

A CONTRIBUTION TO THE WOOD ANATOMY OF SOUTH AMERICAN (CHIEFLY SURINAME) RUBIACEAE. II*

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SUMMARY

This paper contains a discussion of the taxonomic subdivisions of the *Rubiaceae* as proposed by Schumann, Verdcourt, and Bremekamp. Generally speaking, the subdivisions as proposed and delimited by Bremekamp agree best with the characters of the wood structure, as observed by the author. Furthermore a key to the Suriname genera is given.

1. INTRODUCTION

In a preceding paper (KOEK-NOORMAN 1969) a general description of the wood of South American *Rubiaceae* is given. This is compared with data found in the literature.

In the present study the comprehensive systematic classifications given by SCHUMANN (1897), BREMEKAMP (1954, 1966), and VERDCOURT (1958) are compared with notes elsewhere in the literature and the results of the present investigation.

Besides a key to the Suriname genera is provided, based on the material studied by the author.

2. MATERIAL AND METHODS

The methods are described in the preceding paper. The species studied are listed at the end of the present paper. The illustrations referred to in this study can be found in the preceding paper.

3. DISCUSSION

The classifications by Schumann, Verdcourt, and Bremekamp differ in the number and delimitation of subfamilies, tribes and genera. As Verdcourt's and Bremekamp's systems are the most recent ones and as both authors make use of new characters I shall discuss their work especially. The division by Schumann, Verdcourt, and Bremekamp in subfamilies and tribes is as follows:

* Continued from Acta Botanica Neerl. 18: 108-123. 1969

Schumann:

Cinchonoideae
 Condamineae
 Oldenlandieae
 Rondeletieae
 Cinchoneae
 Naucleaeae
 Mussaendeae
 Gardenieae
 Henriquezieae

Coffeoidaeae
 Alberteae
 Knoxieae

Vanguerieae

Chiococceae
 Ixoreae
 Psychotrieae
 Paederieae
 Anthospermeae
 Coussareae
 Morindeae
 Spermacoceae
 Rubieae
 Guettardeae

Verdcourt:

Cinchonoideae
 Rondeletieae
 Cinchoneae
 Naucleaeae
 Mussaendeae
 Gardenieae
 Catesbaeeae
 Ixoreae
 Alberteae
 Vanguerieae
 Chiococceae
 Retiniphyllaeae

Rubioideae
 Knoxieae
 Psychotrieae

Coussareae
 Morindeae
 Schradereae
 Craterispermeae
 Paederieae
 Coccocypseleae
 Argostemmataeae
 Hamelieae
 Cruckshanksieae
 Hedyotideae
 Anthospermeae
 Spermacoceae
 Rubieae
 Urophyllaeae
 Ophiorrhizeae

Bremekamp:

Cinchonoideae
 Condamineae (Chimarrhis)
 Rondeletieae (Elaeagia, Warszewiczia)
 Cinchoneae (Capirona, Ferdinandusa, Uncaria)
 Naucleaeae
 Mussaendeae (Isertia)
 Sabiceaeae
 Sipaneaeae

Ixoroideae
 Coptosapelteae
 Acranthereae
 Cremasporeae
 Gardenieae (Alibertia, Amajoua, Duroia, Genipa,
 Randia, Rosenbergiendendron, [Posoqueria?])
 Ixoreae (Chomelia, Ixora)
 Chiococceae
 Vanguerieae

Rubioideae
 Knoxieae
 Psychotrieae (Cephaelis, Mapouria, Naletonia,
 Palicourea, Psychotria, Ronabea, Rudgea, Strem-
 pelia)

Coussareae (Coussarea, Faramea)
 Morindeae (Morinda)
 Schradereae (Schradera)
 Craterispermeae
 Paederieae
 Coccocypseleae
 Argostemmataeae
 Hamelieae (Hamelia)
 Cruckshanksieae
 Hedyotideae
 Anthospermeae
 Spermacoceae
 Rubieae
 Perameae
 Triainolepideae
 Lathraeocarpeae
 Gaertnereae (Pagamea)

Urophyllloideae
 Urophyllaeae
 Ophiorrhizeae
 Pauridiantheae
 Simireae (Sickingia, Simira)

Hillioideae
 Hillieae (Hillia)

<i>Guettardoideae</i>	<i>Guettardoideae</i>
Guettardeae	Guettardeae (Guettarda, Malanea)
	<i>Pomazotoideae</i>
	Pomazoteae
	<i>Gleasonioideae</i>
	Gleasonieae

(The genera mentioned between brackets are studied in the recent investigation. To make a comparison between the divisions more easy I listed the tribes in a different arrangement as the authors did).

The subfamily *Cinchonoideae*, as established by Schumann and Verdcourt, is divided by Bremekamp in *Cinchonoideae* and *Ixoroideae*.

3.1. Subfamily Cinchonoideae:

Bremekamp divided the tribe *Rondeletiae* (in the sense Verdcourt intended) in the *Condamineae* and *Rondeletieae*, as Schumann did.

Available were wood samples of *Chimarrhis longistipulata*, *Chimarrhis turbinata* (*Condamineae*), *Elaeagia maguirei*, and *Warszewiczia coccinea* (*Rondeletieae*).

Condamineae. Schumann was not sure whether *Chimarrhis turbinata* was rightly placed in this genus. DUCKE (1922) referred it to a new genus, viz. *Pseudochimarrhis*. According to BREMEKAMP (1932) and STEYERMARK (1965) *Chimarrhis* and *Pseudochimarrhis* are not separable. RECORD & HESS (1944) report that the wood of *Pseudochimarrhis barbata* Ducke is similar in every respect, to the wood of *Chimarrhis*. Actually, the wood of *Chimarrhis turbinata* greatly resembles *Chimarrhis longistipulata*, the place of which is not in doubt. They differ only in minor features.

Rondeletieae. *Elaeagia maguirei* and *Warszewiczia coccinea*, the two species of the *Rondeletieae* examined, also resemble each other much in their wood structures.

However, there is a clear difference between the investigated samples of the *Rondeletieae* and of the *Condamineae*. In the *Condamineae* the parenchyma is narrowly vasicentric, in the *Rondeletieae* it is lacking; the *Condamineae* have 6–12 vessels per sq. mm, which are up to 150 μ wide, in the *Rondeletieae* the number of vessels is about 40 per sq. mm, their width not over 90 μ ; the upright ray dells are up to 50 μ and 80 μ respectively; furthermore most *Rondeletieae* show the combination of over 4-seriate rays of great height and sheath cells (see KOEK-NOORMAN 1969) in contrast to the *Condamineae* which have no sheath cells or have no broad rays.

Summarizing we may say that the *Rondeletieae* as far as studied resemble the *Rubioideae*, whereas the *Condamineae* as represented by *Chimarrhis longisti-*

pulata and *Chimarrhis turbinata* agree more with our material of the *Cinchoneae*. This seems to be consistent with the opinion of Bremekamp, when he considers the *Condamineae* and *Rondeletieae* to be two distinct tribes.

