All About Climate Plants

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Plants of Continental Subarctic Climate

Vaccinium Vitis-Idaea

Vaccinium vitis-idaea (**cowberry** or **lingonberry**) is a short evergreen shrub in the heath family that bears edible sour fruit, native to boreal forest and Arctic tundra throughout the Northern Hemisphere from Eurasia to North America. It is seldom cultivated, but fruit is commonly collected in the wild.

Names

Vaccinium vitis-idaea is called cowberry in the United States, United Kingdom and Ireland and lingonberry in North America.

The name *cowberry* is derived from the scientific name *Vaccinium*, which comes from *vaccīnus*, an adjective from Latin *vacca* "cow".

The name lingonberry originates from the Swedish name *lingon* for the species.

Other names include csejka berry, foxberry, quailberry, mountain cranberry, red whortleberry, lowbush cranberry, mountain bilberry, partridgeberry (in Newfoundland and Cape Breton), and redberry (in Labrador). Because the names mountain cranberry and lowbush cranberry perpetuate the longstanding confusion between the cranberry and the lingonberry, some botanists have suggested that these names should be avoided.

Description

flowers and young shoots

Vaccinium vitis-idaea and spreads by underground stems to form dense clonal colonies. Slender and brittle roots grow from the underground stems.

The stems are rounded in cross-section and grow from 10 to 40 cm (4 to 16 in) in height. Leaves grow alternately and are oval, 5–30 mm (0.2–1.2 in) long, with a slightly wavy margin, and sometimes with a notched tip.

Flowers of var. *vitis-idaea*

The flowers are bell-shaped, white to pale pink, 3–8 mm (0.1–0.3 in) long, and produced in the early summer.

The fruit is a red berry 6–10 mm (0.2–0.4 in) across, with an acidic taste, ripening in late summer to autumn.

Ecology

Vaccinium vitis-idaea keeps its leaves all winter even in the coldest years, unusually for a broad-leaved plant, though in its natural habitat it is usually protected from severe cold by snow cover.

It is extremely hardy, tolerating as low as -40 °C (-40 °F) or lower, but grows poorly where summers are hot.

It prefers some shade (as from a forest canopy) and constantly moist, acidic soil. Nutrient-poor soils are tolerated but not alkaline soils.

Subdivisions

Varieties

Vaccinium vitis-idaea var. *minus*

There are two regional varieties or subspecies of *Vaccinium vitis-idaea*, one in Eurasia and one in North America, differing in leaf size:

- *Vaccinium vitis-idaea* var. *vitis-idaea* L. — syn. *Vaccinium vitis-idaea* subsp. *vitis-idaea*.
  Cowberry. Eurasia. Leaves 10–30 mm (0.4–1.2 in) long.
- *Vaccinium vitis-idaea* var. *minus* Lodd. — syn. *Vaccinium vitis-idaea* subsp. *minus* (Lodd.) Hultén.
  Lingonberry. North America. Leaves 5–18 mm (0.2–0.7 in) long.

Uses

Lingonberry jam on toast

The berries collected in the wild are a popular fruit in northern, central and eastern Europe, notably in Scandinavia, the Baltic states, Germany, Austria, Switzerland, Czech Republic, Poland, Slovenia, Slovakia, Romania, Russia, and Ukraine. In some areas they can legally be picked on both public and private lands in accordance with the freedom to roam.

The berries are quite tart, so they are almost always cooked and sweetened before eating in the form of lingonberry jam, compote, juice, or syrup. The raw fruit are also frequently simply mashed with sugar, which preserves most of their nutrients and taste. This mix can be stored at room temperature in closed but not necessarily sealed containers, but in this condition, they are best preserved frozen. Fruit served this way or as compote often accompany game meats and liver dishes. In Sweden and Norway, caribou and deer steak

is traditionally served with gravy and lingonberry sauce. Preserved fruit is commonly eaten with meatballs and potatoes in Sweden and Norway, and also with pork. In Sweden and Russia, when sugar was still a luxury item, the berries were usually preserved simply by putting them whole into bottles of water. This was known as vattlingon (watered lingonberries); the procedure preserved them until next season. This was also a home remedy against scurvy. In Russia this preserve had been known as "Lingonberry water" (брусничная вода) and is a traditional soft drink. In Russian folk medicine, lingonberry water was used as a mild laxative. A traditional Finnish dish is sautéed reindeer (*poronkäristys*) with mashed potatoes and lingonberries, either cooked or raw with sugar. In Finland, a porridge made from the fruit is also very popular. In Poland, the berries are often mixed with pears to create a sauce served with poultry or game. The berries can also be used to replace red currants when creating Cumberland sauce to give it a more sophisticated taste.

Lingonberries are also popular as a wild picked fruit in Canada in the Canadian province of Newfoundland and Labrador, where they are locally known as partridgeberries. In this region they are also incorporated into jams, syrups, and baked goods.

Lingonberries are a staple item in Sweden, and at the Swedish retailer IKEA. It is often sold as jam and juice in the store and as a key ingredient in dishes. They are used to make Lillehammer berry liqueur, and in East European countries, lingonberry vodka is sold.

The berries are an important food for bears and foxes, and many fruit-eating birds. Caterpillars of the Coleophoridae case-bearer moths *Coleophora glitzella*, *Coleophora idaeella* and *Coleophora vitisella* are obligate feeders on *Vaccinium vitis-idaea* leaves.

Nutritional properties

19th century illustration

The berries contain plentiful organic acids, vitamin C, provitamin A (as beta carotene), B vitamins (B_1, B_2, B_3), and the elements potassium, calcium, magnesium, and phosphorus. In addition to these nutrients, they also contain phytochemicals that are thought to counteract urinary-tract infections, and the seeds are rich in Omega-3 fatty acids.

Related species

Vaccinium vitis-idaea differs from the similar cranberries (*Vaccinium oxycoccus*, *V. microcarpum* and *V. macrocarpon*) in having white flowers with petals partially

enclosing the stamens and stigma, rather than pink flowers with petals reflexed backwards, and rounder, less pear-shaped berries.

Other species of the genus *Vaccinium* include blueberries, bilberries, and huckleberries. Hybrids between *Vaccinium vitis-idaea* and *Vaccinium myrtillus*, named *Vaccinium* × *intermedium* Ruthe, are occasionally found in Europe.

Rubus Chamaemorus

Rubus chamaemorus

Ripe cloudberry

Scientific classification	
Kingdom:	Plantae
Division:	Magnoliophyta
Class:	Magnoliopsida
Order:	Rosales
Family:	Rosaceae
Genus:	*Rubus*
Species:	***R. chamaemorus***

Rubus chamaemorus (**cloudberry**, **bakeapple** in Atlantic Canada; Greek *chamai* "on the ground", *moros* "mulberry") is a rhizomatous herb native to alpine and arctic tundra and boreal forest, producing amber-colored edible fruit similar to the raspberry or blackberry. Unlike most *Rubus* species, the cloudberry is dioecious, and fruit production by a female plant requires pollination from a male plant.

The cloudberry grows to 10-25 cm high. The leaves alternate between having 5 and 7 soft, handlike lobes on straight, branchless stalks. After pollination, the white (sometimes

reddish-tipped) flowers form raspberry-sized berries. Encapsulating between 5 and 25 drupelets, each fruit is initially pale red, ripening into an amber color in early autumn.

Distribution and ecology

Cloudberries occur naturally throughout the Northern Hemisphere from 78°N, south to about 55°N, and very scattered south to 44°N mainly in mountainous areas. In Europe and Asia, they grow in the Nordic countries, especially in Finland and much in the Baltic states; sometimes in the moorlands of Britain and Ireland, and across northern Russia east to the Pacific Ocean. Small populations are also found further south, as a botanical vestige of the Ice Ages; it is found in Germany's Weser and Elbe valleys, where it is under legal protection. In North America, cloudberries grow wild across most of northern Canada, Alaska, northern Minnesota, New Hampshire, Maine, and a small population on Long Island, New York.

The cloudberry can withstand cold temperatures down to well below -40°C, but is sensitive to salt and to dry conditions. It grows in bogs, marshes and wet meadows and requires sunny exposures in acidic ground (between 3.5 and 5 *p*H).

Cloudberry leaves are food for caterpillars of several Lepidoptera species. The moth *Coleophora thulea* has no other known foodplants.

Wild cloudberries at Littleisland, Norway

Male flower

Unripe cloudberry

Cloudberry jam

Wide distribution occurs due to the excretion of the indigestible seeds by birds and animals. Further distribution arises through its rhizomes which can develop extensive berry patches. Cuttings of these taken in May or August are successful in producing a genetic clone of the parent plant.

Cultivation

Despite its modern demand as a delicacy exceeding supply (particularly in Norway) the cloudberry is primarily a wild plant. Wholesale prices vary widely based on the size of the yearly harvest, but can reach 10€/kg.

Since the middle of the 1990s, however, the species has formed part of the "Northernberries" research project. The Norwegian government, in cooperation with Finnish, Swedish and Scottish counterparts, has vigorously pursued the aim of enabling commercial production of various wild berries (Norway imports 200 - 300 tonnes of cloudberries per year from Finland). Beginning in 2002, selected cultivars have been available to farmers, notably "Apolto" (male), "Fjellgull" (female) and "Fjordgull" (female). The cloudberry can be cultivated in Arctic areas where few other crops are possible, for example along the northern coast of Norway.

Uses

The ripe fruits are golden-yellow, soft and juicy, and are rich in vitamin C. When eaten fresh, cloudberries have a distinctive tart taste. When over-ripe, they have a creamy texture and flavour somewhat like yogurt. They are often made into jams, juices, tarts, and liqueurs. In Finland, the berries are eaten with "leipäjuusto" (a local cheese; the name translates to "bread-cheese"), and lots of cream and sugar. In Sweden, cloudberries or cloudberry jam, are used as topping for ice cream, pancakes and waffles. In Norway, they are often mixed with whipped cream and sugar to be served as a dessert called "multekrem" (Clodberry cream), as a jam or even as an ingredient on home made ice cream. They may also be added to cakes that often contain marzipan. In Canada, cloudberries are used to flavour a special beer. Canadians also use them for jam, but not on the same scale as Scandinavians. In Alaska, the berries are mixed with seal oil, reindeer or caribou fat (which is diced up and made fluffy with the seal oil) and sugar to make "Eskimo Ice Cream" or Agutak. The recipes vary by region. Along the Yukon and Kuskokwim river areas, white fish (pike, whitefish) along with shortening and sugar is used. Due to its high vitamin C content, the berry is valued both by Nordic seafarers and by Canadian Inuit as protection against scurvy. Its high benzoic acid content acts as a natural preservative.

Tea made from cloudberry leaves was used in ancient Scandinavian herbal medicine to cure urinary tract infections.

Alcoholic drinks

In Nordic countries traditionally liqueurs such as *Lakkalikööri* (a Finnish liqueur) are made of cloudberry. It has a strong taste and a high sugar content. Cloudberry has also served as a spice for akvavit.

Dogfish Head Brewery has made an Arctic Cloudberry Imperial Wheat beer, which was inspired by the cloudberry lambic dubbed Soleil de Minuit made by Brasserie Cantillon for the Akkurat pub in Stockholm.

Rodrigues Winery located in Newfoundland, Canada makes a cloudberry wine and a cloudberry liqueur from Newfoundland and Labrador grown berries.

In Sweden, Grythyttans vin produces a real fermented wine from cloudberries. The company started in 1999 and issued the first bottles in 2000. The wine is popular with blue cheese and desserts.

A cloudberry liqueur is also made in the northeastern Quebec region of Canada. The liqueur is known as chicoutai, which is the local aboriginal name for the cloudberry.

Ikea stores in Britain sell an alcoholic (4.5% alcohol by vol.) sparkling apple drink with cloudberry flavour which contains 1.2% cloudberry aroma. It also sells Swedish-made cloudberry jam in its stores.

Alnus viridis

Green Alder

Green Alder *Alnus viridis*
(foreground foliage)

Scientific classification	
Kingdom:	Plantae
Division:	Magnoliophyta
Class:	Magnoliopsida
Order:	Fagales
Family:	Betulaceae
Genus:	*Alnus*
Subgenus:	*Alnobetula*
Species:	***A. viridis***

Alnus viridis (**Green Alder**) is an alder with a wide range across the cooler parts of the Northern Hemisphere.

Description

It is a large shrub or small tree 3-12 m tall with smooth grey bark even in old age. The leaves are shiny green, ovoid, 3-8 cm long and 2-6 cm broad. The flowers are catkins, appearing late in spring after the leaves emerge (unlike other alders which flower before leafing out); the male catkins are pendulous, 4-8 cm long, the female catkins 1 cm long and 0.7 cm broad when mature in late autumn, in clusters of 3-10 on a branched stem. The seeds are small, 1-2 mm long, light brown with a narrow encircling wing.

Distribution

There are four to six subspecies, some treated as separate species by some authors:

- *Alnus viridis* subsp. *viridis*. Central Europe.
- *Alnus viridis* subsp. *suaveolens*. Corsica (endemic).

- *Alnus viridis* subsp. *fruticosa*. Northeast Europe, northern Asia, northwestern North America.
- *Alnus viridis* subsp. *maximowiczii* (*A. maximowiczii*). Japan.
- *Alnus viridis* subsp. *crispa* (*A. crispa*, Mountain Alder). Northeastern North America, Greenland.
- *Alnus viridis* subsp. *sinuata* (*A. sinuata*, Sitka Alder or Slide Alder). Western North America, far northeastern Siberia.

A. viridis is classed as an environmental weed in New Zealand.

Ecology

A. viridis has a shallow root system, and is marked not only by vigorous production of stump suckers, but also by root suckers.

A. viridis is a light-demanding, fast-growing shrub that grows well on poorer soils. In many areas, it is a highly characteristic colonist of avalanche chutes in mountains, where potentially competing larger trees are killed by regular avalanche damage. *A. viridis* survives the avalanches through its ability to re-grow from the roots and broken stumps. Unlike some other alders, it does require moist soil, and is a colonist of screes and shallow stony slopes. It also commonly grows on subarctic river gravels, particularly in northern Siberia, Alaska and Canada, occupying areas similarly disrupted by ice floes during spring river ice breakup; in this habitat it commonly occurs mixed with shrubby willows.

Uses

It is sometimes used for afforestation on infertile soils which it enriches by means of its nitrogen-fixing nodules, while not growing large enough to compete with the intended timber crop. *A. sinuata* can add 55 lbs of nitrogen per acre per year to the soil.

