THE WOOD OF AMBELANIA LAXA MUELL. ARG.

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RESUMEN

El leño de «Ambelania laxa» Muell. Arg. — Se estudia anatómicamente el leño y destaca la importancia que podría tener, por su liviandad, para construcciones de aviación, radio, etc.

Ambelania laxa (A. DC.) Muell. Arg., of the family *Apocynaceae,* is a small tree occurring in the 5-20 meter high understory of tall forests from Brazil to the Guianas. It is described and figured in Martius' *Flora brasiliensis* (8). The wood specimen herein described (Yale 22623; Ducke 163) was collected for the Yale School of Forestry by Dr. Adolpho Ducke on an inundated margin of the upper Río Negro in Amazonas, and made available for study through the courtesy of Prof. Samuel J. Record.

Although Bentham (1) reported in 1841 that on the Río Negro the wood of *Ambelania laxa* (*Tabernaemontana laxa* A. DC.) « from its excessive lightness, is used for various purposes instead of cork », apparently no value has been attached to the wood of this genus in recent years. However, in view of the present demands of the refrigerator, radio, and aviation industries for light-weight woods, and consequent interest in Balsa (*Ochroma*) substitutes, the possible future importance of the wood of *Ambelania* should not be disregarded. Record and Hess (11) report its weight as 9 lbs. per cu. ft. The woods of several species of the related genus *Alstonia* of Asia, Africa, and the Pacific Islands are among the lightest now known (3, 5, 6, 10).

The exceedingly light-weight wood of *Ambelania laxa* is unusually soft, and in common with many other light-weight woods (4, 6) it is nearly colorless, being whitish streaked with pale gray. It is rather lustrous, without distinctive taste or odor, and like the wood of *Alstonia spathulata* Bl. (3) is velvety to the touch. It also resembles *Alstonia* wood in having homogeneous rather than laminated structure (6) and widely scattered radial canals readily visible to the naked eye (2, 9). It is diffuse-porous, with barely visible growth rings from 0,5 to 2 mm wide marked by very narrow bands of slightly smaller tracheids. The pores are indistinct without a lens and inconspicuous with it because all of the wood elements are very thin-walled and the tracheids comprising the bulk of the wood are of about the same diameter as the pores. The rays are straight and, to the unaided eye, readily visible on radial, barely visible on transverse, and invisible on tangential sections. Wood parenchyma is visible with a lens on cross sections as very fine and closely spaced tangential lines.

Unlike all tropical light-weight woods investigated by Hyde (4), the wood of *Ambelania laxa* is harder and heavier near the pith than near the bark. As shown in figs. 1 and 2, the wood elements close to the intraxylary phloem are of smaller diameter than those formed later. The consequent finer texture of the first-formed wood accounts for its somewhat greater hardness, since there is no pronounced change in the proportion of the various types of wood elements as the stem ages. However, in *Ambelania* even a centrifugal decrease in the percentage of wood fibers, such as noted by Hyde, would not make for increased hardness away from the pith, since the tracheids commonly exceed wood parenchyma cells in diameter and length but not wall thickness.

It may be added that several of the gross morphological characteristics often said to be common to all trees producing light-weight woods (4, 6), are not found in *Ambelania laxa*. The bark (figs. 7, 8) is neither thick nor fibrous, and the leaves are neither very large nor soft in texture.

MINUTE ANATOMY OF THE WOOD

Pores (figs. 1, 2) very small to small, 33-89 μ, mostly 60-70 μ in diameter, scattered without definite pattern, mostly in multiples of 2-7, occasionally in clusters of 3-12, moderately numerous, 8-37, mostly about 20 per sq. mm. *Vessel members* (figs. 15-17) medium-sized to moderately long, 385-855 μ, mostly 500-600 μ, in length, cylindric to irregular in shape. Perforation plates horizontal or oblique, at ends of vessel members or some distance from them. Perforations simple, sometimes more than two to a vessel member (figs. 16, 17), usually with rather broad rims. Vascular pits numerous, generally alternate, vestured; usually with round border about 5-5,5 μ in diameter and slit-like to narrow lenticular, included apertures; occasionally diagonally elongated and then with borders up to 16 μ long. Intervascular pitting bordered, parenchyma-vessel pitting half-bordered, ray-vessel pitting half-bordered or unilaterally compound with one pit in ray covering 2-5 pits in vessel.

