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THE GENUS *HEVEA* IN COLOMBIA

BY

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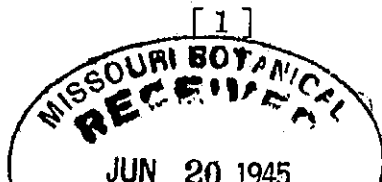
I.

IN RECENT YEARS, as a direct result of the emergency created by the present war, there has been evidenced considerable interest in the wild stands of *Hevea* in eastern Colombia. Exploitation of these stands is about to enter its third consecutive year. In addition to the tapping of the wild trees for rubber, there is being carried out a scientific study and search of the stands for superior clones for plantation programs in Latin America.

A knowledge of the distribution of the chief species of *Hevea* is, obviously, of prime importance for such commercial and scientific work. Up to the present time, we have had a very incomplete comprehension of this economic genus as it occurs in Colombia. In fact, less is known about the genus in Colombia, the northwesternmost extent of its range, than in any other part of the vast area where *Hevea* occurs naturally. This has been due largely to the lack of botanical exploration of eastern Colombia.

The need for a provisional summary of the distribution of the species seems to be urgent, and it appears hardly advisable to await the more exhaustive studies which

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may, and most probably will, be made in the future, before presenting a general and admittedly provisional outline of the problem.

For three and a half years,² I have been engaged in botanical work on the Amazonian watershed of Colombia. This work has been carried out principally along the following rivers: Vaupés, Itilla, Ajaju, Macaya, Apaporis, Cananarí, Piraparaná, Caquetá, Miritiparaná, Putumayo, Loretoyacu, Hamacayacu and Boiauassú, and in the Leticia area of the "trapecio amazonico." In addition to my own observations and collections, I have had data kindly made available to me by Hans G. Sorenson of the Office of Rubber Plant Investigations of the United States Department of Agriculture and Paul H. Allen of the Rubber Development Corporation. I have also had the benefit of numerous conferences with Dr. Adolpho Ducke whose knowledge of *Hevea* in Brazil is extensive and profound. From these sources, it has been possible to reconstruct the distribution of the genus in Colombia according to river systems. It should be borne in mind that the range of *Hevea* in Colombia covers a vast area, extraordinarily difficult for travel and rather varied as to topography. We have observations from only a few localities in this great drainage-area and adequate herbarium material from still fewer localities.

It is evident that there remains much to do before we can understand fully the details of the specific distribution of *Hevea* in Colombia. Only a beginning has been made. Fortunately, however, this beginning has been well extended over a wide area so that we have, geographically speaking, a relatively complete representa-

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tion for nearly the entire Amazonian watershed. The only major drainage-area for which, to the best of my knowledge, absolutely nothing is known is the Inirida River, north of the Vaupés. Among the minor drainage areas which we still must explore are the great sandstone mesas whose rivers pour their waters into the Yari River, emptying into the Caquetá below Araracuara; the Cahuinari, also flowing into the Caquetá; and the small but geographically strategical Cotuhé, entering the Putumayo River near the Brazilian border.

It is not always easy to define certain species of *Hevea*. The identifications of some collections must be made with reservation because of incomplete material. For the most part, however, the broad specific lines have been established. It seems to me that in eastern Colombia there may exist a number of subspecific variations which cannot easily be accommodated to concepts already described and established. There are perhaps even some undescribed species to be found in the more remote parts of Colombia's Amazonian watershed, especially those areas which we now know to be rich in endemics.

In the present short summary, I have purposely refrained from consideration of any but the most easily recognized and well-established subspecific concepts. The complete and critical treatment of the subspecific variations in *Hevea* in Colombia must await much more study and exploration. For one thing, we still do not have enough representative flowering and fruiting specimens to attempt to present even an outline of all the varieties and forms of the principal species. Furthermore, we are learning that bark characters, hitherto unstudied, except in isolated cases, are of unexpected importance in distinguishing between subspecific variants in *Hevea*; we must retrace some of our steps and examine the barks of thousands of trees in numerous areas before making a

final decision and before the preparation of a critical taxonomic treatment.

Even in the case of a number of easily accessible localities in eastern Colombia, we are at a disadvantage because the herbarium material which is available is sterile. The very short flowering and fruiting seasons of *Hevea* make it impossible to gather complete material over a wide area in the same year. Sterile material, while better than no material, has very definite limitations as to its value in taxonomic work on *Hevea*. One example of the handicaps imposed by incomplete specimens may be presented. In the gigantic crevasses and faults in one of the grotesque sandstone mountains near the confluence of the Ajaju and Macaya Rivers in the upper Apaporis basin, there exists a curious colony of very tall trees representing apparently an undescribed variety of *Hevea guianensis*. It has excellent bark characters as well as peculiarities in leaf pilosity. Unfortunately, however, only very immature capsules could be obtained. Nothing is known of the seeds or flowers. This highly interesting tree, growing under conditions of psammophytic and physiological drought some 600 to 800 feet above the surrounding forest floor or about 1600 feet above sea-level, may prove to be an important link in our understanding of the distribution or even of the phylogenetic interrelationships of the *Hevea guianensis*-complex.³

