

Subclassis: HAMAMELIDIDAE

Ordo: Hamamelidales

Familia: Hamamelidaceae – Witch-hazel family

Hamamelidaceae consist of mainly subtropical trees and shrubs, distributed from Asia to North America. The leaves are simple or palmately divided. Inflorescences are racemes or flower heads, the actinomorphic or zygomorphic flowers are 4-5-merous, corolla or perianth is often absent. The gynoecium is coenocarpous, the fruit is a capsule with lignified fruit wall, each containing a single, winged seed. In the cell vacuoles quinic acid, shikimic acid and ellagitannins are the dominant compounds.

Witch-hazels (*Hamamelis*) are present with three species in North America, and one each in Japan and China. The most well-known species is *H. virginiana*, native to eastern North America. Witch-hazels are deciduous shrubs or small trees. The North American species are also called winterblooms, because the flowers appear in late fall or winter. Each flower has 4 slender strap-shaped petals, yellow, orange or red, depending on the species. The fruit is a two-part capsule, which splits explosively at maturity. The bark and leaves are **astrigent**, due to the presence of so-called “**Hamameli-tannins**”. Extracts are used in aftershave lotions and to treat bruises and insect bites. Witch-hazel helps to shrink and contract blood vessels back to the normal size, hence it is used as the active ingredient in many haemorrhoid medications.

Sweetgum (*Liquidambar*) is a genus of four species, which are large, deciduous trees, with palmately 5- to 7-lobed leaves arranged spirally on the stems, having a pleasant aroma when crushed. The flowers are small, produced in a dense, globular inflorescence. The fruit is a woody multiple capsule, covered in numerous woody armatures. Oriental sweetgum (*L. orientalis*) is native to Asia Minor, while American sweetgum (*L. styraciflua*) to eastern North America. The hardened sap, called gum or “styra” resin, is a balsamic resin excreted from the wounds of sweetgums.

Ordo: Fagales

The order contains some of the best known trees, also called “catkin trees” or “cupule trees”. The plants are monoecious, the perianth of the unisexual flowers is a perigonium (consists of tepals) or completely missing. **Staminate** flowers form a **catkin**, while **pistillate** flowers are clustered in flower **heads**. The fruit is an **acorn** (nut), surrounded by a **cupule**.

Familia: Fagaceae – Beech family (Oak family)

The Fagaceae consist of mostly deciduous, rarely evergreen trees or shrubs, distributed worldwide in nontropical regions. The leaves are simple, undivided to divided, usually spiral. The male inflorescence is a **catkin** or a head of reduced dichasia, the female flowers located at the base of male inflorescences or solitary. The flowers are small, actinomorphic, the involucre bracts of the female flowers often fused forming a **cupule** (e.g. acorn cup). The gynoecium is syncarpous, with an inferior ovary. The fruit is a **nut**, with a usually hard pericarp, subtended by accrescent involucre bracts, forming the cupule. The seeds of various species have been a traditionally important source of food for humans and animals. Plants are usually wind pollinated, although they are insect pollinated in *Castanea*. The phytochemical character of family members is dominated by various **tannins** (gallo- and ellagitannins, as

well as condensed tannins), which can accumulate in the leaves, fruits and bark. Total tannin content may reach 10-30%, or even 75% in the nutgalls of dyer's oak or gall oak (*Quercus infectoria*).

The European beech or common beech (*Fagus sylvatica*) is a deciduous tree, forming forests in the northern temperate regions, including Hungary. The trees are tall (up to 50 m), the leaves are alternate, simple and entire. The flowers are clustered in small catkins. The fruits, called beechnuts, are small triangular nuts, with two nuts in each cupule. The seeds are rich in oils. The tar (*Fagi pix*), obtained with the dry distillation of beech wood, is used in dermatology.

Sweet chestnut (*Castanea sativa*) is originally native to southeastern Europe and Asia Minor, but it is now widely dispersed throughout Europe. Sweet chestnut is a medium-sized to large deciduous tree, with oblong-lanceolate, toothed leaves. The flowers of both sexes are borne in upright catkins, the male flowers in the upper part, the female flowers in the lower part. The latter develop into 2-4 brownish nuts surrounded by a spiny cupule. The species is widely cultivated for its edible, starch-containing seeds. Medicinally the leaves and bark are used, the latter providing the so-called hamameli tannin.

The oaks (*Quercus*) are native to the northern hemisphere, and include deciduous to evergreen species. Oaks have spirally arranged leaves, with a lobed margin in many species. The inflorescences are catkins. The fruit is an acorn (nut), borne in a cup-like cupule. Both sessile oak (*Q. petraea*) and pedunculate or English oak (*Q. robur*) are native to most of Europe. Distinctive features of sessile oak are the stalked leaves and stalkless (sessile) acorns, whereas pedunculate oak is characterized by its leaves having a very short stalk, and by pedunculate (stalked) acorns in groups of twos or threes. Downy oak or pubescent oak (*Q. pubescens*) is native to southern Europe and southwest Asia. The twigs and the young leaves, as well as the acorn stalks and cupules, are covered with various non-glandular trichomes. Turkey oak (*Q. cerris*) is native to southern Europe and Asia Minor. On mature trees the bark fissures are often streaked orange. The acorn cup is densely covered in soft, "mossy" bristles. Cork oak (*Q. suber*) is an evergreen oak tree, native to southwest Europe and northwest Africa. The tree forms a thick bark – containing high levels of suberin –, which is the source of commercial cork. The bark of various oaks – mainly *Q. petraea* and *Q. robur* – is official in several pharmacopoeias, due to its high tannin content and astringent property.

