

## CEDRO REAL (SPANISH CEDAR)

### Common names

(Burmese) : Thit kado

(Creole) : Sèd

(English) : American cedar, Brazilian mahogany, cedar, cedar wood, Central American cedar, cigar box cedar, cigar box cedrela, cigar-box tree, Honduras cedar, Jamaican cedar, Mexican boxwood, Mexican cedar, red cedar, Spanish cedar, stinking mahogany, West Indian cedar

(French) : acajou á muebles, Acajou à planches, acajou amer, Acajou femelle, acajou pays, acajou rouge, acajou senti, Cèdre, cedrela

(German) : Cedrela, Zigarrenkistchenholz

(Spanish) : acajú, cédre, cédre espagnol, cedro, cedro amargo, cedro blanco, cedro colorado, cedro del país, cedro dulce, cedro español, Cedro hembra, cedro hembra del país, cedro macho, cedro mexicano, cedro oloroso, cedro real, cedro vermelho, culche, redcedar

(Swahili) : mwerezi

(Thai) : yom-hom



### Botanic description

*Cedrela odorata* is a monoecious, deciduous, medium-sized to large tree up to 40 m tall (up to 60 m in South America); bole straight, cylindrical, branchless for up to 25 m, to 120 (max. 300) cm in diameter; buttresses absent or small and up to 2 m high; bark surface rough and fissured, reddish brown especially near the base of the bole, grayish higher up; inner bark pink or purplish-red; branch lenticels finely to conspicuously lenticellate. Leaves alternate, par pinnate with (min. 5) 6-12 (max. 15) pairs of leaflets; leaflets opposite to alternate, entire, ovate to oblong-lanceolate, 5-16 cm long, usually glabrous, base oblique; apex acute to shortly acuminate. Inflorescence in terminal panicles. Flowers unisexual, but with well-developed vestiges of the opposite sex, actinomorphic, pentamerous, greenish-white, sub sessile, 6-9 mm long, smelling of garlic. Calyx cup-shaped, split on 1 side, shallowly to deeply toothed; petals free, imbricate and adnate for 1/3 of their length, forming into a long, columnar androgynophore by a medium carina (therefore preventing their spreading in open flowers), white or cream tinged red near the margin. Stamens 5, free, but adnate to the androgynophore below; anthers dorsifixed, opening by longitudinal slits; ovary 5-locular, pubescent; each

locule with 10-14 ovules; style short, stigma discoid. Fruit a pendulous, reddish-brown capsule with 5 thin, woody valves, oblong-ellipsoid, to obovoid (min. 1.5) 2-3.5 (max. 4) cm long. Seed a sharply angled or winged columella. The genus *Cedrela* is included in the tribe Cedreleae of the subfamily Swietenioideae, as is the genus *Toona*. All the Eastern species of *Cedrela* have been transferred to *Toona*. *Cedrela* differs from *Toona* by its prominent androgynophore with adnate petals and filaments, the cuplike calyx, the bigger and woodier capsule, and seedlings having entire leaflets. The specific name, 'odorata' is Latin for sweet-smelling, fragrant.

### **Ecology and distribution**

#### **History of cultivation**

As a well-known plantation tree, *Cedrela* is planted in many tropical regions. Timber plantations have been established in Costa Rica, Uganda, Tanzania, Madagascar, South Africa, Java, Solomon Islands and Western Samoa. It has also been introduced into southern Florida and in Southeast Asia, where it is known to be planted in Indonesia, peninsular Malaysia, the Philippines, Singapore and Thailand. In Southeast Asia only, small-scale plantations exist and production and international trade of *C. odorata* is of no importance; most of the timber is consumed locally. Seed from Mexican cedar of continental America, formerly regarded as a distinct species, has also been tested in Puerto Rico. Although widely planted in the public forests for timber, most of the trees became chlorotic and died for reasons not understood; nevertheless, a few trees grew very rapidly. Trial plantations in peninsular Malaysia failed; the tree was introduced into Fiji in the 1930s, but only a few wind-battered specimens survive. It was introduced into Nigeria in 1922, into Tanganyika and Kenya in 1933, South Africa on a trial basis and Solomon Islands in 1953.

