

# THE PIPERACEAE OF COSTA RICA

By WILLIAM TRELEASE

## INTRODUCTION

As a result of the first explorations in Costa Rica by the Swiss botanists Henry Pittier and Adolf Tonduz, Monsieur Casimir De Candolle<sup>1</sup> in 1891 listed for that country 5 species and 2 varieties of the segregable genus *Pothomorphe*, and 1 species of the genus which I have segregated<sup>2</sup> as *Sarcorrhachis*, in addition to 74 differentiated forms of *Piper* and 45 of *Peperomia*. Of the *Pipers*, 33 were described as new; and of the *Peperomias*, 15. A later enumeration,<sup>3</sup> of further collections by the same botanists, reduces the *Pothomorphes* to 3, but (if one may assume names listed in the first enumerations to have been held as valid except when definitely noted as synonyms, for the lists are not formally comparable) increases the differentiated *Pipers* to 135, of which 57 were considered new; and the differentiated *Peperomias* to 79, of which 24 were described as new. By far the larger part of these forms were endemic, so far as available material showed, and with South American affinities.

Since the collections by Pittier and Tonduz, made a generation ago, little has been brought to light except for a few interesting species collected by William R. Maxon, of the United States National Herbarium, until the recent exploration by Paul C. Standley. The privilege of examining his collections has led to the following mono-

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<sup>1</sup> Bull. Soc. Bot. Belg. 30: 197-235. 1891, preceded by a partial enumeration in volume 29, part 2, of the same Bulletin, 1890.

<sup>2</sup> Contr. U. S. Nat. Herb. 26: 16. 1927.

<sup>3</sup> Anal. Inst. Fis.-Geogr. Costa Rica 9:153-180. 1897. This and the list of 1891 were reprinted in the *Primitiae Florae Costaricensis* of Durand and Pittier, and reference is made commonly to the latter. Unfortunately the second contribution is ascribed to volume 8 of the *Anales*; but it actually appeared in volume 9, and, according to Monsieur Pittier, the editor, was published on November 28, 1897—three years earlier than the date of the Belgian *Primitiae* reprint, which is commonly referred to. The very differently repaged and recomposed reprints commonly seen measure 14×21 cm., but direct "separata" of the original constitute a veritable *édition de luxe*, the type-bed (measuring 17×23 cm.) on paper 30×41 cm., and with the unchanged pagination here cited.

graph of all of the Costa Rican Piperaceae, which, as I now see them, number 2 species of *Pothomorphe*, 2 of *Sarcorrhachis*, 290 of *Piper*, and 140 of *Peperomia*—in the last two genera the novelties reaching, respectively, 159 and 71, apart from minor forms and earlier characterized varieties here given specific rank.

It is of interest to note that when Monsieur De Candolle monographed the Piperaceae for the *Prodromus*<sup>4</sup> in 1869 only a few species from Costa Rica had been seen (15 numbers of *Peperomia* and 7 of *Piper*, collected by Hoffmann); but in 1872 he published<sup>5</sup> the results of an examination of a somewhat larger number (14 of *Peperomia* and 21 of *Piper*), collected by Oersted.

The individual collections—including the foregoing—on which the present summation is based, number about 800 specimens of *Peperomia* and 1,300 of *Piper*, made by some 30 botanists, none of whom has preserved representatives of more than 20 *Peperomias* or 30 *Pipers*, except for Pittier and Tonduz (205 *Peperomias*, 523 *Pipers*), and Standley, Rojas Torres, and Valerio (461 *Peperomias*, 616 *Pipers*). Attention should be called to the fact that labels and references are somewhat interchanged in different herbaria as between Pittier and Tonduz, so that their numbers are preferably to be ascribed to them jointly rather than individually.

As a matter of convenience, locality data for Mr. Standley's very numerous collections are cited in greatly abbreviated form, except in the case of type specimens; a full list of the Costa Rican localities in which he collected, with altitudes, date, and geographic data, has already been published.<sup>6</sup>

Notwithstanding the large number of collections that have been made, the localities that they came from constitute but a small fraction of the area of Costa Rica, from which equally large and significant collections remain for the future, since in large part the species appear to be closely localized.

Apparently conditions are especially favorable for the differentiation of the Piperaceae in Costa Rica, which reaches from the Caribbean Sea to the Pacific Ocean, rising into a chain of volcanic peaks separating the two main drainage systems, between which a high central valley or meseta lies—the divide merging into that of Panama at the one end and melting away into the comparative lowlands of Nicaragua at the other. This configuration affords a great range in precipitation, sunshine and evaporation, and temperature, for parts of the lower Pacific slope are arid, while almost daily rain:

<sup>4</sup> DC. *Prodr.* 16<sup>1</sup>: 235<sup>\*\*</sup>–471. 1869.

<sup>5</sup> *Linnaea* 37: 333–390, "1872–1873," actually of July, 1872.

<sup>6</sup> In a paper by Edwin B. Bartram, *Costa Rican Mosses Collected by Paul C. Standley in 1924–1926.* (*Contr. U. S. Nat. Herb.* 26: 51–114. 1928.)

and mist characterize the higher volcanic mountains; and the central meseta is comparable with the great Reventazón Valley, which falls from it on the rainy Caribbean slope.

In his publications on the Costa Rican Piperaceae, Monsieur De Candolle draws attention to the extreme richness of this country in species. The following comparative tabulation of the Piperaceae that I have recognized in several countries of comparable area not only brings this fact out but shows some very striking contrasts in the generic representation and differentiation of the family in these countries—differentiation of forms being far greater on the continent, where *Pipers* predominate, than on the islands, where *Peperomias* predominate.

Country	Area	Genera	Pothomorphe	Manekia	Sarcorrhachis	Piper	Verbuellia	Piperanthera	Peperomia	Total species
	<i>Square miles</i>									
Costa Rica.....	23, 000	4	2	0	2	290	0	0	140	434
Panama.....	32, 400	4	2	0	1	92	0	0	44	139
Cuba.....	44, 200	4	2	0	0	28	2	0	61	93
Hispaniola.....	29, 500	6	2	1	0	28	1	1	58	92
For all West Indies <sup>a</sup> .....		7	2	1	1	66	3	1	79	153

<sup>a</sup> As monographed in 1903 by Monsieur De Candolle.

KEY TO GENERA

Stigmas 2 to 5 (mostly 3 or 4).

Spikes axillary or terminal; plants suffruticose.

Spikes several on a common penduncle.

1. POTHOMORPHE (p. 117).

Spike solitary in the leaf axil, or terminal.

2. SARCORHACHIS (p. 118).

Spikes opposite the leaves, solitary; plants woody. 3. PIPEP (p. 119).

Stigma 1, more or less penicillate; plants herbaceous.

4. PEPEROMIA (p. 185).

1. POTHOMORPHE Miq.

Leaves distinctly peltate.....1. *P. peltata*.

Leaves cordate, not peltate.....2. *P. umbellata*.

1. *Pothomorphe peltata* (L.) Miq. Comm. Phyt. 37. 1840.

*Piper peltatum* L. Sp. Pl. 30. 1753. (Spelled "pelatum.")

*Peperomia peltata* Dietr. Syn. Pl. 1: 142. 1831.

*Lepianthes peltatum* Raf. Sylv. Tellur. 85. 1838.

*Heckeria peltata* Kunth, Linnaea 13: 565. 1839.

*Piper ottonia* Auct., as to Costa Rica.

TYPE LOCALITY: "America calidiora."

RANGE: From Cuba through the West Indies, and on the mainland from northern South America to Mexico.

