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XYLOTOMIC STUDY OF SOME WOODY PLANT SPECIES FROM CUBA, I

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This paper is a continuation of the dissertaion entitled "Xylotomic study of endemic species from Cuba" started in 1976. Now the authors present the most important anatomical features of the xylem, external morphology, occurrence and habitat of eight Cuban species, namely: *Garrya fadyenii* Hook. (*Cornaceae*), *Catalpa punctata* Griseb. ssp. *punctata* (*Bignoniaceae*), *Tabebuia lepidota* (H.B.K.) Britt. (*Bignoniaceae*), *Pera bumeliaefolia* Griseb. (*Euphorbiaceae*), *Trichilia hirta* L. (*Meliaceae*), *Guarea guidonia* (L.) Sleumer (*Meliaceae*), *Cupania glabra* Sw. (*Sapindaceae*), *Calophyllum antillanum* Britt. (*Clusiaceae*).

Materials and methods

The eight tested species form a part of a collection consisting of 23 samples which was brought to Budapest by M. VALES scientific research worker (Botanical Institute of the Academy of Sciences of Cuba). Blocks of the different woods were softened in an autoclave, then cross, tangential and radial sections were obtained. The sections were dyed in an aqueous solution of the microdyestuff of toluidin blue. The maceration of the xylem was performed by the SCHULZE's method (SÁRKÁNY—SZALAI 1964).

Length of the fibres and vessel elements, tangential and radial diameters of the vessels, width and height of the medullary rays, and other features were measured (BABOS and VALES 1977).

Minimum—maximum values for each anatomic feature of individual species were calculated from 50—100 measurements.

Suitably enlarged microphotographs were prepared of each section.

Exterior morphology and occurrence

Garrya fadyenii Hook.

Shrub or small tree up to 8—10 m height. Branches 4-gonous, pubescent; leaves opposite, oblong-elliptic to lanceolate, 3—7 cm long, obtuse or mucronulate at the apex, glabrous and shiny above, hairy beneath, when young. Inflorescence amentiform, densely tomentose, male one 2—3 cm long, ramificate, female one up to 5 cm long, bracts lanceolate. Male flowers: calyx 4-lobed, lobes linear, valvate, connate at the apex; petals 0, stamens 4, epipetalous, filaments free. Female flowers: calyx tube ovate with 2 short or inconspicuous opposite lobes; ovary unilocular, style 2; berry globose, black, shiny, glabrate, crowned

Guarea Guidonia (L.) Sleumer

High tree up to 30—35 m height. Leaves paripinnate, with 4—10 pairs of opposite, elliptic, lanceolate-elliptic or oblong-obovate, 8—25 cm long leaflets, obtuse or abruptly acuminate at the apex. Inflorescence racemous. axilar; flowers hermaphrodite; calyx cupular, short, entire or denticulate with 4—5 minute teeth, hispid. Petals 4—5, oblong, 5—7.5 mm long, free, greenish-white, densely pubescent on the dorsal surface. Staminal tube entire or shortly lobulate, anthers 8—12; disc emergent with a ring-shaped pubescence of rigid hairs. Ovary sessile on the disc, puberulous; capsule obovate, lignescent with 3—5 cavities, 1.5—1.9 cm in diameter, brownish; seeds 1—2 in each cavity. 9—13 mm in diameter.

This species is a neotropical floristic element occurring in the Greater Antilles (Cuba, Hispaniola and Porto Rico), Panama and tropical South America (León and Alai 1953; Alain 1969). It can be found in the humid and semihumid submontane and colline forest regions of all the Cuba and Isle of Pines, as an important evergreen forestal tree of the submontane rain forests of the Northeastern Mountains of the Province Oriente (Moa-Baracoa region), where it is a common tree in the second canopy layer, but some giant examples occur in the first one as well. This tree is rather frequent also in the first canopy of the submontane seasonal evergreen forests in the Sierra Maestra, Escambry, Rosario, and Organos Ranges, further in the riverside gallery forests of the West Cuban oak-and-pine belts, while it occurs somewhat rarely in the lowland seasonal evergreen and semideciduous forests, but is completely absent in the montane, high montane and in the dry lowland regions (Borhidi 1973, 1974, 1976).

Cupania glabra Sw.

Tree up to 30—35 m height. Bark smooth, gray; leaves large, mostly paripinnate, leaflets 7—14, predominantly alternate, oblong-obovate, rotundate to retuse at the apex, sometimes obtuse or acute, 6—20 cm long, margin dentate or subentire, glabrous or pubescent beneath. Inflorescence panicle axilar or terminal, puberulous, 11—20 cm long, ramificate. Flowers white, sepals pubescent, stamens 8, filaments short, anthers included, oblong. Capsule turbinate-globose, 1.5—2 cm in diameter, glabrous.

This species has a North Caribbean distribution pattern, occurring in Central America, Florida, Jamaica and Cuba. In Cuba it is a very common tree species, having an important phytocenological role in the second canopy of the submontane rain forests and in the first canopy layer of the lowland and submontane seasonal evergreen forests and, as an important evergreen element of the upper tree layer of the semideciduous forests (Borhidi 1973, 1976).

Calophyllum antillanum Britt.

Evergreen tree up to 30 m height with pyramidal canopy. Leaves coriaceous, lustrous, elliptic to oblong-obovate, 5—12 cm long, rotundate and emarginate at the apex, cuneate to obtuse at the base; lateral veins parallel, closely disposed, prominent on both sides. Inflorescence recemous, axilar or lateral, few-flowered shorter than the leaves; pedicels 4—10 mm long, flowers white, fragrant; sepals 4, orbicular, petals generally 4, stamens about 50, filaments free or connate at the very base; anthers oval, 2-locular; ovary unilocular, drupe about 2—2.5 cm in diameter.

This species is distributed all over the Antilles occurring in many variable, morphologically hardly discernible populations considered by the botanists as forms or higher infraspecific taxa. In the present paper we excluded from the *C. antillanum* Britt. the *C. utile* Bisse, the latter being a surely recognizable good endemic species of the serpentine mountains of the Sagua-Baracoa Massif in the Northern Oriente (Cuba) (Bisse 1974). The *C. antillanum* s. str. is a tree species of a considerable forestal importance; its timber is used for carpentry and joinery, the living tree is often planted in streets, parks and afforestations. In Cuba it occurs frequently in the submontane seasonal evergreen forests as emergent trees or members of the high canopy, and can be found in the lowland gallery forests and sometimes in the seasonally inundated swamp forests as well (Borhidi 1973, 1974, 1976). The predominant *Calophyllum* species of the submontane and montane serpentine rain forests in East-Cuba is the *C. utile* Bisse.

Wood anatomy

Garrya fadyenii Hook.

Wood porous diffuse; the ground mass of the wood is formed by polygonal-shaped fibres with thick wall and narrow lumen. Diffuse paratracheal longitudinal parenchyma. Medullary rays with one or more cells in width (Fig. 1). Tracheae are oval-shaped with small sizes. Number is 69 per 1 sq. millimeter. Tangential diameter 18.4—52.9 μ. Radial diameter 23.0—57.5 μ. Vessel members are 355.0—1065.0 μ long, rarely with bordered pits on the wall. Perforation plate is scalariform (parts indicated with → of Fig. 2). Heterogeneous medullary rays with 1—5 cells in width. Height 230.0—483.0 μ. Width 23.0—112.0 μ. Polygonal-shaped, small crystals in the cells of the medullary rays (Figs 2 and 3). Fibres are commonly ordered in radial lines. Diameter 16.1—25.3 μ. Thickness of wall 10.7—11.5 μ. Full length 781.0—1633.0. Tips of the fibres commonly ending in a peak, one side with saw-teeth, rarely forking.

Diameter of the longitudinal parenchyma cells 6.9—23.0 μ.

Height 51.1—265.0 μ. Cells contain mastic material.

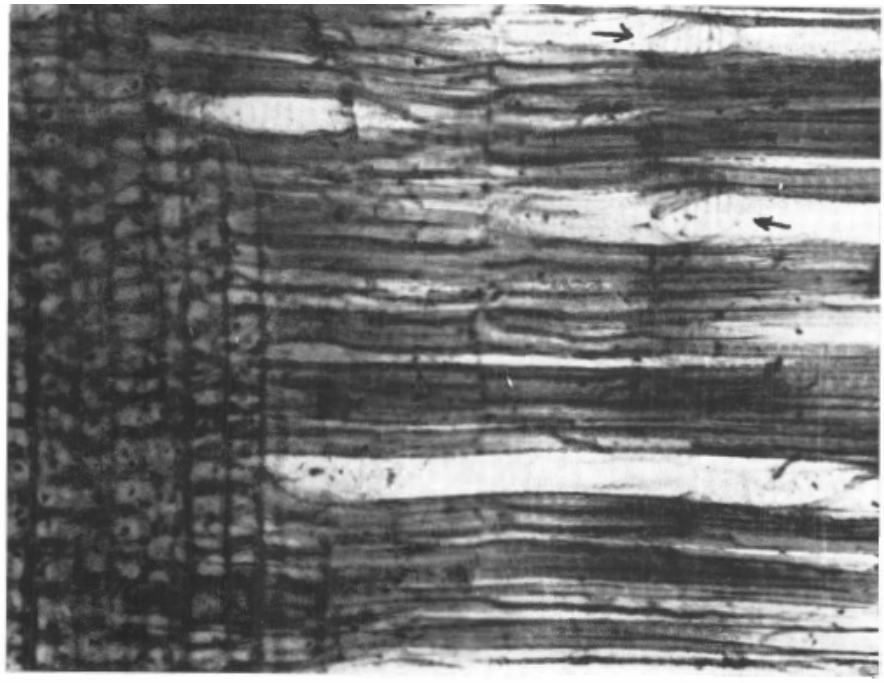

Fig. 2. Garrya fadyenii Hook. Radial section ×120. Heterogeneous medullary ray, cells of medullary rays with small crystals. Fibres with thick wall, vessels with scalariform perforation (mark: →)