These considerations serve merely to emphasize the need for continued and systematically planned *Hevea*

³This highland tree appears to have a number of striking similarities with the highland representatives of the *Hevea guianensis*-complex which I have recently had occasion to examine in the forests on the slopes along the upper Huallaga River in Peru. It is very evident that the greatest need at the moment is for more detailed taxonomic and distributional studies of the poorly understood species and varieties of *Hevea* in highland regions.

field-research. It is conceded that on the basis of herbarium studies alone it will be difficult to clarify our understanding of *Hevea*—its specific and varietal limitations, its history and its present distribution. This is perhaps one of the outstanding examples of the necessity for close correlation of field and herbarium studies and for close collaboration of the field and herbarium workers. We must guard against minimizing the fundamental importance of herbarium methods and studies in handling the genus *Hevea*. Yet, at the same time, we should recognize that recourse must be made to methods not traditionally employed in systematics and to characters which, in some instances, can be appreciated only in the field.

Some botanists believe that the genus *Hevea* may have had its origins in highland areas or on the slopes of mountains near the headwaters of the affluents of the Amazon and that the more primitive species and varieties are to be expected along the westernmost fringes of the range of the genus. In connection with such theoretical concepts, a study of *Hevea* in Colombia, as well as in Peru, holds especial interest, inasmuch as these countries have in their territories the highlands and slopes which would seem to have been most favorable for the early differentiation of the genus.

II.

As stated above, the present study is preliminary and provisional. It is not yet possible to present a consideration of all of the taxonomic entities of subspecific rank which have been found in Colombia. Therefore, the following enumeration of the entities which have been found in the eastern regions of Colombia includes only three easily distinguishable varieties and no forms. An asterisk indicates a species or variety not yet known to occur in Colombia but known from localities so near the Colom-

bian frontier as to suggest the probability of its occurrence within the boundaries of this country.

- Hevea Benthamiana *Mueller-Argentius*
- Hevea brasiliensis (HBK.) *Muell.-Arg.* var. subconcolor *Ducke*
- Hevea Foxii *Huber*
- *Hevea glabrescens *Huber*
- Hevea guianensis *Aubl.*
- Hevea guianensis *Aubl.* var. lutea (*Benth.*) *Ducke & R. E. Schultes*
- Hevea pauciflora (*Spruce ex Benth.*) *Muell.-Arg.* var. coriacea *Ducke*
- *Hevea rigidifolia (*Benth.*) *Mueller-Argentius*
- Hevea viridis *Huber*
- Hevea viridis *Huber* var. toxicodendroides *R. E. Schultes & E. L. Vinton*

Hevea Benthamiana *Mueller-Argentius* in *Linnaea* 34 (1865) 204.

Hevea Benthamiana is usually found in those swampy regions commonly known as "rebalsés" or "igapós," areas which are subjected to heavy yearly inundations during the rainy seasons and which are more or less permanently boggy. This species is often closely associated with *Hevea viridis* and *H. pauciflora* var. *coriacea*, often hybridizing with the latter and possibly also to a lesser extent with the former.⁴

Frequently, this species is seen in association with the interesting "moriche" or "canangucho" palm (*Mauritia minor*), one of the most striking indicators of igapó areas. Because of its predilection for moist and acidic habitats, *Hevea Benthamiana* generally occurs close to and along the banks of rivers and creeks (especially those which carry little suspended clay or sand and which are known as "aguas negras"), rarely invading the usually higher hinterland. This species has no special common name in

⁴The most extensive hybridization of *Hevea* which I have seen in Colombian forests is that of *Hevea Benthamiana* × *H. pauciflora* var. *coriacea* in the Río Miritiparaná above the Raudal de Chimborazo where there are stands of the hybrid and of the two parents.

Colombia other than "siringa" or "siringa blanca." It yields a product only slightly inferior to that of *Hevea brasiliensis*.

Hevea Benthamiana is represented in various parts of eastern Colombia by a number of rather distinct varieties and forms which are not yet sufficiently well understood to be described. I believe that more exploration and study will show that this is the most variable species in Colombia.

Hevea brasiliensis (HBK.) Muell.-Arg. var. *subconcolor* Ducke in Arch. Jard. Bot. Rio Janeiro 6 (1933) 55.

Hevea nitida Mueller-Argentius in Martius Fl. Bras. 11 (1874) 301.

Hevea brasiliensis, a widespread species in the Amazon Valley, occurs in Colombia apparently only in the southern half of the "trapecio amazonico"—in the Leticia area—where it is represented by the very strikingly distinct variety *subconcolor*. This variety, with firmly chartaceous or thinly coriaceous leaflets which are nearly as green beneath as above and very glossy on both surfaces, was described from the nearby Brazilian locality of São Paulo de Olivença. In Colombia, it is a tree of heavily floodable areas and occurs along river and creek banks, but not to any appreciable extent on land which is above the height of the annual floodwaters. In Leticia, it is referred to as "siringa fina." It yields the highest grade of Colombian *Hevea* rubber, the so-called "Up-River" or "Alto-Río" grade.