COSTA RICA: La Colombiana Farm, *Standley* 36718, 36724. Hacienda de Guácimo, *United Fruit Co.* 11. Zent and Guácimo, *Tonduz* 14648. Boca de Zhorquín, *Tonduz* 8546. Boruca, *Tonduz* 3596, 4487, 4782. Matina, *Pittier* 9723. Tuis, *Tonduz* 11522, 11523. Tsuritkub, *Tonduz* 8658. Punta Mala, *Tonduz* 6808. Puerto Viejo and Sarapiquí River, *Biolley* 7440. Tsaki, *Tonduz* 9529. Shirores, *Tonduz* 9269. Río Zhorquín, "Yurquin," *Tonduz* 8546, Naranjo, *Oersted* 884a. Limón, *Stevens* 848, 894. El Arenal, Guanacaste, *Standley & Valerio* 45184. Río Corozal, *Tonduz* 9977.

2. *Pothomorphe umbellata* (L.) Miq. *Comm. Phyt.* 36. 1840.

*Piper umbellatum* L. *Sp. Pl.* 30. 1753.

*Peperomia umbellata* Kunth, *Syn. Pl. Aequin.* 1: 124. 1822.

*Lepianthes umbellatum* Raf. *Sylv. Tellur.* 85. 1838.

*Heckeria umbellata* Kunth, *Linnaea* 13: 569. 1839.

*Piper dombeyanum* Auct., as to Costa Rica.

*Piper subpellatum sidaefolium* Auct., as to Costa Rica.

*Piper umbellatum glabrum* Auct., as to Costa Rica.

TYPE LOCALITY: Hispaniola.

RANGE: Through the West Indies; and on the continent from Peru and Brazil to Mexico.

COSTA RICA: Trejos, *Tonduz* 12865. Turrialba, *Oersted* 906; *Tonduz* 8344. La Palma, *Tonduz* 12608. Carrillo Road, *Tonduz* 2527. Punta Mala, *Tonduz* 6808. Tuis, *Tonduz* 8167, 11522, 11523. Cartago, *Cooper* 341, distributed as J. D. Smith 5920. San José, *Tonduz* 693, 1377, 5023. Peralta, *Stevens* 330, 342, 446. Experiencia Farm, *Stevens* 546b. La Colombiana Farm, *Standley* 36713. Las Pavas, *Standley* 36094. Tilarán, *Standley & Valerio* 44218. San Pedro de Montes de Oca to Curridabat, *Standley* 32776. San Sebastián, *Standley* 49351. Without locality, *Kuntze* 1874.

2. **SARCORHACHIS** Trel.

Spikes axillary-----1. *S. naranjoana*.

Spikes terminal-----2. *S. anomala*.

1. *Sarcorhachis naranjoana* (C. DC.) Trel. *Contr. U. S. Nat. Herb.* 26: 17. 1927.

*Piper naranjoanum* C. DC. *Linnaea* 37: 363. 1872.

TYPE LOCALITY: Naranjo, Costa Rica (*Oersted* 878, the type).

RANGE: Costa Rica; occurring also in Darien, Panama.

COSTA RICA: Río Hondo, plains of Santa Clara, *Cook & Doyle* 616. Hacienda de Zent, *Tonduz* 14646. Juan Viñas, *Tonduz* 1871. El Muñeco, *Standley & Valerio* 50957, with leaves 10-14×15 cm. Quebrada Serena, Tilarán, *Standley & Valerio* 46172.

2. *Sarcorhachis anomala* Trel., sp. nov.

A scandent soft shrub, differing from *S. naranjoana* in its terminal spike (thus resembling the Brazilian *Sarcorhachis obtusa* (Miq.) Trel.),<sup>7</sup> 4×70 mm., on a thickened peduncle 15 mm. long, the depressed berries lenticularly elongated with the rachis.

Type in the U. S. National Herbarium, no. 1,229,452, collected at La Hondura, Province of San José, Costa Rica, altitude 1,300 to 1,700 meters, March 2-4, 1924, by Paul C. Standley (no. 37909).

RANGE: Central mountains of Costa Rica.

<sup>7</sup>*Artanthe obtusa* Miq. *Syst. Pip.* 416. 1844.

*Piper fluminense* C. DC. in DC. *Prodr.* 16<sup>1</sup>: 308. 1869.

<sup>†</sup>*Piper convallariodorum* C. DC. *Bull. Herb. Boiss.* II. I: 356. 1901.

3. PIPER L.

KEY TO SPECIES

1. Leaves palmately nerved.....2.
- Leaves pinnately or multiple nerved.....16.
2. Leaves gibbous or very inequilateral at base.....3.
- Leaves not gibbous, nearly equilateral.....4.
3. Glabrous; leaves scarcely 4 by 13 cm.....2. *P. pertractatum*.
- Puberulent; leaves becoming twice as wide.....3. *P. magnifolium*.
4. Leaves elongate, not cordate.....5.
- Leaves usually about half as broad as long.....7.
5. Glabrous.....6.
- Obscurely papillate.....6. *P. compactum*.
- Puberulent or velvety.....5. *P. san-marcosanum*.
6. Leaves lance-oblong, 3 by 13 cm.....1. *P. virillanum*.
- Leaves subelliptic, twice as wide.....13.
7. Petioles not winged, with the leaves truly cordate.....8.
- Lower petioles often winged, then with cordate blades.....13.
8. Glabrous when mature.....9.
- Obscurely papillate.....6. *P. compactum*.
- At least locally puberulent or velvety.....12.
- Locally subvillous.....7. *P. tilaranum*.
9. Leaves scarcely 6 by 12 cm.....10.
- Leaves becoming 13 to 18 cm. long.....11.
- Leaves becoming distinctly larger.....13.
10. Nerves glandular-granular.....8. *P. adenophlebium*.
- Nerves not glandular-granular.....4. *P. tenuipes*.
11. Leaves minutely pale-dotted beneath.....9. *P. xanthoneurum*.
- Leaves neither dotted nor granular.....10. *P. venulosum*.
12. Leaves scarcely 7 by 8 cm.....13.
- Leaves becoming 10 to 13 cm. long.....11. *P. recuperatum*.
13. Glabrous when mature.....14.
- At least locally velvety or hirtellous.....15.
14. Leaves scarcely 8 by 16 cm.....13. *P. dissimulans*.
- Leaves becoming much larger; stigmas on a disk.....14. *P. smilacifolium*.
15. Leaves scarcely 7 by 11 cm.....12. *P. nicoyanum*.
- Leaves becoming 16 by 18 cm.....15. *P. san-joseanum*.
16. Midrib subequally branched nearly throughout.....17.
- Without strong ascending branches upward.....30.
17. Leaf-base appreciably acute or else equilateral.....18.
- Leaf-base appreciably obtuse or very inequilateral.....22.
18. Leaves scarcely 7 cm. wide.....19.
- Leaves becoming fully 10 cm. wide.....22.
19. Spikes short (25 mm.) and pointed.....34. *P. candelarianum*.
- Spikes elongate.....20.
20. Leaves 3 or 5 nerved from near the base.....29. *P. guanacastense*.
- Leaves not triple-nerved.....21.
21. Fruit deeply sulcate.....30. *P. acuminatissimum*.
- Fruit not deeply sulcate.....27. *P. arleanum*.
22. Leaf-base nearly or quite equilateral.....23.
- Leaf-base distinctly inequilateral.....28.
23. Leaves glabrous above.....24.
- Leaves pubescent on upper side.....27.