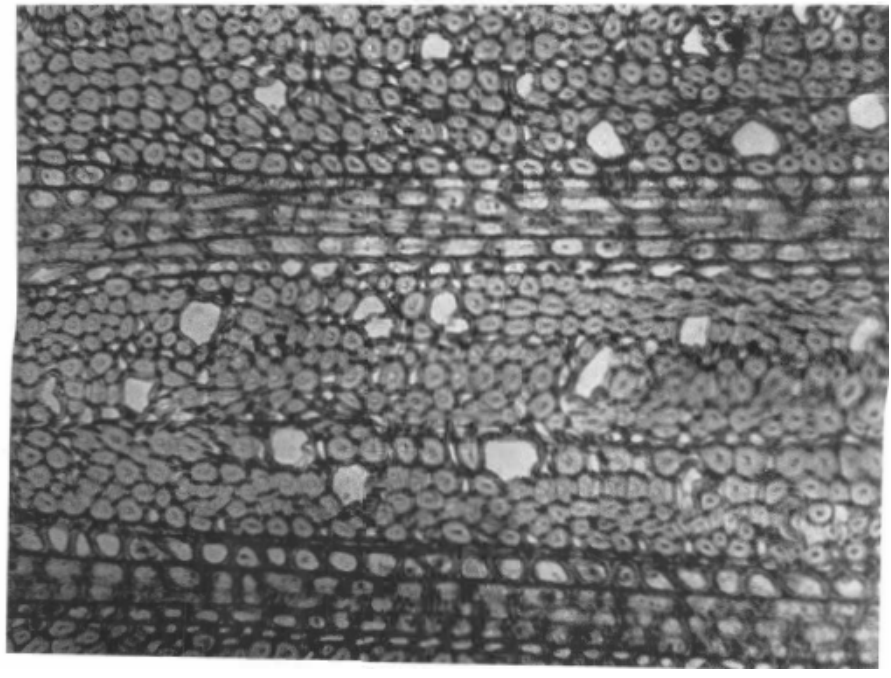

Fig. 1. Garrya fadyenii Hook. Cross section ×120. Small pores, wide medullary rays, fibres with thick wall

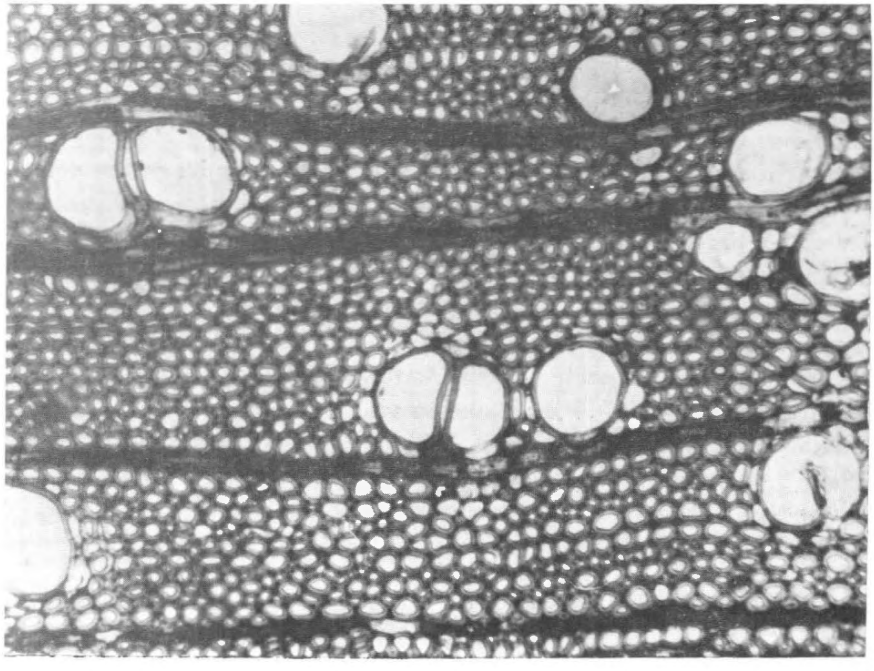

Fig. 4. Catalpa punctata Griseb. Cross section ×120. Medium-sized vessels, medullary rays with one or two cells in width. Fibres with large lumen

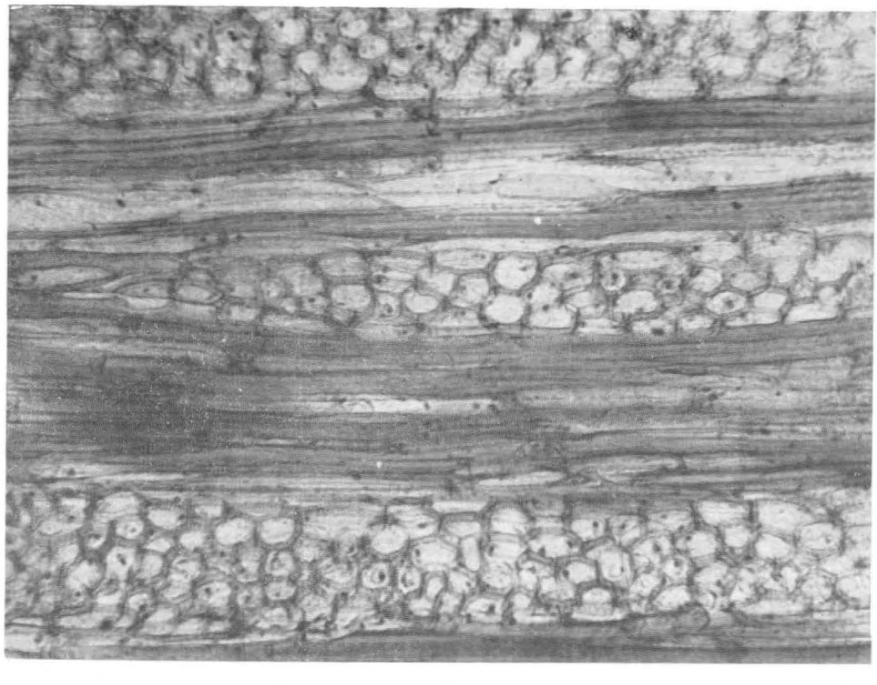

Fig. 3. Garrya fadyenii Hook. Tangential section ×120. Medullary rays two and five cells in width. Fibres with thick wall and trachea

Catalpa punctata Griseb.

Wood porous diffuse. The ground mass of the wood is formed by polygonal-shaped fibres with thin wall and wide lumen. Paratracheal vasicentric longitudinal parenchyma. Medullary rays with one or more cells in width (Fig. 4). The solitary tracheae are oval-shaped; tracheae forming groups of 2—4 members with irregular direction are flattened in radial direction. Number is 24 per 1 sq. millimeter. Medium sizes. Tangential diameter 23.0—119.6 μ. Radial diameter 284.0—852.0 μ. Length of the vessel members is 284.0—852.0μ, with oblong bordered pits on the wall. Simple perforation plate. Heterogeneous medullary rays 1—2 cells in width. Height 83.7—306.9 μ. Width 9.3—32.5 μ. The medullary ray cells contain mastic material, and square or polygonal-shaped crystals (Figs 5 and 6). Fibres are in radial lines or in irregular arrangement. Cellular structure. Diameter 16.1—25.3 μ. Constant wall thickness 9.2 μ. Full length 639.0—1491.0 μ. Tips of the fibres smooth, ending in a peak, or one side with saw-teeth. Diameter of the longitudinal parenchyma cells 9.2—25.3 μ. Height 41.8—241.8 μ. Number of the vasicentrical cells 1—3. Cells contain mastic material.

Tabebuia lepidota (H.B.K.) Britt

Wood porous diffuse. The ground mass of the wood is formed by fibres of thick wall and longitudinal parenchyma. Paratracheal-aliform confluent longitudinal parenchyma. Medullary rays mostly one, very rarely two cells in width (Fig. 7).

Rare solitary vessels with roundish shape. Generally arranged in radial or irregular groups of 2—4 members, with oval shape. Number is 47 per 1 sq. millimeter. Sizes are a little greater than those of the *Catalpa*. Tangential diameter 25.3—92.0 μ. Radial diameter 34.5—96.6 μ. Vessel members are 213.0—426.0 μ long with oblong bordered pitting on their wall. Simple perforation plate. Medullary rays with one or very rarely two cells in width. Homogeneous structure. Height 32.5—167.4 μ. Width 4.6—32.5 μ. Cells of medullary rays rarely contain mastic material (Figs 8 and 9).

Fibres in radial lines or in irregular arrangement. Diameter 11.5—13.8 μ. Wall thickness 6.3—9.9 μ. Full length 497.0—1136.0 μ. Tips of fibres ending in a smooth peak, rarely with saw-teeth on one side.

Diameter of longitudinal parenchyma cells 9.2—29.9 μ. Height 32.5—172.0 μ. Strands of longitudinal parenchyma with 3—6 cells in width.