Arctostaphylos uva-ursi

Arctostaphylos uva-ursi

Scientific classification

Kingdom:	Plantae
(unranked):	Angiosperms
(unranked):	Eudicots
(unranked):	Asterids
Order:	Ericales
Family:	Ericaceae
Genus:	*Arctostaphylos*
Species:	***A. uva-ursi***

Arctostaphylos uva-ursi - flowers

Arctostaphylos uva-ursi subsp. *uva-ursi* - fruit

Arctostaphylos uva-ursi, with names for this species including **Kinnikinnick** and **Pinemat manzanita**, one of several related species referred to as **Bearberry**. It is a species of *Arctostaphylos* - manzanita.

Distribution

The *Arctostaphylos uva-ursi* distribution is circumpolar, widespread in northern latitudes, confined to high altitudes further south:

- in Europe, from Iceland and North Cape, Norway south to southern Spain (Sierra Nevada), central Italy (Apennines) and northern Greece (Pindus mountains);
- in Asia from arctic Siberia south to Turkey, the Caucasus and the Himalaya;
- in North America from arctic Alaska, Canada and Greenland south to California, north coast, central High Sierra Nevada (above Convict Lake, Mono County, California), Central Coast, California, San Francisco Bay Area, to New Mexico in the Rocky Mountains; and the Appalachian Mountains in the northeast United States.

In some areas the plant is endangered or has been extirpated from its native range. In other areas it is abundant. They are a common plant in Jack pine areas.

Description

Arctostaphylos uva-ursi is a small procumbent woody groundcover shrub 5-30 cm high. The leaves are evergreen, remaining green for 1–3 years before falling. The fruit is a red berry.

The leaves are shiny, small, and feel thick and stiff. They are alternately arranged on the stems. Undersides of leaves are lighter green than on the tops. New stems can be red if the plant is in full sun, but are green in shadier areas. Older growth stems are brown. In spring, they have white or pink flowers.

Subspecies

There are four subspecies:

- *Arctostaphylos uva-ursi* subsp. *uva-ursi*. **Common Bearberry**; circumpolar arctic and subarctic, and in mountains further south.
- *Arctostaphylos uva-ursi* subsp. *adenotricha*. Central high Sierra Nevada.
- *Arctostaphylos uva-ursi* subsp. *coactilis*. North coastal California, central coast California, San Francisco Bay Area.
- *Arctostaphylos uva-ursi* subsp. *cratericola* (J. D. Smith) P. V. Wells. **Guatemala Bearberry**, endemic to Guatemala at very high altitudes (3000-4000 m).

Uses

Medicinal

Bearberry has historically been used for medicinal purposes. It contains the glycoside arbutin, which has antimicrobial properties and acts as a mild diuretic. It has been used for urinary tract complaints, including cystitis and urolithiasis. An infusion may be made by soaking the leaves in ethanol and then diluting with water.

Cultivation

There are several cultivars that are propagated for use as ornamental plants. It is an attractive evergreen plant in gardens, and it is also useful for controlling erosion.

Eurybia sibirica

Siberian Aster

Eurybia sibirica in the Yukon Territory

Conservation status

Secure (NatureServe)

Scientific classification

Kingdom:	Plantae
(unranked):	Angiosperms
(unranked):	Eudicots
(unranked):	Asterids
Order:	Asterales
Family:	Asteraceae
Tribe:	Astereae
Genus:	*Eurybia*
Species:	***E. sibirica***

Eurybia sibirica, commonly known as the **Siberian aster** or **arctic aster**, is an herbaceous perennial native to north western North America and northern Eurasia, stretching from Scandinavia to Canada. It is found largely in open areas of subarctic boreal forests, though it is also found in a wide variety of habitats in the region. It is similar in appearance to *Eurybia merita*, but their ranges only overlap near the border between the US and Canada, where *E. sibirica* is generally found at higher elevations. The flowers emerge in the summer and display white to pale purple ray florets as well as and yellow disc florets that become purplish as they mature.

Distribution and habitat

E. sibirica is present in much of the subarctic region of world, from western North America through Siberia and to Scandinavia. Its range stretches from the northern Rocky Mountains beginning in the south in Idaho and Montana, north to the Canadian provinces

of Alberta and British Columbia, farther into the North West Territories and Nunavut, west to Yukon and Alaska, across the Bering Strait into Siberia and continuing west through Russia and into Norway. It is found at heights ranging from sea level up to 2200 metres in sandy or gravely soils in disturbed or open areas of boreal forests. It is also present in wet meadows, in open areas of aspen and spruce woods and along riparian thickets. In addition, it is common growing in sandy or gravelly stream flats, along stream banks and the shores of lakes, on bluffs, in sand dunes and other sandy places, and in both sub-alpine and mountain meadows.

Hylocomium splendens

Glittering Wood-moss

Scientific classification

Kingdom:	Plantae
Division:	Bryophyta
Class:	Bryopsida
Subclass:	Bryidae
Order:	Hypnales
Family:	Hylocomiaceae
Genus:	*Hylocomium*
Species:	***H. splendens***

Hylocomium splendens, commonly known as **Glittering Wood-moss**, **Stair-step Moss** and **Mountain Fern Moss**, is a perennial clonal moss with a widespread distribution in Northern Hemisphere boreal forests. It is commonly found in Europe, Russia, Alaska and Canada, where it is often the most abundant moss species. It also grows in the Arctic tundra and further south at higher elevations in, for example, northern California, western Sichuan, East Africa, Australia, New Zealand and the West Indies. In Scotland it is a characteristic species of the Caledonian Forest. Under the UK's national vegetation classification system, pinewood community W18 is named as "Pinus sylvestris-Hylocomium splendens woodland", indicating its significance in this ecosystem.

Morphology

Close up taken in Mount Baker-Snoqualmie National Forest.

It is generally olive green, yellowish or reddish green in colour, with reddish stems and branches. These often form branches up to 20 cm. long, with current year's growth starting from near the middle of the previous year's branch. This produces feathery fronds in steps. It is possible to estimate the age of a plant by counting the steps - a new level being produced each year. This form of growth enables the species to "climb" over other mosses and forest debris that falls on it. It is shade-loving, grows in soil and humus and on decaying wood and often forms mats with living parts growing on top of older, dead or dying sections. Further south, the plants are larger with several steps; further north, in the arctic tundra, the plants are smaller with few steps.

Ecology

Occurring widely in the boreal forests, this plant is often found on forest floors even in relatively harsh northern latitudes. In Canada, for example, according to C. Michael Hogan the Black Spruce/Feathermoss climax forest often occurs with moderately dense canopy featuring a forest floor of feathermosses that include *H. splendens*, *Pleurozium schreberi* and *Ptilium crista-castrensis*.

Use

The species has a commercial use in floral exhibitions and for lining fruit and vegetable storage boxes. In the past it was utilised as a floor covering for dirt floors and in Alaska and northern Canada it is still used for filling the gaps between the logs in log cabins. It has anti-bacterial qualities and may also contain anti-tumour agents.

Salix herbacea

Salix herbacea

Plant in Iceland

Scientific classification	
Kingdom:	Plantae
Division:	Magnoliophyta
Class:	Magnoliopsida
Order:	Malpighiales
Family:	Salicaceae
Genus:	*Salix*
Species:	***S. herbacea***

Salix herbacea (**Dwarf Willow**, **Least Willow** or **Snowbed Willow**) is a species of tiny creeping willow (family Salicaceae).

Leaves and seed capsules

It is adapted to survive in harsh Arctic and sub-Arctic environments, and has a wide distribution on both sides of the North Atlantic, in Arctic northwest Asia, northern Europe, Greenland, and eastern Canada, and further south on high mountains, south to the Pyrenees, the Alps and the Rila in Europe, and the northern Appalachian Mountains in the eastern United States. It grows in tundra and rocky moorland, usually at over 1,500 m altitude in the south of its range but down to sea level in the Arctic.

It is one of the smallest woody plants in the world. It typically grows to only 1-6 cm in height and has round, shiny green leaves 1-2 cm long and broad. Like the rest of the willows, Dwarf Willow is dioecious, with male and female catkins on separate plants. As a result the plant's appearance varies; the female catkins are red-coloured, while the male catkins are yellow-coloured.

Salix polaris

Salix polaris

Scientific classification

Kingdom:	Plantae
Division:	Magnoliophyta
Class:	Magnoliopsida
Order:	Malpighiales
Family:	Salicaceae
Genus:	*Salix*
Species:	***S. polaris***

Salix polaris (**Polar Willow**) is a species of willow with a circumpolar distribution in the high arctic tundra, extending north to the limits of land, and south of the Arctic in the mountains of Norway, the northern Ural Mountains, the northern Altay Mountains, Kamchatka, and British Columbia, Canada.

Description

One of the smallest willows in the world, it is a prostrate, creeping dwarf shrub, only 2-9 cm high, and has underground branches or runners in the uppermost soil layers. The leaves are rounded-ovate, 5-32 mm long and 8-18 mm broad, dark green and have entire margins. It is dioecious, with separate female and male plants. The flowers are grouped in short catkins each bearing only a few flowers. The fruit is a brownish and hairy capsule. The long runners with freely-rooting stems creep in mats of mosses and lichens, which keeps them together and protects them from the wind. It grows as well in open gravel as in closed vegetation.

Fossil remains of the species from the Pleistocene ice ages are known in Europe south to southern England, the Alps, and the Carpathians.

The species has also been reported from Arizona, but this is not accepted by the USDA.

Veronica wormskjoldii

Veronica wormskjoldii

Scientific classification

Kingdom:	Plantae
(unranked):	Angiosperms
(unranked):	Eudicots
(unranked):	Asterids
Order:	Lamiales
Family:	Plantaginaceae
Genus:	*Veronica*
Species:	***V. wormskjoldii***

Veronica wormskjoldii is a species of flowering plant in the plantain family known by the common name **American alpine speedwell**. It is native to much of northern and western North America, including the western United States and northern Canada, from where it grows in moist alpine habitat, such as mountain forest understory. It has a wide subarctic distribution from Alaska to Greenland. This is a rhizomatous perennial herb producing a decumbent to erect, mostly unbranched stem up to 25 to 40 centimeters tall and coated in long hairs. The oppositely arranged leaves are 2 to 4 centimeters long and lack petioles. The inflorescence is a hairy, glandular raceme of flowers at the tip of the stem. Each flower has hairy, lance-shaped sepals and a blue corolla up to a centimeter wide. The fruit is a capsule around half a centimeter long which contains tiny flattened seeds.

Chapter- 2

Plants of Mediterranean Climate

Garrigue

Garrigue, France

Garrigue is a type of low, soft-leaved scrubland ecoregion and plant community in the Mediterranean forests, woodlands, and scrub biome. It is found on limestone soils around the Mediterranean Basin, generally near the seacoast, where the climate is ameliorated, but where annual summer drought conditions obtain. The term has also found its way into haute cuisine, suggestive of the resinous flavours of a garrigue shrubland.

Habitat and vegetation

Garrigue in Languedoc, Midi-Pyrénées

Cistus and *Senecio* are characteristic plants of the garrigue

UNEP World Conservation Monitoring Centre described garrigue as "discontinuous bushy associations of the Mediterranean calcareous plateaus, often composed of kermes oak, lavender, thyme, and white cistus. There may be a few isolated trees."

Aside from dense thickets of kermes oak that punctuate the garrigue landscape, juniper and stunted holm oaks are the typical trees; aromatic lime-tolerant shrubs such as lavender, sage, rosemary, wild thyme and *Artemisia* are common garrigue plants.

Allelopathy

The aromatic oils and soluble monoterpenes of such herbs leached into garrigue soils from leaf litter have been connected with plant allelopathy, which asserts the dominance of a plant over its neighbors, especially annuals, and contributes to the characteristic open spacing and restricted flora in a garrigue. The fines (charred wood and smoke residues, or charcoal dust) of periodic brush fires also have had an effect on the patterning and composition of the garrigues. Clear summer skies and intense solar radiation have induced the evolution of protective physiologies: the familiar glaucous, grayish-green of garrigue landscapes is produced by the protective white hairs and light-diffusing, pebbled surfaces of many leaves typical of garrigue plants.

Maquis

Maquis is broadly similar to garrigue, but the vegetation is more dense, being composed of numerous closely spaced shrubs. Maquis is associated with siliceous (acid) soils.The plant communities are often suites associated with Holm Oak. Calciphobes such as Erica and Calluna are present in the Maquis biome.

Garrigue is discontinuous with widely spaced bush associations with open spaces (often extensive). Garrigue is associated with calcareous plateaus (limestone and base rich) and calcium associated plants. Both garrigue and maquis are associated with Mediterranean climate. However, the distinction is not clear and term use is inconsistent. Other terms, for instance Matorral, give rise to confusion through misunderstandings.

Conservation

Deforestation of the indigenous oak forest since the Late Bronze Age, for cultivation of olives, vines and grain, the introduction of sheep and especially goats and charcoal-making for heat and iron-working, exposed the land surface to weathering and resulted in erosion of the topsoil. The wild garrigue, then, is a man-formed landscape. The intensity of grazing pressure has had a direct response in the ecotope, reflected today in the decline of goat-pasturing.

Similar ecoregions

Garrigue is a common general word for the shrubland habitat ecosystems in France along with maquis, which are known elsewhere as: *phrygana* in Greece; *tomillares* and

matorral in Spain; and *batha* in Israel. In California a similar Mediterranean climate ecoregion is called chaparral; in South Africa it's fynbos; in Australia it's mallee, and in Chile it's matorral. All are in the Mediterranean forests, woodlands, and scrub biome.

Origin of the word

First cited in the French language in 1546, the singular word *garrigue* is borrowed from the Provencal *garriga,* equivalent to old French *jarrie.* Etymologist Oscar Bloch states that it is most likely related to the Gascon *carroc,* meaning *rock* and to the Germanic Swiss *Karren,* a kind of sedimentary rock. These related words could stem from *(peut être ramené á)* a supposed *carra,* or *rock,* which could be a remnant of a pre-Latin language, to judge from its geographic distribution even before Celtic times, and possibly akin to Basque **karr-*, *harri*, 'rock'. It is thought that Gallic and Latin incorporated these words and then transmitted them in various forms to the Romance languages.

