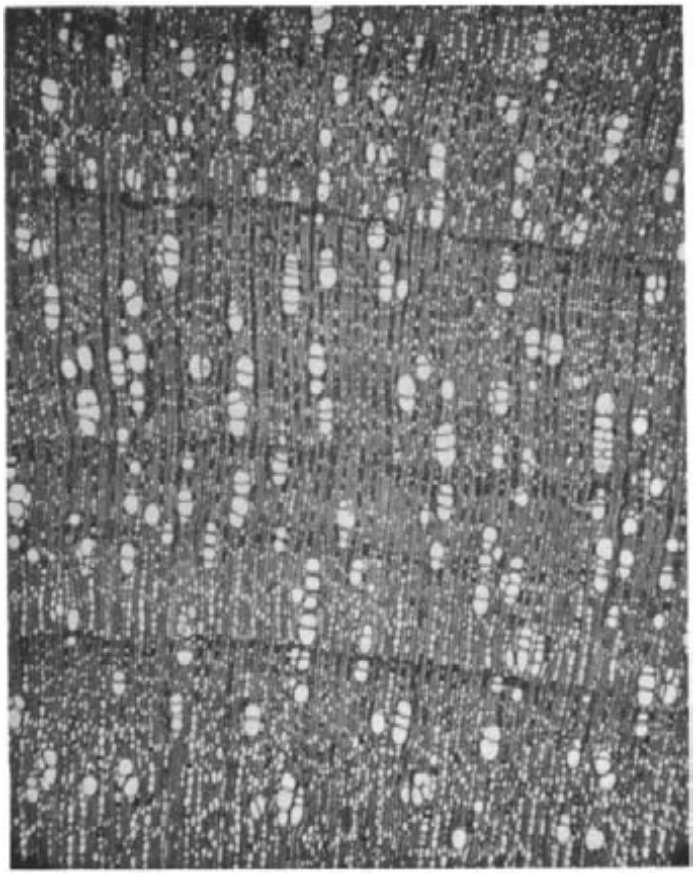
# WOOD ANATOMY OF THE NEOTROPICAL SAPOTACEAE

## *VII. CHRYSOPHYLLUM*

*RESEARCH PAPER FPL 331*

*FOREST PRODUCTS LABORATORY*
*FOREST SERVICE*
*U.S. DEPARTMENT OF AGRICULTURE*
*MADISON, WIS.*

*1978*



# Preface

The Sapotaceae form an important part of the ecosystem in the neotropics; forexample, limited inventories made in the Amazon Basin indicate that this family makes up about 25% of the standing timber volume there. This would represent an astronomical volume of timber but at present only a very small fraction is being utilized. Obviously, better information would help utilization--expecially if that information can result in clear identification of species.

The Sapotaceae represent a well-marked and natural family but the homogeneous nature of their floral characters makes generic identification extremely difficult. This in turn is responsible for the extensivesynonomy.

Baehni and Bernardi state the situation with respect to Peru but this would hold equally well for all of the neotropics: "For instance, of the 39 species and one variety described hereunder, 13 are known only from the Peruvian type; and 23 taxa here presented have no fruit or seed. It is universally admitted that the taxonomy of this family is almost impossible without--for the same species--leaves, flowers, fruits, and seeds."

Unfortunately, species continue to be named on the basis of flowering or fruiting material alone and this continues to add to the already confused state of affairs.

This paper on Chrysophyllum is the seventh in a series describing the anatomy of the secondary xylem of the neotropical Sapotaceae. The earlier papers, all by the same author and under the same general heading,include:

I. Bumelia--Research Paper FPL 325
II. Mastichodendron--Research Paper FPL 326
III. Dipholis--Research Paper FPL 327
IV. Achrouteria--Research Paper FPL 328
V. Calocarpum--Research Paper FPL 329
VI. Chloroluma--Research Paper FPL 330

Publication in this manner will afford interested anatomists and taxonomists the time to make known their opinions and all such information is hereby solicited. At the termination of this series the data will be assembled into a single comprehensive unit.

# WOOD ANATOMY OF NEOTROPICAL SAPOTACEAE:

## VII. CHRYSOPHYLLUM

By

B. F. Kukachka, Botanist[1/]

Forest Products Laboratory, Forest Service
U.S. Department of Agriculture

---

## Abstract

In the neotropics, the genus Chrysophyllum consists of C. cainito and a number of species which have recently been assigned to the genus Cynodendron. Many taxonomists have not accepted the new genus Cynodendron and this is supported by the present study of the wood anatomy. In this restricted sense, Chrysophyllum consists of a group of closely related species that are readily identifiable by their anatomical structure.

