

Moulmein Teak, Rangoon or Burma Teak

Tectona grandis L.f. (n = 12, 18)

Family: Verbenaceae

Teak is unquestionably one of the most famous timbers in the world and is renowned for its dimensional stability, that is, it changes little with fluctuations in temperature and humidity. Extremely durable and hard, the wood resists decay even when unprotected by paints or other preservatives. Native to India, Java, Sumatra and parts of Indonesian Archipelago, teak has been used widely in India for more than 2000 years as shown by the ruins of old temples in southern and western India where timbers have been found in good condition. Extensive forests of teak occur in Myanmar and Thailand; in fact, it is so plentiful in Myanmar that it is used for flooring and roofing tiles. Even some streets in Rangoon are paved with blocks of teak wood. Teak plantations have been set out in Sri Lanka, Java and other islands of the East Indies and in the central and northern South America. In India, teak forests cover an area of about 7 276 000 ha, chiefly in Madhya Pradesh (3 119 000 ha), Maharashtra (1 404 000), Gujarat (1 176 000) and Karnataka (1 000 000). Other teak producing states are Rajasthan, Kerala, Tamil Nadu and Andhra Pradesh.

Teak is a large deciduous tree, up to 30.5 m in height with a girth of 2.4 to 4 m and a probable age of over 200 years. Teak branches are pubescent, four-angled and bear large opposite or whorled, broad ovate leaves that are 0.6 to 0.9 m long. Minute white flowers are borne in large panicles at the tips of the branches and the small fruits are surrounded by papery inflated calyces (Figure 12.9).

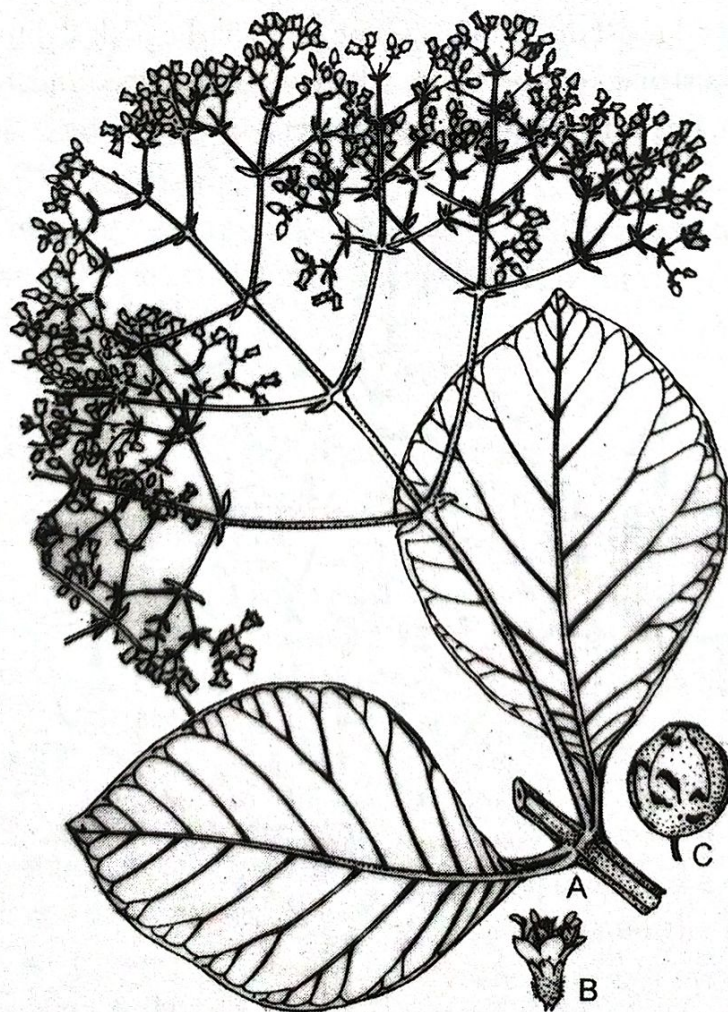


Figure 12.9 (A) A flowering branch of Burma teak, *Tectona grandis*, (B) a flower and (C) a fruit covered by persistent inflated calyces.