The word is related to *Quercus,* the Latin word for *oak,* which in turn perhaps comes from an older, pre-Indo-European, root, *kar,* meaning *to be hard.*

Uses

Cultivation

The dense, thrifty growth of garrigue flora has recommended many of its shrubs and sub-shrubs for gardens. Many shrubs and flowering perennials of the garrigue are mainstays of the English "mixed border" of herbaceous and woody plants found in English gardens - around the world, though often grown under cooler, moister conditions.

Viticulture

Grapes that are grown in the *garrigues* region of France are said to produce wines with a "barnyard" or "earthy" tone, or "the herbal scent of lavender that fills the hills of Provence in the summer time." Some wines bottled in Southern France contain the word *Garrigues* as part of their appellation or label name.

Aesculus Hippocastanum

Aesculus hippocastanum

Aesculus hippocastanum, Horse-chestnut planted as a feature tree in a park

Scientific classification

Kingdom:	Plantae
(unranked):	Angiosperms
(unranked):	Eudicots
(unranked):	Rosids
Order:	Sapindales
Family:	Sapindaceae
Genus:	*Aesculus*
Species:	***A. hippocastanum***

Aesculus hippocastanum is a large deciduous tree, commonly known as **Horse-chestnut** or **Conker tree**.

Distribution

Aesculus hippocastanum is native to a small area in the mountains of the Balkans in southeast Europe, in small areas in northern Greece, Albania, the Republic of Macedonia, Serbia, and Bulgaria (Pindus Mountains mixed forests and Balkan mixed forests). It is widely cultivated throughout the temperate world.

Growth

Foliage and flowers

It grows to 36 m tall, with a domed crown of stout branches, on old trees the outer branches often pendulous with curled-up tips. The leaves are opposite and palmately compound, with 5–7 leaflets; each leaflet is 13–30 cm long, making the whole leaf up to 60 cm across, with a 7–20 cm petiole. The leaf scars left on twigs after the leaves have fallen have a distinctive horseshoe shape, complete with seven "nails". The flowers are usually white with a small red spot; they are produced in spring in erect panicles 10–30 cm tall with about 20–50 flowers on each panicle. Usually only 1–5 fruit develop on each panicle; the shell is a green, softly spiky capsule containing one (rarely two or three) nut-like seeds called conkers or horse-chestnuts. Each conker is 2–4 cm diameter, glossy nut-brown with a whitish scar at the base.

Etymology

The common name *horse-chestnut* is reported as having originated from the erroneous belief that the tree was a kind of chestnut, together with the observation that eating them cured horses of chest complaints.

Uses

Leaves and trunk

Cultivation for its spectacular spring flowers is successful in a range of climatic conditions provided summers are not too hot, with trees being grown as far north as Edmonton, Alberta, the Faroe Islands, and Harstad, Norway. In more southern areas, growth is best in cooler mountain climates.

In Britain and Ireland, the nuts are used for the popular children's game conkers. During the two world wars, horse-chestnuts were used as a source of starch which in turn could be used via the *Clostridium acetobutylicum* fermentation method devised by Chaim Weizmann to produce acetone. This acetone was then used as a solvent which aided in the process of ballistite extrusion into cordite, which was then used in military armaments.

The nuts, especially those that are young and fresh, are slightly poisonous, containing alkaloid saponins and glucosides. Although not dangerous to touch, they cause sickness when eaten. Some mammals, notably deer, are able to break down the toxins and eat them safely. They are reputed to be good for horses with wind, but this is unproven and feeding them to horses is not advisable. The saponin *aescin* (a complex mixture of triterpene glycosides), however, has been used for health purposes (such as varicose

veins, edema, sprains) and is available in food supplements, as is the coumarin glucoside aesculin.

A selection of fresh conkers from a horse-chestnut

In the past, horse-chestnut seeds were used in France and Switzerland for whitening hemp, flax, silk and wool. They contain a soapy juice, fit for washing of linens and stuffs, for milling of caps and stockings, etc., and for fulling of cloth. For this, 20 horse-chestnut seeds were sufficient for six liters of water. They were peeled, then rasped or dried, and ground in a malt or other mill. The water must be soft, either rain or river water; hard well water will not work. The nuts are then steeped in cold water, which soon becomes frothy, as with soap, and then turns milky white. The liquid must be stirred well at first, and then, after standing to settle, strained or poured off clear. Linen washed in this liquid, and afterwards rinsed in clear running water, takes on an agreeable light sky-blue colour. It takes spots out of both linen and wool, and never damages or injures the cloth.

In Bavaria the chestnut is the typical tree for a beer garden. Originally they were planted for their deep shade which meant that beer cellar owners could cut ice from local rivers and lakes in winter to cool the Märzen Lager beer well into summer. Nowadays guests enjoy the shade to keep their heads cool - even after the second Maß (a mug with a liter of beer).

Conkers have been threatened by the leaf-mining moth *Cameraria ohridella*, whose larvae feed on horse chestnut leaves. The moth was described from Macedonia where the species was discovered in 1984 but took 18 years to reach Britain.

Aesculus hippocastanum is used in Bach flower remedies. When the buds are used it is referred to as "Chestnut Bud" and when the flowers are used it is referred to as "White Chestnut".

The flower is the symbol of the city of Kiev, capital of Ukraine.

Germination on lawn

Horse-chestnuts can be used to make jewelry using the conkers as beads.

Trunk

Although the horse-chestnut is sometimes known as the buckeye, this name is generally reserved for the New World members of the *Aesculus* genus.

A famous specimen was the Anne Frank Tree, a horse-chestnut in the center of Amsterdam which she mentioned in her diary and which survived there until August 2010.

Conkers are rumoured to keep spiders away if they are placed in the corners of a room.

Diseases

- Bleeding Canker. Half of all Horse-chestnuts in Great Britain are now showing symptoms to some degree of this potentially lethal bacterial infection.
- Guignardia leaf blotch, caused by the fungus *Guignardia aesculi*
- Wood rotting fungi, e.g. such as Armillaria and Ganoderma
- Horse-chestnut scale, caused by the insect *Pulvinaria regalis*
- Horse-chestnut leaf miner, *Cameraria ohridella*, a leaf mining moth.
- Phytophthora bleeding canker, a fungal infection.

Aloe Vera

Aloe vera

Aloe vera plant with flower detail inset.

Scientific classification	
Kingdom:	Plantae
Order:	Asparagales
Family:	Asphodelaceae
Genus:	*Aloe*
Species:	***Aloe vera***

Aloe vera, also known as the **true** or **medicinal aloe**, is a species of succulent plant that, it is presumed, originated in the southern half of the Arabian peninsula, Northern Africa, the Canary islands, and Cape Verde. *Aloe vera* grows in arid climates and is widely distributed in Africa, India, and other arid areas. The species is frequently cited as being used in herbal medicine. Many scientific studies of the use of aloe vera have been undertaken, some of them conflicting. Despite these limitations, there is some preliminary evidence that *Aloe vera* extracts may be useful in the treatment of wound and burn healing, minor skin infections, Sebaceous cyst, diabetes, and elevated blood lipids in humans. These positive effects are thought to be due to the presence of compounds such as polysaccharides, mannans, anthraquinones, and lectins.

Description

Aloe vera is a stemless or very short-stemmed succulent plant growing to 60–100 cm (24–39 in) tall, spreading by offsets. The leaves are thick and fleshy, green to grey-green, with some varieties showing white flecks on the upper and lower stem surfaces. The margin of the leaf is serrated and has small white teeth. The flowers are produced in summer on a spike up to 90 cm (35 in) tall, each flower pendulous, with a yellow tubular corolla 2–3 cm (0.8–1.2 in) long. Like other *Aloe* species, *Aloe vera* forms arbuscular mycorrhiza, a symbiosis that allows the plant better access to mineral nutrients in soil.

Taxonomy and etymology

Spotted forms of *Aloe vera* are sometimes known as *Aloe vera* var. *chinensis*.

The species has a number of synonyms: *A. barbadensis* Mill., *Aloe indica* Royle, *Aloe perfoliata* L. var. *vera* and *A. vulgaris* Lam., and common names including Chinese Aloe, Indian Aloe, true Aloe, Barbados Aloe, burn Aloe, first aid plant. The species name *vera* means "true" or "genuine." Some literature identifies the white spotted form of *Aloe vera* as *Aloe vera* var. *chinensis*, however, the species varies widely with regard to leaf spots and it has been suggested that the spotted form of *Aloe vera* may be conspecific with *A. massawana*. The species was first described by Carl Linnaeus in 1753 as *Aloe perfoliata* var. *vera*, and was described again in 1768 by Nicolaas Laurens Burman as *Aloe vera* in

Flora Indica on the 6th of April and by Philip Miller as *Aloe barbadensis* some ten days after Burman in the *Gardener's Dictionary*.

Techniques based on DNA comparison suggest that *Aloe vera* is relatively closely related to *Aloe perryi*, a species that is endemic to Yemen. Similar techniques, using chloroplast DNA sequence comparison and ISSR profiling have also suggested that *Aloe vera* is closely related to *Aloe forbesii*, *Aloe inermis*, *Aloe scobinifolia*, *Aloe sinkatana*, and *Aloe striata*. With the exception of South African species *A. striata*, these *Aloe* species are native to Socotra (Yemen), Somalia, and Sudan. The lack of obvious natural populations of the species have led some authors to suggest that *Aloe vera* may be of hybrid origin.

Products

Aloe vera gel being used to make a dessert

Cultivated *Aloe vera*

Some varieties of *Aloe vera* have no spots

Aloe vera growing on a roadside in Aruba

Aloe vera fields

Another *Aloe vera* plant

Distribution

The natural range of *Aloe vera* is unclear, as the species has been widely cultivated throughout the world. Naturalised stands of the species occur in the southern half of the Arabian peninsula, through North Africa (Morocco, Mauritania, Egypt) as well as Sudan and neighbouring countries, along with the Canary, Cape Verde, and Madeira Islands. This distribution is somewhat similar to the one of *Euphorbia balsamifera*, *Pistacia atlantica*, and a few others, suggesting that a dry sclerophyl forest once covered large areas, but has been dramatically reduced due to desertification in the Sahara, leaving these few patches isolated. Several closely related species (or sometimes identical) can be found on the two extreme sides of the Sahara: Dragon trees and *Aeonium* being some of the most representative examples.

The species was introduced to China and various parts of southern Europe in the 17th century. The species is widely naturalised elsewhere, occurring in temperate and tropical regions of Australia, Barbados, Belize, Nigeria, Paraguay and the US It has been suggested that the actual species' distribution is the result of human cultivation and that the taxonomy could be doubtful too.

Alternative names

- In India, *Aloe vera* is known as *Korphad* (in Maharashtra), *Kattar vazha* (in Kerala), *Gwarpatha* (in Rajasthan and Gujarat), *Ghrtakumari* (Hindi/Sanskrit:) or *Gheekvar*, and is used in Ayurvedic medicine and as a home remedy for skin allergies, acne, fungus infections, and beauty-aid. In the state of Tamil Nadu, the plant is called *Katralai* or *Katrazhai* and its pulp is highly regarded for its anti-ageing potential, hence its pet name *Kumari*. The pulp is used extensively in Siddha medicines for treating ailments including constipation, enlargement of the spleen, zymotic disease, and chengamaari (a type of venereal infection). It is also known as *Kalabanda* in the Telugu language, and as *Gheekoari* in Oriya.
- In Pakistan, the plant is known as *Quargandal* and is used in Unani (Greek-Islamic) medicine.
- In Indonesia, it is known as *Lidah Buaya* (or "Crocodile's Tongue").
- In Thailand, it is known as the "Crocodile Tail" (Thai: ว่านหางจระเข้) plant.
- In Vietnam, it is known as the "Nha Đam" plant.
- In Latin America and the Philippines, it is often called either "Savia", "Savila", or "Sabila". Both indigenous peoples and some Mestizos use it as a traditional medicine.

Cultivation

Aloe vera can be grown as an ornamental plant.

Aloe vera has been widely grown as an ornamental plant. The species is popular with modern gardeners as a putatively medicinal plant and due to its interesting flowers, form, and succulence. This succulence enables the species to survive in areas of low natural rainfall, making it ideal for rockeries and other low-water use gardens. The species is hardy in zones 8–11, although it is intolerant of very heavy frost or snow. The species is relatively resistant to most insect pests, though spider mites, mealy bugs, scale insects, and aphid species may cause a decline in plant health. In pots, the species requires well-drained sandy potting soil and bright sunny conditions; however, in very hot and humid tropical or subtropical climates, aloe plants should be protected from direct sun and rain, as they will burn and/or turn mushy easily under these conditions. The use of a good-quality commercial propagation mix or pre-packaged "cacti and succulent mix" is recommended, as they allow good drainage. Terracotta pots are preferable as they are porous. Potted plants should be allowed to completely dry prior to re-watering. When potted aloes become crowded with "pups" growing from the sides of the "mother plant," they should be divided and re-potted to allow room for further growth and help prevent pest infestations. During winter, *A. vera* may become dormant, during which little moisture is required. In areas that receive frost or snow ,the species is best kept indoors or in heated glasshouses. Large scale agricultural production of *Aloe vera* is undertaken in Australia, Bangladesh, Cuba, the Dominican Republic, China, Mexico, India, Jamaica, Kenya and South Africa, along with the USA to supply the cosmetics industry with *Aloe vera* gel.

Uses

Medicinal uses

Scientific evidence for the cosmetic and therapeutic effectiveness of *Aloe vera* is limited and when present is frequently contradictory. Despite this, the cosmetic and alternative medicine industries regularly make claims regarding the soothing, moisturising, and healing properties of *Aloe vera*, especially via Internet advertising. *Aloe vera gel* is used as an ingredient in commercially available lotion, yogurt, beverages, and some desserts. Aloe vera juice is used for consumption and relief of digestive issues such as heartburn and irritable bowel syndrome. It is common practice for cosmetic companies to add sap or other derivatives from *Aloe vera* to products such as makeup, tissues, moisturizers, soaps, sunscreens, incense, shaving cream, and shampoos. Other uses for extracts of *Aloe vera* include the dilution of semen for the artificial fertilization of sheep, use as fresh food preservative, and use in water conservation in small farms.

Aloe vera has a long association with herbal medicine, although it is not known when its medical applications were first discovered. Early records of *Aloe vera* use appear in the Ebers Papyrus from 16th century BCE, in both Dioscorides' *De Materia Medica* and Pliny the Elder's *Natural History* written in the mid-first century CE along with the *Juliana Anicia Codex* produced in 512 CE. *Aloe vera* is non-toxic, with no known side effects, provided the aloin has been removed by processing. Taking *Aloe vera* that contains aloin in excess amounts has been associated with various side-effects. However,

the species is used widely in the traditional herbal medicine of China, Japan, Russia, South Africa, the United States, Jamaica, Latin America and India.