Familia: Betulaceae – Birch family

The Betulaceae consist of monoecious trees or shrubs, distributed in northern temperate and mountainous, tropical regions. The leaves are simple, deciduous, usually spiral, with the margin often serrate or toothed. The male inflorescence is a pendulous catkin, the female inflorescence a short, pendulous or erect catkin, both bearing numerous, 1-3 flowered, bracteate, simple dichasia. The perianth consists of scale-like sepals, the corolla is missing. The fruit is a nut or 2-winged samara, subtended by woody bracts, or partially enclosed by leafy bracts. Plants are wind pollinated. Characteristic compounds are flavonoids, triterpenes (betulin) and the nitrogen-containing citrulline.

Silver birch (*Betula pendula*) is a widespread European birch. The bark is white, often with black, diamond-shaped marks. The leaves are triangular with a broad base and pointed tip, and coarsely double-serrated margins. The wind-pollinated catkins are produced before the leaves in early spring. The small, winged seeds ripen in late summer on pendulous, cylindrical catkins. Silver birch is distinguished from downy birch (*B. pubescens*), the other common European birch, in having hairless, warty shoots (hairy and without warts in downy birch). Birches commonly grow in mycorrhizal associations with fungi like fly agaric (*Amanita muscaria*). The leaves of both species are official in the Hungarian Pharmacopoeia

(Ph. Hg. VIII.), applied as diuretic. The trees can be tapped, the outflowing sap being a rich source of antioxidant flavonoids.

European or common alder (*Alnus glutinosa*) is native to most of Europe, preferring moist soils. The species is noted for its symbiotic relationship with the nitrogen-fixing fungus, *Frankia alni*, which forms nodules on the tree's roots. The bark is astringent, and can be used for tanning and dyeing. The leaves are short-stalked and rounded. As the Latin name "glutinosa" implies, the buds and young leaves are slightly sticky with a resinous gum. The slender male catkins are pendulous, the female ones are smaller, dark brown to black, hard, somewhat woody, and superficially similar to some conifer cones. When the small, winged seeds have been scattered, the woody cones remain on the tree.

Familia: Corylaceae – Hazel family

Some authors include Corylaceae within Betulaceae, but here we discuss it as a separate family. Its representatives live in the extratropical areas of the northern hemisphere; they are trees or shrubs, with spirally arranged, serrate leaves. Staminate flowers are clustered in a catkin, whereas female flowers are hidden in buds, only the red stigma visible (*Corylus*), or a loose spike (*Carpinus*). The fruit is an acorn (nut), which is surrounded by **leafy bracts**, which often help seed dispersal.

The fruit of hazel (*Corylus*) species is surrounded by a leafy, deeply-divided involucre, and the seed is rich in proteins and oils, making them valuable foods. Common hazel (*C. avellana*) is a shrub, while Turkish hazel (*C. colurna*) grows to a tree. The leaf (*Coryli avellane folium*) extracts have a strong antibacterial and anti-inflammatory effect.

European or common hornbeam (*Carpinus betulus*) is a small to medium size tree, frequently occurring in woods together with various oak species. The leaves are alternate, with a doubly serrate margin. The fruit is a small nut, surrounded by a 3-pointed leafy involucre.

Order: Juglandales

Familia: Juglandaceae – Walnut family

The Juglandaceae are distributed in the northern hemisphere, from Europe to South-America. Members of the walnut family have large, aromatic, pinnately compound leaves. The trees are wind pollinated, and the flowers are arranged in catkins. Both the male and female flowers are protected by a perigonium. In pistillate flowers the tepals fuse with bracts, and form the husk around the developing drupe. The gynoecium is inferior. Active compounds include polyphenols, tannins and quinones, such as juglone.

There are eight genera in the family, including the commercially important nut-producing trees walnut (*Juglans*), hickory (*Carya ovata*) and pecan (*C. illinoensis*). Persian or common walnut (*J. regia*) is one of the major nut crops of the world. It is native in a region stretching from the Balkans to the Himalayas and China. Eastern black walnut (*J. nigra*) is native to eastern North America. Walnut leaves are used as antibacterial, antifungal and anti-inflammatory agents. Walnut and hickory are also valuable timber trees.

Ordo: Myricales

Familia: Myricaceae – Bayberry family

Myricaceae consist of small, aromatic trees and shrubs, with a wide distribution, missing only from Australasia. Some members are deciduous, but the majority of species are evergreen. The roots have nitrogen-fixing fungi which enable the plants to grow on soils that are very poor in nitrogen. The leaves are spirally arranged, oblanceolate, with a tapered base and broader tip. The flowers are clustered in catkins, with male and female catkins usually on separate plants (dioecious). The fruit is a small **drupe**, usually with a **wax coating** (hence the common name “wax-myrtle” for *Myrica* species). The wax coating of several species, known as bayberry wax, has been used traditionally to make candles.

M. gale is holarctic in distribution, growing in acidic peat-bogs throughout the colder parts of the northern hemisphere. It is a deciduous shrub growing to 1 m tall. The vegetative and reproductive plant parts contain essential oils, polyphenols and triterpenes. The plant is used for tanning and in dyes, but also as a spice in beer or liqueur production. The foliage is used as insect repellent.