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# THE BROMELIACEAE OF COLOMBIA

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With 88 Illustrations by Robert J. Downs  
U. S. Department of Agriculture



## Publications of the United States National Herbarium

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## Preface

The family Bromeliaceae has been treated by Dr. Lyman B. Smith for North America, Trinidad and Tobago, British Guiana, Surinam, Brasil, and Peru. The present paper, a monographic and floristic account of the species occurring in Colombia, continues these regional treatments. There are 392 species recorded, more than twice as many as were credited to Colombia by Mez in his revision published in 1935. A brief account of important collectors who have contributed to our knowledge of the Bromeliaceae and of the flora of Colombia is given, as well as a short discussion of the distribution and origin of the family.

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# **The Bromeliaceae of Colombia**

## Introduction

The aim of the present paper is twofold, monographic and floristic. On the monographic side it is the largest remaining unit toward a complete coverage of the Bromeliaceae, the family already having been treated for North America,<sup>1</sup> Trinidad and Tobago,<sup>2</sup> British Guiana,<sup>3</sup> Suriname,<sup>4</sup> Brasil,<sup>5</sup> Peru,<sup>6</sup> and Argentina.<sup>7</sup> Floristically this paper adds one more family to the steadily growing unofficial "Flora of Colombia," which already includes Rubiaceae,<sup>8</sup> Mimosa-ceae and Caesalpiniaceae,<sup>9</sup> Begoniaceae,<sup>10</sup> Violaceae,<sup>11</sup> Xyridaceae,<sup>12</sup> and Acanthaceae.<sup>13</sup>

It might seem to be unnecessary to write a treatment of the Colombian Bromeliaceae when Mez monographed the whole family as recently as 1935,<sup>14</sup> but in the relatively short span of 20 years, the known Colombian species have practically doubled. Mez credited 192 species to Colombia and of these 25 have since been reduced to synonymy or invalidated because of erroneous geographical data, leaving a net of 166 as against 372 now. Also the last 20 years have added greatly to the distributional data of the species listed by Mez.

## Collectors

Unfortunately nobody has published an account of Colombian collectors comparable to those of Urban for Brasil<sup>15</sup> and the West Indies,<sup>16</sup> although a hopeful beginning has been made in a few instances as noted below.

So far as we know, the only eighteenth century botanist to collect Colombian Bromeliaceae was Mutis, and his plants were not the basis of any new species. Thus the first new species were collected

<sup>1</sup> L. B. Smith, *North American Flora* 19: 61-228. 1938.

<sup>2</sup> W. E. Broadway & L. B. Smith, *Proc. Am. Acad. Arts & Sci.* 68 (Contrib. Gray Herb. 102): 152-188 1933.

<sup>3</sup> L. B. Smith, *Contrib. Gray Herb.* 89: 46-85. 1930.

<sup>4</sup> L. B. Smith *in* Lanjouw, *Fl. Suriname*.

<sup>5</sup> L. B. Smith, *Smithsonian Misc. Coll.* 126: No. 1: 1-vii, 1-272. 1955.

<sup>6</sup> L. B. Smith *in* J. Francis MacBride, *Flora of Peru*, *Field Mus. Bot.* 13: 495-592. 1936.

<sup>7</sup> A. Castellanos, *Genera et Species Plantarum Argentinarum* 3: 107-382. 1945.

<sup>8</sup> P. C. Standley, *Field Mus. Bot.* 7: No. 1: 3-175. 1930.

<sup>9</sup> N. L. Britton & E. P. Killip, *Ann. N. Y. Acad. Sci.* 35: 101-196. 1936.

<sup>10</sup> L. B. Smith & B. G. Schubert, *Caldasia* 4: 3-38, 77-107, 179-209. 1946.

<sup>11</sup> L. B. Smith & A. Fernández-Pérez, *Caldasia* 6: 83-181. 1954.

<sup>12</sup> J. M. Idrobo, *Caldasia* 6: 183-260. 1954.

<sup>13</sup> E. C. Leonard, *Contrib. U. S. Nat. Herb.* 31: pt. 1: 1-iii, 1-118. 1951; pt. 2: 1-viii, 119-322. 1953; pt. 3: 1-x, 323-782. In press.

<sup>14</sup> Mez *in* Engler, *Das Pflanzenreich* IV. 32: 1-667. 1934-1935.

<sup>15</sup> Urban *in* Mart. *Fl. Bras.* 1, pt. 1: 1-154. 1906.

<sup>16</sup> Urban, *Symbol. Antill.* 3: 14-158. 1902.

by Humboldt and Bonpland <sup>17</sup> in 1801 when they travelled the whole length of Colombia from north to south.

The next important collection was that of Martius <sup>18</sup> in 1820 when he went up the Río Caquetá to Araracuara in southeastern Colombia. He recorded his position as in Brazil and started a confusion that still persists. His plants, though few, included the first examples of the genera *Brocchinia* and *Navia* and marked the discovery of the flora of the Guiana Highland or "Lost World" area.

In 1825 Goudot collected the types of a number of species that are common in the vicinity of Bogotá. Purdie, in 1844, was the first of several botanists to concentrate on Santa Marta, notable among the later ones being H. H. Smith in 1898-1899 and A. Schultze in 1927.

J. J. Linden visited Colombia but according to his own list <sup>19</sup> collected no Bromeliaceae. However, through Funck and Schlim <sup>20</sup> in the 1840's and later through Wallis, <sup>21</sup> he imported into Europe living material of a number of the more ornamental species.

From 1851 to 1857 Triana <sup>22</sup> travelled widely in his native country and his are the first extensive collections from the extreme southwest. His labels bear two series of numbers, of which I am citing the smaller since in the case of the Bromeliaceae that is the collection number, while the larger refers to the taxonomic position of the genus.

About 1855 Holton <sup>23</sup> brought back to the United States a small but significant collection made largely in Valle. His book is helpful as a guide to the political boundaries of that time as well as to place names that have since disappeared.

E. André <sup>24</sup> came to Colombia in 1875 to make a detailed biological survey for the French government, and purposely followed the route of Humboldt and Bonpland as well as making additional side-trips. Bromeliaceae were his chief interest and his collections of this family dwarfed all previous ones.

Kalbreyer made collections in Antioquia around 1879 and was followed in recent years by Archer, Brother Daniel, Gutiérrez, Hodge, and Barkley.

Between 1880 and 1899, Lehmann collected widely in the Andean regions of Colombia and contributed notably to the records of

<sup>17</sup> T. A. Sprague, Kew Bull. for 1926: 23-30. 1926.

<sup>18</sup> A. Dugand, Rev. Acad. Col. de Ciencias 5: No. 18: 212-216. 1942.

<sup>19</sup> Ill. Hortlc. 30: 114-116. 1883.

<sup>20</sup> Barnhart, Journ. N. Y. Bot. Gard. 28: 210. 1927.

<sup>21</sup> E. Morren, Belg. Hortlc. 27: 201. 1877.

<sup>22</sup> A. Dugand, Rev. Acad. Col. de Ciencias 5: No. 20: 483-489. 1944.

<sup>23</sup> New Granada 1-xvi, 18-605. 1857.

<sup>24</sup> Le Tour du Monde 34: 1-64. 1877; 35: 129-224. 1878; 37: 97-144. 1879; 38: 273-368. 1879; 45: 337-416. 1883.

Bromeliaceae. His detailed field notes are in the library at Kew and a copy is in the U. S. National Herbarium.

In late 1899 Langlassé<sup>25</sup> made a trip in southwestern Colombia that ended in his death and the loss of much of his collections. However, a number of Bromeliaceae were in the final salvage and proved of unusual interest. Langlassé's are the latest collections of any importance to be cited in toto in Mez's monograph.

Collectors since then have with scant exception given such full information on their labels that there is little difficulty in finding their localities. Consequently they require but the briefest summary.

General collectors from the United States such as Rusby, Pennell, Killip, and A. C. Smith, have collected a high proportion of Bromeliaceae in their exploration of the Andean flora. Present Colombian botanists of note in this regard include Dugand, Fernández-Pérez, García-Barriga, Idrobo, Romero-Castañeda, and Uribe-Uribe.

Cuatrecasas has not only collected a large number of new species but has done considerable research and publication on the genus *Puya*. In 1939 he collected in Vaupés the first Colombian *Navia* since Martius discovered the genus in 1820. He was followed in this area by P. H. Allen and by Schultes who added to the flora many Amazonian as well as Guiana Highland species.

During the war, members of the Cinchona Mission occasionally diversified their collecting, and as they were avoiding the beaten track their finds were frequently rare or new.

In 1946 Mulford and Racine Foster came to Colombia with the hope of collecting more Bromeliaceae than André. How well they succeeded during their cross-country trek is amply attested in the citations of specimens in this paper.

### Herbaria

The greater part of this paper is based on material in a very few herbaria. Thanks to the possession of André's collections, Kew has the great majority of the types of the older species. Nearly all these are represented by photographic negatives on file in the Gray Herbarium and the United States National Herbarium. Fortunately, the types lost with the Berlin Herbarium are well recorded photographically in the Chicago Natural History Museum.

Recent collections are largely concentrated in the Instituto de Ciencias Naturales, Bogotá (all Colombian botanists, Cuatrecasas, Schultes), the Chicago Natural History Museum (Cuatrecasas), the Gray Herbarium (Foster, Schultes), and the United States National Herbarium (Pennell, Killip, Cuatrecasas, Schultes).

In citing herbaria where specimens are deposited, I have used the

<sup>25</sup> R. McVaugh, *Candollea* 13: 164-174. 1952.



abbreviations provided in Lanjouw's "Index Herbariorum." Citations of photographs of specimens follow the citation of the herbarium having the specimen photographed, e. g. (GH, type, US phot. 3179).

### Distribution and Origin

The Bromeliaceae of Colombia fall into three principal floristic groups, the Andean, the Guiana Highland, and the Amazonian. Judging by the floral morphology of the genera, the Andean flora is primitive and has given rise to the other two. In fact the rich speciation of *Puya* and *Tillandsia* within Colombia make it seem probable that the family had its origin here.

The Andean flora is predominantly a forest on the flanks of the three great Cordilleras, only *Puya* growing consistently above tree-line and no genus being characteristic of coastal areas. It contains many species with ranges of several hundred miles and also many narrow endemics. The large number of endemics is at least partially explained by the formation of numerous microclimatic areas by the division of the Cordillera.

The Guiana Highland flora is the smallest in species and in area, being limited to scattered sandstone mesas in eastern Colombia. The majority of its species are narrow endemics and in Colombia the flora consists of *Brocchinia* and *Navia*, with species of other genera doubtfully characteristic.

The Amazonian flora occupies all of eastern lowland Colombia except for small islands of the Guiana Highland flora already mentioned and consists chiefly of species with large ranges as might be expected from its relatively uniform character. The highly evolved Bromelioideae are much better represented than in the Andean flora and the species of *Pitcairnia* show a higher degree of development in their much greater fusion between the perianth and the ovary.

### Format

In general plan this paper follows Leonard's "The Acanthaceae of Colombia" more than any other work. However, it has been abbreviated in one respect, the descriptions being supplementary to the keys and in general not repeating characters there. Synonymy under each species has been limited to what is considered useful in a floristic treatment.

Wherever possible the orthography of localities is that of the "Index to Map of Hispanic America 1:1,000,000" of the American Geographical Society. In the case of localities not listed there, the orthography of the label has been retained even at the cost of some inconsistency when collectors disagree.

## Systematic Treatment

## BROMELIACEAE: Pineapple family

BROMELIACEAE J. St.-Hil. Expos. Fam. 1:122-5, pl. 19. 1805.

Herbs or rarely shrubby perennials, largely epiphytic; roots usually present, but often serving merely as holdfasts in the epiphytic species; leaves spirally arranged, usually rosulate, dilated-sheathing at the base, simple, entire or spinose-serrate, bearing peltate scales at least when young, and these serving to absorb moisture; inflorescence simple or compound, of spikes or racemes or rarely reduced to a single flower, usually bearing brightly colored conspicuous bracts; flowers perfect in all the Colombian species; perianth heterochlamydeous, the sepals and petals free or connate; stamens 6 in 2 series; filaments free, or joined to the petals or to each other; styles 3-parted; ovary superior to inferior, 3-celled; placentae axile, extending the length of the cell or variously reduced; fruit capsular or baccate; seeds winged, plumose, or naked; embryo small, situated at the base of the copious mealy endosperm.

## KEY

1. Seeds variously appendaged (naked in *Navia*, but the fruit dehiscent); ovary wholly superior to wholly inferior; fruit a capsule (indehiscent in a few species of *Pitcairnia*).
2. The seeds naked (*Navia*) or with entire appendages (the apical one rarely splitting in *Brocchinia paniculata*), not plumose; ovary from wholly superior to wholly inferior; leaves often spinose-serrate; plants almost always terrestrial.

Subfamily 1. PITCAIRNIOIDEAE (p. 5)

2. The seeds plumose; ovary nearly or quite superior in all the Colombian species; leaves always entire; plants chiefly epiphytic . . . . . Subfamily 2. TILLANDSIOIDEAE (p. 91)

1. Seeds always naked; ovary wholly inferior in all the Colombian species; fruit always baccate, fleshy to coriaceous; leaves usually spinose-serrate; plants often epiphytic.

Subfamily 3. BROMELIOIDEAE (p. 245)

## Subfamily 1. PITCAIRNIOIDEAE

PITCAIRNIOIDEAE Harms, Engl. & Prantl, Pflanzenfam. ed. 2. 15a:102. 1930.

Navioideae Harms, Engl. & Prantl, Pflanzenfam. ed. 2. 15a:102. 1930.

Herbs or rarely shrubby perennials, terrestrial or rarely epiphytic in *Pitcairnia*; leaves often spinose-serrate; ovary wholly superior to wholly inferior; fruit a capsule but indehiscent in a few species of *Pitcairnia*; seeds with entire appendages (naked in *Navia* but the fruit

capsular), not plumose (the apical appendage rarely splitting in *Brocchinia paniculata*).

### KEY

1. Sepals convolute with left side of each overlapping the right of the next one; seeds appendaged.
  2. Ovary wholly superior; petals naked, strongly twisted together after anthesis . . . . . **1. *Puya***
  2. Ovary partly inferior; petals often appendaged, not strongly twisted together after anthesis . . . . . **2. *Pitcairnia***
1. Sepals cochlear with both posterior ones overlapping the anterior.
  3. Seeds caudate-appendaged at one or both ends; ovary largely inferior; inflorescence paniculate; leaves usually entire.
 

**3. *Brocchinia***
  3. Seeds naked or rarely with slight traces of an appendage; ovary usually superior; inflorescence paniculate to capitate; leaves usually spinose-serrate . . . . . **4. *Navia***

### 1. *Puya*

*Puya* Molina, Sagg. Chili 160, 351. 1782.

*Pourretia* R. & P. Prodr. 46. 1794, nomen illegitimum.

Perennial, usually long-caulescent, simple or branching, coarse, often several meters high; leaves densely rosulate, usually spinose-serrate with coarse teeth; inflorescence simple or compound; flowers showy; sepals free, much shorter than the petals; petals free, usually spreading at anthesis and twisted after, naked or rarely with paired vertical folds; stamens usually included, the filaments free; ovary superior, glabrous, the style slender, elongate; capsule primarily loculicidal; seeds broad, alate.

Principally Andean with outlying species in Costa Rica, British Guiana and adjacent Brasil, and northwestern Argentina.

The subgenus *Puya* (*Eupuya*) does not occur in Colombia. Mez's remaining subgenera, *Pitcairniopsis* and *Pourretia*, are synonymous and were published at the same time. Since *Pourretia* is confused by its use as an illegitimate generic name, I am reducing it to synonymy and retaining *Pitcairniopsis*. Mez distinguished *Pourretia* on the basis of a simple inflorescence, but in some species such as the Colombian *P. cryptantha* Cuatrecasas, the inflorescence may be simple or compound according to the vigor of the plant.

### KEY

1. Pedicels 15–35 mm. long, slender.
2. Inflorescence compound, substrobilate, its branches strict; primary bracts membranaceous, soon disintegrating.

3. Racemes with a sterile naked base 3–4 cm. long; axes and sepals covered with persistent stellate dark ferruginous trichomes.  
*1. P. gigas*
3. Racemes sessile or subsessile; axes and sepals bearing simple minute early deciduous trichomes . . . . . *2. P. goudotiana*
2. Inflorescence simple, lax or sublax, its flowers and bracts spreading at anthesis.
4. Leaf-blades obscurely lepidote or glabrous on both sides, the spines spreading.
5. Sepals densely and persistently brown-lanate; floral bracts ample, lustrous . . . . . *3. P. nitida*
5. Sepals glabrous; floral bracts narrow, opaque, thin.  
*4. P. sanctae-martae*
4. Leaf-blades densely and persistently lepidote at least above, the spines closely ascending.
6. Sepals almost wholly glabrous at anthesis; leaf-blades soon glabrous beneath . . . . . *5. P. killipii*
6. Sepals persistently whitish-lanate; leaf-blades lepidote on both sides . . . . . *6. P. barkleyana*
1. Pedicels less than 15 mm. long, usually stout.
7. Inflorescence compound, its branches distinct, exceeding the primary bracts.
8. Sepals broadly rounded, elliptic or oblong, 17–21 mm. long; branches of the inflorescence spreading; indument of pale brown stellate trichomes.
9. Racemes slenderly cylindric, their sterile bases mostly much longer than the primary bracts; flowers not at all secund.  
*7. P. lehmanniana*
9. Racemes ellipsoid, their sterile bases much shorter than the primary bracts; flowers downwardly secund.  
*8. P. bicolor*
8. Sepals acute or acuminate or with a narrow blunt apex, narrowly triangular or lanceolate.
10. Flowers subsessile . . . . . *9. P. thomasiana*
10. Flowers distinctly pedicellate.
11. Racemes spreading, very slenderly cylindric; pedicels not over 5 mm. long; leaves densely pale-lepidote beneath.  
*10. P. floccosa*
11. Racemes strict, ellipsoid; pedicels to 10 mm. long; leaves minutely and obscurely lepidote beneath.  
*11. P. furfuracea*
7. Inflorescence simple or strobilate with branches shorter than the primary bracts so that it appears simple.
12. Outer bracts distinctly serrate, at least toward their apices.

13. Inflorescence lanate or tomentose, compound with flowers fasciculate in the axils of primary bracts.
14. Teeth of the primary bracts deltoid; inflorescence lanate . . . . . **12. *P. vestita***
14. Teeth of the primary bracts acicular; inflorescence brown-tomentose . . . . . **13. *P. santosii***
13. Inflorescence soon glabrous, simple; bracts sublustrous  
**14. *P. lineata***
12. Outer bracts entire or at most obscurely denticulate.
15. Lower surface of the leaf-blades covered with appressed persistent cinereous scales; flowering plant 3–8 dm. high.
16. Inflorescence lax at base, simple; sepals exceeding the bracts, 35 mm. long . . . . . **15. *P. grantii***
16. Inflorescence strobilate; sepals equaled or exceeded by the bracts.
17. Flowering plant less than 4 dm. high; inflorescence simple; floral bracts suborbicular, apiculate.  
**16. *P. brachystachya***
17. Flowering plant 6–8 dm. high.
18. Sepals 14–16 mm. long, apiculate; inflorescence usually compound . . . . . **17. *P. cryptantha***
18. Sepals 20–28 mm. long; inflorescence simple.
19. Inflorescence ellipsoid, stout; sepals obtuse.  
**18. *P. santanderensis***
19. Inflorescence slenderly cylindric; sepals acuminate . . . . . **19. *P. gargantae***
15. Lower surface of the leaf-blades bearing minute scales between the nerves or subglabrous; flowering plant 4–40 dm. high.
20. Outer bracts strongly reflexed and exposing most of the flower, membranaceous; inflorescence simple.
21. Leaf-blades serrate throughout; plant much less than 1 m. high; inflorescence subellipsoid.  
**20. *P. trianae***
21. Leaf-blades entire along their upper  $\frac{1}{4}$ ; plant 2–3 m. high; inflorescence slenderly cylindric . **21. *P. nivalis***
20. Outer bracts straight or with only the extreme apex reflexed, covering the sepals; inflorescence mostly compound.
22. Sepals 14–16 mm. long, soon glabrous.  
**22. *P. boyacana***
22. Sepals 20–30 mm. long, densely and persistently lanate.

23. Indument relatively short and lax, not obscuring the outlines of the bracts; bracts membranaceous.

24. Sepals lance-oblong, 24 mm. long, firm.

**23. *P. cuatrecasasii***

24. Sepals lance-ovate, 30 mm. long, membranaceous.

**24. *P. occidentalis***

23. Indument very long and dense, completely covering all details of the inflorescence except the petals and the apices of the bracts.

25. Plants 1–1.5 m. high; indument of the inflorescence brown; sepals lanceolate.

**25. *P. clava-herculis***

25. Plants 2.5–4 m. high; indument of the inflorescence white; sepals broadly elliptic.

**26. *P. hamata***

1. *Puya gigas* André, Rev. Hort. 53: 314, fig. 74. 1881.

Densely massed, the flowering plant 6–10 meters high; leaves 1–1.3 meters long, the blades linear, 4 cm. wide, glabrous above, covered with pale appressed scales beneath, rigid, laxly serrate with ascending spines 11 mm. long; scape erect, 5 cm. or more in diameter; scape-bracts densely imbricate, deciduous; inflorescence bipinnate, fusiform; primary bracts disintegrating soon after anthesis, elliptic; racemes 13–15 cm. long including the sterile base, dense; floral bracts broad, about equaling the sepals, dark brown, membranaceous; flowers erect or suberect; pedicels 15–20 mm. long; sepals elliptic, 26 mm. long, membranaceous.

NARIÑO: Boggy margin of Laguna de la Cocha, alt. 3,000 m., May, 1876, André 3074 (K, type, leaf only). In sphagnum, páramo cloud-forest, Alta de Cruz above Encano, alt. 3,300 m., Nov. 1, 1946, Foster 2046 (GH, US).

Due to the incompleteness of André's records, the dense inflorescence of *Puya gigas* has been erroneously recorded as simple, but the Foster material from very near the type locality is amply branched while agreeing very closely with the type in habit.

2. *Puya goudotiana* Mez in DC. Monogr. Phan. 9:488. 1896. **FIGURE 1**  
 "*Puya aff. bonplandiana*" Cuatrecasas, Trab. Mus. Nac. Cienc. Nat. Madrid, Bot. No. 27:[127], pl. 32, fig. 1. 1934.

Flowering plant to 5 meters high; leaves over 1 m. long, sheaths suborbicular, pale, densely serrulate, blades linear, long-acuminate, rigid, pungent, glabrous above, minutely pale-lepidote between the nerves beneath, very laxly serrate with flat dark more or less uncinatate spines 4–11 mm. long; scape erect, very stout; scape-bracts densely imbricate, the lower subfoliaceous but with thinner bases, the upper suborbicular with a narrowly triangular apex, dark brown, submembranaceous, soon



FIGURE 1.—*Puya goudotiana*: *a*, Habit,  $\times \frac{1}{50}$ ; *b*, primary bract and branch,  $\times \frac{1}{2}$ ; *c*, flower,  $\times 1$ ; *d*, fruit,  $\times 1$ .

disintegrating; inflorescence bipinnate, cylindrical; primary bracts very broadly ovate, triangular-acute, longer or shorter than the axillary branches, entire, covered with a pale brown evanescent indument, dark brown; racemes lax, the axes 2–8 cm. long, rather slender; floral bracts broadly elliptic, acute, exceeding the pedicels, dark brown, membranaceous; flowers divergent to spreading; sepals lanceolate, 20–29 mm. long, prominently nerved, pubescent with minute pale trichomes, soon glabrous; petals 5–6 cm. long, blade suborbicular, green or greenish blue; stamens shorter than the petals, anthers 8–9 mm. long; capsule subglobose.

COLOMBIA: *Mutis* 2905 (US, leaf only).

NORTE DE SANTANDER: Fields, Presidente, Valley of Río Chitagá, alt. 3,400–3,500 m., July 20, 1940, *Cuatrecasas & García-Barriga* 10039 (F, GH, US).

SANTANDER: Forest, vicinity of Charta, alt. 2,600 m., Feb. 1–11, 1927, *Killip & Smith* 18930 (GH, NY, US, juvenile with undeveloped pedicels). Páramo of Santurbán, between Cuesta Boba and the western end, alt. 3,400 m., July 27, 1940, *Cuatrecasas & García-Barriga* 10304 (GH, US).

CUNDINAMARCA: Near Bogotá, *Goudot* (P, type; GH phot. 2976). Same, Nov. 26, 1852, *Holton* 148 (GH). Páramos, Bogotá, April 1916, *Dawe* 174 (US). Páramo, eastern slope of Cerro Diego Largo, massif of Bogotá, alt. 3,220 m., May 28, 1939, *Cuatrecasas* 5162 (F, GH, US). Same, alt. 3,340 m., Jan. 14, 1940,

*Cuatrecasas* 7969 (F, GH, US). Páramo de Guasca, alt. 3,300–3,500 m., Mar. 12, 1939, *Killip* 34153 in part (US). Same, in high grass and occasional thickets, alt. 3,200–3,300 m., June 2, 1940, *Cuatrecasas* 9506 (F, US). Same, eastern slope, alt. 3,200–3,400 m., Jan. 4, 1942, *Cuatrecasas* 13547 (F, US). Same, alt. 2,700–3,000 m., Jan. 22, 1942, *Schultes & Jaramillo* 3196 (GH, US). Same, western slope, alt. 2,920 m., Mar. 17, 1942, *Gutiérrez & Jaramillo* 247 (GH). Páramo of Chocontá, alt. 2,760–2,830 m., June 29, 1940, *Cuatrecasas* 9660 (F, GH, US). Mountains from Montserrate to Chapinero, near Bogotá, road between El Granizo and San Luis, alt. 3,000–3,150 m., Feb. 19, 1946, *García-Barriga* 11929 (US). Subpáramo, south of Usme, between La Regadera and El Hato, alt. 3,000–3,100 m., June 21, 1950, *Idrobo et al.* 405 (COL, US).

3. *Puya nitida* Mez in DC. Monogr. Phan. 9:491. 1896.

*Puya woronowii* Harms, Notizblatt 11:58. 1930.

Flowering plant 1–2 meters high; leaves 3–6 dm. long, sheaths sub-orbicular, denticulate, their upper third dark castaneous, elsewhere stramineous, blades linear, long-acuminate, 2–4 cm. wide, sparsely and very obscurely lepidote, very laxly serrate with dark straight or uncinate spines 3–5 mm. long; scape erect, about 20 mm. in diameter, ferruginous-lanate; scape-bracts imbricate, the lower ones subfoliaceous, the upper broadly elliptic with a small narrowly triangular serrulate apex, dark brown, lustrous; inflorescence cylindric, lax at anthesis, brown-lanate; floral bracts elliptic, acute, nearly equaling the sepals, entire or obscurely denticulate, soon glabrous, dark brown, rugulose; pedicels 15–25 mm. long; sepals lanceolate, 22–26 mm. long; petals 5–6 cm. long, yellow-green to violet; stamens included.

CUNDINAMARCA: Cold region, near Bogotá, *Goudot* (P, type; GH phot. 2997). Road from Bogotá to La Calera, alt. 300 m., May 1921, *Mrs. Tracy* 392 (K). Páramos of Bogotá, April 1916, *Dawe* 175 (K, US). Páramo de Guasca, alt. 3,300–3,500 m., Mar. 12, 1939, *Killip* 34153 in part (GH, US). Same, eastern slope, alt. 3,200–3,400 m., Jan. 4, 1942, *Cuatrecasas* 13539 (F, GH, US). Same, alt. 2,850–3,340 m., Jan. 22, 1942, *Schultes & Jaramillo* 3196 (US). Same, alt. 3,500–3,600 m., Mar. 19, 1944, *Fosberg* 21683 (US). Same, alt. 3,100 m., Mar. 21, 1948, *Haught* 6226 (US). Open ground, Boquerón de Chipaque, alt. 3,150–3,250 m., Mar. 16, 1939, *Killip* 34216 (US). Ridge between Quebrada de las Delicias and Quebrada de las Ninfas, massif of Bogotá, alt. 3,000–3,180 m., June 25, 1939, *Cuatrecasas* 5629 (F, GH, US). Matorrales, Cerro del Guadalupe, massif of Bogotá, alt. 3,250 m., Jan. 14, 1940, *Cuatrecasas* 7958 (F, GH, US). Cordillera of Zipaquirá, between Zipaquirá and Pacho, alt. 3,100–3,200 m., June 16, 1940, *Cuatrecasas* 9529 (F, GH, US); 9529-A (F, GH, US). Páramo de Cruz Verde, western slope of Cordillera Oriental, alt. 3,100–3,200 m., Sept. 9, 1942, *Gutiérrez* 366 (F). El Chico, above Bogotá, alt. 3,000 m., Oct. 11, 1946, *Foster, Jaramillo & Idrobo* 1924 (GH). Same, alt. 2,700 m., June 28, 1952, *García-Barriga* 14200 (COL, US). Páramo de Chasques, above Villapinzón, western slope of the Cordillera Oriental, alt. 3,000–3,500 m., May 23, 1951, *García-Barriga, Schultes & Jaramillo* 13608 (COL, US). Monserrate near Bogotá, alt. 3,000 m., May 26, 1952, *Køie* 5072 (C). Municipio de Calera, Páramo del Palacio, alt. 3,060–3,240 m., Feb. 25, 1953, *Schultes* 18727 (COL, F, GH, K, MA, NY, P, S, UC, US).



4. *Puya sanctae-martae* L. B. Smith, *Phytologia* 4:382, *pl. 2, fig. 5-7.* 1953.

FIGURE 2

Aggregated, flowering plant at least 7 dm. high; leaves many, densely rosulate, 3 dm. long, the blades narrowly triangular, 3 cm. wide, flat, laxly serrate with pale curved spines 4 mm. long, glabrous at least with age; scape erect, 15 mm. in diameter, glabrous; scape-bracts numerous, very densely imbricate, only the lowest at all

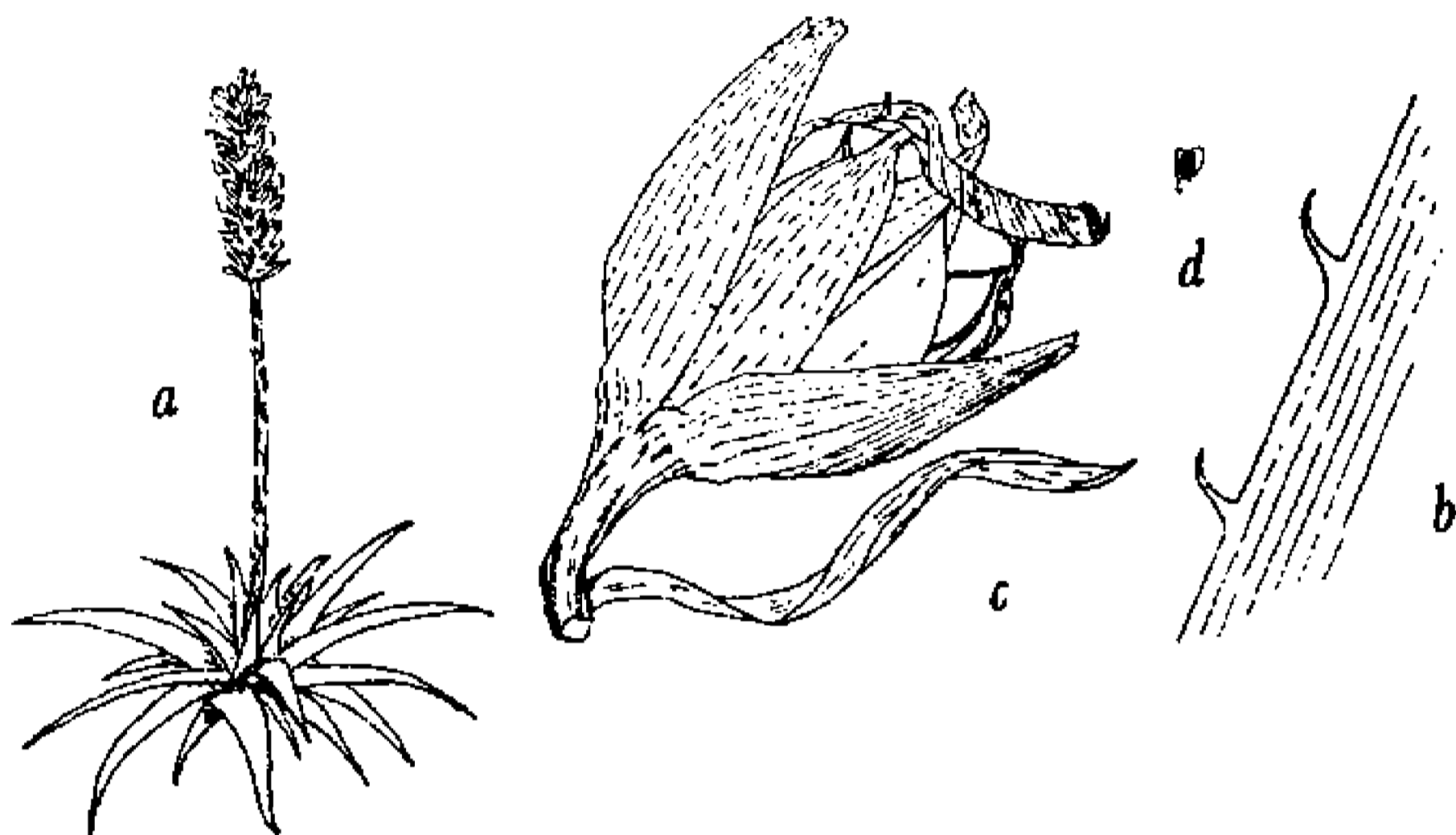


FIGURE 2.—*Puya sanctae-martae*: a, Habit,  $\times \frac{1}{20}$ ; b, leaf-margin,  $\times 1$ ; c, floral bract and flower,  $\times 1$ ; d, seed,  $\times 1$ .

foliaceous, the others thin and deciduous with age, probably reflexed, but undoubtedly completely covering the scape; inflorescence racemose, densely cylindric, 30–45 cm. long, 7 cm. in diameter and glabrous in fruit; axis stout; floral bracts reflexed in age, lanceolate, 5 cm. long; pedicels arcuate-spreading, 15 mm. long, rather slender and slightly thickened toward apex; sepals lanceolate, about 25 mm. long, ecarinate, nerved; petals contorted in drying; seeds alate.

MAGDALENA: On perpendicular rocks in full sun, mountains above Hacienda Cincinnati, Santa Marta, August 1946, *Foster & E. Smith* 1408 (GH, type, US phot. 3938).

5. *Puya killipii* Cuatrecasas, *Not. Fl. Colombia* 6:38, *fig. 31.* 1944.

Flowering shoot 6–15 dm. high; leaves 22–24 cm. long, sheaths suborbicular, 4 cm. in diameter, serrulate, blades linear-triangular, 20–25 mm. wide, densely and closely cinereous-lepidote above, laxly serrate with straight slender spines 4 mm. long; scape central, erect, 15–18 mm. in diameter, pale-flocculose; scape-bracts erect, exceeding the internodes but exposing much of the scape at anthesis, the lowest subfoliaceous, the others broadly ovate with a linear acuminate apex, subdensely spinulose-serrate, soon glabrous, dark castaneous, lustrous, somewhat rugose when dry; inflorescence 40 cm. long, the rhachis and pedicels persistently pale-flocculose; floral bracts like the upper scape-bracts but with merely apiculate summits, about equaling the

sepals at anthesis, serrulate to subentire; pedicels 15–25 mm. long, about 3 mm. in diameter; sepals elliptic-oblong, acute, 24–28 mm. long, 10 mm. wide; petals 45 mm. long, blue, claw long, blade obovate, abruptly acute, 15 mm. wide; stamens included, anthers 6 mm. long; capsule oblong-ovoid, acute, 25 mm. long.

NORTE DE SANTANDER: Páramo de Tamá, vicinity of La Cueva, alt. 3,000–3,200 m., Oct. 28, 1941, *Cuatrecasas, Schultes & C. E. Smith, Jr.*, 12652 (COL, F, GH, US). Near El Piñuelad, Pamplona, June 30, 1945, *Garganta* 1009 (F. US). Alto de las Coronadas, south of Pamplona, Nov. 29, 1946, *Garganta* 1273 (F. US, juvenile).

SANTANDER: Open rocky hillsides, vicinity of Vetas, alt. 3,100–3,250 m., Jan. 16–20, 1927, *Killip & A. C. Smith* 17875 (US). Open hillside, southern slope of Páramo de Romeral, alt. 3,300 m., Jan. 29–31, 1927, *Killip & A. C. Smith* 18497 (COL, type; GH, US).

6. *Puya barkleyana* L. B. Smith, *Phytologia* 5:180, *pl. 2, figs. 4–7.* 1955.

FIGURE 3

Stemless, 1 meter high; leaves numerous, to 44 cm. long, sheaths broadly ovate, 5 cm. long, nearly white except for the dark castaneous apex, glabrous, blades linear, acuminate, pungent, 2 cm. wide, covered with fine appressed cinereous scales, laxly serrate with minute spines; scape erect, stout; scape-bracts strict, imbricate, ovate, glabrous, brown and slightly lustrous, the lower ones with small foliaceous



FIGURE 3.—*Puya barkleyana*: *a*, Section of leaf,  $\times 1$ ; *b*, lower floral bract and flower,  $\times 1$ ; *c*, upper floral bract,  $\times \frac{1}{2}$ ; *d*, sepal,  $\times 1$ .

blades; inflorescence 45 cm. long; axis stout; floral bracts straight, orbicular with a narrowly triangular minutely serrate apex, 5 cm. long, about equaling the sepals, thin, brown, glabrous, slightly lustrous; pedicels 25 mm. long, white-lanate; sepals oblong, broadly acute, 28 mm. long, 7 mm. wide, nerved; capsule subglobose, 2 cm. long.

SANTANDER: Mountain crest, 2 km. from Berlín, alt. 2,800 m., Dec. 18, 1948, *Molina & Barkley* 18-S-404 (US, type, US phot. 4475, 4476).

7. *Puya lehmanniana* L. B. Smith, *Phytologia* 5:34. 1954.*Puya lanuginosa* sensu Wittm. *Bot. Jahrb.* 11:56. 1889, not Schult. 1830.*Pitcairnia pastoensis* Baker, *Handb. Bromel.* 122. 1889.*Puya pastoensis* Mez in DC. *Monogr. Phan.* 9:483. 1896, not André 1889.

Plant caulescent, flowering shoot 18–24 dm. high; stem 18–24 dm. long, branching; leaves rosulate at the ends of the stem, very numerous, 45–75 cm. long, sheaths white, succulent, blades linear, acuminate, pale green, bearing pale brown spines; inflorescence amply paniculate, the axes covered with appressed tomentum, becoming glabrous; primary bracts narrowly triangular, pungent, serrulate; racemes stipitate for 3–4 cm. but fertile at apex, 17 cm. long, dense; floral bracts broadly ovate, triangular-acute, much shorter than the sepals, convex, entire, tomentulose; flowers erect or suberect; pedicels stout, 5 mm. long; sepals asymmetric, subelliptic, rounded-emarginate and mucronulate, 21 mm. long, nearly 10 mm. wide, ferruginous-tomentulose, becoming glabrous; petals 50 mm. long, olivaceous-blue, spreading to reflexed at anthesis, naked; stamens included, filaments dilated toward base, anthers 8 mm. long.

NARIÑO(?): Alluvial soil vicinity of Pasto, alt. 1,500–2,000 m., *Lehmann* 665 (BM, type, GH phot. 6643; G). Between El Espino and Piedrancha, alt. 1,500–2,100 m., Nov. 29, 1946, *Foster* 2267 (GH, US).

8. *Puya bicolor* Mez in DC. *Monogr. Phan.* 9:482. 1896.

FIGURE 4

Flowering plant 1–3 meters high; leaves 6–8 dm. long, the sheaths elliptic-oblong, inconspicuous, serrulate, the blades linear, long-acuminate, 2–4 cm. wide, smooth and glabrous above, covered beneath with appressed cinereous scales, laxly serrate with slender red-brown spines 3–5 mm. long; scape erect, stout, pale-flocculose when young; scape-bracts foliaceous or subfoliaceous, much exceeding the internodes but exposing most of the upper scape; inflorescence laxly paniculate; primary bracts broadly ovate, acuminate, about half as long as the branches, spinulose-serrate; racemes densely many-flowered, 10–11 cm. long including the short naked sterile base; floral bracts broadly elliptic, apiculate, entire, equaling or slightly exceeding the pedicels; flowers spreading at anthesis; pedicels 5–10 mm. long; sepals lance-oblong, 17–21 mm. long; petals 40 mm. long, green and violet, naked, exceeding the stamens; anthers stout, 7 mm. long.

NORTE DE SANTANDER: Region of Pamplona, alt. 2,300–2,600 m., *Funck & Schlim* 1451 (G, type, GH phot. 6469).

BOYACÁ: Pauna, on road to Muzo, "Las Curubitas" (Km. 114), alt. 2,850 m., *García-Barriga* 13218 (COL, US). El Gran Hotel Termales, near Paipa, alt. 2,577 m., May 6, 1944, *Ewan* 15642 (COL, US).

CUNDINAMARCA: Cógua, alt. 2,850 m., *Huertas & Camargo* 104 (F, US). Rocky ridge, Los Espinos, end of Chía, Sabana de Bogotá, alt. 2,620–2,650 m., June 29, 1940, *Cuatrecasas* 9641 (F, GH, US). On rocks, Suesca, alt. 2,580 m., Oct. 9, 1946, *Foster* 1803 (GH, US).

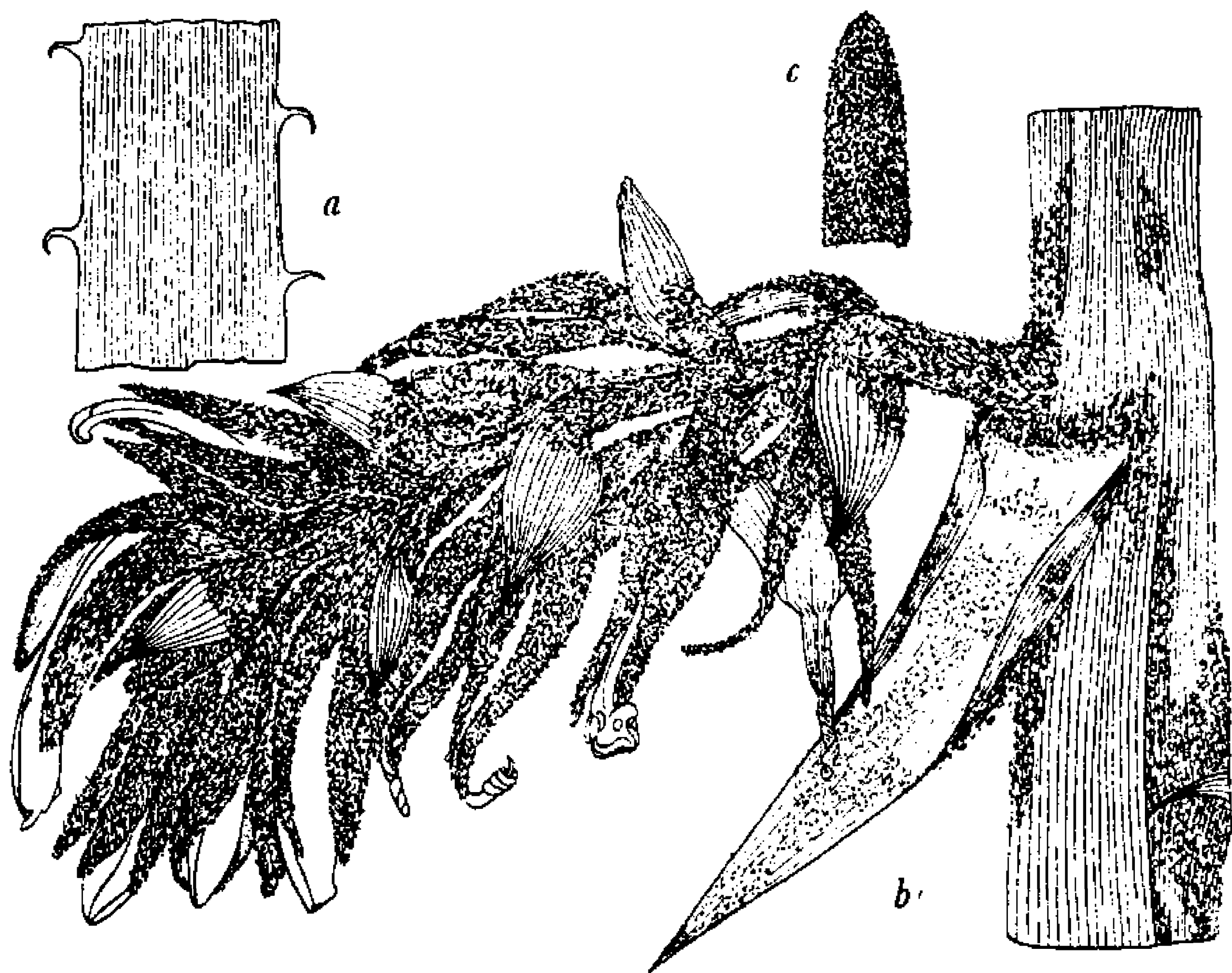


FIGURE 4.—*Puya bicolor*: *a*, Section of leaf-blade,  $\times 1$ ; *b*, primary bract and branch,  $\times 1$ ; *c*, sepal,  $\times 1$ .

9. *Puya thomasiana* André, Énum. Bromél. 5. Dec. 13, 1888; Rev. Hort. 60:565. Dec. 16, 1888; Bromel. Andr. 35, pl. 11, fig. D. 1889.

Stem to 1 meter high; flowering shoot 2–4 meters high; leaves very densely rosulate, 1 meter long, the blades linear, coarsely uncinateserrate; inflorescence laxly paniculate; primary bracts deltoid, acuminate, many times shorter than the branches, spinose; branches 15–20 cm. long, few-flowered, toward apex dense, fertile and stellate-pilose, flattened above, sulcate; floral bracts ovate, acute, cucullate, much shorter than the sepals, sulcate-corrugated at the base, soon glabrous; flowers 63 mm. long, pedicels very short and stout, obconical; sepals lanceolate, acute, about 25 mm. long, rufous-tomentose; petals obovate, obtuse, exceeding the stamens, greenish blue, revolute toward the apex, naked; capsule ovoid, acute, triquetrous, the valves carinate; seeds compressed, broadly scarious-margined.

NARIÑO: Banks of the Río Guaitara, between Pasto and Tuquerres, alt. 1900 m., May 1876, André 3191 (K, type).

ECUADOR.

FIGURE 5

10. *Puya floccosa* (Linden) E. Morr. Belg. Hort. 35:81. 1885.

*Puya guianensis* Kl. in Schomburgk, Fauna u. Flora 1067. 1848, nomen.

*Pourretia floccosa* Linden, Catal. 1853 ex Bot. Zeitung 11:718. 1853.



FIGURE 5.—*Puya floccosa*: *a*, Leaf,  $\times \frac{1}{4}$ ; *b*, inflorescence,  $\times \frac{1}{4}$ ; *c*, primary bract and branch,  $\times 1$ ; *d*, flower,  $\times 1$ ; *e*, petal,  $\times 1$ ; *f*, stamen and pistil,  $\times 1$  (*c*, *d*, *e*, and *f*, after André).

*Pitcairnia floccosa* Regel, Act. Hort. Petrop. 3:124. 1875.

*Puya quetameensis* André, Énum. Bromél. 5. Dec. 13, 1888; Rev. Hort. 60: 565. Dec. 16, 1888; Bromel. Andr. 38, pl. 11, fig. A. 1889.

*Pitcairnia guyanensis* Baker, Bromel. 120. 1889.

*Pitcairnia quetameensis* Baker, Bromel. 121. 1889.

*Pourretia achupalla* Hort. Linden ex Baker, Bromel. 126. 1889, nomen in synonym.

*Puya bonplandiana* sensu Baker, Bromel. 126. 1889, in part as to above, not Schult. 1830.

*Puya achupalla* Mez in DC. Monogr. Phan. 9:479. 1896, erroneously attributed to Baker.

*Pitcairnia sanctae-crucis* sensu Mez in DC. Monogr. Phan. 9:479. 1896, not Baker 1889.

Short-caulescent, flowering shoot 1–2 meters high; leaves numerous, over 1 meter long, the sheaths inconspicuous, serrulate, the blades linear, acuminate, 25–30 mm. wide, glabrous, above, laxly serrate with pale brown uncinatate spines 4–6 mm. long; scape stout, white-tomentose; scape-bracts subfoliaceous, densely imbricate, lanceolate, acuminate, spinose-serrate; inflorescence laxly bipinnate, 8–10 dm. long, densely white-tomentose; primary bracts many times shorter than the branches, serrate; branches straight or nearly so, laxly to densely 6–12-flowered; floral bracts ovate, apiculate,  $\frac{1}{2}$  to  $\frac{3}{4}$  as long as the sepals, entire; flowers erect, not secund; pedicels slender, 2–5 mm. long, sepals narrowly triangular, acuminate, 25–33 mm. long, 4 mm. wide, densely tomentose, ecarinate; petals 41 mm. long, blue, naked; stamens exceeding the petals, anthers 4.5 mm. long; capsule 14 mm. long, broadly ovoid, acute, loculicidal; seeds 3 mm. long.

COLOMBIA: Mutis 2225 (US).

SANTANDER: Open hillside, northern slope of Mesa de los Santos, alt. 1,000–1,500 m., Dec. 11–15, 1926, Killip & A. C. Smith 15002 (GH, NY, US).

CUNDINAMARCA: Bogotá, Aug. 1868, Stuebel 477–b (GH). (Flora Zipsaquerena), Sasaima Oriente, alt. 1,220 m., Jan. 5, 1943, Huertas & Camargo 531 (F). San Francisco, road to La Vega, alt. 1,650–1,730 m., Jan. 4, 1944, García-Barriga 10954 (US). Dry cliffs in temperate forest, Chuneca Creek, 5 km. west of Ubalá, alt. 2,000 m., Sept. 19, 1944, Grant 10189 (US). On rocks in full sun, Boqueron, Río Suma Paz, alt. 900 m., Oct. 13, 1946, Foster 1883 (GH). Pacho, Hacienda de Patasía, alt. 1,900 m., June 21, 1948, Uribe-Uribe 1731 (COL).

CUNDINAMARCA-VALLE: Cartago and Anapoima, alt. 1,000 m., Triana 549 (US).

VAUPÉS: Granitic soil, savanna, San José del Guaviare, alt. 270 m., Nov. 12, 1939, Cuatrecasas 7696 (US). Mesa La Lindosa, hill 15–20 km. south of San José del Guaviare, alt. 400–600 m., Dec. 13–15, 1950, Idrobo & Schultes 642 (COL, US).

HUILA: Open foothill, east of Neiva, Cordillera Oriental, alt. 700–1,200 m., Aug. 1–8, 1917, Rusby & Pennell 1122 (GH, NY).

CAUCA: Knolls on open slopes, Aganche, alt. 1,150–1,250 m., June 3, 1922, Pennell & Killip 6260 (GH, US). Open rocky slopes east of Aganche, alt. 1,200–1,500 m., July 14, 1922, Pennell & Killip 8330 (GH).

BRITISH GUIANA and adjacent BRASIL, VENEZUELA.

11. *Puya furfuracea* (Willd.) L. B. Smith, *Phytologia* 5:34. 1954.  
*Pitcairnia furfuracea* Willd. *Enum.* 1:346. 1809.  
*Achupalla* Humb. *Vues des Cordillères* 221, *pl.* 30. 1813.  
*Pourretia pyramidata* sensu H. B. K. *Nov. Gen. & Sp.* 1:296. 1816, not  
 R. & P. 1802.  
*Pitcairnia pyramidata* Link, *Enum.* 1:308. 1821, as to material not as to  
 basonym.  
*Puya bonplandiana* Schult. *in R. & S. Syst.* 7, *pt.* 2:1236. 1830.  
*Pourretia bonplandiana* D. Dietr. *Syn. Pl.* 2:1060. 1840.

Flowering plant, 2.3–3.5 meters high; leaves numerous, 5–9 dm. long, linear, long-acuminate, pungent, 2–3 cm. wide, serrate with ascending spines 5 mm. long; scape ferruginous-tomentose when young, becoming glabrous; inflorescence amply bipinnate, the axes ferruginous-tomentose; primary bracts triangular-ovate, acute, spinulose-serrate; racemes strobilate, 15 cm. long including the 2 cm. naked sterile base; floral bracts triangular-ovate, acuminate, about equaling the midpoint of the sepals, entire, tomentulose; pedicels stout, tomentose; sepals triangular, obtuse, 23 mm. long, becoming glabrous; petals naked; capsule subglobose, 16 mm. long.

CAUCA: Temperate region, near Pansitara, Mamendoy, and Almaguer, October–November 1801, *Humboldt & Bonpland* 6321 in part (B, type, F phot. 11392; P, F phot. 39606).

NARIÑO: Common, brush-covered hills, north edge of Pasto, near the retén, alt. 2,500 m., July 9, 1944, *Ewan* 15906 (COL, US).

12. *Puya vestita* André, *Enum. Bromél.* 5. Dec. 13, 1888; *Rev. Hort.* 60:565. Dec. 16, 1888; *Bromel. Andr.* 37, *pl.* 12, *fig.* B. 1889.

Flowering plant to 2 meters high; leaves 3 dm. long, the blades 24 mm. wide, covered beneath with pale brown scales, soon glabrous above, laxly serrate with pale slender teeth 6 mm. long; inflorescence strobiliform, compound, rufous-lanate; primary bracts large, nearly concealing the flowers, deltoid with long linear apices, coarsely serrate; branches reduced to pulvini bearing 3–4 flowers; floral bracts ovate, acute, keeled, 3 cm. long; flowers sessile; sepals ovate, 18–30 mm. long; petals about 6 cm. long, obtuse, pale green, equaling the stamens.

NARIÑO: Between Pasto and Laguna de la Cocha, on the Cerro Patascoy, *Stuebel* 364–a (B, ! Mez). High valley of Río Putumayo, crest of the cordillera between El Encano and Sibundoy, Páramo de San Antonio de Bordoncello, alt. 3,250 m., Jan. 4, 1941, *Cuatrecasas* 11737 (F, GH; small sepals).

13. *Puya santosii* Cuatrecasas, *Rev. Acad. Colombiana Cienc. Exact. Fisico-Quimic. y Nat.* 4:160, *figs.* 1, 2, *pls.* 1, 2. 1941.

Stemless, 1–2 meters high; leaves very numerous, sheaths very broadly elliptic, dark brown and serrulate near the apex, elsewhere pale and entire, blades linear, acuminate, rigid, even and glabrous above, minutely pale-lepidote between the nerves beneath, laxly serrate with slender dark uncinuate spines 3.5 mm. long; scape central, erect, much

exceeding the leaves, 4 cm. in diameter; scape-bracts numerous and very densely imbricate, the lower foliaceous, the upper elliptic-oblong with a small linear glabrous green blade, dark brown, brown-tomentose; inflorescence ellipsoid and obtuse at anthesis, cylindric in fruit, 3–5 dm. long; primary bracts ample, dark brown, firm, the lower ones much exceeding the flowers, serrulate near apex, the upper shorter than the corollas, entire; fascicles of 2–3 fertile and several aborted flowers; floral bracts ovate-elliptic, acute, exceeding the sepals; pedicels 5 mm. long at anthesis, 10 mm. long in fruit; sepals elliptic, obtuse, 16–19 mm. long, 6–10 mm. wide; petals obtuse, 30–36 mm. long, 6–10 mm. wide, greenish blue, naked; stamens included, anthers 4 mm. long; capsule subglobose, 12–20 mm. long.

**13a. *Puya santosii* var. *santosii***

Leaves large, sheaths 7–8 cm. long, 5–7 cm. wide, blades 50–60 cm. long, 30–35 mm. wide; inflorescence 10 cm. in diameter; primary bracts elliptic or suborbicular, the lowest with acuminate apices.

CUNDINAMARCA: Dense thickets, Usaquén, massif of Bogotá, alt. 3,000 m., Jan. 20, 1940, *Cuatrecasas* 7996 (F, US). Same, May 22, 1940, *Cuatrecasas* 9441 (COL, type; F, GH, US). Woods, San Miguel, southeast end of Sabana de Bogotá, alt. 2,800–3,000 m., Sept. 10, 1941, *Cuatrecasas & Jaramillo* 12042 (F, US). Western slope of Páramo de Guasca, alt. 3,100–3,300 m., July 15, 1945, *García-Barriga* 11632 (US). Subparamo, Estacion Agrícola Experimental "Usme," south of Usme, between La Regadera and El Hato, alt. 3,000–3,100 m., June 21, 1950, *Idrobo et al* 409 (US).

**13b. *Puya santosii* var. *verdensis* Cuatrecasas, Not. Fl. Colombia 6:39, fig. 32, 33. 1944.**

Leaves smaller, sheaths 6–7 cm. long, 4–6 cm. wide, blades 30–40 cm. long, 45 mm. wide; inflorescence more slender; primary bracts ovate, apiculate.

CUNDINAMARCA: Páramo de Choachi by lake, near Bogotá, alt. 3,700 m., Aug. 8, 1922, *Killip & Ariste-Joseph* 11950 (US). Páramo de Cruz Verde, alt. 3,100 m., June 12, 1940, *Cuatrecasas* 9518 (COL, F). Same, alt. 3,400–3,500 m., Sept. 15, 1940, *Cuatrecasas* 10468 (COL, type; F, US). Páramo de Cruz Verde, road to Choachi, alt. 3,000–3,200 m., Oct. 8, 1942, *Gutiérrez* 386 (COL, F). Usmé, alt. 3,400 m., June 22, 1952, *Køie* 5373 (C, US). In swampy ground, Páramo de Chisacá, southeast of Bogotá, alt. 3,300–3,600 m., July 1953, *Schultes* 20149 (COL, F, K, NY, P, UC, US).

**14. *Puya lineata* Mez in DC. Monogr. Phan. 9:497. 1896.**

*Puya lepidota* Cuatrecasas, *Caldasia* [1], No. 5:17, fig. 1–8. 1942.

Stemless, 4–8 dm. high; leaves numerous, 3–6 dm. long, sheaths suborbicular, 4 cm. in diameter, thick, dark brown and cinereous-lepidote near the apex, blades linear, caudate-acuminate, 8–22 mm. wide, curved, densely cinereous-lepidote, becoming glabrous above in age, laxly serrate with pale brown slender uncinuate spines 2–4 mm.



long; scape erect, lanate when young; scape-bracts imbricate, the lower subfoliaceous, the upper broadly ovate, apiculate, pectinate-serrate, thin, fuscous, striate, white-flocculose, at length glabrous and sublustrous; inflorescence strobilate, ellipsoid or cylindric, obtuse, 10–30 cm. long, 3.5–6 cm. in diameter; floral bracts like the upper scape-bracts, exceeding the sepals; pedicels 5 mm. long; sepals oblong, apiculate, 13–18 mm. long, 6–10 mm. wide, sparsely white-flocculose; petals 30–35 mm. long, blue; stamens included, anthers 4 mm. long; capsule ovoid, 16–18 mm. long.

COLOMBIA: No data but doubtless from the vicinity of Bogotá, *Goudot* (P, type; GH phot. 2998).

CUNDINAMARCA: Facatativá, alt. 2,400 m., Apr. 29, 1918, *Ariste-Joseph* A-193 (US). Bogotá, May 23, 1939, *Antonio* in hb. *Apolinar-María* 527 (F). Thickets, Alto de la Cruz, between Cogua and San Cayetano, alt. 2,880 m., June 1942, *Huertas* (Cuatrecasas). Thickets, 8 km. above Cogua, alt. 2,850–2,900 m., July 4, 1942, *Cuatrecasas* 13631 (COL, type of *Puya lepidota* Cuatrecasas; F; GH; US). Top of Suba Hill, near Bogotá, Mar. 22, 1945, *Schiefer* 613 (GH, US). Terrestrial, mostly in shade, "Chico," above Bogotá, alt. 3,000 m., Oct. 11, 1946, *Foster* 1837 (GH).

15. *Puya grantii* L. B. Smith, *Phytologia* 5:181, *pl. 2, figs. 11–13.* 1955.

FIGURE 6

Stemless, 5 dm. high; leaves numerous, 3 dm. long, sheaths suborbicular, 3 cm. in diameter, white and glabrous except the extreme apex, blades linear, acuminate, pungent, 2 cm. wide, glabrous above, laxly serrate with pale slender ascending spines 2 mm. long; scape erect, 1 cm. in diameter, finely white-flocculose, becoming glabrous; lowest

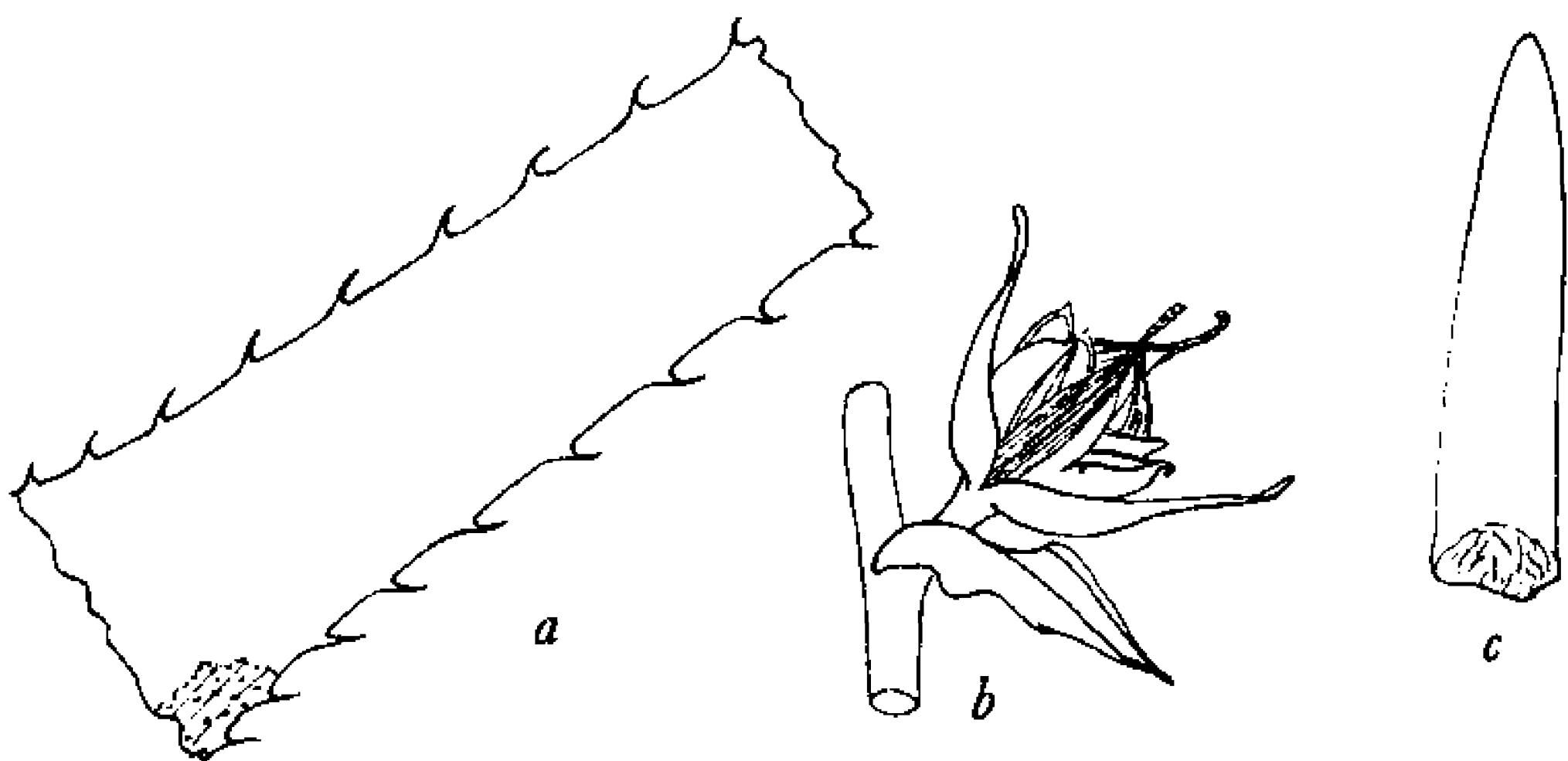


FIGURE 6.—*Puya grantii*: *a*, Base of leaf-blade,  $\times 1$ ; *b*, flower,  $\times \frac{1}{2}$ ; *c*, sepal,  $\times 1$ .

scape-bracts foliaceous and densely imbricate, the highest barely equaling the internodes and exposing most of the scape, ovate, acute, subchartaceous, dark red; inflorescence 12 cm. long, finely white-flocculose; floral bracts like the upper scape-bracts, 35 mm. long, entire, slightly exceeded by the sepals; flowers divergent to spreading; pedi-

cels cylindrical, 10 mm. long; sepals lance-oblong, broadly acute, ecarinate, thick, coriaceous; petals twisted together after anthesis; capsule stout-ellipsoid, 2 cm. long.

MAGDALENA: Or páramo, Sierra de Perijá, 25 km. east of Codazzi, on the Venezuelan border, alt, 3,000 m., Feb. 17, 1945, *Grant* 10980 (US, type, US phot. 4470).

16. *Puya brachystachya* (Baker) Mez in DC. Monogr. Phan. 9:496. 1896.

FIGURE 7

*Pitcairnia brachystachya* Baker, Handb. Bromel. 118. 1889.

Rhizome erect, bulbous-thickened; leaves 20–30, rosulate, 15–20 cm. long, the sheaths suborbicular, 2 cm. long, serrulate, the blades arching, linear, acuminate, carinate, 7–8 mm. broad, glabrous above, very laxly serrulate with pale brown slender spines 1.5 mm. long; scape erect, exceeding the leaves, slender, sparsely white-pilose; scape-bracts imbricate, the lowest subfoliaceous with elliptic sheaths, the upper elliptic, apiculate, entire, membranaceous, striate, dark; inflorescence cylindrical, obtuse, 4–7 cm. long, 30–35 mm. in diameter, few-flowered, sparsely white-pilose; floral bracts like the upper scape-bracts but suborbicular, exceeding the sepals; pedicels stout, 5 mm. long; sepals oblong, apiculate, 17 mm. long, thin; petals about 3 cm. long, naked,

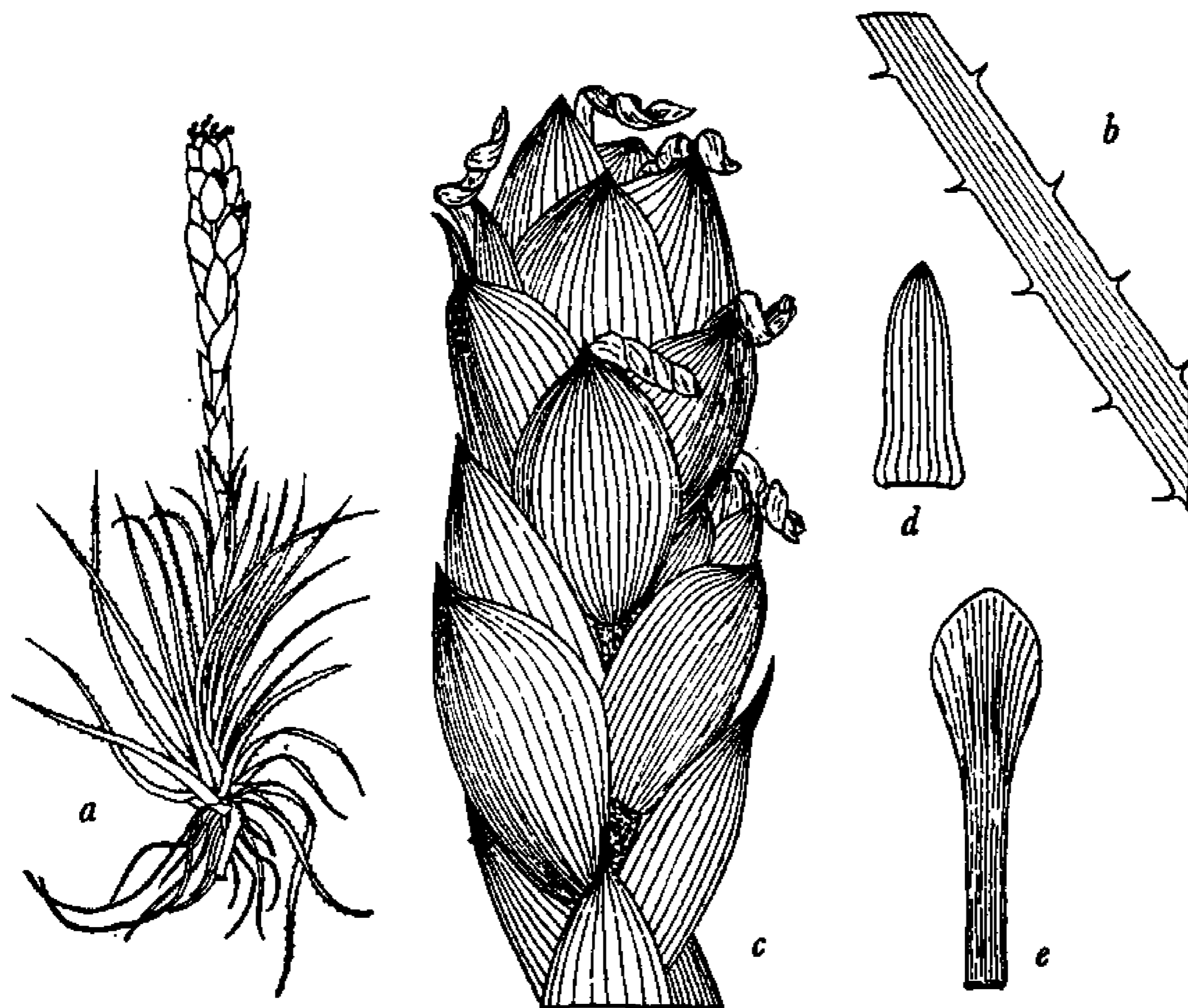


FIGURE 7.—*Puya brachystachya*: *a*, Habit,  $\times \frac{1}{6}$ ; *b*, section of leaf-blade,  $\times 1$ ; *c*, inflorescence,  $\times 1$ ; *d*, sepal,  $\times 1$ ; *e*, petal,  $\times 1$ .

pale; stamens included, anthers 2.5 mm. long; capsule stout, ellipsoid, acute, 12 mm. long.

MAGDALENA: Santa Marta, *Purdie* (K, type, phot. K). Dry open hillsides, above San Sebastian, Sierra Nevada de Santa Marta, alt. 2,850 m., August 1946, *Foster & C. E. Smith, Jr.*, 1458 (GH, US).

17. *Puya cryptantha* Cuatrecasas, Rev. Acad. Colombiana Cienc. Fisico-Quimic. y Nat. 4:161, pl. 2. 1941.

Flowering shoot 7 dm. high; leaves 2–3 dm. long, sheaths sub-orbicular, 4 cm. in diameter, pale except for the dark brown apex, blades linear, acuminate, 16–20 mm. wide, glabrous above, laxly serrate with flat dark straight or uncinatate spines 2–4 mm. long; scape erect, ferruginous-lanate; scape-bracts very densely imbricate, the lowest subfoliaceous but with narrower darker sheaths, the upper ovate, acuminate, sparsely serrate, striate, dark brown, ferruginous-lanate, becoming glabrous; inflorescence short-cylindric, obtuse; primary bracts like the upper scape-bracts but obscurely denticulate, exceeding the flowers; branches reduced to pulvini bearing 2 fertile flowers and several rudiments or rarely a single flower; floral bracts elliptic, acuminate, 20 mm. long, 12 mm. wide, densely lanate; flowers sessile; sepals oblong, densely lanate; petals obtuse, 26–28 mm. long, pale greenish blue; stamens and style included.

CUNDINAMARCA: Páramo de Zipaquirá, between Zipaquirá and Pacho, alt. 3,100–3,200 m., June 16, 1940, *Cuatrecasas* 9568 (COL, type; F, US).

18. *Puya santanderensis* Cuatrecasas, Rev. Acad. Colombiana Cienc. Exact. Fisico-Quimic. y Nat. 4:162. 1941.

Leaves densely rosulate, 25–30 cm. long, sheaths reniform, 3.5 cm. long, 4–6 cm. broad, blades narrowly triangular, acuminate, pungent, 15–17 mm. wide, laxly serrate with dark uncinatate spines 2–3 mm. long, smooth and glabrous above; scape 7–10 mm. in diameter, densely pale-tomentose; scape-bracts densely imbricate, the lower subfoliaceous but with narrower sheaths, the upper elliptic-ovate with an acuminate apex, sparsely serrulate; inflorescence 6–8 cm. long; floral bracts ovate, acuminate, 4–8 cm. long, 2–3 cm. wide, exceeding the flowers, densely stellate-lanate, becoming glabrous except near apex; pedicels 7 mm. long, stout; sepals elliptic-oblong, 6–7 mm. wide, densely lanate; petals elliptic-oblong, obtuse, 30–35 mm. long, 7–8 mm. wide, white tinged with yellow-green.

SANTANDER: Turfy field, Chorreón de Comagüeta, alt. 3,500 m., July 20, 1940, *Cuatrecasas & García-Barriga* 10035 (COL, type; F; GH, US phot. 4049; US).

19. *Puya gargantae* L. B. Smith, Phytologia 5:180, pl. 2, figs. 8–10. 1955.

FIGURE 8

Stemless, 8 dm. high; leaves numerous, 20 cm. long, sheaths sub-orbicular, 3 cm. in diameter, entire, white, glabrous, blades linear,

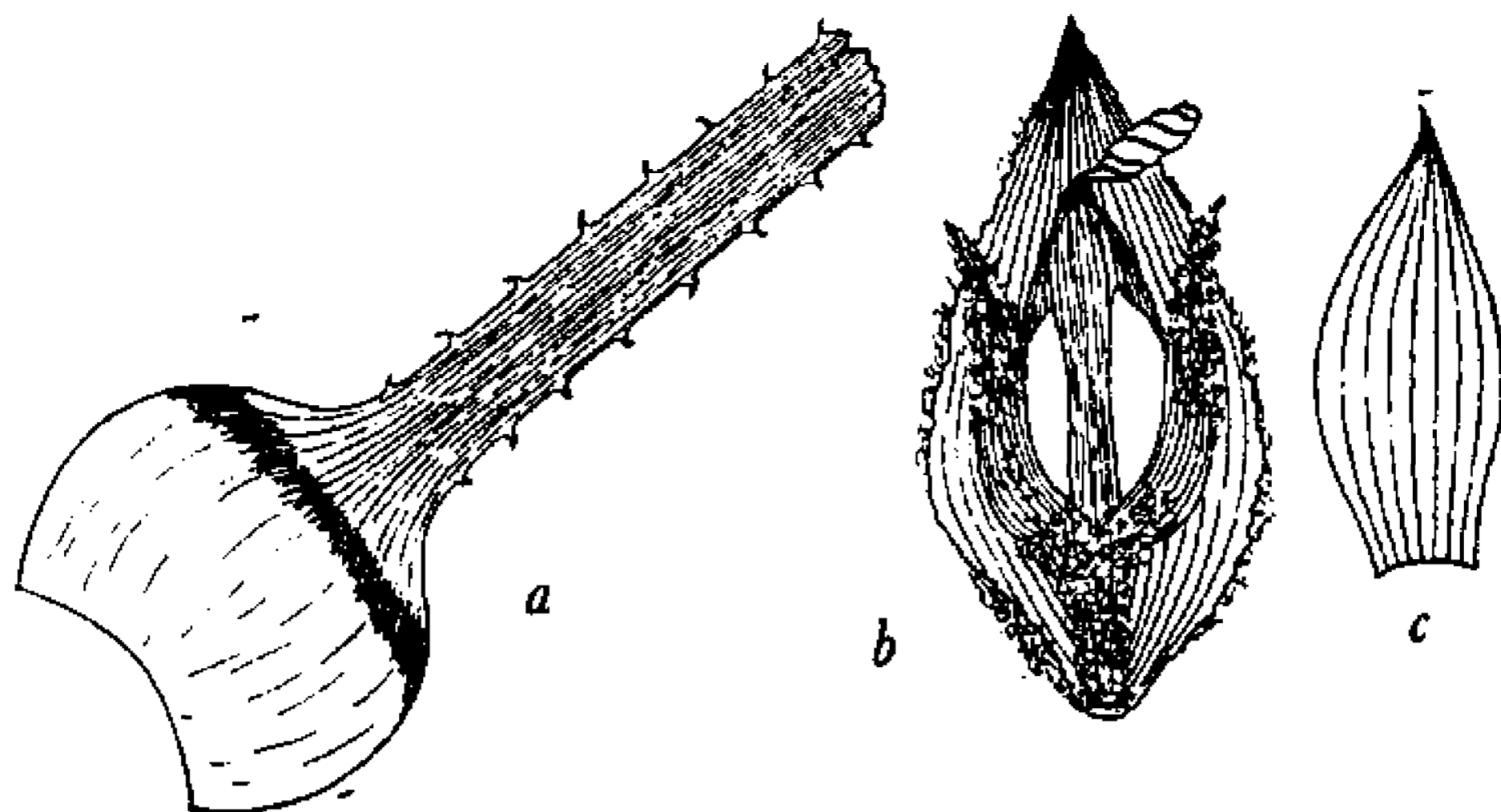


FIGURE 8.—*Puya gargantae*: *a*, Base of leaf,  $\times \frac{1}{2}$ ; *b*, ventral side of flower and floral bract,  $\times 1$ ; *c*, sepal,  $\times 1$ .

acuminate, 15 mm. wide, glabrous above, bearing coarse spreading scales on the margin, very laxly serrate with dark spreading straight or uncinatate spines 2.5 mm. long; scape erect, stout; scape-bracts strict, densely imbricate, elliptic, brown and subchartaceous when dry, pale-lanate becoming glabrous, all but the highest with foliaceous blades; inflorescence 25 cm. long, about 4 cm. in diameter in fruit, pale-lanate; floral bracts densely imbricate, ovate, 6 cm. long, much exceeding the sepals, entire, membranaceous, brown with finely crisped margins when dry; pedicels subcylindric, slender, 8 mm. long; sepals elliptic, 27 mm. long, membranaceous; petals twisted together after anthesis; capsule subglobose, 15 mm. long.

NORTE DE SANTANDER: On páramo, between La Laguna and Nariz de Judío, Mutiscua, June 19, 1946, *Garganta* 1197 (US, type, US phot. 4471, 4472; F).

20. *Puya trianae* Baker, Bromel. 124. 1889.

Leaves 25 cm. long, the sheaths suborbicular, pale and entire or the extreme apex dark brown and serrulate, the blades narrowly triangular, acuminate, pungent, 25 mm. wide, covered with appressed cinereous scales, soon glabrous beneath, laxly serrate with slender dark spines 4 mm. long; scape stout, ferruginous-lanate; scape-bracts numerous, densely imbricate, the lower foliaceous, the upper broadly elliptic with a short foliaceous blade, dark brown, membranaceous; inflorescence strobilate, obtuse, 15–30 cm. long, 6–7 cm. in diameter, floral bracts like the upper scape-bracts but with soft entire blades, exceeding the sepals and often the petals also but almost wholly reflexed; pedicels very short; sepals elliptic, acute or acuminate, 20–25 mm. long, thin, dark brown; petals pale green.

CUNDINAMARCA: Páramo de Cruz Verde,<sup>20</sup> *Triana* "1314" (BM, type phot. GH; COL; F). Páramo de Cruz Verde, alt. 3,400–3,500 m., Sept. 15, 1940, *Cuatrecasas*

<sup>20</sup> The Triana citation reads also: "Andes of Pasto," but according to R. E. Schultes this phrase then applied to all Colombia and not to just the department of Nariño.

10474 (F, US). Occasional, brushy slopes and ridges above timberline, Páramo de Guasca, 8 km. east of Guasca, lat. 4° 51–53' N., long. 73° 48' W., alt. 3,500–3,600 m., Mar. 19, 1944, *Fosberg* 21685 (US).

21. *Puya nivalis* Baker, *Bromel.* 124. 1889.

Leaves 3–6 dm. long, the sheaths suborbicular, dark brown, serrulate, the blades linear, acuminate, 23 mm. wide, smooth and glabrous above, the lower  $\frac{3}{4}$  laxly serrate with dark uncinatate spines 6 mm. long; scape erect 3 cm. in diameter, brown-lanate, becoming glabrous; scape-bracts numerous, much longer than the internodes, reflexed, the lower ones foliaceous but with narrower sheaths and smaller blades, the upper elliptic with caudate apices, dark brown, membranaceous throughout, entire; inflorescence densely many-flowered, 5–6 cm. in diameter, floral bracts like the upper scape-bracts, much exceeding the flowers but soon reflexed; flowers erect; pedicels 5–10 mm. long; sepals lance-elliptic, apiculate, 18–20 mm. long, striate, subcoriaceous; petals about 4 cm. long, obtuse, pale.

MAGDALENA: Sierra Nevada de Santa Marta, June 1844, *Purdie* (K, type, phot. K). Páramos of the Sierra Nevada de Santa Marta, alt. 4,875 m., July 1932, *Seifríz* 515-d (PENN, only a single leaf but characteristic). Siminchicua, Sierra Nevada de Santa Marta, Aug. 19, 1946, *Foster & C. E. Smith, Jr.*, 1462 (GH, US).

22. *Puya boyacana* Cuatrecasas, *Rev. Acad. Colombiana Cienc. Exact. Fisico-Quimic. y Nat.* 4:162. 1941.

Flowering plant 1 meter high; leaves rosulate, 40–45 cm. long, the sheaths distinct, 40 mm. long, 40–45 mm. wide, the blades linear, acuminate, pungent, 30 mm. wide, glaucous-green, serrate with uncinatate spines 2–3 mm. long, lepidote between the nerves beneath; scape 1 cm. in diameter, tomentulose; scape-bracts densely imbricate, subfoliaceous; inflorescence strobiliform, 10 cm. long; primary bracts broadly ovate or elliptic-ovate, acuminate, exceeding the flowers, entire or minutely denticulate, tomentose at first, becoming glabrous; branches reduced to pulvini bearing fascicles of 2 fertile flowers and several sterile rudiments; floral bracts ovate, acuminate, 20–25 mm. long, 12–15 mm. wide, stellate-tomentose near the apex; flowers subsessile; sepals elliptic, obtuse, tomentose at first; petals oblong, obtuse, 35 mm. long, greenish blue; stamens and style included.

BOYACÁ: Páramo de Guantiva, between Alto de Canutos and Campohermoso, alt. 3,300–3,400 m., July 17, 1940, *Cuatrecasas & García-Barriga* 9756 (COL, type; F; GH, US phot. 4045; US).

23. *Puya cuatrecasasii* L. B. Smith, *Phytologia* 5:33, *pl.* 1, *figs.* 5–9. 1954.

FIGURE 9

Rhizome epigaeous, much branched; flowering shoot 1 meter high; leaves 26 cm. long, sheaths suborbicular, serrulate toward the apex, blades narrowly triangular, straight, flat, acuminate, pungent, above even, glabrous, and lustrous, coarsely cinereous-lepidote along the

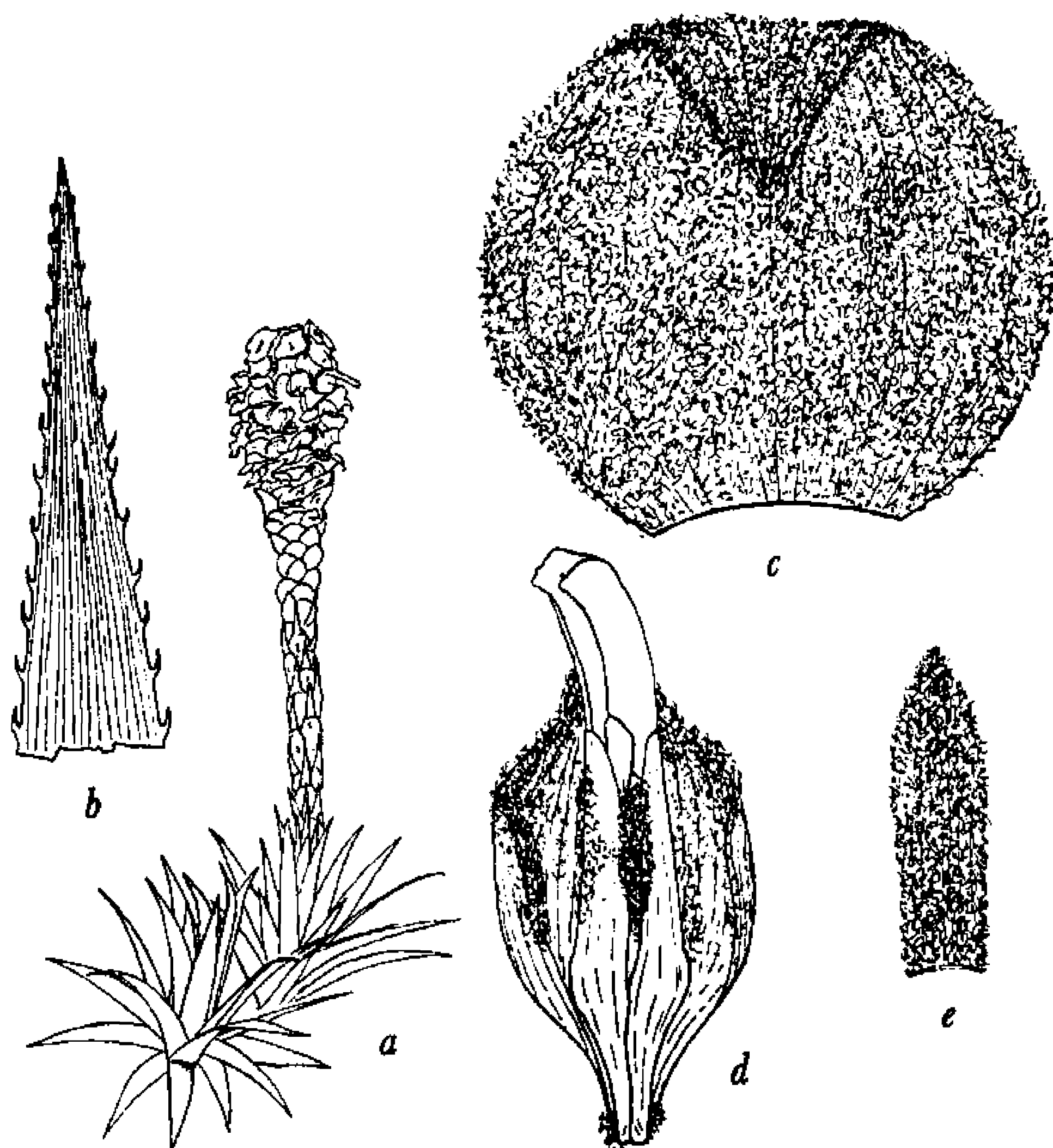


FIGURE 9.—*Puya cuatrecasasii*: *a*, Habit from photograph; *b*, apex of leaf,  $\times 1$ ; *c*, primary bract,  $\times 1$ ; *d*, floral bract and flower,  $\times 1$ ; *e*, sepal,  $\times 1$ .

margins, laxly serrate with ascending nearly straight dark slender spines 6 mm. long; scape erect, about 13 mm. in diameter; scape-bracts strict, densely imbricate, the lower foliaceous but narrow, the upper with suborbicular entire membranaceous nearly black sheaths and short serrulate blades; inflorescence clavate-strobiliform, 9 cm. in diameter, coarsely ferruginous-lanate; primary bracts like the upper scape-bracts but with nearly or quite entire apices, spreading at anthesis and revealing the flowers, the extreme apex more or less reflexed; branches reduced to few-flowered pulvini; floral bracts suborbicular, exceeding the sepals, entire, membranaceous, dark; pedicels very short and stout; sepals acute; petals 5 cm. long, obtuse.

TOLIMA: Above "Auxilio," headwaters of Río Erije, alt. 3,400 m., Nov. 21, 1944, *Core* (F, US).

CAUCA: Río Vinagre, Puracé, alt. 3,800 m., September 1936, *Dryander* 1850 (US). Páramo, Alto de Las Casitas, sources of the Río Palo, western slope of the Cordillera Central, alt. 3,800 m., Dec. 3, 1944, *Cuatrecasas* 18962 (F, type, US phot. 3678).

24. *Puya occidentalis* L. B. Smith, *Phytologia* 5:34, *pl. 2, figs. 1-3.* 1954.

Flowering shoot 6-8 dm. high; leaves densely rosulate, 35-50 cm. long, sheaths suborbicular, 5 cm. long, blades narrowly triangular, acuminate, pungent, 25 mm. wide, glabrous and lustrous above, minutely cinereous-lepidote between the nerves beneath, laxly serrate with dark spreading spines 5 mm. long; scape 15 mm. in diameter, soon glabrous; scape-bracts broadly ovate with foliaceous blades, membranaceous, nearly black when dry, fragile and soon disintegrating; inflorescence strobiliform, densely and finely white-lanate; primary bracts broadly ovate with a triangular apex, 10 cm. long, entire, nearly black; branches aborted, one-several-flowered; floral bracts broadly ovate, acute, exceeding the sepals; pedicels short and stout; sepals acute, 13 mm. wide.

VALLE: On páramos, Los Farallones, crest of the Cordillera Occidental, northern end of range of Alto del Buey, alt. 3,500-3,600 m., Oct. 11, 1944, *Cuatrecasas* 17919 (F). Los Farallones, crest of the Cordillera Occidental, between La Torre and Alto del Buey, alt. 3,400-3,550 m., August 1946, *Cuatrecasas* 21905 (US, type; F, US phot. 3661).

25. *Puya clava-herculis* Mez & Sodiro, *Bull. Herb. Boiss.* II. 4:863. 1904.

Stem 4 cm. in diameter; leaves 3-4 dm. long, sheaths short, more or less ovate, blades narrowly triangular, pungent, 25 mm. wide, glabrous above, densely white-lepidote between the nerves beneath, laxly serrate with stout mostly antrorse dark brown spines 6-9 mm. long; scape erect, very stout; scape-bracts densely imbricate, densely lanate, the lower with reflexed foliaceous blades; inflorescence bipinnate, very densely ellipsoid or subcylindric, 17 cm. long, 10 cm. in diameter, densely lanate; primary bracts lanceolate, acuminate, entire, their apices exceeding the branches and exerted from the wool of the inflorescence; branches short with 2-4 subfasciculate flowers; floral bracts like the primary bracts but smaller, exceeding the sepals; pedicels short and stout but distinct; sepals acute, 25-27 mm. long, coriaceous; petals blue-green.

NARIÑO: Open páramo slopes but especially in wind-protected ravines of the paramillo, occasional, northwest slope of Volcán de Chiles, alt. 3,350 m., Sept. 1, 1944, *Ewan* 16020 (COL, US).

ECUADOR.

26. *Puya hamata* L. B. Smith, *Contr. U. S. Nat. Herb.* 29:315, *fig. 55.* 1949.

FIGURE 10

Leaves 7-15 dm. long, the sheaths ample, serrulate toward apex, the blades linear, acuminate, pungent, 2-3 cm. wide, flat, glabrous above, beneath minutely pale-lepidote between the nerves, laxly serrate with large hooked teeth; scape erect, very stout; inflorescence cylindrical, very densely bipinnate, densely lanate; primary bracts acuminate from an ovate base, exceeding the axillary branches at

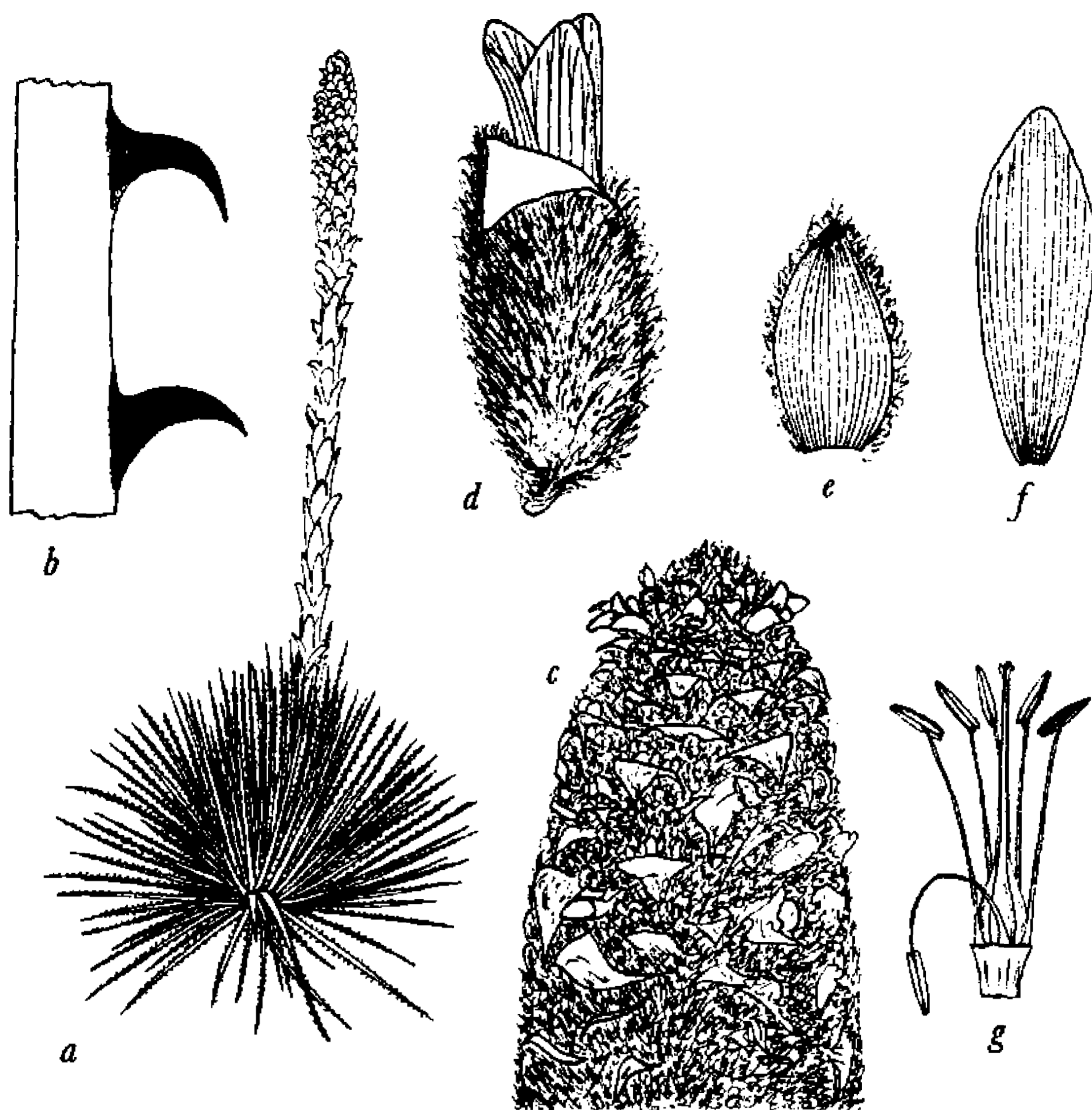


FIGURE 10.—*Puya hamata*: *a*, Habit,  $\times \frac{1}{40}$ ; *b*, section of leaf-blade,  $\times 1$ ; *c*, apex of inflorescence,  $\times \frac{1}{4}$ ; *d*, floral bract and flower,  $\times 1$ ; *e*, sepal,  $\times 1$ ; *f*, petal,  $\times 1$ ; *g*, stamens and pistil,  $\times 1$ .

anthesis, entire; racemes subglabrous, subsessile; floral bracts elliptic, acute, entire, about equaling the sepals, chartaceous when dry; pedicels stout, about 1 cm. long, sepals to 23 mm. long, ecarinate, coriaceous; petals obtuse, 4 cm. long, dark blue.

VALLE: Páramo de Bavaya, Corrales, Valley of the Río Bugalagrande, Barragán, western slope of the Cordillera Central, alt. 3,400–3,550 m., Apr. 10, 1946, Cuatrecasas 20578 (F, GH, US).

CAUCA: San Rafael, Páramo del Puracé, crest of the Cordillera Central, alt. 3,400 m., July 25, 1943, Cuatrecasas 14814 (F; US, determination uncertain, inflorescence not seen). Páramo de Puracé, Cordillera Central, alt. 3,500 m., May 26, 1944, Killip & Lehmann 38587 (US, immature and thus still unusually small in all parts).

ECUADOR.

## 2. *Pitcairnia*

*Pitcairnia* L'Hérit. Sert. Angl. 7. 1788, nomen conservandum.

*Hepetis* Sw. Prodr. 4, 56. 1788.

*Conanthes* Raf. Fl. Tell. 4:24. 1838.



- Neumannia* Brongn. Ann. Sci. Nat. II. 15:369. 1841.  
*Spirastigma* L'Hérit. ex Schult. in R. & S. Syst. 7, pt. 2: p. lxx. 1830.  
*Lamproconus* Lem. Jard. Fleur. 2:pl. 127. 1852.  
*Cochliopetalum* Beer, Flora 37:347. 1854.  
*Phlomostachys* Beer, Bromel. 16, 45. 1857.  
*Orthopetalum* Beer, Bromel. 17, 70. 1857.  
*Pepinia* Brongn. ex André, Ill. Hortie. 17:32, pl. 1870.  
*Melinonia* Brongn. ex E. Morr. Cat. Bromél. Liège 10. 1873.  
*Willrussellia* Aug. Chevalier, Bull. Soc. Bot. France for 1937, 84:503. 1938.

Plants mostly terrestrial, rarely epiphytic, mostly stemless, but a few species definitely caulescent; leaves fasciculate or imbricate and many-ranked along a stem, entire or spinose-serrate, the sheath usually small, often bulbous-thickened, the blades linear to broadly elliptic with a definite petiole or narrowly triangular, sometimes dimorphic with some blades reduced to horny spinose-serrate spines, deciduous in some species; inflorescence simple or compound; flowers perfect, pedicellate to sessile; sepals free, acute or obtuse; petals free, slightly zygomorphic in most species, naked or appendaged on the inside near the base; stamens from slightly exerted to shorter than the petals, the anthers linear; ovary usually superior for most of its length; style filiform, about equaling the petals; ovules many, usually caudate; fruit mostly a septicidal capsule; seeds caudate at both ends or rarely with an annular wing.

Mexico and the West Indies to northern Argentina. One species in Africa.

The species of *Pitcairnia* are grouped in the text under some of the subgenera and sections used by Mez in the Pflanzenreich, but both the order of taxa and the emphasis on characters has been changed to effect what is considered a more natural sequence. Thus the primary division is upon the character of the seed-appendage, a character that is considered fully generic everywhere else in the family. The character of indehiscent fruit is advanced and should end the genus instead of beginning it as in Mez's monographs. The size of the bracts is of minor importance and the former subgenera *Phlomostachys* and *Neumannia* must be regarded as convenient but highly artificial groupings.

The subgenera and sections of *Pitcairnia* represented in Colombia are separated by the following key:

#### KEY

1. Seeds caudate-appendaged at the base and apex.

#### Subgenus 1. *Pitcairnia*

2. Floral bracts not imbricate at anthesis (imbricate in *P. kniphoioides* but small and quickly deciduous), relatively inconspicuous; inflorescence compound or simple. Section 1. PITCAIRNIA  
(*Normales*)

2. Floral bracts imbricate, showy; inflorescence simple.
3. Pedicels distinct, slenderer than the ovary.

Section 2. *PHLOMOSTACHYS*

3. Pedicels nearly as stout as the ovary or lacking.

Section 3. *NEUMANNIA*

1. Seeds with a circumferential wing.
  4. Fruit dehiscent . . . . . *Subgenus 2. Schweideleria*
  4. Fruit indehiscent . . . . . *Subgenus 3. Pepinia*  
(*Melinonia*)

Since there is doubt about the systematic position of many of the Colombian species of *Pitcairnia* their sequence in the text is tentative and their identification is more accurately effected by the following artificial key:

## KEY

1. Floral bracts not imbricate at anthesis or else quickly deciduous, relatively inconspicuous.
  2. Inflorescence compound . . . . . *Subkey I*
  2. Inflorescence simple . . . . . *Subkey II*
1. Floral bracts imbricate at anthesis, showy; inflorescence simple.
  - Subkey III*

## SUBKEY I

1. Sepals acute or acuminate.
  2. The sepals echinate at least at base.
    3. Leaves spinose-serrate along the petiole; sepals 35–45 mm. long, echinate throughout . . . . . *1. P. echinata*
    3. Leaves entire; sepals 22 mm. long, echinate at base only.
      - 2. P. exserta*
  2. The sepals even, nerved or verruculose, but not at all echinate.
    4. Pedicels 20–70 mm. long; sepals 38–50 mm. long.
      5. Sepals 38 mm. long; pedicels biangulate, 20 mm. long, exceeding the persistent floral bracts . . . . . *3. P. chocoensis*
      5. Sepals 50 mm. long; pedicels terete.
        6. Pedicels 20 mm. long; flowers spreading or recurved.
          - 59. P. haughtii*
        6. Pedicels 50–70 mm. long; flowers erect or incurved and making a sharp angle with the pedicels.
          - 4. P. spectabilis*
      4. Pedicels not more than 15 mm. long.
        7. Ovules and seeds alate; leaves homomorphic, serrate at least toward base.
          8. Pedicels slender, terete, 2–3 times as long as the floral bracts . . . . . *60. P. patentiflora*

8. Pedicels stout, strongly costate, slightly if at all exceeding the floral bracts . . . . . **61. *P. bulbosa***
7. Ovules and seeds caudate or apiculate.
9. Sepals not more than 25 mm. long.
10. Inflorescence amply 4-pinnate; leaf-blades petiolate, 8 cm. wide, entire . . . . . **5. *P. diffusa***
10. Inflorescence not more than bipinnate.
11. Pedicels alate, with wings extending onto the base of the sepals, obconic . . . . . **6. *P. tolimensis***
11. Pedicels terete, slenderly cylindrical.
12. Floral bracts persistent, narrowly lanceolate, acuminate; leaves fasciculate, the largest blades linear-lanceolate, 15-25 mm. wide.  
**7. *P. schultzei***
12. Floral bracts deciduous at anthesis, broadly elliptic; leaves distributed along the stem, the largest blades broadly lanceolate, 40-80 mm. wide . . . . . **8. *P. kniphofioides***
9. Sepals 30-40 mm. long.
13. Racemes dense; floral bracts narrowly lanceolate, much exceeding the pedicels . . . . . **9. *P. megasepala***
13. Racemes lax; floral bracts broad, shorter than or rarely equaling the pedicels.
14. Leaf-blades trimorphic, the largest deciduous, entire.  
**10. *P. trimorpha***
14. Leaf-blades apparently homomorphic, persistent, serrulate especially toward the base.  
**11. *P. poortmanii***
1. Sepals obtuse or rounded and apiculate.
15. Racemes no longer than their peduncles.
16. Leaves entire; racemes strobiliform . . . . . **12. *P. dendroidea***
16. Leaves spinose-serrate especially at base of blade or apex of sheath; racemes laxer.
17. Pedicels 15 mm. long . . . . . **13. *P. commixta***
17. Pedicels not over 7 mm. long . . . . . **14. *P. lehmannii***
15. Racemes much longer than their peduncles.
18. Leaves entire; sepals oblong, rounded and apiculate, 33 mm. long . . . . . **15. *P. killipiana***
18. Leaves more or less serrate; sepals 20-22 mm. long.
19. Scape-bracts and primary bracts entire . **16. *P. arenicola***
19. Scape-bracts and lower primary bracts pectinate-serrate.  
**62. *P. heliophila***

## SUBKEY II

1. Leaf-blades more or less narrowed toward the base but not actually petiolate.
    2. The leaf-blades, or least at the broader ones, deciduous along a straight transverse line.
      3. Inflorescence sessile or subsessile . . . . . **17. *P. heterophylla***
      3. Inflorescence raised on a conspicuous scape.
        4. Sepals alate-carinate . . . . . **9. *P. megasepala***
        4. Sepals not alate.
          5. Upper scape-bracts equaling or exceeding the internodes.
            6. Pedicels obconic, alate . . . . . **6. *P. tolimensis***
            6. Pedicels slenderly cylindric, terete.
              7. Leaves all alike; plant long-caulescent, branching.
 

**18. *P. lignosa***
              7. Leaves dimorphic; plant stemless. . . . . **19. *P. pungens***
        5. Upper scape-bracts shorter than the internodes; leaf-blades glabrous or subglabrous.
          8. Floral bracts very narrowly triangular, much exceeding the pedicels; leaf-blades 5–12 mm. wide.
 

**20. *P. stenophylla***
          8. Floral bracts elliptic, all but the lowest distinctly shorter than the pedicels; leaf-blades 20 mm. wide.
 

**10. *P. trimorpha***
2. Leaf-blades all persistent.
  9. Sepals over 40 mm. long; ovules and seeds alate.
    10. Lower part of ovary costate; petals glabrous.
 

**63. *P. costata***
    10. Lower part of ovary even; petals white-lepidote.
 

**64. *P. lepidopetalon***
  9. Sepals 8–40 mm. long.
    11. Ovary more than half inferior; ovules and seeds alate.
      12. Fruit dehiscent; inflorescence 30–70 cm. long.
 

**65. *P. turbinella***
      12. Fruit indehiscent; inflorescence 10–15 cm. long
        13. Inflorescence lax; ovary straight . . . . . **72. *P. caricifolia***
        13. Inflorescence dense; ovary geniculate.
 

**73. *P. quesnelioides***
    11. Ovary one-half superior or more.
      14. Inflorescence dense at least toward the apex; sepals obtuse or rounded and apiculate.
        15. Pedicels 9 mm. long; sepals 15 mm. long, green.
 

**21. *P. petraea***

15. Pedicels 15 mm. long.
16. Sepals 20–25 mm. long; floral bracts exceeding the pedicels . . . . . **22. *P. macrobotrys***
16. Sepals 8 mm. long; floral bracts mostly shorter than the pedicels . . . . . **23. *P. trianae***
14. Inflorescence lax throughout.
17. Scape-bracts much exceeding the internodes; sepals 23 mm. long; petals yellow and orange.  
**66. *P. andreana***
17. Scape-bracts shorter than the upper internodes.
18. Leaf-blades homomorphic, 10 mm. wide; sepals 30 mm. long; petals white . . . . . **24. *P. johannis***
18. Leaf-blades trimorphic, the largest 15–25 mm. wide; sepals 13–17 mm. long; petals red.  
**7. *P. schultzei***
1. Leaf-blades distinctly petiolate.
19. Pedicels 25–70 mm. long.
20. Sepals and lower part of ovary verrucose . **25. *P. verrucosa***
20. Sepals and lower part of ovary even or nerved.
21. The sepals obtuse, narrowly oblong; leaf-blades densely white-lepidote beneath . . . . . **26. *P. tumulicola***
21. The sepals acute or acuminate.
22. Sepals glabrous; floral bracts minute.
23. Leaf-blades 30 mm. wide; pedicels 50 mm. long.  
**27. *P. longipes***
23. Leaf-blades 65–90 mm. wide; pedicels 70 mm. long.  
**4. *P. spectabilis***
22. Sepals densely ferruginous-tomentose.
24. Leaf-blades 25 mm. wide, linear-lanceolate; pedicels 60 mm. long; floral bracts unknown.  
**28. *P. laxissima***
24. Leaf-blades 140 mm. wide, oblanceolate; pedicels 35 mm. long, shorter than the floral bracts.  
**29. *P. calophylla***
19. Pedicels not more than 35 mm. long.
25. Leaves entire (sometimes obscurely serrulate at apex in *P. rubiginosa*).
26. Sepals 50 mm. long; ovules obtuse . . . . . **59. *P. haughtii***
26. Sepals 15–30 mm. long.
27. Leaf-blades 14 cm. wide, broadly oblanceolate; flowers spreading to reflexed, many-ranked, dense.  
**30. *P. multiflora***

27. Leaf-blades 2–6 cm. wide.
28. Pedicels 12–35 mm. long.
29. Leaf-blades elliptic, nearly 6 cm. wide; ovary about half superior; pedicels 15–25 mm. long.
- 31. *P. bella***
29. Leaf-blades linear-lanceolate, 2–3.5 cm. wide; ovary  $\frac{1}{4}$  inferior.
30. Sepals broadly obtuse; pedicels spreading, much exceeding the floral bracts . **74. *P. alborubra***
30. Sepals acute; pedicels ascending, shorter than the floral bracts . . . . . **75. *P. rubiginosa***
28. Pedicels 4–10 mm. long, shorter than the floral bracts.
31. Scape-bracts shorter than the upper internodes.
32. Inflorescence lax; flowers secund; sepals ecarinate.
- 32. *P. occidentalis***
32. Inflorescence dense; flowers not secund; sepals somewhat carinate toward base.
- 33. *P. brachysperma***
31. Scape-bracts all imbricate.
33. Posterior and anterior sepals ecarinate, 20 mm. long . . . . . **34. *P. guaritermae***
33. Posterior sepals strongly carinate, 28 mm. long.
- 35. *P. macarenensis***
25. Leaves spinose-serrate on the petioles.
34. Sepals densely papillose at base; leaf-blades obovate, nearly 20 cm. wide and only 40 cm. long . . **36. *P. sylvestris***
34. Sepals even or nerved.
35. Scape-bracts spinose-serrate or serrulate.
36. Sepals 12–15 mm. long; floral bracts ovate, ample, densely imbricate before anthesis, deciduous afterward . . . . . **8. *P. kniphofioides***
36. Sepals 18–68 mm. long; floral bracts generally narrow and persistent.
37. Upper scape-bracts only about half as long as the internodes.
38. Floral bracts about equaling the pedicels, entire.
- 37. *P. kalbreyeri***
38. Floral bracts much exceeding the pedicels, the lower ones pectinate-serrate . **67. *P. pectinata***
37. Upper scape-bracts usually exceeding the internodes, rarely a little shorter.
39. Sepals 57–68 mm. long; floral bracts nearly equaling the sepals, the lower ones serrate.
- 38. *P. dolichopetala***

39. Sepals not more than 33 mm. long, much exceeding the floral bracts.
40. Ovary little more than half superior; leaves 3–9 cm. wide . . . . . **68. *P. sprucei***
40. Ovary  $\frac{1}{2}$  superior; leaves not more than 1.5 cm. wide . . . . . **76. *P. uaupensis***
35. Scape-bracts entire.
41. Flowers strongly secund.
42. Scape and inflorescence erect; sepals broadly acute and apiculate, 10 mm. long; leaf-blades 4 cm. wide. **39. *P. semaphora***
42. Scape decurved; inflorescence finally prostrate on the ground; sepals acute; leaf-blades 3–10 cm. wide. **69. *P. corallina***
41. Flowers not secund.
43. Sepals 34 mm. long.
44. Floral bracts broadly elliptic, apiculate, 15–20 mm. long; sepals very narrowly triangular; pedicels 4 mm. long . . . **40. *P. adscendens***
44. Floral bracts lanceolate, acuminate, to 50 mm. long; sepals oblong, broadly acute; pedicels 20 mm. long . . . . . **70. *P. cuatrecasana***
43. Sepals 12–25 mm. long.
45. Floral bracts exceeding the 11 mm. long pedicels; plant acaulescent, aggregated . **41. *P. similis***
45. Floral bracts shorter than the 20 mm. long pedicels; plant long-caulescent . . **42. *P. volubilis***

### SUBKEY III

1. Sepals not over 14 mm. long; inflorescence capitate or nearly so.
2. Floral bracts concolorous, straight; seeds long-caudate. **43. *P. capitata***
2. Floral bracts bicolorous, the upper part strongly reflexed; ovules obtuse . . . . . **71. *P. guzmanioides***
1. Sepals 23–75 mm. long; inflorescence mostly elongate.
3. Leaves entire; inflorescence becoming lax at base; pedicels slender, conspicuous . . . . . **44. *P. maidifolia***
3. Leaves serrate along the petiole or the narrowed base of the blade.
4. Sepals exceeding the floral bracts.
5. Floral bracts and sepals obtuse . . . . . **50. *P. archeri***

5. Floral bracts and sepals acute or acuminate.  
 6. Sepals uncinata, acuminate, 60 mm. long.  
**45. *P. macranthera***
6. Sepals straight, acute, 35–37 mm. long . **51. *P. maritima***
4. Sepals not exceeding the floral bracts.  
 7. The sepals 75 mm. long; inflorescence pendent.  
**52. *P. elongata***
7. The sepals not over 50 mm. long.  
 8. Floral bracts strict.  
 9. Pedicels slender; leaf-blades dimorphic.  
**46. *P. fosteriana***
9. Pedicels when present nearly as thick as the ovary, short.  
 10. Sepals acuminate . . . . . **53. *P. arcuata***  
 10. Sepals broadly acute to retuse.  
 11. Floral bracts corrugated, soon disintegrating to a fine mesh of fibers . . . . . **54. *P. bakeri***  
 11. Floral bracts even . . . . . **55. *P. oblanceolata***
8. Floral bracts soon spreading at least toward apex.  
 12. The floral bracts serrate, 10 cm. long.  
**47. *P. brunnescens***
12. The floral bracts entire.  
 13. Flowers soon spreading; floral bracts triangular, acuminate . . . . . **48. *P. brongniartiana***
13. Flowers erect.  
 14. Leaf-blade not more than three times as long as broad; sepals subtriangular, acuminate.  
**56. *P. nigra***
14. Leaf-blade much more than three times as long as broad; sepals oblong or narrowly elliptic to linear-lanceolate.  
 15. Petals densely puberulent outside, orange-yellow . . . . . **57. *P. barrigae***
15. Petals glabrous.  
 16. Sepals oblong, truncate and apiculate, 25 mm. long . . . . . **58. *P. atrorubens***  
 16. Sepals linear-lanceolate, acute, 32–39 mm. long . . . . . **49. *P. squarrosa***



### Subgenus 1. *Pitcairnia*

*Pitcairnia* subgenus *Pitcairnia*

*Pitcairnia* subgenus *Eupitcairnia* Baker, Journ. Bot. 19:226. 1881.

Seeds caudate-appendaged at the base and apex. Species 1-58.

#### Section 1. *Pitcairnia*

*Pitcairnia* section *Pitcairnia*

*Pitcairnia* section *Normales* Mez in Mart. Fl. Bras. 3, pt. 3:433. 1894.

Inflorescence compound or simple; floral bracts not imbricate at anthesis (imbricate in *P. kniphofioides* but small and quickly deciduous), relatively inconspicuous. Species 1-42.

1. *Pitcairnia echinata* Hook. Bot. Mag. 79:pl. 4709. 1853.

*Hepetis echinata* Mez in DC. Monogr. Phan. 9:973. 1896.

Plant 1 meter or higher; leaves numerous, fasciculate, persistent, densely white-lepidote beneath, dimorphic, the outer greatly reduced, broadly elliptic-ovate, the inner to 14 dm. long, sheaths narrowly triangular-ovate, densely serrate with straight spines 3 mm. long, blades linear-lanceolate, acuminate, narrowed toward base, to 65 mm. wide; scape stout, white-lepidote becoming glabrous; scape-bracts linear, filiform-acuminate, the upper ones longer or shorter than the internodes; inflorescence laxly bipinnate, pyramidal; primary bracts like the scape-bracts, much shorter than the branches; branches spreading-ascending, 13-33 cm. long; floral bracts ovate, acuminate, longer or shorter than the pedicels; pedicels spreading, slender, 1-3 cm. long; sepals narrowly triangular, yellow with a red-orange base; petals linear, to 67 mm. long, naked; ovary  $\frac{3}{4}$  superior; ovules caudate.

1a. *Pitcairnia echinata* var. *echinata*.

Sepals and base of ovary densely and coarsely echinate with processes 1-2 mm. long; petals white.

COLOMBIA: "Mexico," cultivated, *Hort. Kew.* (K, type; GH phot. 2536).

CUNDINAMARCA: Fusagasugá, *Holton* 152 (!Mez). La Mesa, Bogotá, 1851-7, *Triana* (BM). Road to "Rionegro," Zipaquira, alt. 1,500 m., *Huertas & Camargo* 1029 (F). By the Cambao road near the settlement of "La Rioja," alt. 1,300 m., Mar. 20, 1955, *Fernández & Jaramillo-M.* 2870 (COL, US).

TOLIMA: Ibaguè, 1844, *Goudot* (P).

1b. *Pitcairnia echinata* var. *sublaevis* L. B. Smith, *Contr. U. S. Nat. Herb.* 29:304. 1949.

Sepals and base of ovary minutely and sparsely stellate, nearly even.

CUNDINAMARCA: On rocks along river near Pandi, alt. 900 m., Oct. 13, 1946, *Foster* 1889 (GH, type).

1c. *Pitcairnia echinata* var. *vallensis* L. B. Smith, *Phytologia* 4:378. 1953.

Petals rose-orange; stamens exserted.

VALLE: On lomas of the Cuchilla de Santa Barbara, Cartago, alt. 1,000–1,140 m., Nov. 17, 1946, *Cuatrecasas* 22963 (F, type). Río Bugalagrande, alt. 1,300 m., June 1930, *Dryander* 436 (US, petal color not wholly certain).

2. *Pitcairnia exserta* L. B. Smith, *Caldasia* 5:10, *fig.* 1948.

Probably over 1 meter high; leaves 1 meter long, subpetiolate, glabrous above, white-lepidote beneath soon becoming glabrous, blade linear-lanceolate, acuminate, 25 mm. wide; scape unknown; inflorescence laxly tripinnate; primary bracts narrowly triangular, much shorter than the sterile bases of the branches; branches ascending, slender, to 28 cm. long, sparsely white-flocculose, soon glabrous; floral bracts ovate, acute, about half as long as the slender mature pedicels; flowers spreading, perhaps becoming slightly secund; sepals acute and apiculate, petals to 45 mm. long, red, naked; ovary three-fifths superior, echinate and flocculose below; ovules caudate.

CUNDINAMARCA: Near the road between Pacho and Rionegro, alt. 1,000–1,200 m., Feb. 22–26, 1942, *García-Barriga* 10735 (US, type; COL). Sasaima, May 2, 1942, *Ricardo* in hb. *Apolinar-María* 183 (GH).

CAUCA: Drainage of Río Tambito, Cerro de Munchique, western slope of the Cordillera Occidental, alt. 2,000–2,500 m., July 16, 1939, *Pérez-Arbeláez & Cuatrecasas* 6261 (US).

3. *Pitcairnia chocoensis* L. B. Smith *Contr. U. S. Nat. Herb.* 29:302, *fig.* 24. 1949.

Leaves persistent, more than 1 meter long, the blades linear-lanceolate, long-acuminate, 55 mm. wide, glabrous; scape unknown; inflorescence 1 meter high, very laxly bipinnate, the axes slender, glabrous, bright red, racemes ascending, very lax, 45 cm. long, the sterile base 11 cm. long; floral bracts ovate, acute; pedicels slender, sparsely stellate-lepidote; flowers spreading, more or less secund, pale green; sepals narrowly lanceolate, acute, ecarinate, even, glabrous.

CHOCÓ: Terrestrial, Río Nuqui, Jan. 25, 1947, *Haught* 5481 (US, type, US phot. 3530).

4. *Pitcairnia spectabilis* Mez *in* DC. *Monogr. Phan.* 9:421. 1896.

*Hepetis spectabilis* Mez *in* DC. *Monogr. Phan.* 9:974. 1896.

Plant 1.5–1.8 m. high; leaves petiolate, entire, glabrous, blade acuminate, 6 dm. long, 65–90 mm. wide; racemes laxly many-flowered, 20–25 cm. long, glabrous; floral bracts triangular, 4 mm. long; pedicels spreading, slender; flowers erect or incurved and making a sharp angle with the pedicel; sepals narrowly triangular, acuminate, subcarinate at base; petals red or green, naked or appendaged; ovary almost wholly superior; ovules caudate.

NARIÑO: Barbacoas, alt. 330 m., 1851–57, *Triana* 547 (BM, type, GH phot. 6660; US). On large mounds of matted roots, Altaquer, alt. 1,050 m., Nov. 11, 1946, *Foster* 2131 (GH).

5. *Pitcairnia diffusa* L. B. Smith, *Caldasia* 5:8, *fig.* 1948.

Plant very large; stem short; leaves apparently all alike, over 1 meter long, the sheaths narrowly triangular and passing gradually into the petioles, petioles over 2 dm. long, covered with appressed brown scales, blades oblong-lanceolate, long-attenuate at base and apex, flat, very minutely and obscurely brown-lepidote on both sides; scape erect, slender, glabrous; scape-bracts subfoliaceous, large but the upper ones shorter than the internodes; inflorescence diffuse, 2 meters long, glabrous; primary bracts very short; branches very slender, spreading, over 5 dm. long, greenish purple; floral bracts triangular, acuminate; flowers spreading or reflexed; pedicels slender; sepals acuminate, 25 mm. long, ecarinate, nerved, green; petals linear, 5 cm. long, red or blue, ligulate at base; ovary  $\frac{3}{8}$  superior.

VALLE: Epiphytic in woods, La Elsa, Quebrada La Cristalina, right bank of the Río Digua, western slope of the Cordillera Occidental, alt. 1,000–1,150 m., Sept. 30, 1943, *Cuatrecasas* 15242 (GH, type, US phot. 4121, 4122). Anchicayá, alt. 500 m., Aug. 11, 1952, *Køie* 4793 (C).

NARIÑO: Terrestrial, above El Diviso, alt. 705 m., Nov. 13, 1946, *Foster* 2149 (GH). Between Barbacoas, Santander District (Buenavista) and Barbacoas (on the Río Telembi drainage), alt. 200–840 m., Aug. 3–5, 1948, *García-Barriga* 13216 (COL, US).

6. *Pitcairnia tolimensis* L. B. Smith, *Caldasia* [1], No. 4:17, *fig.* 4. 1942.

Plant 8–12 dm. high; leaves numerous, the inner 9 dm. long, sheaths suborbicular, 3 cm. in diameter, entire, dark castaneous, sparsely white-flocculose, blades deciduous along a straight transverse line slightly above the base, bearing subdense straight dark 2 mm. long spines below the line, entire above, linear, filiform-acuminate, not at all petiolate, 18–25 mm. wide, flat, glabrous above, densely white-flocculose beneath; scape erect or ascending, 7–10 mm. thick; scape-bracts strict, much exceeding the internodes, subfoliaceous, entire; inflorescence few-branched or simple, 2–3 dm. long, glanduliform-lepidote; primary bracts lanceolate, acuminate, much shorter than the branches; branches including the terminal one horizontal from a sub-erect base, sterile base naked, short; floral bracts membranaceous, the lowest lanceolate, acuminate, about equaling the sepals, the others broadly ovate, apiculate, much shorter; sepals narrowly triangular, acuminate, 21 mm. long; petals sublinear, acute, 26 mm. long, flavous, each bearing a large obtuse scale at base; ovary  $\frac{3}{4}$  superior; seeds long-caudate.

TOLIMA: Open rocky slope, Honda, alt. 300–400 m., Jan. 3–4, 1918, *Pennell* 3571 (NY). Llanos of Tolima, along the Gualanday, between Ibagué and Giradot, July 22, 1939, *Pérez-Arbeláez & Cuatrecasas* 6504 (COL, type, GH phot. 6995). Near Ibagué, alt. 800 m., Aug. 2, 1952, *Køie* 5158 (C, US).

HUILA: Cliffs, Río Saldaña, alt. 400–450 m., July 22, 1917, *Rusby & Pennell* 215 in part (US).

7. *Pitcairnia schultzei* Harms, Notizblatt 10:212. 1928.

Stemless, 35–50 cm. high; leaves trimorphic, the outer reduced to small broadly ovate sheaths with short linear spinose-serrate blades, the next with longer lanceolate blades that are spinose-serrate only at base, the innermost 25–50 cm. long, entire, blades acuminate, narrowed toward base but not petiolate, thin, glabrous above, white-flocculose beneath; scape erect or ascending, very slender; scape-bracts strict, linear-lanceolate, filiform-acuminate, shorter than the upper internodes; inflorescence simple or few-branched, sparsely white-flocculose; primary bracts like the scape-bracts, much shorter than the branches; racemes lax, short-stipitate; floral bracts from shorter to longer than the pedicels; flowers suberect to spreading; pedicels 4–10 mm. long; sepals lanceolate, acuminate, 13–17 mm. long; petals linear, 4 cm. long, red, naked or appendaged; ovary  $\frac{1}{2}$  superior; ovules apiculate; seeds caudate.

MAGDALENA: Lower hills on the trail from Río Frio to San Andres de la Sierra, alt. 200 m., July 1906, *H. Pittier* 1712 (US). Santa Marta, 1898–1901, *H. H. Smith* 2350 (F, GH, US). On gneiss ledges of Cerro del Mico above Río Frio, Santa Marta, alt. 300 m., Aug. 4, 1927, *A. Schultze* 1014 (B, type; F phot. 11380). On shaded but dry sandstone slope, 12 km. north of Codazzi, Sept. 5, 1938, *Haught* 2317 (GH, US). On rocks, 13 km. from Santa Marta, alt. 210 m., Aug. 11, 1946, *Foster & C. E. Smith, Jr.*, 1435 (GH). On rocks, Pueblo Bello, Sierra Nevada de Santa Marta, alt. 600 m., August 1946, *Foster & C. E. Smith, Jr.*, 1474 (GH, US).

8. *Pitcairnia kniphofioides* L. B. Smith, Proc. Amer. Acad. Sci. 70:153, pl. 1, fig. 18. 1935. FIGURE 11

Caulescent, 3–3.6 meters long, the flowering shoot 75–90 cm. high; leaves dimorphic, some with triangular-ovate dark castaneous brown-lepidote sheaths and subulate coarsely spinose-serrate brown blades,

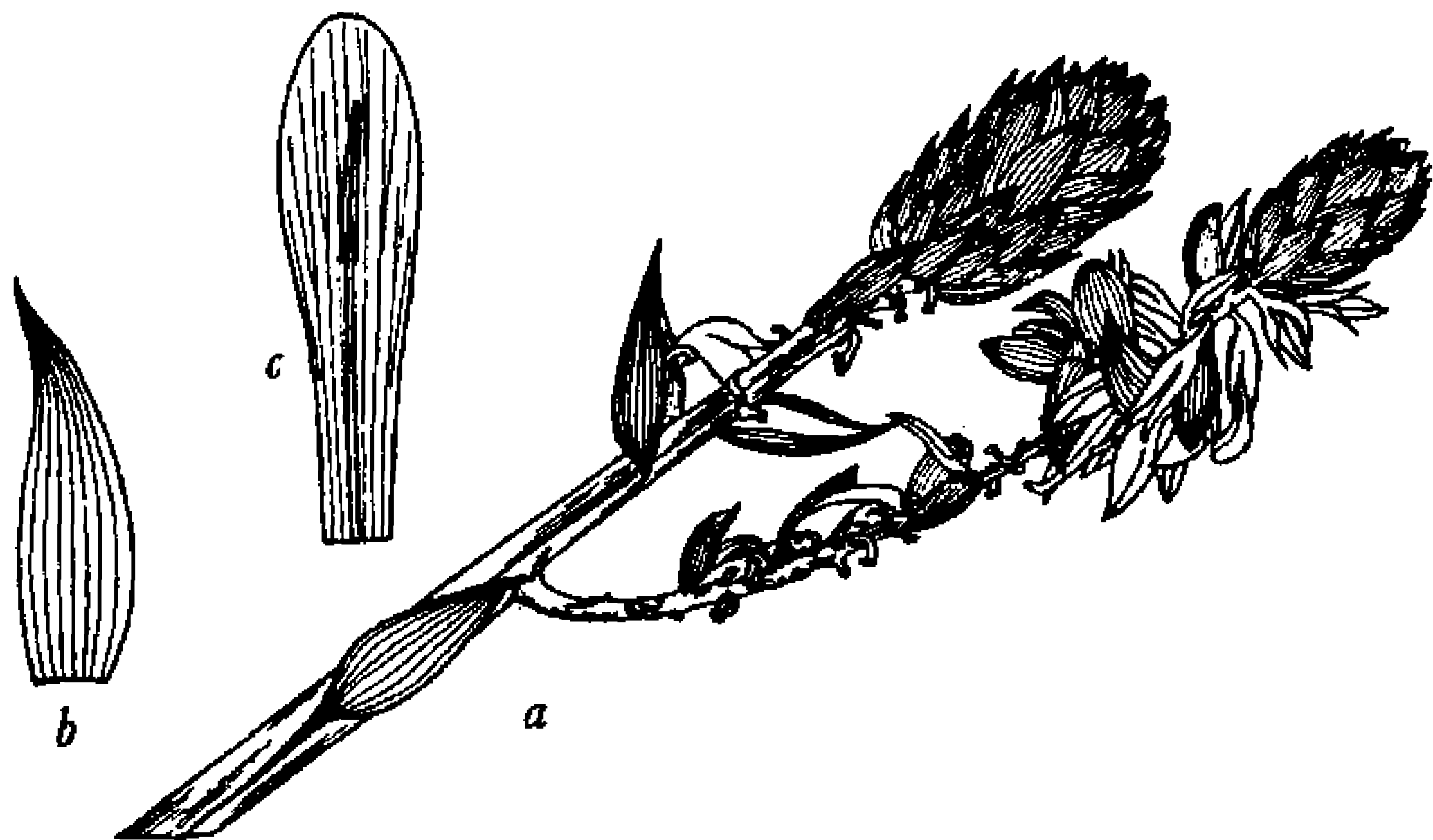


FIGURE 11.—*Pitcairnia kniphofioides*: a, Inflorescence,  $\times \frac{1}{2}$ ; b, sepal,  $\times 2$ ; c, petal,  $\times 2$ .

others with more or less distinct spinose-serrate petioles and entire glabrous blades 3–7 dm. long and 4–8 cm. wide; scape erect, brown-floccose; scape-bracts erect, the lower foliaceous and densely imbricate, the upper lance-ovate, acute, shorter than the internodes, red, spinose-serrate; inflorescence simple or few-branched, glabrous; primary bracts small; branches ascending, 10–14 cm. long, densely many-flowered; floral bracts acute, 2 cm. or longer, membranaceous, imbricate and concealing the flowers before anthesis; pedicels to 3 mm. long; flowers reflexed at anthesis; sepals lanceolate, broadly acute, 12–15 mm. long, ecarinate; petals slightly exceeding the sepals, naked, bluish white; ovary two-thirds superior, ovules caudate.

VALLE: Epiphyte, forest, on peak southeast of La Cumbre, alt. 2,200–2,400 m., May 14–19, 1922, *Pennell & Killip* 5803 (GH). Epiphyte, dense forest, San Antonio, west of Cali, near summit of Cordillera Occidental, alt. 1,900–2,350 m., Feb. 26–Mar. 2, 1939, *Killip & H. Garcia* 33912 (COL, GH, US). Climbing on tree, 16 km. above Cali, Dec. 5, 1946, *Foster* 2302 (GH).

CAUCA: Terrestrial in damp woods, above Arrayanal on the Río Ritaralda, alt. 2,000 m., 1883, *Lehmann* 3310 (G, type, GH phot. 6997).

9. *Pitcairnia megasepala* Baker, Journ. Bot. 19:229. 1881. FIGURE 12

*Pitcairnia araneosa* Baker, Journ. Bot. 19:231. 1881.

*Pitcairnia goudotiana* André, Énum. Bromél. 4. Dec. 13, 1888; Rev. Hort. 60:564. Dec. 16, 1888.

*Pitcairnia camptocalyx* André, Énum. Bromél. 4. Dec. 13, 1888; Rev. Hort. 60:564. Dec. 16, 1888.

*Pitcairnia camptocalyx* var. *lutea* André, Énum. Bromél. 4. Dec. 13, 1888; Rev. Hort. 60:564. Dec. 16, 1888.

*Pitcairnia camptocalyx* var. *robusta* André, Énum. Bromél. 4. Dec. 13, 1888; Rev. Hort. 60:564. Dec. 16, 1888.

*Hepetis camptocalyx* Mez in DC. Monogr. Phan. 9:973. 1896.

*Hepetis camptocalyx* var. *lutea* Mez in DC. Monogr. Phan. 9:973. 1896.

*Hepetis camptocalyx* var. *robusta* Mez in DC. Monogr. Phan. 9:973. 1896.

*Hepetis megasepala* Mez in DC. Monogr. Phan. 9:974. 1896.

Plant slender to stout, 6–15 dm. high; leaves dimorphic, the outer with broadly ovate dark castaneous sheaths and persistent reduced spiniform laxly spinose-serrate blades, the inner leaves with progressively longer paler sheaths, their blades elongate, linear, acuminate, narrowed at the base but not petiolate, to 15 dm. long, 15–25 mm. wide, pale furfuraceous beneath when young, deciduous along a straight transverse line, entire above the line and finely spinose-serrate below; scape erect, slender, soon glabrous; scape-bracts erect, lanceolate, acuminate, the upper ones from slightly shorter to slightly longer than the internodes; inflorescence simple or few-branched at base, 20–33 cm. long, white-furfuraceous, becoming glabrous; floral bracts elliptic, acuminate, the lowest much exceeding the pedicels; pedicels divergent, slender, 10–20 mm. long; flowers suberect to spreading; sepals very narrowly triangular, long-acuminate, 30–40 mm. long;

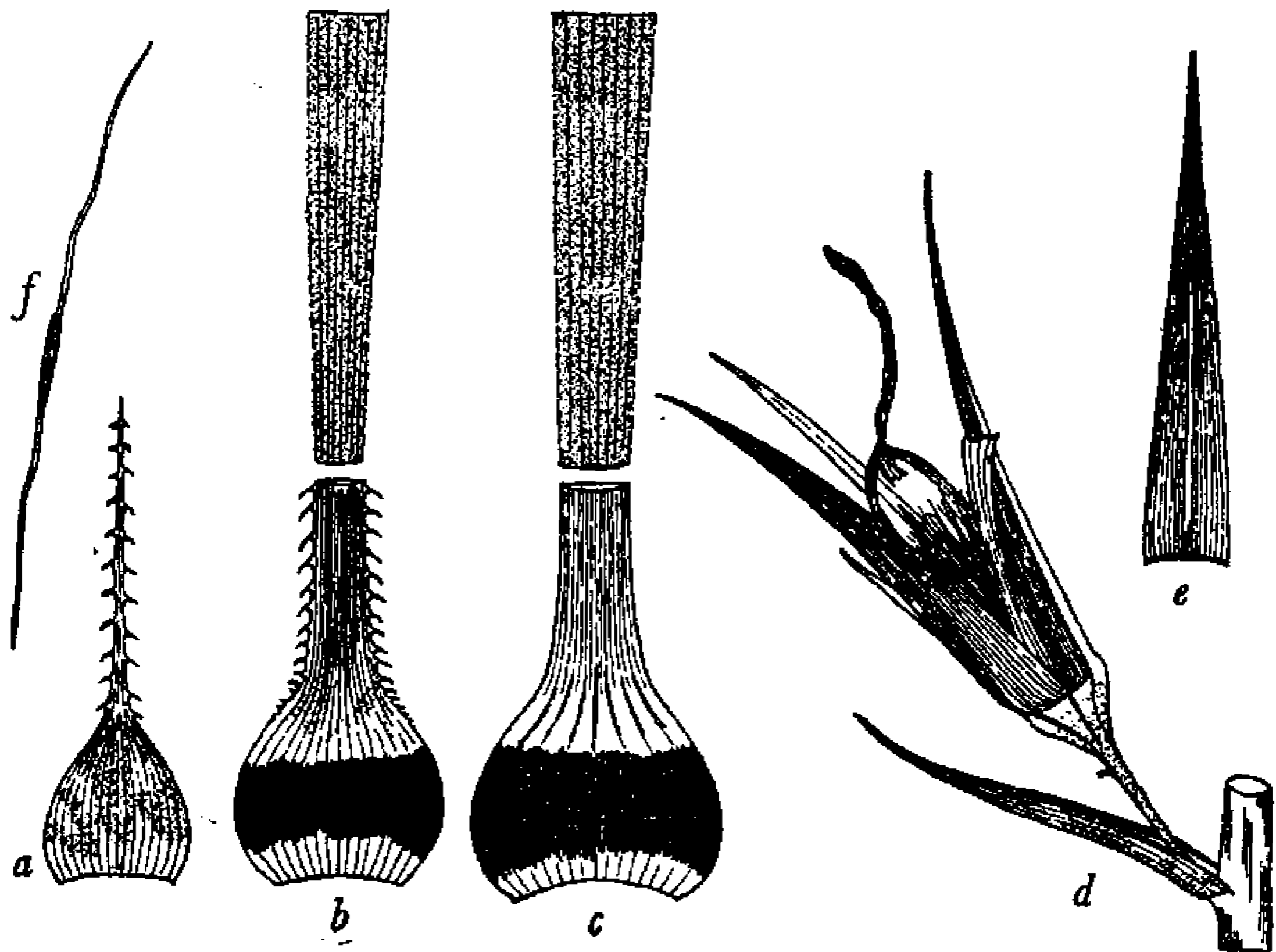


FIGURE 12.—*Pitcairnia megasepala*: a, Reduced leaf,  $\times \frac{1}{2}$ ; b, base of serrate functional leaf,  $\times \frac{1}{2}$ ; c, base of unarmed functional leaf,  $\times \frac{1}{2}$ ; d, floral bract, sepals, and fruit,  $\times 1$ ; e, sepal expanded,  $\times 1$ ; f, seed,  $\times 5$ .

petals linear, acute or acuminate, to 6 cm. long, red, yellow, or white, bearing a crenate or emarginate scale at the base; ovary  $\frac{2}{3}$  to  $\frac{1}{2}$  superior; ovules caudate.

COLOMBIA: *Lehmann* K-339 (F).

NORTE DE SANTANDER: Near Ocafia, alt. 1,250 m., October 1850, *Schlim* 139 (K, type of *Pitcairnia araneosa* Baker, GH phot. 2518). Same, *Kalbreyer* 661 (! Mez).

SANTANDER: Thickets along trail, between Nariño and El Tambor, alt. 150–300 m., Dec. 4, 1926, *Killip & A. C. Smith* 14954 (GH). Vicinity of Barranca Bermeja, Magdalena Valley, between Sogamoso and Colorado Rivers, alt. 100–500 m., Jan. 13, 1935, *Haught* 1516 (F, GH, US).

TOLIMA: Among rocks, Piedras, at the foot of Mount Quindio, valley of the Río Magdalena, alt. 695 m., Mar. 1, 1876, *André* 1934 bis (K, type of *Pitcairnia camptocalyx* var. *robusta* André, GH phot. 2607). La Ceja, March 1876, *André* 1934 ter (K, type of *Pitcairnia camptocalyx* var. *lutea* André; GH phot. 2602). On cliffs of volcanic tuff, Chicoral, alt. 450 m., Feb. 25, 1949, *Haught* 6317 (COL, US).

HUILA: Cliffs, Río Saldaña, alt. 400–450 m., July 22, 1917, *Rusby & Pennell* 215 in part (NY). Terrestrial, arroyo thicket on foothill, Cordillera Oriental east of Neiva, alt. 900–1,200 m., Aug. 1–8, 1917, *Rusby & Pennell* 1093 (NY). In colonies on wet walls, moist quebrada in a dissected plateau of Miocene sandstone and clays, 5 km. north of Villavieja, upper basin of Río Magdalena, alt. 400 m., July 22, 1950, *S. G. Smith* 1248 (COL, UC, US).

ANTIOQUIA: In mostly dense woods near Dabeiba, alt. 1,350 m., Dec. 20, 1947, *Barkley & Gutiérrez* 1817 (COL, US).

VALLE: La Paila, Mar. 21, 1853, *Holton* 153 (K, type, GH phot. 2514; PH). Rocks by the Río Dagua, alt. 1,550 m., April 1876, *André* 1934 (K, type of *Pitcairnia camptocalyx* André, GH phot. 2606). Epiphyte, thickets along Río Dagua, Cisneros, alt. 300–500 m., May 5, 1939, *Killip* 35587 (US).