Aloe vera is alleged to be effective in treatment of wounds. Evidence on the effects of *Aloe vera* sap on wound healing, however, is limited and contradictory. Some studies, for example, show that *Aloe vera* promotes the rates of healing, while, in contrast, other studies show that wounds to which *Aloe vera* gel was applied were significantly slower to heal than those treated with conventional medical preparations. A more recent review (2007) concludes that the cumulative evidence supports the use of *Aloe vera* for the healing of first to second degree burns. In addition to topical use in wound or burn healing, internal intake of *Aloe vera* has been linked with improved blood glucose levels in diabetics, and with lower blood lipids in hyperlipidaemic patients, but also with acute hepatitis (liver disease). In other diseases, preliminary studies have suggested oral *Aloe vera* gel may reduce symptoms and inflammation in patients with ulcerative colitis. Compounds extracted from *Aloe vera* have been used as an immunostimulant that aids in fighting cancers in cats and dogs; however, this treatment has not been scientifically tested in humans. The injection of *Aloe vera* extracts to treat cancer has resulted in the deaths of several patients.

Topical application of *Aloe vera* may be effective for genital herpes and psoriasis. However, it is not effective for the prevention of radiation-induced injuries. Although anecdotally useful, it has not been proven to offer protection from sunburn or suntan. In a double-blind clinical trial, both the group using an *Aloe vera* containing dentifrice and the group using a fluoridated dentifrice had a reduction of gingivitis and plaque, but no statistically significant difference was found between the two.

Aloe vera extracts have antibacterial and antifungal activities, which may help in the treatment of minor skin infections, such as boils and benign skin cysts. *Aloe vera* extracts have been shown to inhibit the growth of fungi that cause tinea; however, evidence for control beneath human skin remains to be established. For its anti-fungal properties, *Aloe vera* is used as a fish tank water conditioner. For bacteria, inner-leaf gel from *Aloe vera* was shown to inhibit growth of *Streptococcus* and *Shigella* species *in vitro*. In contrast, *Aloe vera* extracts failed to show antibiotic properties against *Xanthomonas* species.

Commodity uses

Aloe vera is now widely used on face tissues, where it is promoted as a moisturiser and/or anti-irritant to reduce chafing of the nose of users suffering hay-fever or cold. It has also been suggested that biofuels could be obtained from *Aloe vera* seeds. It can also be used to retwist dreadlocked hair, a favourite agent for vegans and those preferring natural products. Aloe Vera is also used for soothing the skin, and keeping the skin moist while eliminating the risk of flaky scalp and skin in harsh and dry weather.

Historical uses

Aloin was the common ingredient in OTC laxative products in the United States prior to 2003, when the FDA ruled that aloin was a class III ingredient, therefore banning its use. It should be noted that processed aloe that contains *aloin* is used primarily as a laxative, whereas processed aloe vera juice that does not contain significant amounts of aloin is used as a digestive healer. Manufacturers commonly remove aloin in processing due to the FDA ruling.

Culinary uses

Aloe is also used as a food substance. Some molecular gastronomists have begun to take advantage of its gelling properties. Perhaps the most notable among these is Chef Quique Dacosta's "Oysters Guggenheim," created at El Poblet in Spain.

Biologically active compounds

Aloe vera leaves contain a range of biologically active compounds, the best-studied being acetylated mannans, polymannans, anthraquinone C-glycosides, anthrones and anthraquinones, and various lectins.

Sclerophyll

Fynbos in South Africa

Sclerophyll is a type of vegetation that has hard leaves and short internodes (the distance between leaves along the stem). The word comes from the Greek *sclero* (hard) and *phyllon* (leaf). Sclerophyllous plants occur in many parts of the world but are most typical in the chaparral biomes. They are also prominent in the Mediterranean forests, woodlands, and scrub biome that cover the Mediterranean Basin, Californian woodlands, Chilean Matorral, and the Cape Province of South Africa.

Australian bush

Bush around Eagle Bay, Western Australia

Most areas of the Australian continent able to support woody plants are occupied by **sclerophyll** communities as forests, savannas or heathlands. Common plants include the Proteaceae (Grevilleas, Banksias and Hakeas), tea-trees, Acacias, Boronias, and the Eucalypts.

The most common sclerophyll communities in Australia are savannas dominated by grasses with an overstorey of Eucalypts and Acacias. Acacia (particularly mulga) shrublands also cover extensive areas. All the dominant overstorey Acacia species and a majority of the understorey Acacias have a scleromorphic adaptation in which the leaves have been reduced to phyllodes consisting entirely of the petiole. Many plants of the sclerophyllous woodlands and shrublands also produce leaves unpalatable to herbivores by the inclusion of toxic and indigestible compounds in an attempt to maintain these long-lived leaves. This trait is particularly noticeable in the eucalypt and Melaleuca species which possess oil glands within their leaves that produce a pungent volatile oil that makes them unpalatable to most browsers. These traits make the majority of woody plants in these woodlands largely unpalatable to domestic livestock. It is therefore important from a grazing perspective that these woodlands support a more or less continuous layer of herbaceous ground cover dominated by grasses.

Sclerophyll forests cover a much smaller area of the continent, being restricted to relatively high rainfall locations. They have a eucalyptus overstory (10 to 30 metres) with the understory also being hard-leaved. *Dry sclerophyll* forests are the most common forest type on the continent, and although it may seem barren dry sclerophyll forest is highly diverse. For example, a study of sclerophyll vegetation in Seal Creek, Victoria, found 138 species.

Even less extensive are *wet sclerophyll* forests. They have a taller eucalyptus overstory than dry sclerophyll forests, 30 metres or more (typically Mountain Ash, Alpine Ash, Messmate Stringybark or Manna Gum), and a soft-leaved, fairly dense understory (tree ferns are common). They require ample rainfall — at least 1000mm (40 inches).

History

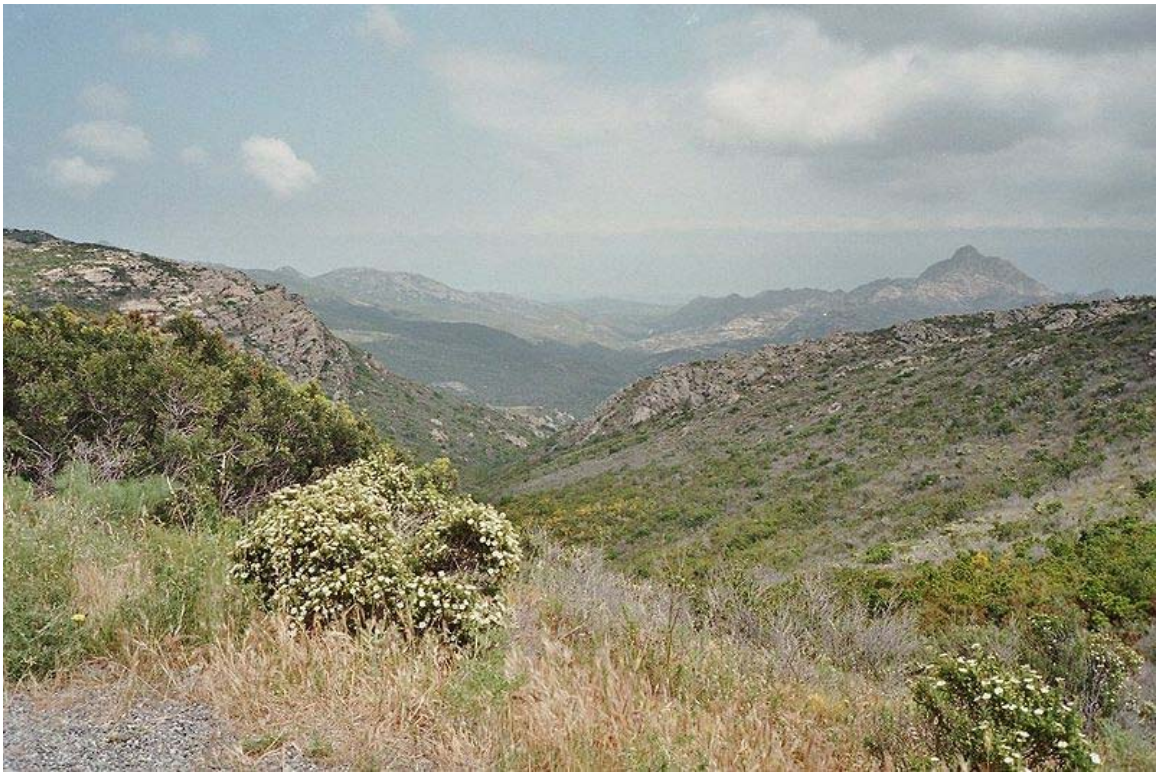
Sclerophyllous plants are all part of a specific environment and are anything but newcomers. By the time of European settlement, sclerophyll forest accounted for the vast bulk of the forested areas.

Most of the wooded parts of present-day Australia have become sclerophyll dominated as a result of the extreme age of the continent combined with Aboriginal fire use. Deep weathering of the crust over many millions of years leached chemicals out of the rock, leaving Australian soils deficient in nutrients, particularly phosphorus. Such nutrient deficient soils support non-sclerophyllous plant communities elsewhere in the world and did so over most of Australia prior to human arrival. However such deficient soils cannot support the nutrient losses associated with frequent fires and are rapidly replaced with sclerophyllous species under traditional Aboriginal burning regimes. With the cessation of traditional burning non-sclerophyllous species have re-colonised sclerophyll habitat in many parts of Australia. The presence of toxic compounds combined with a low carbon : nitrogen ratio make the leaves and branches of scleromorphic species long-lived in the litter, and can lead to a large build-up of litter in woodlands. The toxic compounds of many species, notably Eucalyptus species, are volatile and flammable and the presence of large amounts of flammable litter, coupled with an herbaceous understorey, encourages

fire. All the Australian sclerophyllous communities are liable to be burnt with varying frequencies and many of the woody plants of these woodlands have developed adaptations to survive and minimise the effects of fire.

Sclerophyllous plants generally resist dry conditions well, making them successful in areas of seasonally variable rainfall. In Australia, however, they evolved in response to the low level of phosphorus in the soil — indeed, many Australian native plants cannot tolerate higher levels of phosphorus and will die if fertilised incorrectly. The leaves are hard due to lignin, which prevents wilting and allows plants to grow even when there isn't enough phosphorus for substantial new cell growth.

Maquis shrubland



Low Maquis in Corsica

High *macchia* in Sardinia

Maquis (French) or **macchia** (Italian: *macchia Mediterranea*) is a shrubland biome in the Mediterranean region, typically consisting of densely growing evergreen shrubs such as holm oak, tree heath, strawberry tree, sage, juniper, buckthorn, spurge olive and myrtle. It is found throughout the Mediterranean Basin, including most of coastal Italy, southern France, Sardinia, Corsica, and elsewhere.

It is similar to the English heath in many aspects, but with taller shrubs, typically 2–4 m high as opposed to 0.2–1 m for heath. A similar habitat type in North America is known as chaparral, though the kinds of shrubs involved are different.

Although maquis is by definition natural, its appearance in many places is due to destruction of forest cover, mainly by frequent burning that prevents young trees from maturing. It tends otherwise to grow in arid, rocky areas where only drought-resistant plants are likely to prosper.

The word comes from the plural of Italian *macchia* (English "thicket"). The extremely dense nature of maquis made it ideal cover for bandits and guerrillas, who used it to shelter from the authorities. It is from this meaning that the Second World War French resistance movement, the Maquis, derived its name. In Italian *darsi alla macchia* means "becoming a fugitive".

Acer opalus

Acer opalus **Italian Maple**

Italian Maple leaves in autumn

Scientific classification	
Kingdom:	Plantae
(unranked):	Angiosperms
(unranked):	Eudicots
(unranked):	Rosids
Order:	Sapindales
Family:	Sapindaceae
Genus:	*Acer*
Species:	***A. opalus***

Acer opalus (**Italian Maple**) is a species of maple native to the hills and mountains of southern and western Europe, from Italy to Spain and north to southern Germany, and also in northwest Africa in Morocco and Algeria.

Description

Acer opalus is a medium-sized deciduous tree growing to 20 m tall, with a trunk up to 1 m diameter. The leaves are glossy green, 7-13 cm long and 5-16 cm across, palmately lobed with blunt teeth. They turn yellow in autumn. The bark is grey and pink. It peels in square plates. It has small yellow flowers that open before the leaves appear. The fruit is a pair of winged samaras, each seed 1 cm diameter with a 1.5-2.5 cm wing.

Subspecies

Acer opalus trees with shallowly lobed leaves are sometimes separated as a distinct subspecies ***Acer opalus* subsp. *obtusatum***.
The characteristics are not always constant, and the species is treated as monotypic by the *Flora Europaea*.

