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WOOD ANATOMY OF THE NEOTROPICAL SAPOTACEAE

XXV. RAGALA

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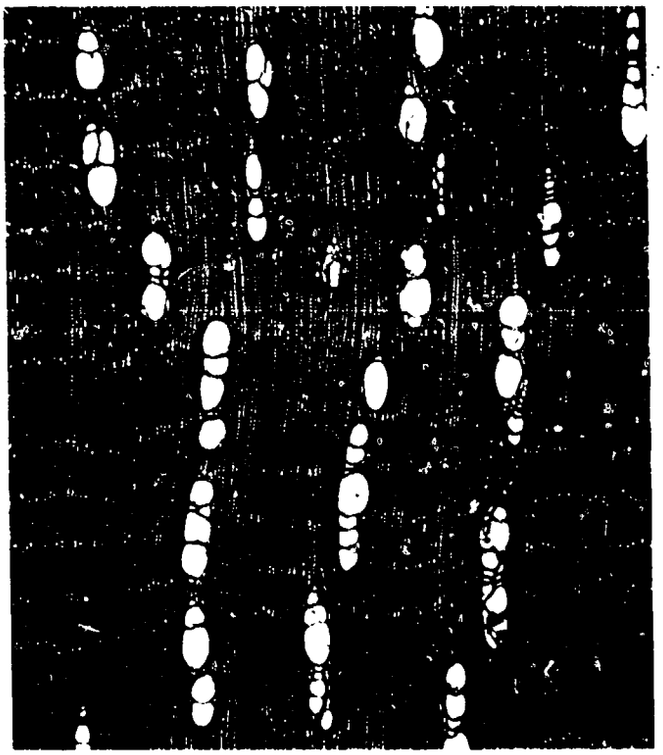

Abstract

Ragala is a small genus of four species limited to the Guianas and the Amazon Basin. At one time its species were included in the genus Ecclinusa and another time both Ecclinusa and Ragala were a part of the very large genus Chrysophyllum. This study of the wood anatomy supports the separation of Ecclinusa and Ragala as well as their removal from Chrysophyllum. Ragala is a silica-accumulating genus.

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 Ragala is the twenty-fifth 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--Res. Pap. FPL 325
II. Mastichodendron--Res. Pap. FPL 326
III. Dipholis--Res. Pap. FPL 327
IV. Achrouteria--Res. Pap. FPL 328
V. Calocarpum--Res. Pap. FPL 329
VI. Chloroluma--Res. Pap. FPL 330
VII. Chrysophyllum--Res. Pap. FPL 331
VIII. Diploon--Res. Pap. FPL 349
IX. Pseudoxythece--Res. Pap. FPL 350
X. Micropholis--Res. Pap. FPL 351
XI. Prieurella--Res. Pap. FPL 352
XII. Neoxythece--Res. Pap. FPL 353
XIII. Podoluma--Res. Pap. FPL 354
XIV. Elaeoluma--Res Pap. FPL 358
XV. Sandwithiodoxa--Res. Pap. FPL 359
XVI. Paralabatia--Res. Pap. FPL 360
XVII. Gambeya--Res. Pap. FPL 361
XVIII. Gomphiluma--Res. Pap. FPL 362
XIX. Chromolucuma--Res. Pap. FPL 363
XX. Manilkara--Res. Pap. FPL 371
XXI. Barylucuma--Res. Pap. FPL 372
XXII. Pradosia--Res. Pap. FPL 373
XXIII. Gayella--Res. Pap. FPL 374
XXIV. Ecclinusa--Res. Pap. FPL 395

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 THE NEOTROPICAL SAPOTACEAE

XXV. *RAGALA*

By

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Introduction

As created by Pierre in 1891, *Ragala* consisted of the single species *R. sanguinolenta* from French Guiana. Aubréville (1)[3/] included the four species now known as *Ragala* in the older genus *Ecclinusa* but noted that three of the species differed from *R. sanguinolenta* in that the fruits were characterized by an accrescent calyx. In 1964 Aubréville (2) reinstated *Ragala sanguinolenta* Pierre as the type of the genus and made two new combinations, *R. spuria* (Ducke) Aubr. and *R. ulei* (Krause) Aubr. In 1965 (3) Baehni reduced the species attributed to *Ecclinusa*, *Ragala*, and a few other genera to synonomy under his unwieldy genus *Chrysophyllum*. Aubréville (1) had described *Ecclinusa ucuquirana-branca* as an imperfectly known species because fruiting specimens were not available at that time. It remained to Rodrigues (4), upon the acquisition of fruiting specimens, to make the new combination *Ragala ucuquirana-branca* (Aubr. and Pellegr.) W. Rodr. These four known species of *Ragala* are restricted to the Guianas and the Amazon Basin.