24. Leaves glabrous beneath; nerves not impressed	25.
Leaves ciliate, or the many nerves puberulent or impressed	27.
25. Leaves up to 5 by 10 cm	28. <i>P. cyanophyllum</i> .
Leaves becoming distinctly larger	26.
26. Leaves 8 to 10 cm. wide	24. <i>P. asymmetricum</i> .
Leaves becoming one-half wider	25. <i>P. borucanum</i> .
27. Leaves subovate; nerves not impressed	26. <i>P. prismaticum</i> .
Leaves subelliptic; nerves impressed	21. <i>P. sublineatum</i> .
28. Leaves scarcely 12 cm. long, thin and green	16. <i>P. tuberculatum minus</i> .
Leaves distinctly larger, firm	29.
29. Leaves lance-oblong, acute-based	20. <i>P. longepetiolatum</i> .
Leaves broadly oblong	19. <i>P. pseudobumbratum</i> .
Leaves lance-ovate	18. <i>P. obumbratifolium</i> .
Leaves elliptic-ovate	17. <i>P. corozalanum</i> .
30. Leaf-base appreciably acute	31.
Leaf-base appreciably obtuse, or cordate at least on one side	63.
31. Petiole characteristically winged; stigmas borne on a style	119.
Petiole not winged, or else the stigmas sessile	32.
32. Leaves glabrous above, between the nerves	33.
Leaves granular or scabrous or pubescent on both sides	213.
33. Leaves glabrous beneath	34.
Leaves puberulent or pubescent beneath, at least along the nerves	54.
34. Leaves about half as broad as long	35.
Leaves more elongate	40.
35. Spikes short and thick (3 by 25 mm.)	95. <i>P. gracilipedunculum</i> .
Spikes longer and more slender	36.
36. Leaves callous-inrolled at base	204. <i>P. catacryptum</i> .
Leaves not bicalloused at base	37.
37. Leaves barely 4 by 9 cm	38.
Leaves 4 to 5 by 12 cm., lance-ovate	207. <i>P. elliptico-lanceolatum</i> .
Leaves about 6 by 14 cm	39.
Leaves 7 to 9 by 15 cm., elliptic-ovate	77. <i>P. caeruleifolium</i> .
Leaves distinctly larger	22. <i>P. brenesii</i> .
38. Leaves elliptic	210. <i>P. leptoneuron</i> .
Leaves rhombic-ovate	216. <i>P. pablense</i> .
39. Spikes thick, with sterile tip	97. <i>P. decurrens</i> .
Spikes slender	96. <i>P. surubresanum</i> .
40. Leaves bicalloused at base	203. <i>P. urophyllum</i> .
Lowest leaves sometimes truncate-cordate	110.
Leaves neither calloused nor cordate	41.
41. Leaves lance-elliptic	42.
Leaves elliptic-suboblong	47.
Leaves lanceolate	53.
42. Leaves scarcely 12 cm. long	43.
Leaves about 15 cm. long	46.
43. Spikes 30 to 40 mm. long	205. <i>P. tractifolium</i> .
Spikes more elongate	44.
44. Spikes filiform	45.
Spikes 3 mm. thick	218. <i>P. coarctatum</i> .
45. Twigs scarcely sulcate	206. <i>P. concinnifolium</i> .
Twigs strongly sulcate in drying	217. <i>P. carnosicaule</i> .
46. Spikes 50 to 70 mm. long	166. <i>P. arundinetorum</i> .
Spikes about 100 cm. long	219. <i>P. tuisanum</i> .

47. Spikes thick, with slender tip.....	59. <i>P. impube.</i>
Spikes slenderer or longer.....	48.
48. Plants scandent.....	211. <i>P. xanthostachyum.</i>
Plants not scandent.....	49.
49. Spikes filiform.....	50.
Spikes 3 mm. thick.....	51.
50. Nerves from the lower third.....	215. <i>P. heptaneurum.</i>
Nerves from the lower half.....	212. <i>P. stenocladum.</i>
51. Leaf-base slightly inequilateral.....	208. <i>P. diquisanum.</i>
Leaf-base essentially equilateral.....	52.
52. Lower nerves approximate.....	214. <i>P. costaricense.</i>
Nerves not congested below.....	53.
53. Spikes filiform.....	209. <i>P. tenuispicum.</i>
Spikes 3 mm. thick.....	213. <i>P. stenocladophorum.</i>
54. Leaves about half as broad as long.....	55.
Leaves more elongate.....	58.
55. Petioles winged; stigmas borne on a style.....	119.
Petioles not winged, or else stigmas sessile.....	56.
56. Spikes filiform.....	57.
Spikes 3 mm. thick.....	176. <i>P. esquivelanum.</i>
57. Leaves up to 8 by 16 cm.....	175. <i>P. oppressum.</i>
Leaves nearly 10 by 20 cm.....	174. <i>P. epigynium.</i>
58. Petioles winged; stigmas born on a style.....	119.
Petioles not winged, or else stigmas sessile.....	59.
59. Leaves linear-oblong, 2 by 8 cm.....	224. <i>P. linearifolium.</i>
Leaves lance-oblong, twice as long.....	60.
Leaves lanceolate or subelliptic, still larger.....	62.
60. Lower petioles winged; glandular-granular.....	177. <i>P. machadoanum.</i>
Petioles not winged.....	61.
61. Plant scandent.....	199. <i>P. silvivagum.</i>
Plant not scandent.....	179. <i>P. nodosum.</i>
62. Nerves puberulent beneath.....	185. <i>P. disparipes.</i>
Nerves hispid or silky beneath.....	180. <i>P. coactoris.</i>
Pubescence subvillous.....	181. <i>P. villistipulum.</i>
63. Leaves distinctly peltate, large.....	64.
Leaves not peltate.....	65.
64. Leaves regularly ovate, glabrous.....	104. <i>P. peltaphyllum.</i>
Leaves subcordate-ovate, glabrous.....	105. <i>P. veraguense.</i>
Leaves cordate-truncate, subpentagonal, pubescent.....	106. <i>P. copeyanum.</i>
65. Leaves cordate or auricled, large; petiole long.....	66.
Leaves shallow or subtruncate-cordate; petiole moderately long or thick.....	96.
Leaves short-petioled, if cordate.....	113.
66. Auricles acute; stigmas borne on a style.....	107. <i>P. sagittifolium.</i>
Auricles or basal lobes not acute.....	67.
67. Petiole rather thick and winged, or basal lobes unequal.....	68.
Petiole slender; basal lobes subequal.....	90.
68. Sinus lateral, or one lobe large or auricle-like.....	69.
Sinus basal, the lobes scarcely auricle-like if unequal.....	82.
69. Petiole equilong on both sides.....	70.
Petiole observably longer on one side.....	75.
70. Leaves subpandurately elliptic.....	108. <i>P. glabrifolium.</i>
Leaves subpandurately oblong.....	120. <i>P. cenecladum.</i>
Leaves elliptic.....	109. <i>P. pseudo-glabrifolium.</i>
Leaves (with basal auricle) subobovate.....	71.