The specific concept described by Mueller in 1874 under the name *Hevea nitida* is known only from the type material which von Martius collected "in prov. do Alto Amazonas, in silvis secus flumina Solimoës et Amazonium." In his "Revision of the Genus *Hevea*, mainly the

Brazilian Species," Ducke cited *Hevea nitida* as an insufficiently known species, stating, in part: "I compare a leaf of the type. . . [which] resembles, in the nearly equal colour of both surfaces, the leaves of *H. viridis* but [it] is more coriaceous and has a different form." Mueller wrote in the original description that the leaflets are "subtus vix pallidiora" and that the concept is "evidenter affinis *H. rigidifoliae* et *H. Brasiliensis*, sed folia minus rigide coriacea quam in priore et margine haud recurva, distinctius venosa, et capsulae et semina multo minora quam in posteriore, a qua insuper colore foliorum recedit."

The type locality of *Hevea nitida* coincides with the region where the concept *Hevea brasiliensis* var. *subconcolor* is known to be rather widely distributed.

After having studied individually thousands of trees of the variety of *Hevea brasiliensis* which occurs in the "trapezio amazonico"—which have been determined both by Dr. Ducke and by myself as representing the concept *H. brasiliensis* var. *subconcolor*—I am convinced that this variety is identical with the concept *H. nitida*. All the characters of *Hevea nitida* mentioned by Mueller in his ample description agree with those described by Ducke for his variety *subconcolor*. Consequently, I believe that it is advisable to reduce *H. nitida* to synonymy. Because of the International Rule requiring the use of the earliest name under the rank maintained, it is impossible to use the earlier epithet *nitida* as the varietal designation.

Hevea Foxii Huber in Bol. Mus. Goeldi 7 (1918) 228.

Hevea Foxii, for which the common name "ituri" has been reported, is a very poorly understood species known only from the type material which was collected at El

Retiro near the headwaters of the Río Igaraparaná. In 1942, I searched carefully along the Igaraparaná from La Chorrera to its confluence with the Río Putumayo, but could not find a tree showing characters similar to those ascribed to this species. Extensive collections of topotypical material of *Hevea Foxii* are urgently needed before we can evaluate critically its exact relationship to *H. guianensis* var. *lutea* with which it appears to be allied.⁶

* *Hevea glabrescens* Huber in Bol. Mus. Goeldi 7 (1913) 230.

Described from material gathered on the Río Putumayo, *Hevea glabrescens* is rather poorly understood as a species. In 1942, I attempted to collect topotypical material, but without success. It cannot be a common species, for I did not find it in any locality along the Putumayo. Its relationships would seem to be with *Hevea guianensis* var. *lutea*.⁶ Although the type was collected on the Peruvian bank of the Río Putumayo, there seems little reason to believe that it does not occur on both sides of the river.

Hevea guianensis Aublet Pl. Guian. 2 (1775) 228.

Hevea guianensis Aubl. var. *lutea* (Benth.)
Ducke et R. E. Schultes comb. nov.

Hevea lutea (Benth.) Mueller-Argentius in Linnaea 34 (1865) 204.

During several conferences which I had with Dr. Adolpho Ducke in Manaus in June, 1944, it became evident that we had arrived quite independently at the conclusion that *Hevea lutea* actually represents only a variety of the widely distributed and very variable *H.*

⁶ Ducke (Arch. Jard. Bot. Rio Janeiro 5 (1930) 152) has considered *Hevea Foxii* and *H. glabrescens* as varieties of *H. lutea* and has made the appropriate nomenclatorial transfers.

guianensis. We have both encountered variability in the characters which have been used to maintain *H. lutea* as a species. In 1943 (Arquiv. Serv. Florest. Rio Janeiro 2 (1943) 31) Ducke stated: "Quanto as relações de afinidade entre as espécies *guianensis* e *lutea*, e a descoberta de uma forma que parece representar uma transição de *guianensis* var. *occidentalis* para *lutea* var. *pilosula*." Hans G. Sorenson likewise believes, after very extensive field work in the Amazon Valley, that *H. lutea* represents but a variety of *Hevea guianensis*.

Hevea guianensis and *H. guianensis* var. *lutea* occur most commonly on "tierra firme" and on higher and well-drained knolls or river banks. They comprise the most widespread complex of Colombian representatives of *Hevea*. Furthermore, they occur coexistantly and are extremely abundant where the annual inundation does not exert a direct flooding or "drowning" influence for long periods. Of the two, *Hevea guianensis* var. *lutea* is by far the more abundant in most regions. Both are known generally as "siringa amarilla" because they have yellowish latexes; in regions bordering Brazil, the name "borracha fraca" is current. In Leticia, the Peruvian term "jebe debil" is used. While these trees yield a weak rubber in some regions, the rubber from the Vaupés, which comes for the most part from *Hevea guianensis* var. *lutea*, is considered to be good. There are numerous localized varieties and forms of both concepts.

Hevea pauciflora (*Spruce ex Benth.*) *Muell.-Arg.*
var. ***coriacea*** *Ducke* in Arch. Inst. Biol. Veg. Rio Janeiro 2 (1935) 239.

Hevea pauciflora var. *coriacea*, a small to medium-sized tree, occurs in light (catinga-type) forests on the slopes of rocky hills or in the vicinity of rock outcrops. It is not common in Colombia. The latex is whitish. This species is never tapped.