CAUCA: Cartago, August 1852, *Triana* (COL). Quebrada de Guavita, Apr. 22, 1876, *André* 2861 (K, type of *Pitcairnia goudotiana* André, GH phot. 2522). On steep rock-face by an arroyo, vicinity of Hacienda Aguaclara, El Tambo, mouth of the Patia, Mosquera District, alt. 1,100 m., August 1949, *Idrobo & Fernández* 156 (COL, US).

10. *Pitcairnia trimorpha* L. B. Smith, *Phytologia* 5:179, *pl.* 2, *figs.* 1–3. 1955.

FIGURE 13

Stemless, about 1 meter high; leaves numerous, fascicled, sheaths broadly ovate, 3 cm. long, dark castaneous, entire, blades glabrous, the outermost small, linear, spinose-serrate, persistent, the next elliptic, entire, brown when dry, 5–8 cm. long, the innermost green, deciduous along a straight transverse line, linear, acuminate, narrowed slightly toward base, 6–8 dm. long, 20 mm. wide; scape erect, slender; scape-bracts very narrowly triangular, filiform-acuminate, the highest

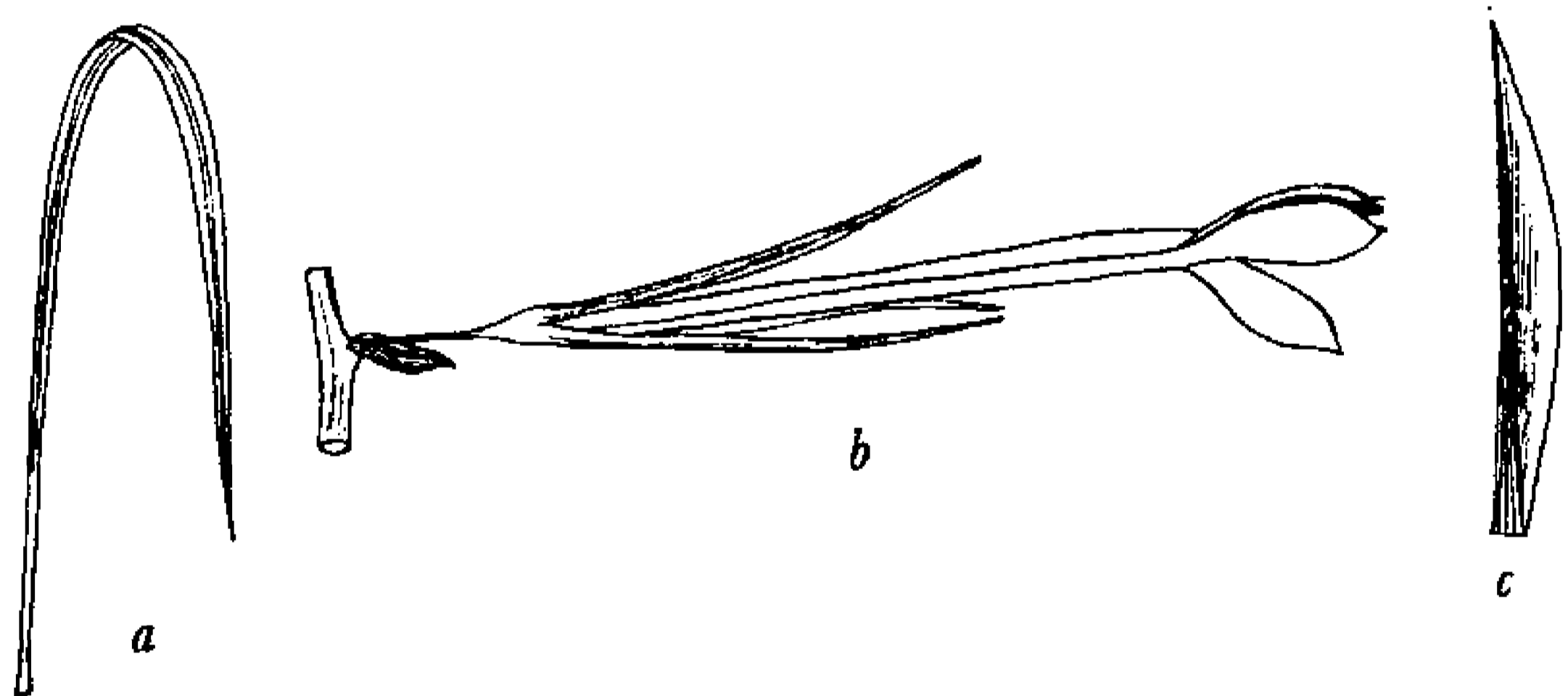


FIGURE 13.—*Pitcairnia trimorpha*: a, Leaf-blade,  $\times \frac{1}{10}$ ; b, flower,  $\times 1$ ; c, sepal,  $\times 1$ .

shorter than the internodes; inflorescence simple or few-branched; primary bracts shorter than the sterile bases of the branches; racemes 12–25 cm. long, sparsely white-flocculose, becoming glabrous; floral bracts elliptic, apiculate; flowers divergent; pedicels slender, 11 mm. long; sepals linear-lanceolate, acute, 33 mm. long, ecarinate; petals white, 5 cm. long, bearing a truncate scale at base; ovary  $\frac{1}{2}$  superior; ovules caudate.

SANTANDER: Rocky granitic soil, subarid wooded valley, Pailas, 5 km. south of Pie de Cuesta, alt. 950 m., Dec. 16, 1948, *Molina & Barkley* 18-S-238 (US, type, US phot. 4473, 4474).

11. *Pitcairnia poortmanii* André, Énum. Bromél. 4. Dec. 13, 1888; Rev. Hortie. 60:564. Dec. 16, 1888.

*Hepetis poortmanii* Mez in DC. Monogr. Phan. 9:974. 1896.

Plant about 1.5 meters high; leaf-blades linear-lanceolate, acuminate, 7 dm. long, densely serrulate toward base, laxly above, glabrous; scape straight; scape-bracts narrowly triangular, acuminate, the upper about equaling the internodes; inflorescence lax, pyramidal, 25–30 cm. long, verruculose, sparsely stellate-lepidote; primary bracts shorter than the long sterile bases of the branches; floral bracts acuminate; flowers spreading, more or less secund at anthesis; pedicels slender, 8 mm. long; sepals acute, 30–35 mm. long, ecarinate; petals 60–70 mm. long, exceeding the stamens, red, bearing an emarginate ligule at base; ovary  $\frac{3}{4}$  superior; ovules caudate.

ANTIOQUIA: Dense woods, near Dabeiba, alt. 1,350 m., Dec. 20, 1947, *Barkley & Gutiérrez* 1826 (COL, US, a large plant with small sepals doubtfully referred to this species because lacking leaves).

CAUCA: On rocks, upper Río Cauca, 1876, *André* 2937 bis (K).

ECUADOR.

12. *Pitcairnia dendroidea* André, Énum. Bromél. 4. Dec. 13, 1888; Rev. Hortie. 60:564. Dec. 16, 1888.

*Hepetis dendroidea* Mez in DC. Monogr. Phan. 9:973. 1896.

Plant 2 meters high; leaves to 17 dm. long, blade linear-lanceolate, acuminate, 4 cm. wide, glabrous, narrowed to a narrowly triangular floccose base but not petiolate, flat, slightly if at all channeled; inflorescence laxly bipinnate; primary bracts triangular, shorter than the long sterile bases of the branches; floral bracts ovate, 4 mm. long; flowers nutant; pedicels slender, 5–7 mm. long at anthesis; sepals lance-oblong, obtuse, 15 mm. long; petals 4 cm. long, red or yellowish, appendaged; ovary  $\frac{3}{4}$  superior; ovules caudate.

CAUCA: Bushy banks, between San Antonio and "San Jose," Cordillera Occidental, alt. 2,200–2,400 m., June 27, 1922, *Pennell & Killip* 7274 (GH, US). Irrigated banks, El Tambo region, alt. 1,700 m., Nov. 4, 1934, *Sneidern* 80 (S, US).

NARIÑO: Wet rocky banks of Río Nembi, between Tuquerres and Barbacoas, alt. 989 m., May 23, 1876, *André* 3361 (K, type, GH phot. 2526).

ECUADOR.

The flowers of the type are very immature so that the floral bracts still exceed the pedicels and the petals are still included in the sepals.

13. *Pitcairnia commixta* L. B. Smith, Contr. U. S. Nat. Herb. 29:303. 1949.

*Pitcairnia orgyalis* sensu André, Énum. Bromél. 4. Dec. 13, 1888, nomen; Rev. Hortie. 60:564. Dec. 16, 1888, nomen; André ex Mez in DC. Monogr. Phan. 9:412. 1896, not Baker 1881.

Caulescent, flowering shoot to 2 meters high; leaves apparently homomorphic, 6–15 dm. long, sheaths broadly ovate, 7 cm. long, dark castaneous, covered with a membrane of white scales, becoming gla-



brous, blades subpetiolate, linear-lanceolate, acuminate, 3–4 cm. wide, at first minutely white-lepidote beneath, sparsely serrulate, the long narrow base densely serrate with straight spreading spines 4–8 mm. long; inflorescence very laxly bipinnate, minutely white-flocculose becoming glabrous; primary bracts narrowly triangular, shorter than the long sterile bases of the branches; racemes ascending, subdensely many-flowered, 25–30 cm. long; floral bracts triangular-ovate, 4 mm. long; flowers becoming secund-nutant after anthesis; pedicels slender; sepals oblong, obtuse, 14 mm. long, ecarinate; petals red, appendaged; ovary  $\frac{3}{8}$  superior; ovules caudate.

CUNDINAMARCA: Río Batatas, alt. 660 m., August 1855, *Triana* 1305 in part (546) (BM).

CAUCA: Dense forest, Cerro Seguengue, West Andes of Popayan, alt. 2,000–2,500 m., *Lehmann* 7766 (B, F phot. 11371).

NARIÑO: In trees, Altaquer, alt. 1,050 m., Nov. 11, 1946, *Foster* 2125 (GH, US).  
ECUADOR.

14. *Pitcairnia lehmannii* Baker, Journ. Bot. 19:273. 1881. FIGURE 14  
*Pitcairnia orgyalis* Baker, Journ. Bot. 19:273. 1881.  
*Hepetis lehmannii* Mez in DC. Monogr. Phan. 9:974. 1896.  
*Pitcairnia auriculata* Mez, Bull. Herb. Boiss. II. 3:134. 1903.

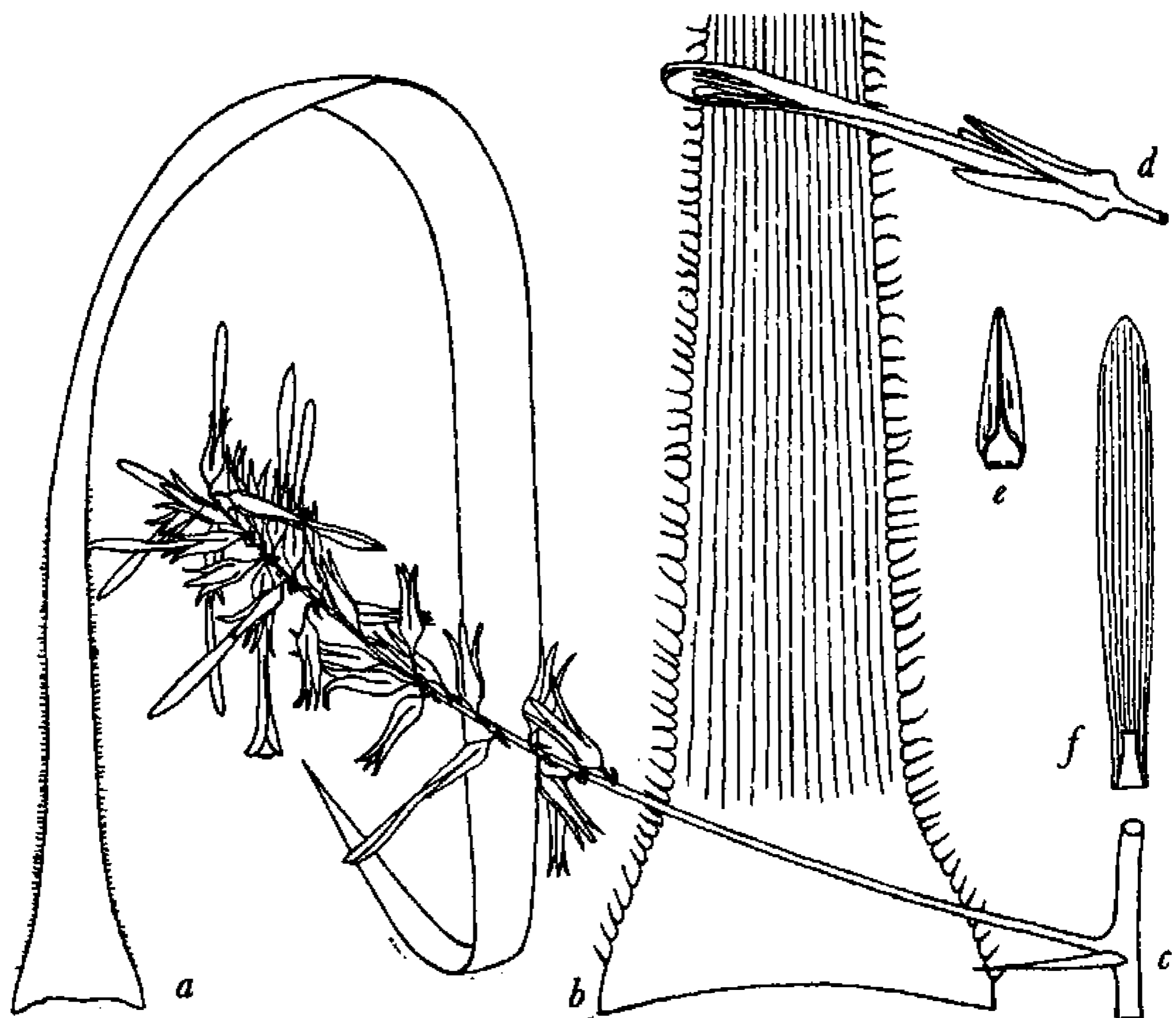


FIGURE 14.—*Pitcairnia lehmannii*: a, Leaf,  $\times \frac{1}{6}$ ; b, base of leaf,  $\times \frac{1}{2}$ ; c, primary bract and branch,  $\times \frac{1}{2}$ ; d, flower,  $\times 1$ ; e, sepal,  $\times 1$ ; f, petal,  $\times 1$ .

Plant 1-2 meters high; leaves all alike and persistent, over 1 meter long, narrowed above the sheath but far from petiolate, sheath large, elliptic, rigid, brown, armed with spreading acicular often fascicled spines up to 7 mm. long, subglabrous, blade lance-linear, 4 cm. wide, entire; scape erect; scape-bracts strict, all or all but the highest exceeding the internodes, lanceolate, entire, green; inflorescence bipinnate; primary bracts like the upper scape-bracts, much shorter than the peduncles; branches suberect, to 23 cm. long; floral bracts reflexed, ovate-elliptic, 3 mm. long, glabrous; pedicels mostly spreading, slender; sepals suboblong, rounded at apex and often splitting when dry to form an auricle, 13 mm. long; petals 38 mm. long, exceeding the stamens, red, naked or bearing a bicuspidate scale at base; ovary more than  $\frac{1}{4}$  superior; ovules caudate.

COLOMBIA: Eastern slopes of the Cordillera Occidental, alt. 2,500 m., Nov. 24, 1898, *Langlassé* 92 (B, isotype of *Pitcairnia auriculata* Mez, F phot. 11349).

CUNDINAMARCA: Occasional on ridges, Cordillera de los Farallones, 10 km. south of Gachalá on trail to Medina, lat. 4°37' N., long. 73°31' W., alt. 2,150 m., May 28, 1944, *Fosberg & Grant* 21972 (COL, US).

CAUCA: El Tambo, alt. 1,700 m., Mar. 22, 1935, *Sneidern* 398 (F, GH, NY, S).

NARIÑO: Near Pasto, *Lehmann* (K, type, GH phot. 2525). Moist ravines above Sibundoy, alt. 2,280 m., Oct. 28, 1946, *Foster* 1965 (GH).

ECUADOR.

15. *Pitcairnia killipiana* L. B. Smith, *Contr. U. S. Nat. Herb.* 29:308, *fig. 29*. 1949.

Flowering plant 85 cm. high; stem horizontal; leaves fascicled, all alike, nearly 9 dm. long, slightly narrowed above the narrowly elliptic sheath but hardly petiolate, the blades linear, long-acuminate, 3 cm. wide, glabrous; scape erect, slender, sparsely ferruginous-lepidote; scape-bracts erect, subfoliaceous, exceeding the internodes but covering little of the scape; inflorescence very laxly bipinnate, sparsely pale-lepidote; primary bracts quickly deciduous; racemes ascending, the sterile naked base 6 cm. long; floral bracts elliptic, acute; flowers divergent, subdistichous, red; pedicels slender, 15-19 mm. long, sepals nerved, glabrous; petals about 6 cm. long, bearing a large bidentate scale at base; ovary subglobose, almost wholly superior.

CHOCÓ: Terrestrial in dense forest, Corcovada Region, upper Río San Juan, ridge along Yeracúf Valley, alt. 200-275 m., Aug. 24, 25, 1939, *Killip* 35245 (US, type, US phot. 3486; GH).

16. *Pitcairnia arenicola*. L. B. Smith, *Contr. U. S. Nat. Herb.* 29:299, *fig. 21*. 1949.

Flowering plant 1 meter high; leaves fasciculate, dimorphic, some persistent, reduced to suborbicular dark castaneous brown-flocculose sheaths and short linear spinose-serrate blades, other 1.1 meters long, slightly narrowed and deciduous above the large elliptic-oblong sheaths but not petiolate, glabrous, the blades linear, long-acuminate, 25 mm.

wide; scape erect, slender, white-flocculose; scape-bracts very narrowly triangular, long-acuminate, the upper ones slightly shorter than the internodes; inflorescence a depauperate panicle, lax, sparsely flocculose; primary bracts like the scape-bracts, much shorter than the subdense racemes; lateral racemes 7 cm. long, the terminal 17 cm. long; floral bracts elliptic, apiculate, scarious; pedicels slender, 6 mm. long; flowers divergent; sepals narrowly oblong, 22 mm. long, carinate, nerved, red, glabrous; petals 47 mm. long, pale yellow, bearing a ligule at base; ovary two-thirds superior; ovules caudate.

NORTE DE SANTANDER: On sandstone rocks in ravines, Orú on pipeline, alt. 540 m., Sept. 18, 1946, *Foster* 1733 (GH, type, US phot. 3170).

17. *Pitcairnia heterophylla* (Lindl.) Beer, *Bromel.* 68. 1857. FIGURE 15

*Puya heterophylla* Lindl. *Bot. Reg.* 26: *pl.* 71. 1840.

*Puya longifolia* C. Morren, *Ann. Soc. Agr. Bot. Gand* 2:483, *pl.* 1846.

*Hepetis heterophylla* Mez in DC. *Monogr. Phan.* 9:973. 1896.

Flowering plant 1 dm. high or rarely to 2 dm.; leaves very numerous in a large bulb, sheaths suborbicular to ovate, deep castaneous, blades dimorphic, the outer reduced to spinose-serrate castaneous spines,

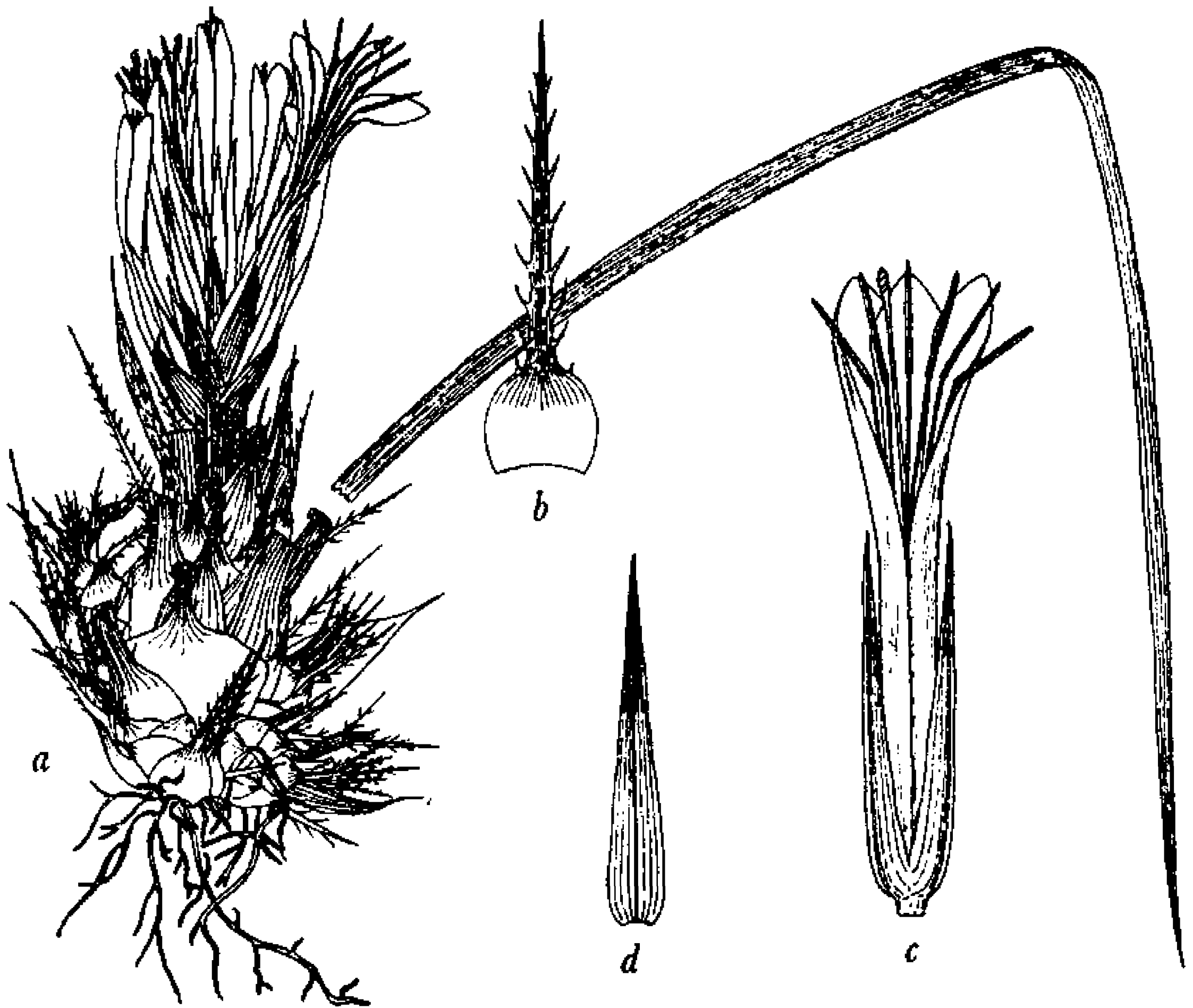


FIGURE 15.—*Pitcairnia heterophylla*: *a*, Habit,  $\times \frac{1}{2}$ ; *b*, reduced leaf,  $\times \frac{1}{2}$ ; *c*, flower,  $\times 1$ ; *d*, sepal,  $\times 1$ .

the inner green, linear, filiform-acuminate, to 7 dm. long and 13 mm. wide, pale-flocculose beneath, soon glabrous, deciduous before anthesis along a straight transverse line slightly above the base, entire above that line, spinulose-serrate below it; scape usually very short and concealed by the leaves; scape-bracts ovate, acuminate or the lower with a dark slenderly spinose apex, thin, white-flocculose; inflorescence capitate or subspicate, 3- to 12-flowered; floral bracts like the upper scape-bracts, entire, shorter than the sepals; flowers erect; pedicels 3 mm. long, obconic; sepals narrowly subtriangular, acuminate, 3 cm. long, subalate-carinate, thin, flocculose; petals linear, to 55 mm. long, red or sometimes white, bearing a sacciform retuse scale well above the base; ovary about half superior; ovules long-caudate; capsule slenderly ovoid, acute, shorter than the sepals.

MAGDALENA: On faces of limestone blocks on open pasture above Manare, alt. ca. 1,000 m., Jan. 16, 1944, *Haught* 3954 (GH, US). In huge trees, semiarid section, mountains above Santa Marta, alt. 300 m., July 29, 1946, *Foster & C. E. Smith, Jr.*, 1322 (GH). On exposed rocks, above San Sebastian, Sierra Nevada de Santa Marta, alt. 2,250 m., August 1946, *Foster & C. E. Smith, Jr.*, 1457 (GH). St. Sogrome Valley, Sierra Nevada de Santa Marta, 1954, *College of the West Indies* 48 (US).

NORTE DE SANTANDER: Vicinity of Sarare, valley of the Río Chitagá between Chorro Colorado and Bata, Cordillera Oriental, alt. 1,300 m., Oct. 14-17, 1941, *Cuatrecasas, Schultes & C. E. Smith, Jr.*, 12213 (US).

CUNDINAMARCA: On rocks and banks, Quetame, December 1939, *Pérez-Arbeláez* 10098 (COL). On rock, Monte Redondo, Quetame, alt. 1,450 m., Dec. 17, 1950, *Schneider* 1027 (COL).

ANTIOQUIA: On the rock of Peñol, January 1945, *Daniel* 3413 (US).

Southern MEXICO to PANAMA, VENEZUELA, and PERU.

18. *Pitcairnia lignosa* L. B. Smith, *Contr. U. S. Nat. Herb.* 29:309, *fig. 30.* 1949.

Flowering shoot about 5 dm. high; stem woody, covered with the remains of old leaf-sheaths; leaves 3-4 dm. long, the sheaths suborbicular, 2 cm. in diameter, dark castaneous, white-flocculose, the blades linear, long-acuminate, about 10 mm. wide, glabrous above, densely white-lepidote beneath, deciduous along a straight transverse line 4 cm. above the sheaths, subdensely serrate below the line with brown teeth 2 mm. long, the remnant spirally incurved, entire above the line; scape erect, 8 mm. in diameter, densely white-flocculose; scape-bracts long-acuminate from an ovate base, much exceeding the internodes but covering little of the scape, white-lepidote; inflorescence 15-19 cm. long, lax at base, rather dense toward apex; floral bracts like the scape-bracts, the lowest much exceeding the pedicels and nearly equaling the sepals; flowers divergent; pedicels slender, 16 mm. long; sepals narrowly triangular, acuminate, 17 mm. long, carinate; petals about 5 cm. long, apparently naked; ovary  $\frac{3}{4}$  superior; ovules caudate.

CAUCA: On dry rocks and banks, near Mercaderes on the road to Pasto, alt. 1,167 m., Oct. 25, 1946, *Foster* 1928 (GH, US phot. 3172).

NARIÑO: By road between Tangüa and Tuquerres, alt. 3,000 m., Nov. 18, 1946, *Foster* 2200 (GH, type, US phot. 3173).

19. *Pitcairnia pungens* H. B. K. Nov. Gen & Sp. 1:294. 1816. FIGURE 16  
*Pitcairnia laevis* Willd. ex Schult. in R. & S. Syst. 7, pt. 2:1249. 1830,  
 in synon.  
*Pitcairnia concolor* Baker, Journ. Bot. 19:269. 1881.  
*Hepetis pungens* Mez in DC. Monogr. Phan. 9:974. 1896.

Rarely more than 4 dm. high, the base often appearing somewhat bulbous; leaves dimorphic, some persistent and reduced to brown serrate spines, others deciduous above the sheath, green, linear, 3 dm. long, entire except for the persistent base; scape erect; scape-bracts



FIGURE 16.—*Pitcairnia pungens*: a, Habit,  $\times \frac{1}{6}$ ; b, reduced leaf,  $\times \frac{1}{2}$ ; c, inflorescence,  $\times 1$ ; d, base of petal,  $\times 1$ .

strict, acuminate, pungent, soon glabrous; inflorescence usually few-flowered, white-flocculose; floral bracts subovate, entire, acuminate-mucronate, exceeding the pedicels; flowers erect at anthesis, 55 mm. long, yellowish red; pedicels to 10 mm. long; sepals acuminate, 25 mm. long, carinate; petals about equaling the stamens, bearing a large emarginate scale at base; ovary almost wholly superior; ovules caudate.

COLOMBIA: *Goudot* (1 Mez). *Triana* (BM). On rocks, Cascada del Buitre, Jan. 5, 1920, *Ariste-Joseph* A-474 (US).

MAGDALENA: Sierra Nevada de Santa Marta, *Lehmann* 29 (1 Mez).

CUNDINAMARCA: Open steep slope, "Monte Redondo," south of Quetame, alt. 1,400–1,600 m., Sept. 6, 1917, *Pennell* 1833 (NY).

VALLE: Bank of Río Bugalagrande between El Puente and Las Salinas, western slope of Cordillera Central, alt. 2,000 m., Mar. 27, 1946, *Cuatrecasas* 20478 (F). River bank, Bugalagrande, Barragan, Cerro de la Laguna, west side of the Cordillera Central, alt. 2,920–2,950 m., Apr. 17, 1946, *Cuatrecasas* 20846 (F, GH).

CAUCA: Around Tacueyó, Río Palo Valley, Huila group, Cordillera Central, alt. 1,800 m., January 1906, *H. Pittier* 1028 (US). Rocks along Río Vinagre, Coconuco, Cordillera Central, alt. 2,200–2,300 m., June 11, 1922, *Pennell & Killip* 6483 (GH, US). Granite cliffs, Coconuco, alt. 2,300–2,500 m., June 17–18, 1922, *Killip* 6849 (GH, NY, US). Irrigated banks, El Tambo region, alt. 1,700 m., Dec. 27, 1934, *Sneidern* 71 (GH, S, US). On rocks, Cascada Chirimbo Roca, Puracé, alt. 2,800 m., September 1936, *Dryander* 1857 (US). Waterfall, Río Vinagres, alt. 3,000 m., September 1936, *Dryander* 1829 (GH). Steep grassy bank below Puracé, alt. 2,500 m., April 16, 1939, *Alston* 8084 (BM). Between Puracé and Coconuco, alt. 2,300–2,400 m., July 12, 1939, *Pérez-Arbeláez & Cuatrecasas* 5987 (US). Woods and thickets, La Tolda, above Tacueyó, Río Palo Valley, western slope of Cordillera Central, alt. 2,000–2,030 m., Dec. 18, 1944, *Cuatrecasas* 19452 (F, GH).

NARIÑO: Yacanquer to Río Guaitara, May 15–16, 1876, *André* 2934 (K). Berruecos, Apr. 26–29, 1876, *André* 2934 bis (US). On earth and rocks by Río Guaitara, Yacanquer, alt. 1,800–2,500 m., Feb. 10, 1881, *Lehmann* 664 (BM). Vertical rock outcrops on dry cleared slopes, ridge west of Quebrada de Pueblo Viejo, 6 km. south of Piedrancha, Río Guabo drainage, alt. 2,800 m., lat. 1°5' N., long. 77°53' W., Oct. 3, 1943, *Fosberg* 21121 (US). On dry banks, Pasto city limits, alt. 2,550 m., Nov. 2, 1946, *Foster* 2069 (GH, US). On rocks, between Tangua and Tuquerres, alt. 3,000 m., Nov. 18, 1946, *Foster* 2210 (GH).

ECUADOR, PERU.

20. *Pitcairnia stenophylla* André, *Enum. Bromél.* 4. Dec. 13, 1888; *Rev. Hort.* 60:564. Dec. 16, 1888.

*Hepetis stenophylla* Mez in DC. *Monogr. Phan.* 9:974. 1896.

Stemless, 5–15 dm. high; leaves numerous, sheaths suborbicular, 1 cm. in diameter, pale, glabrous, blades dimorphic, some reduced to short dark pectinate-serrate spines, others foliaceous, linear, filiform-acuminate, 5–10 dm. long, deciduous, entire except for the persistent base, white-flocculose beneath becoming glabrous; scape straight, very slender; scape-bracts erect, very narrowly triangular, all but the uppermost exceeding the internodes, flocculose becoming glabrous; inflorescence many-flowered, 20–35 cm. long, sparsely white-flocculose; flowers subspreading; pedicels slender, 3–6 mm. long; sepals linear-triangular, long-acuminate, 22 mm. long, carinate, yellow at base; petals 4 cm. long, equaling the stamens, acuminate, white, appendaged; ovary more than  $\frac{3}{4}$  superior; ovules caudate.

TOLIMA: Bank of Río Magdalena, Guataquicito, alt. 966 m., February 1876, *André* 1876 (K, type, GH phot. 2610). Honda, August 1919, *Ariste-Joseph* A-369 (US). Same, 1922, *Ariste-Joseph* (US).

21. *Pitcairnia petraea* L. B. Smith, Contr. U. S. Nat. Herb. 29: 433, *fig. 39*. 1951.

Over 2 meters high; leaves all alike, 1.5 meters long, entire, narrowed between sheath and blade but not petiolate, sheaths narrowly triangular, elongate, densely brown-flocculose when young, blades linear-lanceolate, acuminate, to 5 cm. wide, brown-flocculose beneath becoming glabrous; scape erect, about 1 cm. in diameter; scape-bracts subfoliaceous, the lower imbricate, the upper remote; inflorescence subdense, many-flowered, 20–25 cm. long; floral bracts narrowly triangular, about equaling the lower pedicels; flowers spreading; sepals oblong, ecarinate, nerved, glabrous; petals at least 2 cm. long, greenish white; stamens included; ovary  $\frac{3}{8}$  superior; fruit dehiscent; seeds long-caudate.

CUNDINAMARCA: On rocks, Páramo de San Miguel, alt. 3,300 m., Oct. 12, 1946, *Foster* 1877 (GH, type, US phot. 3286; US). "Chantilly," alt. 2,300 m., July 11, 1952, *Køie* 5248 (C, US).

22. *Pitcairnia macrobotrys* André, Énum. Bromél. 4. Dec. 13, 1888; Rev. Hort. 60:564. Dec. 16, 1888.

*Hepetis macrobotrys* Mez in DC. Monogr. Phan. 9:974. 1896.

Stem stout, 1 meter high; flowering shoot 1 meter high; leaves homomorphic, lanceolate, acuminate, long-attenuate toward base but not petiolate, 8 dm. long, 7 cm. wide, sparsely spinulose at base, glabrous; scape straight, stout, sulcate, sparsely white-furfuraceous; scape-bracts strict, imbricate, triangular-ovate, acute, the upper ones 4–5 cm. long; inflorescence subdensely many-flowered, 5 dm. long, sparsely white-furfuraceous; floral bracts lanceolate, acute; flowers subspreading; sepals narrowly triangular, subobtuse, ecarinate; petals 55 mm. long, equaling the stamens, red with narrow white margins, appendaged; ovary  $\frac{3}{8}$  superior; ovules caudate.

NARIÑO: Vertical rock-faces by Río Juanambú, alt. 1,250 m., Apr. 26–29, 1876, *André* 2892 (K, type, GH phot. 2511, 2512).

23. *Pitcairnia trianae* André, Énum. Bromél. 4. Dec. 13, 1888; Rev. Hort. 60:564. Dec. 16, 1888.

*Hepetis trianae* Mez in DC. Monogr. Phan. 9:974. 1896.

Flowering shoot to 2 meters high; leaves numerous, 12 dm. long, sheaths broadly ovate, dark castaneous, blades linear, acuminate, narrowed toward the spinose base but not petiolate, 3–4 cm. wide, soon glabrous; scape straight, very stout, at first white-arachnoid; scape-bracts strict, very narrowly triangular, the lower spinose-serrate, the upper entire, shorter than the internodes; inflorescence many-flowered, very dense except toward the base, 3–5 dm. long; axis straight, stout, arachnoid; floral bracts triangular-ovate; flowers spreading to reflexed; pedicels very slender; sepals oblong, obtuse, ecarinate; petals obtuse, 35–45 mm. long, equaling the stamens, white or pale yellow, naked; ovary at least  $\frac{3}{8}$  superior; ovules short-caudate.

SANTANDER: Mesa de los Santos, Cordillera Oriental, alt. 1,500 m., Dec. 11–15, 1926, *Killip & A. C. Smith* 15223 (US, very old fruit, identity doubtful). Bucumaranga, road to Cucuta, alt. 2,400 m., May 1948, *Sandeman* 6101 (COL, K).

TOLIMA: San Juan, near Quindio, alt. 2,000 m., Mar. 1–9, 1876, *André* 2069 (K, type; GH phot. 2537).

ANTIOQUIA: Páramo thickets, 10 km. north of Sonsón, alt. 2,750 m., Mar. 6, 1948, *Gutiérrez, Correa & Barkley* 18–C–206 (US). Dense moist woods, near La Ceja, alt. 2,500 m., Aug. 21, 1948, *Barkley & Johnson* 254 (US). Moist woods, subpáramo, 10 km. east of Sonsón, alt. 2,700 m., Mar. 18, 1949, *Scolnik, López & Barkley* 19–An–212 (US).

CAUCA: Settlement of "El Asomadero," Carpinterías, region of Munchique, alt. 2,550 m., Oct. 21, 1954, *Fernandez* 2860 (COL).

NARIÑO: El Portachuelo, crest of the Cordillera between the Valley of Sibundoy and Mocoa, alt. 2,600 m., Dec. 30, 1940, *Cuatrecasas* 11487 (COL). On rocky slopes, San Francisco, near Sibundoy, alt. 2,190 m., Oct. 29, 1946, *Foster* 1976 (GH).

ECUADOR (variety), BOLIVIA.

24. *Pitcairnia johannis* L. B. Smith, *Phytologia* 5:179, pl. 1, figs. 11–13. 1955.

FIGURE 17

Aggregated, the flowering shoot 86 cm. high; leaves numerous, fasciculate, to 45 cm. long, glabrous at maturity, sheaths suborbicular, 1 cm. in diameter, dark castaneous, blades linear, filiform-acuminate, slightly narrowed toward base, entire, bearing a conspicuous pale

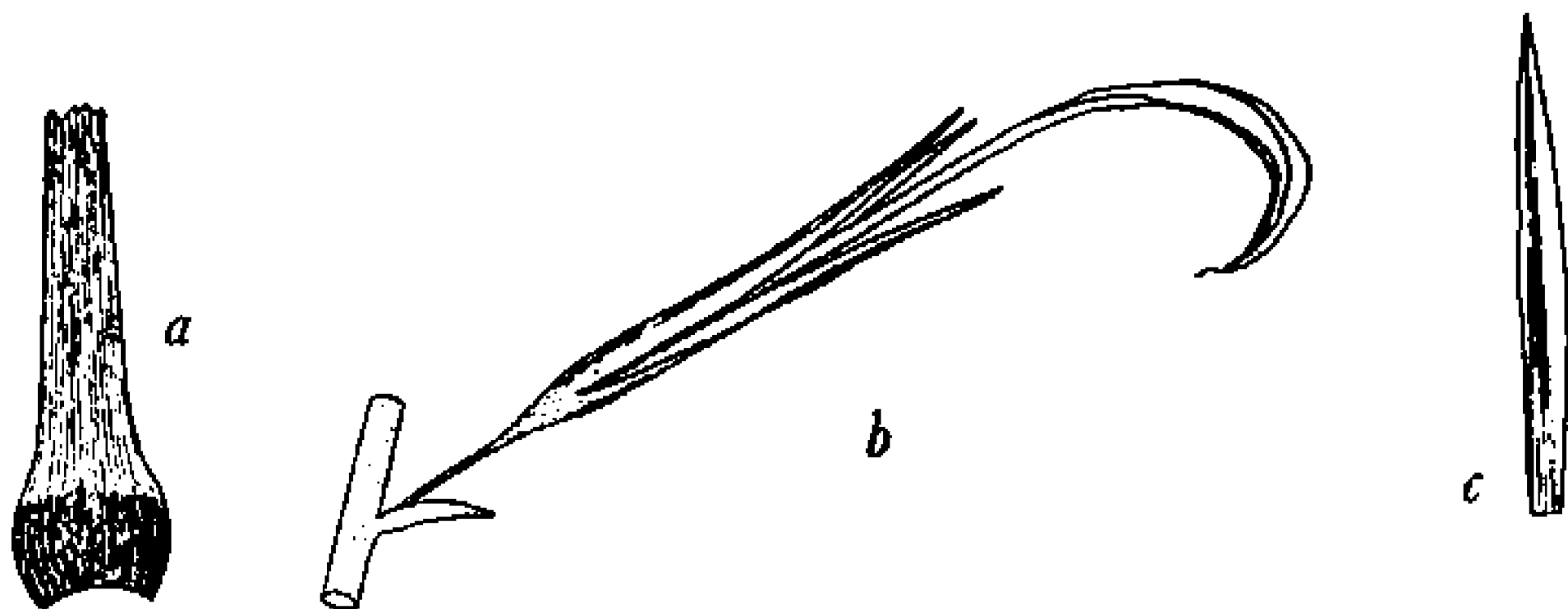


FIGURE 17.—*Pitcairnia johannis*: a, Base of leaf,  $\times \frac{1}{2}$ ; b, flower,  $\times 1$ ; c, sepal,  $\times 1$ .

median channel; scape straight, very slender, sparsely white-flocculose becoming glabrous; scape-bracts strict, very narrowly triangular; inflorescence 25 cm. long, sparsely white-flocculose; floral bracts elliptic, acute, shorter than the pedicels; flowers subspreading; pedicels slender, to 15 mm. long; sepals asymmetric, linear-lanceolate, acute, obtusely carinate; petals narrowly oblanceolate, acuminate, 4 cm. long, appendaged; stamens included; ovary  $\frac{2}{3}$  superior; ovules caudate.

SANTANDER: In crevices of sandstone, Quebrada Boquerona, at confluence with Quebrada La Putana, west of Cordillera de La Paz, alt. 200 m., lat.  $7^{\circ}5' N.$ , long.  $73^{\circ}30' W.$  July 7, 1944, *St. John* 20554 (US, type; COL).



25. *Pitcairnia verrucosa* L. B. Smith, *Phytologia* 4:380, *pl. 2, figs. 1-4.* 1953.

FIGURE 18

Caulescent; stem erect, probably climbing, 1 cm. in diameter, the lower part long-setose with the persistent nerves of decayed leaves; leaves all alike, entire, rigid, glabrous, sheaths broadly ovate, encircling the stem, brown, petioles 3 dm. long, slightly widened toward base and apex, centrally 6 mm. wide, strongly channeled, blades lance-oblong, flat, 3-4 dm. long, 7-8 cm. wide, acuminate, rounded

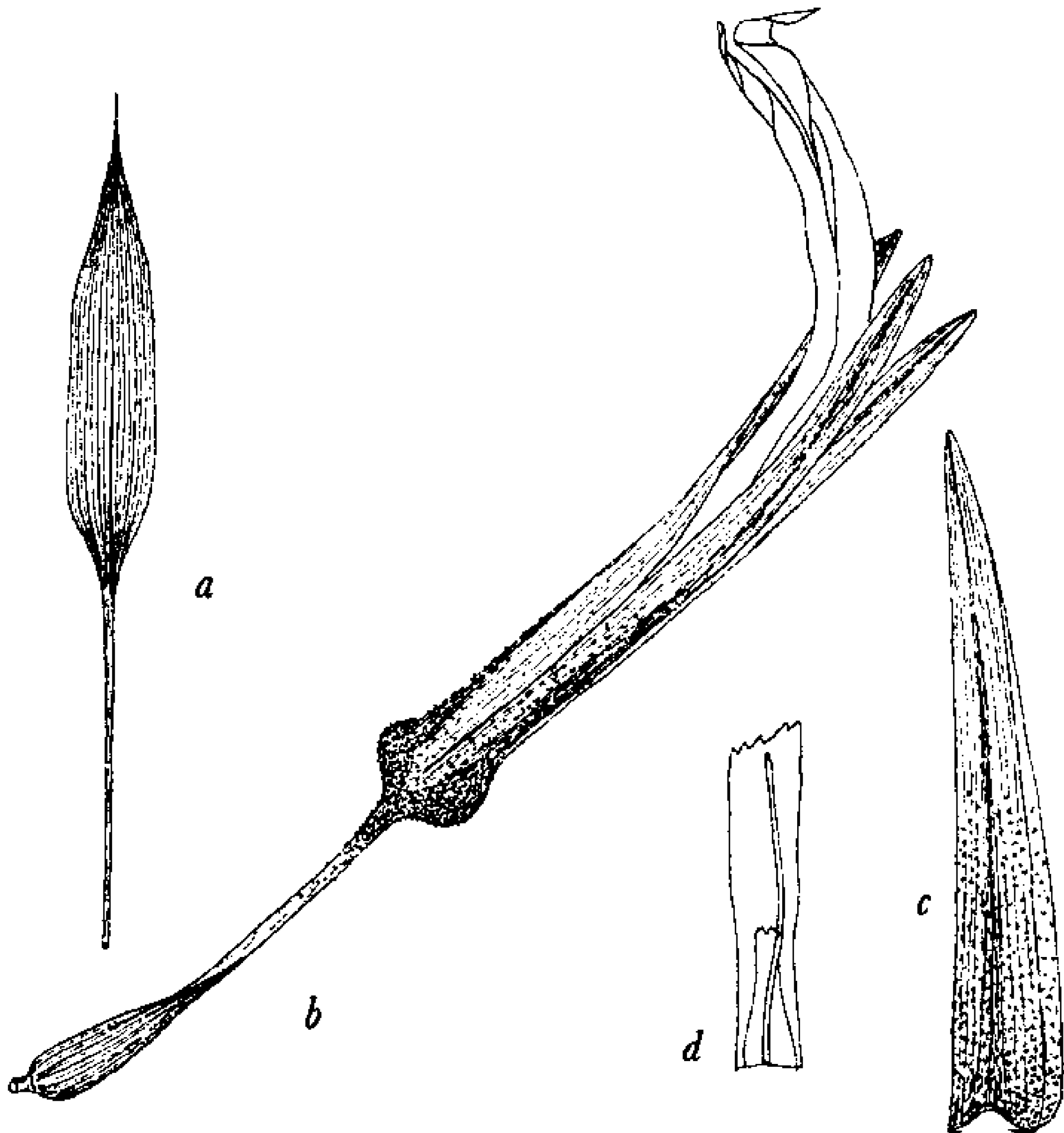


FIGURE 18.—*Pitcairnia verrucosa*: *a*, Leaf,  $\times \frac{1}{10}$ ; *b*, floral bract and flower,  $\times 1$ ; *c*, sepal,  $\times 1$ ; *d*, Base of petal,  $\times 1$ .

at base, bright violet beneath, green above; floral bracts ovate, acuminate, 17 mm. long; pedicels spreading, nearly straight, slender, 4 cm. long, verrucose and lepidote toward apex; sepals very narrowly triangular, obtuse, 6 cm. long, coarsely verrucose especially at the green base, elsewhere red-violet; petals 9 cm. long, acute, reddish yellow, at base bearing a bidentate scale 13 mm. long; ovary almost wholly superior.

VALLE: In ravine by km. 51, left bank of Río San Juan, near Queremal, basin of Río Digua, western slope of the Cordillera Occidental, alt. 1,540-1,650 m., Feb. 25, 1947, *Cuatrecasas* 23738 (F, type, US phot. 3653, 3654).

26. *Pitcairnia tumulicola* L. B. Smith, Contr. U. S. Nat. Herb. 29:314, fig. 34. 1949.

Flowering plant 1.3 meters high; leaves few, all alike, slightly shorter than the inflorescence, the sheaths small, broadly ovate, dark castaneous, densely ferruginous-lepidote, becoming glabrous, the petioles elongate, red, the blades lanceolate, acuminate, 7 cm. wide, dark green above and glabrous, reddish beneath; scape erect, slender, white-flocculose; scape-bracts erect, lanceolate, acuminate, much shorter than the internodes, densely white-flocculose; inflorescence lax, 14 cm. long, densely white-flocculose; floral bracts lanceolate, acute, about a third as long as the pedicels; pedicels very slender, ascending, to 4 cm. long; sepals 30 mm. long, strongly nerved, carinate, crested at base; petals 45 mm. long, acute, green, bearing a large scale at base; stamens included; ovary  $\frac{3}{8}$  superior; ovules caudate.

NARIÑO: On mounds of roots and mosses, Altaquer, alt. 1,050 m., Nov. 10, 1946, Foster 2071 (GH, type, US phot. 3175).

27. *Pitcairnia longipes* Mez, Repert. Sp. Nov. Fedde 12:416. 1913.

Stemless, nearly 1 meter high; leaves about 20, all alike, persistent, entire, subpetiolate and deeply channeled below blade, sheaths elongate, narrowly triangular, subglabrous, blades narrowly lanceolate, filiform-acuminate, 5 dm. long; scape erect, rather stout, subangulate, glabrous; scape-bracts erect, narrowly lanceolate, glabrous, the upper ones shorter than the internodes; inflorescence exceeded by the leaves, few-flowered, very lax, cylindric, 2 dm. long; axis angled, straight, subglabrous; floral bracts lance-ovate, acute, much shorter than the pedicels, obscurely lepidote; pedicels divergent, incurved near apex; flowers suberect; sepals narrowly lanceolate, acute, asymmetric, 42 mm. long, ecarinate; petals 75 mm. long, exceeding the stamens, deep red, bearing a large entire scale at base; anthers 10 mm. long; ovary almost wholly superior; ovules short-caudate.

CAUCA: Dense wet woods, western Andes of Popayan, alt. 1,800-2,300 m., Lehmann 8248 (B, type; K, GH phot. 2587; F.). Virgin forest, La Costa, El Tambo, alt. 1,300 m., July 25, 1936, Sneidern 840 (NY, S); 841 (S).

28. *Pitcairnia laxissima* Baker, Handb. Bromel. 101. 1889.

*Hepetis laxissima* Mez in DC. Monogr. Phan. 9:974. 1896.

Leaves entire, petiole over 15 cm. long, blade 75 cm. long, filiform-acuminate, glabrous; scape evidently erect, slender, glabrous; scape-bracts unknown; inflorescence very lax, few-flowered, 25 cm. long, axis straight, soon glabrous but showing traces of stellate ferruginous scales at the bases of the pedicels; pedicels slender, incurved at apex; sepals acuminate, 45 mm. long, ecarinate, soon becoming glabrous; petals 7 cm. long, naked.

CAUCA: Andes, near Popayán, Lehmann (K, type, GH phot. 2531).

29. *Pitcairnia calophylla* L. B. Smith, Contr. U. S. Nat. Herb. 29:432, *fig. 38*. 1951.

Terrestrial, nearly 2 meters high; leaf 12 dm. long, entire, petiole slender, elongate, blade oblanceolate, abruptly acuminate, 7 dm. long, channeled in the center, dark green above, deep maroon beneath; scape erect, 1 cm. in diameter; inflorescence lax, elongate; floral bracts lance-ovate, acute, 65 mm. long, entire, thin, densely ferruginous-flocculose; pedicels spreading, slender; flowers erect, at right angles to the pedicels; sepals narrowly lanceolate, acuminate, 47 mm. long, carinate toward base; ovary  $\frac{1}{2}$  superior.

NARIÑO: Above El Diviso, alt. 705 m., Nov. 13, 1946, *Foster* 2159 (GH, type, US phot. 3283).

30. *Pitcairnia multiflora* L. B. Smith, Contr. U. S. Nat. Herb. 29:312, *fig. 32*. 1949.

Flowering plant over 1 meter high; leaves few, some reduced to elliptic acute pale-appressed-lepidote sheaths, others long-petiolate, the blades acute, 42 cm. long, glabrous, reticulate beneath; scape erect, slender, pale-flocculose; scape-bracts much exceeding the internodes, narrowly lanceolate, entire, thin, red, flocculose at base; inflorescence cylindrical, 55 cm. long, 7 cm. in diameter, many-flowered, minutely pale-flocculose, the axis straight, sulcate; floral bracts sharply reflexed, nearly covering the axis, narrowly lanceolate, acuminate, membranaceous, red, the lowest longer than the pedicels, the upper only about half as long; pedicels very slender, 16 mm. long, the lower ones subreflexed, the upper spreading or slightly ascending; sepals linear-lanceolate, acuminate, 20 mm. long, ecarinate, green; petals narrowly elliptic, acute, barely exceeding the sepals, white, naked; stamens included; ovary almost wholly superior; ovules long-caudate.

VALLE: Rocky cliffs 30 km. above Buenaventura, Dec. 8, 1946, *Foster* 2320 (GH, US). Terrestrial, at km. 95 on the Cali-Buenaventura Highway, alt. 450 m., Dec. 11, 1946, *Haight* 5348 (US, type, US phot. 3477, 3488). Epiphytic, right bank of Río San Juan below Queremal, between km. 52 and 53, Río Dagua drainage, alt. 1,300–1,500 m., Mar. 24, 1947, *Cuatrecasas* 23948 (F, US, VALLE). Anchicayá, between Cali and Buenaventura, alt. 500 m., Aug. 11, 1952, *Køie* 4823 (C, COL, US).

31. *Pitcairnia bella* L. B. Smith, *Caldasia* 3:240, *fig.* 1945.

Stemless; leaves few, much exceeding the inflorescence, above pale green with a violet margin, soon glabrous, beneath dark purple and densely brown-flocculose, sheaths small, inconspicuous, petioles winged, to 10 cm. long, blades elliptic, abruptly long-acuminate, nearly 6 cm. wide; scape very slender, more or less decurved, red, soon glabrous; scape-bracts lanceolate, filiform-caudate; inflorescence laxly few-flowered, sparsely and minutely flocculose; floral bracts elliptic, 4–10 mm. long, the lowest caudate; flowers red; pedicels

slender; sepals sublinear, acute, ecarinate; petals over 55 mm. long, bearing a bifid ligule at base; ovary about half superior; ovules apiculate.

**31a. *Pitcairnia bella* var. *bella***

Upper scape-bracts shorter than the internodes; sepals 24 mm. long.

ANTIOQUIA: In wet moss at the base of a steep hill, Puerto Valdivia, alt. 1,010 m., Feb. 20, 1942, *Metcalf & Cuatrecasas* 30097 (GH, type, US phot. 3479; F).

**31b. *Pitcairnia bella* var. *densior* L. B. Smith, *Contr. U. S. Nat. Herb.* 29:300. 1949.**

Scape-bracts exceeding the internodes; sepals not over 17 mm. long.

NARIÑO: On rocks, Pepino, near Mocoa, alt. 1,200 m., Nov. 21, 1946, *Foster* 2211 (GH, type; US).

**32. *Pitcairnia occidentalis* L. B. Smith, *Phytologia* 4:380, *pl. 1, figs. 4-6.* 1953.**

FIGURE 19

Epiphytic, caulescent; flowering shoot 42 cm. high; stem 4 mm. in diameter, covered with roots and old leaf-bases; leaves all alike, fasciated at the apex of the stem, 5-6 dm. long, sparsely and very obscurely brown-lepidote beneath, glabrous above, sheaths small, ovate, petioles short but distinct, blades linear-lanceolate with a

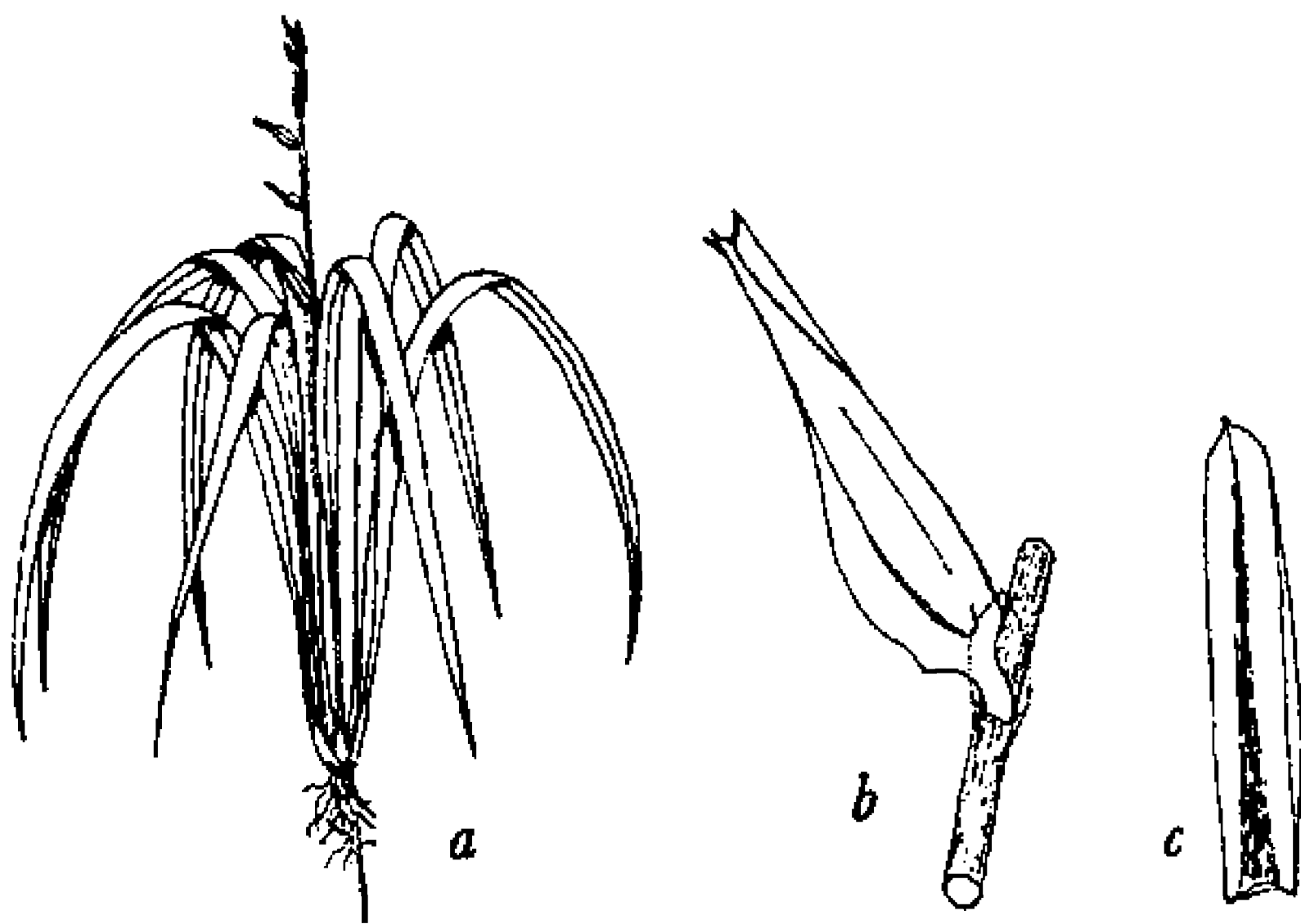


FIGURE 19.—*Pitcairnia occidentalis*: a, Habit,  $\times \frac{1}{10}$ ; b, flower,  $\times 1$ ; c, sepal,  $\times 1$ .

strong narrow median channel, flat, caudate-acuminate, to 30 mm. wide; scape erect, very slender, brown-flocculose; scape-bracts large, all but the uppermost exceeding the internodes, but divergent and very narrow so that the scape is completely exposed; inflorescence simple, very laxly 6-flowered, 12 cm. long, sparsely and obscurely flocculose when young; floral bracts ovate, acute, exceeding the pedicels, thin; sepals broadly rounded and apiculate, 30 mm. long, ecarinate, thin; petals naked.

VALLE: Córdoba, basin of the Río Dagua, western slope of the Cordillera Occidental, alt. 39-60 m., Nov. 14, 1945, *Cuatrecasas* 19849 (VALLE, type, US phot. 3665).

33. *Pitcairnia brachysperma* André, Énum. Bromél. 4. Dec. 13, 1888; Rev. Hortic. 60:564. Dec. 16, 1888.

*Hepetis brachysperma* Mez in DC. Monogr. Phan. 9:973. 1896.

Stemless, 0.4 to 1 meter high; leaves distichous, dimorphic, the outer ones reduced to short triangular sheaths, the inner 4-7 dm. long with long narrow sheaths, petioles distinct, slender, short, blades lance-linear, acuminate, 3-5 cm. wide, white-furfuraceous beneath, soon becoming wholly glabrous; scape slender, erect, sparsely floccose; scape-bracts erect, lanceolate or ovate, acuminate; inflorescence 6-15 cm. long, sparsely white-flocculose; floral bracts ovate, acute, thin; pedicels slender; sepals narrowly triangular, 25-27 mm. long; petals 5 cm. long, red, bearing a ligule at base; anthers 9-10 mm. long; capsule thick-fusiform, about half superior; seeds short-appendaged.

NORTE DE SANTANDER: Region of Sarare, Alto de Santa Ines, Cordillera Oriental, alt. 2,200 m., Oct. 12, 1941, *Cuatrecasas*, *Schultes & C. E. Smith, Jr.*, 12113 (F, GH, US). Same, woods, Oct. 19-23, 1941, 12453 (F, US). Woods, Alto del Venado between Samaria and Toledo, Cordillera Oriental, alt. 2,300-2,400 m., Oct. 31, 1941, *Cuatrecasas*, *Schultes & C. E. Smith, Jr.*, 12811 (F, US).

CUNDINAMARCA: On rocks, cascades of the Río Chirajara, Cordillera Oriental, alt. 1,500 m., Dec. 1875, *André* 1088 (K, type, GH phot. 2521).

NARIÑO: Berruecos, valley of the Río Cauca, alt. 2,000 m., April 1876, *André* 2934 bis in part (fide André, not seen). A form with foliaceous appendages on the floral bracts.

34. *Pitcairnia guaritermae* André, Énum. Bromél. 4. Dec. 13, 1888; Rev. Hortic. 60:564. Dec. 16, 1888.

*Hepetis guaritermae* Mez in DC. Monogr. Phan. 9:973. 1896.

Flowering shoot 6 dm. high; leaves few, fascicled, persistent, the outer ones reduced to triangular-ovate sheaths, the inner to 8 dm. long, glabrous, blades linear-lanceolate, 30-40 mm. wide; scape straight, stout; scape-bracts lanceolate, acuminate, entire, the lower ones setiferous at apex; inflorescence very dense, 15 cm. long, white-furfuraceous; floral bracts linear, acuminate, the lowest to 15 mm. long, scarious; flowers suberect; pedicels slender, 4-7 mm. long; sepals sublinear, broadly acute or obtuse and apiculate; petals 48 mm. long, red, appendaged; stamens included; ovary  $\frac{3}{4}$  superior; ovules caudate.

CUNDINAMARCA: On metamorphic rocks, Guariterma, near Quetame, alt. 2,100 m., Jan. 13, 1876, *André* 1209 (K, type; GH phot. 2516). Shrub savanna, Río Blanco Valley, 10 km. west of Gutiérrez, 45 km. south of Bogotá, Cordillera Oriental, alt. 2,000 m., July 26, 1944, *Grant* 9685 (COL, US).

35. *Pitcairnia macarenensis* L. B. Smith, Bot. Mus. Leaflet. Harvard 16:192, pl. 25, figs. 1-4. 1954.

Stemless, flowering shoot 55 cm. high; leaves dimorphic, some reduced to broadly ovate apiculate dark castaneous sheaths, others over 1 meter long with slender elongate petioles, blades linear-lanceolate with a strong median channel, filiform-acuminate, flat, glabrous; scape erect, slender, sparsely white-flocculose; scape-bracts strict, lanceolate, acuminate, sparsely pale-lepidote; inflorescence dense, 7-9 cm. long, white-flocculose except for the petals; floral bracts narrowly triangular, pale green; pedicels slender, 8 mm. long; flowers suberect; sepals lance-oblong, acute; petals slightly zygomorphic, linear, obtuse, 45 mm. long, red, bearing a large oblong truncate scale at base; stamens included; ovary  $\frac{3}{8}$  superior; ovules caudate.

**META:** On rocks, slopes of Cuchillo Palmitas, Macizo Renjifo, northeastern end of Cordillera La Macarena, alt. 1,500 m., March 1951, Schultes 12126 (US, type, US phot. 4347).

36. *Pitcairnia sylvestris* L. B. Smith, Contr. Gray Herb. 117:29, pl. 2, fig. 27. 1937.

Caulescent; leaves few, erect, sheath broadly ovate, 3 cm. long, dark castaneous, covered with a buff membrane of coalesced scales, petiole slender, 4 dm. long, channeled, bearing dark teeth 1 mm. long, blade broadly acute, acuminate at base, flat, soon glabrous, reticulate between the nerves; scape unknown; inflorescence at least 26 cm. long, dense, axis stout, ferruginous-lanate; floral bracts triangular, acuminate, to 4 cm. long, much exceeding the pedicels but shorter than the sepals, chartaceous, ferruginous-lanate, soon glabrous; flowers spreading; pedicels slender, 1 cm. long; sepals very narrowly triangular, subulate-acuminate, 48 mm. long, chartaceous, glabrous, strongly nerved; petals linear-spathulate, broadly truncate and apiculate, 75 mm. long, bearing a large oblong obtuse scale at base, red; stamens included; ovary  $\frac{2}{3}$  superior; ovules very long-caudate.

**CAUCA:** Primaeval forest, La Costa, District of El Tambo, alt. 1,200 m., 1936, Sneider 939 (S, type; GH phot. 6543).

37. *Pitcairnia kalbreyeri* Baker, Journ. Bot. 19:273. 1881.  
*Hepetis kalbreyeri* Mez in DC. Monogr. Phan. 9:974. 1896.

Stemless, over 2 m. high; leaves dimorphic, some much reduced with spiniform serrate blades, others elongate, their blades linear-lanceolate, acuminate, 4-7 cm. wide, entire, more or less furfuraceous beneath, narrowed at base into an elongate serrate petiole; scape erect, soon glabrous; scape-bracts lanceolate, acuminate; inflorescence laxly racemose, soon glabrous; floral bracts narrowly triangular, about equaling the pedicels; flowers spreading, slender; pedicels 15 mm. long; sepals narrowly triangular, acuminate, 2 cm. long,

ecarinate, striate; petals linear, to 65 mm. long, naked or with minute auricles near the base; ovary  $\frac{3}{4}$  superior.

NORTE DE SANTANDER: Woods, mountains between Ocaña and Pamplona, alt. 1,350–1,500 m., July 1879, *Kalbreyer* 1003 (K, type, GH phot. 2533).

ANTIOQUIA: Moist woods, Fuentes Termales de Santo Domingo, alt. 1,200 m., May 7, 1949, *Scolnik, Molina & Barkley* 19-An-514 (US, immature, identity doubtful).

PANAMA.

38. *Pitcairnia dolichopetala* Harms, *Notizblatt* 12:530. 1935.

Epiphytic, caulescent; stem elongate, 15 mm. in diameter, covered with old leaf-bases; leaves dimorphic, some reduced to broadly ovate entire dark castaneous buff-lepidote sheaths with short linear spinose-serrate blades, others large with long slender spinose-serrate petioles, the blades elliptic or lance-elliptic, acute or acuminate, 36–53 cm. long, 9–16 cm. wide, flat, entire, glabrous; scape to 4 dm. long, brown-floccose; scape-bracts strict, lanceolate, acuminate; inflorescence cylindric, subdense, many-flowered, 20–36 cm. long, densely brown-flocculose except the petals; floral bracts lanceolate, acuminate, subchartaceous, carmine (! Cuatrecasas); pedicels 5–9 mm. long; flowers spreading; sepals lanceolate, acuminate, carinate toward base; petals acute, 8–9 cm. long, bearing two small scales at base, orange (! Cuatrecasas); ovary almost wholly superior; ovules caudate.

VALLE: Alto Mercedes, Cordillera Occidental, alt. 2,000 m., May 1930, *Dryander* 239 (B, type; US). Woods, Piedra de Moler, left bank of the Río Digua, western slope of the Cordillera Occidental, alt. 900–1,180 m., Aug 19–28, 1943, *Cuatrecasas* 14915 (GH, US). Right bank of the Río San Juan below Queremal, between km. 52 and 53, Río Digua Valley, alt. 1,300–1,500 m., Mar. 24, 1947, *Cuatrecasas* 23972 (F, US phot. 3672).

39. *Pitcairnia semaphora* L. B. Smith, *Caldasia* 3:242. 1945.

Caulescent, flowering shoot 3–10 dm. high; leaves trimorphic, the outer greatly reduced and squamiform with short very narrowly triangular entire or spinose blades, the inner leaves to 1 meter long, petiole subdensely serrate with straight dark spines 3 mm. long, blades linear-lanceolate, acuminate, entire, sparsely white-flocculose beneath, soon glabrous; scape, slender, sparsely flocculose; scape-bracts lanceolate, the lowest imbricate, the highest shorter than the internodes; inflorescence dense, 2–3 dm. long; floral bracts ovate, acute, 8–20 mm. long, much exceeding the pedicels, flocculose, red; pedicels slender, 5 mm. long; sepals suboblong, ecarinate, nerved, sparsely white-lepidote; petals to 14 mm. long, exceeding the stamens, naked, yellow-green; ovary  $\frac{2}{3}$  to  $\frac{3}{4}$  superior; ovules caudate.

ANTIOQUIA: In deep shade, moist slopes, between Puerto Valdivia and Yarumal, alt. 2,000 m., Feb. 20, 1942, *Metcalf & Cuatrecasas* 30105 (GH, type; US, US phot. 3489).

CALDAS: Mossy open shale ledge in temperate forest, near head of Río Mapa, Cerro Tatamá, lat. 5°1' N., long. 76°2' W., alt. 2,200 m., Dec. 4, 1944, *St. John* 20886 (US).

40. *Pitcairnia adscendens* L. B. Smith, *Contr. U. S. Nat. Herb.* 29:298, *fig. 20*. 1949.

Epiphytic, scandent, 2.4–6 meters long including the 1.2-meters-long flowering part; stem branched; leaves possibly dimorphic but only large ones seen, 45–60 cm. long, the sheaths suborbicular, 15 mm. wide, dark castaneous, densely appressed-white-lepidote, the petioles 10 cm. long, slender, densely serrate with dark spines 2 mm. long, the blades oblanceolate, acute, 6 cm. wide, soon glabrous, reticulate beneath; scape straight, stout, flocculose; lower scape-bracts subfoliaceous, densely imbricate, the others broadly lanceolate, acute, the uppermost about equaling the internodes; inflorescence straight, 75 cm. long, laxly many-flowered, flocculose; floral bracts spreading to reflexed, membranaceous, brown; pedicels slender; sepals green; petals 85 mm. long, yellow, bearing two auricles which are probably the remains of a deeply incised ligule; ovary  $\frac{3}{4}$  superior.

VALLE: Buenaventura, near sea level, Dec. 8, 1946, *Foster* 2318 (GH, type).

41. *Pitcairnia similis* L. B. Smith, *Contr. U. S. Nat. Herb.* 29:434, *fig. 40*. 1951.

Terrestrial; leaf 1.3 meters long, sheath small, dark castaneous, petiole stout, elongate, subdensely serrate with dark uncinatate spines 2–3 mm. long, covered with a pale brown membrane of coalesced scales, blade linear-lanceolate, acuminate, cuneate, 9 cm. wide; scape erect, 15 mm. in diameter at base; scape-bracts imbricate, the lowest subfoliaceous but entire, the others lanceolate, acute or acuminate, closely enfolding the scape, thin, glabrous; inflorescence erect, slenderly cylindrical, 5 dm. long, subdense, many-flowered, bearing a small coma of sterile bracts at apex, sparsely pale-flocculose; floral bracts reflexed, narrowly lanceolate, acuminate, membranaceous, red; flowers pale yellow; pedicels very slender; sepals 12 mm. long; petals 17 mm. long, naked; stamens included; ovary  $\frac{1}{2}$  superior; ovules caudate.

VALLE: Monte La Guarida, crest of the Cordillera Occidental above La Carbonera (between Las Brisas and Albán), alt. 1950–2000 m., Oct. 18, 1946, *Cuatrecasas* 22262 (GH, type, US phot. 3284, 3285; F).

42. *Pitcairnia volubilis* L. B. Smith, *Phytologia* 5:33, *pl 1, figs. 1–4*. 1954.

FIGURE 20

Epiphytic, climbing; stem over 1 meter long, 5 mm. in diameter, covered by the leaf-sheaths; leaves dimorphic, some with broad blades, others bladeless with the petiole modified into a slender serrate spine, sheaths uniform, suborbicular, 1 cm. long, dark castaneous except for the green apex and margins, sparsely pale-lepidote, pectinate-serrate near the apex, entire below, petioles 5 cm. long, 5 mm.



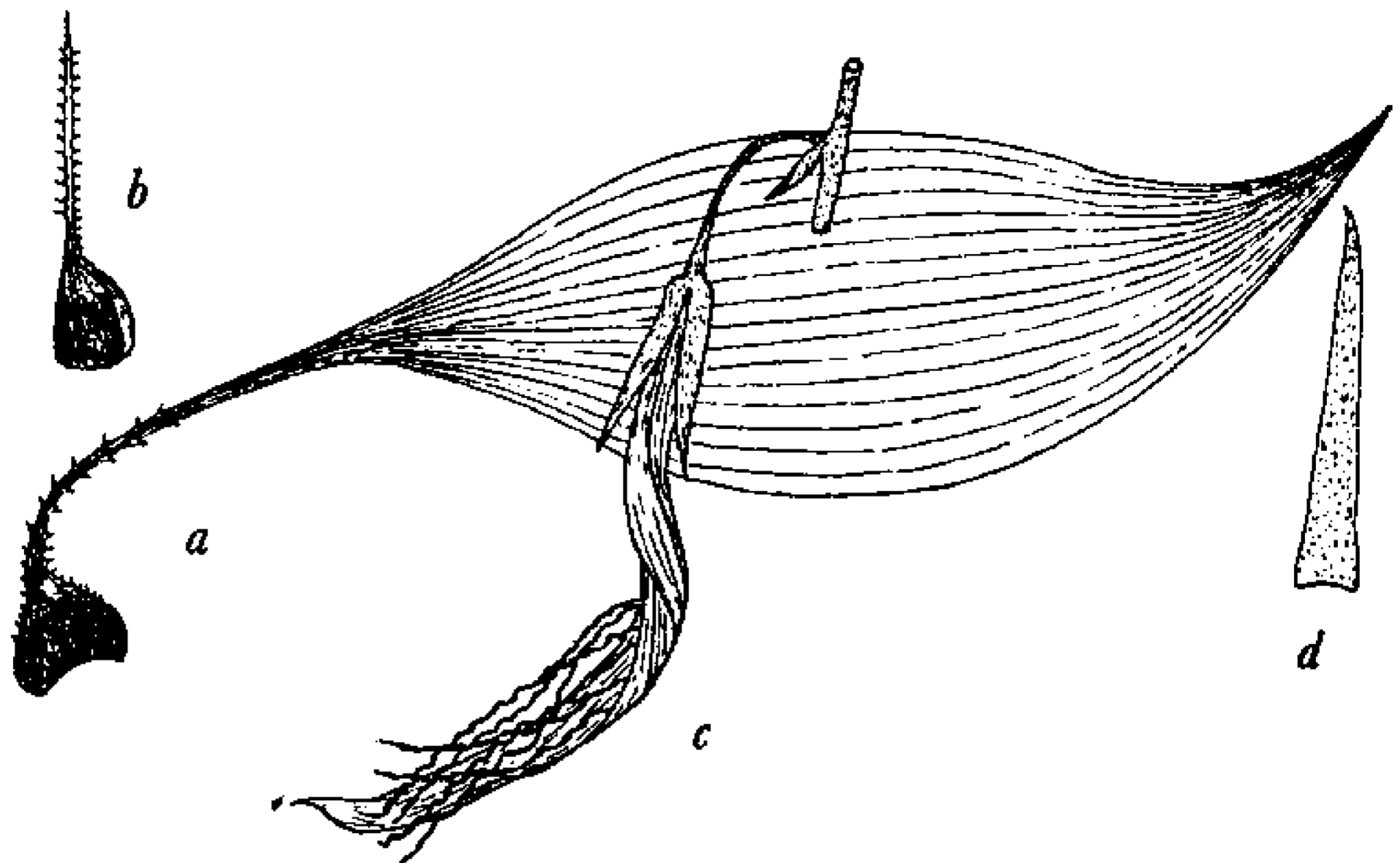


FIGURE 20.—*Pitcairnia volubilis*: *a*, Complete leaf,  $\times \frac{1}{2}$ ; *b*, reduced leaf,  $\times \frac{1}{2}$ ; *c*, flower,  $\times \frac{1}{2}$ ; *d*, sepal,  $\times 1$ .

wide, channeled, the lower half laxly serrate with slender black spines 1.5 mm. long, blades elliptic, acuminate at both ends, 15 cm. long, entire, mottled with dark green, sparsely white-flocculose, soon glabrous; scape elongate, slender, soon glabrous; scape-bracts erect, all but the highest exceeding the internodes, the lower ones like the leaf-blades, the upper lance-ovate and much smaller; inflorescence erect, lax, many-flowered, 35 cm. long, finely white-floccose; floral bracts lance-ovate, acuminate; pedicels spreading, slender; sepals narrowly triangular, abruptly acute, 25 mm. long, ecarinate; petals 10 cm. long, white, naked; ovary slenderly fusiform,  $\frac{1}{2}$  superior; ovules caudate.

NARIÑO: On trees, Las Mesas, Nov. 22, 1946 (bloomed in cultivation June 21, 1952), *Foster* 2229 (US, type, US phot. 4349).

#### Section 2. *Phlomostachys*

*Pitcairnia* section *Phlomostachys* L. B. Smith, *Phytologia* 5:401. 1956.

Inflorescence simple; floral bracts imbricate, showy; pedicels distinct, slenderer than the ovary. Species 43–49.

43. *Pitcairnia capitata* L. B. Smith, *Contr. U. S. Nat. Herb.* 29:301, *fig. 23*. 1949.

Aggregated, subcaulescent, flowering plant 3–4 dm. high; leaves numerous, fasciculate, uniform, slightly exceeding the inflorescence, somewhat narrowed above the sheath but not petiolate, entire, glabrous, the sheaths narrowly triangular, the blades linear, long-acuminate, 13 mm. wide; scape erect, slender, soon glabrous, red; scape-bracts erect and exceeding the internodes but not covering

much of the scape, the lower subfoliaceous, the upper narrowly lanceolate, acuminate, membranaceous; inflorescence simple, densely ellipsoid, 5 cm. long, glabrous; floral bracts elliptic, acuminate, membranaceous, nerved, bright red, the lowest exceeding the sepals, the upper shorter; pedicels short but slender; sepals oblong, acute, 14 mm. long, strongly alate-carinate with the wings decurrent on the ovary; petals 22 mm. long, obtuse, naked, blue except for the pale margin, about equaling the stamens; ovary  $\frac{1}{2}$  superior.

NARIÑO: On rocks, near San Francisco, alt. 2,400 m., Nov. 26, 1946, *Foster* 2262 (GH, type, US phot. 3168).

44. *Pitcairnia maidifolia* (C. Morren) Dene. in *Planch. Fl. Serres* 9:151, pl. 915. 1854.

*Puya maidifolia* C. Morren, *Ann. Soc. Agr. Bot. Gand* 5:453, pl. 1849.

*Puya funkiana* Linden, *Cat.* 5:2. 1850.

*Pitcairnia funkiana* A. Dietr. *Allgem. Gartenzeit.* 19:337. 1851.

*Pitcairnia macrocalyx* Hook. *Bot. Mag.* 79:pl. 4705. 1853.

? *Pitcairnia polyanthoides* Brongn. *Rev. Hort.* 27:244. 1855.

*Phlomostachys funkiana* Beer, *Bromel.* 47. 1857.

*Neumannia maidifolia* K. Koch, *Ind. Sem. Hort. Berol.* 1856; App 2. 1857.

*Pitcairnia oerstediana* Mez in *DC. Monogr. Phan.* 9:448. 1896.

*Hepetis funkiana* Mez in *DC. Monogr. Phan.* 9:973. 1896.

*Hepetis maidifolia* Mez in *DC. Monogr. Phan.* 9:974. 1896.

*Hepetis oerstediana* Mez in *DC. Monogr. Phan.* 9:974. 1896.

Flowering shoot to 1.3 meters high; leaves persistent, the outer ones reduced to blackish sheaths, the inner well developed, about 10 in a fasciculate rosette, their sheaths narrowly ovate, brown-lepidote, petioles to 2 dm. long, blades lanceolate, acuminate, 5–10 dm. long, 6–8 cm. wide, glabrous at maturity; scape erect, more or less furfuraceous, lower scape-bracts foliaceous, exceeding the internodes, the upper ovate, acuminate; inflorescence simple, dense before anthesis, lax afterwards, few-many-flowered, subcylindric, 10–45 cm. long; floral bracts broadly ovate, acute, 30–35 mm. long, about equaling the sepals, green or yellow often tinged with bright red; flowers spreading at anthesis, often subsecund; sepals asymmetric, broadly elliptic, obtuse, 26–30 mm. long, ecarinate, green or yellow, glabrous; petals linear, broadly acute, decurved at anthesis, unequal, 5–6 cm. long, barely exceeding the stamens, naked, white or greenish white; anthers 1 cm. long; ovary almost wholly superior; seeds long-caudate.

MAGDALENA: Woods, Santa Marta, Nov. 1844, *Purdie* (K). Same, 1845, *Purdie* (K, GH phot. 2541). Same, 1898–1901, *H. H. Smith* 2552 (BM, F, GH, PH, US). "Recuerdo," Sierra Nevada de Santa Marta, July 27, 1946, *Foster & C. E. Smith, Jr.*, 1286 (GH). Pueblo Bello, Sierra Nevada de Santa Marta, alt. 960 m., Aug. 19, 1946, *Foster & C. E. Smith, Jr.*, 1470 (GH, US).

NORTE DE SANTANDER: El Banco near Sarare, confluence of Río Cubugón and Río Cobaría, Cordillera Oriental, alt. 320 m., Nov. 15, 1941, *Cuatrecasas*

13192 (COL). In masses on sides of rocks, Oru on pipeline, alt. 540 m., Sept. 17, 1946, *Foster* 1732 (GH).

SANTANDER: Mogotes, December 1945, *Miguel* in hb. *Apolinar-María* 59 (GH).

CUNDINAMARCA: Near Carretera, between Pacho and Rionegro, alt. 1,000–1,200 m., Feb. 22–26, 1942, *García-Barriga* 10768-A (COL). Between Cachipay and Quebrada del Hueso, Cordillera Oriental, alt. 1,600–1,700 m., Mar. 22, 1942, *Cuatrecasas* 13592 (F, GH, US). Subtropical forest, Alto de Quemara, Gazaunta Valley, 10 km. northwest of Medine, Cordillera Oriental, alt. 1,430 m., Oct. 5, 1944, *Grant* 10374 (US).

META: Damp rocky forest in the foothills by the llanos, bank of the Río Guatiquía near Villavicencio, alt. 350 m., Nov. 20, 1948, *Molina & Barkley* 18-M-010 (US). Wet rock at side of river, Sierra La Macarena, alt. 450 m., Nov. 29, 1949, *Philipson, Idrobo & Fernández* 1602 (BM, US). Hanging from steep river bank in shade, dense forest, north side of river near junction of Güejar and Zanza Rivers, north end of Cordillera Macarena, alt. 500 m., Aug. 20, 1950, *S. G. Smith & Idrobo* 1487 (COL, UC, US).

VAUPÉS: Forest, Río Guayabero, alt. 240 m., Nov. 8, 1939, *Cuatrecasas* 7544 (COL, US). Banks by road to San Martín, vicinity of Río Ocoa, Oct. 23, 1945, *P. H. Allen* 3356 (US).

TOLIMA: River bank, Ibagué, 1844, *Goudot* 102 (P).

ANTIOQUIA: Residual woods, region of Rioverde, Hacienda "La Soledad," Quebrada "Curubital," Mun. Sonsón, Jan. 22, 1947, *Gutiérrez* in Goodspeed Exped. 35526 (UC). Moist open woods, near Dabeiba, Mar. 21, 1948, *Johnson & Barkley* 126 (US).

VALLE: Epiphytic, thickets and residual woods, right bank of Río Cali between Puente Sofía and Yanaconas, eastern slope of the Cordillera Occidental, alt. 1,580–1,730 m., Nov. 6, 1944, *Cuatrecasas* 18719 (GH).

NARIÑO; Swampy woods, between Mocoa and Sachamates, eastern slope of the Cordillera, alt. 1,400–1,500 m., Dec. 29, 1940, *Cuatrecasas* 11414 (US).

SURINAM, BRITISH GUIANA, VENEZUELA, COSTA RICA, HONDURAS.

45. *Pitcairnia macranthera* André, Énum. Bromél. 5. Dec. 13, 1888; Rev. Hort. 60:565. Dec. 16, 1888; Bromel. Andr. 29, pl. 9, fig. F. 1889; emend. L. B. Smith, Contr. U. S. Nat. Herb. 29:310. 1949.

Stem erect, scandent, bearing widely separated fascicles of leaves, elsewhere covered with large triangular-oblong mucronate dark-castaneous buff-lepidote sheaths; leaves 5–6 dm. long, petiolate, the sheaths small, broadly ovate, the petioles short, rather densely serrate with dark spines 2 mm. long, buff-lepidote, the blades narrowly oblanceolate, acuminate, 4–5 cm. wide, entire, glabrous, reticulate beneath; scape erect, 8 dm. long; scape-bracts large, imbricate and tightly sheathing the scape, the lowest like those of the stem, the upper lanceolate, acuminate, green; inflorescence cylindrical, 16 cm. long, 3–5 cm. in diameter, the axis sparsely buff-lepidote; floral bracts erect, densely imbricate, broadly ovate, acute, 48 mm. long, even, glabrous, green; flowers 4-ranked; pedicels short but slender; sepals linear-lanceolate, much exceeding the bracts, glabrous; petals linear, acute, 12 cm. long, about equaling the stamens, arcuate-recurved, white, bearing a serrate ligule at base; anthers 2 cm. long; ovary  $\frac{1}{2}$  superior; ovules caudate.

VALLE: Barco, Río Cajambre, Pacific Coast, alt. 5–80 m., April 21–30, 1944, *Cuatrecasas* 17194 (VALLE). On trees, 30 km. above Buenaventura, alt. 30 m., Dec. 8, 1946, *Foster* 2336 (GH, very old, identity dubious).

NARIÑO: Río Cuaiquer, May 1876, *André* 2051 in part (NY). On sandstone rocks, near El Espino, May 1876, *André* 2593 (K, type, GH phot. 2579). Climbing in dense shrubbery, Altaquer, Río Cuaciquiere, alt. 900 m., Nov. 12, 1946, *Foster* 2145 (COL, GH). Barbacoas, road from Santander (Buenavista) to Barbacoas, Río Telembi drainage, alt. 200–840 m., Aug. 3–5, 1948, *García-Barriga* 13159 (COL); 13166 (COL, US).

46. *Pitcairnia fosteriana* L. B. Smith, *Contr. U. S. Nat. Herb.* 29:305, *fig. 26*. 1949.

Flowering plant over 2 meters high; stem stout, elongate, branched, rather laxly foliate; leaf-sheaths broadly ovate, enfolding the stem, covered with a brown membrane of coalesced scales, densely serrate with straight dark castaneous spines 5 mm. long, the blades persistent, dimorphic, some reduced to linear-triangular spinose-serrate spines, others green, 1.2 meters long, the petioles distinct, spinose-serrate, soon glabrous, the blades narrowly lanceolate, acuminate, 8 cm. wide, entire, glabrous; scape elongate, ascending; scape-bracts imbricate, elliptic, strongly spinose-serrate, subcoriaceous, dark castaneous, soon glabrous, the lower with long caudate blades, the upper acute and pungent; inflorescence densely strobilate, fusiform, 30 cm. long, 5 cm. in diameter, the axis and the bases of the flowers covered with spreading dark castaneous scales; floral bracts straight, densely imbricate, like the upper scape-bracts; sepals linear-lanceolate, acuminate, 5 cm. long, carinate, nerved; petals 12 cm. long when dry, greenish white, appendaged, strongly curved; stamens slightly exerted, anthers 25 mm. long; ovary  $\frac{3}{4}$  superior; ovules caudate.

VALLE: Brisas, above Cartago, alt. 900 m., Dec. 10, 1946, *Foster* 2354 (GH).

NARIÑO: Terrestrial, near Sibundoy, alt. 2,220 m., Oct. 29, 1946, *Foster* 1977 (GH, type, US phot. 3116, 3117).

47. *Pitcairnia brunnescens* L. B. Smith, *Contr. U. S. Nat. Herb.* 29:300, *fig. 22*. 1949.

Flowering plant over 1 meter high; stem branched; leaves all alike, up to 1.2 meters long, the blades linear-lanceolate, narrowed at base and bearing dark spines 5 mm. long but scarcely petiolate, entire elsewhere, acuminate, at least 4 cm. wide, soon glabrous; scape elongate, ascending; scape-bracts densely imbricate, the lower foliaceous, the upper elliptic, acute, densely serrate, green, inconspicuously pale-flocculose; inflorescence very dense, cylindric, many-flowered, 30 cm. long, 7 cm. in diameter; floral bracts erect, imbricate but with the apices spreading, lanceolate, subcoriaceous and rugulose when dry, brownish, the bases brown-flocculose; pedicels short but slender; sepals narrowly triangular, acuminate, 4 cm. long, glabrous, green except for the dark brown apex; petals recurved, lingulate, broadly

rounded, 9–10 cm. long, 2 cm. wide, naked, white; stamens included, the anthers 20 mm. long; ovary  $\frac{1}{2}$  superior; ovules caudate.

NARIÑO: Sibundoy, near Buenos Aires, alt. 2,700 m., Oct. 29, 1946, *Foster* 2010 (GH, type, US phot. 3181; US).

ECUADOR.

48. *Pitcairnia brongniartiana* André, Énum. Bromél. 5. Dec. 13, 1888; Rev. Hortie. 60:565. Dec. 16, 1888.

*Hepetis brongniartiana* Mez in DC. Monogr. Phan. 9:973. 1896.

Caulescent, flowering shoot 1.2–1.8 meters high, brown-lepidote becoming glabrous; leaves over 7 dm. long, the sheath small, suborbicular, dark castaneous, petiole distinct, laxly armed with spines 1.5 mm. long, blade narrowly lanceolate, acuminate, 8 cm. wide; scape erect, stout, scape-bracts strict, imbricate, large, ovate, the lowest firm, dark castaneous, the upper membranaceous, pale brown when dry; inflorescence 3 dm. long, dense at anthesis; floral bracts equaling the sepals, erect before anthesis, later deciduous; flowers reflexed in fruit; pedicels much narrower than the ovary, 8–10 mm. long; sepals oblong, acute, 40–45 mm. long, chartaceous, brown; petals white or yellowish; ovary almost wholly superior; capsule shorter than the sepals; seeds long-caudate.

VALLE: Terrestrial, dense forest along Río Engaña, alt. 675 m., Apr. 2–4, 1939, *Killip* 34835 (US). Epiphytic, woods, La Laguna, left bank of the Río Sanquiní, western slope of the Cordillera Occidental, alt. 1,250–1,400 m., Dec. 10–20, 1943, *Cuatrecasas* 15591 (F, GH). Anchicaya, alt. 500 m., Aug. 11, 1952, *Køie* 4814 (C); 4833 (C).

NARIÑO: On rocks by Río Cuaiqueres, May 1876, *André* 3394 (K, type, GH phot. 2576). Climbing on trees, Altaquer, alt. 1,050 m., Nov. 11, 1946, *Foster* 2132 (GH).

49. *Pitcairnia squarrosa* L. B. Smith, *Caldasia* 5:11, *fig.* 1948.

Terrestrial in dense masses; leaves to 1.2 meters long, exceeding the inflorescence, sheaths small, ovate, dark castaneous, covered with a buff membrane of coalesced scales, petioles elongate, channeled, 6 mm. wide in the middle, armed with dark recurved spines 3 mm. long, blades linear, long-acuminate, 2 cm. wide, entire, glabrous; scape erect, 6 mm. in diameter; scape-bracts densely imbricate, the lowest subfoliaceous, the others elliptic, dark castaneous with divergent green apices; inflorescence cylindrical, 30–35 cm. long, glabrous; floral bracts very densely imbricate, like the scape-bracts but with spreading apices, 7 cm. long, equaling or exceeding the flowers; pedicels short but slender; lateral sepals slightly carinate; petals to 7 cm. long, about equaling the stamens, naked; ovary  $\frac{1}{2}$  superior; capsule slenderly ellipsoid, 22 mm. long; seeds long-caudate.

49a. *Pitcairnia squarrosa* var. *squarrosa*

Floral bracts castaneous with acuminate green apices; petals white.

CUNDINAMARCA: Sasaima, San Bernardo trail, La María between La María and La Victoria Quebradas, alt. 1,750–1,940 m., Jan. 23, 1948, *García-Barriga* 12553 (COL, US).

49b. *Pitcairnia squarrosa* var. *colorata* L. B. Smith, *Caldasia* 5:12. 1948.

Floral bracts bright red; petals dark purple.

VALLE: Epiphytic, bank of the Río Anchicayá, Sabaletas, western slope of the Cordillera Occidental, alt. 25 m., Nov. 13–16, 1945, *Cuatrecasas* 19862 (F, US). Cliffs, 30 km. above Buenaventura, alt. 30 m., Dec. 8, 1946, *Foster* 2321 (GH, type; COL). Anchicayá, alt. 500 m., Aug. 11, 1952, *Køie* 4817 (C, US).

49c. *Pitcairnia squarrosa* var. *aurantiaca* L. B. Smith, *Phytologia* 5:396. 1956.

Inflorescence 10 cm. long; floral bracts with short broadly acute apices; sepals 25 mm. long; petals orange.

VALLE: Anchicayá, alt. 500 m., Aug. 11, 1952, *Køie* 4785 (C, type, US phot. 4459).

### Section 3. *Neumannia*

*Pitcairnia* section *Neumannia* L. B. Smith, *Phytologia* 5:401. 1956.

Inflorescence simple; floral bracts imbricate, showy; pedicels nearly as stout as the ovary or lacking. Species 50–58.

50. *Pitcairnia archeri* L. B. Smith, *Contr. Gray Herb.* 104:79, *pl. 3, figs. 20, 21.* 1934. FIGURE 21

Very short-caulescent; leaves polystichous, very obscurely punctulate-lepidote, dimorphic, the outer reduced to broadly ovate entire

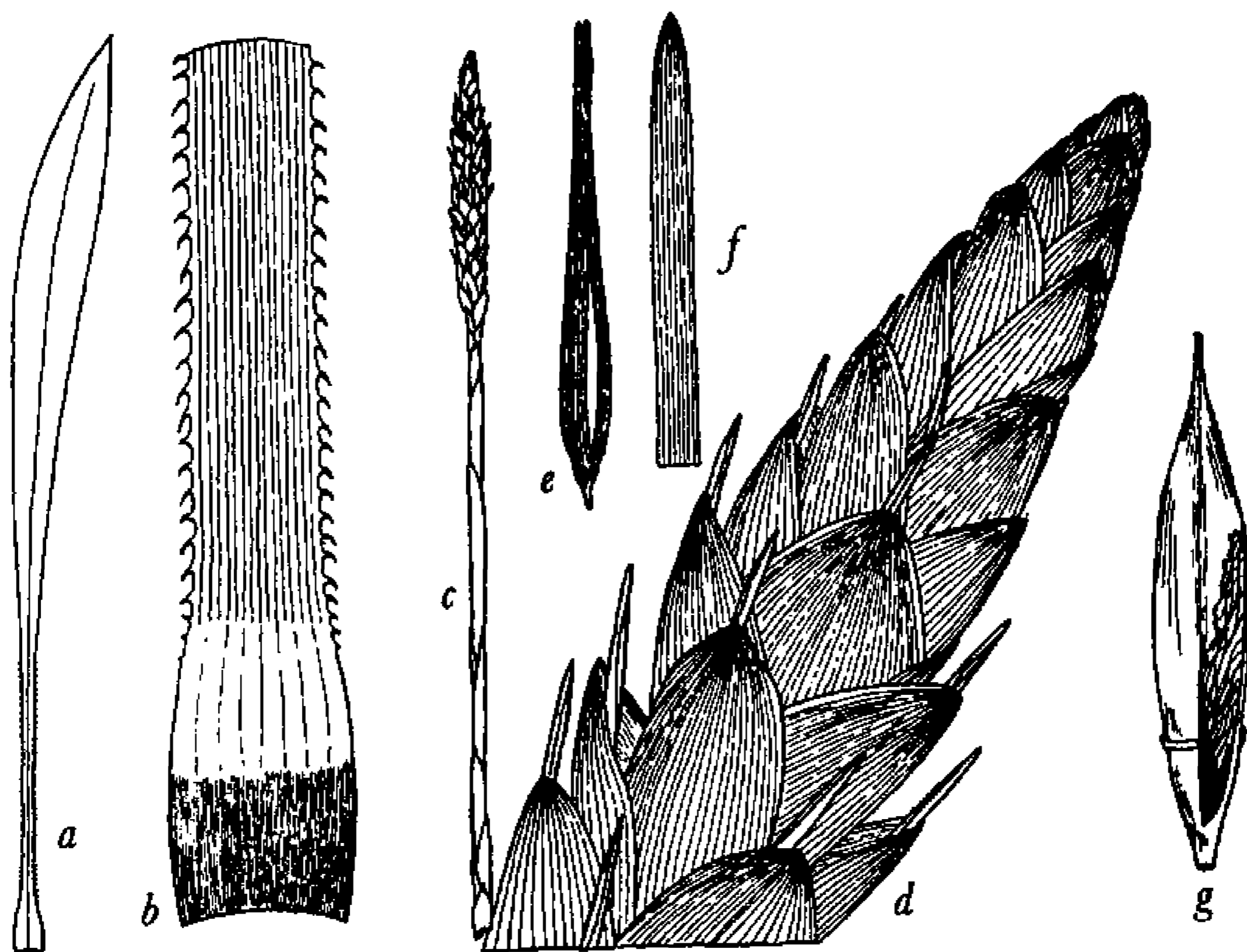


FIGURE 21.—*Pitcairnia archeri*: a, Leaf,  $\frac{1}{10}$ ; b, base of leaf,  $\times 1$ ; c, scape and inflorescence,  $\times \frac{1}{10}$ ; d, apex of inflorescence,  $\times 1$ ; e, flower,  $\times 1$ ; f, sepal,  $\times 1$ ; g, ovary,  $\times 2$ .

sheaths, the inner to 1.5 meters long, contracted above the sheath into an elongate spinose-serrate deeply channeled petiole, the blade lanceolate, entire, 6–8 cm. wide, flat except for a strong median channel; scape erect; scape-bracts imbricate, elliptic; inflorescence densely cylindrical, 8–35 cm. long; floral bracts strict, imbricate, broadly elliptic, 20–35 mm. long, even or finely striate, subcoriaceous, bright red; flowers slenderly pedicellate; sepals linear, to 4 cm. long, ecarinate, white, soon turning black toward the apex; petals naked, apparently included at anthesis.

CHOCÓ: On ground, La Concepción, 15 km. east of Quibdó, alt. ca. 75 m., Apr. 20–May 23, 1931, *Archer* 2078 (US, type, GH phot. 6090). Terrestrial, dense forest, Corcovada Region, upper Río San Juan, ridge along Yeracúf Valley, alt. 200–275 m., Apr. 24, 25, 1939 *Killip* 35255 (US). Epiphyte, dense forest, Istmina, on Río San Juan, alt. ca. 75 m., Apr. 29, 1939, *Killip* 35468 (US). Valley of the upper Río Atrato, between Carmen de Atrato and Tutunendo, km. 52–70 on the route between Bolívar and Quibdó, alt. 500–600 m., July 25, 26, 1944, *García-Barriga* 11140 (US).

VALLE: Epiphytic and terrestrial, Pacific Coast, Río Cajambre, Barco, alt. 5–80 m., Apr. 21–30, 1944, *Cuatrecasas* 17157 (F, GH). Anchicayá, alt. 500 m., Aug. 11, 1952, *Køie* 4784 (C).

NARIÑO: Above El Diviso, alt. 705 m., Nov. 13, 1946, *Foster* 2151, (GH, US). Barbacoas, District of Santander (Buenavista) to Barbacoas (bank of the Río Telembi), alt. 200–840 m., Aug. 3–5, 1948, *García-Barriga* 13205 (US).

51. *Pitcairnia maritima* L. B. Smith, *Contr. U. S. Nat. Herb.* 29:311, *fig. 31*. 1949.

Flowering plant 1.8 meters high; leaves few, 1.8 meters long, long-petiolate, the sheaths small, broadly reniform, dark ferruginous-lanate, petioles serrate with dark spines 2 mm. long, the blades linear-lanceolate, acuminate, cuneate, entire, 9 cm. wide, brown-lanate but soon glabrous; scape straight, nearly 1 meter long, 1 cm. in diameter, densely lanate; scape-bracts very densely imbricate, large, lanceolate, thin; inflorescence densely cylindrical, over 7 dm. long, 4 cm. in diameter, brown-lanate; floral bracts erect, imbricate, broadly ovate, 4 cm. long, slightly exceeded by the sepals, even, dark brown, thin-coriaceous; flowers 3-ranked; pedicels short and stout; sepals lanceolate, strongly asymmetric, brown; petals recurving after anthesis, strap-shaped, broadly rounded, 55 mm. long, yellow, densely and minutely brown-lepidote outside, bearing a cupuliform scale at base; ovary  $\frac{3}{8}$  superior; ovules unknown.

VALLE: On rocks near sea level, Buenaventura, Dec. 8, 1946, *Foster* 2319 (GH, type, US phot. 3180).

52. *Pitcairnia elongata* L. B. Smith, *Contr. U. S. Nat. Herb.* 29:304, *fig. 25*. 1949.

Scandent, long-caulescent, flowering plant 1.8–2.1 meters long; leaves persistent, up to 1.5 meters long, strongly petiolate, the sheaths small, broadly ovate, dark castaneous, covered with a brown mem-

brane of coalesced scales, the petioles elongate, densely armed with dark stout often forked spines 5 mm. long, wholly brown-lepidote, the blades oblanceolate, acute, 1 meter long, 15 cm. wide, glabrous, reticulate; scape slender, densely appressed-brown-lepidote; scape-bracts densely imbricate, the lower subfoliaceous, the others broadly lanceolate, acuminate, papyraceous; inflorescence slenderly cylindrical, lax at the base, but the sterile or immature apex covered with bright red bracts, the axis densely brown-lepidote; floral bracts over 15 cm. long, stramineous; flowers erect or suberect but not imbricate nor concealing the axis; pedicels very short and stout; sepals lanceolate with caudate-acuminate spirally recurved apices, coriaceous, dark castaneous except for the flavous margins and apex, glabrous; petals yellow, densely flocculose-lepidote outside, at the base bearing a ligule 2 cm. long; stamens included; ovary  $\frac{1}{2}$  superior; ovules caudate.

NARIÑO: On mounds of shrubbery, above El Diviso, alt. 705 m., Nov. 13, 1946, *Foster* 2154 (GH, type, US phot. 3177, 3178).

ECUADOR.

53. *Pitcairnia arcuata* (André) André, *Enum. Bromél.* 5. Dec. 13, 1888; *Rev. Hort.* 60:565. Dec. 16, 1888.

*Neumannia arcuata* André, *Rev. Hort.* 58:108, *pl.* 1886.

*Hepetis arcuata* Mez in DC. *Monogr. Phan.* 9:973. 1896.

Short-caulescent, to 7 dm. high; leaves 12–20, fascicled, petiole distinct, dark-spinose toward base, blade lanceolate, 40 cm. long, 7.5–10 cm. wide, entire, glabrous, scape stout, shorter than the leaves; scape-bracts imbricate, elliptic-ovate, acuminate, inflorescence densely cylindrical, arching, 25 cm. long; rhachis long-lanate; floral bracts elliptic, acute, to 7 cm. long, bright red; pedicels to 10 mm. long; sepals to 5 cm. long, carinate toward base, soon glabrous, bright red; petals 75 mm. long, pale flavous, bearing very large scales; anthers 16 mm. long; ovary almost wholly superior; ovules caudate.

NARIÑO: On schist ledges, between Tuquerres and Barbacoas, alt. 1,800 m., May 1876, *André* 3803 (K, type, GH phot. 2580).

54. *Pitcairnia bakeri* (André) André ex Mez in DC. *Monogr. Phan.* 9:460. 1896; emend. L. B. Smith, *Caldasia* 5:4, *fig.* 1948. FIGURE 22

*Quesnelia bakeri* André, *Enum. Bromél.* 4. Dec. 13, 1888; *Rev. Hort.* 60:564. Dec. 16, 1888.

*Hepetis bakeri* Mez in DC. *Monogr. Phan.* 9:973. 1896.

Caulescent, flowering plant 1.8–2.4 meters high; stem prostrate, 2 cm. in diameter when dry, dark castaneous, densely foliate; leaves apparently dimorphic, some with large triangular-ovate sheaths and greatly reduced blades, others to 1.2 meters long, with distinct petiole and broad blade, their sheaths suborbicular, 4–5 cm. in diameter, dark castaneous, covered with a brown membrane of coalesced scales, coriaceous, petioles elongate, to 13 mm. wide,



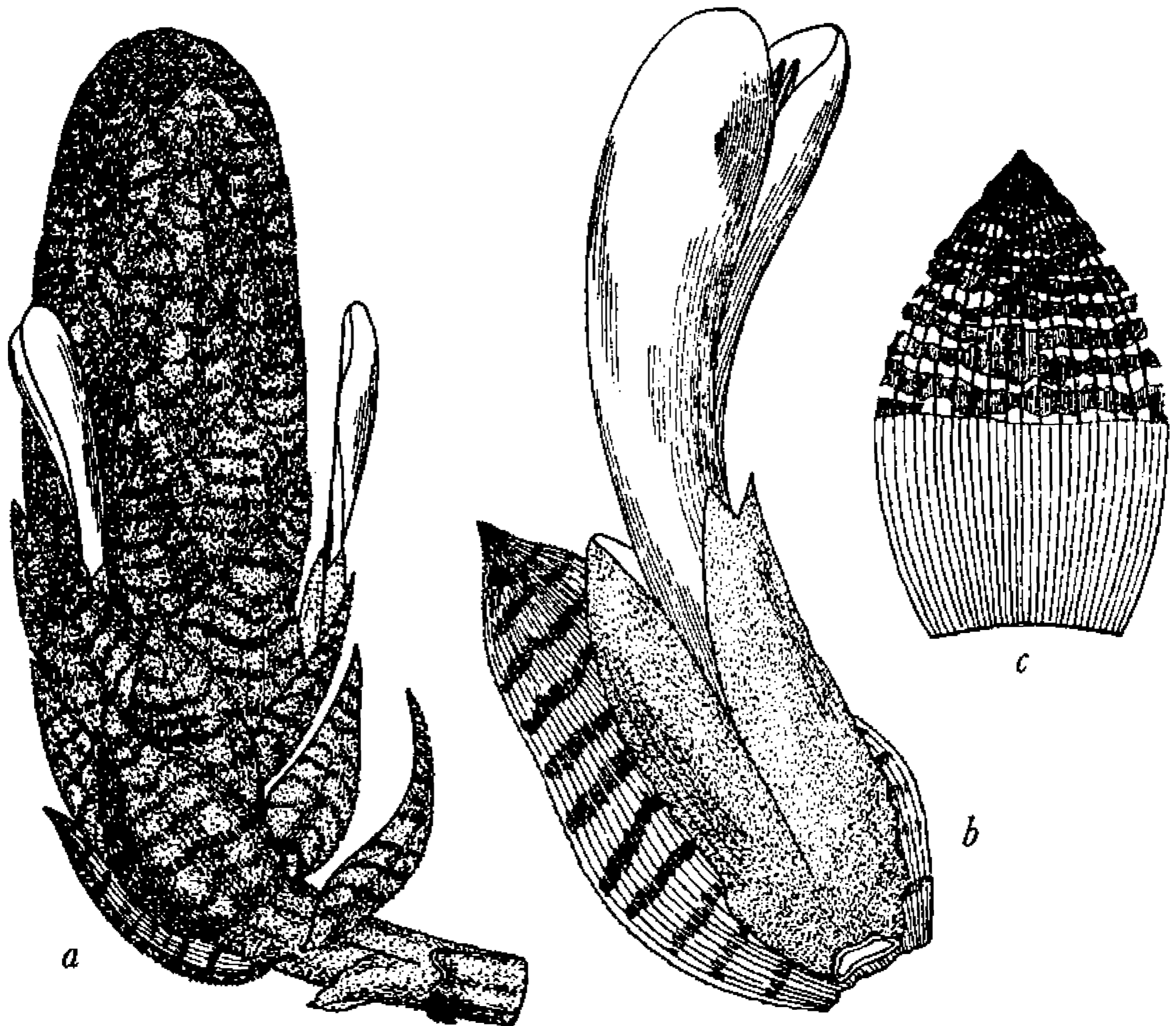


FIGURE 22.—*Pitcairnia bakeri*: *a*, Inflorescence,  $\times \frac{1}{2}$ ; *b*, floral bract and flower,  $\times 1$ ; *c*, old partially disintegrated floral bract,  $\times 1$  (*a* and *b*, after André).

channeled, subdensely armed with straight dark spines to 3 mm. long, blades linear-lanceolate, acuminate, nearly 8 cm. wide, entire, glabrous; scape straight, 1 cm. in diameter, covered with spreading ferruginous scales; scape-bracts densely imbricate, the lower sub-foliaceous; inflorescence very densely cylindric, obtuse, 17–35 cm. long, 6–7 cm. in diameter; floral bracts broadly ovate, triangular-acute, 5 cm. long, thin, purple-castaneous, rugose in transverse bands, brown- or ferruginous-farinose; sepals broad, rounded, 4 cm. long, thick; petals broadly rounded, cucullate, retuse, 7–8 cm. long, lepidote, bearing a large triangular ligule at base; anthers 15 mm. long; ovary about half superior.

NARIÑO: Moist woods near San Pablo, alt. 1,275 m., May 1876, *André* 3391 (K, type). Terrestrial, partly climbing on other plants, "El Paramo" above El Diviso, alt. 720 m., Nov. 13, 1946, *Foster* 2161 (COL, GH, US).

ECUADOR.

55. *Pitcairnia oblanceolata* L. B. Smith, *Contr. Gray Herb.* 117:26, *pl.* 2, *fig.* 18. 1937.

Climbing woody stem averaging over 1 meter long; leaves few, erect, sheaths broadly ovate, 3–4 cm. long, dark castaneous, covered with a buff membrane of coalesced scales, petiole distinct, stout, channeled,

densely serrate with dark spines to 3 mm. long, blades oblanceolate, acute, 85–95 cm. long, 105–125 mm. wide, entire, flat, glabrous or slightly flocculose beneath; scape erect, stout, 3–4 dm. long; scape-bracts very densely imbricate, some subfoliaceous, others vaginiform, elliptic, caudate; inflorescence simple, densely cylindrical, 3–8 dm. long, 3–4 cm. thick before anthesis; floral bracts broadly elliptic, acute or acuminate, 7–8 cm. long, much exceeding the sepals, chartaceous, pink or dark ochraceous, drying to castaneous; flowers erect or spreading at anthesis; pedicels to 1 cm. long; sepals oblanceolate, 45 mm. long, 10 mm. wide, thin; petals 8 cm. long, exceeding the stamens, yellow, bearing a large truncate scale at base.

VALLE: Woods between Pavas and Miramar, right bank of the Río Anchicayá, western slope of the Cordillera Occidental, alt. 350–450 m., Apr. 15, 1943, Cuatrecasas 14373 (GH).

COSTA RICA, PANAMA.

56. *Pitcairnia nigra* (Carr.) André, Énum. Bromél. 5. Dec. 13, 1888, incorrectly attributed to Carr.; Rev. Hortie. 60:565. Dec. 16, 1888.

*Neumannia nigra* Carr. Rev. Hortie. 53:390, pl. 1881.

*Pitcairnia gravisiana* Wittm. Bot. Jahrb. 11:56. 1889.

*Hepetis nigra* Mez in DC. Monogr. Phan. 9:974. 1896.

Long-caulescent; leaves few, fasciculate, trimorphic, the outer with short subtriangular sheaths and acicular spinose-serrate blades, others with small lanceolate entire blades, and the largest with stout petioles 3 dm. long, blades elliptic or obovate, apiculate, cuneate, 30–37 cm. long, 10–14 cm. wide, soon glabrous, entire; scape erect or ascending, short; scape-bracts densely imbricate, elliptic, acute, pungent, spinose-serrate, red; inflorescence 1–5 dm. long; axis densely ferruginous-lanate; floral bracts elliptic, acute, arched-spreading, 65 mm. long, carinate toward apex, bright red, glabrous; flowers sessile; sepals 36 mm. long, thin, nerved; petals acute, 10 cm. long, very dark purple, appendaged; stamens included; ovary almost wholly superior; seeds long-caudate.

VALLE: By Río Dagua, alt. 0–300 m., *Lehmann* 3854 (1 Mez).

NARIÑO: Altaquer, alt. 1,000 m., May 1876, *André* 3360 (K, GH phot. 2578). Climbing on trees, Ricaurte, alt. 1,200 m., Nov. 15, 1946, *Foster* 2186 (GH).

ECUADOR.

57. *Pitcairnia barrigae* L. B. Smith, *Caldasia* 5:5, fig. 1948.

Leaves 1 meter or more long, sheaths dark castaneous, toward apex densely serrate and very densely brown-lepidote, petioles narrow and very distinct, laxly armed toward base with dark nearly straight spines to 2 mm. long, blades linear-lanceolate, long-attenuate at both ends, 3 cm. wide, entire, glabrous; scape 13 mm. in diameter, brown-lepidote; scape-bracts erect, densely imbricate, the lowest subfoliaceous and somewhat petiolate, over 25 cm. long, densely serrate

below the blade, the highest not at all petiolate; inflorescence dense, very densely ferruginous-lepidote; floral bracts imbricate, lanceolate, acuminate, to 55 mm. long, exceeding the sepals, membranaceous; pedicels short and stout; sepals lance-oblong, acuminate, 34 mm. long, the lateral ones alate-carinate; petals naked, 8 cm. long, the blade oblong, broadly rounded, to 14 mm. wide; stamens included, anthers 15 mm. long; ovary  $\frac{3}{4}$  superior; ovules caudate.

CHOCÓ: Epiphytic, between Carmen de Atrato and Tutunendo, km. 52 to 70 on the road from Bolívar to Quibdó, valley of the upper Río Atrato, alt. 500–600 m., July 25, 26, 1944, *García-Barriga* 11136 (US, type; COL).

58. *Pitcairnia atrorubens* (Beer) Baker, Journ. Bot. 19:307. 1881.

*Phlomostachys atrorubens* Beer, Bromel. 48. 1857.

*Puya warszewiczii* H. Wendl. ex Hook. in Bot. Mag. Curtis 87:pl. 5225. 1861.

*Pitcairnia lamarcheana* E. Morr. ex Baker, Handb. Bromel. 111. 1889.

*Pitcairnia lindeni* Baker, Handb. Bromel. 112. 1889.

*Pitcairnia atrorubens*  $\beta$ . *lamarcheana* Mez in DC. Monogr. Phan. 9:457. 1896.

*Hepetis atrorubens* Mez in DC. Monogr. Phan. 9:973. 1896.

*Hepetis atrorubens* var. *lamarcheana* Mez in DC. Monogr. Phan. 9:973. 1896.

*Hepetis lindeni* Mez in DC. Monogr. Phan. 9:974. 1896.

Plant 6–9 dm. high; leaves about 6, some much reduced, ovate, abruptly acute, brown, others 6–9 dm. long, petiolate, sheaths triangular-ovate, brown-lepidote, petioles 2 dm. long, channeled, armed with small dark recurved spines, tomentose-lepidote beneath, blades lanceolate, acuminate, 5 dm. long, 55–60 mm. wide, entire, glabrous; scape erect, stout, elongate; scape-bracts with a large ovate base and long acuminate blade, subglabrous, especially the upper ones brownish purple; inflorescence subspicate, obtuse, densely many-flowered, 2–3 dm. long, 3–5 cm. thick; floral bracts broadly ovate with a narrowly triangular blade, 5–7 cm. long, glabrous, deep reddish purple to bright red or rarely yellowish; flowers sessile; sepals narrowly winged near apex, minutely lanate; petals linear, broadly acute, exceeding the stamens, unequal, to 77 mm. long, pale yellow, bearing a large bidentate scale at base; ovary  $\frac{3}{4}$  superior; ovules long-caudate; capsule broadly ovoid, 13–20 mm. long.

BOYACÁ: High forested barranco, El Umbo, 130 miles north of Bogotá, alt. 1,200 m., Apr. 4, 1933, *Lawrance* 732 (GH).

COSTA RICA, PANAMA, MEXICO (?)

### Subgenus 2. *Schweideleria*

*Pitcairnia* subgenus *Schweideleria* E. Morr. ex Baker, Handb. Bromel. 90. 1889.

Fruit dehiscent; seeds with a circumferential wing. Species 59–71.

59. *Pitcairnia haughtii* L. B. Smith, Contr. U. S. Nat. Herb. 29:307, fig. 28 1949.

Flowering plant about 1 meter high; leaves few, to 1.5 meters long, petiolate, glabrous, the blades linear-lanceolate, long-acuminate, 5 cm. wide; scape apparently erect or ascending, 7 mm. in diameter, densely brown-lanate; scape-bracts foliaceous and much exceeding the internodes but covering little of the scape; inflorescence subsimple with a short 2-flowered branch at base, lax, sparsely brown-flocculose, the axis slender, straight; primary bract deciduous, unknown; floral bracts quickly deciduous, the only one known lanceolate, acuminate, slightly exceeding the pedicel; flowers spreading or reflexed; pedicels slender, 2 cm. long; sepals asymmetric, narrowly lanceolate, acute, green; petals linear-spatulate, broadly rounded and apiculate, 8 cm. long, red, bearing a large truncate scale at base; stamens included; ovary almost wholly superior.

CAUCA: In very sterile soil, Chuare, alt. 70 m., Dec. 24, 1946, *Haught* 5389 (US, type, US phot. 3521, 3526).

60. *Pitcairnia patentiflora* L. B. Smith, Contr. Gray Herb. 127:18, pl. 1, fig. 4. 1939.

Stemless, 5–20 dm. high; leaves numerous, subbulbous-rosulate, 3–10 dm. long, sheaths broadly ovate, 2 cm. wide, dark castaneous, white-lepidote, blades linear, acuminate, somewhat or not at all narrowed at base, covered with spreading white scales when young, becoming glabrous, laxly serrate with straight spreading spines 2 mm. long or entire toward apex; scape straight, glabrous; scape-bracts strict, the lower foliaceous, the upper lanceolate, entire, several times shorter than the internodes; inflorescence laxly bipinnate or subtripinnate, glabrous; primary bracts lanceolate, much shorter than the sterile bases of the branches; racemes very lax, 6–28 cm. long; floral bracts lanceolate, acute, 5 mm. long; flowers spreading; pedicels 10–15 mm. long; sepals narrowly triangular, acuminate, carinate at base; petals linear, acute, slightly longer than the sepals, red, naked; ovary  $\frac{2}{3}$  superior.

- 60a. *Pitcairnia patentiflora* var. *patentiflora*

Plant 5–10 dm. high; leaf-blades scarcely or not at all narrowed toward base, 3–15 mm. wide, serrate for most of their length; sepals 15–20 mm. long.

VAUPÉS: Near Cerro Monachí, Río Naquieni, Río Guainia Basin, June 1948, *Schultes & López* 10082 (US).

VENEZUELA, BRASIL.

60b. *Pitcairnia patentiflora* var. *subintegra* L. B. Smith, Bot. Mus. Leaflet. Harvard 17:68. 1955.

Leaf-blades distinctly narrowed toward base, to 20 mm. wide, serrate only at extreme base; sepals 13–18 mm. long.

VAUPÉS: Savanna de Yapobodá, Alto Río Cuduyarí, Dec. 10, 1943, *P. H. Allen* 3116 (COL). Cerro Chiribiquete by the Río Macaya, Jan. 17, 1944, *Gutierrez* 672 (GH). On sandstone rocks, savanna, Cerro Yapoboda, Río Kuduyarí, alt. 450 m., Oct. 5, 1951, *Schultes & Cabrera* 14214 (COL, GH, US). Quartzite savanna near headwaters of Río Kuduyarí (tributary of Río Vaupés), alt. 270–300 m., lat. 1°20'N., long. 70°30'W., April 1953, *Schultes & Cabrera* 20009 (COL, GH, K, NY, US). Cerro Isibukurí, Río Kananarí (affluent of Río Apaporis), Oct. 29, 1951 *Schultes & Cabrera* 14532 (US, type; B; COL; F; GH).

60c. *Pitcairnia patentiflora* var. *macrantha* L. B. Smith, Bot. Mus. Leaflet. Harvard 17:68. 1955.

Plant 2 m. high; leaf-blades distinctly narrowed toward base, to 25 mm. wide, serrate only at extreme base; sepals 25 mm. long.

VAUPÉS: Sandstone ledges, Cerro Chiribiquete, Río Macaya, upper Río Apaporis basin, alt. 630 m., July 24, 1943, *Schultes* 5613 (US, type; GH).

61. *Pitcairnia bulbosa* L. B. Smith, *Phytologia* 5:178, pl. 1, figs. 7–10. 1955.

FIGURE 23

Stemless, over 1 meter high; leaves numerous, 5 dm. long, sheaths suborbicular, 3 cm. in diameter, dark castaneous, forming a compact pseudobulb 8 cm. in diameter, blades very narrowly triangular, acuminate, pungent, not at all narrowed at the base, 25 mm. wide, covered with a membrane of coalesced cinereous scales, becoming glabrous above, very laxly serrate with uncinata antrorse spines 2 mm. long; scape unknown; inflorescence laxly bipinnate, red, sparsely pale-lepidote becoming glabrous; primary bracts narrowly triangular, acuminate, 10 cm. long, exceeding the short peduncle; branches

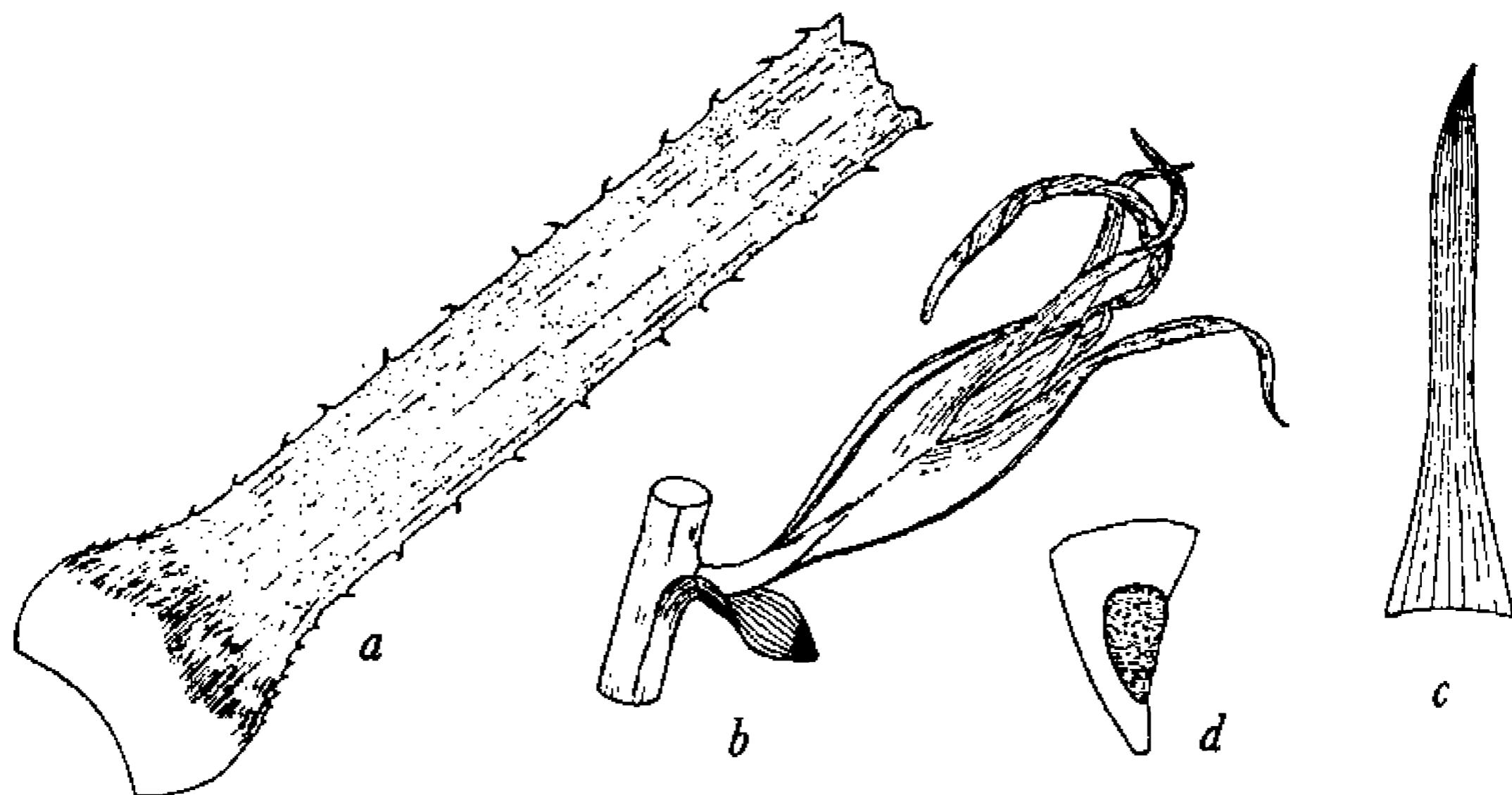


FIGURE 23.—*Pitcairnia bulbosa*: *a*, Base of leaf, dorsal side,  $\times \frac{1}{2}$ ; *b*, flower,  $\times 1$ ; *c*, sepal,  $\times 1$ ; *d*, seed,  $\times 5$ .

spreading-ascending, laxly many-flowered, 35 cm. long; floral bracts broadly elliptic, acute, 10 mm. long; flowers spreading; sepals linear-lanceolate, acute 35 mm. long, ecarinate, sulcate with age; petals about 45 mm. long, greenish white, naked; ovary slightly more than half inferior; capsule dehiscent at apex.

VAUPÉS: Dry rich soil in crevices of granite rock by Río Atabapo, alt. 250 m., Nov. 27, 1948, *Araque-Molina & Barkley* 18-Va-228 (US, type).

VENEZUELA.

62. *Pitcairnia heliophila* L. B. Smith, *Caldasia* [1], No. 5:8, *fig.* 1942.

Plant over 7 dm. high; scape 7 mm. in diameter, sparsely white-floccose; scape-bracts linear, acuminate, pungent, to 36 cm. long and 1 cm. wide, densely white-floccose on both sides, subdensely serrate with straight spreading spines 1.5 mm. long; inflorescence laxly tripinnate, 4 dm. long, 2 dm. wide, glabrous, red; primary bracts short, narrowly triangular; branches spreading, slightly divided, lax; floral bracts elliptic, apiculate, about equaling the pedicels or the lowest somewhat shorter, submembranaceous; flowers spreading; pedicels slender, 4–6 mm. long; sepals linear, 2 cm. long; petals 35 mm. long, naked; ovary  $\frac{3}{4}$  superior; ovules narrowly winged.

VICHADA: On ferruginous sandstone in full sunshine, about 60 km. south 60° east of Orocué, alt. 150 m., Apr. 19, 1939, *Haught* 2774 (GH, type; COL; US, US phot. 3478).

63. *Pitcairnia costata* L. B. Smith, *Caldasia* 5:7, *fig.* 1948.

Stemless, densely aggregated; leaves all alike, subdistichous, to 1.5 meters long, much exceeding the inflorescence, soon glabrous, the sheaths narrow, pale, auricled at base, the blades linear, long-acuminate, conduplicate, 2 cm. wide; scape erect, slender, glabrous; lowest scape-bracts foliaceous, the upper broadly ovate, acuminate, about equaling the internodes or slightly shorter; inflorescence 15–25 cm. long, subglabrous; floral bracts broadly ovate, acuminate, about equaling the pedicels, obscurely lepidote toward apex; flowers divergent; pedicels, slender, 2 cm. long tricostate with the lower part of the ovary; sepals narrowly oblong, acute, 45 mm. long, ecarinate, green, transversely ridged at the junction with the ovary; petals 6 cm. long, greenish white, ligulate at base; ovary 12 mm. in diameter, about half superior.

NARIÑO: Terrestrial in great masses in very wet places, above El Diviso, alt. 705 m., Nov. 13, 1946, *Foster* 2150 (GH, type; COL; US, US phot. 3482).

64. *Pitcairnia lepidopetalon* L. B. Smith, *Caldasia* 5: No. 21:10, *fig.* 1948.

Terrestrial in large masses, the flowering shoot about 1 meter high; leaves subdistichous, about equaling the inflorescence, sheaths narrow, dark castaneous, sparsely and obscurely brown-lepidote, blades linear, long-acuminate, 1 cm. wide; scape erect, 5 mm. in

diameter, sparsely pale-floccose, soon glabrous; inflorescence lax, rather few-flowered, to 32 cm. long; rhachis slightly flexuous; floral bracts broadly ovate, acuminate, slightly exceeding the pedicels; flowers erect or slightly divergent; pedicels slender, to 2 cm. long, sparsely lepidote; sepals oblong, truncate with a black apiculus, 42 mm. long, sparsely lepidote, the exposed part bright red, the covered part yellow; petals linear, acuminate, 7 cm. long, red, bearing a ligule at base; stamens included; ovary  $\frac{2}{3}$  superior; ovules obtuse.

NARIÑO: Moist places, Barbacoas, Rio Nambi, alt. 450 m., Nov. 16, 1946, Foster 2187 (GH, type, US phot. 4124; COL).

65. *Pitcairnia turbinella* L. B. Smith, *Caldasia* [1], No. 4:17, fig. 5. 1942.

FIGURE 24

Flowering shoot 1.5–3 meters high; leaves rosulate, homomorphic, 5–13 dm. long, sheaths reniform, 4–6 cm. wide, glabrous, blades linear, long-acuminate, 6–7 mm. wide except for the triangular base, subdensely serrate toward base with pale slender spreading spines 3 mm. long, laxly serrate above, covered with a membrane of cinerous coalesced scales; scape straight, soon glabrous; scape-bracts erect, very narrowly triangular, filiform-acuminate, lepidote, the lower imbricate, serrate, the upper shorter than the internodes, entire;

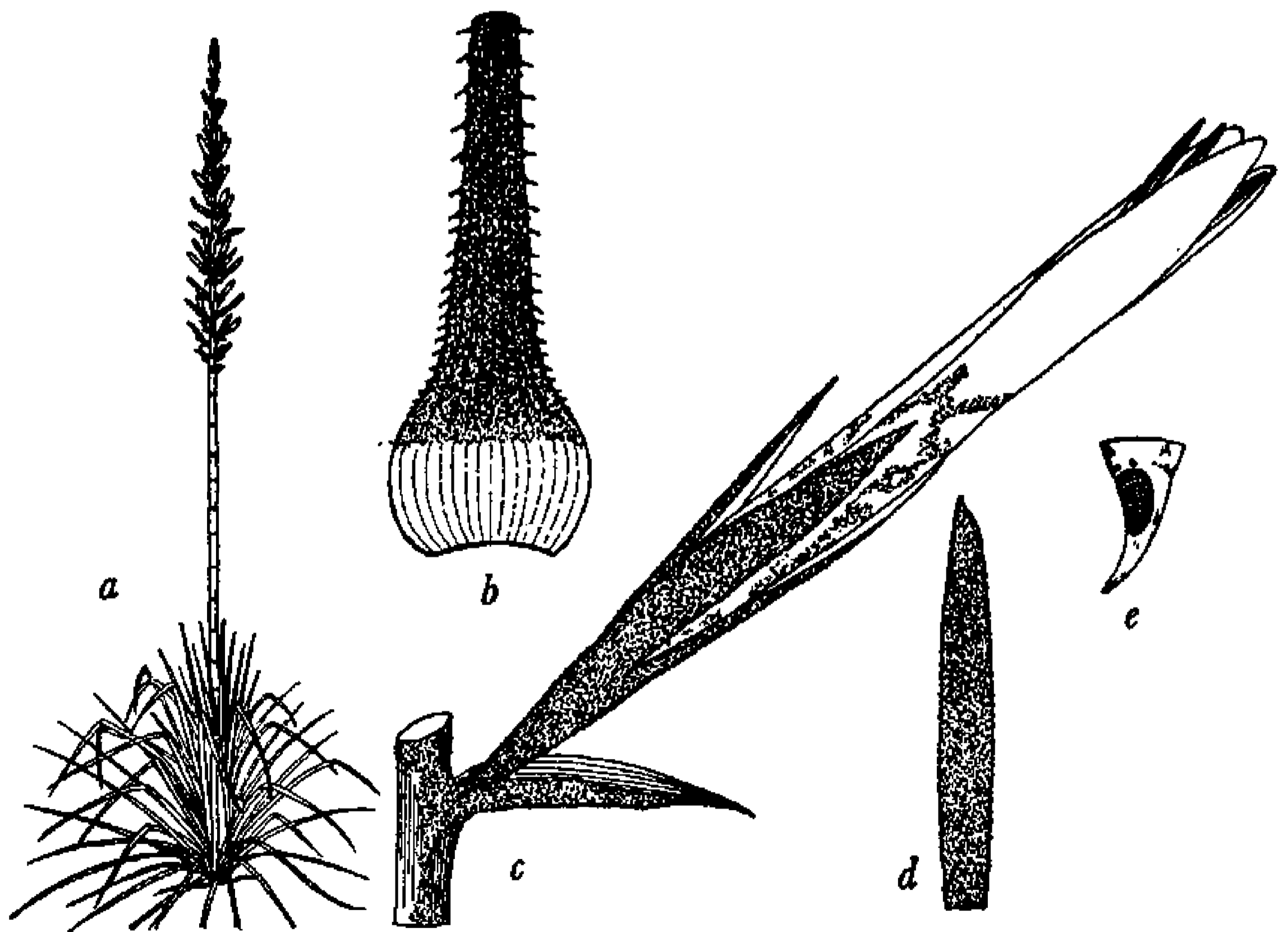


FIGURE 24.—*Pitcairnia turbinella*: *a*, Plant,  $\times \frac{1}{20}$  (after photo); *b*, base of leaf,  $\times \frac{1}{2}$ ; *c* floral bract and flower,  $\times 1$ ; *d*, sepal,  $\times 1$ ; *e*, seed,  $\times 5$ .

inflorescence many-flowered, 3–7 dm. long, densely cinerous-lepidote including the petals; axis stout; floral bracts narrowly elliptic, acuminate, 2–3 cm. long; flowers ascending; pedicels 3–5 mm. long; sepals oblong, obtuse, 25 mm. long, ecarinate; petals linear, obtuse, 8 cm. long, naked, red; ovary  $\frac{1}{2}$  inferior, its base turbinate; fruit dehiscent; seeds winged.

VAUPÉS: Cerro de Circasia, alt. 300–500 m., Oct. 10, 1939, *Cuatrecasas* 7195 (US, type, GH phot. 6083). Same, on rocks, sandy savanna, quartzite base, alt. 230 m., lat. 0°45' N., long. 70°30' W., Apr. 20, 1953, *Schultes & Cabrera* 19205 (COL, GH, K, NY, P, S, US). Granitic soil, savanna, San José del Guaviare, alt. 270 m., Nov. 12, 1939, *Cuatrecasas* 7706 (COL). On bare rock, summit of Cerro E-ree-eé-kō-mee-ō-kee, Río Piraparana (tributary of Río Apaporis, lat. 0°15' S. to 0°25' N., long. 70°30' W., Sept. 10, 1952, *Schultes & Cabrera* 17532 (COL, F, GH, K, MA, US). Quartzite savanna, Yapobodá, near headwaters of Río Kuduyari (tributary of Río Vaupés), alt. 270–300 m., April 1953, *Schultes & Cabrera* 20004 (COL, GH, US); 20018 (COL, GH, US).

66. *Pitcairnia andreana* Linden, Cat. 1873.

Flowering shoot about 2 dm. high; leaves all alike, linear-lanceolate, acuminate, to 35 cm. long, 3 cm. wide, covered beneath with coarse white appressed scales, green and sparsely lepidote above; scape short but evident, often curved-ascending, green, sparsely lepidote; scape-bracts foliaceous, many times exceeding the internodes; inflorescence laxly racemose, few-flowered, usually much exceeded by the leaves, slightly furfuraceous; floral bracts narrowly ovate, equaling or exceeding the lower pedicels; pedicels ascending, slender, 10 mm. long; flowers erect; sepals sublanceolate, acute, ecarinate, green; petals zygomorphic, acute, 65 mm. long, equaling the stamens, yellow toward apex, bright orange elsewhere; anthers 7 mm. long; ovary  $\frac{1}{2}$  superior; ovules obtuse.

Chocó: Introduced by Linden in 1872 and widely cultivated, not collected again in its natural habitat (see Bot. Mag. Curtis 106: pl. 6180. 1880). *Hort. La Croix* (K, GH phot. 2538).

67. *Pitcairnia pectinata* L. B. Smith, Contr. Gray Herb. 98:9, pl. 3, figs. 6, 7. 1932.

Plant about 1 meter high; leaves 1 meter or longer, petioles spinose, blades lanceolate, entire, 8 cm. wide; scape erect, ferruginous-lanate, soon glabrous; scape-bracts narrowly triangular, ferruginous-lanate, pectinate-serrate; inflorescence densely subspicate, its axis and bracts ferruginous-lanate; floral bracts like the scape-bracts; flowers pale red, erect, glabrous, short-pedicelled; sepals very narrowly triangular, to 28 mm. long; petals naked; ovary about half superior, ovules winged.

ANTIOQUIA: La Sierra, Medellín, alt. ca. 1,500 m., 1931, *Archer* 1372 (GH, type; US, US phot. 3480, 3485).



68. *Pitcairnia sprucei* Baker, Journ. Bot. 19:303. 1881.

*Hepetis sprucei* Mez in DC. Monogr. Phan. 9:974. 1896.

Stem short; leaves dimorphic, some reduced to narrowly triangular sheaths, others large, equaling or exceeding the inflorescence, sheaths broadly ovate, dark castaneous, covered beneath with a brown membrane of coalesced scales, petioles slender, 10–48 cm. long, channeled, laxly serrate toward the base, blades lanceolate or oblanceolate, acuminate, cuneate, 2–5 cm. long, flat, serrulate especially toward apex, at first pale lepidote beneath, soon glabrous; scape erect, slender, 15–28 cm. high, red; scape-bracts erect or suberect, longer or shorter than the internodes, lanceolate, acuminate, sparsely lepidote, green; inflorescence usually few-flowered, 1–2 dm. long; floral bracts lanceolate, exceeding the pedicels; flowers divergent or spreading at anthesis, red; pedicels slender, 10–18 mm. long; sepals oblong, broadly acute or obtuse, 18–25 mm. long, ecarinate, sparsely lepidote; petals 5–6 cm. long, appendaged; ovules obtuse; capsule ovoid, shorter than the sepals; seeds winged.

VAUPÉS: Río Guainía near Caño del Caribe (between Isla del Venado and San José), alt. 255–270 m., lat. 2°45' N., long. 67°50' W., Nov. 2, 1952, *Schultes, Baker & Cabrera* 18257 (US).

AMAZONAS-VAUPÉS: Lagunas del Churuco, Río Apaporis, alt. 280 m., Nov. 22, 1951, *García-Barriga* 13668 (COL).

BRASIL, PERU.

69. *Pitcairnia corallina* Linden & André, Belg. Hort. 23:112. 1873.

*Hepetis corallina* Mez in DC. Monogr. Phan. 9:973. 1896.

Stemless; leaves dimorphic, the outer ovate, acute, the inner entire except for the petiole, blade narrowly lanceolate, acute or acuminate, strongly plicate, to 1 m. long, glabrous above, densely and finely white-lepidote beneath; scape stout; scape-bracts usually imbricate, ovate, acuminate, green; inflorescence densely many-flowered; axis stout; floral bracts lanceolate, much exceeding the pedicels; pedicels 1 cm. long; sepals subtriangular, 26 mm. long; petals appendaged, 7 cm. long, red with a narrow white margin; ovary about half superior; ovules and seeds winged.

69a. *Pitcairnia corallina* var. *corallina*

Leaves to 10 cm. wide; inflorescence coral-red.

CHOCÓ: *Hort. Linden* (existence of type specimen not verified).