71. Petiole shorter than the auricle.....121. *P. signatum*.  
 Petiole about equaling the auricle.....72.  
 Petiole longer than the auricle.....73.
72. Leaves not bullulate; plant subhirsute.....122. *P. ciliatifolium*.  
 Leaves bullulate; plant velvety.....123. *P. bullulaefolium*.
73. Nerves puberulent beneath.....124. *P. tinctum*.  
 Pubescence subvillous.....74.
74. Auricle as broad as long.....125. *P. biseriatum*.  
 Auricle twice as long as broad.....126. *P. dasypogon*.
75. Spikes 5 to 6 mm. thick.....76.  
 Spikes long and slender.....77.
76. Petiole fleshy-warty; leaves ovate, puberulent.....127. *P. magnilimbium*.  
 Petiole not fleshy-warty; leaves villous.....128. *P. fimbriulatum*.
77. Pubescence villous.....78.  
 Puberulent or short-pubescent.....80.
78. Leaves bullulate, villous.....135. *P. silvicola*.  
 Leaves not bullulate.....79.
79. Tomentulose-subvillous.....131. *P. exiguispicum*.  
 Essentially glabrous.....130. *P. pseudo-fimbriulatum*.
80. Peduncle nearly 10 cm. long.....132. *P. perlongipes*.  
 Peduncle much shorter.....81.
81. Leaves somewhat pubescent on both sides.....133. *P. auritum amplifolium*.  
 Leaves glabrous beneath.....134. *P. auritifolium*.
82. Leaves subpandurately obovate.....83.  
 Leaves broadly ovate.....84.
83. Nerves hirtellous beneath; twigs crisp-velvety.....129. *P. pentagonum*.  
 Nerves obscurely puberulent.....110. *P. pacacantum*.
84. Leaves scarcely longer than broad.....111. *P. subfuscum*.  
 Leaves more elongate.....85.
85. Not fleshy-warty.....86.  
 Nodes and petioles fleshy-warty.....89.
86. Basal lobes unequal.....87.  
 Basal lobes nearly equal.....88.
87. Leaves broadest at base.....112. *P. ceibense*.  
 Leaves somewhat narrowed below.....113. *P. neurostachyum*.
88. Nerves puberulent beneath.....114. *P. escuadrantum*.  
 Pubescence crisp-velvety.....115. *P. irrasum*.  
 Pubescence crisp-villous.....117. *P. aserrianum*.
89. Petiole shorter than the lobes.....118. *P. cincinnatum*.  
 Petiole longer than the lobes.....116. *P. palmanum*.  
 Petiole subequal to the lobes.....119. *P. clavuliger*.
90. Nerves deeply impressed.....78. *P. corrugatum*.  
 Nerves scarcely impressed.....91.
91. Petiole winged to the end.....79. *P. gibbosum*.  
 Petiole usually unwinged.....92.
92. Sinus U-shaped.....93.  
 Sinus contracted above the base; nerves yellow.....81. *P. omega*.
93. Drying thin and green.....94.  
 Drying firm and bluish.....110.
94. Glabrous.....95.  
 Nerves somewhat puberulent beneath.....80. *P. paulownifolium*.
95. Blade not crossing the petiole.....82. *P. carrilloanum*.  
 Margin connate across the petiole.....83. *P. vallicolum*.



96. Petiole stout, winged; leaves large.....	97.
Petiole slender.....	102.
97. Leaf-base obliquely rounded; petiole warty.....	136. <i>P. mirabile</i> .
Leaf-base narrowly cordate.....	98.
Leaf-base subtruncate-cordate.....	99.
98. Leaves elliptic.....	137. <i>P. evasum</i> .
Leaves ovate.....	138. <i>P. longevillosum</i> .
99. Leaves dark-granular.....	139. <i>P. pittieri</i> .
Leaves not glandular-roughened.....	100.
100. Nerves appressed-pubescent beneath.....	101.
Villous-hirsute.....	141. <i>P. riparense</i> .
101. Nodes and petiole fleshy-warty.....	140. <i>P. trimetræle</i> .
Not fleshy-warty.....	142. <i>P. euryphyllum</i> .
102. Petioles characteristically winged.....	103.
Only the longest petioles, if any, winged above the base.....	108.
103. Spikes elongate.....	104.
Spikes short and thick, with sterile tip.....	119.
104. Leaves suboblong.....	93. <i>P. melanocladum</i> .
Leaves lanceolate.....	72. <i>P. aereum</i> .
Leaves broadly ovate.....	105.
Leaves round-ovate, equilateral.....	106.
105. Stigmas on at least a short style.....	119.
Stigmas sessile.....	73. <i>P. deflexispicum</i> .
106. Plant scandent; leaves 10 cm. wide.....	84. <i>P. aragonense</i> .
Plant bushy.....	107.
107. Leaves 10 cm. wide.....	85. <i>P. perpuberulum</i> .
Leaves becoming 15 by 15 cm.....	86. <i>P. cercidiphyllum</i> .
108. Leaves broadly ovate.....	109.
Leaves obliquely lanceolate.....	112.
109. Leaves drying thin and green.....	74. <i>P. escasuense</i> .
Leaves drying firm and bluish.....	110.
110. Upper leaves narrow and acute-based.....	75. <i>P. tacamahaca</i> .
Leaves all ovate.....	76. <i>P. subvariabile</i> .
Leaves obliquely and broadly elliptic.....	111.
111. Nerves puberulent beneath.....	89. <i>P. cyphophyllum</i> .
Nerves crisp-pubescent beneath.....	92. <i>P. sinuatifolium</i> .
112. Petiole glabrous.....	90. <i>P. falcigerum</i> .
Petiole puberulent.....	91. <i>P. sublaevifolium</i> .
113. Leaves oblanceolate, very obliquely auricled.....	114.
Leaves lance-oblong, deeply cordulate.....	227. <i>P. disparispicum</i> .
Leaves lanceolate, obliquely cordulate.....	149. <i>P. subaspericaule</i> .
Leaves lance-ovate, ovate, or subobovate, obliquely subcordulate.....	115.
Leaves not as above.....	118.
114. Petiole glabrate; nerves puberulent.....	144. <i>P. auriculiferum</i> .
Petiole appressed-pubescent.....	143. <i>P. otophorum</i> .
115. Glabrous; leaves falcately pointed.....	148. <i>P. celatipetiolum</i> .
Nerves puberulent beneath.....	147. <i>P. disparifolium</i> .
Crisp-hairy beneath; twigs and upper side villous.....	146. <i>P. insolens</i> .
Generally villous.....	116.
116. Leaves scabrous.....	145. <i>P. blaauritum</i> .
Leaves scarcely scabrous, small.....	117.
117. Pubescence stiff beneath.....	161. <i>P. polytrichum</i> .
Pubescence soft.....	160. <i>P. rhodostachyum</i> .

118. Petiole mostly winged; stigmas on a style.....	119.
Stigmas sessile, even though petiole winged.....	158.
119. Leaves less than twice as long as broad, or elliptical if slightly longer.....	120.
Leaves about twice as long as broad.....	133.
Leaves more elongate.....	143.
120. Peduncle filiform; villous throughout.....	121.
Peduncle not filiform and villous.....	122.
121. Leaves short-acuminate; spikes with hairy tip.....	31. <i>P. urostachyum</i> .
Leaves narrowly caudate.....	32. <i>P. arcte-acuminatum</i> .
122. Leaves (mature) glabrous above between the nerves.....	123.
Leaves pubescent on both sides.....	131.
123. Leaves glabrous beneath.....	124.
Nerves, at least, pubescent beneath.....	126.
124. Leaves glandular-granular.....	125.
Leaves scarcely granular.....	48. <i>P. submultiplinerve</i> .
125. Upper leaves elliptic and acute-based.....	43. <i>P. pachystylum</i> .
Leaves all equilaterally ovate.....	47. <i>P. labeculatum</i> .
126. Spikes thick and short (10 by 20 mm.).....	127.
Spikes slender or elongate.....	128.
127. Leaves ovate.....	39. <i>P. cuspidispicum</i> .
Leaves elliptic.....	38. <i>P. pubinerve</i> .
128. Petiole winged throughout.....	129.
Petiole winged only below the middle.....	49. <i>P. nudifolium</i> .
Petiole winged only near the base; leaves bullulate.....	33. <i>P. irazuanum</i> .
129. Leaf-base appreciably acute.....	45. <i>P. annulatum</i> .
Leaf-base obtuse or subcordulate.....	130.
130. Leaves scarcely 6 by 12 cm.....	53. <i>P. altevaginans</i> .
Leaves becoming 7 by 16 cm.....	55. <i>P. operosum</i> .
Leaves becoming 9 by 18 cm.....	57. <i>P. zhorquinense</i> .
131. Petiole 5 mm. long.....	41. <i>P. dryadum</i> .
Petiole and spikes elongate.....	132.
132. Leaves strongly bullulate-rugose.....	33. <i>P. irazuanum</i> .
Leaves not bullulate.....	42. <i>P. rufescens</i> .
133. Leaves (mature) glabrous above between the nerves.....	134.
Leaves pubescent on both sides.....	40. <i>P. viridispicum</i> .
134. Leaves glabrous beneath.....	135.
Nerves, at least, pubescent beneath; spikes elongate.....	137.
135. Spikes short and thick.....	136.
Spikes elongate.....	46. <i>P. pseudopropinquum</i> .
136. Flowering internodes short.....	36. <i>P. curtispicum</i> .
Flowering internodes elongate.....	37. <i>P. ripicola</i> .
137. Petioles and twigs glabrate.....	138.
Petioles (and twigs below them) somewhat hairy.....	139.
138. Nerves obscurely puberulent.....	67. <i>P. orosianum</i> .
Nerves velvety-subhirtellous.....	44. <i>P. viridifolium</i> .
Nerves hirtellous-subhirsute.....	66. <i>P. brevistylum</i> .
139. Leaves oblique, subfalcately pointed.....	140.
Leaves nearly equilateral, or else short-acuminate.....	141.
140. Pubescence appressed-silky.....	56. <i>P. subsericeum</i> .
Pubescence upcurved-subvillous.....	54. <i>P. pexum</i> .
141. Nerves subappressed-pubescent.....	142.
Nerves subvillous-hirsute.....	73. <i>P. deflexispicum</i> .
142. Nerves subcrisp-hirtellous.....	58. <i>P. detonsum</i> .
Nerves appressed-pubescent.....	52. <i>P. jubatum</i> .