## Introduction

Chrysophyllum, in the widest sense, consists of a large number of species of pan-tropical distribution. The accepted type species, Chrysophyllum cainito L. was established in 1753 and since that time the genus has grown in numbers with a corresponding increase in complexity. Cronquist (5,6) maintained 40 species native to the Americas after excluding a number of species considered to belong to the genera Ecclinusa, Oxythece (Neoxythece), and Pradosia. However, his treatment has species which are now regarded as belonging to Chloroluma and Prieurella.

Aubreville (1,2) regarded Chrysophyllum cainito L. as monotypic in the Americas and segregated about a dozen genera, some old and some newly described, from the old genus Chrysophyllum. The remaining species of "true" Chrysophyllum in the Americas were placed in the new genus Cynodendron created by Baehni (3), which is based on the type species Cynodendron oliviforme (L.) Baegni. Baehni (3) in his "Inventory of

---

1/ Pioneer Research Unit, FPL. The Laboratory is maintained at Madison, Wis. in cooperation with the University of Wisconsin, Madison.

the Genera" maintained Chrysophyllum cainito L. as the type of his pan-tropical Chrysophyllum and reduced to synonomy practically all the genera which previously had been excluded by Cronquist and Aubreville.

Apparently the taxonomic difference between Chrysophyllum cainito and the species assigned to Cynodendron lies in the character of the fruit: that of cainito being several-seeded while those of Cynodendron are one-seeded.

Baehni and Bernardi (4) state "For specimens devoid of fruit, the identification of Cynodendron and Chrysophyllum will always be hypothetical." This is perhaps the best taxonomic summation of the current problem.

From the anatomical standpoint, the first generic description of the American species was by Record (7); this description is very brief and apparently confused because of the inclusion of several, now-excluded genera.

The present anatomical description is based on wood specimens of Chrysophyllum canito and the species assigned to Cynodendron by Aubreville and Baehni. From the standpoint of wood anatomy the species investigated form a very closely related group which is readily identifiable. The small differences encountered are quantitative only and well within the range of variability to be expected within any given genus. No feature or combination of features was found in the anatomy of Chrysophyllum cainito that would separate it from the species that have referred to Cynodendron. Because of the close anatomical relationship and because Chrysophyllum cainito L. is the type species, the generic name Chrysophyllum is adopted here; which is in accord with most American taxonomists.

## Description

Based on specimens of acreanum, argenteum, auratum, cainito, marginatum, mexicanum, oliviforme, ovale, panamense, and revolutum (table 1).

General: Wood gray to light brown; without luster. No distinction in color between heartwood and sapwood. Growth rings distinct in oliviforme and marginatum but obscure or indistinct in other species (fig. 1). Sometimes apparently demarcated by zones which are relatively free of parenchyma. Wood heavy with a specific gravity range of individual specimens from 0.60 to 1.04 with an overall average of 0.88.

Anatomical:

Pores essentially diffuse (figs. 1,5,7) but with a tendency toward radial-echelon arrangement in marginatum (fig. 3). Pores commonly in radial multiples of 2-4 and occasionally to 6; rarely longer. Maximum pore diameter of individual specimens ranges from 79 to 197 µm: smallest in acreanum (79 µm, fig. 5), largest in auratum and cainito (197 µm, fig. 7).

Vessel member length averages 700 µm for all species; shortest average in marginatum (530 µm) and longest in oliviforme (820 µm).

Tyloses commonly thin-walled but frequently thick-walled or sclerotic in the denser specimens. Very large crystals were observed in the tyloses of most specimens but were not seen in the specimens of acreanum, argenteum or marginatum. Inter-vessel pit-pair diameter 6-8 µm in acreanum, argenteum, and marginatum; 8-10 µm in other species. Perforations simple.

Axial parenchyma typically reticulate (figs. 2,4,6,8); the cells characteristically without colored contents, crystals, or silica.