VAUPÉS: In clumps in water, Caño Oo-moó-ña, Río Piraparaná, Mar. 9, 1952, *Schultes & Cabrera* 17165 (COL, GH, US). In clump in water, Caño Teemeña, Río Piraparaná (tributary of Río Apaporis), lat. 0°15' S. to 0°25' N., long. 70°30' W., Sept. 6, 1952, *Schultes & Cabrera* 17258 (US). Along edge of stream on exposed roots, near Wacaricuara, Río Paca (tributary of Río Papurí), alt. 195

m., lat. 0°30' N., long. 70°10' W., June 1-3, 1953, *Schultes & Cabrera* 19527 (COL, US).

AMAZONAS-VAUPÉS: Epiphyte, near Cachivera de Jirijirimo, Río Apaporis, alt. 250 m., June 13, 1951, *Schultes & Cabrera* 12483 (COL, GH, US).

PERU.

69b. *Pitcairnia corallina* var. *viridis* L. B. Smith, Bot. Mus. Leaflet. Harvard 17:67. 1955.

Leaves only 3 cm. wide; inflorescence yellow-green.

VAUPÉS: Along brook, sandy savanna, Circasia, Río Vaupés, alt. 240 m., lat. 0°45' N., long. 70°30' W., Apr. 20, 1953, *Schultes & Cabrera* 19206 (US, type; COL).

70. *Pitcairnia cuatrecasana* L. B. Smith, *Caldasia* [1], No. 4:16, fig. 1942.

Petiole 55 cm. long, stout, strongly channeled, serrulate, leaf-blade linear-lanceolate, acuminate, attenuate at base, over 1.4 meters long, 8 cm. wide, brown-lepidote beneath but soon entirely glabrous, serrulate toward apex; scape stout, red; scape-bracts broadly lanceolate, acuminate; inflorescence dense, many-flowered, over 5 dm. long, red, all except the petals covered with fine pale stellate scales, floral bracts always exceeded by the sepals; flowers suberect; sepals scarcely carinate, coriaceous; petals 8 cm. long, narrowly pale-margined, bearing a large rounded scale at base; ovary  $\frac{3}{4}$  inferior; ovules bearing a dorsal wing.

CAQUETÁ: Thickets, gorge of the Río Hacha, Florencia, alt. 400-450 m., Apr. 1, 1940, *Cuatrecasas* 8967 (US, type, GH phot. 6082).

71. *Pitcairnia guzmanioides* L. B. Smith *Contr. U. S. Nat. Herb.* 29:306, fig. 27. 1949.

Short-caulescent; leaves few, all alike, fascicled, 7 dm. long, much exceeding the inflorescence, entire, short-petiolate, minutely white-flocculose beneath, glabrous above, the sheaths elliptic, 12 cm. long, the blades linear-lanceolate, acuminate, 35 mm. wide; scape-bracts very densely imbricate, concealing the slender scape, the lower foliaceous, the upper elliptic, acuminate, chartaceous when dry, subinflated; inflorescence very dense, ovoid, 4.5 cm. long, nearly 4 cm. in diameter; floral bracts broadly ovate, acuminate, longer than the flowers but reflexed, pale below, dark red above; flowers sessile, more than half of them open at one time; sepals subtriangular, broadly obtuse, 14 mm. long, scarcely carinate, coriaceous, coarsely nerved, sparsely flocculose; petals 25 mm. long, white; stamens included; ovary  $\frac{3}{4}$  superior.

NARIÑO: On rocks, between San Francisco and Las Mesas, alt. 2,550 m., Nov. 26, 1946, *Foster* 2263 (GH, type, US phot. 3182).

Subgenus 3. *Pepinia*

*Pitcairnia* subgenus *Pepinia* Baker, Journ. Bot. 19:227. 1881; emend. Mez in DC. Monogr. Phan. 9:347. 1896.

Fruit indehiscent; seeds with a circumferential wing. Species 72–76.

72. *Pitcairnia caricifolia* Mart. ex Schult. f. in R. & S. Syst. 7, pt. 2:1242. 1830. FIGURE 25

*Pitcairnia kegeliana* Schlecht. Linnaea 24:664. 1851.

*Pitcairnia pauciflora* Baker, Journ. Bot. 19:230. 1881.

*Pitcairnia subjuncta* Baker, Handb. Bromel. 116. 1889.

*Hepetis caricifolia* Mez in DC. Monogr. Phan. 9:973. 1896.

*Hepetis kegeliana* Mez in DC. Monogr. Phan. 9:974. 1896.

*Hepetis pauciflora* Mez in DC. Monogr. Phan. 9:974. 1896.

Proliferating by short shoots; stem very short; leaves numerous, all alike, 6–8 dm. long, very slightly narrowed above the sheaths, finely and laxly serrulate to subentire, the sheaths narrowly ovate, inconspicuous, dark castaneous toward base, blades sublinear, 6–13 mm. wide, filiform-acuminate, glabrous above, covered beneath with a pale membrane of coalesced scales; scape erect, slender, 25–45 cm. long, white-furfuraceous at first; scape-bracts erect, lepidote, the lower foliaceous and imbricate, the upper lanceolate and rarely shorter than the internodes; inflorescence more or less secund, 10–15 cm. long, usually few-flowered, minutely white-lepidote; lower floral bracts narrowly lanceolate, filiform-acuminate, sometimes equaling the ovary, the upper ovate, barely exceeding or even shorter than the pedicels; flowers slender, suberect at anthesis, usually spreading at maturity;

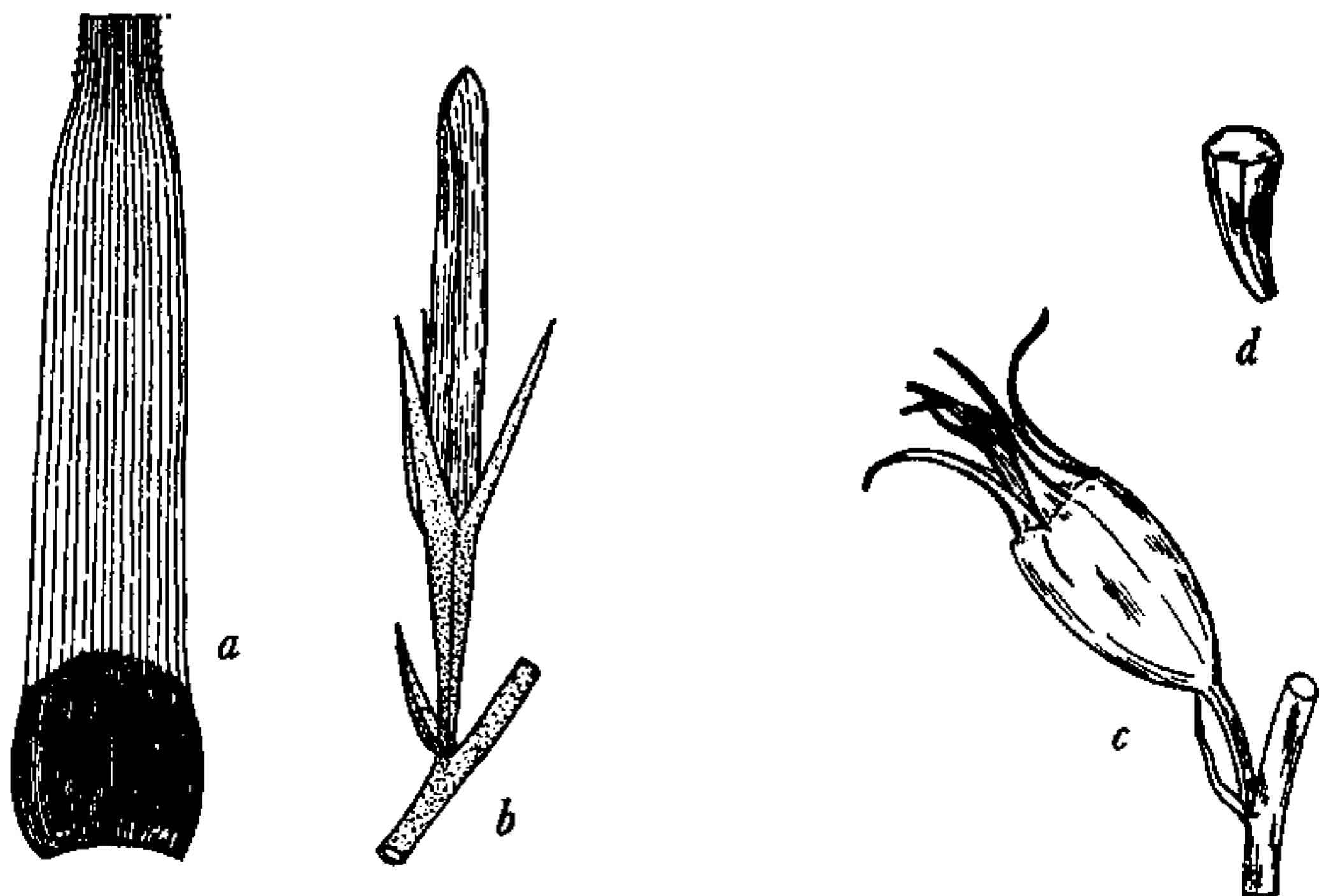


FIGURE 25.—*Pitcairnia caricifolia*: *a*, Base of leaf,  $\times 1$ ; *b*, floral bract and flower,  $\times 1$ ; *c*, fruit,  $\times 1$ ; *d*, seed,  $\times 5$ .

sepals sublinear, acute, 15 mm. long, ecarinate, green, thin; petals 3–4 cm. long, red or orange to white, bearing a large scale; stamens about equaling the petals; ovary almost wholly inferior; capsule stout, to 2 cm. long; seeds narrowly winged.

**META:** Woods, vicinity of Villavicencio, near Caño Quenane, eastern llanos, alt. 450 m., July 24–28, 1946, *Jaramillo, Mesa, Idrobo & Fernández* 320 (COL, US).

**VICHADA:** On peaty soil at edge of forest, about 72 km. S. 65 km. E. of Orocué, alt. 150 m., Apr. 22, 1939, *Haught* 2784 (US).

**VAUPÉS:** Terrestrial in woods and thickets, Caño Cuduyari, Zurubí (affluent of the Vaupés), alt. 200 m., Oct. 15, 1939, *Cuatrecasas* 7219 (GH, US). Same, 7219–A (COL, US). Woods, Río Guayabero, alt. 240 m., Nov. 8, 1939, *Cuatrecasas* 7520 (F, US). Epiphytic, settlement of "Alto Caribe," remanso "Caraná," bank of Río Inírida, long. 70°35' W., alt. 220 m., Jan. 23, 1953, *Fernández* 1903 (COL).

Northern BRASIL, GUIANA, VENEZUELA.

73. *Pitcairnia quesnelioides* L. B. Smith, *Contr. U. S. Nat. Herb.* 29:313, *fig. 33*. 1949.

Plants growing in dense masses; leaves over 1.5 meters long, subpetiolate, laxly serrulate at base, densely brown-flocculose beneath, soon glabrous above, the blades linear-lanceolate, acuminate, 4 cm. wide; scape erect for 15–20 cm. then decurved and prostrate; lower scape-bracts foliaceous; inflorescence cylindrical, 15 cm. long, 5 cm. in diameter; floral bracts deciduous; flowers sessile; sepals triangular-lanceolate, broadly acute, 24 mm. long, strongly nerved, glabrous in age, the posterior ones strongly carinate; petals 5 cm. long, bearing a large lacerate scale at base; ovary spreading then abruptly ascending,  $\frac{1}{4}$  inferior, winged, brown-flocculose at base.

**NARIÑO:** Puerto Limón, alt. 900 m., Nov. 24, 1946, *Foster* 2257 (GH, type, US phot. 3179).

74. *Pitcairnia alborubra* Baker, *Handb. Bromel.* 102. 1889.

Plant over 8 dm. high; leaves over 8 dm. long, entire, petiole distinct, over 2 dm. long, deeply channeled, blade linear-lanceolate, acuminate, 2–3 cm. wide, sparsely floccose-lepidote beneath, soon glabrous, prominently nerved and channeled, scape erect, 6 mm. in diameter, glabrous; scape-bracts erect, the lower foliaceous, the upper triangular-ovate with long caudate tips; inflorescence laxly racemose, 18 cm. long, few-flowered, glabrous; floral bracts broadly ovate, acute, 5–10 mm. long; pedicels spreading; flowers erect at anthesis and making an angle with the pedicels; sepals narrowly triangular, broadly obtuse, 20–24 mm. long, ecarinate; petals broadly rounded, 52 mm. long, red at base, white toward apex, bearing a broadly retuse scale; stamens nearly equaling the petals, anthers 9 mm. long; ovary ellipsoid, becoming globose; seeds very narrowly winged; capsule indehiscent.

**ANTIOQUIA:** Without further locality, alt. 3,000 m., *Kalbreyer* 1640 (K, GH phot. 2603). Corcorná, July 30, 1937, *Daniel* 1806 (US).

75. *Pitcairnia rubiginosa* (Brongn. ex E. Morr.) Baker, Handb. Bromel. 116. 1889.

*Melinonia rubiginosa* Brongn. ex E. Morr. Cat. Bromel. Jard. Liége 11. 1873.

Stemless; leaves few, dimorphic, entire or the blades sometimes obscurely serrulate near the apex, some reduced to triangular dark castaneous buff-lepidote sheaths, others fully developed and with green sheaths, 75 cm. long, much exceeding the inflorescence, petiole to 20 cm. long, blade 30–35 mm. wide with a strong median channel, glabrous above, covered beneath with coarse brown appressed scales; scape erect or ascending, red, minutely floccose, becoming glabrous; scape-bracts suberect, narrowly triangular, exceeding the internodes or the upper somewhat shorter, green, firm; inflorescence laxly racemose, to 12 cm. long, minutely floccose; floral bracts lance-triangular; pedicels slender, 12–20 mm. long; sepals narrowly triangular, acute, 22–24 mm. long, ecarinate; petals 55 mm. long, red, appendaged; fruit indehiscent; seeds winged.

VAUPÉS: Cerro de Circasia, between Río Tí and Ñamú, Río Vaupés, alt. 380–450 m., Oct. 30, 1952, *García-Barriga* 15041 (US).

FRENCH GUIANA.

76. *Pitcairnia uaupensis* Baker, Handb. Bromel. 93. 1889.

*Hepetis uaupensis* Mez in DC. Monogr. Phan. 9:974. 1896.

Stem short; leaves dimorphic, the outer reduced to brown sheaths, the inner much exceeding the inflorescence, their sheaths triangular-ovate, petioles 15–20 cm. long, spinulose-serrate toward base, blades linear, acuminate, to 4 dm. long, flat, densely white-lepidote beneath, serrulate near apex; scape straight, very slender, densely furfuraceous; scape-bracts imbricate, lanceolate, filiform-acuminate, serrulate toward apex; inflorescence 1–2 dm. long; floral bracts lanceolate, exceeding the pedicels, purple, white-lepidote; flowers spreading, more or less secund; pedicels very slender, to 2 cm. long; sepals oblong-elliptic, broadly acute and apiculate, to 33 mm. long, ecarinate, white-furfuraceous; petals linear, to 6 cm. long, red, appendaged; ovary ellipsoid; capsule indehiscent; seeds winged.

VAUPÉS: Near Piedra de Cocuí, Dec. 27, 1947, *Schultes & López* 9471 (US). Near Cerro Monachí, Río Naquieni, Río Guainia basin, June 1948, *Schultes & López* 10056 (US). In rocky quartzite soil, summit of Cerro Isibukuri, near Río Kananarí, alt. 250 m., Nov. 29–30, 1951, *García-Barriga* 13770 (COL, US). Near San Felipe (below confluence of Río Guainia and Río Casiquiare), Río Negro, alt. 180 m., lat. 1°50' N., long. 67°0' W., Oct. 24, 1952, *Schultes, Baker & Cabrera* 17951 (COL, US). Same, Nov. 5, 1952, 18137 (COL, US). Dense forest, Villa Fátima, Nov. 13, 1952, *Romero Castañeda* 3448 (COL). Same, 3450 (COL). Epiphytic, settlement of "Raudal Alto" or Mariapiri, right bank, Río Inírida, long. 69°45' W., alt. 250 m., Feb. 3, 1953, *Fernández* 2048 (COL). On rocks, between Mitú and Javareté, Río Vaupés, May 14–24, 1953, *Schultes & Cabrera* 19285 (COL, GH, US).

AMAZONAS-VAUPÉS: Río Apaporis between Río Pacoa and Río Kananarí, alt. 250 m., Aug. 16, 1951, *Schultes & Cabrera* 13593 (US). On cliff bathed in spray from falls, Raudal Jirijirimo (below mouth of Río Kananarí), Río Apaporis, alt. 270 m., lat. 0°5' N., long. 70°40' W., Jan. 21, 1952, *Schultes & Cabrera* 14977 (COL, GH, K, NY, US). On rocks, near Raudal Yayacopi (La Playa), Río Apaporis, alt. 240 m., lat. 0°5' S., long. 70°30' W., Feb. 15, 1952, *Schultes & Cabrera* 15345 (COL, GH, US). On trees, Jino-Gojé, Río Apaporis, between Río Piraparaná and Río Popeyaká, alt. 250 m., Sept. 3-11, 1952, *García-Barriga* 14362 (COL, US).

AMAZONAS: Río Ricapuyá (tributary of Río Apaporis below Río Piraparaná), alt. 210 m., lat. 0°25' S., long. 70°30' W., Sept. 25-26, 1952, *Schultes & Cabrera* 17625 (COL, US). On trees, Río Caquetá, La Pedrera, alt. 240 m., Oct. 1-4, 1952, *García-Barriga* 14638 (COL, US).

BRASIL.

### 3. *Brocchinia*

*Brocchinia* Schult. f. in Roem. & Schult, Syst. 7, pt. 2:lxx, 1250. 1830.

Plants low to several meters high, stemless or with an often woody stem; leaves densely rosulate, large, the blades linear or triangular, entire or rarely serrate, minutely lepidote or glabrous; scape erect, its bracts usually foliaceous; inflorescence much branched, the ultimate divisions racemose; floral bracts minute; flowers pedicellate, small, perfect; sepals imbricate, free; petals free, naked, actinomorphic, the blades relatively large; stamens included at anthesis; ovary nearly or quite inferior in most cases, placentae linear, ovules few, long-appendaged.

Colombia, Venezuela, Brasil (Rio Branco).

### KEY

1. Ovary only one-third inferior; leaves and scape-bracts serrate . . . . . *1. B. serrata*
1. Ovary wholly or almost wholly inferior; leaves and scape-bracts entire.
  2. Leaf-blades narrowly triangular, acuminate . . . . . *2. B. acuminata*
  2. Leaf-blades ligulate, broadly acute or rounded and apiculate.
    3. Petals much longer than broad, not at all unguiculate; ovary wholly inferior; inflorescence flocculose . . . . . *3. B. hechtioides*
    3. Petals about as broad as long, suborbicular, distinctly unguiculate; ovary in small part superior; inflorescence coarsely appressed-lepidote . . . . . *4. B. paniculata*

1. *Brocchinia serrata* L. B. Smith, *Caldasia* [1]: No. 4:14, fig. 2. 1942.

Stem prostrate, twisted, 20 cm. in diameter; leaves rosulate, to 1.8 meters long, blades linear, caudate-acuminate, to 2 cm. wide, glabrous, laxly serrate toward the base with dark curved spines 3 mm. long, minutely serrulate elsewhere; scape stout, floccose; scape-bracts subfoliaceous; inflorescence amply paniculate; primary bracts much

shorter than the branches, narrowly triangular, serrulate; branches slender, flocculose; ultimate racemes over 20 cm. long, subdense; floral bracts broadly ovate, long-caudate, barely exceeding the base of the sepals; flowers spreading to reflexed, subsessile; sepals ovate, cucullate, 4 mm. long, densely lepidote; petals subunguiculate, obtuse, 5–6 mm. long; stamens free, included; ovary stout, style about equaling the petals; seeds few, caudate-appendaged at either end.

VAUPÉS: Cerro de Circasia, alt. 300–500 m., Oct. 10, 1939, *Cuatrecasas* 7183 (US, type, GH phot. 6175). Savanna de Yapobodá, near Maloca de Yararáca, Alto Río Cuduyarí, Dec. 10, 1943, *P. H. Allen* 3223 (COL). Same, Jan. 23, 1944, *P. H. Allen* 3268 (MO). On quartzite rocks of savanna, Cerro Yapoboda, Río Kuduyarí, alt. 450 m., Oct. 5, 1951, *Schultes & Cabrera* 14210 (COL, GH, NY, US); 14390 (K, US). Same, alt. 270–300 m., lat. 1°20' N., long. 70°30' W., April 1953, *Schultes & Cabrera* 20051 (COL, GH, US). Savanna, Cerro de Cañienda, Río Kubiyú, alt. 380–680 m., Nov. 2–4, 1952, *García-Barriga* 15096 (COL, US).

2. *Brocchinia acuminata* L. B. Smith, *Brittonia* 3:160, *fig. 3 a-d.* 1939.

Flowering plant 2 meters high; leaves in a bulbous rosette 25 cm. in diameter, 8 dm. long, sheaths elliptic, 20 cm. wide, dark castaneous, subdensely appressed-white-lepidote, blades 2–4 cm. wide, glabrous; scape straight, 2 cm. in diameter, its bracts foliaceous, the upper ones with sheaths shorter than the internodes; inflorescence amply paniculate, lax, 1 meter long, glabrous; primary bracts subfoliaceous; floral bracts broadly triangular; flowers subsessile, divergent, 9–12 mm. long; sepals broadly ovate, obtuse, cucullate, 4.5 mm. long; petals narrowly obovate; ovary terete, almost wholly inferior.

VAUPÉS: Cerro Isibukuri, Río Kananarí, Oct. 29, 1951, *Schultes & Cabrera* 14534 (COL, F, GH, K, NY, UC, US). Same, covering summit, lat. 0°15' N., long. 70°35' W., Jan. 23–25, 1952, *Schultes & Cabrera* 15051 (COL, US).

VENEZUELA.

3. *Brocchinia hechtioides* Mez, *Fedde Rep. Sp. Nov.* 12:414. 1913.

Plant 1–2 m. high; leaves numerous in a broad rosette, recurved-spreading, 4–8 dm. long, sheaths ample, dark castaneous, densely punctulate-lepidote, blades broadly rounded and apiculate, 7–10 cm. wide; scape slender; lowest scape-bracts foliaceous, the others ovate, acute, shorter than the internodes; inflorescence laxly paniculate; primary bracts small, like the upper scape-bracts; branches spreading; floral bracts ovate, acuminate or apiculate, the lower ones about equaling the ovary; pedicels short; sepals elliptic, acute, 3.5 mm. long, thin; petals the same form and size as the sepals, white.

VAUPÉS: Cerro Isibukuri, Río Kananarí, affluent of Río Apaporis, Oct. 29, 1951, *Schultes & Cabrera* 14516 (COL, GH, K, NY, US). Same, quartzite soil, alt. 250–700 m., Nov. 29–30, 1951, *García-Barriga* 13796 (COL, US).

VENEZUELA.

4. *Brocchinia paniculata* Schult. f. in Roem. & Schult. Syst. 7, pt. 2:1250. 1830.

FIGURE 26

Plant to 4 meters high; leaves 6–12 dm. long, sheaths ample, dark castaneous, pale-appressed-lepidote, blades broadly acute, pungent, 11 cm. wide; scape stout; inflorescence amply paniculate, lax, to 3 m. long; primary bracts ovate, acute, pungent, shorter than the sterile bases of the branches; floral bracts ovate, apiculate, shorter than the

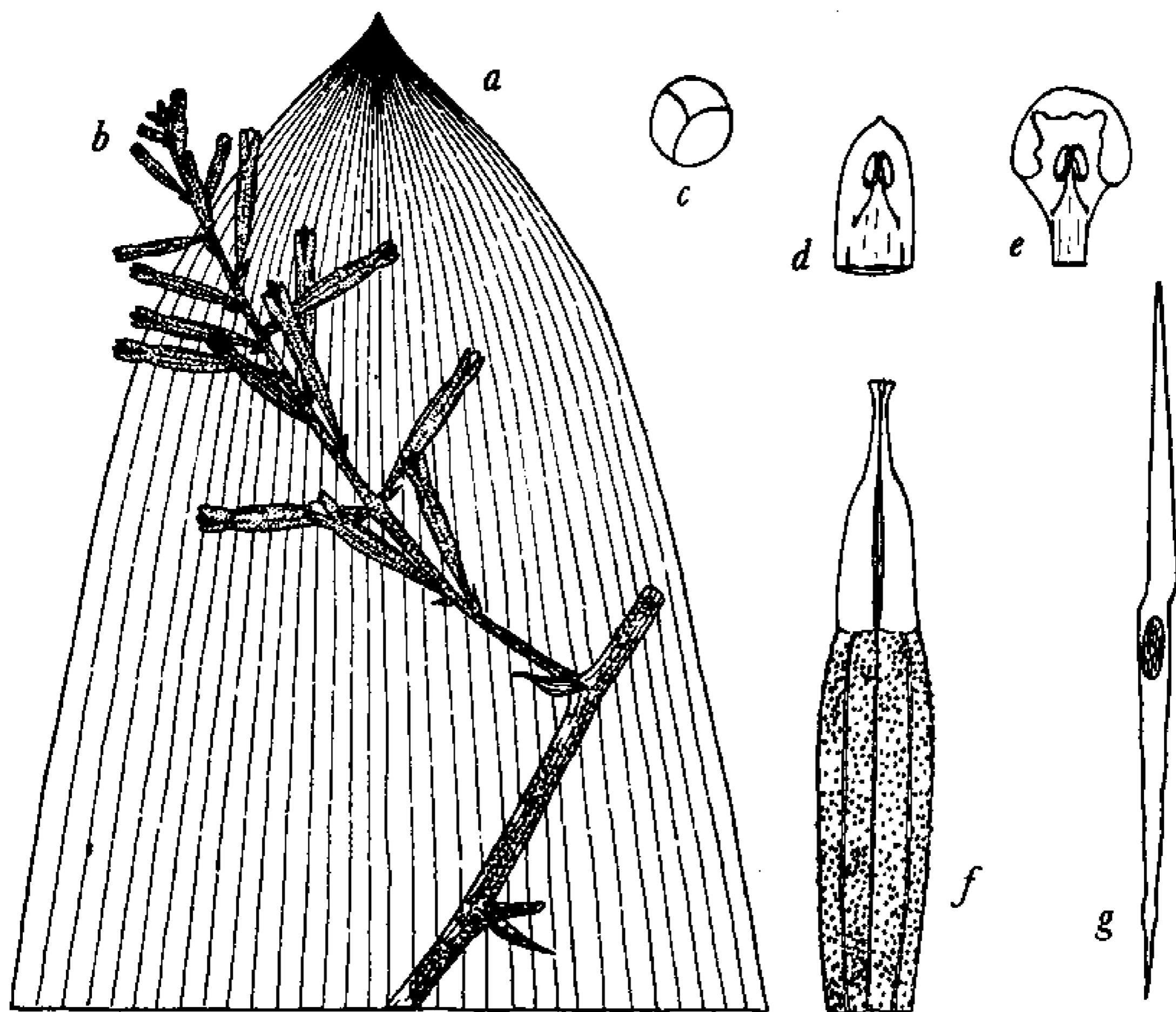


FIGURE 26.—*Brocchinia paniculata*: a, Apex of leaf,  $\times 1$ ; b, branchlet,  $\times 1$ ; c, apex of young corolla to show petal-imbrication,  $\times 5$ ; d, sepal and stamen,  $\times 5$ ; e, petal and stamen,  $\times 5$ ; apex of capsule,  $\times 5$ ; g, seed  $\times 5$ .

pedicels; flowers spreading, 12–15 mm. long; pedicels 4 mm. long; sepals oblong, obtuse, 2.5 mm. long; petals about equaling the sepals, claw narrow, blade reniform; stamens connate with the sepals and petals; ovary  $\frac{1}{2}$  inferior.

VAUPÉS: Araracoara, January 1820, *Martius* s. n. (M, type, F phot. 8632). Riverbank, middle Río Piraparaná, Jan. 9, 1952, *Schultes & Cabrera* 17131 (B, COL, GH, US).

AMAZONAS-VAUPÉS: Jirijirimo, Río Apaporis, alt. 250 m., Nov. 25–26, 1951, *García-Barriga* 13731 (COL, US). On rocks, quartzite base, Raudal Jirijirimo below mouth of Río Kananarí, Río Apaporis, alt. 270 m., lat.  $0^{\circ}5' N.$ , long.  $70^{\circ}40' W.$ , Jan 21, 1952, *Schultes & Cabrera* 14971 (COL, F, GH, K, NY, P, S, UC, US).

VENEZUELA.



4. *Navia*

*Navia* Schult. f. in Roem. & Schult. Syst, 7, pt. 2:lxv, 1195. 1830, nomen conservandum propositum, non *Navia* Borkh. 1792.

Plants low and often pulvinate to stout and several meters high; leaves numerous and in many rows, rosulate or densely imbricate along an elongate stem, narrow, entire or serrate; scape none to elongate; inflorescence of one or more distinct or agglomerated heads or paniculate; flowers sessile or pedicellate, perfect; sepals cochlear-imbricate, the anterior covered by the two posterior, free or connate; petals connate in slender tube, naked, the blades spreading at anthesis, cucullate with an inflexed acute apex; anthers linear; ovary superior to almost wholly inferior; style slender; placentae linear; ovules naked or nearly so; fruit dehiscent, capsular; seeds naked or with a vestigial wing, reticulate or corrugated.

Colombia, Venezuela, British Guiana, Surinam, Brasil (Amazonas).

## KEY

1. Inflorescence laxly paniculate.
  2. Ovary wholly superior; branches and flowers spreading; sepals equal, ecarinate, 2 mm. long . . . . . *1. N. garcia-barrigae*
  2. Ovary  $\frac{1}{2}$  inferior; ultimate branches pendent; flowers reflexed; sepals unequal, the alate-carinate posterior ones 6 mm. long and distinctly exceeding the ecarinate anterior sepal.
    2. *N. reflexa*
1. Inflorescence glomerate or moniliform-glomerate.
  3. The inflorescence elongate, moniliform from several heads.
    3. *N. caulescens*
  3. The inflorescence simple glomerate from a single head or several digitately arranged spikes.
    4. Ovary superior.
      5. Sepals free, 50 mm. long; leaf-blades entire, to 23 mm. wide . . . . . *4. N. lopezii*
      5. Sepals connate, 4–6 mm. long; leaf-blades serrulate.
        6. Scape 3 cm. long, raising the inflorescence above the leaf-sheaths; leaf-blades densely white-lanate beneath.
          5. *N. bicolor*
        6. Scape short and wholly concealed by the leaf-bases or none; leaf-blades sparsely lepidote or glabrous.
          7. Leaf-blades to 20 mm. wide; plants mostly simple.
            6. *N. heliophila*
          7. Leaf-blades 2–10 mm. wide; plants mostly pulvinate.
            8. The leaf-blades abruptly acute, 6–10 mm. wide.
              7. *N. acaulis*

8. The leaf-blades acuminate, 2–3 mm. wide.

9. Floral bracts much exceeding the sepals; leaf-blades soon deciduous and exposing the branched stem, 3 cm. long . . . . . 8. *N. schultesiana*

9. Floral bracts shorter than the sepals; leaf-blades persistent and concealing the stem, 7 cm. long.

9. *N. graminifolia*

4. Ovary almost wholly inferior; sepals 28 mm. long; leaf-blades serrulate, 8 mm. wide . . . . . 10. *N. fontoides*

1. *Navia garcia-barrigae* L. B. Smith, Bot. Mus. Leaflet, Harvard 16:194, pl. 25, figs. 5–9. 1954.

Leaves rosulate, the blade linear, acuminate, 22 cm. long, 8 mm. wide, very laxly serrate with minute ascending spines, covered on both sides with white appressed scales, roseate for 2 cm. at base; inflorescence nearly 8 dm. long, amply tripinnate, red-brown when dry; primary bracts narrowly triangular, 16 mm. long, much shorter than the naked flattened sterile bases of the branches, entire, nerved; branches to 25 cm. long, their axes straight and very slender; racemes to 9 cm. long including the short sterile base, subdensely many-flowered; floral bracts broadly ovate, acuminate, 2 mm. long, thin; flowers obscurely pedicellate; sepals subtriangular, obtuse; petals 3.5 mm. long, white; ovules naked.

AMAZONAS: White sand among rocks, Sabana de La Angostura, Araracuara, Río Caquetá, Dec. 21, 1951, *García-Barriga & Schultes* 14137 (US, type).

2. *Navia reflexa* L. B. Smith, Bot. Mus. Leaflet, Harvard 16:196, pl. 26, figs. 1–4. 1954.

Over 3 meters high; leaves 9 dm. long, the sheath subquadrate, barely wider than the blade, white except for the lustrous brown apex, entire, nearly glabrous, the blade linear with a long entire acuminate pungent apex, 5 cm. wide, flat, closely sulcate, laxly serrate with dark ascending spines 1.5 mm. long, covered above with a very fine white membrane of coalesced scales, glabrous beneath; scape erect, over 14 mm. in diameter; scape-bracts erect, foliaceous but much reduced, much exceeding the internodes, but so narrow as to leave most of the scape exposed; inflorescence ample, at least tripinnate, glabrous (at least in age); primary bracts broadly triangular, several times shorter than the naked flattened sterile bases of the branches, entire; branches spreading with the ultimate divisions pendent; racemes to 20 cm. long including the short naked sterile base, densely many-flowered, the rhachis strongly angled; floral bracts broadly ovate, acuminate, 7 mm. long, entire, subcoriaceous; flowers obscurely pedicellate; sepals free, heteromorphic, elliptic; seeds wingless.

VAUPÉS: San Felipe (El Castillo), Río Negro below its confluence with Río Casiquiare, Dec. 12, 1947, *Schultes & López* 9321 (US, type). Same, alt. 180 m., lat. 1°50' N., long. 67°0' W., Oct. 25, 1952, *Schultes, Baker & Cabrera* 18002 (COL, GH, US). Puerto Colombia (opposite Venezuelan town of Maroa), lat. 2°40' N., long. 67°30' W., alt. 240–255 m., Oct. 31–Nov. 2, 1952, *Schultes, Baker & Cabrera* 18162 (COL, US).

3. *Navia caulescens* Mart. ex Schult. f. in Roem. & Schult. Syst. 7, pt. 2:1195. 1830. FIGURE 27

*Dyckia caulescens* Baker, Handb. Bromel. 137. 1889.

Plant distinctly caulescent and sometimes branched, flowering shoot 2–3 dm. high; leaves 9–12 cm. long, 5–12 mm. wide, stellate-lepidote beneath when young, densely and minutely serrulate, flat; scape evident, sometimes equaling the leaves, slender; scape-bracts lanceolate,

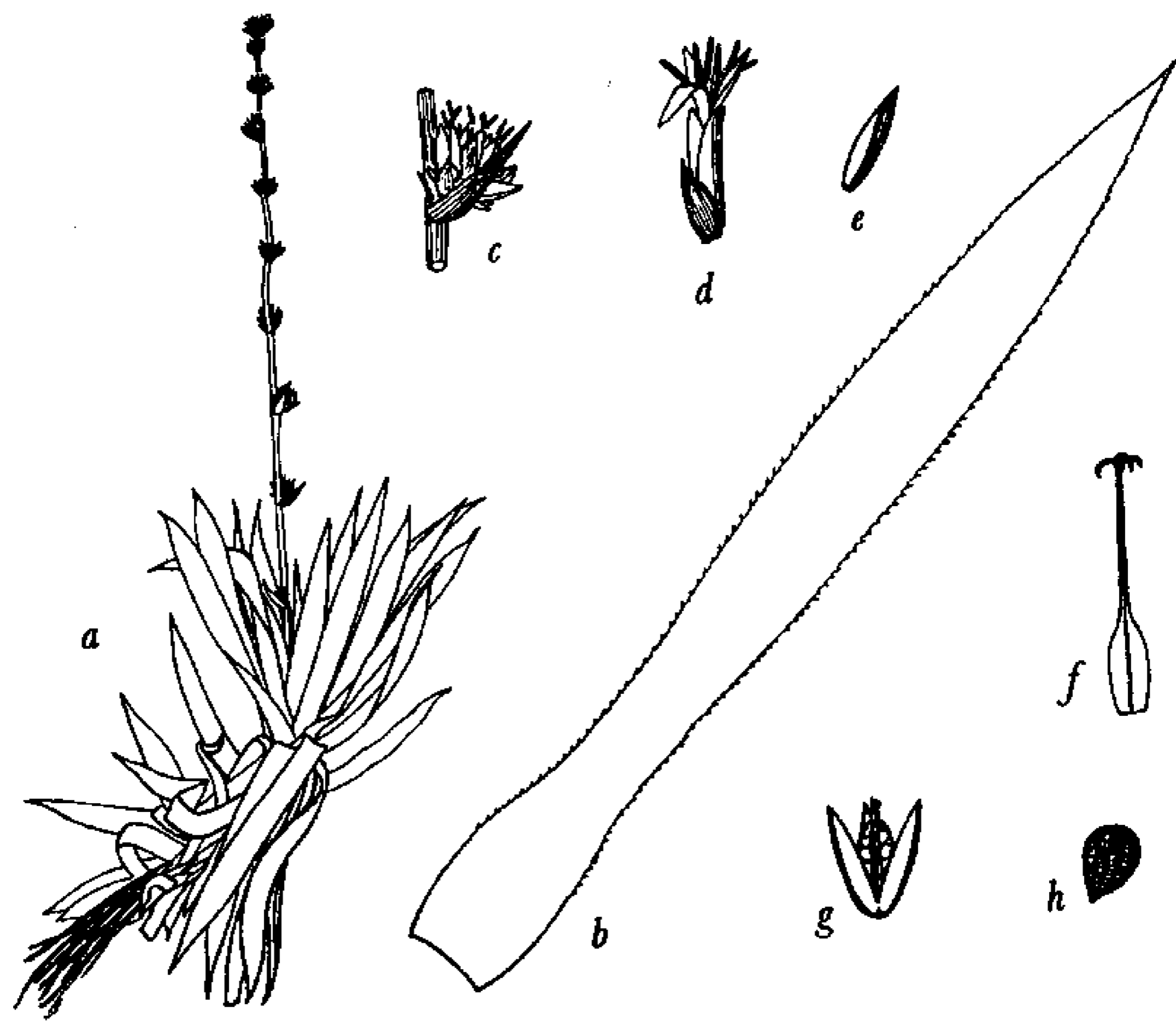


FIGURE 27.—*Navia caulescens*: *a*, Habit,  $\times \frac{1}{4}$ ; *b*, leaf  $\times 1$ ; *c*, primary bract and fascicle of flowers,  $\times 1$ ; *d*, floral bract and flower,  $\times 2$ ; *e*, sepal,  $\times 2$ ; *f*, pistil,  $\times 5$ ; *g*, fruit,  $\times 2$ ; *h*, seed,  $\times 10$ .

acuminate, almost equaling the internodes; primary bracts like the scape-bracts, the lower ones slightly exceeding the heads; heads hemispherical or spherical, many-flowered, to 15 mm. in diameter; floral bracts broadly ovate, to 4 mm. long, reddish, entire; sepals slightly

unequal, about 5 mm. long; petals white, 7 mm. long, almost equaling the stamens.

**3a. *Navia caulescens* var. *caulescens***

Leaves 10–12 mm. wide.

AMAZONAS: Cupatí by the Río Japura, January 1820, *Martius* (M, type). On rocks, summit of Cerro Cupatí, Nov. 24, 1912, *Ducke* 12297 (MG, RB, US). On rocks at summit of Cerro La Pedrera, near La Pedrera, April 1944, *Schultes* 5859 (US). Río Caquetá, La Pedrera, Cerro de Cupatí, alt. 240–580 m., Sept. 30, 1952, *García-Barriga* 14523 (COL); 14536 (COL, US).

**3b. *Navia caulescens* var. *minor* Schult. in Roem. & Schult. Syst. 7, pt. 2:1195. 1830.**

Leaves not over 5 mm. wide, otherwise as in variety *caulescens*.

AMAZONAS: White sand and rocks, Sabana de la Angostura, Araracuara, Río Caqueta, alt. 400 m., Dec. 21, 1951, *García-Barriga & Schultes* 14171 (COL, US).

VAUPÉS: On sandstone ledges of the "Casa del Gallo de la Sierra," Savanna de Yapobodá, near Maloca de Yararáca, Alto Río Cuduyarí, Dec. 10, 1943, *P. H. Allen* 3220 (COL); 3221 (COL). In dense mats with mosses on cliff, Cerro Isibukuri, Río Kananarí, alt. 250–700 m., Aug. 4, 1951, *Schultes & Cabrera* 13314 (COL, GH, US). Same on face of cliff, 13315 (B, COL, GH, K, P, S, US). Same, 13340 (COL, GH, K, NY, US). Same, Nov. 29–30, 1951, *García-Barriga* 13798 (US); 13816 (US). Same, on rocks, Oct. 28, 1951, *Schultes & Cabrera* 14468 (US). Same, at quartzite base of mountain, lat. 0°15' N., long. 70°35' W., Jan. 23–25, 1952, *Schultes & Cabrera* 15062 (COL, US). Savanna Goo-ran-hoo-dá, quartzite base, Mesa de Yambí, Río Karurú (tributary of Río Vaupés), alt. 285–300 m., lat. 1°20' N., long. 71°20' W., April 15–16, 1953, *Schultes & Cabrera* 19150 (COL, GH, US). Same, alt. 240 m., 19168 (US).

**4. *Navia lopezii* L. B. Smith, Bot. Mus. Leafl., Harvard 15:40. 1951; 16:195, pl. 28. 1954.**

Saxicolous, scandent; stem stout; leaves densely many-ranked, sheaths broadly ovate, about 2 cm. long, nerved, dark castaneous, lustrous; blades sublinear, flat, to 22 cm. long, slightly contracted at base, acuminate toward apex and involute-subulate for a short distance, with a narrow brown cartilaginous margin, beneath very minutely and obscurely white-lepidote; inflorescence terminal, sessile, dense, globose from a few few-flowered fascicles; outer bracts oblong, broadly acute; floral bracts lanceolate, acuminate, ample, subcoriaceous; flowers sessile; sepals free, linear, acuminate, subcoriaceous, glabrous, the anterior sepal flat, the two posterior alate-carinate; petal-blades 1 cm. long, exceeding the stamens.

**4a. *Navia lopezii* var. *lopezii***

Outer bracts of the inflorescence equaling the sepals; petals rose-purple.

Not yet found in Colombia.

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4b. *Navia lopezii* var. *colombiana* L. B. Smith, Bot. Mus. Leafl., Harvard 16:195. 1954.

Outer bracts of the inflorescence much exceeded by the sepals; petals white.

VAUPÉS: On cliff in shade, Cerro Isibukuri, Río Kananarí, alt. 250–700 m., Aug. 4, 1951, *Schultes & Cabrera* 13342 (US, type; COL, GH). Same, alt. 250–700 m., Aug. 4, 1951, *Schultes & Cabrera* 13393 (US). Same, quartzite base of large mountain, lat. 0°15' N., long. 70°35' W., Jan. 23–25, 1952, *Schultes & Cabrera* 15078 (COL. US).

5. *Navia bicolor* L. B. Smith, Bot. Mus. Leafl., Harvard 12:119, pl. 14. 1946.

Plant with very short stems, solitary or in clusters of 6 or 7; leaves 9–14 cm. long, sheaths scarcely broader than the blades, concealed, blades linear-oblong, acute or acuminate, glabrous and green above, nerved when dry, very densely serrulate except near apex; scape, glabrous; inflorescence 35 mm. in diameter, glabrous except for the slightly flocculose outer bracts; floral bracts broadly ovate, acuminate, about equaling the sepals, entire, pungent; flowers subsessile; sepals oblong, acute, 5.5 mm. long, connate for 1.5 mm.; petals white when dry, blades lanceolate, 9 mm. long, strongly inflexed at apex.

VAUPÉS: On sandstone in xerophytic savannah, Cerro Chiribiquete, Río Macaya basin of the upper Río Apaporis, alt. 390–630 m., May 15–16, 1943, *Schultes* 5444 (GH, US). Cerro Chiribiquete, Jan. 17, 1944, *Gutiérrez* 653 (GH, type).

6. *Navia heliophila* L. B. Smith, Bot. Mus. Leafl., Harvard 16:194, pl. 26, figs. 5–8, pl. 27. 1954.

Short-caulescent; most of the stem covered with decayed leaf-bases; living leaves many in a spreading rosette at the apex of the stem, sheaths completely covered, blades linear, acute, pungent, 25 cm. long, flat, densely serrulate; inflorescence very dense, compound, globose, 25 mm. in diameter; primary bracts lance-triangular, pungent, serrate, shorter than the globose short-stipitate spikes; floral bracts ovate, acute, slightly but consistently shorter than the sepals, ferruginous-flocculose at base; pedicels short and inconspicuous; sepals lance-oblong, acute, 6 mm. long, the posterior ones sharply carinate and connate for 2 mm.; petals white, blades spreading, narrowly elliptic.

AMAZONAS: On exposed ledge in savannah and caatinga, Raudal de Jirijirimo, Río Apaporis, March 1951, *Schultes* 12085 (US, type); same, Nov. 25–26, 1951, *García-Barriga* 13712 (US); 13735 (US).

AMAZONAS-VAUPÉS: On face of ledge, near Cachivera de Jirijirimo, alt. 250 m., June 13, 1951, *Schultes & Cabrera* 12457 (COL, F, K, GH, NY, US). Same, Sept. 16, 1951, *Schultes & Cabrera* 14050 (B, COL, F, GH, MA, MO, NY, P, S, US). Quartzite base, Raudal de Jirijirimo (below mouth of Río Kananarí), Río Apaporis, alt. 270 m., lat. 0°5' N., long. 70°40' W., Nov. 25, 1951, *Schultes & Cabrera* 14583 (COL, GH, K, US). Quartzite base, near Raudal Yayacopi (La Playa), Río Apaporis, alt. 240 m., lat. 0°5' S., long. 70°30' W., Feb. 16, 1952, *Schultes & Cabrera* 15380 (COL, GH, US); 15422 (COL, GH, NY, UC, US).

7. *Navia acaulis* Mart. ex Schult f. in Roem. & Schult. Syst. 7, pt. 2:1196. 1830.

FIGURE 28

*Dyckia acaulis* Baker, Handb. Bromel. 137. 1889.

Plant short-caulescent, sometimes branched; leaves to 12 cm. long, the blades very densely serrulate, glabrous; inflorescence sunk in the center of the leaf-rosette, globose; floral bracts lanceolate, acuminate



FIGURE 28.—*Navia acaulis*: *a*, Habit,  $\times \frac{1}{2}$  (after Flora Brasiliensis); *b*, apex of leaf,  $\times 1$ ; *c*, sepal,  $\times 5$ .

5 mm. long; sepals equal, 4–6 mm. long, the posterior ones alate-carinate; stamens exserted; capsule broadly ellipsoid, woody-coriaceous, shorter than the sepals.

VAUPÉS: Granitic soil, savanna, San José del Guaviare, Río Guaviare, alt. 270 m., Nov. 12, 1939, Cuatrecasas 7707 (F, US). Sandstone shelf at base of mountain, Mount Campana, Ajaju River, Upper Apaporis Basin, alt. 900–1,500 m., June 1–6, 1948, Schultes 5570 (GH). On rocks, Mesa La Lindosa, a small range 15–20 km. south of San José del Guaviare, alt. 400–600 m., Dec. 13–15, 1950, Idrobo & Schultes 644 (US); 667 (COL).

AMAZONAS: Araracuara, January 1820, Martius (M). Quartzite base of Cerro Castillo, by Apaporis River, alt. 375–570 m., July 27, 1943, Schultes 5656 (US). Rocky soil, white sand, Sabana de la Angostura, Araracuara, Río Caquetá, alt. 400 m., Dec. 21, 1951, García-Barriga 14169 (COL, US).

8. *Navia schultesiana* L. B. Smith, *Caldasia* 3:131, *fig.* 1944; *Bot. Mus. Leaf.*, Harvard 12:121, *pl.* 15. 1946.

Plant forming dense cushions; stem woody, over 30 cm. long, 8–10 mm. thick, covered below with old leaf-bases, densely leafy near the apices; leaves spreading, sheaths small and inconspicuous, blades linear-triangular, pungent, 2 mm. wide, sparsely lepidote with pale appressed scales, subdensely serrulate with curved spines 0.3 mm. long; scape very short, naked; inflorescence terminal, capituliform, 1 cm. in diameter; primary bracts lanceolate, acuminate, pungent, exceeding the flowers, serrulate, sparsely lepidote; flowers sessile; sepals lanceolate, acuminate, 5 mm. long, connate for 1.5 mm., glabrous; petals 8 mm. long, white, acute, strongly inflexed at apex.

VAUPÉS: Cerro del Castillo, upper Río Apaporis, alt. 3,000 m., July 27, 1943, *Schultes* 5655 (GH, type; COL, US).

9. *Navia graminifolia* L. B. Smith, *Bot. Mus. Leaf.*, Harvard 12:120. 1946.

Stem branched and densely foliate; leaf-sheaths small, ovate, blades linear, nerved, soon completely glabrous, subdensely serrulate; scape not over 1 cm. long, slender, naked; inflorescence a globose cluster of small heads, 15–18 mm. in diameter, glabrous; floral bracts broadly ovate, acuminate; flowers subsessile; sepals oblong, acute, 5 mm. long, short-connate posteriorly; petals flavous, blades lanceolate, 3 mm. long, strongly inflexed at apex.

VAUPÉS: On sandstone in xerophytic savannah, Cerro Chiribiquete, Río Macaya, basin of the upper Río Apaporis, alt. 390–630 m., May 15–16, 1943, *Schultes* 5492 (GH, type; US).

10. *Navia fontoides* L. B. Smith, *Bromeliad Soc. Bull.* 5:19, *fig.* 1955.

Short-caulescent, erect; the old leaves covering the stem, the living leaves forming a dense decurving rosette at its apex, 55 cm. long, glabrous, sheaths broadly ovate, 1 cm. long, blades linear, filiform-acuminate, flat, green except for the white base, very laxly serrate with slender brown spines 1 mm. long; inflorescence sessile, 3 cm. in diameter, many-flowered; bracts membranaceous, dark brown with brown spreading scales, the outer ones narrowly triangular from an ovate base and with a short foliaceous apex; floral bracts very narrowly triangular, about equaling the sepals, curved and thickened at the apex; flowers sessile; sepals like the floral bracts but straight at the apex, imbricate, free, auricled, carinate; capsule subquadrate, 5 mm. long; seeds subquadrate, corrugated, wing vestigial.

AMAZONAS-VAUPÉS: Wet east facing cliff, vicinity of Raudal Yayacopi (La Playa), Río Apaporis, alt. 240 m., lat. 0°5' S., long. 70°30' W., Feb. 16, 1952, *Schultes & Cabrera* 15391 (US, type; COL). Same, on cliffs in dripping water, quartzite base, Mar. 14, 1952, *Schultes & Cabrera* 15926 (B, COL, F, GH, K, S, UC, US). Same, alt. 240 m., Apr. 15, 1952, *Schultes & Cabrera* 16212 (COL, GH, K, US).

AMAZONAS: Soft sandstone cliff, near mouth of Río Popeyacá (tributary of Apaporis between Río Piraparaná and Raudal Yayacopi, alt. 200 m., lat. 0°20' S., long. 70°30' W., Feb. 22–26, 1952, *Schultes & Cabrera* 15557 (COL, GH, US).

VAUPÉS: On rock, Cachivera Palito, Río Kananarí, alt. 250 m., Oct. 25, 1951, *Schultes & Cabrera* 14413 (COL, GH, NY, US).

### Subfamily 2. TILLANDSIOIDEAE

TILLANDSIOIDEAE Harms, Engl. & Prantl, *Pflanzenfam.* ed. 2. 15a:115. 1930.

Herbs; leaves always entire; flowers perfect or in some species of *Catopsis* functionally or completely dioecious; ovary nearly or quite superior in all Colombian species; fruit capsular; seeds plumosely appendaged at the base or apex.

#### KEY

1. Appendage of the seed basal, straight at maturity.
  2. Petals free or slightly joined, the corolla-tube then deeply included in the calyx.
    3. The petals naked; inflorescence of one or more distichous-flowered spikes or rarely simple and polystichous- or even one-flowered . . . . . 5. *Tillandsia*
    3. The petals each bearing two scales on the inner face.
      6. *Vriesia*
  2. Petals joined or closely agglutinated and simulating true fusion, the corolla-tube about equaling the calyx or longer; flowers always polystichous.
    4. The petals naked . . . . . 7. *Guzmania*
    4. The petals each bearing two scales on the inner face.
      8. *Mezobromelia*
1. Appendage of the seed apical, folded at maturity; sepals strongly asymmetric; flowers polystichous . . . . . 9. *Catopsis*

The species of Tillandsioideae in fruiting condition are distinguished by the following key and subkeys (for further distinctions see the keys under the appropriate genera and subgenera):

1. Spikes with the flowers distichous (sometimes becoming secund) or else the inflorescence reduced to a single flower.
  2. Sepals asymmetric, free, oblong<sup>m</sup> or broadest near the apex, not over 12 mm. long in the Colombian species.

#### *Tillandsia* subgenus *Pseudo-Catopsis*

2. Sepals symmetric or, if slightly asymmetric, then ovate or lanceolate and broadest near the base.
  3. Leaf-blades ligulate or lanceolate with curving sides, mostly flat, thin, and obscurely lepidote.
    4. Inflorescence compound . . . . . Subkey I
    4. Inflorescence simple . . . . . Subkey II



3. Leaf-blades very narrowly triangular or linear, frequently involute or densely and coarsely lepidote or both.
5. Inflorescence either simple or else compound with the sheaths of the primary bracts shorter than the axillary branches . . . . . *Subkey III*
5. Inflorescence compound with the sheaths of the lower primary bracts equaling or exceeding the branches.  
*Subkey IV*
1. Spikes with the flowers in more than 2 ranks or in axillary few-flowered fascicles on pulviniform aborted axes.
6. Plumose appendage of the seed apical, folded over at maturity; sepals strongly asymmetric in most species . . . . . *Catopsis*
6. Plumose appendage of the seed basal, straight at maturity; sepals usually symmetric.
7. Inflorescence compound . . . . . *Subkey V*
7. Inflorescence simple . . . . . *Subkey VI*

## SUBKEY I

1. Sheaths of the primary bracts shorter than the axillary spikes.
2. Flowers secund; inflorescence laxly bipinnate . . . *Vriesia 2, 22*
2. Flowers not secund, or if slightly so, then the inflorescence amply tripinnate.
3. The flowers closely imbricate.
4. Inflorescence lax; spikes mostly spreading to reflexed.
5. Floral bracts ample, concealing the angled or narrowly alate rhachis; posterior sepals carinate. *Tillandsia 1-5*
5. Floral bracts narrow, exposing much of the broadly alate rhachis; sepals ecarinate . . . . . *Vriesia 1, 3, 4*
4. Inflorescence dense, thyrsoid to digitate.
6. The inflorescence thyrsoid, several times longer than broad . . . . . *Tillandsia 6, 7*
6. The inflorescence digitate or short-pinnate, nearly or quite as broad as long.
7. Sepals 12-17 mm. long.
8. The sepals ecarinate, free, obtuse . . . . *Vriesia 14*
8. The sepals carinate, high-connate posteriorly.  
*Tillandsia 8, 9*
7. Sepals 25-45 mm. long . . . . . *Tillandsia 1, 10, 11*
3. The flowers spreading or remote; spikes lax.
9. Flowers remote, erect . . . . . *Tillandsia 12*
9. Flowers mostly more than twice as long as the internodes, divergent to spreading.
10. Sepals 8 mm. long; floral bracts carinate; inflorescence tripinnate . . . . . *Tillandsia 13*

- 10. Sepals 17–40 mm. long.
  - 11. Rhachis broadly alate . . . . . *Tillandsia* 48
  - 11. Rhachis merely angled . . . . . *Vriesia* 2, 23
- 1. Sheaths of the primary bracts equaling or exceeding the lower spikes . . . . . *Tillandsia* 11, 25–33

## SUBKEY II

- 1. Floral bracts fleshy, rugulose when dry . . . . . *Vriesia* 18, 19
- 1. Floral bracts even or nerved, but not rugulose.
  - 2. Flowers secund . . . . . *Vriesia* 20–22, 24, 25
  - 2. Flowers not secund.
    - 3. Inflorescence very lax, pendulous; flowers spreading; rhachis very slender . . . . . *Vriesia* 17
    - 3. Inflorescence dense, erect or ascending; flowers imbricate.
      - 4. Floral bracts with a sigmoid keel, membranaceous, to to 45 mm. long . . . . . *Vriesia* 16
      - 4. Floral bracts with a convex or nearly straight keel.
        - 5. Sepals acute or acuminate . . . . *Tillandsia* 1, 40, 42, 43
        - 5. Sepals obtuse or subtruncate.
          - 6. Leaf-blades dark-spotted; rhachis broadly alate.
            - Tillandsia* 41
          - 6. Leaf-blades concolorous; rhachis narrowly alate.
            - Vriesia* 14, 15

## SUBKEY III

- 1. Plant caulescent; inflorescence simple or rarely digitate (*Tillandsia* 45).
  - 2. Leaves distichous, linear, not over 2 mm. in diameter.
    - Tillandsia* 52, 53
  - 2. Leaves polystichous, wider.
    - 3. Scape none; inflorescence 1-2-flowered; leaves appressed-lepidote . . . . . *Tillandsia* 73
    - 3. Scape evident; inflorescence usually more than 2-flowered.
      - 4. Sepals densely lepidote; leaf-blades flat except near the apex.
        - Tillandsia* 45
      - 4. Sepals glabrous; leaf-blades involute-subulate.
        - 5. Floral bracts 12–17 mm. long, about equaling the sepals.
          - Tillandsia* 51
        - 5. Floral bracts 20–30 mm. long, much exceeding the sepals.
          - Tillandsia* 77
  - 1. Plant stemless with rosulate or fasciculate leaves, sometimes stoloniferous.
    - 6. Flowers secund; plant 2–4 m. high; branches of the inflorescence 5–9 dm. long . . . . . *Tillandsia* 74

6. Flowers not secund.
  7. Spikes lax; flowers remote or spreading.
    8. Flowers erect, appressed to the rhachis.
      9. Rhachis nearly straight; floral bracts exceeding the sepals. *Tillandsia 14*
      9. Rhachis strongly flexuous or geniculate; floral bracts shorter than the sepals . . . . . *Tillandsia 76*
    8. Flowers spreading.
      10. Floral bracts about equaling the internodes; pedicels to 7 mm. long . . . . . *Tillandsia 75*
      10. Floral bracts longer than the internodes; pedicels short . . . . . *Tillandsia 50*
  7. Spikes dense; flowers imbricate.
    11. Leaf-sheaths inflated and forming a pseudobulb, nearly concolorous with the blades; plants mostly small.
      12. Floral bracts 10 mm. long, strongly nerved, lepidote only along the keel . . . . . *Tillandsia 15*
      12. Floral bracts 15-32 mm. long . . . . . *Tillandsia 86-90*
    11. Leaf-sheaths not inflated, often dark castaneous and contrasting sharply with the blades.
      13. Scape none; inflorescence 1-2-flowered . . *Tillandsia 73*
      13. Scape evident; inflorescence usually more than 2-flowered.
        14. Indument of the leaves of coarse spreading cinereous scales; floral bracts and sepals lepidote. *Tillandsia 44*
        14. Indument of the leaves of closely appressed scales.
          15. Floral bracts coriaceous or fleshy, nearly or quite even or rugulose when dry but not strongly nerved.
          16. Sepals free or equally very short-connate.
            17. Floral bracts fleshy, becoming rugulose when dry, strongly incurved toward the apex. *Tillandsia 82*
            17. Floral bracts coriaceous, even, nearly straight toward the apex.
              18. The floral bracts ecarinate, obtuse; inflorescence laxly pinnate . . . . . *Tillandsia 81*
              18. The floral bracts carinate toward the apex, acute; inflorescence dense or simple.
                19. Leaf-sheaths deep maroon; inflorescence compound . . . . . *Tillandsia 21*
                19. Leaf-sheaths green with red stripes; inflorescence simple . . . . . *Tillandsia 49*

16. Sepals distinctly more connate posteriorly than anteriorly.
20. Inflorescence pinnately compound.
21. The inflorescence tripinnate; lower primary bracts with long linear blades exceeding the branches . . . . . *Tillandsia 16*
21. The inflorescence merely bipinnate.
22. Floral bracts 15–20 mm. long; inflorescence dense . . . . . *Tillandsia 85*
22. Floral bracts 20–24 mm. long; inflorescence lax at least at base . *Tillandsia 23*
20. Inflorescence simple or digitately compound with the spikes much longer than the axis.
23. Leaf-blades linear-subulate; floral bracts densely lepidote . . . . . *Tillandsia 78*
23. Leaf-blades very narrowly but distinctly triangular; floral bracts sparsely lepidote to glabrous.
24. Spikes nearly terete; posterior sepals almost wholly connate. . . . . *Tillandsia 39*
24. Spikes distinctly complanate; posterior sepals only partially connate.
25. Floral bracts cucullate; leaves cinereous-lepidote below . . . . . *Tillandsia 24*
25. Floral bracts nearly straight toward the apex; leaves finely and equally lepidote . . . . . *Tillandsia 83*
15. Floral bracts thin, usually strongly nerved.
26. Sepals free or equally very short-connate.
27. Inflorescence laxly pinnate with spreading spikes.
28. Leaf-sheaths concolorous with the blades; spikes straight, 20–40 cm. long.  
*Tillandsia 20*
28. Leaf-sheaths dark<sup>7</sup>/<sub>1</sub> castaneous, contrasting sharply with the blades; spikes angled abruptly from the erect sterile bases, 4–7 cm. long . . . . . *Vriesia 7, 8*
27. Inflorescence simple or digitate with erect spikes.
29. Floral bracts shorter than the sepals.  
*Tillandsia 79*

29. Floral bracts equaling or exceeding the sepals.
30. The floral bracts carinate, to 16 mm. long.  
*Vriesia 9*
30. The floral bracts rounded on the back, ecarinate.
31. Scape much exceeding the leaves; floral bracts 40–50 mm. long; petals coarsely glandular. . . . . *Vriesia 6*
31. Scape equaling or shorter than the leaves; floral bracts 25–35 mm. long; petals eglandular.
32. The scape much shorter than the leaves; floral bracts 25–35 mm. long.  
*Tillandsia 80*
32. The scape about equaling the leaves; floral bracts 35 mm. long. *Vriesia 5*
26. Sepals more connate posteriorly than anteriorly.
33. Leaf-sheaths concolorous with the blades  
*Tillandsia 84*
33. Leaf-sheaths dark castaneous, contrasting sharply with the blades.
34. Floral bracts rounded on the back, ecarinate; spikes 10–14 cm. long. . . . *Tillandsia 46*
34. Floral bracts carinate toward the apex; spikes 25–35 (rarely to 70) mm. long.
35. Posterior sepals short-connate, acute; floral bracts densely imbricate and concealing the rhachis . . . . . *Vriesia 10*
35. Posterior sepals high-connate, obtuse; floral bracts laxly imbricate and exposing much of the rhachis . . . *Tillandsia 19*

## SUBKEY IV

1. Sepals 7–12 mm. long.
2. Floral bracts laxly imbricate, only concealing part of the rhachis; sepals oblong, obtuse . . . . . *Tillandsia 21*
2. Floral bracts densely imbricate.
3. Inflorescence 3-pinnate, 50 cm. long . . . . . *Tillandsia 34*
3. Inflorescence merely bipinnate.
4. Floral bracts glabrous; inflorescence subglobose.  
*Tillandsia 35*
4. Floral bracts lepidote; inflorescence slender . . . *Vriesia 11*

1. Sepals 18–30 mm. long.
  5. The sepals nearly or quite free.
    6. Floral bracts densely lepidote . . . . . *Tillandsia* 18
    6. Floral bracts soon glabrous . . . . . *Vriesia* 12, 13
  5. The sepals much connate posteriorly . . . . . *Tillandsia* 17, 22, 36–38

## SUBKEY V

1. Flowers on definite branches, not fasciculate; primary bracts not foliaceous.
  2. Inflorescence lax at least at the base, pinnate; lower spikes usually stipitate.
    3. Lowest branches divided; inflorescence 3–4-pinnate  
*Guzmania* 1–3
    3. Lowest branches simple; inflorescence bipinnate.
      4. Spikes 5–25 cm. long, lax; flowers not all contiguous.  
*Guzmania* 4–8
      4. Spikes not over 4 cm. long or else dense with all the flowers contiguous.
        5. Leaf-blades 5–12 mm. wide, acuminate . . . . . *Guzmania* 9
        5. Leaf-blades mostly ligulate, 15–70 mm. wide.
          6. Floral bracts equaling or exceeding the sepals.
            7. Branches pendulous . . . . . *Guzmania* 10
            7. Branches erect to spreading.
              8. Sepals coriaceous, even, 15–24 mm. long.
                9. Floral bracts broadly rounded, 20 mm. long; sepals 15 mm. long, opaque, lepidote; coma brown . . . . . *Guzmania* 11
                9. Floral bracts acute, 25–30 mm. long; sepals 24 mm. long, lustrous, glabrous; coma white.  
*Vriesia* 26
              8. Sepals rather thin, distinctly nerved, 25–30 mm. long; leaf-apices subulate-indurate.  
*Guzmania* 5, 12
    6. Floral bracts shorter than the sepals.
      10. Sepals 8–18 mm. long.
        11. Spikes 10 cm. long; floral bracts truncate, membranaceous . . . . . *Guzmania* 13
        11. Spikes 2–6 cm. long.
          12. Flowers all contiguous; spikes dense.
            13. Scape-bracts lax; primary bracts many times shorter than the spikes . . . . . *Guzmania* 14

13. Scape-bracts imbricate; primary bracts about equaling or exceeding the lower branches.
14. Axis of the inflorescence geniculate, dark; floral bracts with a thick apical cusp.  
*Guzmania 15*
14. Axis of the inflorescence not more than flexuous; floral bracts thin.
15. Spikes 12-15-flowered; sepals 10 mm. long, obtuse . . . . *Guzmania 16*
15. Spikes 3-5-flowered; sepals 18 mm. long, broadly acute . . . *Mezobromelia*
12. Flowers not all contiguous; spikes lax at least at the base; floral bracts and sepals prominently nerved . . . . *Guzmania 17, 18*
10. Sepals 21-40 mm. long . . . . *Guzmania 19-23*
2. Inflorescence dense throughout . . . . *Guzmania 9, 16, 24-32*
1. Flowers fasciculate in the axils of large generally foliaceous or subfoliaceous bracts; inflorescence bipinnate.
16. Floral bracts 6-8 cm. long, with membranaceous dilated apices.  
*Guzmania 33*
16. Floral bracts much smaller.
17. Sepals coriaceous, persistent.
18. Fascicles 10-15-flowered, not much concealed by the broadly ovate spreading primary bracts . . *Vriesia 27*
18. Fascicles few-flowered, concealed by the subfoliaceous primary bracts.
19. Leaves acuminate; floral bracts partially coriaceous, persistent; sepals lanceolate . . . . . *Guzmania 34*
19. Leaves broadly acute; floral bracts thin, evanescent; sepals broadly elliptic . . . . . *Vriesia 28*
17. Sepals membranaceous, disintegrating after anthesis, usually connate . . . . . *Guzmania 35-44*

## SUBKEY VI

1. Outer bracts of the inflorescence forming a cyathiform involucre 6 cm. or longer that exceeds and conceals the large flowers.  
*Guzmania 45-47*
1. Outer bracts of the inflorescence never concealing more than the lowest flowers.
2. Sepals much more connate posteriorly than anteriorly; leaf-blades subulate-acuminate, 2-7 mm. wide.
3. Floral bracts membranaceous, nearly or quite glabrous; sepals 10 mm. long . . . . . *Tillandsia 47*

3. Floral bracts coriaceous or subcoriaceous, densely lepidote; sepals 15-20 mm. long . . . . . *Tillandsia* 78
2. Sepals free or subequally connate.
4. The sepals connate for less than half their length or free.
5. Floral bracts coriaceous or subcoriaceous.  
*Guzmania* 30, 48-52
5. Floral bracts thin.
6. Inflorescence lax, elongate; flowers suberect to spreading; sepals acute . . . . . *Guzmania* 6
6. Inflorescence dense; flowers and floral bracts imbricate.
7. Leaf-blades not more than 10 mm. wide; plant caulescent . . . . . *Guzmania* 53
7. Leaf-blades more than 10 mm. wide; plant stemless.
8. Floral bracts densely brown-lepidote; sepals acuminate . . . . . *Guzmania* 54
8. Floral bracts glabrous or obscurely pale-lepidote; sepals broadly rounded or acute.
9. Sepals coriaceous, even . . . . . *Guzmania* 55, 56
9. Sepals thin, nerved . . . . . *Tillandsia* 25
4. The sepals connate for more than half their length.  
*Guzmania* 57-66

#### 4. *Tillandsia*

*Tillandsia* L. Sp. Pl. 286. 1753.

*Renalmia* L. Sp. Pl. 286. 1753, non L. f. 1781 (nomen conservandum).

*Bonapartea* R. & P. Fl. Peruv. 3:38, pl. 262. 1802.

*Acanthospora* Spreng. Anl. ed. 2, 2:255. 1817.

*Misandra* F. G. Dietr. Lex. Nachtr. 5:102. 1819, non Commerson 1789.

*Dendropogon* Raf. Neog. 3. 1825.

*Buonapartea* Sweet, Hort. Brit. ed. 3. 706. 1839.

*Strepsia* Nutt. ex Steud. Nomencl. Bot. ed. 2, 2:645. 1841.

*Allardtia* A. Dietr. Allg. Gartenzeit. 20:241. 1852.

*Anoplophytum* Beer, Flora 37:346. 1854.

*Diaphoranthema* Beer, Flora 37:349. 1854.

*Phytarrhiza* Visiani, Mem. Ist. Veneto 5:340. 1855.

*Platystachys* K. Koch ex Beer, Bromel. 18, 80. 1857.

*Pityrophyllum* Beer, Bromel. 17, 79. 1857.

*Wallisia* E. Morr. Belg. Hortie. 20:97. 1870, nomen invalidum.

Caulescent or acaulescent herbs of very variable habit; leaves rosulate or fasciculate or distributed along a stem, polystichous or distichous, entire, ligulate or narrowly triangular or linear; scape usually distinct; inflorescence various, usually of distichous-flowered spikes or sometimes reduced to a single polystichous-flowered spike by the reduction of the spikes to single flowers or rarely the whole inflorescence reduced to a single flower; flowers perfect; sepals usually symmetric, free, or equally or posteriorly joined; petals free, naked;



stamens of various lengths relative to the petals and pistil; ovary superior, glabrous; ovules usually many, caudate; capsule septicidal; seeds erect, narrowly cylindric or fusiform, the plumose appendage white, straight, basal.

Southeastern United States to northern Argentina and Chile.

### CONSPECTUS OF SUBGENERA

1. Stamens equaling the petals or shorter.
  2. Sepals symmetric, or if slightly asymmetric, then ovate or lanceolate and broadest below the middle.
    3. Stamens appearing in the throat of the corolla; style slender, much longer than the ovary.
      4. Filaments straight . . . . . **1. *Allardtia***
      4. Filaments more or less transversely plicate or widened toward their apices; inflorescence dense; often simple with the flowers in more than 2 ranks; leaf-blades narrowly triangular . . . . . **2. *Anoplophytum***
    3. Stamens deeply included; style short and stout; leaf-blades narrowly triangular or linear.
      5. Petal-blades broad, conspicuous . . . . . **3. *Phytarrhiza***
      5. Petal-blades narrow and inconspicuous; sepals not over 9 mm. long in the Colombian species; inflorescence almost always simple; small plants with the appearance of coarse mosses . . . . . **4. *Diaphoranthema***
  2. Sepals asymmetric, nearly or quite free, broadest near the apex, not over 12 mm. long in the Colombian species
    5. ***Pseudo-Catopsis***
1. Stamens longer than the petals, exerted; leaf-blades narrowly triangular or linear in the Colombian species . . . **6. *Tillandsia***

#### Subgenus 1. *Allardtia*

1. Inflorescence compound.
  2. Sheaths of the primary bracts shorter than the axillary branches.
  3. Leaf-blades ligulate to linear-lanceolate, their sides curved.
  4. Flowers closely imbricate.
    5. Inflorescence lax; spikes mostly spreading to reflexed.
    6. Sepals 20–45 mm. long; inflorescence rarely more than bipinnate.
    7. The sepals narrow, acute, 25–45 mm. long.
      8. Spikes lanceolate to linear, several times longer than broad . . . . . **1. *T. deppeana***
      8. Spikes broadly ovate, almost as broad as long.
        2. ***T. lajensis***

7. The sepals broadly elliptic, obtuse, not over 20 mm. long . . . . . **3. *T. pyramidata***
6. Sepals 11–15 mm. long.
9. Floral bracts even; sepals 15 mm. long; inflorescence bipinnate, or tripinnate at base only  
**4. *T. denudata***
9. Floral bracts prominently nerved; sepals 11 mm. long; inflorescence amply tripinnate . **5. *T. arnoldiana***
5. Inflorescence dense, thyrsoïd to digitate.
10. The inflorescence thyrsoïd, several times longer than broad.
11. Inflorescence tripinnate; sepals free.  
**6. *T. acuminata***
11. Inflorescence bipinnate; sepals connate posteriorly.  
**7. *T. carrierei***
10. The inflorescence digitate or short-pinnate, nearly or quite as broad as long.
12. Sepals 12–17 mm. long; spikes scarcely more than 15 mm. wide.
13. Primary bracts little larger than the floral bracts; spikes divergent . . . . . **8. *T. reversa***
13. Primary bracts half as long as the spreading spikes . . . . . **9. *T. fassettii***
12. Sepals 25–45 mm. long; spikes broad.
14. The sepals free.
15. Margin of the floral bracts arching to a broad apex . . . . . **1. *T. deppeana***
15. Margin of the floral bracts sigmoid-curved just below the apex, acuminate **10. *T. sigmoidea***
14. The sepals high-connate posteriorly; margin of the floral bracts arching . . . . . **11. *T. ultima***
4. Flowers remote or spreading, not imbricate.
16. Inflorescence laxly bipinnate; floral bracts 20–25 mm. long, about twice as long as the internodes, suberect  
**12. *T. rariflora***
16. Inflorescence amply tripinnate, thyrsoïd; floral bracts 8 mm. long, much more than twice the internodes, spreading . . . . . **13. *T. delicatula***
3. Leaf-blades very narrowly triangular with straight sides or linear.
17. Spikes lax; floral bracts much less than twice the length of the internodes . . . . . **14. *T. adpressiflora***

17. Spikes dense; floral bracts imbricate.
18. Leaf-blades linear-subulate; sheaths suborbicular, inflated and forming a pseudobulb . . . **15. *T. disticha***
18. Leaf-blades very narrowly triangular.
19. Lower primary bracts with elongate linear blades that exceed the branches.
20. Inflorescence tripinnate; sepals 10–12 mm. long  
**16. *T. longifolia***
20. Inflorescence bipinnate.
21. Sepals 30 mm. long; inflorescence subtax.  
**17. *T. restrepoana***
21. Sepals 12–18 mm. long; inflorescence dense at least toward apex.
22. Inflorescence nutant; sepals glabrous, 18 mm. long, nearly free . . . . **18. *T. schultzei***
22. Inflorescence erect; sepals more or less lepidote, 12 mm. long, high-connate posteriorly.  
**19. *T. archeri***
19. Lower primary bracts bladeless or with short inconspicuous blades that do not exceed the branches.
23. Floral bracts thin, strongly nerved; sepals 11–13 mm. long; spikes linear, 20–40 cm. long, many-flowered . . . . . **20. *T. elongata***
23. Floral bracts coriaceous to subchartaceous, even or faintly nerved; sepals 20–32 mm. long.
24. Sepals free; spikes secund . . . **21. *T. arcuans***
24. Sepals high-connate posteriorly.
25. Lower primary bracts nearly equaling the spikes; floral bracts densely lepidote toward apex, straight . . . . . **22. *T. cuatrecasii***
25. Lower primary bracts much shorter than the spikes; floral bracts glabrous or nearly so.
26. Floral bracts straight; inflorescence laxly bipinnate . . . . . **23. *T. confinis***
26. Floral bracts cucullate; inflorescence short-pinnate or digitate . . . **24. *T. suescana***
2. Sheaths of the primary bracts equaling or exceeding at least the lower axillary branches.
27. Leaf-blades ligulate or subtriangular with curved sides.
28. Floral bracts distinctly shorter than the sepals.
29. Spikes short-stipitate; inflorescence erect or ascending; leaf-blades 20 mm. wide . . . . . **25. *T. biflora***
29. Spikes long-stipitate; inflorescence pendulous; leaf-blades 45 mm. wide . . . . . **26. *T. stipitata***

28. Floral bracts equaling or exceeding the sepals.
30. Inflorescence digitate; primary bracts narrowly triangular or lanceolate; sepals subfree . 27. *T. schimperiana*
30. Inflorescence pinnate.
31. Spikes spreading; sepals nearly free, 13–20 mm. long.  
28. *T. buseri*
31. Spikes erect or suberect.
32. Leaf-blades densely cinereous-lepidote at least beneath, obscurely ligulate or subtriangular.
33. Floral bracts subchartaceous, nerved, not strongly incurved toward apex . . . 29. *T. fusiformis*
33. Floral bracts coriaceous, even, strongly incurved toward apex . . . . . 30. *T. orbicularis*
32. Leaf-blades obscurely lepidote, green.
34. Sepals short-connate posteriorly; inflorescence erect, dense, cylindric . . . . 31. *T. pastensis*
34. Sepals high-connate posteriorly; scape curved.
35. Inflorescence cylindric.
36. Sepals 22 mm. long . . . . 32. *T. brunonis*
36. Sepals 13 mm. long . . . 33. *T. humboldtii*
35. Inflorescence stout, ellipsoid . 11. *T. ultima*
27. Leaf-blades narrowly triangular with straight sides.
37. Inflorescence tripinnate, narrowly cylindric; sepals 8 mm. long . . . . . 34. *T. engleriana*
37. Inflorescence bipinnate.
38. Sepals 7–12 mm. long.
39. Floral bracts densely imbricate; sepals ovate, acute, equally short-connate . . . . . 35. *T. myriantha*
39. Floral bracts laxly imbricate, only concealing part of the rhachis; sepals oblong, obtuse, much connate posteriorly . . . . . 19. *T. archeri*
38. Sepals 18–30 mm. long, much connate posteriorly.
40. Primary bracts acuminate or laminate from a narrow base.
41. Floral bracts nearly or quite glabrous; sepals 20 mm. long . . . . . 36. *T. caloura*
41. Floral bracts densely lepidote; sepals to 28 mm. long . . . . . 22. *T. cuatrecasasii*
40. Primary bracts rounded and apiculate from an orbicular or broadly ovate or elliptic base.
42. Inflorescence densely ovoid or ellipsoid; scape-bracts densely cinereous-lepidote . . . 37. *T. turneri*
42. Inflorescence cylindric; scape-bracts glabrous except for the short triangular apex.  
38. *T. dichrophylla*

1. Inflorescence simple.
  43. Flowers polystichous; leaf-blades ligulate . . . . 25. *T. biflora*
  43. Flowers distichous.
    44. Leaf-blades involute, narrow.
      45. Inflorescence nearly terete; floral bracts 20–25 mm. long.
 

39. *T. rhomboidea*
      45. Inflorescence complanate; floral bracts 6–10 mm. long.
 

15. *T. disticha*
    44. Leaf-blades flat.
      46. Rhachis alate; floral bracts shorter than the sepals of at least the upper flowers.
        47. Floral bracts narrow, carinate toward apex; leaf-blades linear, acuminate, 15 mm. wide . . . . 40. *T. dubia*
        47. Floral bracts broad, ecarinate; leaf-blades ligulate, rounded and long-apiculate, to 22 mm. wide.
 

41. *T. excavata*
      46. Rhachis not more than angled; floral bracts equaling or exceeding the sepals.
        48. Floral bracts 11–13 cm. long, acuminate, much exceeding the sepals . . . . . 42. *T. monstrum*
        48. Floral bracts much smaller with broad apices, little if at all longer than the sepals.
          49. Inflorescences several and lateral in each rosette; floral bracts ecarinate; sepals 10–15 mm. long.
 

43. *T. complanata*
          49. Inflorescence single and terminal; floral bracts more or less carinate toward apex; sepals 25–45 mm. long.
 

1. *T. deppeana*

Subgenus 2. Anoplophytum

1. Flowers distichous; sepals lepidote.
  2. Primary bracts from slightly shorter to exceeding the 4–5 cm. long spikes; sepals 10–14 mm. long . . . . . 44. *T. gardneri*
  2. Primary bracts much shorter than the spikes or the inflorescence simple.
    3. Sepals 14 mm. long; inflorescence usually simple; leaf-blades 10–17 mm. wide . . . . . 45. *T. incarnata*
    3. Sepals 22 mm. long; inflorescence subdigitate; leaf-blades 30 mm. wide . . . . . 46. *T. chartacea*
1. Flowers polystichous; sepals glabrous; inflorescence simple.
  47. *T. pulchella*

Subgenus 3. *Phytarrhiza*

1. Inflorescence compound; leaf-blades ligulate; rhachis broadly alate.  
48. *T. platyrhachis*
1. Inflorescence simple; leaf-blades narrowly triangular.
  2. Leaf-blades obscurely punctulate-lepidote, flat; plants essentially stemless.
    3. Floral bracts densely imbricate, to 40 mm. long, exceeding the sepals . . . . . 49. *T. anceps*
    3. Floral bracts spreading, lax, 17 mm. long, equaling the sepals.  
50. *T. monadelpha*
  2. Leaf-blades densely spreading-lepidote, involute; plants long-caulescent . . . . . 51. *T. paleacea*

Subgenus 4. *Diaphoranthema*

1. Stem not more than 1 dm. long, wholly concealed by the imbricate leaf-sheaths; scape terminal, always evident . . 52. *T. recurvata*
1. Stem to 8 m. long, exposed between the leaves; flowers solitary on short pseudo-axillary branches . . . . . 53. *T. usneoides*

Subgenus 5. *Pseudo-Catopsis*

1. Inflorescence simple or of a few closely aggregated spikes; floral bracts broad, usually membranaceous, nearly twice as long as the sepals.
  2. Spike lax; rhachis exposed; sepals 12 mm. long.  
54. *T. trapeziformis*
  2. Spikes dense; floral bracts concealing the rhachis.
    3. Leaf-blades straight . . . . . 55. *T. seemannii*
    3. Leaf-blades undulate-crisped . . . . . 56. *T. crispa*
1. Inflorescence ample, pinnately compound, or the floral bracts shorter than the sepals.
  4. Flowers remaining distichous, not secund.
    5. The flowers erect, remote; floral bracts mostly equaling or shorter than the internodes; leaf-blades ligulate, over 3 cm. wide . . . . . 57. *T. tenuispica*
    5. The flowers divergent to spreading; floral bracts mostly longer than the internodes.
      6. Floral bracts about equaling or exceeding the sepals.
        7. The floral bracts 15 mm. long, carinate.  
58. *T. inconspicua*
        7. The floral bracts less than 10 mm. long.
          8. Floral bracts sulcate with a definite midnerve.  
59. *T. subalata*

8. Floral bracts even or faintly few-nerved near the margin, without a midnerve.
9. Primary branches of the inflorescence simple, 8.5–15 cm. long . . . . . **60. *T. triticea***
9. Primary branches of the inflorescence divided, or if simple not over 7 cm. long.
10. Spikes lax; flowers spreading, not touching at maturity; floral bracts 4–5 mm. long.  
**61. *T. micrantha***
10. Spikes dense; flowers contiguous; floral bracts 6–9 (rarely 5) mm. long . . **62. *T. spiculosa***
6. Floral bracts or most of them shorter than the sepals.
11. Primary branches arching-pendulous or spreading to reflexed; spikes dense or subdense; leaf-blades rounded and apiculate.
12. The primary branches nearly straight, spreading to reflexed; primary bracts spreading to reflexed; scape-bracts usually imbricate.  
**63. *T. membranacifolia***
12. The primary branches arching-pendulous; primary bracts erect; scape-bracts remote . **64. *T. michelii***
11. Primary branches erect to spreading or if rarely reflexed then either the spikes lax or the leaf-blades triangular.
13. Inflorescence definitely tripinnate or more divided; scape-bracts usually small and remote.
14. Leaf-blades ligulate; leaf-sheaths nearly flat, dark brown; scape-bracts apiculate.  
**65. *T. ropalocarpa***
14. Leaf-blades very narrowly triangular; leaf-sheaths inflated.
15. Scape-bracts acuminate. **66. *T. sanctae-martae***
15. Scape-bracts linear-laminate. . **67. *T. penlandii***
13. Inflorescence bipinnate.
16. Leaf-blades not over 2 cm. wide, involute; primary bracts narrowly ovate-oblong; sepals scarcely more than 5 mm. long . . . . . **68. *T. adpressa***
16. Leaf-blades 3–8 cm. wide, usually flat; primary bracts broadly ovate or ovate-elliptic; sepals to 10 mm. long . . . . . **69. *T. tetrantha***
4. Flowers secund.
17. The flowers all turned upward.
18. Inflorescence bipinnate; leaves acute . **69. *T. tetrantha***
18. Inflorescence tripinnate; leaves subrounded and apiculate . . . . . **70. *T. fraseri***

17. The flowers turned downward.

19. Floral bracts secund with the flowers, 6–8 mm. long.

71. *T. pectinata*

19. Floral bracts not secund, 10–13 mm. long.

72. *T. riocreuxii*

#### Subgenus 6. *Tillandsia*

1. Scape none; inflorescence 1- (rarely 2-) flowered . 73. *T. andreana*

1. Scape developed (covered by the leaf-sheaths in *T. pruinosa*); inflorescence with much more than 2 flowers.

2. Spikes lax.

3. Flowers downwardly secund; plant 2–4 m. high . 74. *T. mima*

3. Flowers not secund.

4. The flowers spreading; rhachis slender, flexuous.

75. *T. flexuosa*

4. The flowers erect; rhachis stout, geniculate.

76. *T. dasyliriifolia*

2. Spikes dense; floral bracts imbricate.

5. Plant caulescent; leaves densely cinereous- or ferruginous-lepidote; inflorescence simple . . . . . 77. *T. schiedeana*

5. Plant stemless, but sometimes stoloniferous (*T. juncea*).

6. Leaf-sheaths nearly flat not forming a pseudobulb, their apices well separated from the scape or the base of the inflorescence.

7. The leaf-blades linear-subulate; inflorescence digitate or simple with polystichous flowers . . . . . 78. *T. juncea*

7. The leaf-blades narrowly but definitely triangular.

8. Floral bracts shorter than the sepals . 79. *T. brevior*

8. Floral bracts equaling or exceeding the sepals.

9. Leaf-sheaths brown or brown-lepidote, contrasting with the blades.

10. Floral bracts ecarinate.

11. Spikes complanate, 10–24 cm. long; sepals 15–20 mm. long . . . . . 80. *T. incurva*

11. Spikes subterete, 9 dm. long; sepals 30 mm. long . . . . . 81. *T. racinae*

10. Floral bracts carinate.

12. Sepals free, densely lepidote; floral bracts incurved, fleshy, thin and black when dry.

82. *T. kegeliana*

12. Sepals connate posteriorly, glabrous; floral bracts nearly straight toward apex, coriaceous . . . . . 83. *T. fasciculata*



9. Leaf-sheaths essentially concolorous with the blades.  
 13. Floral bracts submembranaceous. *84. T. valenzuelana*
- ♂ 13. Floral bracts coriaceous . . . *85. T. polystachia*
6. Leaf-sheaths inflated and forming a pseudobulb, their apices closely enfolding the scape or the base of the inflorescence.
14. Floral bracts even or nerved only near the margin, glabrous or obscurely lepidote, coriaceous; leaves concolorous or purple-margined, appressed-lepidote. *86. T. balbisiana*
14. Floral bracts either strongly nerved or densely lepidote or both together, subcoriaceous to chartaceous.
15. Scape-bracts vaginiform, the upper ones merely apiculate; leaf-blades straight or arched, appressed-lepidote; sepals ecarinate . . . *87. T. paraënsis*
15. Scape-bracts foliaceous or the scape enclosed by the leaf-sheaths; leaf-blades usually coiled or contorted.
16. Floral bracts densely cinereous-lepidote with coarse spreading or subspreading scales; scape almost wholly covered by the leaf-sheaths. *88. T. pruinosa*
16. Floral bracts appressed-lepidote; scape generally evident.
17. Leaf-sheaths orbicular, distinct, making a sharp angle with the blades . . . . . *89. T. bulbosa*
17. Leaf-sheaths ovate or elliptic, merging into the blades . . . . . *90. T. circinnata*

### Subgenus 1. *Allardtia*

*Tillandsia* subgenus *Allardtia* Baker, Journ. Bot. 26:40. 1888.

Leaf-blades various; inflorescence compound or simple; flowers nearly always distichous; sepals symmetric or nearly so; stamens equaling the claw of the petal but not exceeding the blade, the filaments straight; style slender, much longer than the ovary. Species 1-43.

1. *Tillandsia deppeana* Steud. Nomencl. ed. 2.2:688. 1841.

Stemless, to 2 meters high; leaves many in a dense funnellform rosette, 6-10 dm. long, sheaths subelliptic, inconspicuous, 1-3 dm. long, very densely and finely brown-lepidote, blades ligulate, triangular-acuminate, to 8 cm. wide, flat, nearly or quite glabrous; scape erect, stout; scape-bracts densely imbricate, foliaceous; inflorescence mostly bipinnate, rarely simple or tripinnate; primary bracts

like the upper scape-bracts, much shorter than the spikes but much larger than the floral bracts; spikes acute, complanate, densely 6-many-flowered, often spreading or recurved, more or less stipitate with reduced sterile bracts at base; floral bracts obovate, carinate toward apex, coriaceous, rigid, glabrous, even, about equaling the sepals; flowers short-stipitate; sepals oblong-lanceolate, 25–45 mm. long, carinate, equally subfree; petals slightly exceeding the stamens, blue.

## KEY

1. Inflorescence bipinnate or subtripinnate, elongate, lax.
  2. Spikes erect, long-stipitate . *1a. T. deppeana* var. *deppeana*
  2. Spikes spreading to decurved.
    3. The spikes straight, mostly spreading, distinctly complanate, mostly with a short sterile base.
      - 1b. T. deppeana* var. *latifolia*
    3. The spikes decurved, nutant, slightly complanate, the sterile base mostly elongate . . . *1c. T. deppeana* var. *clavigera*
1. Inflorescence simple or digitate from a few spikes.
  - 1d. T. deppeana* var. *reducta*

**1a. *Tillandsia deppeana* var. *deppeana***

*Tillandsia paniculata* Schlecht. & Cham. Linnaea 6:54. 1831, not L. 1762.

Not reported from COLOMBIA.

MEXICO and the WEST INDIES.

**1b. *Tillandsia deppeana* var. *latifolia* (Griseb.) L. B. Smith, Phytologia 5:394. 1956. FIGURE 29**

*Tillandsia excelsa* var. *latifolia* Griseb. Nachr. Ges. Wis. Goett. for 1864:17. 1865.

*Tillandsia fendleri* Griseb. Nachr. Ges. Wis. Goett. for 1864:17. 1865.

*Tillandsia kalbreyeri* Baker, Journ. Bot. 26:45. 1888.

*Tillandsia paniculata*  $\beta$ . *fendleri* Mez in DC. Monogr. Phan. 9:703. 1896.

*Tillandsia bangii* Baker, Mem. Torrey Bot. Club 6:124. 1896.

*Tillandsia macrodactylon* Mez, Repert. Nov. Sp. Fedde 3:39. 1906.

*Tillandsia rubra* sensu L. B. Smith, Contr. Gray Herb. 95:46. 1931, in part; not R. & P. 1802.

Plant 1–2 m. high; spikes 1–3 dm. long, 5 cm. wide.

MAGDALENA: Rain forest, mountains above Santa Marta, alt. 1,350–1,500 m., August 1946, *Foster & C. E. Smith, Jr.*, 1431 (GH).

NORTE DE SANTANDER: Between Ocaña and Pamplona, alt. 1,050 m., *Kalbreyer* 1013 (! Mez, type of *Tillandsia kalbreyeri* Baker).

SANTANDER: Epiphytic, woods, Mesa de los Santos, eastern Cordillera, alt. 1,500 m., Dec. 11–15, 1926, *Killip & A. C. Smith* 15207 (GH, US).

CUNDINAMARCA: Near Bogotá, *Ariste-Joseph* (US). In trees, near Fusagasugá, alt. 2,700 m., Oct. 12, 1946, *Foster* 1869 (COL, GH, US). Ubaté, 100 km. north of Bogotá, alt. 2,600 m., May 18, 1952, *Køie* 4548 (C). Between Bogotá and Villeta, alt. 1,700 m., Jan. 13, 1953, *Weber* 103 (MAINZ).

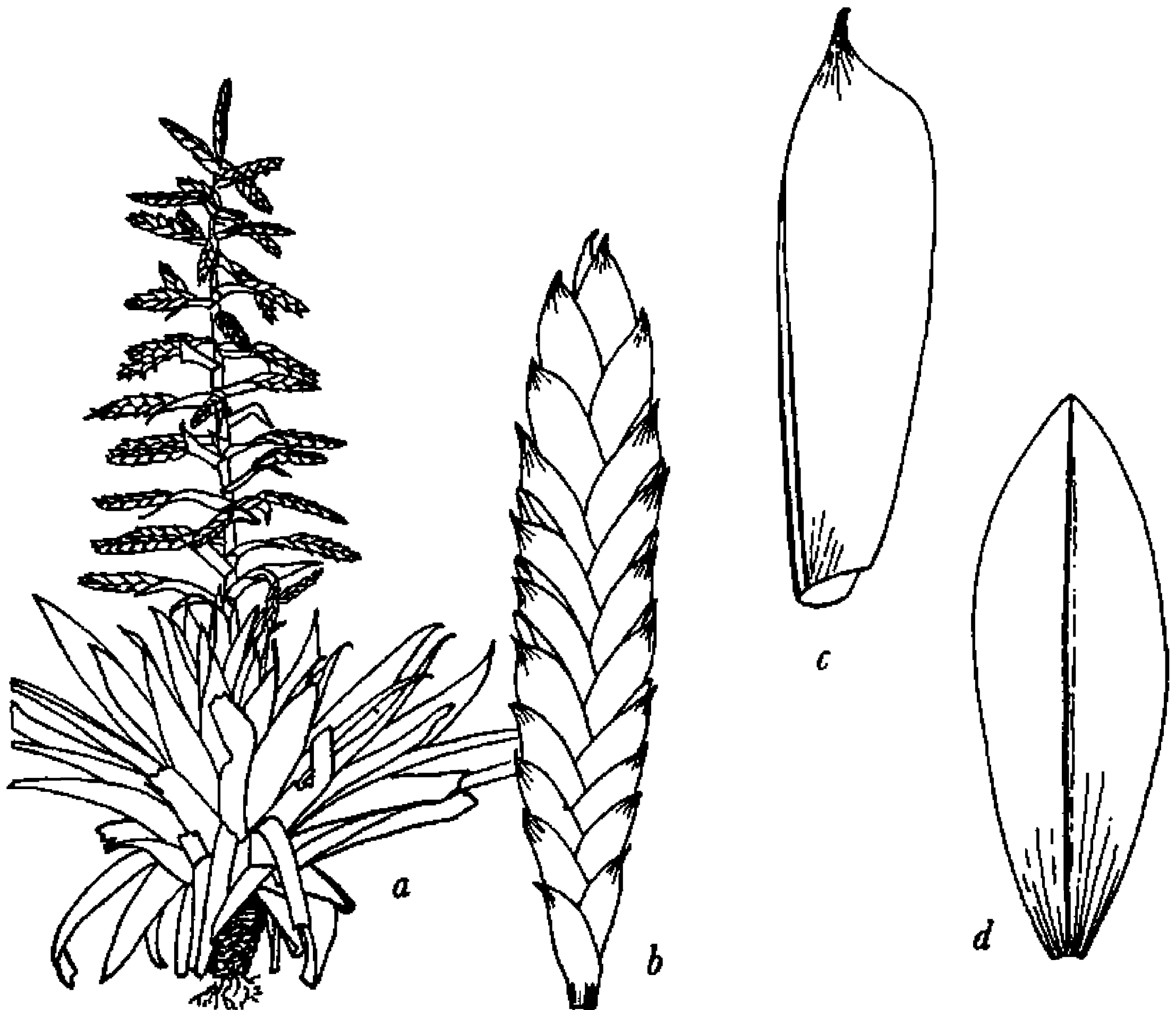


FIGURE 29.—*Tillandsia deppeana* var. *latifolia*: *a*, Habit,  $\times \frac{1}{20}$ ; *b*, spike,  $\times \frac{1}{4}$ ; *c*, floral bract,  $\times 1$ ; *d*, sepal,  $\times 1$ .

**META:** Epiphytic, dense forest, North Ridge, Central Mountains, Sierra de la Macarena, alt. 1,500 m., Dec. 30, 1949, *Philipson & Idrobo* 2000 (BM, COL, US).

**TOLIMA:** Forest, Libano, alt. 1,400–1,600 m., Dec. 26–29, 1917, *Pennell* 3402 (US).

**NARIÑO:** Epiphytic, Umbria, May 28, 1935, *García-Barriga* 4440 (COL, US).

**ANTIOQUIA:** Los Alpes, Jan. 1942, *Daniel* 2705 (GH, US). "Monte del Diablo," near La Ceja, July 21, 1944, *Daniel* 3254 (GH). Epiphytic, damp woods, hot springs of Santo Domingo, alt. 1,200 m., May 7, 1949, *Scolnik, Molina & Barkley* 19-An-430 (US).

**VALLE:** Between Cartago and Naranjo, valley of the Río Cauca, alt. 950 m., March 1876, *André* 1690 (F).

**CAUCA:** On tree, in potrero, La Capilla, 25 km. north of Popayán, alt. 1,740 m., May 24, 1944, *Killip* 38468 (COL, GH, US).

**MEXICO and the WEST INDIES to VENEZUELA and BOLIVIA.**

**1c. *Tillandsia deppeana* var. *clavigera* (Mez) L. B. Smith, *Phytologia* 5:395. 1956.**

*Tillandsia clavigera* Mez in DC. Monogr. Phan. 9:783. 1896.

Plant about 2 meters high; spikes 8–25 cm. long, 2 cm. wide.

**MAGDALENA:** Outer edges of rain forest, Chinchicua, Sierra Nevada de Santa Marta, alt. 1,200 m., August 1946, *Foster & C. E. Smith, Jr.*, 1473 (GH, US).

**CUNDINAMARCA:** On small trees, El Chicó, above Bogotá, alt. 3,000 m., Oct. 11, 1946, *Foster* 1844 (COL, GH, US).

**PERU.**

- 1d. *Tillandsia deppeana* var. *reducta* (L. B. Smith) L. B. Smith, *Phytologia* 5:395. 1956.

*Tillandsia rubra* var. *reducta* L. B. Smith, *Fieldiana Bot.* 28:151. 1951.

Plant 6–10 dm. high.

NORTE DE SANTANDER: On ground and stumps, Ocaña, alt. 1,200 m., Sept. 20, 1946, *Foster* 1751 (COL, GH, US).

VENEZUELA.

2. *Tillandsia lajensis* André, *Enum. Bromél.* 7. Dec. 13, 1888; *Rev. Hort.* 60:567. Dec. 16, 1888.

Leaves to 7 dm. long, blades linear-lanceolate, acute, 45 mm. wide, glabrous; scape slightly curved, very stout; scape-bracts imbricate, foliaceous, minutely lepidote; inflorescence very laxly bipinnate; primary bracts lance-ovate, acuminate, suberect; spikes spreading, short-stipitate, acute, 6 cm. wide; floral bracts ovate, acute, 45 mm. long, much exceeding the sepals, strongly carinate, glabrous; sepals free, oblong, 30 mm. long; petals linear, violet, slightly exceeding the stamens.

NARIÑO: La Laja, near Ipiales, alt. 2,900 m., June 1, 1876, *André* 3477 (K, type, US phot. 4155; NY).

3. *Tillandsia pyramidata* André, *Bromel. Andr.* 86. 1889.

Plant 10–12 dm. high; leaves 3–6 dm. long, sheaths elliptic, 15 cm. long, brown, sparsely punctulate-lepidote, blades ligulate, acute, 4–6 cm. wide, flat, coriaceous, glabrous above; scape erect, stout; scape-bracts imbricate, the lower foliaceous, the upper lanceolate, acute; inflorescence laxly pyramidal, glabrous; primary bracts like the upper scape-bracts, slightly exceeding the short bracteate sterile bases of the branches; spikes spreading, lanceolate or linear-lanceolate, acute, complanate, 8–13 cm. long, 8–12-flowered; floral bracts imbricate, ovate, acute, 20–25 mm. long, exceeding the sepals, carinate, even, sublustrous; sepals free, coriaceous, even.

CUNDINAMARCA: Western slopes of Cordillera Oriental, Barroblanco, alt. 2,000 m., February 1876, *André* 1522 (K, type, US phot. 4156).

NARIÑO: In trees, Sibundoy lowland, alt. 2,190 m., Oct. 28, 1946, *Foster* 1964 (COL, GH).

PERU.

4. *Tillandsia denudata* André, *Enum. Bromél.* 8. Dec. 13, 1888; *Rev. Hort.* 60:568. Dec. 16, 1888.

Stemless, 1–3 meters high; leaves 5–8 dm. long, sheaths large, elliptic, minutely appressed-lepidote, dark castaneous at least toward base, blades ligulate, acute, 5–8 cm. wide, glabrous above; scape erect, stout; scape-bracts imbricate, the lower foliaceous, the upper subfoliaceous or lanceolate; inflorescence narrowly pyramidal; primary bracts ovate, mostly shorter than the long bracteate sterile bases of the branches; spikes lanceolate to linear, acute, complanate,

4–27 cm. long, dense; rhachis flexuous, quadrangular, alate; floral bracts imbricate, broadly ovate, acute, 15–20 mm. long, exceeding the sepals, faintly carinate, coriaceous, even and sublustrous-castaneous except the margins; sepals nearly free, elliptic, obtuse; petals blue; capsules subprismatic, to 4 cm. long.

CUNDINAMARCA: On ground by Salto de Tequendama, alt. 2,100 m., February 1876, *André* 1358 in part (K, lectotype, US phot. 4153). Same, Oct. 16, 1946, *Foster* 1910 (COL, GH, US). Thickets, Macizo de Bogotá, Quebrada de Chico, alt. 2,640–2,670 m., May 25, 1939, *Cuatrecasas* 5045 (COL, US). Same, on trees and rocks, alt. 3,000 m., Oct. 11, 1946, *Foster* 1839 (COL, GH); 1841 (COL, GH). Same, alt. 2,550–2,850 m., Nov. 30, 1952, *Schultes* 18583 (US); 18586 (US). On trees, "El Chico," road to La Calera, between Bogotá and Usaquén, alt. 3,000–3,100 m., Dec. 15, 1946, *García-Barriga* 12120 (COL, US).

ECUADOR.

5. *Tillandsia arnoldiana* Harms, Notizblatt 10:579. 1929.

FIGURE 30

Plant 1–1.5 meters high; leaves 5–7 dm. long, sheaths ample, 17 cm. long, densely and finely lepidote, more or less dark castaneous toward base, blades ligulate, acute, 6–10 cm. wide, glabrous above; scape erect; scape-bracts imbricate, subfoliaceous; primary bracts lanceolate, slightly shorter or longer than the naked bases of the branches; branches nearly straight, 1–3 dm. long; secondary bracts small; spikes short-stipitate with 1–3 sterile bracts, linear, 3–6 cm. rarely to 10 cm. long, complanate; floral bracts oblong-ovate, navic-

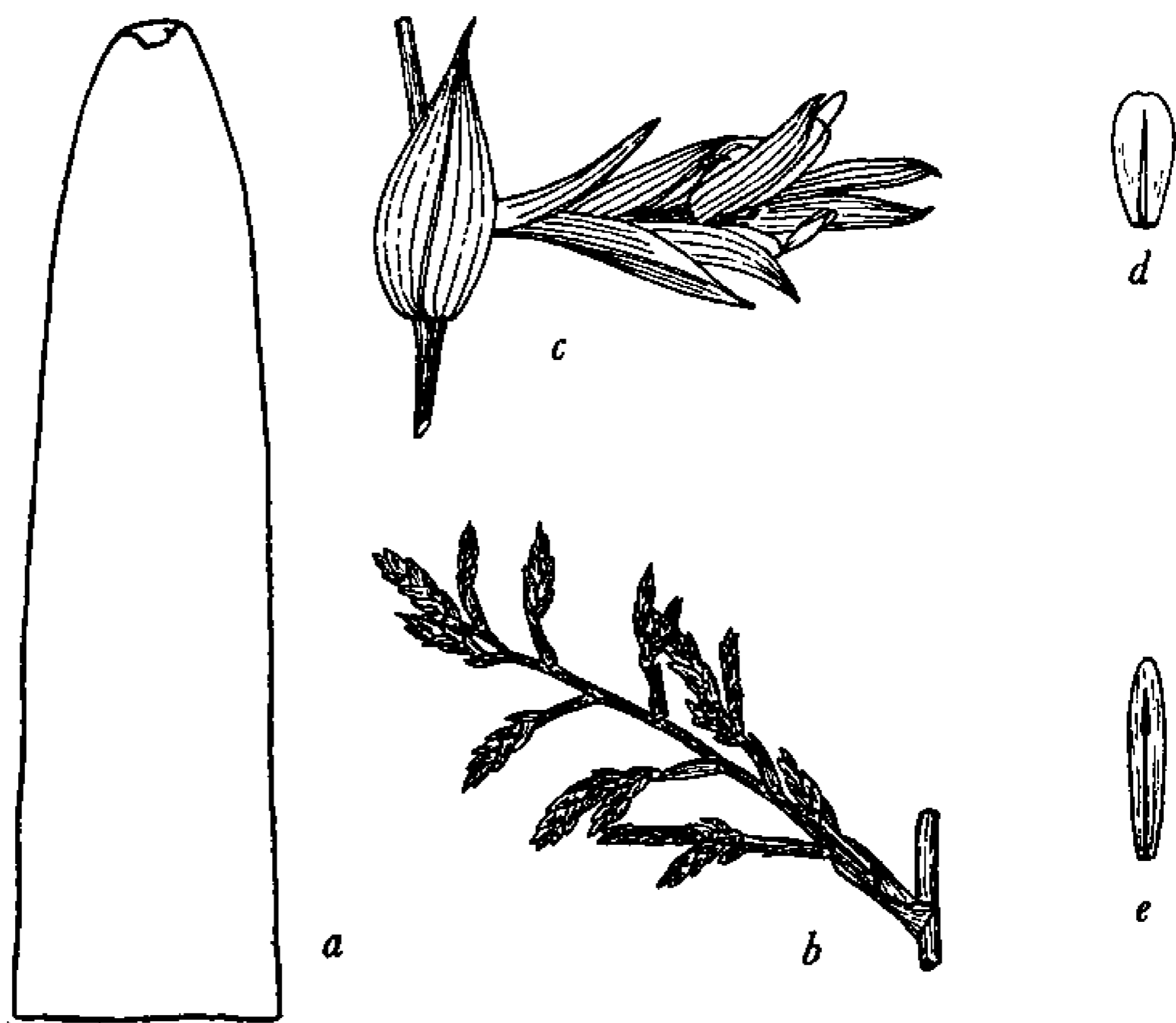


FIGURE 30.—*Tillandsia arnoldiana*: a, Apex of leaf,  $\times \frac{1}{2}$ ; b, branch,  $\times \frac{1}{2}$ ; c, spike,  $\times 1$ ; d, sepal,  $\times 1$ ; e, petal and stamen,  $\times 1$ .

ular, 10–13 mm. long, nearly or quite equaling the sepals, glabrous; sepals unequally short-connate, oblong, obtuse; corolla 15 mm. long, lobes spreading, obtuse, purple; stamens included; capsule slenderly cylindrical, 2–3 cm. long.

MAGDALENA: On low bushes, "El Mamon," Sierra Nevada de Santa Marta, alt. 2,200 m., February 1928, *A. Schultze* 1133 (B, F phot. 11478).

ANTIOQUIA: Epiphytic, La Sierra, Medellín, alt. 2,000 m., Jan. 4, 1931, *Archer* 1373 (US). Low woods on crest, Las Palmas, between Medellín and El Retiro, alt. 2,500 m., Oct. 23, 1945, *Hodge* 6656 (GH, US). Salto del Buey (La Ceja), alt. 2,080 m., January 1949, *Daniel* 4203 (US). Low woods, Alto de Santa Elena, Medellín, alt. 2,500 m., Jan. 14, 1950, *Uribe Uribe* 2066 (COL, US).

ECUADOR, PERU.

6. *Tillandsia acuminata* L. B. Smith, *Contr. U. S. Nat. Herb.* 29:434, *fig. 41 a-c.* 1951.

Stemless, 1.5–2 meters tall; leaves 7.5–10 dm. long, obscurely punctulate-lepidote, sheaths elliptic, blades ligulate, acuminate, flat, 55 mm. wide; scape erect; scape-bracts imbricate, coiling-recurved toward their apices; inflorescence nearly glabrous; primary bracts elliptic, barely exceeding the sterile bases of the branches; branches ascending, bearing several small sterile bracts at base and a digitate cluster of 5–7 spikes at apex; spikes lance-oblong, acute, 5–7 cm. long, 15 mm. wide, strongly complanate, densely 8–13-flowered; floral bracts broadly elliptic, acute, carinate, 17 mm. long, equaling or exceeding the sepals, coriaceous, sublustrous, castaneous with buff margins when dry; sepals ovate, 13–15 mm. long, coriaceous, even, the posterior carinate; capsule cylindrical, 3 cm. long.

MAGDALENA: Dense rain forest, mountains above Hacienda Cincinnati, Santa Marta, alt. 2,100 m., Aug. 3, 1946, *Foster & C. E. Smith, Jr.*, 1402 (GH, type, US phot. 3468); 1406 (GH, US phot. 3470).

7. *Tillandsia carrierei* André, *Énum. Bromél.* 8. Dec. 13, 1888; *Rev. Hortic.* 60:568. Dec. 16, 1888.

Plant 5 dm. high; leaves to 4 dm. long, punctulate-lepidote, sheaths elliptic, 1 dm. long, blades ligulate, broadly rounded and apiculate, 35 mm. wide, bearing dark purple spots beneath; scape decurved, slender, much shorter than the leaves; scape-bracts imbricate, broadly elliptic, acute; inflorescence 2 dm. long; primary bracts ovate-elliptic, acute, about half as long as the spikes, even except near apex; spikes sessile, elliptic, acute, very strongly complanate, 4–5 cm. long; floral bracts suberect, much longer than the internodes but only laxly imbricate and exposing the rhachis, elliptic, acute, to 18 mm. long, exceeding the sepals, sharply carinate, even, glabrous, the upper somewhat incurved; sepals oblong, acute, carinate; petal-blades 10 mm. long, yellow; stamens included.

ANTIOQUIA: Monte del Diablo, near La Ceja, July 21, 1944, *Daniel* 3256 (GH); 3257 (GH).

VALLE: Alto del Potrerito, near Vijas, May 30, 1876, *André* 2700 (K, type, NY, GH phot. 1760).

8. *Tillandsia reversa* L. B. Smith, *Phytologia* 5:40, *pl.* 4, *figs.* 1-8. 1954.

Stemless, 4 dm. high; leaves numerous, 3 dm. long, sheaths ample, obscurely brown-lepidote, dark purple above, blades ligulate, broadly acute, flat, 5 cm. wide, green with a few small purple spots, glabrous above, sparsely lepidote beneath; scape erect; scape-bracts imbricate, ovate, acute; inflorescence bipinnate, subdigitate; primary bracts broadly ovate, acute, ecarinate; spikes linear-lanceolate, acute, slightly complanate, 8 cm. long, 10-flowered with 2-3 sterile bracts at base; floral bracts densely imbricate, exceeding the sepals, broadly elliptic, acute with the extreme apex incurved, carinate, coriaceous, even, glabrous, orange; sepals oblong, obtuse, 17 mm. long, glabrous outside, lepidote inside, the posterior high-connate.

SANTANDER: Edge of woods, near La Baja, alt. 2,700-3,500 m., Jan. 14-31, 1927, *Killip & A. C. Smith* 18056 (GH, type, US phot. 3499; NY, US).

9. *Tillandsia fassettii* L. B. Smith, *Phytologia* 5:284, *pl.* 2, *figs.* 6-8. 1955.

FIGURE 31

Stemless, 35 cm. long; leaves about 20 in a broadly funnelform rosette, 20 cm. long, sheaths elliptic, 7 cm. long, pale, diffusely brown-punctulate, blades broadly rounded and apiculate, 25-30 mm. wide, flat, soon glabrous above, covered beneath with rather coarse appressed cinerous brown-centered scales; scape 2.5 mm. in diameter, glabrous; scape-bracts elliptic, apiculate, red, the lower barely imbricate, the

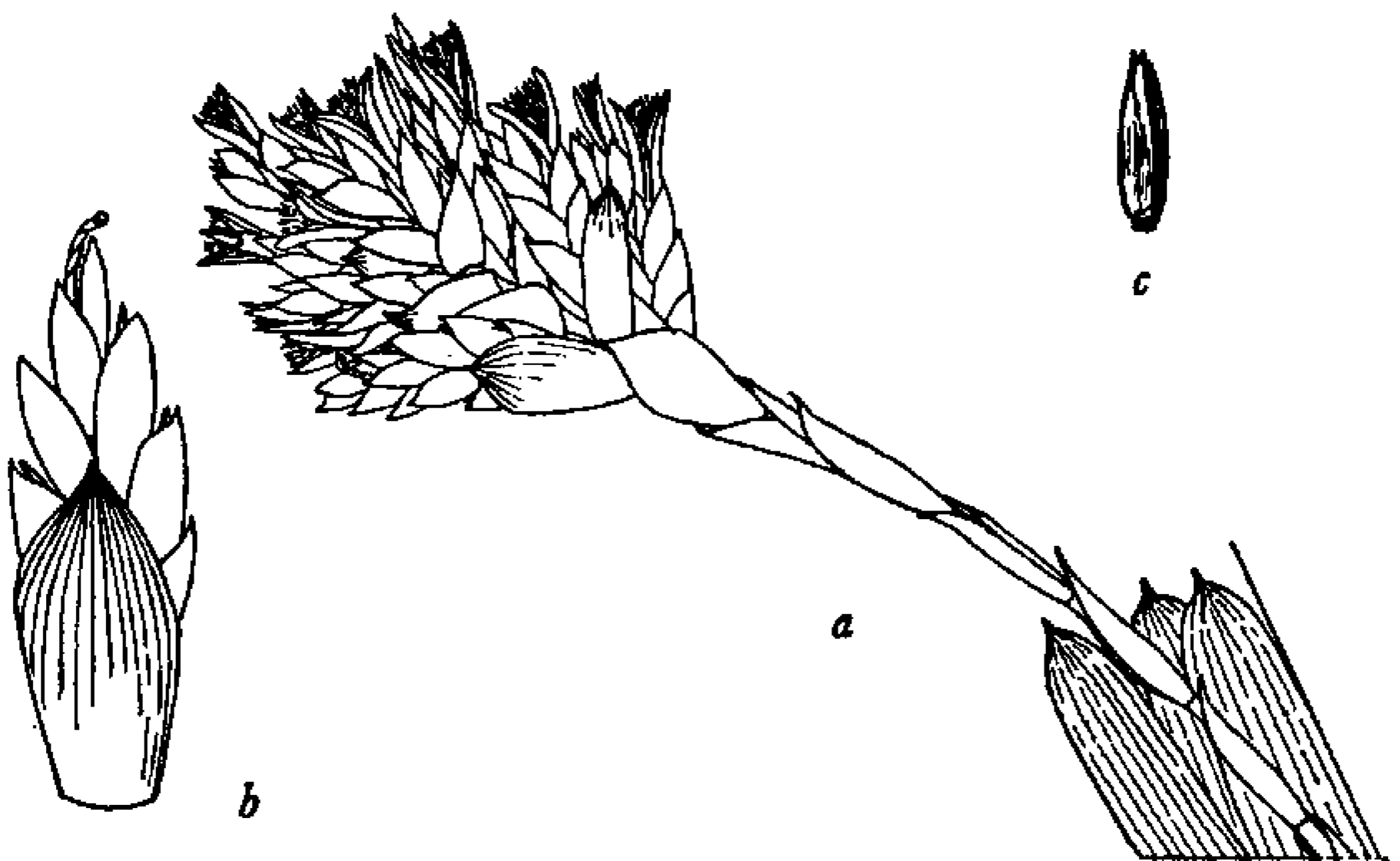


FIGURE 31.—*Tillandsia fassettii*: *a*, Leaf-blades, scape, and inflorescence,  $\times \frac{1}{2}$ ; *b*, primary bract and spike,  $\times 1$ ; *c*, posterior sepals,  $\times 1$ .

upper densely so; inflorescence broadly ovoid, 7 cm. long; primary bracts like the scape-bracts; spikes subsessile, lanceolate, acute, to 4 cm. long, complanate, 8-flowered; floral bracts densely imbricate, broadly elliptic, acute, 15 mm. long, carinate, slightly if at all incurved, coriaceous, even, glabrous; flowers subsessile; sepals oblong-elliptic, 12 mm. long, the posterior carinate, high-connate; petal-blades elliptic, 6 mm. long; capsules slenderly subprismatic, 2 cm. long.

SANTANDER: On small trees, crest of Cerro del Páramo, Cerro de Armas, region about Landazuri, 70 km. north of Velez, alt. 1,860 m., July 2, 1944, *Fassett* 25434 (US, type, US phot. 4413; COL).

10. *Tillandsia sigmoidea* L. B. Smith, *Contr. U. S. Nat. Herb.* 29:440, *fig. 44 e-g*. 1951.

Stemless, over 1 meter tall; leaves 30–45 cm. long, obscurely brown-lepidote, sheaths elliptic, ample, nearly as long as the blades and scarcely distinct, brown or purple, blades ligulate, acute, 5–8 cm. wide, often purple-spotted; scape erect, stout; scape-bracts densely imbricate, the upper broadly elliptic, acute; inflorescence globose, 25 cm. long, essentially glabrous, sublustrous; primary bracts broadly ovate, much shorter than the spikes; spikes spreading, lance-ovate, acute, strongly complanate, 12 cm. long, 6 cm. wide, very densely 20–22-flowered; floral bracts broadly obovate, 40–45 mm. long, alate-carinate, coriaceous, even, red; pedicels 2 mm. long; sepals lanceolate, acute, 30 mm. long, subcoriaceous, lepidote inside, the posterior carinate; petals purple; capsule shorter than the floral bracts.

MAGDALENA: On rocks, river bank, alt. 180 m., Aug. 14, 1946, *Foster & C. E. Smith, Jr.*, 1446 (COL). In the last line of trees on the mountainside, Aduriameina, Sierra Nevada de Santa Marta, alt. 3,060 m., Aug. 19, 1946, *Foster & C. E. Smith, Jr.*, 1461 (GH, type, US phot. 3461; US).

11. *Tillandsia ultima* L. B. Smith, *Contr. U. S. Nat. Herb.* 29:442, *fig. 45 c-e*. 1951.

Plant about 8 dm. long; leaves 4–5 dm. long, obscurely brown-lepidote, sheaths elliptic, ample, 15–18 cm. long, dark purple with light streaks at base, blades ligulate, acute to acuminate, 4 cm. wide, maroon-spotted; scape curved, stout; scape-bracts densely imbricate, the lower foliaceous, the upper elliptic, acuminate, red; inflorescence ellipsoid, 23 cm. long, 9 cm. wide, red, very sparsely and obscurely lepidote, sublustrous; lower primary bracts like the upper scape-bracts, equaling or slightly exceeding the spikes, the upper broadly rounded and apiculate, much shorter than the spikes; spikes strict, subsessile, lanceolate, acute, 8 cm. long, 3 cm. wide, strongly complanate, densely 4–7-flowered; floral bracts elliptic, acute, 35 mm. long, much exceeding the sepals; sepals oblanceolate, obtuse, 25 mm. long, carinate, coriaceous, even; capsule prismatic, barely exceeding the floral bracts.



MAGDALENA: In last line of trees on the mountain-side, Aduriameina, Sierra Nevada de Santa Marta, alt. 3,000 m., Aug. 19, 1946, *Foster & C. E. Smith, Jr.*, 1460 (GH, type, US phot. 3469; COL, US).

12. *Tillandsia rariflora* André, *Enum. Bromél.* 8. Dec. 13, 1888; *Rev. Hort.* 60:568. Dec. 16, 1888.

Stemless, 1-2 meters high; leaves 1 meter long, sheaths large but scarcely distinct, densely brown-punctulate, blades ligulate, 6-7 cm. wide, subglabrous, bearing small pale violet spots toward apex; scape stout, erect, terete, glabrous; scape-bracts lance-ovate, slightly exceeding the upper internodes; inflorescence 8 dm. long, glabrous; primary bracts like the scape-bracts, barely exceeding the sterile bases of the branches; branches suberect, to 12 cm. long, laxly few-flowered with a sterile bract at base; axis straight, slender; floral bracts ovate, exceeding the immature sepals, ecarinate, coriaceous except for the thin margins.

CALDAS: Mountains of Quindio near Salento, alt. 1,790 m., March 1876, *André* 2333 (K, type, US phot. 4151).

13. *Tillandsia delicatula* L. B. Smith, *Phytologia* 5:36, *pl. 3, figs. 1-3.* 1954.

Stemless, to 65 cm. high; leaves 4-5 dm. long, sheaths large, elliptic, very dark at base, covered with a glaucous coat of thin appressed whitish scales, blades ligulate, flat, broadly retuse and apiculate, 3-4 cm. wide, subdensely pale-lepidote beneath, soon glabrous above; scape slender, erect, glabrous; scape-bracts strict except for the acute divergent apex, elliptic, all but the lowest imbricate, thin; inflorescence 3 dm. long, glabrous; primary bracts lanceolate, acuminate, red; branches suberect, to 75 mm. long, consisting of a short naked base and 1-3 spikes; secondary bracts slightly larger than the floral bracts; spikes laxly 8-flowered; rhachis slender, flexuous; floral bracts ovate, acute, sharply carinate, thin, prominently nerved, red; pedicels 2 mm. long; sepals elliptic, broadly obtuse, nerved, subequally short-conate; petals yellow, exceeding the stamens.

VALLE: In woods, La Laguna, left bank of Río Sanquinini, western slope of Cordillera Occidental, alt. 1,250-1,400 m., Dec. 10-20, 1943, *Cuatrecasas* 15647 (VALLE, type, US phot. 3652).

NARIÑO: Terrestrial, between Sibundoy and Mocoa, alt. 2400-2790 m., Mar. 15, 1953, *Schultes & Cabrera* 18822 (COL, US).

14. *Tillandsia adpressiflora* Mez in DC. *Monogr. Phan.* 9:661. 1896.

Stemless, 1-2 meters high; leaves 40-56 cm. long, densely and minutely appressed-lepidote, sheaths suborbicular, large, dark brown, blades narrowly triangular, 3-5 cm. wide, filiform-acuminate, cinereous; scape erect, stout; scape-bracts densely imbricate, foliaceous; inflorescence laxly paniculate, red; primary bracts narrowly lanceolate, acute, scarcely larger than the floral bracts, involute about the sterile bases of the spikes; spikes spreading, linear, elongate; rhachis slender;

floral bracts narrowly lanceolate, 5 cm. long, tubular-involute around the flower and rhachis together, only slightly longer than the internodes, subglabrous, ecarinate; flowers subsessile, 6–7 cm. long; sepals free, narrowly lanceolate, acute; petals violet, slightly exceeding the stamens; capsule slenderly cylindrical, 5 cm. long.

VAUPÉS: Savanna Goo-ran-hoo-dá, Mesa de Yambí, Río Karuarú (tributary of Río Vaupés), alt. 285–300 m., Apr. 15, 16, 1953, *Schultes & Cabrera* 19196 (US). On ground, Yuticá, between Mitú and Javareté, Río Vaupés, May 14–24, 1953, *Schultes & Cabrera* 19372 (US).

AMAZONAS-VAUPÉS: Epiphytic, Soratama, between Río Pacca and Río Kananarí, alt. 250 m., June 17, 1951, *Schultes & Cabrera* 12637 (COL, NY, US); Aug. 1, 1951, *Schultes & Cabrera* 13234 (COL, GH, K, US).

AMAZONAS: Epiphytic, near mouth of Río Popeyacá (tributary of Apaporis between Río Piraparaná and Raudal Yayacopi), lat. 0°20' S., long. 70°30' W., alt. 210 m., Apr. 15, 1952, *Schultes & Cabrera* 16180 (COL, GH, US).

SURINAM, VENEZUELA, BRASIL, PERU.

15. *Tillandsia disticha* H. B. K. Gen. & Sp. 1:292. 1816.

Stemless, 15–65 cm. high; leaves 1–5 dm. long, covered with appressed cinereous scales, sheaths broadly ovate to orbicular, forming a globose pseudobulb 2–4 dm. in diameter, blades involute-subulate, 3 mm. wide, filiform-acuminate; scape erect or ascending, slender, shorter than the leaves; scape-bracts imbricate, lanceolate, filiform-laminate, lepidote with larger scales on the margins; inflorescence digitate from a few spikes or rarely simple; primary bracts lanceolate, acuminate, much shorter than the spikes; spikes subsessile, linear, 4–6 cm. rarely to 14 cm. long, 8 mm. wide, dense, complanate; floral bracts triangular, acute, 6–10 mm. long, exceeding the sepals, carinate, nerved, subglabrous; flowers subsessile; sepals acute, carinate, glabrous; petals 13 mm. long, yellow, blade narrowly lanceolate; stamens included.

NARIÑO: Isla El Morro Grande, January 1942, *Dryander* 2576 (F, US).  
ECUADOR, PERU.

16. *Tillandsia longifolia* Baker, Handb. Bromel. 185. 1889.

*Tillandsia elongata* sensu Griseb. Nachr. Ges. Wis. Goett. for 1864:17. 1865, not H. B. K. 1816.

Plant 2–3 meters high; leaves to 8–10 dm. long, sheaths elliptic, ample, 15–25 cm. long, blades 3–4 cm. wide, subdensely appressed-lepidote on both sides; scape erect, very stout; scape-bracts imbricate, foliaceous; inflorescence pyramidal; primary bracts ovate; branches suberect, to 2 dm. long, the sterile bases laxly bracteate; spikes short-stipitate, linear-lanceolate, acute, 4–12 cm. long; floral bracts ovate, obtuse, to 15 mm. long, exceeding the sepals, broadly convex with a thickened midnerve but scarcely carinate, coriaceous, glabrous; sepals obovate, obtuse, short-connate posteriorly; petal-blades obtuse, 5 mm. long; stamens included.

NARIÑO: On trees, Sibundoy lowland, Oct. 28, 1946, *Foster* 1969 (COL, GH, US).

VENEZUELA, BOLIVIA.

17. *Tillandsia restrepoana* André, Énum. Bromél. 6. Dec. 13, 1888; Rev. Hort. 60:566. Dec. 16, 1888.

Stemless, 1 meter high; leaves suberect, 5–6 dm. long, appressed-lepidote, sheaths elliptic, 2 dm. long, green, blades acuminate, 4–5 cm. wide, becoming glabrous above; scape erect, stout; scape-bracts densely imbricate, foliaceous; inflorescence 25–50 cm. long; primary bracts elliptic-ovate; spikes suberect to spreading, sessile, elliptic to oblong, 7–15 cm. long, complanate; floral bracts densely imbricate, oblong-elliptic, acute, 30–35 mm. long, exceeding the sepals, incurved, coriaceous, even; sepals oblong, acute, half-connate posteriorly; petals oblong, pale lilac with a violet apex, blades spreading, 10 mm. long; stamens slightly exceeding the throat of the corolla.

CUNDINAMARCA: On mossy rocks by Tequendama Falls, Río Funza, alt. 2,500 m., February 1876, *André* 1356 (K, type, US phot. 4158). In trees, Salto de Tequendama, alt. 2,100 m., Oct. 16, 1946, *Foster, Jaramillo & Venegas* 1909 (COL, GH, US).

18. *Tillandsia schultzei* Harms, Notizblatt 10:216. 1928.

FIGURE 32

Stemless, 3–6 dm. long; leaves many in a subbulbous rosette, 30–45 cm. long, covered with fine cinereous appressed scales, sheaths sub-orbicular, 6–7 cm. wide, castaneous, blades narrowly triangular, long-acuminate, 20–25 mm. wide; scape-bracts densely imbricate, foliaceous; inflorescence cylindrical, densely bipinnate, red except the petals; primary bracts subfoliaceous, their blades exceeding the lower spikes; spikes suberect to spreading, lanceolate to linear, acute, 5–8 cm. long, complanate, 8–13-flowered; floral bracts densely imbricate, lanceolate, acute, 20–24 mm. long, exceeding the sepals, carinate, arachnoid-lepidote and fimbriate on the margins; sepals lanceolate, acute, 18 mm. long, thin, glabrous, nearly free; petals about 3 cm. long, blades denticulate, violet; stamens included, filaments free.

MAGDALENA: On a log, Sierra del Libano, alt. 1,650 m., Jan. 23, 1898, *H. H. Smith* 2854 (NY). On trees, especially palms, mountain forest, between San José and San Andrés, alt. 1,400–1,600 m., Jan. 24, 1927, *Schultze* 716 (B, type, F phot. 11526). Cerro Bandera, alt. 2,000 m., 1932, *Giacometto* 150 (US). In trees, above Pueblo Bello, Sierra Nevada de Santa Marta, alt. 1,200 m., August 1946, *Foster & C. E. Smith, Jr.*, 1449 (COL, GH).

NORTE DE SANTANDER: Epiphytic, near Teorama, alt. 1,200 m., Sept. 11, 1946, *Foster* 1663 (COL, GH).

SANTANDER: Epiphytic, dense woods, Mesa de los Santos, alt. 1,500 m., Dec. 11–15, 1926, *Killip & A. C. Smith* 15326 (GH).

BOYACÁ: On steep mossy bank, Río Pomera, 13 km. northwest of Arcabuco, alt. 2,805 m., Aug. 20, 1944, *St. John* 20677 (US).

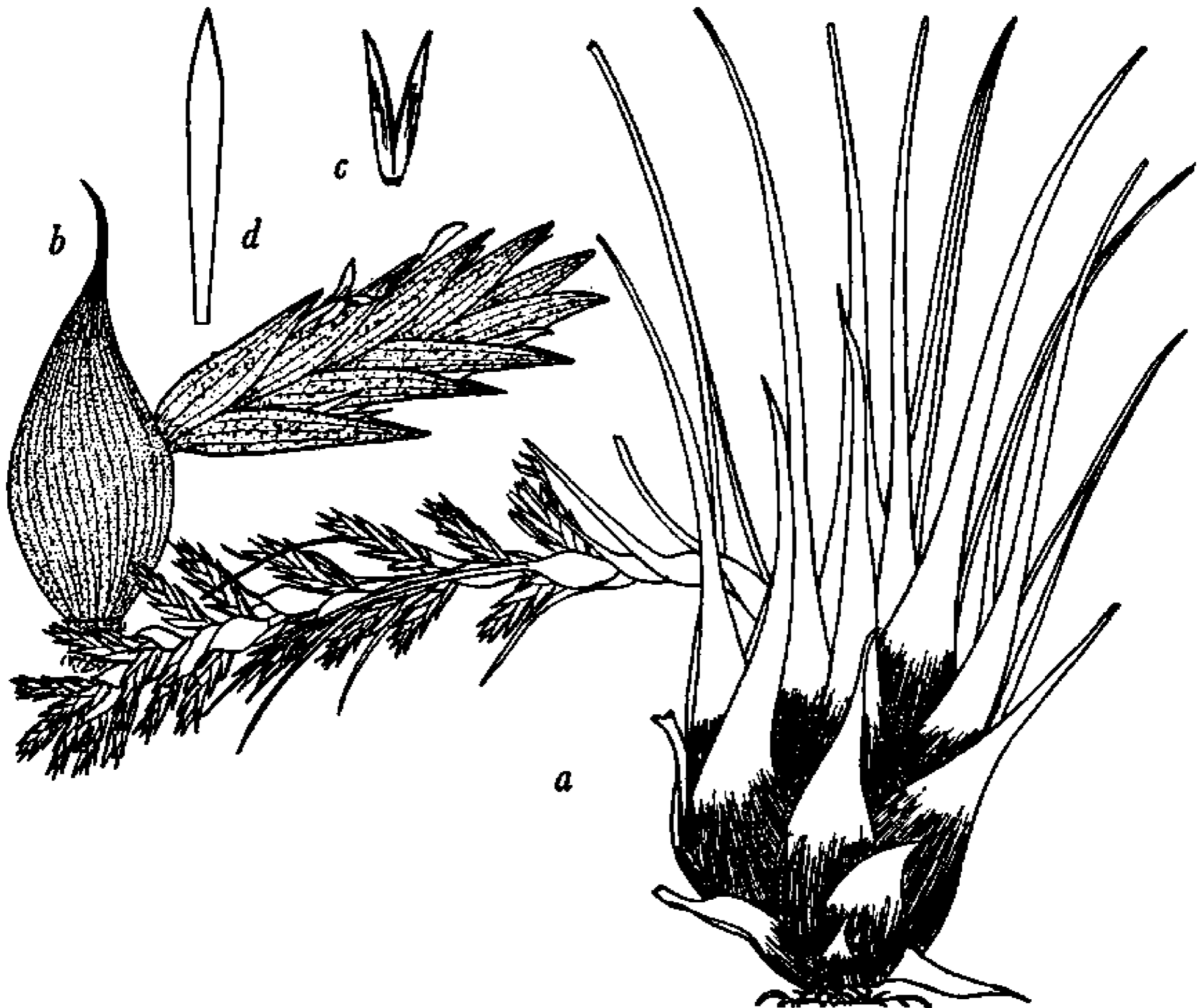


FIGURE 32.—*Tillandsia schultzei*: *a*, Habit,  $\times \frac{1}{4}$ ; *b*, primary bract and spike,  $\times 1$ ; *c*, sepals,  $\times 1$ ; *d*, petal,  $\times 1$ .

CUNDINAMARCA: On *Psidium guajava*, Santandercito, alt. 1,700 m., Nov. 1, 1942, *Uribe-Uribe* 233 (COL, US). Epiphytic, between Guaduas and Alto del Trigo on the old road to Villeta, alt. 1,100–1,800 m., Nov. 10, 1945, *García-Barriga* 11810 (COL). On trees, Páramo de San Miguel, alt. 3,000 m., Oct. 12, 1946, *Foster* 1878 (COL, GH, US).

19. *Tillandsia archeri* L. B. Smith, Proc. Amer. Acad. 68:147, pl. 1, figs. 14, 15. 1933.

Stemless, 25–30 cm. high; leaves suberect, 15–22 cm. long, covered with appressed cinereous brown-centered scales, sheaths broadly ovate, 6–9 cm. long, castaneous, blades, acuminate, 15 mm. wide; scape erect, slender; scape-bracts imbricate, foliaceous; inflorescence bipinnate, ovoid, dense at apex, usually lax below, bright red; primary bracts broadly ovate, lepidote, the lower exceeding the spikes at least by their caudate blades; spikes sessile, lanceolate, 25–35 mm. long, complanate, 5–6-flowered; floral bracts laxly imbricate and exposing the rachis, oblong-ovate, 12–15 mm. long, exceeding the sepals, carinate, incurved, thin, strongly nerved, soon glabrous; flowers sessile; sepals oblong, obtuse, to 12 mm. long, sparsely lepidote or glabrous, nerved, much connate posteriorly; petals oblong, obtuse, white; stamens included.

NORTE DE SANTANDER: Epiphytic, Alto Santa Inés, Sararé region, Cordillera Oriental, alt. 2,200 m., Oct. 12, 1941, *Cuatrecasas, Schultes & C. E. Smith, Jr.*, 12112 (COL).

CUNDINAMARCA: Caqueza, alt. 1,700 m., December 1855, *Triana* 1306 in part (COL). Epiphytic, temperate forest, north side of Quebrada San Roque, Río Blanco Valley, 10 km. west of Gutiérrez, 45 km. south of Bogotá, alt. 2,725 m., July 27, 1944, *Grant* 9734 (US).

CAQUETA: Epiphytic, valley of Río Hacha, below Gabinete, eastern slope of Cordillera Oriental, alt. 2,100–2,250 m., Mar. 23, 1940, *Cuatrecasas* 8568 (COL).

NARIÑO: On trees, wet lowland, Sibundoy, alt. 2,190 m., Oct. 28, 1946, *Foster* 1966 (COL, GH).

ANTIOQUIA: Near Medellín, 1911, *Charetier* 76 (US); 80 (US). Same, alt. 1,560 m., October 1948, *Ruiz* 148 (GH). Epiphytic, Santa Elena, Dec. 28, 1930, *Archer* 1204 (US, type, GH phot. 5065). Low woods of summit, near Santa Elena, between Medellín and Río Negro, alt. 2,300–2,500 m., October 1945, *Fernández* 351 (GH). "El Carmen," August 1937, *Daniel* 1426 (GH). Epiphytic, dense moist woods, slopes west of Sonsón, alt. 2,700 m., Aug. 20, 1948, *Johnson & Barkley* 18-C-817 (US). On shrubs, low woods, Laguna de Guarne, Medellín, alt. 2,700 m., July 27, 1951, *Uribe Uribe* 2180 (COL, US).

VALLE OF CAUCA (?): Valley of Cauca, alt. 1,000 m., *Triana* 557 in part (P).

CAUCA: La Cega, Central Andes of Popayán, alt. 1,800–2,300 m., *Lehmann* 5308 (F).

**20. *Tillandsia elongata* H. B. K. Nov. Gen. & Sp. 1:293. 1816.**

Stemless, 1–2 meters high; leaves many in a utriculate rosette, to 8 dm. long, densely punctulate-lepidote, sheaths ovate, large, not inflated, blades recurving, subulate-acuminate, 4 cm. wide; scape erect, 10–15 mm. in diameter; scape-bracts imbricate, the lower foliaceous with long reflexed blades, the upper ovate and usually apiculate or with short filiform erect blades; inflorescence lax, bipinnate or sometimes subtripinnate; primary bracts like the upper scape-bracts, much shorter than the curved-ascending branches; spikes complanate, 12 mm. wide, the sterile base bracteate; rhachis nearly straight, slender, angled, glabrous; floral bracts erect, usually 2–3 times as long as the internodes but exposing the rhachis, narrowly ovate, obtuse or apiculate, inrolled at apex, 18–20 mm. long, exceeding the sepals, subchartaceous, glabrous; flowers subsessile; sepals narrowly elliptic, obtuse, glabrous, nerved; petals 25 mm. long, blue or lilac; stamens included; capsule slenderly cylindrical, 3–4 cm. long.

**20a. *Tillandsia elongata* var. *elongata***

Spikes to 4 dm. long and 40-flowered.

MAGDALENA: In trees, Fundación, Sierra Nevada de Santa Marta, alt. 105 m., Aug. 29, 1946, *Foster* 1621 (COL, GH, intermediate form).

CUNDINAMARCA: Terrestrial or epiphytic, thickets, hillside east of Apulo, along trail to Anapoima, alt. 460–600 m., May 4, 1944, *Killip, Dugand & Jaramillo* 38150 (COL, GH, US). In trees, near Giradot, alt. 300 m., Oct. 13, 1946, *Foster* 1892 (COL, GH, US). On legume tree, Guaduas, by old road to Honda, alt. 1,000 m., Dec. 7, 1952, *Uribe Uribe* 2384 (COL).

TOLIMA: Honda, by Río Magdalena, September 1801, *Humboldt & Bonpland* (B, type, F phot. 11492). On trees, Río Icononzo, alt. 1,050 m., Oct. 13, 1946, *Foster* 1888 (GH).