143. Leaves more than one-third as broad as long-----144.  
 Leaves relatively narrower-----149.
144. Leaves glabrous-----145.  
 Nerves, at least, puberulent or pubescent beneath-----147.
145. Leaves obliquely subcordulate-----69. *P. collostachyum*.  
 Leaves scarcely cordulate-----146.
146. Leaves green-----46. *P. pseudopropinquum*.  
 Leaves bronzing; style obsolete-----72. *P. aereum*.
147. Leaves not cordulate, scarcely 18 cm. long-----137.  
 Leaves cordulate at the narrowed base-----148.
148. Bracts not calcarate-----50. *P. chirripoense*.  
 Bracts calcarately thickened-----51. *P. calcaratum*.
149. Leaf-base not truncate-----150.  
 Leaf-base obliquely truncate-cordulate; subvillous-----155.
150. Petioles and twigs glabrous-----151.  
 Petioles, and usually twigs below them, pubescent-----152.
151. Spikes thick and short (10 by 20 mm.)-----35. *P. artanthopse*.  
 Spikes slenderer and longer-----68. *P. arcessitum*.
152. Leaves at least minutely glandular-granular-----153.  
 Leaves not glandular-granular-----154.
153. Nerves puberulent beneath-----61. *P. tarrazuense*.  
 Nerves crisp-pubescent beneath-----62. *P. subzhorquinense*.
154. Petiole subpuberulent-----65. *P. calvirameum*.  
 Petiole hirsute-----64. *P. sinugaudens*.  
 Petiole subvillous-----60. *P. figlinum*.  
 Crisp-villous-----63. *P. ripense*.
155. Leaves glabrous above-----71. *P. pallidifolium*.  
 Leaves mostly hairy on both sides-----70. *P. tonduzii*.
156. Mature leaves glabrous above between the nerves-----157.  
 Leaves rough or pubescent on both sides-----213.
157. Plants spreading or repent or scandent-----158.  
 Plants not repent or scandent-----169.
158. Leaves glabrous or quickly glabrescent beneath-----159.  
 Nerves, at least, pubescent beneath-----166.
159. Twigs glabrous-----160.  
 Twigs somewhat pubescent; leaves elongate-----165.
160. Leaves about half as broad as long-----161.  
 Leaves more elongate-----162.
161. Leaves scarcely 6 cm. wide-----170. *P. bryogetum*.  
 Leaves nearly twice as wide-----165. *P. conceptionis*.
162. Midrib distinctly nearer one side-----200. *P. reptabundum*.  
 Midrib subcentral-----163.
163. Leaves about 3 by 11 cm-----194. *P. dotanum*.  
 Leaves 5 to 6 cm. wide-----164.
164. Nerving of leaves pinnate-----166. *P. arundinetorum*.  
 Nerving multiple-----169. *P. pseudo-aduncum*.
165. Leaves scant 4 by 11 cm-----198. *P. carpinteranum*.  
 Leaves 5 by 16 cm-----201. *P. flavirameum*.
166. Nerves subvelvety beneath-----168. *P. pendens*.  
 Nerves puberulent beneath-----84. *P. aragonense*.  
 Nerves appressed-pubescent beneath-----167.
167. Many leaves acute-based-----199. *P. silvivagum*.  
 Leaves scarcely acute-based-----168.

168. Leaves not rugose.....	190. <i>P. subdivaricatum</i> .
Leaves becoming subrugose.....	192. <i>P. zonulatispicum</i> .
169. Leaves glabrous or quickly glabrescent beneath.....	170.
Nerves, at least, puberulent or pubescent beneath.....	187.
170. Leaves about half as broad as long, 7 to 10 cm. wide.....	171.
Leaves more elongate, or much smaller.....	176.
171. Leaves about 7 cm. wide.....	172.
Leaves about 10 cm. wide.....	173.
172. Leaves ovate-elliptic.....	77. <i>P. caeruleifolium</i> .
Leaves subquadrate.....	244. <i>P. subquadratum</i> .
173. Nerves from the lower third.....	163. <i>P. scleromyelum</i> .
Nerves from the lower half.....	174.
174. Leaf-base equilateral.....	175.
Leaf-base inequilateral.....	154. <i>P. anisophyllum</i> .
175. All except 2 nerves basal.....	87. <i>P. dumetorum</i> .
Eight nerves from above the base.....	88. <i>P. zentanum</i> .
176. Leaves scant 4 by 15 cm.....	177.
Leaves becoming 5 to 7 or 9 cm. wide.....	180.
177. Leaf-base inequilateral; twigs slender, granular.....	178.
Leaf-base equilateral.....	179.
178. Petiole 10 mm. long.....	197. <i>P. verruculosum</i> .
Petiole scarcely one-half as long.....	196. <i>P. verruculigerum</i> .
179. Upper leaves acute-based.....	37.
Leaves all rounded at base.....	171. <i>P. matinanum</i> .
180. Leaves scant 16 cm. long.....	181.
Leaves becoming 16 to 20 cm. long.....	184.
181. Leaves falcately pointed.....	182.
Leaves not falcate.....	183.
182. Nerves 5 pairs.....	98. <i>P. micranthera</i> .
Nerves 4 pairs, impressed.....	23. <i>P. seductum</i> .
183. Spikes filiform.....	172. <i>P. cabagranum</i> .
Spikes 3 by 70 mm.....	99. <i>P. opacibracteum</i> .
184. Leaves obscurely unguiculate at base.....	100. <i>P. unguiculiferum</i> .
Leaves not unguiculate.....	185.
185. Leaves lance-oblong.....	186.
Leaves lanceolate.....	102. <i>P. terrabanum</i> .
Leaves elliptic-oblong.....	103. <i>P. longistipulum</i> .
186. Leaves cordulate.....	101. <i>P. xiroresanum</i> .
Leaves not cordulate.....	167. <i>P. sulcinervosum</i> .
187. Leaves about half as broad as long.....	188.
Leaves more elongate.....	198.
188. Leaves scarcely 6 by 12 cm.....	189.
Leaves becoming appreciably larger.....	191.
189. Twigs striately hirtellous-hirsute.....	220. <i>P. striatum</i> .
Twigs somewhat hirsute-subvillous.....	190.
190. Some leaves rotund.....	221. <i>P. guacimonum</i> .
Leaves ovate-subelliptic.....	222. <i>P. poasanum</i> .
191. Leaves obliquely cordulate.....	162. <i>P. nigricaulis</i> .
Leaves scarcely cordulate.....	192.
192. Leaf-base nearly equilateral.....	193.
Leaf-base somewhat inequilateral.....	195.
193. Twigs somewhat crisp-pubescent.....	223. <i>P. silvanorum</i> .
Twigs glabrous or quickly glabrescent.....	194.

