



Walnut common name for some members of the Juglandaceae, a family of chiefly deciduous, resinous trees characterized by large and aromatic compound leaves. Species of the walnut family are indigenous mostly to the north temperate zone, but also range from Central America along the Andes to Argentina and through tropical Asia to Java and New Guinea.

Common Species and Their Uses

Several trees of the Juglandaceae are of commercial importance for the edible nuts and for lumber. The "nuts" (they are actually drupelike), usually enclosed in a leathery or woody hull, include many of the most valuable food nuts of the United States—the walnut and the butternut of the walnut genus *Juglans* and the pecan, hickory nut, pignut, and mockernut of the hickory genus *Carya*. The single-seeded nuts contain no endosperm; the edible portion is the corrugated, meaty seed leaves of the embryo itself. Lumber is obtained chiefly from *Juglans*, *Carya*, and *Engelhardia*. The latter genus is now restricted to East Asia, but fossil trees have been found in the United States. Species of these and other genera (e.g., *Pterocarya*, the Asian wingnuts) are often planted as ornamental shade trees.

The walnut genus *Juglans* (from Lat. *Jovis glans* =nut of Jove) is the largest and most widely distributed genus of the family. The dark timber of the black walnut (*J. nigra*), found in hardwood forests in the eastern half of North America, and of the Persian, or English, walnut (*J. regia*), native to W Asia, is unusually hard and durable and is valued for furniture, interior paneling, gunstocks, musical instruments, and other uses. Black walnut has been the foremost cabinet wood of North America since colonial times.

The closer-grained English walnut, usually sold as lumber under the name Circassian walnut, is widely cultivated in S Europe and the Orient and has been introduced with great success into California, now the major producing area of the world. The nut of this tree is more easily extracted from the shell than that of the black walnut and is the one usually sold commercially for use as a table nut and for confectionery, flavorings, and sometimes pickling. A decoction of the leaves, bark, and hulls has been used for a brown wool dye and the crushed leaves for an insect repellent.

The butternut, or white walnut (*J. cinerea*), of approximately the same range as the black walnut, has a sweet and oily nut that is gathered locally but is not of commercial importance. The butternut is also timbered; the wood is softer than that of the black and English walnuts. Sugar is

sometimes obtained from its sap, and the hulls yield a yellow to gray dye that gave color to the homespun of pioneers and to the "butternut" uniforms of some Confederate soldiers. The inner root bark, called butternut bark, has been used in domestic remedies, as have the hulls of the English walnut. Other American and Old World walnuts are also used and esteemed locally for timber, dyes, and food.

Walnuts (genus *Juglans*) are plants in the family Juglandaceae. They are deciduous trees, 10 - 40 meters tall (about 30-130 ft.), with pinnate leaves 200 - 900 millimetres long (about 7-35 inches), with 5 - 25 leaflets; the shoots have chambered pith, a character shared with the wingnuts (*Pterocarya*) but not the hickories (*Carya*) in the same family.

The 21 species in the genus range across the north temperate Old World from southeast Europe east to Japan, and more widely in the New World from southeast Canada west to California and south to Argentina. The Latin name *Juglans*, derives from *Jovis glans*, "Jupiter's acorn": figuratively, a nut fit for a god.

The word walnut derives from Old English *wealhnutu*, literally "foreign nut", *wealh* meaning "foreign" (*wealh* is akin to the terms Welsh and Vlach; see **Walha* and History of the term Vlach).[1] The walnut was so called because it was introduced from Gaul and Italy. The previous Latin name for the walnut was *nux Gallica*, "Gallic nut".[1]

Species and classification

Sect. *Juglans*. Leaves large (20-45 cm) with 5-9 broad leaflets, hairless, margins entire. Wood hard. Southeast Europe to central Asia.

Juglans regia L. (*J. duclouxiana* Dode, *J. fallax* Dode, *J. orientis* Dode) - Persian Walnut, Carpathian, or Common Walnut

Juglans sigillata Dode - Iron Walnut (doubtfully distinct from *J. regia*)

Sect. *Rhysocaryon*. Leaves large (20-50 cm) with 11-23 slender leaflets, finely pubescent, margins serrated. Wood hard. North America, South America.

