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WOOD ANATOMY OF THE NEOTROPICAL SAPOTACEAE: VII. CHRYSOPHYLLUM. (U)  
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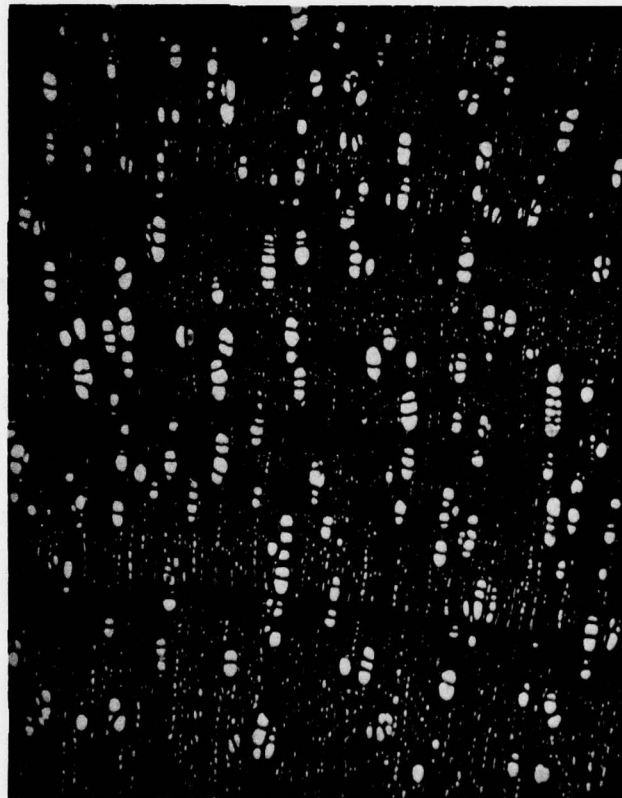
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**WOOD ANATOMY  
OF THE  
NEOTROPICAL SAPOTACEAE  
VII. CHRYSOPHYLLUM**

RESEARCH PAPER FPL 331

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

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## Preface

The Sapotaceae form an important part of the ecosystem in the neotropics; for example, 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--especially 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 extensive synonymy.

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.

6 WOOD ANATOMY OF NEOTROPICAL SAPOTACEAE:  
VII. CHRYSOPHYLLUM #A068034

10 By B. F. Kukachka ~~Botanist~~<sup>1/</sup>

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

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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.

9 Forest Service research papers

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.) Baehni. 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.

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the Genera" maintained Chrysophyllum cainito L. as the type of his pan-tropical Chrysophyllum and reduced to synonymy 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 accreanum, 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  $\mu\text{m}$ : smallest in acreanum (79  $\mu\text{m}$ , fig. 5), largest in auratum and cainito (197  $\mu\text{m}$ , fig. 7).

Vessel member length averages 700  $\mu\text{m}$  for all species; shortest average in marginatum (530  $\mu\text{m}$ ) and longest in oliviforme (820  $\mu\text{m}$ ).

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  $\mu\text{m}$  in acreanum, argenteum, and marginatum; 8-10  $\mu\text{m}$  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  $\mu\text{m}$ ; 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  $\mu\text{m}$  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.

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Literature Cited

1. Aubreville, A.  
1961. Notes sur des Chrysophylées 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.



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Wood anatomy of neotropical Sapotaceae:  
VII. Chrysophyllum, by B. F. Kukachka. Res.  
Pap. FPL 331, FPL, For. Serv., USDA. 9 p.  
Madison, Wis.

In neotropica, the genus Chrysophyllum consists of C. cainito and a number of species recently assigned to the genus Cynodendron. Many taxonomists have not accepted the new genus, and the present study of wood anatomy supports the question. In this restricted sense, Chrysophyllum consists of closely related species readily identifiable by their anatomical structure.

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

Species	Collector and number		Origin	Number of wood collection	
				MADw	SJRw***
accreanum 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	
	Commercial		Puerto Rico	3597	
	Commercial	3	Costa Rica	11702	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

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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
	Marts-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.

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Table 2.--Silica content of some Chrysophyllum species

Species	Collector		Country	Silica*
				<u>Pct</u>
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 oven-dry weight of the wood.