The sapwood is white and rather susceptible to attack by termites and wood rotting fungi. However, the heartwood is golden yellow to golden brown when freshly sawn, turning darker after exposure, and similar to the sapwood, is relatively immune to attack. The wood is greasy to touch, with a characteristic smell that is rather like that of the old leather. It is hard but not very difficult to work and takes an exceedingly good polish. The grain is normally straight and the texture very coarse and uneven. The average weight is between 609–689 kg/m³ in the dry state. The wood does not warp, split or crack. Unlike many tropical timbers, it shows distinct growth rings, quite visible to the naked eyes. The wood is ring-porous and is marked by the presence of large vessels. Tyloses are quite common.

The uses of teak are too well known and too numerous to mention. It is one of the best timbers in the world and is used as a standard for comparison to other timbers. It is the chief railway carriage and wagon wood of India. In shipbuilding, it is in a class by itself, even superior to oak. Its wood is used in house construction, bridge-building, cabinet making, boats, shingles, turnery, carving, brush backs, toys, plywood and other decorative surfaces, flooring, greenhouse construction and piles.

The name teak is at times applied to some other unrelated genera, for example, African or Nigerian teak (better called iroko), *Chlorophora excelsa* (Welw.) Benth. and Hook. f.; Eng teak or Eng Gurjun tree, *Dipterocarpus tuberculatus* Roxb. and Rhodesian teak (sometimes known as Zambesi redwood), *Baikiaea plurijuga* Harms.

Cedar

Cedrus deodara (Roxb.) Loud. (n = 12)

Family: Pinaceae, Gymnospermae

The name cedar is applied to several very different kinds of unrelated trees and shrubs. A few examples include eastern red cedar or Virginian pencil cedar (*Juniperus virginiana* L.), stinking cedar (*Torreya taxifolia* Arn.), the Port Oxford cedar [*Chamaecyparis lawsoniana* (A. Murr.) Parl.], the Alaska cedar [*Chamaecyparis nootkatensis* (D. Don) Spach], the incense cedar (*Libocedrus decurrens* Torr.), the southern white cedar [*Chamaecyparis thyoides* (L.) Britton, Sterns and Poggenb.], the northern white cedar (*Thuja occidentalis* L.), the western red cedar (*Thuja plicata* Don), Spanish cedar, cigar-box cedar, or West Indian cedar (*Cedrela odorata* L.), Moulmein cedar (*Cedrela toona* Roxb.) and ground cedar (*Lycopodium complanatum* L.).

However, most specifically and properly, the true cedar designates any one of the four species of the genus *Cedrus* (a). the Atlas cedar or Atlantic cedar (*C. atlantica* Manetti.), which grows mainly in the Atlas mountains in the north-western corner of Africa, (b). the Cyprus cedar [*C. libani* A. Rich, subsp. *brevifolia* (Hook. f.) Meikle; syn. *C. brevifolia* Hook. f.], covering a few hundred acres on the Troodos mountains of Cyprus, (c). the cedar of Lebanon (*C. libani* Barrel.), grows chiefly on the Tarus Mountains of Asia Minor, but has become rarer in Lebanon itself where it is a protected species in its natural habitat, and (d). the deodar cedar or Himalayan cedar (*C. deodara*) extending from the westernmost Himalayas to Nepal. Each of the four has evolved on its own 'island' of mountains from some common ancestral stock.

Deodar is the most important and strongest of Indian softwoods, growing chiefly in the north-western Himalayas, that is, Kashmir, Himachal Pradesh, Uttar Pradesh and Punjab. Large quantities of the timber are floated down the rivers from the Himalayas to the plains. It is available mostly in sleepers of 10 feet × 10 × 5 inches (3 m × 25 cm × 12.5 cm).