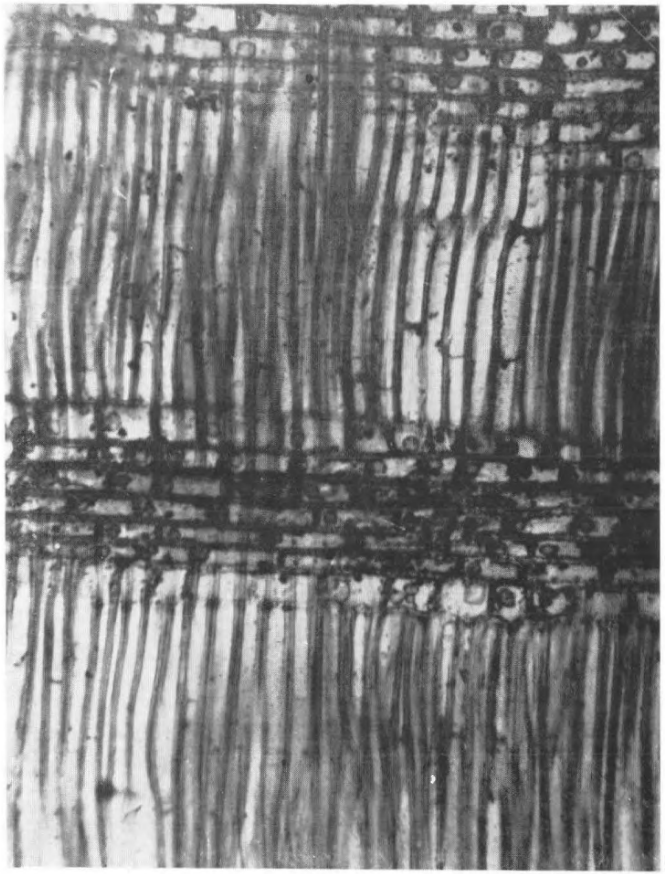

Fig. 5. Catalpa punctata Griseb. Radial section ×120. Heterogeneous medullary rays. Cells of medullary rays with mastic and crystal. Cellular fibres

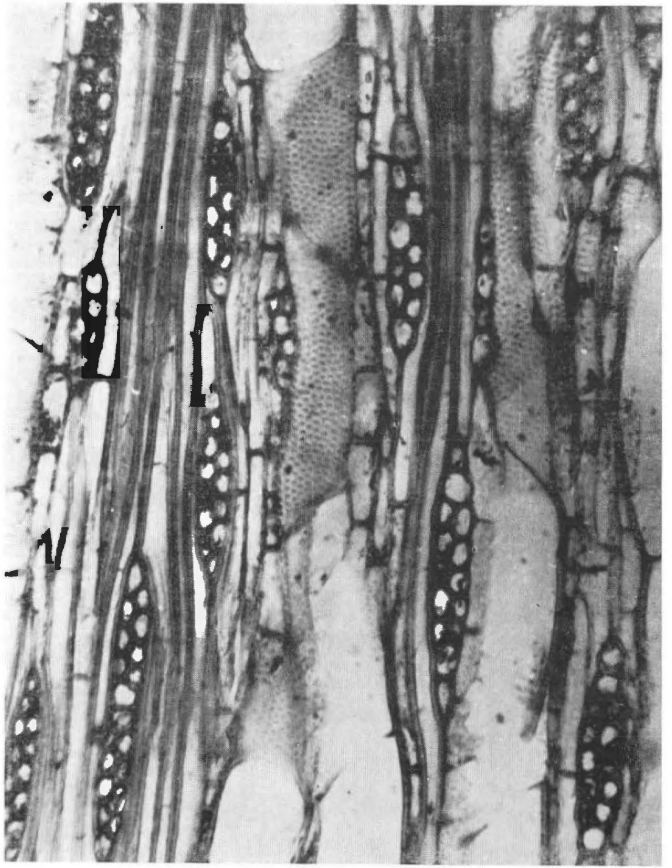

Fig. 6. Catalpa punctata Griseb. Tangential section ×120. Medullary rays with one or two cells in width. Longitudinal parenchyma, cellular fibres. The bordered pits are distinctly visible on the wall of the vessels

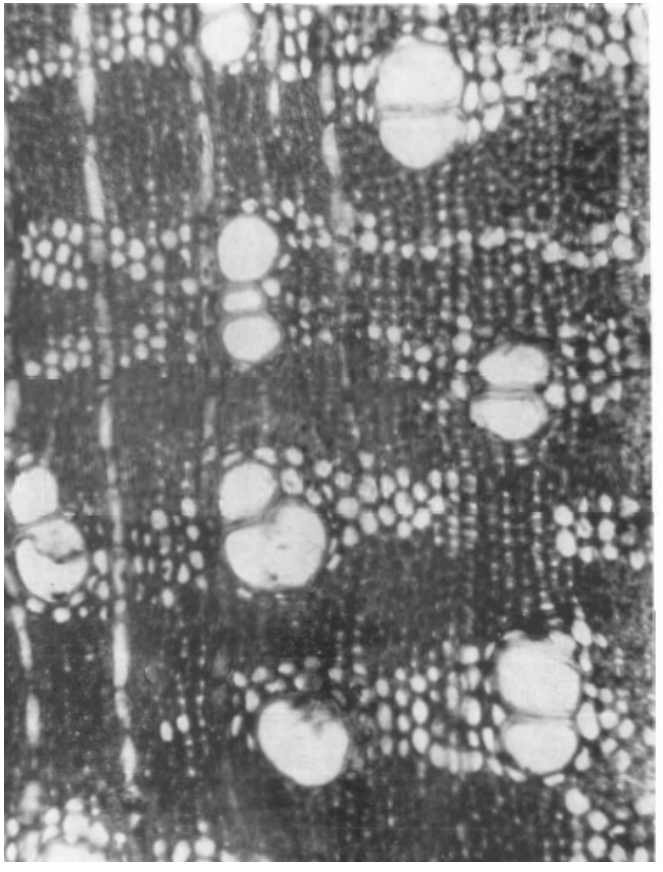

Fig. 7. Tabebuia lepidota (H.B.K.) Britt. Cross section ×120. Medium-sized vessels with relatively thick wall. Medullary rays with one cell in width, fibres of medium thickness, strand of longitudinal parenchyma

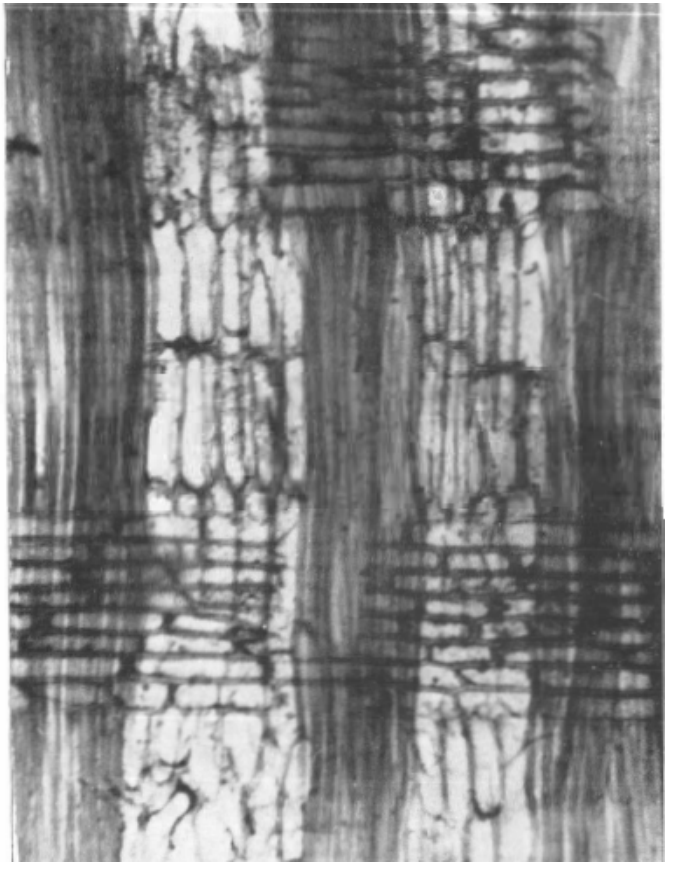

Fig. 8. Tabebuia lepidota (H.B.K.) Britt. Radial section ×120. Homogeneous medullary rays, cells of medullary rays with a small quantity of mastic. Longitudinal parenchyma and fibres

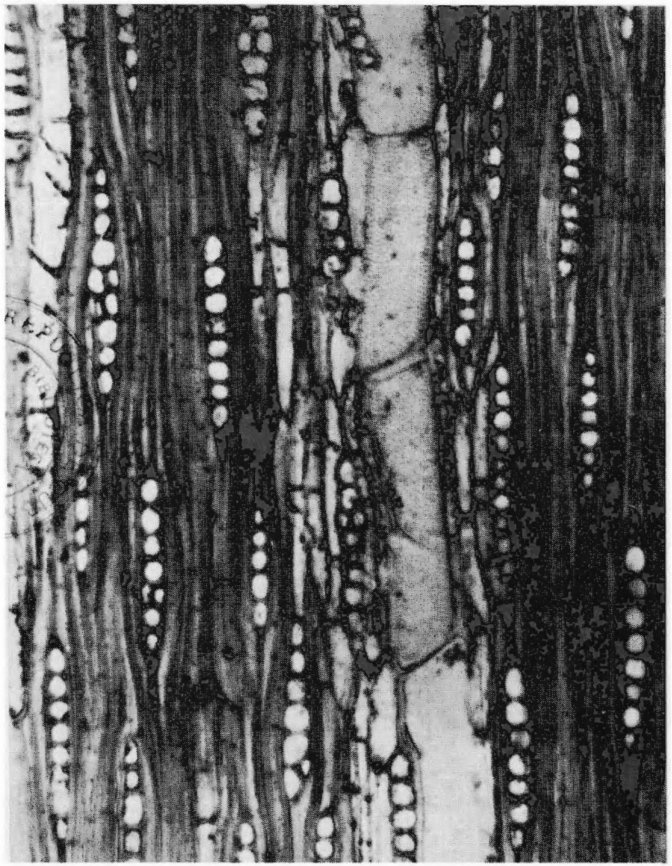

Fig. 9. Tabebuia lepidota (H.B.K.) Britt. Tangential section ×120. Uni- and twoseriate medullary rays. Longitudinal parenchyma and fibres. Small bordered pits on the wall of vessels

Fig. 10. Pera bumeliaefolia Griseb. Cross section ×120. Large-sized vessels with thick wall and gummy material. Uniseriate medullary rays, fibres and longitudinal parenchyma

Pera bumeliaefolia Griseb.