Wood rays 1-3(4) seriate; heterocellular. Vertical fusions common. The maximum body height of the 2-4 seriate portion ranges from 79 to 710 µm; very inconsistent even within species and of no diagnostic value. Vessel-ray pitting irregular in shape and size. Silica common in the wood rays and commonly confined to cells with yellow-brown contents. The silica particles are commonly spheroidal or sometimes irregular (clinker), ranging in size from maxima of 8 to 30 µm in different specimens (table 2). The larger particles are frequently of the clinker type. A few crystals were observed in the wood rays of two specimens of oliviforme.

Wood fibers thick-walled; the fiber length averages for the different specimens range from 1.22 to 2.10 mm with an overall generic average of 1.64 mm. Vascular tracheids few to rare and not observed in the macerated material of many specimens.

One specimen of mexicanum (Skutch 1333) cited by Cronquist (5) apparently does not belong here because of the presence of two-sized crystals and microcrystals which are frequent in the axial parenchyma and wood rays. The characters would suggest Mastichodendron but the presence of silica in the wood rays and the large inter-vessel pitting rule out the latter. According to Cronquist, herbarium material is deposited at A, F, NY, and US.

Diagnostic features: Wood gray or light brown; heavy. Essentially diffuse-porous with reticulate parenchyma. Wood rays with silica. Axial parenchyma free of contents.

## Literature Cited


1. Aubreville, A.
   1961. Notes sur des Chrysophylees Americaines. Adansonia 1(1):9-38.

2. Aubreville, A.
   1964. Sapotacées. Adansonia, Mémoire No. 1:1-157.

3. Baehni, Charles.
   1965. Mémoires sur les Sapotacées. III. Inventaire des genres. Boissiera II:1-262.

4. Baehni, Charles, and Luciano Bernarni.
   1970. Flora of Peru. Field Mus. XIII: Part V-A, No. 3. 135-177.

5. Cronquist, Arthur.
   1945. Studies in the Sapotaceae. I. The North American species of Chrysophyllum. Bull. Torrey Bot. Club. 72(2):191-204.

6. Cronquist, Arthur.
   1946. Studies in the Sapotaceae. V. The South American species of Chrysophyllum. Bull. Torrey Bot. Club. 73(3):286-311.

7. Record, Samuel J.
   1939. American woods of the family Sapotaceae. Tropical Woods 59:30-32.

Table 1.--Wood specimens of Chrysophyllum examined

| Species | Collector and number | | Origin | Number of wood collection | |
|---|---|---|---|---|---|
| | | | | MADw | SJRw*** |
| acreanum M. A. C. Smith | Krukoff | 5593(TYPE) | Brazil | 9833 | |
| | Krukoff | 8254 | Brazil | 31998 | |
| argenteum Jacq. | Forest Dept. | 283 | Trinidad | 16800 | |
| | Leonard | 2535 | Haiti | | 4879 |
| | Stern-Wasshausen | 2389 | Dominica | 24114 | |
| | Stoffers | 127 | Curacao | 32961 | |
| auratum Miq. | Froes | 65 | Brazil | | 27352H |
| | Froes | 102 | Brazil | | 27373H |
| | Lindeman | 3735 | Surinam | 32933 | |
| | Lindeman | 6489 | Surinam | 32939 | |
| | Little | 34 | Ecuador | 24370 | |
| | Maguire | 23886 | Surinam | 11938 | 44074 |
| | Maguire et al | 48030 | Brazil | 20237 | |
| | Williams | 3945 | Peru | 19908 | 18338 |
| | Williams-Alston | 11074 | Venezuela | 32919 | |
| | Forest Dept. | 3301 | Guyana | 3651 | 43740 |
| cainito L | Commercial | | Panama | 3210 | |
| | Commercia1 | | Puerto Rico | 3597 | |
| | Comercia1 | 3 | Costa Rica | 11708 | 47884 |
| | Cooper-Slater | 264 | Panama | | 10617 |
| | Cooper-Slater | 247 | Panama | 32902 | 10600 |
| | Forest Service | 103 | Haiti | | 19577 |
| | Forgeson | 19 | Panama | | 50964 |
| | Fors | 77 | Cuba | 13786 | 13377 |
| | Gill-Whitford | 89 | Cuba | | 9100 |
| | IICA | Z-38 | Costa Rica | 24771 | |
| | Kluge | 49 | Panama | | 7248 |
| | Schiffino | 4 | Dominican Rep. | | 35155 |
| | Shank | 38 | Nicaragua | | 46831 |
| | Shank | 116 | Nicaragua | | 46902 |
| | Skutch | 1330 | Guatemala | | 33864H |
| | stern et al | 853 | Panama | | 55104 |
| marginatum (H. & A,) Radlk. | Bosques-Yerb. | 314 | Argentina | 13706 | 23540 |
| | Curran | 691 | Argentina | | 1702 |
| | Curran | 713 | Argentina | | 1719 |
| | Lindeman-de Haas | 1009 | Brazil | 32977 | |
| | venturi | 18 | Argentina | | 22803H |
| mexicanum Brand, ex Standl. | Castillo | 21 | Belize | | 21482 |
| | Maderas Trop. | 20 | Mexico | 11244 | 47915 |
| | Skutch | 1333* | Guatemala | | 22983H |
| | Williams | 8643 | Mexico | 23438 | 34647 |