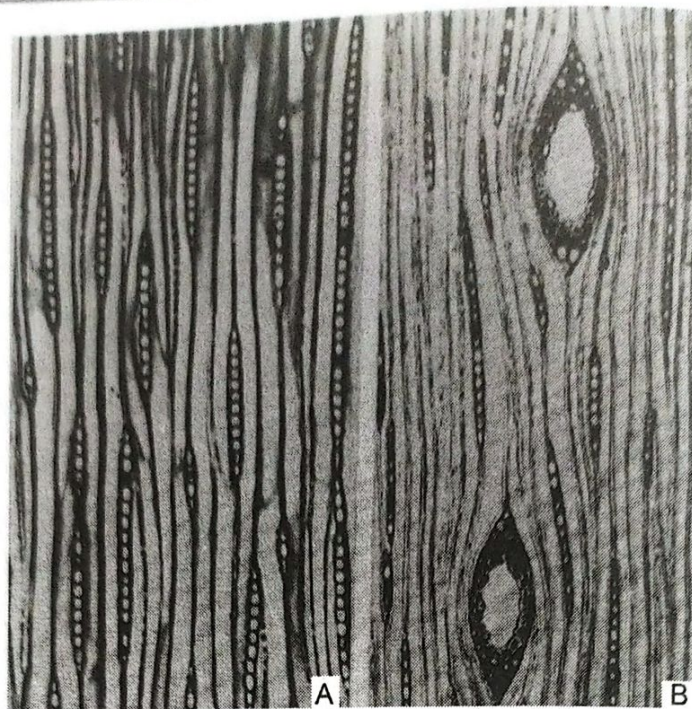


Figure 12.13 (A) TLS of *Cedrus* wood showing uniseriate rays, (B) TLS of the wood showing both uniseriate and multiseriate rays—in the latter, a resin duct always occupies the middle. Note that the rays are rarely biseriate.

The primary use of deodar is for railway sleepers, the average life of an untreated sleeper being 15 years. As a constructional material, it is extensively employed for beams, posts, doors and window frames, bridge construction, carriage and wagon building. Other uses include furniture, carving, packing cases, brush backs and pattern wood. The wood is unsuited for veneers because of the presence of knots.

Pines

Pinus spp. (x = 12)

Family: Pinaceae, Gymnospermae

Pine is an attractive tree with an ancient lineage. Species although distinct from the existing ones, but still clearly recognisable as belonging to the genus *Pinus*, occur as fossils in Cretaceous rocks over 100 million years old. They are also widely distributed in the Tertiary period. At present, pines are limited almost exclusively to the Northern Hemisphere and chiefly to the temperate and cold climate regions. Only two pines, Benguet pine or Luzon pine (*P. insularis* Endl.) and Merkus pine (*P. merkusii* Jungh.) are natives of Myanmar, the Indochinese peninsula and the Philippines; the latter extending as far as Borneo and Sumatra. Many kinds, however, have now been transplanted by man to parts of the Southern Hemisphere. More than 80 well-defined species of pines are recognised, of which only a few are widely used as sources of timber. Other than lumber, many of them are sources of pulpwood, turpentine, rosin, tar, pitch and essential oils. The seeds of some are also valued as human food.

A few to mention, commercially important pine timbers are eastern white pine, Quebec pine, or American yellow pine (*Pinus strobus* L.); western white pine (*P. monticola* Dougl.); Scots pine (*P. sylvestris* L.); red pine or Norway pine (*P. resinosa* Ait.); ponderosa pine or western yellow pine (*P. ponderosa* Laws.); pitch pine (*P. palustris* Mill.); maritime pine or cluster pine (*P. pinaster* Ait.); lodgepole pine (*P. contorta* Dougl. ex Loud.); jack pine (*P. banksiana* Lam.); slash pine or British Honduras pitch pine (*P.*

caribaea Maorelet), blue pine (*P. wallichiana* A.B. Jackson); loblolly pine (*P. taeda* L.); Japanese black pine (*P. thunbergii* Parl.); Corsican, black, or Austrian pine (*P. nigra* Arn.) and chir pine or long-leaved pine (*P. roxburghii* Sarg.). Especially noteworthy timber yielding pines among the American species are white pine, longleaf pine, loblolly pine and slash pine. Scots pine, native to many parts of Europe, is the best known and most popular species producing commercial timber in much of Europe. In India, *Pinus roxburghii* (hard pine) and *P. wallichiana* (soft pine) are the two most popular and best known of the several species of *Pinus* that yield timber. The former occurs in the outer hill ranges of Siwalik and the valleys of the Himalayas, from 405 up to 2290 m, while the latter prefers higher elevations from 1830-2690 m, occasionally reaching 3660 m. The principal states having extensive forests of blue and chir pines are Himachal Pradesh, Jammu and Kashmir, Punjab and Uttar Pradesh.

As a group, the pines favour open, wind-swept, sunny locations and well-drained soils. In fact, they flourish on lands too lean in nutrients and stony and steep for agriculture. When young, pine species are conical, but they often become irregular in outline and extremely picturesque at maturity (Figure 12.14). The leaves or needles are characteristically of two types (a). primary needles, borne singly in spirals in young pines, and (b). secondary needles, occurring in fascicles of two to five (solitary in *P. cembroides* Zucc. var. *monophylla* (Torr. and Frém.) Voss) and their bases are enclosed in a sheath. Pine trees are monoecious with male cones usually appearing lower down the tree while the female cones are borne on the highest branches (Figure 12.15). At maturity, the male cones release clouds of wind-borne pollen, which can be easily seen if a branch is shaken vigorously.