Anthriscus sylvestris

Anthriscus sylvestris

Scientific classification

Kingdom:	Plantae
(unranked):	Angiosperms
(unranked):	Eudicots
(unranked):	Asterids
Order:	Apiales
Family:	Apiaceae
Genus:	*Anthriscus*
Species:	***A. sylvestris***

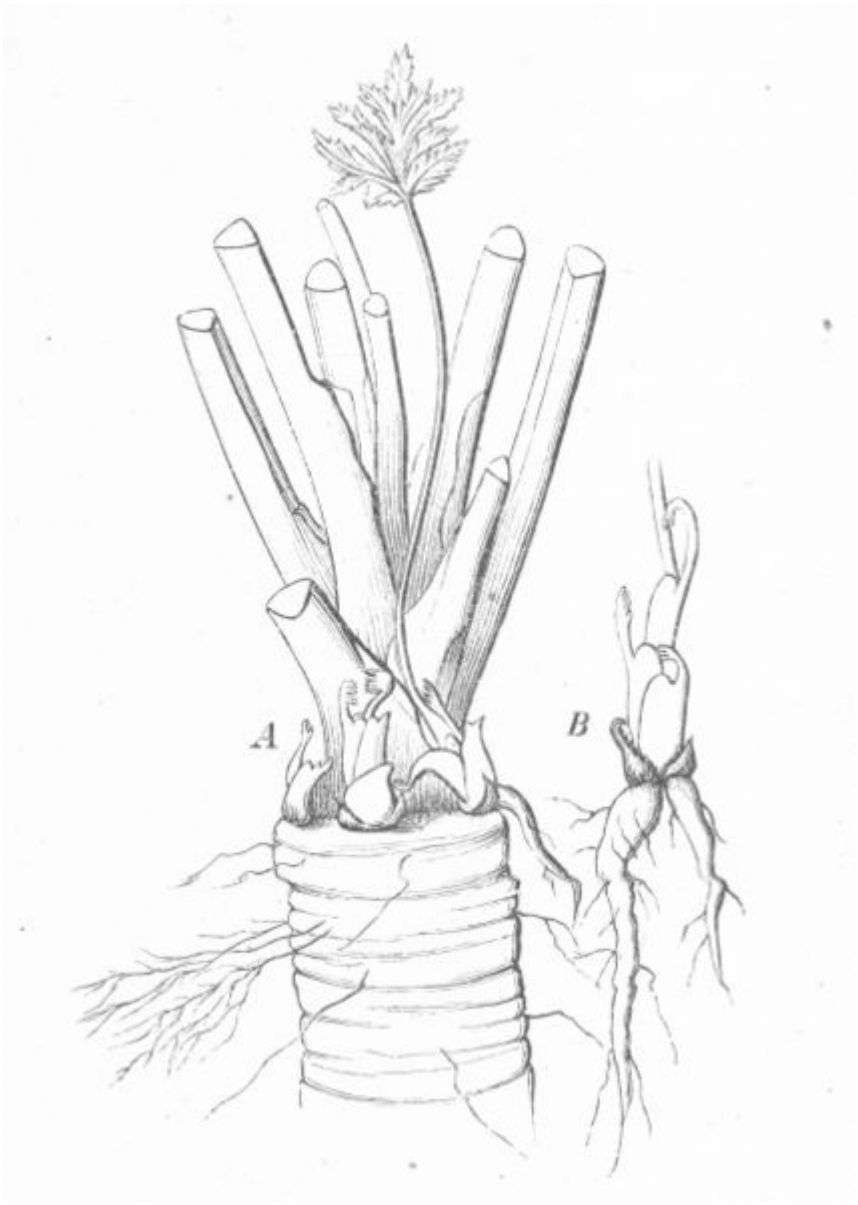
Anthriscus sylvestris, known as **Cow Parsley**, **Wild Chervil**, **Wild Beaked Parsley**, and **Keck**, is a herbaceous biennial or short-lived perennial plant in the family Apiaceae, genus *Anthriscus*. It is also sometimes called **Mother-die** (especially in the UK), a name that is also applied to the *Common Hawthorn*. It is native to Europe, western Asia and northwestern Africa; in the south of its range in the Mediterranean region, it is limited to higher altitudes. It is related to other diverse members of Apiaceae such as parsley, carrot, hemlock and hogweed.

Cow parsley

The hollow stem grows to a height of between 60–170 cm, branching to umbels of small white flowers. Flowering time is mid-spring to early summer.

The tripinnate leaves are 15–30 cm long and have a triangular form. The leaflets are ovate and subdivided.

Cow Parsley grows in sunny to semi-shaded locations in meadows and at the edges of hedgerows and woodland. It is a particularly common sight by the roadside. It is sufficiently common and fast-growing to be considered a nuisance weed in gardens. Cow parsley's ability to grow rapidly through rhizomes and to produce large quantities of seeds in a single growing season has made it an invasive species in many areas of the United States. The state of Vermont has listed cow parsley on its "Watch List" of invasive species while Massachusetts and Washington have banned the sale of the plant.



The base of a second year plant in September and a young layer (Warming 1884)

Uses

Warning: Cow Parsley can be mistaken for the similar-looking Poison hemlock and Fool's parsley.

Cow Parsley is considered to be edible, though having a somewhat unpleasant flavour, sharper than Garden Chervil, with a hint of Carrot.

Cow Parsley is rumoured to be a natural mosquito repellent when applied directly to the skin. However cow parsley can be confused with giant hogweed, the sap of which can cause severe burns after coming in contact with the skin.

Arbutus unedo

Arbutus unedo **Strawberry Tree**

Strawberry tree leaves and fruit

Scientific classification	
Kingdom:	Plantae
Division:	Magnoliophyta
Class:	Magnoliopsida
Order:	Ericales
Family:	Ericaceae
Genus:	*Arbutus*
Species:	***A. unedo***

Arbutus unedo, commonly called **Strawberry Tree**, **Apple of Cain**, or **Cane Apple**, is an evergreen shrub or small tree in the family Ericaceae, native to the Mediterranean region and western Europe north to western France and Ireland. Due to its presence in South West Ireland, it is also known as **Irish strawberry tree**, and **Killarney strawberry tree**.

Description

2-coloured fruits + flowers

Arbutus unedo, grows to 5-10 m tall, rarely up to 15 m, with a trunk diameter of up to 80 cm. Zone: 7-10

The leaves are dark green and glossy, 5-10 cm long and 2-3 cm broad, with a serrated margin.

The hermaphrodite flowers are white (rarely pale pink), bell-shaped, 4-6 mm diameter, produced panicles of 10-30 together in autumn. They are pollinated by bees.

The fruit is a red berry, 1-2 cm diameter, with a rough surface, maturing 12 months at the same time as the next flowering. The fruit is edible, though many people find it bland and mealy; the name 'unedo' is explained by Pliny the Elder as being derived from *unum edo* "I eat one", which may seem an apt response to the flavour. They mainly serve as food for birds but in some countries they are used to make jam and liqueurs (such as the Portuguese *medronho*, a kind of strong brandy).

Cultivation and uses

Unlike most of the Ericaceae, *Arbutus unedo* grows well in limy soils. It is best planted in a sheltered position due to its late flowering habit. When grown as a tree rather than a multi-stemmed shrub, it is important to select one stem that becomes the main trunk, keeping any other basal sprouts pruned off. It prefers well-drained soil and only moderate amounts of water.

Arbutus unedo is naturally adapted to dry summers, though also growing well in the cool, wet summers of western Ireland. It is therefore useful for planting in areas with a dry-summer climate, and has become a very popular garden specimen in California and the rest of the west coast of North America. It is hardy in USDA Hardiness Zones 8 to 10. Pests include Scales and Thrips, and diseases include anthracnose, *Phytophthora*, root rot, and rust.

Synonyms include *Unedo edulis* Hoffm. and *Arbutus vulgaris* Bub.

tree

branches and leaves

Symbolic use

Central panel of *The Garden of Earthly Delights*.

The title of *The Garden of Earthly Delights*, a mysterious painting by Hieronymus Bosch, is a later attribution. It was listed in the inventories of the Spanish Crown as "the picture with the strawberry-tree fruits".

Calotropis procera

Calotropis procera

Apple of Sodom near the Dead Sea in Israel

Scientific classification	
Kingdom:	Plantae
(unranked):	Angiosperms
(unranked):	Eudicots
(unranked):	Asterids
Order:	Gentianales
Family:	Apocynaceae
Genus:	*Calotropis*
Species:	***C. procera***

Calotropis procera is a species of flowering plant in the dogbane family, Apocynaceae, that is native to North Africa, Tropical Africa, Western Asia, South Asia, and Indochina. It is commonly known as **Apple of Sodom**, a name derived from the Hebrew *Tapuah Sdom*. The green globes are hollow but the flesh contains a toxic milky sap that is extremely bitter and turns into gluey coating resistant to soap.

History

The fruit is described by the Roman Jewish historian Josephus, who saw it growing near Sodom: "...as well as the ashes growing in their fruits; which fruits have a color as if they were fit to be eaten, but if you pluck them with your hands, they dissolve into smoke and ashes."

In his *Biblical Researches in Palestine*, Edward Robinson describes it as the fruit of the Asclepias gigantea vel procera, a tree 10–15 feet high, with a grayish cork-like bark called *osher* by the Arabs. He says the fruit resembled a large, smooth apple or orange, hanging in clusters of three or four. When pressed or struck, it exploded with a puff, like a bladder or puff-ball, leaving in the hand only the shreds of the thin rind and a few

fibers. It is filled chiefly with air, which gives it the round form. In the center a small slender pod runs through it which contains a small quantity of fine silk, which the Arabs collect and twist into matches for their guns. The plant, however, is not native solely to Israel. It is known to occur throughout the tropical belt and is also common in the West Indies (e.g. Jamaica), where the locals know it as "pillow cotton". When the ripe "apples" burst, the fibrous contents are ejected along with the seeds. The former are collected by the Jamaicans and used for filling pillows.

Flowers

Fruits

Fruits

Fruits. Seed.

The Sodom Apple is mentioned in the Mishnah and the Talmud. The long fibers attached to the seeds may once have served as wicks. The rabbis rule that these fibers were not suitable for *Shabbat* wicks: "It may not be lighted with cedar-bast, nor with uncombed flax, nor with floss-silk, nor with willow fiber, nor with nettle fiber."

Some biblical commentators believe that the Sodom Apple may have been the poisonous gourd (or poison-tasting gourd) that led to "death in the pot" in 2 Kings 4:38–41. In this story, a well-meaning servant of the prophet Elisha gathers herbs and a large quantity of the unknown gourds, and casts them into the pot. After the outcry from the band of prophets, Elisha, instructs them to cast flour into the stew pot, and they are saved. The fibre of the Sodom Apple may have been used for the linen of the high priests.

Chemical properties

The milky sap contains a complex mix of chemicals, some of which are steroidal heart poisons known as "cardiac aglycones". These belong to the same chemical family as similar chemicals found in foxgloves (*Digitalis purpurea*). The steroidal component includes an hydroxyl group in the C3β position, a second attached to the C14 carbon, a C/D-*cis* ring junction and an α,β-unsaturated-γ-lactone in the C17 position. In the plants,

the steroidal component is commonly attached via a glycosidic link to a 2-desoxy or a 2,6-didesoxy sugar molecule. The features described are those required for toxicity but in addition there can be other substitutions into the steroid nucleus. These can be a C19-aldehyde in place of the more usual methyl group in this position as well as additional hydroxyl functions and sometimes epoxide structures.

In the case of the Calotropis glycosides, their names are calotropin, calotoxin, calactin, uscharidin and voruscharin (the latter two involve rare sugars with nitrogen and sulphur in the structures). The steroidal moiety (known as "calotropagenin", formula $C_{23}H_{32}O_6$) has one of the more unusual structures. The C-19 formyl (CHO) group is present and there is an additional secondary alcohol as well as the common C3 and C14 hydroxyl functions. The position of this third hydroxyl function remains in some doubt. It was apparently established by the Swiss group under Thadeus Reichstein as being in the C2 position with an equatorial configuration. However, this assignment does not explain some of the known features and behaviours of this molecule, in particular the absence of spin-spin coupling of the two axial protons associated with their geminal hydroxyl groups and the failure to react with iodate in a cleavage reaction which the presence of such a viscinal 1,2-diol would require.

Instead, a position at C6 has been advanced (though not published). This structure agrees with all the known properties of this molecule as being a 3β,6α,14ξ-trihydroxy-19-oxo-carda-20(22)-dienolide.

Chapter- 3

Plants of Mild Maritime Climate

Aristotelia chilensis

Maqui

Maqui Tree with fruits

Scientific classification	
Kingdom:	Plantae
(unranked):	Angiosperms
(unranked):	Eudicots
(unranked):	Rosids
Order:	Oxalidales
Family:	Elaeocarpaceae
Genus:	*Aristotelia*
Species:	***A. chilensis***

Aristotelia chilensis (**Maqui** or **Chilean Wineberry**) is a species of the Elaeocarpaceae family native to the Valdivian temperate rainforests of Chile and adjacent regions of southern Argentina.

Description

It is a small dioecious tree reaching 4-5 m in height, evergreen, and with a divided trunk with smooth bark. Its branches are abundant, thin and flexible. Its leaves are simple, opposite, pendulous, oval-lanceolate, with serrated edges, glabrous, coriaceous with venation and strong red petioles. Its flower is small and white, yielding a small edible

fruit (maqui berry) that is a favored food for birds. The small, purple-black berries are approximately 4-6 mm in diameter. The maqui berry is also known as the Chilean wineberry, and locally as maqui or maquei, queldrón, ach, koelon, and clon.

Polyphenols

Only limited polyphenol research has been completed on the maqui berry showing its anthocyanin content includes eight glucoside pigments of delphinidin and cyanidin, the principal anthocyanin being delphinidin 3-sambubioside-5-glucoside (34% of total anthocyanins). The average total anthocyanin content was 138 mg per 100 g of fresh fruit (212 mg per 100g of dry fruit), placing maqui low among berries for anthocyanin content.

Anthocyanins are also present in maqui leaves.

Uses

According to myths, the edible fruit was a preferred food of the Mapuche. Claude Gay documented in 1844 that natives used maqui to prepare chicha as may have been referenced in his "Physical Atlas of History and Politics of Chile". Today, maqui may be used to make jam, juice or an astringent.. It has been planted in Spain.

Berberis microphylla

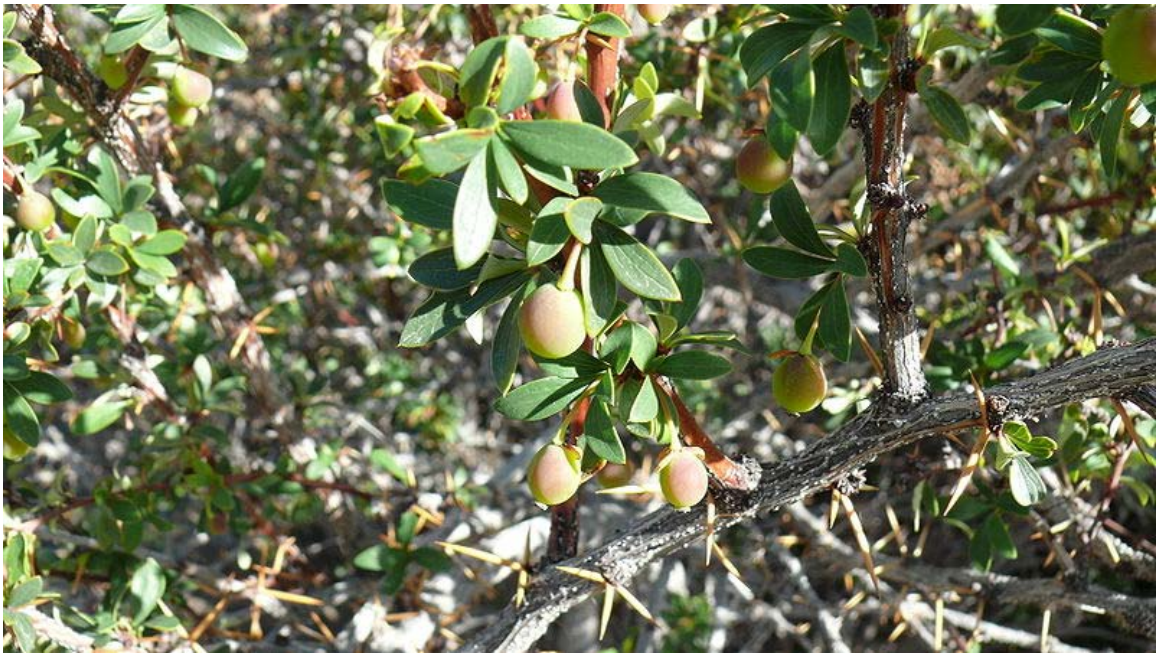
Calafate Barberry

Scientific classification

Kingdom:	Plantae
Division:	Magnoliophyta
Class:	Magnoliopsida
Order:	Ranunculales
Family:	Berberidaceae
Genus:	*Berberis*
Species:	***B. microphylla***

Berberis microphylla or ***Berberis buxifolia***, common name the **Magellan Barberry**, in Spanish **Calafate**, is an evergreen shrub, with shiny box-like leaves. The Calafate is native to the south of Argentina and Chile and is a symbol of Patagonia.