Juglans australis Griseb. (*J. boliviana* Dode) - Argentine Walnut

Juglans brasiliensis Dode - Brazilian Walnut

Juglans californica S.Wats. - California Walnut

Juglans hindsii (Jepson) R.E.Smith - Hinds' Walnut

Juglans hirsuta Manning - Nuevo Leon Walnut

Juglans jamaicensis C.DC. (*J. insularis* Griseb.) - West Indies Walnut

Juglans major (Torrey) Heller (*J. arizonica* Dode, *J. elaeopyron* Dode, *J. torreyi* Dode) - Arizona Walnut

Juglans major var. *glabrata* Manning

Juglans microcarpa Berlandier (*J. rupestris* Engelm.) - Texas Walnut or Little Walnut

Juglans microcarpa var. *stewartii* (Johnston) Manning

Juglans mollis Engelm. - Mexican Walnut

Juglans neotropica Diels (*J. honorei* Dode) - Andean Walnut

Juglans nigra L. - Black Walnut

Juglans olanchana Standl. & L.O.Williams -

Juglans peruviana Dode - Peruvian Walnut

Juglans soratensis Manning -

Juglans steyermarkii Manning - Guatemalan Walnut

Juglans venezuelensis Manning - Venezuela Walnut

Sect. *Cardiocaryon*. Leaves very large (40-90 cm) with 11-19 broad leaflets, softly downy, margins serrated. Wood soft. Northeast Asia, eastern North America.

Juglans ailantifolia Carr. (*J. cordiformis* Maxim., *J. sieboldiana* Maxim.) - Japanese Walnut

Juglans cinerea L. - Butternut

Juglans mandshurica Maxim. (*J. cathayensis* Dode, *J. formosana* Hayata, *J. hopeiensis* Dode, *J. stenocarpa* Maxim.) - Manchurian Walnut or Chinese Walnut.

Japanese Walnut foliage and nutsThe best-known member of the genus is the Persian Walnut (*Juglans regia*), native from the Balkans in southeast Europe, southwest & central Asia to the Himalaya and southwest China.

The scientific name *Juglans* is from the Latin *jovis glans*, "Jupiter's acorn", and *regia*, "royal". Its common name, Persian walnut, indicates its origins in Persia (Iran) in southwest Asia; 'walnut' derives from the Germanic *wal-* for "foreign", recognising that it is not a nut native to northern Europe. According to the UN Food and Agriculture Organization (FAO), Shahmirzad orchard in Iran is the largest in the world (700-750 ha). In Kyrgyzstan alone there are 230,700 ha of walnut-fruit forest, where *J. regia* is the dominant overstorey (Hemery and Popov 1998). This is the species which is widely cultivated for its delicious nuts. *J. regia* is also called English walnut because English merchant marines once controlled its world commerce.

The Black Walnut (*Juglans nigra*) is a common species in its native eastern North America, and is also widely cultivated elsewhere. The nuts are edible, but have a smaller kernel and an extremely tough shell, and they are not widely grown for nut production.

The Butternut (*Juglans cinerea*) is also native to eastern North America, where it is currently endangered by an introduced disease, butternut canker, caused by the fungus *Sirococcus clavignenti*. Its leaves are 40-60 cm long, and the nuts oval.

The Japanese Walnut (*Juglans ailantifolia*) is similar to Butternut, distinguished by the larger leaves up to 90 cm long, and round (not oval) nuts.

Hybrids

Juglans x bixbyi Rehd. - *J. ailantifolia* x *J. cinerea*

Juglans x intermedia Carr. - *J. nigra* x *J. regia*

Juglans x notha Rehd. - J. ailantifolia x J. regia
Juglans x quadrangulata (Carr.) Rehd. - J. cinerea x J. regia
Juglans x sinensis (D. C.) Rehd. - J. mandschurica x J. regia
Juglans x paradox Burbank - J. hindsii x J. regia
Juglans x royal Burbank - J. hindsii x J. nigra

[edit] Cultivation and uses

Walnut output in 2005The two most commercially important species are J. regia for timber and nuts, and J. nigra for timber. Both species have similar cultivation requirements and are widely grown in temperate zones.

Walnuts are light-demanding species that benefit from protection from wind. Walnuts are also very hardy against drought.

Interplanting walnut plantations with a nitrogen fixing plant such as *Elaeagnus × ebbingei* or *E. umbellata*, and various *Alnus* species results in a 30% increase in tree height and girth (Hemery 2001).