Wood porous diffuse. The ground mass of the wood is formed by polygonal-shaped fibres. Diffuse-apotracheal and metatracheal-continuous longitudinal parenchyma. Medullary rays one or very rarely with two cells in width (Fig. 10). Oval-shaped tracheae, solitary or arranged in radial lines of 2—6 members, with medium or large sizes. Number is 7 per 1 sq. millimeter.

Tangential diameter 46.0—184.0 μ. Radial diameter 68.5—264.0 μ. Vessel members are 781.0—1065.0 μ long, with bordered pitting on their wall. Simple perforation plate. Vessels contain gummy material.

Medullary rays with one or very rarely two cells in width, with heterogeneous structure, more (2—3) marginal cell series. Height 115.0—851.0 μ. Width 11.5—34.5 μ. Cells of medullary rays contain gummy material and small, polygonal-shaped crystals (Figs 11 and 13). Fibres arranged in radial lines. Diameter 9.2—18.4 μ. Wall thickness 4.6—9.2 μ. Full length 1278.0—2201.0 μ. Tips of fibres ending in a smooth peak, or with saw-teeth on one side. Diameter of longitudinal parenchyma cells 11.5—25.3 μ. Height 65.1—437.1 μ. Cells contain mastic or gummy material. It is necessary to mention the cellular crystal holder parenchyma (part of Fig. 12 marked with →).

Trichilia hirta L.

Wood porous diffuse; the ground mass of the wood is formed by polygonal shaped fibres with thick wall and narrow lumen. Paratracheal aliform-confluent longitudinal parenchyma. Medullary rays with one or two cells in width (Fig. 14).

Tracheae are roundish or oval-shaped with small sizes, containing mastic material. Their number is 39 per 1 sq. millimeter. Tangential diameter 36.8—71.3 μ. Radial diameter 46.0—96.6 μ. Vessel members are 355.0—923.0 μ long; on their wall there are some adorned bordered pits in alternative positions. Perforation plate is simple. Heterogeneous medullary rays 1—2 cells in width. Height 57.5—1115.5 μ. Width 11.5—34.5 μ. Cells of the medullary rays contain polygonal-shaped crystals (Figs 15—16).

Fibres are commonly ordered in radial lines. Diameter 9.2—18.4 μ. Thickness of wall 6.9—11.5 μ. Full length 710.0—1491.0 μ. Tips of the fibres commonly ending in a peak, one side with saw-teeth. Diameter of the longitudinal parenchyma cells 9.3—27.9 μ. Height 51.1—190.6 μ. Cellular crystal holder longitudinal parenchyma occurs frequently.

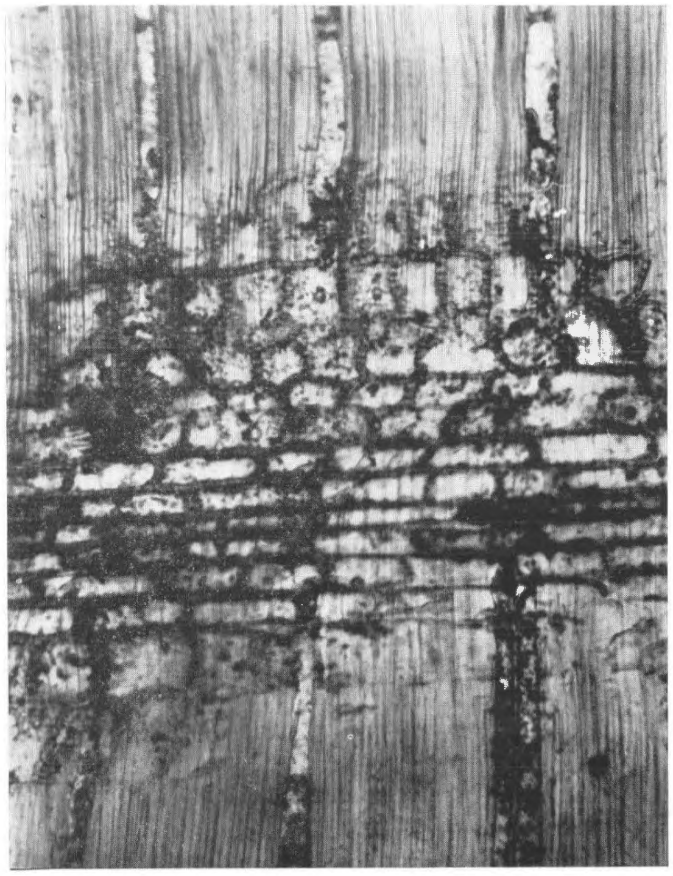

Fig. 11. Pera bumeliaefolia Griseb. Radial section ×120. Heterogeneous medullary ray, longitudinal parenchyma and fibres. Within the cells of medullary rays and longitudinal parenchyma gum or mastic

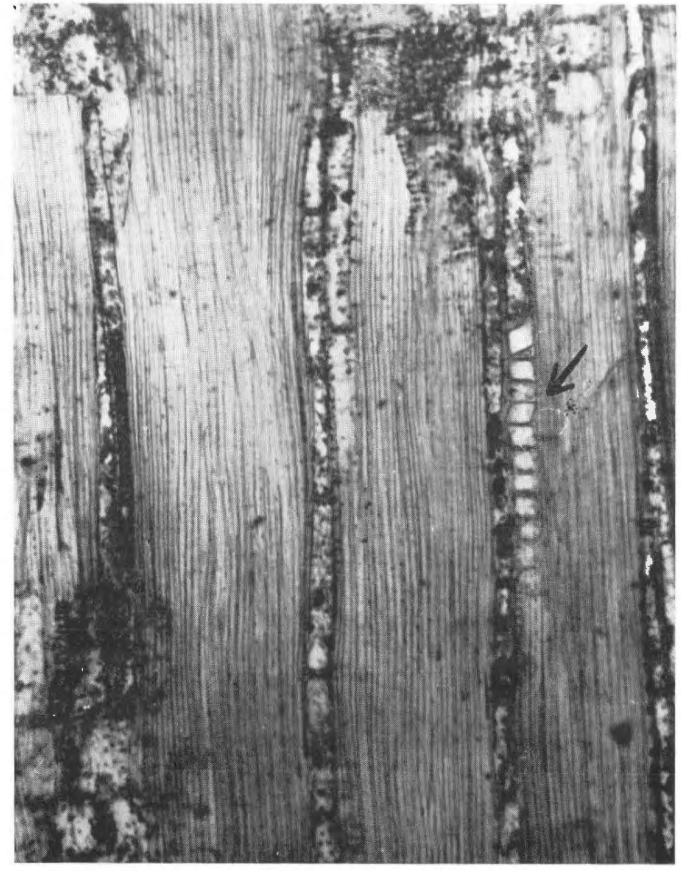

Fig. 12. Pera bumeliaefolia Griseb. Radial section ×120. Crystal holder — longitudinal parenchyma (mark: →)

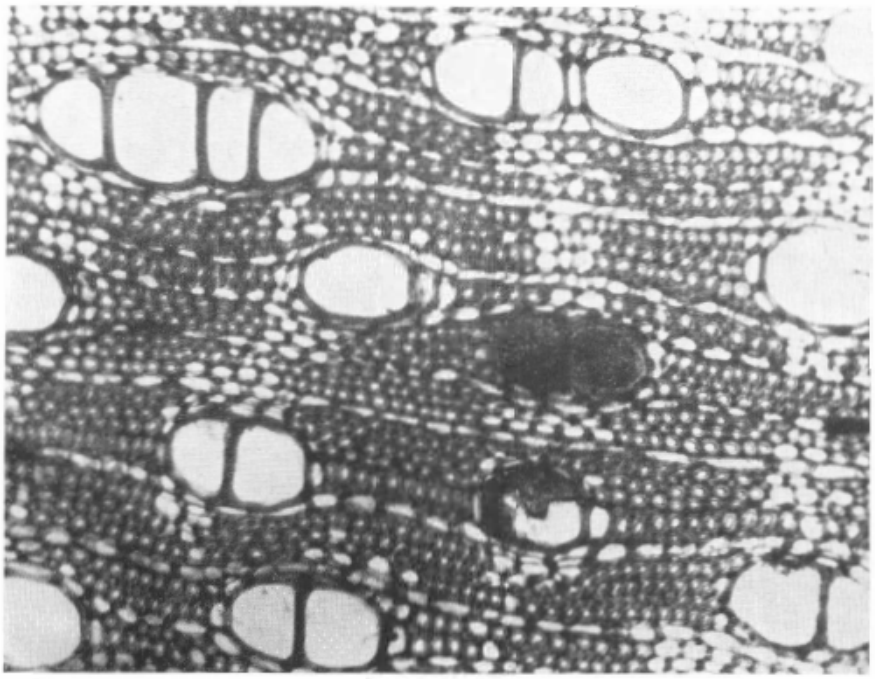

Fig. 14. Trichilia hirta L. Cross section ×120. Tracheae of small size. Tracheae contain mastic material. Narrow medullary rays. thick wall of fibres