The bush grows to a height of 1.0 to 1.5 m (3 ft 3 in to 4 ft 11 in). It has many arching branches, each covered in many tripartite spines. The bush has many small yellow flowers in summer. Its edible blue-black berries are harvested for jams, but are eaten fresh too - a legend tells that anyone who eats a Calafate berry will be certain to return to Patagonia.



Fruits in spring

The Calafate is grown commercially for its fruit, potential medical uses and as a garden plant or bonsai. Its wood is used to make a red dye. The cultivar *Berberis microphylla* 'Nana' is widely available as a garden shrub, and is also used in commercial plantings as a low spiny hedge to discourage intruders, but it does not fruit.

Chusquea culeou

Chusquea culeou

Colehual, colihues' bush in San Fabián de Alico.

Scientific classification	
Kingdom:	Plantae

(unranked):	Angiosperms
(unranked):	Monocots
(unranked):	Commelinids
Order:	Poales
Family:	Poaceae
Subfamily:	Bambusoideae
Genus:	*Chusquea*
Species:	***C. culeou***

Picture of Mapuches using *C. coleou* as spear during a malón raid

Chusquea culeou (Spanish: ***caña coligüe*** *or* ***colihue***) is a gramineae perennial bush of the bamboo subfamilly that grows in the humid temperate forests of Chile and southwestern Argentina.

Its hairy lanceolate leaves have a spine on their end, and its flower is a whisk of light brown colour. The plant also produces a caryopsis fruit. After blooming and releasing its seeds, the plant dies. The cane is straight, of up to 6 metres in height, and was used by the Aboriginals for the pole of their spears. They are still used by the Mapuche people for a musical instrument known as trutruca.

A particularity of this *Chusquea* is that its wood is solid, differentiating from most of the bamboosoids, with hollow interiors.

Lapageria rosea

Copihue

Copihue in flower

Scientific classification	
Kingdom:	Plantae
(unranked):	Angiosperms
(unranked):	Monocots
Order:	Liliales
Family:	Philesiaceae
Genus:	***Lapageria***
Species:	***L. rosea***

Stem twining counterclockwise

Lapageria rosea, commonly known as the **Copihue** (*co-pee-way* < Mapudungun *kopiwe*) or **Chilean Bellflower**, is the national flower of Chile. It grows in forests in the southern part of Chile, being part of the Valdivian flora. It is the only species in the genus *Lapageria*. It is an evergreen climbing plant reaching over 10 m high among shrubs and trees. Leaves are arranged alternately and are evergreen, leathery, lanceolate and feature three to seven prominent parallel veins. The vines twine counterclockwise. The flowers are red spotted with white, there are six thick, waxy tepals; and they are most frequently produced in late summer and fall, although they may be produced at other times. The fruit is an elongate berry with a tough skin containing numerous small seeds about the size of a tomato seed, and are covered in an edible fleshy aril. In the wild the plant is pollinated by hummingbirds. Seed is distributed by birds and other animals.

The fruit is colloquially known in Chile as a *pepino* (cucumber). In the past, the fruit was sold in markets, but the plant has now become rare through over-collection and forest clearance.

The name of the fruit in Mapudungun is actually *kopiw*, which is the etymon of Spanish *copihue*; the Mapuche call the plant *kolkopiw* (*colcopihue* in Spanish, which may also refer to the whole plant). The flower is called *kodkülla* in the indigenous language. The roots were once collected and used as a substitute for sasparilla. In 1977 The plant was given legal protection in the country of Chile.

There are a substantial number of named garden cultivars, mostly developed at one nursery in Chile, with flower colour varying from deep red through pink to pure white (*L. rosea* 'Albiflora'), and some with variegated flowers. In cultivation, to obtain fruit it is generally necessary to pollinate by hand if there are not native hummingbirds. Some cultivars are self-fruitful, but better pollination is achieved with differing parents. Germination is best with fresh moist seed; dried seeds take special treatment and have a much poorer germination rate. Propagation of cultivars is by cuttings (usually rooted under mist), layering, or division. Seedlings take from three to ten years to flower. Cuttings usually flower more quickly.

Lapageria rosea is related to *Philesia magellanica* (syn. *P. buxifolia*), another plant from the Valdivian flora, closely related to *L. rosea*, having similar flowers, but is a shrubby plant bearing some similarity to a heath. ×*Philageria veitchii* is a hybrid between *L. rosea* and *P. magellanica*. It is more similar in appearance to the former.

Mapuche legends

There are several legends in Chile relating to the origin of the Copihue. One tells of how, after a great battle of the mapuche people, some survivors climbed trees to see the outcome of the battle. Seeing that all their friends were dead, they wept, and their tears became flowers of blood, to honor the souls of their dead friends.

Another legend tells of two leaders of the Mapuche people: Hues, the daughter of Copiñiel, the leader of all the mapuches; and Copih, the chieftain of the pehuenche tribe. The two young people secretly fell in love. One day, Copiñiel found them exchanging vows on the banks of the Nahuel lake, and, in a fit of rage, ordered them both stabbed through the heart by spears. His guards obeyed, and the two lovers were killed, fell into the lake, and disappeared in the water.

Some time later, both the mapuche and Pehuenche tribes met on the banks of the lake to mourn the deaths of the two. At sunrise, they saw two spears rise from the water, intertwined by a vine, on which grew two large flowers, one as red as blood, and the other as white as snow. They called these flowers copihue, in honor of the two lovers, Copih and Hues.

Introduction to Europe

The plant was introduced to Europe by William Lobb during his plant collecting expedition to the Valdivian temperate rain forests in 1845–1848 and was growing at Kew in 1847.

Ugni molinae

Ugni molinae

Murtilla, *Ugni molinae*

Scientific classification	
Kingdom:	Plantae
(unranked):	Angiosperms
(unranked):	Eudicots
(unranked):	Rosids
Order:	Myrtales
Family:	Myrtaceae
Genus:	*Ugni*
Species:	***U. molinae***

Ugni molinae (syn. *Myrtus ugni, Eugenia ugni*) is a shrub native to Chile and adjacent regions of southern Argentina. The Mapuche Native American name is *"Uñi"*, and Spanish names include *"Murta"* and *"Murtilla"* ("little myrtle"); and the *"Ugni"* is also sometimes known as *"Chilean guava"* (it is related to the Guava, though not closely so; and really is more like a small cranberry).

Description

The Ugni is a shrub from 30 cm to 170 cm tall with evergreen foliage. In some exceptional cases the shrub can grow up to 3 m in height. The leaves are opposite, oval, 1-2 cm long and 1-1.5 cm broad, entire, glossy dark green, with a spicy scent if crushed. The flowers are drooping, 1 cm diameter with four or five white or pale pink petals and

numerous short stamens; the fruit is a small red, white or purple berry 1 cm diameter. In its natural habitat; the Valdivian temperate rain forests the fruit matures in autumn from March to May.

It was first described by Juan Ignacio Molina (hence its name) in 1782. It was introduced to England in 1844 by the botanist and plant collector William Lobb, where it became a favorite fruit of Queen Victoria. It is also grown as an ornamental plant.

The fruit (*"Ugniberry"*) is cultivated to a small extent. The usage of the fruit in cuisine is limited to southern Chile where it grows. It is used to make the traditional liqueur Murtado that is made of aguardiente and sugar flavoured by conserving *murtas* inside the bottle. It is also used to make jam and the Murta con membrillo dessert and in Kuchens. The Ugniberry is known as "New Zealand cranberry" in New Zealand and marketed as the "Tazziberry" in Australia, but it is not a native plant to these countries

Chapter- 4

Plants of Temperate Climates

Blueberry

Blueberry

Vaccinium corymbosum
Scientific classification

Kingdom:	Plantae
(unranked):	Angiosperms
(unranked):	Eudicots
(unranked):	Asterids
Order:	Ericales
Family:	Ericaceae
Genus:	*Vaccinium*
Section:	***Cyanococcus*** Rydb.

Blueberries are flowering plants of the genus *Vaccinium* (a genus which also includes cranberries and bilberries) with dark-purple berries and is a perennial. Species in the section *Cyanococcus* are the most common fruits sold as "blueberries" and are mainly native to North America. They are usually erect but sometimes prostrate shrubs varying in size from 10 centimetres (3.9 in) to 4 metres (160 in) tall. In commercial blueberry production, smaller species are known as "lowbush blueberries" (synonymous with "wild"), and the larger species are known as "highbush blueberries". The leaves can be either deciduous or evergreen, ovate to lanceolate, and 1–8 centimetres (0.39–3.1 in) long and 0.5–3.5 centimetres (0.20–1.4 in) broad. The flowers are bell-shaped, white, pale pink or red, sometimes tinged greenish.

The fruit is a berry 5–16 millimetres (0.20–0.63 in) diameter with a flared crown at the end; they are pale greenish at first, then reddish-purple, and finally indigo when ripe. They have a sweet taste when mature, with variable acidity. Blueberry bushes typically bear fruit in the middle of the growing season: fruiting times are affected by local conditions such as altitude and latitude, so the height of the crop can vary from May to August depending upon these conditions.

Origins

The genus *Vaccinium* has a circumpolar distribution with species in North America, Europe and Asia.

Many commercially sold species whose English common names include "blueberry" are currently classified in section *Cyanococcus* of the genus *Vaccinium* and come predominantly from North America. Many North American native species of blueberries are now also commercially grown in the Southern Hemisphere in Australia, New Zealand and South American countries.

Several other plants of the genus *Vaccinium* also produce commonly eaten blue berries such as the predominantly European bilberry *(Vaccinium myrtillus),* which in many languages has a name that means "blueberry" in English.

Species

Note: habitat and range summaries are from the *Flora of New Brunswick*, published in 1986 by Harold R. Hinds.

- *Vaccinium angustifolium* (Lowbush Blueberry):acidic barrens, bogs and clearings. Manitoba to Labrador, south to Nova Scotia and in the USA, to Iowa and Virginia
- *Vaccinium boreale* (Northern Blueberry): Peaty barrens. Quebec and Labrador (rare in New Brunswick), south to New York and Massachusetts.
- *Vaccinium caesariense* (New Jersey Blueberry)
- *Vaccinium cyanococcus* (American blueberry)
- *Vaccinium corymbosum* (Northern Highbush Blueberry)
- *Vaccinium darrowii* (Southern Highbush Blueberry)
- *Vaccinium elliottii* (Elliott Blueberry)
- *Vaccinium formosum* (southern blueberry)
- *Vaccinium fuscatum* (Black Highbush Blueberry; syn. *V. atrococcum*)
- *Vaccinium hirsutum* (Hairy-fruited Blueberry)
- *Vaccinium myrtilloides (Sour top, Velvet Leaf, or Canadian Blueberry): clearings, thickets and peat bogs. Northwest Territories (Canada) to Labrador, south to Nova Scotia, and Montana to Virginia.*
- *Vaccinium operium* (cyan-fruited Blueberry)
- *Vaccinium myrtilloides* (Canadian Blueberry)
- *Vaccinium pallidum* (Dryland Blueberry)
- *Vaccinium simulatum* (Upland Highbush Blueberry)
- *Vaccinium tenellum* (Southern Blueberry)
- *Vaccinium virgatum* (Rabbiteye Blueberry; syn. *V. ashei*)

Some other blue-fruited species of *Vaccinium:*

- *Vaccinium koreanum*
- *Vaccinium myrsinites* (Evergreen Blueberry)
- *Vaccinium myrtillus* (Bilberry)
- *Vaccinium uliginosum*

Identification

Wild Blueberry in autumn foliage. Pilot Mtn., NC. 10-30-2008.

Commercially offered "wild blueberries" are usually from species that naturally occur only in eastern and north-central North America. Other sections in the genus, native to other parts of the world including western North America, South America, Europe, and Asia, include other wild shrubs producing similar-looking edible berries such as huckleberries in (North America) and bilberries (Europe). These species are sometimes called "blueberries" and sold as blueberry jam or other products.

The names of blue berries in languages other than English often translate as "blueberry", *e.g.*, Scots *Blaeberry* and Norwegian *Blåbær*. "*Blaeberry*", "*Blåbær*" and French "*myrtilles*" usually refer to the European native bilberry (*Vaccinium myrtillus*), while *bleuets* refers to the North American blueberry.

Cyanococcus blueberries can be distinguished from the nearly identical looking bilberries by cutting them in half. Ripe blueberries have white or light green flesh, while bilberries and huckleberries are red or purple throughout. Bilberries are most often found singularly or in pairs, while blueberries are most often found in clusters.

Cultivation

Blueberries may be cultivated, or they may be picked from semi-wild or wild bushes. In North America, the most common cultivated species is *V. corymbosum*, the Northern highbush blueberry. Hybrids of this with other *Vaccinium* species adapted to southern U.S. climates are known collectively as Southern highbush blueberries.

