FOREIGN WOOD SERIES

CRABWOOD

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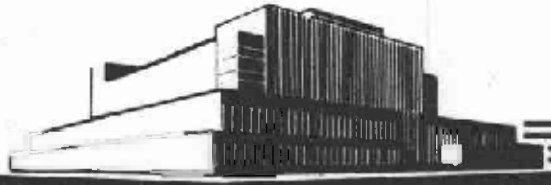

FOREST PRODUCTS LABORATORY
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UNITED STATES DEPARTMENT OF AGRICULTURE
FOREST SERVICE
In Cooperation with the University of Wisconsin

CRABWOOD

Carapa guianensis Aubl.
Family: Meliaceae

By

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Distribution and Habitat

Carapa occurs in tropical America from the West Indies and Central America to Peru and Brazil. The genus is widely distributed in West Africa and is also present in East Africa.

Crabwood is not exacting as to soil and site when the area is not too dry. The locality of growth, however, influences the quality of the wood. Trees growing in the mangrove swamps are generally small, and they produce coarse timber that tends to split badly. The growth in riparian swamps is better, but the best timber comes from areas that are under water only part of the time. Crabwood is common in the Amazon flood plains and the Guianas. It is of limited occurrence in the overflow delta lands of the Orinoco, in Venezuela, and in Central America. It sometimes grows in nearly pure stands.

The wood is sometimes divided into two groups: "lowland" or "white" and "upland" or "red." The terms are inaccurate, however, since the species is rare on hillsides and the color variation may be found on the same site and even within the same tree (4, 8, 10).[2]

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[1] Maintained at Madison, Wis., in cooperation with the University of Wisconsin.

[2] Underlined numbers in parentheses refer to Literature Cited at the end of text.

The wood of Carapa is also called andiroba, cedro macho, or tangaré.

The Tree

Crabwood trees may reach a height of 80 to 120 feet and have a trunk diameter of 1-1/2 to 4 feet. Trees up to 170 feet high and 6 feet in diameter above the low buttresses occur when growing conditions are very good. Clear boles often are 50 feet or more in length (1, 8).

The Wood

Dry heartwood is reddish-brown to brown. The denser specimens are darker colored. Freshly cut sapwood is pinkish, but upon exposure it becomes pale brown or grayish. It is 1 to 2 inches thick and usually is not sharply distinct from the heartwood. The wood has a rather low to high luster that is highest in dense, fine-textured timber. Neither odor nor taste is distinctive in crabwood. The grain is typically straight, yet sometimes interlocked. The texture is medium, but the swamp-grown wood is of a coarser texture.

Mechanical Properties

The average specific gravity of crabwood, as determined by various investigators, ranges from 0.41 to 0.56, based on the ovendry weight and the volume of the green wood.

Averages of the values obtained for the mechanical properties of crabwood and mahogany are presented in table 1.

Seasoning and Shrinkage

Crabwood is moderately difficult to season by air drying and shows only slight checking and warping when dried at a moderate rate (12).

The British Forest Products Research Laboratory recommends its kiln schedule C for this wood (1). The U. S. Forest Products Laboratory schedule that appears most appropriate for 4/4 stock is T3-C2 (11). Shrinkage data for crabwood and mahogany are given in table 2.

Crabwood tested at Yale University shows good weathering characteristics. The heartwood is highly resistant to the absorption of moisture and is rated intermediate to teak and white oak in this respect (12).

Durability

In recent tests, the heartwood of Carapa from South America was rated "very durable" to "durable" in resistance to a white-rot fungus, Polyporus versicolor (L.) Fr., and "very durable" when exposed to the brown-rot fungus, Poria monticola Murr. (12).

Logs are reported to be susceptible to damage from ambrosia beetles. The sapwood of seasoned timber is attacked by powder-post beetles (1).

Working Characteristics

Crabwood is moderately easy to work with both hand and machine tools. It has a slight tendency to split when nailed, but it has good screwholding and gluing characteristics (8). Machining tests conducted at the U. S. Forest Products Laboratory resulted in a rating of good in such operations as planing, shaping, turning, sanding, boring, and mortising (3). The wood is suitable for the manufacture of veneer. It is not adapted to steam bending (1, 8).

Uses

Crabwood is used locally for furniture and all kinds of interior and exterior construction work, shingles, wagon bodies, and interior work in boats as well as for spars and masts. It is preferred by native shoemakers for wooden heels.

The wood of higher density can be used for all types of construction. It is suitable for solid furniture and cabinet parts as well as for face veneer, plywood, house and factory flooring, and interior trim (8).

Identifying Features

The growth rings, when present, are marked by narrow concentric bands of parenchyma. The wood is diffuse-porous, with multiples of two or three cells common. The larger pores are readily visible without magnification.

Parenchyma surrounding the pores is not abundant. Marginal parenchyma is distinct as narrow, light-colored bands on the cross section. Parenchyma cells occasionally contain crystals. On a cross section the rays are readily visible with a lens and they form a distinct fleck, which is darker than the background, on the radial section. The rays are sometimes 1 millimeter high and rarely are storied. Crystals are common in the marginal ray cells, and gum deposits are present. The fibers are septate with simple pits. Normal gum ducts are absent, but traumatic intercellular canals are sometimes present.