(Page 1 of 2)

Table 1.--Wood specimens of Chrysophyllum examined--con.

| Species | Collector and number | | Origin | Number of wood collection | |
|---|---|---|---|---|---|
| | | | | MADw | SJRw*** |
| nitidum G.F.W. Mey | Forest Dept. | 4757** | Guyana | 3653 | 46443 |
| oliviforme | Bucher | sn | Cuba | | 16139 |
| | Caldwell | 8731 | Florida | 1283 | 49259 |
| | Field Mus. | sn | Puerto Rico | 32908 | 4520 |
| | Fors | 192 | Cuba | 13855 | |
| | Gill-Whitford | 41 | Cuba | | 9052 |
| | Gill-Whitford | 84 | Cuba | | 9095 |
| | Gillis | 11983 | Bahamas | 28438 | |
| | Judd | 2594 | Hawaii | | 32252 |
| | Harts-Smith | sn | Florida | 12902 | |
| | Miller | 1645 | Puerto Rico | 20872 | |
| | Rhoads | 8314 | Florida | 9340 | 49051 |
| | Scarff | 11 | Dominican Rep. | | 35301 |
| | Scott | sn | Florida | 13541 | |
| | Stern | 140 | Florida | | 49466 |
| | Stern-Brizicky | 383 | Florida | | 51187 |
| | Stern-Brizicky | 420 | Florida | | 51216 |
| | Wilson | 15 | Florida | 15959 | |
| | 10th Census | 135 | Florida | | 5179 |
| ovale Rusby | Schunke | 4630 | Peru | 33040 | |
| panamense Pittier | Cooper | 353 | Panama | 32898 | 11946 |
| | Stork | 1669 | Costa Rica | | 38464 |
| | Wurdack-Adderley | 43679 | Venezuela | | 54437 |
| revolutum Mart. and Eichl. | Williams | 5522 | Peru | 16345 | 18766 |
| | Williams | 6140 | Peru | 16346 | 18910 |
| | Williams | 6655 | Peru | 32904 | 19029 |
| | Williams | 6900 | Peru | 16343 | 19097 |
| unassigned | Acosta-Solis | 6394 | Ecuador | | 45158 |
| | Acosta-Solis | 6456 | Ecuador | | 45202 |
| | Field Museum | 15011 | Puerto Rico | | 10911 |
| | Kluge | 19 | Belize | | 7574 |
| | Krukoff | 6605 | Brazil | 12562 | 36762 |
| | Maguire et al | 54831 | Surinam | 22773 | |
| | Pittier | 309 | Venezuela | | 8295 |
| | Woytkowski | 5 | Peru | | 37792 |
| | Commercial | 29 | Honduras | 23098 | |

* Wood doubtfully of this species or genus.
** The MADw and SJRw are different and do not belong in this genus
*** Wood number with H are from the Harvard Wood Collection.

Table 2.--Silicacontent of some *Chrysophyllum* species

| Species | Collector | | Country | Silica* |
|---|---|---|---|---|
| | | | | Pct |
| cainito | Shank | 116 | Nicaragua | 0.25 |
| marginatum | Lindeman-de Haas | 1347 | Brazil (Parana) | 0.54 |
| oliviforme | Caldwell | 8731 | Florida | 0.25 |
| panamense | Stork | 1669 | Costa Rica | 0.96 |
| revolutum | Williams | 6140 | Peru | 1.13 |

* Based on ovendry weight of the wood.