VALLE: Epiphytic, open arid slopes, Espinal, below Dagua, Dagua Valley, alt. 600–900 m., Sept. 6, 7, 1922, *Killip & Hazen* 11097 (GH). Epiphytic, thickets, near Río Cauca, northeast of Cali, alt. 1,000 m., Mar. 31, 1939, *Killip & Varela* 34696 (COL, GH, US). Woods, Hacienda Valparaiso, Zarzal, near Bugalagrande, alt. 1,020 m., July 20, 1939, *Pérez-Arbeláez & Cuatrecasas* 6403 (COL). Epiphytic, Valle Plain, Hacienda El Medio, Zarzal, alt. 1,000 m., Oct. 7, 1946, *Cuatrecasas* 22105 (F, GH). Epiphytic, Campos, Cartago, Santa Ana de los Caballeros, alt. 950 m., Nov. 19, 1946, *Cuatrecasas* 23044 (F, GH). Epiphytic, moist open woods, near Palmira, alt. 1,000 m., Dec. 3, 1947, *Ramírez, Murgueitio & Barkley* 17-C-880 (COL); 17-C-882 (US).

20b. *Tillandsia elongata* var. *subimbricata* (Baker) L. B. Smith, *Journ. Washington Acad. Sci.* 43:68. 1953.

*Tillandsia subimbricata* Baker, *Journ. Bot.* 25:304. 1887.

*Tillandsia orthorhachis* Mez & C. F. Baker, *Bull. Torrey Bot. Club* 30:435. 1903.

Spikes only about 2 dm. long and 20-flowered.

MAGDALENA: Epiphytic, savanna, Chiriguaná, Magdalena Valley, July 25, 1924, *C. Allen* 161 (MO).

BOLÍVAR: Epiphytic, thickets, north of Arjona, alt. 30–50 m., Nov. 15, 1926, *Killip & A. C. Smith* 14530 (GH, US).

CALDAS: Epiphytic, Granja cafetera de Chinchiná, alt. 1,300 m., Mar. 15–17, 1947, *Duque-Jaramillo* 4670 (COL).

VALLE: Epiphytic, low forest, east of Zarzal, Cauca Valley, alt. 970–1,050 m., July 21, 1922, *Pennell, Killip & Hazen* 8396 (GH, NY, PH, US).

MEXICO and JAMAICA to PERU and northern BRASIL.

21. *Tillandsia arcuans* L. B. Smith, *Contr. U. S. Nat. Herb.* 29:436, *fig. 41, d, e*. 1951.

Stemless, 6–8 dm. long; leaves numerous in a funnellform rosette; over 5 dm. long, covered with cinereous brown-centered scales, sheaths elliptic, 25 cm. long, 10 cm. wide, deep maroon, blades flat, 5 cm. wide, green; scape arching-decurved, 15 mm. thick; scape-bracts densely imbricate, the lower foliaceous, the upper elliptic, deep maroon, bearing a short acuminate recurved green blade; primary bracts like the upper scape-bracts, many times shorter than the spikes; spikes few, pendulous, lance-oblong, acute, 4–5 cm. wide, 13–17-flowered; floral bracts broadly elliptic, acute, 4 cm. long, exceeding the sepals, carinate, glabrous, lustrous, yellow-green with maroon-red margins; pedicels stout, 4 mm. long; sepals elliptic, 32 mm. long, carinate, thin-coriaceous, sparsely lepidote; petals 6 cm. long, blade deep purple; stamens included.

NARIÑO: On perpendicular rocks of El Cañon de Naciento del Diablo, below El Espinal, alt. 2,100 m., Nov. 29, 1946, *Foster* 2266 (GH, type, US phot. 3467; COL).

22. *Tillandsia cuatrecasasii* L. B. Smith, *Phytologia* 5:36, *pl. 2, figs. 4-6*. 1954.

Stemless, about 1 meter high; leaves to 57 cm. long, densely appressed-lepidote, sheaths nearly as long as the blades, elliptic, ample, ferruginous, blades flat, 45 mm. wide, cinereous; scape elongate, straight or slightly curved; scape-bracts very densely imbricate, subfoliaceous; inflorescence densely bipinnate, 2-3 dm. long; primary bracts densely lepidote; spikes suberect, lanceolate, acute, to 13 cm. long, 3 cm. wide; floral bracts densely imbricate, exceeding the sepals, broadly elliptic, not incurved toward apex, strongly carinate, coriaceous, even, red; sepals lanceolate, acute, to 28 mm. long, sparsely lepidote; petals violet, exceeding the stamens and pistil.

VALLE: Between Barragán on the Río Bugalagrande and Corrales on the Páramo de Bavaya, western slope of the Cordillera Central, alt. 3,400-3,550 m., Apr. 11, 1946, *Cuatrecasas* 20599 (US, type; F, GH).

VENEZUELA.

23. *Tillandsia confinis* L. B. Smith, *Phytologia* 4:218, *pl. 2, figs. 5-7*. 1953.

Stemless, 47 cm. high; leaves many in a funnellform rosette, 35-40 cm. long, sheaths ample, elliptic, 13-20 cm. long, inconspicuously punctulate-lepidote, smooth and sublustrous, pale green spotted with dark purple, blades straight, 25 mm. wide, cinereous-lepidote beneath, becoming glabrous above; scape probably erect, slender, glabrous; scape-bracts strict, imbricate, subfoliaceous, the upper with red sheaths; inflorescence, 13-21 cm. long; primary bracts broadly ovate, much shorter than the spikes, the lower caudate, the upper apiculate; spikes divergent to spreading, lanceolate to linear-lanceolate, 6-10 cm. long, 8-10-flowered with 1-3 sterile bracts at base; floral bracts imbricate and concealing the rhachis at anthesis but later exposing it, lance-oblong, acute, 20-24 mm. long, equaling or exceeding the sepals, even or faintly nerved, lustrous, subchartaceous; pedicels 1 mm. long; sepals linear, acute, the posterior carinate; petal-blades elliptic, small; stamens included.

MAGDALENA: On tree trunk, temperate forest, Sierra de Perija, Espiritu Santo Valley, 20 km. east of Codazzi, 5 km. from the Venezuelan border, alt. 2,800 m., Feb. 14, 1945, *Grant* 10934 (COL, US).

PERU.

24. *Tillandsia suescana* L. B. Smith, *Contr. U. S. Nat. Herb.* 29:441, *fig. 45, a, b*. 1951.

Stemless, 4-6 dm. tall; leaves numerous in a funnellform rosette, 3-4 dm. long, sheaths elliptic, 15 cm. long, brown, punctulate-lepidote, blades flat, 3-4 cm. wide, green and sparsely appressed-lepidote above, cinereous-lepidote beneath; scape erect or ascending, much shorter than the leaves; scape-bracts densely imbricate, the lower foliaceous, the upper elliptic with caudate cinereous-lepidote apices, faintly striate, subglabrous; inflorescence few-branched; primary bracts like

the upper scape-bracts, only about half as long as the spikes; spikes suberect to spreading, sessile or nearly so, lanceolate acute, 7–9 cm. long, 22 mm. wide, 8–13-flowered; floral bracts elliptic, equaling the sepals, carinate, coriaceous, even, orange-yellow; pedicels obconic, 3 mm. long; sepals linear-lanceolate, acute, 28 mm. long, coriaceous; petals linear, obtuse, blade 5 mm. long, pink.

NORTE DE SANTANDER: Epiphyte in wood, Páramo de Fontibon, Pamplona, alt. 2,400 m., *Alston* 7278 (BM).

SANTANDER: Dwarfed cloud forest, ridge above "La Victoria," headwaters of Quebrada Chiriviti, mountains west of Galan, alt., 2,700 m., Sept. 5, 1944, *Fassett* 25712 (COL, US).

CUNDINAMARCA: On rocks and trees, Suesca, alt. 2,580 m., Oct. 9, 1946, *Foster* 1801 (GH, type, US phot. 3465; COL).

25. *Tillandsia biflora* R. & P. Fl. Per. 3:41, pl. 268, fig. b. 1802. FIGURE 33

*Diaphoranthema biflora* Beer, Bromel. 156. 1857.

*Tillandsia tetrantha* sensu Griseb. Nachr. Ges. Wiss. Goett. for 1864:18. 1865, not R. & P. 1802.

*Tillandsia grisebachiana* Baker, Journ. Bot. 26:143. 1888.

*Tillandsia augustae-regiae* Mez, Engler Bot. Jahrb. 30, Beibl. 67:10. 1901.

Stemless, up to 35 cm. high; leaves utriculate-rosulate, 2 dm. long, obscurely punctulate-lepidote, often purple-mottled, sheaths ovate, large, blades 2 cm. wide, acute; scape slender, usually curved; scape-

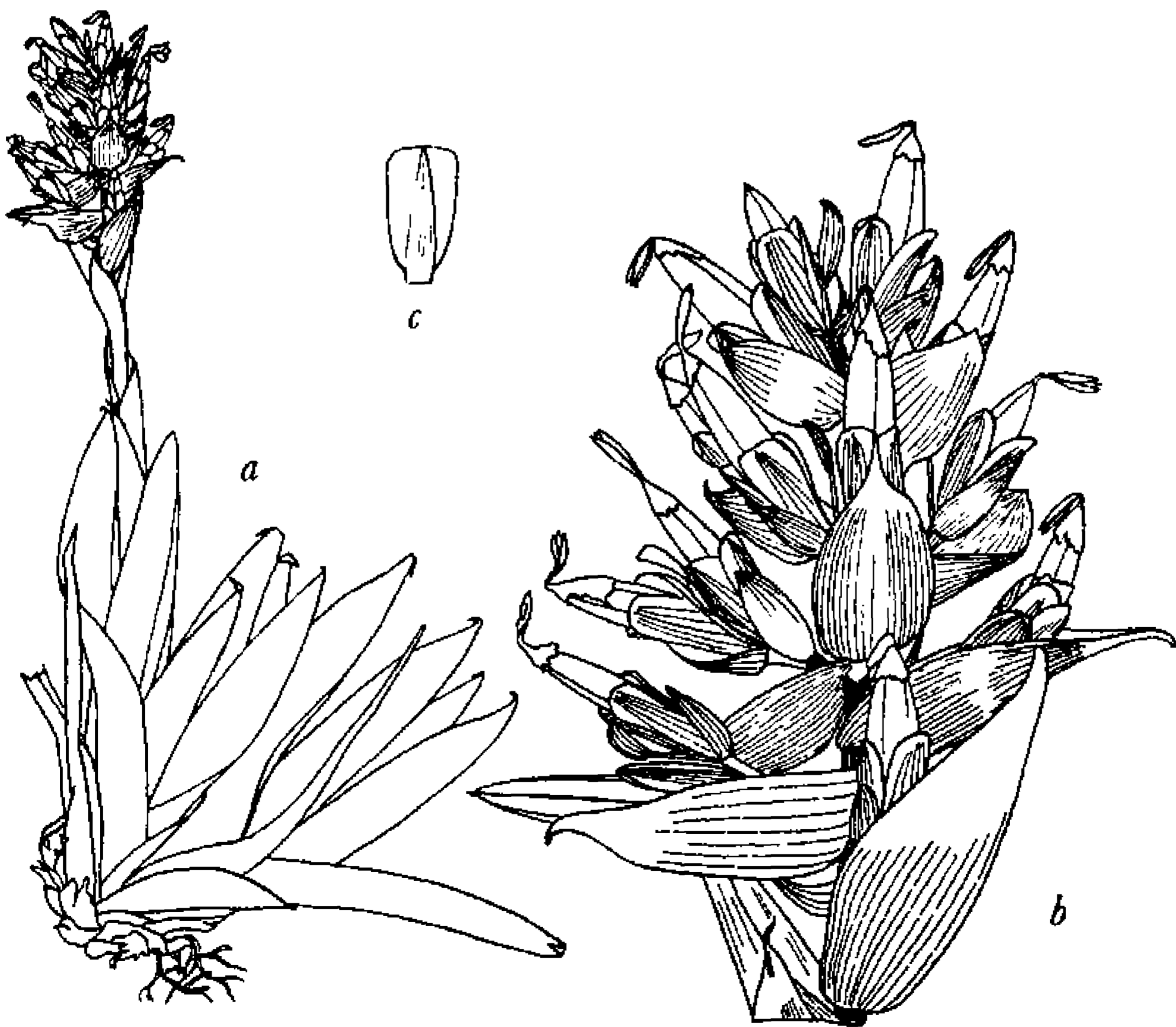


FIGURE 33.—*Tillandsia biflora*: a, Habit,  $\times \frac{1}{4}$ ; b, inflorescence,  $\times 1$ ; c, sepal,  $\times 1$ .



bracts foliaceous, densely imbricate; inflorescence densely bipinnate or rarely reduced to a single polystichous spike, ovoid, glabrous or obscurely punctulate-lepidote; primary bracts broadly ovate, thin, inflated, exceeding the lower and middle spikes, the lower acuminate, the upper apiculate; spikes laxly 1-3-flowered, short-stipitate; floral bracts broadly ovate, obtuse or rarely broadly acute, carinate, strongly nerved, membranaceous; flowers suberect, 2 cm. long; sepals oblong, obtuse or rarely broadly acute, 12-15 mm. long, subfree, carinate, nerved; petals ligulate, blue, lavender, or purple; stamens and pistil included.

MAGDALENA: On tree trunk, temperate forest, Sierra de Perija, 6 km. east-northeast of Manaure, 42 km. east of Valledupar, 7 km. from the Venezuelan border, alt. 2,175 m., Feb. 2, 1945, *Grant* 10755 (US). Rain forest, Valley of Chinchicua, Sierra Nevada de Santa Marta, alt. 1,500-1,800 m., Aug. 16, 1946, *Foster & C. E. Smith, Jr.*, 1450 (GH).

NORTE DE SANTANDER. Between Pamplona and Pamplonita, May 3, 1946, *Garganta* 1168 (F).

CUNDINAMARCA: Dense forest of La Hondada, Salto de Tequendama, alt. 2,250-2,300 m., Oct. 2, 1938, *Cuatrecasas* 224 (US). Epiphyte, Páramo de Guasca, Municipio de Guasca, alt. 2,730 m., Dec. 15-19, 1938, *García-Barriga* 6263 (COL). On trees and ground, El Chico above Bogotá, alt. 3,000 m. Oct. 11, 1946, *Foster, Jaramillo & Idrobo* 1838 (COL, GH). In trees, Páramo de San Miguel, alt. 3,000 m., Oct. 12, 1946, *Foster* 1876 (GH). "El Chico" on the road to La Calera, between Bogotá and Usaquén, alt. 3,000-3,100 m., Dec. 15, 1946, *García-Barriga* 12121 (COL); 12123 (COL). On rock, Tequendama, alt. 2,500 m., Sept. 25, 1949, *Haught* 6621 (US). About 100 km. northwest of Bogotá, alt. 2,300 m., July 10, 1952, *Køie* 4716 (C, COL). Epiphyte, Tábia, alt. 2,700 m., July 9, 1950, *García-Barriga* 13477 (US). Usaquén, above the village of Santa Ana, alt. 2,700 m., *Uribe-Uribe* 367 (COL).

TOLIMA-CALDAS: Quindío, *T. v. Bayern* 55 (M, type of *Tillandsia augustae-regiae* Mez, F phot. 18752).

HUILA: Forest, east of Neiva, Cordillera Oriental, alt. 2,100-2,500 m., Aug. 1-8, 1917, *Rusby & Pennell* 730 (NY, US).

ANTIOQUIA: Epiphyte, La Sierra, 18 km. north of Medellín, alt. 2,000 m., January 1931, *Archer* 1377 (US). Epiphyte, low woods of the summit near Las Palmas, between Medellín and El Retiro, alt. 2,500 m., Mar. 17, 1946, *Hodge* 6733 (GH). Common in low woods of the summit near Boquerón, between Medellín and Palmitas, alt. 2,300-2,500 m., May 16, 1946, *Hodge* 6840 (US). Epiphyte, Alto de La Honda, 6 km. west of Sonsón, alt. 2,600 m., Mar. 19, 1949, *Scolnik, Araque & Barkley* 19-An-298 (US).

VALLE: Epiphyte, dense forest, El Silencio, Yanacónas, alt. 1,900-2,200 m., Feb. 28, 1939, *Killip & H. Garcia* 33845 (US).

CAUCA: Epiphyte, El Tambo, alt. 2,000 m., Jan. 18, 1935, *Sneidern* 396 (S). Epiphyte, bank of the Río Palo, between Tacueyó and La Tolda, western slope of the Cordillera Central, alt. 1,780-1,900 m., Dec. 19, 1944, *Cuatrecasas* 19508 (GH).

NARIÑO: Epiphyte, Sibundoy, Valley of Sibundoy, alt. 2,225-2,300 m., May 29, 1946, *Schultes & Villarreal* 7698 (US). On trees, above Sibundoy, alt. 2,280 m., Oct. 28, 1946, *Foster* 1971 (GH).

COSTA RICA and VENEZUELA to PERU and BOLIVIA.

26. *Tillandsia stipitata* L. B. Smith, *Phytologia* 5:40, *pl. 4, figs. 4-6*. 1954.

Stemless, 56 cm. long; leaves many in a funnelform rosette, to 39 cm. long, obscurely brown-lepidote, suffused with purple, sheaths elliptic, large, blades acute, flat; scape short, curved; scape-bracts densely imbricate, foliaceous; inflorescence densely bipinnate, slenderly fusiform; primary bracts erect, imbricate, suborbicular, equaling or exceeding the spikes, the lower with foliaceous blades, the upper apiculate; spikes with a long flattened naked stipe, laxly 3-flowered; floral bracts broadly ovate or elliptic, acute, about half as long as the sepals, carinate, thin but not strongly nerved, glabrous; sepals oblong-obovate, broadly truncate, 12 mm. long, carinate, even, sparsely and obscurely punctulate-lepidote; capsule slenderly cylindrical, acuminate, 32 mm. long.

CAUCA: Forest, between Paletará and Calaguala, Cordillera Central, alt. 3,000-3,200 m., June 17, 1922, *Pennell* 7099 (GH, type, US phot. 3507).

27. *Tillandsia schimperiana* Wittm. *Bot. Jahrb.* 11:67. 1889.

Leaves 7 dm. long, sheaths elliptic, large, blades acuminate, sparsely punctulate-lepidote beneath; scape straight, stout; scape-bracts densely imbricate, foliaceous; primary bracts suberect, acuminate, exceeding the spikes; spikes sessile, elliptic, acute, 45 mm. long, 20 mm. wide, complanate, 6-9-flowered; floral bracts densely imbricate, elliptic, broadly acute, 22 mm. long, equaling or slightly exceeding the sepals, incurved, carinate, coriaceous, even, glabrous; sepals oblong-elliptic, obtuse, to 21 mm. long; petal-blades narrowly elliptic, 7 mm. long; stamens included.

ANTIOQUIA: Epiphytic, forest, Carolina, alt. 1,800 m., Sept. 25, 1884, *Lehmann* XXVI (G, type, US phot. 3970).

PERU.

28. *Tillandsia buseri* Mez, *Bull. Herb. Boiss.* II. 3:145. 1903.

Plant at least 7 dm. high; leaves 5-6 dm. long, sheaths elliptic, 2 dm. long, covered with fine cinereous brown-centered scales, green except the extreme base, blades acute, 35 mm. wide, glabrous above; scape erect, stout; scape-bracts densely imbricate, subfoliaceous; inflorescence dense, thyrsoid, 3 dm. long; primary bracts erect to spreading, lanceolate, acuminate, exceeding the spikes, coriaceous, red, punctulate-lepidote beneath; spikes short-stipitate, lanceolate, 5-7 cm. long, 8-14-flowered, strongly complanate, the lower sometimes scorpioid-decurved; floral bracts densely imbricate, broadly elliptic, 20-25 mm. long, slightly exceeding the sepals, incurved, strongly carinate, coriaceous, glabrous; sepals, elliptic, obtuse, even or faintly nerved; petals erect, linear, yellow; stamens included.

CUNDINAMARCA: On trees, Sasaima, La Victoria Trail, Hacienda Gualivá, Peñas del Aserradero, north of Facatativá, alt. 2,300–2,900 m., Oct. 8, 9, 1954, *García-Barriga* 15341 (COL, US); 15352 (COL, US).

CAUCA: Western slope of Cordillera Occidental, alt. 1,800 m., December 1899, *Langlassé* 102-a (K, isotype, GH phot. 2651).

NARIÑO: In trees, Las Mesas, near Mocoa, alt. 1,350 m., Nov. 22, 1946, *Foster* 2223 (GH, US phot. 3463).

ECUADOR.

**29. *Tillandsia fusiformis*** L. B. Smith, *Contr. U. S. Nat. Herb.* 29:438, *fig. 43*. 1951.

Stemless, 5 dm. long; leaves 3–4 dm. long, covered with appressed cinereous brown-centered scales, sheaths elliptic, 1–2 dm. long, dark purple, blades acute to acuminate, 4 cm. wide; scape curved, largely concealed by the leaves; scape-bracts foliaceous, densely imbricate; inflorescence fusiform, 15 cm. long, 35 mm. in diameter; primary bracts obscurely punctulate-lepidote, lustrous, probably red, the lower ones slightly shorter to slightly longer than the spikes and bearing narrowly triangular densely lepidote blades; spikes short-stipitate without any sterile bracts, lanceolate, 3–4 cm. long, densely 5-flowered, strongly complanate; floral bracts lance-oblong, acute, carinate, 20–24 mm. long, equaling the sepals, glabrous; pedicels very short and stout; sepals subfree, lanceolate, carinate, chartaceous, glabrous; petals 3 cm. long, blade oblanceolate, obtuse, purple; stamens included, filaments forming a tube.

NARIÑO: On trees and rocks, La Cabana near Pepino, alt. 1,200 m., Nov. 21, 1946, *Foster* 1970a=2341 (GH, type, US phot. 3464; US).

**30. *Tillandsia orbicularis*** L. B. Smith, *Phytologia* 5:38, *pl. 3, figs. 4–7*. 1954.

Stemless, 65 cm. high; leaves numerous in a funnelform rosette, nearly 5 dm. long, sheaths large, elliptic, merging with the blades, blades subtriangular with the margins slightly bowed, flat, acuminate, 5–6 cm. wide, subglabrous and green above, densely cinereous-lepidote beneath; scape erect; scape-bracts strict, densely imbricate, subfoliaceous; inflorescence slightly decurved, bipinnate, 14 cm. long; primary bracts erect, imbricate, even, glabrous, the lower exceeding the spikes and bearing long narrowly triangular lepidote red blades, the upper slightly shorter than the spikes and merely apiculate; spikes sessile and without sterile bracts at base, suborbicular, 4–5-flowered, strongly complanate; floral bracts oblong-obovate, acute, exceeding the sepals, sharply carinate, red or yellow, appressed-lepidote toward apex and soon glabrous outside, dark-lepidote inside; sepals oblong-obovate, broadly acute, 18 mm. long, sparsely dark-lepidote, nerved.

VALLE: Epiphytic, páramos, extreme north of the Alto del Buey range, Los Farallones, crest of the Cordillera Occidental, alt. 3,500–3,600 m., Oct. 12, 1944, *Cuatrecasas* 17945 (F, GH).

CAUCA: Thickets and low forest of páramo, Alto del Duende, valley of the Río Lopez, headwaters of the Río Palo, western slope of the Cordillera Central, alt. 3,300–3,350 m., Dec. 1, 2, 1944, *Cuatrecasas* 18831 (GH, type, US phot. 3497).

ECUADOR.

31. *Tillandsia pastensis* André, *Enum. Bromél.* 8. Dec. 13, 1888; *Rev. Hort.* 60:568. Dec. 16, 1888. FIGURE 34

Stemless, 1–1.2 m. high; leaves 5–6 dm. long, obscurely punctulate-lepidote, sheaths elliptic, large, like the blades in color, blades acute or acuminate, 5–8 cm. wide, flat; scape stout; scape-bracts densely imbricate, lanceolate, acute or acuminate; primary bracts acuminate,

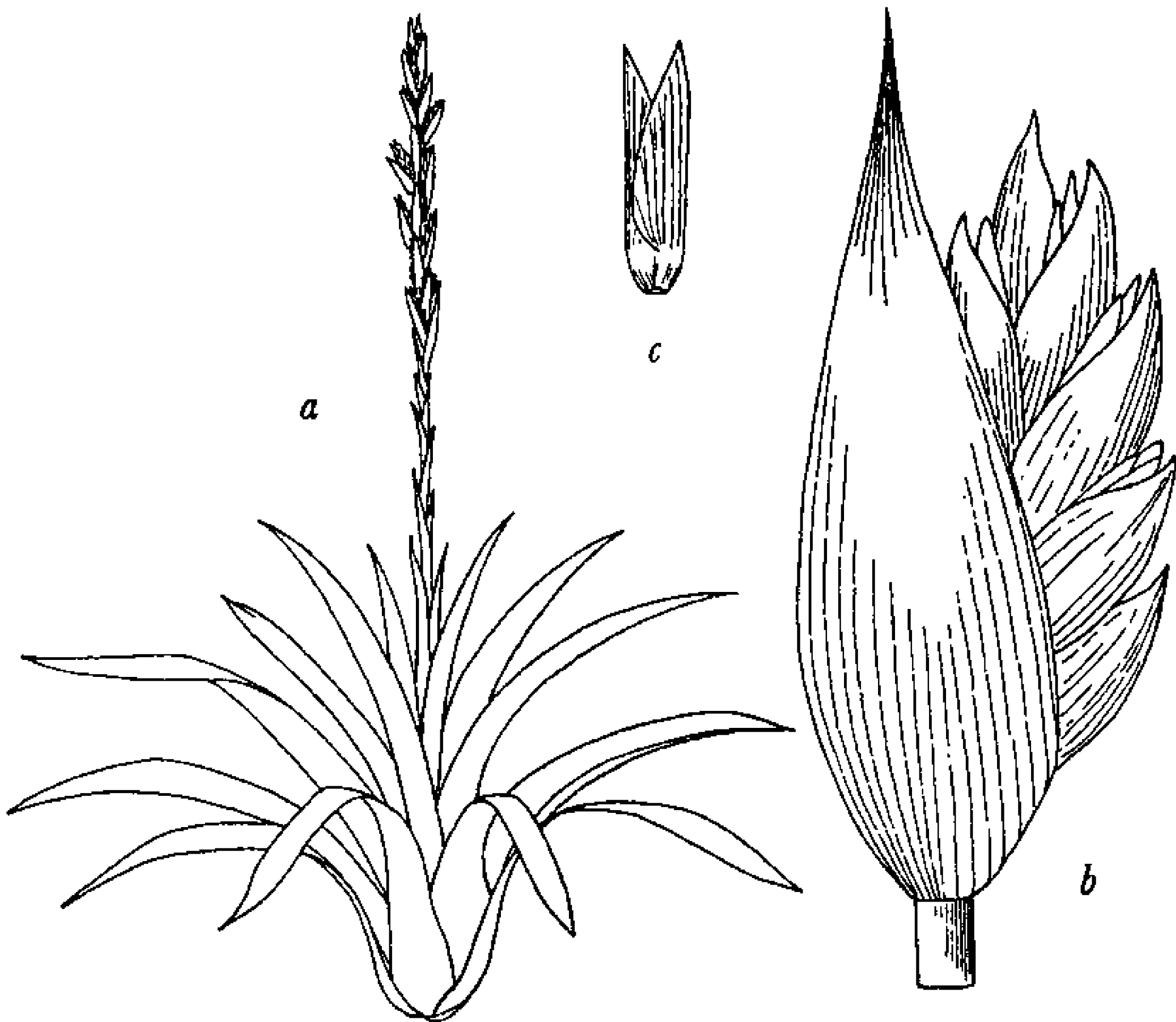


FIGURE 34.—*Tillandsia pastensis*: *a*, Habit  $\times \frac{1}{20}$ ; *b*, primary bract and spike,  $\times 1$ ; *c*, posterior sepals,  $\times 1$  (*a* and *b*, after André).

at least the lower exceeding the spikes; spikes sessile, elliptic, 4–6 cm. long, complanate, densely 6–8-flowered; floral bracts broadly elliptic, acute, subinflated, 20 mm. long, carinate, coriaceous, even or slightly nerved, glabrous; sepals elliptic to 18 mm. long; petals 25 mm. long.

CUNDINAMARCA: Barro Blanco, near Fusagasugá, alt. 2,500 m., Feb. 10, 1876, *André* 1747 in part (NY, GH phot. 1761). On small trees and rocks, Chicó savanna above Bogotá, alt. 3,000 m., Oct. 11, 1946, *Foster* 1842 (COL, GH).

CAUCA: Woods, Pedro Piso, Puracé, alt. 3,400 m., Sept. 1936, *Dryander* 1851 (US). Uarló Bridge, between Popayán and Puracé, alt. 2,600 m., July 10, 1939, *Pérez-Arbeláez & Cuatrecasas* 5894 (COL, F, US).

NARIÑO: Volcán Galer, Pasto, alt. 3,000 m., May 1876, *André* 1747 in part (K, type). Between Espinol and Piedrancha, alt. 1,500–2,100 m., Nov. 26, 1946, *Foster* 2268 (COL, GH, US).

ECUADOR.

32. *Tillandsia brunonis* André, *Enum. Bromél.* 8. Dec. 13, 1888; *Rev. Hort.* 60:568. Dec. 16, 1888. FIGURE 35

*Tillandsia brunonis* var. *mutabilis* André, *Enum. Bromél.* 8. Dec. 13, 1888; *Rev. Hort.* 60:568. Dec. 16, 1888.

Stemless, 8 dm. long; leaves about 12 in a broadly funnelform rosette, 3–4 dm. long, purple-spotted, sheaths elliptic, 15 cm. long, blades broadly acute or rounded and apiculate, 5 cm. wide, flat; scape stout; scape-bracts imbricate, the lower foliaceous, the upper lanceolate, acute; inflorescence 3–4 dm. long, red except the petals; primary bracts erect, elliptic, ample, covering the lower spikes; spikes sessile, subelliptic, 4–6 cm. long, complanate, 8–10-flowered; floral bracts densely imbricate, ovate, acute, 25 mm. long, slightly exceeding the sepals, carinate, slightly incurved, coriaceous, even, glabrous; sepals lanceolate, acute, carinate, half-connate posteriorly; petals linear, acute, white, violet toward apex; stamens included.



FIGURE 35.—*Tillandsia brunonis*: a, Habit,  $\times \frac{1}{6}$ ; b, primary bract and spike,  $\times 1$ ; c, posterior sepals,  $\times 1$  (a and b, after André).

CUNDINAMARCA: Between Puerto Grande and Barroblanco, road from Bogotá to Fusagasugá, alt. 2,900 m., February 1876, *André* 1757 (K, type, US phot. 4159). Barroblanco, near Fusagasugá, alt. 2,900 m., February 1876, *André* 1759 (K, type of *Tillandsia brunonis* var. *mutabilis* Andre). Epiphytic, temperate forest, Muchindote Valley, east side of Quebrada Negra, 13 km. northeast of Gachetá, alt. 2,800 m., July 4, 1944, *Grant* 9585 (US). Epiphytic, damp woodland, San Miguel, near Sibaté, alt. 2,900 m., June 7, 1948, *Hawkes & Garcia-Barriga* 42 (COL, US).

ANTIOQUIA: Monte del Diablo, July 21, 1944, *Daniel* 3256 (GH).

VALLE: Epiphytic, páramos, crest of the cordillera, north end of the Alto del Buey Range, alt. 3,500–3,600 m., Oct. 11, 1944, *Cuatrecasas* 17908 (VALLE). Epiphytic, Mina El Diamante, Quebrada del Ratón, northwest slope of Los Farallones, Cordillera Occidental, alt. 2,950–3,000 m., July 29, 30, 1946, *Cuatrecasas* 21754 (VALLE).

CAUCA: Forest, "La Galera," Micay Valley, Cordillera Occidental, alt. 1,400–1,500 m., June 29, 30, 1922, *Killip* 7792 (GH). El Tambo, Munchique, *Agredo* 454 (F).

NARIÑO: In trees, páramo cloud-forest, Alto Tabano above Encano, alt. 3,300 m., Oct. 31, 1946, *Foster* 2039 (COL, GH).

33. *Tillandsia humboldtii* Baker, Handb. Bromel, 203. 1889.

Over 44 cm. long; leaf-blade acute, over 18 cm. long, 25 mm. wide, glabrous above; scape-bracts densely imbricate, foliaceous, their sheaths elliptic, ample; inflorescence dense except at base, 2 dm. long, 35 mm. in diameter; primary bracts erect, broadly elliptic, apiculate, covering the spikes; spikes short-stipitate, ovate, 25 mm. long, 15 mm. wide, complanate, 4-flowered; floral bracts imbricate, 17 mm. long, exceeding the sepals, carinate, incurved, coriaceous, nearly even, glabrous; sepals ovate, acute, even, glabrous.

COLOMBIA or ECUADOR: *Humboldt & Bonpland* (B, type, F phot. 11504).

34. *Tillandsia engleriana* Wittm. Bot. Jahrb. 11:63. 1890.

Plant 1 meter or higher; leaves to 45 cm. long, sheaths elliptic, large, blades filiform-acuminate, involute, 3 cm. wide, cinereous-lepidote; inflorescence curved, 50 cm. long, 45 mm. in diameter, its axes white-arachnoid; primary bracts strict, elliptic-ovate, dark brown, the lower ones exceeding the branches and bearing long slender lepidote blades; branches with 5 spikes and a long naked base, to 7 cm. long; spikes oblong, 25 mm. long, 10 mm. wide, complanate, 6–10-flowered; floral bracts densely imbricate, elliptic, acute, exceeding the sepals, carinate; sepals free, elliptic, ovate, acute, coriaceous; petals white.

NARIÑO: On trees, forest, Santiago, eastern slopes of the Cordillera of Pasto, alt. 2,000 m., Feb. 17, 1881, *Lehmann* 520 (G, type, US phot. 3963).

35. *Tillandsia myriantha* Baker, Journ. Bot. 25:242. 1887.

Stoloniferous, flowering shoot 20–28 cm. long; leaves many in a spreading rosette, 20–27 cm. long, covered with fine subappressed

cinereous scales, sheaths broadly ovate, 5 cm. long, castaneous, blades filiform-acuminate, 15 mm. wide; scape erect or curved, slender; scape-bracts imbricate, ovate with very long slender blades; inflorescence densely bipinnate, 45–70 mm. long; primary bracts erect, like the scape-bracts but with shorter blades, exceeding the lower spikes, densely cinereous-lepidote; spikes sessile, elliptic, 25 mm. long, complanate, 4–6-flowered; rhachis alate; floral bracts lanceolate, obtuse, to 11 mm. long, equaling or slightly shorter than the sepals, slightly carinate, thin, nerved; sepals equally short-connate, 7–9 mm. long, even, glabrous; petals 14 mm. long, blades elliptic, denticulate, blue or violet; stamens included.

COLOMBIA: Caraguaza, *Triana* († Mez).

CUNDINAMARCA: Caqueza, *André* 815 († Mez).

CAUCA: Near Huila, Indian village in Río Paez Valley, Tierra Adentro, 1,600–1,900 m., January 1906, *H. Pittier* 1247 (US). Epiphytic, El Tambo region, alt. 1,700 m., July 1, 1934, *Sneidern* 74 (S, US).

VENEZUELA.

36. *Tillandsia caloura* Harms, Notizblatt 10:580. 1929.

Leaves 4–5 dm. long, densely appressed-lepidote, sheaths lanceolate, large, dark purple, blades acuminate; scape over 9 cm. long; scape-bracts densely imbricate, subfoliaceous; inflorescence dense except near base, 25–34 cm. long; primary bracts lanceolate, acuminate, exceeding the lower spikes; spikes suberect, lanceolate, acute, 6–8 cm. long, 20–25 mm. wide, complanate; floral bracts densely imbricate, elliptic, acute, 20–23 mm. long, exceeding the stamens, incurved, carinate, coriaceous, even; sepals much connate.

MAGDALENA: Epiphytic, forest, El Mamon, Sierra Nevada de Santa Marta, alt. 2,200 m., Feb. 26, 1928, *Schultze* 1104 (B, type, F phot. 11485). Rain forest, mountains above Hacienda Cincinnati, Santa Marta, alt. 2,100 m., Aug. 3, 1946, *Foster & C. E. Smith, Jr.*, 1394 (COL, GH). San Sebastian, Sierra Nevada de Santa Marta, alt. 1,860 m., Aug. 17, 1946, *Foster & C. E. Smith, Jr.* 1456 (GH).

37. *Tillandsia turneri* Baker, Journ. Bot. 26:144. May 1888. FIGURE 36

*Tillandsia cornuaulti* André, Énum. Bromél. 8. Dec. 13, 1888; Rev. Hortie. 60:568. Dec. 16, 1888.

*Guzmania cornuaulti* André ex Mez in DC. Monogr. Phan. 9:925. 1896.

*Thecophyllum cornuaultii* Mez in Engl. Pflanzenreich IV. 32:423. 1935.

Stemless, 4–5 dm. high; leaves many in a funnelform rosette, 2–5 dm. long, covered with fine appressed scales, sheaths elliptic, large, brown-lepidote, blades straight, acuminate, flat, 3–4 cm. wide, cinereous-lepidote; scape straight, stout; scape-bracts densely imbricate, foliaceous; inflorescence 10–14 cm. rarely to 20 cm. long, 6–7 cm. in diameter; primary bracts erect, broadly elliptic, the lower almost equaling to exceeding the spikes and with foliaceous blades, the

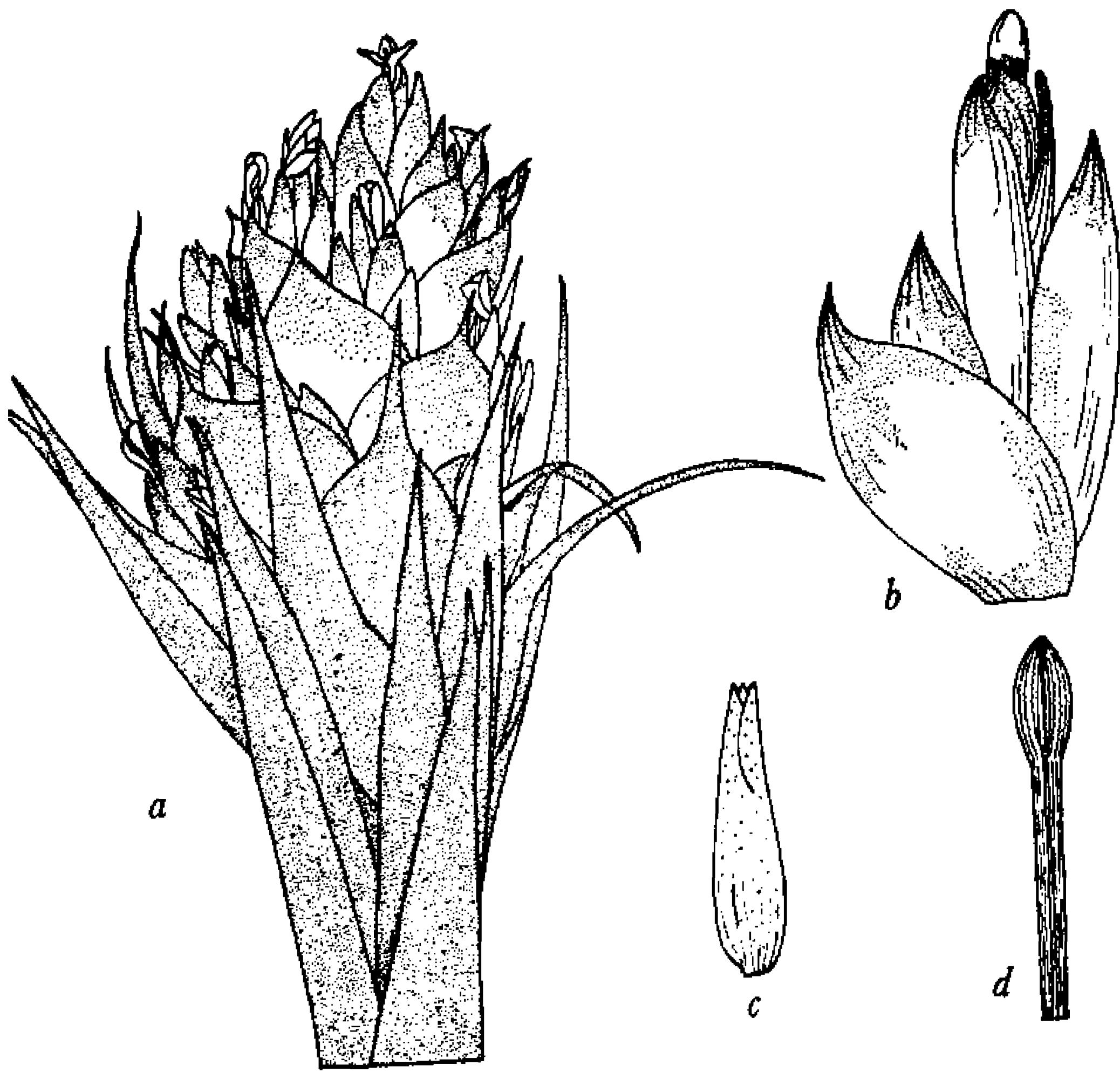


FIGURE 36.—*Tillandsia turneri*: *a*, Inflorescence,  $\times \frac{1}{2}$ ; *b*, primary bract and spike,  $\times 1$ ; *c*, calyx, posterior side,  $\times 1$ ; *d*, petal and stamen,  $\times 1$ .

upper shorter and apiculate; spikes lanceolate, 4–6 cm. long, complanate; floral bracts densely imbricate, ovate, acute, 18–30 mm. long, carinate, glabrous or slightly lepidote toward apex; flowers subsessile; sepals oblong, obtuse, 18–20 mm. long; petals erect, violet; stamens included.

NORTE DE SANTANDER: Epiphytic, deep woods, Páramo del Hatico, between Toledo and Pamplona, alt. 2,900 m., Mar. 12, 13, 1927, *Killip & A. C. Smith* 20646 (GH).

SANTANDER: Epiphytic, woods, mountains east of Las Vegas, alt. 3,000–3,300 m., Dec. 20, 21, 1926, *Killip & A. C. Smith* 15822 (GH). Epiphytic, woods, western slope of Páramo Rico, Eastern Cordillera, alt. 3,300–3,600 m., Jan. 15–19, 1927, *Killip & A. C. Smith* 17776 (BM, F, GH, US).

BOYACÁ: Valle del Cocuy, toward southwest, alt. 3,400–3,600 m., Sept. 15, 1938, *Cuatrecasas* 1751 (F, US).

CUNDINAMARCA: Andes of Bogotá, *Turner* (K, type, GH phot. 2639). Boqueron de Bogotá, alt. 2,900 m., January 1876, *André* 1248 (K). Forests of tree ferns, between Soacha and Barroblanco, alt. 2,800 m., February 1876, *André* 1764 (K, type of *Tillandsia cornuaulti* André, US phot. 4176). San Cristobal, near Bogotá, alt. 2,700 m., October 1917, *Ariste-Joseph* A-177 (US). Quebrada de Chicó, Macizo de Bogotá, alt. 2,750–2,890 m., June 8, 1939, *Cuatrecasas* 5408 (COL, US). Quebrada de Rosal, Macizo de Bogotá, alt. 3,200 m., June 29, 1939,



*Cuatrecasas* 5720 (COL, GH, US). On rocks, Finca El Mortiño, Zipaquirá, alt. 2,700 m., August 1939, *Uribe Uribe* 368 (COL). Quebrada Chicó, hills above Bogotá, alt. 3,300 m., July 11, 1943, *P. H. Allen* 2980 (MO). Epiphytic, temperate forest, Muchindote Valley, east side of Quebrada Negra, 13 km. northeast of Gacheta, alt. 2,700–2,800 m., July 4, 5, 1944, *Grant* 9584 (US); 9616 (COL, US). On rocks, páramo near Choachi, above Bogotá, alt. 3,000 m., October 19, 1946, *Foster* 1925 (COL, GH, US). On trees, "El Chicó" on the road to Calera, between Bogotá and Usaquén, alt. 3,000–3,100 m., December 15, 1946, *García-Barriga* 12122 (COL, US). Epiphytic, Zipaquirá, Pacho Highway, alt. 3,000 m., August 21, 1947, *Haught* 6103 (COL, US). Páramo de Chasques, source of Rio Bogotá, above Villapinzón, alt. 3,000–3,500 m., May 23, 1951, *García-Barriga, Schultes & Jaramillo-Mejía* 13609 (COL, US). On trees, Quebrada Matatigre, Subachoque, alt. 2,750 m., August 7, 1951, *García-Barriga* 13630 (COL, US). Epiphytic, páramo forest, Represa de Sisga, alt. 2,700 m., Mar. 2, 1953, *Schultes* 18810 (COL, US).

NARIÑO: Between Laguna La Cocha and Páramo de Tábano, alt. 2,800–3,000 m., June 1, 1946, *Schultes & Villarreal* 7834-L (US).

A variety in VENEZUELA and BRITISH GUIANA.

38. *Tillandsia dichrophylla* L. B. Smith, *Phytologia* 5: 283, *pl. 2, figs. 1–3*. 1955. FIGURE 37

Stemless, 55 cm. long; leaves about 20 in a funnelliform rosette, the outer greatly reduced, the inner to 36 cm. long, sheaths elliptic, to 20 cm. long, pale yellow-green except for the purple-tinged apex, obscurely punctulate-lepidote, blades 3 cm. wide, flat, green and glabrous above, covered beneath with appressed cinereous brown-centered scales; scape curved, about 5 mm. in diameter; scape-bracts

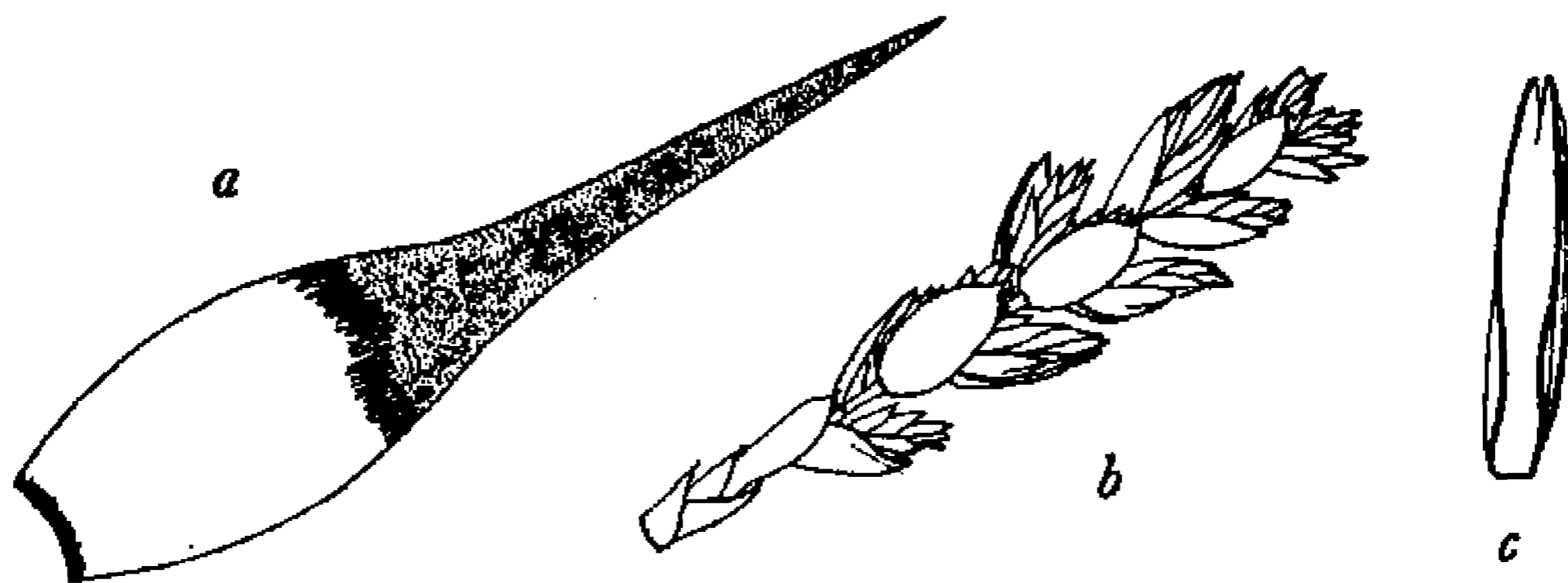


FIGURE 37.—*Tillandsia dichrophylla*: a, Leaf,  $\times \frac{1}{8}$ ; b, inflorescence,  $\times \frac{3}{8}$ ; c, posterior sepals,  $\times 1$ .

imbricate, the lower foliaceous, the upper broadly elliptic with short triangular lepidote blades, red, glabrous; inflorescence bipinnate, 18 cm. long, glabrous except for the apices of the primary bracts, red except for the petals (color unknown); primary bracts suberect, like the upper scape-bracts, almost exactly equaling the lower spikes; spikes nearly erect, sessile, elliptic, 4 cm. long, complanate; floral

bracts densely imbricate, elliptic, acute, 25 mm. long, exceeding the sepals, carinate, nearly straight toward apex, coriaceous, even; flowers subsessile; sepals lanceolate, acute, to 23 mm. long; petal-blades elliptic, 6 mm. long; stamens included.

ANTIOQUIA: Epiphytic, near Medellín, alt. 1,560 m., Nov. 11, 1946, *Gutiérrez & Delisle* 250 (US, type, US phot. 4398; F).

39. *Tillandsia rhomboidea* André, *Enum. Bromél.* 6. Dec. 13, 1888; *Rev. Hort.* 60: 566. Dec. 16, 1888.

Stemless; leaves stiff, 15–20 cm. long, densely cinereous-lepidote, sheaths large, elliptic, blades narrowly triangular, filiform-acuminate; scape short but distinct, erect, stout; scape-bracts imbricate, sub-foliaceous; inflorescence 10–12 cm. long, about equaling the leaves; rhachis not excavated; floral bracts broadly rhombic, acute and apiculate, twice as long as the sepals, rose-purple, sparsely lepidote, the median nerve prominent; sepals lanceolate, acute, free anteriorly, completely connate posteriorly; petals three times as long as the sepals, about equaling the stamens, violet, their blades spreading to recurved, broadly obovate.

VALLE: Piedra de Moler on the banks of the Río de la Vieja, Cauca Valley near Cartago, alt. 900 m., Mar. 15, 1876, *André* 2745 in part (K, lectotype, US phot. 4164; NY). Banks of the Río Bitaco, near Cali, alt. 1,000 m., March-April 1876, *André* 2745 in part (K, NY).

40. *Tillandsia dubia* L. B. Smith, *Phytologia* 5:284, *pl.* 2, *figs.* 4, 5. 1955.

FIGURE 38

Plant 34 cm. high; leaves 25 cm. long, obscurely and diffusely punctulate-lepidote, sheaths ovate, inconspicuous, stramineous, blades green above, pale reddish purple beneath; scape erect, very slender; scape-bracts imbricate, tightly enfolding the scape, lanceolate, acuminate, membranaceous, purplish, glabrous; inflorescence 13 cm. long,

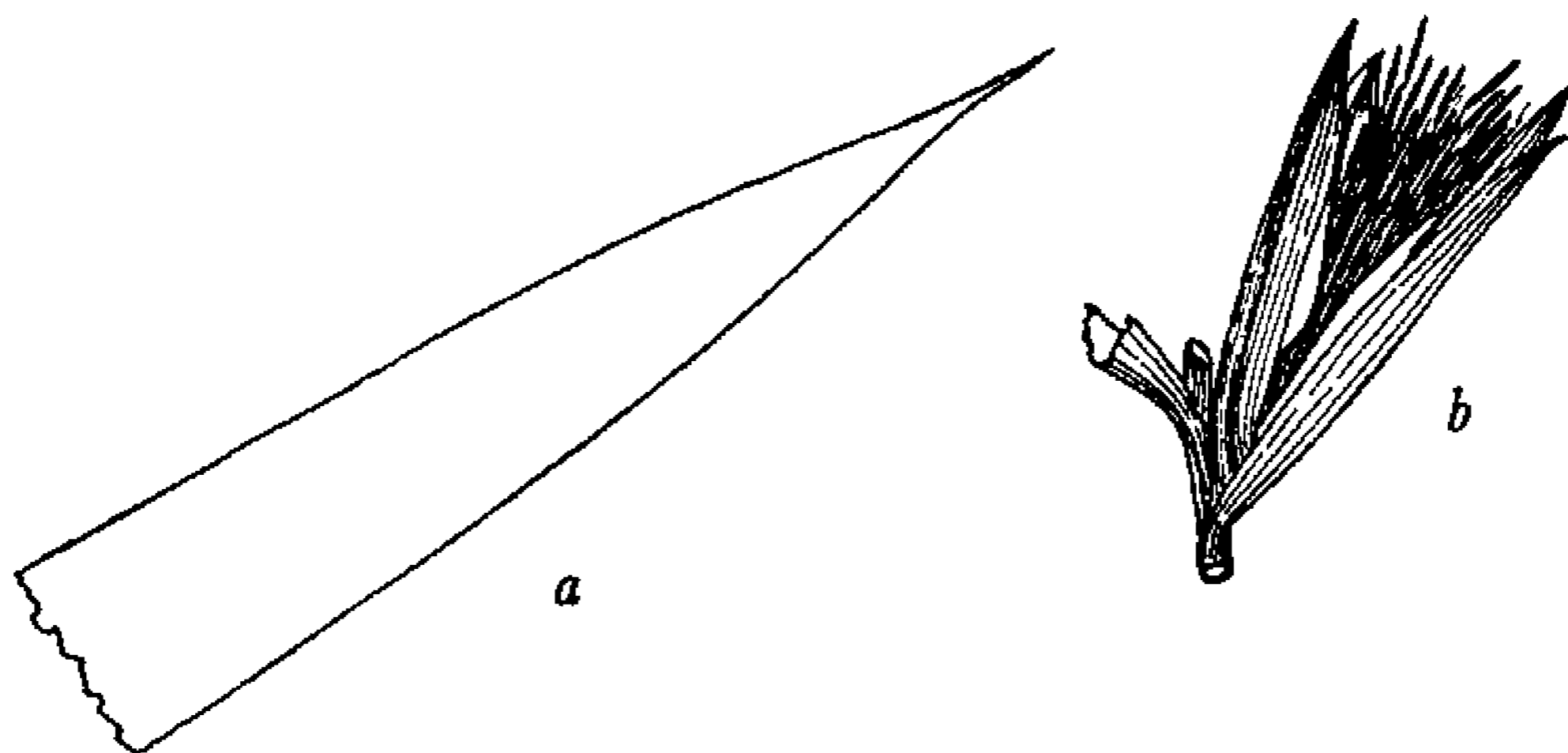


FIGURE 38.—*Tillandsia dubia*: a, Apex of leaf,  $\times 1$ ; b, section of inflorescence,  $\times 1$ .

estimated about 2 cm. wide at anthesis, strongly complanate, glabrous; rhachis slender; floral bracts erect at anthesis, narrowly lanceolate, acute, 3 cm. long, about 5 times as long as the internodes, membranaceous, nerved, red-purple with stramineous apices; flowers subsessile; sepals free, linear-lanceolate, acute, 27 mm. long, thin, nerved; capsules cylindrical, shorter than the sepals.

NARIÑO: Epiphytic, along trail north of Puerto Leguízamo, alt. 200 m.. Nov. 22, 1948, *Jaramillo-Mejía* 571 (COL, type, US phot. 4365).

41. *Tillandsia excavata* L. B. Smith, *Caldasia* 3:243, *fig.* 1945.

Leaves few, narrowly rosulate, to 3 dm. long, sheaths elliptic, densely punctulate-lepidote, dark castaneous at base, blades green, soon glabrous above, covered with pale appressed scales beneath; scape slender, slightly curved; scape-bracts densely imbricate, elliptic, acute, coriaceous, even, dark-spotted, densely and minutely white-lepidote; inflorescence dense, 13-flowered, subelliptic, complanate, 7.5 cm. long, about 3 cm. wide; rhachis straight, lepidote; floral bracts suberect before anthesis, broadly obovate, apiculate, to 25 mm. long, coriaceous, even, dark-spotted, white-lepidote; pedicels obconic; sepals free, elliptic, obtuse, ecarinate, 18 mm. long, slightly exceeding the upper bracts, coriaceous, even, glabrous; petals and stamens unknown.

NARIÑO: Isla de Gallos, February 1942, *Dryander* 2581 (US, type, GH phot. 5086).

42. *Tillandsia monstrum* Mez, *Repert. Sp. Nov. Fedde* 16:78. 1919.

FIGURE 39

Stemless, 1 meter high; leaves 8 dm. long, sheaths ample, 2 dm. long, covered with appressed brown-centered scales, dark castaneous toward base, blades broadly acute and apiculate, 7 cm. wide, appressed-lepidote beneath; scape lateral, straight, 7 mm. in diameter, glabrous; scape-bracts distichous, densely imbricate, lanceolate, acute, carinate, coriaceous, even, red, obscurely lepidote, the lowest small, regularly larger toward apex of scape and merging evenly with the floral bracts; inflorescence linear-oblanate, very strongly complanate, 7 cm. wide, densely many-flowered; rhachis angled, internodes about 15 mm. long; floral bracts suberect, linear-lanceolate, acuminate, straight, subglabrous; flowers subsessile; sepals free, narrowly lance-triangular, acuminate, 25–41 mm. long, thin, nerved, carinate, glabrous; petals 7 cm. long; capsule subcylindrical, acute, 35 mm. long.

ANTIOQUIA: On trees, forest, San Carlos, alt. 1,050 m., Feb. 2, 1880, *Kalbreyer* 1393 (B, type, F phot. 11514).

VALLE: Epiphytic, mangrove swamp, Punta Arenas, north shore of Buenaventura Bay, near sea level, June 2, 1944, *Killip & Cuatrecasas* 38629 (F, GH, US). On trees, mangroves at tidewater, Dec. 8, 1946, *Foster* 2316 (GH).

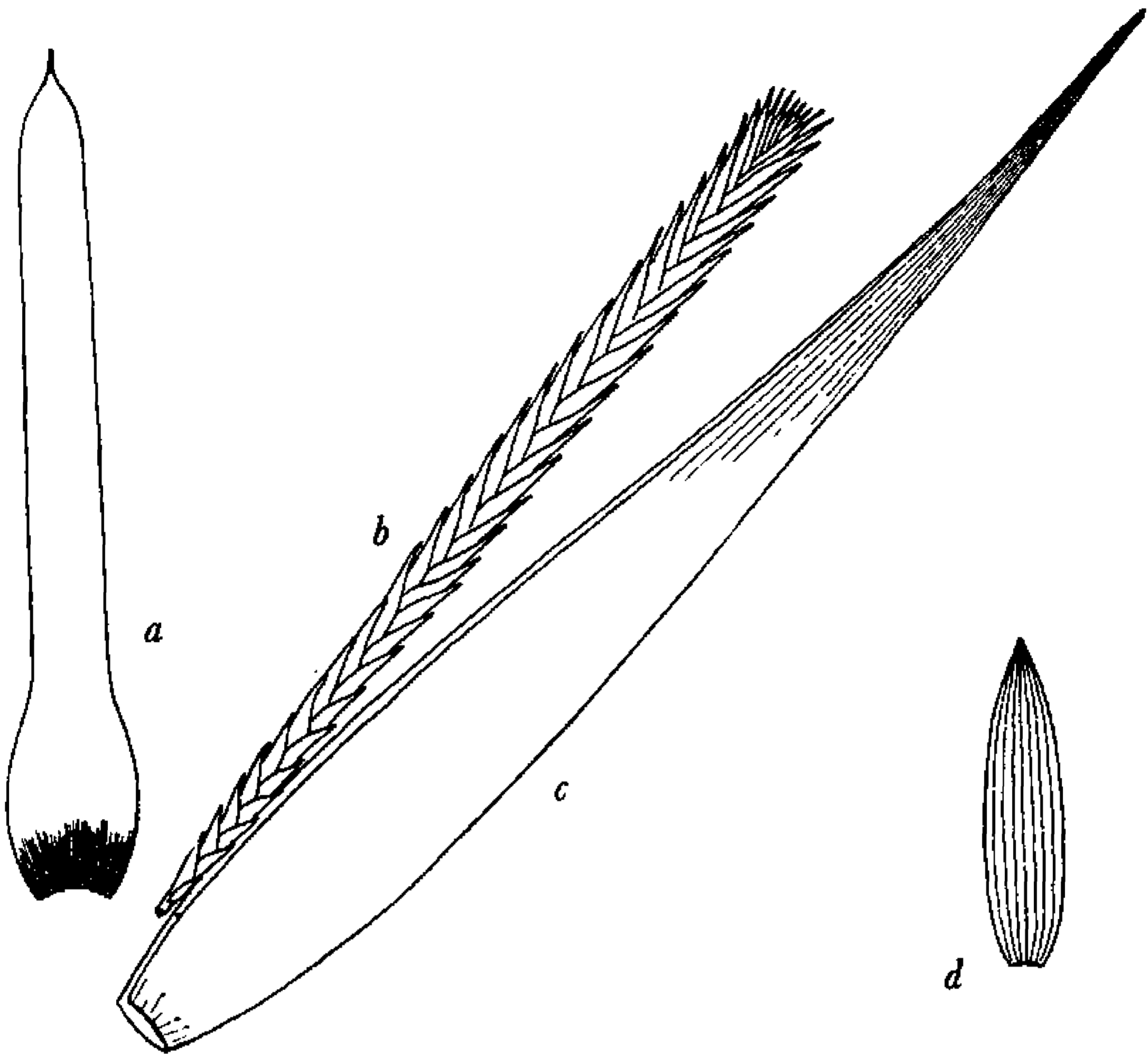


FIGURE 39.—*Tillandsia monstrum*: *a*, Leaf,  $\times \frac{1}{10}$ ; *b*, scape and inflorescence,  $\times \frac{1}{10}$ ; *c*, floral bract,  $\times 1$ ; *d*, sepal,  $\times 1$ .

43. *Tillandsia complanata* Benth. Bot. Voy. Sulph. 173. 1846.

*Tillandsia axillaris* Griseb. Fl. Brit. W. Ind. 597. 1864.

Leaves many in a dense rosette, 3–4 dm. long or rarely more, mostly exceeding the inflorescence, spotted, streaked, or suffused with dark purple especially toward the base, sheaths elliptic or narrowly ovate, 10–16 cm. long, densely and minutely brown-appressed-lepidote blades abruptly acute or subobtuse, 3–5 cm. wide, obscurely punctulate-lepidote, soon glabrous above; scapes ascending, 1–2 mm. in diameter above the flattened base, glabrous; scape-bracts numerous, erect, usually imbricate, narrowly lanceolate, acute or acuminate, subchartaceous, glabrous or subglabrous; inflorescences simple, lanceolate or linear in outline, acute, densely 4–24-flowered, up to 8 cm. long, 15–20 mm. wide, usually complanate, glabrous; floral bracts erect, imbricate, elliptic, obtuse, 15–25 mm. long, exceeding the sepals, coriaceous or subcoriaceous, even or prominently nerved, often rose or purple; flowers sessile; sepals lanceolate, acute, 10–15 mm. long, subcoriaceous, the posterior ones carinate and usually much connate; petals ligulate, about 2 cm. long, rose, purple, or blue, the blades suberect, obtuse; stamens and pistil slightly shorter than the petals; capsule slenderly cylindrical, acute, 4 cm. long.

NORTE DE SANTANDER: Epiphyte, dense woods, road from Pamplona to Toledo, crossing the divide between Río La Teja (Maracaibo drainage) and Río Mesme (Orinoco drainage), alt. 2,800–3,000 m., Feb. 27–28, 1927, *Killip & A. C. Smith* 19916 (GH, US). Epiphyte, woods, vicinity of Toledo, alt. 1,700–1,900 m., Mar. 3–11, 1927, *Killip & A. C. Smith* 20101 (GH, US). Epiphyte, Páramo del Hatico, en route from Toledo to Pamplona, alt. 2,900 m., Mar. 12–13, 1927, *Killip & A. C. Smith* 20650 (F, GH, US). Woods, between Alto del Loro and Alto de Santa Inés near Sarare, Cordillera Oriental, alt. 1,800–2,200 m., Oct. 21, 1941, *Cuatrecasas, Schultes & C. E. Smith, Jr.*, 12567 (US). On trees between Ocaña and Convención, alt. 1,200 m., Sept. 20, 1946, *Foster* 1747 (GH).

SANTANDER: Epiphytic, woods, vicinity of Las Vegas, alt. 2,600–3,000 m., Dec. 21–23, 1926, *Killip & A. C. Smith* 15930 (GH). Epiphyte, oak forest, vicinity of La Baja, alt. 3,500 m., Jan. 14–31, 1927, *Killip & A. C. Smith* 18099 (GH). Dense forest, Quebrada de Pais, north of La Baja, alt. 3,200 m., Jan. 31, 1927, *Killip & A. C. Smith* 18782 (GH, US).

BOYACÁ: La Rusia, northwest of Duitama, alt. 2,600 m., Nov. 14, 1945, *Uribe-Urbe* 1084 (COL).

CUNDINAMARCA: "El Tiburón," below Salto Camino de Herradura, *García B.* 124 (COL).

ANTIOQUIA: Alto de La Unión, July 24, 1944, *Daniel* 3261 (US). Terrestrial, rich sandy soil subparamo in low moist open woods east of Sonsón, alt. 2,800 m., Oct. 30, 1948, *Araque & Barkley* 18-A.—300 (COL, US).

CALDAS: Epiphytic, forest, "Pinares," above Salento, Cordillera Central, alt. 2,600–2,900 m., Aug. 2–10, 1922, *Pennell* 9223 (GH, NY, US); same, *Pennell* 9267 (GH, PH, US).

VALLE: Epiphytic, forest, La Cumbre, alt. 1,700–2,200 m., Sept. 11–18, 1922, *Killip* 11350 (GH). "Car. almar" (?road to coast), alt. 2,200 m., September 1939, *Dryander* 2442 (US); *Cuatrecasas* 18207 (F, GH).

CAUCA: Epiphytic, thicket in páramo, "Paletara", Cordillera Central, alt. 2,950–3,100 m., June 15–17, 1922, *Pennell* 6978 (GH, PH). Epiphytic, ravine in forest, "San Jose," San Antonio, Cordillera Occidental, alt. 2,400–2,700 m., July 1, 1922, *Pennell* 7611 (GH, US). Epiphytic, El Tambo, alt. 2,800 m., Sept. 25, 1939, *Sneidern* 2071 (S). On tree trunk, near La Depresión, headwaters of Río Guaitara, alt. 2,500 m., Sept. 17, 1944, *Core* 1286 (US).

NARIÑO: Epiphyte, thickets of residual woods, south side of the Valley of Sibundoy, upper Río Putumayo, alt. 2,200 m., Jan. 3, 1941, *Cuatrecasas* 11657 (US).

COSTA RICA, the WEST INDIES, and BRITISH GUIANA to PERU and BOLIVIA.

### Subgenus 2. *Anoplophytum*

*Tillandsia* subgenus *Anoplophytum* Baker, Journ. Bot. 25:212. 1887.

Leaf-blades narrowly triangular; inflorescence compound with distichous flowers, when simple the flowers usually polystichous; stamens about equaling the petals, the filaments transversely plicate; style slender, much longer than the ovary. Species 44–47.

44. *Tillandsia gardneri* Lindl. Bot. Reg. 28: sub pl. 63. 1842.

Stemless, 12–25 cm. high; leaves many, 10–27 cm. long, without distinction between sheath and blade, 15–20 mm. wide, filiform-

acuminate; scape suberect to decurved, slender, densely lepidote; scape-bracts densely imbricate, the lower foliaceous, the upper lanceolate, acuminate; inflorescence bipinnate, stoutly ellipsoid or globose, 4–6 cm. long, of 4–12 spikes; primary bracts like the upper scape-bracts; spikes ovate to linear-lanceolate, acute, more or less complanate; floral bracts ovate, acute, carinate toward apex, exceeding the sepals, lepidote; sepals subovate, acute or obtuse, carinate; petals ligulate, obtuse or emarginate, 14–17.5 mm. long, rose or pale lavender; stamens included, filaments transversely plicate; capsule cylindric, 35–45 mm. long.

NORTE DE SANTANDER: Epiphytic, La Cabuya, region of the Sarare, Cordillera Oriental, alt. 1,300 m., October 1941, *Cuatrecasas, Schultes & C. E. Smith, Jr.*, 12068 (COL). Epiphytic, Río Catatumbo, beyond Teorama, alt. 750 m., Sept. 11, 1946, *Foster 1661* (COL, GH).

TRINIDAD, VENEZUELA, BRASIL.

45. *Tillandsia incarnata* H. B. K. Nov. Gen. & Sp. 1:291. 1816.

FIGURE 40

In dense tangled masses; stem branching, its branches to 75 cm. long; roots present on young plants; leaves densely polystichous,

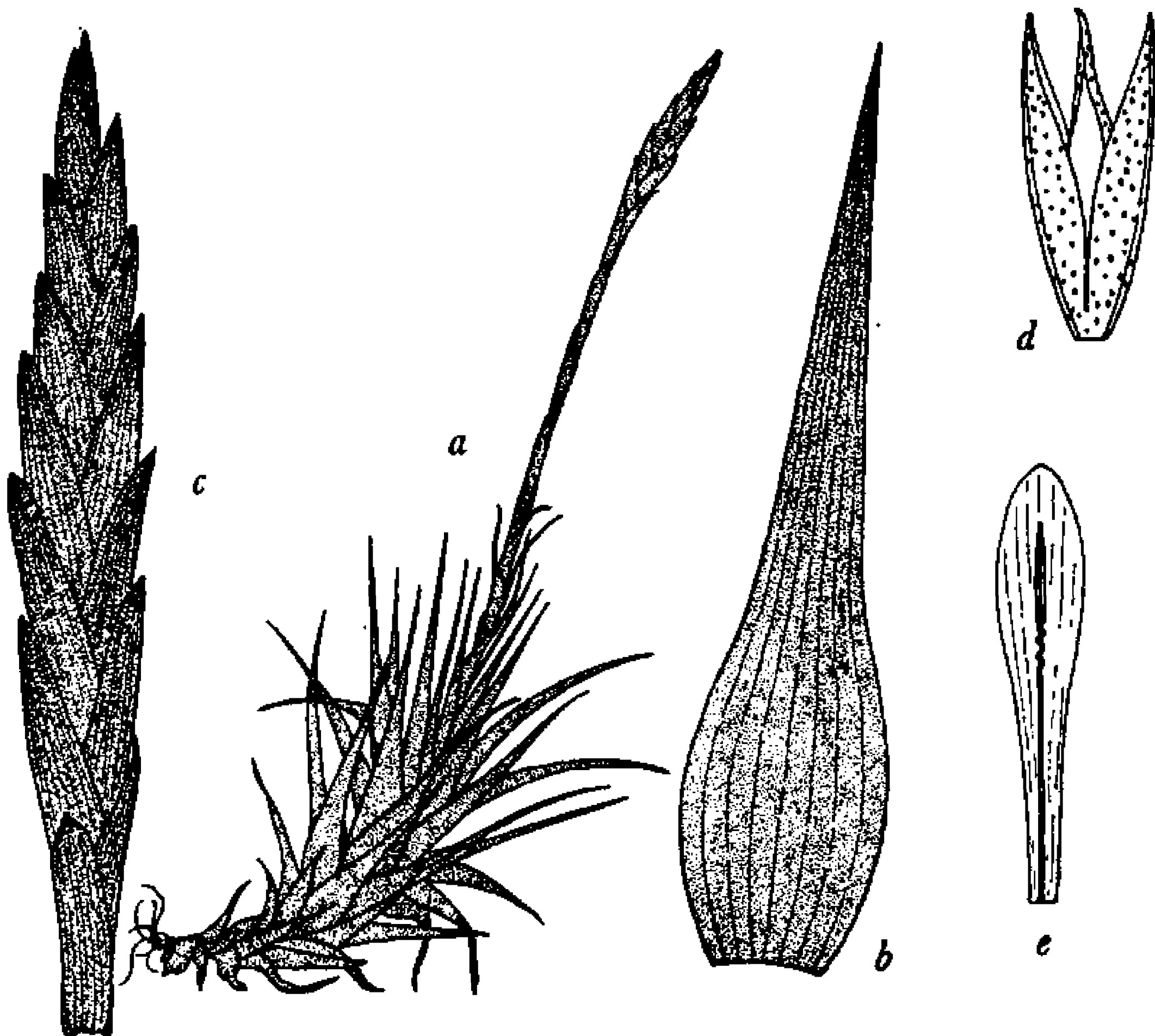


FIGURE 40.—*Tillandsia incarnata*: *a*, Habit,  $\times \frac{1}{4}$ ; *b*, leaf,  $\times 1$ ; *c*, inflorescence,  $\times 1$ ; *d*, sepals,  $\times 2$ ; *e*, petal and stamen,  $\times 2$ .

8–24 cm. long, covered with appressed or slightly spreading scales, sheaths ovate, indistinct, sometimes tinged with brown, blades sub-erect to spreading, narrowly triangular, filiform-acuminate, usually involute toward apex; scape terminal, straight or slightly curved, about 2 mm. in diameter, 1–4 dm. long, lepidote or glabrous; scape-bracts densely imbricate, elliptic, chartaceous, roseate, densely cinereous-lepidote, the lower with long filiform blades, the upper acute or apiculate; inflorescence simple or rarely digitate from a few spikes; primary bracts like the scape-bracts; spikes lanceolate or linear, acute, 5–12 cm. long, complanate, 5–18-flowered; rhachis nearly straight, sharply quadrangular, lepidote; floral bracts imbricate or the lowest slightly divergent, elliptic, apiculate, 20–25 mm. long, exceeding the sepals, ecarinate, chartaceous, sulcate, roseate, densely lepidote; flowers subsessile; sepals lance-elliptic, acute, carinate, sulcate, posteriorly connate; petals narrowly elliptic, obtuse, 20–25 mm. long, erect or nearly so, rose; stamens included, filaments dilated above and transversely plicate; capsule subprismatic, to 25 mm. long.

NORTE DE SANTANDER: Pamplona, July 1842, *Funck & Schlim* 1479 (BM). On rocky bank, between Mutiscua and Pamplona, Eastern Cordillera, alt. 2,500 m., Feb. 23, 1927, *Killip & A. C. Smith* 19767 (GH, NY, US). Near García, south of Pamplona, Mar. 18, 1945, *Garganta* 979 (F). On rocks, Pamplona, alt. 2,400 m., Oct. 2, 1946, *Foster* 1797 (COL, GH).

CUNDINAMARCA: Between Bogotá and La Mesa, *Goudot* (l Mez). Facatativá, alt., 2,750 m., December 1875, *André* 604 in part (K, NY). Salto de Tequendama, alt. 2,500 m., February 1876, *André* 604 in part (K, NY). Same, 1925, *Schultze* 71 (US). Bogotá, alt. 2,640 m., *Amórtegui* 175 (US). Quetame, alt. 100–500 m., January 1930, *Pérez-Arbeláez* 4 (COL, US). On rocks, Usaquén, above the village of Santa Ana, alt. 2,800 m., August 1939, *Uribe-Uribe* 359 (COL). On large rocks, Mun. Mosquera, near Laguna "La Herrera," alt. 2,680 m., Dec. 14, 1943, *García-Barriga* 10915 (COL, US). On bare rocks, Ubate, Carupa Highway, alt. 2,700 m., Sept. 14, 1947, *Haught* 6171 (COL, F, US). On dry soil, Mosquera Hills, west of Bogotá, 6 km. southwest of Mosquera, alt. 2,550 m., Jan. 23, 1949, *Mason* 13745 (COL, US). On rock, Charquito, alt. 2,500 m., Oct. 30, 1949, *Haught* 6661 (COL, US). Epiphytic, Sopó, eastern slope of Cordillera Oriental, alt. 2,800 m., Dec. 3, 1949, *García-Barriga* 13357 (COL, US). On low shrubs, about 5 km. southwest of Bogotá on road to Usme, alt. 2,800 m., Aug. 4, 1950, *S. G. Smith & Idrobo* 1316 (COL, UC, US). "Terreros" (Bosa), alt. 2,600–2,700 m., Aug. 21, 1952, *Hammen* 461 (COL). Epiphytic, Zipaquira, alt. 2,700 m., March 1955, *Uribe-Uribe* 2641 (COL, US). Ubaté, 100 km. north of Bogotá, alt. 2,600 m., May 18, 1952, *Køie* 4543 (C, COL).

NARIÑO: La Galera Volcano, near Pasto, alt. 3,200 m., May 1876, *André* 604 in part (K). Between Tangua and Tuquerres, alt. 3,000 m., Nov. 18, 1946, *Foster* 2202 (COL, GH). West of Pasto, alt. 2,500 m., Mar. 25, 1950, *Espinosa* (US).

ECUADOR.

46. *Tillandsia chartacea* L. B. Smith, Contr. U. S. Nat. Herb. 29:437, fig. 42 d, e. 1951.

Short-caulescent, nearly 1 dm. high; leaves 35 cm. long, sheaths elliptic, 8 cm. long, covered with brown appressed scales, blades narrowly triangular, caudate-acuminate, covered with appressed cinereous scales with brown centers, somewhat plicate; scape erect, elongate, 6 mm. thick, glabrous; scape-bracts strict, densely imbricate and closely enfolding the scape, the lower foliaceous, the upper broadly elliptic, long-caudate, red; primary bracts like the upper scape-bracts but merely apiculate; spikes suberect, linear, strongly complanate, 15–20 mm. wide; floral bracts elliptic, obtuse, ecarinate, 28 mm. long, exceeding the sepals, chartaceous, nerved, subdensely lepidote with cinereous brown-centered scales; pedicels short and stout; sepals linear-lanceolate, nerved; petals linear, obtuse, white with dark pink blade; stamens included, filaments plicate near apex.

CUNDINAMARCA: On rocks, Suesca, alt. 2,580 m., Oct. 9, 1946, *Foster* 1802 (GH, type, US phot. 3462; COL).

A variety in PERU.

47. *Tillandsia pulchella* Hook. Exot. Fl. pl. 154 (on plate). 1825.

More or less caulescent with stem up to 25 cm. long, often branching and associated in great mats, variable but represented in Colombia by the typical variety; leaves densely polystichous along the stem, 5–10 cm. long, densely and minutely appressed-lepidote, sheaths small and inconspicuous, blades subulate-acuminate, channeled above, 2–7 mm. wide; scape erect or ascending, slender, short; scape-bracts imbricate, elliptic, caudate, membranaceous, rose; inflorescence about equaling the leaves, simple, typically polystichous-flowered, ovoid, densely 4–10-flowered; floral bracts like the scape-bracts but sub-orbicular and less caudate, much exceeding the sepals; sepals lanceolate, acute, glabrous, 10 mm. long, membranaceous, much connate posteriorly; petals blue, white or rose, 20 mm. long, blade oblong, obtuse; filaments transversely plicate; capsule cylindrical, 15 mm. long.

NORTE DE SANTANDER: In trees, between Ocaña and Convención, alt. 1,200 m., Sept. 20, 1946, *Foster* 1745 (COL, GH).

WEST INDIES to BOLIVIA and northern ARGENTINA.

### Subgenus 3. *Phytarrhiza*

*Tillandsia* subgenus *Phytarrhiza* Baker, Journ. Bot. 25:212, 214. 1887.

Leaf-blades ligulate, narrowly triangular, or linear; inflorescence compound or simple; flowers distichous; petal-blades broad, conspicuous; stamens deeply included; style short and stout. Species 48–51.



48. *Tillandsia platyrhachis* Mez in DC. Monogr. Phan. 9:848. 1896.

Stemless, to 6 dm. high; leaves 6–7 dm. long, densely and minutely pale-lepidote beneath, glabrous above, sheaths ovate, inconspicuous, blades acute, thin, 35 mm. wide; scape erect, stout; scape-bracts densely imbricate, foliaceous; inflorescence lax, glabrous; primary bracts triangular, acuminate, exceeding the short naked sterile bases of the branches, lepidote; spikes oblong, obtuse, 15 cm. long; rhachis geniculate; floral bracts elliptic, obtuse, 2–3 cm. long, much shorter than the sepals, striate, miniate, the margins white on drying; pedicels obconic, 5 mm. long; sepals free, elliptic, obtuse, 2–4 cm. long, ecarinate, striate; petal-blades spreading, suborbicular, 1 cm. long, deep violet; stamens deeply included, exceeding the pistil.

ANTIOQUIA: Forest, alt. 1,200–1,350 m., 1879, *Kalbreyer* 1328 (K, US phot. 4170).

ECUADOR, PERU.

49. *Tillandsia anceps* Lodd. Bot. Cab. 8: pl. 771. 1823.

Stemless; leaves numerous, 15–40 cm. long, equaling or exceeding the inflorescence, very densely and minutely pale-lepidote, green, sheaths triangular-ovate, blades recurving, acuminate, 7–12 mm. wide; scape erect, stout, very short and almost completely hidden by the leaves; scape-bracts densely imbricate, ovate, acute or the lowest with an erect linear blade, much smaller than the floral bracts, coriaceous, even, glabrous; inflorescence elliptic, strongly complanate, 10–15 cm. long, 55 mm. wide, 10–20-flowered, glabrous; floral bracts suberect, acute, coriaceous, even, somewhat lustrous, green or pale rose with greenish margins; flowers short-pedicellate; sepals narrowly lanceolate, acute, 3 cm. long, coriaceous, even, carinate; petals more than twice as long as the sepals, the claw linear, white, the blade spreading, lance-elliptic, acute, blue or rarely white; stamens deeply included, exceeding the style; capsule slenderly cylindrical, shorter than the sepals.

NORTE DE SANTANDER: Epiphytic, Bellavista on pipeline, alt. 750 m., Sept. 15, 1946, *Foster*, 1690 (COL, GH).

VALLE: On trees in dense forest, Las Juntas del Dagua, alt. 300–600 m., *Lehmann* K-356 (K). Epiphytic, mangrove swamp, Buenaventura Bay, Apr. 13, 1939, *Killip* 34952 (US). Epiphyte, mangrove swamp, Río Potedó, Estero de Bodegas, south shore of Buenaventura Bay, June 2, 1944, *Killip* 38679 (F).

CENTRAL AMERICA, TRINIDAD, northern SOUTH AMERICA.

50. *Tillandsia monadelpha* (E. Morr.) Baker, Journ. Bot. 25:281. 1887.

*Phytarrhiza monadelpha* E. Morr. Belg. Hortie. 32:168, pl. 7. 1882.

Stemless, 35 cm. high; leaves 2 dm. long, sheaths ovate, blades 10–15 mm. wide; scape erect, soon becoming lateral, slender, glabrous; scape-bracts imbricate, lance-elliptic, lepidote at apex; inflorescence lax, oblong to linear, about 22-flowered, 13 cm. long; rhachis straight,

alate; floral bracts ovate, acute, coriaceous or subcoriaceous, carinate, striate, soon glabrous; flowers 30 mm. long, fragrant; sepals equally short-connate, lance-elliptic, carinate, glabrous; petals white or yellow, blades ovate, reflexed; stamens deeply included, exceeding the style; filaments connate; capsule slenderly cylindrical, 4–7 cm. long.

VALLE: Epiphytic, forest, Santa Rosa, Dagua Valley, alt. 200–300 m., Sept. 22, 1922, *Killip* 11532 (GH, NY, PH, US). Epiphytic, woods, Río Cajambre, Pacific coast, alt. 5–80 m., May 5–15, 1944, *Cuatrecasas* 17465 (F, GH). Epiphytic, dense forest, Agua Clara, along highway from Buenaventura to Cali, alt. 100 m., June 6, 1944, *Killip & Cuatrecasas* 38879 (COL, F, GH, US).

CAUCA: On trees, dense forest, Timbiquí, *Lehmann* 8637 (F).

NARIÑO: Epiphytic, dense forest along stream, east side of Gorgona Island, alt. 50–100 m., Feb. 11, 1939, *Killip & Garcia* 33182 (COL, GH, US).

CENTRAL AMERICA, TRINIDAD, northern SOUTH AMERICA.

51. *Tillandsia paleacea* Presl, Rel. Haenke. 1:125. 1827.

*Tillandsia scalarifolia* Baker, Journ. Bot. 25:235. 1887.

*Tillandsia schenckiana* Wittm. Bot. Jahrb. 11:63. 1889.

Flowering plant 1–7 dm. long; roots present at least at first; stem much branched, appearing stout because of the leaf-sheaths; leaves more than distichous but relatively few-ranked and widely spaced so that the blade and the upper half of the sheath are clearly visible, cinerous often becoming fuscous with age, sheaths broadly ovate or elliptic, large, glabrous except on the upper half outside, blades abruptly spreading, usually contorted, to 12 cm. long, 4–6 mm. wide; scape erect, slender, very short to over 15 cm. long, glabrous or nearly so; scape-bracts mostly equaling or exceeding the internodes, narrowly elliptic, apiculate, lepidote, the lower filiform-laminate; inflorescence narrowly lanceolate, acute, to 5 cm. long, dense, 1–12-flowered; rhachis straight or flexuous, angled, glabrous; floral bracts ovate or elliptic, about 3 times as long as the internodes, slightly shorter to slightly longer than the sepals, ecarinate, sulcate, soon glabrous; flowers sessile; sepals lanceolate, 10–17 mm. long, free, glabrous; petals with narrow claw and large suborbicular spreading blue or violet blade; stamens deeply included, exceeding the pistil; capsule cylindrical, 2 cm. long.

CAUCA or TOLIMA (?): Near La Plata, alt. 1,000 m., December 1882, *Lehmann* XXVII (G, type of *Tillandsia schenckiana* Wittm.; BM, GH phot. 6644).

PERU, BOLIVIA, CHILE.

#### Subgenus 4. *Diaphoranthema*

*Tillandsia* subgenus *Diaphoranthema* Baker, Journ. Bot. 16:236. 1878.

Leaf-blades narrowly triangular or linear; inflorescence simple, 1–few-flowered; flowers distichous; petal-blades narrow and inconspicuous; stamens deeply included; style short and stout. Species 52, 53.

52. *Tillandsia recurvata* (L.) L. Sp. Pl. ed. 2. 410. 1762.

*Renealmia recurvata* L. Sp. Pl. 287. 1753, excluding var.  $\beta$ .

*Tillandsia uniflora* H. B. K. Nov. Gen. & Sp. 1:290. 1816.

*Diaphoranthema uniflora* Beer, Brom. 154. 1857.

*Diaphoranthema recurvata* Beer, Brom. 156. 1857.

Stems densely massed, simple or few-branched, 1–10 cm. long, typically much shorter than the leaves but occasionally about equaling them; roots present; leaves 3–17 cm. long, covered with cinereous or ferruginous subspreading scales, sheaths elliptic-ovate, thin, many-nerved with a broad hyaline nerveless margin, imbricate, blades typically recurved, sometimes only spreading or even erect, linear, terete, 0.5–2 mm. in diameter, rather soft with a weak point; scape up to 13 cm. long, about 0.5 mm. in diameter; scape-bracts linear-lanceolate, lepidote, 1 or very rarely 2 immediately below the inflorescence, sometimes one next the inflorescence and one remote; inflorescence typically 1–2-flowered or rarely up to 5-flowered, dense; floral bracts like the scape-bracts but smaller, typically equaling or exceeding the sepals but often distinctly shorter, several-nerved densely lepidote; flowers erect, subsessile; sepals lanceolate, usually acute, 4–9 mm. long, thin, with 3 or more prominent nerves; petals narrow, pale violet or white; stamens deeply included, exceeding the pistil; capsule slenderly cylindrical, abruptly short-beaked, up to 3 cm. long.

MAGDALENA. Tenerife, Dec. 5, 1875, *André* 161 in part (F, GH). On tree trunk, open tropical forest, Sierra de Perijá, 5 km. west of Manaure, and 32 km. east of Valledupar, alt. 580 m., Jan. 30, 1945, *Grant* 10713 (US). In *Pereskiopsis*, semiarid section, mountains above Santa Marta, alt. 300 m., July 29, 1946 *Foster & C. E. Smith, Jr.*, 1323 (GH).

NORTE DE SANTANDER. Epiphyte, woods, vicinity of Toledo alt. 1,700–1,900 m., Mar. 3–11, 1927, *Killip & A. C. Smith* 20122 (F, GH, NY, PH, S, US). Epiphyte, La Cabuya, region of the Sarare, Cordillera Oriental, alt. 1,300 m., Oct. 12–24, 1941, *Cuatrecasas, Schultes & C. E. Smith, Jr.*, 12069 (COL). On *Cereus hexagonus* (?), dry llanos, Aguacaliente de San Luis (Cúcuta), Feb 13, 1946, *Garganta* 1128 (F).

SANTANDER. Epiphyte, wooded banks of stream, Río Suratá Valley, between Bucaramanga and El Jaboncillo, alt. 800–1,500 m., Jan. 2, 1927, *Killip & A. C. Smith* 16391 (BM, F, GH, NY, PH, US). Epiphyte, ca. 40 km. south of Bucaramanga, alt. 600 m., Dec. 16, 1948, *Araque & Barkley* 18-S-332 (US).

BOYACÁ: On *Cereus* and *Opuntia*, arid slopes, Soatá, alt. 2,130 m., Sept. 6, 1938, *Cuatrecasas* 1001 (F, GH, US). Banks of the Río Súnuba between Gue-teque and Guayatá, eastern slope of the Cordillera Oriental, alt. 1,500 m., June 30, 1940, *Cuatrecasas* 9707 (F, GH). On tree, along Río Soapaga, 12 km. east of Belén, Cordillera Oriental, alt., 2,460 m., Nov. 7, 1944, *Fosberg* 22183 (US). On marine cretaceous shale, 7 km. southwest of Leiva, Cordillera Oriental, alt. 2,130 m., Jan. 19, 1949, *Mason* 13707 (US).

CUNDINAMARCA: Fusagasugá, alt. 1,800 m. February 1876, *André* 161 in part (F). Epiphytic, woods, Natural Bridges, Pandi, alt. 800–900 m., Dec. 1–3, 1917, *Pennell* 2832 (GH, NY). La Esperanza, on railroad from Girardot to Bogotá, August 1924, *Ariste-Joseph* B-85 (US). Same, between Anolaima and La Esperanza, alt. 1,280–1,780 m., Feb. 10–12, 1929, *García-Barriga* 7070 (COL).

Epiphytic, Quetame, alt. 500–1,000 m., Jan. 1930, *Pérez-Arbeláez* 1 (COL, US). Guasca, May–June 1937, *Idinaël* 1277 (F, GH). On telegraph wires, Bogotá, alt. 2,500 m., Jan. 1938, *Idinaël* 1616 (F). Epiphyte, thickets, Puente de Seviez, between Chipaque and Cáqueza, eastern slope of the Cordillera Oriental, alt. 1,940 m., Dec. 31, 1939, *Cuatrecasas* 7938 (GH, US). Epiphyte, roadside thickets, vicinity of Apulo, alt. about 455 m., May 5, 1944, *Killip, Dugand & Jaramillo* 38210 (GH, US). On trees, between La Mesa and San Javier, alt. 1,320 m., May 20–30, 1946, *Duque-Jaramillo* 3669 (COL). On trees, La Mesa, on the road to San Javier, alt. 950–1,320 m., Jan. 2–20, 1947, *García-Barriga* 12167 (US). On trees, Municipio La Mesa, "Laguna Verde," south of La Mesa, alt. 700–750 m., May 15, 1952, *Fernández & Mora* 1363 (COL, US).

META: Epiphytic, scrub on summit of small hill, northern escarpment, Sierra de la Macarena, alt. 800 m., Jan. 30, 1950, *Philipson* 2305 (BM). Epiphyte, dense woods between Ríos Guëjar and Sansa, upper part of the eastern slope opposite the pass of Los Puercos, Sierra de La Macarena, alt. 500–1,000 m., Aug. 23, 1950, *Idrobo* 459 (US). Epiphyte, Mesa del Río Sansa, Cordillera La Macarena, alt. 1,000–1,300 m., Jan. 23, 1951, *Idrobo & Schultes* 1310 (US).

ANTIOQUIA: Near Medellín, Mar. 19, 1927, *Toro* 79 (NY). On mango tree, Medellín, alt. about 1,500 m., July 7, 1930, *Archer* 384 (GH, US). On electric wires, San Antonio, Dec. 1936, *Daniel* 1224 (F, GH, US). Medellín, May 1938, *Daniel* 1429 (GH). Common epiphyte, Facultad de Agronomía, Medellín, alt. 1,560 m., July 10, 1947, *Hodge* 6896 (US). On electric wires, Medellín, alt. 1,540 m., *Daniel* 685–b (COL).

HUILA: On *Prosopis*, dry bluffs of Río Ambicá just above its confluence with Río Cabrera, alt. 1,000 m., Dec. 15, 1942, *Fosberg* 19343 (US). On *Bursera* tree, steep rather dry slopes above Colombia, alt. 1,150 m., Dec. 26, 1942, *Fosberg* 19587 (US). Mun. Garzón. Vereda de las Quebraditas, alt. 900 m., Feb. 21–26, 1947, *Bermúdez* in Goodspeed Exped. 34927 (UC).

VALLE: La Paila, Mar. 24, 1853, *Holton* 154 (NY, PH). Abundant on trees round Cali, alt. 1,000 m., *Lehmann* 7767 (F). On tree in open, "La Manuelita," Palmira, Cauca Valley, alt. 1,090–1,100 m., May 26–30, 1922, *Pennell & Killip* 6172 (GH, NY, PH, US). Epiphyte, desert stream-bottom, Espinal, below Dagua, alt. 600–700 m., Sept. 6, 7, 1922, *Killip & Hazen* 11081 (GH, NY, PH, US). Dry thickets, Lobo Guerrero, western slope of the Cordillera Occidental, alt. 610–650 m., Sept. 9, 10, 1944, *Cuatrecasas* 17812 (F, GH). Epiphyte, roadsides and haciendas, Plana del Valle, between San Fernando and Río Pance, alt. 1,000 m., July 13, 1945, *Cuatrecasas* 19661 (GH). Epiphyte, moist open woods along Río Cauca near Palmira, alt. 1,000 m., Dec. 2, 1947, *Bermudez & Barkley* 17–C–906 (GH, US).

NARIÑO: Abundant on dry cliffs above road, bridge across Río Guaitará at confluence of Río Bobo, 6 km. east of Imues, 29 km. southwest of Pasto, Sept. 30, 1943, *Fosberg* 21060 (US).

Extreme southern UNITED STATES to northern ARGENTINA and CHILE.

53. *Tillandsia usneoides* (L.) L. Sp. Pl. ed. 2. 411. 1762.

*Renealmia usneoides* L. Sp. Pl. 287. 1753.

*Tillandsia trichoides* H. B. K. Nov. Gen. & Sp. 1:290. 1816.

*Dendropogon usneoides* Raf. Fl. Tellur. 4:25. 1838.

*Strepsia usneoides* Steud. Nomencl. Bot. ed. 2. 2:645. 1841.

*Tillandsia crinita* Willd. ex Beer, Brom. 152. 1857.

Growing pendent from trees in slender branching strands; roots usually absent; stem less than 1 mm. thick, sympodial, internodes

3-6 cm. long with only the extreme base covered by the leaves, curved; leaves 5 cm. long, densely lepidote, sheaths elliptic, 8 mm. long, blades filiform, less than 1 mm. thick; scape lacking; inflorescence reduced to a single flower: floral bracts shorter than the sepals, ovate, lepidote; sepals narrowly ovate, acute, to 7 mm. long thin, nerved, glabrous, equally short-connate; petals narrow, 9-11 mm. long, pale green or blue; stamens deeply included, exceeding the pistil; capsule cylindrical, to 25 mm. long.

GUAJIRA: Abundant, hanging from branches of trees, forest, 9 km. south of Carraipia, alt. 200 m., July 25, 1944, *Haught* 4263 (US).

MAGDALENA: On trees, San Sebastian, Sierra Nevada de Santa Marta, alt. 1,860 m., August 1946, *Foster & C. E. Smith, Jr.*, 1451 (GH, US). Epiphytic, Pivijay, alt. 15 m., Apr. 30, 1948, *Romero-Castañeda* 1115 (COL).

ATLÁNTICO: Piojó near Barranquilla, alt. 400 m., January 1929, *Elias* 709 (US). Near Barranquilla, 1938, *Elias* 1601 (US). Epiphytic, thicket on dry hill, near Miramar Beach, alt. 1-20 m., Dec. 27, 1949, *Dugand* 4411 (COL).

NORTE DE SANTANDER: Epiphyte, woods, near Toledo, alt. 1,700-1,900 m., Mar. 3-11, 1927, *Killip & A. C. Smith* 20121 (F, GH, NY, US). El Naranjo, between Pamplona and Cúcuta, Aug. 18, 1944, *Garganta* 912 (F). On trees overhanging the river, near Labateca valley of Río Chitaga, near Pamplona, alt. 1,260 m., Oct. 14, 1944, *Fassett* 25936 (COL, GH).

SANTANDER: Drooping from branches, Río Suratá Valley, between Bucaramanga and El Jaboncillo, alt. 800-1,500 m., Jan. 2, 1927, *Killip & A. C. Smith* 16348 (F, GH, NY, PH, S, US).

BOYACÁ: Labranzagrando, alt. 1,150 m., 1932, *Amórtegui* 331 (US). Banks of Río Súnuba, between Gueteque and Guayatá, eastern slopes of the Cordillera Oriental, alt. 1,500 m., June 30, 1940, *Cuatrecasas* 9706 (F, US).

CUNDINAMARCA: San Antonio, *Triana* (US); 635 (BM). Near Fusagasugá, Feb. 6, 1876, *André* 1860 bis (F, GH, NY, US). Epiphytic, woods, Natural Bridges, Pandi, alt. 800-900 m., Dec. 1-3, 1917, *Pennell* 2836 (NY). Pendent epiphyte, Quetame, alt. 500-1,000 m., January 1930, *Pérez-Arbeláez* 5 (US). Epiphyte, Cabrera to Pandi, July 1930, *Pérez-Arbeláez* 567 (US). Covering trees, Pacho, Hacienda de Patasía, alt. 1,800 m., Oct. 14, 1948, *Uribe-Uribe* 1820 (COL).

META: Epiphytic, scrubby forest on summit of Approach Ridge, Central Mountains, Sierra de la Macarena, alt. 1,200 m., Dec. 20, 1949, *Philipson & Idrobo* 1829 (BM, COL). Pendent epiphyte, upper part of eastern slope opposite the pass of Los Puercos, dense woods between Ríos Guëjar and Sansa, Sierra de La Macarena, alt. 500-1,000 m., Aug. 23, 1950, *Idrobo* 458 (COL, US). Eastern slopes of Macizo Renjifo, northeast end of Cordillera La Macarena, alt. 600-1,300 m., Dec. 30, 1950-Jan. 5, 1951, *Idrobo & Schultes* 872 (COL). Epiphytic, plain of the Río Sansa, alt. 1,000-1,300 m., Jan. 23, 1951, *Idrobo & Schultes* 1305 (COL).

ANTIOQUIA: Medellín, 1935, *Daniel* 685 (GH).

TOLIMA: On trees, near coffee plantations, El Libano, alt. 1,580 m., July 17, 1947, *García-Barriga* 12210 (US).

HUILA: On trees, Río Venadito, 25 km. southwest of La Bodega, Cordillera Oriental, alt. 1,500-1,620 m., Dec. 2, 1944, *Little* 9028 (COL).

VALLE: La Paila, Mar. 25, 1853, *Holton* 155 (NY, PH).

CAUCA: Around Huila, Indian village in Río Paez valley, Tierra Adentro, alt.

1,600–1,900 m., Jan. 1906, *H. Pittier* 1294 (US). Coconuco, alt. 2,400 m., Feb. 26, 1939, *Sneidern* 2070 (F, US).

NARIÑO: Yacanquer, alt. 1,600–1,700 m., Jan. 5, 1943, *Garganta* 505 (F, US).  
Southeastern UNITED STATES to central ARGENTINA and CHILE.

### Subgenus 5. *Pseudo-Catopsis*

*Tillandsia* subgenus *Pseudo-Catopsis* Baker, Handb. Bromel. 157, 192. 1889.

Leaf-blades various; inflorescence mostly compound; flowers distichous, sometimes becoming secund; sepals strongly asymmetric, broadest at the center or near the apex; stamens included; style short. Species 54–72.

54. *Tillandsia trapeziformis* Mez in DC. Monogr. Phan. 9:737. 1896.

Stemless, 2 dm. high; leaves 2 dm. long, not at all undulate, minutely appressed-lepidote especially beneath, sheaths large, elliptic, dark ferruginous, blades narrowly triangular, 23 mm. wide, green-cinereous; scape decurved, slender, glabrous; scape-bracts imbricate, elliptic, acute, inflated, densely brown-lepidote; inflorescence 8 cm. long, 3 cm. wide; rhachis geniculate, ferruginous-floccose; floral bracts distichous, subtrapeziform, acute, 22 mm. long, ecarinate, densely ferruginous-lepidote; flowers suberect, short-pedicellate; sepals broadly elliptic, coarsely lepidote.

MAGDALENA: Sierra Nevada de Santa Marta, *Wagner* (Z, type).

55. *Tillandsia seemannii* (Baker) Mez in DC. Monogr. Phan. 9:737. 1896.

*Guzmania bulliana* sensu Baker, Journ. Bot. 25:173. 1887, in part, not André 1886.

*Caraguata pulchella* André, Énum. Bromél. 5. Dec. 13, 1888; Rev. Hort. 60:565. Dec. 16, 1888, not *Tillandsia pulchella* Hook. 1825.

*Guzmania seemannii* Baker, Handb. Bromél. 153. 1889.

*Tillandsia mezii* André ex Mez in DC. Monogr. Phan. 9:738. 1896.

*Tillandsia seemannii* var. *mezii* L. B. Smith, Contr. Gray Herb. 89:14. 1930.

Stemless or short-caulescent; leaves 10–15, 10–15 cm. long, sheaths broadly ovate, dark brown, obscurely lepidote, blades narrowly triangular, to 8 mm. wide; scape erect, very slender, usually shorter than the leaves; scape-bracts suberect, suborbicular, shorter than the internodes; spikes 1 or 2, few-flowered; rhachis straight to slightly geniculate, more or less ferruginous-lepidote; floral bracts imbricate, suborbicular, acute or apiculate, 14 mm. long, exceeding the flowers, membranaceous, pale-lepidote; flowers erect, sessile; sepals obtuse, thin, nerved, lepidote; petals 12–15 mm. long, coherent; stamens included.

ANTIOQUIA: Epiphytic, San Antonio de Pereira, January 1946, *Daniel* 3841 (US).

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56. *Tillandsia crispa* (Baker) Mez in DC. Monogr. Phan. 9:739. 1896.

*Guzmania crispa* Baker, Journ. Bot. 25:173. 1887.

*Tillandsia undulifolia* Mez in DC. Monogr. Phan. 9:740. 1896.

Stemless, 1–3 dm. high; leaves many, densely rosulate, finely appressed-lepidote, sheaths large, brown-lepidote, blades very narrowly triangular; scape erect or slightly curved, slender; scape-bracts imbricate, elliptic, somewhat inflated, apiculate to finely caudate, appressed-lepidote; inflorescence simple or digitate; primary bracts scarcely larger than the floral bracts, much exceeded by the spikes; spikes oblong, densely 6–36-flowered, 3–8 cm. long, 1.5–2.5 cm. wide; rhachis pruinose, brown-lepidote; floral bracts 9–15 mm. long, sub-orbicular, inflated-convex, lepidote; flowers erect or suberect; sepals 5–8 mm. long, broadly elliptic, ecarinate, coriaceous, sparsely lepidote or glabrous, even; petals exceeding the sepals; stamens and pistil included.

NORTE DE SANTANDER: Ocaña, 1845, *Purdie* (K, type). Epiphytic, shady woods between Ocaña and Convencion, alt. 1,200 m., Sept. 20, 1946, *Foster* 1744 (GH).

ANTIOQUIA: Forests above Amalfi, alt. 1,800–2,000 m., Sept. 22, 1884, *Lehmann* XXIII (G). On trees in wet forest, El Yarumal, alt. 2,300 m., November 1891, *Lehmann* 5300 (K).

VALLE: Woods, Piedra de Moler, left bank of Río Digua, western slope of the Cordillera Occidental, alt. 900–1,180 m., Aug. 19–28, 1943, *Cuatrecasas* 14919 (GH).

PANAMA, ECUADOR, PERU.

57. *Tillandsia tenuispica* André, Énum. Bromél. 7. Dec. 13, 1888; *Rev. Hort.* 60:567. Dec. 16, 1888.

Stemless, 5–10 dm. or higher; leaves 3 dm. long, submembranaceous, sheaths broadly elliptic, 1 dm. long, densely appressed-lepidote, blades acute and apiculate, obscurely lepidote; scape slender, glabrous; scape-bracts about equaling the internodes or shorter, apiculate to short-caudate; inflorescence ample, tripinnate, distichous, 25–60 cm. long; axes glabrous; primary bracts narrowly lanceolate, apiculate, not over 35 mm. long; spikes flexuous, lax; floral bracts acute, slightly keeled toward apex, nerved, about equaling the sepals and closely enfolding them; flowers closely appressed to the rhachis; sepals emarginate, 4 mm. long, glabrous; capsule slenderly cylindrical, 13–20 mm. long.

NORTE DE SANTANDER: Epiphytic, open hillside, western side of Culagá Valley, north of Labateca, alt. 1,480–1,550 m., Mar. 12, 1927, *Killip & A. C. Smith* 20523 (GH, US). Epiphytic, Río Catatumbo, Teorama Trail, alt. 750 m., Sept. 11, 1946, *Foster* 1660 (COL, GH, US).

CUNDINAMARCA: On *Inga*, banks of Río Blanco, La Unión, Municipio Fomeque, alt. 1,600–1,700 m., August 1951, *Hernández-Camacho* 504 (COL, US).

VALLE: Arid region of the Valley of Cauca, between Cartago and Naranjo, alt. 980 m., March 1876, *André* 2414 (NY, isotype).

## VENEZUELA.

58. *Tillandsia inconspicua* André, Énum. Bromél. 8. Dec. 13, 1888; Rev. Hortie. 60:568. Dec. 16, 1888.

? *Tillandsia juzepczukii* Harms, Notizblatt 12:535. 1935.

Stemless, 2–3 meters high; leaves 1 meter long, blades ligulate, 7 cm. wide, apex cuspidate, soon glabrous; scape stout, pale-lepidote; scape-bracts elliptic, green or reddish, the lower imbricate, acuminate, the upper about equaling the internodes, apiculate; inflorescence bipinnate or possibly subtripinnate, pyramidal, lax, distichous, 6 dm. long; primary bracts ovate, acute, sparingly lepidote, the lower 3 cm. long; spikes spreading, 15-flowered, the lower ones 10 cm. long, lax, subsessile, bearing several sterile bracts at base; rhachis undulate, angled, lepidote; floral bracts imbricate, obtuse, slightly nerved, sparsely lepidote; sepals obovate, obtuse, lepidote.

NORTE DE SANTANDER: Forest of La Cruz, Ocaña, alt. 1,800 m., *Schlim* 1204 (BR, GH phot. 6591).

CUNDINAMARCA: Páramo, road to Calera, Bogotá, May 1926, *Woronow & Juzepczuk* (B, type of *Tillandsia juzepczukii* Harms, not seen, identity uncertain).

## ECUADOR.

59. *Tillandsia subalata* André, Énum. Bromél. 7. Dec. 13, 1888; Rev. Hortie. 60:567. Dec. 16, 1888.

*Tillandsia brevispicula* André, Énum. Bromél. 7. Dec. 13, 1888; Rev. Hortie. 60:567. Dec. 16, 1888.

*Tillandsia beleana* André, Bromel. Andreanae 69, pl. 24, fig. b. 1889.

Stemless, 4–7 dm. high; leaves few, 15–40 cm. long, densely and finely appressed-lepidote, coriaceous, sheaths ovate, large, brown, blades linear-lanceolate, acuminate, 2–3 cm. wide, often involute; scape slender, compressed; scape-bracts oblong, apiculate or short-caudate, about equaling the internodes; inflorescence laxly tripinnate, imperfectly distichous; axes pale-ferruginous-lepidote; primary bracts ovate, acute, much shorter than the branches; branches spreading, 4–5 cm. long, usually much divided; spikes about 10-flowered; rhachis strongly geniculate, obscurely alate; floral bracts ovate, acute, 7–9 mm. long, exceeding the sepals, obscurely keeled, incurved at apex, not imbricate at maturity, membranous, lepidote; flowers suberect; sepals subelliptic, obtuse, 5 mm. long, carinate, lepidote; petals 7 mm. long, yellow, blades spreading; stamens included.

TOLIMA: Mountains at Las Cruces, near Quindio, March 1876, *André* 3763 in part (NY, isotype).

CAUCA: Epiphytic, forest, "San Jose," San Antonio, Cordillera Occidental, alt. 2,400–2,700 m., June 30, 1922, *Pennell & Killip* 7406 (GH). Same, *Pennell* 7564 (GH, PH, US).



NARIÑO: Near Pasto, alt. 2,800 m., May 1876, *André* 2496 (K, type of *Tillandsia brevispicula* André, US phot. 4145).

ECUADOR.

60. *Tillandsia triticea* Burchell ex Baker, Journ. Bot. 26:42. 1888.

Stemless, 4–9 dm. high; leaves few to several, 2–3 dm. long, densely punctulate-lepidote, sheaths broadly ovate-elliptic, brown, blades ligulate, rounded and apiculate, 30–35 mm. wide, irregularly mottled with dark purple; scape glabrous; scape-bracts imbricate, narrowly ovate, apiculate, densely lepidote; inflorescence laxly bipinnate, distichous, 2–3 dm. long, glabrous; primary bracts like the scape-bracts, much shorter than and enfolding the base of the spike; spikes spreading, linear, 1 cm. wide, often long-stipitate with several sterile bracts at base, 14–36-flowered; rhachis flexuous, angled; floral bracts broadly ovate, acute, 7 mm. long, equaling the sepals, convex, ecarinate, coriaceous, not imbricate; sepals obovate, coriaceous, even; petals inconspicuous, yellowish; stamens included; capsule slenderly cylindrical, 23 mm. long.

NORTE DE SANTANDER: Epiphytic, near Ocaña, alt. 1,200 m., Sept. 20, 1946, *Foster* 1752 (COL, GH).

NARIÑO: Epiphytic, Río Nembi, Barbacoas, alt. 450 m., Nov. 16, 1946, *Foster* 2194 (GH).

TRINIDAD, GUIANA, BRASIL, PERU, BOLIVIA.

61. *Tillandsia micrantha* Baker, Journ. Bot. 25:303. 1887.

*Tillandsia chinchicuana* Harms, Notizblatt 10:578. 1929.

Stemless, 4–7 dm. high; leaves 3–4 dm. long, obscurely punctulate-lepidote, sheaths large, brown, forming an ellipsoid pseudobulb, blades ligulate, rounded and apiculate, 2–4 cm. wide, often irregularly purple-spotted; scape slender, soon glabrous; scape-bracts lance-ovate, lepidote, the lower acuminate, imbricate, the upper rounded and apiculate, shorter than or equaling the internodes; inflorescence lax, tripinnate or bipinnate, 13–40 cm. long; axis flexuous; primary bracts like the upper scape-bracts, much shorter than the branches; spikes suberect to spreading, often curved, 10–25-flowered, 5–10 mm. wide; rhachis flexuous to geniculate, angled; floral bracts ovate, acute, equaling the sepals or rarely somewhat shorter, not imbricate at maturity, convex, ecarinate, subcoriaceous, sparsely lepidote; sepals obovate, sparsely lepidote or glabrous; capsule slenderly cylindrical.

MAGDALENA: Mountain rain forest, Playoncito near Chinchicua, Sierra Nevada de Santa Marta, alt. 1,800 m., Apr. 6, 1928, *Schultze* 1521 (B, type of *Tillandsia chinchicuana* Harms, F phot. 792). Mount San Lorenzo, near Santa Marta, alt. 1,900–2,400 m., July 1932, *Seifriz* 190 (US).

NARIÑO: Road to Urcusique, alt. 1,200 m., Nov. 23, 1946, *Foster* 2250 (COL, GH).

TRINIDAD, VENEZUELA.

62. *Tillandsia spiculosa* Griseb. in Nachr. Ges. Wiss. Goett. for 1864:17. 1865.

Plant stemless, to 8 dm. high; leaves rosulate, 3–4 dm. long, obscurely punctulate-lepidote, often irregularly purple-spotted, sheaths relatively large, broadly ovate, dark brown, blades ligulate, rounded-apiculate or acute, 2–4 cm. wide; scape erect, glabrous, often much exceeding the leaves; scape-bracts narrowly elliptic, rounded-apiculate or short-caudate, about equaling the internodes or the upper ones slightly shorter, punctulate-lepidote; inflorescence tripinnate or bipinnate, lax; axes soon glabrous; primary bracts narrowly ovate, apiculate, much shorter than the axillary branches; spikes linear, often curved, 24-flowered, to 9 cm. long, 6–9 mm. wide, spreading, usually long-stipitate with sterile bracts at the base; floral bracts broadly ovate, equaling or slightly exceeding the sepals, convex, ecarinate, coriaceous, scanty lepidote or glabrous; sepals broadly elliptic, even, glabrous, asymmetric; petals orange or yellow, acute; stamens included; ovary globose, the style short; capsule slenderly cylindrical, 22 mm. long.

MAGDALENA: Santa Marta, 1898–99, *H. H. Smith* 2852 (NY). Dense rain forest, mountains above Cincinnati, Santa Marta, alt. 1,500 m., Aug. 3, 1946, *Foster & C. E. Smith, Jr.*, 1393 (GH).

META: Dense forest, Entrada Ridge, Central Mountains, Sierra de la Macarena, alt. 1,100 m., Jan. 26, 1950, *Philipson, Idrobo & Jaramillo* 2252 (BM).

VALLE: Epiphyte, woods, La Laguna, left bank of the Río Sanquiní, western slope of the Cordillera Occidental, alt. 1,250–1,400 m., Dec. 10–20, 1943, *Cuatrecasas* 15517 (F, GH).

VENEZUELA, COLOMBIA, BOLIVIA, and a variety in COSTA RICA.

63. *Tillandsia membranacifolia* L. B. Smith, Contr. Gray Herb. 89:11, 32, pl. 2, figs. 4–7. 1930.

Stemless, 5 dm. high; leaves 25 cm. long, very thin, sheaths broadly elliptic, densely brown-lepidote, blades ligulate, 45 mm. wide, obscurely lepidote; scape erect, glabrous, shorter than the leaves; scape-bracts, elliptic, apiculate, pale-lepidote; inflorescence laxly distichous, bipinnate, ovate, 30 cm. long, 12 cm. wide; axis straight, compressed, nearly glabrous; primary bracts ovate, acute, about 15 mm. long; spikes slightly arching, 23-flowered, 70 mm. long, 6–10 mm. wide, the lower long-stipitate with sterile bracts; rhachis undulate, strongly compressed, angled, excavated next the flowers, sparsely pale-lepidote; floral bracts ovate, slightly but regularly shorter than the sepals, ecarinate, even, sparsely lepidote; sepals obovate, retuse, scarcely more than 5 mm. long; capsule slenderly cylindrical, apiculate, 18 mm. long.

SANTANDER: Epiphytic, woods, Mesa de los Santos, eastern Cordillera, alt. 1,500 m., Dec. 11–15, 1926, *Killip & A. C. Smith* 15067 (GH, type; F, US).

CUNDINAMARCA: In trees, Paramo de San Miguel, alt. 3,300 m., Oct. 12, 1946, *Foster* 1881 (GH).

64. *Tillandsia michelii* Mez, Bull. Herb. Boiss. II. 3:146. 1903.

Stemless, 6–10 dm. high; leaves few, erect, 25 cm. long, sheaths ovate-elliptic, densely and finely brown-lepidote, blades ligulate, 27 mm. wide, coriaceous, gray-green, pale-lepidote; scape erect or slightly curving, stout, lepidote; scape-bracts subcaudate; inflorescence erect, laxly tripinnate, 2–4 dm. long; axis straight or nearly so, pale-lepidote; primary bracts broadly elliptic, rounded or apiculate, very short, tubular-involute; branches 11 cm. long, bearing 3–4 pendent spikes; spikes short-stipitate, 10–14-flowered; floral bracts 5 mm. long, slightly shorter than the sepals, laxly imbricate, not concealing the rhachis, scarcely keeled, somewhat incurved, densely lepidote; flowers suberect; sepals elliptic, obtuse, coriaceous; capsules cylindrical, 10 mm. long.

VALLE: Thickets and residual forest, Pichindé, Alto de las Brisas, drainage of Río Cali, eastern slope of Cordillera Occidental, alt. 2,160 m., Oct. 26, 1944, Cuatrecasas 18208 (F, GH); 18208-A (VALLE).

CAUCA: Eastern slope of Cordillera Occidental, alt. 2,500 m., Nov. 25, 1899, Langlassé 94 (GH, US, isotypes, US phot. 3549). Chisquío, region of El Tambo, alt. 1,700 m., Apr. 25, 1936, Sneidern 640 (S). Munchique, region of El Tambo, alt. 1,700 m., Apr. 26, 1936, Sneidern 646 (S).

65. *Tillandsia ropalocarpa* André, Énum. Bromél. 6. Dec. 13, 1888; Rev. Hort. 60:566. Dec. 16, 1888. FIGURE 41

*Tillandsia rhopalocarpa* Mez in DC. Monogr. Phan. 9:757. 1896.

Stemless; leaves 2–3 dm. long, heteromorphic, coriaceous, lepidote, sheaths broadly ovate, large, blades acute, often involute and appearing narrowly triangular, 2–3 cm. wide; scape erect, slender, compressed, lepidote; scape-bracts remote, ovate, very short; inflorescence laxly tripinnate; primary bracts ovate, acute or apiculate, very short, enfolding the bases of the branches; branches of 2–4 spikes; spikes long-stipitate, oblong, laxly 5–12-flowered; rhachis flexuous, lepidote; floral bracts navicular, acute, sulcate; flowers suberect; sepals obovate, 4–5 mm. long, sulcate; petals very small, yellow; capsule cylindrical.

HUILA: Epiphytic, woods, below Gabinete in the drainage of Abra de San Andrés, western slope of Cordillera Oriental, alt. 1,900–2,100 m., Mar. 24, 1940, Cuatrecasas 8602 (COL).

ANTIOQUIA: "Laguna de Guarne," July 1937, Daniel 1430 (GH). Santuario, January 1942, Daniel 2706 (GH). Epiphytic, woods below crest of Cordillera Central, near Las Palmas, between Medellín and El Retiro, alt. 2,500 m., Nov. 8, 1945, Hodge 6686 (US). Same, Mar. 17, 1946, Hodge 6736 (GH). Epiphytic, Medellín, alt. 2,100 m., Jan. 7, 1948, Sandeman 5658 (COL, K). Epiphytic, grassy clearings, Alto de la Honda, 6 km. west of Sonsón, alt. 2,600 m., Mar. 19, 1949, Scolnik, Molina & Barkley 19-An-299 (US).

CALDAS: Tambores, alt. 1,280 m., March 1876, André 2319 (K, type, US phot. 4146; NY).

VALLE: Epiphytic, forest, La Cumbre, Cordillera Occidental, alt. 1,600–2,000 m., May 14–19, 1922, Killip 5843 (GH, NY, US). San Antonio, alt. 2,000 m.,

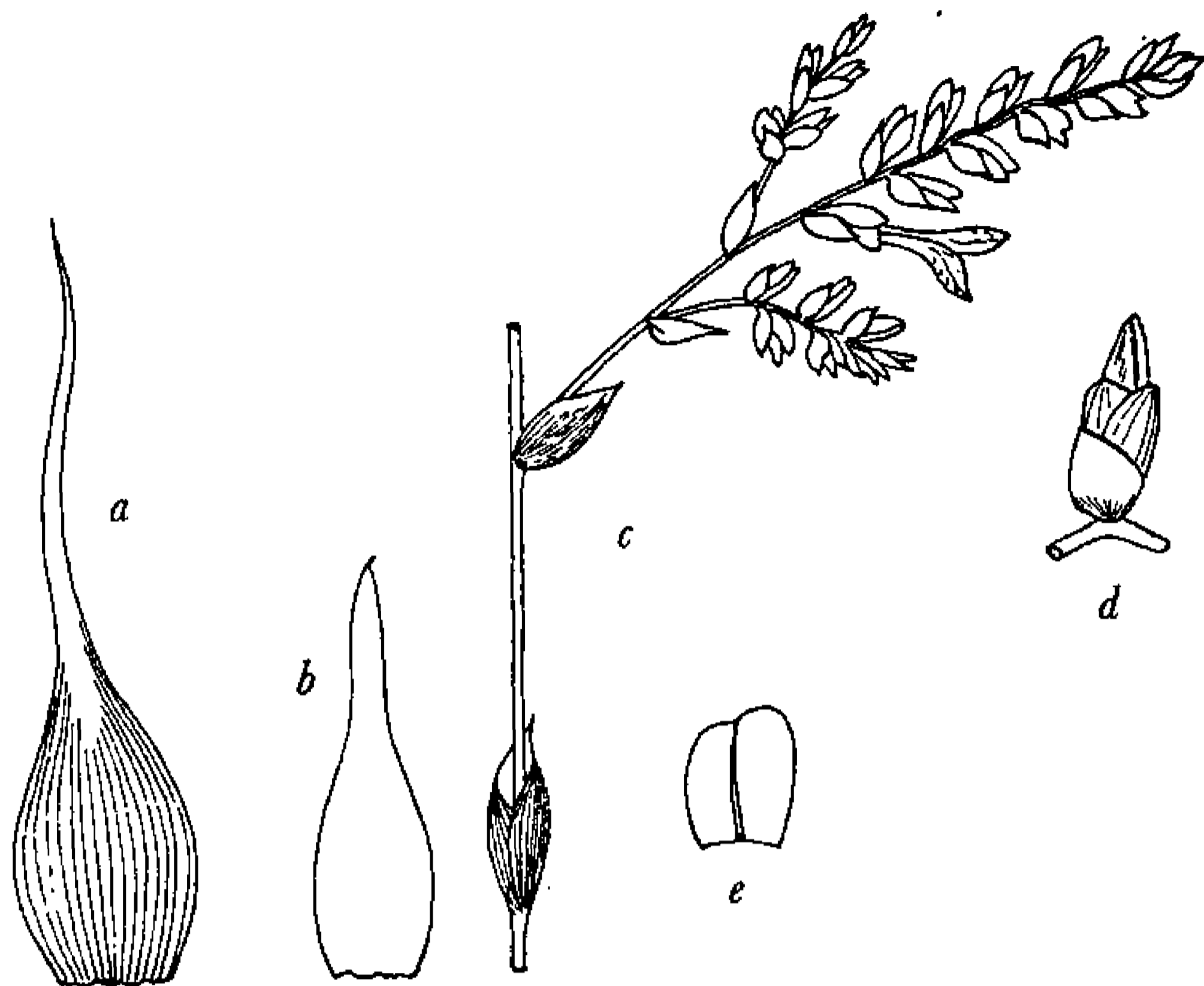


FIGURE 41.—*Tillandsia ropalocarpa*: *a*, Leaf with inrolled blade,  $\times \frac{1}{4}$ ; *b*, leaf with flat blade,  $\times \frac{1}{4}$ ; *c*, upper scape and branch of inflorescence,  $\times 1$ ; *d*, floral bract and flower,  $\times 2$ ; *e*, sepal,  $\times 2$  (*a* and *c*, after André).

March 1, 1939, *Dryander* 2281 (BM). In trees, 16 km. above Cali, 1946, *Foster* 2299 (COL, GH).

NARIÑO: San Francisco, alt. 2,100 m., Nov. 26, 1946, *Foster* 2265 (GH, scape-bracts longer than normal).

ECUADOR.

66. *Tillandsia sanctae-martae* L. B. Smith, *Phytologia* 5:396, pl. 1, figs. 3, 4, 1956.

*Tillandsia aeris-incola* sensu L. B. Smith, *Contr. Gray Herb.* 89:22, pl. 5, fig. 5. 1930, as to Colombian material, not Mez. 1896.

Stemless, 3–5 dm. high with the inflorescence extended; leaves densely bulbous-rosulate, 15–25 cm. long, densely and minutely pale-lepidote, sheaths suborbicular, 6 cm. in diameter, thin, blades to 15 mm. wide, coriaceous; scape slender, curved, cinereous-lepidote becoming glabrous; scape-bracts ovate, at least the upper ones shorter than the internodes; inflorescence apparently pendulous, laxly tripinnate, narrow, cinereous-lepidote; primary bracts like the scape-bracts, mostly shorter than the sterile naked bases of the branches; spikes about 8-flowered, 2–3 cm. long; rhachis geniculate; floral bracts ovate, about half as long as the sepals, ecarinate but with a distinct midnerve; flowers spreading or subspreading; sepals obovate, asymmetric, 5 mm. long; petals slightly if at all exerted.

MAGDALENA: Forest, Sierra del Libano, Santa Marta, alt. 1,650 m., Jan. 19, 1899, *H. H. Smith* 2346 (NY, type, GH phot. 7036; K). High in trees, rain

forest, near Hacienda Cincinnati, mountains above Santa Marta, alt. 1,200 m., Aug. 6, 1946, *Foster & C. E. Smith, Jr.*, 1433 (GH).

**67. *Tillandsia penlandii*** L. B. Smith, *Lilloa* 6:384, *pl. 1, figs. 14, 15.* 1941.

Stemless, 6 dm. high; leaves 3 dm. long, the outer greatly reduced, sheaths elliptic, forming a large ellipsoid pseudobulb, densely and minutely appressed-lepidote, dark castaneous toward base, blades involute and contorted, densely pale-lepidote; scape erect, slender, pale-lepidote; scape-bracts broadly elliptic, their linear contorted blades exceeding the internodes; inflorescence lax, 4-pinnate, sub-cylindric, 3 dm. long, 8 cm. in diameter, white-flocculose; lower primary bracts like the scape-bracts, the others apiculate; branches with up to 10 spikes; spikes densely few-flowered, 10–15 mm. long; rhachis slender, geniculate; floral bracts not at all concealing the rhachis; flowers subspreading; sepals 5 mm. long, diffusely lepidote; petals slightly exserted, pale flavous; stamens included.

**67a. *Tillandsia penlandii* var. *penlandii***

Primary bracts equaling or exceeding the sterile bases of the branches; floral bracts broadly ovate, obtuse, slightly shorter than the sepals.

ANTIOQUIA: Alto de La Unión, July 24, 1944, *Daniel* 3262 (GH).

NARIÑO: On trees, wet lowlands, alt. 2,190 m., Oct. 28, 1946, *Foster* 1963 (COL).  
ECUADOR.

**67b. *Tillandsia penlandii* var. *pedunculata*** L. B. Smith, *Lilloa* 6:385, *pl. 1, figs. 16, 17.* 1941.

Primary bracts much shorter than the elongate sterile bases of the branches; floral bracts triangular, acute, much shorter than the sepals.

ANTIOQUIA: San Pedro, December 1937, *Daniel & Tomás* 1558 (US, type).

**68. *Tillandsia adpressa*** André, *Énum. Bromél.* 6. Dec. 13, 1888; *Rev. Hort.* 60:566. Dec. 16, 1888.

Stemless, 2–7 dm. high; leaves many, usually forming an ovoid pseudo-bulb, 15–30 cm. long, sheath broadly elliptic-ovate, dark brown with a narrow hyaline margin, densely brown-lepidote, blade narrowly triangular, erect or curved, densely pale-lepidote; scape erect or nearly so; scape-bracts from shorter than to exceeding the internodes, narrowly ovate-oblong, long-caudate, densely appressed-lepidote; inflorescence narrow, of 4–12 spikes, erect or arching-pendulous; axis straight to very strongly geniculate, spreading-lepidote, becoming glabrous; primary bracts attenuate to definitely caudate, lepidote; spikes 8–12-flowered; floral bracts ovate, acute, distinctly shorter than the sepals at anthesis, densely tomentose-lepidote; flowers spreading; sepals obovate, densely lepidote; capsule cylindric, 20–25 mm. long.

**68a. *Tillandsia adpressa* var. *adpressa*.**

Spikes erect and appressed to the axis at maturity.

VALLE: Forests above Cali, alt. 1,700–2,200 m., *Lehmann* BT-536 (NY).  
ECUADOR.

**68b. *Tillandsia adpressa* var. *tonduziana* (Mez) L. B. Smith, *Contr. Gray Herb.* 89:8. 1930. FIGURE 42**

*Catopsis schumanniana* Wittm. *Bot. Jahrb.* 11:70. 1889.

*Tillandsia schumanniana* Mez in DC. *Monogr. Phan.* 9:740. 1896.

*Tillandsia tonduziana* Mez, *Bot. Jahrb.* 30: Beibl. 67:9. 1901.

Spikes spreading or reflexed at maturity.

NORTE DE SANTANDER: Epiphytic, woods, Eastern Cordillera, near Toledo, alt. 1,700–1,900 m. March 3–11, 1927, *Killip & Smith* 20106 (GH). Between Ocaña and Convencion, alt. 1,200 m., Sept. 20, 1946, *Foster* 1748 (COL, GH).

SANTANDER: Epiphytic, dense woods, southern slope of Mount San Martin, near Charta, alt. 2,300–2,500 m., Feb. 10, 1927, *Killip & Smith* 19197 (GH, NY, US). On small trees, crest of Cerro del Paramo, Cerro de Armas, near Landazuri, 70 km. north of Velez, alt. 1,860 m., July 2, 1944, *Fassett* 25433 (US).

HUILA: Epiphytic, woods, below Gabinete, drainage of Abra de San Andrés, western slope of Cordillera Oriental, alt. 1,900–2,100 m., March 24, 1940, *Cuatrecasas* 8603 (COL).



FIGURE 42.—*Tillandsia adpressa* var. *tonduziana*: *a*, Habit,  $\times \frac{1}{4}$ ; *b*, leaf,  $\times 1$ ; *c*, primary bract and branch,  $\times 1$ ; *d*, calyx and capsule,  $\times 1$ ; *e*, sepal,  $\times 2$ .

ANTIOQUIA: Forests near Amalfi, alt. 2,000 m., Sept. 22, 1884, *Lehmann XXII* (G, type of *Catopsis schumanniana* Wittm., US phot. 3968). "El Carmen," August 1937, *Daniel* 1427 (GH).

VALLE: La Cumbre, Cordillera Occidental, alt. 2,100 m., May 14-19, 1922, *Killip* 5587 (GH). Same, epiphytic, forest, above La Cumbre, May 14-19, 1922, *Pennell & Killip* 5746 (GH, PH). Epiphytic, dense forest, San Antonio, west of Cali, near summit of Cordillera Occidental, alt. 1,900-2,350 m., Feb. 26-Mar. 2, 1939, *Killip & García* 33930 (COL, GH, US). Alto Mercedes, alt. 2,000 m., Mar. 1, 1939, *Dryander* 2280 (BM). On tree, forest, San Antonio, alt. 2,000 m., May 18, 1939, *Alston* 8574 (BM). Epiphytic, woods, La Laguna, left bank of Río Sanjuniquín, western slope of Cordillera Occidental, alt. 1,250-1,400 m., Dec. 10-20, 1943, *Cuatrecasas* 15606 (GH). Epiphytic, residual thickets, Morro Pelado, Pichindé, drainage of Río Cali, eastern slope of Cordillera Occidental, alt. 2,270-2,320 m., Oct. 17, 1944, *Cuatrecasas* 18183 (GH). Epiphytic, La Guarida, crest of the Cordillera Occidental, above La Carbonera, between Las Brisas and Alban, alt. 1,950-2,000 m., Oct. 17, 1946, *Cuatrecasas* 22196 (US). High in trees, 16 km. above Cali, Dec. 5, 1946, *Foster* 2298 (GH, US).

CAUCA: Río Palacé, highlands of Popayán, alt. 1,700-1,800 m., November 1889, *Lehmann* K-352 (F).

COSTA RICA, PANAMA, PERU, BOLIVIA.

69. *Tillandsia tetrantha* R. & P. Fl. Peruv. 3:39, pl. 265. 1802.

Stemless, 4-8 dm. long; leaves erect, densely appressed-lepidote, sheaths broadly elliptic-ovate, large, dark brown, blades narrowly lanceolate, gray-green, often purple-spotted; scape usually much curved, about equaling the leaves; scape-bracts elliptic, long-caudate, inflated, usually the loosely sheathing bases shorter than the internodes; inflorescence erect or pendulous; axis more or less geniculate; primary bracts apiculate to short-caudate, from half as long as to longer than the spikes, finely lepidote; spikes spreading or reflexed, distichous-flowered often becoming secund; rhachis nearly straight; floral bracts shorter than the sepals, broadly ovate, nerved, lepidote; flowers spreading, subsessile; sepals obovate or oblong, lepidote; petals slightly exserted, conglutinated, yellow; stamens included; capsule cylindrical, acute, 30 mm. long.

#### KEY

1. Floral bracts minute or wanting; inflorescence lax, pendulous; spikes lax . . . . . 69a. *T. tetrantha* var. *tetrantha*

1. Floral bracts about half as long as the sepals.

2. Primary bracts orange to dark brown, often shorter than the spikes.

3. Inflorescence elongate, lax with lax spikes; scape-bracts mostly shorter than the internodes.

69b. *T. tetrantha* var. *aurantiaca*

3. Inflorescence short, dense; scape-bracts imbricate.

69c. *T. tetrantha* var. *densiflora*

2. Primary bracts bright red or rarely pale greenish yellow, exceeding the spikes.

4. Leaves coriaceous, firm; inflorescence elongate, lax.

69d. *T. tetrantha* var. *scarlatina*

4. Leaves soft, flexible: inflorescence mostly small, compact.

69e. *T. tetrantha* var. *miniata*

69a. *Tillandsia tetrantha* var. *tetrantha*

Not yet reported from COLOMBIA.

PERU.

69b. *Tillandsia tetrantha* var. *aurantiaca* (Griseb.) L. B. Smith, Contr. Gray Herb. 89:15. 1930.

*Tussacia fulgens* Kl. ex Beer, Bromel. 100. 1857.

*Tillandsia aurantiaca* Griseb. Nachr. Ges. Wis. Goett. for 1864:16. 1865.

*Catopsis garckeana* Wittm. Bot. Jahrb. 11:70. 1889.

*Tillandsia fulgens* Mez, Engl. Pflanzenreich IV. 32:501. 1935.

NORTE DE SANTANDER. Epiphytic, dense woods, road from Pamplona to Toledo, crossing the divide between Río La Teja (Maracaibo drainage) and Río Mesme (Orinoco drainage), eastern Cordillera, alt. 2,800–3,000 m., Feb. 27, 28, 1927, Killip & A. C. Smith 19959 (GH, US). Epiphytic, Páramo de Fontibón, region of the Sarare, October 1941, Cuatrecasas, Schultes & C. E. Smith, Jr., 12307 (US). Epiphytic, woods, region of the Sarare between Alto del Loro and Alto de Santa Inés, alt. 1,800–2,200 m., Oct. 18–21, 1941, Cuatrecasas, Schultes & C. E. Smith, Jr., 12415 (COL, GH, US).

SANTANDER: La Baja, Funck & Schlim 1447 (BR, GH phot. 2803). Epiphytic, open hillside, mountains east of Las Vegas, alt. 3,000–3,300 m., Dec. 20, 21, 1926, Killip & A. C. Smith 15843 (GH, US). Epiphytic, woods, western slope of Páramo Rico, alt. 3,000–3,600 m., Jan. 15–19, 1927, Killip & A. C. Smith 17207 (GH). Epiphytic, oak forest, western slopes of Páramo de las Puentes, above La Baja, alt. 3,300–3,400 m., Jan. 25–31, 1927, Killip & A. C. Smith 18269 (GH).

CUNDINAMARCA: Epiphytic, wet forest, Zipaquirá, Pacho Highway, alt. 3,000 m., Aug. 21, 1947, Haught 6104 (COL, US). Epiphytic, forest, "La Caldera," Zipaquirá, alt. 3,050 m., May 19, 1942, Camargo 1 (GH).

ANTIOQUIA: Low forest, Plateau de Santa Rosa, alt. 2,500–2,700 m., Sept. 28, 1884, Lehmann XXI (G, type of *Catopsis garckeana* Wittm., US phot. 3967). Epiphytic, wet open woods, old road to Boquerón de San Cristobal, alt. 2,500 m., June 2, 1948, Barkley, Puccini & Correa 101 (F, US).

CALDAS: Epiphytic, forest, "Pinares," above Salento, Cordillera Central, alt. 2,600–2,800 m., Aug. 2–10, 1922, Pennell 9268 (GH, NY, PH, US).

VALLE: Epiphytic, Corrales, Páramo de Bavaya, Barragán, drainage of Río Bugalagrande, alt. 3,400–3,550 m., Apr. 10, 1946, Cuatrecasas 20563 (F, GH).

CAUCA: Corrales, western slopes of Andes of Popayán, alt. 2,500–2,800 m., Lehmann 4465 (K).

NARIÑO: Alto de la Cruz, alt. 3,000 m., May 1876, André 2214 (NY). Lowland, Sibundoy, alt. 3,000 m., Oct. 31, 1946, Foster 1970 (GH).

VENEZUELA, ECUADOR.

69c. *Tillandsia tetrantha* var. *densiflora* (André) L. B. Smith, Contr. Gray Herb. 89:15. 1930.

*Tillandsia aurantiaca* var. *densiflora* André, Énum. Bromél. 7. Dec. 13, 1888; Rev. Hort. 60:567. Dec. 16, 1888.



*Tillandsia fulgens* var. *densiflora* Mez, Engl. Pflanzenreich IV. 32:501. 1935, incorrectly attributed to André.

MAGDALENA: Epiphytic, rather open forest, mountains above Hacienda Cincinnati, Santa Marta, alt. 2,250 m., Aug. 5, 1946, *Foster & C. E. Smith, Jr.*, 1407 (GH).

ECUADOR.

69d. *Tillandsia tetrantha* var. *scarlatina* (André) L. B. Smith, Contr. Gray Herb. 89:15. 1930.

*Tillandsia aurantiaca* var. *scarlatina* André, Énum. Bromél. 7. Dec. 13, 1888; Rev. Hortie. 60:567. Dec. 16, 1888.

*Tillandsia fulgens* var. *scarlatina* Mez, Engl. Pflanzenreich IV. 32:502. 1935, incorrectly attributed to André.

CAUCA: Woods, San Francisco, Puracé, alt. 3,800 m., September 1936, *Dryander* 1859 (US).

NARIÑO: Epiphytic on *Podocarpus*, road between El Encano Laguna de la "Cocha" and Páramo "El Tabano," alt. 3,300 m., Aug. 10, 11, 1939, *García-Barriga* 7794 (COL, US).

ECUADOR.

69e. *Tillandsia tetrantha* var. *miniata* (André) L. B. Smith, Contr. Gray Herb. 89:15. 1930. FIGURE 43

*Tillandsia aurantiaca* var. *miniata* André, Énum. Bromél. 7. Dec. 13, 1888; Rev. Hortie. 60:567. Dec. 16, 1888.

*Tillandsia fulgens* var. *miniata* Mez, Engl. Pflanzenreich IV. 32:501. 1935, incorrectly attributed to André.

MAGDALENA: On tree trunk, temperate forest, Sierra de Perijá, Espíritu Santo Valley, 20 km. east of Codazzi, 5 km. from Venezuelan border, alt. 2,800 m., Feb. 14, 1945, *Grant* 10933 (US).

CUNDINAMARCA: Epiphytic, Quebrada de Juiquín, eastern slope of Páramo de Guasca, Cordillera Oriental, alt. 2,900–3,000 m., Aug. 27, 1941, *Cuatrecasas* 11972 (US).

CALDAS: Epiphytic, forest, "Magaña," Old Quindío Trail, Cordillera Central, alt. 3,200–3,300 m., Aug. 1, 2, 1922, *Killip & Hazen* 9457 (GH). Epiphytic, mossy forest, Cerro Tatama, Cordillera Occidental, alt. 3,200–3,400 m., Sept. 6–10, 1922, *Pennell* 10514 (GH).