194. Petiole scarcely 10 mm. long.....	152. <i>P. vicinum</i> .
Petiole becoming twice as long.....	151. <i>P. chrysostachyum</i> .
195. Nerves velvety beneath.....	196.
Nerves appressed-pubescent beneath.....	197.
Nerves subcrisp-pubescent beneath.....	155. <i>P. pseudodilatatum</i> .
196. Spikes about 50 mm. long.....	157. <i>P. uvitanum</i> .
Spikes twice as long.....	158. <i>P. alajuelanum</i> .
197. Twigs and petioles glabrous.....	173. <i>P. blepharilepidum</i> .
Twigs and petioles puberulent.....	150. <i>P. virgultorum</i> .
Twigs transiently soft-pubescent.....	189. <i>P. pubens</i> .
198. Leaf-base equilateral; nerves impressed.....	199.
Leaf-base inequilateral or else the nerves not impressed.....	200.
199. Spikes hooked; peduncle long.....	225. <i>P. pseudo-lanceaefolium</i> .
Spikes not strongly curved.....	164. <i>P. subsessilifolium</i> .
200. Leaves obliquely cordulate, over 15 cm. long.....	201.
Leaves scarcely cordulate, or else smaller.....	202.
201. Nerves puberulent beneath.....	149. <i>P. subaspericaule</i> .
Nerves appressed-hirtellous.....	150. <i>P. virgultorum</i> .
Nerves transiently villous.....	159. <i>P. villosisquamulum</i> .
202. Leaves scarcely 7 by 15 cm.....	203.
Leaves becoming somewhat larger.....	208.
203. Nerves appressed-pubescent beneath.....	204.
Nerves crisp-pubescent beneath.....	207.
204. Twigs quickly glabrescent.....	189.
Twigs more persistently hispid-hirsute.....	205.
Twigs subvillous.....	202. <i>P. pilibaccum</i> .
205. Pubescence of twigs upcurved.....	190. <i>P. subdivaricatum</i> .
Pubescence retrorse.....	206.
206. Twigs pale-granular.....	192. <i>P. zonulatispicum</i> .
Twigs scarcely granular.....	191. <i>P. rotundibaccum</i> .
207. Bracts gray; peduncle 20 mm. long.....	193. <i>P. ejuncidum</i> .
Bracts white; peduncle shorter.....	195. <i>P. pseudo-albuginiferum</i> .
208. Nerves puberulent or papillate beneath.....	209.
Nerves crisp-hairy beneath.....	182. <i>P. tabanicidum</i> .
209. Twigs glabrous.....	210.
Twigs transiently puberulent.....	187. <i>P. imparipes</i> .
Twigs crisp-pubescent.....	183. <i>P. barbulatum</i> .
210. Petiole glabrous.....	211.
Petiole puberulent.....	184. <i>P. umbricola</i> .
211. Nerves rough; twigs granular.....	186. <i>P. papulatum</i> .
Nerves scarcely roughened.....	212.
212. Leaves scarcely 5 cm. wide.....	188. <i>P. leptocladum</i> .
Leaves 6 to 8 cm. wide.....	185. <i>P. disparipes</i> .
Leaves 9 cm. wide.....	178. <i>P. brachistophodum</i> .
213. Leaves about half as broad as long.....	214.
Leaves more elongate.....	244.
214. Leaves scarcely scabrous.....	215.
Leaves granular-roughened or scabrous above.....	219.
215. Pubescence appressed; leaves scarcely rugose.....	216.
Pubescence subhirsute.....	153. <i>P. pelliticaule</i> .
Pubescence villous.....	218.
216. Leaves scarcely 8 by 15 cm.....	217.
Leaves 8 to 9 by 16 to 19 cm.....	285. <i>P. domingense</i> .

217. Peduncle about 15 mm. long	252. <i>P. salinasanum</i> .
Peduncle one-half as long	262. <i>P. verbenanum</i> .
218. Leaves subcordulate	94. <i>P. tortuosipilum</i> .
Leaves not cordulate	156. <i>P. zacatense</i> .
219. Pubescence of nerves appressed	220.
Pubescence crisp or spreading	233.
220. Leaves somewhat rugose, commonly 15 to 18 cm. long	221.
Leaves scarcely rugose	222.
221. Leaves subcordulate, inequilateral	262. <i>P. verbenanum</i> .
Leaves scarcely cordulate	256. <i>P. spicilongum</i> .
222. Twigs pale-granular	223.
Twigs scarcely granular	224.
223. Leaves 6 by 12 cm.	265. <i>P. carminis</i> .
Leaves 16 to 19 cm. long	272. <i>P. punctiunculatum</i> .
224. Leaves 12 to 15 cm. long	225.
Leaves becoming 15 to 20 cm. long	226.
225. Leaves becoming lepidote	274. <i>P. injucundum</i> .
Leaves scarcely lepidote	252. <i>P. salinasanum</i> .
226. Leaves becoming rugose	227.
Leaves scarcely rugose	243. <i>P. tsurikubense</i> .
227. Twigs pale-granular	228.
Twigs scarcely granular	229.
228. Leaves about 5 by 10 cm.	229. <i>P. cartagoanum</i> .
Leaves about 8 by 15 cm.	239. <i>P. bisasperatum</i> .
229. Leaves about 12 cm. long	230.
Leaves 13 to 15 cm. long	232.
Leaves becoming 18 cm. long	253. <i>P. griseo-pubens</i> .
230. Twigs hispid; bracts white	275. <i>P. albuginiferum</i> .
Twigs hirsute-subvillous	231.
231. Leaves brown-granular	269. <i>P. fusco-granulatum</i> .
Leaves white-scabrous	237. <i>P. reventazonis</i> .
232. Leaf-base acute	236. <i>P. echeverrianum</i> .
Leaf-base obtuse	240. <i>P. pavasense</i> .
233. Twigs pale-granular	234.
Twigs scarcely granular	236.
234. Leaves about 10 cm. long	231. <i>P. gonagricum</i> .
Leaves 12 to 15 cm. long	235.
235. Spikes 4 by 50 to 60 mm.	277. <i>P. lanatibracteum</i> .
Spikes twice as long	270. <i>P. baculiferum</i> .
236. Leaves about 10 cm. long	237.
Leaves 12 to 15 cm. long	239.
Leaves becoming 15 to 20 cm. long	241.
237. Leaves blunt-pointed	230. <i>P. sepicola</i> .
Leaves sharply acuminate	238.
238. Peduncle 10 mm. long	233. <i>P. curvipilum</i> .
Peduncle one-half as long	232. <i>P. pejivallense</i> .
239. Twigs subtomentose or subvillous	262. <i>P. verbenanum</i> .
Twigs hispid-hirsute	240.
240. Leaves glistening-punctulate	274. <i>P. injucundum</i> .
Leaves white-scabrous	263. <i>P. valetudinarii</i> .
Leaves transiently pubescent	266. <i>P. coronatibracteum</i> .
241. Leaves glistening-punctulate	268. <i>P. scintillans</i> .
Leaves white-scabrous	242.