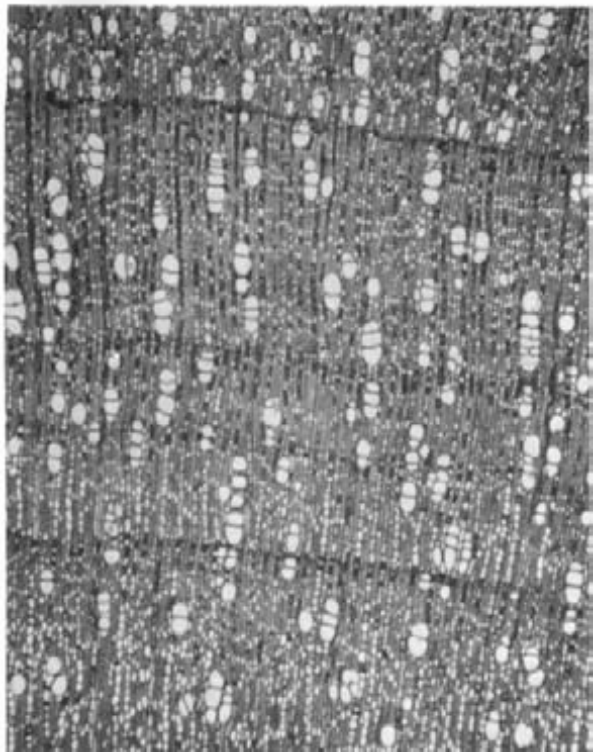


Figure 1.--C. oliviforme, showing distinct growth rings and typical pore and parenchyma arrangement (Stern 140) X 30.

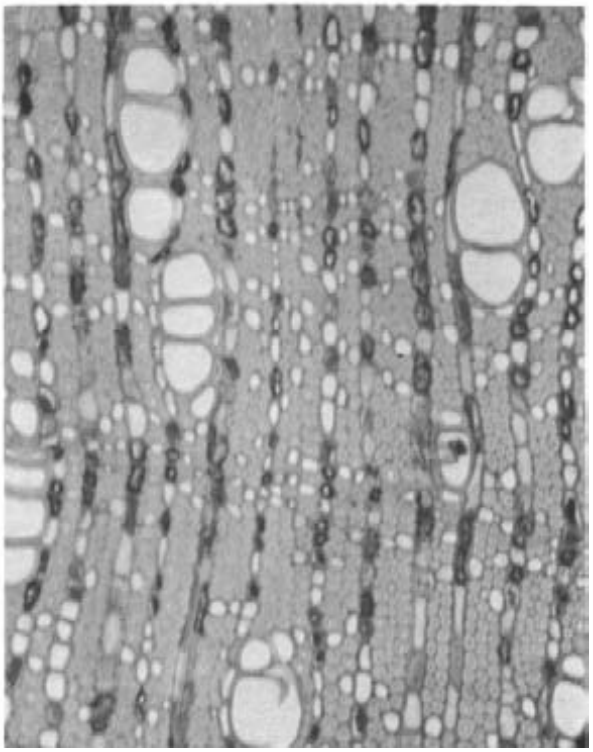


Figure 2.--C. oliviforme, but showing parenchyma detail. X 110.

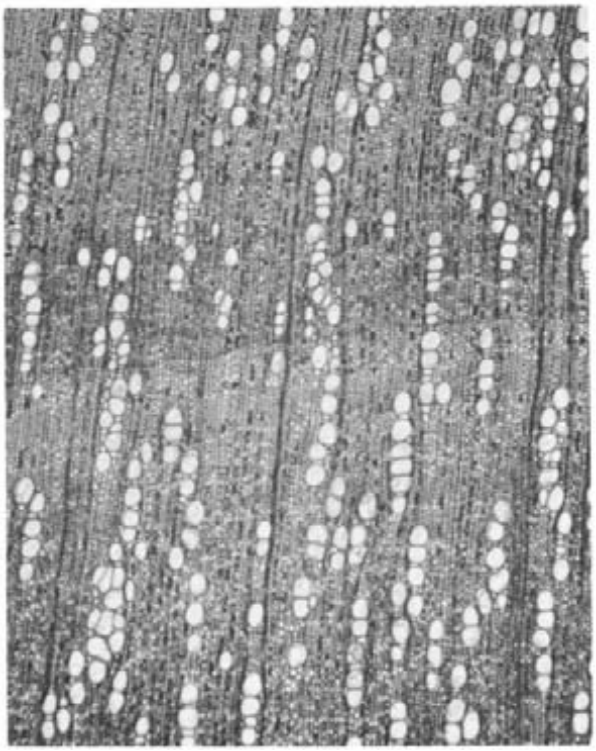


Figure 3.--C. marginatum showing radial-echelon arrangement of pores. (Venturi 18) X 30.