Simira Aubl. (= *Sickingia* Willd.), another genus placed in the *Rondeletieae* by earlier authors, fits in well with the *Urophyллоideae* according to BREMEKAMP (1954). However, as far as wood characters are concerned *Elaeagia* and *Simira* agree very well, whereas *Simira* differs from the structure of *Urophyllum* as judged from in the descriptions of the latter genus by JANSSONIUS (1926; see p. 387).

Other genera placed in the *Urophyллоideae* by Bremekamp were not studied.

Cinchoneae. Next to *Capirona* and *Ferdinandusa*, placed by earlier authors in the tribe of *Cinchoneae* too, Bremekamp referred *Uncaria*, until then classed in the *Naucleaeae*, to the *Cinchoneae*. *Ferdinandusa rudgeoides* and *Capirona surinamensis* are fairly similar: *Capirona* has some vessels in radial pairs, *Ferdinandusa* has many vessels in small clusters, but they are alike in the structure of the rays, the inconspicuously vested intervacular pits, the libriform fibres and the very scarce paratracheal parenchyma.

The description of *Cinchona* sp. by JANSSONIUS (1926) does differ; the material, however, was poor and not identified up to the species. Therefore this material is perhaps not quite reliable. Further investigations in this genus will be needed.

Uncaria guianensis and *U. africana* (Uw 9464) has many solitary vessels, some in radial pairs, the rays are smaller than those of *Capirona* and *Ferdinandusa*, the fibres are non-septate with large bordered pits on radial and tangential walls, and the parenchyma is diffuse.

Naucleaeae. I did not study any other representatives of the *Naucleaeae* but descriptions and illustrations of species of *Nauclea* and other genera belonging to this tribe (JANSSONIUS 1926; NORMAND 1960) resemble *Uncaria guianensis* in the distribution of the vessels, the structure of the rays, the presence of fibre tracheids and the diffuse parenchyma.

Mussaendeae. *Isertia*, belonging to the tribe of *Mussaendeae*, resembles the species of the *Ixoreae* and *Gardenieae* studied and *Posoqueria* (of uncertain position, see p. 381). Curiously *Isertia* is the only genus of the *Cinchonoideae* studied which has fibre tracheids, just like the *Ixoroideae*.

Bremekamp excluded a large number of genera from the *Mussaendeae*, among others *Schradera* (transferred to a tribe of its own in the *Rubioideae*, see p. 385), *Tammsia*, *Pentagonia*, *Hippotis* and *Sommeria*. The systematic position of the last four genera is uncertain. Of these genera no wood samples were available.

According to METCALFE & CHALK (1950) *Hippotis* and *Pentagonia* possess libriform fibres. This feature supports Bremekamp's opinion that these genera do not belong in the same tribe with *Isertia*.

The *Sipaneaeae* and *Sabiceaeae* include only herbaceous genera.

3.2. Subfamily Ixoroideae:

Two tribes were represented, the *Gardenieae* and *Ixoreae* (The other tribes are entirely herbaceous or they occur in the Old World, except for the *Chiococceae*, including shrubs of Central America and the West Indian Isles).

Gardenieae. Many wood samples of the *Gardenieae* were available, viz. of the genera *Alibertia*, *Amajoua*, *Duroia*, *Genipa*, *Randia* and *Rosenbergiodendron*. The most samples agree rather well. They show a moderate variation in characteristics of the parenchyma distribution (diffuse, in short or long bands), the diameter and number of the vessels, the width of the rays, etc.

The libriform fibres, the long, not interrupted parenchyma bands and the small and numerous vessels in *Alibertia myrciifolia* do not fit in with the features of *Alibertia edulis* nor with the other genera of this tribe studied. Because of these great differences it seems necessary to study this species in more detail in order to decide if it is rightly placed in this genus.

The position of *Posoqueria*, placed in the *Gardenieae* by VERDCOURT (1958) and STEYERMARK (1967), it doubtful in Bremekamp's opinion, the pollination mechanism amongst others being different from those of other genera in this tribe. *Posoqueria* possesses libriform fibres, contrary to most *Gardenieae*, which supports the idea of Bremekamp.

Ixoreae. *Chomelia* and *Ixora*, belonging to the *Ixoreae* according to Bremekamp, differ in many characteristics. *Chomelia* resembles many species of the *Guettardeae* because of the libriform fibres, the structure of the rays and the vessels in radial multiples (table 1). This fits in with the view of STEYERMARK (1967), who places *Chomelia* in the *Guettardeae*. From the material investigated it is not possible to distinguish *Ixora* from the *Gardenieae* by the structure of the wood. JANSSONIUS (1926) notes from his study of different genera the same about these two tribes. Using the classification of SCHUMANN (1897) and BENTHAM & HOOKER (1873), in which the *Gardenieae* and *Ixoreae* are placed in different subfamilies, he remarks that a classification based upon anatomical characteristics can be quite different from a division based upon other systematic features.

The *Vanguerieae* classified in the *Coffeoidae* by SCHUMANN (1897) seem to be rightly placed in the *Ixoroideae* by Bremekamp, because of the presence of fibre tracheids (JANSSONIUS 1926). No material was studied in the present investigation.

Hamelia, often placed in the *Gardenieae* (SCHUMANN 1897) is classified in a separate tribe in the *Rubioideae* by Bremekamp (see p. 387).

The *Retiniphyllae*, belonging to the *Cinchonoideae* according to VERDCOURT (1958), have not been classified by BREMEKAMP (1966), who is of the opinion that a detailed study is necessary before a decision can be made about the right position of *Retiniphyllum* (see p. 388).

The *Henriquezieae* are changed from tribe to family: *Henriqueziaceae* (BREMEKAMP 1956; see p. 389).

Table 1

	Vessels								Fibres				Rays								Parenchyma						
	solitary	<50% in rad. mult.	>4 per mult.	diam. >40µ	diam. >100µ	>20 per sq. mm	>40 per sq. mm	tyloses	separate	Pit-borders small or absent	Pit-borders large	Pits frequent on tg. walls	uniseriate	uni- and biseriata	over 4-seriate	all cells square/upright	margins of more than 4 cells	width 25-50µ	width 100-300µ	Height >1 mm	Sheath cells	absent	narrowly vascular	diffuse	short bands	long bands	raphides or rhombic crystals
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
RUBIOIDEAE																											
Gaetnereae																											
<i>Pagamea capitata</i>																											
<i>P. guianensis</i>																											
UROPHYLLOIDEAE																											
Simireae																											
<i>Sickingia maxonii</i>																											
<i>S. oliveri</i>																											
<i>S. glazovii</i>																											
<i>S. sampaioana</i>																											
<i>S. fragrans</i>																											
RUBIOIDEAE																											
Psychotriaceae																											
<i>Strepelia cornifolia</i>																											
<i>Ronabea latifolia</i> (1*)																											
<i>Naletonia violacea</i>																											
<i>Psychotria paniculata</i>																											
<i>Cephaelis glabrescens</i>																											
<i>Rudgea cornigera</i>																											
<i>R. graciliflora</i> (1*)																											
<i>R. hostmanniana</i>																											
<i>Palicourea crocea</i>																											
<i>P. guianensis</i>																											
<i>P. longiflora</i>																											
Hameliaceae																											
<i>Hamelia ventricosa</i>																											