#### **Natural Habitat**

In its natural area of distribution, *C. odorata* is found in both primary and secondary evergreen to semi-deciduous lowland or lower montane rainforest. It demands light and does not tolerate water logging or flooding. Widely distributed in wet forests of low elevations in tropical America. Native apparently throughout West Indies in Greater Antilles and Lesser Antilles to Trinidad and Tobago, the range spread by cultivation. Also native in continental tropical America from Mexico to Ecuador, Peru, Brazil and French Guyana. Trees are best planted in regions with very fertile soils and with perfect drainage that results in the good aeration of the soil required by the root system. Drought for part of the year does not adversely affect the health of the tree. In its natural habitat, removing trees around the seed tree and gradually opening up the canopy in the forest can encourage regeneration. In research plots in Papua New Guinea, the latter method has been shown to encourage growth; however, it increases the risk of insect attack. Because of the valuable wood, the native trees of this species are now found only in scattered,

remote areas in Puerto Rico, chiefly in the moist limestone and lower cordillera forest regions.

### **Geographic distribution**

Native : Argentina, Brazil, Cuba, Dominican Republic, Ecuador, French Guiana, Haiti, Honduras, Jamaica, Mexico, Peru, Trinidad and Tobago

Exotic : Costa Rica, Fiji, Indonesia, Kenya, Madagascar, Malaysia, Nigeria, Philippines, Samoa, Singapore, Solomon Islands, South Africa, Tanzania, Thailand, Uganda, United States of America

### **Biophysical limits**

Altitude: 0-1900 m, Mean annual temperature: 22-26 deg. C, Mean annual rainfall: 1000-3700 mm Soil type: *C. odorata* is not demanding of soil nutrients, tolerating soils high in calcium; it prefers fertile, free draining, weakly acidic soil but tolerates heavy soil.

### **Reproductive Biology**

First flowering can be expected after 10-15 years. Flowering is annual, but good seed crops occur every 1-2 years. Seeds of *C. odorata* in the Philippines ripen in March-June.

### **Propagation and management**

#### **Propagation methods**

Transplanting of naturally regenerated seedlings or establishing branch and stem cuttings are the most common propagation methods. Grafting and budding methods have also been successful. Regeneration may also be done by seed, wildings or air-layering. Fresh seed germinates readily, but when stored under ambient conditions it rapidly loses its viability. They may be broadcast or sown in lines in level nursery beds and lightly covered with soil, sand, sawdust or charcoal. Where there is adequate moisture, shade is not necessary; shade increases the risk of damping-off. Germination takes 2-4 weeks. It is fastest at temperatures 30-35 deg. C, but seed also germinates at 15 deg. C. Seedlings grow very quickly and may attain 40-50 cm height after 3 months and 130-150 cm after 12 months. Collecting wildings in the Philippines had a survival rate of 94% and after some months had a shorter taproot and more lateral roots than the original seedlings growing under the mother tree. Height increment of these wildings was 50 cm during the 1st 6 months after transplanting. In Papua New Guinea, transplanted wildings showed 100% survival under about 60% relative light intensity. Stumps, striplings and container seedlings are used for planting; occasionally wildings may be used. Stumps 20 cm tall, with a diameter of 1-2 cm, planted 10 cm deep showed nearly 100% survival in Indonesia. Direct seeding is feasible, as the young plants develop very quickly; as trees seem to experience a rather severe planting

shock; this method is recommended when there is no shortage of seed. Early annual growth may be up to 2.3 m in height and up to 4.8 cm in diameter under favorable conditions and when not attacked by *Hypsipyla* shoot borers. Dormancy of the shoot may be signaled by the abscission of the whole terminal shoot tip, leaving lateral buds to continue axial growth.