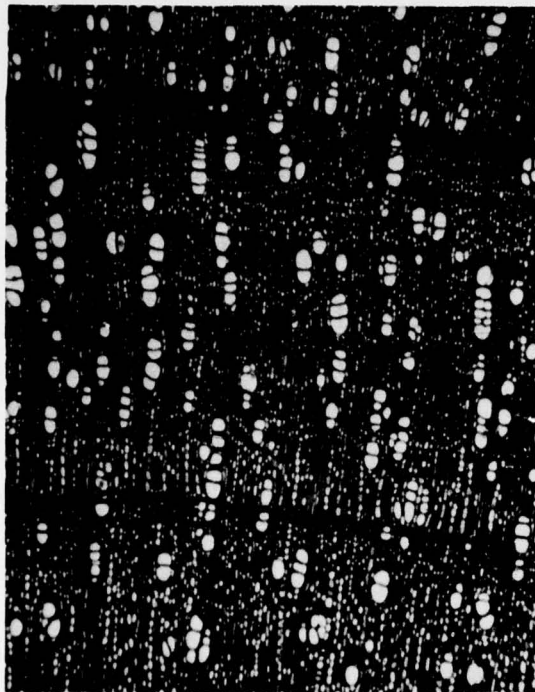


Figure 1.--*C. oliviforme*, showing distinct growth rings and typical pore and parenchyma arrangement (Stern 140) X 30.

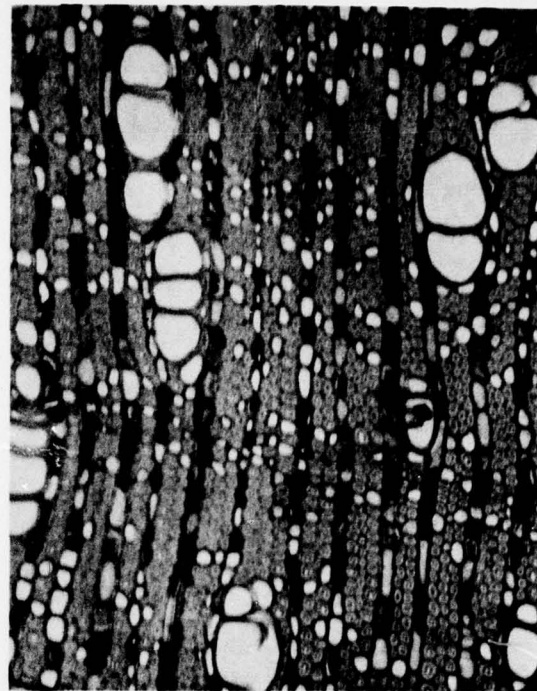


Figure 2.--*C. oliviforme*, but showing parenchyma detail. X 110.



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

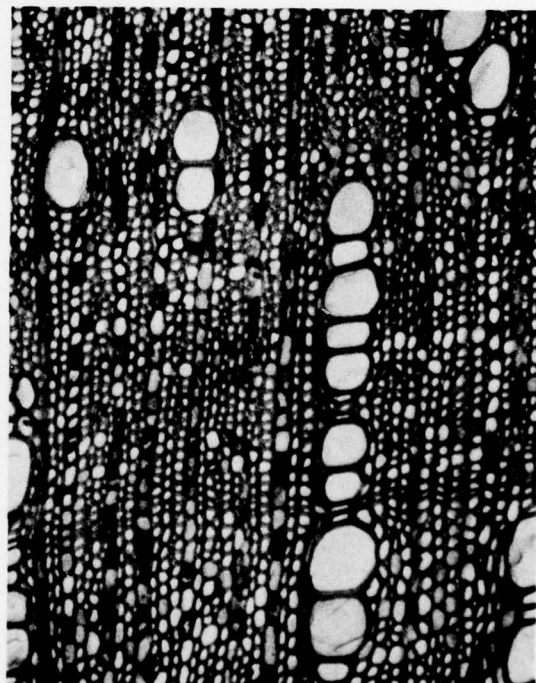


Figure 4.--*C. marginatum* but showing parenchyma detail. X 110.

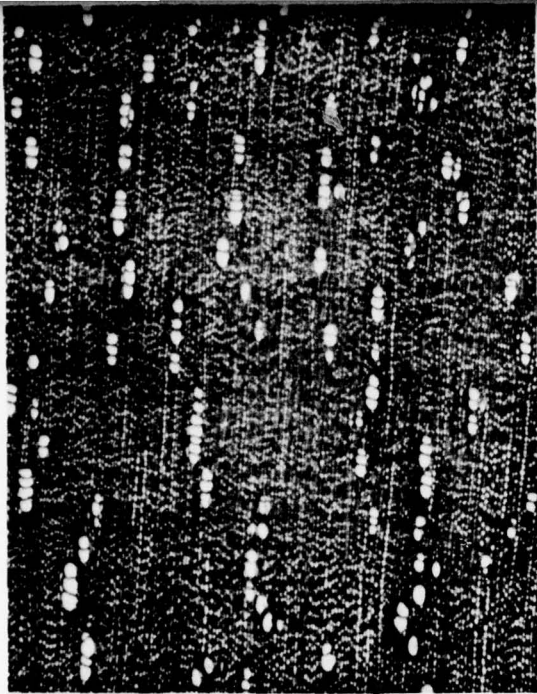


Figure 5.--C. acreanum showing general arrangement of pores and parenchyma and the very small pores of this species (Krukoff 5593) X 30.

