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WOOD ANATOMY OF THE NEOTROPICAL SAPOTACEAE. X. MICROPHOLIS. (U)
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Wood Anatomy of the Neotropical Sapotaceae. X. *Micropholis*

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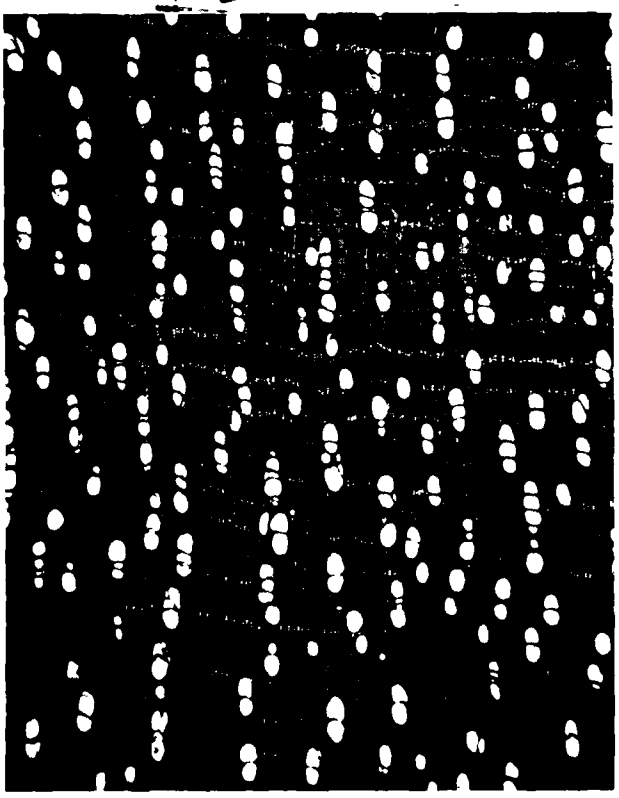
Research Paper FPL 351

Department of Agriculture
Forest Service
Forest Products Laboratory
1979



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Abstract

The genus Micropholis, originally maintained as a section of the large pan-tropical genus Sideroxylon, was raised to generic status in 1891 by Pierre. The genus was adopted by most students of the family with the exception of Baehni who reduced the various species to synonomy within his very large and overwhelming genus Pouteria. This study of the wood anatomy confirms the establishment of Micropholis as a distinct entity among the American Sapotaceae.

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 percent 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 synonomy. 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 Micropholis is the tenth 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
VII. Chrysophyllum--Research Paper FPL 331
VIII. Diploon--Research Paper FPL 349
IX. Pseudoxythece--Research Paper FPL 350

WOOD ANATOMY OF THE NEOTHROPICAL SAPOTACEAE

X. MICROPHOLIS

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By

B. F. Kukachka, Botanist[1/]

Forest Products Laboratory,[2/] Forest Service
U.S. Department of Agriculture

Introduction

In 1891 Pierre segregated a number of species from the pan-tropical genus Sideroxylon and placed them in his newly described genus Micropholis, limited to tropical America. His genus was adopted by recent monographers Aubreville (1), Cronquist (6), and Eyma (7), but Baehni (3) transferred most of the Micropholis species to synonomy under Pouteria and a few to the extra-American genera Xantholis and Planchonella.

The genus Micropholis is readily recognized by the very fine and close nervation of the leaves, a feature it shares with Gomphiluma, Myrtiluma, Paramicropholis, and some species of Neoxythece. Anatomically, Paramicropholis appears to be closely related to Micropholis.

Flora of Peru (4) cites no species of Micropholis as such, but six of the 20 species of Pouteria listed should be referred to Micropholis. Mastichodendron williamsii (Baehni) Baehni ex Bernardi, cited in the latter Flora, is also referrable to Micropholis. Flora of Panama (5) cites no species of Micropholis although barbourii (Barbour 1052) and an unassigned specimen (IICA-GGC 55) apparently belong there.