* ***Hevea rigidifolia*** (*Benth.*) *Mueller-Argentinus* in *Linnaea* 34 (1865) 203.

Hevea rigidifolia, collected by Spruce in catinga forests along the Río Vaupés at Panuré in Brazil (near the Colombian boundary), is known only from the type material. It seems entirely probable that this species will be found in Colombia. I have examined a duplicate type which is preserved in the Gray Herbarium and find that it is an extraordinarily distinct species which resembles no other known representative of the genus. The leaflets are glabrous, glossy, rigidly thick-coriaceous with strong, recurvate margins.

Hevea viridis Huber in *Rev. Cult. Colon.* 10 (1902) 194.

Hevea viridis occurs in two very different habitats, but always in the vicinity of sandstone or granitic rock outcrops. In the igapós subjected to heavy inundation each year, it becomes a very robust tree; on rocky hillsides and sterile places near falls and rapids, it is a medium sized and poorly developed tree, superficially resembling *Hevea pauciflora* var. *coriacea*. Its chief characters, however, are exceedingly constant despite the wide variance in its chosen habitats. I have never encountered *Hevea viridis* in the areas of inundation where rock outcrops are remote. The latex of this species is yellowish (in igapós) or, rarely, white (in drier, rockier locations) and gives a sticky rubber devoid of elasticity. It not only yields a product which is of no commercial value, but it will spoil the latexes of other species if mixed with them. In the Vaupés, the common name is "siringa pegajosa."

Hevea viridis *Huber* var. ***toxicodendroides*** *R. E. Schultes* & *E. L. Vinton* in *Caldasia* 3 (1944) 25.

Hevea viridis var. *toxicodendroides* is a bushy or shrub-

by representative of the genus found on the sterile tops of sandstone mountains in the Caquetá and Vaupés. It yields a rubber which is described by chemists as "very good," an exceedingly interesting report in view of the inferior and worthless quality of the rubber of *Hevea viridis* itself. Unfortunately, due to its diminutive size, *Hevea viridis* var. *toxicodendroides* is commercially without value because it cannot be tapped. Nevertheless, it represents a very interesting variety which might be of use in a breeding program. It has no common name which has come to my attention.

III.

The distribution of *Hevea* in Colombia can best be understood if it be presented according to river-systems.

VAUPES RIVER BASIN: The Itilla and the Vaupés itself above the falls of Yuruparí are populated by an abundance of *Hevea guianensis* var. *lutea*, considerable *H. guianensis* and a relatively small amount of *H. Benthamiana*; *H. viridis* is apparently entirely absent. Below Yuruparí, the Vaupés is very rocky, interrupted by innumerable rapids and one finds proportionately less *Hevea guianensis* var. *lutea*, little *H. guianensis* but much more *H. Benthamiana*; *H. viridis* is extremely abundant in igapós near rock outcrops; *H. viridis* var. *toxicodendroides* is found on sandstone mesas at Yapobodá near the headwaters of the affluent Cuduyarí and on Cerro Circasia; *H. rigidifolia* may occur below Mitú near the Brazilian border.

APAPORIS RIVER BASIN: In the upper and middle basins above the falls of Jerijerimo (which correspond to Yuruparí geologically and geographically), the most abundant trees are *Hevea guianensis* var. *lutea* and *H. guianensis*; *H. Benthamiana* (including several unusual

forms) is common; on the numerous sandstone hills, especially on Cerro Chiribiquete and Cerro de la Campana, *H. viridis* var. *toxicodendroides* is extraordinarily abundant; *H. viridis* is found only in the vicinity of Jerijerimo. The affluents of the upper and middle basins—the Ajaju, Macaya, Macayari, Tacunema and Cananari—are similarly populated. In the lower basin, from the Cachivera (rapids) de Jerijerimo to the Cachivera de Yayacopi, the composition of the *Hevea* flora resembles that of the upper and middle basins; the large affluent, the Piraparaná, is also similar. From Yayacopi downstream to the mouth of the Apaporis, however, *Hevea Benthamiana* predominates along the banks, while the *H. guianensis*-complex is relegated to the higher hinterland mesas; *H. viridis* is found, but apparently not in abundance, in the vicinity of the Cachivera de Yayacopi. (The lowest affluent of the Apaporis, the Taraíra, is said by “caucheros” to have practically no *Hevea* along its banks. If this be true, it curiously coincides with conditions which Allen found on the Río Papuri, an affluent of the lower Vaupés in the same general region as the Taraíra.)

It is interesting to note here that the results of a mile-by-mile census of *Hevea* which I made along a 62 kilometer path connecting the middle Vaupés and the middle Apaporis basins indicates that *Hevea Benthamiana* is almost completely absent on the high hinterlands and that the only representatives of the genus encountered are *H. guianensis* and *H. guianensis* var. *lutea*, the latter by far the more abundant. Similar results were obtained on a 36 kilometer traverse which I studied between the Itilla and the Macaya.

