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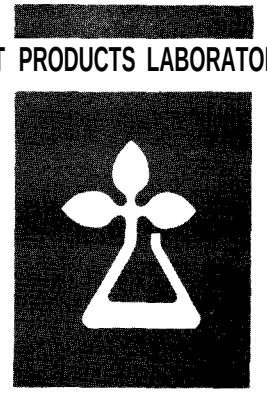

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RESEARCH NOTE
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SPANISH-CEDAR [1]

Cedrela spp.

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Introduction

From the earliest days of exploration and colonization in tropical America, Spanish-cedar has been one of the most important timber trees of the area. The wood became an article for the export trade during the 1800's when the cigar industry demanded the use of Spanish-cedar for packing cigars. These fragrant boxes were commonplace before rising costs in the 1930's finally forced the cigar industry to turn to paperboard or less expensive containers manufactured from soft native lumber. Spanish-cedar remains to this day as one of the most valued trees for local use in Latin America. In the areas of growth the tree and wood are generally referred to as cedro.

Distribution and Habitat

Spanish-cedar occurs from Mexico to Argentina and is found in all of the Latin American countries with the exception of Chile. The trees are almost exclusively restricted to well-drained sites and may occur in deciduous forests or lowland and montane rain forest.

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[1] This Research Note supersedes Forest Products Laboratory Report No. 1948 of the same title, originally issued in 1948 and revised in 1957.

Nomenclature

Up to 1954 there were 37 validly published Cedrela species names applied to American trees listed in Index Kewensis, with a number of varieties and forms in the literature. Smith[2] made an exhaustive study of the genus and reduced it to 7 species, which are:

Cedrela angustifolia Sessé & Moc. ex DC. (synonym C. huberi Ducke)
Trees to 185 feet on dry to moist sites at less than 6,500 foot elevation and ranging from Mexico to northern Argentina but absent from the West Indies as native trees.

Cedrela fissilis Vell.
Trees to 80 feet on slopes at elevations of 350 to 1,000 feet in Peru, Brazil, Bolivia, Paraguay, and Argentina.

Cedrela lilloi C. DC.
Small trees to 25 feet on hill slopes from 2,500 to 9,000 feet in Peru, Bolivia, and Argentina.

Cedrela montana Turcz.
Trees to 160 feet in montane forest at elevations from 4,000 to 10,000 feet in Venezuela, Colombia, and Ecuador.

Cedrela oaxacensis C. DC. & Rose (synonym C. tonduzii C. DC.)
Trees to 130 feet on dry to moist sites at elevations to 7,000 feet and ranging from Durango, Mexico, to Chiriqui Province, Panama.

Cedrela odorata L. (synonyms C. guianensis A. Juss. and C. mexicana Roem.)
Trees to 130 feet on dry to moist soils at lower elevations ranging from northern Mexico and the West Indies to the Amazon drainage of Brazil.

Cedrela weberbauerii Harms
Small trees to 35 feet and limited to the eastern Andean foothills of Peru.

Smith also concluded from his studies that C. odorata intergrades with C. angustifolia, that this species intergrades with C. oaxacensis in Central America and with C. fissilis in South America, and that C. fissilis intergrades with C. lilloi to a lesser extent. Only C. montana, restricted to higher elevations in northwestern South America seems to be relatively distinct.

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[2] Smith, C. Earle, Jr. A revision of Cedrela (Meliaceae). Fieldiana: Rotany 29(5):295-341. Chicago Natural History Museum. 1960.

The Tree

Under favorable conditions of growth, trees may attain a height of 185 feet and a diameter of 4 to 5 feet. The trunk is usually free of limbs for at least a single log length (16 feet) if the tree grows in the open Trees developing under forest conditions may have trunks free of branches to a height of 75 feet or more above the ground. As these trees rarely develop greatly extended buttresses, almost the entire bole length is available for lumber.