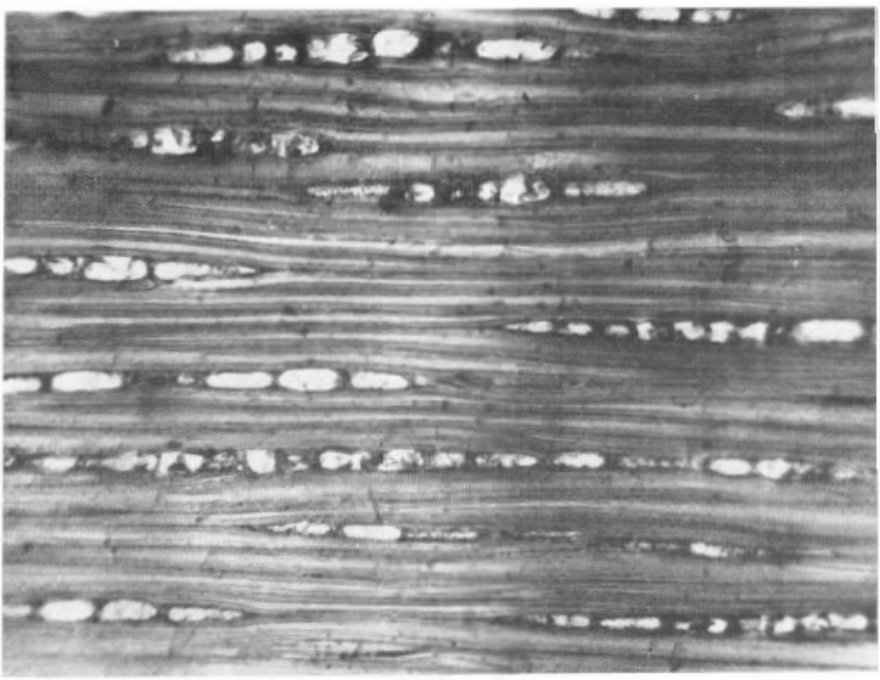

Fig. 13. Pera bumeliaefolia Griseb. Tangential section ×120. Medullary rays with one cell in width, within the cells mastic or gum, and fibres

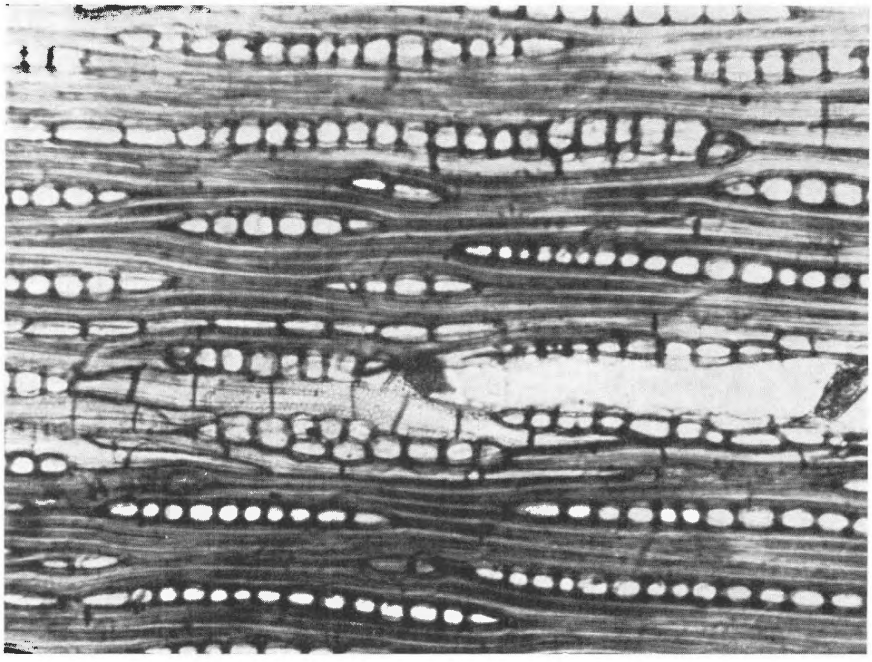

Fig. 16. Trichilia hirta L. Tangential section ×120. Medullary rays of one cell in width. Fibres and trachea of thick wall

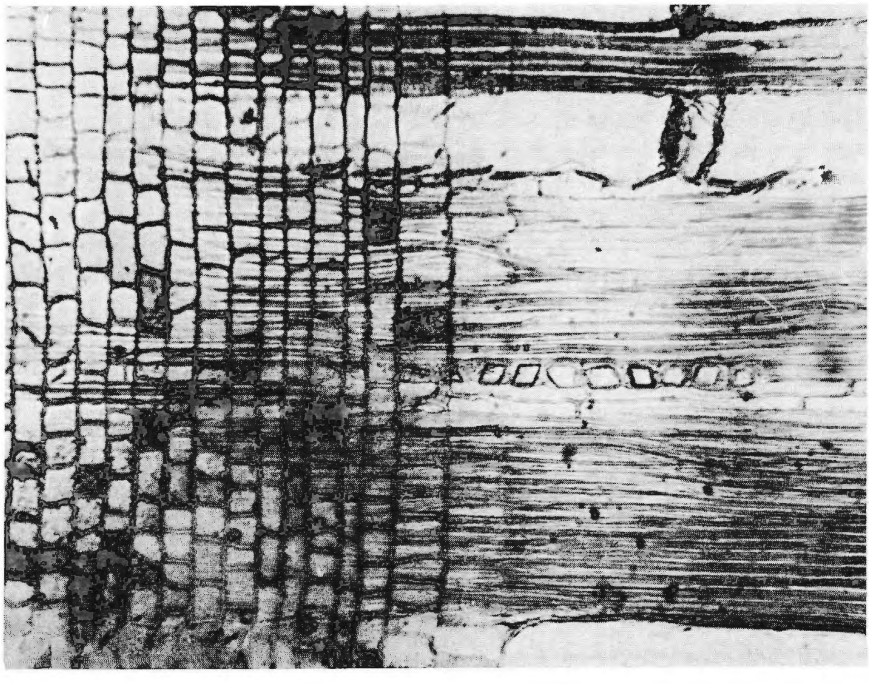

Fig. 15. Trichilia hirta L. Radial section ×120. Heterogeneous medullary ray; cells of medullary ray contain crystals of polygonal shape. Fibres of thick wall and cellular crystal holder longitudinal parenchyma

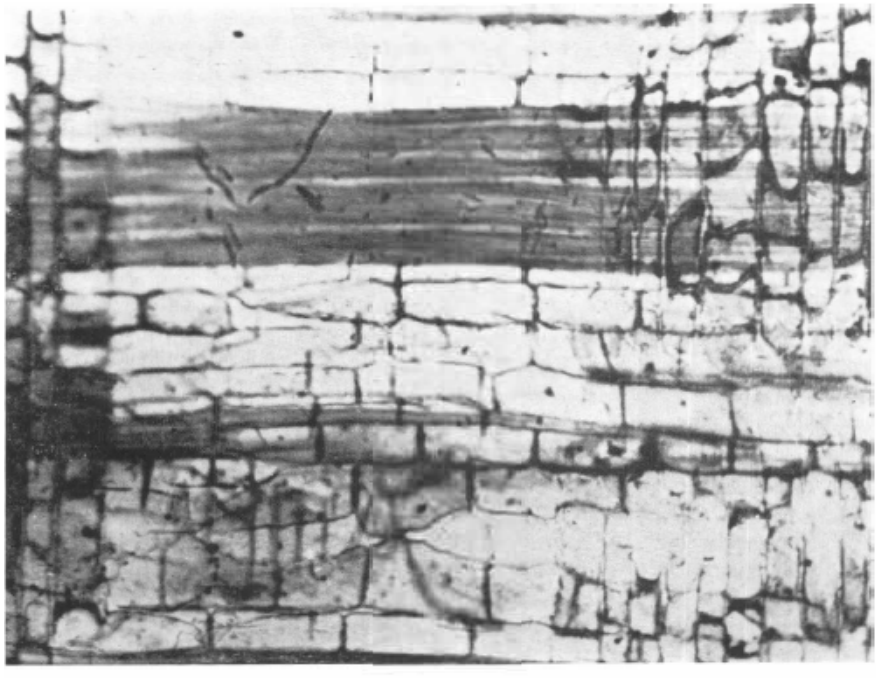

Fig. 18. Guarea Guidonia (L.) Sleumer. Radial section 120×. Heterogeneous medullary rays; cells of medullary rays contain mastic material. Longitudinal parenchyma and fibres of thick wall