Micropholis is one of the larger genera of the neotropical Sapotaceae and may actually be the largest. Accordingly, its range of growth is rather extensive: in South America northward from northern Argentina, Bolivia, and Amazonian Peru, including Pacific Colombia and Ecuador; the

1/ Pioneer Research Unit, Forest Products Laboratory.

2/ Maintained at Madison, Wis., in cooperation with the University of Wisconsin, Madison.

larger islands of the West Indies; Panama, southern Mexico, Belize, and Guatemala. It is surprising that the genus is unknown between Panama and Guatemala. Four species are known from the West Indies (6) and two or three from Mexico and Central America. In South America there may be about 35 species but the available literature only states that there are many species, frequently difficult to identify.

The wood anatomy of Micropholis displays the variability that would normally be expected to occur within a large genus and, in this instance, it is primarily with respect to pore arrangement, pore size, inter-vessel pit size, and the occurrence of crystalliferous strands in two species.

The northernmost representative of the genus in continental North America is Micropholis mexicana Gilly ex Cronquist native to southern Mexico, Belize, and Izabal Department of Guatemala (9). In the Samuel J. Record collections this species is represented by herbarium material and a wood specimen (Kinloch 216) collected in Belize. The herbarium material was identified by Cronquist but apparently there was a mix-up in the numbering of the wood specimen because it proved to be a species of Vitex (family Verbenaceae).

The only available anatomical description is that by Record (8) based on specimens of six species from Brazil and the Guianas; it is obviously inadequate and somewhat confused.

Description

Based on specimens of apiculata (1), barbourii (1), belemensis (1), chrysophylloides (1), cylindrocarpa (5), cyrtobotrya (4), duckeana (4), egensis (2), flavescens (1), garciniifolia (2), gardneriana (4), guyanensis (23), killipii (1), cf. linoneura (1), madeirensis (1), martiana (1), melinonina (1), melinonii (5), mensalis (1), resinifera (1), splendens (2), spruceana (3), truncifiora (2), ulei (7), venulosa (27), williamii (1), williamsii (1), and 37 unassigned wood specimens. A total of 141 wood specimens were sectioned and critically examined. Of this number, 104 were named specimens representing 27 species and 37 specimens received as Micropholis sp., Sideroxylon, and Pouteria or simply as Sapotaceae (table 1).

General: Wood gray to light brown with little or no luster. No distinction in color between heartwood and sapwood. Growth rings indistinct or in a few species demarcated by a very narrow zone of flattened wood fibers. Wood moderately heavy to heavy, the specific gravity of individual specimens ranging from 0.50 to 0.98 with a generic average of 0.79. Bark thin, ranging from 2-5 mm in thickness.

Anatomical:

Pore arrangement various, ranging from diffuse (fig. 1) to echelon fig. 3) or in "widely" spaced radial tiles (fig. 4). Pores commonly in radial multiples of 2-4 and occasionally to 6; rarely longer. Maximum pore diameter of individual specimens ranging from 55 µm to 213 µm; in the majority of specimens between 79 µm and 150 µm.

Vessel member length averages 740 µm for the species used in this study; ranging from an average of 590 µm in egensis to 930 µm in resinifera. Inter-vessel pit diameter may serve to divide the genus into three groups: those with diameters to 4 µm, to 6 µm, and to 8 µm (see table 2). Tyloses when present, generally thin-walled; sclerotic tyloses observed in five specimens of guyanensis, duckeana (Froes 72), spruceana (Krukoff 6683) and one unassigned specimen (Bertin 3008). Large crystals, sometimes multi-sized, occur sporadically in the tyloses and were observed in egensis, gardneriana, garciniifolia, mensalis, ulei, and an unassigned specimen (Maguire et al. 47459). Perforations simple.

Axial parenchyma typically banded (under hand lens); the individual bands irregularly 1-3 seriate (fig. 2). The individual cells with or without brown contents. Small silica particles infrequently present and then only in the cells with other contents. Crystalliferous strands found only in egensis and ulei and unique to this genus.