VALLE: Epiphytic, Mina El Diamante, Quebrada del Ratón, Los Farallones, Cordillera Occidental, alt. 2,950–3,000 m., July 30, 1946, *Cuatrecasas* 21761 (F, GH).

TOLIMA: On trees, mountain forest, between Las Mesetas and Las Selvas, Tolima Massif, alt. 2,500 m., Jan. 20, 1953, *Weber* 220 (MAINZ).

CAUCA: Páramo de Barbillas, Pansitaro, alt. 3,000–3,500 m., *Lehmann* 6320 (K). Epiphytic, thickets in and around páramo, "Paletara," Cordillera Central, alt. 2,950–3,100 m., June 15–17, 1922, *Pennell* 6979 (GH, PH, US). On tree, near the settlement of "Gabriel López," region of Malvasá, western slope of the Cordillera Central, alt. 3,000–3,100 m., Oct. 9, 1954, *Fernández* 2827 (COL).

NARIÑO: Páramo de Guapuscal, Andes of Pasto, May 1876, *André* 3138 (NY). On trees, Isla La Corota and Sixce Turibamba, Laguna de la Cocha, alt. 2,850 m., July 26, 1948, *García-Barriga, Hawkes & Villarreal* 13054 (COL, US). Epiphytic, highway between Túquerres and Azufral Volcano, alt. 3,100–3,900 m., Jan. 8, 1952, *Fernández & Mora* 1108 (COL). Páramo cloud forest, Alto Tabano above Encano, alt. 3,300 m., Oct. 31, 1946, *Foster* 2040 (COL, GH).

ECUADOR.

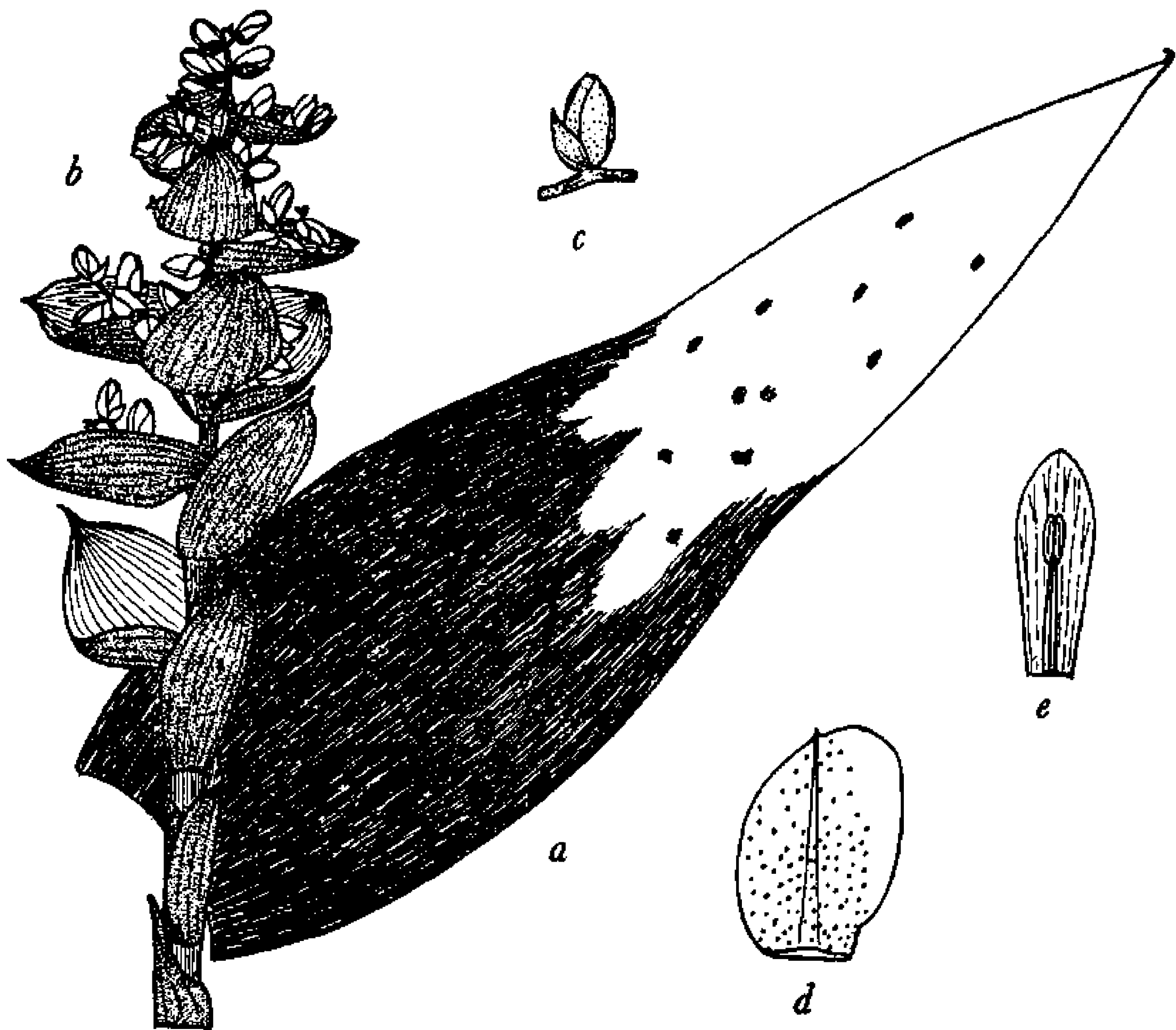


FIGURE 43.—*Tillandsia tetrantha* var. *miniata*: *a*, Leaf,  $\times \frac{1}{2}$ ; *b*, inflorescence,  $\times \frac{1}{2}$ ; *c*, floral bract and flower,  $\times 1$ ; *d*, sepal,  $\times 2$ ; *e*, petal and stamen,  $\times 2$ .

70. *Tillandsia fraseri* Baker, Handb. Bromel. 187. 1889. FIGURE 44  
*Tillandsia erectiflora* André, Énum. Bromél. 7. Dec. 13, 1888, as "*rectiflora*";  
 Rev. Hortie. 60:567. Dec. 16, 1888, as "*rectiflora*"; Bromel. Andreanae  
 86, pl. 26-B. 1889, corrected, not *Tillandsia erectiflora* Baker 1887.

Stemless, 1.5–3 m. high; leaves 8 dm. long, punctulate-lepidote becoming glabrous, sheaths ovate, very large, dark brown, blades ligulate, 8 cm. broad, flat; scape and inflorescence dark red; scape erect, stout, terete, glabrous; scape-bracts ovate-oblong, acute, exceeding the internodes, finely pale-lepidote; inflorescence erect, 3–4 dm. long; primary bracts lanceolate, acuminate; axes slightly flexuous, angled, glabrous; secondary bracts much shorter than the spikes; spikes linear, acute, 11 cm. long, scarcely more than 1 cm. wide, short-stipitate, laxly 20–30-flowered, at first distichous but soon becoming secund-flowered; rhachis geniculate, angled; floral bracts becoming secund with the flowers but not so strongly, triangular, acute and often mucronate, 10 mm. long, exceeding the sepals when not secund, sulcate, sparsely lepidote; flowers short-pedicelled, spreading; sepals oblong, acute, sulcate with a strong midnerve, glabrous; petals 2 mm. longer than the sepals, white changing to yellow; stamens included; capsule cylindric, 20–28 mm. long.

COLOMBIA or ECUADOR: *Fraser* (BM, type, US phot. 3998).

CAUCA: On tree trunks, region of El Tambo, alt. 1,700 m., Aug. 5, 1934, *Sneidern* 73 (S). On trees, Río Elegido on the road between Popayan and El Tambo, alt. 1,800 m., *García-Barriga, Hawkes & Villarreal* 12770 (COL).

NARIÑO: Samaniego, May 1943, *Osorno & Rengifo* 5 (GH, US). On rocks and small trees, between Tangua and Tuquerres, alt., 3,000 m., Nov. 18, 1946, *Foster* 2201 (COL, GH, US).

ECUADOR.

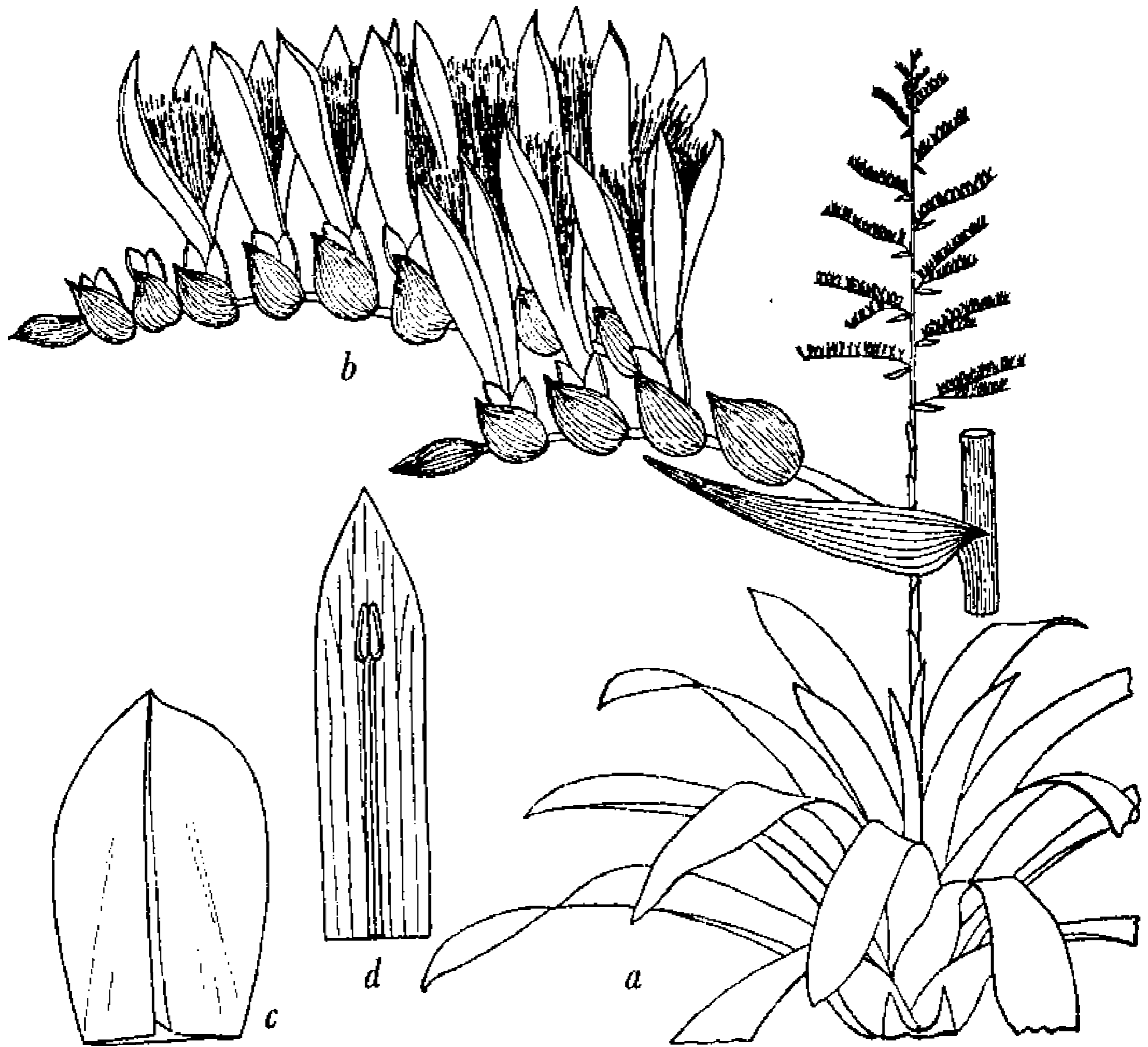


FIGURE 44.—*Tillandsia fraseri*: *a*, Habit,  $\times \frac{1}{10}$ ; *b*, primary bract and branch,  $\times 1$ ; *c*, sepal,  $\times 5$ ; *d*, petal and stamen,  $\times 5$  (*a* and *b*, after André).

71. *Tillandsia pectinata* André, Énum. Bromél. 7. Dec. 13, 1888; Rev. Hortie. 60:567. Dec. 16, 1888.

Stemless, 6–10 dm. high; leaves 25–50 cm. long, obscurely lepidote, sheaths elliptic, brown, blades ligulate, broadly acute and apiculate, 4 cm. wide; scape erect; scape-bracts remote, lanceolate, acuminate; inflorescence narrow, tripinnate, 5 dm. long; primary bracts lanceolate, acute, to 6 cm. long, chartaceous, obscurely lepidote: lower branches 7–8 cm. long, of 3–4 spikes, upper branches simple; secondary bracts 10 mm. long; spikes sessile or subsessile, often curved; floral bracts ovate, acute, about equaling the sepals, sulcate with a strong midnerve, densely lepidote; flowers densely distichous at first, short-stipitate; sepals obovate, obtuse, membranaceous, sparsely

lepidote; petals scarcely exerted, yellow; stamens included; capsule slenderly cylindrical, 18 mm. long.

NARIÑO: On ground and small trees, between Pasto and Tuquerres, alt. 2,610 m., Nov. 18, 1946, *Foster* 2203 (COL, GH, US).

ECUADOR.

72. *Tillandsia riocreuxii* André, *Enum. Bromél.* 7. Dec. 13, 1888; *Rev. Hort.* 60:567. Dec. 16, 1888.

*Tillandsia tristis* Mez in DC. *Monogr. Phan.* 9:762. 1896.

Stemless, 8–13 dm. high; leaves 3–5 dm. long, densely appressed-lepidote, sheaths large, broadly ovate or suborbicular, ventricose dark ferruginous, blades narrowly subtriangular, acute, 2–4 cm wide, cinereous, mostly involute when dry; scape erect, stout, lepidote; scape-bracts broadly elliptic, apiculate, slightly inflated, sparsely pale-lepidote, the upper ones about equaling the internodes; inflorescence laxly bipinnate or tripinnate at base, distichous, narrowly pyramidal, 35–60 cm. long; primary bracts like the scape-bracts, barely equaling the lowest flowers; spikes spreading, sublinear, 7–9 cm. long including the sterile bracteate base, sublax, 10–20-flowered; floral bracts slightly imbricate, suborbicular, obtuse, ecarinate, faintly nerved, soon glabrous; sepals oblong, obtuse, 7–9 mm. long; petals much exceeding the sepals, white, blades spreading, conspicuous; stamens included.

COLOMBIA: *Triana* (BM, type of *Tillandsia tristis* Mez, US phot. 3995).

CUNDINAMARCA: In trees, Páramo de San Miguel, alt. 3,300 m., Oct. 12, 1946, *Foster* 1873 (COL, GH, US). On trees, damp woodland, San Miguel, near Sibaté, alt. 2,950 m., June 7, 1948, *Hawkes & García-Barriga* 32 (COL, US).

NARIÑO: Epiphytic, south shore of Laguna de la Cocha, Páramo de Santa Lucia (source of Río Alisales), alt. 2,900–3,100 m., Jan. 9, 1941, *Cuatrecasas* 11881 (COL, F, US). In trees, above Sibundoy, alt. 2,280 m., Oct. 28, 1946, *Foster* 1973 (GH).

ECUADOR.

### Subgenus 6. *Tillandsia*

*Tillandsia* subgenus *Tillandsia*

*Platystachys* Beer, *Bromel.* 18, 80. 1857.

*Tillandsia* subgenus *Platystachys* Baker, *Journ. Bot.* 25:212, 236. 1887.

Leaf-blades narrowly triangular or linear-subulate; inflorescence compound or simple; flowers nearly always distichous; petals mostly erect in a slender tube; stamens exerted; style slender, elongate. Species 73–90.

73. *Tillandsia andreana* E. Morr. ex André, *Enum. Bromel.* 7. Dec. 13, 1888; *Rev. Hort.* 60:567. Dec. 16, 1888.

*Tillandsia funckiana* Baker, *Handb. Bromel.* 196. 1889.

Plant varying from the typically stemless phase to long-caulescent; leaves scarcely more than 5 cm. long, densely lepidote with appressed

cinereous or brownish scales, sheaths distinct, triangular-ovate, about 5 mm. long, blades erect to recurved, linear, 1-2 mm. wide, filiform-acuminate, strongly keeled below; floral bracts lance-oblong, acute, membranaceous, 1-nerved, glabrous, not more than half as long as the sepals; sepals elliptic-ovate, obtuse, about 15 mm. long, chartaceous, even, glabrous, free; petals erect, to 44 mm. long, red; stamens and pistil exerted.

MAGDALENA: High in trees, Manaure, Sierra Perijá and Sierra de Santa Marta, alt. 1,050 m., Aug. 24, 1946, *Foster & C. E. Smith, Jr.*, 1476 (GH).

NORTE DE SANTANDER: Gramalote, Cúcuta, Dec. 1940, *Hno. Niceforo Maria* 2558 (COL, GH).

CUNDINAMARCA: On trees, Río de la Honda, near Bridge of Icononzo, Pandí, alt. 1,640 m., February 1876, *André* 1762 (K, type, US phot. 4139).

TOLIMA: Epiphytic, Río Icononzo, alt. 900 m., Oct. 13, 1946, *Foster* 1884 (GH).  
VENEZUELA.

74. *Tillandsia mima* L. B. Smith, *Caldasia* 3:244, *fig.* 1945. FIGURE 45  
*Tillandsia secunda* sensu André, *Enum. Bromél.* 6. Dec. 13, 1888; *Rev. Hort.* 60:566. Dec. 16, 1888, in part, not H. B. K. 1816.

Leaves rosulate, nearly 7 dm. long, the sheaths oblong-elliptic, inconspicuous, very densely and minutely castaneous-lepidote, the

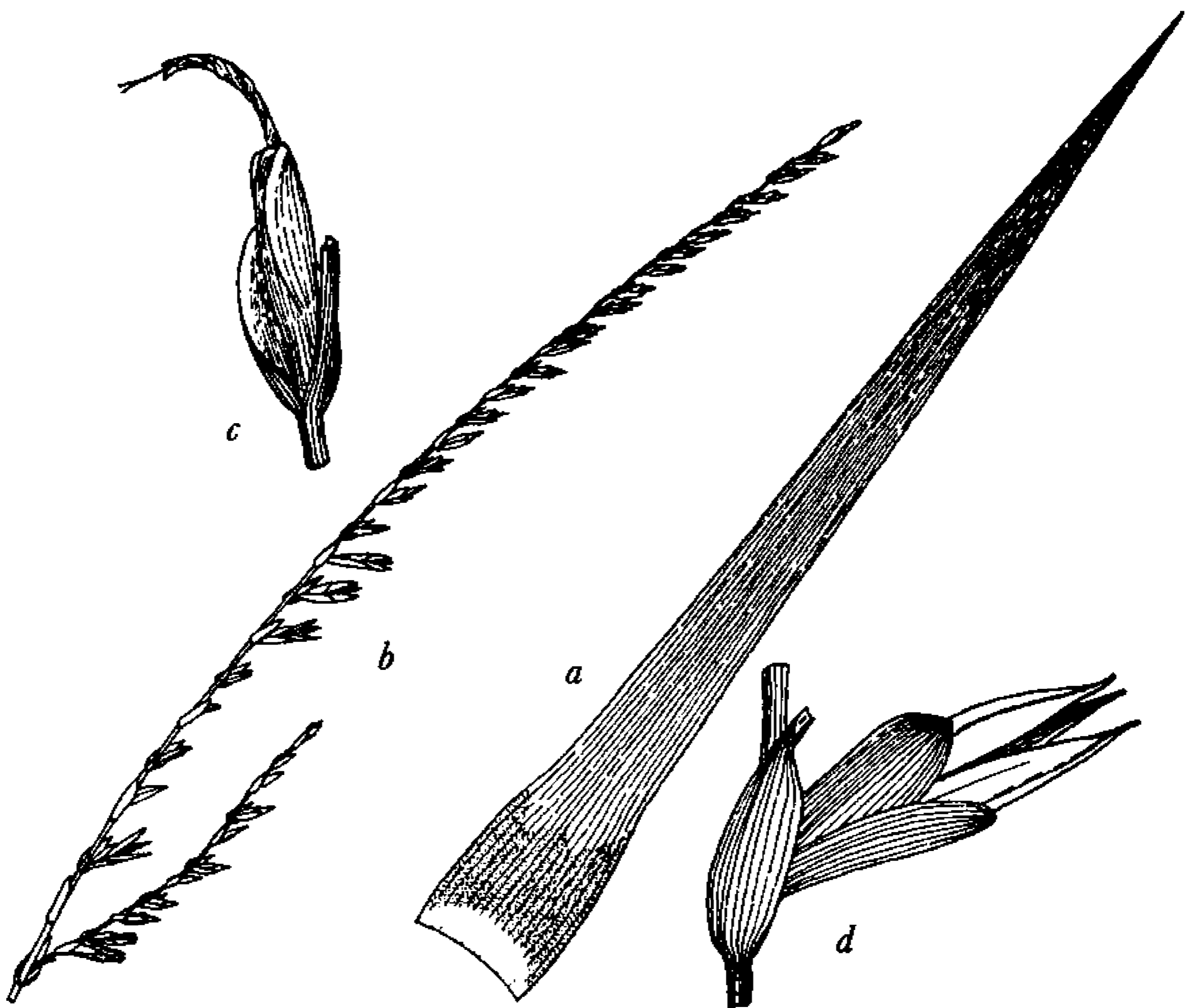


FIGURE 45.—*Tillandsia mima*: *a*, Leaf,  $\times \frac{1}{6}$ ; *b*, apex of inflorescence,  $\times \frac{1}{6}$ ; *c*, floral bract and flower,  $\times 1$ ; *d*, floral bract and fruit,  $\times 1$ .

blades narrowly triangular, acuminate, 5–6 cm. wide, densely and minutely white-lepidote on both sides; scape erect, 2 cm. in diameter, glabrous; scape-bracts foliaceous, erect, imbricate; inflorescence very laxly 2–3-pinnate, glabrous; primary bracts lanceolate, acute, shorter than the sterile bases of the branches; branches divergent, 5–9 dm. long, laxly many-flowered, prophyllate at the base; rhachis flexuous, slender, red-purple; floral bracts erect, elliptic, apiculate, 20–25 mm. long, about equaling the internodes, ecarinate, subcoriaceous, green at the base, elsewhere violaceous; pedicels stout, angled, 5 mm. long; sepals free, broadly acute, ecarinate, to 24 mm. long, nerved; petals linear, 35 mm. long, blue-violet; stamens and style long-exserted; capsule slender, ellipsoid, long-acuminate.

VALLE: Buga, Portachuelo, and Vijes, alt. 1,000–2,000 m., Mar. 29, 1876, *André* 2448 in part (K). Boca del Horno, bank of Río Dagua, March 1876, *André* 2448 in part (K). Epiphytic in dry thickets, Lobo Guerrero, western slope of the Cordillera Occidental, alt. 610–650 m., Sept. 9–10, 1944, *Cuatrecasas* 17816 (GH, type; F, US, VALLE).

CAUCA: By Río Piendamó, alt. 1,885 m., Apr. 10, 1876, *André* 2448 in part (K).

NARIÑO: Rocky hillsides, near La Unión, road to Pasto, alt. 1,745 m., Oct. 25, 1946, *Foster* 1929 (GH, US).

ECUADOR.

75. *Tillandsia flexuosa* Sw. Prodr. 56. 1788. FIGURE 46

*Tillandsia tenuifolia* sensu Jacq. Sel. Stirp. Am. 92, pl. 63. 1763, not L.

*Tillandsia flexuosa*  $\beta$  *fasciata* Lindl. in Bot. Reg. 9: under pl. 749. 1823.

*Tillandsia aloifolia* Hook. Exot. Fl. 3: pl. 205. 1827.

*Tillandsia patens* Willd. ex Schult. in R. & S. Syst. Veg. 7, pt. 2:1229. 1830.

*Vriesea aloëfolia* Beer, Bromel. 95. 1857.

*Vriesea tenuifolia* Beer, Bromel. 96. 1857.

*Platylachys patens* K. Koch in Ind. Sem. Hort. Berol. for 1873. App. 4:5. 1874.

*Tillandsia flexuosa* var. *vivipara* André, Bromel. Andr. 82. 1889.

Plant 2–15 dm. high; leaves 10–20 in a dense often subbulbous rosette, 2–5 dm. long, covered with pale appressed scales, usually marked with broad white transverse bands, the outer bladeless, squamiform, sheaths ovate, very large but merging with the blade, blades about 25 mm. wide, acuminate, then abruptly acute, curved, stiff; scape erect, slender, glabrous; scape-bracts erect, tubular-involute, elliptic, lepidote, at least the upper ones shorter than the internodes; inflorescence simple or very laxly bipinnate; primary bracts like the upper scape-bracts, much shorter than the sterile bases of the branches; branches ascending, to 4 dm. long; rhachis angled, glabrous; floral bracts elliptic, acute, 2–3 cm. long, equaling or shorter than the sepals, ecarinate, chartaceous, nerved, lepidote; pedicels to 7 mm. long; sepals narrowly elliptic, obtuse, 2–3 cm. long, free, sparsely lepidote or glabrous; petals tubular-erect, to 4 cm. long,

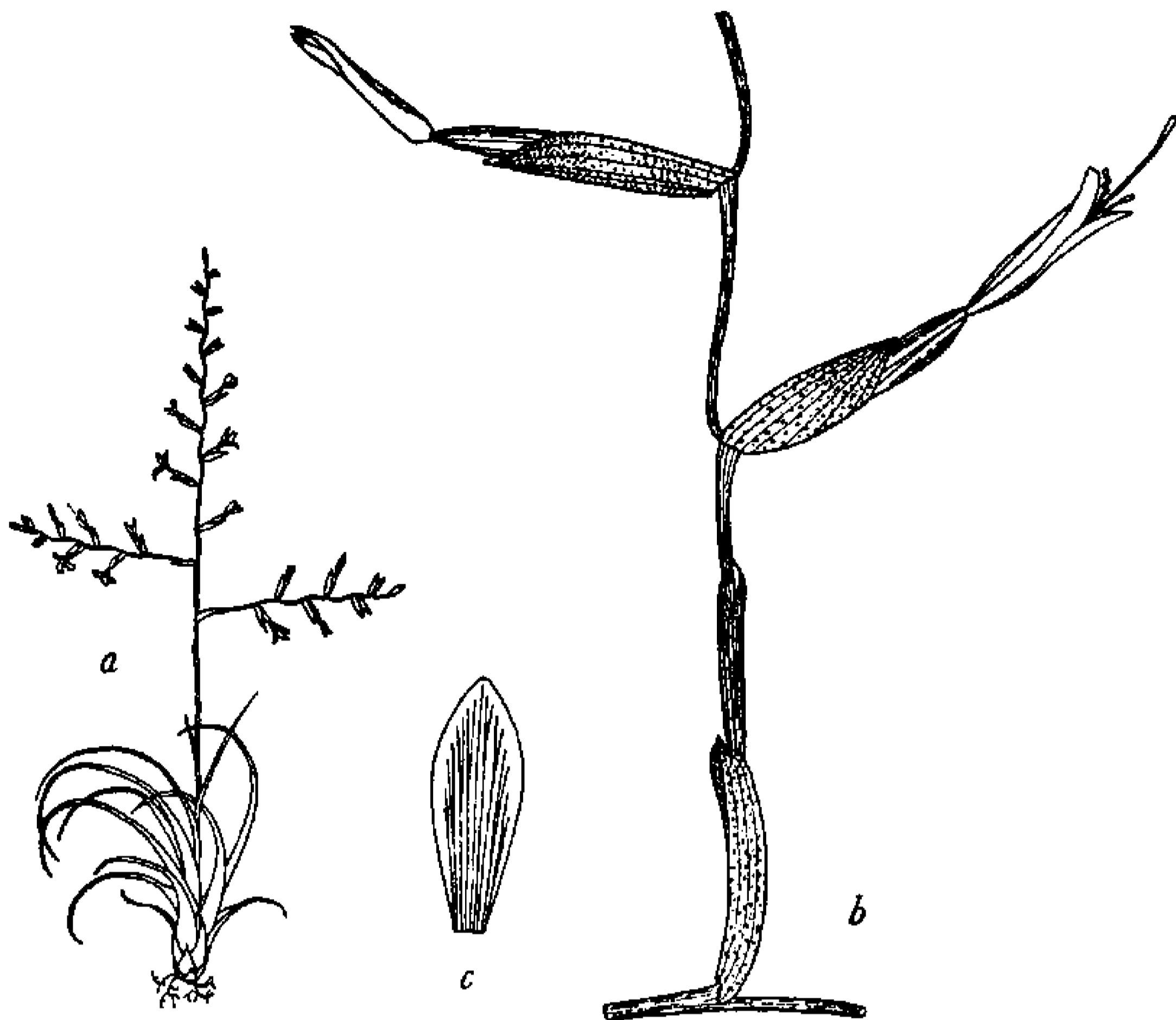


FIGURE 46.—*Tillandsia flexuosa*: *a*, Habit,  $\times \frac{1}{10}$ ; *b*, primary bract and base of branch,  $\times 1$ ; *c*, sepal,  $\times 1$ .

white, rose, or purple; stamens exserted; capsule slenderly cylindrical, to 7 cm. long.

COLOMBIA: *Triana* (COL).

MAGDALENA: Santa Marta, alt. 45 m., 1898–1901, *H. H. Smith* 2347 (F, GH, PH, US). Around Río Frío, between Ciénaga de Santa Marta and the foothills, alt. 0–100 m., June 22–30, 1906, *H. Pittier* 1608 (US). Epiphytic on *Crescentia*, savanna, La Jagua, Magdalena Valley, Sept. 8, 1924, *C. Allen* 617 (MO). Epiphyte, arid coastal belt, south of Santa Marta, *Killip & A. C. Smith* 21098 (GH, US). Abundant epiphyte in dry open woods, near San Juan de Cesar, alt. 200 m., June 12, 1944, *Haught* 4198 (F, GH, US). In *Pereskopsis*, semiarid section, mountains above Santa Marta, July 29, 1946, *Foster & C. E. Smith, Jr.*, 1327 (GH). Valle Du Par, valley of the Sierra Nevada de Santa Marta, alt. 210 m., August 1946, *Foster & C. E. Smith, Jr.*, 1441 (GH, US).

ATLÁNTICO: Epiphyte, Puerto Colombia, July 1928, *Elias* 536 (US). Barranquilla July 1932, *Elias* 786 (GH). Abundant epiphyte, usually on "Totumo," Sabanilla lagoon, Aug. 28, 1932, *Dugand* 88 (F). Common epiphyte, El Palmar, 1937, *Elias* 1570 (F). Epiphyte, dry woods and swamps of the Río Magdalena, finca "El Paraiso," between Palmar de Varela and Ponedera, Aug. 2–4, 1943, *Dugand & Jaramillo* 3469 (COL, US). On *Cereus*, mesquite flats on Magdalena River, alt. 12 m., July 12, 1946, *Foster & C. E. Smith, Jr.*, 1263 (GH).

BOLÍVAR: Common on "guayacán bola," along the Mompos-Juana Sanchez trail, Island of Mompos, Lands of Loba, April–May 1916, *Curran* (US). Vicinity

of Cartagena, 1920, *Heriberto* 355 (US). Coastal thicket, Tierrabomba Island, Cartagena Bay, Nov. 4, 1926, *Killip & A. C. Smith* 14118 (GH). Epiphyte, vicinity of Turbaco, alt. 200–300 m., Nov. 6–22, 1926, *Killip & A. C. Smith* 14222 (GH, US). Epiphyte, Torrecilla, near Turbaco, alt. 150–300 m., Nov. 7–19, 1926, *Killip & A. C. Smith* 14261 (GH, US). Epiphyte, thickets, north of Arjona, alt. 30–50 m., Nov. 15, 1926, *Killip & A. C. Smith* 14529 (GH, US).

CÓRDOBA: Epiphyte, swampy flat, region of El Sinú near hacienda "Martínica," 15 km. from Montería, alt. 30 m., Jan. 7, 1949, *Zainum, Araque & Barkley* 19-Bo-089 (US).

NORTE DE SANTANDER: Between Cúcuta and El Rosario, February 1941, *Carvajalino & Diaz* 35 (COL).

CUNDINAMARCA: Tocaima, December 1932, *Arbeláez* 2099 (US). Epiphyte, El Paso, bank of the Río Sumapaz, between Girardot and Melgar, alt. 400 m., Aug 7, 1939, *Arbeláez & Cuatrecasas* 6558 (US). Epiphyte, thickets, hillside east of Apulo, along trail to Anapoima, alt. 460–600 m., May 4, 1944, *Killip, Dugand & Jaramillo* 38159 (US).

VAUPÉS: Terrestrial, quartzite savanna near headwaters of Río Kuduyarí (tributary of Río Vaupés), Yapobodá, lat. 1°20' N., long. 70°30' W., alt. 270–300 m., April 1953, *Schultes & Cabrera* 20036 (COL. US).

TOLIMA: Caracoli, Río Magdalena, Dec. 12, 1875, *André* 695 (F). On trees, Flandes, alt. 330 m., Dec. 14, 1946, *Schneider* 226 (COL). Near Ibagué, alt. 800 m., Aug. 1, 1952, *Køie* 5139 (C).

HUILA: Epiphyte, Quebrada de Angeles to Río Cabrera, alt. 450–500 m., July 25, 1917, *Rusby & Pennell* 321 (US). Epiphytic, dissected plateau with woody plants mainly restricted to gullies and stream-bottoms, Cabrera Lajas, ca. 11 km. east of Villavieja on road to Baraya, upper basin of Río Magdalena, alt. 460 m., July 4, 1950, *S. G. Smith* 1138 (US).

Southern FLORIDA, WEST INDIES, PANAMA, VENEZUELA, GUIANA.

76. *Tillandsia dasyliiriifolia* Baker, Journ. Bot. 25:304. 1887.

Stemless, 5–15 dm. high; leaves many, to 7 dm. long, densely and finely appressed-lepidote, sheaths large, elliptic, dark castaneous, blades linear-triangular, to 6 cm. wide; scape erect, stout, usually exceeding the leaves; scape-bracts erect, ovate or lanceolate, acute, at least the lower imbricate and linear-laminate; inflorescence laxly bipinnate, usually ample, subpyramidal; primary bracts ovate, shorter than the sterile bracteate bases of the branches; spikes suberect or curved-ascending, to 45 cm. long; rhachis glabrous; floral bracts very broadly ovate and enfolding the rhachis along with the flower, obtuse, 16–25 mm. long, about equaling the internodes or slightly longer, coriaceous, glabrous outside, ecarinate, even except near the margin; flowers sessile; sepals narrowly elliptic or obovate, obtuse, to 25 mm. long, even, short-connate; petals tubular-erect, obtuse, 3–4 cm. long, white or greenish; stamens and pistil exserted; capsule slenderly cylindrical, 4–5 cm. long.

SAN ANDRES: Epiphytic, Isla de Providencia, lat. 13°21' N., long. 81°23' W., Apr. 29–May 9, 1948, *Proctor* 3480 (PH, US).

Southern MEXICO to SALVADOR and HONDURAS.



77. *Tillandsia schiedeana* Steud. Nomencl. ed. 2. 2:688. 1841.

*Tillandsia vestita* Schlecht. & Cham. Linnaea 6:52. 1831, not Willd. 1830.

Flowering plant to 4 dm. long, but usually not much over 2 dm., often pulvinate; roots present; stem simple or few-branched; leaves varying greatly in density, to 25 cm. long, sheaths suborbicular, large, densely imbricate and making the stem appear stout, glabrous only where covered, blades very narrowly triangular, filiform-acuminate, involute-subulate, densely cinereous- or ferruginous-lepidote, the scales appressed near the apex of leaf, spreading below; scape terminal, erect, shorter than the leaves; scape-bracts imbricate, the lower foliaceous, the upper thinner and usually roseate but usually with a filiform blade; inflorescence distichous or sometimes polystichous at base (! Mez), lanceolate, acuminate, to 7 cm. long and 8 mm. in diameter, few-flowered; floral bracts lance-elliptic, obtuse or the basal ones apiculate, 30 mm. long, much exceeding the sepals, membranaceous, roseate, sulcate, the upper ones often glabrous; flowers to 46 mm. long; sepals lanceolate, acute, to 20 mm. long, subcoriaceous, even or nearly so; petals tubular-erect, yellow; stamens and pistil exserted; capsule cylindric, to 45 mm. long.

MAGDALENA: Santa Marta, alt. 240 m., 1898-99, *H. H. Smith* 2348 in part (F, GH). On tree trunk, open tropical forest, Sierra de Perijá, 5 km. west of Manaure and 32 km. east of Valledupar, alt. 580 m., Jan. 30, 1945, *Grant* 10714 (US). Semiarid section above Santa Marta, alt. 300 m., July 29, 1946, *Foster & C. E. Smith Jr.*, 1325 (GH, US). On trees, Manaure, Sierra Perijá and Sierra Santa Marta, alt. 1,050 m., August 1946, *Foster & C. E. Smith, Jr.*, 1477 (GH).

HUILA: On *Bursera* tree, steep dry slopes, above Colombia, lat. 3°23' N., long. 74°49' W., alt. 1,150 m., Dec. 26, 1942, *Fosberg* 19586 (US).

MEXICO, CENTRAL AMERICA, WEST INDIES, VENEZUELA.

78. *Tillandsia juncea* (R. & P.) Poir. in Lam. Encycl. Suppl. 5: 309. 1817.

FIGURE 47

*Bonaparteia juncea* R. & P. Fl. Per. 3: 38, pl. 262. 1802.

Plant 2-4 dm. high, often bearing scaly branching rhizomes; leaves many in a dense fasciculate rosette, usually equaling the inflorescence or shorter, densely subappressed-lepidote, the sheaths ferruginous; scape erect or ascending, stout; scape-bracts densely imbricate, lance-elliptic, acuminate, filiform-laminate, subchartaceous, densely pale-lepidote; inflorescence densely digitate from a few spikes or sometimes reduced to a single densely polystichous-flowered spike, ovoid, rarely over 7 cm. long; primary bracts like the upper scape-bracts, subinvolucrate below the inflorescence, their sheaths slightly shorter than the lower spikes, their blades mostly exceeding them; spikes sessile, elliptic or lanceolate, acute, to 4 cm. long, stout, slightly complanate; floral bracts densely imbricate, broadly ovate, exceeding the sepals, carinate in the distichous-flowered spikes, coriaceous or subcoriaceous, nearly or quite even, densely lepidote,

often red; flowers subsessile; sepals lanceolate, acute, 15–20 mm. long, glabrous or sparsely lepidote, the posterior ones much connate; petals tubular-erect, to 4 cm. long, violet; stamens exserted; capsule slenderly cylindric, 25–35 mm. long.

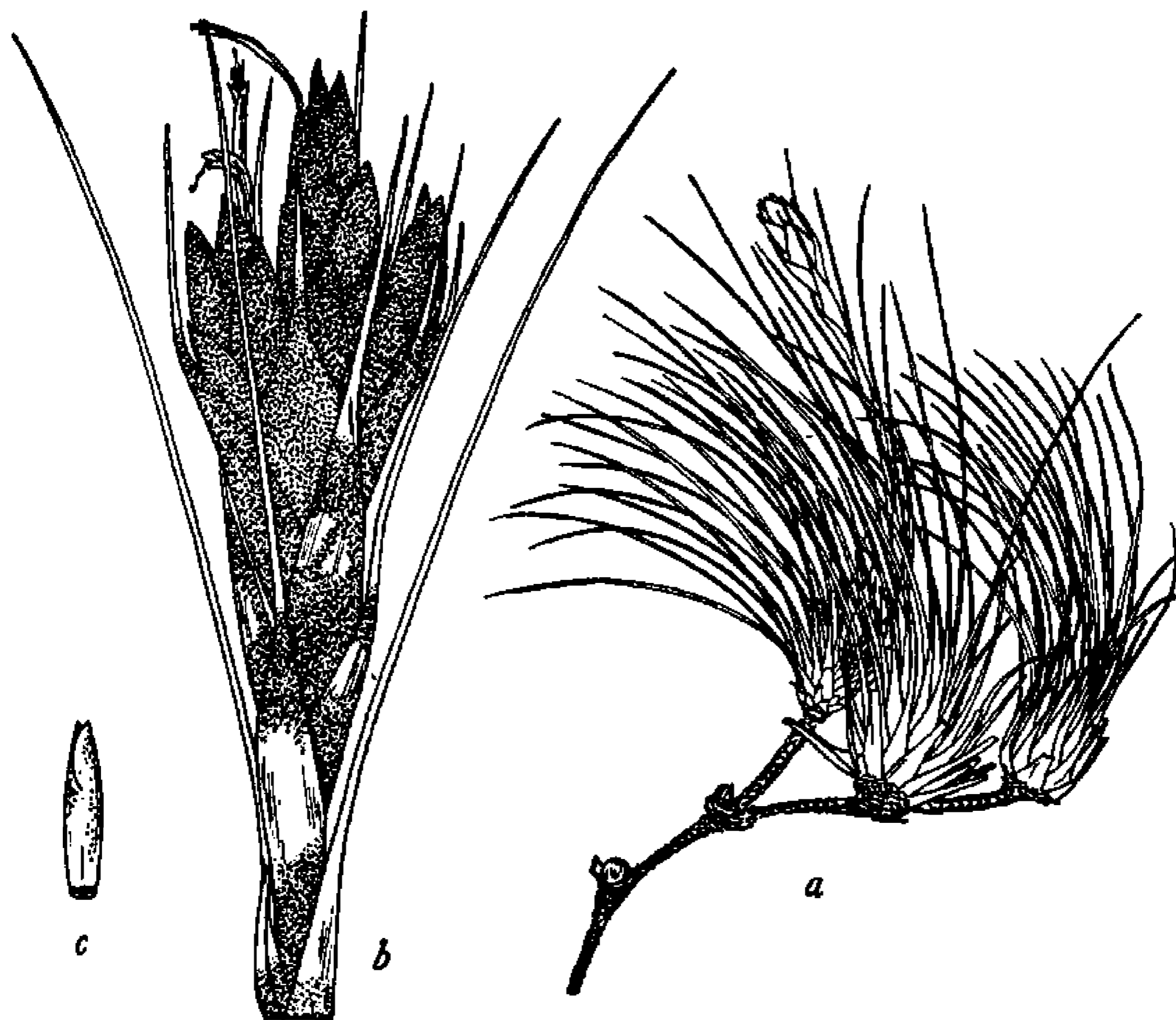


FIGURE 47.—*Tillandsia juncea*: *a*, Habit,  $\times \frac{1}{4}$ ; *b*, inflorescence,  $\times 1$ ; *c*, posterior sepals,  $\times 1$

MAGDALENA: Santa Marta, alt. 240 m., *H. H. Smith* 2348 in part (F). Dense woods, between Fundación and Medialuna, alt. 50 m., Jan. 22, 1940, *Dugand & García-Barriga* 2517 (US). In *Pereskioipsis*, semiarid section, mountains above Santa Marta, alt. 300 m., July 29, 1946, *Foster & C. E. Smith, Jr.*, 1326 (GH). In trees in clusters, below Puerto Bello, Sierra Nevada de Santa Marta, alt. 450 m., August 1946, *Foster & C. E. Smith, Jr.*, 1454 (COL, GH). Same, alt. 600 m., 1466 (GH, US).

SANTANDER: San Gil, November 1944, *Miguel* in *Hb. Apolinar-Maria* 57 (GH). Saxicolous in region of cactus and cycads, about 40 km. south of Bucamaranga, alt. 600 m., Dec. 16, 1948, *Araque & Barkley* 18-S-305 (US).

CUNDINAMARCA: Quetamé, January 1930, *Pérez-Arbeláez* in *Hb. Nac. Colomb.* 9 (COL, US).

ANTIOQUIA: Copacabana, Apr. 28, 1934, *Daniel* 285 (US).

TOLIMA: Near Ibagué, alt. 700 m., Aug. 1, 1952, *Køie* 5167 (C, COL).

HUILA: Epiphytic on *Bursera*, hills above Colombia, alt. 1,150 m., Dec. 26, 1942, *Fosberg* 19588 (US).

VALLE: Dagua Valley, alt. 1,000 m., July 1881, *Lehmann* 769 (US). Epiphytic, low forest east of Zarzal, Cauca Valley, alt. 970–1,050 m., July 21, 1922, *Pennell, Killip & Hazen* 8399 (GH, PH, US). Epiphytic, desert stream-bottom, Espinal,

below Dagua, Dagua Valley, alt. 600–700 m., Sept. 6–7, 1922, *Killip & Hazen* 11082 (GH, PH, US). Epiphytic, Restrepo, Cordillera Occidental, Sept. 16, 1922, *Killip* 11261 (GH, PH). Dry thickets, Lobo Guerrero, western slope of Cordillera Occidental, alt. 610–650 m., Nov. 9, 1944, *Cuatrecasos* 17771 (GH). On trees, moist wooded bottom-lands of the Río Cauca, near Palmira, alt. 1,000 m., Dec. 3, 1947, *Ramírez, Murgueitio & Barkley* 17-C-883 (US).

FLORIDA, CUBA, JAMAICA, HISPANIOLA, southern MEXICO, CENTRAL AMERICA, TRINIDAD, and COLOMBIA south to PERU and BOLIVIA.

**79. *Tillandsia brevior*** L. B. Smith, *Contr. U. S. Nat. Herb.* 29: 436, *fig. 42 a-c.* 1951.

Plant 45–65 cm. long; leaves many in a globose rosette, 45 cm. long, very densely appressed-lepidote, sheaths large, distinct, oblong-elliptic, dark castaneous, blades long-acuminate, flat, 35 mm. wide, cinereous-lepidote; scape decurved, slender; scape-bracts imbricate, elliptic, densely cinereous-lepidote, the lowest with foliaceous blades, the others apiculate; inflorescence subdigitate from a few spikes; primary bracts like the upper scape-bracts, much shorter than the sterile bracteate bases of the spikes; spikes strict, linear, broadly acute, the lateral 12–13 cm., the terminal to 18 cm. long, strongly complanate, dense; rhachis flexuous, angled, alate; floral bracts erect, 18 mm. long, ovate, acute, subchartaceous, glabrous; pedicels stout, obconic, 4 mm. long; sepals lanceolate, 15–20 mm. long, ecarinate, even, glabrous.

MAGDALENA: In tall trees, Hacienda Cincinnati, mountains above Santa Marta, alt. 1,200 m., Aug. 6, 1946, *Foster & C. E. Smith, Jr.*, 1432 (GH, type, US phot. 4213; COL).

**80. *Tillandsia incurva*** Griseb. *Nachr. Ges. Wis. Goett. for* 1864: 15. 1865.

Plant 15–40 cm. long; leaves many in a subglobose rosette, 15–35 cm. long, very densely and finely appressed-lepidote, sheaths large, distinct, broadly ovate to suborbicular, dark castaneous, blades long-acuminate, 2–3 cm. wide, cinereous; scape slender, short; scape-bracts barely imbricate, obovate or elliptic, densely lepidote, the lower caudate; inflorescence pendulous, simple or digitate with 2–5 spikes; primary bracts scarcely larger than the floral bracts; spikes strict, linear or lance-linear with several sterile bracts at base, acute, 7–16-flowered; rhachis flexuous, slender, angled, lepidote at first; floral bracts erect or slightly divergent, two to three times as long as the internodes but usually exposing most of the rhachis, elliptic, obtuse, 25–35 mm. long, ecarinate at maturity, red, submembranaceous, nerved to almost even, lepidote to glabrous; sepals free, elliptic, 15–20 mm. long, ecarinate, even, soon glabrous, stramineous, thin; petals ligulate, 35 mm. long, yellow; stamens exerted.

NORTE DE SANTANDER: Epiphytic, between Ocaña and Convención, alt. 1,200 m., Sept. 20, 1946, *Foster* 1746 (COL, GH).

CUNDINAMARCA: On trees, Páramo de San Miguel, alt. 3,300 m., Oct. 12, 1946, *Foster* 1879 (COL, GH).

CAUCA: On tree trunks, near El Tambo, alt. 1,800 m., Apr. 24, 1934, *Sneidern* 72 (S). In virgin forest, Munchique, near El Tambo, alt. 2,900 m., Apr. 28, 1936, *Sneidern* 665 (S).

FLORIDA, GREATER ANTILLES, COSTA RICA to VENEZUELA, BOLIVIA.

81. *Tillandsia racinae* L. B. Smith, *Contr. U. S. Nat. Herb.* 29:439, *fig. 44 a-d.* 1951.

Plant 9–12 dm. long; leaves numerous in a funnellform rosette, over 1 m. long, covered with appressed scales, sheaths broadly elliptic, distinct, 2 dm. long, dark castaneous-lepidote, blades 4 cm. wide, cinereous-lepidote; scape curved, very stout, glabrous; scape-bracts densely imbricate, foliaceous; inflorescence laxly bipinnate, glabrous; primary bracts broadly ovate, acute, shorter than the sterile bases of the spikes; spikes arching-decurved, linear, 2 cm. wide at anthesis, about 50-flowered with the apical flowers blooming after the basal ones have formed mature capsules, bearing a few sterile bracts at base; floral bracts broadly elliptic, obtuse, 5 cm. long, coriaceous, even centrally, nerved by margins and apex, stramineous; sepals free, narrowly oblanceolate, obtuse, ecarinate, coriaceous, nerved by margins and apex; petals 5 cm. long, lavender; stamens exserted.

TOLIMA: On cliffs, Río Icononzo, alt. 900 m., Oct. 13, 1946, *Foster* 1885 (GH, type, US phot. 3466; COL).

82. *Tillandsia kegeliana* Mez *in* DC. *Monogr. Phan.* 9:725. 1896.

Leaves many, 12–17 cm. long, sheaths broadly ovate, over 3 cm. long, membranaceous, castaneous-lepidote, blades often secund, linear-triangular, involute-subulate, acuminate, 5 mm. wide, densely pale-lepidote; scape ascending, slender, very short, glabrous; scape-bracts densely imbricate, lance-ovate, long-caudate, appressed-lepidote; inflorescence simple, exceeded by the leaves, elliptic, strongly complanate, 40–55 mm. long, 30–35 mm. wide, 6–8-flowered; floral bracts densely imbricate, acuminate from a broadly elliptic base, 3 cm. long, 16 mm. wide, bright red when living, thin, minutely rugulose when dry, obscurely lepidote to glabrous; pedicels short; sepals elliptic, obtuse, 2 cm. long, coriaceous when dry, slightly nerved; petals over 4 cm. long, dark purple; stamens exserted; capsule sub-prismatic, over 5 cm. long.

SANTANDER: Epiphytic, Camp Puente, near Barranca Bermeja, Magdalena Valley, between Sogamoso and Colorado Rivers, alt. 100–500 m., Mar. 5, 1935, *Haught* 1587 (GH, US). On trees along ridges, Camp Carare iv, near Puerto Berrio, between Carare and Magdalena Rivers, alt. 100–700 m., May 2, 1935. *Haught* 1689 (US).

PANAMA, SURINAM, BRASIL.

**83. *Tillandsia fasciculata* Sw. Prodr. 56. 1788.**

Plant 2–10 dm. high; leaves rosulate, sheaths large, ovate, ferruginous, blades 2–3 cm. wide, finely lepidote; scape erect, stout; scape-bracts imbricate, the lower ones foliaceous; inflorescence simple or digitate; primary bracts broadly ovate, acuminate, shorter than the spikes; spikes sessile to long-stipitate, erect to spreading, bearing reduced sterile bracts at the base, usually over 1 dm. long, strongly complanate; floral bracts broadly acute, 2–4 cm. long, even to strongly nerved, glabrous or subglabrous; sepals usually shorter than the bracts; petals 6 cm. long, white to purple; stamens exerted.

**83a. *Tillandsia fasciculata* var. *fasciculata***

*Vriesia glaucophylla* Hook. in Bot. Mag. 74: pl. 4415. 1848.

*Tillandsia fasciculata* var. *bogotensis* André, Brom. Andr. 79. 1889.

*Tillandsia fasciculata* var.  $\beta$  *latispica* Mez in DC. Monogr. Phan. 9:683. 1896.

Inflorescence simple to few-branched; spikes short-stipitate, broad, dense, mostly over 1 dm. long; floral bracts 25–40 mm. long, even or nearly so, almost straight toward the apex.

MAGDALENA: Tree-tops, between Valencia and Pueblo Bello, Sierra Nevada de Santa Marta, alt. 450 m., Aug. 16, 1946, *Foster & C. E. Smith, Jr.*, 1448 (GH, US). Epiphytic, Fundación, Sierra Nevada de Santa Marta, alt. 105 m., August 1946, *Foster & C. E. Smith, Jr.*, 1622 (GH, US).

BOLÍVAR: Epiphyte, thickets, north of Arjona, alt. 30–50 m., Nov. 15, 1926, *Killip & A. C. Smith* 14563 (GH).

NORTE DE SANTANDER: Epiphyte, Valley of the Río Peralonso, near Santiago, alt. 120 m., Dec. 21, 1948, *Molina & Barkley* 18–N. S.–130 (US).

CUNDINAMARCA: On trees, Caqueza, east of Bogotá, alt. 2,070 m., January 1876, *André* 812 (NY, isotype of *T. fasciculata* var. *bogotensis* André).

META: Epiphyte, woods along Río Guatiquía, near Villavicencio, alt. 500 m., Mar. 18, 19, 1939, *Killip* 34435 (GH, US).

VALLE: Epiphytic, San Antonio near Cali, alt. 2,200 m., November 1899, *Langlassé* 93–c (K).

FLORIDA, WEST INDIES, MEXICO to COLOMBIA and GUIANA.

**83b. *Tillandsia fasciculata* var.  $\theta$  *uncispica* Mez in DC. Monogr. Phan. 9:684. 1896.**

Inflorescence few-branched; spikes short-stipitate, narrow, dense, mostly less than 1 dm. long; floral bracts less than 25 mm. long, incurved.

NORTE DE SANTANDER: Río Catatumbo, beyond Teorama, alt. 750 m., Sept. 11, 1946, *Foster* 1658 (GH), on trees, Bellavista on pipeline, alt. 690 m., Sept. 15, 1946, *Foster* 1697 (GH).

CUBA, SANTO DOMINGO, SAINT LUCIA, GUATEMALA, PANAMA.

**84. *Tillandsia valenzuelana* A. Rich. in Sagra, Hist. Cuba 11:267. 1850.**

Plant 2–6 dm. high; leaves many in a utriculate rosette, to 4 dm. long, the outer reduced to scalelike sheaths, covered with fine ap-

pressed cinereous scales, sometimes becoming glabrous above, sheaths large, ovate, blades acuminate, usually flat, 10–25 mm. wide; scape erect or ascending, slender, glabrous; scape-bracts imbricate, ovate, inflated, cinereous-lepidote, pink or red, fading to olivaceous, at least the lower ones with linear foliaceous blades; inflorescence simple or pinnately compound from a few spikes; axes slender, soon glabrous; primary bracts like the upper scape-bracts, their sheaths much shorter than the spikes but their blades sometimes exceeding the lower ones; spikes divergent, oblong, acute, complanate, often rather lax, 6–17-flowered, especially the terminal spike with sterile bracts at the base, 5–20 cm. long, 1–2 cm. wide; rhachis angled, slightly flexuous; floral bracts erect or suberect, usually 2–3 times as long as the internodes but exposing the rhachis, elliptic-oblong, obtuse or apiculate, 2 cm. long, much exceeding the sepals, nerved, subglabrous, pink or red, sometimes carinate toward the apex; flowers subsessile; sepals oblong, obtuse, somewhat connate posteriorly; petals linear, 3 cm. long, lilac or violet; stamens exerted; capsule prismatic, 3 cm. long.

MAGDALENA: Fundación, Sierra Nevada de Santa Marta, alt. 1,050 m., Aug. 1946, *Foster & C. E. Smith, Jr.*, 1475 (GH, US).

NORTE DE SANTANDER: Epiphyte, open woods, between Pamplonita and Chinácota, Río Pamplonita Valley, Eastern Cordillera, alt. 1,300–1,800 m., Mar. 17, 1927, *Killip & A. C. Smith* 20758 (GH, US). Epiphytic, Bellavista on pipeline, alt. 660 m., Sept. 19, 1946, *Foster* 1739 (GH).

SANTANDER: Terrestrial, rocky wooded slope, Río Suratá Valley, between El Jaboncillo and Suratá, alt. 1,500–1,800 m., Jan. 3, 1927, *Killip & A. C. Smith* 16405 (GH).

VALLE: Epiphytic, "Guayabal" to Zarzal, Cauca Valley, alt. 910–930 m., July 20, 1922, *Killip & Hazen* 8384 (GH, US). Epiphytic, low forest east of Zarzal, alt. 970–1,050 m., July 21, 1922, *Pennell, Killip & Hazen* 8418 (GH, PH, US). Epiphyte, open woods, Cisneros, alt. 300–500 m., May 5, 1939, *Killip* 35538 (GH, US). On trees, Zarzal, Dec. 10, 1946, *Foster* 2343 (GH).

CAUCA: Quebrada Portachuela, 1876, *André* 492 (NY).

Southern FLORIDA, GREATER ANTILLES, southern MEXICO, CENTRAL AMERICA, VENEZUELA, BOLIVIA.

85. *Tillandsia polystachia* (L.) L. Sp. Pl. ed. 2. 410. 1762. FIGURE 48  
*Renealmia polystachia* L. Sp. Pl. 286. 1753.  
*Tillandsia angustifolia* Sw. Prodr. 57. 1788.

Plant 20–65 cm. high; leaves many in a dense subspreading rosette, usually much exceeded by the inflorescence and arched-recurving, covered with fine pale appressed scales, often with a narrow purple margin, sheaths broadly ovate or elliptic-oblong, large and conspicuous, pale ferruginous toward the base, blades filiform-acuminate, 10–25 mm. wide at the base, usually flat for most of their length; scape erect or ascending, slender; scape-bracts foliaceous with erect densely imbricate sheaths and elongate spreading or recurved blades,

green, red, or purple; inflorescence pinnately or subdigitately compound or very rarely simple, usually subcylindric or slenderly fusiform, dense, up to 3 dm. long; primary bracts elliptic, acute, the lower ones short-laminate; spikes erect, sessile, linear, acute, 3–10 cm. long, complanate; floral bracts erect, barely to densely imbricate,



FIGURE 48.—*Tillandsia polystachia*: *a*, Habit,  $\times \frac{1}{4}$ ; *b*, young inflorescence (stamens not yet exerted),  $\times 1$ ; *c*, posterior sepals,  $\times 1$ .

broadly ovate, mucronulate, 15–20 mm. long, about equaling the sepals, even or slightly nerved toward the apex, glabrous or obscurely lepidote, slightly carinate near apex; flowers subsessile; sepals elliptic, coriaceous, even, glabrous, posteriorly short-connate; petals tubular-erect, 3 cm. long, violet; stamens and pistil exerted; capsule slenderly cylindric, acute, 3–4 cm. long.

NORTE DE SANTANDER: Epiphytic, Río Catatumbo, beyond Teorama, alt. 750 m., Sept. 11, 1946, *Foster* 1662 (GH).

SANTANDER: Epiphytic, wooded banks of stream, Río Suratá Valley, between Bucaramanga and El Jaboncillo, Eastern Cordillera, alt. 800–1,500 m., Jan. 2, 1927, *Killip & A. C. Smith* 16394 (GH, US). Vicinity of Barranca Bermeja, Magdalena Valley, between Sogamoso and Colorado Rivers, alt. 100–500 m., Feb. 27, 1935, *Haught* 1583 (US).

TOLIMA: Epiphytic, Puente Natural, Río Icononzo, alt. 1,050 m., Oct. 13, 1946, *Foster* 1887 (GH).

VALLE: Epiphytic, Santander to Cali, Dec. 4, 1946, flowered May 1949, *Foster* 2304 (US). On trees, Zarzal, Dec. 10, 1946, *Foster* 2342 (GH).

MEXICO and the WEST INDIES to BRASIL and BOLIVIA.

86. *Tillandsia balbisiana* Schult. in R. & S. Syst. Veg. 7, pt. 2:1212. 1830.

Plant stemless, 13–65 cm. high; leaves many, covered with minute pale appressed scales, sheaths ovate, forming an ovoid or ellipsoid pseudobulb to 12 cm. long, pale-ferruginous toward the base, blades abruptly spreading or recurved from the apices of the sheaths, filiform-acuminate, 1 cm. wide, usually all involute; scape erect or ascending, slender, subglabrous; scape-bracts imbricate, elliptic with long linear spreading or reflexed blades, inflated; inflorescence densely pinnate or subdigitate or rarely simple, slenderly fusiform or subcylindric, to 2 dm. long; primary bracts like the upper scape-bracts, at least their sheaths shorter than the spikes; spikes sessile, strict, linear, acute, complanate, 3–12 cm. long, 12 mm. wide; floral bracts imbricate, ovate, obtuse and apiculate but often appearing acute, 15–22 mm. long, exceeding the sepals, glabrous or obscurely lepidote, ecarinate, often bright red; sepals lanceolate, acute, glabrous, connate posteriorly; petals tubular-erect, obtuse, 30–45 mm. long, violet; stamens exserted; capsule cylindrical, 4 cm. long.

MAGDALENA: Epiphyte on *Crescentia*, savanna, La Jagua, Magdalena Valley, Sept. 8, 1924, *C. Allen* 618 (MO). In high trees, below Pueblo Bello and Fundación, Sierra Nevada de Santa Marta, alt. 600 m., August 1946, *Foster & C. E. Smith, Jr.*, 1467 (GH, US).

FLORIDA, BAHAMAS, CUBA, JAMAICA, HISPANIOLA, MEXICO, CENTRAL AMERICA.

87. *Tillandsia paraënsis* Mez in Mart. Fl. Bras. 3, pt. 3:586, pl. 109. 1894.

Plant 15–46 cm. high; leaves to 35 cm. long, covered with minute pale appressed scales, the outer reduced to small acute sheaths, the inner sheaths large, ovate, convex and forming an ovoid pseudobulb, blades very narrowly triangular, abruptly acute, pungent, involute; scape curved, suberect, 3 mm. in diameter, sparsely lepidote; scape-bracts elliptic, equaling or slightly exceeding the internodes, densely lepidote; inflorescence simple or of two spikes; primary bract like the upper scape-bracts, much shorter than the spikes; spikes linear, complanate, 6–17-flowered, to 25 cm. long; floral bracts erect and imbricate but later convolute about the flowers and exposing the rhachis, broadly elliptic or suborbicular, obtuse or minutely apiculate, 25–32 mm. long, much exceeding the sepals, ecarinate, nerved, subchartaceous, greenish, yellowish, or purplish; densely lepidote; flowers subsessile; sepals free, elliptic, acute, 24 mm. long, lepidote; petals 33–70 mm. long, erect, red; stamens exserted; capsule cylindrical, 3–7 cm. long.



VAUPÉS: Epiphytic, banks of the Río Cudyari, tributary of the Río Vaupés, alt. 200 m., Sept. 15, 1939, *Cuatrecasas* 6835 (COL). Epiphytic, Bacuraba Cachoeira, the first major cataract on the Vaupés east of Mitú, alt. 200 m., Nov. 4, 1944, *P. H. Allen* 3319 (US). Epiphytic, middle course of Río Piraparaná, 1952, *Schultes & Cabrera* 17139 (COL, GH, K, NY, US). Savanna, Caño Teemeefia, Río Piraparaná (tributary of Río Apaporis), lat. 0°15' S. to 0°25' N., long. 70°30' W., Sept. 6, 1952, *Schultes & Cabrera* 17223 (COL, GH, US). Epiphytic, Río Guainía, near Caño del Caribe (between Isla del Venado and San José), lat. 2°45' N., long. 67°50' W., alt. 255–270 m., Nov. 2, 1952, *Schultes, Baker & Cabrera* 18263 (US). Raudal Tayasú, between Mitú and Javareté, Río Vaupés, May 14–24, 1953, *Schultes & Cabrera* 19277 (US). Epiphytic, Yuticá, between Mitú and Javareté, Río Vaupés, May 14–24, 1953, *Schultes & Cabrera* 19382 (US).

AMAZONAS-VAUPÉS: Epiphytic, near Cachivera de Jirijirimo, Río Apaporis, alt. 250 m., June 10, 1951, *Schultes & Cabrera* 12493 (US). Epiphytic, savanna, Raudal de Jirijirimo (below mouth of Río Kananari), Río Apaporis, lat. 0°5' N., long. 70°40' W., alt. 270 m., Jan. 21, 1952, *Schultes & Cabrera* 14940 (COL, US). Epiphytic, quartzite base, near Raudal Yayacopi (La Playa), Río Apaporis, lat. 0°5' S., long. 70°30' W., alt. 240 m., Feb. 15, 1952, *Schultes & Cabrera* 15358 (COL, F, GH, US).

AMAZONAS: On shrubs, savanna, right bank of Río Apaporis, Raudal de Jirijirimo, March 1951, *Schultes* 12091 (US). Epiphytic, near mouth of Río Popeyacá (tributary of Apaporis between Río Piraparaná and Raudal Yayacopi), lat. 0°20' S, long. 70°30' W, alt. 210 m., Apr. 15, 1952, *Schultes & Cabrera* 16190 (US).

PERU, BOLIVIA, western BRASIL.

88. *Tillandsia pruinosa* Sw. Fl. Ind. Occ. 1:594. 1797.

Plant 8–20 cm. high; leaves to 2 dm. long, densely cinereous- or ferruginous-lepidote with coarse spreading scales, sheaths elliptic to suborbicular, forming an elongate pseudobulb, abruptly contracted into the blades at the apex and the inner ones closely enfolding the base of the inflorescence, castaneous, blades usually exceeding the inflorescence, linear, filiform-acuminate, involute-subulate, 2–4 mm. in diameter; scape short, included in the pseudobulb; inflorescence simple or digitate from 2 or 3 spikes; spikes 5–15-flowered, to 7 cm. long and 4 cm. wide, complanate; rhachis straight, angled, densely lepidote; floral bracts erect, four or five times as long as the internodes, ovate, acute, 20–26 mm. long, much exceeding the sepals, carinate toward the apex, subcoriaceous, pink at anthesis; sepals broadly elliptic, obtuse, 13–19 mm. long, sparsely lepidote or glabrous, coriaceous, connate posteriorly; petals linear, 3 cm. long, violet; stamens exserted; capsule cylindrical, to 55 mm. long.

NORTE DE SANTANDER: Epiphytic, Río Catatumbo, beyond Teorama, alt. 750 m., Sept. 11, 1946, *Foster* 1657 (COL, GH).

ANTIOQUIA: Bello, August 1944, *Emmanuel & Daniel* 3313 (COL, GH, MO).

Southern FLORIDA, southern MEXICO and CUBA to ECUADOR and BRASIL.

89. *Tillandsia bulbosa* Hook. Exot. Fl. 3: pl. 173. 1826,

Plants usually in dense masses, 7–32 cm. high; leaves 8–15, often exceeding the inflorescence, covered with fine closely appressed cine-

reous scales, sheaths, greatly inflated, 2–5 cm. long, forming an ovoid pseudobulb, green or greenish white, often with a narrow red or purple margin, blades involute-subulate, acuminate, contorted, spreading and at least the outer ones making a sharp angle with the apex of the sheath, to 3 dm. long, 2–7 mm. in diameter; scape erect; scape-bracts foliaceous with elongate blades exceeding the inflorescence, the upper often red; inflorescence simple or subdigitate from a few spikes, red or green; primary bracts ovate, acute, much shorter than the spikes but their foliaceous blades sometimes exceeding them; spikes spreading, lanceolate, acute, complanate, 2–6 cm. long, 2–8-flowered; rhachis slender, lepidote; floral bracts imbricate, ovate, acute, 15 mm. long, exceeding the sepals, two to three times as long as the internodes, subchartaceous, densely and finely lepidote, carinate; sepals oblong, apiculate, 13 mm. long, glabrous, more or less connate posteriorly; petals linear, acute, 3–4 cm. long, blue or violet; stamens exserted; capsule cylindric, to 4 cm. long.

NORTE DE SANTANDER: Río Catatumbo, beyond Teorama, alt. 750 m. Sept. 11, 1946, *Foster* 1654 (COL, GH, US).

SANTANDER: Vicinity of Puerto Berrio, between Carare and Magdalena Rivers, alt. 100–700 m., Aug. 11, 1935, *Haught* 1879 (GH, US).

META: On liana at river shore, dense forest, north side of river near junction of Güejar and Zanza Rivers, north end of Cordillera Macarena, alt. 500 m., Aug. 20, 1950, *S. G. Smith & Idrobo* 1481 (COL, UC).

VAUPÉS: Epiphytic, Cerro Isibukuri, Río Kananari (affluent of Río Apaporis), Oct. 29, 1951, *Schultes & Cabrera* 14518 (COL, US).

ANTIOQUIA: On trees, open woods, near Dabeiba and the right bank of the Río Sucio, alt. 1,350 m., Dec. 20, 1947, *Gutiérrez & Barkley* 17-C-487 (COL, US).

VALLE: Epiphytic, mangrove thicket along bay, Buenaventura, alt. 0–5 m., May 7, 9, 1922, *Killip* 5228 (GH, NY, PH, US); April 13, 1939, *Killip* 34970 (COL, GH, US). Punta Arenas, north shore of Buenaventura Bay, June 2, 1944, *Killip & Cuatrecasas* 38625 (F, GH, US).

NARIÑO: "Prov. de Barbacoas," May 1853, *Triana* 1306 (BM, COL). Barbacoas, alt. 800 m., *Triana* 551 (US).

Southern MEXICO and the WEST INDIES to COLOMBIA and eastern BRASIL.

90. *Tillandsia circinnata* Schlecht. *Linnaea* 18:430. 1844.

Stemless and 10–45 cm. high or pseudocaulous by repeated proliferation of the inflorescence and several meters long; leaves thick, covered with coarse closely appressed cinereous scales, sheaths forming a narrowly ovoid or ellipsoid pseudobulb 5–15 cm. long, blades involute-subulate, to 2 dm. long, 3–7 mm. in diameter, curved or contorted or coiled; scape erect; scape-bracts imbricate, foliaceous; inflorescence simple or digitate or pinnate from a few spikes; primary bracts always somewhat shorter than the spikes but their blades often exceeding them; spikes erect or suberect, linear-lanceolate, acute, often curved, to 12 cm. long, 2–10-flowered; floral bracts elliptic, acute,

nearly or quite ecarinate, 2–3 cm. long, subchartaceous, nerved, densely pale-lepidote; sepals lance-oblong, acute, 2 cm. long, subchartaceous, glabrous or sparsely lepidote, nerved, more or less connate posteriorly; petals linear, erect, to 4 cm. long, violet; stamens exserted; capsule 4 cm. long.

MAGDALENA: On *Pereskia*, semiarid section, mountains above Santa Marta, alt. 300 m., July 29, 1946, *Foster & C. E. Smith, Jr.*, 1324 (GH).

Southern FLORIDA, BAHAMAS, CUBA, HISPANIOLA, MEXICO, CENTRAL AMERICA.

## 6. *Vriesia*

*Vriesia* Lindl. Bot. Reg. 29:pl. 10. 1843, nomen conservandum.

*Hexalepis* Raf. Fl. Tell. 4:24. 1838.

*Cipuropsis* Ule, Verh. Bot. Ver. Brand. 48:148. 1907.

*Neovriesia* Britton ex Britton & Wilson, Sci. Surv. Porto Rico 5:141. 1923.

*Alcantarea* Harms, Notizblatt 10:802. 1929.

Herbs, mostly large, showy and epiphytic; leaves densely rosulate, entire, often banded or mottled, inflorescence simple or compound; primary bracts from small and inconspicuous to large and showy and more or less covering the axillary branches; spikes usually distichous-flowered; floral bracts conspicuous, enfolding or concealing the bases of the flowers; flowers sessile to slenderly pedicellate; sepals usually free; petals free or connate in a short tube that is much exceeded by the sepals, appendaged, the appendages almost always paired; ovary superior or very slightly inferior; style elongate; ovules many, usually caudate; seeds fusiform, with a long straight basal coma.

Mexico and the West Indies to Argentina.

## KEY

1. Flowers in 2 ranks; spikes with a well developed axis.
  2. The flowers remaining in 2 opposite ranks after anthesis, not secund.
    3. Inflorescence compound.
      4. Leaf-blades linear, ligulate, or lanceolate with curved sides.
        5. Inflorescence tripinnate; floral bracts thin, prominently nerved.
          6. Flowers imbricate; floral bracts exceeding the sepals; inflorescence laxly pyramidal . . . . . 1. *V. elata*
          6. Flowers spreading and not at all imbricate; floral bracts much shorter than the sepals; inflorescence thyrsoid.
            2. *V. hospitalis*
        5. Inflorescence only bipinnate.
          7. Spikes lax with spreading flowers; sepals elliptic, coriaceous; leaves ending in a hard acuminate cusp . . . . . 23. *V. killipiana*

7. Spikes dense with imbricate flowers.
8. Inflorescence digitate; floral bracts broadly ovate, concealing all or nearly all of the rhachis.  
*14. V. chrysostachys*
8. Inflorescence pinnate; floral bracts narrow, exposing nearly all of the rhachis.
9. Floral bracts lanceolate, acute, carinate.  
*3. V. rubra*
9. Floral bracts obovate, subtruncate, ecarinate.  
*4. V. hodgei*
4. Leaf-blades very narrowly triangular with straight sides.
10. Primary bracts all much shorter than the spikes.
11. Floral bracts ecarinate, 35–50 mm. long.
12. The floral bracts densely cinereous-lepidote, 35 mm. long . . . . . *5. V. pereziana*
12. The floral bracts glabrous, 40–50 mm. long.  
*6. V. chlorantha*
11. Floral bracts carinate, not more than 16 mm. long.
13. Inflorescence pinnate, lax; spikes nearly all geniculate, spreading abruptly from the long erect sterile base.
14. Spikes lanceolate; petals nearly or quite entire, lilac or white . . . . . *7. V. didistichoides*
14. Spikes linear; petals crenulate, pale rose.  
*8. V. heterandra*
13. Inflorescence digitate; spikes straight.
15. Scape little if any longer than the spikes; petals pale green . . . . . *9. V. chontalensis*
15. Scape much longer than the spikes; petals white.  
*10. V. crenulipetala*
10. Primary bracts large, broad, covering all or the greater part of each of the lower spikes.
16. Sepals 8–10 mm. long . . . . . *11. V. fragrans*
16. Sepals 20–22 mm. long.
17. Inflorescence erect; blades of the scape-bracts mostly reflexed . . . . . *12. V. cylindrica*
17. Inflorescence pendulous; blades of the scape-bracts erect . . . . . *13. V. tequendamae*
3. Inflorescence simple.
18. Floral bracts even or nerved, never rugulose.
19. Inflorescence erect or ascending.
20. Leaf-blades densely cinereous-lepidote, regularly and very narrowly triangular, long-acuminate; floral bracts to 16 mm. long . . . . . *9. V. chontalensis*

20. Leaf-blades obscurely lepidote, triangular, linear or ligulate.
21. Floral bracts subcoriaceous, 15–35 mm. long; outline of the keel convex.
22. Leaf-blades 1–5 cm. wide; floral bracts densely imbricate or rarely lax toward the apex of the inflorescence; inflorescence many-flowered, to 1 m. long . . . . . 14. *V. chrysostachys*
22. Leaf-blades usually 3.5 (rarely to 10) mm. wide, linear; floral bracts laxly imbricate and exposing the rhachis at anthesis; inflorescence 4–6- (rarely to 14-) flowered. . . . . 15. *V. schultesiana*
21. Floral bracts membranaceous, to 45 mm. long; outline of the keel sigmoid. . . . . 16. *V. heliconioides*
19. Inflorescence pendulous; flowers spreading; rhachis very slender . . . . . 17. *V. simplex*
18. Floral bracts fleshy, rugulose when dry.
23. Inflorescence many-flowered; floral bracts imbricate. . . . . 18. *V. gladioliflora*
23. Inflorescence 3-flowered; floral bracts spreading, not more than twice as long as the internodes. . . . . 19. *V. verrucosa*
2. The flowers becoming secund at or after anthesis.
24. Scape-bracts shorter than the internodes; inflorescence simple, very lax . . . . . 20. *V. socialis*
24. Scape-bracts imbricate.
25. Rhachis verrucose just below the nodes.
26. Floral bracts and sepals rugulose; leaf-blades less than 2 cm. wide; inflorescence 3-flowered, lax. . . . . 19. *V. verrucosa*
26. Floral bracts and sepals nerved or even but not rugulose; leaf-blades to 6 cm. wide; inflorescence mostly compound . . . . . 21. *V. ringens*
25. Rhachis not verrucose.
27. Floral bracts rugulose when dry. . . . . 18. *V. gladioliflora*
27. Floral bracts never rugulose.
28. Plant stout, 1–2 m. high; rhachis thick, subalate; inflorescence mostly compound. 22. *V. sanguinolenta*
28. Plant slender, not over 1 m. high; rhachis slender, not at all alate; inflorescence simple.
29. Floral bracts more than twice as long as the internodes . . . . . 24. *V. viridiflora*
29. Floral bracts less than twice as long as the internodes . . . . . 25. *V. vexillata*

1. Flowers obviously in more than 2 ranks or the spikes with aborted axis and few flowers.  
 30. Axis of the spike well developed . . . . . 26. *V. splitgerberi*  
 30. Axis of the spike aborted to a pulvinus.  
 31. Flowers 10–15 in each fascicle . . . . . 27. *V. capituligera*  
 31. Flowers 2–3 in each fascicle . . . . . 28. *V. hygrometrica*

1. *Vriesia elata* (Baker) L. B. Smith, *Phytologia* 5:288. 1955. FIGURE 49  
*Tillandsia elata* Baker, *Journ. Bot.* 26:46. 1888.  
*Tillandsia excelsa* Mez, wrongly attributed to Wittm., in DC. *Monogr.*  
*Phan.* 9:766. 1896.  
*Tillandsia exaltata* Mez in DC. *Monogr. Phan.* 9:766. 1896.

Stemless, about 2 meters high; leaves 4–10 dm. long, sheaths elliptic, 1–3 dm. long, subdensely lepidote with pale appressed brown-centered scales, blades linear, acute with a subulate apex, 4–7 cm. wide, glabrous above; scape erect, over 15 mm. in diameter, glabrous; scape-bracts

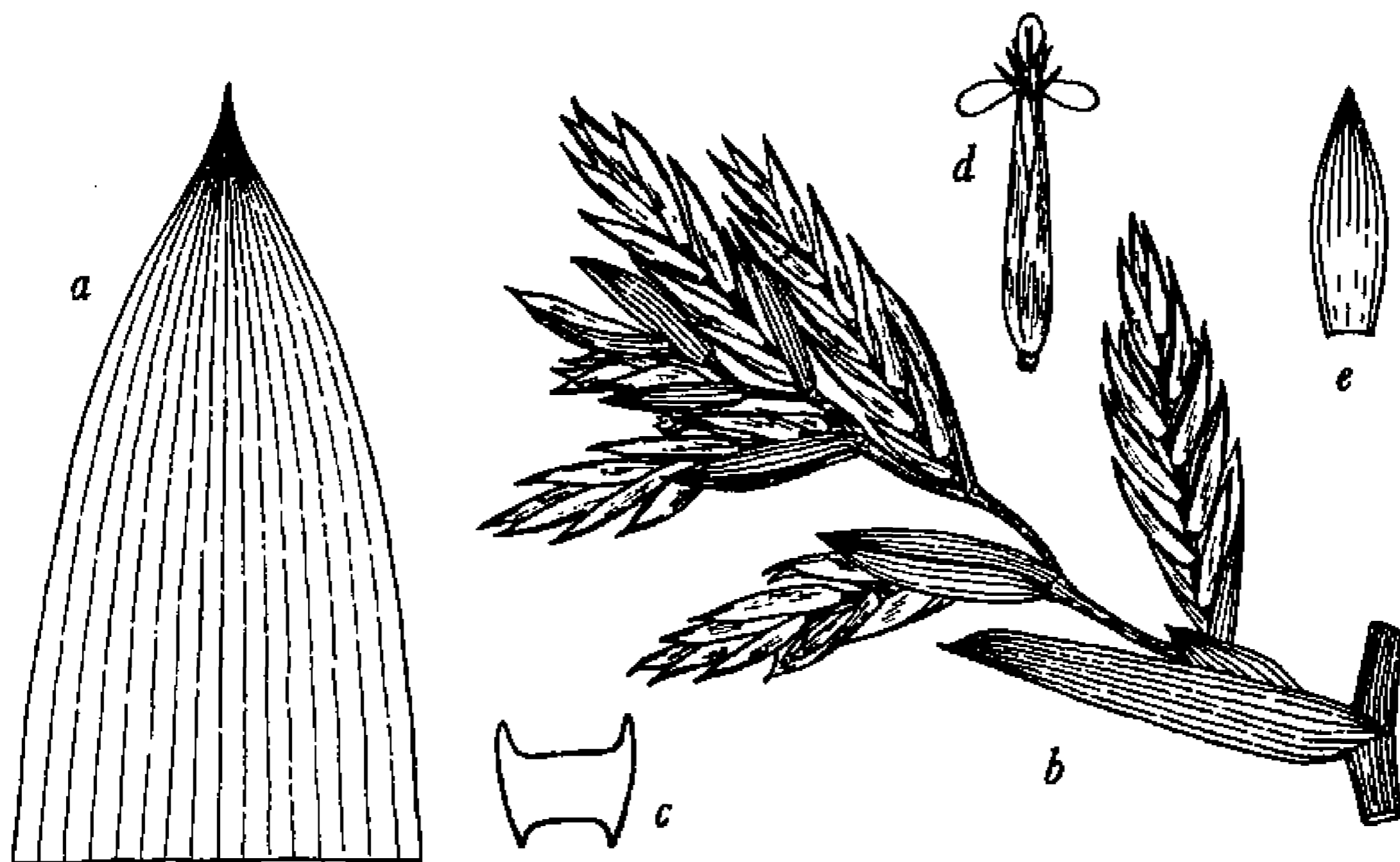


FIGURE 49.—*Vriesia elata*: a, Apex of leaf,  $\times \frac{1}{2}$ ; b, branch of inflorescence,  $\times \frac{1}{2}$ ; c, cross-section of rachis,  $\times 5$ ; d, flower,  $\times 1$ ; e, sepal,  $\times 1$ .

closely imbricate, lanceolate, acute with a subulate apex, thin; inflorescence red except the petals; primary bracts like the scape-bracts, exceeding the bracteate sterile bases of the branches; secondary bracts half as long as the spikes or less; spikes sessile, lanceolate, acute, strongly complanate, 4–14 cm. long; floral bracts imbricate but exposing the alate rachis and much of the sepals, oblong, acute, 20–23 mm. long, incurved, glabrous; flowers sessile; sepals lanceolate, 15–20 mm. long, posteriorly short-connate, thin, carinate; petals linear, 25 mm. long, white or yellow; stamens included.

COLOMBIA: *Triana* 85 (COL).

MAGDALENA: Valle Dupar, Santa Marta, *Purdie* (K, type, US phot. 4149). Santa Marta, 1898–1901, *H. H. Smith* 2345 (F, GH, PH, US). Same, *A. Schultze* 692 (f Mez). Cerro Bandera, alt. 2,000 m., 1932, *Giacometto* 62 (US). Mount San Lorenzo, near Santa Marta, alt. 1,900–2,400 m., July 1932, *Seifriz* 84 (PENN). Northern slope of Sierra Nevada de Santa Marta, July 1932, *Seifriz* 602-a (PENN). Epiphytic, rain forest, mountains above Hacienda Cincinnati, Santa Marta, Aug. 3, 1946, *Foster & C. E. Smith, Jr.*, 1396 (COL, GH).

NORTE DE SANTANDER: Woods between Río Negro (tributary of Río Margua) and Quebrada de La China in Santa Librada (drainage of Río Cubugón), alt. 1,000–1,300 m., Nov. 10, 1941, *Cuatrecasas* 12959 (COL). On ground, near Ocaña, alt. 1,200 m., Sept. 20, 1946, *Foster* 1753 (COL, GH, US).

CAQUETA: Open woods, Cajón de Pulido, Quebrada of the Río Hacha, eastern slope of Cordillera Oriental, alt. 1,700 m., Mar. 26, 1940, *Cuatrecasas* 8763 (COL, US). Woods, Sucre, eastern slope of Cordillera Oriental, alt. 1,000–1,300 m., Apr. 4, 1940, *Cuatrecasas* 9060 (COL).

ANTIOQUIA: Epiphytic and terrestrial, damp woods, Amalfi, alt. 1,600–2,000 m., Sept. 23, 1884, *Lehmann* XXV (G, type, GH phot. 6930; US). Between Valdivia and Yarumal, alt. 2,000 m., Feb. 20, 1942, *Metcalf & Cuatrecasas* 30107 (GH, UC, US). Epiphytic, woods of Paramitos, Nariño, alt. 2,100 m., Jan. 3, 1949, *Uribe-Uribe* 1863 (COL).

2. *Vriesia hospitalis* (L. B. Smith) L. B. Smith, *Phytologia* 5:397. 1956.

*Tillandsia hospitalis* L. B. Smith, *Caldasia* 5:13, *fig.* 1948.

Plant 1.8–2.7 meters high; stem prostrate, 9–12 dm. long, perennial, defoliate; leaves rosulate at the apex of the stem, 12–18 dm. long, sheaths elliptic, castaneous, minutely pale-lepidote, blades broadly acute and apiculate, to 11 cm. wide, glabrous above and marked with purple-brown lines, sparsely and obscurely punctulate-lepidote beneath; scape erect, stout; scape-bracts foliaceous, densely imbricate; inflorescence 60–75 cm. long, glabrous; primary bracts ovate, acuminate, much shorter than the branches; base of the branch very short, bearing 3 fasciculate spikes; spikes oblong, 10–12-flowered; rhachis angled, geniculate, the internodes scarcely more than 6 mm. long; floral bracts ovate, ecarinate; pedicels very stout, 6 mm. long; sepals elliptic, obtuse, short-connate, ecarinate, membranaceous when dry; petals 5 mm. longer than the sepals; stamens included.

MAGDALENA: Terrestrial, completely exposed to the sun, páramo, hills above Hacienda Cincinnati, montañas of Santa Marta, alt. 2,100–2,250 m., Aug. 3, 1946, *Foster & C. E. Smith, Jr.*, 1403 (GH, type, US phot. 3937). On hillsides at fringe of true páramo, Surivaquito, Sierra Nevada de Santa Marta, alt. 2,400 m., Apr. 22, 1939, *Hanbury-Tracy* 310 (K, US).

3. *Vriesia rubra* (R. & P.) Beer, *Bromel.* 98. 1857.

*Tillandsia rubra* R. & P. *Fl. Per.* 3:40, *pl.* 266. 1802.

*Vriesia albiflora* Ule, *Verhandl. Bot. Ver. Brandenburg* 48:141. 1907.

*Tillandsia rhododactyla* Mez, *Repert. Sp. Nov. Fedde* 16:76. 1919.

Over 1 meter high; leaves 6 dm. long, blades ligulate, 7 cm. wide, flat, rounded and apiculate, subglabrous; scape erect, stout; scape-

bracts imbricate, elliptic, acute; inflorescence laxly bipinnate; primary bracts lanceolate, much shorter than the spikes; spikes suberect, linear, 25 cm. long, 2-3 cm. broad, complanate, prophyllate; floral bracts imbricate, 25 mm. long, equaling the sepals, glabrous, even; sepals narrowly elliptic, acute, coriaceous; petals ligulate, bearing 2 largely adnate scales, white; stamens and pistil included; capsule equaling the sepals.

NORTE DE SANTANDER: Dense jungle, Bellavista on pipeline, alt. 750 m., Sept. 15, 1946, *Foster* 1694 (GH).

META: Epiphytic, dense humid forest, Cano Yerly, Sierra de La Macarena, alt. 450 m., Nov. 24, 1949, *Philipson, Idrobo & Fernández* 1551 (BM, US).

CAQUETÁ: Epiphytic, left bank of Río Caguán, opposite mouth of Río Guayas, Apr. 20, 1953, *Romero Castañeda* 4018 (COL, US). Epiphytic, right bank of Río Caquetá, between La Tagua and Puerto Boy, "8 horas in Johnson de 10 H. P. al oeste de aquella," May 9, 1953, *Romero Castañeda* 4219 (COL, US).

TRINIDAD, GUIANA, Amazonian BRASIL, PERU.

4. *Vriesia hodgei* L. B. Smith, *Caldasia* 5:14, *fig.* 1948.

Stemless, to 1.4 meters high; leaves rosulate, 8 dm. long, minutely and obscurely lepidote, sheaths elliptic, 2 dm. long, nearly the same color as the blades, blades ligulate, acute, to 65 mm. wide; scape erect, about 8 mm. in diameter; scape-bracts erect, densely imbricate, broadly ovate, acute; inflorescence laxly bipinnate, 8 dm. long; axis slender, slightly flexuous, glabrous; primary bracts elliptic, acute, much shorter than the spikes; spikes spreading or slightly ascending, to 25 cm. long, 15-flowered, bearing 1 or 2 sterile bracts at the base; rhachis slender, slightly flexuous, excavated, glabrous; floral bracts imbricate, not at all secund, to 32 mm. long, exceeding the sepals, coriaceous, glabrous, and even at base and center, the apex and margins thin, obscurely lepidote, nerved, punctulate-lepidote within; pedicels short and obscure; sepals narrowly elliptic, obtuse, 24 mm. long, thin, nerved, punctulate-lepidote, posteriorly connate for 3 mm.; petals about 30 mm. long, white, bearing 2 scales above the base; stamens included.

ANTIOQUIA: Epiphytic, summer-flowering evergreen woods, near Porcesito, Valley of the Río Medellín, alt. about 1,100 m., May 19, 1946, *Hodge* 6867 (GH, type; US).

5. *Vriesia pereziana* (André) L. B. Smith, *Contr. U. S. Nat. Herb.* 29:444. 1951.

*Tillandsia pereziana* André, *Enum. Bromél.* 7. Dec. 13, 1888; *Rev. Hortic.* 60:567. Dec. 16, 1888.

Leaves about 10 in a subbulbous rosette, 3-6 dm. long, densely appressed-lepidote, sheaths broadly ovate, 10-15 cm. long, dark castaneous, blades 25 mm. wide, cinerous-lepidote, involute; scape decurved, slender; scape-bracts barely imbricate, ovate, filiform-laminate; inflorescence pendent, subpinnate from 5-6 spikes; primary



bracts lance-ovate, not much larger than the floral bracts, the lower filiform-laminate; spikes lance-oblong, 10-15 cm. long, lax, complanate; floral bracts divergent, ovate, acute; flowers subsessile; sepals free, elliptic, acute, 16 mm. long, subchartaceous, even, soon glabrous; petals linear, 4 cm. long, green, bearing 2 linear largely adnate scales; stamens exserted.

CUNDINAMARCA: On small trees hanging above the rocks of the Río Funza near Tequendama Falls, alt. 2,550 m., February 1876, *André* 1348 (K, type, US phot. 4138, F). On rocks and small trees, Salto de Tequendama, alt. 2,100 m., Oct. 16, 1946, *Foster* 1907 (COL, GH).

6. *Vriesia chlorantha* L. B. Smith, *Phytologia* 5:286, pl. 2, figs. 9-12. 1955.

FIGURE 50

Plant nearly 1 meter long; leaves many, 27 cm. long, covered with appressed cinereous scales, sheaths broadly ovate, 10 cm. long, dark castaneous, blades filiform-acuminate, 25 mm. wide; scape slightly curved, much exceeding the leaves, 5 mm. in diameter; scape-bracts imbricate, tightly enfolding the scape, elliptic, acute and the lower caudate, membranaceous, cinereous-lepidote; inflorescence digitate

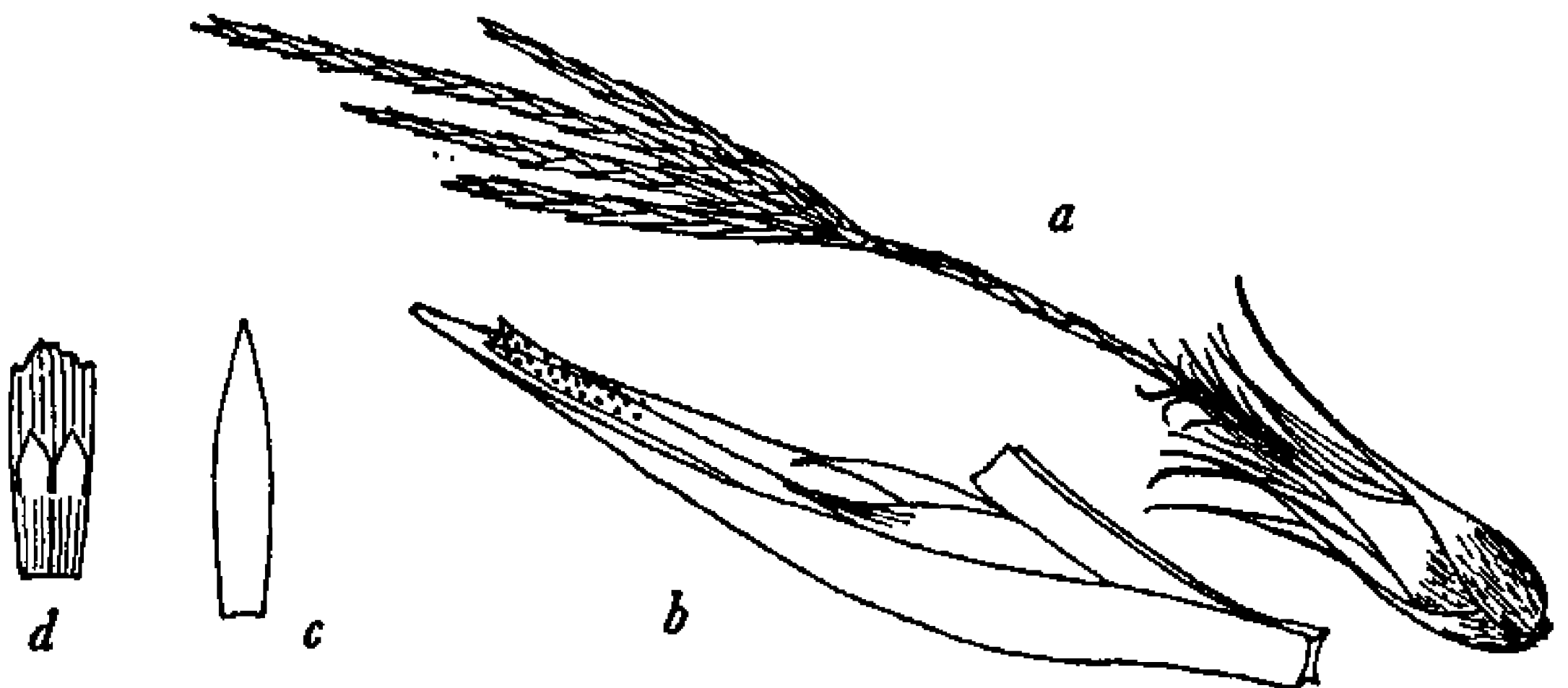


FIGURE 50.—*Vriesia chlorantha*: a, Habit,  $\times \frac{1}{10}$ ; b, section of spike,  $\times 1$ ; c, sepal,  $\times 1$ ; d, base of petal,  $\times 2$ .

from 4 spikes; primary bracts like the upper scape-bracts, not much larger than the floral bracts; spikes linear, acuminate, complanate, many-flowered, 20-25 mm. wide, the terminal 42 cm. long with several sterile bracts at the base, the lateral 24-28 cm. long; rhachis flexuous, slender, strongly alate; floral bracts narrowly lanceolate, nearly even except for a prominent midnerve, membranaceous, purple; flowers subsessile; sepals lanceolate, acute, 18 mm. long, free, ecarinate; petals linear, 4 cm. long, about equaling the stamens, green, bearing 2 linear scales at base.

CUNDINAMARCA: Epiphytic, Sesquilé, Dec. 9, 1950, *Schneider* 1015 (COL, type, US phot. 4369).

7. *Vriesia didistichoides* (Mez) L. B. Smith, *Phytologia* 5:281. 1955.

*Tillandsia didistichoides* Mez in DC. *Monogr. Phan.* 9:778. 1896.

Stemless, about 2 dm. high; leaves 20–25 cm. long, densely appressed-lepidote, sheaths broadly ovate, inflated and forming a large pseudobulb, deep castaneous, blades involute-subulate; scape decurved, slender; scape-bracts imbricate, broadly ovate, caudate, inflated; inflorescence bipinnate; primary bracts like the upper scape-bracts, erect, imbricate; spikes densely 8–10-flowered, strongly complanate, 4–5 cm. long, 10–15 mm. wide; rhachis alate; floral bracts elliptic, acute, 15 mm. long, much exceeding the sepals, nerved, obscurely lepidote, pink; sepals free, elliptic, acute, 10 mm. long, glabrous, nerved; petals 20 mm. long; stamens slightly shorter than the petals.

MAGDALENA: Chinchicua, Sierra Nevada de Santa Marta, alt. 1,200 m., Aug. 19, 1946, *Foster & C. E. Smith, Jr.*, 1471 (GH).

WEST INDIES, TRINIDAD, VENEZUELA.

8. *Vriesia heterandra* (André) L. B. Smith, *Contr. U. S. Nat. Herb.* 29:443. 1951.

*Tillandsia heterandra* André, *Enum. Bromél.* 7. Dec. 13, 1888; *Rev. Hortie.* 60:567. Dec. 16, 1888.

Stemless, to 35 cm. high; leaves 3–4 dm. long, covered with appressed cinereous brown-centered scales, sheaths very broadly ovate or elliptic, 6–10 cm. long, dark castaneous, blades 15–20 mm. wide; scape curved; scape-bracts imbricate, broadly ovate with long subsetaceous blades, densely lepidote; inflorescence 15–20 cm. long; primary bracts erect, like the scape-bracts but the upper ones merely apiculate; spikes acute, complanate, 4–7 cm. long above the sterile base; floral bracts ovate, acute, 13 mm. long, exceeding the sepals, lepidote; flowers subsessile; sepals free, elliptic-oblong, acute, glabrous; petals 18 mm. long, bearing 2 linear acuminate largely adnate scales; stamens included, the second series partially connate with the petals; capsule slenderly cylindrical, 2 cm. long.

GOAJIRA: Epiphytic, near Quebrada Taguaira, southwest slope of Serranía de Macuira, alt. 400 m., Dec. 3, 1953, *Romero Castañeda* 4487 (COL).

NORTE DE SANTANDER: In trees, Bellavista on pipeline, alt. 750 m., Sept. 15, 1946, *Foster* 1695 (GH, US).

SANTANDER: Woods, near California, alt. 2,200 m., Jan. 11–27, 1927, *Killip & A. C. Smith* 17115 (GH).

CUNDINAMARCA: Puente de Quetame, Andes of Bogotá, alt. 1,975 m., Jan. 1876, *André* 1213 (K, type, US phot. 4152).

NARIÑO: In trees, road to Urcusique, alt. 1,200 m., Nov. 23, 1946, *Foster* 2249 (COL, GH).

ECUADOR, BOLIVIA.

9. *Vriesia chontalensis* (Baker) L. B. Smith, Contr. U. S. Nat. Herb. 29:518, fig. 76. 1951.

*Tillandsia chontalensis* Baker, Journ. Bot. 25:237. 1887.

*Tillandsia spuria* Mez & Wercklé, Repert. Sp. Nov. Fedde 16:74. 1919.

Stemless, less than 2 dm. high; leaves 12–14 cm. long, sheaths suborbicular, 25 mm. wide, densely castaneous-lepidote, blades erect, 10–12 mm. broad, involute, densely cinereous-lepidote; scape erect or ascending; scape-bracts densely imbricate, broadly ovate, caudate, roseate, densely lepidote; inflorescence with 1–6 spikes; primary bracts like the scape-bracts, inconspicuous; spikes linear-lanceolate with an attenuate base of several sterile bracts, acute, complanate, 4–8 cm. long, 10–12 mm. wide, densely 6–14-flowered; floral bracts triangular-ovate, to 16 mm. long, equaling or exceeding the sepals, lepidote toward apex; sepals lanceolate, acute, 10–12 mm. long, subfree, chartaceous, glabrous; petals oblong, subtruncate, 12–18 mm. long, denticulate, pale green, bearing 2 scales with long attached bases and small free apices; stamens and pistil included; capsule barely exerted from the bracts.

NORTE DE SANTANDER: On trees, Orú on pipeline, alt. 690 m., Sept. 17, 1946, Foster 1737 (GH, identity dubious).

META: Epiphyte, scrubby forest on summit of Approach Ridge, Central Mountains, Sierra de La Macarena, alt. 1,200 m., Dec. 20, 1949, Philipson & Idrobo 1828 (BM, US). Epiphytic, eastern slopes, northern end of Cordillera La Macarena, alt. 600–1,300 m., Dec. 30, 1950–Jan. 5, 1951, Idrobo & Schultes 851 (COL, US).

VALLE: Epiphytic in woods, Piedra de Moler, left bank of the mouth of Río Digua, west slope of Cordillera Occidental, alt. 900–1,180 m., Aug. 19–28, 1943, Cuatrecasas 15188 (GH).

NICARAGUA, COSTA RICA, PANAMA.

10. *Vriesia crenulipetala* (Mez) L. B. Smith, Phytologia 5:288. 1955.

*Tillandsia crenulipetala* Mez, Repert. Sp. Nov. Fedde 16:76. 1919.

*Tillandsia attenuata* Rusby, Descr. So. Am. Pl. 4. 1920.

Spreading by short stolons, flowering shoot 26–40 cm. long; leaves many, spreading, covered with fine appressed cinereous brown-centered scales, sheaths suborbicular, 4–5 cm. long, dark castaneous, blades filiform-acuminate, 10–15 mm. wide; scape curved; scape-bracts densely imbricate, lanceolate, long-laminate; primary bracts like the scape-bracts but the upper merely apiculate, shorter than the spikes; spikes erect, short-stipitate, lanceolate, acute, 25–35 mm. rarely to 70 mm. long, 12 mm. wide, complanate; floral bracts imbricate, ovate, acute, 13–15 mm. long, exceeding the sepals, carinate and lepidote toward the apex, nerved; flowers sessile; sepals unequally short-connate, elliptic, acute, 11–13 mm. long; petals bearing 2 linear acute highly adnate scales, their blades elliptic, broadly rounded, 6 mm. long, denticulate; stamens included.

MAGDALENA: Santa Marta, 1898–1901, *H. H. Smith* 2349 (F, GH, PH, US, isotypes). Forest near Manganazes, alt. 1,000 m., 1898–1899, *H. H. Smith* 2857 (NY, type of *Tillandsia attenuata* Rusby, GH phot. 7032). Cerro San Lorenzo, Santa Marta mountains, alt. 2,500 m., Jan. 1–20, 1942, *Apolinar* 637 (US). On tree trunk, temperate forest, Sierra de Perijá, 6 km. east-northeast of Manaure, 42 km. east of Valledupar, 7 km. from the Venezuelan border, alt. 2,175 m., Feb. 2, 1945, *Grant* 10756 (US). Rain forest, mountains above Hacienda Cincinnati, Santa Marta, alt. 1,800–2,100 m., Aug. 3, 1946, *Foster & C. E. Smith, Jr.*, 1398 (COL, GH). On trees, above Pueblo Bello, Sierra Nevada de Santa Marta, alt. 1,200 m., Aug. 16, 1946, *Foster* 1452 (COL, GH). Same, alt. 450 m., Aug. 1946, *Foster & C. E. Smith, Jr.*, 1455 (COL, GH, US). Chinchicua, Sierra Nevada de Santa Marta, alt. 1,200 m., Aug. 19, 1946, *Foster & C. E. Smith, Jr.*, 1472 (GH). Epiphytic, Los Cumbres, above Minca, Sierra Nevada de Santa Marta, alt. 2,000 m., Feb. 26, 1949, *Hawkes* 588 (COL, US).

CUNDINAMARCA: Caqueza, 1855, *Triana* (552) "1306" in part (BM).

11. *Vriesia fragrans* (André) L. B. Smith, *Contr. U. S. Nat. Herb.* 29:443. 1951.  
*Tillandsia fragrans* André, *Enum. Bromél.* 7. Dec. 13, 1888; *Rev. Hortie.* 60:567. Dec. 16, 1888.

Stemless, flowering shoot to 23 cm. long; leaves 23 cm. long, covered with appressed cinerous brown-centered scales, sheaths broadly elliptic, 5–6 cm. long, dark castaneous, blades involute; scape slender, curved; scape-bracts imbricate, lance-ovate with setaceous blades, densely cinereous-lepidote; inflorescence densely bipinnate, subcylindric, 8–10 cm. long, 20–25 mm. in diameter; primary bracts strict, ovate, the lower ones long-caudate; spikes subsessile, elliptic, complanate, 2 cm. long, densely 5–6-flowered; floral bracts lanceolate, acute, 10–12 mm. long, about equaling the sepals, carinate, thin, nerved, lepidote; flowers subsessile, fragrant; sepals subfree, elliptic, red, glabrous, chartaceous; petals white or lavender, bearing 2 linear acute largely adnate scales, blades spreading, elliptic, obtuse; stamens and pistil included.

CUNDINAMARCA: Tocaima, December 1932, *Pérez-Arbeláez* 2593 (US). In trees, Páramo de San Miguel, alt. 3,300 m., Oct. 12, 1946, *Foster* 1880 (GH, US). On rock, Finca San Pablo, between Facatativá and Albán, alt. 1,800 m., June 20, 1953, *Weber* 860 (MAINZ).

VALLE: Quebrada de Las Juntas, alt. 2,500 m., 1876, *André* 4397 (K, type, US phot. 4161).

ECUADOR.

12. *Vriesia cylindrica* L. B. Smith, *Contr. U. S. Nat. Herb.* 29:445, *fig. 46*. 1951.

Plant 4–8 dm. high; leaves numerous in a funnelform rosette, 4–6 dm. long, densely and finely appressed-lepidote, sheaths elliptic, 1 dm. long, brown, blades 4 cm. wide; scape short and stout; scape-bracts densely imbricate, the lower foliaceous, the upper broadly elliptic with a linear blade; inflorescence slenderly cylindric, densely bipinnate; lower primary bracts like the upper scape-bracts, the upper merely apiculate, nearly equaling the spikes, obscurely lepidote; spikes strict, elliptic, 6–8 cm. long, 2–3 cm. wide, strongly complanate,

dense, 8-12-flowered, bearing a few carinate lepidote sterile bracts at base; rhachis excavated; floral bracts imbricate, ovate, acute, 24 mm. long, about equaling the sepals, coriaceous, even, all but the lowest scarcely or not at all carinate and soon glabrous; pedicels 2 mm. long, stout; sepals free, lance-ovate, obtuse or apiculate but the thin margins inrolled and making them appear acuminate, 22 mm. long, coriaceous; petals about 3 cm. long, green with dark purple margins, bearing 2 scales; stamens and pistil exserted.

NARIÑO: In trees, below Altaquer, Río Cuaciquiere, alt. 900 m., Nov. 12, 1946, *Foster* 2143 (GH). Ricaurte, alt. 1,200 m., Nov. 15, 1946, *Foster* 2185 (GH), ECUADOR.

13. *Vriesia tequendamae* (André) L. B. Smith, *Contr. U. S. Nat. Herb.* 29:444. 1951. FIGURE 51

*Tillandsia tequendamae* André, *Enum. Bromél.* 8. Dec. 13, 1888; *Rev. Hortic.* 60:568. Dec. 16, 1888.

Stemless; leaves 5-6 dm. long, densely cinereous-lepidote, sheaths broadly ovate, to 17 cm. long, dark castaneous, blades 6-7 cm. wide at base; scape decurved, stout; scape-bracts densely imbricate, slenderly laminate; inflorescence densely bipinnate, slenderly cylindrical, 2-4 dm. long; primary bracts like the scape-bracts but the upper ones bladeless, orange, densely lepidote at apex; spikes sessile, lanceolate, 4-7 cm. long, complanate, 6-10-flowered; floral bracts densely imbricate, ovate, acute, 22 mm. long, equaling or shorter than the sepals, carinate, coriaceous, even, glabrous, orange; flowers subsessile; sepals elliptic, acute, even, glabrous; petals linear, 4 cm. long, green with blue margins, bearing 2 linear largely adnate scales; stamens exserted.

MAGDALENA: In high trees, above Pueblo Bello, Sierra Nevada de Santa Marta, alt. 1,200 m., Aug. 16, 1946, *Foster & C. E. Smith Jr.*, 1453 (GH).

NORTE DE SANTANDER: Epiphytic, woods along stream, Culagá Valley, near Tapatá (north of Toledo), alt. 1,500-2,100 m., Mar. 3-8, 1927, *Killip & A. C. Smith* 20177 (GH, US).

CUNDINAMARCA: On rocks near the Falls of Tequendama, alt. 2,500 m., February 1876, *André* 1355 (K, type, GH phot. 2636); 1355 bis (K, abnormal?). San Cristóbal, July 1917, *Ariste-Joseph* A-112 (US). Quebrada de Chico, Macizo de Bogotá, alt. 2,650-2,750 m., June 1, 1939, *Cuatrecasas* 5253 (COL). In small trees, cold dry windy areas, El Chico above Bogotá, alt. 3,000 m., Oct. 11, 1946, *Foster* 1840 (COL, GH).

ANTIOQUIA: Epiphytic, moist open woods, on road to Boquerón de San Cristóbal, alt. 2,500 m., June 2, 1948, *Barkley, Durán & Correa* 100 (COL, US).

CAUCA: Epiphytic, forest, "Canaan," Mount Purace, Cordillera Central, alt. 3,100-3,300 m., June 11-16, 1922, *Killip* 6698 (GH). In virgin forest, near El Tambo, Munchique, alt. 2,000 m., June 13, 1936, *Sneidern* 735 (F, S).

NARIÑO: On trees, San Francisco, alt. 2,100 m., Nov. 26, 1946, *Foster* 2264 (COL, GH).

ECUADOR.

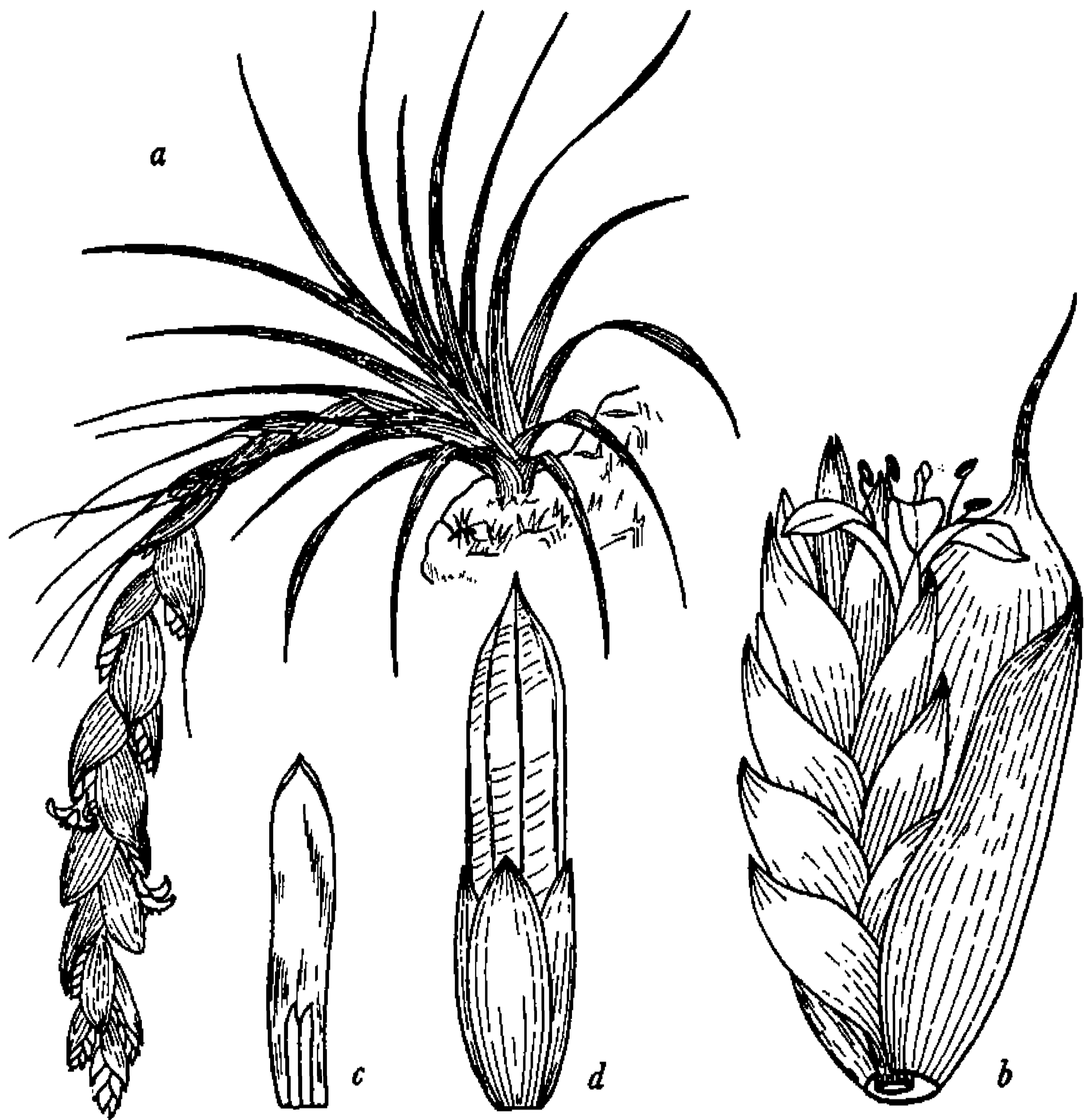


FIGURE 51.—*Vriesia tequendamae*: *a*, Plant,  $\times \frac{1}{4}$ ; primary bract and spike,  $\times 1$ ; *c*, petal,  $\times 1$ ; *d*, sepals and capsule,  $\times 1$  (all after André).

14. *Vriesia chrysostachys* E. Morr. Belg. Hort. 31:87. 1881.

*Tillandsia chrysostachys* Baker, Bot. Mag. 112: pl. 6906. 1886.

Stemless; leaves 3–5 dm. long, sheaths elliptic, densely ferruginous-lepidote, blades linear to lanceolate, minutely punctulate-lepidote; scape slender, erect; scape-bracts imbricate, broadly ovate, the lower acuminate, the upper obtuse; inflorescence of 1–4 spikes; primary bracts short and inconspicuous; spikes linear, complanate, many-flowered; floral bracts triangular-acute, 25–35 mm. long, exceeding the flowers, yellow, coriaceous; flowers sessile, 25 mm. long; sepals lance-ovate, 15 mm. long; stamens included.

14a. *Vriesia chrysostachys* var. *chrysostachys*.

Leaves rounded and apiculate or broadly acute, 4–5 cm. wide; inflorescence simple or rarely digitate; petals yellow.

**META:** On rocks, in deep humus, on exposed ridges, mesa of the Río Sansa, Cordillera La Macarena, alt. 1,000–1,300 m., Jan. 23, 1951, *Idrobo & Schultes* 1309 (COL, US).

**VAUPÉS:** On rocks, savanna along banks of Caño Pacú, affluent of Vaupés near Tayasú and Circasia, alt. 280 m., Mar. 6, 1944, *Schultes* 5826 (GH). Quartzite rock, Cerro Isibukuri, Río Kananarí, alt. 250–700 m., Aug. 4, 1951, *Schultes & Cabrera* 13386 (COL, GH, US, dwarf form—pathological?). Same, at base of mountain, lat. 0°15' N., long. 70°35' W., Jan. 23–25, 1952, *Schultes & Cabrera* 15083 (COL, US). Terrestrial, Cerro E-ree-eé-kö-mee-ö-kee, Río Piraparaná (tributary of Río Apaporis), lat. 0°15' S. to 0°25' N., long. 70°30' W., Sept. 18, 1952, *Schultes & Cabrera* 17512 (COL, GH, US). On quartzite rocks, Savanna Goo-ran-hoo-dá, Mesa de Yambí, Río Karurú (tributary of Río Vaupés), alt. 285–300 m., lat. 1°20' N., long. 71°20' W., Apr. 15–16, 1953, *Schultes & Cabrera* 19118 (COL, GH, US). Cerro de Tipieca, Río Vaupés between Mitú and Javareté, May 14–24, 1953, *Schultes & Cabrera* 19309 (COL, GH, US). Mountain below Teresita, Río Papurí, May 28, 1953, *Schultes & Cabrera* 19486 (US). Quartzite rocks, Raudal de Yuruparí, Río Vaupés, lat. 0°40' N., long. 70°30' W., November 1951, *Schultes & Cabrera* 19714 (COL, US).

**CAQUETÁ:** Woods, Florencia, Cerro de La Sargentia, alt. ca. 500 m., Mar. 30, 1940, *Cuatrecasas* 8912 (COL).

**AMAZONAS-VAUPÉS:** Near Cachivera de Jirijirimo, Río Apaporis, alt. 250 m., June 11, 1951, *Schultes & Cabrera* 12366 (COL, GH, US). Same, savanna (caatinga) on right bank of Raudal Jirijirimo, March 1951, *Schultes* 12087 (COL, US).

TRINIDAD, PERU.

**14b. *Vriesia chrysostachys* var. *stenophylla* L. B. Smith, Bot. Mus. Leaf. Harvard 17:71. 1955.**

Leaves acuminate, about 1 cm. wide; inflorescence simple; petals white.

**AMAZONAS-VAUPÉS:** On ledge in light forest, near Cachivera de Jirijirimo, Río Apaporis, alt. 250 m., Sept. 16, 1951, *Schultes & Cabrera* 14097 (US, type; COL, GH). Quartzite rocks, Raudal de Jirijirimo (below mouth of Río Kananarí), Río Apaporis, alt. 270 m., lat. 0°5' N., long. 70°40' W., Nov. 25, 1951, *Schultes & Cabrera* 14596 (COL, GH, US). Same, on cliff, Jan. 21, 1952, *Schultes & Cabrera* 14936 (COL, GH, US).

**15. *Vriesia schultesiana* L. B. Smith, Bot. Mus. Leaf. Harvard 16:197, fig. 1954.**  
FIGURE 52

Stemless, 12–50 cm. high; leaves 8–15 in a fasciculate rosette, 22–45 cm. long, sometimes exceeding the inflorescence, green, concolorous, sheaths broadly ovate, covered with coarse subappressed ferruginous scales, blades ferruginous-lepidote, soon becoming glabrous; scape very slender, glabrous; scape-bracts erect and enfolding the scape, barely or not imbricate and exposing sections of the scape but their caudate apices always exceeding the internodes, very obscurely lepidote; inflorescence linear, complanate, 10–15 mm. wide; rhachis slender, subterete; floral bracts broadly elliptic, subacute, 15–20 mm. long, much exceeding the sepals, ecarinate, nerved when dry, glabrous outside or sparsely lepidote near apex, pale yellow; pedicels very short, broadly obconic; sepals free, oblong, obliquely subtruncate,

8.5 mm. long, ecarinate, thin, nerved, sparsely lepidote; petals oblong, obtuse, 13 mm. long, bearing 2 large obtuse entire scales at base; stamens included; capsules shorter than the floral bracts.



FIGURE 52.—*Vriesia schultesiana*: *a*, Habit,  $\times \frac{1}{4}$ ; *b*, inflorescence,  $\times 1$ ; *c*, sepal,  $\times 1$ .

AMAZONAS-VAUPÉS: On ledge of conglomerate quartzite, savanna (caatinga), Raudal de Jirijirimo, Río Apaporis, March 1951, *Schultes* 12088 (US, type, US phot. 4337; COL). Same, Nov. 25–26, 1951, *García-Barriga* 13710 (COL, US). Same, alt. 270 m., lat.  $0^{\circ}5' N.$ , long.  $70^{\circ}40' W.$ , Nov. 25, 1951, *Schultes & Cabrera* 14553 (COL, GH, US). Same, *Schultes & Cabrera* 14967 (COL, GH, US).

AMAZONAS: On cliffs, near mouth of Río Popeyacá (tributary of Apaporis between Río Piraparaná and Raudal Yayacopi), alt. 210 m., lat.  $0^{\circ}20' S.$ , long.  $70^{\circ}30' W.$ , Apr. 15, 1952, *Schultes & Cabrera* 16185 (COL, GH, US).

16. *Vriesia heliconioides* (H. B. K.). Hook. ex Walp. Ann. Bot. 3:623. 1852.

FIGURE 53

*Tillandsia heliconioides* H. B. K. Nov. Gen. & Sp. 1:293. 1816.

*Tillandsia disticha* Willd. ex Schult. in R. & S. Syst. Veg. 7, pt. 2:1226. 1830, as synonym.

*Platystachys disticha* Beer, Bromel. 264. 1857.

*Vriesia disticha* Kuntze, Rev. Gen. 3:304. 1898, as to material cited, not as to basonym.

Flowering plant rarely over 4 dm. high; leaves about 2 dm. long, green above, suffused with red and sometimes spotted below, sheaths distinct, ovate-elliptic, obscurely punctulate-lepidote, blades ligulate, acute or acuminate, 15–30 mm. wide, subglabrous; scape erect, usually much shorter than the leaves; scape-bracts erect, very densely imbricate, very broadly ovate, abruptly acute; inflorescence oblong in outline, densely 6–18-flowered, up to 20 cm. long, 6 cm. wide, strongly



complanate; floral bracts very broadly ovate and triangular-acute or subrhombic, the base suberect, the middle spreading horizontally and the apex incurved and sharply carinate, bright red above the middle, greenish yellow at the apex; flowers erect, or suberect, sessile, about 6 cm. long; sepals lanceolate, acuminate, 27 mm. long, thin;

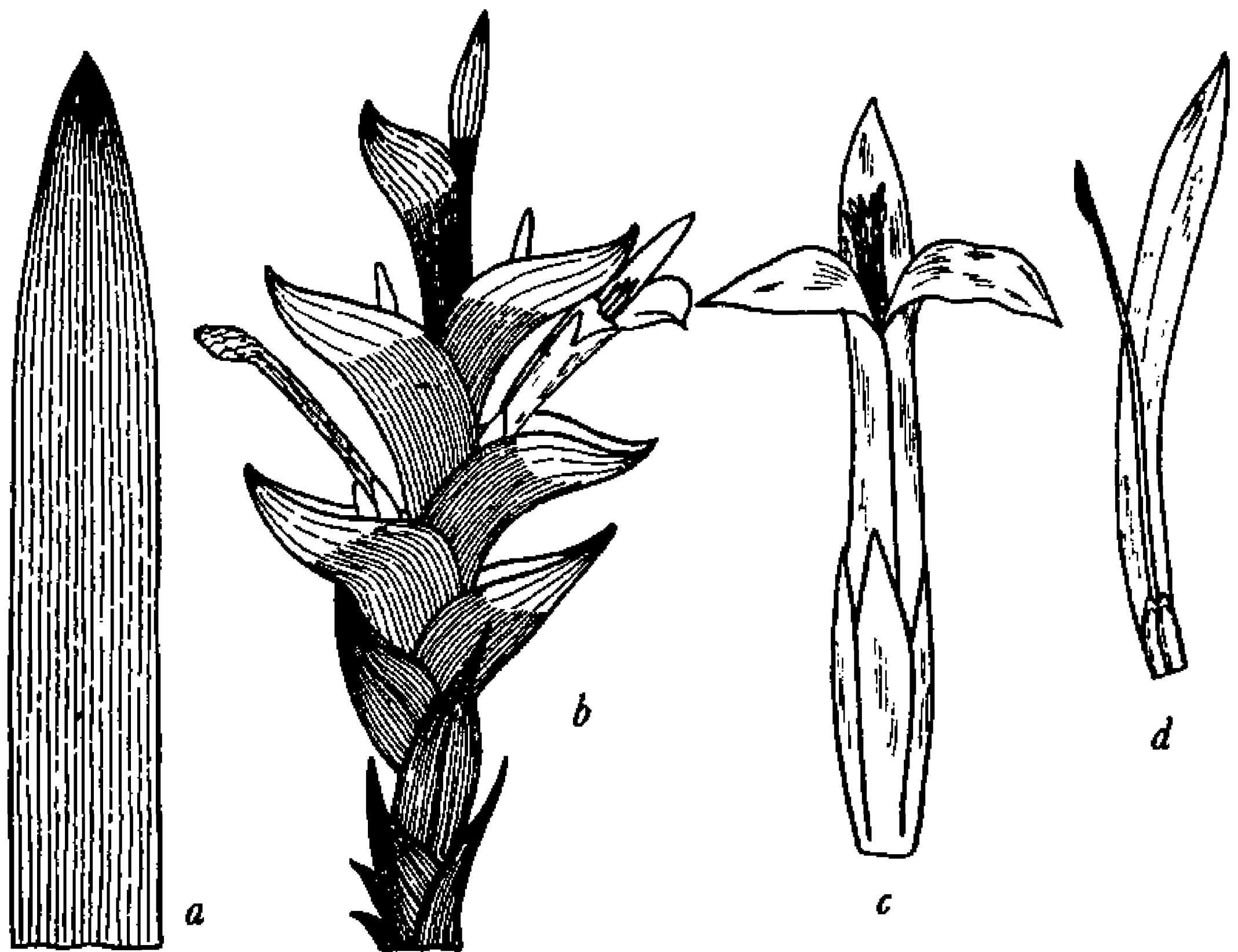


FIGURE 53.—*Vriesia heliconioides*: *a*, Apex of leaf,  $\times \frac{1}{2}$ ; *b*, inflorescence,  $\times \frac{1}{2}$ ; *c*, flower,  $\times 1$ ; petal and stamen,  $\times 1$  (all after Antoine).

petals white, ligulate, acute, each bearing 2 ovate obtuse entire scales; stamens shorter than the petals; filaments not at all dilated apically; capsule about 5 cm. long; coma reddish brown.

GUAJIRA: Epiphyte, forest along stream, 13 km. south of Carraipia, alt. 400 m., Aug. 2, 1944, *Haught* 4285 (US).

NORTE DE SANTANDER: Rain forests, Orú on pipeline, alt. 540 m., Sept. 17, 1946, *Foster* 1736 (GH, US).

SANTANDER: Common in trees along creek, vicinity of Barranca Bermeja, Magdalena Valley between Sogamoso and Colorado Rivers, alt. 100–500 m., July 2, 1934, *Haught* 1297 (GH, US). Epiphytic, 15 leagues southeast of Barranca Bermeja, 3 km. from the left bank of Río Opón, alt. 200 m., Oct. 9, 1954, *Romero Castañeda* 5008 (COL); 5046 (COL).

META: Epiphyte, Caño Yerli, between Río Güejar and Caño Guaypayita, alt. 500–600 m., Dec. 20–28, 1950, *Idrobo & Schultes* 777 (US).

TOLIMA: Espinal, 1801, *Humboldt & Bonpland* (P, type; GH phot. 3030).

VALLE: Las Juntas del Dagua, Cali, alt. 0–500 m., *Lehmann* 7768 (K).

CENTRAL AMERICA and COLOMBIA to BOLIVIA and southwestern BRASIL.

17. *Vriesia simplex* (Vell.) Beer, Bromel. 97. 1857.

*Tillandsia simplex* Vell. Fl. Fluminensis 133. 1825; Icon. 3: pl. 180. 1835.

Plant 4–7 dm. high with the inflorescence extended; leaves 10–12 in an infundibuliform rosette, 3–4 dm. long, sheaths broadly elliptic, 7–10 cm. long, minutely lepidote, blades linear-oblongate, broadly acute or rounded and apiculate, 15–35 mm. wide, flat, obscurely lepidote beneath, concolorous; scape decurved, very slender; scape-bracts erect, broadly elliptic, apiculate, chartaceous, red with yellow or green apices; inflorescence very lax, 2–3 cm. long, 8–12-flowered, glabrous; axis flexuous to strongly geniculate; floral bracts broadly ovate, 35–50 mm. long and more than half as wide, completely enfolding the base of the flower and its margins overlapping, carinate toward the apex, chartaceous; pedicels slender, 8–20 mm. long; sepals elliptic, obtuse, 3–4 cm. long, usually much exceeding the bracts; petals 10–15 mm. longer than the sepals, yellow; stamens exserted.

MAGDALENA: On tree, forest, Mount Cuaco, alt. 1,350 m., 1898–99, *H. H. Smith* 2856 (NY, GH phot. 5160).

TRINIDAD, BRASIL.

18. *Vriesia gladioliflora* (Wendl.) Ant. Wiener Ill. Gart. 5:98. 1880.

*Tillandsia gladioliflora* Wendl. Hamb. Gartenz. 19:31. 1863.

Plant up to 1 meter high; leaves rosulate, 6 dm. long, purplish when young, becoming deep green especially above, sheaths elliptic, inconspicuous, densely lepidote with brown punctiform scales, blades ligulate, broadly acute or obtuse, apiculate, 6–8 cm. wide, unmarked, glabrous above, obscurely punctulate-lepidote beneath; scape erect, very stout; scape-bracts exceeding the internodes, elliptic, abruptly acute; inflorescence subcylindric at anthesis, acute, 2–4 dm. long, up to 5 cm. wide; floral bracts very broadly ovate, obtuse or broadly subacute, 45–55 mm. long, ecarinate, equaling to much exceeding the sepals, three to four times as long as the internodes, coriaceous, glabrous, green, purplish toward the apex, becoming buff when dry; flowers suberect, slightly or not at all secund; pedicels very short and stout; sepals broadly elliptic, obtuse, 20–45 mm. long, coriaceous; petals ligulate with suborbicular blade, 4–7 cm. long, greenish white, bearing 2 obovate subincised scales at the base; stamens and pistil shorter than the petals.

NORTE DE SANTANDER: On trees, Bellavista on pipeline, alt. 750 m., Sept. 15, 1946, *Foster* 1693 (GH, US).

VAUPÉS: Epiphytic, Caño Teemeefia, Río Piraparaná (tributary of Río Apaporis), lat. 0°15' S. to 0°25' N., long. 70°30' W., Sept. 6, 1952, *Schultes & Cabrera* 17248 (COL, US).

AMAZONAS: Epiphytic, Río Ricapuyá (tributary of Río Apaporis below mouth of Río Piraparaná), alt. 210 m., lat. 0°25' S., long. 70°30' W., Sept. 25, 26, 1952, *Schultes & Cabrera* 17640 (COL, US).

VALLE: Epiphyte, coastal thickets, Buenaventura Bay, Feb. 3, 1939, *Killip*

33018 (GH, US). Epiphyte, dense forest, Córdoba, Feb. 17, 1939, *Killip & García* 33455 (US). Epiphyte in mangrove swamp, north shore of Buenaventura Bay, near sea level, June 2, 1944, *Killip & Cuatrecasas* 38620 (US). Epiphyte, mangrove swamp, Estero de Bodegas, south shore of Buenaventura Bay, June 2, 1944, *Killip & Cuatrecasas* 38673 (US).

NARIÑO: In trees, Altaquer, alt. 1,050 m., Nov. 11, 1946, *Foster* 2127 (GH). On trees, Barbacoas, Río Nembí, alt. 450 m., Nov. 16, 1946, *Foster* 2190 (GH).

GUATEMALA to COLOMBIA.

**19. *Vriesia verrucosa*** L. B. Smith, *Phytologia* 5:44, *pl. 5, figs. 4, 5.* 1954.

Stemless, 4 dm. high; leaves few, subfasciculate, 25 cm. long, sheaths elliptic, small and inconspicuous, blades ligulate, acute with a linear soft cusp 1 cm. long, flat, 2 cm. wide, green; scape erect, slender; scape-bracts imbricate and tightly enfolding the scape, elliptic, acute, thin, even, obscurely punctulate-lepidote; inflorescence lax with a sterile rudiment at apex; axis slender, flexuous, enlarged and verrucose below each node; floral bracts not imbricate, ovate, 3 cm. long, much exceeding the sepals, ecarinate, very obscurely lepidote, nerveless when dry, probably somewhat fleshy in life; flowers more or less secund; pedicels obconic, 5 mm. long; sepals broadly elliptic, about 2 cm. long, ecarinate, nerveless and rugulose; capsule slenderly ellipsoid, acute, 3 cm. long.

NARIÑO: On trees, Las Mesas, near Pepino, alt. 1,350 m., Nov. 22, 1946, *Foster* 2224 (GH, type, US phot. 3501).

**20. *Vriesia socialis*** L. B. Smith, *Bot. Mus. Leaflet*, Harvard 12:121, *fig.* 1946.

Plant 5–27 dm. high; leaves 1 meter long, sheaths broadly elliptic, 25 cm. long, densely and minutely ferruginous-lepidote, blade ligulate, acute, cuspidate, 6–7 cm. wide, obscurely punctulate-lepidote beneath; scape straight, 8–10 mm. in diameter, glabrous; scape-bracts erect, elliptic, acute, membranaceous, obscurely punctulate-lepidote; inflorescence erect, 6–26-flowered, 10–36 cm. long, glabrous; rhachis flexuous; floral bracts becoming secund with the flowers, ovate, acute, ecarinate, to 25 mm. long, barely exceeding the internodes, membranaceous; flowers subspreading; pedicels stout, 7 mm. long; sepals suboblong, to 4 cm. long, 9 mm. wide, ecarinate, thin; petals slightly exceeding the sepals; stamens included; capsule stout, ellipsoid, to 24 mm. long.

VAUPÉS: Forming dense masses with *Vriesia chrysostachys* on rocks, savanna along banks of Caño Pacú, affluent of Vaupés near Tayasú and Circasia, alt. 280 m., Mar. 6, 1944, *Schultes* 5826-A (GH, type, US phot. 4069). Terrestrial in huge colonies, caatinga, San Felipe (El Castillo), below confluence of Río Guainía and Casiquiare, Río Negro, Dec. 12, 1947, *Schultes & López* 9320 (US). Terrestrial, savanna of Caño Teemeefia, Río Piraparaná (tributary of Río Apaporis), lat. 0°15' S. to 0°25' N., long. 70°30' W., Sept. 15, 1952, *Schultes & Cabrera* 17478 (COL, GH, US). Terrestrial, Cerro E-ree-eé-kö-mee-ö-kee, Río Piraparaná (tributary of Río Apaporis), Sept. 18, 1952, *Schultes & Cabrera* 17497 (COL, US).

Same, Caño Paca, Sept. 19, 1952, *Schultes & Cabrera* 17566 (COL, GH, US). Terrestrial, near Puerto Colombia (opposite Venezuelan town of Maroa), Río Guainía, alt. 240–255 m., lat. 2°40' N., long. 67°30' W., Oct. 31–Nov. 2, 1952, *Schultes, Baker & Cabrera* 18163 (COL, US).

21. *Vriesia ringens* (Griseb.) Harms, Notizbl. Bot. Gart. Berlin 10:801. 1929.

*Tillandsia ringens* Griseb. Cat. Pl. Cub. 255. 1866.

*Vriesia paniculata* Mez in DC. Monogr. Phan. 9:614. 1896, as to material cited, not as to basonym.

Flowering plant very variable in size; leaves up to 9 dm. long, sheaths ovate-elliptic, mostly indistinct, brown-punctulate-lepidote, blades ligulate, acute or acuminate, green or occasionally with a faint purplish tinge, concolorous or obscurely banded, obscurely punctulate-lepidote beneath; scape erect, stout; scape-bracts elliptic-lanceolate, acute, pale green; inflorescence up to 5 dm. long; primary bracts like the scape-bracts but thinner, much shorter than the axillary branches; branches suberect, few-flowered, bearing several imbricate sterile bracts at the base; rachis usually slender; floral bracts very broadly ovate, acuminate, 30–65 mm. long, enfolding the flowers, exceeding the sepals of at least the lower flowers, straight, carinate toward the apex, green or brownish; flowers erect, up to 8 cm. long, glabrous; sepals elliptic, acuminate, 25–35 mm. long, 13 mm. wide, subcoriaceous, lustrous; petals white or yellow, coiling-recurved, shorter than the stamens, flaccid, bearing 2 large spatulate acute scales at the base.

BOLIVAR: Epiphytic, coastal thickets, alt. 0–10 m., Oct. 5–10, 1922, *Pennell* 11736 (GH).

VALLE: Epiphytic, coastal thickets, Puntarenas, Buenaventura Bay, Feb. 3, 1939, *Killip* 33019 (GH, US).

COSTA RICA, PANAMA, WEST INDIES.

22. *Vriesia sanguinolenta* Cogn. & Marchal, Pl. Ornem. pl. 52. 1874.

*Tillandsia sanguinolenta* Baker, Handb. Bromel. 226. 1889.

Leaves about 10 in a dense rosette, suberect, 6–7 dm. long, green, usually with large irregular spots of deep red especially near the base, obscurely punctulate-lepidote, sheaths ovate-elliptic, the same color as the blades and but slightly broader, blades ligulate, acute or subrounded with a long apiculus, 8–10 cm. wide; scape erect, greatly exceeding the leaves, well over 1 cm. in diameter at the summit, glabrous; scape-bracts erect, very broadly ovate, acute or the lower ones triangular-laminate, glabrous, even, thick, coriaceous; inflorescence simple or laxly few-branched, up to 4 cm. long; primary bracts suberect, like the upper scape-bracts, covering only the sterile bases of the branches; branches suberect, 11–15-flowered, the lateral ones 25 cm. long with 1 or 2 sterile bracts at the base, the terminal one nearly 4 dm. long with a sterile base as long as the fertile part and appearing like a continuation of the scape; rachis flexuous, glabrous; floral bracts becoming secund with the flowers, suborbicular, abruptly acute, up

to 5 cm. long, more than twice as long as the internodes, glabrous, even, rigid, coriaceous, green, drying to light brown, incurved and carinate toward the apex; flowers spreading and downwardly secund; pedicels very stout, up to 12 mm. long; sepals very broadly elliptic, obtuse or broadly acute, 30–45 mm. long, rigid, coriaceous, even and glabrous outside; petals white, about 4 cm. long.

COLOMBIA: Cultivated, January 1880, *F. Massange* (LG, GH phot. 2857). Cultivated, May 14, 1885, *E. Morren* (LG, GH phot. 2856).

NORTE DE SANTANDER: On trees and palm trunks, near Orú on pipeline, alt. 480 m., Sept. 23, 1946, *Foster* 1761 (GH).

VALLE: Epiphytic, coastal thickets, Buenaventura, alt. 0–10 m., Oct. 5–10, 1922, *Killip* 11736 (GH).

CUBA, COSTA RICA, PANAMA.

23. *Vriesia killipiana* L. B. Smith, *Phytologia* 5:42, *pl. 5, figs. 1–3*. 1954.