### **Tree Management**

Pruning is not required when *C. odorata* is grown as a stand, but trees affected by *Hypsipyla* attack may need pruning to remove multiple leaders formed. Early weeding is essential. *C. odorata* is a fast-growing, light demanding species. Under natural conditions, it is a long-lived pioneer that tolerates shade only temporarily. In enrichment planting, it is important to ensure sufficient overhead light. As the root system is superficial, there is some risk of wind damage and therefore thinning should be executed carefully. In Fiji, *C. odorata* proved to be very vulnerable to being blown over by wind. In mixed stands, it is realistic to raise only 10-20 high-quality trees/ha. Well-formed, straight stems are usual except in trees grown in open places. The tree does not coppice. During the 1st 9 years in trial plantations of *C. odorata* in Java, the mean annual increment was 17 cubic m/ha at 650 m altitude and 28 cubic m/ha at 800 m altitude. A 40-year-old plantation in Nigeria yielded a timber volume of 445 cubic m/ha. *C. odorata* shows potential for plantations, as it is fast growing and produces multipurpose timber. Trials in mixed plantations similar to those conducted with *Toona* species should be implemented.

### **Germplasm Management**

Seed storage behavior is orthodox. Viability is maintained in hermetic storage at cool temperatures with 6-9.5% mc; seeds can be stored for about 2 years if kept in dry, cool (2-4 deg. C) and airtight containers. Well-dried seeds (6-9.5% mc) stored in paper bags, show no decrease in germination after 3 months, irrespective of the temperature during storage, ranging from -30 to 30 deg. C. Germination of seed kept in closed glass bottles at 4-6 deg. C is 82% after 2 months and 78% after 14 months. There are about 40 000 - 60 000 dry seeds/kg without wings or 31 000-48 000 seeds/kg with wings.

### **Functional uses**

#### **Products**

Apiculture: Flowers are visited by bees as a source of nectar for honey production. Fuel: A good firewood species. Fibre: In Papua New Guinea, the bark has been used for twine. Kraft pulping tests give a low yield of 54%, with a Kappa number of 71 and low brightness. Timber: *C. odorata* is a lightweight and comparatively soft wood. The heartwood is pale creamy immediately after sawing, turning pinkish-brown upon exposure, and is clearly demarcated from

the narrow band of sapwood. Heartwood is rated as moderately durable and moderately resistant to termites, but the sapwood is susceptible to staining and powder post beetles and is not durable. The density is 410-525 kg/cubic m at 12% mc. The grain is usually interlocked, sometimes straight or woolly, indicating the presence of tension wood; texture moderately fine to moderately coarse; the grain pattern is attractive in flat sown boards. Freshly cut wood has a distinct onion like odor, which disappears after 2-3 days. It is easy to work, saws, bores, turns and sands without problems and produces a good finish; it is easy to glue. However, growth stresses may cause severe end splitting of logs and warping and splitting during saw milling. Tests in Samoa showed that the timber can be rotary peeled without pretreatment with good results, producing attractively patterned veneer; veneer slicing also gave good results. The wood is difficult to treat with preservatives, even by a pressure treatment. A premier timber for furniture, decorative veneer, musical instruments, wooden novelties and doors. The best known use of cedar timber is for cigar boxes, but it is also used for light construction, moldings, cabinets, furniture, paneling, boxes, exterior joinery, weather boards, louvered doors, boat building (especially racing boats), canoes, musical instruments, turnery, matchboxes, household implements, face veneer and plywood. Lower grades are suitable for crates, fencing and animal pens. The repellent smell of the wood to insects makes it particularly suitable for the manufacture of clothing chests and wardrobes. Medicine: Root and trunk bark is used to reduce fever and pain; the trunk is harvested to prepare a decoction for abortion; seeds are believed to have vermifugal properties.

### **Services**

Shade or shelter: As the trees have many low branches and a spreading crown, they are used for shade and as a windbreak in courtyard gardens and in cocoa and coffee plantations. Ornamental: *C. odorata* is sometimes planted as an ornamental along roads and in parks, for example, in peninsular Malaysia, Papua New Guinea and Singapore. Intercropping: *C. odorata* is highly susceptible to *Hypsipyla* attack; therefore it is recommended that trees be planted in mixed plantations, for example with *Leucaena leucocephala*, *Cordia* spp., or *Anthocephalus chinensis* or under the light shade of trees such as *Eucalyptus delgupta*.