Continuation
of
Table 1

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	
	solitary	<50% in rad. mult.	>4 per mult.	diam. <40 μ	diam. >100 μ	<20 per sg mm	<40 per sg. mm	tyloses	septate	Pit-borders small or absent	Pit-borders large	Pits frequent on tg. walls	uniseriate	uni- and biseriate	over 4-seriate	all cells square/upright	margins of more than 4 cells	width 25-50 μ	width 100-300 μ	Length > 1 mm	Sheath cells	absent	narrowly vasicentric	diffuse	short bands	long bands	raphides or rhombic crystals	
IXOROIDEAE																												
Gardenieae																												
<i>Duroia genipoides</i>																												
<i>D. eriopila</i>																												
<i>D. aquatica</i>																												
CINCHONOIDEAE																												
Mussaendeae																												
<i>Iserlia coccinea</i>																												
<i>I. parviflora</i>																												
<i>I. hypoleuca</i>																												
IXOROIDEAE																												
Gardenieae																												
<i>Rosenbergiodendron formosum</i> (1*)																												
<i>Randia spinosa</i>																												
<i>Genipa americana</i>																												
<i>Duroia sprucei</i>																												
<i>Alibertia edulis</i>																												
<i>A. myrsinitifolia</i>																												
<i>Amajoua guianensis</i>																												
Ixoreae																												
<i>Ixora orinocensis</i>																												
<i>I. surinamensis</i>																												
<i>Chomelia tenuiflora</i>																												

The subfamily of *Rubioideae* as circumscribed by VERDCOURT (1958) is divided by BREMEKAMP (1940, 1966) in the *Urophyllloideae* and *Rubioideae*.

3.2. Subfamily Rubioideae:

Bremekamp considers the presence of raphides in any part of the plant essential for all genera of the *Rubioideae*; on the other side, all genera possessing raphides belong in this subfamily according to him (the only exception being *Hillia* which is placed in a subfamily of its own: *Hillioideae*). Indeed, in many genera studied raphides are present in ray or parenchyma cells.

The tribes of the *Rubioideae* represented were the *Psychotrieae*, *Coussareeae*, *Morindeae*, *Schradereae*, *Gaertnereae*, and *Hamelieae*.

Psychotrieae. The wood of the genera of the tribe *Psychotrieae* is very similar. *Mapouria* is recognizable by the radial vessel multiples of more than 4 cells, and the frequency of the raphides in the ray cells. *Palicourea* is exceptional in that it has many procumbent ray cells. *Cephaelis*, *Naletonia*, *Psychotria*, *Ronabea*, *Rudgea*, and *Strepelia* can hardly be told apart, as is apparent from the key. The rays differ slightly in number, but these differences do not permit diagnostic conclusions, neither can one divide the genera on the small differences in fibre length and vessel diameter. Raphides in the ray cells of species of *Psychotria* as mentioned by JANSSONIUS (1926) and HESS (1936) were not present in the studied sample of *Psychotria paniculata*.

Coussareeae. The woods of the genera *Coussarea* and *Faramea* of the *Coussareeae* are as difficult to distinguish from each other as the woods of the *Psychotrieae* are. They stand apart from the other *Rubioideae* by their scanty vasicentric parenchyma, also mentioned by METCALFE & CHALK (1950). Raphides are numerous in both genera.

Morindeae. Of the *Morindeae* two samples of *Morinda citrifolia* were studied. Although one sample was taken from a branch, with a diameter of 1.5 cm, and the other specimen was 10 cm wide, their wood structures are much alike and they well correspond with the description by JANSSONIUS (1926). Because of the numerous raphides Bremekamp and Verdcourt refer this genus to the *Rubioideae*. Raphides do occur in the axial parenchyma. The abundant apotracheal and paratracheal parenchyma is very exceptional in this subfamily, *Morinda citrifolia* being the only species of the material studied in which it occurs. SOLEREDER (1885) mentions this feature for *Morinda royoc*; NORMAND (1960) describes *Morinda geminata* and *Morinda lucida* with numerous 4-6-seriate parenchyma bands, but remarks, that this feature is not constant within the whole genus.

Schradereae. The tribe of *Schradereae* was represented by a sample of *Schradera rotundata*, collected in Colombia. Because of the non-lignified axial and ray parenchyma, the large oval fibre pits (12-15 μ) and the large intervascular pits

(12 μ), *Schradera rotundata* does not very well resemble the other *Rubiaceae* studied. However, the libriform fibres and the frequent occurrence of raphides in the apotracheal parenchyma suggest affinity to the *Rubioideae*. For these very reasons *Schradera* is not related to *Isertia*, with which genus SCHUMANN (1897) placed it in the *Mussaendeae*.

Gaertnereae. The *Gaertnereae* include *Pagamea* and *Gaertnera*, of which *Pagamea* is represented in tropical America. On account of the almost entirely superior ovary both genera were often placed in the *Loganiaceae* and they are also treated under that family by RECORD & HESS (1944) and by NORMAND (1960). SOLEREDER (1885) considers both genera to belong to the *Rubiaceae* on account of the anatomical structure. BREMEKAMP (1966) concluded from the presence of raphides and a number of morphological characteristics that *Pagamea* and *Gaertnera* are closest to the *Psychotriaceae*. Indeed the presence of raphides in *Pagamea* fits in with the *Rubioideae*, whereas raphides are lacking in the *Loganiaceae*. The parenchyma bands in *Pagamea* indicate the isolated place in the *Rubioideae* because parenchyma bands are rare in this subfamily (*Morinda*), though they are found in other *Rubiaceae*.

Hamelieae. The *Hamelieae*, represented by *Hamelia ventricosa*, collected in Jamaica, fit very well in with the *Rubioideae* as regards the libriform fibres, the absence of parenchyma and the number and diameter of the vessels, whereas the *Gardenieae*, in which tribe *Hamelia* was placed by previous authors (SCHUMANN 1897), possess fibre tracheids, and parenchyma in short or long bands. The tribes *Craterispermeae*, *Coccocypseleae*, *Argostemmatideae*, *Cruckshanksiaceae*, *Anthospermeae*, *Spermacocceae*, *Rubieae*, *Paederieae*, *Knoxieae*, *Perameae*, *Triainolepideae*, and *Lathraeocarpeae* were excluded from the present investigation, being either absent from tropical South America or non-woody. Of *Hindsia*, belonging to the *Hedyotideae* (small shrubs) no wood sample was available.

