem giving it a fleshy appearance; having thick juicy leaves or stems.

T

Terminal: Describes any organ that is located at the end of a stem, leaf, or flower; *also* Apical.

Thorn: Hardened, stiff, and sharp-pointed body growing on a stem, branch, or leaf, and equipped with a vascular bundle; *also* Spine.

Thorny: With the sharp-pointed shape or form of a spine or thorn; *also* Spiny.

Tomentum: Dense and soft covering of short entangled hairs pressed close to the surface.

Tortuous: long and complex stem which regularly twists and turns.

Torulose: Having an elongated cylindrical shape with constrictions or bulges; *also* Moniliform.

Transverse Vein: Set of veins that derive from the main vein or rachis.

Trimerous: Constituted by three elements or multiples of three.

Trimonecious: Having three classes of flowers on the same individual plant – bisexual, male, and female; *also* Polygamous.

Truncate: Cut off or blunt; squared off apex.

Trunk: The main woody stem on trees.

Tubiform: Tubular; in the shape of a tube.

U

Under Surface: The underside or abaxial (lower) face of any laminar organ, which normally faces towards the ground.

Undulate: With a widely waved shape.

Unisexual: Describes flowers or plants that only present the reproductive organs (stamens or carpels) of one sex but not both; *also* Dioecious.

Upper Surface: Adaxial (upper) side of any laminar organ, the side that normally faces the sun.

V

Valve: A part of the fruit wall which separates at dehiscence in order to open.

Variiegated: Having varied leaf or flower colours or irregular colour variations in a plant organ.

Vascular: Related to conductive tissues such as xylem and phloem which move fluids.

Vein: Each of the vascular bundles of conducting tissue (xylem and phloem) that develop in laminar organs (leaves, bracts, sepals, petals etc.) of a plant; *also* Nerve.

Verruculose: Slightly wart-like appearance; surface covered with protuberances resembling very small warts.

Verticil: Whorl; set of more than two similar bodies which surround the stem on the same plane.

Villous: Having or covered with long, soft, crooked (but not matted) hair.

W

Woolly: With wool-like hairs, as in woolly indumentum.

X

Xeric: an environment or habitat that contains very little water and is very dry.

Xerophyte: Plant that is adapted to, and which thrives in, very dry or arid habitats or regions with long periods of drought.

Xerophytic: describes a species of plant that has adapted to survive in an environment with very little liquid water.

Z

Zygomorphic: Having one plane of symmetry; bilaterally symmetrical.

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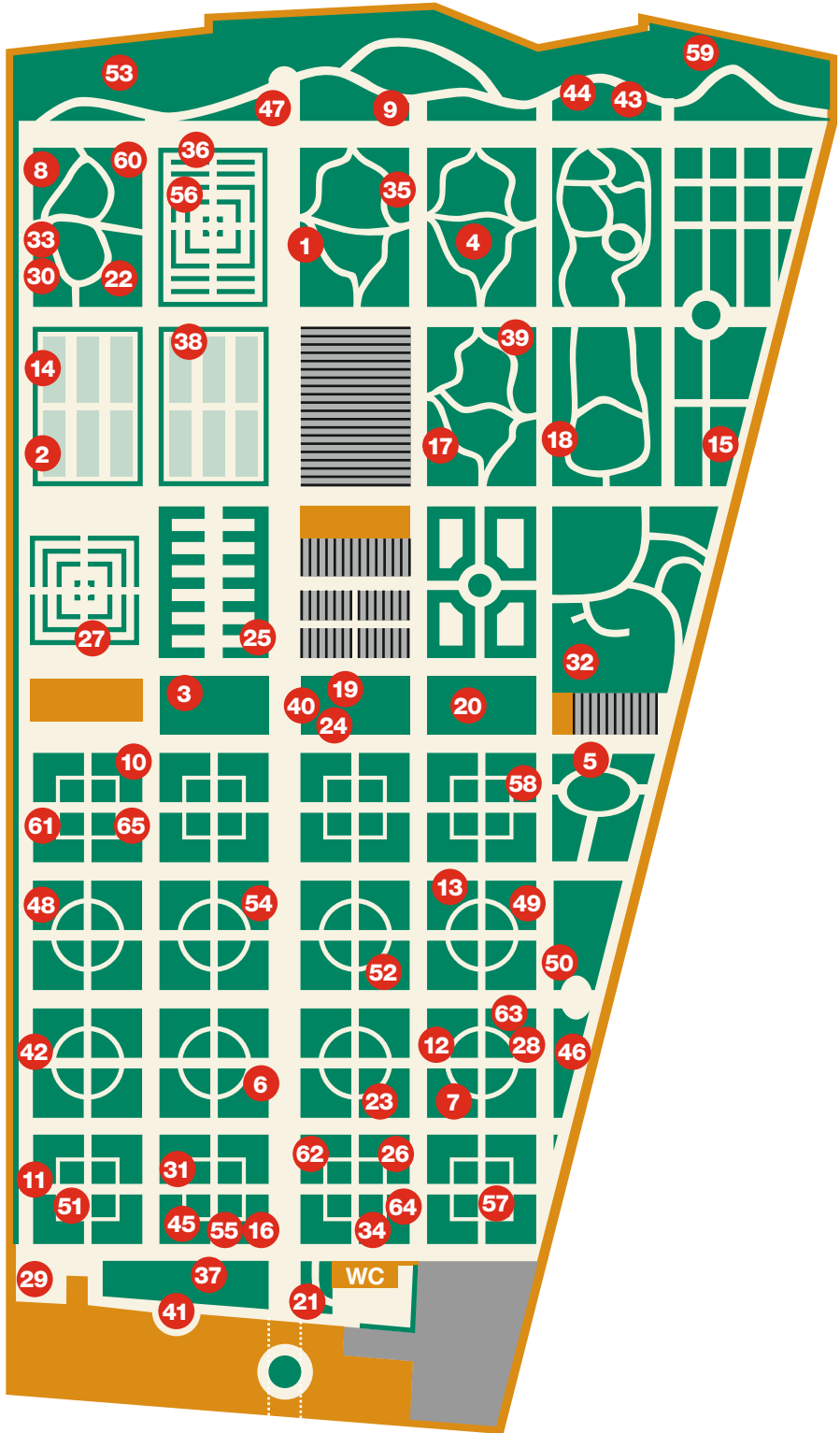
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Leaves from *Ginkgo biloba* L.



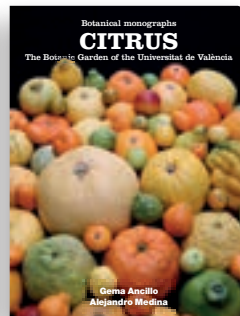
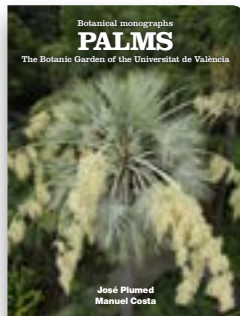
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