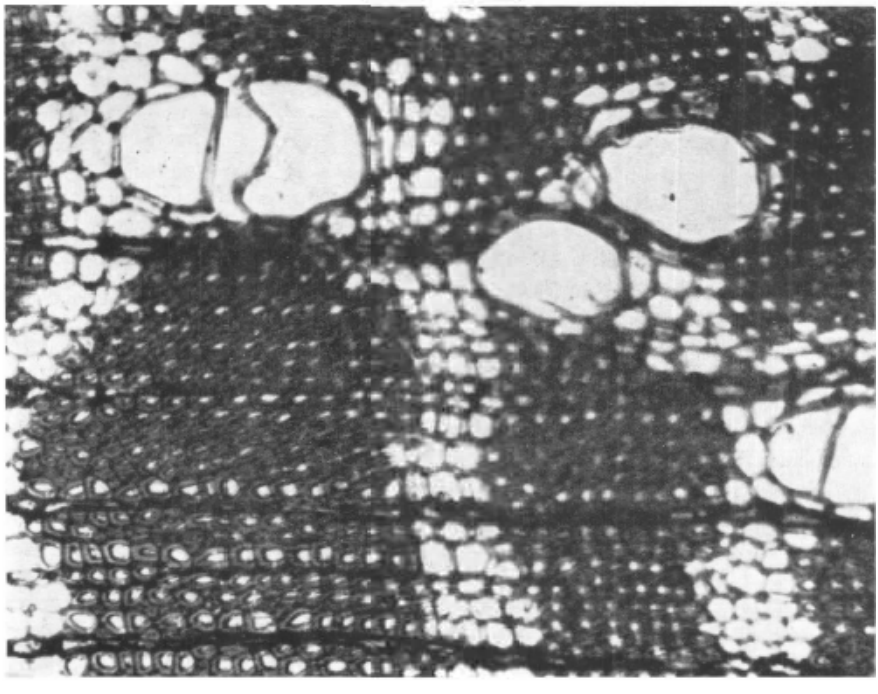

Fig. 17. Guarea Guidonia (L.) Sleumer. Cross section ×120 Large tracheae, medullary rays of one or two cells in width and longitudinal parenchyma. Small lumen of fibres

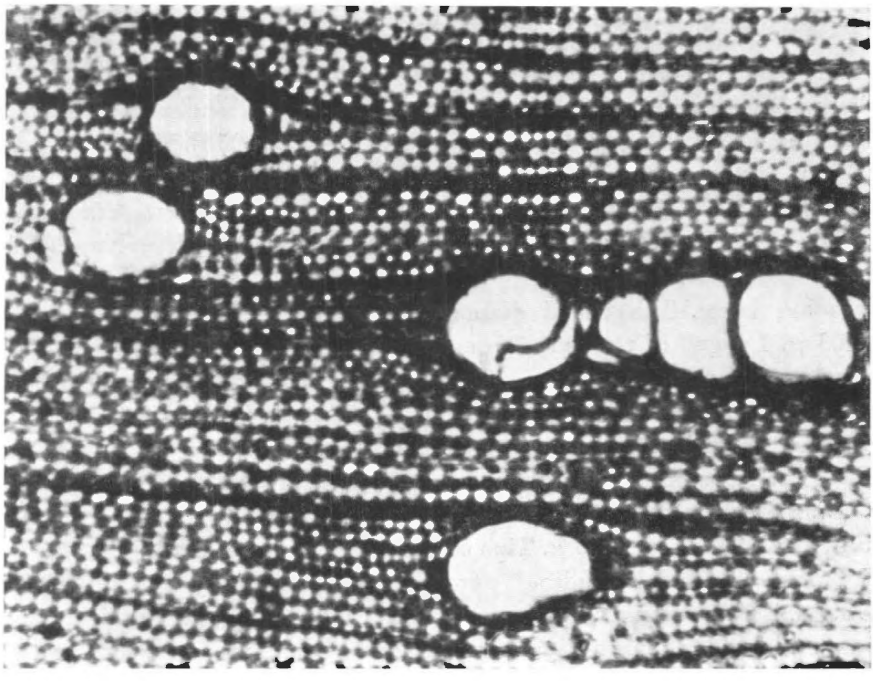

Fig. 20. Cupania glabra Sw. Cross section ×120. Tracheae of small size, narrow medullary rays. Vasicentric-contact longitudinal parenchyma. Thin wall of fibres

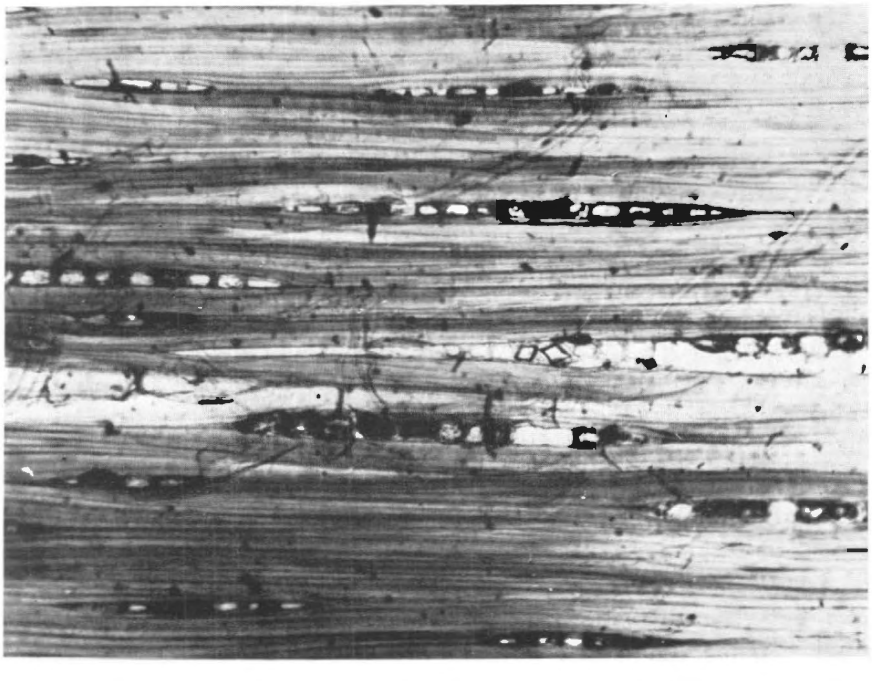

Fig. 19. Guarea Guidonia (L.) Sleumer. Tangential section ×120. Medullary ray of one cell in width and fibres of thick wall. Cells of medullary rays contain mastic material

Fig. 20. Cupania glabra Sw. Cross ection ×120. Tracheae of small size, narrow medullary rays. Vasicentric-contact longitudinal parenchyma. Thin wall of fibres

Fig. 19. Guarea Guidonia (L.) Sleumer. Tangential section ×120. Medullary rays of one cell in width and fibres of thick wall. Cells of medullary rays contain mastic material

Guarea Guidonia (L.) Sleumer

Wood porous diffuse. The ground mass of the wood is formed by fibres with thick wall and narrow lumen and by longitudinal parenchyma. Paratracheal aliform-confluent longitudinal parenchyma. (JANE 1956). Medullary rays with one or rarely two cells in width (Fig. 17). The solitary or double tracheae are oval-shaped. They can rarely form groups of 3—4 members with irregular direction; in this case tracheae are flattened in radial direction. Number is 9 per 1 sq. millimeter.

Sizes are large. Tangential diameter 64.4—165.6 μ. Radial diameter 57.5—209.3 μ. Length of the vessel members is 149.5—805.0 μ, with oblong bordered pits on the wall. Simple perforation plate. Heterogeneous medullary rays 1, rarely 2 cells in width. Height 92.0—575.0 μ. Width 11.5—34.5 μ. Medullary rays contain mastic material (Figs 18—19).

Fibres are in radial lines or in irregular arrangement. Structure is rarely cellular. Diameter 13.8—27.6 μ. Wall thickness 9.2—13.8 μ.

Full length 852.0—2485.0 μ. Tips of the fibres smooth, ending in a peak.

Diameter of the longitudinal parenchyma cells 13.9—41.8 μ. Height 79.0—190.6 μ. Zones of longitudinal parenchyma with 2—4 cells in width. The cellular crystal holder longitudinal parenchyma occurs more rarely than in the *Trichilia*.

Cupania glabra Sw.

Wood porous diffuse. The ground mass of the wood is formed by fibres with thin wall and wide lumen. Paratracheal vasicentric contact longitudinal parenchyma. (WAGENFÜHR and SCHEIBER 1974). Medullary rays mostly with one or very rarely with two cells in width (Fig. 20).

Tracheae are solitary or arranged in lines of 2—5 members, in radial direction, with a mildly oval shape. Number is 18 per 1 sq. millimeter. Small sizes. Tangential diameter 23.0—108.1 μ. Radial diameter 23.0—121.9. Vessel members are 568.0—1136.0 μ long, with a lot of small bordered pits on their wall. Simple perforation plate.

Medullary rays with one or very rarely two cells in width. Homogeneous structure. Height 41.8—1126.5 μ. Width 9.3—27.9 μ. Medullary rays'cells contain mastic materials (Figs 21, 22, 23).

Fibres are arranged in radial lines. Diameter 13.8—25.3 μ. Wall thickness is 3.5—9.2 μ; cellular structure. Full length 71.0—1420.0 μ. Tips of the fibres end in a smooth peak.

Diameter of the longitudinal parenchyma cells is 9.3—7.9 μ. Height 60.4—181.3 μ. Number of the vasicentric-contact cells is 1—2. The cells contain mastic materials. Between the fibres there are some cellular crystal holder longitudinal parenchyma zones.