242. Spikes not strongly curved.....	243.
Some spikes curved.....	250.
243. Leaves lepidote.....	272. <i>P. punctiunculatum</i> .
Leaves scarcely lepidote.....	243. <i>P. tsurikubense</i> .
244. Leaves scarcely scabrous.....	245.
Leaves granular-roughened or scabrous above.....	247.
245. Nerves appressed-hispid.....	189. <i>P. pubens</i> .
Leaves appressed-hirsute.....	246.
Leaves subvillous.....	156. <i>P. zacatense</i> .
246. Spikes filiform.....	284. <i>P. perhispidum</i> .
Spikes 3 mm. thick.....	238. <i>P. pseudofulgineum</i> .
247. Pubescence of nerves appressed.....	248.
Pubescence of nerves spreading.....	260.
248. Twigs pale-granular.....	249.
Twigs scarcely granular.....	253.
249. Leaves some 12 to 15 cm. long.....	250.
Leaves becoming 15 to 20 cm. long.....	273. <i>P. emollitum</i> .
250. Spikes not strongly curved.....	251.
Spikes hooked or strongly curved.....	226. <i>P. celitidifolium</i> .
251. Twigs glabrous.....	248. <i>P. angullaespicum</i> .
Twigs at least transiently pilose or hispid.....	252.
252. Leaves minutely granular.....	283. <i>P. ventoleranum</i> .
Leaves white-scabrous.....	276. <i>P. phanerolepium</i> .
253. Leaves about 12 to 15 cm. long.....	254.
Leaves becoming 15 to 20 cm. long.....	257.
254. Leaves very lepidote.....	267. <i>P. subhirsutum</i> .
Leaves scarcely lepidote.....	255.
255. Twigs glabrous.....	259. <i>P. torresanum</i> .
Twigs hispid.....	234. <i>P. pergeniculatum</i> .
Twigs transiently subvillous.....	256.
256. Leaves lanceolate.....	242. <i>P. cookii</i> .
Leaves oblanceolate.....	250. <i>P. oblanceolatum</i> .
257. Leaves caudately pointed.....	258.
Leaves scarcely caudate.....	259.
258. Pubescence yellow.....	286. <i>P. flavescens</i> .
Pubescence not yellow.....	287. <i>P. suberythrocarpum</i> .
259. Peduncle velvety.....	260. <i>P. inhorrescens</i> .
Peduncle appressed-pubescent.....	264. <i>P. submolle</i> .
260. Leaves becoming rugose.....	261.
Leaves scarcely rugose.....	274.
261. Twigs pale-granular.....	262.
Twigs scarcely granular.....	265.
262. Leaves 4 by 10 cm., caudate.....	258. <i>P. caudatifolium</i> .
Leaves 12 to 16 cm. long.....	289. <i>P. rugosifolium</i> .
Leaves becoming 15 to 18 or 20 cm. long.....	263.
263. Petiole 10 to 15 cm. long.....	264.
Petiole one-half as long.....	261. <i>P. squali-pelliculum</i> .
264. Nerves flattened above.....	239. <i>P. bisasperatum</i> .
Nerves convallate above.....	254. <i>P. leucophlebium</i> .
265. Leaves about 10 to 15 cm. long.....	266.
Leaves becoming 15 to 20 cm. long.....	272.
266. Leaves very bullulate.....	267.
Leaves openly lacunose.....	289. <i>P. rugosifolium</i> .
Leaves merely rugose.....	268.



267. Leaf-base appreciably obtuse.....	290. <i>P. pseudopsis.</i>
Leaf-base appreciably acute.....	288. <i>P. pileatum.</i>
268. Leaf-base appreciably obtuse.....	269.
Leaf-base appreciably acute; twigs villous.....	246. <i>P. laevius.</i>
269. Leaves scabro-hispid.....	270.
Leaves scabro-hirsute.....	271.
270. Peduncle scarcely 5 mm. long.....	275. <i>P. albuginiferum.</i>
Peduncle twice as long.....	263. <i>P. valetudinarii.</i>
271. Spikes subfiliform.....	251. <i>P. comatum.</i>
Spikes 3 mm. thick.....	249. <i>P. dumeticola.</i>
Spikes 4 by 75 mm.....	282. <i>P. capacibracteum.</i>
272. Leaf-hairs stiff.....	261. <i>P. squali-pelliculum.</i>
Leaf-hairs soft except at base.....	273.
273. Petiole 10 to 15 mm. long.....	254. <i>P. leucophlebium.</i>
Petiole scarcely 10 mm. long.....	245. <i>P. machucanum.</i>
274. Twigs pale-granular.....	275.
Twigs scarcely granular.....	283.
275. Leaves 10 to 15 cm. long.....	276.
Leaves becoming 15 to 20 cm. long.....	281.
276. Twigs quickly glabrescent.....	277.
Twigs persistently pubescent.....	279.
277. Leaf-base appreciably obtuse.....	279. <i>P. pullibracteatum.</i>
Leaf-base appreciably acute.....	278.
278. Leaves granular and lepidote.....	281. <i>P. curridabatanum.</i>
Leaves white-scabrous.....	257. <i>P. trichophlebium.</i>
279. Twigs hispid.....	280.
Twigs hirsute.....	247. <i>P. granulatum.</i>
280. Peduncle short.....	255. <i>P. scalpens.</i>
Peduncle elongate.....	278. <i>P. lanosibracteum.</i>
281. Leaves with hard-based hairs above.....	241. <i>P. talamancanum.</i>
Leaves not hirsute above.....	282.
282. Leaves lepidote.....	267. <i>P. subhirsutum.</i>
Leaves scarcely lepidote.....	280. <i>P. fusco-bracteatum.</i>
283. Leaves about 12 to 15 cm. long.....	284.
Leaves becoming 15 to 20 cm. long.....	287.
284. Leaves not hirsute above.....	285.
Leaves with hard-based hairs above.....	240. <i>P. pavasense.</i>
285. Leaf-base appreciably obtuse.....	250. <i>P. oblanceolatum.</i>
Leaf-base appreciably acute.....	286.
286. Twigs hispid or crisp-pubescent.....	271. <i>P. rectamentum.</i>
Twigs villous-hirsute.....	235. <i>P. genuflexum.</i>
287. Spikes often curved.....	228. <i>P. aduncifolium.</i>
Spikes essentially straight.....	256. <i>P. spicilongum.</i>

1. *Piper virillanum* C. DC. Anal. Inst. Fis.-Geogr. Costa Rica 9: 158. 1897.  
 TYPE LOCALITY: Río Virilla, San José, Costa Rica (*Tonduz* 9831, the type; distributed also as J. D. Smith 7145).

RANGE: Upper Pacific slope of Costa Rica.

COSTA RICA: Río Virilla, *Tonduz* 10127 (distributed also as J. D. Smith 7301).

2. *Piper pertractatum* Trel., sp. nov.

A shrub, nodose, glabrous; flowering internodes slender and short; leaves lanceolate, protracted-acute, gibbously oblique, moderate (3.5 to 4×11 to 13

cm.), palmately 3 or obscurely 5 or 7 nerved; petiole short (scarcely 10 mm.), not winged; spikes as yet some  $2 \times 50$  mm.; peduncle slender, 10 to 15 mm. long; bracts concave.

Type in the U. S. National Herbarium, no. 1,080,638, collected at Nuestro Amo, Alajuela, Costa Rica, February, 1919, by Otón Jiménez.

RANGE: Pacific slope of Costa Rica.

COSTA RICA: Rodeo de Pacaca, *Pittier* 3294. Tilarán, *Standley & Valerio* 45694, 45710. Río Febas, San Juan, ? *Jiménez* 817.

### 3. *Piper magnifolium* (C. DC.) Trel.

*Piper pseudo-lindenii magnifolium* C. DC. *Linnaea* 37: 336. 1872.

TYPE LOCALITY: Naranjo, Costa Rica (*Oersted*).

RANGE: Caribbean slope of Costa Rica.

COSTA RICA: Tuis, *Tonduz* 12293. Tsaki, *Tonduz* 9530. Hacienda de Zent, *Tonduz* 9530, 14650.