Wood rays 1-3(4) seriate; heterocellular. In-part 4-seriate wood rays were observed only in barbourii. None of the specimens available for this study were strictly uniseriate. Silica sparse to abundant and may be found in cells with or without other contents; ranging in size from 6 µm to 26 µm; spheroidal to irregular in shape and largest in the marginal or upright cells. Vessel-ray pitting irregular in shape and size; frequently linear.

Wood fibers with medium to moderately thick walls. Fiber length of the various species ranges from 1.05 mm. to 1.65 mm. with a generic average of 1.34 mm. Vascular tracheids lacking.

Silica content of 26 selected specimens ranged from 0.10 to 1.05 percent but most specimens gave values of 0.10 to 0.50 percent (table 37).

Diagnostic features: Wood light colored; moderately heavy. Parenchyma narrow, banded. Cells of axial parenchyma and wood rays commonly with brown contents. Silica in wood rays. Crystalliferous strands unique to

egensis and ulei. Vascular tracheids lacking. Superficially similar, with respect to color and parenchyma, to Nemaluma and Paramicropholis. However, these genera are characterized by the presence of vascular tracheids.

Notes for Taxonomists

The five specimens of M. cylindrocarpa available for this study appear to be a mixture of three species on the basis of pore size. In Krukoff 8355 (Brazil) and Williams 2995 (Peru) the maximum pore diameter is only 55 μm. Williams 2995 is cited in Flora of Peru (4) as Pouteria (Micropholis) cylindrocarpa and thus may be assumed to represent the correct species. The Froes specimens 360 and 361 have a maximum pore diameter of 118 μm, twice that of the Krukoff and Williams specimens. The specimen of Loureiro-Osmarino 6760 has pores with a maximum diameter of 173 μm and the inter-vessel pit diameter is 6 to 8 μm; in these respects it is similar to cf. linoneura (Pires 15770).

Froes 73, received as M. duckeana, is characterized by the presence of microcrystals in the axial parenchyma--a feature of Pradosia. Although this herbarium specimen was identified by Gilly, it is apparent that this is another instance of the wrong number being applied to a wood specimen.

The two specimens of M. spruceana represented by Froes 464 and Krukoff 6683 exhibit considerable variation with respect to specific gravity, vessel-member length, ray seriation, and maximum pore size. Krukoff 6683 was cited by Baehni in his Pouteria monograph and presumably is the correct species.

Eyma has stated (7) that M. venulosa is rather polymorphous, especially in the form of the leaves. Baehni (3), who had never accepted the genus Micropholis, placed venulosa in the Old World genus Xantholis but later (4) returned it to Pouteria. The 27 wood specimens examined here also exhibit variation with respect to several anatomical features and conceivably some other species may have been included here. Eyma (7) indicates that it is very similar to M. melinoniana and M. acutangula (Paramicropholis) but that these may be separated on the basis of their fruits. It is not known how many of the herbarium specimens backing our wood specimens have fruiting material but it is highly unlikely that every herbarium specimen has both flowers and fruits and some are undoubtedly completely sterile.

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

Species	Collector and number	Origin	Number of wood collection
apiculata Gilly	Froes 306	Brazil	A 27451
barbourii Standl.	Barbour 1052	Panama	SJR 43470
belemensis Gilly	Froes 237	Brazil	A 27417
chrysophylloides Pierre	Inst. Trop. For. 7	Puerto Rico	MAD 17446
cylindrocarpa (Poepp. & Endl.) Pierre	Froes 361	Brazil	A 27488
	Froes 360	Brazil	A 27487
	Krukoff 8355	Brazil	MAD 14835
	L. Williams 2995	Peru	SJR 18085
	Loureiro-Osmarino 6760	Brazil	INPA 3074
cyrtobotrya (Mart.) Baill.	Wurdack-Adderley 43487	Venezuela	SJR 54350
	Smith, C. W. 12225	Brazil	A 27548
	Ferreira 5732	Brazil	INPA 546
	Smith, A. C. 2734	Guyana	SJR 35684
duckeana Gilly	Froes 72	Brazil	A 27357
	Ducke 112	Brazil	SJR 22572
	L. Williams 910	Peru	MAD 9943