FIGURE 54

Stemless, 1.2 meters high; leaves 6–8 dm. long, minutely brown-lepidote, sheaths large, elliptic, slightly broader than the blades, dark castaneous on the outside, blades ligulate, acute, flat, 11 cm. wide,

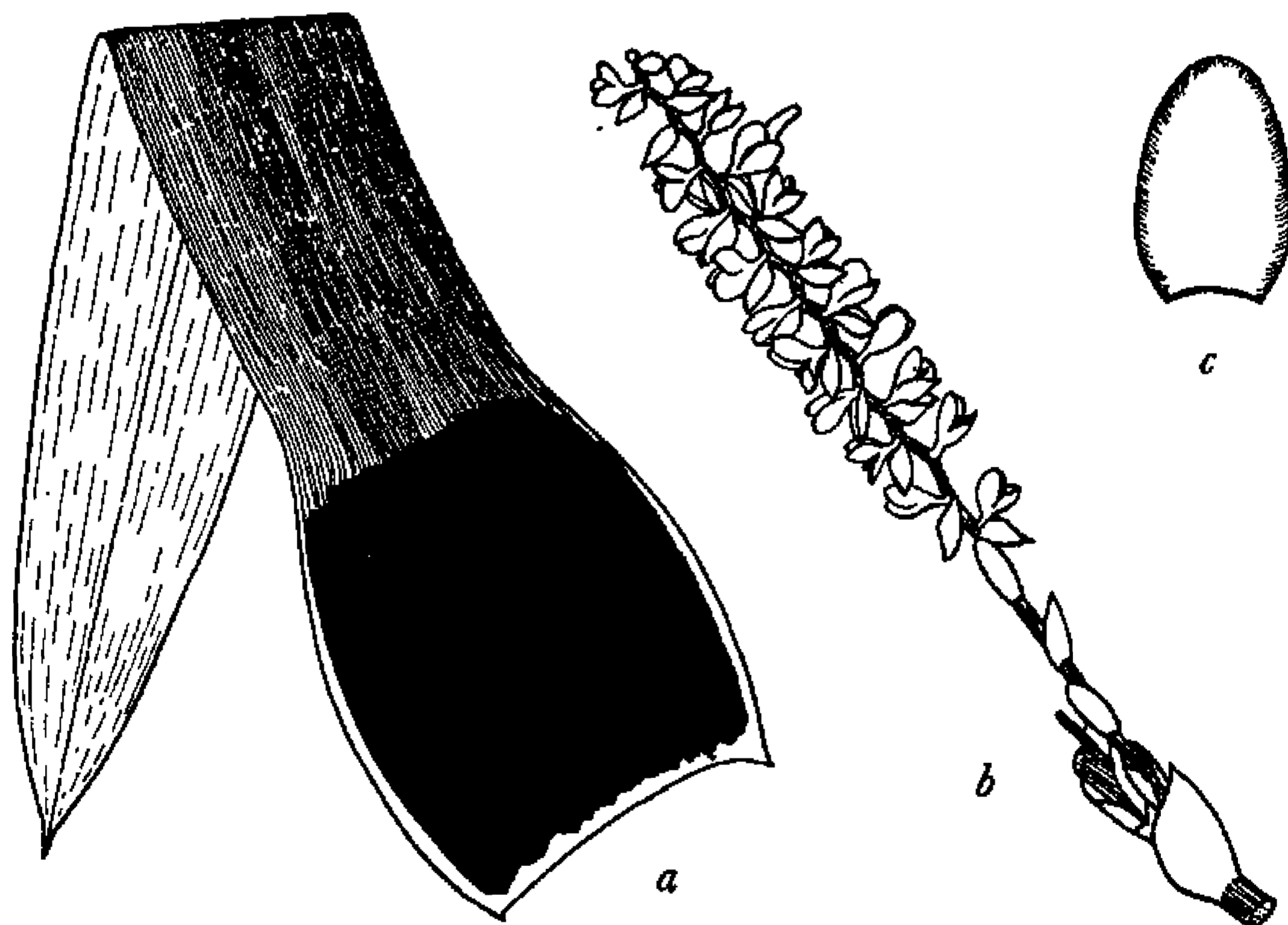


FIGURE 54.—*Vriesia killipiana*: *a*, Leaf,  $\times \frac{1}{6}$ ; *b*, branch of inflorescence,  $\times \frac{1}{6}$ ; *c*, sepal,  $\times 1$  (all after L. B. Smith).

obscurely mottled with dark green; scape stout; scape-bracts imbricate, the lower subfoliaceous, the upper broadly ovate and apiculate; inflorescence much branched; primary bracts like the upper scape-bracts, several times shorter than the long sterile bases of the branches; branches strict, 4 dm. long, laxly prophyllate at the base, many-flowered; axis slightly flexuous, stout; floral bracts broadly ovate, in-

flated, ecarinate, to 3 cm. long, from equaling to slightly shorter than the sepals, coriaceous, even, glabrous; pedicels stout, about 1 cm. long; sepals ecarinate.

VALLE: Epiphytic, mangrove swamp, Punta Arenas, north shore of Buenaventura Bay, near sea level, June 2, 1944, *Killip & Cuatrecasas* 38619 (US, type; F, GH).

24. *Vriesia viridiflora* (Regel) Wittm. ex. Mez in Engl. Pflanzenreich IV. 32:387, 1935.

*Pitcairnia viridiflora* Regel, Ind. Sem. Hort. Petrop. for 1866: 81. 1867.

*Tillandsia viridiflora* Regel, Ind. Sem. Hort. Petrop. for 1866: 81. 1867, nomen, in synonym.

*Vriesia viminalis* E. Morr. Belg. Hort. 28:257, pl. 14, 15. 1878.

*Tillandsia viminalis* Hemsl. Biol. Centr. Am. Bot. 3:323. 1884.

Leaves densely rosulate, up to 55 cm. long, blades ligulate, acuminate, 3–4 cm. wide, green, concolorous, glabrous above, obscurely punctulate beneath; scape erect, 4 mm. in diameter, elongate; scape-bracts erect and tubular-involute, broadly elliptic, acute, stramineous; inflorescence 15–18 cm. long; floral bracts becoming secund with the flowers, very broadly ovate, obtuse, equaling the sepals, ecarinate, thin-coriaceous, minutely verrucose near the apex, green with brownish tips; flowers suberect; pedicels stout, 4–5 mm. long; sepals elliptic, obtuse, 15–20 mm. long; petals oblong, subtruncate and emarginate, about 4 cm. long, white, spreading above the sepals, each bearing 2 acute serrulate scales at the base; stamens slightly shorter than the petals; capsule fusiform, 4 cm. long; coma white.

NORTE DE SANTANDER: Very moist rain forests, Camp 84, on pipeline, Sept. 16, 1946, *Foster* 1728 (GH).

NARIÑO: In trees, Altaquer, alt. 1050 m., Nov. 11, 1946, *Foster* 2128 (GH).

COSTA RICA, BRITISH GUIANA.

25. *Vriesia vexillata* L. B. Smith, Bot. Mus. Leaflet Harvard 17:72, pl. 21, figs. 1, 2. 1955.

Plant 85 cm. high; leaves to 53 cm. long, obscurely punctulate-lepidote, sheaths broadly elliptic, 7 cm. long, blades ligulate, acuminate, 25 mm. wide, purple toward the base; scape straight, very slender; scape-bracts strict, closely enfolding the scape, lanceolate, chartaceous, glabrous, purple when dry; inflorescence lax, at least 4-flowered, glabrous; floral bracts secund with the flowers, broadly elliptic, apiculate, to 35 mm. long, thin, nerved, ecarinate; pedicels slender, 5 mm. long; sepals elliptic, obtuse, 25 mm. long, exerted, thin, nerved, castaneous; petals slightly exceeding the sepals, pale yellow when dry; stamens included; capsule slenderly ellipsoid, slightly exceeding the sepals, long-beaked.

VAUPÉS: Epiphytic, caatinga forest, Teresita, Río Papurí, May 27, 1953, *Schultes & Cabrera* 19443 (US, type).

26. *Vriesia splitgerberi* (Mez) L. B. Smith & Pittendrigh, Journ. Washington Acad. Sci. 43:403. 1953.

*Guzmania splitgerberi* Mez in DC. Monogr. Phan. 9:930. 1896.

*Thecophyllum splitgerberi* Pittendrigh, Evolution 2:60. 1948.

Plant 1–1.5 meters high; leaves in a spreading rosette, 4–12 dm. long, minutely pale-lepidote, sheaths elliptic, 12–15 cm. long, pale brown, blades ligulate, acuminate, 4–7 cm. wide, green; scape erect, 12 mm. in diameter; scape-bracts densely imbricate, subfoliaceous; inflorescence bipinnate, dense toward the apex, more or less interrupted below 2–6 cm. long, 1–2 dm. in diameter; primary bracts spreading, broadly ovate, the lower with a narrowly triangular blade exceeding the spikes, the upper apiculate and shorter than the spikes; spikes divergent to spreading, stipitate, densely ovoid or ellipsoid, 5–7 cm. long; floral bracts broadly elliptic, obtuse, to 33 mm. long, exceeding the sepals, subchartaceous, carinate toward the apex, minutely lepidote; flowers subsessile; sepals subfree, oblong, rounded and apiculate, 20–24 mm. long, coriaceous, even, lustrous; petals linear, obtuse, 25 mm. long, white, bearing 2 linear obtuse largely adnate scales; capsule about equaling the sepals; coma white.

AMAZONAS-VAUPÉS; Epiphytic, Soratama, between Río Pacoa and Río Kananari, alt. 250 m., June 21, 1951, *Schulles & Cabrera* 12757 (COL, US). Same, Aug. 31, 1951, *Schulles & Cabrera* 13804 (COL, US).

COSTA RICA, VENEZUELA, TRINIDAD, SURINAM, BRITISH GUIANA.

27. *Vriesia capituligera* (Griseb.) L. B. Smith & Pittendrigh, Journ. Washington Acad. Sci. 43:402. 1953. FIGURE 55

*Tillandsia capituligera* Griseb. Cat. Pl. Cub. 254. 1866.

*Tillandsia fastuosa* André, Énum. Bromél. 8. Dec. 13, 1888; Rev. Hort. 60:568. Dec. 16, 1888.

*Guzmania fastuosa* André ex Mez in DC. Monogr. Phan. 9:926. 1896.

*Guzmania capituligera* Mez in DC. Monogr. Phan. 9:926. 1896.

*Schlumbergeria capituligera* Harms, Notizblatt 10:804. 1929.

*Thecophyllum fastuosum* Mez in Engl. Pflanzenreich IV. 32:423. 1935.

Stemless, 5–8 dm. high; leaves numerous, 7 dm. long, sheaths inconspicuous, brown, densely and minutely brown-lepidote, blades ligulate, acuminate, 6–8 cm. wide, glabrous above, obscurely punctulate-lepidote beneath; scape straight, stout; scape-bracts densely imbricate, foliaceous, red or green; inflorescence columnar, 3–5 dm. long; primary bracts divergent to spreading, suborbicular, the lower ones exceeding the axillary spikes and bearing a narrowly triangular acuminate blade; spikes on a stout stipe up to 1 cm. long, subglobose, corymbose, 3–4 cm. in diameter; floral bracts broadly elliptic or ovate, obtuse and apiculate, 25–30 mm. long, equaling or exceeding the sepals, chartaceous, prominently nerved; flowers erect on short stout pedicels, complanate; sepals elliptic, obtuse, 2 cm. long, ecarinate,

coriaceous, even, glabrous; petals linear, obtuse, 28 mm. long, bearing 2 scales near the base, white; capsule slenderly ellipsoid, barely exceeding the sepals.

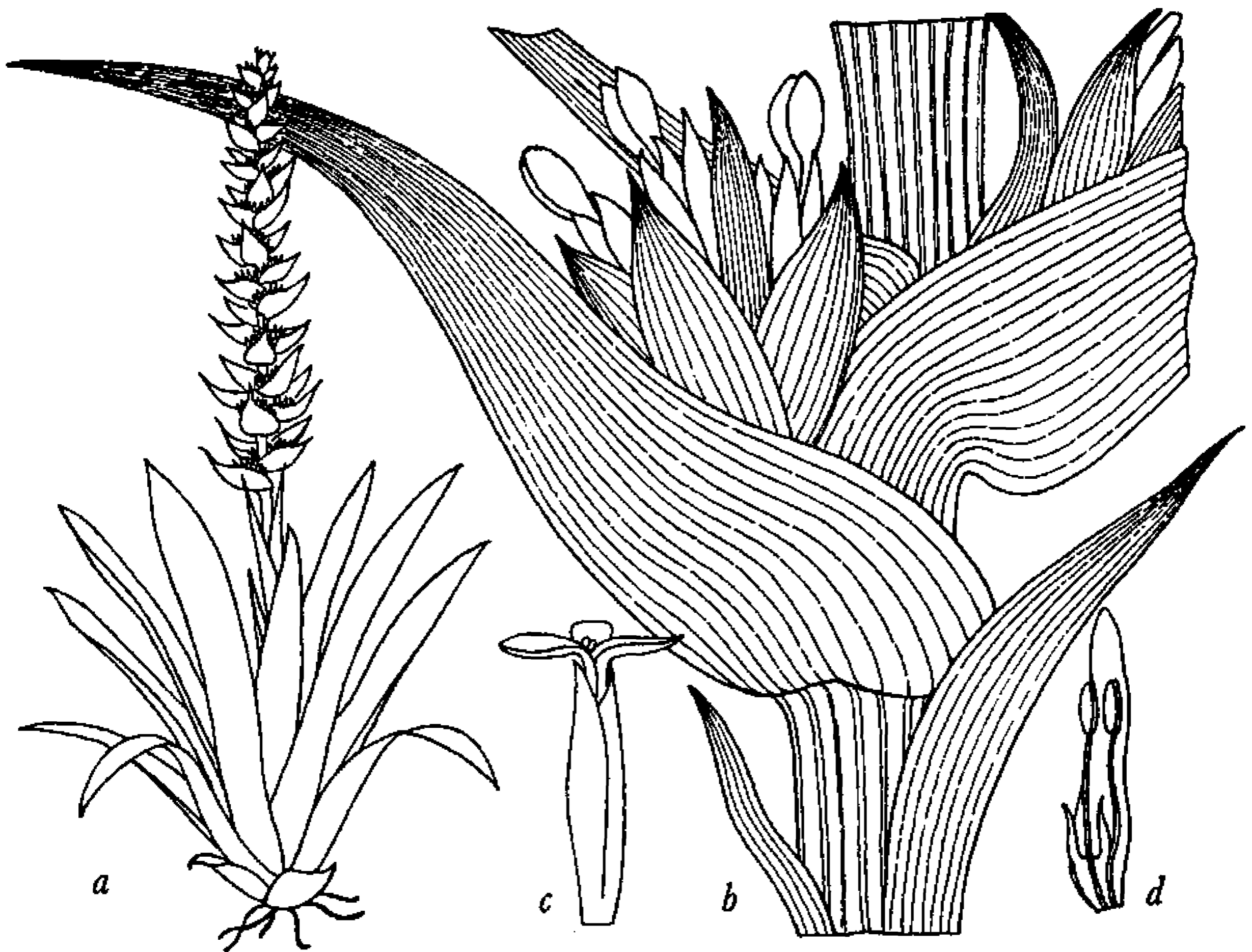


FIGURE 55.—*Vriesia capituligera*: *a*, Habit,  $\times \frac{1}{10}$ ; *b*, section of inflorescence,  $\times 1$ ; *c*, flower,  $\times 1$ ; *d*, petal and stamens,  $\times 1$  (all after André).

CUNDINAMARCA: On trees, Barroblanco, near Fusagasugá, alt. 2,900 m. February 1876, André 1746 (K, type of *Tillandsia fastuosa* André; F, NY, GH phot. 6123).

VALLE: Forest above La Cumbre, alt. 1,800–2,100 m., May 14–19, 1922, Pennell & Killip 5737 (GH). Same, 5747 (US). Woods, La Laguna, left bank of Río Sanquiní, western slope of Cordillera Occidental, alt. 1250–1400 m., Dec. 10–20, 1943, Cuatrecasas 15594 (GH).

CAUCA: Epiphytic, road to Pandiguando, El Tambo District, alt. 1,750 m., Aug. 24, 1949, Idrobo & Fernández 276 (COL, US).

NARIÑO: In trees, Altaquer, alt. 1,050 m., Nov. 11, 1946, Foster 2129 (GH, US). On trees, Las Mesas, near Mocoa, alt. 1,350 m., Nov. 22, 1946, Foster 2225 (GH).

WEST INDIES, VENEZUELA.

23. *Vriesia hygrometrica* (André) L. B. Smith & Pittendrigh, Journ. Washington Acad. Sci. 43:402. 1953.

*Caraguata hygrometrica* André, Énum. Bromél. 6. Dec. 13, 1888; Rev. Hortic. 60:566. Dec. 16, 1888.

*Guzmania hygrometrica* André ex Mez in DC. Monogr. Phan. 9:919. 1896.

*Thecophyllum hygrometricum* Mez, Bull. Herb. Boiss. II. 3:131. 1903.



Stemless, 5 dm. high; leaves 25 cm. long, sheaths inconspicuous, with a glaucous paintlike coat of scales over dark castaneous epidermis, blades ligulate, broadly acute or rounded and apiculate, 35–50 mm. wide, tessellate, glabrous; scape straight, stout; scape-bracts strict, densely imbricate, deltoid-acute and apiculate, tessellate, the lower lanceolate, the upper ovate; inflorescence cylindric, 7–8 cm. long, few-flowered; primary bracts like the upper scape-bracts, much exceeding the flowers; floral bracts broadly elliptic, acute, exceeding the sepals, thin, soon disintegrating; pedicels short; sepals elliptic, broadly rounded, 15 mm. long, coriaceous; petals white; stamens free; capsule slenderly ellipsoid, trigonous, 25 mm. long.

VALLE: Alto de San Antonio near Cali, Apr. 2, 1876, *André* 2638 in part (K, GH phot. 2661). Epiphytic, forest on peak southeast of La Cumbre, Cordillera Occidental, alt. 2,150–2,400 m., May 14–19, 1922, *Pennell & Killip* 5804 (GH).

NARIÑO: Very dense wet woods, Altaquer, alt. 1,050 m., May 1876, *André* 2638 in part (! *André*, type). Same, Nov. 10, 1946, *Foster* 2074 (COL, GH). Epiphytic, below Altaquer, Río Cuacuquere, alt. 900 m., Nov. 12, 1946, *Foster* 2144 (COL, US phot. 4368). On trees, Ricaurte, alt. 1,200 m., Nov. 15, 1946, *Foster* 2184 (GH). Epiphytic, Barbacoas, Río Nembi, alt. 450 m., Nov. 16, 1946, *Foster* 2196 (COL, GH). On rocks, near San Francisco, alt. 2,400 m., Nov. 26, 1946, *Foster* 2261 (GH).

## 7. *Guzmania*

*Guzmania* R. & P. Fl. Peruv. 3:37. 1802.

*Caraguata* Lindl. Bot. Reg. 13: under *pl.* 1068. 1827.

*Devillea* Bertero ex Schult. in R. & S. Syst. Veg. 7, pt. 2:1229. 1830, hyponym.

*Massangea* E. Morren, Belg. Hort. 27:59, 199. 1877.

*Sodihoa* André, Bull. Soc. Bot. France 24:167. 1877.

*Schlumbergera* E. Morren, Belg. Hort. 33:46. 1883, not Lemaire 1858.

*Thecophyllum* André, Bromel. Andr. 107. 1889.

Acaulescent or rarely long-caulescent mostly epiphytic plants; leaves entire, the sheaths usually conspicuous; inflorescence simple or compound, the spikes always polystichous-flowered; flowers perfect; sepals usually somewhat connate; petals closely agglutinated but not truly connate, naked, yellow or white; stamens usually included, the filaments more or less agglutinated to the petals; ovary wholly superior, pyramidal, ellipsoid or ovoid, glabrous; ovules many, densely glomerate; capsule septicidal; seeds with a long, basal, straight, usually brownish coma.

Predominantly Andean with a few species in Central America, the West Indies, Venezuela, Guiana, and Brasil.

## KEY

1. Inflorescence compound.
  2. Flowers on definite branches, not fasciculate; primary bracts not foliaceous.
    3. Inflorescence lax at least at base, pinnate; lower spikes usually stipitate.
      4. Lowest branches divided; inflorescence 3-4-pinnate.
        5. Pedicels stout, shorter than the floral bracts; sepals 12-15 mm. long.
          6. Leaves broadly acute or rounded and apiculate; branches short and densely flowered.
 

**1. *G. candelabrum***
          6. Leaves acuminate or subacuminate; branches 8-21 cm. long, lax. . . . . **2. *G. diffusa***
        5. Pedicels slender, equaling or exceeding the floral bracts; sepals 8 mm. long. . . . . **3. *G. punnellii***
      4. Lowest branches simple; inflorescence bipinnate.
        7. Spikes 5-25 cm. long, lax; flowers not all contiguous.
          8. Leaves and primary bracts with thick pungent apices.
            9. Floral bracts coriaceous, much shorter than the sepals; sepals obtuse, 16-20 mm. long.
 

**4. *G. costaricensis***
            9. Floral bracts thin, equaling or exceeding the sepals; sepals acute, 25 mm. long. . . . . **5. *G. pungens***
          8. Leaves and primary bracts uniform in thickness and texture.
            10. Sepals acute, straight; scape-bracts imbricate.
 

**6. *G. brasiliensis***
            10. Sepals obtuse, cucullate.
              11. Scape-bracts imbricate; primary bracts about equaling or exceeding the short sterile bases of the branches; sepals 20-25 mm. long.
 

**7. *G. scherzeriana***
              11. Scape-bracts lax; primary bracts much shorter than the elongate sterile bases of the branches; sepals 10 mm. long. . . . . **8. *G. rhonhofiana***
  7. Spikes not over 4 cm. long or else dense with all the flowers contiguous.
    12. Leaf-blades 5-12 mm. wide, graminiform, acuminate; floral bracts thin, prominently nerved.
 

**9. *G. calamifolia***

12. Leaf-blades 15–60 mm. wide, mostly ligulate.
13. Floral bracts equaling or exceeding the sepals.
14. Branches pendulous; leaf-blades 60 mm. wide, broadly acute.....*10. G. bakeri*
14. Branches erect to spreading.
15. Sepals coriaceous, even, 15 mm. long, opaque, lepidote.....*11. G. pleiosticha*
15. Sepals rather thin, distinctly nerved, 25–30 mm. long; leaf-apices subulate-indurate.
16. Primary bracts broadly ovate, much shorter than the branches; sepals obtuse.  
*12. G. amplectens*
16. Primary bracts narrowly lanceolate, about equaling the lower branches; sepals acute.  
*5. G. pungens*
13. Floral bracts shorter than the sepals.
17. Sepals 8–17 mm. long.
18. Spikes 10 cm. long; floral bracts truncate, membranaceous; sepals acute, 17 mm. long.  
*13. G. stricta*
18. Spikes 2–6 cm. long.
19. Flowers all contiguous; spikes dense.
20. Scape-bracts lax; primary bracts many times shorter than the spikes; inflorescence of 2–6 spikes, very lax.  
*14. G. patula*
20. Scape-bracts imbricate; primary bracts about equaling or exceeding the lower branches; inflorescence of more than 6 spikes, dense toward apex.
21. Axis of the inflorescence geniculate, dark; floral bracts with a thick apical cusp.  
*15. G. geniculata*
21. Axis of the inflorescence not more than flexuous; floral bracts thin with a membranous margin. . . *16. G. mitis*
19. Flowers not all contiguous; spikes lax at least at base; floral bracts and sepals prominently nerved.
22. Leaf-blades narrowly triangular, acuminate, densely cinereous-lepidote above, glabrous beneath, 15 mm. wide.  
*17. G. gracilior*

22. Leaf-blades ligulate, broadly acute or rounded and apiculate, obscurely and equally lepidote on both sides, to 50 mm. wide . . . . . **18. *G. multiflora***
17. Sepals 21–40 mm. long.
23. Spikes deflexed; flowers downwardly secund; leaves abruptly acute; sepals 40 mm. long.  
**19. *G. lehmanniana***
23. Spikes suberect to spreading; flowers not secund.
24. Floral bracts and sepals with broad thin crisped margins; spikes lax . **20. *G. radiata***
24. Floral bracts and sepals without distinctive margins; spikes dense.
25. Sepals free, 30 mm. long; leaf-blades glabrous. . . . . **21. *G. andreana***
25. Sepals connate for 3–5 mm., 21–25 mm. long; leaf-blades lepidote beneath.
26. Spikes 2–4-flowered; leaf-blades glabrous above . . . . . **22. *G. virescens***
26. Spikes to 8-flowered; leaf-blades lepidote on both sides . . . **23. *G. straminea***
3. Inflorescence dense throughout.
27. The inflorescence pinnate, much longer than wide.
28. Floral bracts equaling or exceeding the sepals; sepals 16 mm. long, acute, nearly half-connate.  
**24. *G. densiflora***
28. Floral bracts shorter than the sepals; sepals 10–14 mm. long, obtuse or truncate, short-connate.
29. Spikes subcylindric, 50 mm. long; sepals 14 mm. long.  
**25. *G. vanvolxemii***
29. Spikes globose or thick-ovoid, 25–30 mm. long; sepals 10 mm. long . . . . . **16. *G. mitis***
27. The inflorescence digitate or subdigitate, globose or nearly so.
30. Floral bracts prominently nerved.
31. Primary bracts broad, thin, red, forming a showy involucre . . . . . **26. *G. eduardii***
31. Primary bracts small, firm, inconspicuous.
32. Leaf-blades ligulate, 10–30 mm. wide; spikes dense.  
**27. *G. goudotiana***
32. Leaf-blades graminiform, 5–12 mm. wide, acuminate; spikes sublax . . . . . **9. *G. calamifolia***

30. Floral bracts even or faintly nerved.
33. Sepals covered by the floral bracts.
34. Scape- and primary bracts dark castaneous except their broad triangular apices; sepals acute.  
*28. G. glomerata*
34. Scape- and primary bracts wholly green with narrow blades; sepals obtuse. . . . . *29. G. acuminata*
33. Sepals partially exerted above the floral bracts.
35. Leaf-blades cross-barred, 15–25 mm. wide; sepals 15 mm. long, obtuse . . . . . *30. G. vittata*
35. Leaf-blades concolorous; sepals 10–12 mm. long.
36. Sepals acute; leaf-blades 10–15 mm. wide; floral bracts ecarinate . . . . . *31. G. subcorymbosa*
36. Sepals broadly obtuse; leaf-blades 30 mm. wide; floral bracts obtusely carinate.  
*32. G. sphaeroidea*
2. Flowers fasciculate in the axils of large generally foliaceous or subfoliaceous bracts; inflorescence bipinnate.
37. Floral bracts 6–8 cm. long, with membranaceous dilated apices; primary bracts spreading and exposing the axis.  
*33. G. wittmackii*
37. Floral bracts much smaller, their apices not notably dilated.
38. Sepals coriaceous, persistent, lanceolate; leaves acuminate; floral bracts partially coriaceous, persistent.  
*34. G. verecunda*
38. Sepals membranaceous, disintegrating after anthesis, usually connate.
39. Leaf-blades narrowly triangular, acuminate (the extreme apex abruptly acute in *G. mosquerae*); sepals 8–10 mm. long.
40. Flowering shoot 20 cm. high; leaf-blades 16 mm. wide, soon glabrous above; plant caulescent.  
*35. G. kraenzliniana*
40. Flowering shoot 35–55 cm. high; leaf-blades conspicuously cinereous-lepidote above.
41. Sepals from slightly to half exerted above the lanceolate floral bracts; leaf-blades densely lepidote on both sides . . . . . *36. G. mosquerae*
41. Sepals more than half exerted above the suborbicular floral bracts; leaf-blades soon glabrous beneath . . . . . *37. G. confinis*

39. Leaf-blades ligulate, broadly acute or rounded and apiculate; sepals 12–33 mm. long.
42. Primary bracts essentially glabrous.
43. Sepals 25–30 mm. long, nearly free; fascicles many-flowered . . . . . **38. *G. gloriosa***
43. Sepals 12–14 mm. long, high-connate; fascicles few-flowered.
44. Leaf-blades 15 mm. wide; inflorescence sublax; calyx-lobes acute . . . . . **39. *G. longipetala***
44. Leaf-blades 20–35 mm. wide; inflorescence dense; calyx-lobes suborbicular.
- 40. *G. sibundoyorum***
42. Primary bracts conspicuously lepidote.
45. Fascicles about 10-flowered.
46. Lower primary bracts overtopping the center of the inflorescence; scape-bracts white-lepidote on both sides; sepals 18–20 mm. long.
- 41. *G. cryptantha***
46. Lower primary bracts well exceeded by the center of the inflorescence.
47. Flowers subsessile; sepals 23 mm. long.
- 42. *G. lychnis***
47. Flowers slenderly pedicellate; sepals 33 mm. long. . . . . **43. *G. danielii***
45. Fascicles 2–5-flowered; sepals 20 mm. long.
- 44. *G. palustris***
1. Inflorescence simple.
48. Outer bracts of the inflorescence forming a cyathiform involucre 6 cm. or longer that exceeds and conceals the large flowers.
49. Scape lacking; inflorescence sunk in the leaf-rosette; flowers 7 cm. long; sepals connate for 4 mm. . . . **45. *G. sanguinea***
49. Scape evident; flowers not over 4.5 cm. long; sepals free.
50. Leaf-blades 30–40 mm. wide; floral bracts strongly cucullate . . . . . **46. *G. lingulata***
50. Leaf-blades not over 25 mm. wide; floral bracts slightly or not at all cucullate. . . . . **47. *G. minor***
48. Outer bracts of the inflorescence never concealing more than the lowest flowers.
51. Sepals free or connate for less than half their length.
52. Leaves broadly rounded and retuse-apiculate; floral bracts orbicular, coriaceous . . . . . **48. *G. retusa***

52. Leaves acute or acuminate.
53. Floral bracts coriaceous or subcoriaceous.
54. Scape-bracts remote; floral bracts strongly nerved.  
*49. G. pallida*
54. Scape-bracts densely imbricate.
55. Floral bracts shorter than the sepals, pale; inflorescence globose; leaves usually cross-banded  
*30. G. vittata*
55. Floral bracts covering the sepals, mostly castaneous or green, sometimes stramineous; inflorescence longer than broad; leaves never banded.
56. Sepals 35 mm. long, obscurely brown-lepidote; floral bracts dull, all but the lowest broadly rounded . . . . . *50. G. cylindrica*
56. Sepals 13-16 mm. long.
57. The sepals glabrous; floral bracts lustrous, castaneous or stramineous, the apex broadly triangular and obtuse . *51. G. coriostachya*
57. The sepals densely pale-lepidote; floral bracts dull, green toward the acuminate apex.  
*52. G. triangularis*
53. Floral bracts thin.
58. Inflorescence lax, elongate; flowers suberect to spreading; sepals acute . . . . . *6. G. brasiliensis*
58. Inflorescence dense; flowers and floral bracts imbricate.
59. Plant caulescent; leaf-blades not more than 10 mm. wide . . . . . *53. G. angustifolia*
59. Plant stemless; leaf-blades more than 10 mm. wide.
60. Floral bracts densely brown-lepidote; sepals acuminate. . . . . *54. G. calothyrsus*
60. Floral bracts glabrous or obscurely pale-lepidote; sepals broadly rounded.
61. Inflorescence fertile throughout; bracts all uniformly bright red . . . *55. G. melinonis*
61. Inflorescence sterile toward the apex; fertile bracts brown- or purple-striped.  
*56. G. monostachia*
51. Sepals connate for more than half their length.
62. Plants stemless
63. Inflorescence elongate, lax.
64. Leaf-blades ligulate . . . . . *57. G. sprucei*
64. Leaf-blades graminiform . . . . . *58. G. dissitiflora*
63. Inflorescence globose or subglobose, dense.

65. Leaf-blades ligulate, usually cross-lined.

59. *G. musaica*

65. Leaf-blades graminiform, concolorous. 60. *G. globosa*

62. Plants caulescent; leaf-blades graminiform.

66. Leaf-sheaths nearly concolorous with the blades.

67. Sepals not more than 25 mm. long; inflorescence  
4-8-flowered . . . . . 61. *G. graminifolia*

67. Sepals 40-55 mm. long; inflorescence 10-12-flowered.

62. *G. caricifolia*

66. Leaf-sheaths dark castaneous.

68. Scape exceeding the leaves, less than 1 mm. in diameter; scape-bracts mostly shorter than the internodes; inflorescence slenderly ellipsoid and dense before anthesis, becoming lax with spreading flowers.

63. *G. kalbreyeri*

68. Scape shorter than the leaves, over 1 mm. in diameter; scape-bracts always imbricate; inflorescence always dense.

69. Sepals acute; inflorescence 2- rarely 4-flowered.

64. *G. pearcei*

69. Sepals obtuse; inflorescence 4-6-flowered.

70. Upper scape-bracts with foliaceous blades exceeding the base of the inflorescence; sepals about 4 cm. long with free lobes 15-20 mm. long.

65. *G. obtusiloba*

70. Upper scape-bracts with short colored blades that do not attain the inflorescence; sepals 7 cm. long with free lobes 35 mm. long.

66. *G. sneidernii*

1. *Guzmania candelabrum* (André) André ex Mez in DC. Monogr. Phan. 9: 935. 1896. FIGURE 56

*Caraguata candelabrum* André, Énum. Bromél. 6. Dec. 13, 1888; Rev. Hort. 60:566. Dec. 16, 1888.

Plant over 1.5 meters high, spreading by stout stolons; leaves rosulate, 5-6 dm. long, punctulate-lepidote, sheaths large but only a little wider than the blades, often purplish toward base, blades ligulate, 4-6 cm. wide; scape erect, stout, dark red like its bracts and the inflorescence; scape-bracts strict, the lowest subfoliaceous and densely imbricate, the upper ovate, acute, and about equaling the internodes; inflorescence lax, 35-65 cm. long, narrow, tripinnate at base, bipinnate above; primary bracts broadly ovate, acute, barely exceeding the sterile base of the branch; branches decurved with downwardly secund



flowers, 5–9 cm. long; floral bracts ovate, 8 mm. long, thin, nerved; pedicels stout, 6 mm. long; sepals subelliptic, obtuse, short-connate, nerved, glabrous; petals 24 mm. long, white, the blades spreading, elliptic.

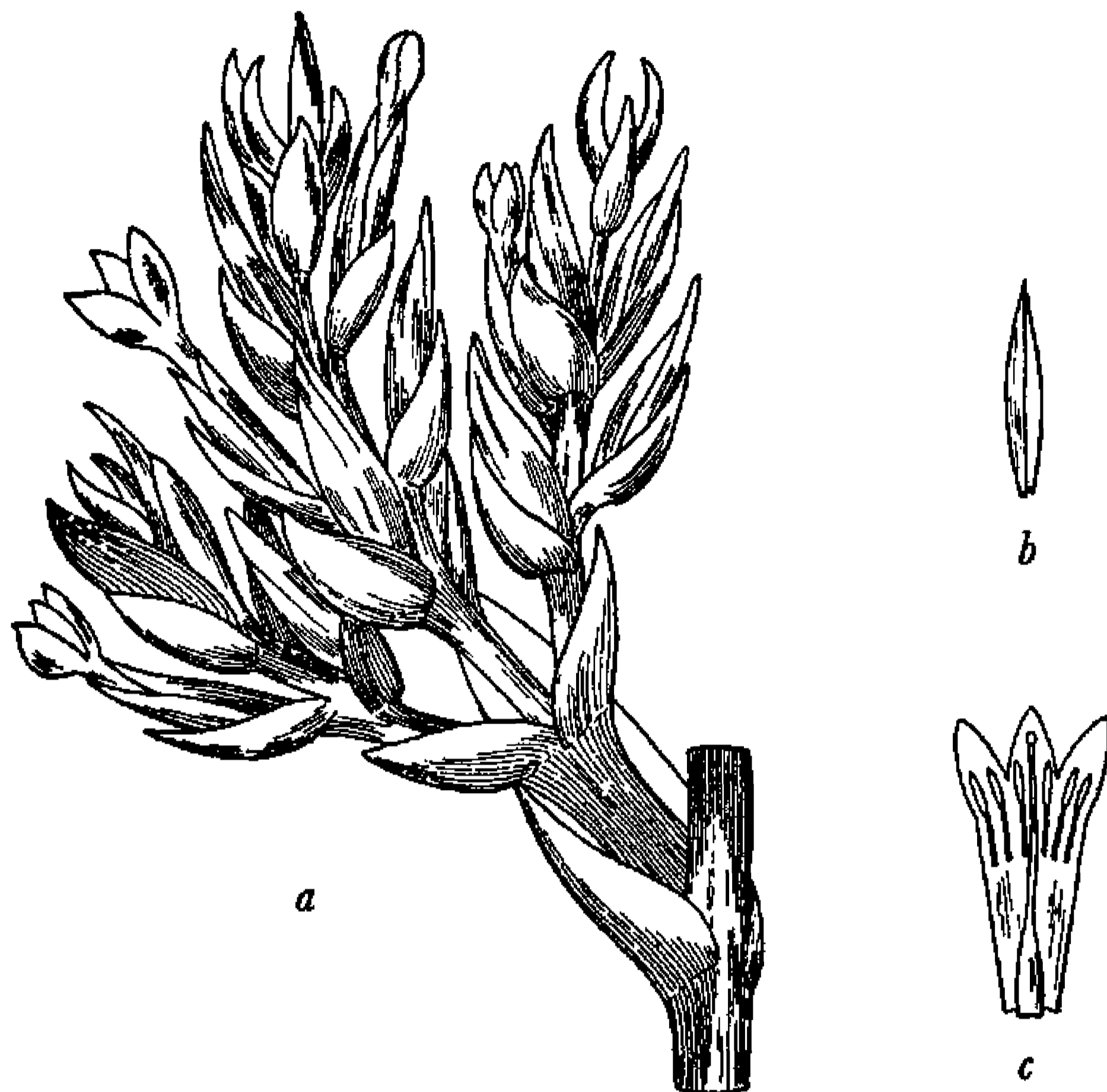


FIGURE 56.—*Guzmania candelabrum*: *a*, Branch of inflorescence,  $\times 1$ ; *b*, sepal,  $\times 1$ ; *c*, corolla, stamens, and pistil,  $\times 1$  (all after André).

SANTANDER: Woods, near Las Vegas, alt. 2,600–3,000 m., Dec. 21–23, 1926, Killip & A. C. Smith 15873 (GH, NY, US). Open woods, east of Bucamaranga, alt. 2,400 m., Dec. 18, 1948, Molina & Barkley 18-S-363 (US).

NARIÑO: Alto del Tabano and Páramo de Chimbalan (2 collections?), alt. 3,000 m., May 1876, André 2963 (K, type, US phot. 4190). Páramo de San Antonio del Bordoncillo, crest of the cordillera between El Encano and Sibundoy, alt. 3,250 m., Jan. 4, 1941, Cuatrecasas 11693 (F, US). Páramo cloud-forest, Alto Tabano above Encano, alt. 3,300 m., Oct. 31, 1946, Foster 2037 (GH, US). Ciudadela, above Laguna La Cocha on road to Sibundoy near Páramo de Bordoncillo, alt. 2,800–3,000 m., May 27, 1946, Schultes & Villarreal 7563 (US). Epiphytic, km. 14 on the highway between Pasto and Sibundoy, alt. 3,000–3,200 m., Jan. 5, 1952, Fernández & Knott 1005 (COL). Páramo de San Antonio between Pasto and Sibundoy, alt. 2,790–2,880 m., Mar. 13, 1953, Schultes & Cabrera 18852 (COL, GH, US). Páramo, Sibundoy, alt. 2,800 m., June 30, 1953, Schultes & Cabrera 20117 (US).

2. *Guzmania diffusa* L. B. Smith, *Caldasia* 5:2, fig. 1948.

Plant about 2 meters high; leaves rosulate, 6–8 dm. long, minutely appressed-lepidote, sheaths inconspicuous, pale brown, blades ligulate, 4–8 cm. wide; scape erect; scape-bracts foliaceous, densely imbricate;

inflorescence lax, 4–10 dm. long; primary bracts ovate, acuminate, many times shorter than the branches, lepidote, red or yellow; branches divergent to spreading, 8–21 cm. long, short-stipitate, few—mostly 3-branched, yellow, glabrous; floral bracts ovate, obtuse, 7–10 mm. long, thin, nerved; flowers suberect to downwardly secund; pedicels 3–4 mm. long; sepals obovate, broadly obtuse, 12 mm. long, connate for 3 mm., thin, nerved; petals 20 mm. long, white or yellow, blades elliptic, obtuse.

ANTIOQUIA: Moist open woods of subpáramo, east of Sonsón, alt. 2,800 m., Oct. 30, 1948, *Molina & Barkley* 18-A-348 (COL, US).

VALLE: Mina El Diamante, Quebrada del Ratón, northwest of Los Farallones, Cordillera Occidental, alt. 2,950–3,000 m., July 30, 1946, *Cuatrecasas* 21778 (F, GH).

CAUCA: Gorge of Río San Marcos, between Jardín and San Rafael, eastern slope of the Cordillera Central near the crest, alt. 2,700–2,900 m., July 25, 1943, *Cuatrecasas* 14803 (GH, type; VALLE).

NARIÑO: Páramo de Tambillo, northeast of Valle del Sibundoy, alt. 2,700–2,800 m., Dec. 13–14, 1942, *Schultes & C. E. Smith, Jr.*, 3131 (US). On trees, above Sibundoy, alt. 2,280 m., Oct. 28, 1946, *Foster* 1967 (GH, US). Páramo cloud-forest, Alto Tabano, above Encano, alt. 3,300 m., Oct. 31, 1946, *Foster* 2038 (GH).

#### ECUADOR.

3. *Guzmania pennellii* L. B. Smith, *Contr. Gray Herb.* 98:30, *pl. 6, fig. 3.* 1932.  
*Thecophyllum pennellii* Mez, *Pflanzenreich* IV. 32:422. 1935.

Leaves 55–65 cm. long, densely pale-appressed-lepidote beneath, sheaths broadly ovate, brownish, blades ligulate, acute, 25–70 mm. wide, glabrous above; inflorescence lax, elongate, 3–4-pinnate, dark red except the petals, becoming glabrous; primary bracts ovate, acute, barely exceeding the sterile bases of the branches; branches spreading, 7–12 cm. long; floral bracts elliptic, obtuse, 5 mm. long, submembranaceous, nerved; sepals narrowly elliptic, connate for 3 mm., nerved; petals 15 mm. long, white, blades elliptic, obtuse.

BOLÍVAR: Terrestrial in shrub zone, below Páramo de Chaquiro, Cordillera Occidental, alt. 2,800–3,100 m., Feb. 24, 1918, *Pennell* 4344 (NY, type, GH phot. 6063).

NORTE DE SANTANDER: Páramo de Tamá on the slope toward Samaria, Cordillera Oriental, alt. 2,600–2,900 m., Oct. 29, 1941, *Cuatrecasas, Schultes & C. E. Smith, Jr.*, 12743 (US).

4. *Guzmania costaricensis* Mez & Wercklé, *Repert. Sp. Nov. Fedde* 16:78. 1919.

Over 2 meters high; leaves rosulate, 65–90 cm. long, sheath elliptic, 3 dm. long, densely brown-lepidote, blade acuminate, 6 cm. wide, glabrous; scape stout; scape-bracts foliaceous, spinose-pungent, erect; inflorescence laxly thyrsoid, 5 dm. long, 12 cm. in diameter; axis minutely furfuraceous; primary bracts acuminate from an ovate base, pungent, much shorter than the branches; branches ascending, 13–23 cm. long, many-flowered, the sterile base very short; floral

bracts ovate-elliptic, obtuse, scarcely or not at all carinate, nerved; pedicels stout, 5–10 mm. long; sepals narrowly elliptic, free, coriaceous, nerved; petals slightly exceeding the sepals, acute.

VALLE: Forest, La Laguna, left bank of Río Sanquiní, west side of the Cordillera Occidental, alt. 1,250–1,400 m., Dec. 10–20, 1943, *Cuatrecasas* 15549 (F, GH).

COSTA RICA.

5. *Guzmania pungens* L. B. Smith, *Contr. U. S. Nat. Herb.* 29:293, *fig.* 17. 1949.

Plant over 1.5 meters tall; leaves 9–12 dm. long, sheaths large, elliptic, blades 9 cm. wide, acuminate to a strongly thickened pungent apex, minutely appressed-lepidote throughout; scape erect, stout; scape-bracts strict, imbricate, foliaceous; inflorescence laxly bipinnate; primary bracts acuminate, pungent; spikes suberect, stipitate for 3 cm., cylindric, subdense, 8 cm. long; flowers suberect, subsessile; sepals narrowly lanceolate, ecarinate; capsule slenderly ellipsoid, 28 mm. long.

NARIÑO: Swamp, Altaquer, alt. 1,050 m., Nov. 10, 1946, *Foster* 2076 (GH, US). Above El Diviso, alt. 705 m., Nov. 13, 1946, *Foster* 2156 (GH, type, US phot. 3121; US).

6. *Guzmania brasiliensis* Ule, *Verh. Bot. Ver. Brand.* 48:147. 1907.

Plant to 1.5 meters high; leaves densely rosulate, to 75 cm. long, sheaths broadly elliptic, dark brown, blades linear, acuminate, 20–25 mm. wide, green, glabrous, subpapyraceous; scape erect, to 1 meter long, its bracts more or less foliaceous, imbricate; inflorescence laxly bipinnate from 3–6 branches or rarely simple; primary bracts ovate, apiculate, much shorter than the branches; branches spreading, sublaxly 20–40-flowered, to 25 cm. long; floral bracts ovate, acute, exceeded by the sepals, thin; flowers suberect to spreading, short-pedicellate; sepals lanceolate, mucronulate, 15–22 mm. long, connate for 8 mm., coriaceous; petals acute, about 3 cm. long, pale yellow.

VAUPÉS: Epiphytic, bank of Río Cuduyarí, affluent of Río Vaupés, Sept. 15, 1939, *Cuatrecasas* 6840 (F, US).

AMAZONAS-VAUPÉS: Near Soratama (above mouth of Río Kananarí), lat. 0°5' N., long. 70°40' W., alt. 270 m., Mar. 26, 1952, *Schulles & Cabrera* 16068 (US).

BRASIL.

7. *Guzmania scherzeriana* Mez in DC. *Monogr. Phan.* 9:949. 1896.

*Guzmania herthae* Harms, *Notizblatt* 14:329. 1939

Plant 5–8 dm. high; leaves rosulate, 4–8 dm. long, sheaths ovate, covered with pale brown-centered appressed scales, dark castaneous at base, blades ligulate, acute, apiculate, 30–55 mm. wide, glabrous; scape erect, 7–10 mm. in diameter; scape-bracts strict, the lower foliaceous, the upper broadly ovate, caudate-acuminate; inflorescence

lax, bipinnate, 18–37 cm. long, glabrous; primary bracts broadly ovate, acuminate or acute, about equaling the sterile naked bases of the branches, red; branches suberect to spreading; floral bracts broadly ovate or elliptic, obtuse, much shorter than the sepals, even or slightly nerved, yellow; pedicels 4–6 mm. long; sepals elliptic-oblong, 20–25 mm. long, connate for 10 mm.; petals 33 mm. long, yellow with green apices.

**7a. *Guzmania scherzeriana* var. *scherzeriana*.**

Branches dense or subdense with suberect flowers, 5–7 cm. rarely to 10 cm. long; floral bracts 12–20 mm. long.

CHOCÓ: Dense forest, ridge along Yeracúf Valley, upper Río San Juan, Corcovada Region, alt. 200–275 m., Apr. 24, 25, 1939, *Killip 35207* (GH, US).

VALLE: Dense forest along Río Dagua, about 20 km. east of Buenaventura, alt. 40 m., Feb. 15, 1939, *Killip & García 33327* (COL, US). Dense forest, Córdoba, alt. 50–100 m., Feb. 17, 1939, *Killip & García 33454* (US). Wooded slopes, left bank of Río Anchicayá, El Prado, alt. 250–350 m., Aug. 4, 1943, *Cuatrecasas 14848* (GH). Silva, Pacific Coast, Río Cajambre, alt. 5–80 m., May 5–15, 1944, *Cuatrecasas 17618* (GH). Dense forest, Agua Clara, between Buenaventura and Cali, alt. 100 m., June 6, 1944, *Killip & Cuatrecasas 38882* (US). Quebrada de La Brea, Río Calima, alt. 30–40 m., May 19, 1946, *Schultes & Villarreal 7328* (US).

NARIÑO: Dense forest along stream, east side of Gorgona Island, alt. 50–100 m., Feb. 11, 1939, *Killip & García 33187* (US).

PANAMA, ECUADOR.

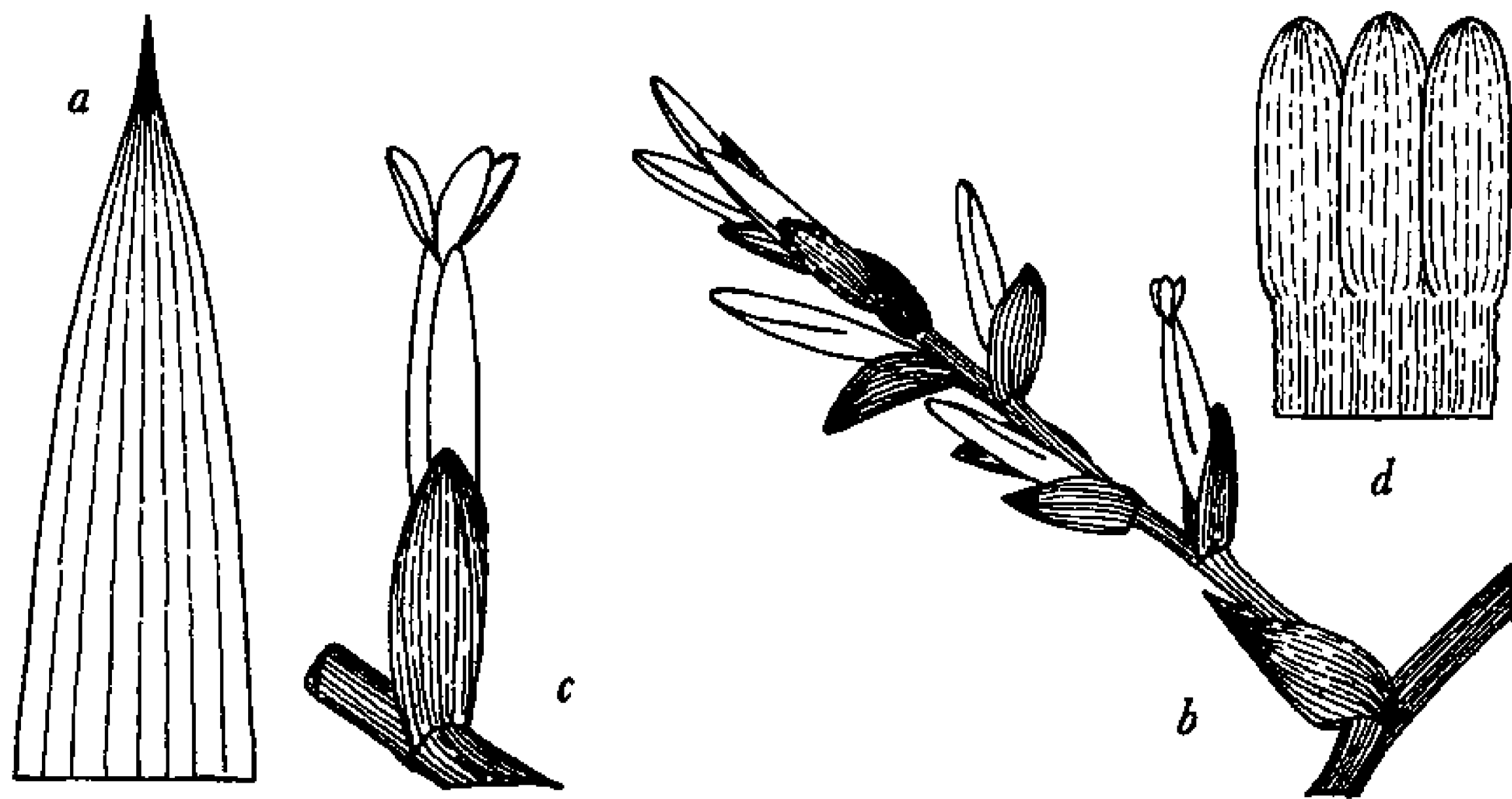


FIGURE 57.—*Guzmania scherzeriana* var. *guatemalensis*: *a*, Apex of leaf,  $\times \frac{1}{2}$ ; *b*, primary bract and branch,  $\times \frac{1}{2}$ ; *c*, floral bract and flower,  $\times 1$ ; *d*, sepals,  $\times 1$ .

**7b. *Guzmania scherzeriana* var. *guatemalensis* (L. B. Smith) L. B. Smith,**  
 Contr. U. S. Nat. Herb. 29:296. 1949. FIGURE 57  
*Guzmania guatemalensis* L. B. Smith, Contr. Gray Herb. 117:8, pl. 1, fig. 13.  
 1937.

Branches lax with divergent to spreading flowers, floral bracts 17–25 mm. long.

VALLE: Non-inundable woods at edge of mangrove swamp, Punta Arenas, north shore of Buenaventura Bay, near sea level, June 2, 1944, *Killip & Cuatrecasas* 38644 (F, US). Drainage of Río Dagua, Córdoba, alt. 39–60 m., Nov. 14, 1945, *Cuatrecasas* 19826 (F). Quebrada de Aguadulce, Buenaventura Bay, alt. 0–10 m., Feb. 24, 1946, *Cuatrecasas* 19997 (F). On trees, above Buenaventura, alt. 30 m., Dec. 8, 1946, *Foster* 2326 (GH); 2327 (GH).

NARIÑO: Woods, east coast of Isla Gorgona, June 22, 1950, *Fernández* 407 (COL, US).

GUATEMALA, PANAMA.

8. *Guzmania rhonhofiana* Harms, Notizblatt 14:329. 1939.

*Guzmania roezlii* sensu L. B. Smith, Contr. Gray Herb. 98:33. 1932, as to Colombian material, not Mez 1896.

Leaves 50–75 cm. long, minutely and obscurely lepidote, sheaths narrowly ovate, indistinct, blades ligulate, acute to rounded and apiculate, 45–50 mm. wide; scape erect, slender, glabrous; scape-bracts ovate, acute; inflorescence 20–56 cm. long, glabrous; primary bracts broadly ovate, acute, 2 cm. long, much shorter than the sterile 1–3-bracteate bases of the branches; branches ascending, 12–21 cm. long, many-flowered; floral bracts ovate, acute, 6–8 mm. long, subcoriaceous, yellow, nerved; flowers divergent; pedicels broadly obconic, 3 mm. long; sepals oblong-obovate, short-connate; capsule 25–30 mm. long.

VALLE: Forest, Cisneros, Dagua Valley, Sept. 21, 1922, *Killip* 11474 (GH). Pacific coast, Río Naya, between Puerto Merizalde and Meregildo, to the headwaters of Río Chabirré, alt. 5 m., Mar. 2, 1943, *Cuatrecasas* 14343 (GH). Woods, western slope of Cordillera Occidental, valley of Río Dagua, La Elsa, alt. 1,000–1,200 m., Sept. 9, 1943, *Cuatrecasas* 15302 (GH). In trees, Buenaventura, sea level, Dec. 8, 1946, *Foster* 2324 (GH).

NARIÑO: On trees, Ricaurte, alt. 1,200 m., Nov. 15, 1946, *Foster* 2183 (GH). Barbacoas, Río Nembí, alt. 450 m., Nov. 16, 1946, *Foster* 2188 (US).

ECUADOR.

9. *Guzmania calamifolia* André ex Mez in DC. Monogr. Phan. 9:931. 1896.

*Caraguata acorifolia* André, Énum. Bromél. 6. Dec. 13, 1888; Rev. Hort. 60:566. Dec. 16, 1888, not *Guzmania acorifolia* (Griseb.) Mez 1896.

Flowering shoot 3.5–6 dm. high; leaves fasciculate, 5–10 dm. long, covered beneath with appressed pale brown-centered scales, sheaths elongate, narrow, inconspicuous, brown toward the base, blades linear, long-acuminate, 5–12 mm. wide; scape erect or ascending, slender; scape-bracts subfoliaceous, imbricate; inflorescence laxly bipinnate from 4 to 7 branches or rarely subdigitate, 7–13 cm. long, glabrous; primary bracts broadly ovate, acute or acuminate, the lowest rarely equaling or exceeding the branches, the others about half as long; spikes spreading, fusiform or elliptic, 2–6 cm. long, the lowest short-stipitate; floral bracts imbricate, ovate, about equaling the sepals to slightly shorter, thin, prominently nerved, yellow; flowers sessile; sepals narrowly elliptic, acute, 12–16 mm. long,

short-connate; petals acute, yellow; capsule cylindric, 15 mm. long, dark violet.

COLOMBIA: *Triana* (COL).

CHOCÓ: On dead tree, between La Oveja and Quibdó, April 1, 2, 1931, *Archer* 1747 (US). Dense forest south of Río Condoto, between Quebrada Guarapo and Mandinga, alt. 120–180 m., Apr. 22, 1939, *Killip* 35186 (US).

VALLE: Dense forest, Córdoba, alt. 50–100 m., Feb. 17, 1939, *Killip & García* 33449 (US). Estero del Encanto, Pacific Coast, between Río Yurumanguí and Río Cajambre, alt. 0–5 m., Feb. 11, 1944, *Cuatrecasas* 16172 (F, GH). Buenaventura Bay, Quebrada de San Joaquín, alt. 0–10 m., Feb. 23, 1946, *Cuatrecasas* 19880 (VALLE); 19967 (F, US). In trees, above Buenaventura, alt. 30 m., Dec. 8, 1946, *Foster* 2323 (GH). Anchicayá, between Cali and Buenaventura, alt. 500 m., Aug. 11, 1952, *Køie* 4824 (C, COL).

NARIÑO: Andes, Río Nembi, alt. 990 m., May 1876, *André* 3396 (K, type; NY, GH phot. 6040). Swampy woods of Río San Miguel, near mouth of Río Conejo, Ecuadorian frontier, alt. 300 m., Dec. 8, 1940, *Cuatrecasas* 10897 (COL)

10. *Guzmania bakeri* (Wittm.) Mez in DC. Monogr. Phan. 9:933. 1896.

*Caraguata bakeri* Wittm. Bot. Jahrb. 11:59. 1889.

Stemless, 1 meter high or more; leaves numerous, spreading, 30–35 cm. long, sheaths elliptic, elongate but only a little wider than the blades, brown-lepidote, blades ligulate, punctulate-lepidote beneath, becoming glabrous above; scape erect, soon glabrous; scape-bracts strict, shorter than the internodes, broadly ovate, bright red; inflorescence lax, 4 dm. long, axes glabrous, bright red; primary bracts broadly ovate, triangular-acute, exceeding the lowest branches to shorter than the highest; branches short-stipitate, to 35 mm. long, subdensely 4–8-flowered; floral bracts broadly elliptic, obtuse, about equaling the sepals; flowers sessile; sepals narrowly elliptic, obtuse, 15 mm. long, carinate, connate for about  $\frac{1}{2}$  their length; petals 19 mm. long, obtuse, yellow.

NARIÑO: Mountains near Pasto, alt. 3,000 m., Feb. 20, 1881, *Lehmann* 867 (G).

11. *Guzmania pleiosticha* (Griseb.) Mez in DC. Monogr. Phan. 9:930. 1896.

*Tillandsia pleiosticha* Griseb. Nachr. Ges. Wiss. Goett. for 1864:19. 1865.

*Guzmania altsonii* L. B. Smith, Contr. Gray Herb. 89:7, pl. 1, fig. 1. 1930.

Plant 1–1.5 meters high; leaves 5–9 dm. long, pale-appressed-lepidote beneath, soon glabrous above, sheaths elliptic, 18 cm. long, dark castaneous at the base, blades ligulate, acute, 4–5 cm. wide; scape erect, glabrous; scape-bracts strict, the lower foliaceous and densely imbricate, the upper elliptic, acute, about equaling the internodes or slightly shorter; inflorescence laxly bipinnate from 8–10 spikes; primary bracts ovate, acute, exceeding the sterile base of the spike; spikes spreading, ellipsoid or fusiform, 4–6 cm. long, 2 cm. in diameter; floral bracts strict, densely imbricate, broadly elliptic, broadly convex, 20 mm. long, equaling the sepals, coriaceous, even except toward the apex, sublustrous, obscurely punctulate-lepidote:

pedicels obconic; sepals narrowly elliptic, 15 mm. long, short-connate, carinate, nerved; petals erect, 25 mm. long, white; capsule cylindrical, acute, 25 mm. long.

NARIÑO: Las Mesas, alt. 1,350 m., Nov. 22, 1946, *Foster* 2220 (GH).  
VENEZUELA, GUIANA.

12. *Guzmania amplexans* L. B. Smith, *Contr. U. S. Nat. Herb.* 29:292, *fig. 16*. 1949.

To 1 meter high; leaves rosulate, 4–5 dm. long, subdensely lepidote with small pale appressed scales, sheaths elliptic, dark castaneous, blades acuminate, 25 mm. wide; scape erect, 7 mm. in diameter, glabrous; scape-bracts erect, densely imbricate, the lower foliaceous, the upper broadly ovate, acuminate; inflorescence 35 cm. long; primary bracts like the upper scape-bracts; spikes erect, slenderly ellipsoid, dense, 10 cm. long, 2–3 cm. in diameter; floral bracts each enfolding a single flower after anthesis, oblong-elliptic, 48 mm. long, much exceeding the sepals, ecarinate, obscurely pale-appressed-lepidote, bright red except for the orange apex, the center subcoriaceous, the margins membranaceous; flowers sessile, erect but subsecund at anthesis; sepals elliptic, 30 mm. long, sparsely white-lepidote, the posterior ones carinate, connate for 8 mm. with each other and for 4 mm. with the ecarinate anterior one.

NARIÑO: Near Junín, alt. 840 m., Nov. 14, 1946, *Foster* 2169 (GH, type, US phot. 3118; US).  
ECUADOR.

13. *Guzmania stricta* L. B. Smith, *Contr. U. S. Nat. Herb.* 29:297, *fig. 19*. 1949.

Over 1 meter high; leaves 12 dm. long, very minutely and obscurely lepidote, sheaths inconspicuous, blades linear, acuminate, 25 mm. wide, strongly plicate; scape erect, 1 cm. in diameter; scape-bracts erect, densely imbricate, the lower foliaceous, the upper ovate, acuminate; inflorescence 25 cm. long, glabrous; primary bracts like the upper scape-bracts but thinner, much shorter than the spikes; spikes strict or slightly divergent, cylindrical, rather dense, 2–2.5 cm. in diameter; floral bracts broadly elliptic, 18 mm. long, slightly but constantly shorter than the sepals, ecarinate, nerved, green; flowers suberect, short-pedicellate; sepals lanceolate, carinate, membranaceous, yellow toward apex, the posterior connate for 2 mm., the anterior subfree; petals 25 mm. long, pale yellow, blades elliptic, obtuse; capsule cylindrical, barely exceeding the sepals.

NARIÑO: Near El Páramo, above El Diviso, alt. 720 m., Nov. 13, 1946, *Foster* 2160 (GH, type, US phot. 3119; US).

14. *Guzmania patula* Mez & Wercklé, *Repert. Sp. Nov. Fedde* 14:255. 1916.

Stemless, 5–6 dm. high; leaves numerous, 25–41 cm. long, sheaths elliptic, finely brown-lepidote, red-striped, blades linear, acute, 20–35

mm. wide, subglabrous; scape erect, slender, glabrous; scape-bracts strict, ovate, acute; primary bracts like the scape-bracts; spikes subcylindric, 2 cm. in diameter, the terminal one 6 cm. long and on a long scapelike stipe, the lateral smaller and short-stipitate; floral bracts erect, ovate, obtuse, 15 mm. long, ecarinate, coriaceous with a narrow thin margin; flowers glabrous; pedicels very short; sepals slightly asymmetric, obtuse, exceeding the floral bracts after anthesis; petals white or greenish yellow, 20 mm. long.

TOLIMA: Forest, Libano, alt. 1,500–1,800 m., Dec. 26–29, 1917, *Pennell* 3396 (NY, GH phot. 6054).

ANTIOQUIA: Los Alpes, alt. 1,920 m., Jan. 15, 1953, *Daniel* 4483 (US).

COSTA RICA, VENEZUELA, ECUADOR.

15. *Guzmania geniculata* L. B. Smith, Journ. Washington Acad. Sci. 42:282, fig. 1. 1952.

Plant 8–11 dm. high; leaves 7 dm. long, sheaths 1 dm. long, dark castaneous at base, purple-striped above, appressed-lepidote, blades acute, 4–5 cm. wide, very obscurely lepidote, green; scape erect, stout; scape-bracts strict, the lower foliaceous, the upper ovate, acute; inflorescence cylindric, lax below; axis dark castaneous in age; primary bracts ovate, acute, the lower ones about equaling the spikes; spikes divergent, subglobose, 3 cm. long, stipe stout, flattened, 5–10 mm. long; floral bracts broadly ovate, rounded with a thick apical cusp, slightly shorter than the sepals, coriaceous, even, glabrous; flowers subsessile; sepals elliptic, 13 mm. long, connate for 3 mm., nerved.

NARIÑO: On trees, above Sibundoy, alt. 2,280 m., Oct. 28, 1946, *Foster* 1972 (GH, type, US phot. 3493).

VENEZUELA.

16. *Guzmania mitis* L. B. Smith, Contr. Gray Herb. 98:31, pl. 6, figs. 4, 5. 1932.  
FIGURE 58

Stemless, 1 meter or higher; leaves 50–85 cm. long, punctulate-lepidote, sheaths broadly ovate, more or less castaneous at base, blades acute, 3–5 cm. wide; scape erect, stout, glabrous; scape-bracts strict, densely imbricate, foliaceous or subfoliaceous; inflorescence 11–26 cm. long, 5 cm. in diameter, glabrous; primary bracts suberect, ovate or lanceolate, much exceeding the lower branches; spikes globose or thick-ovoid, short-stipitate, 25–30 mm. long, 12–15-flowered the lowest usually remote, the others densely aggregated; floral bracts broadly ovate, obtuse; flowers subsessile; sepals obovate, obtuse, 10 mm. long, nerved; petals 18 mm. long, white, blades erect, elliptic.

NORTE DE SANTANDER: Dense woods, Pica-Pica Valley above Tapatá (north of Toledo), alt. 2,100–2,400 m., March 1927, *Killip & A. C. Smith* 20195 (GH, type).

SANTANDER: Dense wet woods, western slope of Mount San Vicente near Charta, alt. 2,500–2,700 m., Feb. 9, 1927, *Killip & A. C. Smith* 18990 (GH, NY).





FIGURE 58.—*Guzmania mitis*: *a*, Apex of leaf,  $\times 1$ ; *b*, primary bract and branch,  $\times 1$ ; *c*, floral bract and flower,  $\times 1$ ; *d*, sepals,  $\times 1$ .

CUNDINAMARCA: Dintel, between Facatativá and La Vega, alt. 2,300–2,700 m., June 4, 1939, *Pérez Arbeláez & Cuatrecasas* 5269 (COL, US). On trees, Páramo de San Miguel, alt. 3,300 m., Oct. 12, 1946, *Foster* 1875 (GH). On trees and ground, Salto de Tequendama, alt. 2,100 m., Oct. 16, 1946, *Foster, Jaramillo & Vanegas* 1908 (GH). On tree-trunks, dense forest, Municipio de Tena, near Laguna de Pedro Palo, 3 km. north of Tena, alt. 2,080 m., May 19, 1952, *Fernández & Mora* 1439 (COL, US).

ANTIOQUIA: In chaparral of páramo, 10 km. north of Sonsón, alt. 2,750 m., Mar. 6, 1948, *Gutiérrez, Correa & Barkley* 18-C-210 (US).

17. *Guzmania gracilior* (André) Mez in DC. Monogr. Phan. 9:937. 1896.

*Caraguata vanvolxemii* var. *gracilior* André, Bromel. Andr. 54. 1889.

Caulescent, branching, flowering shoot 2–4 dm. long; leaves densely imbricate along the stem, 13–16 cm. long, sheaths elliptic, 5–6 cm. long, densely pale-lepidote, dark castaneous at base, finely purple-striped above, blades 15 mm. wide; scape erect or ascending, slender, glabrous; scape-bracts imbricate, ovate, acuminate, glabrous beneath, densely lepidote above, red; inflorescence lax, 9–30 cm. long, subthyrsoid, axes glabrous; primary bracts like the upper scape-bracts, exceeding the lowest branches; spikes 3–6-flowered, distinctly stipitate, 2–4 cm. long, yellow; floral bracts broadly elliptic, obtuse, distinctly shorter than the sepals; flowers sessile; sepals elliptic, broadly rounded and emarginate, 8 mm. long, about half connate; petals to 16 mm. long, blades elliptic, obtuse.

HUILA-CAQUETA: Gabinete, crest of the Cordillera Oriental, alt. 2,300–2,450 m., March 21, 1940, *Cuatrecasas* 8447 (COL, US). Dominant on small humus-covered knob surrounded by wet forest, near juncture of ridge between Río Cuarapas and Río Guachicas with crest of Cordillera Oriental, at head of Río Villalobos, southwest of Pitalito, lat.  $1^{\circ}34'$  N. (?), long.  $76^{\circ}16'$  W., alt. 2,400 m., Feb. 6, 1943, *Fosberg* 19953 (US).

ANTIOQUIA: On rocks, Alto El Oso, north of Yarumal, alt. 2,320 m., May 4, 1944, *Core* 625 (US).

CAUCA: Cerro de Munchique, alt. 2,200–2,800 m., March 1884, *Lehmann* 3660 (G, type; US). Rock plant in dense clumps, west of Tambo, west slope of Cordillera Occidental, alt. 2,300 m., Nov. 6, 1946, *Haught* 5207 (COL, US).

NARIÑO: In heavy mats of mosses and ferns, Altaquer, alt. 1,050 m., Nov. 10, 1946, *Foster* 2073 (GH). Above El Diviso, alt. 705 m., Nov. 13, 1946, *Foster* 2155 (GH).

18. *Guzmania multiflora* (André) André ex Mez in DC. Monogr. Phan. 9:939. 1896.

*Caraguata multiflora* André, Énum. Bromél. 6. Dec. 13, 1888; Rev. Hort. 60:566. Dec. 16, 1888.

Stemless, 60–75 cm. high; leaves numerous, to 75 cm. long, arched-decurving, sheath elliptic, large, castaneous toward base, blade 5 cm. wide; scape erect, glabrous, red; scape-bracts strict, imbricate, ovate, acute; inflorescence lax, 25–40 cm. long, 7 cm. in diameter, glabrous, usually red in large part; primary bracts narrowly triangular from a suborbicular base, exceeding the lower branches; spikes suberect to spreading, distinctly stipitate, ovoid, laxly 6–8-flowered; floral bracts broadly elliptic, obtuse, much shorter than the sepals; flowers subsessile; sepals obovate, truncate, 10 mm. long, short-connate, thin; petals 18 mm. long, white or yellow, lobes ovate, obtuse.

MAGDALENA: Sierra Nevada de Santa Marta, alt. 2,000 m., *Lehmann* misc. no. 51 (l Mez). Rain forest, mountains above Santa Marta, alt. 1,800–2,400 m., Aug. 3, 1946, *Foster & C. E. Smith, Jr.*, 1404 (GH).

BOLÍVAR: Shrub zone below Páramo de Chaquiro, Cordillera Occidental, alt. 2,800–3,100 m., Feb. 24, 1918, *Pennell* 4318 (NY).

TOLIMA: Machin, Páramo de Quindio, alt. 2,000 m., Mar. 7, 1876, *André* 2970 in part (K, type).

HUILA: Epiphytic in primaeval forest, La Plata, alt. 2,600 m., Mar. 20, 1939, *Sneidern* 2072 (S).

VALLE: Cordillera above Retiro near Cali, alt. 2,000 m., *Lehmann* 2887 (l Mez). Forest, La Cumbre, Cordillera Occidental, alt. 1,600–2,100 m., Sept. 25–27, 1922, *Killip* 11592 (GH). Thickets and residual woods, Pichinde, Río Cali, eastern slope of Cordillera Oriental, alt. 2,160 m., Oct. 27, 1944, *Cuatrecasas* 18274 (F, GH). In trees, 16 km. above Cali, alt. 900 m., Dec. 5, 1946, *Foster* 2300 (COL, GH).

CAUCA: Forest, "Paletara" to "Calaguala," Cordillera Central, alt. 3,000–3,200 m., June 17, 1922, *Pennell* 7117 (GH, NY, US).

NARIÑO: Páramo de Chimbalan, near Pasto, alt. 2,300 m., 1876, *André* 2970 in part (K).

#### ECUADOR

19. *Guzmania lehmanniana* (Wittm.) Mez in DC. Monogr. Phan. 9:934. 1896.

*Schlumbergeria lehmanniana* Wittm. Bot. Jahrb. 11:60. 1889.

*Caraguata lehmanniana* Baker, Handb. Bromel. 150. 1889.

Stemless, large; leaves numerous, 4 dm. long, sheaths elliptic, distinct, minutely brown-lepidote, blades 3 cm. wide, minutely lepidote; scape stout, erect, glabrous; scape-bracts ovate, acuminate, the lower densely imbricate, the upper equaling the internodes, red; inflorescence

lax; axes becoming glabrous, red; primary bracts like the upper scape-bracts, reflexed, shorter than the branches; spikes 4-6-flowered, their axes 4 cm. long; floral bracts narrowly ovate, obtuse, navicular, 15 mm. long; pedicels stout, 5-8 mm. long; sepals lanceolate, acute, coriaceous, lepidote toward base; petals linear, obtuse, 68 mm. long; stamens included.

CAUCA: Western slopes of Cerro Munchique, Cordillera Occidental, alt. 2,200-2,600 m., Mar. 3, 1884, *Lehmann* 3629 (G, type; US, GH phot. 7068).

20. *Guzmania radiata* L. B. Smith, *Contr. U. S. Nat. Herb.* 29:294, *fig. 18*. 1949.

Plant 1 meter high; leaves densely rosulate, 6 dm. long, minutely and very obscurely lepidote, sheaths elliptic, 10 cm. long, blades ligulate, acuminate, 25 mm. wide, green above, reddish beneath, green-spotted on both sides; scape erect or suberect, slender, red, pale-flocculose; scape-bracts subfoliaceous, very densely imbricate; inflorescence very lax, 32 cm. long, pale-flocculose; primary bracts long-acuminate from an ovate base, the lowest about equaling the branches; spikes spreading, laxly 3-6-flowered; floral bracts broadly obovate, truncate, 15 mm. long, ecarinate, flavous with red stripes, nerved; pedicels 4 mm. long; sepals narrowly oblong, obtuse, 31 mm. long, nerved, equally connate for 2 mm.; capsule subcylindric, much shorter than the sepals.

NARIÑO: El Páramo above Diviso, alt. 720 m., Nov. 13, 1946, *Foster* 2162 (GH, type, US phot. 3120; US).

21. *Guzmania andreana* (E. Morr.) Mez *in* DC. *Monogr. Phan.* 9:936. 1896.  
*Caraguata andreana* E. Morr. *Rev. Hort.* 56:247, *fig. 61*. 1884.

Plant stemless, 6 dm. high; leaves numerous, 45 cm. long, sheaths indistinct, minutely brown-lepidote, blades ligulate, acuminate, 3 cm. wide; scape erect, about equaling the leaves, glabrous; scape-bracts strict, densely imbricate, lanceolate, acuminate, veined; inflorescence lax, 2 dm. long; primary bracts acuminate from an ovate base, exceeding the lowest branches; branches about 4-flowered, the lowest stipitate; floral bracts broadly ovate; flowers sessile; sepals slightly asymmetric, elliptic, obtuse; petals 56 mm. long, yellow, lobes spreading or reflexed, obtuse.

NARIÑO: Mountains between Piedra Ancha and Pilcuan, alt. 1,000-1,800 m., May 1876, *André* 3448 bis (K). Same, cultivated, Hort. Lacroix, *André* K-354 (K, type, GH phot. 2667).

22. *Guzmania virescens* (Hook.) Mez *in* DC. *Monogr. Phan.* 9:943. 1896.

FIGURE 59

*Puya virescens* Hook. *Bot. Mag.* 83: *pl. 4991*. 1857.

*Pitcairnia virescens* K. Koch, *Ind. Sem. Hort. Berol.* 1857: App. 4. 1858.

*Caraguata virescens* Baker, *Handb. Bromel.* 151. 1889.

*Caraguata beleana* André, Rev. Hort. 63:114, fig. 27. 1891.

*Guzmania beleana* André ex Mez in DC. Monogr. Phan. 9:944. 1896.

Stemless, 50–75 cm. high; leaves numerous, 5–7 dm. long, sheaths elliptic, indistinct, blades ligulate, acuminate, 3 cm. wide; scape erect, glabrous; scape-bracts strict, imbricate, elliptic with narrowly triangular



FIGURE 59.—*Guzmania virescens*: a, Apex of leaf,  $\times \frac{1}{2}$ ; b, inflorescence,  $\times \frac{1}{2}$  (both after Botanical Magazine).

blades, pale green with red stripes; inflorescence lax, 15–20 cm. long; primary bracts broadly ovate, acute or acuminate, much exceeded by the flowers; spikes spreading; floral bracts ovate, 15–20 mm. long; flowers sessile; sepals lanceolate or elliptic, 23–25 mm. long; petals 5–6 cm. long, stramineous.

COLOMBIA (?): Described from cultivation: Hort. Lacroix, André K-355 (K, type of *Caraguata beleana* André, GH phot. 2670).

23. *Guzmania straminea* (K. Koch) Mez in DC. Monogr. Phan. 9:937. 1896.  
*Anoplophytum vittatum* Beer, Bromel. 43. 1857, not *Guzmania vittata* Mez, 1896.  
*Anoplophytum stramineum* K. Koch, Ind. Sem. Hort. Berol. for 1856: App. 7. 1857.  
*Caraguata straminea* Baker, Handb. Bromel. 150. 1889.

Plant to 8 dm. tall; leaves numerous, densely rosulate, 4–6 dm. long, sheaths distinct, ovate, blades acuminate, subpungent, 3 cm. wide; scape erect or ascending, stout, about equaling the leaves; scape-bracts strict, densely imbricate, subfoliaceous; inflorescence lax, 2 dm. long, axes glabrous; primary bracts spreading to reflexed, ovate, triangular-acute, about equaling the lower spikes, much shorter than the upper; spikes spreading, globose, 5 cm. long including the flowers, the lowest stipitate; floral bracts broadly elliptic, membranaceous; pedicels 2 mm. long; sepals elliptic, subobtuse, subsymmetric, 21 mm. long, coriaceous; petals 4 cm. long, pale stramineous, blades elliptic, obtuse.

COLOMBIA (?): Described from cultivation: *Morren* Icon (K, phot. K).

24. *Guzmania densiflora* Mez, Bull. Herb. Boiss. II. 3:226. 1903.

Plant 1 meter high; leaves to 65 cm. long, minutely appressed-lepidote, becoming glabrous above, sheaths elliptic, nearly concolorous with the blades, blades ligulate, acute, 4–5 cm. wide; scape stout, erect, glabrous; scape-bracts strict, imbricate, ovate, acute, sometimes violet-striped; inflorescence bipinnate from about 15 spikes, 10 cm. long; primary bracts like the scape-bracts, exceeding the lowest spikes; spikes suberect, globose, 4 cm. long; floral bracts densely imbricate, ovate, acute, coriaceous, nerved; flowers short-pedicellate; sepals elliptic; petals white, the blades elliptic, obtuse, 10 mm. long; capsule stout, 22 mm. long, coma ferruginous.

META: Epiphytic, Pico Renjifo, central mountains, Sierra de la Macarena, alt. 1,650 m., Jan. 21, 1950, *Philipson, Idrobo & Jaramillo* 2179 (BM, COL).

CAUCA: Eastern slope of the Cordillera Occidental, alt. 2,800 m., Nov. 1899, *Langlassé* 96-a (G?, type). Forest, "San José," San Antonio, Cordillera Occidental, alt. 2,400–2,700 m., June 30, 1922, *Pennell* 7573 (GH, NY).

NARIÑO: In trees, beyond Sibundoy, near Buenos Aires, alt. 2,700 m., Oct. 29, 1946, *Foster* 2009 (GH, US).

25. *Guzmania vanvolxemii* (André) André ex Mez in DC. Monogr. Phan. 9:938. 1896.

*Caraguata vanvolxemii* André, Ill. Hortie. 25:139, pl. 326. 1878.

Stemless, 1 meter or higher; leaves 20–30, arching-deflexed, 5 dm. long, sheath elliptic, brown toward base, blade linear, acute, pungent, 35 mm. wide, glabrous above; scape erect, stout, about equaling the leaves or shorter; scape-bracts strict, densely imbricate, lance-elliptic, elongate, dorsally brown-punctulate; inflorescence slenderly cylindric,

dense, 9 cm. in diameter; axes bright red, glabrous; primary bracts ovate, acuminate, red except for the green apex, much exceeding the lowest branches; spikes suberect, short-stipitate, 6-12-flowered; floral bracts broadly elliptic, 9 mm. long, nerved, red; pedicels very short and stout; sepals asymmetric, obovate, truncate, red or yellow, nerved; petals 20 mm. long, pale yellow, acute.

TOLIMA: Quindio, alt. 2,500 m., *André* 2228 (K, type, US phot. 4189; US).

26. *Guzmania eduardii* André ex Mez in DC. Monogr. Phan. 9:947. 1896.

FIGURE 60

*Caraguata morreniana* André, Rev. Hort. 59:12, pl. 1887, not *Guzmania morreniana* (Linden) Mez, 1896.

Leaves rosulate at the end of the stout caudex, 4-7 dm. long, much exceeding the inflorescence, sheaths elliptic, 10 cm. long, scarcely wider than the blades, covered with minute pale appressed scales, dark castaneous toward the base, blades ligulate, acute, minutely pale-lepidote beneath; scape erect, from very short to 3 dm. long;

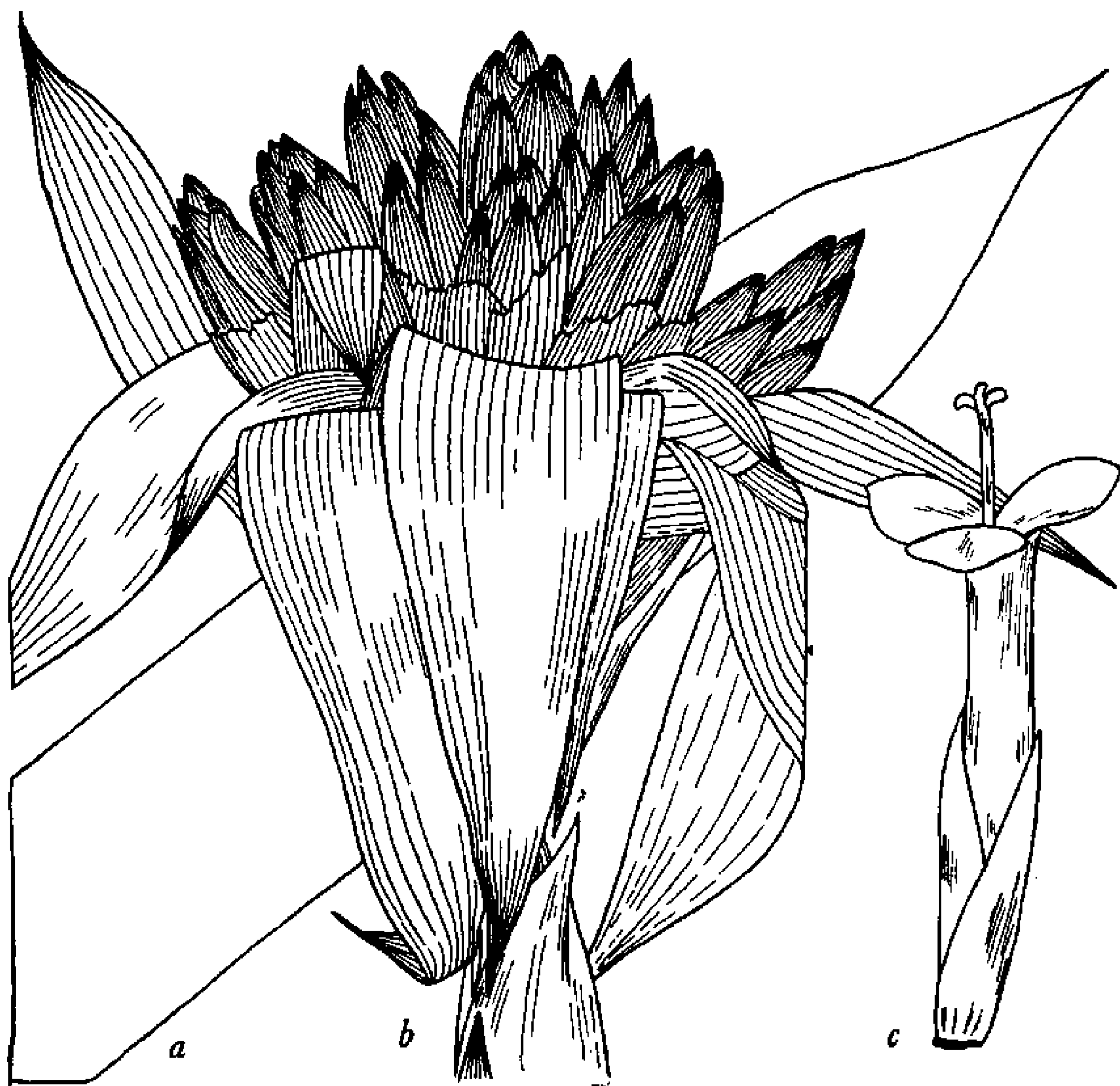


FIGURE 60.—*Guzmania eduardii*: a, Apex of leaf,  $\times 1$ ; b, inflorescence,  $\times 1$ ; c, floral bract and flower,  $\times 2$  (c, after Revue Horticole).

scape-bracts erect, densely imbricate, the lower elliptic, acute, the highest ovate, red; inflorescence densely digitate from about 10 spikes; primary bracts like the upper scape-bracts; spikes fusiform, 5–8 cm. long, few-flowered; floral bracts densely imbricate, elliptic, obtuse, 32 mm. long, pale green or yellow, thin; pedicels 5 mm. long; sepals elliptic, 26 mm. long, high-connate, thin; petals 4 cm. long, yellow or white, the lobes spreading, elliptic.

CHOCÓ: Km. 52 to 70 on road from Bolívar to Quibdó, upper Río Atrato Valley, alt. 500–600 m., July 25–26, 1944, *García-Barriga* 11125 (US).

VALLE: Forest, Córdoba, Dagua Valley, alt. 80–100 m., May 6, 8, 1922, *Killip* 5082 (GH, NY, US). Barco, Río Cajambre, Pacific Coast, alt. 5–80 m., Apr. 21–30, 1944, *Cuatrecasas* 17008 (F, GH). Lomas opposite Quebrada de la Brea, right bank of Río Calima (region of the Chocó), alt. 30–50 m., May 22, 1946, *Cuatrecasas* 21189 (F). On trees, Buenaventura, alt. 30 m., Dec. 5, 1946, *Foster* 2338 (COL, GH).

CAUCA: Forest, near La Costa, El Tambo District, alt. 1,200 m., Mar. 23, 1938, *Sneidern* 1592 (GH, S, US).

NARIÑO: Río Caiquer, alt. 1,000 m., May 1876, *André* 3396 bis (K, type, GH phot. 2671). In trees, Junín, Nov. 14, 1946, *Foster* 2166 (GH).

**27. *Guzmania goudotiana* Mez in DC. Monogr. Phan. 9:942. 1896.**

Stemless, 3–8 dm. high; leaves 16–80 cm. long, obscurely punctulate-lepidote beneath, sheaths large, elliptic, blades acute; scape slender, erect; scape-bracts strict, the lower foliaceous and dense, the upper subtriangular and about equaling the internodes; inflorescence of a few spikes, 5–9 cm. long, glabrous; primary bracts broadly ovate, acute, about equaling the lower spikes; spikes globose or stout-ellipsoid, 3–4 cm. long; floral bracts ovate, acute, longer to shorter than the sepals; pedicels very short and stout; sepals elliptic, acute, 12–15 mm. long, connate for 3 mm.; petals 20 mm. long, blades elliptic, obtuse.

COLOMBIA: *Goudot* (P, type, GH phot. 3022).

MAGDALENA: Dense rain forest, on Santa Marta above "Cincinnati", alt. 1,200 m., 1946, *Foster & C. E. Smith, Jr.*, 1397 (GH). Mountains above Santa Marta, alt. 1,950 m., Aug. 3, 1946, *Foster & C. E. Smith, Jr.*, 1405 (GH).

CALDAS: Forest, "Pinares," above Salento, Cordillera Central, alt. 2,600–2,800 m., Aug. 2–10, 1922, *Pennell* 9266 (GH).

**28. *Guzmania glomerata* Mez & Wercklé, Fedde Rep. Spec. Nov. 14:256. 1916.**

Flowering plant nearly 1 meter high, propagating by stout scaly rhizomes; leaves up to 20 in a dense rosette, erect, coriaceous, 8 dm. long, sheaths broadly elliptic, deep castaneous, blades subglabrous, wholly green, 30 mm. wide; scape erect, stout; scape-bracts with short acute erect blades, imbricate; inflorescence erect, capitate from about 10 spikes, 65 mm. thick; primary bracts broadly ovate, shorter than the spikes; spikes densely strobiliform, very short-stipitate,

suberect, stout, 45 mm. long; floral bracts elliptic, acute, equaling or slightly exceeding the sepals; flowers glabrous; pedicels 3 mm. long; sepals lanceolate, 16–22 mm. long, short-connate.

NORTE DE SANTANDER: Woods, Alto de Santa Ines, Cordillera Oriental, alt. 2,150–2,250 m., Oct. 19–23, 1941, *Cuatrecasas, Schultes & C. E. Smith, Jr.*, 12435 (US).

META: Near the crest of Renjifo, northeast end of Cordillera La Macarena, alt. 1,300–1,900 m., Jan. 6–20, 1951, *Idrobo & Schultes* 965 (COL, US).

VALLE: Dense forest, 18 km. east of Buenaventura, alt. 50 m., Feb. 14, 1939, *Killip & Garcia* 33243 (US). Dense forest, Agua Clara, between Buenaventura and Cali, alt. 100 m., June 6, 1944, *Killip & Cuatrecasas* 38872 (US). Same, km. 8, near sea level, June 10, 1944, *Killip & Cuatrecasas* 38997 (F, US). In trees, above Buenaventura, alt. 300 m., Dec. 8, 1946, *Foster* 2330 (GH).

COSTA RICA, PANAMA.

29. *Guzmania acuminata* L. B. Smith, *Phytologia* 4: 359, *pl. 2, figs. 3–5*. 1953.

Stemless, 50–75 cm. high; leaves 5–6 dm. long, appressed-lepidote beneath, sheaths elliptic, 8–10 cm. long, pale brown, blades linear, acuminate, 2 cm. wide, green, glabrous above; scape erect, slender; scape-bracts subfoliaceous, densely imbricate, the upper ones involucrate; inflorescence 4 cm. long; primary bracts ovate with a long foliaceous blade equaling or exceeding the spike; spikes many-flowered, 3 cm. long; floral bracts ovate, glabrous; pedicels very short; sepals elliptic, 14 mm. long, connate for 4 mm.; petals white.

NARIÑO: Pepino, near Mocoa, alt. 1,200 m., Nov. 21, 1946, *Foster* 2218 (GH, type, US phot. 3498; US). Near Mocoa, alt. 540–720 m., Mar. 16, 1953, *Schultes & Cabrera* 19079 (US).

30. *Guzmania vittata* (Mart. ex Schult.) Mez in DC. *Monogr. Phan.* 9: 946. 1896. FIGURE 61

*Bonaparteia vittata* Mart. ex Schult. f. in *Roem. & Schult. Syst.* 7, pt. 2: 1198. 1830.

*Caraguata vittata* Baker, *Handb. Bromel.* 146. 1889.

Stemless, to 55 cm. high; leaves over 10 in an infundibuliform rosette, straight, 40–60 cm. long, usually bearing broad dark transverse bands beneath, sheaths broadly ovate, blades linear, acute, 15–25 mm. wide; scape erect, slender, glabrous; scape-bracts tightly imbricate, lanceolate, acuminate, subpungent; inflorescence densely digitate and broadly ovoid from a few spikes or simple and globose, 3–4 cm. long; primary bracts triangular-ovate, acute, mostly shorter than the spikes; spikes sessile, densely 10–15-flowered; floral bracts ovate, 13 mm. long, shorter than the sepals and enfolding them, coriaceous, even or nearly so; flowers subsessile; sepals broadly elliptic, obtuse, 15 mm. long, coriaceous, even, sublustrous; petals about 2 cm. long, white, blades obovate, obtuse and emarginate; stamens included; capsule slender, terete, to 45 mm. long.



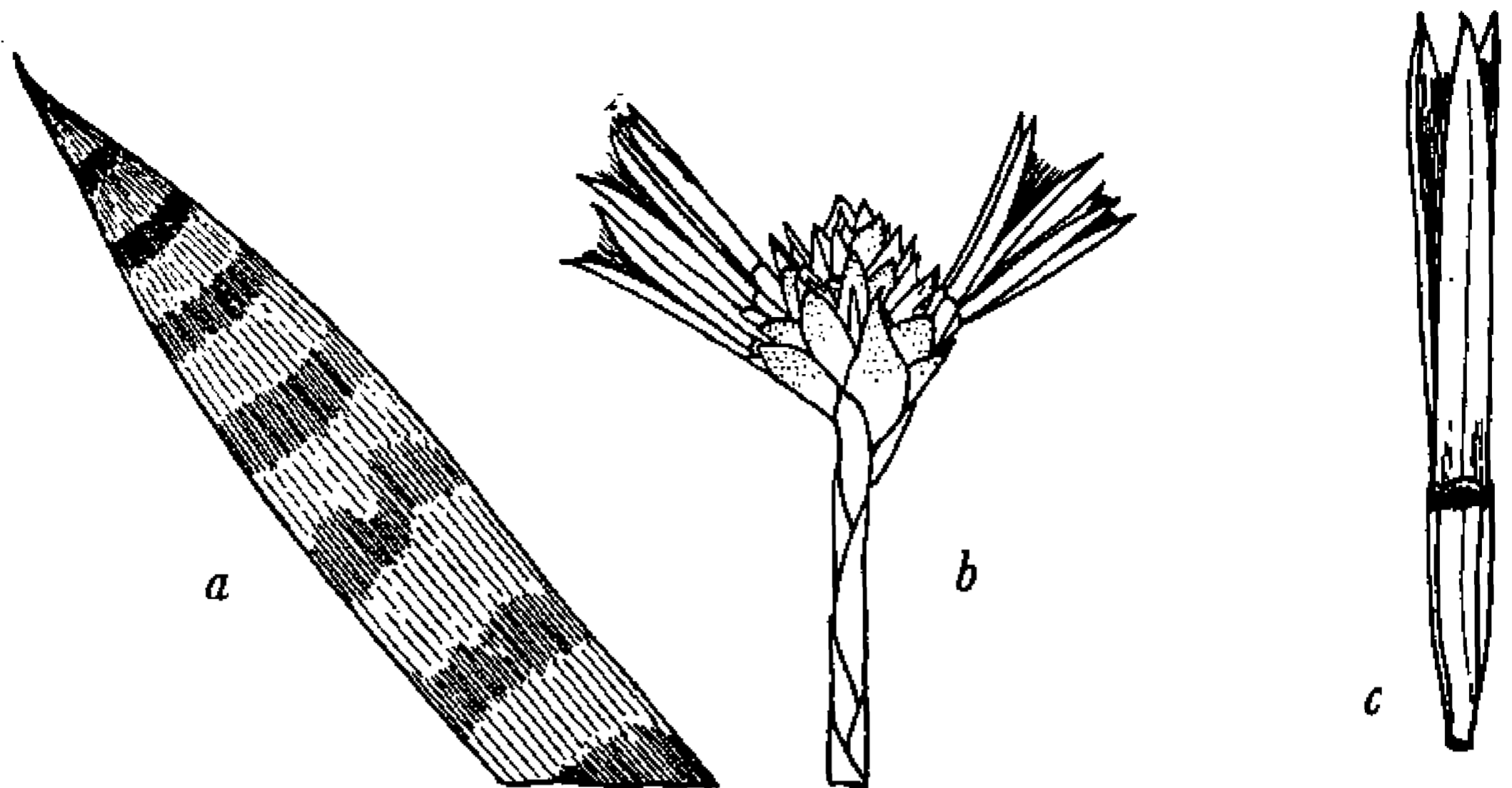


FIGURE 61.—*Guzmania vittata*: *a*, Apex of leaf,  $\times \frac{1}{2}$ ; *b*, inflorescence,  $\times \frac{1}{2}$ ; *c*, sepals and capsule,  $\times 1$ .

VAUPÉS: Woods, Mitú, Río Vaupés, alt. 200 m., Sept. 16, 1939, *Cuatrecasas* 6857 (COL). Same, alt. 250 m., Sept. 8, 1951, *Schultes & Cabrera* 13964 (US). Caño Teemeña, Río Piraparaná (tributary of Río Apaporis), lat.  $0^{\circ}15'$  S. to  $0^{\circ}25'$  N., long.  $70^{\circ}30'$  W., Sept. 6, 1952, *Schultes & Cabrera* 17256 (US). On trees, Mitú, Cerro de Mitú, alt. 380–560 m., Oct. 22, 1952, *García-Barriga* 14932 (COL).

AMAZONAS-VAUPÉS: Near Cachivera de Jirijirimo, Río Apaporis, alt. 250 m., July 5, 1951, *Schultes & Cabrera* 12903 (US); 12927 (US).

BRASIL.

31. *Guzmania subcorymbosa* L. B. Smith, *Contr. Gray Herb.* 117:10, *pl. 1*, *fig. 16*. 1937.

*Guzmania compacta* sensu L. B. Smith, *Contr. Gray Herb.* 98:32. 1932, not Mez 1896.

Spreading by stolons, flowering shoot 3–8 dm. high; leaves rosulate, erect, 6–7 dm. long, sheaths ovate, 7–12 cm. long, often castaneous toward the base, blades linear-triangular, acuminate, glabrous above, obscurely punctulate beneath; scape erect, slender; scape-bracts strict, densely imbricate, foliaceous; inflorescence few-branched, subcorymbose, green; primary bracts ovate, acute or acuminate, about half as long as the branches; spikes subellipsoid, sessile or subsessile, densely 3–10-flowered, 25–40 mm. long; floral bracts ovate, broadly acute or obtuse, slightly but constantly shorter than the sepals, coriaceous, subglabrous; flowers subsessile; sepals elliptic, short-connate, carinate, coriaceous; petals white; capsule slenderly cylindrical, 3 cm. long; coma reddish brown.

VALLE: Wooded cliffs of Río Dagua, Córdoba, alt. 80–100 m., May 6, 8, 1922, *Killip* 5059 (GH, type; PH, US). Dense forest, Córdoba, alt. 50–100 m., Feb. 17, 1939, *Killip & García* 33453 (US). Woods, left bank of Río Dagua, Piedra de Moler, west slope of Cordillera Occidental, alt. 900–1,180 m., Aug. 19–28, 1943, *Cuatrecasas* 14899 (F, GH). La Trojita, Río Calima, Chocó Region, alt. 5–50 m., Feb. 19–Mar. 10, 1944, *Cuatrecasas* 16249 (GH, US); 16833 (F, GH). Barco,

Río Cajambre, Pacific Coast, alt. 5–80 m., Apr. 21–30, 1944, *Cuatrecasas* 16995 (VALLE); 17204 (GH). In trees, 30 km. above Buenaventura, alt. 300 m., Dec. 8, 1946, *Foster* 2325 (GH).

COSTA RICA, PANAMA.

**32. *Guzmania sphaeroidea*** (André) André ex Mez in DC. Monogr. Phan. 9: 942. 1896.

*Caraguata sphaeroidea* André, Énum. Bromél. 6. Dec. 13, 1888; Rev. Hort. 60:566. Dec. 16, 1888.

Stemless, 5–8 dm. high; leaves 4–6 dm. long, sheaths elliptic, 8–15 cm. long, castaneous toward the base, blades ligulate, acuminate, subglabrous; scape erect, stout; scape-bracts strict, densely imbricate, lanceolate, acute; inflorescence 4–6-branched; primary bracts ovate, acuminate, shorter than the branches; spikes spreading to subreflexed, globose, dense, 12–15-flowered; floral bracts ovate, acute, slightly but consistently shorter than the sepals, obtusely carinate, coriaceous, green or brown; pedicels stout, 2.5 mm. long; sepals subelliptic, 11 mm. long, short-connate, coriaceous; capsule slenderly cylindrical, 3 cm. long.

SANTANDER: Dense woods, Mesa de los Santos, alt. 1,500 m., Dec. 11–15, 1926, *Killip & A. C. Smith* 15291 (GH).

CAQUETÁ: Open woods, Cajón de Pulido, Río Hacha, eastern slope of Cordillera Oriental, alt. 1,700 m., Mar. 26, 1940, *Cuatrecasas* 8762 (F, US phot. 3670).

VALLE: Alto del Potrerito near Vijés, alt. 1,780 m., Mar. 30, 1876, *André* 2685 (K, type; US phot. 4191). Woods, La Laguna, left bank of Río Sanquinín, western slope of Cordillera Occidental, alt. 1,250–1,400 m., Dec. 10–20, 1943, *Cuatrecasas* 15496 (VALLE, US phot. 3669).

ECUADOR.

**33. *Guzmania wittmackii*** (André) André ex Mez in DC. Monogr. Phan. 9:921. 1896.

*Thecophyllum wittmackii* André, Bromel, Andr. 107, pl. 39B. 1889.

Leaves to 85 cm. long, minutely and obscurely lepidote, sheaths elliptic, over 16 cm. long, brown, blades ligulate, acuminate, 2–3 cm. wide; scape 8 mm. in diameter, curved; scape-bracts suberect, foliaceous, densely imbricate, red distally; primary bracts foliaceous, to 4 dm. long; fascicles few-flowered; floral bracts oblong, obtuse, ample, enfolding and exceeding the sepals; sepals linear, acuminate, 4 cm. long, free, membranaceous; corolla white, 7–9 cm. long.

NARIÑO: Between Altaquer and El Páramo, alt. 900 m., May 1876, *André* 3298 (K, type, US phot. 4172). On trees, Altaquer, alt. 1,050 m., Nov. 10, 1946, *Foster* 2077 (GH).

ECUADOR.

**34. *Guzmania verecunda*** L. B. Smith, Phytologia 4:366, pl. 4, figs. 4–6. 1953.

Stemless; leaves to 45 cm. long, exceeding the inflorescence, subdensely lepidote with brown appressed scales, sheaths elliptic, 8–10 cm. long, dark castaneous, blades ligulate, 25 mm. wide, flat, green;

scape erect, short; scape-bracts strict, densely imbricate, foliaceous, the upper ones roseate; inflorescence 15 cm. long; primary bracts broadly ovate with a subtriangular blade, erect, much exceeding the flowers, roseate with a castaneous base; floral bracts lanceolate, inflexed at the apex, exceeding the sepals, their apical third pale brown and subchartaceous, elsewhere castaneous and coriaceous; flowers subsessile; sepals like the floral bracts, 20 mm. long, free.

VALLE: Right bank of Río San Juan below El Queremal, between km. 52 and 53, basin of Río Digua, alt. 1,500 m., Mar. 19, 1947, *Cuatrecasas* 23875 (VALLE, type, US phot. 3671).

35. *Guzmania kraenzliniana* Wittm. Bot. Jahrb. 11:62. 1889.

*Thecophyllum kraenzlinianum* Mez, Bull. Herb. Boiss. II. 3:131. 1903.

Stem covered with the remains of old leaves; young leaves clustered at the end of the stem, 10–15 cm. long, exceeding the inflorescence, densely appressed-lepidote beneath, sheaths elliptic, 3–4 cm. long, more or less castaneous toward the base; scape erect, very short, glabrous; scape-bracts foliaceous, densely imbricate; inflorescence few-flowered, dense; lower primary bracts subfoliaceous with red blades; fascicles 2–3-flowered; floral bracts lance-ovate, shorter than the sepals; pedicels very short but distinct; sepals 8–18 mm. long, connate for 5 mm., lobes broadly ovate, emarginate; petal-lobes elliptic, obtuse.

35a. *Guzmania kraenzliniana* var. *kraenzliniana*.

Sepals 8 mm. long; petals 19 mm. long.

CAUCA: Very wet woods, Río Riveralde, near Arrayanal, alt. 2,000 m., Oct. 20, 1883, *Lehmann* 3225 (G, type; BM, GH phot. 6651).

NARIÑO: Without locality, 1946, *Foster* 2146 (GH, US; sterile, determination dubious). Above El Diviso, alt. 705 m., Nov. 13, 1946, *Foster* 2147 (GH, sterile, determination dubious).

35b. *Guzmania kraenzliniana* var. *macrantha* L. B. Smith, *Phytologia* 5:397. 1956.

Sepals 18 mm. long; petals over 60 mm. long.

VALLE: Epiphytic, gully at km. 51, left bank of Río San Juan near Queremal, Río Digua drainage, alt. 1,650 m., Feb. 25, 1947, *Cuatrecasas* 23727 (F, type, US phot. 4454).

36. *Guzmania mosquerae* (Wittm.) Mez in DC. Monogr. Phan. 9:924. 1896.

FIGURE 62

*Caraguata mosquerae* Wittm. Bot. Jahrb. 11:58. 1889.

*Thecophyllum mosquerae* Mez. Bull. Herb. Bois. II. 3:131. 1903.

*Thecophyllum lehmannianum* Mez, Repert. Sp. Nov. Fedde 16:72. 1919.

Leaves numerous, erect, 25 cm. long, densely lepidote, sheaths elliptic, 10 cm. long, brown, blades narrowly subtriangular with an abruptly acute apex, 25 mm. wide; scape erect; scape-bracts foliaceous, densely imbricate, red; inflorescence densely short-cylindric, 9–12

cm. long; primary bracts broadly ovate, greatly exceeding the flowers, red; fascicles few-flowered; floral bracts lanceolate, 7 mm. long; flowers subsessile; sepals symmetric, lobes obovate; petals white or yellow, 20 mm. long.

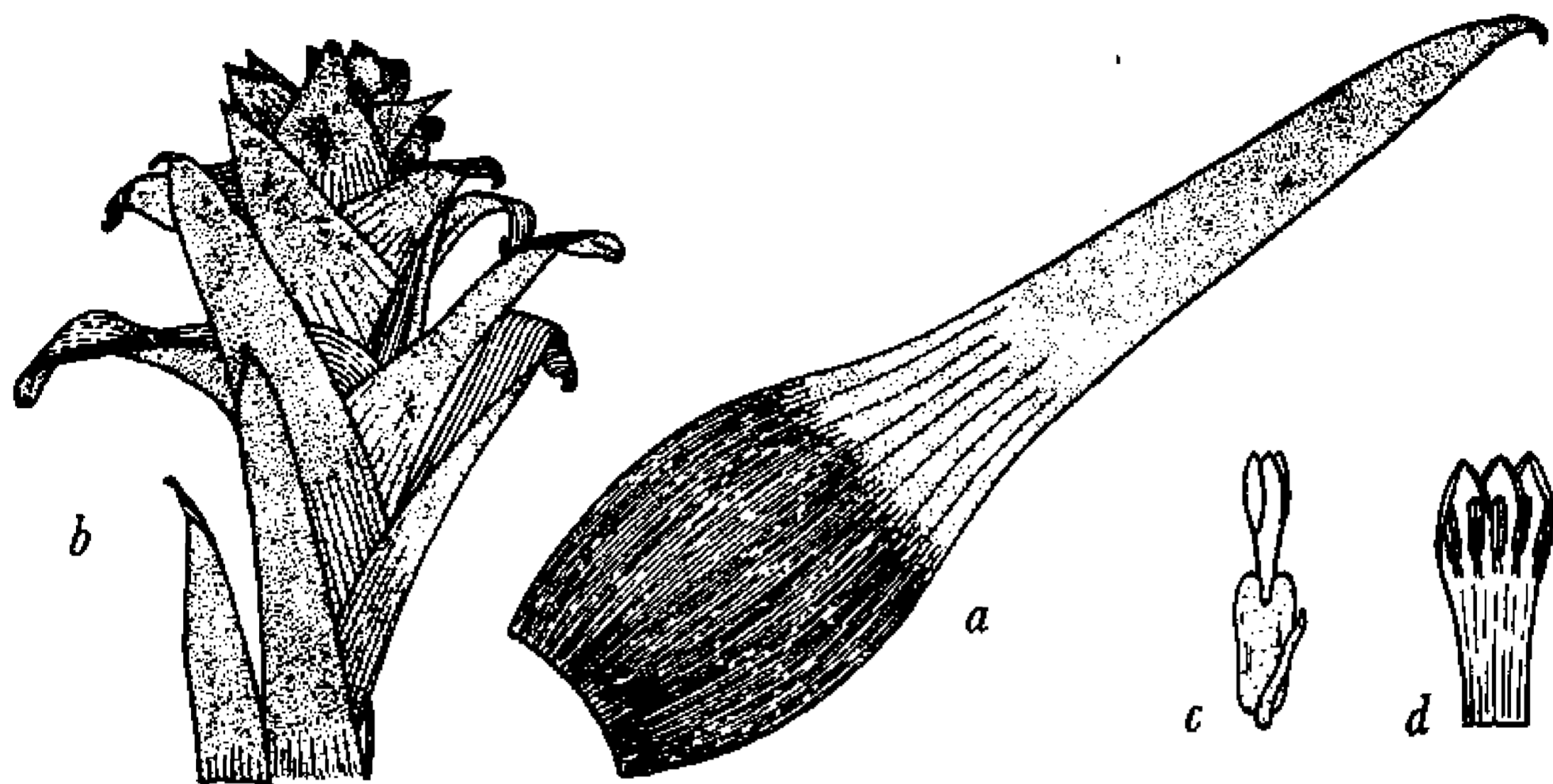


FIGURE 62.—*Guzmania mosquerae*: a, Leaf,  $\times \frac{1}{2}$ ; b, inflorescence,  $\times \frac{1}{2}$ ; c, flower,  $\times 1$ ; d, corolla and stamens,  $\times 1$ .

TOLIMA: Cueva del Tigre, Volcán de Tolima, *Stuebel* 236-2 (B, !Mez).

CAUCA: Western slopes of Cerro Munchique, alt. 2,600 m., Mar. 2, 1884, *Lehmann* 3630 (G, type). Western Cordillera of Popayán, alt. 2,800-3,100 m., *Lehmann* 5296 (B, type of *Thecophyllum lehmannianum* Mez, F phot. 11540; GH, US). Woods, "San José," San Antonio, Cordillera Occidental, alt. 2,400-2,700 m., June 30, 1922, *Pennell* 7560 (GH). Woods, Valley of Micay, Cordillera Occidental, alt. 2,200-2,500 m., July 1, 1922, *Killip* 8002 (GH). Cerro de Munchique, western slope in the valley of the Río Tambito, alt. 2,000-2,500 m., July 16, 1939, *Pérez-Arbeláez & Cuatrecasas* 6206 (COL, US).

NARIÑO: Junín, alt. 840 m., Nov. 14, 1946, *Foster* 2168 (GH). On rocks, San Francisco and Las Mesas, alt. 2,400 m., Nov. 26, 1946, *Foster* 2260 (GH).

37. *Guzmania confinis* L. B. Smith, *Fieldiana Bot.* 28:143, fig. 22a, b. 1951.

Caulescent, branching, flowering shoot 50-55 cm. high; leaves strict, 2-3 dm. long, sheaths elliptic, 10 cm. long, densely lepidote on both sides, blades 2-4 cm. wide; scape erect, slender; scape-bracts subfoliaceous, very densely imbricate, purplish; inflorescence densely cylindrical; primary bracts like the scape-bracts but gradually shorter, the lowest much exceeding the flowers; fascicles 3-flowered; floral bracts membranaceous, sparsely lepidote; sepals oblong, broadly obtuse, about half connate; petals 20 mm. long, white, the blades erect, elliptic; capsule cylindrical, rostrate, 2 cm. long.

VALLE: Páramo, Los Farallones, north end of Alto del Buey, crest of Cordillera Occidental, alt. 3,500-3,600 m., Oct. 11, 1944, *Cuatrecasas* 17907 (F, GH, US).

VENEZUELA

38. *Guzmania gloriosa* (André) André ex Mez in DC. Monogr. Phan. 9:922. 1896.  
*Caraguata gloriosa* André, Enum. Bromél. 5. Dec. 13, 1888; Rev. Hortie.  
 60:565. Dec. 16, 1888.  
*Thecophyllum gloriosum* Mez, Bull. Herb. Boiss. II. 3:131. 1903.  
*Thecophyllum sceptrum* Mez, Bull. Herb. Boiss. II. 3:139. 1903.

Plant over 7 dm. high; leaves rosulate, 4–6 dm. long, sheaths indistinct, covered with fine appressed dark brown scales, blades broadly rounded and apiculate, 7–8 cm. wide, subglabrous, green with a bright red apex; scape stout, erect; scape-bracts foliaceous, very densely imbricate; inflorescence densely cylindrical; primary bracts subfoliaceous, greatly exceeding the fascicles; floral bracts elliptic, obtuse, equaling the sepals or slightly shorter, red, membranaceous; pedicels to 8 mm. long; sepals oblong, acute, red; petals 5 cm. long, yellow, blades erect, elliptic; capsule cylindrical, acute, 4 cm. long.

CALDAS: Forest, "Pinares," above Salento, Cordillera Central, alt. 2,800–3,100 m., Aug. 2–10, 1922, Pennell 9362 (GH).

CAUCA: Eastern slope of Cordillera Occidental, alt. 2,800 m., November 1898, Langlassé 95-b (G, type of *Thecophyllum sceptrum* Mez, F phot. 25277). Valley of Río Tambito, western slope of Cerro Munchique, alt. 2,000–2,500 m., July 16, 1939, Pérez-Arbeláez & Cuatrecasas 6220 (US).

NARIÑO: Between Sibundoy and Buenos Aires, alt. 2,700 m., Oct. 29, 1946, Foster 2007 (GH, US).

ECUADOR.

39. *Guzmania longipetala* (Baker) Mez in DC. Monogr. Phan. 9:919. 1896.  
*Tillandsia longipetala* Baker, Journ. Bot. 26:142. 1888.  
*Thecophyllum longipetalum* Mez, Bull. Herb. Boiss. II. 3:131. 1903.

Caulescent, branching, flowering shoot 25–35 cm. high; leaves 12–22 cm. long, sheath elliptic, appressed-lepidote, brown-striped, blade subacute and apiculate, reddish beneath; scape erect, slender, glabrous; scape-bracts suberect, foliaceous, densely imbricate; inflorescence few-branched, glabrous; primary bracts foliaceous, divergent to spreading; floral bracts elliptic, obtuse, carinate toward the apex, shorter than the sepals; sepals acute, 14 mm. long, high-connate, hyaline; petals 6 cm. long, white.

COLOMBIA: Cultivated, from the Andes, alt. 900–1,200 m., Sander & Son s. n. (K, type; K phot.).

CAUCA: Woods, West Andes, near Popayán, alt. 1,200–1,500 m., Dec. 1899, Lehmann K-349 (F, K, GH phot. 6061).

NARIÑO: Barbacoas to Túquerres, alt. 700 m., May 1853, Triana 544 (BM, GH phot. 6652). Above El Diviso, alt. 705 m., Nov. 13, 1946, Foster 2148 (GH); 2157 (GH).

40. *Guzmania sibundoyorum* L. B. Smith, Phytologia 4:364, pl. 3, figs. 6–8. 1953.

In dense masses, spreading by long stolons, flowering shoot 5 dm. high; leaves 3 dm. long, very obscurely lepidote, marked with fine maroon longitudinal stripes, sheaths elliptic, ample, blades acute,

flat; scape erect; scape-bracts foliaceous, densely imbricate; primary bracts foliaceous, red or red-striped, the lower ones exceeding the center of the inflorescence; fascicles 3-flowered; floral bracts obovate, apiculate, slightly shorter than the sepals, thin, sparsely appressed-lepidote; sepals oblong, yellow; petals 25–40 mm. long, white.

NARIÑO: Terrestrial and epiphytic, south side of Laguna de La Cocha, source of Río Alisales, Páramo de Santa Lucia, alt. 2,900–3,100 m., Jan. 9, 1941, *Cuatrecasas* 11875 (COL). Near La Laguna de La Cocha, by Nariño boundary, February 1942, *Schultes* (US). Sibundoy, Valley of Sibundoy, alt. 2,225–2,300 m., May 29, 1946, *Schultes & Villarreal* 6605–a (US). Near Buenos Aires, beyond Sibundoy, alt. 2,700 m., Oct. 29, 1946, *Foster* 2008 (GH, type, US phot. 3511).

**41. *Guzmania cryptantha*** L. B. Smith, *Caldasia* [1], No. 5: 6, *fig. 2*. 1942.

Over 7 dm. high; leaves 40–55 cm. rarely to 70 cm. long, densely appressed-lepidote, sheaths ample, blades 5–7 cm. wide, often reddish; scape erect, stout; scape-bracts suberect, foliaceous, densely imbricate; inflorescence dense, its axis 15–30 cm. long; primary bracts foliaceous; floral bracts elliptic, broadly obtuse or truncate, about equaling the sepals, lepidote; sepals much connate, the free lobes oblong, obtuse; petals obtuse, 23 mm. long, yellow.

COLOMBIA: *Lehmann* K-354 (K).

NORTE DE SANTANDER: Between Convención and Ocaña, alt. 1,200–1,800 m., Sept. 23, 1946, *Foster* 1754 (GH, US, robust form with less connate sepals than in type).

CUNDINAMARCA: Between Pacho and Río Negro, alt. 1,000–1,200 m., Feb. 22–26, 1942, *García-Barriga* 10764 (COL, US). Muchindote Valley, east side of Quebrada Negra, 13 km. northeast of Gachetá, Cordillera Oriental, alt. 2,800 m., July 4, 1944, *Grant* 9591 (US). Ubalá, near Cerro de los Cristales, alt. 1,950 m., Apr. 18, 1949, *Uribe-Uribe* 1944 (COL, US).

META: Dense forest, central mountains, north ridge, Sierra de la Macarena, alt. 1,500 m., Jan. 10, 1950, *Philipson, Idrobo & Jaramillo* 2075 (BM).

HUILA-CAQUETÁ: Gabinete, crest of the Cordillera Oriental, alt. 2,300–2,450 m., Mar. 22, 1940, *Cuatrecasas* 8472 (US, type, GH phot. 6046).

CAUCA: Río San Marcos, eastern side of the Cordillera Central near the crest, between Jardín and San Rafael, alt. 2,700–2,900 m., July 25, 1943, *Cuatrecasas* 14804 (F, GH).

NARIÑO: Páramo woods, La Cabaña, crest of the cordillera between Sibundoy and Urcusique, alt. 2,810 m., Dec. 31, 1940, *Cuatrecasas* 11536 (COL, US). San Francisco and Las Mesas, alt. 2,550 m., Nov. 26, 1946, *Foster* 2259 (GH, US).

BRITISH GUIANA, VENEZUELA.

**42. *Guzmania lychnis*** L. B. Smith, *Phytologia* 4:363, *pl. 3, figs. 3–5*. 1953.

Long-caulescent, flowering shoot 9 dm. high; leaves rosulate, 4–6 dm. long, densely brown-lepidote beneath, white-lepidote above, sheaths elliptic, large, blades spreading, acute, flat, 4 cm. wide; scape erect or ascending; scape-bracts divergent, foliaceous, densely imbricate; inflorescence cylindric, 25 cm. long; primary bracts spreading, imbricate, dull maroon with green apices, the lower ones subfoliaceous, the

upper broadly ovate, acute; floral bracts elliptic, slightly shorter than the sepals, membranaceous, densely appressed-lepidote; sepals oblong, obtuse, densely lepidote; petals linear, obtuse, 4-5 cm. long, yellow.

NARIÑO: Páramo cloud forest, Alto de Cruz, above Encano, alt. 3,300 m., Nov. 1, 1946, *Foster* 2045 (GH, type; US phot. 3508).

43. *Guzmania danielii* L. B. Smith, *Phytologia* 4:360, *pl. 2, figs. 6-8.* 1953.

Stemless, 1.5 meters high, robust; leaves numerous, decurved-arching, 8 dm. long, densely appressed-lepidote, sheaths elliptic, ample, 2 dm. long, blades broadly subacute and apiculate, 8 cm. wide; scape erect, 2 cm. in diameter; scape-bracts foliaceous, suberect, densely imbricate; inflorescence cylindrical, 20 cm. long; primary bracts densely imbricate but with spreading blades, the lower subfoliaceous, the upper broadly ovate; floral bracts elliptic, ample, about equaling the sepals, membranaceous, densely and finely lepidote; pedicels 5 mm. long; sepals oblong, obtuse, connate for 20 mm.; petals 7 cm. long.

MAGDALENA: Rain forest, mountains above Hacienda Cincinnati, Santa Marta, alt. 1950 m., Aug. 3, 1946, *Foster & C. E. Smith, Jr.*, 1400 (GH, US).

ANTIOQUIA: Monte del Diablo, near La Ceja, July 1944, *Daniel* 3350 (GH, type; US).

44. *Guzmania palustris* (Wittm.) Mez *in* DC. *Monogr. Phan.* 9:923. 1896.

*Caraguata palustris* Wittm. *Bot. Jahrb.* 11:58. 1889.

*Thecophyllum palustre* Mez, *Bull. Herb. Boiss.* II. 3:131. 1903.

Caulescent; stem stout, covered with the remains of old leaves; flowering shoot 2-3 dm. high; leaves numerous, 15-20 cm. long, sheath indistinct, brown, blade broadly acute and apiculate, 5 cm. wide, white-lepidote above, soon glabrous beneath; scape erect, short; scape-bracts subfoliaceous, densely imbricate; inflorescence subglobose, 7 cm. long; primary bracts densely imbricate, broadly ovate; floral bracts broadly elliptic, obtuse, 24 mm. long, carinate; pedicels slender; sepals elliptic, emarginate, symmetric, punctulate within; petals 35 mm. long.

CAUCA: In swamps, near Bordoncillo, Cordillera Oriental of Pasto, alt. 3,500 m., Feb. 20, 1881, *Lehmann* 537 (G, type), 537-a (BM, GH phot. 6649).

45. *Guzmania sanguinea* (André) André *ex* Mez *in* DC. *Monogr. Phan.* 9:901. 1896. FIGURE 63

*Tillandsia sanguinea* André, *Tour du Monde* 38:367. 1879, nomen subnudum.

*Caraguata sanguinea* André, *Rev. Hort.* 55:468, *fig. 95, pl.* 1883.

*Guzmania crateriflora* Mez & Wercklé, *Bull. Herb. Boiss.* II. 5:110. 1905.

Stemless, the flowering plant about 2 dm. high, stout and compact; leaves 15-18 in a cyathiform rosette, 2-3 dm. long; sheaths scarcely broader than the blades, very densely brown-lepidote; blades ligulate, 3 cm. wide, broadly acute to rounded-apiculate, rigid when dry, all or only the inner ones bright red; inflorescence 7-12-flowered; involucre

leaves shorter than the others but otherwise much the same; floral bracts not at all cucullate, exceeding the sepals, membranaceous; flowers erect, 7 cm. long; pedicels slender, about 5 mm. long, angled; sepals elliptic, broadly obtuse, 16 mm. long, subcoriaceous but thinner toward the apex, glabrous, even, slightly lustrous; petals coherent in

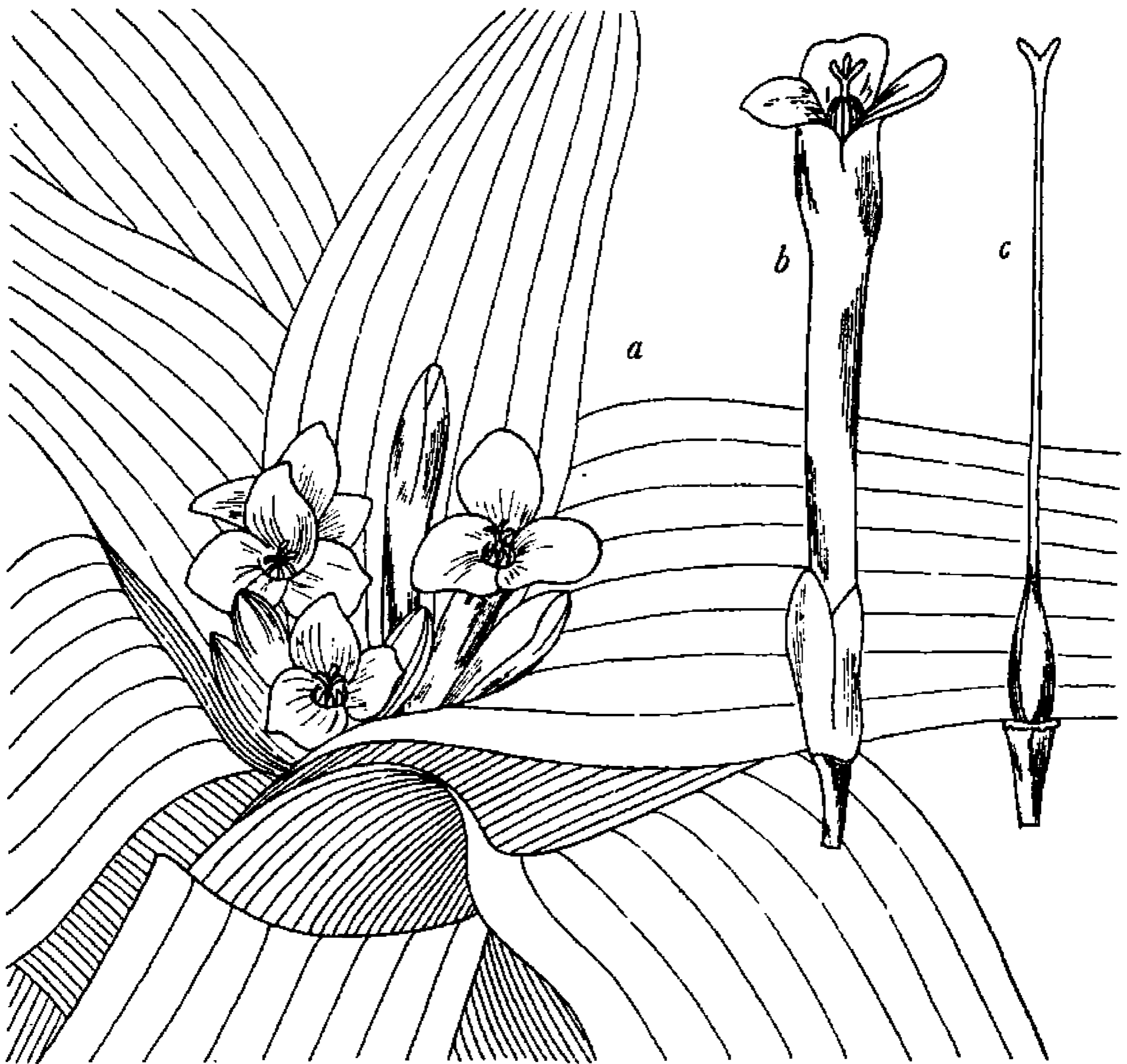


FIGURE 63.—*Guzmania sanguinea*: *a*, Habit,  $\times 1$ ; *b*, flower,  $\times 1$ ; *c*, pistil,  $\times 1$  (all after André).

a slender yellow tube for most of their length, the free lobes spreading broadly ovate, 8 mm. long, white; filaments adherent to the petals almost throughout, anthers projecting from the throat of the corolla but exceeded by the lobes; capsule acuminate, 40–45 mm. long.

VALLE: Woods, Pacific coast, Veneral, Río Yurumanguí, alt. 5–50 m., Jan. 28–Feb. 10, 1944, *Cuatrecasas* 15827 (VALLE). Dense forest, Agua Clara, along highway from Buenaventura to Cali, alt. ca. 100 m., *Killip & Cuatrecasas* 38871 (US).

NARIÑO: On trees, Los Astrojos between Tuquerres and Barbacoas, alt. 900 m., May 20–30, 1876, *André* 3369 (K, type). On trees, Altaquer, alt. 1,050 m., Nov. 11, 1946, *Foster* 2133 (GH).

COCOS ISLAND of COSTA RICA, TRINIDAD, ECUADOR.



46. *Guzmania lingulata* (L.) Mez in DC. Monogr. Phan. 9:899. 1896.  
*Tillandsia lingulata* L. Sp. Pl. 286. 1753.  
*Caraguata lingulata* Lindl. Bot. Reg. 13: under pl. 1068. 1827.  
*Caraguata splendens* Bouché in Otto & Dietr. Allg. Gartenzeit. 24:96, pl. 3. 1856; Planch. Fl. Serres 11:31, pl. 1091. 1856.  
*Caraguata lingulata* var. *cardinalis* André, Ill. Hort. 27:35, pl. 374. 1880.  
*Caraguata cardinalis* André, Rev. Hort. 55:12, pl. 1883.  
*Guzmania lingulata* var. *cardinalis* André ex Mez in DC. Monogr. Phan. 9:900. 1896.  
*Guzmania lingulata* var. *splendens* Mez, Engl. Pflanzenreich IV. 32:609. 1935.  
*Guzmania cardinalis* Mez, Engl. Pflanzenreich IV. 32:609. 1935.

Stemless, the flowering plant about 3 dm. high; leaves 15–30 in a dense rosette, 30–45 cm. long; sheaths ovate, conspicuous, densely brown-lepidote, more or less castaneous at the base, sometimes marked dorsally with fine violet longitudinal stripes; blades ligulate, acute, obscurely punctulate-lepidote; scape erect, usually much shorter than the leaves, stout; scape-bracts, densely imbricate, the lower ones strict, foliaceous, the uppermost lanceolate, usually red, forming a more or less spreading involucre; inflorescence up to 7 cm. wide, 10–50-flowered; floral bracts linear, shorter than the flowers; flowers erect, 45 mm. long; pedicels very short and stout; sepals linear, obtuse, glabrous; petals linear, cucullate, white at the apex; stamens highly agglutinated with the petals; ovary ellipsoid; capsule subellipsoid, 3 cm. long, short-beaked; coma reddish brown.

MAGDALENA: Santa Marta, alt. 600 m., 1898–1901, *H. H. Smith* 2343 (F, GH, NY, PH, US).

NORTE DE SANTANDER: Epiphytic, slopes of El Caraño, valley of the Río Cubugón, region of Sarare, Cordillera Oriental, alt. 500–700 m., Nov. 18, 1941, *Cuatrecasas* 13282 (COL). Dense jungle, Bellavista on pipeline, alt. 750 m., Sept. 15, 1946, *Foster* 1698 (GH). On trees in jungle, Camp 84 on pipeline, alt. 540 m., Sept. 16, 1946, *Foster* 1726 (GH); 1727 (GH).

SANTANDER: Epiphytic, Carare Valley, near Puerto Berrio, alt. 100–700 m., April 21, 1935, *Haught* 1658 (GH, US).

BOYACÁ: In high forest, El Humbo, 130 miles north of Bogotá, alt. 1080 m., *Lawrance* 743 (GH).

AMAZONAS: Epiphytic, near "Quebrada" Agua Preta, Trapecio, Nov. 8, 1946, *Schulles & Black* 46–383 (IAN, US).

ANTIOQUIA: Epiphytic, evergreen forest near Porcesito in the valley of the Río Medellín, alt. about 1,100 m., Apr. 16, 1946, *Hodge* 6773 (F, GH).

CENTRAL AMERICA and the WEST INDIES to GUIANA, BOLIVIA and southwestern BRASIL.

47. *Guzmania minor* Mez in DC. Monogr. Phan. 9:901. 1896.

Stemless; leaves many in a dense rosette, about 3 dm. long, sub-erect, much exceeding the inflorescence; sheaths conspicuous, ovate, punctate-lepidote; blades ligulate, acute or acuminate with a caudate apex, glabrous above, obscurely punctate-lepidote beneath; scape

short but evident, glabrous; scape-bracts densely imbricate, elliptic-lanceolate, acuminate, 65 mm. long, the lower foliaceous, the upper forming a showy involucre exceeding the flowers; inflorescence few-flowered; floral bracts like the upper scape-bracts but smaller and thinner; flowers 35 mm. long; pedicels short, angled, compressed; sepals linear-oblong, acute, 20 mm. long; petals linear, obtuse, yellow with white apices, coherent for most of their length; stamens about equaling the petals, the filaments adherent to the petals almost completely; ovary elongate; capsule subprismatic, about 3 cm. long.

47a. *Guzmania minor* var. *minor*

FIGURE 64

Leaf-sheaths concolorous with the blades; outer bracts of the inflorescence red.



FIGURE 64.—*Guzmania minor* var. *minor*: a, Habit,  $\times \frac{1}{6}$ ; b, floral bract,  $\times 1$ ; c, flower,  $\times 1$ .

CALDAS: Santa Cecilia, western slope of the Cordillera Occidental, alt. 800 m., Nov. 21, 1945, *Sneidern* 5177 (F).

CHOCÓ: In forest, Cueva, Pacific coast, June 1, 1950, *Fernández* 212 (COL, US).

VALLE: Epiphytic, La Trojita, Río Calima (region of the Chocó), alt. 5–50 m., Feb. 19–Mar. 10, 1944, *Cuatrecasas* 16250 (VALLE). Dense forest along Río Engaña, Río Digua Valley, alt. 675 m., April 2, 4, 1939, *Killip* 34836 (US).

COSTA RICA, PANAMA, BRASIL.

47b. *Guzmania minor* var. *flammea* L. B. Smith, *Caldasia* 5:4. 1948.

Leaf-sheaths castaneous; outer bracts of the inflorescence bright scarlet.

VALLE: Epiphytic in dense forest along Río Dagua about 20 km. east of Buenaventura, alt. ca. 40 m., Feb. 15, 1939, *Killip & Garcia* 33326 (US). Pacific coast, Río Naya, between Puerto Merizalde and Meregildo as far as the headwaters of the Río Chabirú, alt. 5 m., Mar. 2, 1943, *Cuatrecasas* 14353 (GH). Forest, La Elsa, left bank of the Río Digua, western slope of the Cordillera Oc-

cidental, alt. 1,000-1,200 m., Nov. 9, 1943, *Cuatrecasas* 15330 (GH, US). In trees, 30 km. above Buenaventura, alt. 30 m., Dec. 8, 1946, *Foster* 2329 (GH).

NARIÑO: Epiphytic, Barbacoas, Río Nembí, alt. 450 m., Nov. 16, 1946, *Foster* 2195 (GH).

ECUADOR.

48. *Guzmania retusa* L. B. Smith, *Fieldiana Bot.* 28:143, fig. 23A-C. 1951.

Stemless; leaves suberect, 5 dm. long, exceeding the inflorescence, minutely and obscurely punctulate-lepidote throughout; sheaths large but not distinct; blades ligulate, 6 cm. wide, pale purple beneath, purple-spotted above, narrowly purple-margined; scape erect, slender; scape-bracts erect, densely imbricate, elliptic, apiculate, punctulate-lepidote; inflorescence densely ellipsoid, 4.5 cm. long, 2 cm. in diameter, fertile throughout; floral bracts slightly convex, 2 cm. in diameter, exceeding the sepals, lustrous, punctulate-lepidote, nerved or nearly even; flowers subsessile; sepals elliptic, 13 mm. long, equally connate for 5 mm., carinate, coriaceous, sparsely lepidote at the apex; petals 23 mm. long, the free lobes broadly elliptic; stamens and style included.

NARIÑO: On trees, Las Mesas, near Pepino, alt. 1,350 m., Nov. 22, 1946. *Foster* 2228 (GH).

VENEZUELA, BOLIVIA.

49. *Guzmania pallida* L. B. Smith, *Contr. Gray Herb.* 98:27, pl. 5, figs. 10, 11. 1932.

Probably stemless, to 6 dm. high; leaves 4 dm. long; sheaths ovate, sparsely punctulate-lepidote; blades ligulate, rounded and apiculate, 35 mm. wide, glabrous above; scape glabrous, sulcate; scape-bracts ovate, acute, submembranaceous, not at all foliaceous, obscurely punctulate-lepidote; inflorescence ellipsoid, strobiliform, 75 mm. long, 35 mm. in diameter; floral bracts broadly ovate, acute, coriaceous, strongly nerved except near the base, exceeding the sepals; flowers short-pedicellate; sepals ovate, acute, 15 mm. long, connate for 3 mm., obscurely punctulate-lepidote; petals 25 mm. long, yellow when dry, the free lobes spreading, elliptic, obtuse; stamens and style exerted from the throat of the corolla.

MAGDALENA: Epiphytic in forest on banks of Río Gaira, alt. ca. 1,200 m., 1898-99, *H. H. Smith* 2342 (NY, type, GH phot. 6048). Epiphytic, edge of rain forest, mountains above Santa Marta, alt. 1,200 m., Aug. 11, 1946, *Foster & C. E. Smith, Jr.*, 1434 (GH).

50. *Guzmania cylindrica* L. B. Smith, *Phytologia* 5:282, pl. 1, figs. 7-9. 1955.  
FIGURE 65

Plant over 8 dm. high; leaves rosulate, large, obscurely and diffusely appressed-lepidote, sheaths broadly elliptic, 25 cm. long; blades acute or acuminate; scape straight, very stout; scape-bracts erect and

densely imbricate, the upper lanceolate, acuminate with involute apices, green; inflorescence cylindric, 22 cm. long, 4 cm. in diameter, fertile throughout; floral bracts in 6 rows, elliptic, 4 cm. long, the lowest acute, the others broadly rounded with an umbonate apex, coriaceous, prominently nerved, obscurely lepidote toward the apex;

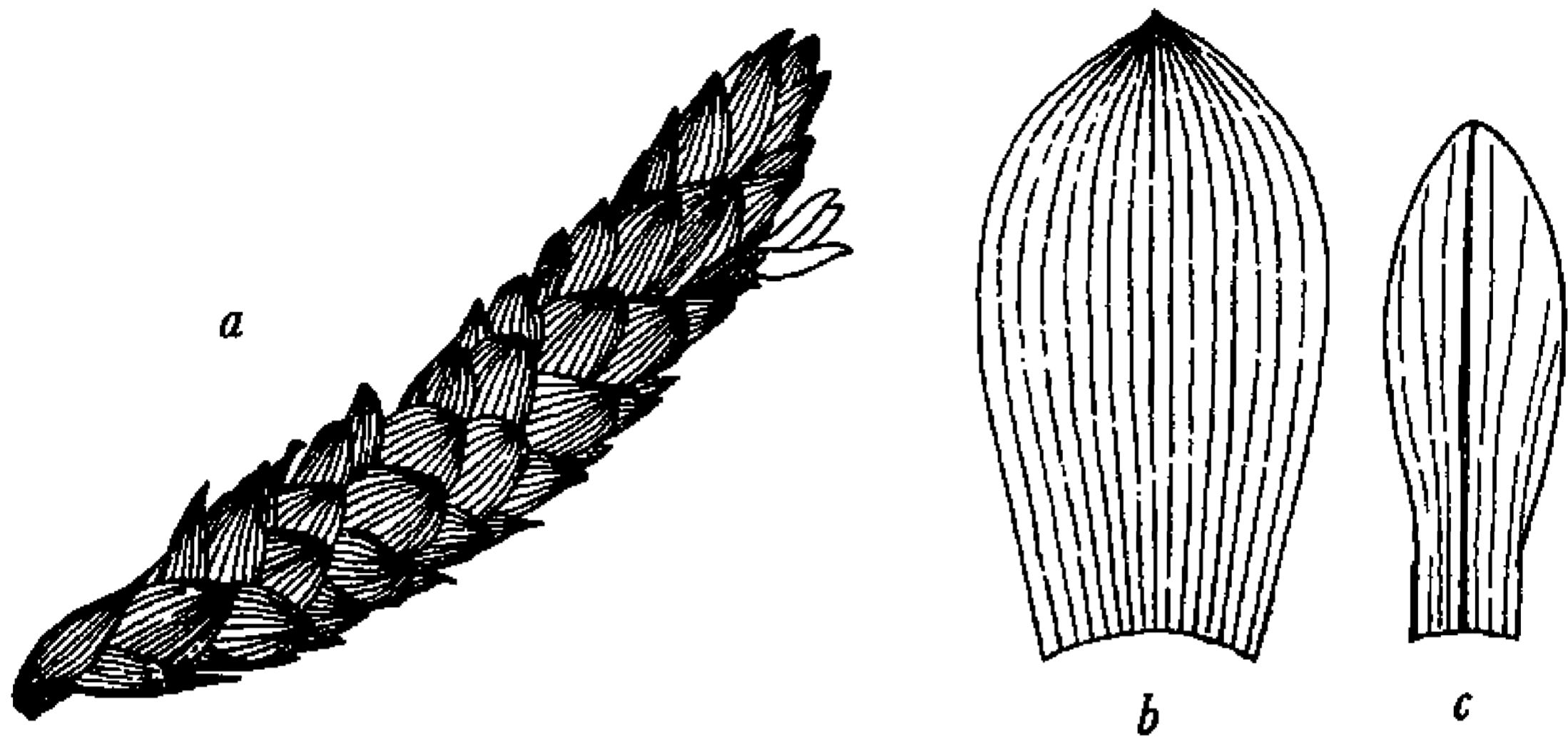


FIGURE 65.—*Guzmania cylindrica*: *a*, Inflorescence,  $\times \frac{1}{4}$ ; *b*, floral bract,  $\times 1$ ; *c*, sepal,  $\times 1$ .

pedicels broadly obconic, 5 mm. long; sepals lanceolate, obtuse, connate for 8 mm., coriaceous, nerved; petal-blades elliptic, obtuse, 25 mm. long, cream drying to yellow; stamens included.