The wood anatomy supports the separation of *Ecclinusa* and *Ragala* as well as their exclusion from *Chrysophyllum*.

Description

Based on 40 specimens distributed as follows: *R. sanguinolenta* Pierre (9), *R. spuria* (Ducke) Aubr. (3), *R. ucuquirana-branca* (Aubr. and Pellegr.) W. Rodr. (3), *R. ulei* (Krause) Aubr. (21), and unassigned (4). (Table 1.)

1/ Pioneer Research Unit, Forest Products Laboratory.

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

3/ Underlined numbers in parentheses refer to literature cited at the end of this report.

General: Wood pale brown or sometimes with a pinkish cast; no distinction between sapwood and heartwood. Growth rings generally lacking or very indistinct. Wood moderately heavy, the specific gravity of individual specimens ranging from 0.57 to 0.89 with the majority falling within the range of 0.63 to 0.82; generic average is 0.74.

Anatomical:

Pores in spaced radial files (fig. 1). Solitary pores present but commonly in radial multiples of 2-4 and very occasionally in multiples of 5-6. The long chains that are frequently observed with a hand lens will be found, upon microscopic examination, to consist of multiples separated by tracheids, fibers, parenchyma, or combinations of these elements. Maximum tangential pore diameter of all specimens examined ranged from 150 μm to 220 μm with an overall average of 185 μm.

Vessel member length averages for all specimens ranged from 650 μm to 1,000 μm with an average of 840 μm. Sclerotic tyloses were observed in the majority of specimens and ranged from very few to abundant. Intervessel pitting commonly 6-8 μm in diameter and occasionally to 10 μm. Perforation plates simple.

Axial parenchyma typically narrow banded and more or less regularly spaced (fig. 2). The individual bands irregularly 1-2 seriate, frequently with yellow-brown contents. Silica particles occasionally present and then confined to the cells with other contents. Rhombic and microcrystals were not observed in any of the specimens examined.

Wood rays commonly 1-2 seriate and occasionally, in part, 3 seriate; heterocellular. The maximum body height of the 2-3 seriate portion ranges from 173 μm to 630 μm; inconsistent within and between species and of no diagnostic value. Vessel-ray pitting irregular in shape and size but most commonly linear to obovoid. Pitting on lateral walls of erect and large square marginals fine and abundant; not conspicuous. Silica common in the wood rays and generally confined to those cells with yellow-brown contents; generally spheroidal in shape and ranging in size from 8 μm to 20 μm in individual specimens. Silica content of the wood as determined by chemical analysis ranged from 0.05 percent to 1.07 percent; average was 0.33 percent for all specimens analyzed. Little or no difference in size of the silica particles between the erect, square, or tabular cells of a given specimen. Rhombic and microcrystals not observed.

Wood fibers moderately thick-walled. Fiber length averages ranged from 1.21 mm to 1.71 mm with an overall average of 1.43 mm. Vascular tracheids present but generally few in number in a given maceration; frequently not detectable in prepared radial sections.

Diagnostic characters: Wood pale brown with an average specific gravity of 0.74; parenchyma bands distinct with a hand lens; pores in radial multiples arranged in laterally spaced radial files; silica uniform in size throughout wood rays; froth test negative. Ragala was formerly included under Chrysophyllum and Ecclinusa but differs from these in that the axial parenchyma of Chrysophyllum is reticulate and in Ecclinusa the pores are appreciably smaller. These separations may be accomplished with a hand lens.

Notes

It appears possible that some of the specimens determined as R. ulei may be R. ucuquirana-branca because both species occur in Amazonas and in both the underside of the leaves is tomentose. In 1974 Rodrigues (4) transferred Ecclinusa ucuquirana-branca to Ragala and separated this species from R. ulei on the bollowing basis: Leaf underside sericeous in R. ulei and rufo-tomentose in ucuquirana-branca. The leaves of sanguinolenta and spuria are glabrous. In the event that some of the ulei specimens are referred to ucuquirana-branca at some future date, it will have no effect on the generic description from the anatomical standpoint.