Table 1.--Wood specimens of *Micropholis* examined--continued

Species	Collector and number	Origin	Number of wood collection
egensis (A. DC.) Pierre	Krukoff 6103	Brazil	MAD 17500
	Krukoff 6470	Brazil	MAD 12511
flavescens Gilly	Froes 301	Brazil	A 27447
garciniifolia Pierre	Inst. Trop. For. 37	Puerto Rico	SJR 50540
	Kramer 36	Puerto Rico	SJR 1348
gardneriana (A. DC.) Pierre	Commercial 1	Brazil	--
	Commercial 2	Brazil	--
	For. Service (SP) --	Brazil	MAD 23328
	For. Service (SP) 27	Brazil	MAD 11474
guyanensis (A. DC.) Pierre	BW-Van Hall 32	Surinam	MAD 32928
	Pires et al. 51668	Brazil	MAD 21369
	Froes 10	Brazil	A27461
	Stahel 14	Surinam	MAD 19543
	Cons. Forests 529	Surinam	SJR 47625
	Cons. Forests 530	Surinam	SJR 47626
	Cons. Forests 531	Surinam	SJR 47627
	Stahel 309	Surinam	MAD 19821
	Froes 308	Brazil	A 27453
	BAFOG 78	French Guiana	MAD 32955
	SAF 64	Surinam	MAD 9808
	BBS 1064	Surinam	MAD 32926
	Lanjouw-Lindeman 1898	Surinam	MAD 32887

Table 1.--Wood specimens of *Micropholis* examined--continued

Species	Collector and number	Origin	Number of wood collection
guyanensis (A. DC.) Pierre	Froes 302	Brazil	A 27448
	Lanjouw-Lindeman 2770	Surinam	MAD 32922
	Krukoff 7095	Brazil	SJR 37085
	Pfeiffer 584	Surinam	MAD 32974
	E. Oliveira 2642	Brazil	MG 2642
	E. Oliveira 5817	Brazil	MG 5817
	Rosa, N. A. 1307	Brazil	MG 1307
	Rosa, N. A. 1083	Brazil	MG 1083
	Rosa, N. A. 1851	Brazil	MG 1851
	Silva, N. T. 2610	Brazil	MG 2610
killipii (Standl.) Gilly	Froes 234	Brazil	A 27414
linoneura (cf) Pierre	Pires-Lucival 15770	Brazil	MG 15770
madeirensis (Baehni) Aubr.	Krukoff 6813	Brazil	SJR 36895
martiana Pierre	BAFOG 1304	French Guiana	MAD 32970
melinoniana Pierre	For. Dep. Guyana 939	Guyana	SJR 32893
melinonii (Engl.)	Smith, A. C. 2962	Guyana	SJR 35759
	Irwin et al. 47320	Brazil	MAD 20163
	Krukoff 6787	Brazil	SJR 36872
	Smith, A. C. 2629	Guyana	SJR 35640
	Pires et al. 51786	Brazil	MAD 21479

Table 1.--Wood specimens of *Micropholis* examined--continued

Species	Collector and number	Origin	Number of wood collection
mensalis (Baehni) Aubr.	Maguire 24310	Surinam	MAD 11981
resinifera (Ducke) Eyma	Froes 284	Brazil	A 27438
splendens Gilly	Froes 447	Brazil	A 27504
	Froes 449	Brazil	A 27506
spruceana (Mart. & Miq.) Pierre	Froes 464	Brazil	A 27510
	Krukoff 6683	Brazil	SJR 36820
	Pires 14252	Brazil	MG 14252
trunciflora Ducke	Rodrigues 5381	Brazil	INPA 1984
	Rosa, N. A. 179	Brazil	MG 179
Olei (Krause) Eyma	Froes 220	Brazil	A 27407
	Krukoff 5404	Brazil	MAD 35381
	Krukoff 8169	Brazil	MAD 31806
	Krukoff 8417	Brazil	MAD 16348
Olei (Krause) Eyma	Williams, L. 20	Peru	MAD 15064
	Williams, L. 191	Peru	MAD 9853
	Williams, L. 4903	Peru	MAD 16557