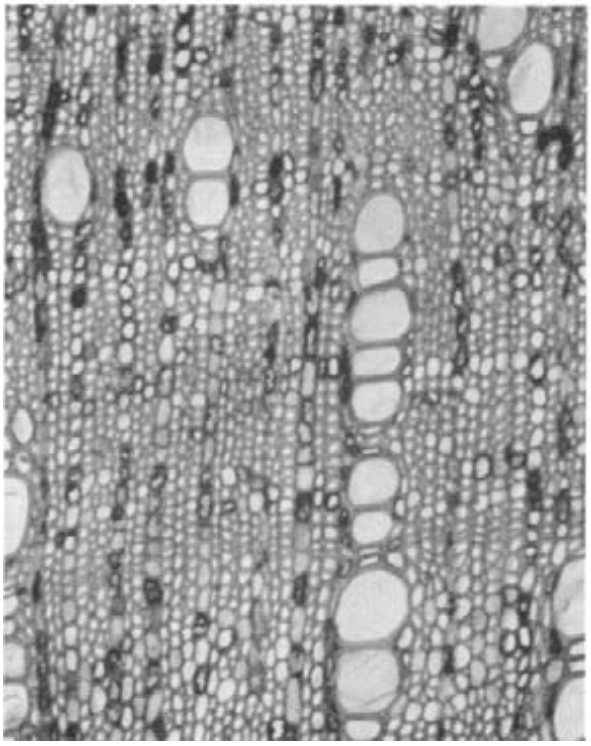


Figure 4.--C. marginatum but showing parenchyma detail. X 110.



2.5 – 8 – 11 – 78

★ U.S. GOVERNMENT PRINTING OFFICE: 1979–650-639

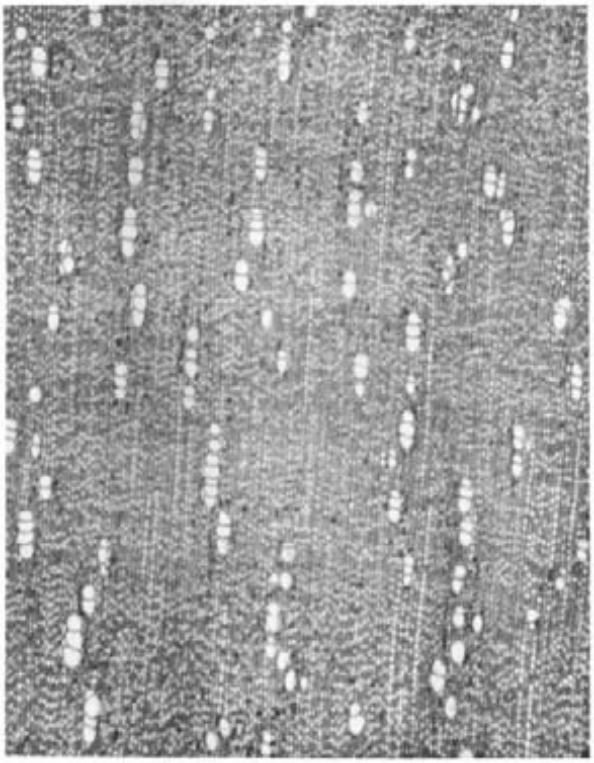


Figure 5.-- C. acreanum showing general arrangement of pores and parenchyma and the very small pores of this species (Krukoff 5593) X 30.