GUAJIRA: Epiphytic, Serranía de Macuira, alt. 100–600 m., Dec. 3, 1953, Romero Castañeda 4465 (COL, type, US phot. 4363).

51. *Guzmania coriostachya* (Griseb.) Mez in DC. Monogr. Phan. 9:914. 1896.

FIGURE 66

*Caraguata coriostachya* Griseb. Nachr. Ges. Wiss. Goett. for 1864: 21. 1865.

*Tillandsia nigrescens* André, Énum. Bromél. 8. 13 Dec. 1888; Rev. Hortie. 60:568. 16 Dec. 1888.

*Guzmania michelii* Mez, Bull. Herb. Boiss. II. 3:226. 1903.

*Guzmania strobilifera* Mez & Wercklé, Bull. Herb. Boiss. II. 5:110. 1905.

Plant 4–10 dm. high; leaves rosulate, suberect, 3–6 dm. long, sheaths narrowly ovate, 8 cm. long, very densely and finely brown-lepidote, castaneous toward the base, green with many fine longitudinal violet stripes toward the apex, blades ligulate, acute to acuminate, 15–30 mm. wide, glabrous above, very obscurely punctulate-lepidote beneath; scape erect, 5–8 mm. in diameter; scape-bracts strict, the lower subfoliaceous, the upper with castaneous and striped base and narrowly triangular apex; inflorescence strobilate, many-flowered, ovoid or cylindric, 5–8 cm. long, 2–3 cm. in diameter, glabrous; floral bracts erect, densely imbricate, suborbicular with a broadly triangular obtuse apex, ecarinate; flowers sessile; sepals ovate, obtuse, 13–16 mm. long, coriaceous, the posterior ones carinate;

corolla white, 6–10 mm. longer than the sepals, its lobes elliptic, obtuse; stamens and pistil included; capsule slenderly cylindric, abruptly short-beaked.



FIGURE 66.—*Guzmania coriostachya*: *a*, Apex of leaf,  $\times 1$ ; *b*, inflorescence,  $\times 1$ ; *c*, sepals.  $\times 1$  (*a* and *b*, after André).

MAGDALENA: Santa Marta, 1898–99, *H. H. Smith* 2853 (NY).

SANTANDER: Woods, near Las Vegas, alt. 2,600–3,000 m., Dec. 21–23, 1926, *Killip & A. C. Smith* 15958 (GH, NY, US).

ANTIOQUIA: Monte del Diablo, July 21, 1944, *Daniel* 3259 (GH). Woods, near Las Palmas, between Medellín and El Retiro, alt. 2,500 m., Mar. 17, 1946, *Hodge* 6726 (F, GH, US).

CHOCÓ: Dense forest, ridge along Yeraquí Valley, Corcovada Region, upper Río San Juan, alt. 200–275 m., Apr. 24, 25, 1939, *Killip* 35221 (US).

VALLE: Forests above La Cumbre, Cordillera Occidental, alt. 2,000–2,200 m., May 14–19, 1922, *Pennell & Killip* 5793 (GH, NY). Dense forest, San Antonio, west of Cali, near summit of Cordillera Occidental, alt. 1,900–2,350 m., Feb. 26–Mar. 2, 1939, *Killip & García* 33911 (US). Woods, Mount La Guarida, above La Carbonera, western slope of the Cordillera Occidental between Las Brisas and Albán, alt. 1,950–2,000 m., Oct. 16, 1946, *Cuatrecasas* 22166 (F, US). In trees, above Cali, Dec. 5, 1946, *Foster* 2296 (GH, US).

CAUCA: Victoria, Cordillera Occidental, alt. 2,000 m., December 1899, *Langlassé* 100-a (G, type of *Guzmania michelii* Mez, F phot. 25276).

NARIÑO: Andes near Altaquer, alt. 1,400 m., May 1876, *André* 3327 (K, type of *Tillandsia nigrescens* André; US phot. 4175). In trees, Puerto Limon, alt. 900 m., Nov. 24, 1946, *Foster* 2297 (GH).

COSTA RICA, PANAMA, VENEZUELA, ECUADOR.

52. *Guzmania triangularis* L. B. Smith, *Phytologia* 4:364, pl. 4, figs. 1–3. 1953.

About 1 meter high; leaves to 11 dm. long; sheaths broadly ovate, dark castaneous, covered with minute appressed pale brown scales;

blades ligulate, subacute and apiculate, 4 cm. wide, green, concolorous, whitish-lepidote beneath; scape erect, stout, glabrous; scape-bracts strict, foliaceous or subfoliaceous; inflorescence strobilate, ellipsoid, 8 cm. long, 6 cm. in diameter, many-flowered; floral bracts strict, much exceeding the sepals, appressed-lepidote, the base broadly ovate, even, castaneous, the apex triangular, strongly nerved; pedicels broadly obconic, compressed, 4 mm. long; sepals obovate, 16 mm. long, connate for 6 mm., coriaceous; petal-blades elliptic, obtuse, about 7 mm. long, yellow-brown

BOYACÁ: Moist shady gorge, Quebrada El Pato, El Cidro, Rio Pomera, 11 km. southeast of Moniquira, lat. 5°47' N., long. 73°21' W., alt. 2,355 m., Aug. 20, 1944, *St. John* 20664 (US, type, US phot. 3657).

53. *Guzmania angustifolia* (Baker) Wittm. Bot. Jahrb. 11:62. 1889.

*Caraguata angustifolia* Baker, Gard. Chron. II. 22:616. 1884.

*Guzmania bulliana* André, Rev. Hortie. 58:324. 1886.

*Guzmania caulescens* Mez & Sodiro, Bull. Herb. Boiss. II. 5:112. 1905.

Stem from quite short to about 2 dm. long and branched; leaves densely and evenly distributed along the stem, 8-15 cm. long, green above, purplish beneath; sheaths distinct, elliptic, densely brown-punctulate-lepidote; blades suberect or slightly spreading, very narrowly triangular, acuminate, punctulate-lepidote; scape slender, almost wholly concealed by the leaves; inflorescence few-flowered, stoutly fusiform, up to 65 mm. long and 40 mm. in diameter, sterile toward the apex; floral bracts ample, ovate-elliptic, acute or subacuminate, erect, much exceeding the sepals, slightly shorter than the flowers at anthesis, membranaceous; flowers sessile; sepals elliptic, obtuse, 15-20 mm. long, membranaceous, glabrous, connate for 3 mm.; petals bright yellow, 7 cm. long, adherent in a slender tube for 6 cm., the free lobes subelliptic, obtuse; stamens 4 mm. shorter than the petals; filaments adherent to the petals for almost their whole length; capsule prismatic, acute, 28 mm. long.

53a. *Guzmania angustifolia* var. *angustifolia*.

Floral bracts bright red, sometimes with dark apices.

COLOMBIA: Cultivated at Kew, *Kalbreyer* (K, type); *Morren* Icon (K).

ANTIOQUIA: Cocorná, July 1937, *Daniel* 1428 (GH).

VALLE: On trees in dense wet mountain forest on Rio Dagua above Dagua, alt. 1,200 m., Sept. 22, 1882, *Lehmann* 1962 (US). Epiphytic, Quebrada of San Juan below Queremal, valley of the Rio Dagua, western slope of the Cordillera Occidental, alt. 1,350 m., Nov. 8, 1946, *Cuatrecasas* 22729 (F).

CAUCA: El Tambo: Epiphytic, La Costa, alt. 1,100 m., Mar. 7, 1935, *Sneidern* 397 (S).

NARIÑO Epiphytic, Altaquer, alt. 1,050 m., Nov. 11, 1946, *Foster* 2130 (GH). Epiphytic, Las Mesas near Pepino, alt. 1,350 m., Nov. 22, 1946, *Foster* 2227 (GH).

COSTA RICA, PANAMA, ECUADOR.

- 53b. *Guzmania angustifolia* var. *nivea* L. B. Smith, *Phytologia* 5:178. 1955.

Floral bracts pure white.

NARIÑO: Las Mesas near Pepino, alt. 1,350 m., Nov. 22, 1946, *Foster* 2226 (GH, type).

54. *Guzmania calothyrsus* Mez in DC. *Monogr. Phan.* 9:910. 1896.

*Anoplophytum calothyrsus* Beer, *Bromel.* 263. 1857, nomen.

Up to 1 meter high; leaves 3–8 dm. long, densely punctulate-lepidote beneath, sheaths narrowly elliptic, brown toward the base, blades linear, acuminate, 2–4 cm. broad; scape stout, erect, its bracts densely imbricate, lanceolate, acuminate, ferruginous-lepidote; inflorescence densely strobilate, fertile throughout, 6–18 cm. long; floral bracts broadly elliptic, acute, membranaceous; flowers sessile; sepals narrowly elliptic, 22 mm. long, connate for 6 mm., thin, lepidote becoming glabrous; petals narrowly elliptic, obtuse.

AMAZONAS: White-sand savannah or caatinga on right bank of Río Apaporis, Raudal de Jirijirimo, March 1951, *Schultes* 12082 (US).

AMAZONAS-VAUPÉS: Near Cachivera de Jirijirimo, alt. 250 m., June 12, 1951, *Schultes & Cabrera* 12433 (COL, GH, US). In clumps on rocks, quartzite base, Río Apaporis, near Raudal Yayacopi (La Playa), lat. 0°5' S., long. 70°50' W., alt. 240 m., Feb. 15, 1952, *Schultes & Cabrera* 15359 (COL, GH, US).

VAUPÉS: Bank of Río Piraparaná (tributary of Río Apaporis), Caño Teemeefia, lat. 0°15' S. to 0°25' N., long. 70°30' W., Sept. 10, 1952, *Schultes & Cabrera* 17454 (US).

PERU, BOLIVIA.

55. *Guzmania melinonis* Regel, *Gartenflora* 34:116. 1885, as *G. melinoki*, a typographical error according to Mez in DC. *Monogr. Phan.* 9:908. 1896.

Flowering shoot 20–23 cm. high; leaves numerous, 3–5 dm. long, sheaths broadly elliptic, pale-appressed-lepidote, blades ligulate, broadly acute or obtuse and apiculate, 2–4 cm. wide, soon glabrous; scape straight, glabrous; scape-bracts imbricate, strict, broadly ovate, acute, red; inflorescence ellipsoid or subcylindric, 5–10 cm. long; floral bracts about 4-ranked, broadly ovate, nearly equaling the flowers, sparsely and obscurely lepidote, nerved; flowers sessile, to 33 mm. long; sepals broadly elliptic, 15 mm. long, short-connate, firm, even, glabrous; petals obtuse, yellow or white; capsule slenderly ellipsoid, beaked, to 27 mm. long, coma white.

VALLE: Wooded slopes, El Prado, left bank of Río Anchicayá, western slope of the Cordillera Occidental, alt. 250–350 m., Aug. 4, 1943, *Cuatrecasas* 14867 (VALLE, US phot. 3667).

NARIÑO: On trees, Pepino near Mocoa, alt. 1,200 m., Nov. 21, 1946, *Foster* 2212 (GH).

FRENCH GUIANA, ECUADOR, BOLIVIA.

56. *Guzmania monostachia* (L.) Rusby ex Mez in DC: Monogr. Phan. 9:905. 1896.

*Renalmia monostachia* L. Sp. Pl. 287. 1753.

*Tillandsia monostachia* L. Sp. Pl. ed. 2. 410. 1762.

*Guzmania tricolor* R. & P. Fl. Peruv. 3:38, pl. 261. 1802.

Flowering plant 2-4 dm. high; leaves many in a dense rosette, obscurely punctulate-lepidote, soon glabrous; sheaths broadly ovate, brownish; blades ligulate, 2 cm. wide, acute, yellow-green, paler beneath; scape erect, much shorter than the leaves, 4-8 mm. in diameter, glabrous; scape-bracts ovate, acute, imbricate, pale green; inflorescence cylindrical, acute, 8-15 cm. long, 2-3 cm. in diameter; axis straight, glabrous; floral bracts ovate, acute, membranous, the fertile ones whitish with conspicuous brown or purple longitudinal stripes, about equaling the flowers, the sterile bright red; flowers erect, white, 23-29 mm. long; sepals joined equally for about one fourth their length, 18 mm. long, obovate, even, coriaceous; petals coherent for most of their length, the lobes elliptic, obtuse; stamens included, filaments adherent to the petals for most of their length; capsule cylindrical, 2-3 cm. long; coma white.

GOAJIRA: Epiphytic in forest, 10 km. south of Carraipia, alt. 350 m., July 4, 1944. *Haught* 4237 (US).

NORTE DE SANTANDER: Epiphytic Río Catatumbo, beyond Teorama, alt. 750 m., Sept. 11, 1946, *Foster* 1656 (GH). High in trees, Oru on pipeline, Sept. 16, 1946, *Foster* 1738 (GH). In trees, near Convención, alt. 1,500 m., Sept. 23, 1946, *Foster* 1759 (GH).

SANTANDER: On nearly all trees on Aguas Blancas Creek, Carare Valley, near Puerto Berrio, alt. 100-700 m., May 2, 1935, *Haught* 1690 (US).

CUNDINAMARCA: Colejío, Río Bogotá, November 1856, *Triana* (COL).

VALLE: La Paila. Mar. 23, 1853, *Holton* 156 (GH, NY, PH). Valle del Cauca, alt. 1,000 m., *Triana* 557 (COL, US). Epiphytic, "Guayabal", Zarzal, alt. 900-920 m., July 20, 1922, *Killip & Hazen* 8365 (GH). Epiphytic, low forest east of Zarzal, alt. 970-1,050 m., July 21, 1922, *Pennell, Killip & Hazen* 8389 (GH, NY, US). Epiphytic, Tuluá, alt. 2,000 m., Aug. 1943, *Dryander* 2729 (F, US). Hacienda de El Medio, Zarzal, plain of El Valle, alt. 1,000 m., Oct. 7, 1946, *Cuatrecasas* 22102 (F).

Southern FLORIDA, WEST INDIES, NICARAGUA to VENEZUELA and BOLIVIA.

57. *Guzmania sprucei* (André) L. B. Smith, Contr. Gray Herb. 104:75. 1934.  
*Sodirola sprucei* André, Énum. Bromél. 5. Dec. 13, 1888; Rev. Hort. 60:565. Dec. 16, 1888.

*Guzmania rosea* L. B. Smith, Proc. Am. Acad. Arts & Sci. 68:147, pl. 2, fig. 6. 1933.

Plant 3.5-5 dm. high; leaves 4-7 dm. long, glabrous above, densely and minutely brown-lepidote beneath, the outer ones reduced to dark castaneous sheaths, blades broadly acute, 25-30 mm. wide, concolorous or slightly lineate or spotted; scape erect, glabrous; scape-bracts imbricate, broadly elliptic, the lower ones acuminate and wholly lepidote,



the upper apiculate and glabrous except at apex; inflorescence 10–25 cm. long, 8–25-flowered; floral bracts orbicular, apiculate, enfolding the sepals, rose, the lower ones about equaling the sepals, the upper distinctly shorter; flowers spreading; pedicels 5 mm. long; sepals to 45 mm. long, the free lobes slightly asymmetric, broadly rounded; petals 5–6 cm. long, obtuse, yellow or green.

CHOCÓ: Dense forest, ridge along Yeracúf Valley, upper Río San Juan, Corcovada Region, alt. 200–275 m., Apr. 24, 25, 1939, *Killip* 35246 (US).

VALLE: On rocks, Foreto on the Río Dagua, *Lehmann* K-362 (K). Woods, Piedra Moler, left bank of Río Digua, western slope of Cordillera Occidental, alt. 900–1,180 m., Aug. 19–28, 1943, *Cuatrecasas* 14932 (VALLE). San Isidro, Río Cajambre, Pacific Coast, alt. 5–100 m., May 2–5, 1944, *Cuatrecasas* 17294 (GH). Córdoba, Río Dagua, alt. 39–60 m., Nov. 14, 1945, *Cuatrecasas* 19850 (VALLE). Bank of Río Digua, between Paragüita and Queremal, alt. 1,570–1,740 m., Mar. 17, 1947, *Cuatrecasas* 23805 (F, VALLE).

CAUCA: Timbiqui, 1903, *Lehmann* K-355 (K, type of *Guzmania rosea* L. B. Smith, GH phot. 6055).

NARIÑO: Río Nembi, alt. 996 m., May 23, 1876, *André* 3349 (K, type; GH phot. 2597). Above El Diviso, alt. 705 m., Nov. 13, 1946, *Foster* 2153 (GH). Junin, alt. 840 m., Nov. 14, 1946, *Foster* 2165 (COL, GH).

58. *Guzmania dissitiflora* (André) L. B. Smith, *Contr. Gray Herb.* 104:74. 1934.  
*Sodirola dissitiflora* André, *Enum. Bromél.* 5. Dec. 13, 1888; *Rev. Hortie.* 60:565. Dec. 16, 1888.

Stemless but usually stoloniferous, the flowering plant 4–9 dm. high; leaves suberect, 3–9 dm. long; sheaths elliptic, distinct, dark castaneous at the base, the rest pale green with fine brown longitudinal stripes, densely and finely lepidote; blades linear, acuminate, 7–12 mm. wide, obscurely punctulate-lepidote beneath; scape erect, 3–5 mm. in diameter, much shorter than the leaves, glabrous; scape-bracts erect, imbricate, the lower foliaceous, the upper elliptic, acute, bright red, glabrous; inflorescence 7–15-flowered, about equaling the leaves; axis nearly straight, slender, glabrous, sulcate; floral bracts like the upper scape-bracts, usually much shorter than the sepals and closely enfolding them; flowers mostly spreading; pedicels slender, 5–8 mm. long; sepals to 3 cm. long, subchartaceous, glabrous, connate into a slender tube for more than half their length, the free segments oblong; petals white; capsule slenderly cylindrical, equaling the sepals.

VALLE: Forest, Córdoba, Dagua Valley, alt. 80–100 m., Oct. 9, 1922, *Killip* 11783 (NY, PH, US).

NARIÑO: Río Nembi, alt. 990 m., May 20–30, 1876, *André* 3339 bis (K, type GH phot. 2593).

COSTA RICA, PANAMA.

59. *Guzmania musaica* (Linden & André) Mez *in* DC. *Monogr. Phan.* 9:898. 1896.

*Tillandsia musaica* Linden & André, *Ill. Hortie.* 20:171. 1873.

*Caraguata musaica* André, *Ill. Hortie.* 24:27, *pl.* 268. 1877.

*Massangea musaica* E. Morr. *Belg. Hortie.* 27:59, 199, *pls.* 8, 9. 1877.

Plant 3–5 dm. high, usually spreading by elongate scaly rhizomes; leaves 15–20 in a spreading rosette, to 7 dm. long, obscurely punctulate-lepidote, sheaths short and indistinct, castaneous toward the base, blades broadly acute or rounded, apiculate, 4–8 cm. wide; scape erect, somewhat shorter than the leaves; scape-bracts densely imbricate, broadly elliptic, acute or acuminate, subinflated; bright rose; inflorescence 12–25-flowered, glabrous; floral bracts broadly obovate, apiculate, about half as long as the sepals and enfolding the base of the flower, coriaceous, bright rose; flowers subsessile; sepals 25–45 mm. long, oblong, obtuse, cucullate, coriaceous, yellowish; petals included at anthesis; stamens shorter than the petals.

59a. *Guzmania musaica* var. *musaica*.

FIGURE 67

Leaves marked with fine dark irregular transverse lines.

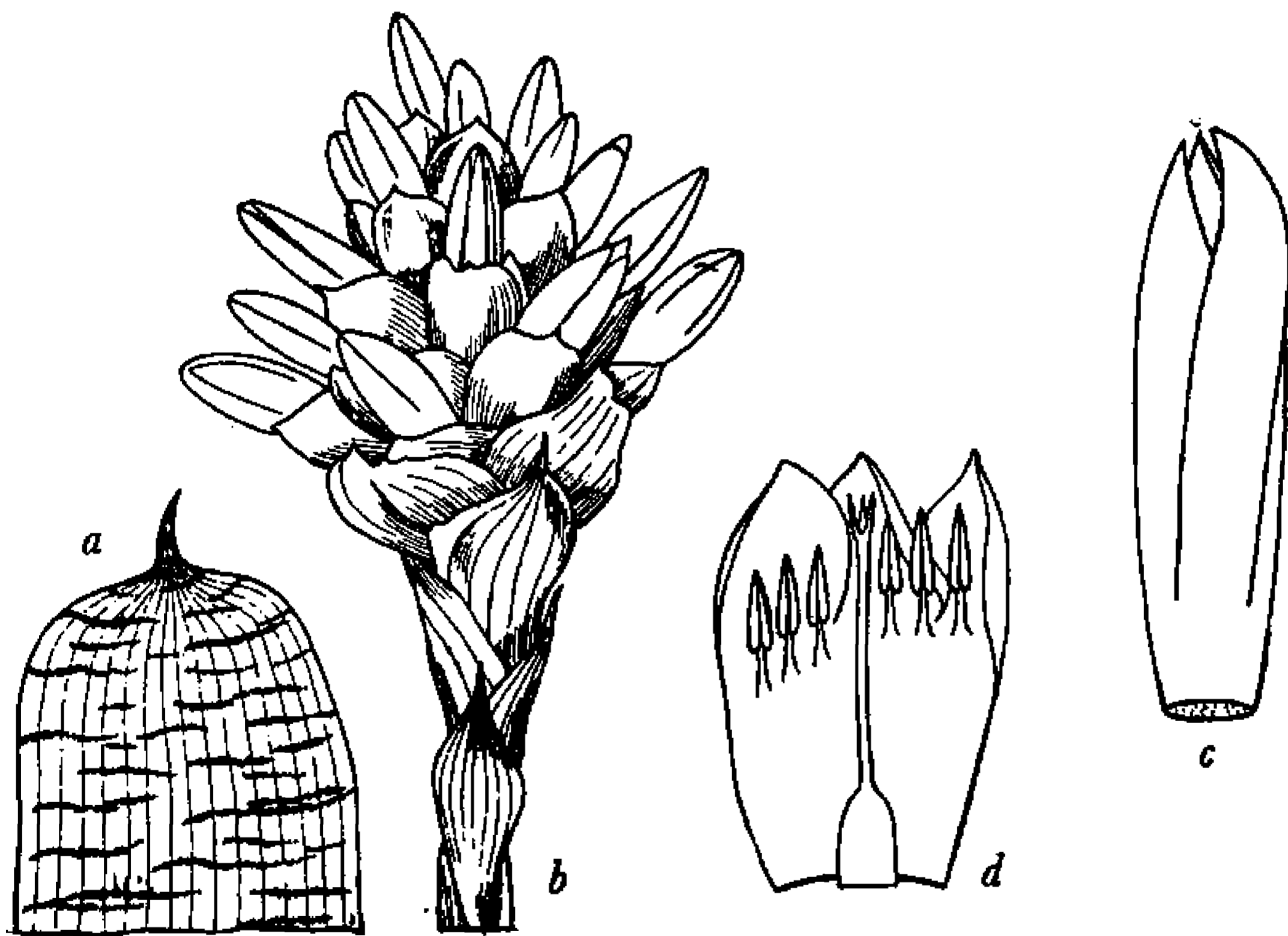


FIGURE 67.—*Guzmania musaica* var. *musaica*: a, Apex of leaf,  $\times \frac{1}{2}$ ; b, inflorescence,  $\times \frac{1}{2}$ ; c, sepals,  $\times 1$ ; d, corolla, stamens, and pistil,  $\times 1$  (all after Belgique Horticole).

NORTE DE SANTANDER: Moist dark canyon, Camp 84 on pipeline, alt. 540 m., Sept. 16, 1946, *Foster* 1729 (COL, GH).

ANTIOQUIA: Rain forest, near Villa Arteaga on the road to the sea, alt. 150 m., Dec. 6, 1948, *López & Sanchez* 26 (US).

VALLE: Mangrove swamp along Río Dagua, Buenaventura, alt. 0–5 m., May 7, 9, 1922, *Killip* 5321 (GH, NY, PH, US). Dense forest near highway bridge over Río Dagua, about 20 km. east of Buenaventura, alt. 40 m., Feb. 15, 1939, *Killip & García* 33308 (COL, US). Mangrove swamp, Buenaventura Bay, Apr. 13, 1939, *Killip* 34978 (US). Non-inundable woods at edge of mangrove swamp, Punta Arenas, north shore of Buenaventura Bay, June 2, 1944, *Killip & Cuatre-*

*casas* 38639 (F, US). Dense forest, Agua Clara along highway from Buenaventura to Cali, alt. 100 m., June 4, 1944, *Killip & Cuatrecasas* 38896 (US). Dense forest along highway from Buenaventura to Cali, near sea level, June 10, 1944, *Killip & Cuatrecasas* 39001 (US). Woods on coast, Río Naya, Puerto Merizalde, alt. 5-20 m., Feb. 20, 1943, *Cuatrecasas* 13959 (GH). Same, left bank of Ají Chiquito, alt. 1-4 m., March 1, 1943, *Cuatrecasas* 14326 (GH). Woods on coast, Veneral, Río Yurumanguí, alt. 5-50 m., Jan. 20-Feb. 10, 1944, *Cuatrecasas* 15856 (GH). Coast, Estero del Encanto, between Río Yurumanguí and Río Cajambre, alt. 0-5 m., Feb. 11, 1944, *Cuatrecasas* 16171 (F, GH). Anchicayá, between Cali and Buenaventura, alt. 500 m., Aug. 11, 1952, *Køie* 4819 (C, COL).

NARIÑO: La Guayacona, Municipio of Tumaco, June 25, 1951, *Romero Castañeda* 2902 (COL).

PANAMA.

59b. *Guzmania musaica* var. *concolor* L. B. Smith, *Contr. U. S. Nat. Herb.* 29:293. 1949.

Leaves concolorous.

CHOCÓ: Between La Oveja and Quibdó, Apr. 1, 2, 1931, *Archer* 1755 (US). Dense forest, Corcovada Region, upper Río San Juan, ridge along Yeraquí Valley, alt. 200-275 m., Apr. 24, 25, 1939, *Killip* 35230 (US). Dense forest south of Río Condoto, between Quebrada Guarapo and Mandínga, alt. 120-180 m., Apr. 22, 28, 1939, *Killip* 35683 (US).

VALLE: Dense forest, Córdoba, alt. 50-100 m., Feb. 17, 1939, *Killip & García* 33448 (US). La Trojita, Río Calima (region of the Chocó), alt. 5-50 m., Feb. 19-Mar. 10, 1944, *Cuatrecasas* 16600 (F, GH). Quebrada de San Joaquín, Buenaventura Bay, alt. 0-10 m., Feb. 23, 1946, *Cuatrecasas* 19968 (F). Río Calima, Quebrada de La Brea, alt. 30-40 m., May 19, 1946, *Schultes & Villarreal* 7337 (US). Buenaventura, alt. 15 m., Dec. 5, 1946, *Foster* 2335 (GH, type).

Apparently variety *zebrina* Cutak of Panama with broad solid bands of color on the leaves has not yet been found in Colombia.

60. *Guzmania globosa* L. B. Smith, *Phytologia* 4:362, *pl. 3, figs. 1, 2*, p. 378. 1953. FIGURE 68

Flowering shoot 4 dm. long; leaves numerous, 8 dm. long; sheaths ovate, 3 cm. long, dark castaneous with a narrow green margin, sparsely and obscurely lepidote; blades linear, 6 mm. wide, green, glabrous or obscurely lepidote; scape decurved slender; scape-bracts erect, imbricate, ovate with long foliaceous blades, red, obscurely lepidote; inflorescence many-flowered, 8 cm. in diameter, filled with a jelly-like substance in life; floral bracts broadly elliptic, obtuse, 30 mm. long, exceeded by the sepals, membranaceous, transparent, yellow with a red base; pedicels obconic, 5 mm. long; sepals 37 mm. long, exceeding the petals and stamens, membranaceous, transparent, obscurely lepidote, green, fused into a cylindrical tube 23 mm. long, the lobes sub-orbicular; petals white.

CHOCÓ: Epiphyte in dense forest, ridge along Yeraquí Valley, Corcovada region, upper Río San Juan, alt. 200-275 m., Apr. 24, 25, 1939, *Killip* 35226 (US).

VALLE: Epiphyte in woods below La Planta, right side of the Río Anchicayá, western slope of the Cordillera Occidental, alt. 400 m., Aug. 5, 1943, *Cuatrecasas*

14875 (F). Epiphytic, Barco, Río Cajambre, near the Pacific Coast, alt. 5-80 m., Apr. 21-30, 1944, *Cuatrecasas* 17044 (F). Between Anchicaya and Buenaventura, alt. 300 m., Aug. 17, 1952, *Køie* 4945 (C, US).

NARIÑO: On mounds of moss, above El Diviso, alt. 705 m., Nov. 13, 1946, *Foster* 2152 (GH, type, US neg. 3506). La Guayacana, Municipio of Tumaco, June 25, 1951, *Romero Castañeda* 2883 (COL).

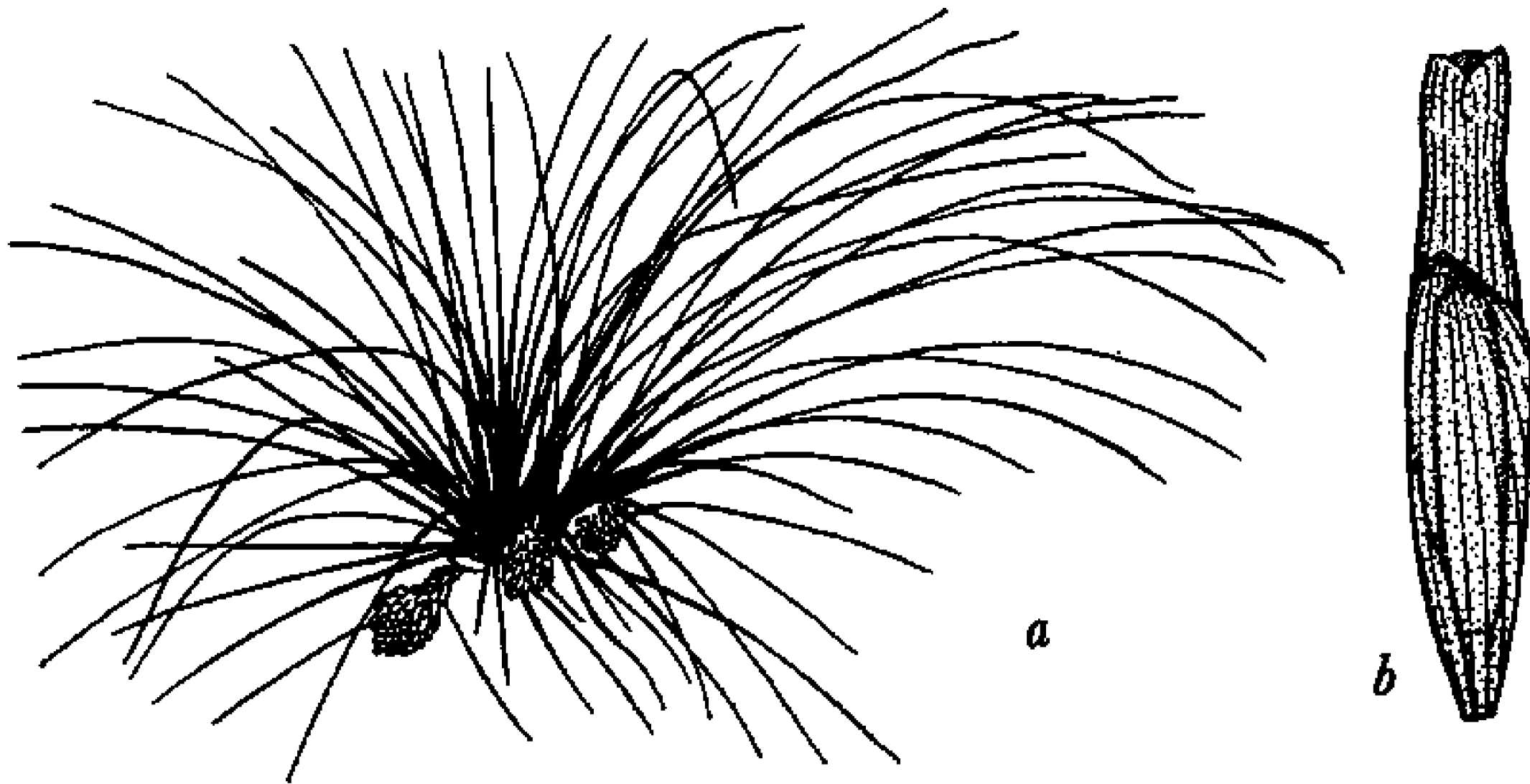


FIGURE 68.—*Guzmania globosa*: a, Habit (after Foster); b, floral bract, sepal, and capsule,  $\times 1$  (after L. B. Smith).

61. *Guzmania graminifolia* (André) L. B. Smith, *Contr. Gray Herb.* 104:74. 1934. FIGURE 69

*Sodirola graminifolia* André ex Baker, *Journ. Bot.* 25:54. 1887; *Brom. Andr.* 40, pl. 13, fig. B. 1889; (earlier publication as nomen nudum).

*Sodirola trianae* Mez in DC. *Monogr. Phan.* 9:888. 1896.

Stem 3 mm. in diameter; leaves 2-3 dm. long, sheaths broadly elliptic and abruptly contracted at apex, 35 mm. long, blades linear, long-acuminate, 2-4 mm. wide; scape more or less distinct, slender; scape-bracts strict, the elliptic sheaths about equaling the upper internodes, membranaceous, red; inflorescence globose, involucrate; outer bracts and floral bracts broadly ovate, acute, 12-18 mm. long; sepals thin, yellow, free lobes ovate, broadly acute, apparently always exceeding the petals.

VALLE: Epiphytic, in valley at Km. 51, San Juan Valley below Queremal, basin of the Río Digua, alt. 1,650 m., Feb. 25, 1947, *Cuatrecasas* 23731 (F, GH).

NARIÑO: Alto de Armada, May 22, 1876, *André* 3402 (K, type; NY, GH phot. 7031). Barbacoas, alt. 250 m., *Triana* 553 (BM, type of *Sodirola trianae* Mez; GH phot. 2638). Ricaurte, western Andes of Tuquerres, alt. 1,200-1,400 m., *Lehmann* 5305 (F, atypical, perhaps pathological). Altaquer, 1946, *Foster* 2072 (GH, US). Barbacoas, road to Buenavista, slopes of Río Telembí, alt. 200-840 m., Aug. 3-5, 1948, *García-Barriga* 13193 (COL, US).



FIGURE 69.—*Guzmania graminifolia*: *a*, Habit (after André); *b*, floral bract and flower,  $\times 1$ .

- 62. *Guzmania caricifolia*** (André) L. B. Smith, Contr. Gray Herb. 104:74. 1934.  
*Sodirola caricifolia* André ex Baker, Journ. Bot. 25:53. 1887.

Stem 2–3 m. long, simple or few-branched; leaves 2–3 dm. long, sheaths densely imbricate, elliptic, about 4 cm. long, blades linear, long-acuminate, flat, 5 mm. wide; inflorescence corymbiform; floral bracts broadly elliptic, 25 mm. long; sepals purplish, the free lobes spreading, oblong-elliptic, obtuse; petals slightly exceeding the sepals, bright green.

NARIÑO: Alto de Armada, May 23, 1876, *André* 3506 (K, type; NY, GH phot. 7030). On trees and stumps, Junín, *Foster* 2167 (GH).

- 63. *Guzmania kalbreyeri*** (Baker) L. B. Smith, Contr. Gray Herb. 104:74. 1934.  
*Sodirola kalbreyeri* Baker, Handb. Bromel. 141. 1889.

Scandent; stem elongate, 3–4 mm. in diameter, finally losing its leaves at the base; leaves 15–20 cm. long, appressed-brown-lepidote beneath becoming glabrous, sheaths densely imbricate, elliptic, 2 cm. long; scape distinct, elongate; scape-bracts elliptic, acuminate, membranaceous; inflorescence 2–4-flowered, its axis to 3 cm. long;

floral bracts broadly elliptic, obtuse or apiculate, 3–4 cm. long, membranaceous; flowers slenderly pedicellate; sepals 4–6 cm. long, thin, red, high-connate in a slender tube, free lobes broadly ovate, acute; petals to 8 cm. long, bright green.

BOLÍVAR: Forest above Cascada Chorrón, south of Antizales, alt. 2,200–2,700 m., Feb. 25, 1918, *Pennell* 4413 (NY, GH phot. 7029).

ANTIOQUIA: Near San José, alt. 2,600 m., Mar. 27, 1880, *Kalbreyer* 1504 (K, type; B, F phot. 11549).

CHOCÓ: On tree trunks in dense forest, Alto de Guadus, near Carmen, alt. 2,000 m., Mar. 1, 1944, *Core* 340 (US). Dense rain forest, near Quebrada de Girardot, branch of Río Atrato, alt. 1,500–2,000 m., Mar. 2, 1944, *Core* 355 (US).

64. *Guzmania pearcei* (Baker) L. B. Smith, *Contr. Gray Herb.* 104:74. 1934.  
*Sodirola pearcei* Baker, *Journ. Bot.* 25:53. 1887.

Stem to 1 meter long; leaves to 22 cm. long, sheaths densely imbricate, ovate, 25 mm. long, appressed-brown-lepidote becoming glabrous, blades linear, filiform-acuminate, flat, 2–4 mm. wide; scape distinct; scape-bracts elliptic, red with green blades; inflorescence involucrate; outer and floral bracts broadly elliptic, much exceeded by the sepals, red; sepals 35–55 mm. long, high-connate in a slender tube, the free lobes broadly ovate, yellow; petals much exceeding the sepals, green.

CAUCA: On mountain slopes, more rarely on trees, western slopes of the Cordillera Occidental near Popayan, alt. 1,400–1,800 m., *Lehmann* 5306 (B, F phot. 11550, F).

ECUADOR.

65. *Guzmania obtusiloba* L. B. Smith, *Contr. Gray Herb.* 104:74. 1934.  
*Sodirola andreana* Wittm. *Bot. Jahrb.* 11:57. 1889, not *Guzmania andreana* Mez 1896.

Stem to 1 meter long, about 4 mm. in diameter; leaves evenly and densely distributed along the stem, 16–25 cm. long, sheaths subelliptic, imbricate, brown-lepidote, blades suberect to spreading, very narrowly triangular, acuminate, 4 mm. wide, chartaceous, glabrous above, minutely appressed-lepidote beneath; inflorescence to 5-flowered; floral bracts erect, broadly ovate, apiculate, 25 mm. long, shorter than the sepals, membranaceous, bright red; pedicels slender, 8 mm. long; sepals membranaceous, connate into a slender tube, glabrous, reddish yellow, the free lobes broadly elliptic; petals bright yellow, the free lobes elliptic; obtuse; stamens slightly shorter than the petals, filaments adherent to the petals for most of their length; pistil barely exerted; capsule slenderly clavate, 25 mm. long; coma flavescent.

ANTIOQUIA: Terrestrial in dense forest, near Amalfi on the road to Carolina, Sept. 23, 1884, *Lehmann* XX (BM, isotype; GH phot. 2649). Dense forest on mountainside above Llano Grande, alt. 2,000 m., Mar. 31, 1944, *Core* 503 (US). Road between Calder and San Luis, Apr. 14, 1949, *Romero Castañeda* 1507 (COL).

COSTA RICA.

66. *Guzmania sneidernii* L. B. Smith, Contr. Gray Herb. 117:9, pl. 1, fig. 14. 1937.

Spreading by long stolons; leaves numerous, erect, to 5 dm. long, very obscurely punctulate-lepidote, sheaths very densely imbricate, ovate, 20–25 mm. long, blades linear, long-acuminate, 5 mm. wide, flat; scape slender, curved; scape-bracts densely imbricate, the upper elliptic, short-caudate, green with red stripes; inflorescence about 6-flowered, involucrate; outer and floral bracts broadly elliptic, broadly acute or apiculate, 4 cm. long, 3 cm. wide, membranaceous, bright red; flowers erect, subfasciculate; sepals forming a slender tube 35 mm. long, subcoriaceous, the free lobes broadly elliptic, convolute, petaloid, bright yellow.

CAUCA: Primaeval forest, La Costa, District of El Tambo, alt. 1,500 m., May 28, 1936, *Sneidern* 695 (S, type; GH phot. 6536).

### 8. *Mezobromelia*

*Mezobromelia* L. B. Smith, Proc. Amer. Acad. 70:151. 1935.

Leaves entire; flowers polystichous, perfect; sepals symmetric; petals tightly conglutinated, bearing 2 scales on the inside; filaments connate with the petals; ovary superior.

Colombia and Ecuador.

1. *Mezobromelia bicolor* L. B. Smith, Proc. Amer. Acad. 70:151, pl. 1, figs. 10, 11. 1935. FIGURE 70

Presumably stemless, flowering plant nearly 5 dm. high; leaves to 45 cm. long, obscurely lepidote, sheaths ovate, castaneous beneath,

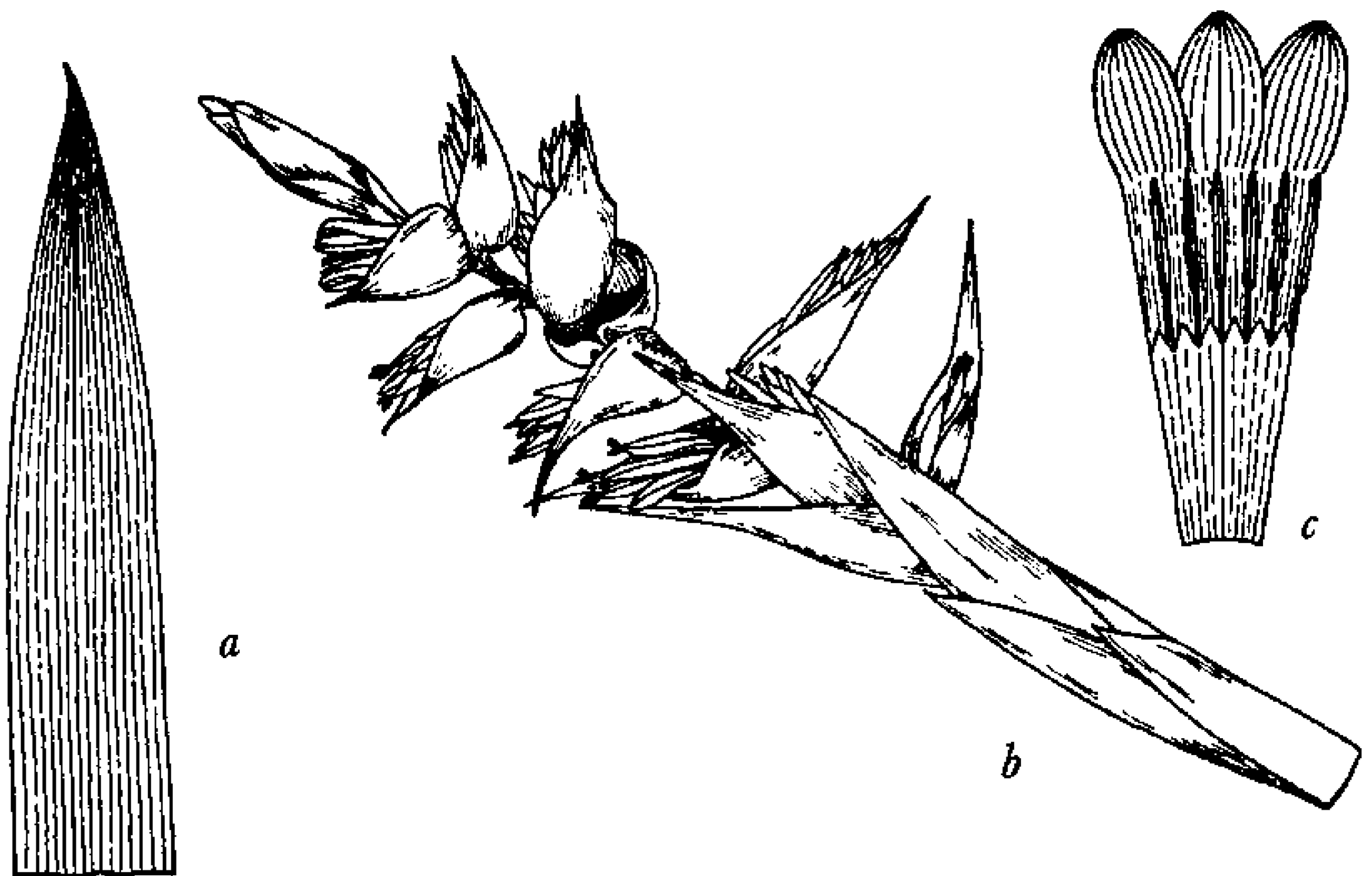


FIGURE 70.—*Mezobromelia bicolor*: a, Apex of leaf,  $\times \frac{1}{2}$ ; b, inflorescence,  $\times \frac{1}{2}$ ; c, corolla and stamens,  $\times 2$  (b and c, after L. B. Smith).

blades ligulate, acute, 25 mm. wide; scape erect, slender; scape-bracts erect, very densely imbricate, foliaceous but the highest bright red; inflorescence laxly bipinnate, 12 cm. long; axis glabrous, sulcate; primary bracts very broadly ovate, bright red, very obscurely lepidote, the lower ones long-acuminate, exceeding the spikes, the upper apiculate, shorter than the spikes; spikes short-stipitate, ellipsoid, compactly 3-5-flowered; rhachis short but distinct; floral bracts oblong-lanceolate, broadly acute, 16 mm. long, exceeded by the sepals, carinate toward apex, glabrous, chartaceous, strongly nerved; flowers subsessile; sepals equally subfree, oblong-lanceolate, broadly acute, 18 mm. long, carinate, glabrous, nerved; petals ligulate, obtuse, 20 mm. long, yellow, bearing 2 triangular scales well above the base; stamens included, about equaling the style.

VALLE: Epiphytic, bushy summit of west peak, La Cumbre, alt. 2,100-2,400 m., Sept. 11, 18, 1922, Killip 11396 (GH, type, GH phot. 6169).

### 9. *Catopsis*

*Catopsis* Griseb. Fl. Brit. W. Ind. 599. 1864.

*Tussacia* Willd. ex Beer, Bromel. 21, 99. 1857, not Reichenb. 1827.

*Pogospermum* Brongn. Ann. Sci. Nat. V. 1:327. 1864.

Stemless herbs; leaves densely rosulate, entire, minutely appressed-lepidote, green, sheath large; scape conspicuous; inflorescence usually bipinnate, rarely simple or tripinnate, equaling or exceeding the leaves, its branches polystichous-flowering; flowers small or minute, mostly sessile or subsessile, perfect or functionally dioecious; sepals free, usually rounded and strongly asymmetric, glabrous; petals free, naked; stamens included, filaments unequal, anthers ovate or elliptic; ovary superior, broadly ovoid or ellipsoid, style shorter than the ovary or lacking, ovules few to several, long-caudate; capsule septicidal; seeds with coma apical and folded over, their bases projecting from the capsule.

West Indies and southern Mexico to Peru.

### KEY

1. Leaves acuminate; sepals 15 mm. long; petals 2 cm. long, bright yellow . . . . . *1. C. nutans*
1. Leaves rounded and apiculate; sepals 7-8 mm. long; petals barely exceeding the sepals, white . . . . . *2. C. sessiliflora*

1. *Catopsis nutans* (Sw.) Griseb. Fl. Brit. W. Ind. 599. 1864.

*Tillandsia nutans* Sw. Prodr. 56. 1788.

*Tillandsia vitellina* Link, Klotzsch & Otto, Ic. Pl. Rar. 101, pl. 40. 1840-1844.

*Catopsis fulgens* Griseb. Nachr. Ges. Wiss. Goett. for 1864. 21. 1865.

*Catopsis vitellina* Baker, Journ. Bot. 25:176. 1887.



Plant 14–40 cm. high; leaves about 10 in a subfasciculate rosette, to 24 cm. long, white-cretaeous especially toward base, sheaths elliptic, about half as long as the blades, blades subtriangular, 25 mm. wide; scape usually decurved, slender; scape-bracts erect, lanceolate or elliptic, acuminate, typically much shorter than the internodes; inflorescence simple or rarely few-branched; primary bracts like the scape-bracts, shorter than the sterile naked base of the spike; spikes laxly 3–15-flowered, to 2 dm. long; rhachis nearly or quite straight, angled, glabrous; floral bracts broadly ovate or elliptic, obtuse or broadly acute, the lower ones barely shorter than the sepals, the upper much shorter; flowers perfect in the typical and only Colombian variety, erect to spreading; sepals strongly asymmetric, broadly elliptic, obtuse, submembranaceous, nerved, glabrous; petals with distinct spreading blade; ovary ovoid, style very short but distinct; capsule ovoid, long-beaked, 15–20 mm. long.

NORTE DE SANTANDER: Epiphytic, open hillside, western side of Culagá Valley, north of Labateca, alt. 1,480–1,550 m., Mar. 12, 1927, *Killip & A. C. Smith* 20530 (GH, US).

CUNDINAMARCA: Quetamé, Jan. 30, 1930, *Pérez-Arbeláez* 214 (COL, US). On trees, Sasaima, alt. 1,400 m., June 1939, *Uribe-Uribe* 369 (COL). Hacienda "Curiche," El Peñón, between Río Bunque and Río Murca, alt. 1,050–1,420 m., Aug. 1–3, 1947, *García-Barriga* 12491 (COL). On *Inga*, banks of the Río Blanco, La Unión, Municipio of Fómeque, alt. 1,600–1,700 m., August 1951, *Hernández-Camacho* 503 (COL).

ANTIOQUIA: Epiphytic, Medellín, alt. 1,500 m., Oct. 16, 1930, *Archer* 664 (COL, US).

VALLE: On tree along Río Cauca, Guanabanal, alt. 1,020–1,040 m., June 2, 1922, *Killip* 6241 (GH). Epiphytic, low forest, east of Zarzal, Cauca Valley, alt. 970–1,050 m., July 21, 1922, *Pennell, Killip & Hazen* 8390 (GH, NY, US).

WEST INDIES and southern MEXICO to VENEZUELA and ECUADOR.

2. *Catopsis sessiliflora* (R. & P.) Mez in DC. Monogr. Phan. 9:625. 1896.

FIGURE 71.

*Tillandsia sessiliflora* R. & P. Fl. Peruv. 3:42, pl. 271, fig. b. 1802.

*Catopsis nutans* var. *erecta* Wittm. Bot. Jahrb. 117:1. 1889.

Plant 1–3 dm. high; leaves 4–13 in a funnelform rosette, 8–20 cm. long, sheaths about as long as the blades but scarcely wider, blades curving outward, ligulate, 12–25 mm. wide, flat, narrowly scarious-margined; scape erect, slender, glabrous; scape-bracts erect, remote, broadly elliptic, apiculate; inflorescence simple or few-branched, lax, to 11 cm. long, glabrous; primary bracts like the scape-bracts, much shorter than the naked sterile base of the spike; spikes divergent, 2–9 cm. long, lax; floral bracts broadly ovate, obtuse, much exceeded by the sepals, thin, nerved; flowers suberect, perfect; sepals asymmetric, suborbicular, subchartaceous, nerved, wrinkled when dry; petals lance-ovate; ovary ovoid, style very short; capsule ovoid, distinctly short-beaked, 12 mm. long.

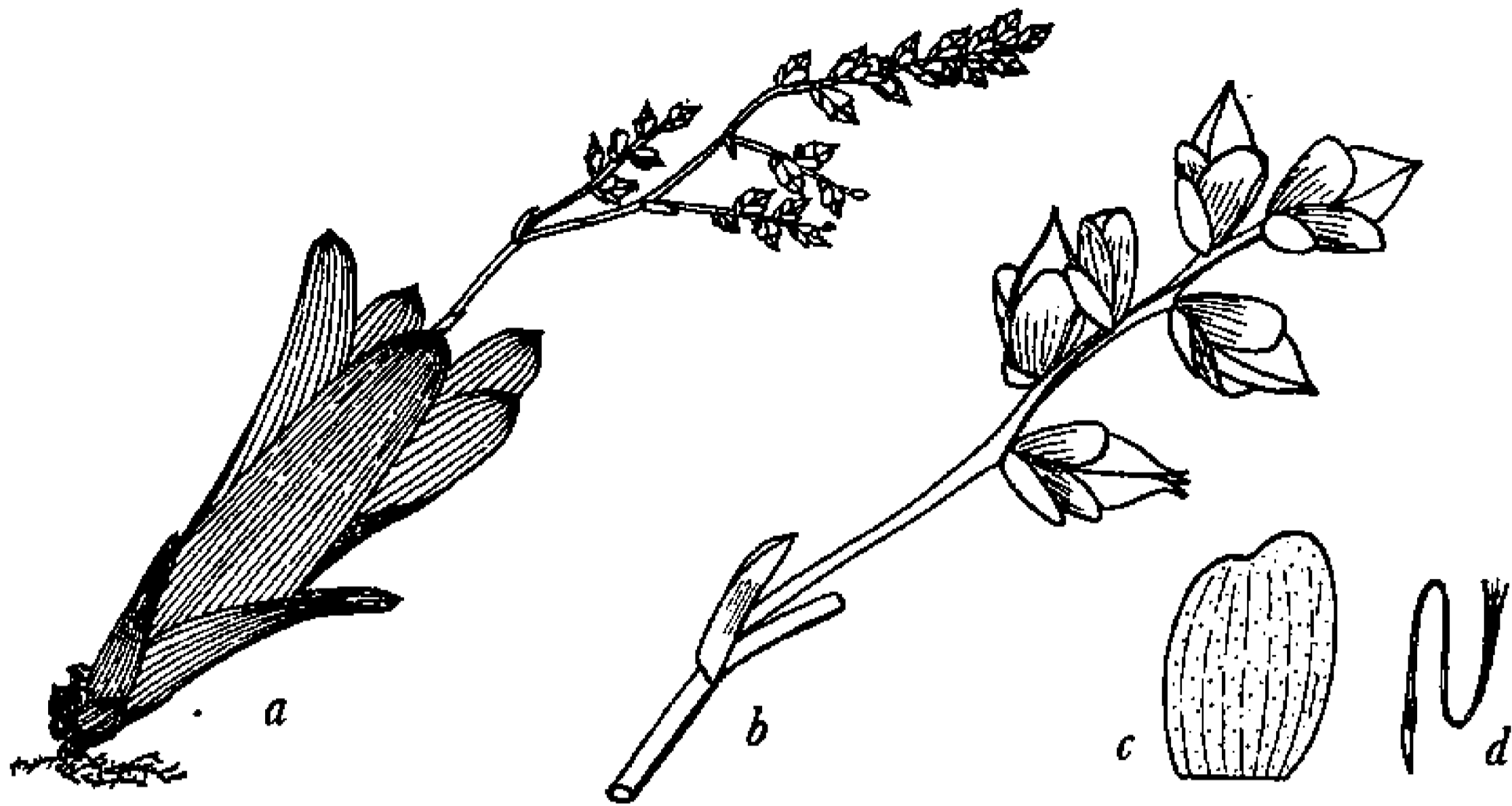


FIGURE 71.—*Catopsis sessiliflora*: *a*, Habit,  $\times \frac{1}{4}$ ; *b*, primary bract and branch,  $\times 1$ ; *c*, sepal,  $\times 2$ ; *d*, seed,  $\times 2$ .

NORTE DE SANTANDER: Epiphytic, dense jungle, Bellavista on pipeline, alt. 750 m., Sept. 15, 1946, *Foster* 1692 (COL, GH).

CUNDINAMARCA: On tree, Hacienda "Curiche", El Peñón, between Río Bunque and Río Murca, alt. 1,050–1,420 m., Aug. 1–3, 1947, *García-Barriga* 12489 (COL, US).

ANTIOQUIA: Epiphytic, moist woods, hot springs of Santo Domingo, alt. 1,200 m., May 7, 1949, *Scolnik, Molina & Barkley* 19-An-424 (US).

VALLE: Buenaventura, 1901, *Lehmann* BT-525 (GH, NY).

CAUCA: Epiphytic, Pacific Coast, Guayabal, Río Micay, alt. 5–20 m., Feb. 26, 1943, *Cuatrecasas* 14164 (GH).

WEST INDIES and southern MEXICO to southern BRASIL and PERU.

### Subfamily 3. BROMELIOIDEAE

BROMELIOIDEAE Harms, Engl. & Prantl, *Pflanzenfam.* ed. 2. 15a:132. 1930.

Herbs, often epiphytic; leaves rosulate, mostly spinose-serrate; flowers perfect in all Colombian species; sepals often asymmetric; ovary wholly inferior in the Colombian species; fruit baccate; seeds naked.

#### KEY

1. Petals naked or sometimes with lateral folds (*Ronnbergia*); flowers never in strobilate spikes.
2. Filaments not forming a tube; petals free or connate by their margins.
3. Inflorescence elongate or if short (some species of *Streptocalyx*) then the flowers distichous; petals free.
4. The inflorescence simple; flowers sessile . . . 10. *Ronnbergia*

4. The inflorescence compound.  
 5. Sepals not more than 3 mm. long; flowers slenderly pedicellate in the Colombian species; ovules few. *11. Araecoccus*
5. Sepals much larger; flowers sessile; ovules numerous. *12. Streptocalyx*
3. Inflorescence capitate or capitiform; flowers never distichous.  
 6. Flowers pedicellate; inflorescence central; sepals asymmetric . . . . . *13. Neoregelia*
6. Flowers sessile; inflorescences lateral; sepals mostly symmetric . . . . . *14. Greigia*
2. Filaments forming a tube to which the fleshy petals are joined along their centers but with their margins free; inflorescence compound, many-flowered, sessile or scapose, globose or elongate . . . . . *15. Bromelia*
1. Petals appendaged or when rarely naked then the flowers strobilate.  
 7. Ovaries always remaining distinct; inflorescence compound or simple; sepals often mucronate.  
 8. Sepals mucronate or pungent or if blunt then small and the ovules long-caudate; petals regular, erect or suberect. *16. Aechmea*
8. Sepals unarmed; petals recurved in a spiral in the Colombian species . . . . . *17. Billbergia*
7. Ovaries fused with each other and with the fleshy bracts to form a syncarp; inflorescence usually with a large apical coma; sepals never mucronate . . . . . *18. Ananas*

### 10. *Ronnbergia*

*Ronnbergia* E. Morr. & André, Ill. Hort. 21:120, pl. 177. 1874.

Low herbs; leaves fasciculate or rosulate, often petiolate, entire or serrulate; scape well developed; inflorescence simple, elongate; flowers sessile, perfect; sepals more or less connate, strongly asymmetric; petals free, naked or with lateral folds, blue; stamens included, the second series free or partially connate with the petals, pollen grains biporate; ovary wholly inferior, epigynous tube large, placentae apical.

Panama to southwestern Colombia.

### KEY

1. Leaves petiolate; filaments of the second series of stamens somewhat connate with the petals.  
 2. The leaves entire; sepals mucronate.  
 3. Leaves spotted, blades ovate or elliptic with a broad base.

*1. R. morreniana*

3. Leaves concolorous, blades lanceolate, narrowly cuneate.

2. *R. maidifolia*

2. The leaves serrulate; sepals muticous. . . . 3. *R. killipiana*

1. Leaves not at all petiolate, spinulose-serrate; filaments all free.

4. *R. columbiana*

1. *Ronnbergia morreniana* Linden & André, Ill. Hort. 21:120, pl. 177. 1874.

Leaves few, much exceeding the inflorescence, sheaths triangular, elongate, brown-lepidote especially above, petioles distinct, 2-3 dm. long, blades acuminate, rounded or acute at the base, 3 dm. long, 9 cm. wide, pale green, densely maculate with dark green, glabrous above, pale-lepidote beneath, channeled centrally; scape erect, slender; scape-bracts imbricate, narrowly lanceolate, acuminate; inflorescence dense, 4-5 cm. long, sparsely pale-lepidote or glabrous; floral bracts mucronate, thin, prominently nerved, the lowest narrowly triangular, equaling or exceeding the sepals, the others ovate, shorter than the ovary; flowers suberect to spreading; sepals 8-10 mm. long, nearly half connate, broadly rounded; petals to 30 mm. long, blades elliptic, obtuse, blue; ovary ellipsoid, stout, 6 mm. long.

COLOMBIA: Cultivated, *Linden* (no herbarium specimen?); *Bull* (no herbarium specimen?). Cultivated, from southern Colombia, western slope of the Cordillera Occidental, July 29, 1949, *Kyburz* 12 (US).

NARIÑO: Between Barbacoas and Tuquerres, *Triana* (BM, US phot. 4011). Terrestrial in thick masses of leaf-mold, *Altaquer*, alt. 1,050 m., Nov. 10, 1946, *Foster* 2075 (GH).

2. *Ronnbergia maidifolia* Mez in DC. Monogr. Phan. 9:158. 1896.

FIGURE 72

Stoloniferous; leaves few, fasciculate, much exceeding the inflorescence, sheaths narrowly triangular, 10-12 cm. long, brown-lepidote

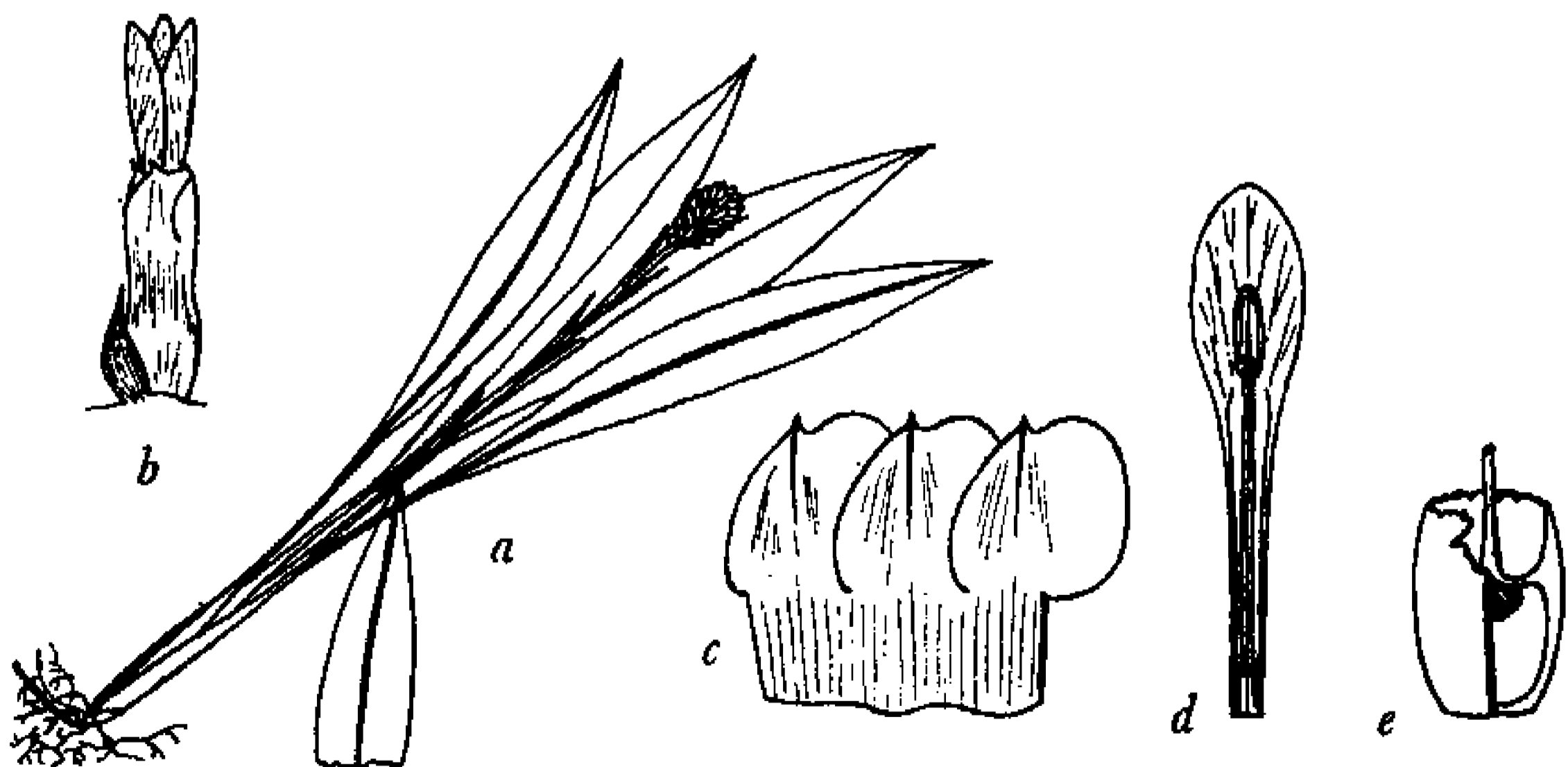


FIGURE 72.—*Ronnbergia maidifolia*: a, Habit,  $\times \frac{1}{10}$ ; b, floral bract and flower,  $\times 1$ ; c, sepals,  $\times 2$ ; d, petal and stamen,  $\times 2$ ; e, ovary,  $\times 2$ .

especially beneath, petioles 2–4 dm. long, blades acuminate, 4–6 dm. long, 50–85 mm. wide, pale-lepidote especially beneath; scape erect, slender, furfuraceous; scape-bracts imbricate, lanceolate, acuminate, membranaceous, lepidote; inflorescence dense, 4–7 cm. long, sparsely pale-lepidote; floral bracts mucronate, thin, prominently nerved, blue, the lowest narrowly triangular, equaling or exceeding the sepals, the highest ovate, shorter than the ovary; flowers spreading; sepals 8–10 mm. long, more than half connate; petals 17–25 mm. long, blades elliptic, obtuse, blue, claw with lateral folds; ovary stout, 3–7 mm. long; fruit globose, 7 mm. in diameter.

VALLE: Tocota, alt. 2,000 m., *Lehmann* 3015 (1 Mez). On the ground in dense damp forest, West Andes, above Cali, alt. 2,000 m., *Lehmann* 6386 (B, type, F phot. 11287; F). Epiphytic, forest above La Cumbre, alt. 2,000–2,200 m., May 14–19, 1922, *Pennell & Killip* 5795 (GH). Same, alt. 1,700–2,200 m., Sept. 11, 18, 1922, *Killip* 11339 (F, GH, US). Epiphytic, dense forest, San Antonio, west of Cali, near summit of Cordillera Occidental, alt. 1,900–2,350 m., Feb. 26–Mar. 2, 1939, *Killip & García* 33664 (COL, GH, US). Epiphytic, steep slopes, El Prado, left bank of Río Anchicayá, west slope of Cordillera Occidental, alt. 250–350 m., Aug. 4, 1943, *Cuatrecasas* 14864 (F). Woods, Quebrada La Cristalina, La Elsa, right bank of Río Digua, west slope of Cordillera Occidental, alt. 1,000–1,150 m., Sept. 30, 1943, *Cuatrecasas* 15241 (F, GH, US). Dense forest, Finca Tokio, near Queremal, alt. 1,800–1,900 m., Oct. 29, 1944, *Core* 1492 (US). Alto Bonito, Quebrada Robada, Río Albán drainage, western slope of Cordillera Occidental, alt. 1,800–1,900 m., Oct. 20, 1946, *Cuatrecasas* 22350 (VALLE). Terrestrial, above Cali, alt. 1,050 m., Dec. 5, 1946, *Foster* 2301 (GH).

PANAMA.

3. *Ronnbergia killipiana* L. B. Smith, *Phytologia* 5:283, pl. 1, figs. 10–12. 1955.

FIGURE 73

Stoloniferous; leaves few, fasciculate, much exceeding the inflorescence, pale-lepidote beneath, sheaths narrowly triangular, 8–12 cm. long, entire, petioles to 20 cm. long, laxly serrulate with ascending flat spines less than 1 mm. long, blades linear-lanceolate, caudate-acuminate, narrowly cuneate, 30–35 cm. long, 28 mm. wide, laxly serrulate; scape curved, 2 mm. in diameter, pale-flocculose; scape-bracts imbricate, lanceolate, acuminate, membranaceous; inflorescence sublax, 3–4 cm. long, minutely pale-furfuraceous; floral bracts ovate, acute or acuminate, all or all but the lowest shorter than the ovary, thin, nerved; flowers spreading; sepals very asymmetric with a large spreading wing, 7 mm. long, about half connate; ovary globose, 4–5 mm. in diameter, epigynous tube large, funnelform; placentae apical; ovules short-caudate.

CHOCÓ: Epiphytic, Istmina, on Río San Juan, alt. 75 m., Apr. 29, 1939, *Killip* 35481 (US, type, US phot. 4397).

NARIÑO: Near Barbacoas, by the Corregimiento Santander (Buenavista), drainage of Río Telembí, alt. 200–840 m., Aug. 3–5, 1948, *García-Barriga* 13167 (COL, US).

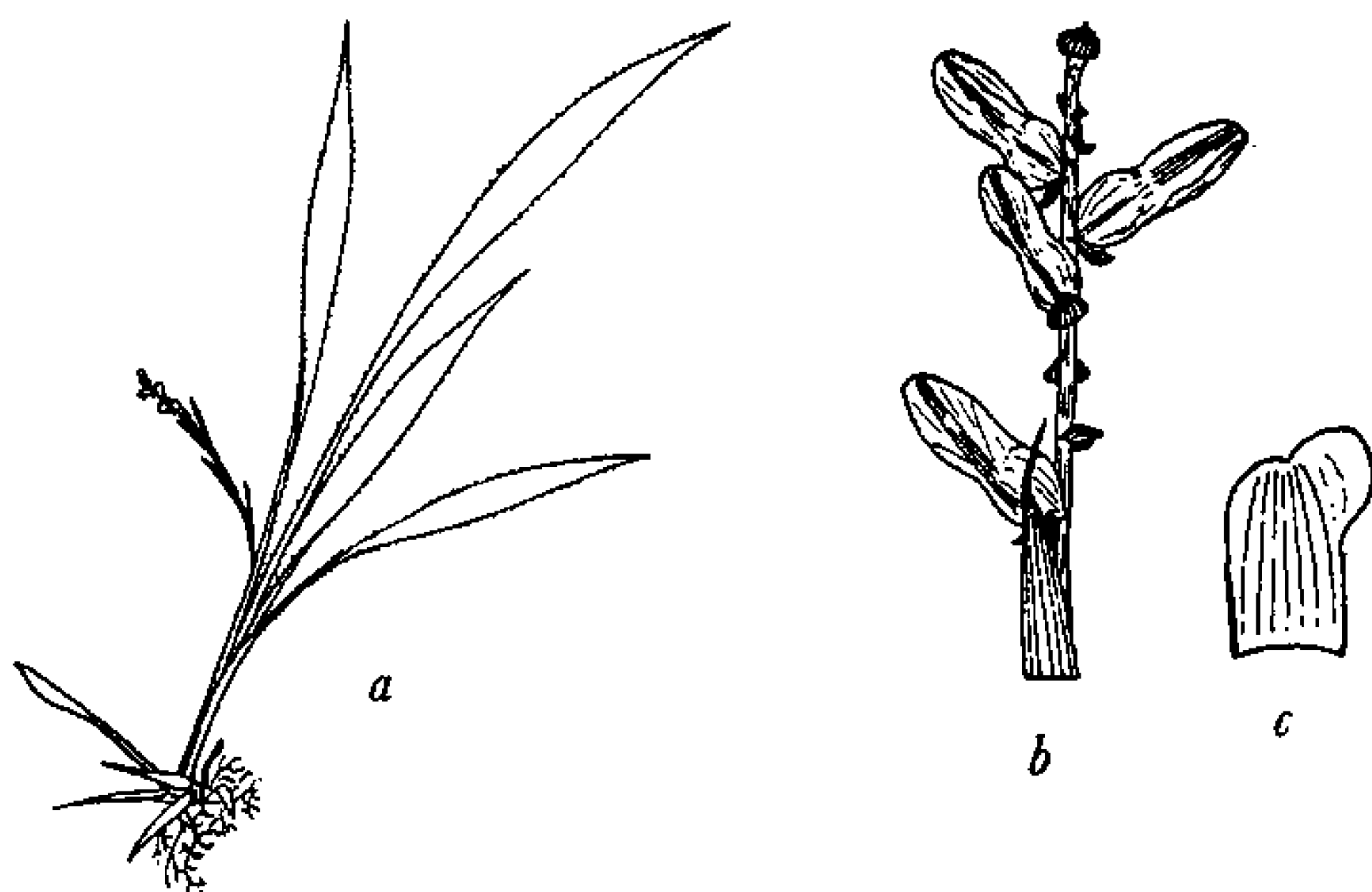


FIGURE 73.—*Ronnbergia killipiana*: a, Habit,  $\times \frac{1}{10}$ ; b, inflorescence,  $\times 1$ ; c, sepal,  $\times 2$ .

4. *Ronnbergia columbiana* E. Morr. Belg. Hort. 35:82. 1885.

*Quesnelia columbiana* Baker, Handb. Bromel. 87. 1889.

Leaves about 8 in a funnelform rosette, 4 cm. long, bearing brown impressed scales especially beneath, sheaths elliptic, narrow, blades linear, broadly acute and cuspidate, 25–48 mm. wide, glaucous-green above, brownish purple beneath, subdensely serrulate with spines about 1 mm. long; scape erect, stout, farinose especially toward apex; scape-bracts imbricate, lanceolate, acuminate, green, membranaceous; inflorescence lax, to 6 cm. long; rhachis tomentulose-lepidote; floral bracts ovate, acuminate, much shorter than the ovary or the lowest sometimes exceeding it, membranaceous, pale-lepidote; flowers divergent; sepals mucronate, to 18 mm. long, short-connate; petals 25–35 mm. long, blades at length spreading, acute, purple with white margins; ovary subcylindric, stout, to 10 mm. long.

COLOMBIA: Cultivated, February–March 1882, *Bull* (LG, GH phot. 2914); André K-333 (K, GH phot. 2688).

VALLE: Epiphytic, La Trojita, Río Calima, region of the Chocó, alt. 5–50 m., Feb. 19–Mar. 10, 1944, *Cuatrecasas* 16311 (F, GH). Epiphytic, rain forest, 30 km. above Buenaventura, Dec. 8, 1946, *Foster* 2333 (GH, US).

## II. *Araeococcus*

*Araeococcus* Brongn. Ann. Sci. Nat. II. 15:370. 1841.

Terrestrial or epiphytic herbs; leaves rosulate, entire or serrate; inflorescence laxly paniculate or rarely simple; flowers sessile or pedicellate, perfect; sepals connate, unarmed or obscurely mucronulate; petals free, naked; stamens included, filaments very short; ovary

inferior, placentae apical, ovules few, long-caudate; fruit only slightly enlarged from the ovary.

Costa Rica, Tobago, Trinidad, Guiana, Venezuela, northern Brasil.

1. *Araecoccus flagellifolius* Harms, Notizblatt 10:784. 1929. FIGURE 74

Leaves few, 7-13 dm. long, much exceeding the inflorescence, sheaths forming a slenderly ovoid pseudobulb, entire or subentire, densely brown-lepidote, the inner ones 8-18 cm. long, blades linear, filiform-acuminate, coarsely serrate toward the base, serrulate or entire toward the apex; scape slender; scape-bracts few, lanceolate,

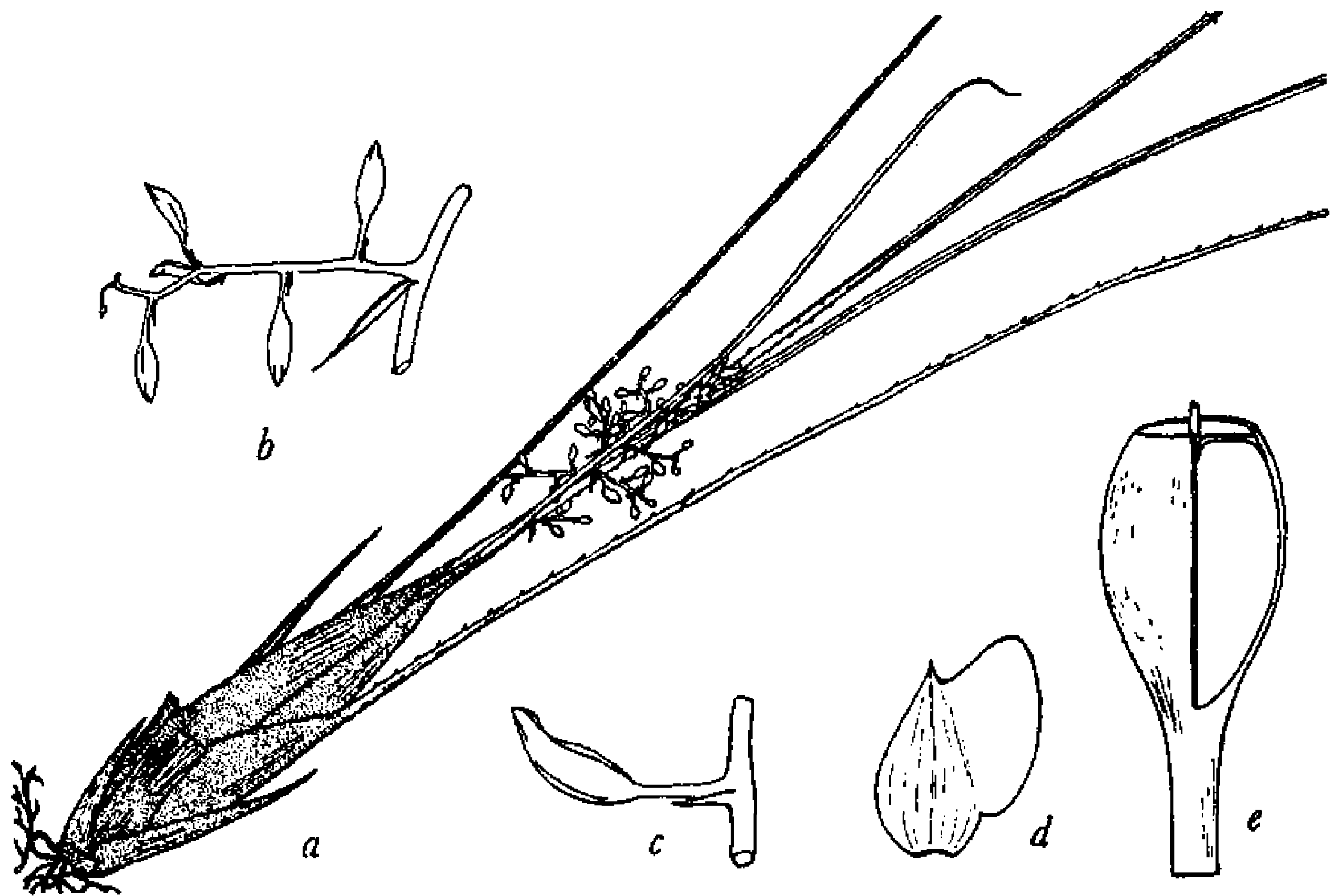


FIGURE 74.—*Araecoccus flagellifolius*: *a*, Habit,  $\times \frac{1}{4}$ ; *b*, primary bract and branch,  $\times 1$ ; *c*, floral bract and flower,  $\times 2$ ; *d*, sepal,  $\times 5$ ; *e*, ovary,  $\times 5$ .

2-12 cm. long; inflorescence bipinnate or rarely simple, subpyramidal, 1-3 dm. long; racemes to 8 cm. long; primary bracts lanceolate, 2-3 cm. long, membranaceous, pale red; floral bracts narrowly triangular, 1-3 mm. long; pedicels spreading, slender, 6-8 mm. long; sepals asymmetric, oblong-ovate, 3 mm. long, obscurely mucronulate; petals 6-9 mm. long.

VAUPÉS: Quartzite base, savannas about 15 miles above the mouth of Río Kubiyú (tributary of Río Vaupés) Cerro Kañendá, alt. 240-270 m. lat.  $1^{\circ}0'$  N., long.  $70^{\circ}15'$  W., Nov. 10, 1952, *Schultes & Cabrera* 18348 (US). Epiphytic, settlement of "Alto Caribe," remanso "Caraná," bank of Río Infrida, alt. 220 m., Jan. 23, 1953, *Fernández* 1909 (COL). Epiphytic, settlement of "Morichal," near the mouth of Río Papunáua, bank of Río Infrida, long.  $70^{\circ}30'$  W., alt. 200 m., Feb. 8, 1953, *Fernández* 2222 (COL).

Amazonian BRASIL, VENEZUELA, SURINAM.

12. *Streptocalyx*

*Streptocalyx* Beer, Flora 37:348. 1854.

Leaves densely rosulate; scape elongate to almost none; inflorescence central, 2-3-pinnate, densely subglobose to laxly paniculate; flowers sessile; sepals free or nearly so, strongly asymmetric with a broad lateral wing; petals free, narrow, naked; stamens and pistil included; pollen grains with 2 or 4 pores; ovary usually farinose, the epigynous tube distinct; fruit somewhat fleshy; seeds ellipsoid or ovoid, naked.

French Guiana, Surinam, Brasil, Ecuador, Peru, Bolivia.

## KEY

1. Floral bracts serrulate.
  2. Inflorescence distinctly scapose; leaf-blades 50 mm. wide; sepals to 25 mm. long . . . . . 1. *S. colombianus*
  2. Inflorescence sessile in the center of the rosette; leaf-blades 4-15 mm. wide; sepals 14-20 mm. long . . . . . 2. *S. longifolius*
1. Floral bracts entire.
  3. Flowers fasciculate on abbreviated branches; floral bracts broadly ovate, apiculate, exceeding the ovary; sepals 16-22 mm. long . . . . . 3. *S. poitaei*
  3. Flowers spicate on distinct branches.
    4. Floral bracts ovate, acuminate, to 12 mm. long.
      4. *S. williamsii*
    4. Floral bracts reniform, apiculate, much shorter than the ovary.
      5. Primary bracts gradually reduced upward, all much larger than the floral bracts . . . . . 5. *S. poeppigii*
      5. Primary bracts abruptly reduced, all but the lowest scarcely larger than the floral bracts . . . . . 6. *S. subnuda*

1. *Streptocalyx colombianus* L. B. Smith, *Caldasia* [1], No. 5:9 *fig. 5*. 1942.

FIGURE 75

Flowering shoot over 4 dm. high; leaves to 17 dm. long, sheath elliptic, densely ferruginous-lepidote, blade linear, rounded and pungent-apiculate, densely white-lepidote beneath, soon glabrous above, laxly serrate with broad spines 2 mm. long; scape stout; scape-bracts densely imbricate, subfoliaceous; inflorescence very densely bipinnate, narrowly ovoid, 20 cm. long, 10 cm. in diameter; primary bracts broadly ovate, rounded and apiculate, exceeding the spikes, densely serrulate, densely white-lepidote; spikes 4-flowered, strongly geniculate; floral bracts suborbicular, not at all lobed, inflated and not all carinate, 3 cm. in diameter, slightly exceeding the ovary, densely lepidote, subchartaceous, prominently nerved; flowers spreading; sepals free, asymmetric, mucronate, glabrous, densely



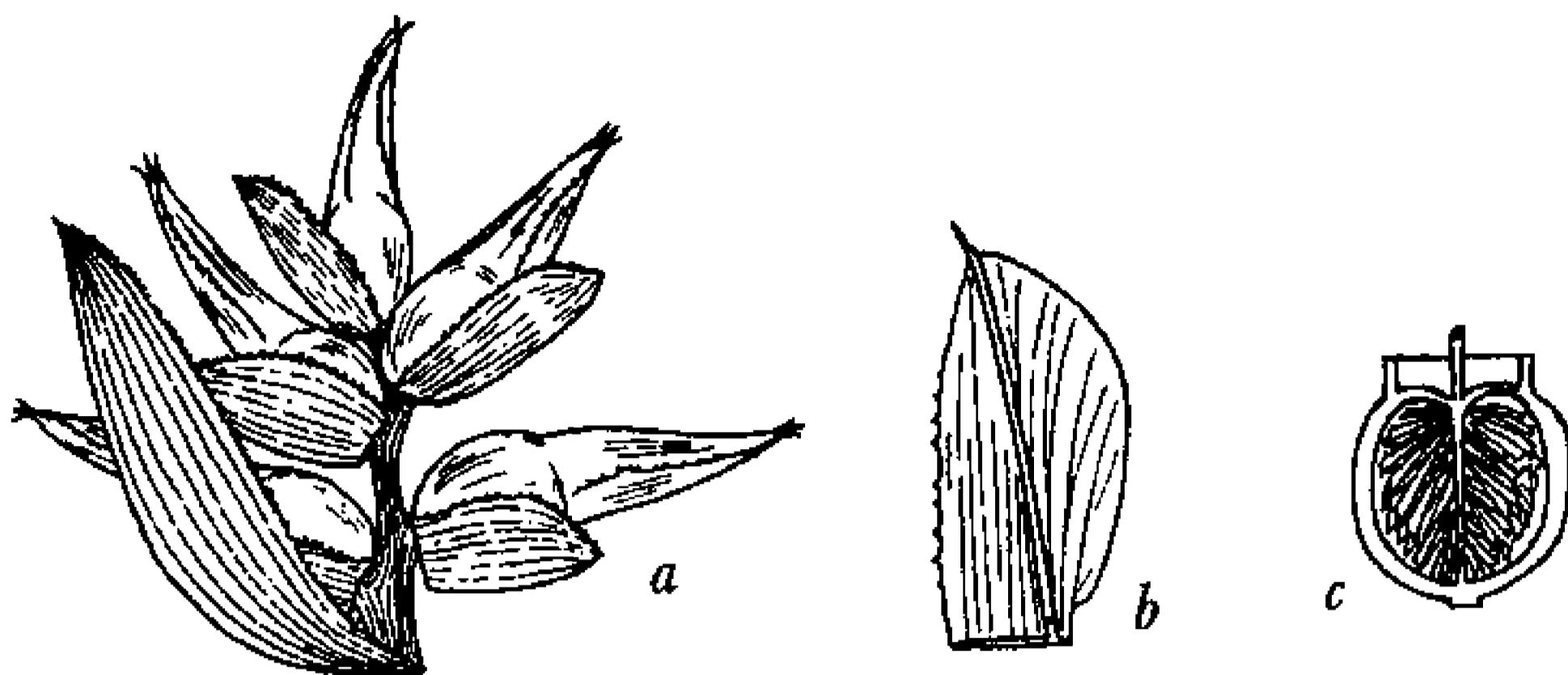


FIGURE 75.—*Streptocalyx colombianus*: *a*, Primary bract and branch,  $\times \frac{1}{2}$ ; *b*, sepal,  $\times 1$ ; *c*, section of fruit,  $\times 1$ .

serrulate near apex; ovary orbicular, strongly compressed, epigynous tube 3 mm. long; placentae apical; ovules apiculate.

VAUPÉS: Woods, Mitú, alt. 200 m., Sept. 16, 1939, *Cuatrecasas* 6863 (US, type, GH phot. 6176; COL). Cachivera Mirití, Río Kananarí, alt. 250 m., Oct. 25, 1951, *Schultes & Cabrera* 14405 (COL, US). Terrestrial, savanna, Caño Teemeña, Río Piraparaná (tributary of Río Apaporis), lat.  $0^{\circ}15'$  S. to  $0^{\circ}25'$  N., long.  $70^{\circ}30'$  W., Sept. 6, 1952, *Schultes & Cabrera* 17218 (US). On granite rocks at rapids, near Wacaricuara, Río Paca (tributary of Río Papuri), lat.  $0^{\circ}30'$  N., long.  $70^{\circ}10'$  W., alt. 195 m., June 1–3, 1953, *Schultes & Cabrera* 19531 (COL, US).

AMAZONAS-VAUPÉS: Forest, near Cachivera de Jirijirimo, Río Apaporis, alt. 250 m., July 7, 1951, *Schultes & Cabrera* 12945 (US).

2. *Streptocalyx longifolius* (Rudge) Baker, *Handb. Bromel.* 31. 1889.

*Bromelia longifolia* Rudge, *Guyan.* 1:31, *pl.* 49. 1805.

*Streptocalyx angustifolius* Mez in *Mart. Fl. Bras.* 3, pt. 3:283, *pl.* 62. 1892.

Leaves numerous in a very dense rosette, 4–12 dm. long, sheaths small but much broader than the blades, dark castaneous, densely and minutely lepidote, blades linear, acuminate, pale-lepidote beneath, laxly serrate with flat spines 2.5 mm. long but entire toward the apex; scape very short or none; inflorescence densely bipinnate, ovoid or ellipsoid, 7–15 cm. long, 7–8.5 cm. in diameter, pale ferruginous-lepidote except the petals; primary bracts ovate or elliptic, rounded and apiculate, 25–50 mm. long, about equaling the spikes, serrulate; spikes densely 3–6-flowered; floral bracts broadly ovate, 25–30 mm. long, covering the ovary, serrulate; sepals free, mucronulate, more or less serrulate; petals 25–30 mm. long, white; ovary broad, 10 mm. long, epigynous tube short; placentae apical; ovules obtuse.

AMAZONAS-VAUPÉS: Epiphytic, flood-bank, Soratama, between Río Pacoa and Río Kananarí, Río Apaporis, lat.  $0^{\circ}5'$  N., long.  $70^{\circ}40'$  W., alt. 250 m., June 21, 1951, *Schultes & Cabrera* 12711 (COL, GH, US). Same, Feb. 4, 1952, *Schultes & Cabrera* 15152 (US).

AMAZONAS: Epiphytic, Loretoyacu River, Trapecio Amazónico, alt. 100 m., September 1946, *Schultes & Black* 8354 (US). Atacuri River, Trapecio Amazónico, alt. 100 m., Oct. 24, 1946, *Schultes & Black* 8643 (US).

NARIÑO: In trees, road to Urcusique, alt. 1,200 m., Nov. 23, 1946, Foster 2254 (COL, GH, US).

GUIANA, Amazonian BRASIL, ECUADOR, PERU.

3. *Streptocalyx poitaei* Baker. Handb. Bromel. 31. 1889.

*Streptocalyx tessmannii* Harms, Notizblatt 9:1151. 1927.

Leaves to 13 dm. long, sheaths elliptic, ample, 2 dm. long, dark castaneous except near the apex, densely buff-lepidote, blades linear, acuminate to a dark pungent cusp, 30–45 mm. wide, white-lepidote, laxly serrate with dark flat spines 2–3 mm. long; scape stout, arching, to 25 cm. long; scape-bracts densely imbricate, broadly ovate, long-laminate; inflorescence densely bipinnate, subglobose or pyramidal, 15–25 cm. long; primary bracts broadly ovate, red, concealing the spikes, denticulate to entire, the lower acuminate, the upper apiculate and strongly cucullate; spikes densely 7–10-flowered; floral bracts 15–20 mm. long, concealing the ovary and part of the sepals, mucronate; sepals free, strongly asymmetric, carinate, mucronate, glabrous; petals 32 mm. long, blue; ovary subglobose, epigynous tube short, funnelform; placentae apical; ovules caudate.

AMAZONAS: Epiphytic, Loretoyacu River, Trapecio Amazónico, alt. 100 m., September–November 1944, Schultes 6353 (US).

FRENCH GUIANA, Amazonian BRASIL, PERU.

4. *Streptocalyx williamsii* L. B. Smith, Contr. Gray Herb. 98:14, pl. 4, fig. 7. 1932.

Leaves 6–15 dm. long, sheaths broadly elliptic, 15 cm. long, dark castaneous, densely buff-lepidote, blades, linear, acuminate, 3–4 cm. wide, densely pale-lepidote, laxly serrulate with spines 1–2 mm. long; scape curved, 2 dm. long, 7 mm. in diameter; scape-bracts densely imbricate, the lower subfoliaceous, the upper ovate, acuminate to a dark brown cusp; inflorescence slenderly cylindric, 13–30 cm. long, farinose; primary bracts broadly ovate, exceeding the spikes, thin, pink, lacinate-dentate, mucronate; spikes very laxly 2–5-flowered; rhachis slender, nearly straight; flowers suberect; sepals free, mucronate, 17 mm. long; petals 26 mm. long, white, drying purple; ovary subglobose, epigynous tube short, funnelform; placentae apical; ovules short-caudate.

AMAZONAS: Loretoyacu River, Trapecio Amazónico, alt. 100 m., October 1946, Schultes & Black 8456 (COL, US).

Amazonian BRASIL, PERU.

5. *Streptocalyx poeppigii* Beer, Bromel. 141. 1857.

FIGURE 76

*Lamprococcus vallerandii* Carr. Rev. Hort. 49:129, figs. 23, 24, pl. 1877.

*Streptocalyx vallerandii* E. Morr. Belg. Hort. 33:13, pls. 1, 2. 1883.

*Streptocalyx juruanus* Ule, Verh. Bot. Ver. Brand. 48:133. 1907.

Flowering shoot 5–8 dm. high; leaves numerous, to 16 dm. long, sheaths elliptic, ample, dark castaneous, densely buff-lepidote, blades

linear, acuminate to a dark pungent cusp, 3–7 cm. wide, laxly serrate with dark curved spines 1–4 mm. long, densely white-lepidote beneath, soon glabrous above; scape curved, red, white-flocculose at first; scape-bracts imbricate, broadly ovate with a linear blade, fimbriate-serrate, bright rose; inflorescence densely bipinnate, slenderly cylindric or pyramidal, 2–4 dm. long, 9–15 cm. in diameter, white-farinose; primary

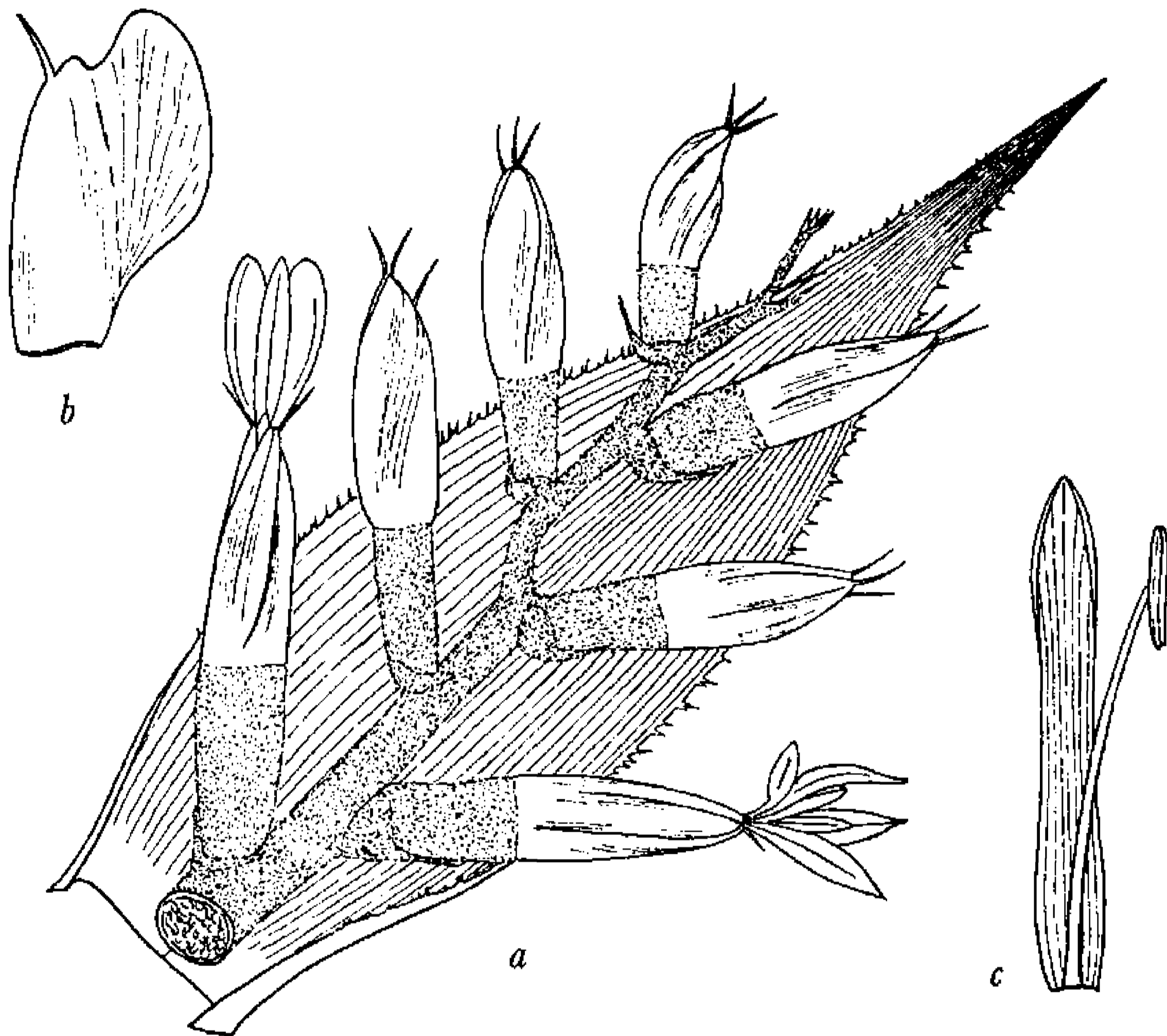


FIGURE 76.—*Streptocalyx poeppigii*: *a*, Primary bract and branch,  $\times 1$ ; *b*, sepal,  $\times 1$ ; *c*, petal and stamen,  $\times 1$  (all after Belgique Horticole).

bracts like the scape-bracts but merely apiculate, about equaling the spikes, divergent; spikes 2–10-flowered, lax, 5–7 cm. long; sepals free, strongly asymmetric, 16–19 mm. long mucronate; petals bright purple; ovary cylindric, epigynous tube large; placentae apical.

NARIÑO: Epiphytic, road to Urcusique, alt. 1,200 m., Nov. 23, 1946, *Foster* 2252 (COL, GH, US).

SURINAM, Amazonian BRASIL, PERU, BOLIVIA.

6. *Streptocalyx subnuda* L. B. Smith, Bot. Mus. Leafl. Harvard 17:73, fig. 1955.

Plant coarse, 1 meter high or more; leaves about 1 meter long, blades ligulate, acuminate, thickened at apex, 7 cm. wide, covered with

white appressed scales, laxly serrulate; scape stout, densely farinose-lepidote; scape-bracts elliptic, 15 cm. long, the upper densely imbricate, serrulate, subchartaceous, rose, subulate-indurate at the apex; inflorescence bipinnate, cylindric, 26 cm. long, farinose-lepidote; lowest primary bracts like the scape-bracts, exceeding the branches; branches spreading, 6 cm. long, geniculate, laxly few-flowered; floral bracts vestigial, narrowly reniform with an acicular apex; flowers divergent; sepals asymmetric with a large wing, mucronate, 11 mm long; ovary slenderly obovoid or ellipsoid, becoming 15 mm. long in fruit, epigynous tube broadly funnelform, 2 mm. high, placentae apical.

AMAZONAS: Loretoyacu River, Trapec'o Amazónico, alt. 100 meters, September 1946, *Schultes & Black* 8294 (US).

NARIÑO: Epiphytic, Río Caucaya, between Puerto Jaramillo and Río Putumayo, alt. 225 m., May 16, 1942, *Schultes* 3719 (GH, type, US phot. 4404, 4405).

### 13. *Neoregelia*

*Neoregelia* L. B. Smith, Contrib. Gray Herb. 104:78. 1934.

*Regelia* Lindm. Öfvers. Akad. Holm. 542. 1890, not Schauer 1843.

Leaves densely rosulate, usually spinose-serrate, sheath large, blade acute or rounded and apiculate; inflorescence central, sunk in the center of the rosette, simple in most species, very densely capitiform-umbellate or corymbose; flowers perfect, pedicellate; sepals asymmetric; petal-blades spreading, acuminate, violet, blue or white; stamens and pistil included.

Largely eastern Brasil.

1. *Neoregelia eleutheropetala* (Ule) L. B. Smith, Contr. Gray Herb. 104:78. 1934. FIGURE 77

*Nidularium eleutheropetalum* Ule, Verh. Bot. Ver. Brand. 48: 131. 1907.

*Aregelia eleutheropetala* Mez ex L. B. Smith, Contr. Gray Herb. 98:5, pl. 1, figs. 4-6. 1932.

Stoloniferous; leaves about 30, 5-7 dm. long, sheaths 12 cm. long, 16 cm. wide, dark brown, lustrous beneath, blades ligulate, acute and apiculate, pungent, 6-8 cm. wide, green or the innermost red, laxly serrate with dark brown spines 5-7 mm. long; inflorescence many-flowered, compound, 6-8 cm. in diameter; outer bracts elliptic with a short purple mucro, 4-5 cm. long, 24-32 mm. wide, membranaceous, lepidote; floral bracts lance-ovate, acute, 40 mm. long, exceeded by the sepals, lepidote toward the apex; pedicels slenderly obconic, merging imperceptibly with the ovary, 15 mm. long; sepals free, obovate, acute, 21-26 mm. long, soon glabrous; petals 35 mm. long, white; ovary 15 mm. long, glabrous.

VAUPÉS: Epiphytic, Mount Chiribiquete, confluence of Río Macaya and Río Ajaju, May 15, 16, 1943, *Schultes* 5382 (COL, GH, US). Epiphytic, Caño Teemeña, Río Piraparaná (tributary of Río Apaporis), lat. 0°15' S. to 0°25' N., long.

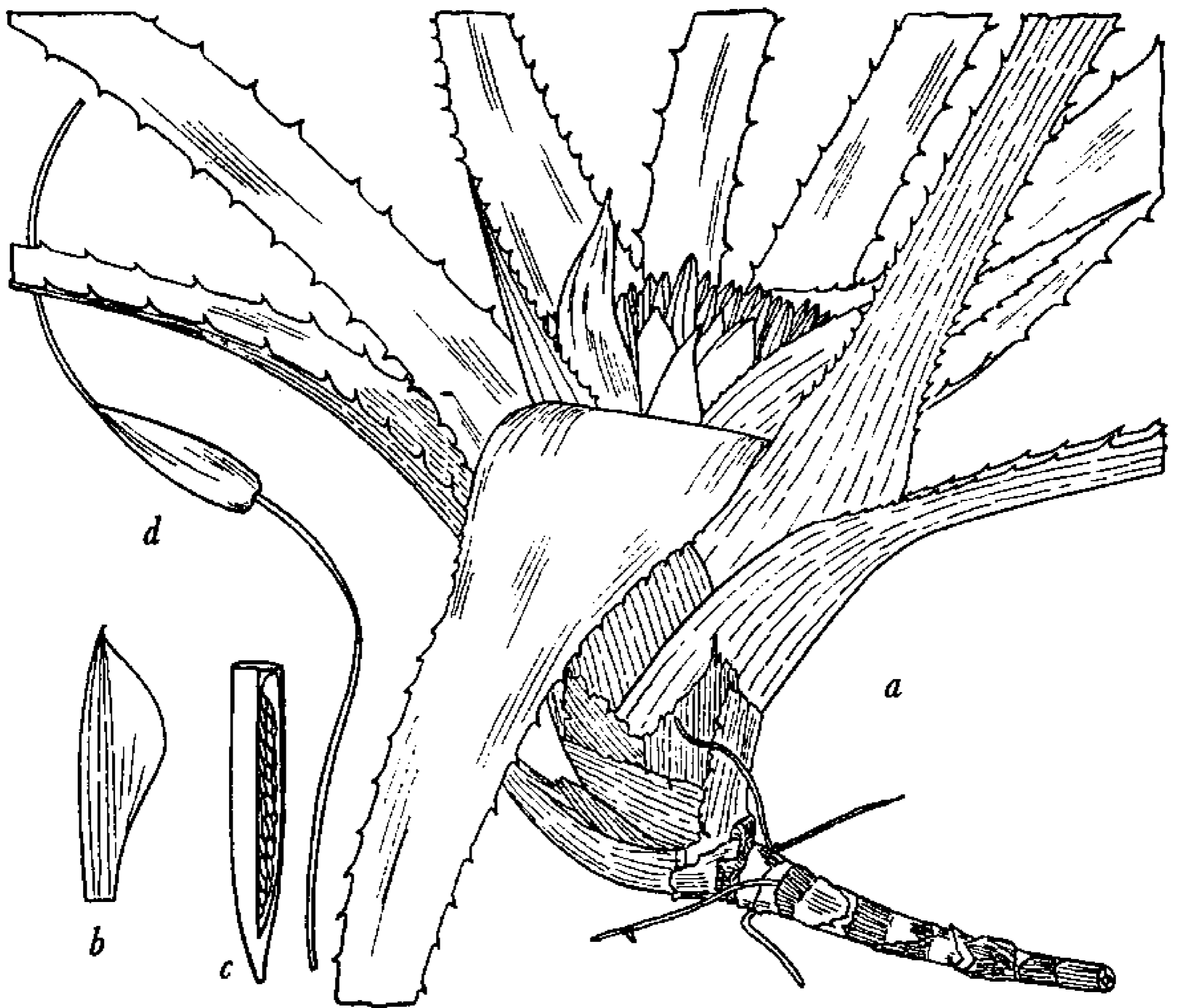


FIGURE 77.—*Neoregelia eleutheropetala*: *a*, Habit,  $\times \frac{1}{2}$ ; *b*, sepal,  $\times 1$ ; *c*, ovary,  $\times 1$ ; *d*, ovule,  $\times 5$ .

70°50' W., Sept. 9, 10, 1952, *Schultes & Cabrera* 17313 (COL, US); 17455 (COL, GH, US).

AMAZONAS-VAUPÉS: Epiphytic, near Jinogojé (at mouth of Río Piraparaná), Río Apaporis, lat. 0°15' S., long. 70°30' W., alt. 210 m., June 8, 1952, *Schultes & Cabrera* 16634 (COL, US).

AMAZONAS: Epiphytic, Loretoyacu River, Trapecio Amazónico, alt. 100 m., September 1946, *Schultes* 8267 (US). Same, November 1946, *Schultes & Black* 8628 (US).

PERU, Amazonian BRASIL.

#### 14. *Greigia*

*Greigia* Regel, *Gartenflora* 14:137. 1865.

*Hesperogreigia* Skotts. *Acta Horti Gotoburgensis* 11:220. 1936.

Large coarse herbs, stemless or caulescent; leaf-blades narrowly triangular, partially or completely serrate or serrulate; scape lacking; inflorescence lateral or central, simple or compound, dense, capitate or corymbose; sepals free or nearly so, usually symmetric; petals connate, fleshy, naked; filaments connate with the petals; anthers narrow, acute, pollen grains large, spherical, smooth; fruit fleshy.

Mexico to Chile.

## KEY

1. Sepals 10–11 mm. long; leaf-blades revolute, 20–23 mm. wide; inflorescence few-flowered.
  2. Leaf-blades minutely serrulate with teeth less than 0.5 mm. long, densely cinereous-lepidote above . . . . . **1. *G. racinae***
  2. Leaf-blades with slender basal spines to 5 mm. long, sparsely lepidote and soon glabrous above . . . . . **2. *G. nubigena***
1. Sepals 15–23 mm. long.
  3. Primary bracts wholly green; leaf-blades finely and remotely serrate; plant 12 dm. high. . . . . **3. *G. sanctae-martae***
  3. Primary bracts dark castaneous in large part.
    4. Leaf-blades 40–50 mm. wide.
      5. Primary bracts not over 25 mm. long, barely exceeding the ovaries, sparsely serrate . . . . . **4. *G. exserta***
      5. Primary bracts to 50 mm. long, usually equaling or exceeding the sepals.
        6. Leaf-blades coarsely serrate throughout; nearly or all of the margin of the primary bracts serrate.
          5. ***G. vulcanica***
          6. Leaf-blades coarsely serrate only at the base; primary bracts serrate only near the apex . . **6. *G. mulfordii***
    4. Leaf-blades 23–30 mm. wide.
      7. Sepals thin, nerved, pale; leaf-blades and sheaths densely cinereous-lepidote beneath . . . . . **7. *G. collina***
      7. Sepals coriaceous and even at least toward the apex, dark castaneous; leaf-blades glabrous.
        8. Primary bracts concolorous, entire. . . . **8. *G. danielii***
        8. Primary bracts with strongly contrasting green blades and hyaline margins, the blades subentire to strongly serrate . . . . . **9. *G. columbiana***

**1. *Greigia racinae*** L. B. Smith, Contr. U. S. Nat. Herb. 29:288, fig. 14. 1949.

Terrestrial, growing in dense masses; leaves 3–4 dm. long, the sheaths elliptic, 6–7 cm. long, brown except for the green apex, covered with coarse pale strongly appressed scales, the blades linear, acuminate to a subulate thickened apex, 2 cm. wide, slightly narrowed at the base, glabrous beneath; inflorescences lateral, numerous, few-flowered, apparently simple, compressed, 3 cm. long; bracts broadly elliptic, 15–23 mm. long, exceeding the sepals, pale and membranaceous except for the castaneous keel and the subconical apex, brown-lepidote; flowers sessile; sepals triangular-ovate, acute, 10 mm. long green except for the castaneous apex, sparsely lepidote; petals 25 mm. long, pale lilac, lepidote outside.

NARIÑO: Páramo cloud-forest, Alto de Cruz, above Encano, alt. 3,300 m., Nov. 1, 1946, *Foster* 2044 (GH, type, US phot. 4221).

2. *Greigia nubigena* L. B. Smith, *Contr. U. S. Nat. Herb.* 29:287, *fig. 13.* 1949.

Terrestrial, growing in dense masses, 45–60 cm. high; leaves 30–45 cm. long, the sheaths broadly elliptic, 5 cm. long, dark castaneous, the blades linear, acuminate, 23 mm. wide, narrowed at the base; inflorescences few-flowered, dense, compressed, 4 cm. long; primary bracts broadly elliptic, thick-subulate at the apex, 25–30 mm. long, much exceeding the sepals, the center and apex coriaceous and castaneous, elsewhere thin and green, sparsely appressed-brown-lepidote, the outer ones entire, the inner sometimes bearing a few minute teeth; floral bracts broadly lanceolate, 22 mm. long, membranaceous except for the thick-subulate apex, entire, sparsely lepidote; flowers sessile; sepals triangular-ovate, acute, 11 mm. long, thin, sparsely lepidote; petals 22 mm. long, nearly white, lepidote outside.

NARIÑO: Moist places, páramo cloud-forest, Alto de Cruz above Encano, alt. 3,300 m., Nov. 1, 1946, *Foster* 2043 (GH, type, US phot. 4125).

3. *Greigia sanctae-martae* L. B. Smith, *Contr. U. S. Nat. Herb.* 29:289, *fig. 15.* 1949.

Terrestrial, caulescent, 1.2–1.35 meters high; leaves 1.5–2.5 meters long, green throughout, glabrous above, the sheaths elliptic, entire, covered beneath with dark ferruginous scales, the blades linear, acuminate, to 35 mm. wide, narrowed at the base, densely white-pruinose beneath, very laxly serrate with spines 1 mm. long; inflorescences lateral, numerous, compressed, many-flowered, 4–6 cm. long; primary bracts broadly ovate or elliptic with a narrowly triangular apex, 6 cm. long, exceeding the sepals at anthesis, toward the apex green, densely serrulate, and white-lepidote, toward the base nearly white, entire, and ferruginous-lepidote, subcoriaceous; floral bracts broadly lanceolate, acuminate, 25 mm. long, entire, green at the apex and keel, elsewhere white, sparsely lepidote; flowers sessile; sepals like the floral bracts, 16–20 mm. long; petals brown with white margins, 22 mm. long, externally lepidote.

MAGDALENA: In heavy undergrowth in heavy dark rain forest, Siminchicua, Sierra Nevada de Santa Marta, alt. 2,520 m., Aug. 19, 1946, *Foster* 1463 (GH, type, US phot. 3517).

4. *Greigia exserta* L. B. Smith, *Caldasia* 3:238, *fig.* 1945.

Leaves over 7 dm. long, sheaths elliptic, 10 cm. long, pale, subdensely serrate with straight slender dark castaneous spines 7 mm. long, blades 5 cm. wide, slightly narrowed at the base, laxly serrate with antrorse spines, the upper spines 2 mm. long; inflorescences strongly complanate and presumably lateral, flabellate, about 15-

flowered; outer bracts suborbicular, abruptly acute, scarcely over 25 mm. long, entire or sparsely serrate with spines 3 mm. long, dark castaneous and lustrous or pale at the extreme apex, sparsely pale-lepidote; floral bracts linear, acute, 3 cm. long, wholly castaneous; flowers short-pedicellate; sepals free, narrowly triangular, pungent, 23 mm. long; petals about 5 mm. longer than the sepals.

NARIÑO: Páramo del Tábano, crest of the Cordillera, between Pasto and El Encano, alt. 3,200 m., Jan. 11, 1941, Cuatrecasas 11897 (US, type, GH phot. 6198; COL, F).

5. *Greigia vulcanica* André, Énum. Bromél. [3]. Dec. 13, 1888; Rev. Hort. 60:563. Dec. 16, 1888. FIGURE 78

Stem short, stout, erect; leaves numerous, 6–8 dm. long, sheaths broadly elliptic, 10 cm. long, dark castaneous, pale-lepidote beneath, densely serrate with spines 7–12 mm. long, blades linear, acuminate, pungent, slightly narrowed toward the base, 4 cm. wide covered

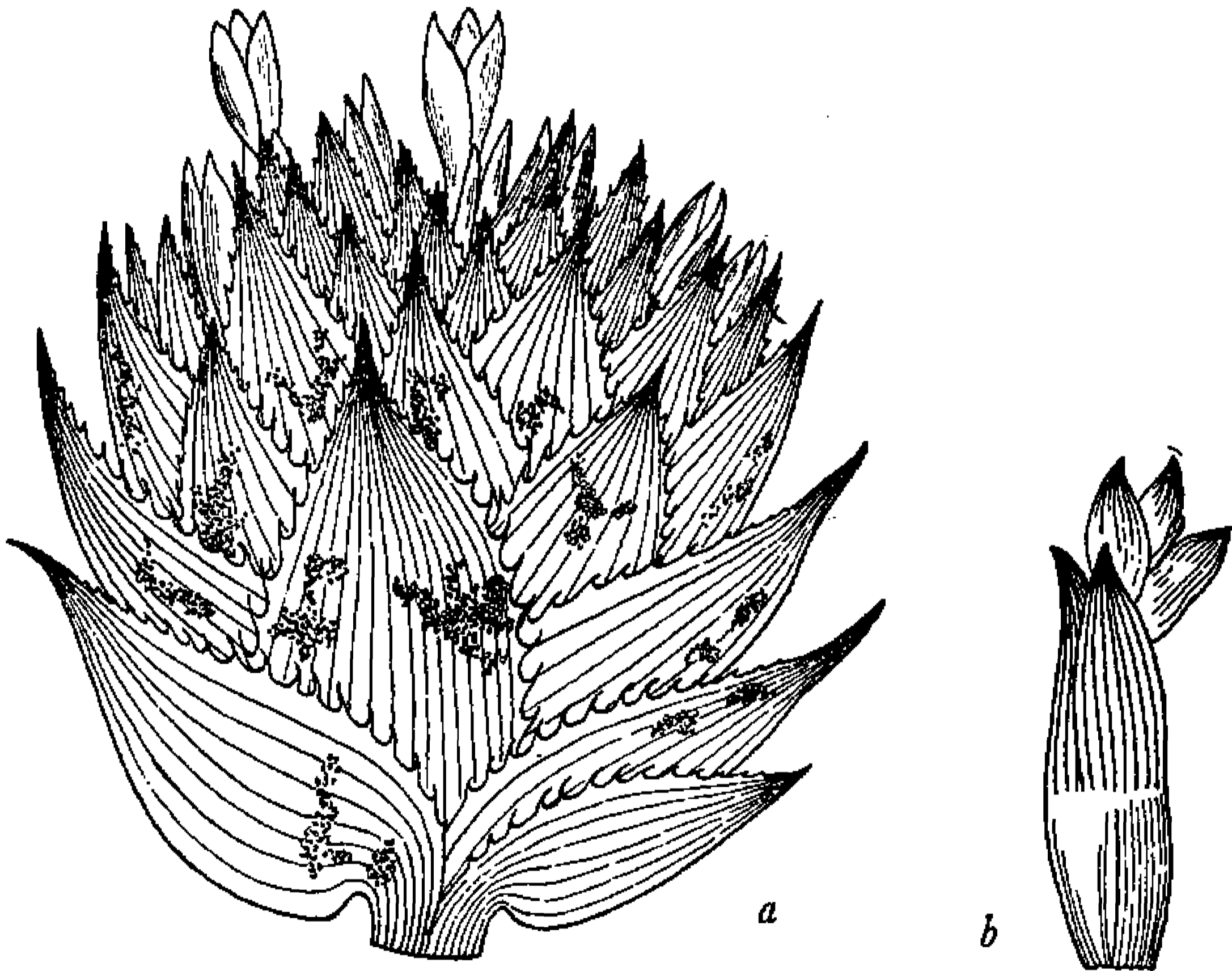


FIGURE 78.—*Greigia vulcanica*: *a*, Inflorescence,  $\times 1$ ; *b*, flower,  $\times 1$  (both after André)<sup>6</sup>

beneath with a membrane of cinereous scales; inflorescence many-flowered, compressed and presumably lateral; outer bracts broadly ovate, abruptly acute, pungent, dark castaneous, pale-lepidote; floral bracts lance-ovate, to 35 mm. long, entire; sepals free, lanceolate, pungent with a subapical mucro, 20 mm. long, carinate, pale castaneous, sparsely lepidote; petals 25 mm. long, blades rose; fruit fleshy, edible.



VALLE: Páramo, Quebrada de Las Vegas, headwaters of Río Tuluá, western slope of Cordillera Central, alt. 3,400–3,500 m., Mar. 23, 1946, *Cuatrecasas* 20391 (F, GH, US).

NARIÑO: Volcán Azufral, near Tuquerres, alt. 3,900 m., May 18, 1876, *André* 2664 (K, type, GH phot. 2681). Páramo cloud forest, Alta de Cruz above Encano, alt. 3,300 m., Nov. 1, 1946, *Foster* 2042 (COL, GH, US).

ECUADOR.

André's habit illustration (*pl.* 2) in his "Bromeliaceae Andreanae" makes the inflorescence appear terminal, but his description (p. 3): "Inflorescence subsessile entre les feuilles radicales, en capitule comprimé latéralement, . . ." indicates lateral inflorescences.

6. *Greigia mulfordii* L. B. Smith, *Contr. U. S. Nat. Herb.* 29:286, *fig.* 12. 1949.

Terrestrial, caulescent; stem erect, 3–15 dm. long; leaves 8 dm. long, brown-lepidote throughout, concolorous, the sheaths elliptic, the blades linear, acuminate, 4 cm. wide, narrowed at the base; inflorescences lateral, numerous, compressed, many-flowered, 6–7 cm. long; primary bracts broadly elliptic with narrowly triangular apices, 35–45 mm. long, exceeding the sepals at anthesis, dark castaneous except for narrow green margins and apices, nearly even, coriaceous, bearing a few obscure teeth toward the apex, sparsely pale-appressed-lepidote; floral bracts lanceolate, subulate-acuminate, 3 cm. long, sparsely lepidote, the base and margins pale and membranaceous, elsewhere castaneous and coriaceous; flowers sessile; sepals lance-triangular, subulate-acute, 21 mm. long, pale except for the castaneous apex, sparsely lepidote; petals 35 mm. long, the blades pale lilac, sparsely lepidote within.

NARIÑO: Cloud-forest of páramo, Alto Tabano above Encano, alt. 3,300 m., Oct. 31, 1946, *Foster* 2041 (GH, type; US).

ECUADOR.

7. *Greigia collina* L. B. Smith, *Contr. U. S. Nat. Herb.* 29:286, *fig.* 11. 1949.

Terrestrial, growing in masses, short-caulescent; leaves many, sub-rosulate, 9–12 dm. long, the sheaths oblong, entire, dark castaneous at the base, the blades linear, acuminate, 28 mm. wide, narrowed at base and armed with dark teeth 5 mm. long, entire near the middle, densely serrulate toward the apex; inflorescences lateral, few-flowered, compressed, 5 cm. long; primary bracts broadly triangular-ovate, thick-subulate toward the apex, 4 cm. long, much exceeding the sepals, dark castaneous, sparsely white-lepidote, entire; floral bracts broadly lanceolate, subulate-acuminate, 24 mm. long, about equaling the sepals, dark castaneous except for the pale base and margins, nerved, sparsely appressed-white-lepidote; flowers sessile; sepals elliptic, 15 mm. long, pale castaneous, sparsely lepidote; ovary sparsely ferruginous-lepidote.

CUNDINAMARCA: Near Fusagasugá, alt. 2,700 m., Oct. 12, 1946, *Foster* 1868 (GH, type; US).

8. *Greigia danielii* L. B. Smith, *Caldasia* 5:1, *fig.* 1948.

Leaves over 8 dm. long, sheaths narrowly triangular-ovate, 5 cm. long, entire, dark castaneous, blades to 23 mm. wide, long-acuminate, narrowed at the base, very laxly serrate with straight or curved spines 2 mm. long; inflorescences lateral, complanate, few-flowered; outer bracts broadly ovate, acuminate, 3 cm. long, dark castaneous, sparsely lepidote; floral bracts narrowly lanceolate, acuminate, scarcely over 2 cm. long, castaneous; flowers short-pedicellate; sepals free, narrowly triangular, acuminate, pungent, 16 mm. long; ovary 10 mm. long.

ANTIOQUIA: Páramo de Sonsón, alt. 2,700–2,850 m., Jan. 26, 1945, *Daniel* 3428 (US, type; GH phot. 6202; COL).

9. *Greigia columbiana* L. B. Smith, *Contrib. Gray Herb.* 98:7, *pl.* 1, *figs.* 7, 8. 1932.

Leaves over 4 dm. long, blades very narrowly lanceolate, to 3 cm. wide, glabrous, for the whole length bearing stout dark castaneous spines 4–5 mm. long; inflorescence rather few-flowered; outer bracts with bases broadly ovate, dark castaneous, sparsely lepidote, entire, broadly hyaline-margined, blades pale; floral bracts linear-lanceolate, acuminate, pungent, 4 cm. long, exceeded by the sepals, entire with a dorsal mucro, the lower part stramineous and membranaceous, the upper dark castaneous, coriaceous, sparsely lepidote; flowers 5–6 cm. long; sepals like the floral bracts, 20 mm. long; corolla 30–35 mm. long.

9a. *Greigia columbiana* var. *columbiana*

Blades of the primary bracts densely and coarsely serrate.

NORTE DE SANTANDER: Páramo de Romeral, alt. 3,800–4,200 m., Jan. 30, 1927, *Killip & A. C. Smith* 18689 (GH, type; US).

COSTA RICA.

9b. *Greigia columbiana* var. *subinermis* L. B. Smith, *Phytologia* 5:397. 1956.

Blades of the primary bracts very obscurely serrate.

NORTE DE SANTANDER: Near García, Pamplona, Mar. 18, 1945, *Garganta* 980 (US, type).

## 15. *Bromelia*

*Bromelia* L. *Sp. Pl.* 285. 1753.

*Karatas* Mill. *Gard. Dict. Abr.* ed. 4. 1754.

*Pinguin* Dill. ex Adans. *Fam.* 2:67, 591. 1763.

*Agallostachys* Beer, *Bromel.* 16, 35. 1857.

*Distiacanthus* Hort. ex Baker, *Handb. Bromel.* 13. 1889.

Coarse terrestrial herbs, spreading by rhizomes or offsets; leaves usually rosulate, bearing large curved spines along the margins; inflorescence sessile or scapose, always compound; sepals free to half-

connate, obtuse to acuminate, rarely mucronate; petals rarely with a definite claw, united into a tube by the filaments but their margins free, without appendages, usually fleshy; stamens included, their filaments forming a tube of various lengths according to the species; epigynous tube conspicuous to nearly lacking; berry succulent, relatively large; seeds few to many, flattened, naked.

Mexico and the West Indies to Paraguay and Argentina.

### KEY

1. Scape evident; inflorescence elongate.
  2. Sepals very narrowly triangular with a soft point, 15–30 mm. long; petal-blades rose with white margins, linear-elliptic.
    1. *B. pinguin*
  2. Sepals broadly ovate, mucronate, 9–17 mm. long; petal-blades yellow, elliptic . . . . . 2. *B. chrysantha*
1. Scape completely lacking; inflorescence densely corymbose, sunk in the center of the leaf-rosette.
  3. Sepals serrulate . . . . . 3. *B. trianae*
  3. Sepals entire.
    4. Floral bracts elliptic-oblong, about equaling the ovary; sepals cucullate; inflorescence few-flowered . . . . . 4. *B. fragilis*
    4. Floral bracts linear to narrowly lanceolate or oblanceolate; sepals acute; inflorescence many-flowered.
      5. Petals connate for 20 mm. or more; floral bracts entire or sparsely serrate . . . . . 5. *B. karatas*
      5. Petals connate for 13 mm.; floral bracts laciniate-serrate toward the apex. . . . . 6. *B. nidus-puellae*

1. *Bromelia pinguin* L. Sp. Pl. 285. 1753.

Leaves many, rosulate, often over 2 meters long, sheaths very broad, densely and coarsely tomentose-lepidote, blades linear, acuminate, 4 cm. wide, deep green above, pale green and very minutely appressed-lepidote beneath, armed with stout teeth to 10 mm. long; scape stout, white-farinose; scape-bracts foliaceous but with the sheaths roseate and subinflated; inflorescence many-flowered, narrowly pyramidal, white-farinose; primary bracts like the scape-bracts but the upper ones entire; branches to 12-flowered; floral bracts linear-subulate from a short broad base, 3 cm. long; flowers to 6 cm. long, distinctly pedicellate; sepals erect, pale; petals 3 cm. long, 5.5–6 mm. wide, densely white-tomentose at the apex; ovary slenderly ellipsoid, 2 cm. long; berry ovoid, about 35 mm. long, yellow or ochraceous, strongly verrucose, acidulous, aromatic.

MAGDALENA: Terrestrial, Valle Du Par, Valley of the Sierra Nevada de Santa Marta, alt. 210 m., August 1946, *Foster & C. E. Smith, Jr.*, 1442 (GH, US).

ATLÁNTICO: Near Barranquilla, March 1935, *Elias* 1311 (F, GH).

BOLÍVAR: In dense masses surrounding volcano area, Los Volcanes, near Turbaco, alt. 200–300 m., Nov. 12, 1926, *Killip & A. C. Smith* 14445 (NY, US, in fruit).

MEXICO and the WEST INDIES to GUIANA and ECUADOR.

2. *Bromelia chrysantha* Jacq. Hort. Schoenbrunn. 1:28, pl. 55. 1797.

FIGURE 79

*Agallostachys chrysantha* Beer, Bromel. 38. 1857.

*Bromelia aurea* Britton, Bull. Torrey Bot. Club 48:328. 1921.

Plant 7–15 dm. high; leaves numerous in a very dense rosette, to 15 dm. long, sheaths distinct, triangular-ovate, covered above with a felt of long fine pale brown scales, blades linear, acuminate, 3–4 cm.

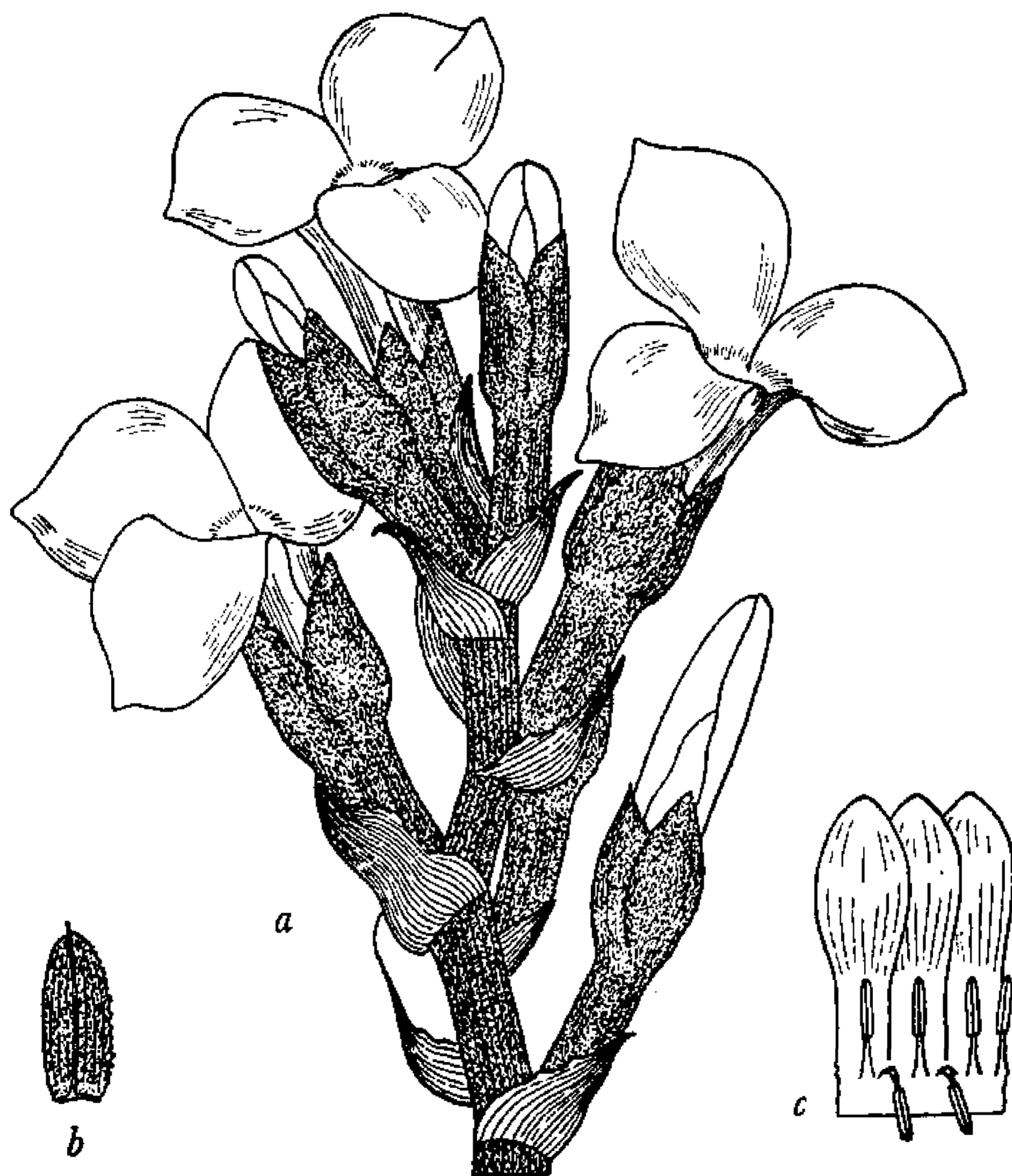


FIGURE 79.—*Bromelia chrysantha*: a, Apex of inflorescence (after Jacquin),  $\times 1$ ; b, sepal,  $\times 1$ ; c, petals and stamens,  $\times 1$ .

wide, glabrous and lustrous above, finely pale-lepidote between the nerves beneath; scape stout, pale brown-flocculose; scape-bracts sub-foliaceous, red with thin bases; inflorescence slenderly cylindric, dense or lax, buff-tomentose except for the petals; primary bracts like the scape-bracts but less serrate and gradually smaller; floral bracts

broadly ovate, apiculate, serrulate 10–15 mm. long, about equaling the ovary; sepals free, carinate; petals glabrous, blades spreading at anthesis, obtuse, 9–10 mm. wide; ovary obconic, merging gradually into the pedicel; fruit turbinate, yellow, very sweet, not verrucose.

MAGDALENA: Santa Marta, 1844, *Goudot* (P). Same, alt. 45 m., 1898–1901, *H. H. Smith* 2344 (BM, F, GH, K, NY, PH, US). Near Río Frío, between the Ciénaga de Santa Maria and the foothills, alt. 0–100 m., June 22–30, 1906, *H. Pittier* 1605 (US). Rocky hillsides, 13 km. from Santa Marta, alt. 210 m., Aug. 11, 1946, *Foster & C. E. Smith, Jr.*, 1437 (COL, GH, US). Same, dry cactus lands, *Foster & C. E. Smith, Jr.*, 1440 (GH). On rocks on river bank, Valle Du Par, Valley of the Sierra Nevada de Santa Marta, alt. 210 m., Aug. 1946, *Foster & C. E. Smith, Jr.*, 1443 (GH, US). Common in dry thickets, Correjón, alt. 200 m., July 30, 1949, *Haught* 6562 (COL, US).

ATLÁNTICO: Near Puerto Colombia, July 1932, *Elias* 989 (F, GH, US). Same, Oct. 1934, *Elias* 1261 (F, GH, US).

TRINIDAD. VENEZUELA. ECUADOR.

3. *Bromelia trianae* Mez in Mart. Fl. Bras. 3, pt. 3: 626. 1894, nomen; Mez in DC. Monogr. Phan. 9:21. 1896.

Leaves over 2 meters long, sheaths elliptic or oblong, little wider than the blades, dark castaneous, densely brown-lepidote with fine elongate scales, blades linear, acuminate, 3 cm. wide, glabrous above, minutely pale-lepidote between the nerves beneath, laxly serrate with antrorse spines 3 mm. long; inflorescence densely tomentose-lepidote with fine brown scales except for the petals; floral bracts linear-lanceolate, equaling the sepals, lacinate-serrulate toward the apex, thin, carinate; flowers including the indistinct pedicel 7–9 cm. long; sepals free, erect, very narrowly triangular, irregularly incurved near the apex, 33 mm. long, carinate, pale toward the apex; petals erect, to 36 mm. long, connate for 13 mm., glabrous, the blade narrowly elliptic, obtuse; ovary slender, triangular-prismatic.

COLOMBIA: Valley of the Río Magdalena, alt. 1,200–1,400 m., September 1855, *Triana* 542 (1300) (BM, isotype, US phot. 4007; COL).

TOLIMA: Among rocks, Río Icononzo, alt. 900 m., Oct. 13, 1946, *Foster* 1886 (GH, US).

4. *Bromelia fragilis* L. B. Smith, Contrib. U. S. Nat. Herb. 29:285, fig. 10. 1949.

Leaves over 12 dm. long, sheaths large, suborbicular, their apices covered with dark brown linear scales, blades linear, to 4 cm. wide, laxly serrate with hooked spines to 5 mm. long, covered with appressed white scales; inflorescence covered with dark brown linear scales; primary bracts broadly elliptic, 7 cm. long, coarsely serrate, dark brown, chartaceous; floral bracts laxly serrulate, very thin; sepals lance-oblong, 22 mm. long, thin; petals 33 mm. long, joined with the filaments into a tube 18 mm. high; ovary cylindrical, 5 cm. long.

MAGDALENA: Terrestrial, Pueblo Bello, Sierra Nevada de Santa Marta, alt. 960 m., Aug. 19, 1946, *Foster & C. E. Smith, Jr.*, 1469 (GH, type, US phot. 4222).

5. *Bromelia karatas* L. Sp. Pl. 285. 1753.*Nidularium karatas* Lem. ex Griseb. Fl. Brit. W. Ind. 591. 1864.*Karatas plumieri* E. Morr. Belg. Hort. 22:131. 1872.

Leaves many in a dense spreading rosette, 15–30 dm. long, sheaths large, broadly triangular, entire or somewhat serrate toward the apex, densely lepidote with elongate coarse dark brown scales, blades linear, acuminate, pungent, 3–5 cm. wide, very minutely appressed-lepidote beneath, densely serrate with stout brown teeth 5–8 mm. long; inflorescence surrounded by cinnabar-red inner leaves; primary bracts like the inner leaves but with shorter blades; floral bracts narrowly oblanceolate, attaining the middle of the sepals, membranaceous, coarsely lepidote; flowers 6–9 cm. long; pedicels very short and stout; sepals narrowly lanceolate, 3 cm. long, erect, free, coarsely brown-lepidote; petals narrowly lanceolate, to 4 cm. long, glabrous, fleshy, rose with white base and margins; ovary triangular-prismatic, densely brown-lepidote; fruit fusiform, 8 cm. long, 2 cm. in diameter.

MAGDALENA: Dry hillsides, 13 km. from Santa Marta, alt. 210 m., Aug. 11, 1946, *Foster & C. E. Smith, Jr.*, 1436 (GH).

VALLE: La Paila, July 12, 1853, *Holton* 151 (NY PH).

NARIÑO: Near Mocoa, alt. 900 m., Nov. 25, 1946, *Foster* 2258 (COL, GH).

MEXICO and the WEST INDIES to BRASIL and ECUADOR.

6. *Bromelia nidus-puellae* (André) André ex Mez in DC. Monogr. Phan. 9:22 1896.

*Karatas nidus-puellae* André, Énum. Bromél. [3]. Dec. 13, 1888; Rev. Hort. 60:563. Dec. 16, 1888.

Leaves numerous, rosulate, to 1 meter long, sheaths narrowly elliptic, covered with linear brown scales, entire or sparsely serrate toward the apex, blades linear, not at all narrowed at the base, acuminate, pungent, 33 mm. wide, laxly serrate with antrorse spines 10 mm. long, bright green above, paler beneath and minutely pale-lepidote; inflorescence oblate, castaneous-lepidote with elongate scales except the petals; primary bracts foliaceous but with reduced red blades; floral bracts linear or narrowly lanceolate, acute or acuminate, equaling the middle of the sepals or higher, thin; flowers 8 cm. long including the indistinct pedicels; sepals free, lanceolate, acuminate, 26 mm. long; petals narrow, 35 mm. long, violet with pale margins, glabrous; ovary slenderly fusiform or cylindrical; fruit ellipsoid, 5 cm. long, 22 mm. in diameter, edible.

CUNDINAMARCA: Dry ground near Tocaima (and Pandi), western slopes of the Cordillera Oriental, alt. 300–(1,200) m., February 1876, *André* 1836 (K, type, GH phot. 2680).

VALLE: Widely cultivated as a hedge, *Lehmann* 3880 (! Mez).

NICARAGUA.

16. *Aechmea*

- Aechmea* R. & P. Fl. Peruv. Prodr. 47. 1794, nomen conservandum.  
*Hoiriri* Adanson, Fam. 2: 67, 584. 1763.  
*Oechmea* J. St.-Hil. Exp. Fam. 1:103. 1805.  
*Eriostax* Raf. Fl. Tell. 4:25. 1838.  
*Pothuava* Gaud. Atl. Voy. Bonite pl. 116. 1851.  
*Macrochordion* De Vriese, Jaarb. Nederl. Maatsch. Tuinb. 1853:14. 1853.  
*Hoplophytum* Beer, Flora 37:348. 1854.  
*Echinostachys* Brongn. ex Planch. Hort. Donat. 25. 1854-58.  
*Libonia* Lem. Ill. Hort. 2: pl. 48. 1855, nomen provisorium.  
*Lamprococcus* Beer, Bromel. 21, 103. 1857.  
*Ortgiesia* Regel, Gartenflora 16:193, pl. 547. 1867.

Large or medium-sized herbs; leaves rosulate, the blades usually ligulate; scape conspicuous in most Colombian species; inflorescence various; flowers sessile in all Colombian species; sepals often asymmetric with a large wing on the right; petals free, bearing 2 scales; second series of stamens more or less joined to the petals; pollen grains with 2 or 4 pores or sometimes aborted; style shorter than the stamens, the stigma-lobes linear, often twisted; ovules caudate or obtuse; berry usually dry; seeds small, rugose, dark.

Mexico and the West Indies to northern Argentina.

## KEY

1. Floral bracts serrulate or spinose-serrate, not distichous.
  2. Inflorescence pinnately compound, cylindrical; sepals serrulate.
    1. *Ae. hoppii*
  2. Inflorescence simple or densely digitate from a few spikes; sepals entire.
    3. Sepals 13 mm. long; floral bracts subcoriaceous, no thicker than the leaves.
      4. Floral bracts merely spreading, broadly acute.
        2. *Ae. germinyana*
      4. Floral bracts spreading-recurving toward the apex, acuminate . . . . . 3. *Ae. veitchii*
    3. Sepals 25 mm. or longer; floral bracts subligneous, much thicker than the leaves.
      5. Floral bracts decurved; inflorescence cinereous-lepidote.
        4. *Ae. magdalenae*
      5. Floral bracts straight; inflorescence densely ferruginous-lepidote . . . . . 5. *Ae. rubiginosa*
  1. Floral bracts entire or microscopically serrulate and distichous.
    6. Inflorescence compound.
      7. Primary bracts exceeding the spikes; inflorescence densely digitate.