Table 1.--Wood specimens of *Micropholis* examined--continued

Species	Collector and number	Origin	Number of wood collection
venulosa (Mart. & Eichl.) Pierre	Froes 455	Brazil	A 27509
	Williams, L. 3187	Peru	SJR 18131
	Krukoff 8509	Brazil	MAD 17073
	Wurdack-Adderley 43496	Venezuela	SJR 54223
	Lanjouw-Lindeman 2852	Surinam	MAD 32923
	Wurdack-Adderley 43434	Venezuela	SJR 54503
	For. Dep. Guyana 3173	Guyana	SJR 46566
	Schunke 2996	Peru	MAD 35305
	Salazar-Lao 1 & 100	Peru	MAD 22323
	Krukoff 6657	Brazil	SJR 36801
	Pires et al. 51795	Brazil	MAD 21488
	Krukoff 8017	Brazil	MAD 14834
	Schunke 2593	Peru	MAD 33081
	For. Dep. Guyana 3151	Guyana	SJR 43693
	Lanjouw-Lindeman 2160	Surinam	MAD 32901
	Breteler 3825	Venezuela	SJR 55519
	Smith, A. C. 2612	Guyana	SJR 35629
	Cavalcante-Silva 413	Brazil	MG 413
	Oliveira, E. 854	Brazil	MG 854
	Oliveria, E. 4529	Brazil	MG 4529
	Ortega 151	Ecuador	CTF 22017
	Pires 12947	Brazil	MG 12947
	Pires-Lucival 15777	Brazil	MG 15777
	Rosa, N. A. 631	Brazil	MG 631
	Rosa, N. A. 1182	Brazil	MG 1182
	Silva, N. T. 2810	Brazil	MG 2810
	Silva, N. T. 3164	Brazil	MG 3164

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Wood anatomy of neotropical Sapotaceae: X. Micropholis, by B. F. Kukachka, Res. Pap. FPL 351, FPL, For. Serv., USDA. 17 p. Madison, Wis.

The genus Micropholis, originally maintained as a section of the large pantropical genus Sideroxylon, was raised to generic status in 1891 by Pierre. This study of the wood anatomy confirms the establishment of Micropholis as a distinct entity among the American Sapotaceae.

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Table 1.--Wood specimens of *Micropholis* examined--continued

Species	Collector and number	Origin	Number of wood collection
williamii Aubr. & Pellegr.	Rodrigues-Lima 3296	Brazil	INPA 1092
williamsii (Baehni)	Williams, L. 3198	Peru	SJR 18142
Micropholis but wood anatomy of the following does not agree with previously named specimens.			
cylindrocarpa	Pires-Lucival 15771	Brazil	MG 15771
egensis	Ortega 117	Ecuador	CTF 21984
gardneriana	Oliveira 1674	Brazil	MG 1674
ulei	Krukoff 8347	Brazil	MAD 32035
venulosa	Oliveira, E. 2595	Brazil	MG 2595
	Silva, N. T. 1722	Brazil	MG 1722
	BAFOG 44	French Guiana	MAD 32952
	Maguire 24452	Surinam	MAD 11999

Table 1.--Wood specimens of *Micropholis* examined--continued

Species	Collector and number	Origin	Number of wood collection
Unassigned species (received simply as Sapotaceae)			
Intervessel pitting to 8 μm diameter			
	Krukoff 8224	Brazil	MAD 31924
	Krukoff 8918	Brazil	MAD 27943
	For. Dep. Guyana 9	Guyana	SJR 3040
	For. Dep. Guyana 171	Guyana	SJR 5103
Intervessel pitting to 6 μm diameter			
	For. Serv. (SP) 2989	Brazil	MAD 13164
	Froes 203	Brazil	A 27398
	BAFOG 342	French Guiana	SJR 50955
	Pittier 794	Venezuela	SJR 34282
	BAFOG 88	French Guiana	MAD 32957
	Froes 1067	Brazil	A 28001
	Rosa, N. A. 1331	Brazil	MG 1331