Interestingly, the two- and three-needle pines yield timber where the early wood and late wood zones are fairly clearly distinguishable, that is, annual rings are well marked (for example, Scots and Corsican pines with two needles and long-leaf pine from the United States and slash pine from the Central America with three needles). In the five-needle pines (*P. strobus* and *P. monticola*), on the other hand, the annual rings are not at all clearly marked and the wood, therefore, has a much more even texture. Pine woods are non-porous.

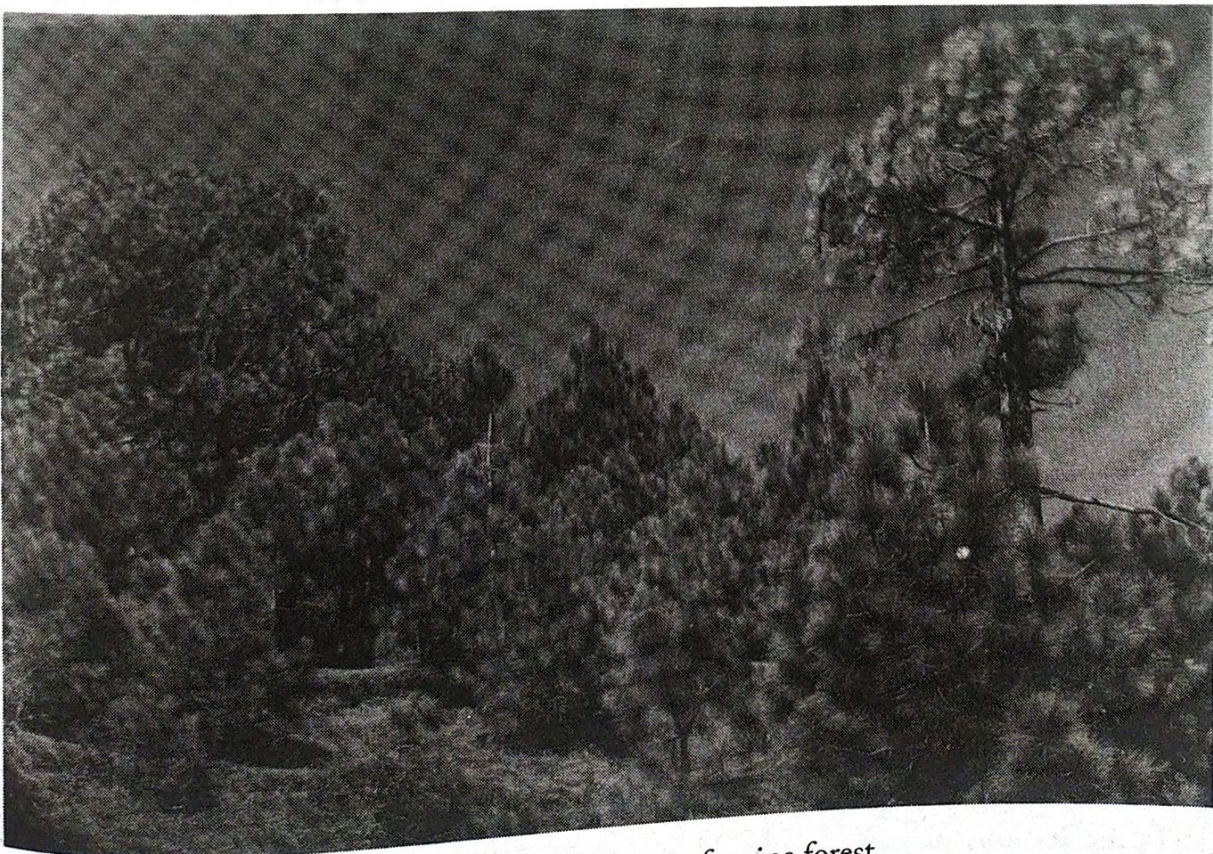


Figure 12.14 A close up of a pine forest.