Fig. 21. Cupania glabra Sw. Radial section ×120. Homogeneous medullary rays. Cells of medullary rays contain mastic material. Cellular fibres. Crystal holder longitudinal parenchyma

Fig. 22. Cupania glabra Sw. Tangential section ×120. Medullary rays of one or two cells in width. Cells of the medullary rays contain mastic material. Fibres of thin wall

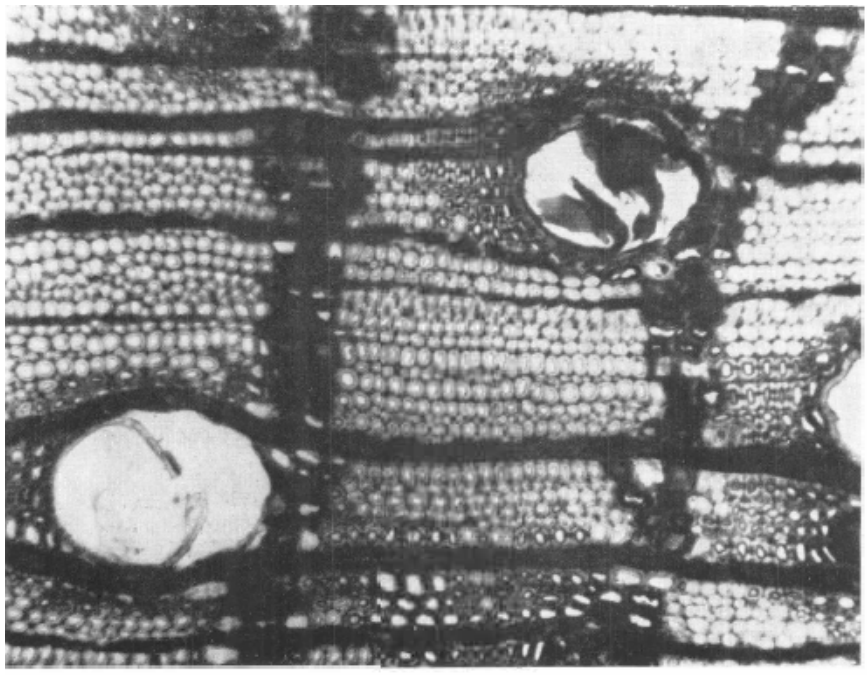

Fig. 24. Calophyllum antillanum Britt. Cross section ×120. Tracheae of large size. Medullary rays of one or two cells in width. Apotracheal and vasicentric contact longitudinal parenchyma cells of parenchyma filled with gummy material. Fibres and fibre-tracheids

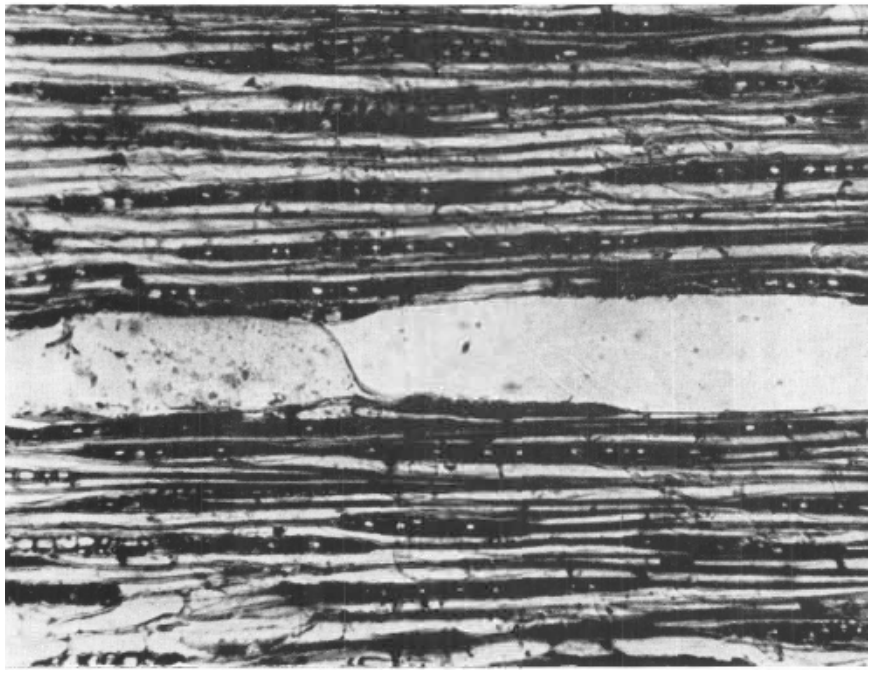

Fig. 23. Cupania glabra Sw. Tangential section ×120. Medullary rays of one cell in width. Cells of medullary rays contain mastic material. A lot of small bordered pits on the wall of tracheae; simple perforation plate

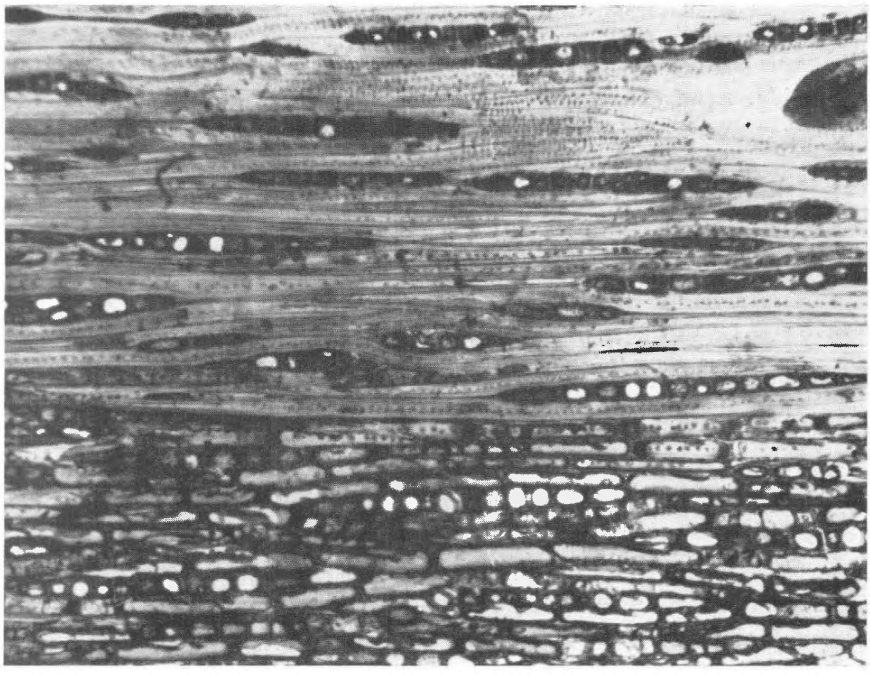

Fig. 26. Calophyllum antillanum Britt. Tangential section ×120. Medullary rays of one or two cells in width, with cumulated arrangement. Cells of medullary rays contain gummy material. Longitudinal parenchyma. Simple and bordered pits distinctly visible on the wall of fibres

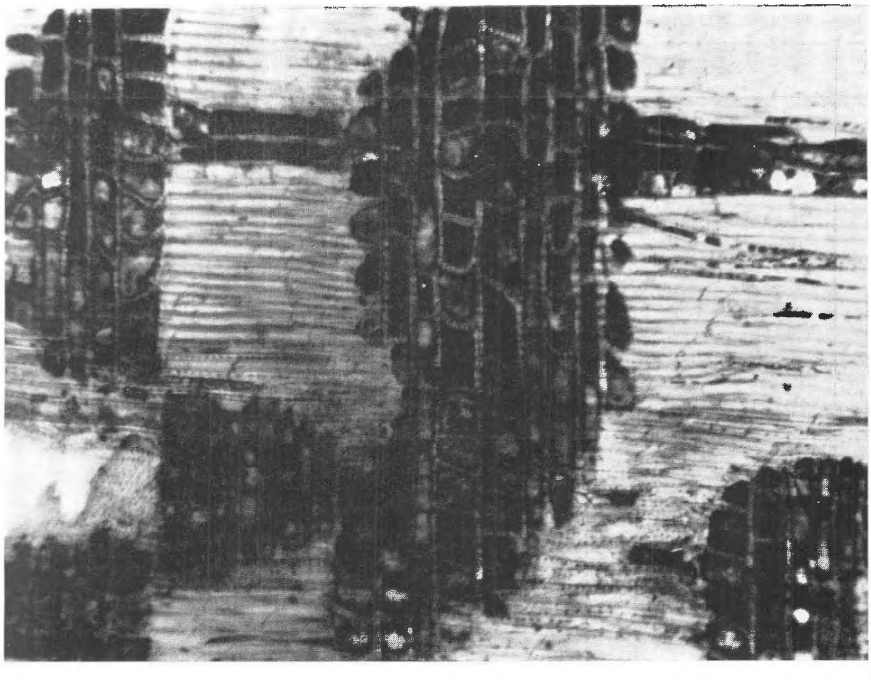

Fig. 25. Calophyllum antillanum Britt. Radial section ×120. Heterogeneous medullary rays. Cells of medullary rays contain gummy material. Fibres of thick wall

Calophyllum antillanum Britt.

Wood porous diffuse. The ground mass of the wood is formed by fibres and fibre-tracheids. Apotracheal and vasicentric-contact longitudinal parenchyma. Medullary rays are one or two cells in width (Fig. 24). Tracheae are oval-shaped. They are solitary, but rarely form irregular groups of 2—4 members; large sizes. Their number is 9 per 1 sq. millimeter. Tangential diameter 52.9—163.3 μ; radial diameter 50.6—234.6 μ. The vessel members are 426.0—1065.0 μ long with a lot of small bordered pits on their wall. Simple perforation plates. The vessels contain mastic material.

Medullary rays 1—2 cells in width, with cumulated arrangement and heterogeneous structure. Height 92.0—494.5 μ. Width 11.5—34.5 μ. Cells of the medullary rays contain gummy-material (Figs 25, 26).