Blueberry flowers

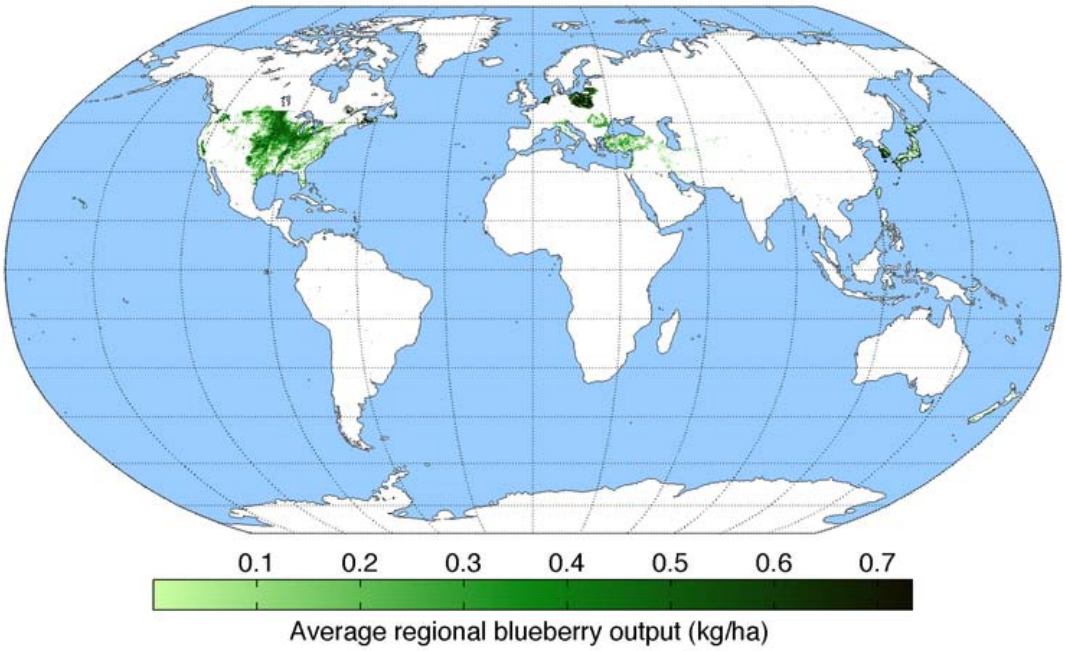
So-called "wild" (lowbush) blueberries, smaller than cultivated highbush ones, are prized for their intense color. The lowbush blueberry, *V. angustifolium*, is found from the Atlantic provinces westward to Quebec and southward to Michigan and West Virginia. In some areas, it produces natural *blueberry barrens*, where it is the dominant species covering large areas. Several First Nations communities in Ontario are involved in harvesting wild blueberries. Lowbush species are fire-tolerant and blueberry production often increases following a forest fire as the plants regenerate rapidly and benefit from removal of competing vegetation. "Wild" has been adopted as a marketing term for harvests of managed native stands of low-bush blueberries. The bushes are not planted or genetically manipulated, but they are pruned or burned over every two years, and pests are "managed".

There are numerous highbush cultivars of blueberries, each of which have a unique and diverse flavor. The most important blueberry breeding program has been the USDA-ARS breeding program based at Beltsville, Maryland, and Chatsworth, New Jersey. This program began when Frederick Coville of the USDA-ARS collaborated with Elizabeth

Coleman White of New Jersey. In the early part of the 20th Century, White offered wild pickers cash for large-fruited blueberry plants. *Rubel*, one such wild blueberry cultivar, is the origin of many of the current hybrid cultivars.

Rabbiteye Blueberry (*V. virgatum,* syn. *V. ashei*) is a southern type of blueberry produced from the Carolinas to the Gulf Coast states. Other important species in North America include *V. pallidum*, the Hillside or Dryland Blueberry. It is native to the eastern U.S., and common in the Appalachians and the Piedmont of the Southeast. Sparkleberry, *V. arboreum*, is a common wild species on sandy soils in the southeastern U.S. Its fruits are important to wildlife, and the flowers are important to beekeepers.

Growing areas



Worldwide highbush blueberry yield

Significant production of highbush blueberries occurs in British Columbia, Maryland, Michigan, New Jersey, North Carolina, and Washington. The production of southern highbush varieties in California is rapidly increasing, as varieties originating from the University of Florida and North Carolina State University have been introduced. Southern highbush berries are now also cultivated in the Mediterranean regions of Europe, Southern Hemisphere countries and China.

United States

A blueberry

Maine produces 25% of all lowbush blueberries in North America, making it the largest producer in the world. Maine's 24,291 hectares (60,020 acres) (FAO figures) of blueberry were propagated from native plants that occur naturally in the understory of its coastal forests. The Maine crop requires about 50,000 beehives for pollination, with most of the hives being trucked in from other states for that purpose. Many towns in Maine lay claim to being the blueberry capital and several festivals are centered around the blueberry. The wild blueberry is the official fruit of Maine and is often as much a symbol of Maine as the lobster. While Maine is the leader of lowbush blueberry production in the United States, Michigan is the leader in highbush production. In 1998, Michigan farms produced 220,000 tonnes (490,000,000 lb) of blueberries, accounting for 32% of the small, round berries eaten in the United States.

Significant acreages of highbush blueberries are cultivated in the states of New Jersey, Florida, Georgia and North Carolina.

Canada

Canadian exports of blueberries in 2007 were $323 million, the largest fruit crop produced nationally, occupying more than half of all Canadian fruit acreage. Among the

most productive growing regions in the world, British Columbia is the largest Canadian producer of highbush blueberries, yielding 29,000 t (64,000,000 lb) in 2004 and over $100 million in 2008 revenues.

Quebec produces a large quantity of wild blueberries, especially in the regions of Saguenay-Lac-Saint-Jean (where a popular name for inhabitants of the regions is *Bleuets*, or "blueberries"), and Côte-Nord which together provide 40% of Quebec's total provincial production. Due in part to declining frequency and intensity of spring frosts, Quebec's wild blueberry production 27,000 t (60,000,000 lb) in 2008 now rivals that of Maine, creating cross-border tensions on pricing and regional markets.

Nova Scotia, the biggest producer of wild blueberries in Canada, recognizes the blueberry as its official provincial berry. The town of Oxford is known as the Wild Blueberry Capital of Canada. New Brunswick and Prince Edward Island are other Atlantic provinces with major wild blueberry farming.

Atlantic Canada contributes approximately half of the total North American annual production of 68,000 t (150,000,000 lb), a threefold increase since the 1980s. Gains in yield derived from improved field management, including better weed control, fertility management and irrigation methods, increased use of bees for pollination, and application of mechanical harvesters.

Europe

Wild blueberries at Litløya, Norway

Highbush blueberries were first introduced to Germany and the Netherlands in the 1930s and have since been spread to Poland, Italy, Hungary and other countries of Europe.

"Many growers in France, Austria, and Italy realized too that it pays to cultivate highbush blueberries, and that good economic gain can be obtained," according to an industry researcher. "Even in Belgium and Norway, some very promising trials with special methods of blueberry cultivation resulted in a limited commercial production which is very successful. …Except in the United Kingdom, Ireland, and Spain, a blueberry industry is developing in all regions where the production is possible due to the climatic and edaphic conditions…"

The northeastern part of Turkey is one of the main sources of Caucasian whortleberry (*Vaccinium arctostaphylos*), bilberry (*Vaccinium myrtillus*) and bog blueberry, bog whortleberry or bog bilberry (*Vaccinium uliginosum*). In this area grow little known wild blueberries with various names such as likapa, ligarba, kaskanaka, çela, morsvi, lifos, çalı çileği, ayı üzümü, çoban üzümü and so on. This region from Artvin to Kırklareli, as well as parts of Bursa (including Rize, Trabzon, Ordu, Giresun, Samsun, Sinop, and of Kastamonu, Zonguldak, İstanbul, İzmit and Adapazari) has rainy, humid growing periods and natural acidic soils which are suitable for blueberries (Çelik, 2005, 2006 and 2007). Native Vaccinium species and open pollinated types have been grown for over a hundred years around the Black Sea region of Turkey. These native blueberries are eaten locally as jelly, dried or fresh fruit and also by those in the Black Sea region (Çelik, 2005). These are not cultivated; wild berries grow naturally on the hills, plateaus and forests. On the other hand, highbush blueberry cultivation started around the year 2000 along with Black Sea region has natural acidic soil and high rainfall. The first commercial blueberry orchard was established by Osman Nuri Yildiz and supervised by Dr. Huseyin Celik who is the founder of Turkish Blueberry Cultivation.

Southern hemisphere

In the Southern hemisphere, Chile, Argentina, Uruguay, South Africa, New Zealand, and Australia now export blueberries.

Blueberries were first introduced to Australia in the 1950s, but the effort was unsuccessful. In the early 1970s David Jones from the Victorian Department of Agriculture imported seed from the U.S. and a selection trial was started. This work was continued by Ridley Bell, who imported more American varieties. In the mid-1970s the Australian Blueberry Growers Association (ABGA) was formed. (Clayton-Greene)

By the early 1980s, the blueberry industry was started in New Zealand and is still growing. (BNZ, n.d)

South Africa exports blueberries to Europe.

The industry is even newer in Argentina: "Argentine blueberry production has increased over the last three years with planted area up to 400 percent," according to a 2005 report

by the U.S. Department of Agriculture. But that increase comes from a tiny base of 400 hectares (990 acres) in 2001 and 1,600 hectares (4,000 acres) in 2004. The industry is new in the country and farmers are still learning the business. "Argentine blueberry production has thrived in four different regions: the province of Entre Rios in Northeastern Argentina, the province of Tucuman, the province of Buenos Aires, near the country's capital city Buenos Aires, and the southern Patagonian valleys," according to the report.

Chile is the biggest producer in South America and the largest exporter to the northern hemisphere, with an estimated area of 6,800 hectares (17,000 acres) (as of 2007). Introduction of the first plants started in the early 1980s and production started in the late 80s in the southern part of the country. Today production ranges from Copiapó in the north to Puerto Montt in the south, which allows the country to offer blueberries from October through late March. The main production area today is the Bio Bio region. Production has evolved rapidly in the last decade, becoming the 4th most important fruit exported in value terms. Fresh market blueberries are exported mainly to North America (80%) followed by Europe (18%). Information from the Fruit Export Association, Chile exported in 2007 more than 21,000 tonnes (46,000,000 lb) of fresh blueberries and more than 1,000 tonnes (2,200,000 lb) of frozen product. Most of the production comes from the highbush type, but several rabbiteye blueberries are grown in the country as well. Information taken from the Chilean Fruit Producers Federation and their Blueberry Committee, stands that there are over 800 blueberry producers with surfaces ranging from 50 to 200 hectares (120 to 490 acres).

Growing seasons

A maturing Polaris blueberry (*Vaccinium corymbosum* 'Polaris')

Blueberries at market

Blueberry production in North America typically starts in mid-May (in Florida) and ends in the month of September, when some fruit is held over in controlled-atmosphere storage in Oregon, Washington, and Canada. (Gaskell, 2006).

Sources give different periods for the growing season in the southern hemisphere. According to the University of California Extension Service, Chile, New Zealand and Argentina begin harvesting in the northern hemisphere winter and continue till mid-March, when Chilean blueberries are held over in controlled-atmosphere storage for about six weeks. "As a result, blueberries reach annual peak prices in mid-April."(Gaskell, 2006)

In Chile, San Jose Farms, which says (according to its Web site) that it is one of the oldest blueberry producers in the country (it started in the early 1990s), states that its harvest season starts in November and continues through March. (San Jose, n.d.)

In Argentina: "The marketing year (MY) for blueberries begins in September and ends in February," according to a U.S. Department of Agriculture report. Blueberries grow in April and May.

Uses

Blueberries are sold fresh or processed as individually quick frozen (IQF) fruit, purée, juice, or dried or infused berries which in turn may be used in a variety of consumer goods such as jellies, jams, blueberry pies, muffins, snack foods, and cereals.

Blueberry jam is made from blueberries, sugar, water, and fruit pectin. Premium blueberry jam, usually made from wild blueberries, is common in Maine, Ontario, Quebec, and British Columbia.

Blueberries have a diverse range of micronutrients, with notably high levels (relative to respective Dietary Reference Intakes) of the essential dietary mineral manganese, vitamin B6, vitamin C, vitamin K and dietary fiber (table). One serving provides a relatively low glycemic load score of 4 out of 100 per day.

Nutrients and phytochemicals

Especially in wild species, blueberries contain anthocyanins, other antioxidant pigments and various phytochemicals possibly having a role in reducing risks of some diseases, including inflammation and certain cancers.

Research on the potential anti-disease effects of blueberries

Researchers have shown that blueberries contain pterostilbene, anthocyanins, proanthocyanidins, resveratrol, flavonols, and tannins, which inhibit mechanisms of cancer cell development and inflammation in vitro. Similar to red grape, some blueberry species contain in their skins significant levels of pterostilbene, a phytochemical.

Although most studies below were conducted using the highbush cultivar of blueberries (*V. corymbosum*), content of polyphenol antioxidants and anthocyanins in lowbush (wild) blueberries (*V. angustifolium*) exceeds values found in highbush species.

At a 2007 symposium on berry health benefits were reports showing consumption of blueberries (and similar berry fruits including cranberries) may alleviate the cognitive decline occurring in Alzheimer's disease and other conditions of aging.

A chemical isolated from blueberry leaves can block replication of the hepatitis C virus and might help to delay disease spread in infected individuals.

Feeding blueberries to animals lowers brain damage in experimental stroke. Research at Rutgers has also shown that blueberries may help prevent urinary tract infections.

Other animal studies found that blueberry consumption lowered cholesterol and total blood lipid levels, possibly affecting symptoms of heart disease. Additional research showed that blueberry consumption in rats altered glycosaminoglycans which are vascular cell components affecting control of blood pressure.

A study soon to be published in the Journal of Agricultural and Food Chemistry found that supplementation with wild blueberry juice enhanced memory and learning in older adults, while reducing blood sugar and symptoms of depression.