Tracheids with very thin walls (figs. 10-13) are the dominant element of the wood. They are short, 225-880 μ, mostly 500-700 μ long, fusiform to irregular in shape, with pointed or frequently blunt ends, mostly angular in cross section, 38-102 μ, mostly about 80 μ in diameter, with abundant vestured pitting in both radial and tangential walls. Pits mostly alternate, 5-5,5 μ in diameter, with diagonal, included, broad-lenticular to elliptic apertures and narrow, elliptic borders. Pitting between rays and tracheids half-bordered.

Wood parenchyma (figs. 1, 2, 4) metatracheal, in bands one cell wide and 1-5 tracheids apart. Wood parenchyma strands (figs. 3, 14) composed of 2-9, mostly 5-8 cells, and 220-875 μ, mostly 570-700 μ long. Wood parenchyma cells 11-22 μ in radial diameter, 32-49 μ, mostly about 40 μ, in tangential diameter, their walls with numerous simple pits.

Rays (figs. 1-4) numerous, 5-7 uniseriate and 2-4 biseriate (rarely triseriate) per mm of tangential section; extremely low, 35-450 μ high; extremely fine to fine, 11-38 μ wide; heterogeneous, fusiform to irregular in shape in tangential section, the

multiseriate often with uniseriate margins, only occasionally connecting vertically. Upright ray cells generally restricted to the margins of the rays; disjunctive, with tubular processes conspicuous in radial section (fig. 6). Procumbent ray cells only occasionally disjunctive and then with much shorter tubular processes than present between the upright cells.

Radial canals conspicuous (figs. 5, 7-9). Their position, form, and dried and somewhat disorganized contents indicate that they were originally filled with tissues composing leaf traces. In a specimen from a stem about $4\frac{1}{2}$ inches in diameter it was possible to trace three radial canals from leaf scars through the bark and wood for the depth of the specimen, which was about 1 inch in maximum thickness. Some sections of these canals showed remenants of leaf trace tissues in which smaller canals, similar in size and shape to the latex tubes of internal phloem, pith, and bark, were clearly visible (figs. 1, 2, 5). In this connection it should be noted that Desch (2) concluded from an examination of material extracted from the large radial canals in the wood of the related species *Alstonia congoensis* Engl. that the passages were originally filled with parenchyma containing latex canals. Sections through the leaf scars of fresh stems of the related species *Nerium oleander* L. show leaf traces similar in size and form to the radial canals found in *Ambelania* wood. In the fresh material of *Nerium*, parenchyma containing latex tubes occupies a large part of the leaf trace, bearing out Desch's suggestion as to the probable original structure of the radial canals in *Alstonia*.

Although latex tubes have been reported in the rays of some apocynaceous woods, including those of *Beaumontia grandiflora* Wall. (7, 12), *Landolphia Watsoni* (7), and possibly *Alstonia scholaris* (9), they were not observed in the wood of *Ambelania*.

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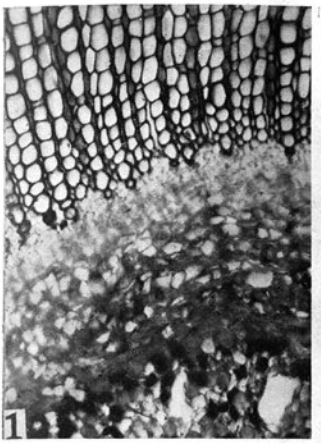
PLATE I

1. Cross section showing finer texture of wood toward center of stem, and latex tubes in intraxylary phloem and pith.
2. Cross section showing coarser texture of wood toward periphery of the stem and latex tubes in phloem.
3. Tangential section of xylem showing heterogeneous rays.
4. Radial section of xylem showing heterogeneous ray with disjunctive upright cells.
5. Tangential section of xylem bordering a radial canal showing latex tubes in leaf trace tissue remaining in the canal.
6. Radial section of xylem showing tubular processes between disjunctive upright ray cells.