3.4. Subfamily Urophyllloideae:

The *Urophyllloideae* include four tribes of which only the *Simireae* with the sole genus *Simira*, are woody plants of tropical South America. Although this genus – congeneric with *Sickingia* Willd. (BREMEKAMP 1954) – has an isolated position within the family, Bremekamp places it in this subfamily, but in order to decide whether it has correctly been referred to the *Urophyllloideae* or not, it will have to be studied in more detail (BREMEKAMP 1966). In SCHUMANN'S division (1897) of the *Rubiaceae* it was placed in the *Rondeletieae* (subfamily *Cinchonoideae*), and the same was done by VERDCOURT, who combined the *Condamineae* and *Rondeletieae* to the *Condamineae* (1958). Of the *Rondeletieae* the only specimens available were *Elaeagia maguirei* and *Warszewiczia coccinea*. As stated before (p. 380) the structure of these species is so much alike to the structure of members of the *Rubioideae* that from the investigated samples no suggestions about the correct place of *Simira* in one tribe or the other can be given.

The species of *Simira* studied do not square very well with the description of *Urophyllum longifolium* (SOLEREDER 1885) and *Urophyllum glabrum* and other species (JANSSONIUS 1926) as regards the structure of the rays, the presence of diffuse parenchyma and fibre tracheids.

The description of *Urophyllum* does not fit in with the *Rubioideae* studied (in which subfamily *Urophyllum* is placed by Verdcourt) because of the presence of fibre tracheids and the structure of the rays. Perhaps *Urophyllum* is more or less alike to *Retiniphyllum* or to *Isertia* (which has smaller parts of procumbent ray cells, and which does not have fused rays). *Isertia* belongs to the *Mussaendeae*, to which tribe *Urophyllum* is also assigned by Schumann.

3.5. Subfamily Hillioideae:

Hillia, included by Schumann in the *Cinchoneae* (*Cinchonoideae*) was considered by Bremekamp and Verdcourt to be related to the *Rubioideae* because of the presence of raphides. Later, however, BREMEKAMP (1966) placed it in a separate subfamily *Hillioideae*. Although raphides are present the wood anatomy supports this concept because of the very large diameter of the vessels (up to 500 μ), the oval intervacular pits, 15–18 μ long, and the wide and numerous rays which occupy about one half of the surface in tangential sections, and the broad confluent parenchyma bands.

3.6. Subfamily Guettardoideae:

About the subfamily *Guettardoideae* Verdcourt and Bremekamp are of the same opinion. It consists of one tribe: *Guettardeae*, to which belong amongst others *Guettarda* and *Malanea*. Except for *Guettarda acreana* the investigated species of *Guettarda* agree rather well in the structure of the rays, the distribution, number and diameter of the vessels, the septate libriform fibres and the absence of parenchyma. *Guettarda acreana* Krause, identical with *Antirrhoea surinamensis* Brem., differs in the presence of small rhombic crystals in ray and parenchyma cells, the narrower (to 25 μ) and higher multiseriate parts of the rays, the non-septate libriform fibres and the long, 4–5-seriate parenchyma bands.

Chomelia, placed in the *Ixoreae* by Bremekamp, belongs according to STEYERMARK (1967) in the *Guettardeae*. Wood anatomically there is more agreement between this tribe and *Chomelia* than between *Chomelia* and the *Ixoreae* (table 1 and p. 381).

Further study of the wood anatomy and pollen morphology of this subfamily could be of interest, for instance to decide whether *Guettarda acreana* is related to other representatives of this subfamily or not.

3.7. Genera of a doubtful position

The position of *Retiniphyllum*, placed in a separate tribe by VERDCOURT (1958), STEYERMARK (1965), and also by BREMEKAMP (1934), is not discussed by the last mentioned author in his most recent publication (1966). Only small branches of *Retiniphyllum laxiflorum* and *Retiniphyllum schomburgkii* were available for in-

vestigation, material, on which an opinion hardly can be based because of a possible discrepancy between juvenile and mature wood. However, judging from this material the structure fits in better with the *Cinchonoideae* and *Ixoroideae* than with the *Rubioideae*. Verdcourt believes that they are to be placed near the *Ixoreae*. (In a personal communication Bremekamp accepted this idea.)

Schuman too accepted the *Henriquezieae*, introduced by HOOKER (1873) for referring the genera *Henriquezia* and *Platicarpum* as a tribe within the *Rubiaceae*. BREMEKAMP (1956) who considers both genera to be related, but denies close relationship with the *Rubiaceae*, created the family of *Henriqueziaceae*.

Wood of *Henriquezia jenmani* was available. It differs from the *Rubiaceae* studied in having more distinctly vested intervacular pits, very heterocellular uniseriate rays: rows of procumbent cells alternating with rows of upright cells, and aliform parenchyma.

STEYERMARK (1964) mentions that *Henriquezia jenmani* differs in a number of morphologic features from the other species, which form a close unit and have about the same geographic distribution, whereas *Henriquezia jenmani* occurs in British Guiana as the sole species of this genus. Further investigations are necessary, before a decision based upon wood anatomy can be made.

Of the subfamily *Pomazotoideae* no representatives are known from tropical America, consequently it was excluded from this investigation.

The *Gleasonioideae* include one genus, *Gleasonia*, occurring in Venezuela and Brazil, of which no samples were available.

In this investigation the author investigated only few species of most tribes and subfamilies. The plan is to expand the preliminary studies with additional material.

4. KEY TO THE SURINAME GENERA:

- 1. a. Raphides present (*Hillioideae*, *Rubioideae*)2
- b. Raphides absent6
- 2. a. Parenchyma in broad bands; diameter of the vessels to 500 μ ; pits between rays and vessels irregularly shaped, apertures oval, 12-15 μ long*Hillia tubiflora*
- b. Parenchyma absent, diffuse, or in short or long bands; diameter of the vessels smaller; pits between rays and vessels nearly always similar to the intervacular pitting3
- 3. a. Parenchyma lacking; more than 50% of the vessels in radial multiples, these often of more than 4 cells; wood reddish brown*Mapouria*
- b. Parenchyma absent or present; commonly less than 50% of the vessels in radial multiples, multiples of more than 4 cells scarce or absent . . .4