When grown for nuts care must be taken to select cultivars that are compatible for pollination purposes, although some cultivars are marketed as "self fertile" they will generally fruit better with a different pollination partner. There are many different cultivars available for growers, offering different growth habit, flowering and leafing, kernel flavour and shell thickness. A key trait for more northerly latitudes of N. America and Europe is phenology, with 'late flushing' being particularly important to avoid frost damage in Spring. Some cultivars have been developed for novel 'hedge' production systems developed in Europe and would not suit more traditional orchard systems.

[edit] Nuts

Inside of a Persian Walnut nut with green outer layer visible in the top left cornerThe nuts of all the species are edible, but the walnuts commonly available in shops are from the Persian Walnut, the only species which has a large nut and thin shell. A horticultural form selected for thin nut shells and hardiness in temperate zones is sometimes known as the 'Carpathian' walnut. The nuts are rich in oil, and are widely eaten both fresh and in cookery. Walnut oil is expensive and consequently is used sparingly; most often in salad dressing. Walnuts are also an excellent source of omega-3 fatty acids, and have been shown as helpful in lowering cholesterol. They need to be kept dry and refrigerated to store well; in warm conditions they become rancid in a few weeks, particularly after shelling. Oil paint often employs walnut oil as an effective binding

medium, known for its clear, glossy consistency and non-toxicity. Flour made from walnut shells is widely used in the plastics industry.

Persian Walnuts In some countries immature nuts in their husks are preserved in vinegar. In England these are called "pickled walnuts" and this is one of the major uses for fresh nuts from the small scale plantings. In Armenian cuisine, walnuts are preserved in sugar syrup and eaten whole. In Italy, liqueurs called Nocino and Nocello are flavoured with walnuts. In Georgia, walnuts are ground along with other ingredients to make walnut sauce.

Walnuts are heavily used in India. In Jammu, India it is used widely as a prasad (offering) to Mother Goddess Vaisnav Devi and, generally, as a dry food in the season of festivals such as Diwali.

Walnut husks are often used to create a rich yellow-brown to dark brown dye that is used for dyeing fabric and for other purposes. When picking walnuts, the husks should be handled wearing rubber gloves, to avoid dyeing one's fingers.

[edit] Wood

Walnut shoot cut longitudinally to show chambered pith. Scale in mm. The Persian Walnut, and the Black Walnut and its allies, are important for their attractive timber, which is hard, dense, tight-grained and polishes to a very smooth finish. The colour ranges from creamy white in the sapwood to a dark chocolate colour in the heartwood. When kiln-dried, walnut wood tends toward a dull brown colour, but when air-dried can become a rich purplish-brown. Because of its colour, hardness and grain it is a prized furniture and carving wood. Walnut burls (or 'burrs' in Europe) are commonly used to create bowls and other turned pieces. Veneer sliced from walnut burl is one of the most valuable and highly prized by cabinet makers and prestige car manufacturers. Walnut wood has been the timber of choice for gun makers for centuries, including the Lee Enfield rifle of the First World War. It remains one the most popular choices for rifle and shotgun stocks, and is generally considered to be the premium – as well as the most traditional – wood for gun stocks. Walnut is also used in lutherie, i.e. making guitar bodies. The wood of the Butternut and related Asian species is of much lower value, softer, coarser, less strong and heavy, and paler in colour.

In North America research has been undertaken mostly on *Juglans nigra* aiming to improve the quality of planting stock and markets. The Walnut Council is the key body linking growers with scientists. In Europe, various EU-led scientific programs have studied walnut growing for timber.[2]

[edit] Shells

The walnut shell has a wide variety of uses. It is commonly used as an organic abrasive, to polish and clean a number of different materials. Black walnut shell is the hardest of the walnut shells, and therefore has the highest resistance to break-down. It is environmentally friendly and can be recycled.

The shells of walnuts. Cleansing and polishing: Walnut shells are mostly used to clean soft metals, fiberglass, plastics, wood and stone. Uses include cleaning automobile and jet engines, electronic circuit boards, and paint and graffiti removal. This soft grit abrasive is well suited for air blasting, de-burring, de-scaling, and polishing operations because of its elasticity and resilience. For example: In the early days of jet transportation, crushed walnut shells were used to scour the compressor airfoils clean, but when engines with air cooled vanes and blades in the turbine started being manufactured this practice was stopped. The problem being that the crushed shells tended to plug up the cooling passages to the turbine, resulting in turbine failures due to overheating.

Oil well drilling: The shell is used widely in oil well drilling for lost circulation material in making and maintaining seals in fracture zones and unconsolidated formations.