Literature Cited

1. Aubréville, A.
   1961. Notes sur les Sapotacées Africaines et Sud-Américaines. III. Notes sur des Chrysophylées Américaines. Adansonia 1(1):17-23.

2. Aubréville, A.
   1964. Notes sur des Sapotacées. Réhabilitation des genres Américaines Ragala Pierre et Prieurella Pierre. Adansonia 4(3):367-371.

3. Baehni, Charles.
   1965. Mémoires sur les Sapotacées. III. Inventaire des genres. Boissiera 11:71-77.

4. Rodrigues, William A.
   1974. Subsidios para o estudo das Sapotáceas da Amazônia. Acta Amazonica 4(3):15-16.

Table 1.--Ragala: Specimens examined and their selected parameters[1/]

Species	Collector and Number	Sp. gr.	VML	MPD	FL	Si[2/]	Source	Wood Collection No.[3/]
			μm	μm	mm	%		
R. sanguinolenta	BAFOG 65 M	0.72	910	220	1.43	0.11	Fr. Guiana	MAD 32954
	BAFOG 1247	0.66	770	213	1.50	0.11	Fr. Guiana	MAD 32965
	Bertin 3010	0.70	760	213	1.35	0.16	Fr. Guiana	SJR 12732
	Bertin 3023	0.64	770	213	1.75	0.43	Fr. Guiana	SJR 6394
	For. Dept. 910	0.87	840	181	1.49	0.32	Guyana	SJR 43557
	For. Dept. 940	0.79	800	213	1.47	0.18	Guyana	SJR 32876
	Mell, C.D. sn.	0.78	750	197	1.20	0.80	Guyana	SJR 3028
	Rosa, N.A. 597	--	650	189	1.21	--	Brazil	
	Smith, A.C. 2966	0.86	760	197	1.44	0.32	Guyana	SJR 35758
R. spuria	Froes 315	0.71	830	150	1.47	0.33	Brazil	A 27458
	Froes 450	0.80	1,100	158	1.64	0.17	Brazil	A 27507
	Froes 579	0.78	870	173	1.34	0.39	Brazil	A 27529
R. ulei	Ducke 49	0.67	840	213	1.39	0.49	Brazil	SJR 20993
	Field Museum sn.	0.66	960	158	1.71	0.06	Peru	MAD 11024
	Froes 168	0.70	960	197	1.56	0.36	Brazil	A 27385
	Froes 419	0.77	690	181	1.26	0.09	Brazil	A 27500
	Froes 349	0.82	910	213	1.40	0.12	Brazil	A 27483
	Froes 420	0.79	920	150	1.33	0.10	Brazil	A 27501
	Froes 446	0.78	760	213	1.21	0.38	Brazil	A 27503
	Froes 804	0.80	850	165	1.45	0.11	Brazil	A 27532
	Froes 808	0.76	840	158	1.53	0.05	Brazil	A 27533
	Froes 846	0.80	820	158	1.38	0.76	Brazil	A 27538
	Froes 878	0.82	860	197	1.37	0.45	Brazil	A 27540
	Krukoff 6800	0.76	660	205	1.29	0.61	Brazil	SJR 36883
	Krukoff 7104	0.70	820	220	1.61	0.78	Brazil	MAD 12828
	Maguire 47384	0.70	780	181	1.50	0.17	Brazil	MAD 20142
	Rodrigues-Chagas 2926	0.72	730	220	1.48	0.19	Brazil	INPA 1029
	Rosa, N.A. 1211	--	780	158	1.45	--	Brazil	
	Silva, N.T. 3945	--	810	189	1.50	--	Brazil	
	Smith, C.W. 12117	0.70	810	189	1.55	0.36	Brazil	A 27545
	Williams, L. 911	0.75	920	220	1.57	0.36	Peru	SJR 17473
	Williams, L. 915	0.74	1,030	158	1.62	0.08	Peru	MAD 13539
	Williams, L. 929	0.57	890	158	1.60	0.14	Peru	SJR 17488
R. ucuuhirana-branca	Monteiro-Lima sn.	0.89	850	158	1.35	1.07	Brazil	INPA 4862
	Monteiro-Lima 126	0.79	840	213	1.28	0.61	Brazil	INPA 4905
	Silva, M.F.	0.74	790	173	1.20	0.45	Brazil	INPA 4987
	UNASSIGNED SPECIMENS							
	Froes [illegible]7	0.63	860	158	1.39	0.19	Brazil	A 27498
	Pess. CI[illegible] 111	--	840	165	1.34	--	Brazil	
	Rosa, N.A. 1609	--	760	165	1.34	--	Brazil	
	Williams, L. 14509	0.64	760	165	1.29	--	Venezuela	SJR 41602
	Average (all)	0.74	840	185	1.43	0.33		

1/ Sp.gr. = specific gravity; VML = vessel member length; MPD = maximum pore diameter; FL = fiber length; Si = silica.