- 4. a. Parenchyma in very scarce paratracheal strands or absent
 *Coussarea, Faramaea*
 b. Paratracheal parenchyma abundant; apotracheal parenchyma diffuse or
 in short of long bands or absent 5
- 5. a. Diffuse and paratracheal parenchyma abundant; rays 4–7-seriate
 *Morinda*
 b. Parenchyma in short or long bands; fibre pits with large borders, frequent
 on radial and tangential walls *Pagamea*
- 6. a. Multiseriate rays composed of upright/square cells, often with one or two
 wings of upright cells; diameter of the vessels to 65 μ , mostly less than 40 μ ;
 parenchyma absent; fibres septate, pits without or with small borders
 (*Psychotriaceae*; see also *Retiniphyllum*) 7
 b. Multiseriate rays composed of procumbent and square/upright cells;
 diameter of the vessels to 100 μ ; parenchyma absent or present; fibres
 septate or non-septate 8
- 7. a. Colour yellowish brown; many sheath cells present; diameter of the
 vessels 40–60 μ *Psychotria*
 b. Colour brown; sheath cells absent; diameter of the vessels less than 40 μ
 *Cephaelis, Naletonia, Ronabea, Rudgea, Stremelia*
- 8. a. Parenchyma absent; sheath cells mostly present; fibres septate with pits
 with very small borders 9
 b. Parenchyma diffuse, paratracheal or in bands 11
- 9. a. Rays 4–7-seriate, to 2 mm (100 cells) high; uniseriate wings composed of
 more than 4 rows; sheath cells scarce; more than 50% of the vessels in
 radial multiples, more than 40 vessels per sq. mm; *Elaegia*
 b. Rays 2–4-seriate 10
- 10. a. Pluriseriate parts of the rays to over 1 mm high, sheath cells present;
 less than 50% of the vessels in radial multiples, the diameter to 100 μ . .
 *Palicourea*
 b. Pluriseriate parts of the rays to 500 μ high, sheath cells absent; more
 than 50% of the vessels in radial multiples, the diameter to 45 μ
 *Guettarida spruceana*
- 11. a. Rays uniseriate or for a very short length biseriate 12
 b. Rays pluriseriate, often over 4-seriate rays present 13
- 12. a. Vessels nearly all solitary; fibres non-septate, pits with large borders;
 parenchyma diffuse and in short bands; rhombic crystals present in the
 parenchyma *Ixora*
 b. Vessels partly in radial multiples; parenchyma in long and short bands;
 crystals absent *Alibertia*
- 13. a. Rays to 130 μ (5 cells) wide, to more than 3,5 mm high; parenchyma
 narrowly vasicentric; fibres septate with pits with small borders; less
 than 20 vessels per sq. mm, the diameter 100–160 μ ; many vessels in small
 clusters *Capirona, Ferdinandusa*
 b. Rays mostly less than 50 μ wide (see however *Retiniphyllum laxiflorum*:
 to 130 μ wide) 14

- 14. a. Vessels solitary, with tyloses; fibres non-septate, the pits on radial and tangential walls with large borders; rays composed of square/upright cells; parenchyma narrowly vasicentric and diffuse or in short bands *Retiniphyllum*
- b. Vessels solitary and in (sometimes few) radial multiples; rays composed of procumbent and square/upright cells 15
- 15. a. Fibres septate; parenchyma narrowly vasicentric; the diameter of the vessels more than 100 μ , less than 20 vessels per sq. mm; wood reddish brown *Chimarrhis*
- b. Fibres non-septate 16
- 16. a. Diameter of the vessels to 250 μ ; fibre pits with large borders *Uncaria guianensis*
- b. Diameter of the vessels not over 150 μ 17
- 17. a. Fibres with large bordered pits, pits rather frequent on radial and tangential walls 18
- b. Fibre pits without or with small borders, often scarce on tangential walls 19
- 18. a. Parenchyma in long or short bands *Amajoua, Duroia*
- b. Parenchyma diffuse and sometimes narrowly paratracheal; most vessels solitary *Isertia, Genipa, Randia, Rosenbergioidendron*
- 19. a. Some radial multiples consisting of more than 4 vessels; rays 2–3-seriate; rhombic crystals in parenchyma; wood reddish brown *Guettarda acreana*
- b. Hardly any radial multiples of more than 4 vessels present; rays mostly 1–2-seriate *Chomelia, Posoqueria*

5. MATERIAL STUDIED

Alibertia edulis (L. Rich.) A. Rich.: *Suriname*—Uw 10927 (Florschütz & Maas 2346, Kabalebo airstrip; diam. 3.5 cm); *Brazil* — Uw 9062 (Belem 51813, Rio Araguari, Amapa; diam. unknown, over 10 cm).

Alibertia myrciifolia K. Schum.: *Suriname*—Uw 6652 (Heyligers 469, *Suriname*; tree, 11 m high, diam. 10 cm); *Brazil* — Uw 8087 (Krukoff 6993, Amazonas; branch, diam. 3.5 cm).

Amajoua guianensis Aubl.: *Suriname* — Uw 1414 (Lanjouw & Lindeman 1186, between Wia-wia-bank and Grote Zwiebelzwamp; tree, 7 m high, diam. 6 cm); Uw 1780 (Lanjouw & Lindeman 2480, Nassau Mountains; tree, 8 m high, diam. 7.5 cm); Uw 2874 (Lindeman 3900, Mapane kreek area; tree, 12 m high, diam. 5.5 cm); Uw 2970 (Mennega 434, Tanjimama R.; tree, 5 m high, diam. 5 cm); *British Guiana* — Uw 1075 (Forest Dept. 2609); *Venezuela* — Uw 11779 (Breteler 3804, Rio Grande o Toro; tree, 8 m high, diam. 8 cm); *Brazil* — Uw 6337 (Reitz & Klein 14438, Santa Catarina; 8 m high, diam. 5 cm); Uw 7882 (Krukoff 6699, Amazonas; tree, 12 m high, diam. unknown).

Capirona surinamensis Brem.: *Suriname* — Uw 172 (Stahel 172, Zanderij I); Uw 2426 (Lindeman 3681, Mapane Kreek area; tree, 15 m high, diam. 7.5 cm); Uw 6861 (Schulz 8583, *Suriname* R., Jodensavanne; tree, 30 m high, diam. 45 cm).

Cephaelis glabrescens (Muell. Arg.) Standley: *Suriname* — Uw 3248 (Lindeman 4724, Mapane Kreek area; shrub, 5.5 m high, diam. 3 cm); Uw 3547 (Lindeman 4674, Mapane Kreek area; shrub, 4 m high, diam. 2 cm).

Chimarrhis longistipulata Brem.: *Suriname* — Uw 207 (Pulle 379, Kabalebo R., Avanovero falls; diam. unknown, over 12 cm).