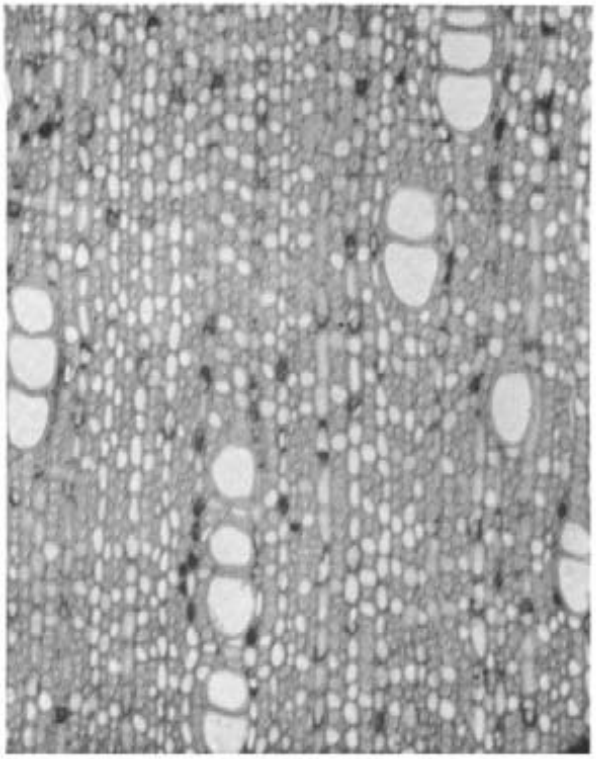


Figure 6.--C. acreanum but showing parenchyma detail. X 110.

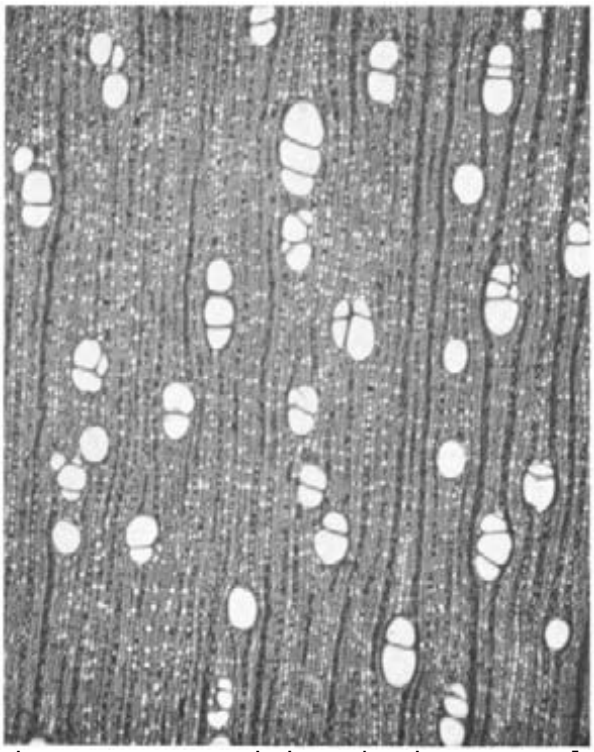


Figure 7.--C. cainito showing general arrangement of pores and parenchyma and the large pores of this species. (Forgeson 19) X 30.

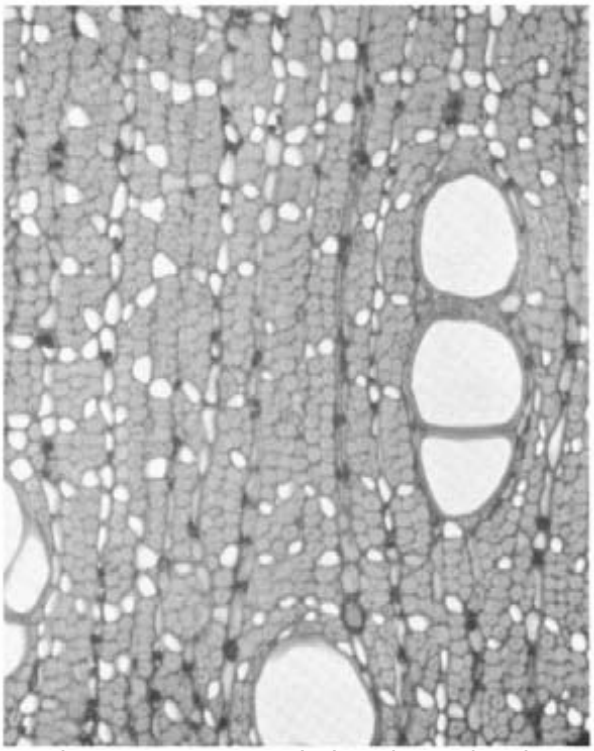


Figure 8.--C. cainito but showing parenchyma detail. X 110.