2/ Silica content based on ovendry weight of wood and determined by Martin F. Wesolowski, Chemist, FPL.

3/ A = Harvard University, Cambridge, Mass.; INPA = Instituto Nacional des Pesquisas da Amazonia, Manaus, Brazil; MAD = Forest Products Laboratory, Madison, Wis.; SJR = Samuel J. Record Memorial Collection, formerly at Yale University but housed at Madison, Wis.

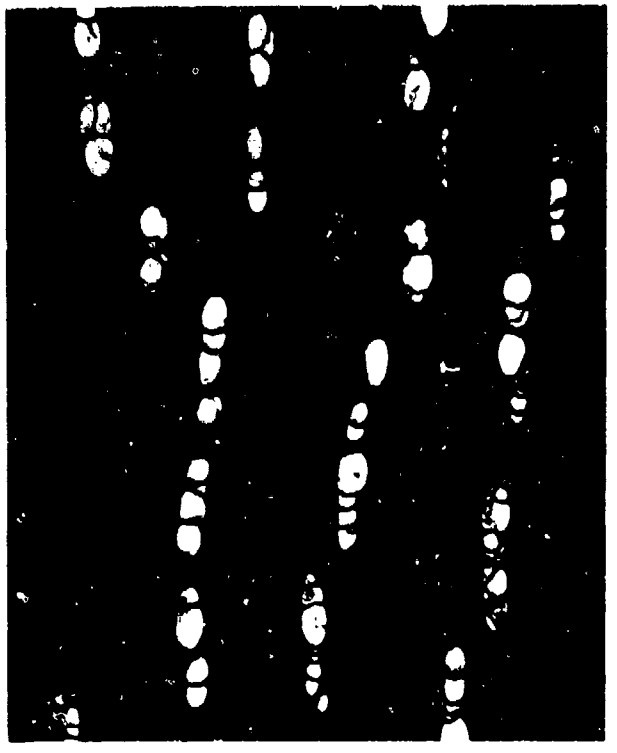

Figure 1.--Ragala sanguinolenta, pore and parenchyma arrangement at 30X. (Forest Dept. Guyana 910).

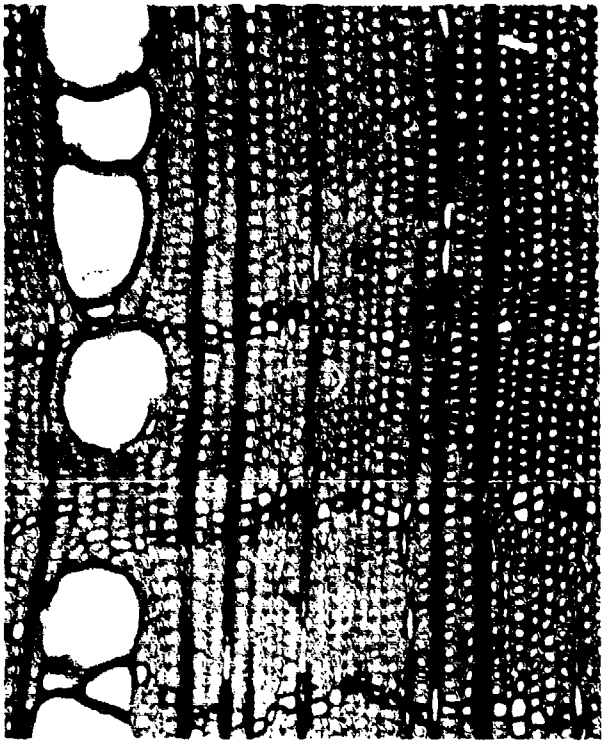

Figure 2.--Same as figure 1, parenchyma detail at 110X.

U. S. Forest Products Laboratory

Wood anatomy of the neotropical Sapotaceae: XXV. Ragala, by B. F. Kukachka, FPL.
6 p. (USDA For. Serv. Res. Pap. FPL 396).

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