- Chimarrhis turbinata* DC.: Suriname – Uw 261 (Stahel 261, Zanderij I); Uw 1935 (Lanjouw & Lindeman 2810, Nassau Mountains; tree, 20 m high, diam. 17 cm); Uw 4951 (Schulz 7289, Mapane Kreek area; diam. 70 cm); Uw 10844 (v. Donselaar 1297, Brokopondo; tree, 20 m high, diam. 24 cm); Uw 10846 (v. Donselaar 1324, Brokopondo; tree, 20 m high, diam. 10 cm); *French Guiana* – Uw 5751 (BAFOG 1262, Cayenne).
- Chomelia tenuiflora* Bth.: Suriname – Uw 378 (Stahel 378, Wayombo).
- Coussarea paniculata* (Vahl) Standley: Suriname – Uw 2303 (Lindeman 3528, Suriname R., Jodensavanne; tree, diam. 15 cm); Uw 2338 (Lindeman 3570, Suriname R., Jodensavanne; tree, 11 m high, diam. 18 cm); Uw 4550 (Lindeman 6731, Mapane Kreek area; diam. 14 cm); Uw 4756 (Lindeman 7110, Wayombo R.; diam. 16 cm); *British Guiana* – Uw 1077 (Forest Dept. 3810).
- Coussarea racemosa* A. Rich.: Suriname – Uw 8565 (Daniels & Jonker, Emmaketen; tree, 7 m high, diam. 4 cm).
- Coussarea surinamensis* Brem.: Suriname – Uw 280 (Stahel 280, Saramacca R.); Uw 1164 (Lanjouw & Lindeman 351, between Moengo Tapoe and Grote Zwiebelzwamp; tree, diam. 10 cm); Uw 1167 (Lanjouw & Lindeman 354, between Moengo Tapoe and Grote Zwiebelzwamp; tree, 8 m high, diam. 9 cm); Uw 1175 (Lanjouw & Lindeman 362, between Moengo Tapoe and Grote Zwiebelzwamp; tree, diam. 10 cm); Uw 2559 (Maguire 24861 = Yale 44276, Coppename R.; tree, 10 m high, diam. 10 cm).
- Duroia aquatica* (Aubl.) Brem.: Suriname – Uw 1631 (Lanjouw & Lindeman 2158, Nassau Mountains; treelet, diam. 3.5 cm); Uw 2334 (Lindeman 3565, Suriname R., Jodensavanne; tree, 11 m high, diam. 7 cm); Uw 2702 (Lindeman 3710, Mapane Kreek area; tree, diam. 20 cm); Uw 11207 (LBB 10782 (Maas), Maratakka R.; tree, 5 m high, diam. 7 cm); *French Guiana* – Uw 5365 (BAFOG 290 M); Uw 5366 (BAFOG 291 M).
- Duroia eriopila* L.f.: Suriname – Uw 324 (Stahel 324, Zanderij I, Sectie 0); Uw 351 (Stahel 351, Wayombo); Uw 1328 (Lanjouw & Lindeman 808, between Moengo Tapoe and Grote Zwiebelzwamp; tree, 8 m high, diam. 10 cm); Uw 5000 (Schulz 7371, Wayombo; tree, diam. 5 cm); Uw 11267 (Maas 3267, Maratakka R.; tree, 8 m high, diam. 4 cm); *British Guiana* – Uw 1078 (Forest Dept. 3179).
- Duroia genipoides* Hook. f.: Suriname – Uw 1922 (Lanjouw & Lindeman 2778, Nassau Mountains; tree, 27 m high, diam. 12 cm); Uw 2553 (Maguire 24393 = Yale 44122, Tafelberg; tree, 10 m high, diam. 15 cm); *British Guiana* – Uw 1079 (Forest Dept. 4038, Moraballi Kreek; tree, 20 m high, diam. 8 cm).
- Duroia sprucei* Rusby: Suriname – Uw 243 (Stahel 243, Zanderij I); Uw 277 (Stahel 277, Zanderij I).
- Elaeagia maguirei* Standley: Suriname – Uw 2552 (Maguire 24449 = Yale 44132, Tafelberg; tree, 15 m high, diam. 30 cm).
- Faramaea longifolia* Bth.: Suriname – Uw 2969 (Mennega 433, Tanjimama R.; tree, sample from branch, diam. 4 × 7 cm); Uw 3930 (Lindeman 5772, Mapane Kreek area; tree, 6 m high, diam. 2.5 cm); Uw 3986a (Lindeman 5834a, Rikanau near Moengo; treelet, diam. 2.5 cm).
- Faramaea occidentalis* (L.) A. Rich.: Suriname – Uw 3867 (Lindeman 5591, Coppename R.; treelet, diam. 5 cm); Uw 4319 (Lindeman 6304, Coppename R.; tree, 8 m high, diam. 6 cm); Uw 8638 (Kramer & Hekking 2192, Jarikaba Kreek; tree, 6 m high, diam. 4.5 cm); *Panama* – Uw 7189 (Smithsonian Institution 770).
- Ferdinandusa rudgeoides* (Bth.) Hook. f.: Suriname – Uw 1933 (Lanjouw & Lindeman 2807, Nassau Mountains; tree, diam. 15 cm); Uw 2551 (Maguire 24879 = Yale 44284, Saramacca R.; tree, 20 m high, diam. 30 cm); Uw 5449 (Schulz 7990; diam. 10 cm).
- Genipa americana* L.: Suriname – Uw 193 (Stahel 193, Powaka near Carolina); Uw 379 (Stahel 379, Wayombo); Uw 677 (BBS 82, Para R., Osembo); Uw 699 (BBS 105, Saramakka R., Klein Moho); Uw 1345 (Lanjouw & Lindeman 906, between Moengo Tapoe and Grote Zwiebelzwamp; tree, diam. 17 cm); Uw 1387 (Lanjouw & Lindeman 1104, between Wia-wia-bank and Grote Zwiebelzwamp; tree, diam. 7.5 cm); Uw 1555 (Lanjouw & Lindeman 1806, Tibitisavanne; tree, diam. 12 cm); Uw 11614 (B.W. 6230 = S.O.H. 316, diam. unknown, over 20 cm); *British Guiana* – Uw 1080 (Forest Dept. 753); *French*