CAQUETA RIVER BASIN: *Hevea guianensis* var. *lutea* and, to a lesser extent, *H. guianensis* are found in abundance along the Caquetá upstream from a point about

eighty miles above the Cachivera de Cordova (near La Pedrera), but from Cordova to this point, *Hevea Benthamiana* predominates on the inundable banks. On the sandstone mesa at Araracuara, *Hevea viridis* var. *toxicodendroides* occurs, but not in abundance as at Chiribiquete on the Apaporis. Below Cordova, the only species found along the banks is *Hevea Benthamiana*, with the exception of a small colony of *H. pauciflora* var. *coriacea* on and around the base of Cerro de La Pedrera. In the Miritiparaná, *Hevea Benthamiana* is the only species found below the lowest rapids where the banks are subject to heavy flooding. Above the rapids, *Hevea guianensis* var. *lutea* and *H. guianensis* are more abundant, except in certain localities (especially in several large igapós) where *H. Benthamiana* and *H. pauciflora* var. *coriacea* also occur in abundance in sandy catingas and on rocky elevations in the neighborhood of the numerous falls and rapids of the Miritiparaná. In the hinterland of the upper reaches of the river, *Hevea guianensis* and its variety *lutea* are found to the exclusion of *H. Benthamiana* but not of *H. pauciflora* var. *coriacea*. I suspect that *Hevea viridis* also occurs in the Miritiparaná, but no trees were encountered.

PUTUMAYO RIVER BASIN: The Putumayo, with its main affluents—the Caraparaná and Igaraparaná—is perhaps the most uniform area of Colombia as far as the distribution of *Hevea* is concerned. *Hevea*, as an important element of the flora, does not extend upstream in the Putumayo beyond Caucaya. From this point nearly to Arica, the chief representatives of the genus are *Hevea guianensis* and its variety *lutea*. Below Arica (or the mouth of the Igaraparaná), *H. Benthamiana* begins to appear, and, near the Brazilian border and possibly also in the Río Cotuhé, it predominates over the other two in

the floodable areas. In the Caraparaná and Igaraparaná, formerly the centres of the famous and powerful Casa Arana which exploited rubber with Indian labor forced by torture and death, *Hevea guianensis* and *H. guianensis* var. *lutea* predominate. Only a small amount of *Hevea Benthamiana* is found along the lower reaches of the Igaraparaná and in the vicinity of the Quebrada Menaje. Nothing is known about the distribution of the little understood species *Hevea Fowii* and *H. glabrescens* of this basin. I did not find *Hevea viridis* in the Putumayo drainage area, but Ducke reports one collection of this species from Occidente on the Río Putumayo.

AMAZON RIVER BASIN: Colombia has only a very short stretch of the Amazon, the southern limit of the wedge-shaped "trapecio amazonico." Nevertheless, this short stretch, receiving several small rivers or large creeks (the Loretoyacu, Hamacayacu, etc.) is of special importance in a study of *Hevea*. This small area is the only part of Colombia where *Hevea brasiliensis* occurs. As yet, we do not know exactly how far into the "trapecio" this species penetrates, but it probably reaches only to the headwaters of the creeks which empty directly into the Amazon above Leticia. In this area, however, *Hevea brasiliensis* var. *subconcolor* predominates, occurring in swampy habitats to the exclusion of other species. There are several very distinct forms of the variety in the Leticia area. On the few higher knolls, *Hevea guianensis* is represented.

IV.

The following key has been prepared with the needs of the field man in mind. A number of the characters—position of the leaflets, color of the latex, consistency and color of the bark, etc.—are rather easily observed in the field even though they may not be available to the stu-

dent who is limited to herbarium material. Such field characters can be of much greater value in the preparation of keys to the smaller subspecific entities and should be carefully noted and annotated by all collectors.

Hevea rigidifolia and *H. glabrescens* have not been included in the key because they have yet to be seen in Colombia. *Hevea Fowii* has been omitted pending the collection of more material and information concerning its characters and relationships.

KEY TO THE GENUS HEVEA IN COLOMBIA

- A. Leaflets horizontal or reclinate in relation to the petiole (sometimes slightly erect in *H. pauciflora* var. *coriacea*). Latex normally pure white (in *H. viridis* yellowish or white). Habitat: bogs, swamps or sterile and rocky locations.
- B. Capsules (ordinarily about 4 cm. or less in diameter) and seeds medium sized. Seeds 300-750 per kilo (except in *H. pauciflora* var. *coriacea*). Disk of staminate flower well-developed. Inflorescence pubescent to nearly glabrous. Leaflets normally coriaceous or subcoriaceous.
- C. Leaflets ordinarily horizontal. Inflorescence pubescent, very rarely subglabrescent. Seeds under 360 per kilo.
- D. Leaflets variously pubescent beneath (usually reddish or ferruginous). Buds of staminate flower acuminate. Anthers normally 7-9 (rarely 5-10) in two irregular verticels. Latex yields very elastic, high-quality rubber. Large trees of floodable forests. Seeds 330-360 per kilo, with large dark brown or black spots, somewhat elongate-ovoid, not angular.
- DD. Leaflets glabrous beneath. Buds of staminate flower obtuse. Anthers normally 10 in two regular verticels. Latex yields a sticky, non-elastic rubber of no commercial value. Medium sized trees of rocky or sandy locations in catanga forests. Seeds not seen for Colombian specimens but apparently larger than those of *H. Benthamiana*.