Fibres are arranged in radial lines. Diameter 11.5—20.7 μ. Wall thickness 6.9—11.5 μ. Full length 852.07—1704.0 μ. On the radial wall of the fibres there is a bordered or simple pit of small size. Tips of the fibres end in a smooth peak, rarely forking.

Diameter of the longitudinal parenchyma cells is 13.9—27.9 μ. Height 46.5—209.2 μ. Cells contain mastic or gummy-material. Cellular crystal holder longitudinal parenchyma does not occur frequently. Detailed anatomical features of the species are shown in Tables 1, 2.

Table 1

Detailed anatomical features of the species

Wood element	Features	*Garrya fadyenii*	*Catalpa punctata*
Vessel members	Arrangement	diffuse-solitary	diffuse-solitary or irregular group of 2—4 members
	Shape	oval — very small	oval or flattened
	Tangential diameter	18.4—52.9 μ	23.0—119.6 μ
	Radial diameter	23.0—57.5 μ	29.9— 85.1 μ
	Wall thickness	2.3— 4.6 μ	2.3— 4.6 μ
	Length of vessel members	355.0—1065.0 μ	284.0—852.0 μ
	Number per sq. mm	69	24
	Intervascular pitting	bordered-rare	bordered-oblong
	Perforation plate	scalariform	simple
	Content	—	—
Medullary rays	Width	uni- to multiseriate	uni- to twoseriate
	Number of cells	1—5	1—2
	Classification	heterogeneous	heterogenous
	Height	230.0—4830.0 μ	83.7—306.9 μ
	Width	23.0— 115.0 μ	9.3— 32.5 μ
	Content of cells	polygonal-shaped small crystals	numerous small polygonal-shaped crystals and mastic

Continued table 1

Wood element	Features	*Garrya fadyenii*	*Catalpa punctata*
Fibres	Arrangement	radial	radial or irregular
	Shape	polygonal	polygonal-cellular
	Full diameter	16.1— 25.3 μ	16.1— 25.3 μ
	Wall thickness	10.7— 11.5 μ	9.2
	Full length	781.0—1633.0 μ	639.0—1491.0 μ
	Type of pitting	bordered	simple
Longitudinal parenchyma	Arrangement	Apotracheal-diffuse	paratracheal-vasicentric
	Diameter	6.9— 23.0 μ	9.2— 25.3 μ
	Height	51.1—265.0 μ	41.8—241.8 μ
	Number of cells	1	1 3
	Content		mastic
	Other		

Wood element	Features	*Tabebuia lepidota*	*Pera bumeliaefelia*
Vessel members	Arrangement	diffuse-solitary or in radial lines of 2—4 members	diffuse-solitary or in radial lines of 2—6 members
	Shape	roundish or oval	oval
	Tangential diameter	25.3— 92.0 μ	46.0— 184.0 μ
	Radial diameter	34.5— 96.6 μ	68.5— 264.0 μ
	Wall thickness	2.3— 6.9 μ	4.6— 11.5 μ
	Length of vessel member	213.0— 426.0 μ	781.0—1065.0 μ
	Number per sq. mm	47	7
	Intervascular pitting	bordered-oblong	bordered
	Perforation plate	simple	simple
	Content		gum
Medullary rays	Width	uni- or very rarely twoseriate	uni- or very rarely twoseriate
	Number of cells	1—2	1—2
	Classification	homogeneous	heterogeneous
	Height	32.5— 167.4 μ	115.0— 851.0 μ
	Width	4.6— 32.5 μ	11.5— 34.5 μ
	Content of cells	mastic	gum and crystals
Fibres	Arrangement	radial or irregular	radial
	Shape	polygonal	polygonal
	Full length	11.5— 13.8 μ	9.2— 18.4 μ
	Wall thickness	6.3— 9.9 μ	4.6— 9.2 μ
	Full length	497.0—1136.0 μ	1278.0—2201.0 μ
	Type of pitting	simple	bordered-flanged
Longitudinal parenchyma	Arrangement	paratracheal-aliform confluent	apotracheal-diffuse metatracheal continuous
	Diameter	9.2— 29.9 μ	11.5— 25.3 μ
	Height	32.5— 172.0 μ	65.1— 437.1 μ
	Number of cells	3—6	1—2
	Content		gum or mastic
	Other		cellular crystal holder parenchyma

Table 2

Detailed anatomical features of the species

Wood element	Features	*Trichilia hirta*	*Guarea Guidonia*
Trachea members	Arrangement	diffuse solitary or radial groups of 2—5 members	diffuse solitary or double
	Shape	roundish or oval	oval
	Tangential diameter	36.8— 71.3 μ	64.4 — 165.6 μ
	Radial diameter	46.0— 96.6 μ	57.5 — 209.3 μ
	Wall thickness	2.3— 6.9 μ	2.3 — 9.2 μ
	Length of vessel members	355.0— 923.0 μ	149.5 — 805.0 μ
	Number per 1 sq. mm	39	9
	Intervascular pitting	adorned-bordered	oblong-bordered
	Perforation plate	simple	simple
	Content	mastic	
Medullary rays	Width	uni- or biseriate	uni- or biseriate
	Number of cells	1—2	1—2
	Classification	heterogeneous	heterogeneous
	Height	57.5—1115.5 μ	92.0— 575.0 μ
	Width	11.5— 34.5 μ	11.5— 34.5 μ
	Content of cells		mastic
Fibres	Arrangement	radial	radial or irregular
	Shape	polygonal	polygonal
	Full diameter	9.2 — 18.4 μ	13.8— 27.6 μ
	Wall thickness	6.9 — 11.5 μ	9.2— 13.8 μ
	Full length	710.0—1491.0 μ	852.0—2485.0 μ
	Type of pit	simple	simple
Longitudinal parenchyma	Arrangement	paratracheal aliform-confluent	paratracheal aliform confluent
	Diameter	9.3— 27.9 μ	13.9— 41.8 μ
	Height	51.1— 190.6 μ	79.0 — 190.6 μ
	Number of cells	1—3	2—4
	Other	cellular crystal holder parenchyma	cellular crystal holder parenchyma

Wood element	Features	*Cupania glabra*	*Colophyllum antillanum*
Trachea members	Arrangement	diffuse, solitary or radial groups of 2—5 members	diffuse, solitary or irregular groups of 2—4 members
	Shape	oval	oval
	Tangential diameter	23.0— 108.1 μ	52.9— 163.3 μ
	Radial diameter	23.0— 121.9 μ	50.6— 234.6 μ
	Wall thickness	2.3— 6.9 μ	2.3— 6.9 μ
	Length of vessel members	568.0—1136.0 μ	426.0—1065.0 μ
	Number per 1 sq. mm	18	9
	Intervascular pitting	bordered	bordered, small
	Perforation plate	simple	simple
	Content		mastic

Table 2, Continued

Wood elements	Features	*Cupania glabra*	*Calophyllum antillanum*
Medullary rays	Width	uni- or biseriate	one, rarely two, cumlated ray
	Number of cells	1—2	1—2
	Classification	homogeneous	heterogeneous
	Height	41.8—1162.5 μ	92.0— 494.5 μ
	Width	9.3— 27.9 μ	11.5— 34.5 μ
	Content of cells	mastic	mastic
Fibres	Arrangement	radial	radial or irreg.
	Shape	polygonal	polygonal
	Full diameter	13.8— 25.3 μ	11.5— 20.7 μ
	Wall thickness	3.5— 9.2 μ	6.9— 11.5 μ
	Full length	710.0—1420.0 μ	852.0—1704.0 μ
	Type of pits	simple	bordered
Longitudinal parenchyma	Arrangement	vasicentric-contact	apotracheal-vasicentric-contact
	Diameter	9.3— 27.9 μ	13.9— 27.9 μ
	Height	60.4— 181.3 μ	46.5— 209.2 μ
	Number of cells	1—2	1—6
	Content	mastic	gummy
	Other	cellular crystal holder parenchyma	cellular crystal holder parenchyma

Origin of the samples

Garrya fadyenii Hook.: Cuba; Prov. Oriente; Sierra Maestra: Pico Marti in altit. of 1300 m. Collected by A. BORHIDI and M. VALES, 12. 1. 1976.

Catalpa punctata Griseb. ssp. *punctata:* Cuba; Prov. Pinar del Rio; Peninsule of Guanahacabibes, El Veral Nature Conserv. Area, in alt. 5—10 m. Collected by A. BORHIDI and M. VALES, 14. 12. 1974.

Tabebuia lepidota (HBK.) Britt.: Cuba; Prov. Matanzas, Canasi; Collected by M. VALES, 6. 11. 1974.

Pera bumeliaefolia Griseb.: Cuba; Prov. Camagüey; Sierra de Cubitas, Loma Tuabaquey in altit. approx. 300 m. Collected by M. VALES, 8. 5. 1975.

Trichilia hirta L.: Cuba; Prov. La Habana; Loma de Perle, Jibacoa, in altit. approx. 100 m. Collected by M. VALES, 29. 10. 1974.

Guarea Guidonia (L.) Sleumer: Cuba; Prov. Pinar del Rio; Sierra del Rosario; Loma El Salón, in altit. approx. 450 m. Collected by M. VALES, 19. 11. 1974.

Cupania glabra Sw.: Cuba; Prov. La Habana; Escaleras de Jaruco in altit. approx. 200 m. Collected by M. VALES, 9. 10. 1974.

Calophyllum antillanum Britt.: Cuba; Prov. Pinar del Rio; Sierra del Rosario, Loma El Salón, in altit. approx. 470 m. Collected by M. VALES, 20. 11. 1974.

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