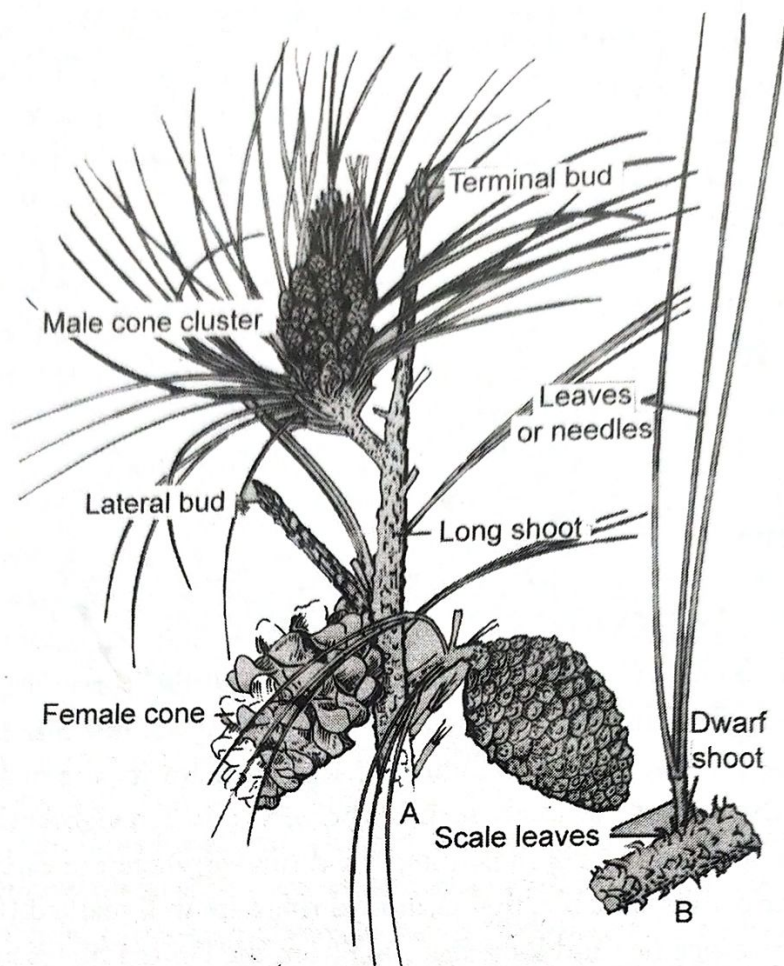


Figure 12.15 (A) The pine branches are dimorphic—branches of unlimited growth or long shoots and branches of limited growth or dwarf shoots. The male cones are borne on lateral branches, and they occur in clusters replacing the dwarf shoot. However, the main shoot continues to grow further. Female cones are larger than the males and are borne at the apices of the long shoots. They are woody dehiscent in the third year. The seeds are small, elongated, winged and are present on the adaxial side towards the base of the ovuliferous scale, (B) A dwarf shoot (also known as a foliar spur) consists of a basal small scaly portion of stem, bearing at the tip a group of three needles. It develops on long shoots in the axil of scale leaves.

Pine timber falls into two broad classes, the soft or white pines and the hard, yellow or pitch pines. The former group has soft, light-coloured woods, tinged pink in the heartwood and nearly white in the sapwood. The wood is light, easy to work but not strong or durable (it dents and breaks readily). The timber is straight-grained and comparatively free from resin. The grain is inconspicuous as there is a little difference between the spring and the summer wood. The wood is mainly used for purposes where strength is not essential, such as for matches, patterns and flasks in foundries, cooperage, crates, boxes and rough carpentry work. The principal white or soft pines are eastern white pine, sugar pine and lodgepole pine.

The hard or yellow pines, on the other hand, have a resinous, heavy, hard, strong and durable wood. The wood is coarse-grained with a pronounced grain pattern, owing to a marked distinction between the thin-walled spring and thick-walled summer wood. Typical uses of pine wood include construction of buildings, bridges, ships and other types of heavy construction. The principal examples are longleaf pine, loblolly pine, slash pine, Norway pine and western yellow pine.

Even today, cork is being used for many articles such as for gaskets, seals, floats (including life preservers), non-slip walkways, handles, corkboard, floor tile and linoleum. The manufacture of composition cork today constitutes one of the most important facets of the cork industry. Composition cork (also known as compounded cork) is manufactured by combining pure, soft granules of cork with suitable glues, synthetic resins and a plasticiser, such as glycerine. Composition cork uses trimmings and small pieces of high-grade cork (scraps), which were previously of no use. A natural resinous adhesive holds the cork cells together, while in composition cork the binding agent is artificial. The physical and chemical characteristics of composition cork and natural cork are more or less the same. Composition cork is greatly used in the manufacture of gaskets or seals for automobiles, linoleum and floor tiles. Shoe innersoles, sealing liners for crown caps, printing press blankets, bathing shoes, beach sandals, house slippers and decorative novelties are a few other uses of composition cork. The binder-coated cork is carefully packed into tubes for rod production or pressed into large moulds for block manufacture and then slowly heated or baked until cured.