H. pauciflora var. *coriacea*

CC. Leaflets ordinarily reclinate, occasionally approaching a semi-horizontal position. Inflorescence subglabrous. Seeds more than 450 per kilo.

E. Erect trees 80-100 feet tall. Trunk thick, cylindrical. Leaflets semi-horizontal to strongly reclinate, usually more or less flat, subcoriaceous. Seeds 450-500 per kilo. Bark clear brown or reddish brown, smooth. Habitat: bogs or well watered rocky slopes.

H. viridis

EE. Erect or semi-prostrate treelets or bushes 8-15 feet tall (rarely up to 25 feet). Trunk slender, weak, often gnarled. Leaflets strongly reclinate, folded at right angles along midrib, firmly coriaceous. Seeds very small, probably 650-750 per kilo. Bark checkered, roughish, brownish or light gray. Habitat: dry sterile sandstone mesas.

H. viridis var. *toxicodendroides*

BB. Capsules (ordinarily 5 cm. or more in diameter) and seeds large. Seeds about 200 per kilo. Disk of staminate flower non-existent or very slightly developed. Inflorescence densely pubescent or rarely subglabrescent. Leaflets ordinarily somewhat membranaceous-papyraceous, reclinate.

H. brasiliensis var. *subconcolor*

AA. Leaflets strongly erect, in relation to the petiole. Latex normally yellowish. Habitat: forests not subject to long periods of annual flooding, headwaters of creeks.

F. Latex usually deep yellow, often orange-yellow. Staminate buds obtuse or short-acuminate. Inflorescence usually pubescent. Anthers 5 (often 4-6) in one regular verticel. Seeds 500 per kilo.

H. guianensis

FF. Latex usually cream-color to yellow. Staminate buds very strongly acuminate. Inflorescence pubescent or subglabrous. Anthers 5 (rarely 6-8) in one irregular or in two irregular or regular verticels. Seeds 500 per kilo.

H. guianensis var. *lutea*

EXPLANATION OF THE ILLUSTRATIONS

PLATE I. Upper figure. Typical rubber-tapper's camp, Loretoyacu River, Amazonas. Here a group of five smoke-houses and several balls of smoked rubber ready for selling can be seen.

Lower figure. A rubber-tapper smoking latex into balls, Loretoyacu River, Amazonas. This ball, the product of about six days' tapping, weighs about 25 kilos. The latex is from *Hevea brasiliensis* var. *subconcolor*. In the Vaupés, latex is coagulated with acid and not with smoke, and the rubber is prepared in sheets.

PLATE II. Upper figure. Exploiting *Hevea brasiliensis* var. *subconcolor*, Loretoyacu River, Amazonas. In the "trapecio amazonico," trees of this variety sometimes attain a diameter of four feet.

Lower figure. Leaves and flowers of *Hevea brasiliensis* var. *subconcolor*, Loretoyacu River, Amazonas. Note the brilliance of the leaflets.

PLATE III. Upper figure. *Hevea guianensis* on the highland knolls of the Loretoyacu River, Amazonas.

Lower figure. *Hevea guianensis* var. *lutea*, Macaya River, Vaupés.

PLATE IV. Upper figure. Young leaves of *Hevea viridis* showing their lustrous surfaces, near Tayasú, Vaupés River, Vaupés.

Lower figure. Trunk of *Hevea viridis*, near Tayasú, Vaupés River, Vaupés.

PLATE V. Upper figure. *Hevea viridis* var. *toxicodendroides* at the type locality, Cerro Chiribiquete, Vaupés. This illustrates the erect habit of the plant.

Lower figure. Cretaceous sandstone ridges of the upper Apaporis River basin, Vaupés, where *Hevea viridis* var. *toxicodendroides* abounds on the xerophytic summits.

PLATE VI. Upper figure. Seeds of *Hevea viridis* from lower Vaupés River, Vaupés.

Lower figure. *Hevea viridis* var. *toxicodendroides* with fruit. Cerro Chiribiquete, Apaporis River, Vaupés.