The Wood

Freshly cut heartwood is pinkish to reddish brown, but upon exposure it becomes red or dark reddish brown, sometimes with a purplish cast. It is reported to be darkest when grown on the drier sites, and this type of wood is preferred by the local craftsmen.

The cell structure of Spanish-cedar ranges from virtually diffuse-porous as mahogany (Swietenia macrophylla) to decidedly ring-porous. The ring-porous wood produces a distinct growth-ring pattern on flat-sawn surfaces or rotary-cut veneer. The grain is commonly straight although sometimes interlocked. The wood has a medium-to-high luster which seems to depend on the color of the wood, being lowest in the lighter colored timber. A cedary odor, similar to that of the coniferous ''cedars'' is usually present due to the volatile oils or resins present in the wood.

When grown with abundant moisture, the wood is lighter in color, less dense, and has a lesser oil content. Native craftsmen state that they can distinguish the lumber of different species of Spanish-cedar. In view of the statements of Record and Hess[3] that the wood samples of the different Cedrela species exhibit the same qualities under test and show the same structure, it is believed that the named kinds of Cedrela of the natives are merely variations in density and color of wood due to the influence of environmental factors during the growth of the trees.

The wood of Spanish-cedar is coarser textured than that of mahogany.

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[3] Record, S. J., and Wess, R. W. Timbers of the new world. 640 pp. Yale Univ. Press. 1943.

Mechanical Properties

On the basis of Yale tests[4] shown in table 1, Spanish-cedar with an average specific gravity of 0.40 (based on the volume when green and weight when ovendry) would be similar to Central American mahogany in most properties except in hardness and compression perpendicular to grain where mahogany is definitely superior. Most of the imported wood falls into the 0.34 to 0.38 average specific gravity class and, as a consequence, its mechanical properties would be proportionately lower than those shown in the table.

The specific gravity for the various species of Cedrela ranges from 0.32 to 0.46, based on the green volume and ovendry weight, with an overall average of 0.38 for the genus.

Seasoning and Shrinkage

Spanish-cedar is considered easy to season by either air-drying or kiln-drying methods. In the tropics it is common practice to end-rack the lumber in the sun and little, if any, seasoning degrade is encountered.

Green wood shrinks about 2.1 percent radially and 3.0 percent tangentially in drying to a moisture content of 15 percent. Shrinkage from the green condition to ovendry (table 2) is similar to that of mahogany.

Wood Exudate

Spanish-cedar wood contains a gum-like substance with a volatile aromatic oil. The exudate is likely to stain materials in intimate contact with the wood, and air-seasoned boards in intimate contact may become literally "glued" together. The use of Spanish-cedar dried by conventional methods is not recommended for such products as closed cases for clocks and other precision equipment because the volatiles condense on the metal parts thus reducing the efficiency of the mechanism. The volatile content of the wood can be materially reduced by kiln drying the unsurfaced stocks to a moisture content of 6 to 8 percent and then heating at 200° F. for 8 to 17 hours at a relative humidity of 60 percent. The oils and gums will exude to the rough surfaces, which can then be smoothed in the dressing process.

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[4] Wangaard. Fred F., and Muschler, Arthur F. Properties and uses of tropical woods. III. Tropical Woods 98:73-80. Yale Univ. School of Forestry. 1952.

Table 1.--Mechanical properties of Spanish-cedar (*Cedrela* spp.)[1] and Central American mahogany (*Swietenia macrophylla*)[2] at 12 percent moisture content

Property	Species	
	Cedrela spp.	*Swietenia macrophylla*
Specific gravity		
Based on volume when green and weight when ovendry	0.40	0.45
Static bending		
Fiber stress at proportional limit...p.s.i.	7,680	7,800
Modulus of rupture...p.s.i.	11,440	11,800
Modulus of elasticity...1,000 p.s.i.	1,430	1,540
Work to maximum load...in.-lb./cu. in.	10.6	8.1
Compression parallel to grain		
Maximum crushing strength...p.s.i.	6,100	6,700
Hardness		
End...lb.	880	1,030
Side...lb.	590	800
Compression perpendicular to grain		
Stress at proportional limit...p.s.i.	680	1,170
Shear parallel to grain		
Maximum shearing strength...p.s.i.	1,140	1,310

[1] Data for Cedrela based on *C. angustifolia* and *C. oaxacensis* as reported in "Tropical Woods No. 98," Yale University School of Forestry.