Figures 1-5, × 91 ; fig. 6, × 475.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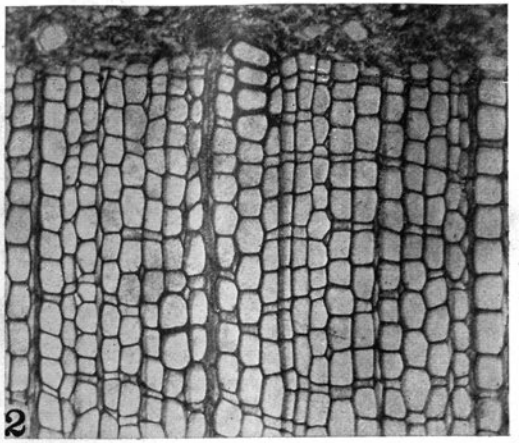
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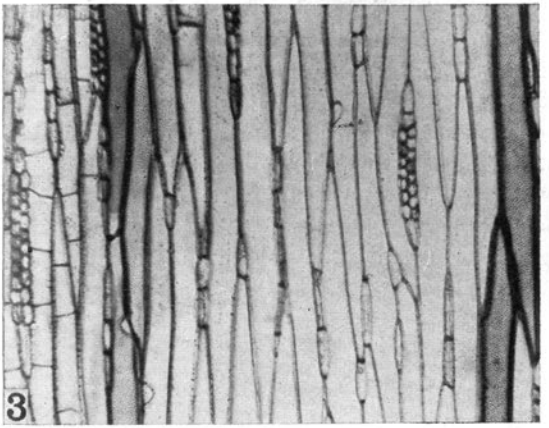
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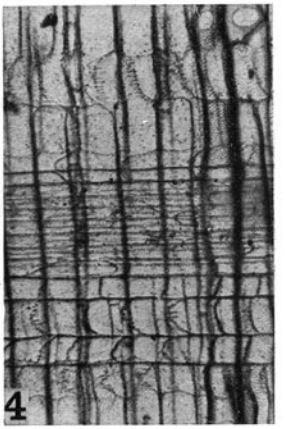
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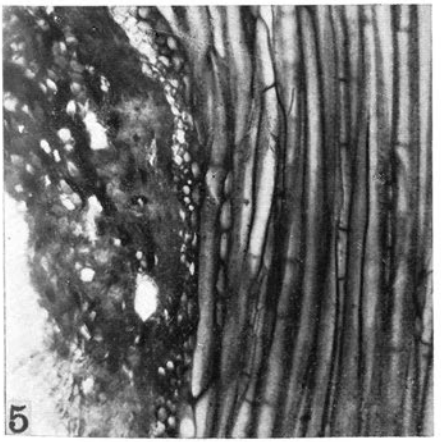
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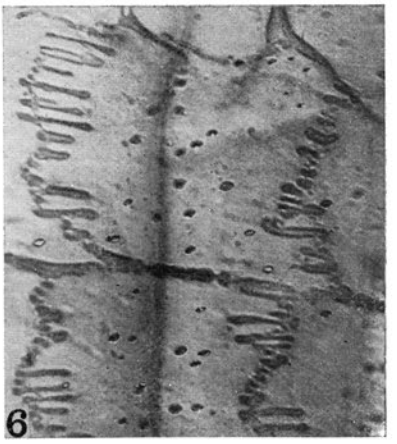
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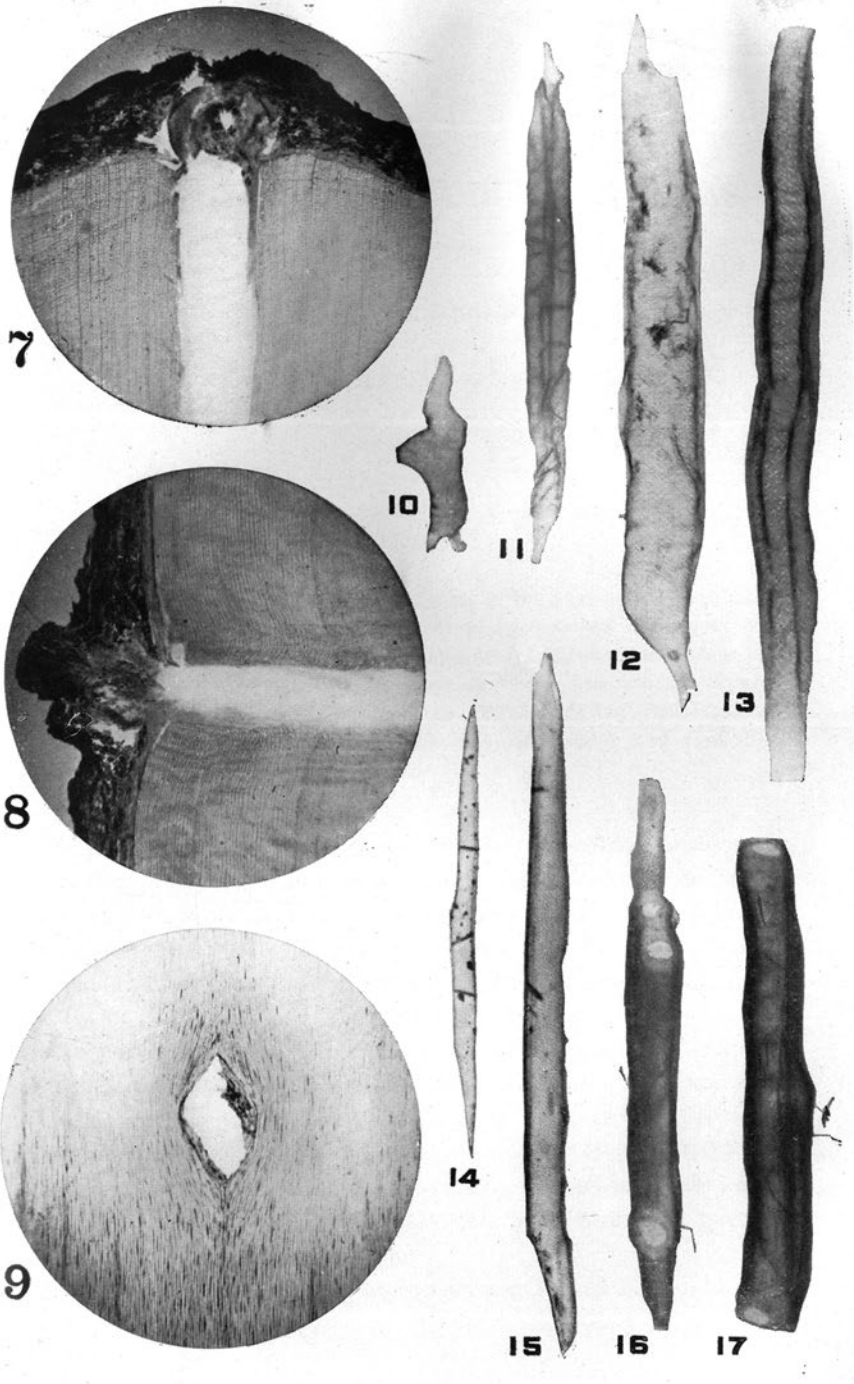
PLATE II

7. Cross section through a leaf scar showing bark, wood, and remnants of leaf trace tissues in radial canal.
8. Radial section through a leaf scar showing bark, wood, and remnants of leaf trace tissues in radial canal.
9. Tangential section of xylem showing radial canal containing remnants of leaf trace tissue.
10-13. Tracheids showing variation in size and form.
14. Small wood parenchyma strand.
15-17. Vessel members showing variation in size and form; note three perforation plates in figs. 16, 17.

Figures 7-9, × 8 1/2; figs. 10-17, × 112.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