Crabwood is sometimes mistaken for African mahogany (Khaya spp.). It is often very difficult to distinguish between the two woods without careful microscopic study.

Literature Cited

(1) British Forest Products Research Laboratory
1956. A Handbook of Hardwoods. Pp. 77-78, Appendix 3. Dept. of Scientific and Industrial Research, Forest Products Research, Her Majesty's Stationery Office, London.

(2) _____
1953. The Strength Properties of Timber. Dept. of Scientific and Industrial Research, Forest Products Research Bull. No. 28, p. 37. Her Majesty's Stationery Office, London.

(3) Davis, E. M.
1949. Exploratory Tests on Machining and Related Properties of Fifteen Tropical American Hardwoods. Report No. R1744. U. S. Forest Products Lab., Madison, Wis.

(4) Fanshawe, D. B.
1947. Studies of the Trees of British Guiana, I. Crabwood (Carapa guianensis). Trop. Woods No. 90, pp. 30-40. Yale Univ., New Haven, Conn.

(5) Harrar, Ellwood S.
1941. Some Physical Properties of Modern Cabinet Woods -- I. Hardness. Trop. Woods No. 68, pp. 1-11. Yale Univ., New Haven, Conn.

(6) _____
1942. Some Physical Properties of Modern Cabinet Woods -- III. Directional and Volume Shrinkage. Trop. Woods No. 71, pp. 26-32. Yale Univ., New Haven, Conn.

(7) Heck, G. E.
1937. Average Strength and Related Properties of Five Foreign Woods Tested at the Forest Products Laboratory. U. S. Forest Products Lab. Rept. No. 1139, 3 pp. Madison, Wis.

(8) Hess, Robert W., Wangaard, F. F., and Dickinson, Fred E.
1950. Properties and Uses of Tropical Woods -- II. Trop. Woods No. 97, pp. 46-52. Yale Univ., New Haven, Conn.

(9) Kynoch, William, and Norton, Newell A.
1938. Mechanical Properties of Certain Tropical Woods, Chiefly from South America. Bull. No. 7, 87 pp. Univ. of Michigan School of Forestry and Conservation, Ann Arbor, Mich.

(10) Record, S. J.
1941. American Timbers of the Mahogany Family. Trop. Woods No. 66, pp. 10-13. Yale Univ., New Haven, Conn.

(11) Torgeson, O. W.
1951. Schedules for the Kiln Drying of Wood. U. S. Forest Products Lab. Rept. No. D1791, 9 pp. Madison, Wis.

(12) Wangaard, Fred F., and Muschler, Arthur F.
1952. Properties and Uses of Tropical Woods -- III. Trop. Woods No. 98, pp. 67-70, 148-149, Yale Univ., New Haven, Conn.

Table 1.--Mechanical properties of crabwood (*Carapa guianensis*)[1] and mahogany (*Swietenia macrophylla*)[1]

(The mechanical properties of crabwood given here apply only to timber of density comparable to that shown in the table)

Property	Species	
	Crabwood (*Carapa guianensis*)	Mahogany (*Swietenia macrophylla*)
Moisture content		
Air dry.....percent	12	12
Specific gravity		
Based on volume when green and weight when ovendry.....	0.49	0.45
Static bending		
Fiber stress at proportional limit		
Air dry.....p.s.i.	9,650	7,830
Modulus of rupture		
Air dry.....p.s.i.	15,620	11,410
Modulus of elasticity		
Air dry.....1,000 p.s.i.	1,850	1,430
Work to maximum load		
Air dry.....in.-lb. per cu. in.	13.4	8.0
Maximum crushing strength		
Air dry.....p.s.i.	7,900	6,550
Hardness		
Air dry		
End.....lb.	1,670	1,030
Side.....lb.	1,220	840
Compression perpendicular to grain -- Stress at proportional limit		
Air dry.....p.s.i.	850	1,040
Shear		
Air dry.....p.s.i.	1,680	1,330

[1] The values for the specific gravity of crabwood are weighted averages of the average values given by the following sources: (3, 12, and unpublished Forest Products Laboratory results); the values for the mechanical properties of the wood are the results of tests on Brazilian *Carapa* made at the Yale School of Forestry (12). The values for the physical and mechanical properties of mahogany are weighted averages of the average values given by the following sources: (2, 5, 7, 9, 12).

Table 2.--Shrinkage values for crabwood (*Carapa guianensis*)[1] and mahogany (*Swietenia macrophylla*)[1]

Species	Shrinkage[2]		
	Radial	Tangential	Volumetric
	Percent	Percent	Percent
Crabwood (*Carapa guianensis*)	4.9	8.2	13.0
Mahogany (*Swietenia macrophylla*)	3.2	4.6	7.9

[1] The shrinkage values are weighted averages of the average values for the various species given by the following sources: crabwood (3, 6, 8, and unpublished Forest Products Laboratory data on Ecuadorian wood); mahogany (2, 6, 7, 9, 12).

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