[2] Data for *Swietenia macrophylla* from Forest Products Laboratory Report No. 2167, "Mahogany (*Swietenia macrophylla* King)," by B. F. Kukachka.

Among importers of Spanish-cedar it is the general consensus that wood from certain areas shows more exudate than others, the principal such areas being Nicaragua, Costa Rica, and the Amazon region. Spanish-cedar from Mexico, British Honduras, and Guatemala infrequently shows such exudations and is therefore favored.

Durability

In soil tests conducted at Madison, Wis., and Saucier, Miss., Ecuadorian Cedrela odorata was rated as resistant to very resistant with respect to fungus attack and rated as resistant to attack by two white rot fungi in pure-culture tests.

Tests made at the Yale University School of Forestry[4] show Cedrela angustifolia to be quite variable in resistance to decay. The heartwood proved to be durable to moderately durable upon exposure to both a white rot fungus and a brown rot fungus. Cedrela oaxacensis was rated as moderately durable to nondurable in resistance to a white rot organism and durable to moderately durable upon exposure to a brown rot fungus.

The heartwood is considered more resistant to dry-wood termites than mahogany, rating resistant as compared to moderately resistant for the mahogany. The wood is sometimes attacked by pin-hole borers and has low resistance to attack by marine borers.

The wood possesses excellent weathering properties when exposed to the elements without the protection of paint.

Working Characteristics

Spanish-cedar is worked very easily with both hand and power tools, giving good results in planing, shaping, mortising, and sanding. The wood is easily turned but is difficult to bore; torn and roughened grain occur in these operations. The presence of gum in some material gives trouble in polishing but, in general, the wood stains and finishes well after filling. It has good nail- and screw-holding properties, is easy to glue, and is a fairly good bending wood. It is very popular in the veneer and plywood industry because it peels cold, dries exceptionally well, and has good gluing properties.[5]

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[5] Longwood, Franklin R. Puerto Rican woods, their machining, seasoning, and related characteristics. U.S. Dept. of Agr., Agr. Handb. No. 205:47-48. 1961.

Uses

Spanish-cedar is used locally for all purposes where an easy working, light but strong, straight-grained, and durable wood is required. The wood has characteristics which recommend it for millwork, cabinets, patterns, musical instruments, boats, decorative and utility veneer. It is still being used to a large extent in the form of very thin veneer for making cigar wrappers which are encased in cellophane and give the cigar a cedary odor formerly supplied by the box itself.

Identification

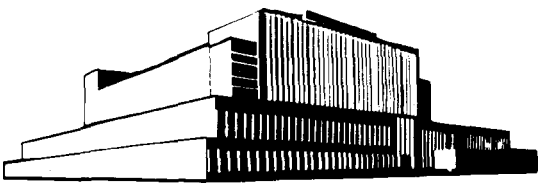
Spanish-cedar may be readily separated from other mahogany-like woods by the pronounced growth ring pattern which is distinct on all longitudinal surfaces. On a smoothly cut end grain surface the growth ring pattern is evident without magnification due to the larger sized pores in the earlywood zone and the wide band of light-colored parenchyma.

Table 2,--Shrinkage values for Spanish-cedar and Central American mahogany[1]

Species	Shrinkage[2]	
	Radial	Tangential
	Percent	Percent
Cedrela spp.	4.0	5.9
Swietenia macrophylla	3.7	5.1

[1] Data from sources as indicated for table 1.

[2] Shrinkage values represent shrinkage from the green to the ovendry condition expressed as a percentage of the green condition.



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