8. Flowers fasciculate; apices of all but the lowest primary bracts cucullate; sepals 23 mm. long.  
*6. Ae. nidularioides*
8. Flowers spicate; apices of the primary bracts straight; sepals 3.5–11 mm. long.
9. Floral bracts equaling the sepals; spikes dense.  
*13. Ae. tillandsioides*
9. Floral bracts shorter than the ovary; spikes lax.
10. Leaves polystichous; sepals 7–11 mm. long; floral bracts vestigial; ovary ellipsoid or subglobose.  
*7. Ae. corymbosa*
10. Leaves distichous; sepals 3.5 mm. long; floral bracts to 7 mm. long; ovary cylindric . . . *8. Ae. brevicollis*
7. Primary bracts shorter than the spikes, or if rarely exceeding the lower ones, then the inflorescence elongate, pinnate.
11. Floral bracts navicular, usually more or less carinate, equaling and often concealing the ovary at anthesis.
12. Leaves petiolate, entire . . . . . *9. Ae. dryanderæ*
12. Leaves slightly if at all narrowed between the sheath and blade, serrate or serrulate.
13. Floral bracts imbricate at anthesis.
14. Sepals mostly concealed by the floral bracts at anthesis.
15. Leaf-blades bearing conspicuous cross-bands; floral bracts 28 mm. long . . . *10. Ae. zebrina*
15. Leaf-blades concolorous; floral bracts 6–25 mm. long.
16. Primary bracts entire; rhachis flattened, but little or not at all excavated.
17. Floral bracts even or nearly so, glabrous, 15–20 mm. long . . . *11. Ae. dactylina*
17. Floral bracts prominently nerved, densely white-arachnoid at first, 6–13 mm. long.  
*12. Ae. pubescens*
16. Primary bracts serrate; rhachis strongly excavated.
18. Spikes short-stipitate or sessile.  
*13. Ae. tillandsioides*
18. Spikes long-stipitate; primary bracts diminishing evenly in size toward the apex of the inflorescence.
19. Floral bracts coriaceous, nearly even, narrow and exposing the rhachis at anthesis.  
*14. Ae. tessmannii*



19. Floral bracts chartaceous, prominently nerved, ample and completely covering the rhachis at anthesis . *15. Ae. romeroi*
14. Sepals almost wholly exerted at anthesis.
20. Primary bracts diminishing gradually in size toward the apex of the inflorescence; sepals 15 mm. long, very unequally connate.
- 16. Ae. anomala*
20. Primary bracts abruptly much shorter toward the apex of the inflorescence; sepals 10–12 mm. long, equally short-connate.
- 17. Ae. amazonica*
13. Floral bracts lax, not imbricate at anthesis.
21. Spike-rhachis excavated or winged.
22. Inflorescence digitate from a few spikes.
- 18. Ae. contracta*
22. Inflorescence pinnate.
23. Upper scape-bracts serrate.
- 19. Ae. angustifolia*
23. Upper scape-bracts entire . *20. Ae. leucocarpa*
21. Spike-rhachis merely angled or terete.
24. Floral bracts abruptly contracted into a narrowly triangular apex that is nearly half as long as the broad base.
25. Sepals narrowly oblong, 10 mm. long, inflorescence densely bipinnate.
- 21. Ae. stenosepala*
25. Sepals broader, 3–6 mm. long.
26. Floral bracts only about as long as the internodes, red, 5–8 mm. long.
- 22. Ae. bracteata*
26. Floral bracts more than twice as long as the internodes, green.
27. Lowest branches of the inflorescence pinnately divided, to 15 cm. long; floral bracts minutely serrate, prominently white-margined . . *23. Ae. pyramidalis*
27. Lowest branches of the inflorescence simple or digitately divided; floral bracts entire, nearly concolorous . *12. Ae. pubescens*

24. Floral bracts broadly rounded and obscurely mucronulate.
28. Sepals 7–10 mm. long; upper scape-bracts usually conspicuously serrate.
29. Inflorescence glabrous or very sparsely arachnoid at anthesis; ovaries little developed at anthesis, mostly less than twice as long as the floral bracts . . . 24. *Ae. servitensis*
29. Inflorescence densely pale-lepidote at anthesis; ovaries mostly well developed at anthesis and more than twice as long as the floral bracts . . . . . 25. *Ae. nivea*
28. Sepals 4–6 mm. long; upper scape-bracts entire or obscurely serrulate.
26. *Ae. penduliflora*
11. Floral bracts either flat and scale-like or ochreiform and sheathing the base of the ovary, neither navicular nor carinate.
30. The floral bracts ochreiform.
31. Scape-bracts and lower primary bracts entire, linear-lanceolate; spikes lax . . . . . 27. *Ae. huebneri*
31. Scape-bracts and lower primary bracts serrate; spikes dense to lax.
32. Floral bracts to 5 mm. long without the mucro; inflorescence wholly fertile . . 28. *Ae. mertensii*
32. Floral bracts 10–14 mm. long without the mucro; inflorescence partially sterile.
33. Inflorescence with all the branches fertile at the base and sterile toward the apex.
29. *Ae. longicuspis*
33. Inflorescence with basal and apical branches completely sterile . . . . . 30. *Ae. setigera*
30. The floral bracts scale-like, much shorter than the ovary.
34. Branches of the inflorescence simple; scape-bracts and lower primary bracts serrulate; indument of the inflorescence of subulate trichomes . . 31. *Ae. sprucei*
34. Branches of the inflorescence divided; scape-bracts and lower primary bracts entire or fimbriate-serrate; indument of the inflorescence of arachnoid scales when present.
35. Inflorescence slenderly cylindric with relatively short basal branches, not more than 12 cm. in diameter . . . . . 32. *Ae. latifolia*

35. Inflorescence pyramidal with elongate basal branches, 3-8 dm. in diameter.
36. Secondary bracts entire, narrowly triangular, much shorter than the spikes.
33. *Ae. spectabilis*
36. Secondary bracts fimbriate-serrate, lanceolate, exceeding the lower spikes . 34. *Ae. woronowii*
6. Inflorescence simple.
37. Flowers distichous, rhachis excavated.
38. Floral bracts imbricate . . . . . 13. *Ae. tillandsioides*
38. Floral bracts lax . . . . . 18. *Ae. contracta*
37. Flowers in more than 2 ranks.
39. Sepals unarmed, truncate, emarginate; inflorescence strobilate, densely white-lanate . . . 35. *Ae. bromeliifolia*
39. Sepals mucronate.
40. Leaf-blades narrowly elliptic, subpetiolate; mucro of the sepal 4 mm. long . . . . . 36. *Ae. subpetiolata*
40. Leaf-blades ligulate, not at all narrowed at the base.
41. Scape-bracts reflexed; inflorescence ellipsoid, stout.
37. *Ae. lalindei*
41. Scape-bracts erect; inflorescence cylindric.
38. *Ae. nudicaulis*

1. *Aechmea hoppii* (Harms) L. B. Smith, *Phytologia* 4:213, pl. 1, figs. 1, 2. 1953.

FIGURE 80

*Streptocalyx hoppii* Harms, *Notizblatt* 12:526. 1935.

Plant 4-6 dm. high: leaves rosulate, 6-10 dm. long, inconspicuously brown-lepidote, sheaths elliptic, 15 cm. long, dark castaneous basally,

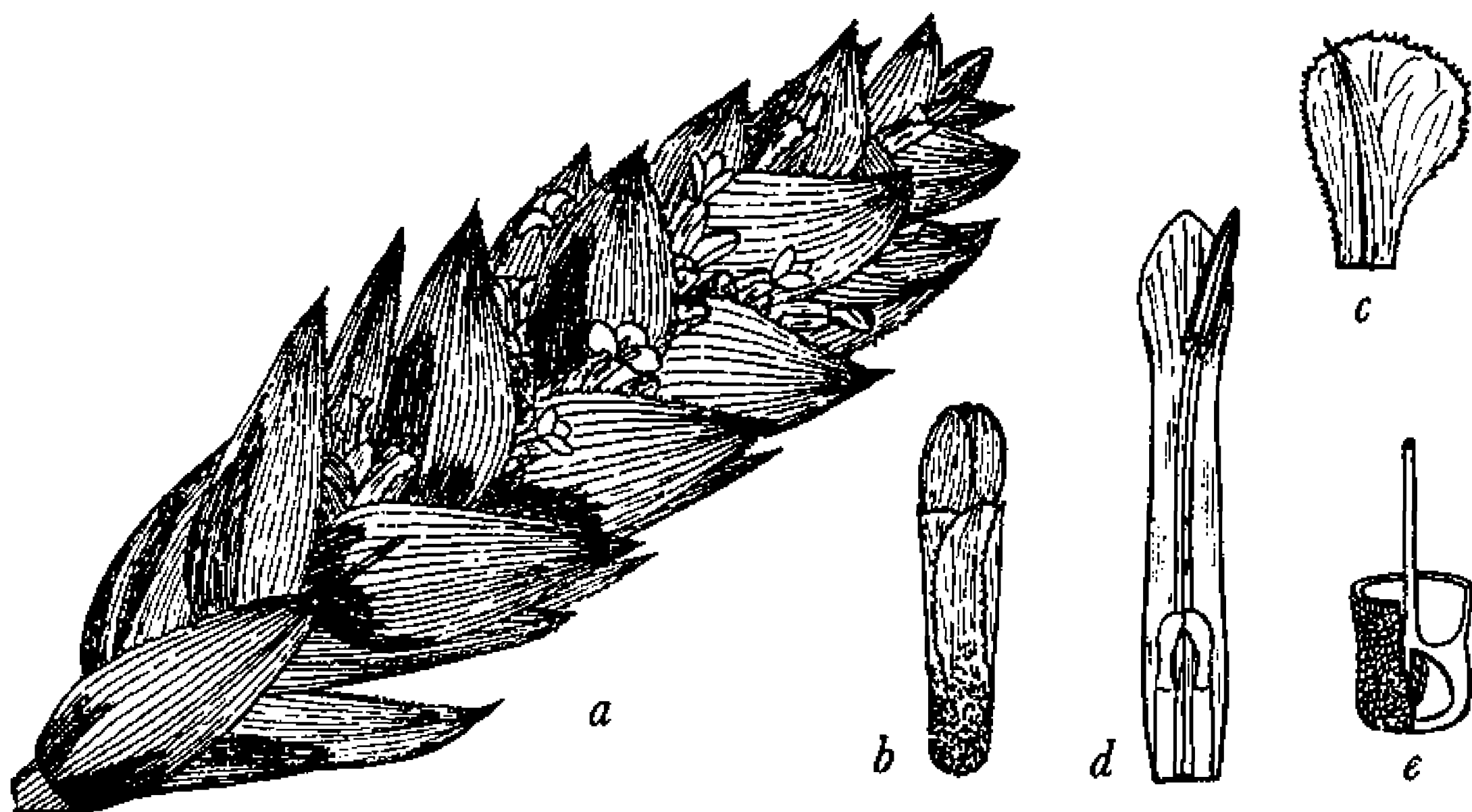


FIGURE 80.—*Aechmea hoppii*: a, Inflorescence,  $\times \frac{1}{2}$ ; b, flower,  $\times 1$ ; c, sepal,  $\times 1$ ; d, petal and stamen,  $\times 2$ ; e, ovary,  $\times 2$ .

blades linear, acuminate into a pungent subulate cusp, 3–4 cm. wide, subclaxly serrulate; scape straight; scape-bracts erect, imbricate, broadly ovate with narrowly triangular blades, densely serrate; inflorescence 12–30 cm. long, subglabrous; primary bracts like the scape-bracts but with short blades or merely apiculate, exceeding the spikes, subchartaceous; spikes densely few-flowered; floral bracts ample, equaling the sepals; flowers sessile; sepals broadly obovate, apiculate, 13–15 mm. long, free; petals 17–20 mm. long, obtuse, bearing 2 long obtuse scales at base; ovary 6–8 mm. long, epigynous tube crateriform, very short, placentae apical; ovules obtuse.

CAQUETÁ: Left bank of Río Caguan, "8 horas in Johnson de 10 H. P. al sur de Cartagena," Apr. 22, 1953, *Romero Castañeda* 4052 (COL, US).

NARIÑO: Uchupayaco, on the plain between Urcusique and Umbria on the banks of the Río Uchupayaco, alt. 300 m., Feb. 22, 23, 1942, *Schultes* 3368 (GH). Epiphytic, by Quebrada Conejo, near Conejo, Río San Miguel or Sucumbios, alt. 300 m., Apr. 2–5, 1942, *Schultes* 3517 (GH). Epiphytic, Sibundoy, Valley of Sibundoy, alt. 2,225–2,300 m., May 29, 1946, *Schultes & Villarreal* 6606–A (US).

#### ECUADOR.

2. *Aechmea germinyana* (Carr.) Baker, *Handb. Bromel.* 66. 1889.

*Chevalliera germinyana* Carr. *Rev. Hort.* 53:230, *fig. 55, pl.* 1881.

*Bromelia daguensis* Carr. *Rev. Hort.* 53:230. 1881, as synonym.

Leaves 20–30 in a spreading rosette, often more than 1 meter long, subchartaceous, sheaths ovate, distinct, large, densely and finely appressed-lepidote, blades ligulate, subobtuse with a broad pungent brown mucro, 3–7 cm. wide, closely serrulate, appressed-lepidote beneath; scape stout, erect; scape-bracts imbricate, lance-elliptic, green, pungent, serrulate; inflorescence simple, many-flowered, ovoid to cylindrical, 5–28 cm. long, 4–7 cm. in diameter, bearing a coma of sterile bracts at the apex; floral bracts densely imbricate, ovate-elliptic, slightly shorter than the mature flowers, scarlet, appressed-lepidote when young, becoming subglabrous; flowers about 32 mm. long; sepals strongly asymmetric, subelliptic, mucronulate, glabrous, free; petals about twice as long as the sepals, acute, white; stamens included, the second series connate with the petals up to the free part of the scales; anthers sublinear, 6 mm. long, mucronulate; ovary 6 mm. long, 3-angled; epigynous tube wanting; style about equaling the stamens; berry globose, 7 mm. in diameter; seeds subfusiform, 3 mm. long.

COLOMBIA: *Lehmann* 4052 (BM, GH phot. 6646).

CHOCÓ: Epiphytic, La Concepción, 15 km. east of Quibdó, alt. 75 m., Apr. 20–May 23, 1931, *Archer* 2084 (US). Epiphytic, dense forest, ridge along Yeracúf Valley, Corcovada Region, upper Río San Juan, alt. 200–275 m., April 24, 25, 1939, *Killip* 35225 (GH, US). Valley of the upper Atrato, km. 52 to 70, between Carmen de Atrato and Tutunendo on the road from Bolívar to Quibdó, alt. 500–600 m., July 25, 26, 1944, *García-Barriga* 11126 (COL, US).

VALLE: Epiphytic, forest, Córdoba, Dagua Valley, alt. 80–100 m., May 6, 8, 1922, *Killip* 5114 (GH). Terrestrial, dense forest, 18 km. east of Buenaventura, alt. 50 m., Feb. 14, 1939, *Killip & García* 33278 (US). Epiphytic, dense forest, Córdoba, alt. 50–100 m., Feb. 17, 1939, *Killip & García* 33452 (US). Epiphytic, dense forest, along highway 10–15 km. east of Buenaventura, near sea level, Apr. 12, 1939, *Killip* 34934 (US). Epiphytic, woods, Veneral, Río Yurumanguí, Pacific Coast, alt. 5–50 m., Jan. 28–Feb. 10, 1944, *Cuatrecasas* 15826 (GH). La Trojita, Río Calima (region of the Chocó), alt. 5–50 m., Feb. 19–Mar. 10, 1944, *Cuatrecasas* 16394 (GH). Lomas opposite Quebrada de la Brea, left bank of Río Calima, region of the Chocó, alt. 30–50 m., May 18, 22, 1946, *Cuatrecasas* 21080 (VALLE). Quebrada of San Juan below Queremal, Río Digua drainage, western slope of Cordillera Occidental, alt. 1,350 m., Nov. 8, 1946, *Cuatrecasas* 22761 (F, GH, US, VALLE). On ground and trees, Buenaventura, sea level, Dec. 8, 1946, *Foster* 2317 (COL, GH). Quebrada of San Juan between Paragüita and Queremal, Río Digua drainage, alt. 1,570–1,740 m., Mar. 17, 1947, *Cuatrecasas* 23804 (F, US, VALLE).

CAUCA: Primaeval forest, La Costa, El Tambo region, alt. 1,200 m., Mar. 29, 1938, *Sneidern* 1594 (S).

PANAMA.

3. *Aechmea veitchii* Baker, Bot. Mag. 103: pl. 6329. 1877.

*Chevalliera veitchii* E. Morr. Belg. Hortie. 28:177, pl. 9. 1878.

Stoloniferous, about 1 meter high; leaves 12–17 in a loosely cyathiform rosette, nearly straight, 3–10 dm. long, sheaths short and indistinct, blades ligulate, abruptly acute, apiculate, pungent, 4–6 cm. wide, glabrous and pale green above with spots of dark green, covered beneath with fine appressed cinereous scales, subdensely serrulate, broadly channeled; scape erect, stout; scape-bracts erect, densely imbricate, foliaceous, acute or acuminate, spinulose-serrate; inflorescence simple with flowers many-ranked, densely spicate, cylindric or slenderly conic, 1–4 dm. long, 30–55 mm. in diameter; floral bracts lance-ovate, pungent, 12–15 mm. long, bright red, glabrous above, sparsely white-furfuraceous beneath; flowers suberect, 2 cm. long; sepals asymmetric, acute, pungent, white with the apex rose, free; petals fugacious, ligulate, obtuse, barely exerted, bearing 2 oblique denticulate scales near the base; stamens included, the second series short-connate with the petals; ovary stoutly obconic, glabrous, white; placentae apical; ovules caudate.

COLOMBIA: Cultivated, *Hort. Kew* (K, type, GH phot. 2708).

BOYACÁ: Thick high forest, region east of Chapón, 100 miles northwest (?) of Bogotá, alt. 1,500 m., July 31, 1932, *Lawrance* 369 (F, GH, S).

TOLIMA: Mariquita, November 1934, *Pérez-Arbeláez* 3076 (US).

HUILA: Woods, ravine of Abra de San Andrés below Gabinete, western slope of the Cordillera Oriental, alt. 1,900–2,100 m., Mar. 24, 1940, *Cuatrecasas* 8648 (COL, US).

VALLE: Woods, La Laguna, left bank of Río Sanquinini, western slope of Cordillera Occidental, alt. 1,250–1,400 m., Dec. 10–20, 1943, *Cuatrecasas* 15465 (GH). Buenaventura, sea level, Dec. 8, 1946, *Foster* 2349 (GH).

COSTA RICA, PANAMA, PERU.

4. *Aechmea magdalenae* (André) André ex Baker, Handb. Bromel. 65. 1889.

FIGURE 81

*Chevalliera magdalenae* André, Énum. Bromél. 3. Dec. 13, 1888; Rev. Hort. 60:563. Dec. 16, 1888.*Bromelia longissima* Posada, Estudios Cient. 241. 1909, nomen subnudum.*Bromelia magdalenae* C. H. Wright, Kew Bull. 1923:267. 1923.*Ananas magdalenae* Standley ex Standley & Calderon, Lista Prelim. Pl. S Salvador 45. 1925.

Flowering shoot about 1 meter high; leaves several in a laxly infundibuliform rosette, to 2 meters long, sheaths short and inconspicuous, barely wider than the blades, denticulate, densely and minutely brown-lepidote, blades linear, acuminate, pungent, 5-10 cm. wide, glabrous above, densely and finely pale-lepidote between the nerves

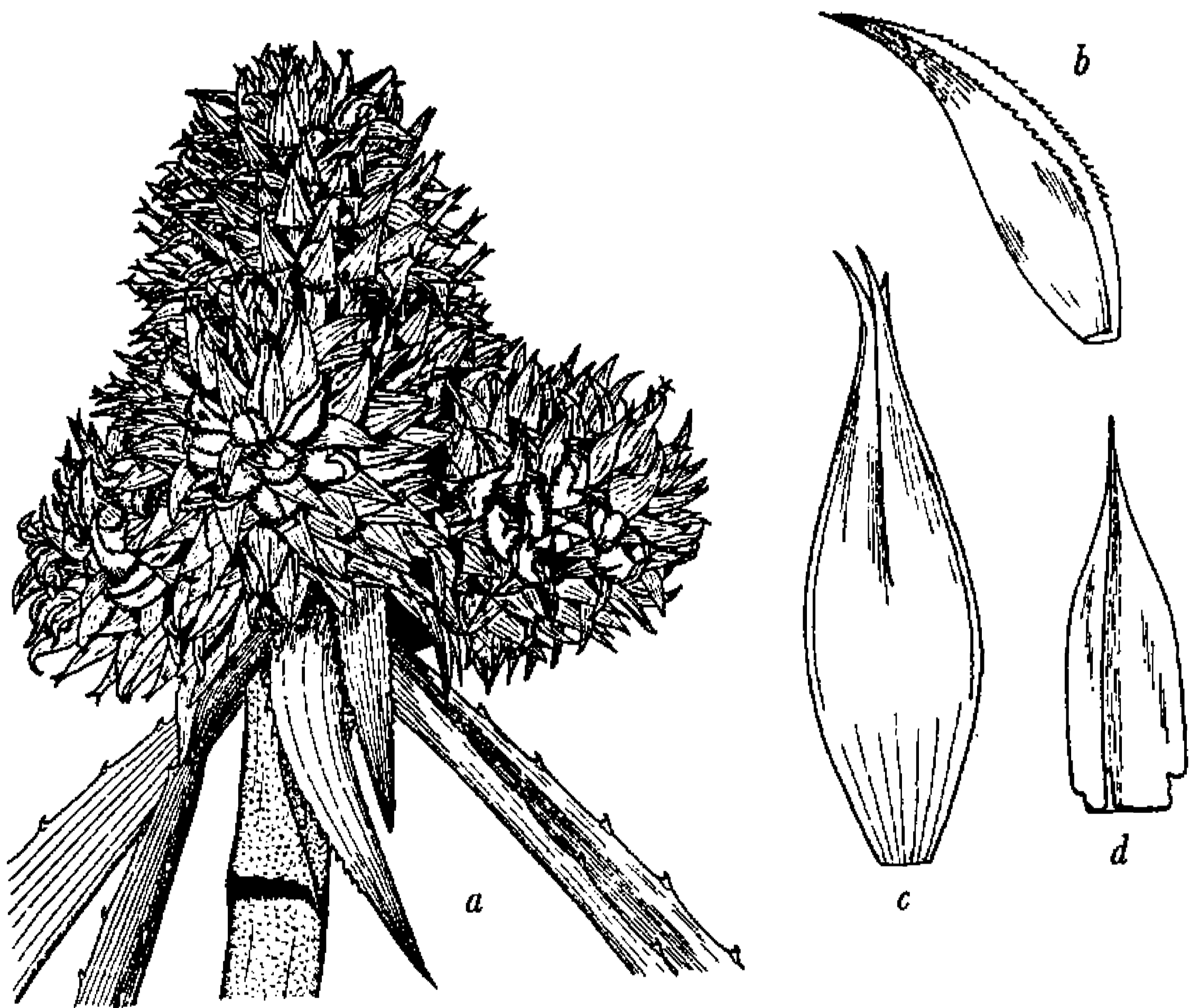


FIGURE 81.—*Aechmea magdalenae*: *a*, Inflorescence (after L. B. Smith); *b*, floral bract,  $\times 1$ ; *c*, fruit,  $\times 1$ ; *d*, sepal,  $\times 1$ .

beneath, laxly armed with dark uncinat spines to 5 mm. long; scape erect, stout, white-flocculose when young; scape-bracts foliaceous, greatly exceeding the internodes, the upper ones massed below the inflorescence and reflexed; inflorescence simple or more often compound from a few subequal heads, compact, broadly pyramidal; spikes sessile, globose, 12 cm. in diameter; floral bracts ovate with a triangular

acuminate pungent apex, to 65 mm. long; flowers to 5 cm. long, much compressed dorsally; sepals asymmetric, narrowly triangular, acuminate, pungent, the anterior one up to 38 mm. long, the posterior ones to 35 mm., coriaceous, thick, rigid, free; petals 4 cm. long with a linear claw and elliptic acute blade, flavous when dry, bearing 2 minute truncate scales well above the base; stamens much shorter than the petals and the second series connate with them; pollen smooth, irregular, probably abortive; ovary broadly elliptic in outline, enlarged in fruit; ovules borne in the upper half of the cell; seeds curved, 6 mm. long, dull black, reticulate.

MAGDALENA: Santa Marta, 1898-99, *H. H. Smith* 2640 (F, NY, US).

MAGDALENA or BOLÍVAR: Banks of the Río Magdalena between Tenerife and Canaletal, December 1875, *André* 692 (K, type, GH phot. 2705).

META: Dense humid forest, Cano Entrada, Sierra de la Macarena, alt. 550 m., Jan. 23, 1950, *Philipson, Idrobo & Jaramillo* 2201 (BM, US).

TOLIMA: Moist shady ground, bridge below Carmen de Apicalá, between Melgar and Girardot, January 1940, *Pérez-Arbeláez* 10142 (COL).

ANTIOQUIA: Areas covered at times by water, on the edge of "Cativo" swamps, Turbo, Jan. 23, 1941, *Seibert* 1668 (US).

CHOCÓ: Tutunendo, 20 km. north of Quibdó, alt. 80 m., May 19, 20, 1931, *Archer* 2158 (US). Areas flooded during wet season, transition from "Cativo" to higher land forest, Feb. 12, 1941, *Seibert* 1692 (US).

MEXICO to VENEZUELA and ECUADOR.

**5. *Aechmea rubiginosa* Mez in DC. Monogr. Phan. 9:285. 1896.**

Leaves 2 meters long, covered on both sides with appressed ferruginous scales, blades ligulate, more or less narrowed toward the base, acuminate, 55-65 mm. wide, laxly armed with stout uncinatate spines 5 mm. long; scape short, stout; inflorescence simple, depressed-globose, many-flowered, 12 cm. in diameter; axis very thick; floral bracts spreading, lance-triangular, 5 cm. long, exceeding the flowers; sepals narrowly triangular, slightly asymmetric, acuminate, pungent, 25 mm. long, free, the posterior ones alate-carinate toward the base; ovary 10 mm. long, broadly elliptic, much compressed, subglabrous.

VAUPÉS: Thickets and woods, Casa Alvarez, Bocas Carurú, alt. 230 m., Sept. 26, 1939, *Cautrecasas* 7024 (COL, US).

AMAZONAS-VAUPÉS: Near Cachivera de Jirijirimo, alt. 250 m., July 5, 1951, *Schultes & Cabrera* 12895 (US).

BRASIL.

**6. *Aechmea nidularioides* L. B. Smith, Phytologia 4:356, pl. 1, figs. 7-11. 1953.**

Flowering shoot 3 dm. high; leaves apparently rosulate, over 7 dm. long, densely appressed-lepidote, sheaths broadly elliptic, 10-14 cm. long, brown-lepidote, blades ligulate, acute with a subulate cusp, flat, 3-5 cm. wide, green, white-lepidote becoming glabrous with age, laxly serrate with broad straight spines 1-2 mm. long; scape suberect, about 15 cm. long; scape-bracts strict, densely imbricate, lanceolate,

acute, pungent, green, spinulose-serrate; inflorescence subglobose, 15 cm. long; primary bracts imbricate, ovate, 7 cm. long, entire, finely nerved, red, covered toward apex with white appressed scales; branches aborted, few-flowered; floral bracts broadly elliptic, apiculate, slightly exceeded by the sepals, entire thin, densely pale-lepidote; flowers white; sepals obovate, strongly asymmetric, short-mucronate, connate for 3 mm., prominently nerved, sparsely pale-lepidote; petals free, oblong, obtuse, cucullate, 35 mm. long, bearing 2 dentate scales at base; stamens included, pollen-grains globose, obscurely 4-pored; ovary completely inferior, epigynous tube shallow but distinct; placentae apical; ovules apiculate.

AMAZONAS-VAUPÉS: Epiphytic, Caño Unguyá, Jino-Gojé, Río Apaporis between Río Piraparaná and Río Popeyaká, alt. 250 m., Sept. 3-11, 1952, *García-Barriga* 14343 (COL, US).

AMAZONAS: Along Río Loretoyacu, Trapecio Amazónico, alt. 100 m., September 1946, *Schultes & Black* 8309 (US, type, US phot. 4243).

NARIÑO: In trees by road to Urcusique, alt. 1,200 m., Nov. 23, 1946, *Foster* 2253 (GH).

7. *Aechmea corymbosa* (Mart. ex Schult.) Mez in Mart. Fl. Bras. 3, pt. 3:316. 1892.

*Billbergia corymbosa* Mart. ex Schult. f. in R. & S. Syst. 7, pt. 2:1268. 1830.

Stoloniferous; leaves 3-6 in a cylindrical rosette, 20-45 cm. long, exceeding the inflorescence, sheaths large, ovate, blades narrowly lanceolate, acute and apiculate, 4-6 cm. wide, minutely appressed-lepidote, laxly spinulose-serrate; scape erect, slender; scape-bracts elliptic, acute, membranaceous, the lower erect, shorter than the internodes, the upper spreading, massed beneath the inflorescence; inflorescence subglabrous, to 20-flowered; primary bracts like the scape-bracts; spikes spreading, few-flowered, fertile throughout; sepals strongly asymmetric, broadly elliptic, unarmed; petals ligulate, obtuse, 17 mm. long, bearing 2 fimbriate scales at base; stamens included; epigynous tube distinct, placentae apical, ovules caudate.

VAUPÉS: Epiphytic, forest between Río Apaporis and Río Vaupés, path from Puerto Naré to Victoria, alt. 300 m., Apr. 10-17, 1943, *Schultes* 5377 in part (GH). Quartzite rock, Cerro Isibukuri, Río Kananarí, alt. 250-700 m., Aug. 4, 1951, *Schultes & Cabrera* 13327 (US). Epiphytic, Río Pacoa (tributary of Río Apaporis), alt. 270 m., lat. 0°20' N., long. 71°20' W., Feb. 7-12, 1952, *Schultes & Cabrera* 15210 (US). Same, 15222 (COL, US). Epiphytic, headwaters of Caño Tee-meeña, Río Piraparaná (tributary of Río Apaporis), lat. 0°15' S. to 0°25' N., long. 70°30' W., Sept. 10, 1952, *Schultes & Cabrera* 17389 (US). Epiphytic, Cerro E-ree-é-kö-mee-ö-kee, Río Piraparaná, Sept. 18, 1952, *Schultes & Cabrera* 17492 (US). On trees, upper Río Vaupés between Río Piendaiva and Río Karurú, alt. 400 m., Oct. 27-29, 1952, *García-Barriga* 15013 (COL). Río Papurí, between Monfort and Santa María, Dec. 2-4, 1952, *Romero Castañeda* 3868 (COL); 3880 (COL).

CAQUETÁ: On rocks in low woods, upper part of Cerro de Cupaty, Nov. 24, 1912, *Ducke* 12299 (MG). Near La Pedrera, Río Caquetá, April 1944, *Schultes*



5853 (US). Near mouth of Río Apaporis, July 15, 1948, *Schulles & López* 10216-A (US).

AMAZONAS-VAUPÉS: Epiphytic, forest, near Cachivera de Jirijirimo, Río Apaporis, alt. 250 m., June 13, 1951, *Schulles & Cabrera* 12435 (US). Same, July 5, 1951, 12908 (US). Same, July 5, 1951, 12937 (US). Same, July 7, 1951, 12954 (US). Same, Aug. 12, 1951, 13513 (US). Same, Sept. 16, 1951, 13999 (US). Epiphytic, Soratama, Río Apaporis between Río Pacoa and Río Kananarí, alt. 250 m., lat. 0°5' N., long. 70°40' W., June 21, 1951, *Schulles & Cabrera* 12725 (US). Same, June 25, 1951, 12796 (US). Same, 12803 (US). Same, Aug. 16, 1951, 13579 (US). Same, Aug. 27, 1951, 13785 (COL, GH, US). Same, Aug. 31, 1951, 13803 (US). Same, Feb. 6, 1952, 15181 (US). Epiphytic, near Raudal Yayacopi (La Playa), Río Apaporis, alt. 240 m., lat. 0°5' S., long. 70°30' W., Feb. 16, 1952, *Schulles & Cabrera* 15390 (US). Epiphytic, near Jinogojé (at mouth of Río Piraparaná), alt. 210 m., lat. 0°15' S., long. 70°30' W., June 15, 1952, *Schulles & Cabrera* 16731 (US). Same, July 1952, 19787 (US). On trees, Soratama, Río Apaporis, March 14, 1953, *Weber* 670-a (MAINZ).

AMAZONAS: Puerto Miranas, on Río Caquetá, 1820, *Martius* (M, type, F phot. 18763). Epiphytic, La Pedrera, Cerro de Cupatí, Río Caquetá, Sept. 30, 1952, *García-Barriga* 14558 (COL).

Amazonian BRASIL, PERU.

8. *Aechmea brevicollis* L. B. Smith, *Contr. Gray Herb.* 154:32, *pl. 3, figs. 1, 2.* 1945.

Stemless, long-stoloniferous; leaves few, subdistichous, appressed-white-lepidote, sheaths forming a slenderly ovate pseudobulb 13–19 cm. long, entire, blades ligulate, acute, abruptly narrowed at the base, 9–31 cm. long, 16–35 mm. wide, flat, laxly serrate with spines 2–3 mm. long, the outer blades greatly reduced; scape slender, almost wholly included in the leaf-sheaths; scape-bracts elliptic, acute, membranaceous; inflorescence dense, few-branched, 4–6 cm. long; primary bracts lanceolate, acute, laxly serrulate, white-flocculose; spikes distichously 5–7-flowered, flexuous, sparsely white-flocculose; floral bracts navicular, much shorter than the ovary, minutely apiculate, entire, thin; flowers suberect, yellow; sepals suborbicular, connate for 1 mm.; petals sublinear, obtuse, cucullate, 10 mm. long, bearing fimbriate scales at the base; ovary 10 mm. long, epigynous tube large, placentae apical, ovules apiculate.

VAUPÉS: Dense forest, San Felipe, Río Negro, alt. 100 m., Jan. 29, 1930, *Holt & Gehriger* 336 (US). Río Macú-Paraná (tributary of Río Papurí), Aug. 11, 1943, *P. H. Allen* 3021 (COL). Caño Pacú, Río Vaupés, Mar. 6, 1944, *Schulles* 5833 (US). Epiphytic, Cerro Circasia, Río Vaupés, Mar. 6, 1944, *Schulles* 5841 (US). Epiphytic, Savanna o-koó-me-gwa, Cano Teemeña, Río Piraparaná (tributary of Río Apaporis), lat. 0°15' S. to 0°25' N., long. 70°30' W., Sept. 6, 1952, *Schulles & Cabrera* 17229 (US). Left bank of Raudal Guacamayo, Río Infrida, long. 69°45' W., Feb. 4, 1953, *Fernández* 2144 (COL, US). Epiphytic, Yutecá, between Mitú and Javareté, Río Vaupés, May 14–24, 1953, *Schulles & Cabrera* 19364 (COL, US).

AMAZONAS-VAUPÉS: Epiphytic, Raudal de Jirijirimo (below mouth of Río Kananarí), Río Apaporis, alt. 270 m., lat. 0°5' N., long. 70°40' W., Jan. 21, 1952, *Schulles & Cabrera* 14935 (US). Same, 14957 (COL, US). Same, Mar. 15, 1952,

*Schultes & Cabrera* 15942 (COL, GH, US). Near Raudal Yayacopi (La Playa), Río Apaporis, alt. 240 m., lat. 0°5' S., long. 70°30' W., Feb. 15, 1952, *Schultes & Cabrera* 15357 (COL, GH, US).

AMAZONAS: Extensive savanna (caatinga) on right bank, Raudal de Jirijirimo, Río Apaporis, March 1951, *Schultes* 12086 (US).

VENEZUELA, BRASIL.

9. *Aechmea dryanderæ* Harms, Notizblatt 12:529. 1935.

Leaf-petiole 6 cm. long, blade lanceolate, 80 cm. long, 65 mm. wide, acuminate, subglabrous; scape slender, over 42 cm. long, glabrous or subglabrous; scape-bracts lanceolate, acuminate, 5–6 cm. long, the lower lax, the upper massed beneath the inflorescence; inflorescence 16 cm. long, narrow, dense; axis flocculose; spikes 20–25 mm. long, 6–8-flowered, sparsely flocculose; floral bracts navicular, deltoid, mucronulate, 6–7 mm. long; flowers yellow; sepals strongly asymmetric, mucronulate, 6 mm. long; petals 10–12 mm. long, mucronulate, bearing fimbriate scales 2–3 mm. above the base; ovary 5 mm. long.

VALLE: Epiphytic, forest, Río Pance, alt. 1,300 m., Aug. 1930, *Dryander* 699 (B, type).

It is obvious from Harms' description that the type and only specimen of *Aechmea dryanderæ* consisted of an inflorescence and a single unattached leaf. The collection was doubtless lost when the Berlin herbarium was destroyed and there appears to be no photographic record surviving either. Although an entire slenderly petiolate leaf is not completely impossible in *Aechmea*, I think it highly probable that the type of *Aechmea dryanderæ* consisted of an inflorescence of *Ae. angustifolia* Poepp. & Endl. or *Ae. leucocarpa* André, both of which have been collected by Dryander, and a leaf from some species of *Pitcairnia*. It is hoped that local botanists will try to clarify this problem.

10. *Aechmea zebrina* L. B. Smith, Phytologia 4:358, pl. 2, figs. 1, 2. 1953.

Stemless, spreading by stolons up to 7 dm. long, flowering shoot 8 dm. high; leaves forming a slender infundibuliform rosette, green and very faintly striped above and inconspicuously though densely lepidote, beneath covered with two types of scales forming broad alternating cross-bands of green and white, sheaths small and inconspicuous, blades ligulate, rounded and apiculate, 5 cm. wide, laxly spinose-serrate; scape elongate, 8 mm. in diameter; inflorescence bipinnate, subdense, 28 cm. long; spikes spreading, densely 17-flowered, 18 cm. long including the 5 cm. long naked strongly flattened stipe; rhachis narrow, strongly excavated; floral bracts broadly ovate, entire, carinate near the apex, bicarinate and grooved below, exceeding the sepals, coriaceous, even, obscurely punctulate-lepidote; sepals free, lance-oblong, slightly asymmetric, muticous, 16 mm. long; ovary globose.

NARIÑO: Puerto Limon on the Río Caquetá, alt. 900 m., Nov. 24, 1946, *Foster* 2256 (GH, type, US photos 3484, 3509).

11. *Aechmea dactylina* Baker, Journ. Bot. 17:161. 1879.

FIGURE 82

Plant to 12 dm. high; leaves 5–14 dm. long, sheaths very large, elliptic, lepidote, blades ligulate, acute, pungent, 45–75 mm. wide, rigid, pale green, armed with straight spreading spines to 1 cm. long; scape erect, elongate, to 1 cm. in diameter; scape-bracts erect, elliptic, acute or acuminate, pale green or the upper ones sometimes red; inflorescence amply paniculate, subthyrsoid, 25–66 cm. long; axes angular, white-arachnoid; primary bracts spreading or reflexed, narrowly lanceolate, acuminate, much shorter than the axillary branches, flaccid, bright red, sparsely lepidote or glabrous; branches divergent

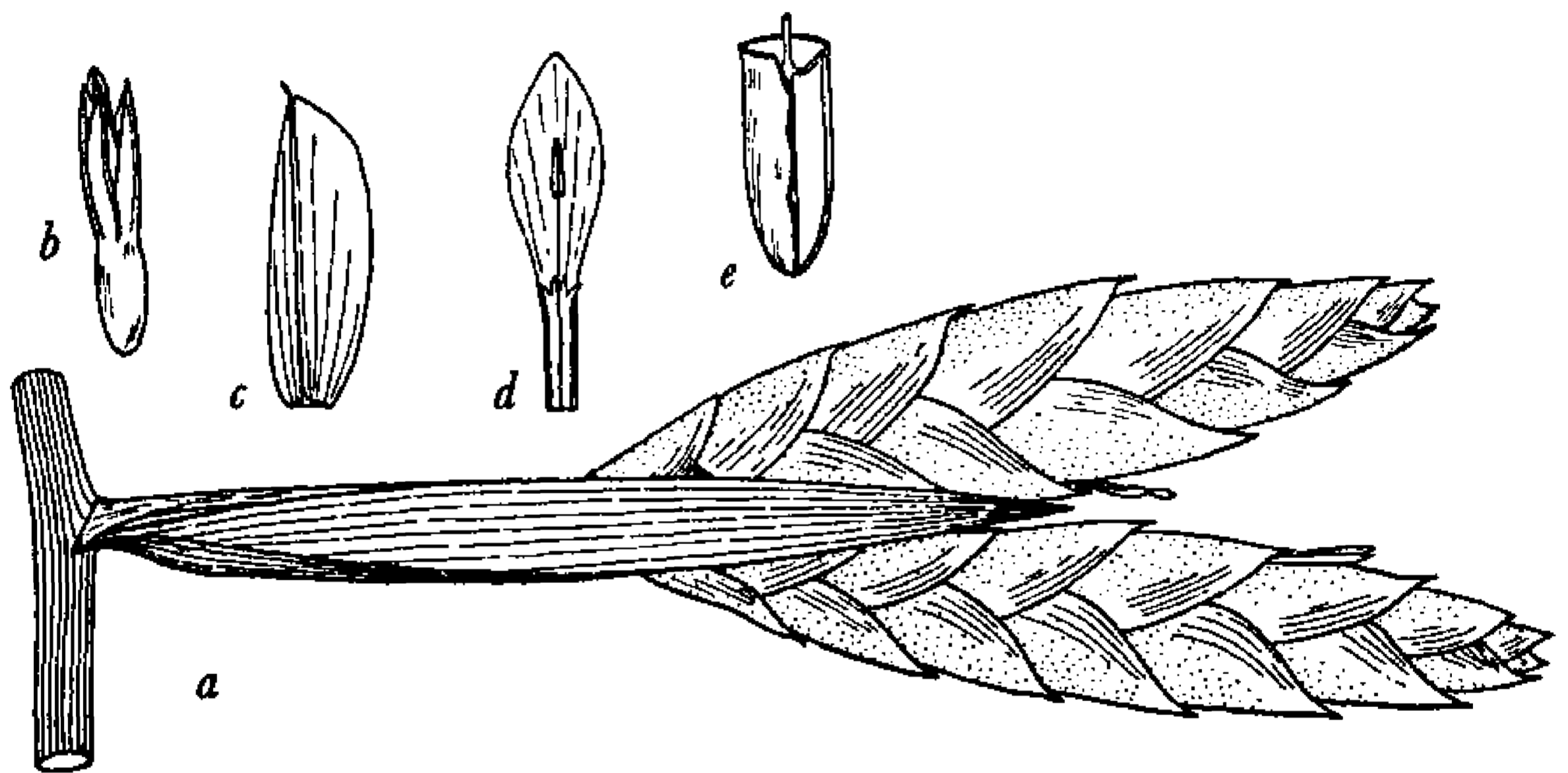


FIGURE 82.—*Aechmea dactylina*: *a*, Primary bract and branch,  $\times 1$ ; *b*, flower,  $\times 1$ ; *c*, sepal,  $\times 2$ ; *d*, petal and stamen,  $\times 2$ ; *e*, ovary,  $\times 2$ .

to spreading, the lower ones usually divided and bearing 2–8 spikes, to 25 cm. long; spikes linear, acute, 5–16 cm. long, 10–16 mm. wide, strongly complanate, densely distichous-flowered; floral bracts all fertile, erect, very broadly ovate or suborbicular, equaling or exceeding the sepals, mucronulate with free entire margins, sharply carinate toward the apex, coriaceous; sepals lanceolate, acute, alate-carinate, 7–8 mm. long, connate for 1 mm.; petals ligulate, acute, yellow; stamens included; ovary sharply 3-angled, 7 mm. long, glabrous, epigynous tube short, placentae apical; ovules caudate.

CHOCÓ: Epiphytic, second growth forest, Andagoya, alt. 70–100 m., Apr. 20–30, 1939, *Killip* 35067 (US). Dense forest, south of Río Condoto, between Quebrada Guarapo and Mandinga, alt. 120–180 m., Apr. 22, 28, 1939, *Killip* 35684 (US). Epiphytic, dense tidal forest, banks of Quebrada Togoromá, June 13, 1944, *Killip & Cuatrecasas* 39135 (US). Epiphytic, Nuquí, Pacific coast, June 2, 1950, *Fernández* 225 (COL).

VALLE: Epiphytic, coastal thickets, Pacific coast, Buenaventura, alt. 0-10 m., Oct. 5-10, 1922, *Killip* 11733 (GH). Epiphytic, woods, Veneral, Río Yurumanguí, Pacific coast, alt. 5-50 m., Jan. 20-Feb. 10, 1944, *Cuatrecasas* 15901 (F, GH). Epiphytic, La Trojita, Río Calima, region of the Chocó, alt. 5-50 m., Feb. 19-Mar. 10, 1944, *Cuatrecasas* 16642 (VALLE). Epiphytic, Silva, Río Cajambre, Pacific coast, alt. 5-80 m., May 5-15, 1944, *Cuatrecasas* 17624 (VALLE).

NARIÑO: Terrestrial, edge of forest at coast, east side of Gorgona Island, Feb. 11, 1939, *Killip & García* 33220 (US); 35625 (US). Same, epiphytic, June 21, 1950, *Fernández* 392 (COL). Forest, Barbacoas, near sea level, May 8, 1939, *Alston* 8495 (BM).

COSTA RICA, PANAMA.

12. *Aechmea pubescens* Baker, Journ. Bot. 17:135. 1879.

Plant 4-12 dm. high; leaves few in a dense rosette, to 1 m. long, green except for a broad pale median channel, the outer leaves bladeless, sheaths broadly elliptic, 15 cm. long, densely brown-punctulate, blades narrowed above the base but not truly petiolate, ligulate, acute, apiculate, 25-50 mm. wide, white-lepidote beneath, laxly serrate toward the base with straight or retrorse green teeth 5 mm. long; scape erect, slender, white-lanate, soon glabrous; scape-bracts densely imbricate, lance-ovate, entire, membranaceous, bright red, pale-lepidote; inflorescence paniculate, bipinnate or the lower branches divided, oblong or pyramidal, 10-35 cm. long, fertile throughout, lax at least toward the base, at first densely white-floccose but often becoming nearly glabrous; primary bracts like the scape-bracts but narrower, the lower ones equaling or exceeding the axillary branches, the upper ones no larger than the floral bracts; spikes linear, densely and distichously 8-16-flowered; rhachis straight or flexuous; floral bracts spreading and exposing the rhachis, broadly ovate, acuminate, pungent, entire with margins free, carinate toward the apex, subcoriaceous; sepals strongly asymmetric, subtriangular, 6 mm. long, mucronulate, strongly carinate; petals ligulate, obtuse, 10 mm. long, bearing 2 fimbriate scales high above the base; ovary subellipsoid, 3-angled, slightly enlarged in fruit; placentae apical.

NORTE DE SANTANDER: Epiphytic, near Teorama, alt. 1,200 m., Sept. 11, 1946, *Foster* 1664 (GH).

ANTIOQUIA: Terrestrial, moist open woods, mountains near Dabeiba, Mar. 21, 1948, *Johnson & Barkley* 18-C-418 (US).

CHOCÓ: Truando, Dec. 1857, *Schott* 1 (F, NY). Epiphytic, partially cleared forest, Bahía Solano, near Ciudad Mutis, alt. 0-75 m., Feb. 21-23, 1939, *Killip & García* 33464 (US). Forest, Nuquí, June 2, 1950, *Fernández* 224 (COL, US).

HONDURAS to PANAMA.

13. *Aechmea tillandsioides* (Mart. ex Schult.) Baker, Journ. Bot. 17:134. 1879.

Leaves 5-12 in a funnelform rosette, 3-5 dm. long, exceeding the inflorescence, sheaths large, broadly elliptic, sometimes purple, blades ligulate, acuminate with a long slender terminal mucro, 2-4 cm. wide, pale-lepidote especially beneath, bearing spines to 2.5 mm. long; scape

erect, slender, white-flocculose becoming glabrous; scape-bracts imbricate, lanceolate, acuminate, spinose-serrate, red; inflorescence usually bipinnate; lower primary bracts like the scape-bracts, exceeding the spikes; spikes densely 4-12-flowered, oblong, compressed, to 15 cm. long, 15-18 mm. wide; rhachis more or less white-flocculose; floral bracts broadly elliptic or obovate, mucronate, carinate, glabrous, equaling the sepals, subcoriaceous; sepals free, slightly asymmetric, elliptic, mucronulate, to 7.5 mm. long; petals mucronulate, 16 mm. long, bearing 2 fimbriate scales above the base; ovary subglobose, epigynous tube evident; placentae apical; ovules long-caudate.

**13a. *Aechmea tillandsioides* (Mart. ex Schult.) Baker var. *tillandsioides*.**

*Billbergia tillandsioides* Mart. ex Schult. f. in R. & S. Syst. 7, pt. 2:1269. 1830.

*Aechmea vriesioides* Baker, Journ. Bot. 17:134. 1879.

*Aechmea xiphophylla* Baker, Handb. Bromel. 63. 1889.

Inflorescence pinnate, 1-3 dm. long, usually much interrupted toward base.

**META:** Epiphytic, Acacías, alt. 450 m., April 1950, *Uribe-Uribe* 2086 (COL, US).

**VAUPÉS:** Epiphytic, headwaters of Caño Teemeeña, Río Piraparaná (tributary of Río Apaporis), lat. 0°15' S. to 0°25' N., long. 70°30' W., Sept. 10, 1952, *Schultes & Cabrera* 17387 (US).

**CAQUETÁ:** Residual thickets, Florencia, alt. 400 m., Mar. 29, 1940, *Cuatrecasas* 8831 (COL, US). Epiphytic, savannas between Florencia and Venecia, alt. 400 m., Mar. 31, 1930, *Cuatrecasas* 8940 (COL).

**NARIÑO:** Road to Ureusique, alt. 1,200 m., Nov. 23, 1946, *Foster* 2251 (GH).  
Amazonian BRASIL, VENEZUELA, BRITISH GUIANA.

**13b. *Aechmea tillandsioides* (Mart. ex Schult.) Baker var. *kienastii* (E. Morr. ex Mez) L. B. Smith, *Caldasia* [1], No. 5: [5]. 1942.**

*Aechmea kienastii* E. Morr. ex Mez in DC. Monogr. Phan. 9: 243. 1896.

*Aechmea squarrosa* Baker, Journ. Bot. 28:305. 1890, not Baker 1889.

Inflorescence digitate or rarely simple.

**NORTE DE SANTANDER:** In trees, Orú on pipeline, alt. 75-240 m., Sept. 18, 1946, *Foster* 1734 (COL, GH). Same, dense jungle, *Foster* 1735 (COL, GH). Epiphytic, Petrolea, alt. 60 m., Sept. 24, 1946, *Foster* 1790 (GH).

**SANTANDER:** Epiphytic, Camp Zarzal, near Barranca Bermeja, Magdalena Valley between Río Sogamoso and Río Colorado, alt. 100-500 m., Dec. 15, 1934, *Haught* 1467 (US). Epiphytic, near Puerto Berrio, between Río Carare and Río Magdalena, alt. 100-700 m., Apr. 14, 1935, *Haught* 1639 (GH, US).

**META:** Epiphytic, dense humid forest, Río Guapaya, Sierra de la Macarena, alt. 500 m., Jan. 18, 1950, *Philipson, Jaramillo & Idrobo* 2125 (BM, US).

**VAUPÉS:** Epiphytic, Mitú, banks of Río Vaupés, alt. 200 m., Sept. 13, 1939, *Pérez-Arbeláez & Cuatrecasas* 6758 (COL). On cliff, Mount Chiribiquete, Macaya-Ajaju River confluence, alt. 510-630 m., May 15, 16, 1943, *Schultes* 5413 (US, leaves banded). Same, *Schultes* 5440 (US, inflorescence simple). Epiphytic, Cerro E-ree-eé-kö-mee-ö-kee, Río Piraparaná (tributary of Río Apaporis), lat. 0°15' S. to 0°25' N., long. 70°30' W., Sept. 18, 1952, *Schultes & Cabrera* 17520 (US). Epiphytic, settlement of "Alto Caribe," remanso "Caraná," bank of Río Infrida, long. 70°35' W., alt. 220 m., Jan. 23, 1953, *Fernández* 1911 (COL).

Epiphytic, San Joaquín, bank of Río Inírida, long. 71° W., alt. 230 m., Jan. 27, 1953, *Fernández* 2009 in part (US). Epiphytic, settlement of "Raudal Alto" or Mariapiri, left bank of Río Inírida, long. 69°45' W., alt. 180 m., Feb. 3, 1953, *Fernández* 2116 (COL). Epiphytic, left bank, Raudal Guacamayo, Río Inírida, long. 69°45' W., alt. 180 m., Feb. 4, 1953, *Fernández* 2138 (COL, US). Epiphytic, Mesa de Yambí, savanna Goo-ran-hoo-dá, Río Karuarú (tributary of Río Vaupés), lat. 1°20' N., long. 71°20' W., alt. 285-300 m., Apr. 15, 16, 1953, *Schulles & Cabrera* 19187 (US).

AMAZONAS-VAUPÉS: Epiphytic, Raudal de Jirijirimo (below mouth of Río Kananarí), Río Apaporis, lat. 0°5' N., long. 70°40' W., alt. 270 m., Jan. 21, 1952, *Schulles & Cabrera* 14961 (US).

CAQUETÁ: Residual thickets, Florencia, alt. 400 m., Mar. 29, 1940, *Cuatrecasas* 8832 (COL).

TOLIMA: In montes, Mariquita, alt. 800 m., Sept. 27, 1954, *Uribe-Uribe* 2624 (COL).

ANTIOQUIA: Epiphytic, rain forest, near Villa Arteaga on the road to the coast, alt. 150 m., Feb. 5, 1948, *Sierra & Klevens* 81 (MEDEL).

CHOCÓ: Woods, Cuevita, Pacific coast, June 1, 1950, *Fernández* 211 (COL).

MEXICO, CENTRAL AMERICA.

14. *Aechmea tessmannii* Harms, Notizblatt 9:1153. 1927.

Plant 1 meter high or higher; leaves 5-7 dm. long, blade linear, acute, 6-10 cm. wide, serrate with spines 3-5 mm. long, appressed-white-lepidote; scape erect, stout; scape-bracts lanceolate, acuminate, bright red; inflorescence amply bipinnate; primary bracts like the scape-bracts, 6-15 cm. long, the lowest about equaling the spikes; spikes spreading, oblong, 8-15 cm. long, densely and distichously 12-20-flowered, glabrous; floral bracts ovate, obtuse, lustrous, 15-25 mm. long, green tipped with orange; sepals obovate-oblong, obtuse, 13 mm. long, nearly free; petals acute, 20 mm. long, orange.

NARIÑO: Epiphytic, Las Mesas, alt. 1,350 m., Nov. 22, 1946, *Foster* 2222 (COL, GH, US).

PERU.

15. *Aechmea romeroi* L. B. Smith, Phytologia 5:282, pl. 1, figs. 4-6. 1955.

FIGURE 83

Stemless; leaves many in a broadly funnelform rosette, to 55 cm. long, exceeding the inflorescence, diffusely punctulate-lepidote, sheaths broadly elliptic, 15 cm. long, pale green, blades ligulate, rounded and apiculate, 5-6 cm. wide, uniformly green except for a paler median channel toward the base, laxly serrulate with flat spreading or ascending spines 2 mm. long; scape curved, 5 mm. in diameter; scape-bracts thin, quickly deciduous; inflorescence sub-laxly bipinnate from about 8 spikes, glabrous at least in age; primary bracts broadly lanceolate, acuminate, 7 cm. long, membranaceous, red; branches simple, divergent to spreading peduncles 4 cm. long, strongly flattened; spikes lance-oblong, 10 cm. long, 25 mm. wide, strongly complanate; rhachis slender; floral bracts very broadly

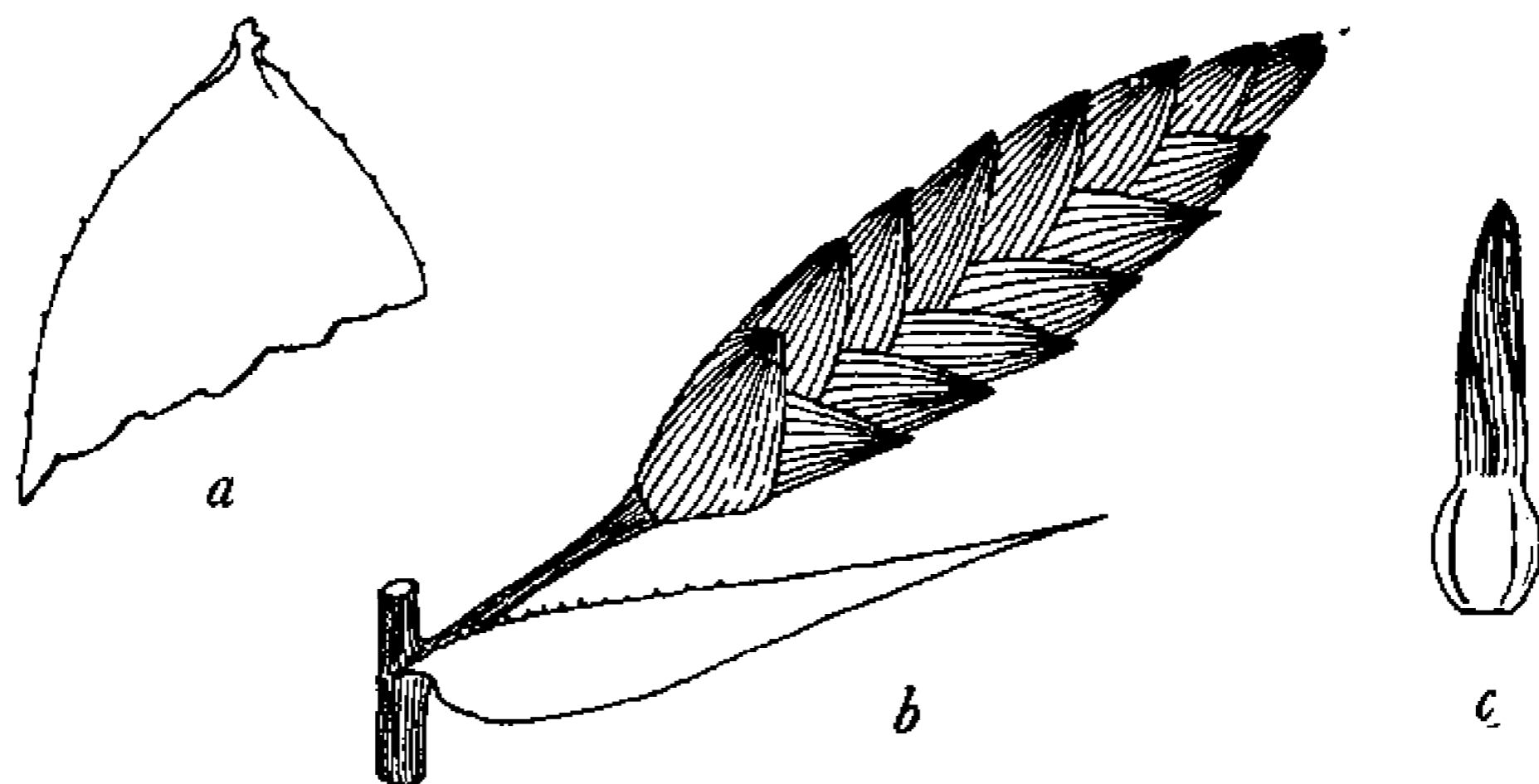


FIGURE 83.—*Aechmea romeroi*: *a*, Apex of leaf,  $\times \frac{1}{2}$ ; *b*, primary bract and branch,  $\times \frac{1}{2}$ ; *c*, ovary and sepals,  $\times 1$ .

ovate, acute, 22 mm. long, equaling or exceeding the sepals, stramineous; sepals free, lance-oblong, slightly asymmetric, over 15 mm. long (tip decayed), thin, nerved; ovary ellipsoid, stout, 6 mm. long, epigynous tube short but distinct, placentae apical; ovules caudate.

CAQUETÁ: Epiphytic, right bank of Río Caquetá, between La Tagua and Puerto Boy, May 9, 1953, *Romero Castañeda* 4220 (US, type; COL).

16. *Aechmea anomala* L. B. Smith, *Caldasia* 3:237, *fig.* 1945.

Stemless, about 1 meter high; leaves to 64 cm. long, sheaths large, elliptic, entire, very densely and minutely brown-lepidote, blades ligulate, rounded and apiculate, 7–8 cm. wide, subdensely serrate toward the base with straight dark spines 4 mm. long, laxly elsewhere, punctulate-lepidote above, covered with appressed cinereous scales beneath; scape stout; scape-bracts densely imbricate, broadly elliptic, 10 cm. long, serrulate, subchartaceous, rose, densely pale-lepidote; inflorescence subdensely bipinnate, 2 dm. or longer; primary bracts like the scape-bracts; spikes densely and distichously few-flowered, their sterile bases stout, naked, to 25 mm. long; rhachis strongly excavated; floral bracts broadly elliptic, obtuse, muticous, to 17 mm. long, about equaling the ovary at anthesis, strongly nerved, pale-lepidote; flowers glabrous; sepals asymmetric, elliptic, obtuse, muticous, connate 2–12 mm.; petals bearing 2 fimbriate scales at base; ovary ellipsoid, epigynous tube narrowly infundibuliform.

NARIÑO: Hydrophilous forest of the Río Putumayo, Puerto Porvenir, above Puerto Ospina toward La Loma, alt. 230–250 m., Nov. 17, 1940, *Cuatrecasas* 10609 (US, type, GH phot. 6197; COL).

17. *Aechmea amazonica* Ule, *Verh. Bot. Ver. Brand.* 48:136. 1907.

Plant to 1 meter high; leaves 4–10 dm. long, densely punctulate-lepidote, sheaths large, broadly ovate, castaneous, blades ligulate, acute or rounded and apiculate, 6–9 cm. wide, often white-banded

beneath; scape erect, slender, white-flocculose; scape-bracts lanceolate, acuminate, laxly serrulate, bright red, the lower lax and erect, the upper spreading and dense; inflorescence laxly bipinnate; lower primary bracts like the scape-bracts, 6–12 cm. long, exceeding the spikes, the upper resembling the floral bracts; spikes long-stipitate, narrowly lanceolate, densely 12-flowered; rhachis geniculate, excavated next the flowers; floral bracts distichous, broadly ovate, subtruncate, 10–13 mm. long, slightly exceeding the ovary, strongly nerved, lepidote; flowers to 32 mm. long; sepals asymmetric, muticous; petals obtuse, 2 cm. long, orange; ovary glabrous; placentae apical; ovules long-caudate.

AMAZONAS-VAUPÉS: Epiphytic, Soratama, Río Apaporis, Feb. 14, 1952, *Schultes & Cabrera* 16114 (COL, US).

AMAZONAS: Epiphytic, Río Carapaná between the mouth and El Encanto, alt. 150 m., May 22–28, 1942, *Schultes* 3822 (GH). Trapecio Amazónico, Loretoyacu River, alt. 100 m., October 1945, *Schultes* 6599 (US). Interior regions of Trapecio Amazónico between Amazon and Putumayo watersheds, alt. over 100 m., October 1945, *Schultes* 6893 (US).

PERU, Amazonian BRASIL.

18. *Aechmea contracta* (Mart. ex Schult. f.) Baker, Journ. Bot. 17:234. 1879.

*Billbergia contracta* Mart. ex Schult. f. in R. & S. Syst. 7, pt. 2:1263. 1830.

Stoloniferous, 5–8 dm. high with the inflorescence extended; leaves 5–10, subfasciculate, to 85 cm. long, sheaths large, very broadly ovate, sometimes maculate, petioles distinct, linear, 12–15 cm. long, strongly channeled, serrate with spreading teeth 4 mm. long, blades linear-lanceolate, acute, 25–35 mm. wide, laxly serrulate, sparsely lepidote; scape curved, slender, white-flocculose; scape-bracts elliptic, acuminate, membranaceous, serrulate, few and distant below, massed beneath the inflorescence; inflorescence usually simple but rarely digitate with 2–4 spikes, curved; spikes linear, 7–25 cm. long, white-flocculose; rhachis geniculate, excavated next the flowers; floral bracts distichous or subtetrahedral, ovate, entire, from barely exceeding the ovary to nearly equaling the sepals, convex; flowers 26–35 mm. long; sepals free, asymmetric, suboblong, truncate-apiculate, 5–8 mm. long; petals ligulate, apiculate, yellow, bearing 2 fimbriate scales near the base; stamens included; ovary terete, constricted at the apex, 7–10 mm. long; epigynous tube short; placentae apical; ovules caudate.

VAUPÉS: Epiphytic, woods by Caño Popore, between Río Vaupés and Río Apaporis, alt. 240 m., Sept. 30, 1939, *Cautrecases* 7097 (US). Epiphytic, Bacaricuara Mission, Río Paca, headwaters of Río Papurí, Sept. 6, 1943, *P. H. Allen* 3056 (COL). Near "La Jirisa," upper Río Vaupés, Jan. 8–10, 1944, *Gutiérrez & Schultes* 571 (GH). Cachivera de Yuruparí, alt. 4,000 m., Oct. 24–26, 1952, *García-Barriga* 14953 (COL, US). Wacaricuara, trail between Río Paca and Río Papurí, Dec. 7, 1952, *Romero Castañeda* 3904 (COL); 3907 (COL). "Morichal" settlement near the mouth of Río Papunúa, Río Inírida, long. 70°30' W., Feb. 14, 1953, *Fernández* 2272 (COL).



CAQUETÁ: Banks of Río Putumayo, near Puerto Leguízamo, alt. 200 m., Nov. 19, 1948, *Jaramillo-Mejía* 549 (COL).

AMAZONAS-VAUPÉS: Epiphytic, Soratama, Río Apaporis between Río Pacoa and Río Kananari, alt. 250 m., June 26, 1951, *Schultes & Cabrera* 12843 (US). Same, Dec. 1-15, 1951, *García-Barriga* 13916 (COL); 13924 (COL); 14062 (COL, US).

AMAZONAS: Epiphytic, Loretoyacu River, Trapecio Amazónico, alt. 100 m., Sept.-Nov. 1944, *Schultes* 6049 (US); 6313 (US). Same, Oct. 20-30, 1945, 6643 (US). Epiphytic, La Pedrera, Río Caquetá, alt. 200 m., Oct. 1-4, 1952, *García-Barriga* 14596 (COL). Same, alt. 240 m., *García-Barriga* 14604 (COL, US).

Amazonian BRASIL, PERU, BRITISH GUIANA.

19. *Aechmea angustifolia* Poepp. & Endl. Nov. Gen. & Sp. 2:43, pl. 159. 1838.

FIGURE 84

*Aechmea cumingii* Baker, Journ. Bot. 17:227. 1879.

Stemless, to 75 cm. high; leaves 10-15, 5-7 dm. long, sheaths elliptic, 1 dm. long, forming an ellipsoid tank, densely and finely brown-lepidote, blades ligulate, 3-6 cm. wide, cinereous-lepidote, spinose-serrate, concolorous; scape erect, white-flocculose becoming glabrous; scape-bracts elliptic, acute, red; inflorescence dense or lax, bipinnate, cylindric, fertile throughout, 15-36 cm. long; lowest

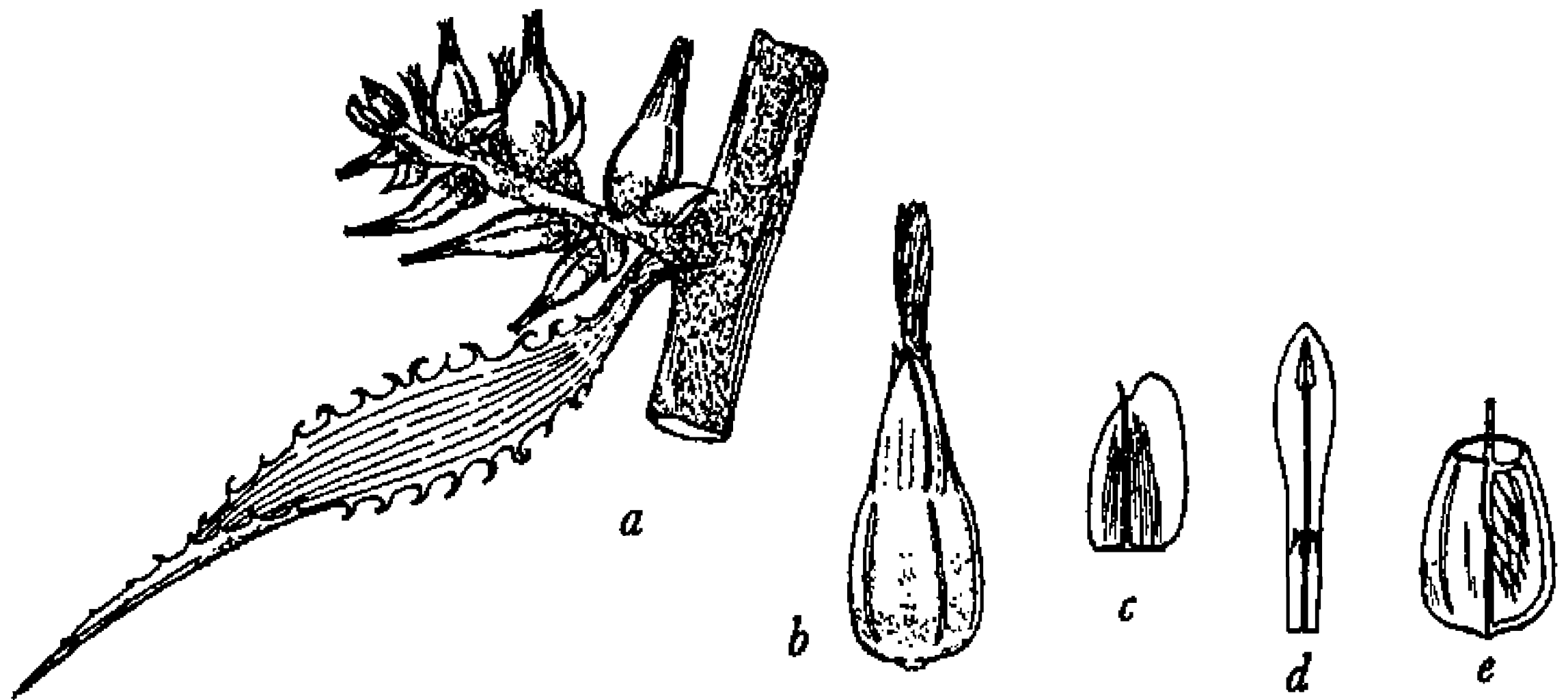


FIGURE 84.—*Aechmea angustifolia*: a, Lower primary bract and branch,  $\times 1$ ; b, flower  $\times 2$ ; c, sepal,  $\times 2$ ; d, petal and stamen,  $\times 2$ ; e, section of ovary,  $\times 2$ .

primary bracts like the scape-bracts, exceeding the axillary spikes, the others abruptly reduced to about the size of the floral bracts; spikes spreading or reflexed, distichously 10-flowered, 20-45 mm. long; rhachis undulate, compressed; floral bracts spreading, cymbiform, broadly ovate with a straight mucro, 5 mm. long, barely exceeding the ovary; sepals asymmetric, mucronate, 4-5 mm. long, free; petals linear, mucronate, 8-10 mm. long, bearing 2 scales well above the base; ovary ellipsoid; placentae apical; ovules caudate.

COLOMBIA: "Panama or Colombia," *Cuming* 1178 in part (K, type of *Aechmea cumingii* Baker, GH phot. 2712).

SANTANDER: Near Barranca Bermeja, between Río Sogamoso and Río Colorado, Magdalena Valley, alt. 100–500 m., Dec. 12, 1939, *Haught* 1453 (US).

CUNDINAMARCA: Epiphytic, Quetame, alt. 1,530 m., *Pérez-Arbeláez* 213 (COL, US).

META: Epiphytic, Villavicencio, alt. 500 m., Nov. 11, 1938, *Cuatrecasas* 4724 (US). Wet rocks by river, Río Guapaya, Sierra de La Macarena, alt. 450 m., Nov. 29, 1949, *Philipson, Idrobo & Fernández* 1622 (BM, COL, US). Same, alt. 500 m., Jan. 18, 1950, *Philipson, Idrobo & Jaramillo* 2119 (BM, COL). Terrestrial, damp forest, gorge of Río Güejar, Sierra de la Macarena, alt. 450 m., Feb. 6, 1950, *Philipson* 2397 (BM).

NARIÑO: Epiphytic, Las Mesas, near Pepino, alt. 1350 m., Nov. 22, 1946, *Foster* 2221 (GH).

TOLIMA-CALDAS: Quindio, *Triana* 560 (US).

ANTIOQUIA: Epiphytic, rain forest, road to the coast near Villa Arteaga, alt. 150 m., Feb. 4, 1948, *Sierra & Klevens* 79 (MEDEL). On trees, dense moist forest, between Río Guapá and Río León, alt. 100 m., Mar. 18, 1948, *Landa, Rivera & Barkley* 18-C-361 (US). Municipio Nariño: On trees, Quebrada of Espiritú Santo, near Río Samaná, alt. 950 m., July 19, 1951, *Uribe-Uribe* 2159 (COL). Same, near Los Termales, *Uribe-Uribe* 2160 (COL, US).

CALDAS: Santa Cecilia, western slope of Cordillera Occidental, alt. 800 m., Nov. 29, 1945, *Sneidern* 5079-A (F, US).

VALLE: Road to the sea, above Cali, alt. 1,700 m., March 1942, *Dryander* 2591 (US). Same, alt. 2,000 m., August 1943, *Dryander* 2728 (F, US).

NARIÑO: On trees, Barbacoas, Río Nembí, alt. 450 m., Nov. 16, 1946, *Foster* 2189 (GH). Municipio Tumaco: Chajal, June 13, 1951, *Romero-Castañeda* 2718 (COL).

COSTA RICA to PERU and BOLIVIA.

20. *Aechmea leucocarpa* André, Énum. Bromél. 3. Dec. 13, 1888; Rev. Hortie. 60:563. Dec. 16, 1888.

Leaves 3–4 dm. long, sheaths ample, blades ligulate, broadly acute and cuspidate, 6 cm. wide, sparsely lepidote, laxly serrate with straight or slightly curved spines 5 mm. long; scape erect, slender, furfuraceous, violet; scape-bracts lanceolate, acute, brownish purple; inflorescence densely bipinnate, subovoid, 12–15 cm. long, 7 cm. in diameter; lower primary bracts like the scape-bracts, exceeding the spikes, upper scape-bracts abruptly much reduced; spikes divergent, distichously about 8-flowered; floral bracts ovate, mucronulate, 5 mm. long; flowers spreading; sepals strongly asymmetric, mucronulate, free, 5 mm. long, glabrous; petals 9 mm. long, pale yellow; placentae apical; ovules caudate; berry globose, 6 mm. long, fleshy, white.

CALDAS: Piedra de Moler, right bank of Río de la Vieja, western base of Quindio, alt. 995 m., Mar. 15, 1876, *André* 2425 (K, type, GH phot. 2713).

VALLE: Cultivated by F. Dryander, from San Antonio, alt. 2,200 m., Apr. 7, 1939, *Killip & Varela* 34912 (US).

NARIÑO: In trees, below Altaquer, Río Caciquere, alt. 900 m., Nov. 12, 1946, *Foster* 2142 (GH).

21. *Aechmea stenosepala* L. B. Smith, Bot. Mus. Leafl. Harvard 17:76, pl. 21, figs. 3-8. 1955.

Over 6 dm. high; leaves to 52 cm. long, covered with closely appressed scales, sheaths broadly elliptic, castaneous, the outer 17 cm. long, blades of the outer leaves ligulate, broadly acute and recurved near the apex, 8 cm. wide, cinereous-lepidote, laxly serrate with dark ascending flat teeth 6 mm. long, blades of the inner leaves vestigial; scape erect, 5 mm. in diameter, white-lanate; scape-bracts lanceolate, acute, about equaling the internodes, membranaceous, rose-purple, densely pale-lepidote, laxly and obscurely serrulate; inflorescence ellipsoid, 12 cm. long; lowest primary bracts like the scape-bracts the others greatly reduced; spikes divergent, densely few-flowered; rhachis densely pale-lepidote; floral bracts distichous, much more than twice as long as the internodes but spreading and not imbricate, broadly ovate, acuminate, mucronate, 7 mm. long, nerved; sepals asymmetric, subtruncate, mucronate, connate for 1 mm.; ovary globose, placentae apical.

VAUPÉS: Mesa La Lindosa, small range 15-20 km. south of San José del Guaviare, alt. 400-600 m., Dec. 13-15, 1950, *Idrobo & Schultes* 645 (US, type, US phot. 3882).

22. *Aechmea bracteata* (Sw.) Griseb. Fl. Brit. W. Ind. 592. 1864.  
*Bromelia bracteata* Sw. Prodr. 56. 1788.

Plant 5-17 dm. or higher; leaves about 20, 3 to over 10 dm. long, sheaths elliptic, very large and conspicuous, forming an ellipsoid tank, densely and finely brown-lepidote, blades ligulate, from acuminate to rounded-apiculate, 3-10 cm. wide, coriaceous, pale green, concolorous, densely white-lepidote beneath, coarsely repand-serrate, the teeth lax, spreading, straight or uncinata, to 1 cm. long; scape erect, relatively slender, finely white-lanate at first; scape-bracts usually imbricate, lanceolate, acute, bright red; inflorescence amply paniculate, thyrsoïd or pyramidal with the lower branches elongate and much divided, 10-65 cm. long; lower primary bracts like the scape-bracts, sometimes exceeding the axillary branches; spikes spreading, laxly and distichously 4-17-flowered; rhachis slender, angled, flexuous; floral bracts spreading, broadly ovate, acute, aciculous, 5-8 mm. long, much exceeded by the sepals, more or less nerved, the margins free and entire; sepals triangular-ovate, strongly asymmetric, mucronulate, 3-4 mm. long, soon glabrous; petals linear, to 1 cm. long, yellow, bearing 2 coarsely dentate scales well above the base; stamens included; ovary stout-ellipsoid or subglobose, enlarged in fruit; placentae apical; ovules caudate.

MAGDALENA: Santa Marta, *H. H. Smith* 2768 (F, GH, NY). Epiphytic, Fundación, Sierra Nevada de Santa Marta, alt. 105 m., August 1946, *Foster & C. E. Smith, Jr.*, 1623 (GH, US).

MEXICO, CENTRAL AMERICA.

**23. *Aechmea pyramidalis* Benth. Bot. Sulph. 173. 1844.***Hohenbergia pyramidalis* Baker in Saunders Ref. Bot. 4: sub pl. 284. 1871.*Aechmea edmonstonei* Baker, Handb. Bromel. 38. 1889.

Plant 1–2 meters high; leaves 6–8 dm. long, sheaths elliptic, ample and conspicuous, covered with coarse appressed pale brown scales, blades ligulate, broadly acute and cuspidate, 4–7 cm. wide, brown-lepidote beneath, becoming glabrous above, laxly serrate with broad flat retrorse teeth, the lowest teeth 8 mm. long; scape erect, slender, soon glabrous; scape-bracts erect and closely enfolding the scape, imbricate, lanceolate, acute, subentire, thin, red; inflorescence tripinnate, broadly pyramidal, white-pilose; axes slender, red; primary bracts like the scape-bracts, much shorter than the branches; secondary bracts not much larger than the floral bracts; spikes 3–5 cm. long, about 10-flowered, dense; rhachis angled; floral bracts broadly ovate, spinose-acuminate, 8 mm. long, broadly convex, strongly nerved, dark green with a contrasting thin white margin; flowers distichous; sepals asymmetric, broadly elliptic, 5 mm. long including the small mucro, short-connate; petals 8–10 mm. long, yellow; ovary 4 mm. long; epigynous tube very short; placentae apical; ovules caudate.

COLOMBIA: *Cuming* 1178 in part (! Mez).

ECUADOR.

**24. *Aechmea servitensis* André, Énum. Bromél. [3]. Dec. 13, 1888; Rev Hortie. 60:563. Dec. 16, 1888.**

Leaves rosulate, 8–12 dm. long, subdensely pale-lepidote, sheaths large, broadly elliptic to suborbicular, blades ligulate, rounded and cuspidate, 2.5–9 cm. wide, becoming glabrous above, laxly or sublaxly serrate with dark straight spreading or ascending spines 2–6 mm. long; scape erect, stout; scape-bracts broadly lanceolate, acute, chartaceous, rose, pale-lepidote, the lower remote, the upper imbricate; inflorescence laxly paniculate, 2–5 dm. long, 20 cm. in diameter; lower primary bracts like the scape-bracts, shorter than the axillary branches, upper primary bracts abruptly and greatly reduced; lower branches 3-parted with long sterile bases, upper branches simple; rhachis flexuous, terete; floral bracts ovate, thin, nerved; sepals asymmetric, free, obscurely mucronulate, 7–8 mm. long; petals 12–14 mm. long, orange-yellow, bearing 2 fimbriate scales near the base; placentae apical; ovules caudate.

**24a. *Aechmea servitensis* var. *servitensis***

Scape-bracts and lower primary bracts ample, strongly serrate.

CUNDINMARCA: Hacienda "Paramillo" west of Guaduas on the highway to Alto de Aguaclara, alt. 1,040–1,320 m., July 24, 1947, *García-Barriga* 12320 (COL, US). Epiphytic, Guaduas, alt. 1,000 m., June 28, 1952, *Uribe-Uribe* 2339

(COL). On rocks, road to Paramillo, Guaduas, alt. 1,000 m., Jan. 8, 1953, *Uribe-Uribe* 2502 (COL, US).

**META:** Moist wooded slopes, Servitá, alt. 550 m., Jan. 12, 1876, *André* 1197 (K, type, GH phot. 2711). Epiphytic, Villavicencio, alt. 480 m., Feb. 7, 1948, *Sandeman* 5798 (K). Epiphytic, myrmecophilous, Acacías, by Río Acacías, alt. 450 m., Apr. 10, 1950, *Uribe-Uribe* 2087 (COL). Epiphytic, savannas of San Juan de Arama, left bank of Río Güejar near "Los Micos" airfield, alt. 500 m., Jan. 22, 1951, *Idrobo & Schultes* 1253 (US).

**VAUPÉS:** Epiphytic, riverbank, San Jose del Guaviare, alt. 240 m., Nov. 5, 1939, *Cuatrecasas* 7445 (COL, US). Epiphytic, Mesa de Yambí, Savanna Goo-ran-hoo-dá, Río Karurú (tributary of Río Vaupés), alt. 285–300 m., lat. 1°20' N., long. 71°20' W., Apr. 15, 16, 1953, *Schultes & Cabrera* 19191 (US, immature, identity uncertain).

**CAQUETÁ:** Epiphytic, Florencia, December 1930, *Pérez-Arbeláez* 706 (COL, US).

**24b. *Aechmea servitensis* var. *exigua*** L. B. Smith, *Phytologia* 4:358. 1953.

Scape-bracts and lower primary bracts narrow, obscurely dentate.

**NARIÑO:** Epiphytic, Las Mesas, alt. 1,350 m., Nov. 22, 1946, *Foster* 2217 (GH, type, US phot. 3505; US).

**25. *Aechmea nivea*** L. B. Smith, *Caldasia* [1], No. 4:13, *fig. 1.* 1942.

Plant 7–10 dm. high or more; leaves to 85 cm. long, nearly covered with minute appressed scales, sheaths large, broadly elliptic, blades ligulate, broadly rounded and apiculate, flat, 75 mm. wide, laxly serrate with dark spines 2–5 mm. long; scape erect, stout; scape-bracts erect, large, imbricate, broadly elliptic, serrulate, membranaceous, rose; inflorescence laxly paniculate, 15–45 cm. long; lower primary bracts like the scape-bracts, the upper greatly reduced; lower branches often divided; spikes suberect, 5–12 cm. long, laxly and distichously flowered; floral bracts very broadly ovate, white; flowers suberect; sepals asymmetric, mucronulate, 8–10 mm. long; petals 20 mm. long, mucronulate, pale yellow, bearing 2 fimbriate scales at base; ovary globose, 8 mm. in diameter, epigynous tube 2 mm. long; placentae apical; ovules long-caudate.

**VAUPÉS:** Epiphytic, Mitú, alt. 200 m., Oct. 22, 1939, *Cuatrecasas* 7297 (US, type; GH phot. 6000). Epiphytic, Bacaricuara Mission, Río Paca, headwaters of Río Papurí, Sept. 6, 1943, *P. H. Allen* 3059 (COL). Sandy savanna, Cerro Circasia, Río Vaupés, Mar. 6, 1944, *Schultes* 5836 (US). Cachivera Palito, alt. 250 m., July 25, 1951, *Schultes & Cabrera* 13144 (US). Epiphytic, Caño Teemeña, Río Piraparaná (tributary of Río Apaporis), lat. 0°15' S. to 0°25' N., long. 70°30' W., Sept. 6, 1952, *Schultes & Cabrera* 17249 (US); 17291 (US). Upper Río Vaupés, between Río Piendaiva and Río Karurú, alt. 400 m., Oct. 27–29, 1952, *García-Barriga* 14991 (COL). Epiphytic, Monfort, Nov. 29, 1952, *Romero-Castañeda* 3836 (COL).

**AMAZONAS-VAUPÉS:** Terrestrial, Jirijirimo, Río Apaporis, alt. 250 m., Nov. 25, 26, 1951, *García-Barriga* 13742 (COL). Same, June 11, 1951, *Schultes & Cabrera* 12373 (COL, US). Same, epiphytic, June 13, 1951, *Schultes & Cabrera* 12442

(US); 12462 (COL, US). Same, terrestrial, Sept. 16, 1951, *Schultes & Cabrera* 14016 (COL, US). Epiphytic, Soratama, between Río Paoa and Río Kananari, alt. 250 m., July 11, 1951, *Schultes & Cabrera* 13032 (US).

26. *Aechmea penduliflora* André, Énum. Bromél. [3]. Dec. 13, 1888; Rev. Hort. 60:563. Dec. 16, 1888. FIGURE 85

*Billbergia paniculata* Mart. ex Schult. f. in R. & S. Syst. 7, pt. 2:1268. 1830, not *Aechmea paniculata* R. & P. 1802.

*Aechmea schultesiana* Mez in Mart. Fl. Bras. 3, pt. 3:334. 1892.

*Aechmea friedrichsthalii* Mez & Donn.-Smith, Bot. Gaz. 19:263. 1894.

*Aechmea inermis* Mez, Bull. Herb. Boiss. II. 4:620. 1904.

Leaves 5–7 dm. long, thin, sheaths conspicuous, ovate, brown-lepidote especially beneath, blades ligulate, not constricted at base, abruptly acute, apiculate, 2–4 cm. wide, pale-lepidote beneath, soon glabrous, subentire or armed toward the base with fine teeth 1 mm. long; scape erect to decurved, 3–5 mm. in diameter, soon glabrous; scape-bracts erect, the lower remote, the upper massed beneath the

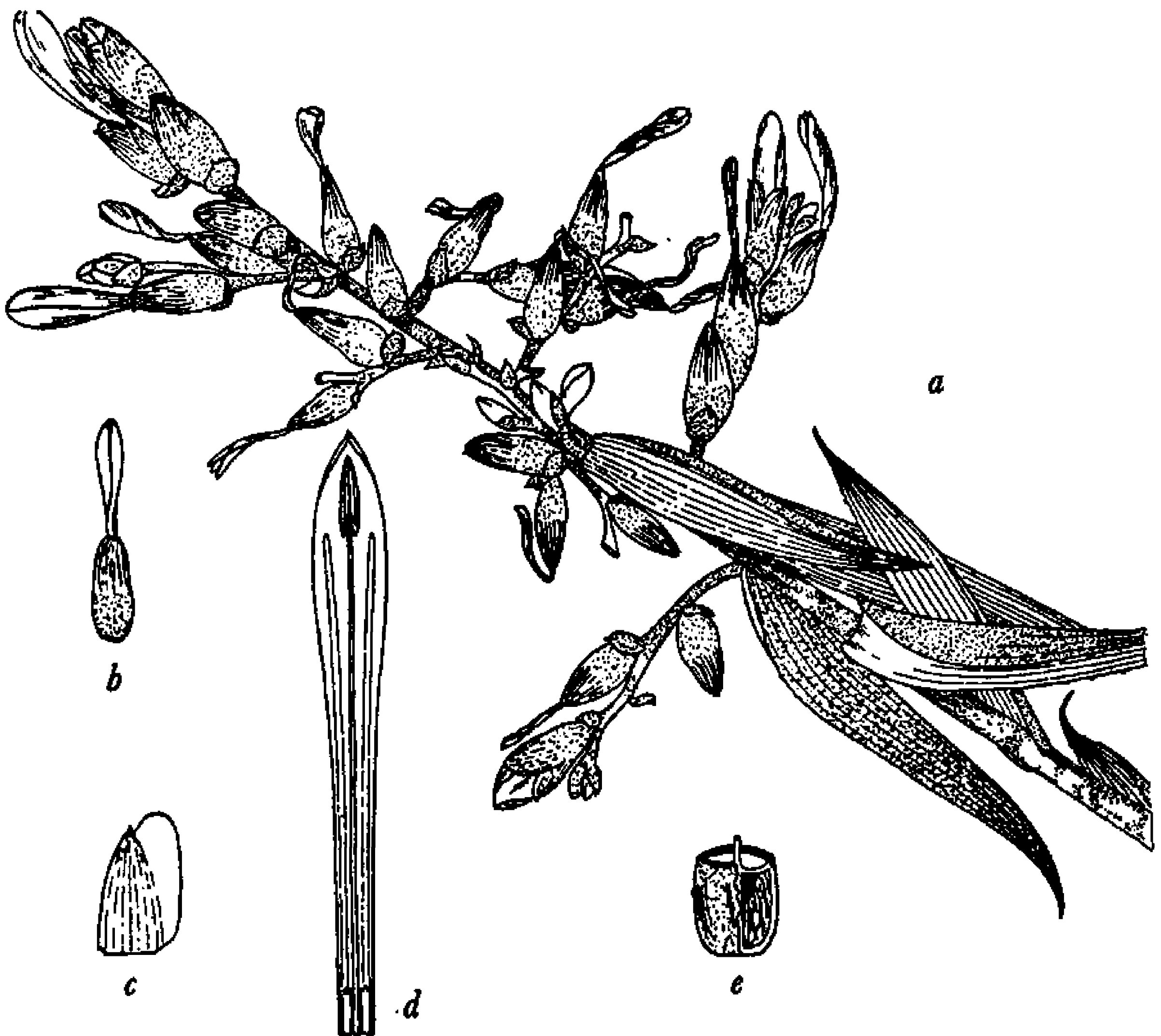


FIGURE 85.—*Aechmea penduliflora*: a, Inflorescence,  $\times 1$ ; b, flower,  $\times 1$ ; c, sepal,  $\times 2$ ; d, petal and stamen,  $\times 2$ ; e, section of ovary,  $\times 2$ .

inflorescence, lanceolate or elliptic, acute or acuminate, membranaceous, bright red; inflorescence paniculate, bipinnate or the lower branches divided, subdensely ellipsoid, 7–15 cm. long, fertile throughout, soon glabrous; lower primary bracts like the scape-bracts, equaling or exceeding the branches, the upper much reduced; spikes suberect to spreading, 35 mm. long, distichously 6–10-flowered, internodes 4–5 mm. long; floral bracts suborbicular, 2–5 mm. long, equaling the ovary at anthesis, thin, nerved; flowers erect; sepals asymmetric, subovate, obtuse, entire or obscurely mucronulate, free or subfree; petals 13 mm. long, bearing 2 fimbriate scales above the base; ovary ellipsoid or subglobose, much enlarged in fruit, epigynous tube short; placentae apical.

COLOMBIA: Isla Brava (Río Magdalena between Yondó, Antioquia, and Chucuri, Santander), Dec. 8, 1875, *André* 378 (K, type, GH phot. 2710).

NORTE DE SANTANDER: In trees, Bellavista on pipeline, alt. 690 m., Sept. 15, 1946, *Foster* 1696 (COL, GH).

VAUPÉS: Epiphytic, bank of Río Vaupés, Mitú, alt. 200 m., Oct. 17, 1939, *Cuatrecasas* 7250 (COL, US). Terrestrial and epiphytic, Piracuara, Nov. 27, 1952, *Romero-Castañeda* 3800 (COL, US). Epiphytic, San Joaquín, bank of Río Infrida, long. 71° W., alt. 230 m., Jan. 27, 1953, *Fernández* 2009 in part (COL). Epiphytic, settlement of "Morichal," near mouth of Río Papunáua, bank of Río Infrida, long. 70°30' W., alt. 200 m., Feb. 17, 1953, *Fernández* 2282 (COL).

CAQUETÁ: Puerto Leguízamo, bank of Río Putumayo, alt. 200 m., Nov. 19, 1938, *Jaramillo-Mejía* 547 (COL). Epiphytic, left bank of Río Caguán by mouth of Río Guayas, Apr. 20, 1953, *Romero-Castañeda* 4017 (COL, US). Epiphytic, right bank of Río Caquetá between La Tagua and Puerto Boy, "8 horas en Johnson de 10 H. P. al oeste de aquélla," May 9, 1953, *Romero-Castañeda* 4218 (COL, US).

ANTIOQUIA: Epiphytic, evergreen woods, near Porcesito, valley of Río Medellín, alt. 1,100 m., Apr. 16, 1946, *Hodge* 6793 (GH).

NARIÑO: Epiphytic, moist woods by Río Putumayo, Puerto Ospina, alt. 230 m., Nov. 14, 1940, *Cuatrecasas* 10560 (COL, F, US). Same, lat. 0°10' N., long. 75°50' W., Mar. 25, 26, 1953, *Schultes & Cabrera* 18952 (US). Moist woods of Río San Miguel, by left-bank tributary Quebrada de la Hormiga, alt. 290 m., Dec. 15, 1940, *Cuatrecasas* 11083 (COL, F, US). Epiphytic, banks of Río Güamués, San Antonio del Güamués, alt. 310 m., Dec. 19, 1940, *Cuatrecasas* 11181 (COL). Moist woods of Río Güamués, in Quebrada del Achote, opposite San Antonio del Güamués, alt. 310 m., Dec. 19, 1940, *Cuatrecasas* 11216 (COL, F, US). Epiphytic, Río San Miguel or Sucumbios, near Santa Rosa, Apr. 7, 8, 1942, *Schultes* 3610 (GH). Puerto Limón, alt. 300–400 m., Feb. 15, 1953, *Mora* 1069 (COL).

COSTA RICA, VENEZUELA, ECUADOR, PERU, Amazonian BRASIL.

27. *Aechmea huebneri* Harms, Notizblatt 10:581. 1929.

Plant 13 dm. high; leaves 10–12 dm. long, rigid, sheaths very broadly elliptic, 3 dm. long, dark castaneous, densely and minutely brown-lepidote, entire, blades narrowly lanceolate, acuminate to a stout spine, 9–10 cm. wide, obscurely punctulate-lepidote, subdensely serrate with stout hooked dark spines 5 mm. long; scape straight,

stout, subglabrous; scape-bracts large, much exceeding the internodes, subchartaceous with a thick pungent apex; inflorescence slenderly cylindrical, subdense, 8–9 cm. in diameter, bearing a few sterile bracts at the apex and at the ends of the branches; primary bracts minute; spikes spreading, few-flowered; rhachis stout, flexuous, angled; floral bracts distichous, subreniform, to 10 mm. long including the terminal mucro but sometimes much smaller; flowers spreading; sepals 6–10 mm. long, obscurely mucronulate.

VAUPÉS: Terrestrial, Cerro E-ree-eé-kö-mee-ö-kee, Río Piraparaná (tributary of Río Apaporis), lat. 0°15' S. to 0°25' N., long. 70°30' W., Sept. 18, 1952, *Schultes & Cabrera* 17494 (COL, GH, US).

BRASIL.

28. *Aechmea mertensii* (Meyer) Schult. in R. & S. Syst. 7, pt. 2:1272. 1830.

*Bromelia mertensii* Meyer, Fl. Essequib. 144. 1818.

Plant very variable, 2–8 dm. high; leaves rather few, rosulate, to 7 dm. long, sometimes exceeding the inflorescence, covered with white appressed scales especially beneath, sheaths large, usually distinct, sometimes purplish, entire, blades ligulate, acute, pungent, 1.5–8 cm. wide, green, laxly serrate with dark nearly straight spines 1–6 mm. long; scape usually erect, slender; scape-bracts lanceolate, acute, serrulate, bright rose, the upper spreading and massed beneath the inflorescence; inflorescence bipinnate, many-flowered, terete, lax to dense, to 35 cm. long but often much shorter, 3–5 cm. in diameter, white-flocculose, soon glabrous; lower primary bracts like the scape-bracts, the others smaller than the floral bracts; spikes spreading, densely 2–8-flowered; floral bracts very broadly ovate or subreniform, enfolding most of the ovary, 5 mm. long, mucronate; flowers distichous, suberect, to 13 mm. long; sepals free, strongly asymmetric, 4 mm. long, mucronate; petals ligulate, mucronate, yellow or red, bearing 2 oblong scales at the base; ovary ellipsoid, epigynous tube distinct; placentae apical; ovules caudate; fruit much enlarged from the ovary, blue.

META-VAUPÉS: Forested banks, Río Guayabero, alt. 240 m., Nov. 8, 1939, *Cuatrecasas* 7496 (COL).

VAUPÉS: Epiphytic, mouth of Río Carurú, alt. 230 m., Sept. 26, 1939, *Cuatrecasas* 7052 (COL, GH, US). Forest between Apaporis and Vaupés Rivers, path from Puerto Naré to Victoria, alt. 300 m., Apr. 10–17, 1943, *Schultes* 5377 in part (COL, US). Epiphytic, Mount Chiribiquete, confluence of Macayu and Ajaju Rivers, alt. 1,700–2,100 m., May 15, 16, 1943, *Schultes* 5382–A (GH). Epiphytic, near Miraflores, upper Río Vaupés, alt. 300 m., Jan. 4, 1944, *Gutiérrez* 515 (GH, MO). Epiphytic, El Castillo, near confluence of Guainía and Casiquiare, Río Negro, Dec. 12, 1947, *Schultes & López* 9315 (US). Terrestrial, Monfort, Nov. 29, 1952, *Romero-Castañeda* 3833 (COL). Río Papurí, between Monfort and Santa María, Dec. 2–4, 1952, *Romero-Castañeda* 3873 (COL). Epiphytic, "Morichal," near the mouth of the Río Papunáua, bank of Río Inírida, long.



70°30' W., Feb. 1, 1953, *Fernández* 2033 (COL, US). Raudal Tayasú, between Mitú and Javareté, May 14–24, 1953, *Schultes & Cabrera* 19276 (US).

CAQUETÁ: December 1930, *Uribe-Uribe* (La Salle).

AMAZONAS-VAUPÉS: Epiphytic, mouth of Río Pacoa, Río Apaporis, alt. 250 m., July 18, 1951, *Schultes & Cabrera* 13072 (COL, US).

AMAZONAS: Epiphytic, Leticia, Amazon River, Trapecio Amazónico, alt. 100 m., Sept. 20, 1945, *Schultes* 6552 (US). Epiphytic, above the rubber station, Río Loretoyacu, Trapecio Amazónico, Dec. 10, 1945, *Duque-Jaramillo* 2291 (COL). Epiphytic, bank of Río Loreto-Yaco, Oct. 31, 1946, *Schultes & Black* 46–291 (IAN, US). Epiphytic, Río Ricapuyá, (tributary of Río Apaporis below mouth of Río Piraparaná), lat. 0°25' S., long. 70°30' W., alt. 210 m., Sept. 25, 26, 1952, *Schultes & Cabrera* 17629 (COL, US).

NARIÑO: Epiphytic, trail 4 km. north of Puerto Leguízamo, alt. 200 m., November 1948, *Jaramillo-Mejía* 617 (COL, US).

TRINIDAD, GUIANA, VENEZUELA, PERU, Amazonian BRASIL.

29. *Aechmea longicuspis* Baker, *Handb. Bromel.* 60. 1889.

Leaves over 8 dm. long, blades ligulate, acute with a stout dark terminal cusp, 8–10 cm. wide, coriaceous, rigid, cinereous-lepidote between the nerves beneath, becoming glabrous above, laxly serrate with dark uncinuate spines 7 mm. long; scape densely white-flocculose; scape-bracts dense, lanceolate, acute, spinose-serrate, rose, white-lepidote; inflorescence densely cylindrical, obtuse, 18 cm. long, 55 mm. in diameter without the petals, densely white-lepidote; lowest primary bracts like the scape-bracts, the others greatly reduced; branches 1–3-flowered, dense; floral bracts very broad, asymmetric, entire, the terminal mucro to 16 mm. long, the sterile bracts reduced to spines; sepals equally short-connate, strongly asymmetric, 21 mm. long, mucronulate; petals linear, 40 mm. long, yellow, bearing 2 fimbriate scales at the base; ovary obconic, 5–10 mm. long, epigynous tube large.

COLOMBIA: Chamba, *Goudot* (P, type, GH phot. 2954).

SANTANDER: Epiphytic, Camp VII (San Juan Valley), near Puerto Berrio, between Río Carare and Río Magdalena, alt. 100–700 m., June 20, 1935, *Haught* 1802 (GH, US).

30. *Aechmea setigera* Mart. ex Schult. f. *in R. & S. Syst.* 7, pt. 2: 1273. 1830

Plant 1–3 meters high with the inflorescence extended; leaves 1 meter long, sheaths suborbicular, 9–30 cm. long, entire, very dark brown, covered below with a castaneous membrane of coalesced scales, blades ligulate, scarcely or not at all constricted at the base, acute or broadly rounded with a broad triangular apiculus, 35–70 mm. wide, densely white-lepidote beneath, densely spinose-serrate toward base, sometimes subentire toward the apex, teeth stout, black, straight or uncinuate, to 15 mm. long; scape arching-decurved, 13 mm. in diameter; scape-bracts suberect, many times exceeding the internodes, linear-lanceolate, acuminate, coarsely spinose-serrate, 2 dm. long, subchartaceous, bright red, pale-lepidote; inflorescence densely bipinnate or subtripinnate, cylindrical, to 9 cm. in diameter, soon

glabrous; primary bracts slenderly spiniform from a small triangular base, 3 cm. long, dark brown; spikes laxly and distichously 2-4-flowered; rhachis 25-35 mm. long, terete; floral bracts subreniform, asymmetric, 1 cm. long, green, nerved, bearing a slender brown terminal spine to 25 mm. long, those toward the apex of the spike sterile and gradually reduced to just the spine; sepals very asymmetric, subelliptic, obtuse, 16 mm. long, unarmed, free; petals ligulate, obtuse, 3 cm. long, pale greenish yellow, bearing 2 fimbriate scales at the base; epigynous tube large, urceolate; placentae subapical; ovules caudate; berry ellipsoid, 1 cm. long.

VAUPÉS: Epiphytic, Bocas del Carurú (affluent of Río Vaupés), orillas caño, alt. 230 m., Sept. 27, 1939, *Cuatrecasas* 7070 (COL). Epiphytic, forest between Río Itilla and Río Macaya, alt. 300 m., Apr. 1-7, 1943, *Schultes* 5379 (GH).

PANAMA, VENEZUELA, FRENCH GUIANA, BRASIL.

31. *Aechmea sprucei* Mez in DC. Monogr. Phan. 9: 226. 1896.

Plant 6-10 dm. high; leaves many in a dense rosette, 6-11 dm. long, covered with a pale membrane of coalesced scales, sheaths large, elliptic, entire, blades ligulate, broadly acute or rounded and apiculate with a stout terminal spine, 7-10 cm. wide, rigid, green, densely serrate with dark straight or slightly curved spines 4 mm. long; scape erect, slender, white-flocculose; scape-bracts elliptic, acuminate, pungent, rose, laxly serrulate, the lower erect, usually lax, the upper spreading and massed beneath the inflorescence; inflorescence paniculate, dense or subdense, many-flowered, to 45 cm. long, 10 cm. in diameter; lower primary bracts like the scape-bracts, the others greatly reduced; branches spreading, 4-6-flowered; rhachis geniculate, terete, slender, green; floral bracts spreading, narrowly triangular from an ovate base, pungent, entire with free margins; flowers suberect, to 17 mm. long; sepals strongly asymmetric, subfree, 5 mm. long without the terminal spine; petals ligulate, obtuse, 12 mm. long, lilac, bearing 2 subentire scales above the base; ovary ellipsoid, stout, epigynous tube short; placentae apical; ovules long-caudate.

VICHADA: Epiphytic, dense forest by river, near Amanabel, mouth of Río Guaviare, alt. 250 m., *Molina & Barkley* 18-V-129 (US).

Northern BRASIL.

32. *Aechmea latifolia* (Willd. ex Schult.) Klotzsch ex Baker, Handb. Bromel. 36. 1889. FIGURE 86

*Bromelia latifolia* Willd. ex Schult. in R. & S. Syst. 7, pt. 2: 1283. 1830.

*Aechmea columnaris* André, Ill. Hort. 25: 50, fig. 1878.

Flowering plant to 2.5 meters high; leaves 1-2 meters long, sheaths elliptic, large, densely brown-lepidote, blades linear, broadly acute or subrounded with a stout terminal cusp, 7-12 cm. wide, rigid, laxly serrate with nearly straight spines to 4 mm. long; scape terete; scape-bracts linear-lanceolate with a subulate pungent terminal cusp,

membranaceous, deciduous with age; inflorescence erect, acuminate, fertile throughout, glabrous or nearly so; lower primary bracts like the scape-bracts, the upper greatly reduced; spikes mostly fascicled and laxly 4–8-flowered, geniculate, slender; floral bracts very short and broad, encircling at least half of the base of the ovary, mucronate; sepals free, strongly asymmetric, 6 mm. long exclusive of the terminal mucro; petals 15 mm. long, bearing 2 fimbriate scales at the base; placentae subapical; ovules short-caudate.

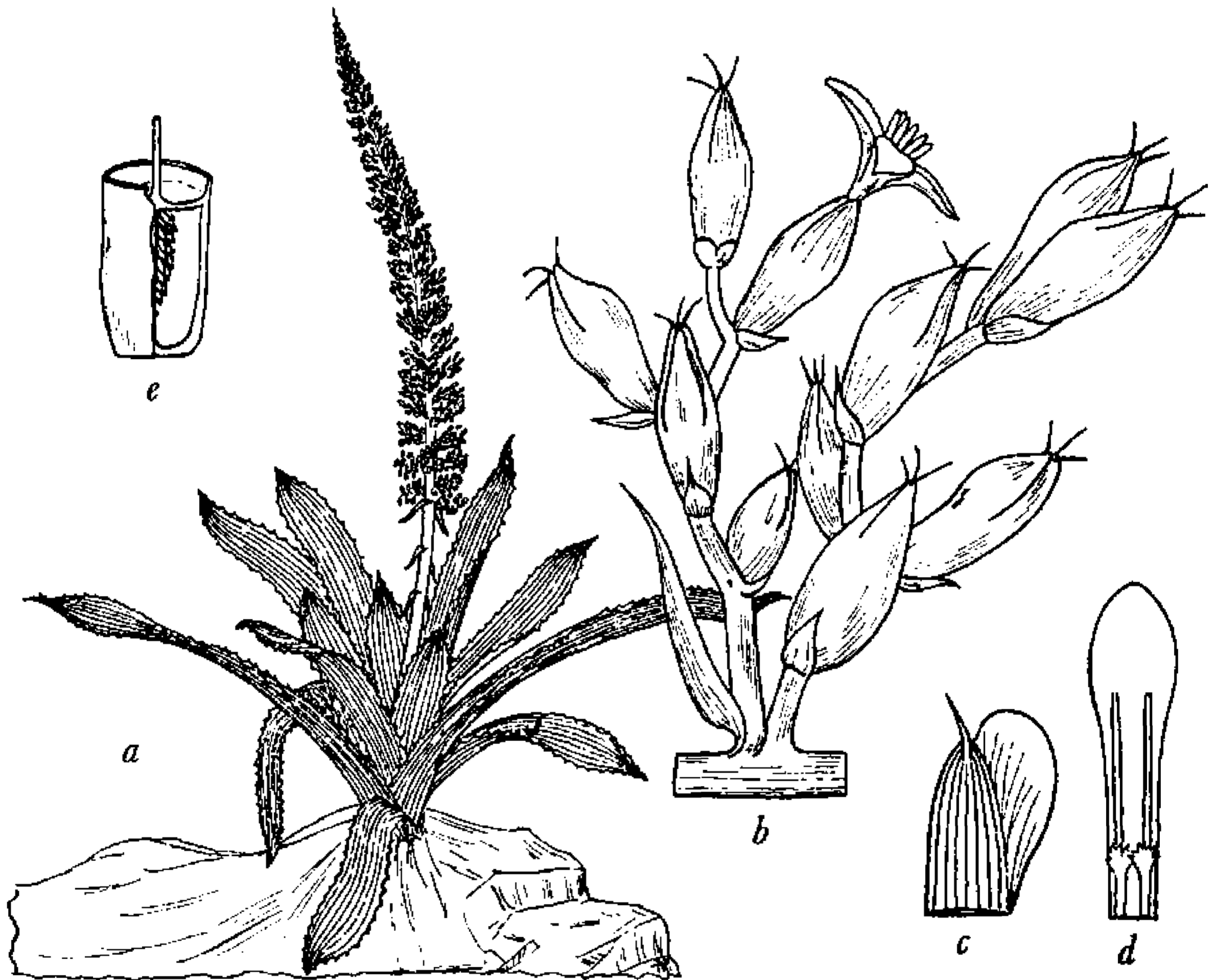


FIGURE 86.—*Aechmea latifolia*: *a*, Habit,  $\times \frac{1}{20}$ ; *b*, primary bract and branch,  $\times 1$ ; *c*, sepal,  $\times 2$ ; *d*, petal,  $\times 2$ ; *e*, section of ovary,  $\times 2$ .

COLOMBIA: *Humboldt & Bonpland* (B, type).

CUNDINAMARCA: Río de la Honda, near Arbeláez, February 1876, *André* 1753 (K, type of *Aechmea columnaris* André, GH phot. 2703; NY). Albán, alt. 1,600 m., 1932, *Amórtegui* 299 (US). Same, December 1932, *Pérez-Arbeláez* 2007 (US). Semi-epiphytic, Estación Santana, above Sasaima, alt. 1,600–1,700 m., July 25–29, 1945, *Dugand & Jaramillo* 3896 (COL, US). On rocks, Arbeláez, alt. 1,200 m., Oct. 12, 1946, *Foster* 1871 (COL, GH, MO, US).

33. *Aechmea spectabilis* Brongn. ex Houlet, *Rev. Hort.* 47:311, *pl.* 1875.

*Pironneava spectabilis* K. Koch ex E. Morr. *Cat. Bromél.* Liége 13. 1873.  
Nomen.

*Aechmea hockelii* Regel, *Descr.* 1887. 5. 1887; *Neubert's Deutsch. Gart. Mag.* 1887:140, *pl.* 8. 1887.

*Aechmea flexuosa* Baker, *Gard. Chron.* 1:8. 1887; *Gartenflora* 36:224. 1887.

Leaves 20–30 in a dense rosette, to 1 meter long, sheaths large, elliptic, 11–17 cm. wide, often purplish, densely brown-lepidote, blades ligulate, acute with a thick terminal cusp, 7–9 cm. wide, coriaceous, pale-lepidote, laxly serrate with broad flat brown spines 3 mm. long; scape erect, stout, floccose; scape-bracts erect, broadly lanceolate, acute, membranaceous; inflorescence lax, 6–10 dm. long, much branched, sparsely white-furfuraceous; lower primary bracts like the scape-bracts, upper primary bracts minute; spikes laxly 1–5-flowered, ca. 6 cm. long; rhachis flexuous, very slender; floral bracts minute, the narrowly triangular apex as long as the flat suborbicular base; sepals strongly asymmetric, 9–12 mm. long, equally short-connate, pale rose; petals 25 mm. long, obtuse, bright red to purple, bearing crenate scales at the base; ovary slenderly obovoid, 7 mm. long; epigynous tube funnelform; placentae apical; ovules caudate.

MAGDALENA: On trees, bank of Río Ariguani, Pueblo Viejo, Sierra Nevada de Santa Marta, alt. 1,100 m., Apr. 13, 1928, *A. Schultze* 1592 (B, F phot. 11324). Damp forest, 11 km. southeast of Molino, alt. 800 m., Mar. 19, 1944, *Haught* 4051 (F, GH, US). In trees, Manaure, between Sierra Perija and Sierra Santa Marta, alt. 1,050 m., August 1946, *Foster & C. E. Smith, Jr.*, 1478 (GH, US).

NORTE DE SANTANDER: In trees, pass between Convención and El Carmen, alt. 1,590 m., Sept. 23, 1946, *Foster* 1760 (GH, US).

SANTANDER: Rocky wooded slope, Río Suratá valley, between El Jaboncillo and Suratá, alt. 1,500–1,800 m., Jan. 3, 1927, *Killip & A. C. Smith* 16410 (F, GH, US).

#### VENEZUELA.

#### 34. *Aechmea woronowii* Harms, Notizblatt 11:60. 1930.

Plant large; leaves 12–15 dm. or longer, sheaths ample, blades lanceolate, acuminate, pungent, subdensely lepidote, spinose-serrate, rigid; inflorescence ample with branches 3–4 dm. long; primary bracts unknown; secondary bracts lanceolate or broadly lanceolate, pungent, 10 cm. long, exceeding the lower spikes, decreasing gradually toward the apex of the branch, flocculose-puberulent, becoming glabrous; spikes laxly 3–5-flowered, 4–5 cm. long; rhachis slightly geniculate, flocculose-puberulent; floral bracts very short and broad, encircling the base of the ovary, cuspidate; ovary oblong or oblong-ovoid, stout, flocculose, 15 mm. long; sepals strongly asymmetric, mucronulate, 10–12 mm. long.

CAQUETÁ: Woods, Hetucha, on Río Ortegua, July 1926, *Woronow & Juzepczuk* 6158 (B, type).

The specimen has not been seen but the description was compiled from the original. The characters given are almost identical with those of a complete inflorescence of *Streptocalyx poeppigii* Beer, while they do not appear very close to a branch of *Aechmea latifolia* (Schult.) Baker with which Harms compared his new species.

**35. *Aechmea bromeliifolia*** (Rudge) Baker in Benth. & Hook. Gen. Pl. 3:664. 1883.

*Tillandsia bromeliifolia* Rudge, Pl. Guian. 32, pl. 50. 1807.

Plant 7–9 dm. high; leaves 12–20 in a tubular rosette, 6–12 dm. long, covered with a membrane of white coalesced scales, sheaths ovate to elliptic-oblong, 1–3 dm. long, usually much broader than the blade and very distinct, entire or with a few teeth toward the apex, blades ligulate, very variable, from acuminate to naturally rounded-apiculate even on the same plant or rounded-emarginate by decay of the point, 4–9 cm. wide, green, concolorous, laxly serrate with antrorse spines to 1 cm. long; scape erect, stout, densely white-lanate; scape-bracts lance-ovate, acute, entire, thin, densely and finely pale-lepidote, the upper ones densely imbricate, the lower sometimes a shorter than the internodes; inflorescence spicate, fertile throughout, ellipsoid or cylindrical, to 15 cm. long, 3–4 cm. in diameter, densely white-lanate with only the petals exposed at first; floral bracts broader than long, truncate, thick, coriaceous, 2-keeled, enfolding the ovary, much shorter than the sepals; sepals suborbicular, 7 mm. long, coriaceous, equally short-connate; petals erect, oblong, emarginate, 15 mm. long, greenish yellow, soon turning black, bearing 2 fimbriate scales well above the base; ovary tomentose; placentae apical; ovules long-caudate.

**MAGDALENA:** In trees, Pueblo Bello, Sierra Nevada de Santa Marta, alt. 960 m., August 1946, *Foster & C. E. Smith, Jr.*, 1465 (GH).

**META:** Epiphytic, dense humid forest, Cano Yerly, Sierra de la Macarena, alt. 450 m., Nov. 25, 1949, *Philipson, Idrobo & Fernández* 1570 (BM). Epiphytic, dense forest, north ridge, central mountains, Sierra de la Macarena, alt. 1,400 m., Dec. 26, 1949, *Philipson & Idrobo* 1948 (BM, US). Epiphytic. Caño Yerli, trail between Río Güejar and Caño Gaupayita, alt. 500–600 m., Dec. 20–26, 1950, *Idrobo & Schultes* 779 (COL). Epiphytic, eastern slopes, Renjifo Massif, extreme northeast of Cordillera La Macarena, alt. 600–1,300 m., Dec. 30, 1950—Jan. 5, 1951, *Idrobo & Schultes* 925 (COL, US).

BRITISH HONDURAS and GUATEMALA to northeastern ARGENTINA.

**36. *Aechmea subpetiolata*** L. B. Smith, Contr. Gray Herb. 124:8, pl. 3. 1939.

Flowering shoot 4 dm. high; leaves over 6 dm. long, sheaths small, elliptic, inconspicuous, blades narrowly elliptic, broadly acute and apiculate, subpetiolate, 75–85 mm. wide, thin, glabrous above, covered beneath with pale appressed scales, minutely serrulate at the base and apex; scape erect, slender; scape-bracts strict, densely imbricate, narrowly lanceolate, acuminate, entire, green, pale-lepidote beneath; inflorescence subcylindrical, 6 cm. long, nearly 4 cm. in diameter, much enlarged in fruit, bearing a small coma at the apex; floral bracts narrowly triangular, pungent, 12 mm. long; flowers sessile; sepals strongly asymmetric, 1 cm. long, sparsely white-lepidote; petals

obtuse and apiculate, slightly exserted, bearing large scales; ovary ellipsoid; placentae apical.

CAUCA: Primaeval forest near La Costa, El Tambo region, alt. 1,500 m., March 1938, *Sneidern* 1593 (S, type, GH phot. 6131, 6132).

37. *Aechmea lalindei* Linden & Rodigas ex Rodigas, Ill. Hort. 30:45. 1883.

Plant 15 dm. high; leaves about 30 in a great rosette, 15–18 dm. long, rigid, blades arching, acute, armed with minute green teeth; scape stout, erect; scape-bracts densely imbricate, the lowest foliaceous, the upper large, elliptic, entire, acute, bright red, massed at the base of the inflorescence; inflorescence ellipsoid or subglobose, densely many-flowered, 12 cm. long, 6 cm. in diameter; sepals elliptic, strongly asymmetric, pilose-lepidote, greenish white with a roseate spot at the apex; petals obtuse, 15 mm. long, white or greenish, often with a violet or red spot at the apex; second series of stamens much connate with the petals.

COLOMBIA: Described from cultivation, *Lalinde* (no herbarium material known); *E. Morren* (K, basis of Bot. Mag. pl. 8107).

COSTA RICA.

Both the original description of *Aechmea lalindei* and its plate indicate entire scape-bracts, while the species associated with it by Baker and Mez have strongly serrate ones.

38. *Aechmea nudicaulis* (L.) Griseb. Fl. Brit. W. Ind. 593. 1864.

*Bromelia nudicaulis* L. Sp. Pl. 286. 1753.

*Billbergia nudicaulis* Lindl. Bot. Reg. 13: under pl. 1068. 1827.

*Hoplophytum nudicaule* K. Koch, Ind. Sem. Hort. Berol. for 1856: App. 6. 1857.

*Hohenbergia nudicaulis* Baker, Saunders Refug. Bot. 4: under pl. 284. 1871.

*Pothuava nudicaulis* Regel, Gartenflora 31:291. 1882.

? *Tillandsia serrata* Sessé & Moc. Fl. Mex. ed. 2. 81. 1894.

Plants very variable in proportions, 3–7 dm. high; leaves numerous in a dense fasciculate rosette, 3–10 dm. long, sheaths large, elliptic, forming an urceolate pseudobulb, purple or castaneous, densely and finely brown-lepidote, blades broadly obtuse and apiculate, 6–10 cm. wide, coriaceous, densely pale lepidote beneath, glabrous above, spinose-serrate with coarse black teeth up to 4 mm. long; scape slender, erect or arching, white-floccose; scape-bracts imbricate, congested below the inflorescence, elliptic, acute, red; inflorescence cylindric, fertile throughout, 5–25 cm. long, pale-floccose-lepidote, becoming glabrous; floral bracts minute or sometimes wanting; flowers 22 mm. long; sepals very asymmetric, 5–10 mm. long, free; petals ligulate, acute, 12 mm. long, yellow, bearing 2 fimbriate scales; ovary subglobose, the epigynous tube conspicuous; placentae central; ovules short-caudate.

COLOMBIA: *Cuming* (f. Mez).

MEXICO and the WEST INDIES to ECUADOR, TRINIDAD and VENEZUELA and two varieties in BRASIL.

### 17. *Billbergia*

*Billbergia* Thunb. Pl. Bras. Dec. 3:30. 1821.

*Eucallias* Raf. Fl. Tell. 4:25. 1838.

*Jonghea* Lem. Jard. Fleur. 2: sub pl. 181/182. 1852.

*Cremnobotrys* Beer, Flora 37:348. 1854.

*Helicodea* Lem. Ill. Hortie. 11: pl. 421. 1864.

Plants stemless; leaves rosulate or rarely fasciculate, sheaths large, blades ligulate; scape erect or arching; scape-bracts red, thin; inflorescence simple in the Colombian species; petals free, spirally recurved at anthesis (subgenus *Helicodea*) in the Colombian species, bearing 2 scales near the base, claw long, blade narrow; stamens exerted at anthesis, both series free or the second joined to the petals only as high as the scales; pollen-grains usually with longitudinal folds when dry but no pores; style exceeding the stamens; epigynous tube evident; ovules many.

Southern Mexico to Bolivia and northern Argentina.

### KEY

1. Floral bracts obtuse and apiculate, the lower ones exceeding the ovary; sepals broadly ovate, 10 mm. long . . . **1. *B. macrolepis***
1. Floral bracts narrowly triangular, at most equaling the ovary; sepals narrowly triangular, 11-14 mm. long . . . **2. *B. rupestris***

1. ***Billbergia macrolepis*** L. B. Smith, Contrib. Gray Herb. 114:3, pl. 1, fig. 6. 1936.

*Billbergia pallidiflora* sensu Mez in DC. Monogr. Phan. 9:303. 1896, in part.

Plant 1 meter or longer when extended; leaves to 12 dm. long, sheaths elliptic, large, blades linear-triangular, acuminate, 3 cm. wide, sparsely serrate with nearly straight teeth 3 mm. long, entire toward the apex, densely pale-lepidote, gray-green, marked beneath with large white spots; scape decurved, 3-4 mm. thick, sparsely white-floccose at first; scape-bracts imbricate, lanceolate, acuminate, to 24 cm. long, white-floccose; inflorescence cylindrical, to 4 dm. long, lax, many-flowered, densely white-farinose; floral bracts spreading or reflexed, narrowly oblong or the uppermost ovate, to 35 mm. long, membranaceous, dark brown when dry; flowers sessile, suberect to spreading; sepals symmetric, broadly acute and apiculate, equal, coriaceous, nerved; petals acute, to 43 mm. long, bronze-green; ovary subglobose, 15 mm. long, coarsely sulcate with the ridges soon glabrous, epigynous tube 3 mm. long.

NORTE DE SANTANDER: High in trees, Petrolea, alt. 60 m., Sept. 24, 1946, Foster 1792 (COL, GH).

COSTA RICA, PANAMA, VENEZUELA.

2. *Billbergia rupestris* L. B. Smith, *Caldasia* [1], No. 5:6, fig. 1. 1942.

FIGURE 87

Plant over 1.3 meters long with the inflorescence extended; leaves over 1.5 m. long, minutely appressed-lepidote, sheaths large but scarcely wider than the blades, blades 11 cm. wide, laxly serrate with

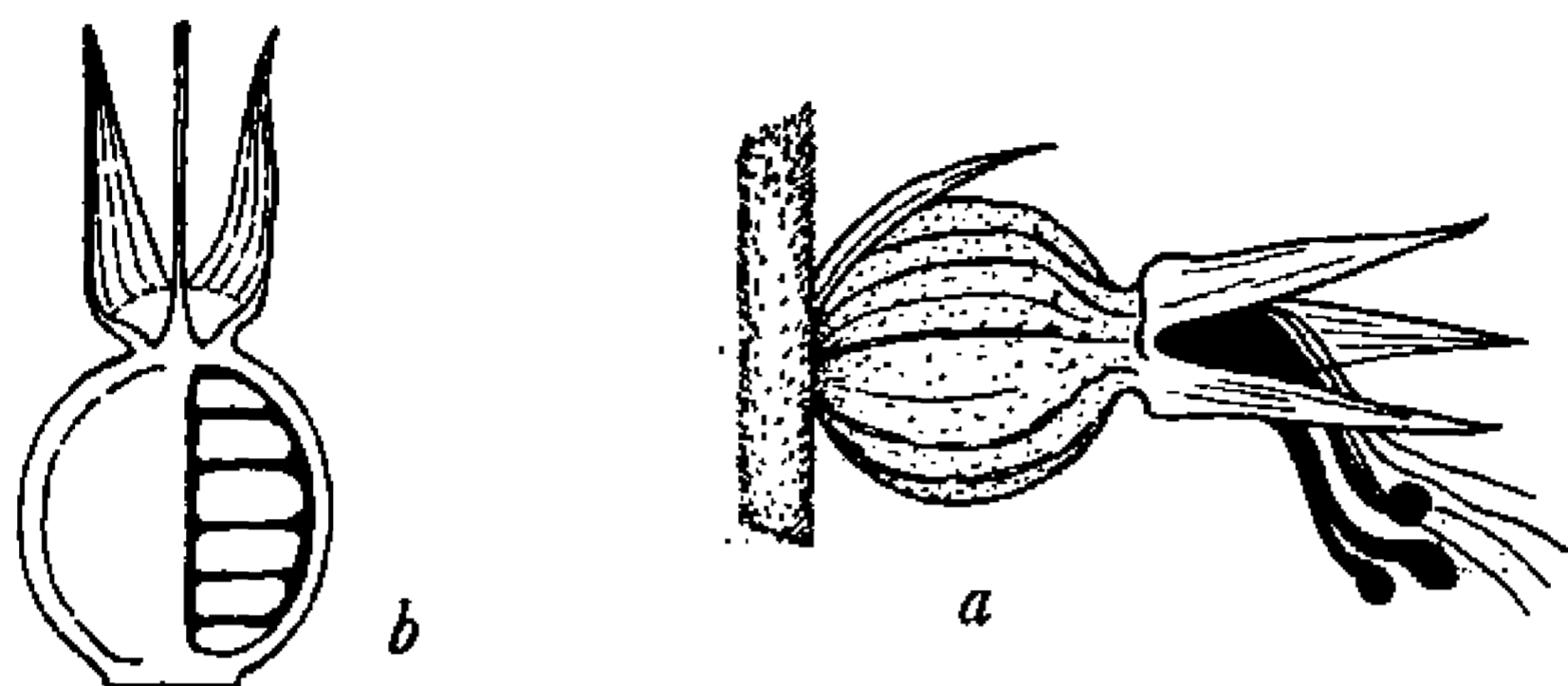


FIGURE 87.—*Billbergia rupestris*: a, Floral bract and fruit with remains of perianth,  $\times 2$  section of fruit,  $\times 2$  (both after Caldasia).

straight dark spines 3–4 mm. long; scape slender, elongate; inflorescence 3–4 dm. long, lax except near the apex, white-farinose; floral bracts membranaceous, the lower ones 2 cm. long and about equaling the ovary; flowers sessile, spreading; sepals equal, acuminate; ovary globose, 12 mm. in diameter, sulcate, epigynous tube short.

VAUPÉS: Epiphytic, mouth of Río Carurú (tributary of Río Vaupés), alt. 230 m., Cuatrecasas 7051 (COL, type, GH phot. 6126).

VENEZUELA, Amazonian BRASIL.

### 18. *Ananas*

*Ananas* Mill. Gard. Dict. Abr. ed. 4. 1754.

*Ananassa* Lindl. Bot. Reg. 13: sub pl. 1081. 1827.

Plant not producing stolons; leaves densely rosulate, scarcely enlarged at base; scape evident, erect; inflorescence densely strobiliform, crowned with a tuft of sterile foliaceous bracts, often producing slips at the base; flowers sessile; sepals free, obtuse, slightly asymmetric; petals free, erect, violet or red, each bearing 2 slenderly funnelliform scales; stamens included, pollen grains ellipsoid with 2 pores; ovaries coalescing with each other and with the bracts and axis to form a fleshy compound fruit, the epigynous tube short; placentae apical; ovules caudate.

Brasil, Guiana, Paraguay. Widely distributed by cultivation throughout the tropics.



## KEY

1. Syncarp 15 cm. long or usually much less, with scant unpalatable flesh at maturity; scape elongate, slender; seeds numerous.

1. *A. ananassoides*

1. Syncarp well over 15 cm. long at maturity with copious palatable flesh; scape stout and usually short; seeds lacking or very rare.

2. *A. comosus*

1. *Ananas ananassoides* (Baker) L. B. Smith, Bot. Mus. Leaflet Harvard 7: 79, pl. 2. 1939. FIGURE 88

*Acanthostachys ananassoides* Baker, Handb. Bromel. 25. 1889.

*Ananas microstachys* Lindm. Svensk. Akad. Handl. 24, No. 8: 39, pl. 7, figs. 20-23. 1891.

*Ananas sativus* var. *microstachys* Mez in Mart. Fl. Bras. 3, pt. 3: 294. 1892.

*Ananas guaraniticus* Bertoni, Monogr. Gen. Ananas in An. Cient. Paraguay, II. No. 4: 274. 1919.

*Ananas comosus* var. *microstachys* L. B. Smith, Contrib. Gray Herb. 104:72. 1934.

Flowering plant over 1 meter high; leaves many, more than 16 dm. long, sheaths densely ferruginous-lepidote, blades linear, long-acuminate, rarely over 35 mm. wide, subdensely serrate with antrorse spines, green, minutely white-lepidote; scape slender, soon glabrous; scape-bracts large, subfoliaceous; inflorescence subcylindric, apical

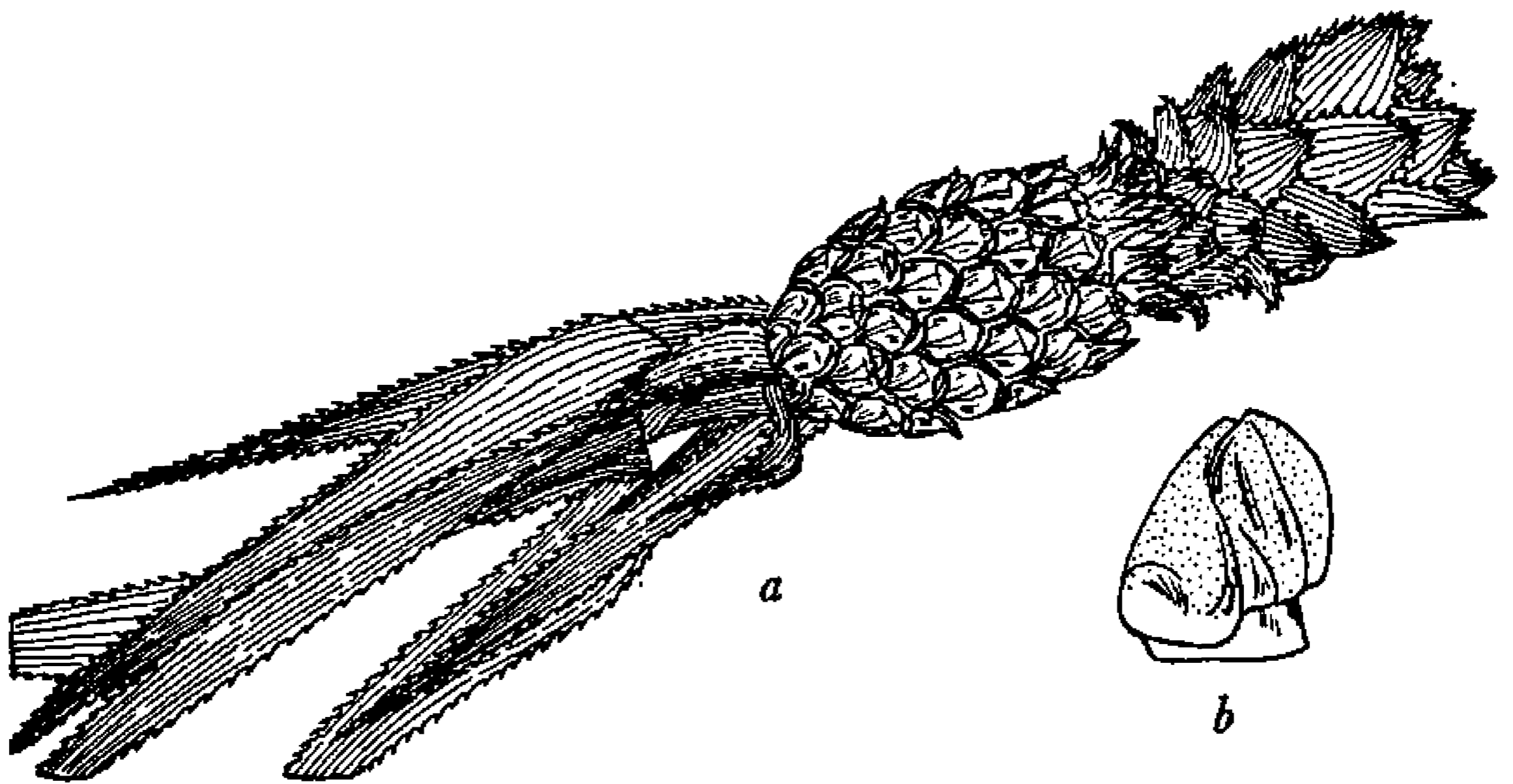


FIGURE 88.—*Ananas ananassoides*: a, Inflorescence,  $\times \frac{1}{2}$ ; b, sepal,  $\times 2$ .

coma small at anthesis but becoming greatly enlarged; floral bracts broadly elliptic, acuminate, 15-20 mm. long, exceeding the sepals, pungent, serrulate; sepals broadly elliptic, 7 mm. long, petals 13-17 mm. long, red or purple; fruit slightly enlarged after anthesis, scarcely edible, readily breaking from the scape; seeds numerous.

VAUPÉS: Caño Pacu, affluent of Vaupés near Tayasú and Circasia, alt. 280 m., March 1944, *Gutiérrez* 651 (GH). Terrestrial, Savanna O-koó-mé-giva, Caño Teemeña, Río Piraparaná (tributary of Río Apaporis), lat. 0°15' S. to 0°25' N., long. 70°30' W., Sept. 6, 1952, *Schultes & Cabrera* 17219 (US). Mountain below Teresita, Río Papurí, May 28, 1953, *Schultes & Cabrera* 19475 (US). On granite rocks by rapids, near Wacaricuara, Río Paca (tributary of Papurí), alt. 195 m., June 1-3, 1953, *Schultes & Cabrera* 19532 (US). On rocks, Río Paraná Pichuna (tributary of Río Vaupés), lat. 1°10' N., long. 70°30' W., alt. 210 m., June 1953, *Schultes & Cabrera* 19910 (US).

AMAZONAS-VAUPÉS: Jino-Gojé, Río Apaporis, alt. 250 m., Aug. 25, 26, 1952. *García-Barriga* 14252 (COL, US, unusually broad leaves).

VENEZUELA, BRASIL, PARAGUAY.

2. *Ananas comosus* (L.) Merrill, *Interpr. Rumph. Amboin.* 133. 1917.

*Bromelia ananas* L. *Sp. Pl.* 285. 1753.

*Bromelia comosa* L. *Herb. Amboin.* 21. 1754; *Amoen. Acad.* 4:130. 1759.

*Ananassa sativa* Lindl. *Bot. Reg.* 13: sub *pl.* 1068. 1827, nomen nudum; Spach, *Hist. Vég.* 12:400. 1846.

*Ananas sativus* Schult. in *R. & S. Syst.* 7, pt. 2: 1283. 1830.

*Ananas ananas* Voss in *Vilm. Blumeng.* ed. 3, 1: 964. 1895.

Leaves coarsely and laxly spinose-serrate; scape short, stout; scape-bracts foliaceous, serrate; inflorescence large, many-flowered; floral bracts soon exposing the apices of the ovaries, relatively inconspicuous, weakly serrulate or entire; syncarp well over 15 cm. long at maturity with copious palatable flesh; seeds lacking or very rare.

META: Villavicencio, alt. 450 m., January 1856, *Triana* 1299 (COL).

VALLE: La Paila, Mar. 16, 1853, *Holton* 150 (GH, PH).

## Excluded and Doubtful Taxa

*Bakerantha* L. B. Smith, *Contrib. Gray Herb.* 104:72. 1934.

*Bakeria* André, *Rev. Hort.* 61:84. 1889 not Seemann 1864.

This monotypic genus was described from cultivated material supposedly originating from Colombia. Actually it is a synonym of *Hechtia* (*H. tillandsioides* (André) L. B. Smith) and is a native of southern Mexico (*Contrib. U. S. Nat. Herb.* 29:431. 1951).

*Guzmania sanguinea* var. *erecta* (André) Mez in *DC. Monogr. Phan.* 9:901. 1896.

*Caraguata sanguinea* var. *erecta* André, *Enum. Bromél.* 5. Dec. 13, 1888; *Rev. Hort.* 60:565. Dec. 16 1888.

The type (*André* 3369 bis) and only material of this concept is so old and fragmentary that it cannot be identified satisfactorily with any previously described in the genus, yet its distinct scape makes it very dubiously conspecific with typical *Guzmania sanguinea*.

*Lindmania pearcei* (Baker) Mez in DC. Monogr. Phan. 9:537. 1896.

*Cottendorfia pearcei* Baker, Handb. Bromel. 128. 1889.

The origin of this species was given as Colombia by Mez in his first monograph but corrected to Bolivia in his second (Contr. Gray Herb. 104:76, 1934).

*Pitcairnia recurvata* (Scheidw.) K. Koch, Ind. Sem. Hort. Berol. for 1857: App. 4. 1858.

*Puya recurvata* Scheidw. Allgem. Gartenzeit. 10:275. 1842.

This species was described from cultivated material supposedly from Brazil, but in the Pflanzenreich, Mez changed the country to "Colombia" apparently on the basis of the synonym *P. polyanthoides* Brongn. This last is much more likely a synonym of *P. maidifolia*, which is already well known in Colombia, than of *P. recurvata* which is native of northern Central America.

*Puya exigua* Mez in DC. Monogr. Phan. 9:495. 1896.

In the absence of any locality data with the type specimen, Mez was forced to conclude that it must have come from either Colombia or Ecuador. However, Lehmann's field notes give this number 6589 as from Cuenca in Ecuador.

*Puya lanata* (H. B. K.) Schult. in R. & S. Syst. 7, pt. 2: 1236. 1830.

*Pourretia lanata* H. B. K. Nov. Gen. & Sp. 1:296. 1816.

Although the original description gave Peru for this species and cited a locality in that country, Mez for some unknown reason changed it to Colombia in both his monographs. Additional collections have verified the range of the species as the area either side of the Peru-Ecuador boundary.

*Puya roezlii* E. Morr. Belg. Hortie. 35:80. 1885.

*Pitcairnia megastachya* Baker, Handb. Bromel. 120. 1889.

Both E. Morren and Baker gave Peru as the country of origin of this species, yet in both of his monographs Mez cited Colombia without any explanation of the change. Subsequent collections have indicated that its homeland is central Peru (Field Mus. Bot. 13:499. 1936).

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