Table 1.--Wood specimens of Micropholis examined--continued

Species	Collector and number	Origin	Number of wood collection
Intervessel pitting to 4 μm diameter			
	Cavalcante-Pires 197	Brazil	MG 197
	Cuatrecasas 15782	Colombia	SJR 42947
	Pires et al. 52624	Brazil	MAD 22715
	Maguire et al. 47459	Brazil	MAD 20170
	JICA-GGC 55	Panama	MAD 24787
	Froes 1064	Brazil	A 28008
	Cuatrecasas 16317	Colombia	SJR 43024
	Krukoff 10737	Bolivia	MAD 29982
	Krukoff 6658	Brazil	SJR 36802
	Froes 1090	Brazil	A 28022
	Pittier 760	Venezuela	SJR 33879
	Krukoff 6815	Brazil	SJR 36896
	Krukoff 6928	Brazil	MAD 12747
	Bertin 3008	French Guiana	SJR 5375
	Pires et al. 51287	Brazil	MAD 21298
	Cowles 2478	Puerto Rico	SJR 47832
	Froes 533	Brazil	A 27519
	Irwin et al. 54579	Surinam	MAD 22742

Table 2.--Species summary

Species	Specific gravity[1/]	Vessel member length	Intervessel pit diameter	Ray seriation	Maximum pore diameter (average)	Fiber length	Pore arrangement
		µm	µm		µm		
apiculata	0.86	860	4	1-2	110	1.41	D[1/]
barbourii	.66	760	8	1-4	197	1.53	D
belemensis	.79	690	6	1-2	79	1.27	E[2/]
chrysophylloides	.90	630	4	1-2	95	1.26	D
cylindrocarpa (see notes)							
cyrtobotrya	.82	790	6	1-3	134	1.45	D
duckeana	.73	790	4	1-3	114	1.39	D
egensis	.64	580	6	1-2	67	1.06	R[3/]
flavescens	.78	790	8	1-2	102	1.44	E
gardneriana	.67	620	4	1-3	112	1.32	D
garciniifolia	.79	690	6	1-2	86	1.33	R
guyanensis	.80	840	4	1-3	122	1.34	D
killipii	.89	900	4	1-2	87	1.48	D
linoneura (cf)	--	530	8	1-3	189	1.10	E
madeirensis	.85	790	8	1-2	102	1.34	E
martiana	.70	740	8	1-3	213	1.65	E
melinoniana	76	700	8	1-2	118	1.32	D
melinonii	.80	780	4	1-3	96	1.33	D
mensalis	.81	790	4	1-2	79	1.32	E
resinifera	.95	930	4	1-2	95	1.46	E
splendens	.83	740	6	1-3	150	1.31	E
spruceana (see notes)							
trunciflora	.98	700	8	1-2	75	1.49	E
ulei	.63	650	6	1-2	85	1.14	R
venulosa	.68	680	6-8	1-3	105	1.19	D-E
williamii	.92	770	6	1-2	110	1.31	D
williamsii	.73	630	4	1-3	102	1.10	D

1/ Diffuse
2/ Echelon
3/ Radial

Table 3.--Silica content[1/]