1
2
3



PLATE I



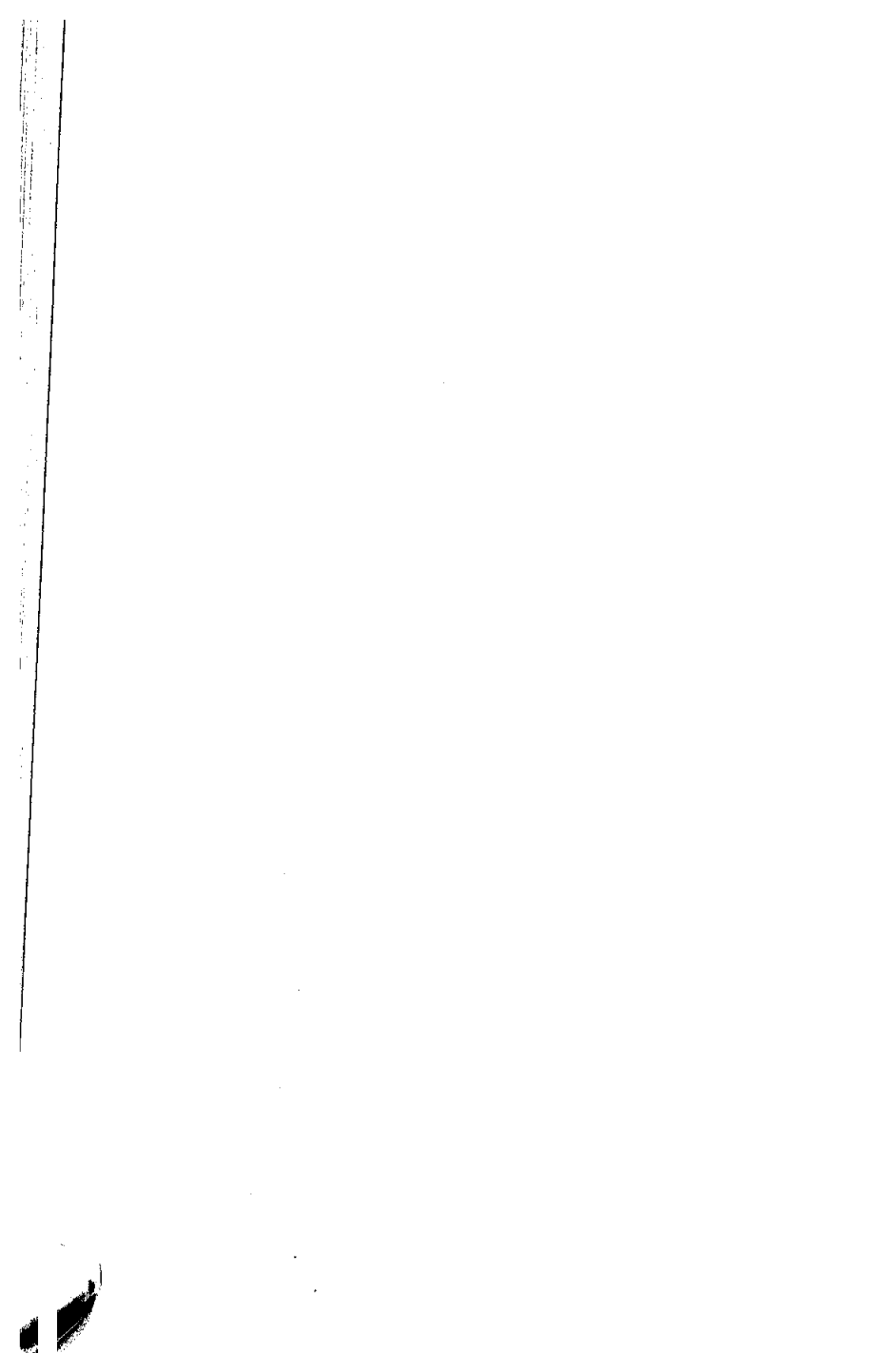


PLATE II



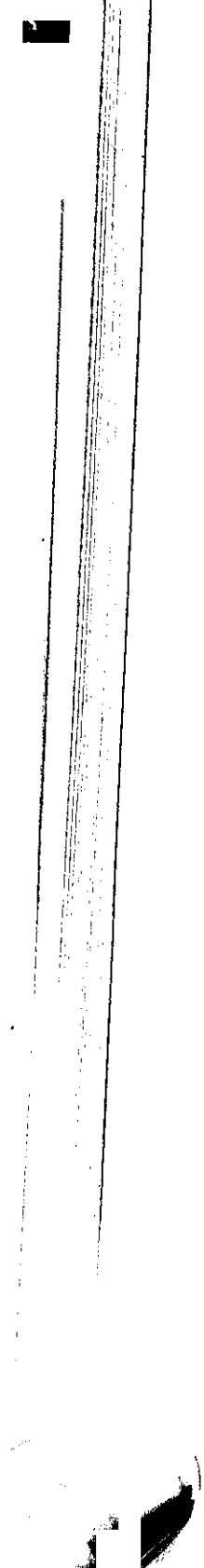


PLATE III