- Guiana* – Uw 5772 (BAFOG 1284, Cayenne).
- Guettarda acreana* Krause: *Suriname* – Uw 4786 (Helstone 237, Maratakka R.; tree, diam. 9 cm; TYPE of *Antirrhoea surinamensis* Brem.); Uw 716 (BBS 123, Kabalebo R., Avano-vero falls); *British Guiana* – Uw 1081 (Forest Dept. 2317).
- Guettarda elliptica* Sw.: *Florida* – Uw 6305 (Stern & Brizicky 530 = Yale 51311, Windley's Key; diam. 4 cm).
- Guettarda pungens* Urb.: *Dominican Republic* – Uw 7279 (Smithsonian Institution 1989; diam. 6 cm).
- Guettarda scabra* (L.) Vent.: *Florida* – Uw 6172 (Stern & Brizicky 320 = Yale 51145, Little Torch Key; diam. 2 cm).
- Guettarda spruceana* Muell. Arg.: *Suriname* – Uw 4256 (Lindeman 6214, Moengo Tapoe; tree, 12 m high, diam. 8 cm).
- Hamelia ventricosa* Sw.: *Jamaica* – Uw 8356 (Smithsonian Institution 6017).
- Henriquezia jenmani* K. Schum.: *British Guiana* – Uw 1082 (Forest Dept. 3583).
- Hillia tubiflora* Cham.: *Suriname* – Uw 3510 (Lindeman 5237, Mapane Kreek area; epiph.).
- Isertia coccinea* (Aubl.) Gmel.: *Suriname* – Uw 1924 (Lanjouw & Lindeman 2781, Nassau Mountains; tree, 6 m high, diam. 7 cm); Uw 1952 (Lanjouw & Lindeman 2860, Nassau Mountains; tree, 12 m high, diam. 9 cm); *French Guiana* – Uw 5358 (BAFOG 283 M).
- Isertia hypoleuca* Bth.: *Suriname* – Uw 2986 (Mennega 513, Kodji Kreek; tree, 11 m high, diam. 15 cm); Uw 6795 (Schulz 8317, Corantyne R.; tree, 14 m high, diam. 15 cm).
- Isertia parviflora* Vahl.: *Suriname* – Uw 680 (BBS 85, Para R., Osembo); Uw 1284 (Lanjouw & Lindeman 648, between Moengo Tapoe and Grote Zwiebelzwamp; shrub, 3 m high, diam. 3 cm); Uw 1319 (Lanjouw & Lindeman 755, between Moengo Rapoe and Grote Zwiebelzwamp; diam. 3.5 cm); Uw 1321 (Lanjouw & Lindeman 785, between Moengo Tapoe and Grote Zwiebelzwamp; treelet, 4 m high, diam. 3 cm); Uw 1324 (Lanjouw & Lindeman 801, between Moengo Tapoe and Grote Zwiebelzwamp; tree, 8 m high, diam. 5.5 cm).
- Ixora orinocensis* Spruce: *Suriname* – Uw 2557 (Maguire 24413 = Yale 44123, Tafelberg; tree, 10 m high, diam. 10 cm); Uw 2558 (Maguire 24282 = Yale 44110, Tafelberg; tree, 8 m high, diam. 10 cm).
- Ixora surinamensis* Brem.: *Suriname* – Uw 3397 (Lindeman 4985, Mapane Kreek area; treelet, 3.5 m high, diam. 2 cm); Uw 3399 (Lindeman 4992, Mapane Kreek area; treelet, diam. 1.5 cm); Uw 3219 (Lindeman 4677, Mapane Kreek area; tree, 6 m high, diam. 5 cm); Uw 3408 (Lindeman 5012, Mapane Kreek area; treelet, 5 m high, diam. 3 cm); Uw 4390 (Lindeman 6404, Upper Coppename R.; treelet, 3 m high, diam. 2 cm).
- Malanea duckei* Standley: *Venezuela* – Uw 12434 (Williams 16009, Sanariapo).
- Malanea macrophylla* Bartl. ex Griseb.: *Suriname* – Uw 12025 (v. Donselaar 3199, Brokopondo; diam. 6 cm).
- Mapouria chionantha* Muell. Arg.: *Suriname* – Uw 1351 (Lanjouw & Lindeman 960, between Moengo Tapoe and Grote Zwiebelzwamp; diam. 6 cm); Uw 2741 (Lindeman 3753, Surin. R., Jodensavanne; 6 m high, diam. 4.5 cm); Uw 3233 (Lindeman 4699, Suriname R., Jodensavanne; 7 m high, diam. 5 cm); Uw 3775 (Lindeman 5437, Perica R., treelet, 7 m high, diam. 5 cm); Uw 12032 (v. Donselaar 3209, Brokopondo; treelet, diam. 2.5 cm).
- Mapouria chlorantha* (Bth.) Brem.: *Suriname* – Uw 2867 (Lindeman 3892, Mapane Kreek area; tree, 9 m high, diam. 6 cm); Uw 3029 (Lindeman 4059, Mapane Kreek area; tree, 11 m high, diam. 5 cm); Uw 3099 (Lindeman 4140, Suriname R., Jodensavanne; tree, 12 m high, diam. 9.5 cm); Uw 4626 (Lindeman 6845, Mapane Kreek area; diam. 9 cm); Uw 4933 (Schulz 7200, Mapane Kreek area; diam. 20 cm); Uw 6749 (Heyligers 720, Suriname R., Jodensavanne; tree, 6.4 m high, diam. 6 cm).
- Mapouria fockeana* (Miq.) Brem.: *Suriname* – Uw 3823 (Lindeman 5526, Coppename R.; treelet, 5 m high, diam. 3 cm).
- Mapouria opaca* Brem.: *Suriname* – Uw 1962 (Lanjouw & Lindeman 2874, Nassau Mountains; tree, 7 m high, diam. 7 cm); Uw 3965 (Lindeman 5811, Rikanau near Moengo; tree, 5.5 m high, diam. 4.5 cm); *Brazil* – Uw 9124 (Belem 51926, Rio Araguari).