Cherry

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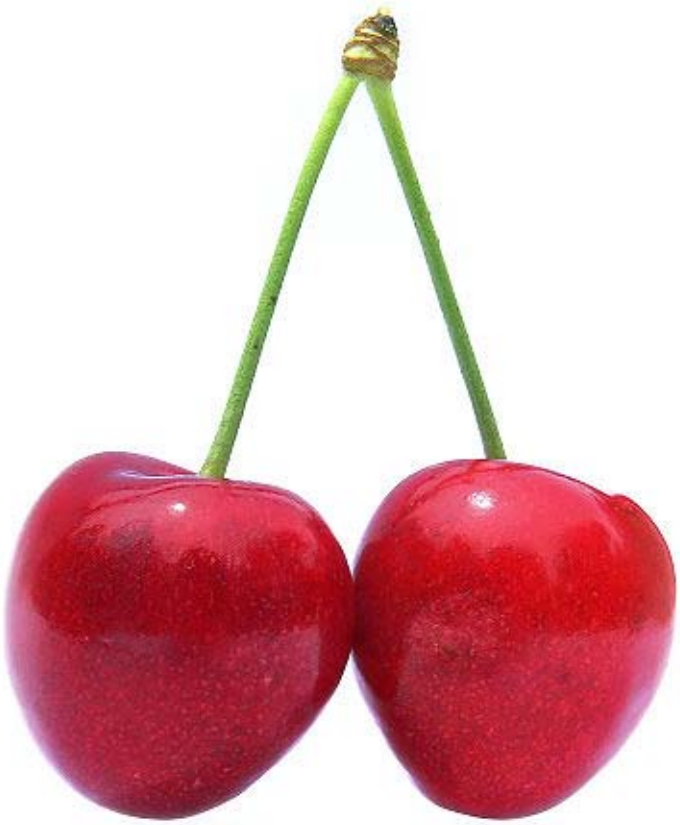


The **cherry** is the fruit of many plants of the genus *Prunus*. It is a fleshy stone fruit. The cherry fruits of commerce are usually obtained from a limited number of species, including especially cultivars of the wild cherry, *Prunus avium*.

The name 'cherry', often as the compound term 'cherry tree', may also be applied to many other members of the genus Prunus, or to all members of the genus as a collective term. The fruits of many of these are not cherries, and have other common names, including

plum, apricot, peach, and others. The name 'cherry' is also frequently used in reference to cherry blossom.

Botany

True cherry fruits are born by members of the sub-genus *Cerasus* which is distinguished by having the flowers in small corymbs of several together (not singly, nor in racemes), and by having a smooth fruit with only a weak groove or none along one side. The subgenus is native to the temperate regions of the Northern Hemisphere, with two species in America, three in Europe, and the remainder in Asian continent

The majority of eating cherries are derived from either *Prunus avium*, the **wild cherry** (sometimes called the **sweet cherry**), or from *Prunus cerasus*, the **sour cherry**.

Species

This list contains many Prunus species that bear the common name cherry. Some common names listed here have historically been used for more than one species, e.g. "Rock cherry" is used as an alternative common name for both *P. prostrata* and *P. mahaleb*.

- *Prunus alabamensis* C. Mohr - Alabama cherry
- *Prunus apetala* (Siebold & Zucc.) Franch. & Sav. - Clove cherry
- *Prunus avium* (L.) L. - Wild cherry, Sweet cherry, Mazzard or Gean
- *Prunus besseyi* - Western Sand Cherry, Hansen's or Hanson's Bush Cherry, Rocky Mountain Cherry, or Bessey's cherry
- *Prunus campanulata* Maxim. - Taiwan cherry, Formosan cherry or Bell-flowered cherry
- *Prunus canescens* Bois. - Greyleaf cherry
- *Prunus caroliniana* Aiton - Carolina laurel cherry or Laurel cherry
- *Prunus cerasoides* D. Don. - Wild Himalayan cherry
- *Prunus cerasus* L. - Sour cherry
- *Prunus cistena* Koehne - Purpleleaf sand cherry
- *Prunus cornuta* (Wall. ex Royle) Steud. - Himalayan bird cherry
- *Prunus cuthbertii* Small - Cuthbert cherry
- *Prunus cyclamina* Koehne - Cyclamen cherry or Chinese flowering cherry

- *Prunus dawyckensis* Sealy - Dawyck cherry
- *Prunus dielsiana* C.K. Schneid. - Tailed-leaf cherry
- *Prunus emarginata* (Douglas ex Hook.) Walp. - Oregon cherry or Bitter cherry
- *Prunus eminens* Beck - German: *mittlere Weichsel* (Semi-sour cherry)
- *Prunus fruticosa* Pall. - European dwarf cherry, Dwarf cherry, Mongolian cherry or Steppe cherry
- *Prunus gondouinii* (Poit. & Turpin) Rehder - Duke cherry
- *Prunus grayana* Maxim. - Japanese bird cherry or Gray's bird cherry
- *Prunus humilis* Bunge - Chinese plum-cherry or Humble bush cherry
- *Prunus ilicifolia* (Nutt. ex Hook. & Arn.) Walp. - Hollyleaf cherry, Evergreen cherry, Holly-leaved cherry or Islay
- *Prunus incisa* Thunb. - Fuji cherry
- *Prunus jamasakura* Siebold ex Koidz. - Japanese mountain cherry or Japanese hill cherry
- *Prunus japonica* Thunb. - Korean cherry
- *Prunus laurocerasus* L. - Cherry laurel
- *Prunus lyonii* (Eastw.) Sarg. - Catalina Island cherry
- *Prunus maackii* Rupr. - Manchurian cherry or Amur chokecherry
- *Prunus mahaleb* L. - Saint Lucie cherry, Rock cherry, Perfumed cherry or Mahaleb cherry
- *Prunus maximowiczii* Rupr. - Miyama cherry or Korean cherry
- *Prunus mume* (Siebold & Zucc.) Ume, Japanese apricot, Chinese plum
- *Prunus myrtifolia* (L.) Urb. - West Indian cherry
- *Prunus nepaulensis* (Ser.) Steud. - Nepal bird cherry
- *Prunus nipponica* Matsum. - Takane cherry, Peak cherry or Japanese Alpine cherry
- *Prunus occidentalis* Sw. - Western cherry laurel
- *Prunus padus* L. - Bird cherry or European bird cherry
- *Prunus pensylvanica* L.f. - Pin cherry, Fire cherry, or Wild red cherry
- *Prunus pleuradenia* Griseb. - Antilles cherry
- *Prunus prostrata* Labill. - Mountain cherry, Rock cherry, Spreading cherry or Prostrate cherry
- *Prunus pseudocerasus* Lindl. - Chinese sour cherry or False cherry
- *Prunus pumila* L. - Sand cherry
- *Prunus rufa* Wall ex Hook.f. - Himalayan cherry
- *Prunus salicifolia* Kunth. - Capulin, Singapore cherry or Tropic cherry
- *Prunus sargentii* Rehder - Sargent's cherry or Ezo Mountain cherry
- *Prunus serotina* Ehrh. - Black cherry
- *Prunus serrula* Franch. - Paperbark cherry, Birch bark cherry or Tibetan cherry
- *Prunus serrulata* Lindl. - Japanese cherry, Hill cherry, Oriental cherry or East Asian cherry
- *Prunus speciosa* (Koidz.) Ingram - Oshima cherry
- *Prunus ssiori* Schmidt- Hokkaido bird cherry
- *Prunus stipulacea* Maxim.
- *Prunus subhirtella* Miq. - Higan cherry or Spring cherry
- *Prunus takesimensis* Nakai - Takeshima flowering cherry

- *Prunus tomentosa* Thunb. - Nanking cherry, Manchu cherry, Downy cherry, Shanghai cherry, Ando cherry, Mountain cherry, Chinese dwarf cherry, Chinese bush cherry
- *Prunus verecunda* (Koidz.) Koehne - Korean mountain cherry
- *Prunus virginiana* L. - Chokecherry
- *Prunus x yedoensis* Matsum. - Yoshino cherry or Tokyo cherry

History

Etymology and antiquity

The native range of the wild cherry extends through most of Europe, and the fruit has been consumed through its range since prehistoric times. A cultivated cherry is recorded as having been brought to Rome by Lucius Licinius Lucullus from northeastern Anatolia, also known as the Pontus region, in 72 BC.

A form of cherry was introduced into England at Teynham, near Sittingbourne in Kent by order of Henry VIII, who had tasted them in Flanders.

The English word *cherry*, French *cerise*, Spanish *cereza* all come from the Classical Greek (κέρασος) through the Latin *cerasum*, thus the ancient Roman place name *Cerasus*, from which the cherry was first exported to Europe.

Nutritional value

Cherries contain anthocyanins, the red pigment in berries. Cherry anthocyanins have been shown to reduce pain and inflammation in rats. Anthocyanins are also potent antioxidants under active research for a variety of potential health benefits. According to a study funded by the Cherry Marketing Institute presented at the Experimental Biology 2008 meeting in San Diego, rats that received whole tart cherry powder mixed into a high-fat diet did not gain as much weight or build up as much body fat, and their blood showed much lower levels of inflammation indicators that have been linked to heart disease and diabetes. In addition, they had significantly lower blood levels of cholesterol and triglycerides than the other rats.

Stella, Prunus avium

Cherry trees in autumn

Wildlife value

Cherry trees also provide food for the caterpillars of several Lepidoptera.

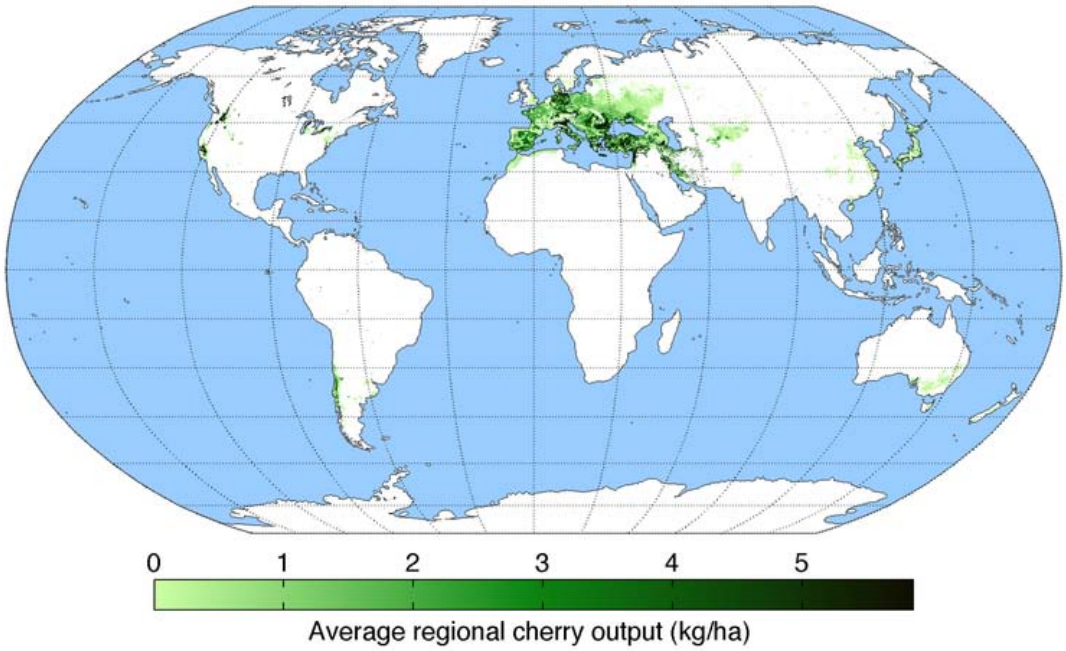
Cultivation

The cultivated forms are of the species wild cherry (*P. avium*) to which most cherry cultivars belong, and the sour cherry (*P. cerasus*), which is used mainly for cooking. Both species originate in Europe and western Asia; they do not cross-pollinate. Some other species, although having edible fruit, are not grown extensively for consumption, except in northern regions where the two main species will not grow. Irrigation, spraying, labor and their propensity to damage from rain and hail make cherries relatively expensive. Nonetheless, there is high demand for the fruit.

Growing season

Cherries have a very short growing season and can grow in most temperate latitudes. The peak season for cherries is in the summer. In Australia they are usually at their peak around Christmas time, in southern Europe in June, in North America in June, in south British Columbia (Canada) in July-mid August and in the UK in mid July. In many parts of North America they are among the first tree fruits to ripen.

Commercial production



Worldwide cherry yield

Annual world production (as of 2007) of cultivated cherry fruit is about two million tonnes. Around 40% of world production originates in Europe and around 13% in the United States.

Top Cherry Producing Nations - 2007 (in thousand metric tons)	
Turkey	398.1
United States	260.7
Iran	225.0
Italy	145.1
Russia	100.0
Syria	75.0
Spain	72.6
Ukraine	68.2
Romania	65.2
Greece	62.8
World Total	**2,033.1**

Europe

Major commercial cherry orchards in Europe extend from the Iberian peninsula east to Anatolia, and to a smaller extent may also be grown in the Baltic States and southern Scandinavia.

North America

In the United States, most sweet cherries are grown in Washington, California, Oregon, and Northern Michigan. Important sweet cherry cultivars include "Bing", "Brooks", "Tulare", "King" and "Rainier". In addition, the Lambert variety is grown on the eastern side of Flathead Lake in northwestern Montana. Both Oregon and Michigan provide light-colored "Royal Ann" ('Napoleon'; alternately "Queen Anne") cherries for the maraschino cherry process. Most sour (also called tart) cherries are grown in Michigan, followed by Utah, New York, and Washington. Additionally, native and non-native cherries grow well in Canada (Ontario and British Columbia). Sour cherries include Nanking and Evans Cherry. Traverse City, Michigan claims to be the "Cherry Capital of the World", hosting a National Cherry Festival and making the world's largest cherry pie. The specific region of Northern Michigan that is known the world over for tart cherry production is referred to as the "Traverse Bay" region. Traverse Bay Farms is one Northern Michigan co-op supported organization in this region that helps to market Michigan-grown cherry products across the globe.

Australia

In Australia, cherries are grown in all the states except for the Northern Territory. The major producing regions are located in the temperate areas within New South Wales, Victoria, South Australia and Tasmania. Western Australia has limited production in the

elevated parts in southwest of the state. Key production areas include Young, Orange and Bathurst in New South Wales, Wandin, Goulburn Valley and Murray Valley in Victoria, Adelaide Hills region in South Australia, Huon and Derwent Valleys in Tasmania.

Key commercial varieties in order of seasonality include Empress, Merchant, Supreme, Rons Seedling, Chelan, Ulster, Van, Bing, Stella, Nordwunder, Lapins, Simone, Regina, Kordia and Sweetheart. New varieties are being introdeced including the late season Staccato and early season Sequoia. The Australian Cherry Breeding program is developing a series of new varieties which are under testing evaluation.

The New South Wales town of Young is called the "Cherry Capital of Australia" and hosts the National Cherry Festival.