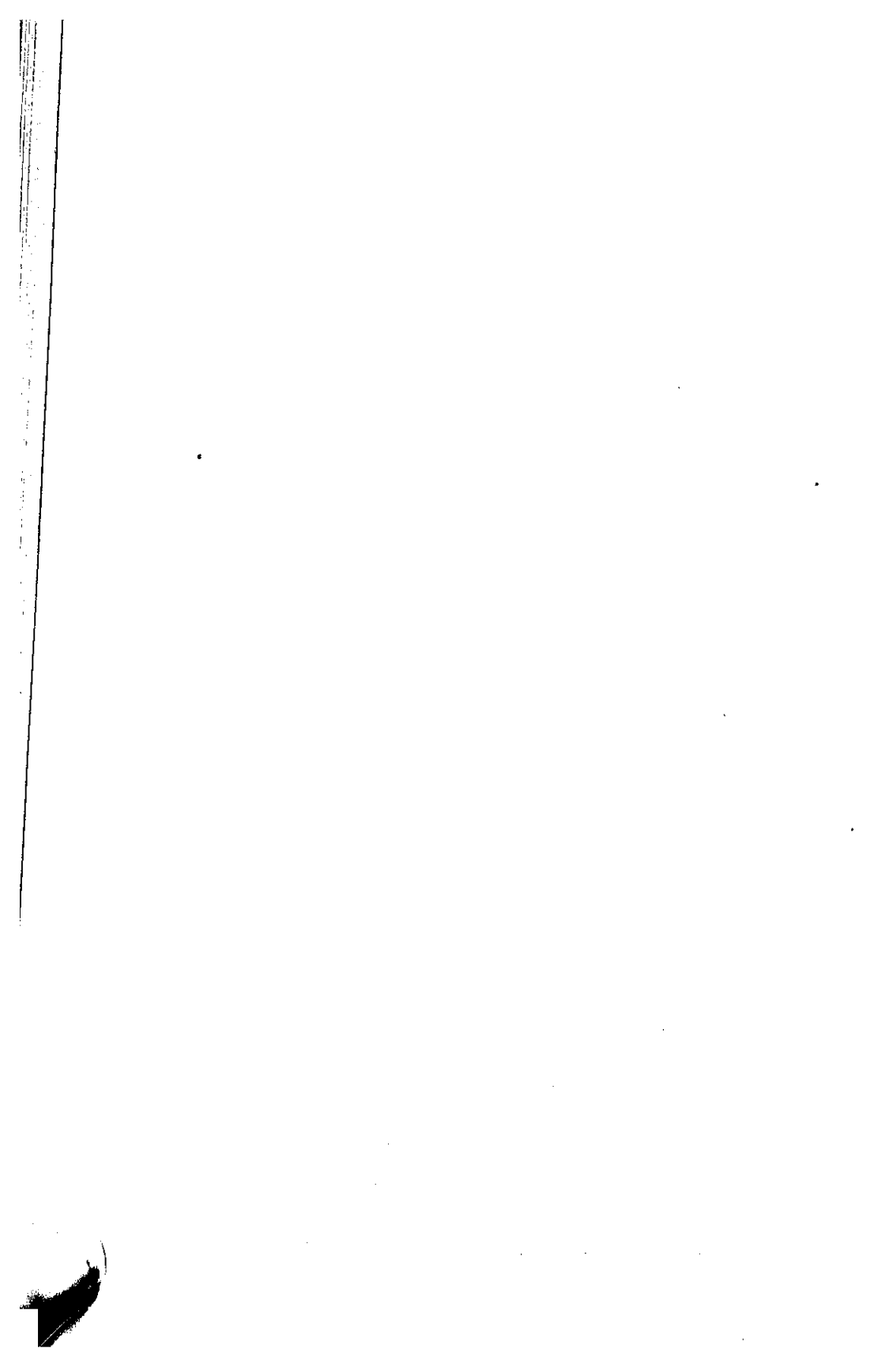


PLATE IV



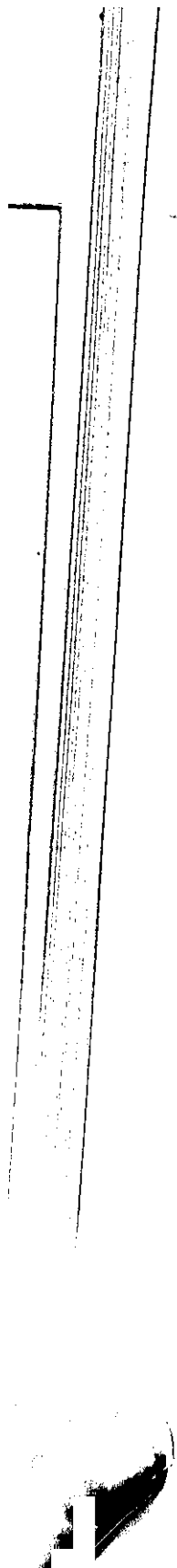


PLATE V

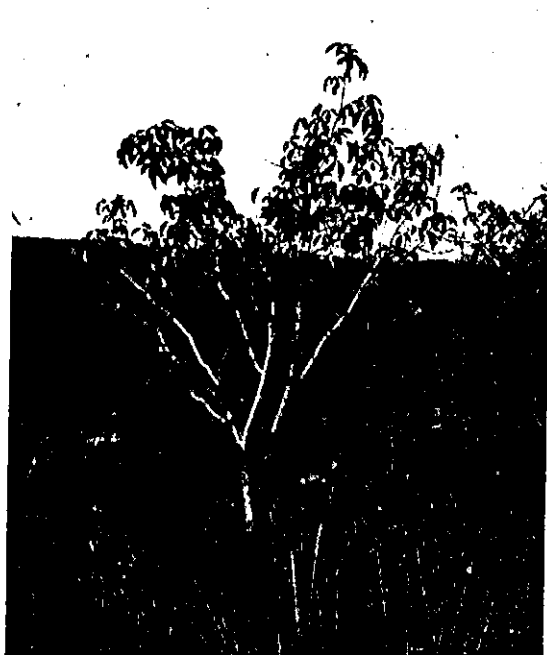




PLATE VI