- Morinda citrifolia* L.: *Suriname* – Uw 3106 (Lindeman 4167, Paramaribo; treelet, 3 m high, diam. 1.5 cm); *Sandwich Islands* – Uw 12435 (Hawaiian Hist. Soc. 275253).
- Naletonia violacea* (Aubl.) Brem.: *Suriname* – Uw 8531 (Daniels & Jonker 760, Emmaketen; shrub, 3 m high, diam. 4 cm).
- Pagamea capitata* Bth.: *Suriname* – Uw 2560 (Maguire 24740 = Yale 44238, Tafelberg; shrub, 5 m high, diam. 10 cm); *British Guiana* – Uw 1085 (Forest Dept. 2375, Mahaicony R.; shrub, diam. 3.5 cm).
- Pagamea guianensis* Aubl.: *Suriname* – Uw 355 (Stahel 355, Wayombo); Uw 2867a (Lindeman 3893, *Suriname* R., Jodensavanne; tree, 13 m high, diam. 8 cm); Uw 2884 (Lindeman 3912, Mapane Kreek area; tree, 13 m high, diam. 5 cm); Uw 2893 (Lindeman 3920, Mapane Kreek area; tree, 8 m high, diam. 7 cm); Uw 3613 (Lindeman 4908, Mapane Kreek area; tree, 13 m high, diam. 7.5 cm); Uw 6752 (Heyligers 724, *Suriname* R.; tree, 7.5 m high, diam. 2 cm); *British Guiana* – Uw 1084 (Forest Dept. 5237, Demerara R.; shrub, 2 m high, diam. unknown, over 5 cm); *Brazil* – Uw 8164 (Krukoff 7083, Amazonas; tree, 15 m high, over 12 cm).
- Palicourea crocea* (Sw.) DC.: *Suriname* – Uw 1481 (Lanjouw & Lindeman 1408, Coppename R.; shrub, 3 m high, diam. 2 cm); *Venezuela* – Uw 10988 Breteler 3115, near Merida; treelet, 10 m high, diam. 4 cm).
- Palicourea guianensis* Aubl.: *Suriname* – Uw 231 (Stahel 231, Zanderij I); Uw 626 (BBS 28, *Suriname* R., Suhoza); Uw 1360 (Lanjouw & Lindeman 977, Moengo Tapoe; tree, 11 m high, diam. 11 cm); Uw 1541 (Lanjouw & Lindeman 1747, Tibitisavanne; tree, 8 m high, diam. 8.5 cm); Uw 1925 (Lanjouw & Lindeman 2782, Nassau Mountains; treelet, 6 m high, diam. 6.5 cm); Uw 2029 (J. & P.A. Florschütz 1355, Saramakka R.; 15 m high, diam. 8.5 cm); Uw 2561 (Maguire 23762 = Yale 44061, Saramakka R.; tree, 12 m high, diam. 15 cm); Uw 11711 (LBB 11008 (Maas, Nickerie R.; tree, 15 m high, diam. 20 cm); *British Guiana* – Uw 1086 (Forest Dept. 2015); Uw 4860 (Cowan 39340; diam. 4 cm); *French Guiana* – Uw 5363 (BAFOG 288 M).
- Palicourea longiflora* (Aubl.) A. Rich.: *Suriname* – Uw 1657 (Lanjouw & Lindeman 2209, Nassau Mountains; shrub, 3 m high, diam. 2 cm); Uw 4550a (Lindeman 6731a, Mapane Kreek area; 3 m high, diam. 12 cm).
- Posoqueria gracilis* Rudge: *Suriname* – Uw 1919 (Lanjouw & Lindeman 2774, Nassau Mountains; treelet, 5 m high, diam. 5 cm).
- Posoqueria latifolia* (Rudge) R. & S.: *Suriname* – Uw 298 (Stahel 298, Zanderij I); Uw 1275 (Lanjouw & Lindeman 600, Moengo Tapoe; diam. 8 cm); Uw 1327 (Lanjouw & Lindeman 806, Moengo Tapoe; diam. 5 cm); Uw 1664 (Lanjouw & Lindeman 2227, Nassau Mountains; diam. 4.5 cm); *British Guiana* – Uw 1087 (Forest Dept. 3340); *Brazil* – Uw 6365 (Reitz 14908, Santa Catarina; tree, 8 m high, diam. 4.5 cm).
- Posoqueria longiflora* Aubl.: *Suriname* – Uw 4294 (Lindeman 6275, Coppename R.; shrub, 4.5 high, diam. 4.5 cm); Uw 10104 (Schulz 9631; diam. 6 cm).
- Psychotria paniculata* (Aubl.) Raeusch: *Suriname* – Uw 1632 (Lanjouw & Lindeman 2159, Nassau Mountains; treelet, 8.5 m high, diam. 6 cm); *British Guiana* – Uw 1089 (Forest Dept. 5305).
- Randia spinosa* (Jacq.) Karsten: *Suriname* – Uw 1656 (Lanjouw & Lindeman 2206, Marowijne R.; diam. 4 cm); Uw 3820 (Lindeman 5523, Coppename R.; tree, 11 m high, diam. 10 cm); Uw 11098 (Florschütz & Maas 2795, Coppename R.; treelet, 3 m high, diam. 3 cm); Uw 10624 (Schulz 10008a, Zuid R.; treelet, 8 m high, diam. 5 cm).
- Retiniphyllum laxiflorum* (Bth.) N.E. Brown: *Suriname* – Uw 2554 (Maguire 24786 = Yale 44245, Tafelberg; shrub, 3 m high, diam. 1 cm).
- Retiniphyllum schomburgkii* (Bth.) Muell. Arg.: *Suriname* – Uw 2555 (Maguire 24788 = Yale 44247, Tafelberg; shrub, 3 m high, diam. 3 cm); Uw 2598 (Maguire 24787 = Yale 44246, Tafelberg; shrub, 3 m high, diam. 3 cm).
- Ronabea latifolia* Aubl.: *Suriname* – Uw 1888 (Lanjouw & Lindeman 2713, Nassau Mountains; diam. 3.5 cm).
- Rosenbergiodendron formosum* (Jacq.) Fagerl.: *Suriname* – Uw 1461 (Lanjouw & Lindeman 1365, Coppename R.; shrub, 2.5 m high, diam. 2.5 cm); Uw 4279 (Lindeman 6238,

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- Moengo Tapoe; diam. 8 cm); Uw 10926 (Florschütz & Maas 2331, Kabalebo air strip; diam. 4 cm).
- Rudgea cornigera* Brem.: Suriname – Uw 3283 (Lindeman 4790, Mapane Kreek area; treelet, 4 m high, diam. 4 cm); Uw 4417 (Lindeman 6437, Coppename R.; treelet, 5 m high, diam. 3.5 cm).
- Rudgea graciliflora* Hansley: Suriname – Uw 4701 (Lindeman 6986, Nassau Mountains; treelet, 6 m high, diam. 5 cm).
- Rudgea hostmanniana* Bth.: Suriname – Uw 2787 (Lindeman 3805, Suriname R., Jodensavanne; treelet, 6 m high, diam. 5 cm); Uw 3184 (Lindeman 4589, Rijnsdijkseweg, 25 km S. of Paramaribo; 7 m high, diam. 6.5 cm); Uw 4517 (Lindeman 6667, Corantijne R.; tree, 5 m high, diam. 4.5 cm).
- Schradera rotundata* Standley: Colombia – Uw 12437 (Cuatrecasas 15755).
- Sickingia fragrans* (Rusby) Standley: Peru – Uw 12438 (Williams 6660, Tarapoto).
- Sickingia glazovii* K. Schum.: Brazil – Uw 12345 (Ministerio de Agricultura Serviço Florestal-Seção de Tecnologia 3894).
- Sickingia maxonii* Standley: Panama – Uw 7134 (Herb.: U.S. Nat. Herb.; Smithsonian Institution 663).
- Sickingia oliveri* K. Schum.: Brazil – Uw 12346 (Ministerio de Agricultura Serviço Florestal-Seção de Tecnologia 664).
- Sickingia sampaioana* Standley: Brazil – Uw 6921 (Reitz 16470, Santa Catarina; diam. 3.5 cm).
- Simira rubescens* (Bth.) Brem.: Peru – Uw 8711 (Ellenberg 2509, El Sacramento; tree, 10 m high, diam. 10 cm).
- Strepelia cornifolia* (H. & B.) Brem.: Suriname – Uw 10107 (Schulz 9634; diam. 2.5 cm).
- Uncaria guianensis* (Aubl.) Gmel.: Suriname – Uw 2550 (Maguire 23807 = Yale 44063, Saramakka R.; liana, diam. 6 cm); Uw 3834 (Lindeman 5543, Coppename R.; liana, diam. 2 cm); Uw 6847 (Schulz 8454, Suriname R., Jodensavanne; liana, diam. 2.5 cm).
- Warszewiczia coccinea* (Vahl) Klotzsch: Venezuela – Uw 11841 (Breteler 4043, between Barinas and San Cristóbal; tree, 9 m high, diam. 11 cm).

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