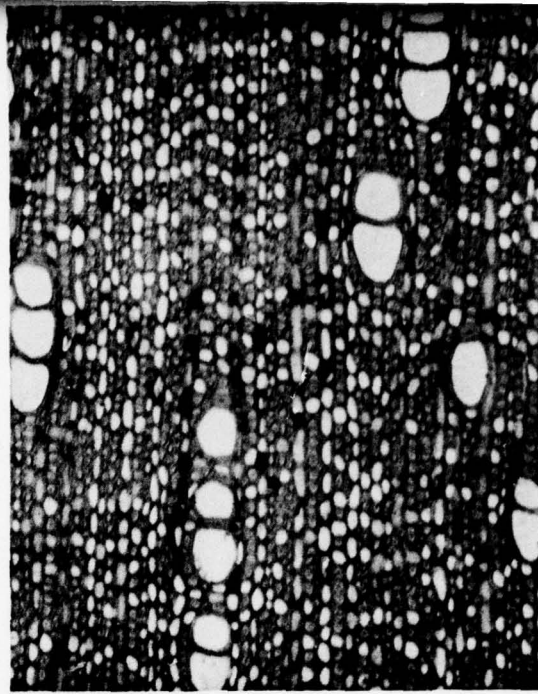


Figure 6.--C. acreanum but showing parenchyma detail. X 110.

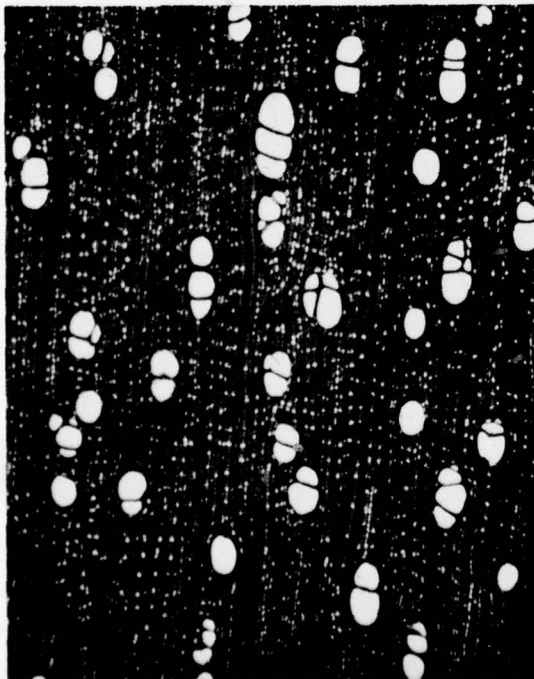


Figure 7.--C. cainito showing general arrangement of pores and parenchyma and the large pores of this species. (Forgeson 19) X 30.

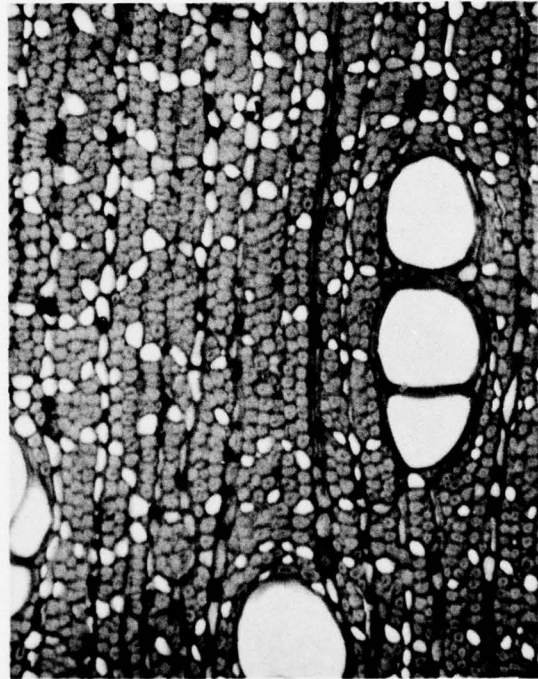


Figure 8.--C. cainito but showing parenchyma detail. X 110.