Cork insulation board is produced by heating pulverised natural cork with binders and then pressed into large moulds and heated until cured. It is used principally for refrigeration, air conditioning, prevention of moisture condensation and for maintenance of exact temperatures. It is also used for machinery isolation and acoustic purposes (for rendering rooms soundproof). The tiny air-filled cells, more than 200 million cells per cubic inch of cork, provide an effective barrier to the flow of heat.

Linoleum is essentially a mixture of pulverised cork or wood flour, resins (rosin or kauri gum), linseed oil, pigments and other ingredients deposited on a burlap backing.

Some Important Commercial Woods

Dalbergia spp. ($x = 10$)

Family: Fabaceae

Dalbergia is a genus of tropical trees providing a valuable dark timber. A few of the examples are *D. nigra* Allem., Brazilian rosewood; *D. melanoxylon* Guill. and Perr., African blackwood; *D. retusa* Hemsl., cocobolo; *D. stevensonii* Standl., Honduras rosewood and *D. latifolia* Roxb., Indian rosewood. Sissoo (*D. sissoo* Roxb.) is another important Asian species and along with Indian rosewood ranks amongst the finest of India's cabinet and furniture woods. The former occurs throughout the sub-Himalayan tracts from Ravi to Assam up to 1530 m, and grows freely along water channels or riverbanks. Rosewood is mostly found in central and southern India and also in the sub-Himalayan tracts (from Oudh in Uttar Pradesh to Sikkim). Mysore rosewood commands an international market, mainly being used for decorative furniture.

Dalbergias have pinnate leaves with an uneven number of leaflets and panicles of small, yellow or white papilionaceous flowers (Figure 12.6). In sissoo, the sapwood is white to brownish in colour while the heartwood is golden brown to dark brown. It is a durable heavy wood with an average weight of 800-850 kg/m³. In Indian rosewood, on the other hand, the sapwood is yellowish but the heartwood varies from dull brown to almost purple. Unlike sissoo, the Indian rosewood has a distinctive characteristic odour. It is durable timber, especially for under water use. The average weight is between 800-960 kg/m³. Although, Indian rosewood is not an easy timber to work with, but it turns and carves well.



Figure 12.6 A fruiting twig of sissoo, *Dalbergia sissoo*. It is an important timber-yielding plant of North India. The leaves are composed of 3-5 broadly elliptic or ovate, acuminate leaflets arranged alternately on a somewhat zigzag axis. The fruit is a thin, strap-shaped pod, $1\frac{1}{2}$ - 4 inches long, containing 1-4 flattened seeds.

The wood structure is diffuse porous; growth rings may not always be visible. Vessels are mostly large and not very numerous.

Sissoo, like Indian rosewood, is a high-class furniture and cabinet wood. It is valued as a constructional and general-purpose timber, being used for railway sleepers, musical instruments, hammer handles, shoe heels, *hookah* tubes and tobacco pipes. Sissoo is good for charcoal making. Rosewood gives an attractive figure when sawn and is usually used for decorative veneers.

Brazilian rosewood (or jacaranda), a native of tropical South America, yields a rose-scented heartwood which may be brown or violet, streaked irregularly with black. The beautiful wood is used for cabinet making, brush backs, knife handles and carpenter's plane handles.

Honduras rosewood is a slightly ornamental cabinet timber of more than local importance and is used for making musical instruments, particularly the bars of xylophones.

Ceylon Ebony

Diospyros ebenum Koenig (n = 45)

Family: Ebenaceae

Ebony wood comes from the heartwood of several species of *Diospyros*, a well-spread genus, especially in the tropics and subtropics. It is particularly abundant in Asia; the true ebony of commerce being derived from *D. ebenum* of India and Sri Lanka. The trees are also found growing in Nigeria, Ghana, Sudan, Gambia and the East Indies. The tree is not very common in India, the limited supplies coming from the states of Karnataka (Coorg district), Kerala, Andhra Pradesh and Tamil Nadu.