Paint thickener: Walnut shells are added to paint to give it a thicker consistency for "plaster effect" ranges.

Explosives: Used as a filler in dynamite.

Cosmetic cleaner: Occasionally used in soap and exfoliating cleansers.

[edit] Parkland and garden trees

Walnuts are very attractive trees in parks and large gardens. The Japanese Walnut in particular is grown for its huge leaves, which have a 'tropical' appearance.

As garden trees they have some drawbacks, in particular the falling nuts, and the releasing of the allelopathic compound juglone, though a number of gardeners do grow them.[3] [4] However, different walnut species vary in the amount of juglone they release from the roots and fallen leaves - the black walnut in particular is known for its toxicity. [5] Juglone is toxic to plants such as tomato, apple, and birch and may cause stunting and death of nearby vegetation. Juglone appears to be one of the walnut's primary defence mechanisms against potential competitors for resources (water, nutrients and sunlight), and its effects are felt most strongly inside the tree's "drip line" (the circle around the tree marked by the horizontal distance of its outermost branches). However, even plants at a seemingly great distance outside the drip line can be affected, and juglone can linger in the soil for several years even after a walnut is removed as its roots slowly decompose and release juglone into the soil.

[edit] Walnut as food plants

Walnuts are used as food plants by the larvae of some Lepidoptera species. These include[citation needed]:

Brown-tail (*Euproctis chrysorrhoea*)

the Coleophora case-bearers *C. laticornella* (recorded on *J. nigra*) and *C. pruniella*.

Common Emerald (*Hemithea aestivaria*)

Emperor Moth (*Pavonia pavonia*)

The Engrailed (*Ectropis crepuscularia*)

Walnut Sphinx (*Amorpha juglandis*)

In addition, walnuts are a popular snack among woodland creatures, specifically mice and squirrels.

[edit] Health aspects of walnuts

Juglans regia walnuts. A 2006 study published in the Journal of the American College of Cardiology found that eating walnuts after a meal high in unhealthy fats can reduce the damaging effects of such fats on blood vessels. Researchers from Barcelona's Hospital Clinic conducted a study on 24 adult participants, half of whom had normal cholesterol levels, and half of whom had moderately high levels of cholesterol. Each group was fed two high-fat meals of salami and cheese, eaten one week apart. During one meal, the researchers supplemented the food with five teaspoons of olive oil. The researcher added eight shelled walnuts to the other meal, the following week.

Tests after each meal showed that both the olive oil and the walnuts helped reduce the onset of dangerous inflammation and oxidation in the arteries after the meals, which were high in saturated fat. However, unlike the olive oil, the walnuts also helped the arteries maintain their elasticity and flexibility, even in the participants with higher cholesterol.

Lead researcher Dr. Emilio Ros said walnuts' protective effects could be because the nuts are high in antioxidants and ALA, a plant-based omega-3 fatty acid. Walnuts also contain arginine, which is an amino acid that the body uses to produce nitric oxide, necessary for keeping blood vessels flexible.[6][7]

The latest scientific development has revealed that the plant leaves have the function of reducing fasting blood sugar (FBS) in diabetic rats, of which beta cells could be regenerated, indicating the promising future of the plant for medicinal use.[8]

[edit] Walnut extract and Alzheimer's

A 2004 study by the NYS Institute for Basic Research in Developmental Disabilities (OMRDD) found that walnut extract was able to inhibit and defibrillize (break down) fibrillar amyloid beta protein - the principal component of amyloid plaques in the brains of patients with Alzheimer's. The study looked at the effect of walnut extract on amyloid beta protein fibrillization by Thioflavin T fluorescence spectroscopy and electron microscopy.[9] Similarly, in a study done at Baldwin-Wallace College in Berea, Ohio it was found that two of its major components in walnuts, gallic and ellagic acid, act as "dual-inhibitors" of the enzyme acetylcholinesterase which, in association with amyloid- β , inhibits protein aggregation, and will also inhibit the site of acetylcholinesterase responsible for the breakdown of acetylcholine.[10]

These results suggest that walnuts may reduce the risk or delay the onset of Alzheimer's disease by maintaining amyloid beta protein in the soluble form and prevent the breakdown of acetylcholine.[9]

[edit] Walnuts in Chinese medicine

In Traditional Chinese Medicine, walnut seeds are primarily considered a kidney tonic. They are also considered beneficial to the brain, back, and skin, and to relieve constipation if it is caused by dehydration.[11]