Species	Collector and number	Country	Percent silica
barbourii	Barbour 1052	Panama	0.42
chrysophylloides	Inst. Trop. For. 7	Puerto Rico	.11
cylindrocarpa	Loureiro-Osmarino 6760	Brazil	.20
cyrtobotrya	Wurdack-Adderley 43487	Venezuela	.34
egensis	Krukoff 6470	Brazil	.35
duckeana	Ducke 112	Brazil	.25
garciniifolia	Inst. Trop. For. 37	Puerto Rico	.13
gardneriana (SP)	For. Service 27	Brazil	.18
guyanensis	Cons. Forests 530	Surinam	.33
	Pires et al. 51668	Brazil	.28
	Cons. Forests 531	Surinam	.26
madeirensis	Krukoff 6813	Brazil	.42
martiana	BAFOG 1304	French Guiana	.24
melinoniana	Forest Dep. 939	Guyana	.41
melinonii	Irwin et al. 47320	Brazil	.19
	Krukoff 6787	Brazil	.93
mensalis	Maguire 24310	Surinam	.81
ulei	Williams 4903	Peru	.30
williamsii	Williams 3198	Peru	.53
venulosa	Lanjouw-Lindeman 2160	Surinam	.10
	Pires et al. 51795	Brazil	.24
	Lanjouw-Lindeman 2852	Surinam	.23
	Forest Dep. 3151	Guyana	.93
sp.	Krukoff 10737	Bolivia	.52
sp.	IICA-GGC 55	Panama	1.05

1/ The author is indebted to Martin F. Wesolowski for making the silica analyses.

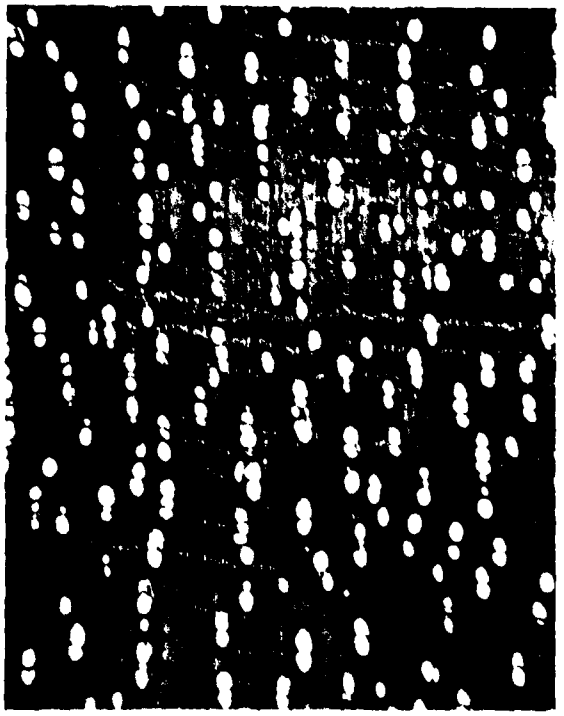

Figure 1.--Micropholis guyanensis showing diffuse pore arrangement (Froes 302) X 30.

Figure 2.--M. guyanensis, parenchyma detail (Froes 302) X 110.

Figure 3.--M. madeirensis, echelon arrangement of pores (Krukoff 6813) X 30.

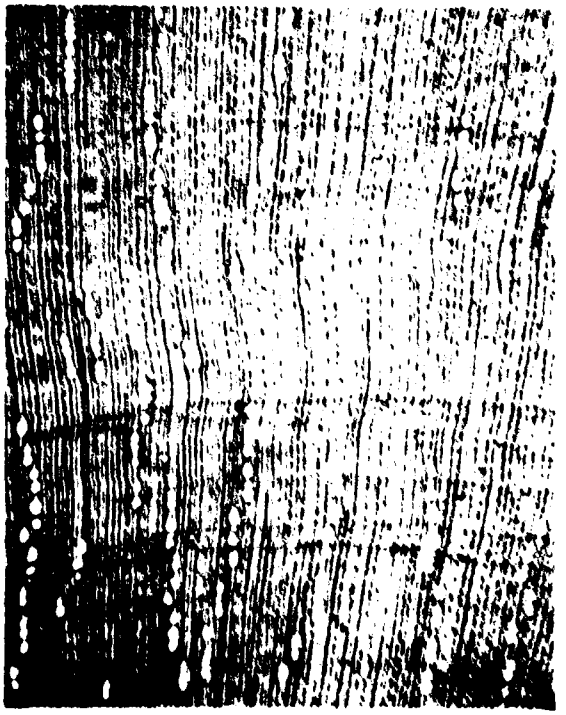

Figure 4.--M. ulei, pores in spaced radial files (Krukoff 8417) X 30.