### 4. *Piper tenuipes* C. DC. *Bot. Gaz.* 70: 174. 1920.

*Piper medium* Auct., as to Costa Rica.

TYPE LOCALITY: San Ramón, Costa Rica (*Brenes* 14193, the type).

RANGE: Pacific slope of Costa Rica.

COSTA RICA: San Ramón, *Brenes* 14196, 14502. Also, in varying forms: Naranjos Agrios, *Standley & Valerio* 46418, 46488. Los Ayotes, *Standley & Valerio* 45562. Quebrada Serena, *Standley & Valerio* 46226. La Tejona, *Standley & Valerio* 45756, 45854. Capulín, Río Grande de Tárcoles, *Standley*, 40147. Bay of Salinas, *Pittier* 2924. Nicoya, *Tonduz* 13938. Matambú, *Oook & Doyle* 703.

### 5. *Piper san-marcosanum* C. DC. *Anal. Inst. Fis.-Geogr. Costa Rica* 9: 158. 1897.

TYPE LOCALITY: San Marcos, Costa Rica (*Tonduz* 7557, the type).

RANGE: Pacific slope of Costa Rica.

COSTA RICA: La Ventolera, Volcán de Poás, *Standley* 34540. Viento Fresco, Alajuela, *Standley & Torres* 47928.

### 6. *Piper compactum* Trel., sp. nov.

A dense shrub, 2 to 5 meters tall, nodose; flowering internodes slender, elongate, drying dark, glabrous; leaves lance- or ovate-elliptic, mucronately long-acuminate, acute at base or less commonly rounded, moderately small (4.5 to  $5 \times 10$  to 12 cm.), palmately 5 or obscurely 7 nerved, typically minutely papillate at base of the nerves beneath; petiole rather short (10 to 15 mm.), slender, not winged or on the lower leaves winged to the middle, obscurely papillate; spikes in fruit  $4 \times 60$  to 80 mm.; peduncle slender, 15 mm. long, papillate; bracts angular-subpeltate, ciliate; stigmas 3, sessile; berries flask-shaped, somewhat granular.

Type in the U. S. National Herbarium, no. 1,307,255, collected near Santa María de Dota, Province of San José, Costa Rica, altitude 1,500 to 1,800 meters, December, 1925, by Paul C. Standley (no. 41801).

RANGE: High central divide of Costa Rica.

COSTA RICA: Santa María de Dota, *Standley & Valerio* 43184, broader-leaved.

### 7. *Piper tilaranum* Trel., sp. nov.

A shrub 2 to 4 meters tall; nodes sparsely crisp-villous; leaves round-ovate, mucronately long-acuminate, rounded below or subacute at the very base, rather large ( $5.5 \times 12$  to  $11 \times 16$  cm.), palmately 5 nerved, the nerves sparsely crisp-villous at base on both sides; petiole 10 to 20 mm. long, not winged, sparsely villous; spikes (young)  $3 \times 60$  mm.; peduncle 10 mm. long, loosely villous; bracts concave, white-pubescent; stigmas 3, sessile.

Type in the U. S. National Herbarium, no. 1,307,464, collected near Tilarán, Province of Guanacaste, Costa Rica, altitude 500 to 650 meters, January, 1926, by Paul C. Standley and Juvenal Valerio (no. 46596).

RANGE: Pacific slope of central Costa Rica.

COSTA RICA: Tilarán, *Standley & Valerio* 44182, 44247, 46085, 46589, 46995.

8. *Piper adenophlebium* Trel., sp. nov.

A small shrub, scarcely 2 meters tall; flowering internodes transiently puberulent; leaves ovate or elliptic, acuminate, rather rounded at base or subcordately contracted, 4.5 to 6×10 cm., palmately 5 or obscurely 7 nerved, the purple nerves glandular-granular below, glabrous; petiole short (10 mm.), not winged, often puberulent and glandular; inflorescence unknown.

Type in the U. S. National Herbarium, no. 1,307,631, collected at El Muñeco, Province of Cartago, Costa Rica, altitude 1,400 to 1,500 meters, March 6, 7, 1926, by Paul C. Standley and Rubén Torres (no. 51104).

RANGE: Upper Reventazón Valley, Costa Rica.

9. *Piper xanthoneurum* Trel., sp. nov.

A glabrous shrub 3 meters tall; leaves elliptic, subrhombically inequilateral above the middle, acuminate, acute at base, 6 to 8×13 to 15 cm., palmately 5 or obscurely 7 nerved, minutely pale-punctulate beneath with the pale veins more or less moniliformly granular; petiole 10 to 15 mm. long, not winged; spikes (very young) 1×10 mm.; bracts concave, ciliate.

Type in the U. S. National Herbarium, no. 1,229,384, collected on the Cerro de la Carpintera, Province of Cartago, Costa Rica, altitude 1,500 to 1,850 meters, February, 1924, by Paul C. Standley (no. 35505).

RANGE: Upper Reventazón Valley, Costa Rica.

COSTA RICA: Turrialba, ? *Tonduz* 4111; *Cook & Doyle* 369.

10. *Piper venulosum* Trel., sp. nov.

A glabrous shrub 2 to 4 meters tall; leaves broadly lanceolate, attenuate rather than acuminate, subequilaterally acute at base, 4 to 6×11 to 13 cm., palmately 5 or 7 nerved, venulose; petiole 10 to 15 mm. long, not winged; spikes 3×60 to 90 mm. or more; peduncle filiform, 15 to 20 mm. long; bracts concave, glabrate; berries small, oblong, glabrous; stigmas 3, sessile.

Type in the U. S. National Herbarium, no. 716,432, collected near San Ramón, Costa Rica, by A. M. Brenes (no. 14192).

RANGE: Pacific slope of central Costa Rica.

COSTA RICA: Tilarán, *Standley & Valerio* 45702. Peña Blanca, ? *Pittier* 11949. Buenos Aires, ? *Tonduz* 4901.

11. *Piper recuperatum* Trel., sp. nov.

*Piper medium* Auct., as to Costa Rica.

A puberulent shrub; leaves broadly ovate, mucronately acuminate, rounded at base or subtruncate with a deltoid contraction into the petiole, palmately 7 nerved; petiole 8 to 15 mm. long, not winged; spikes 4×60 to 70 mm.; peduncle slender, 10 to 15 mm. long; bracts concave, ciliolate; berries small, ovoid, glabrous; stigmas 3, sessile.

Type in the U. S. National Herbarium, no. 796,471, collected in forests of Santo Domingo de Golfo Dulce, Costa Rica, March, 1896, by A. Tonduz (no. 9927; distributed also as J. D. Smith no. 7134).

RANGE: Lowlands of southwestern Costa Rica.

12. *Piper nicoyanum* C. DC. Bot. Gaz. 70: 174. 1920.

TYPE LOCALITY: Nicoya, Costa Rica (*Tonduz* 13689, the type).

RANGE: Lowlands of northwestern Costa Rica.

COSTA RICA: Nicoya, *Tonduz* 13695, 13696. Las Huacas, Nicoya Peninsula, *Cook & Doyle* 735. El Arenal, *Valerio* 131. Capulín, Río Grande de Tárcoles, *Standley* 40190.

13. *Piper dissimulans* Trel., sp. nov.

*Piper papantlense* Auct., as to Costa Rica.

*Piper plantagineum* Auct., as to Costa Rica.

A glabrous shrub; leaves acuminate, subelliptic and rounded or subacute at base, or the lower leaves broadly ovate and cordate, 5×10 to 8 or 12×16 cm., palmately 7 or 9 nerved; petiole 10 to 15 mm. long and unwinged, or on the lower leaves 20 to 35 mm. long and winged to or beyond the middle; spikes 2 (or in fruit 5) ×80 to 150 mm.; peduncle very slender, 15 to 20 mm. long; bracts rounded-subpeltate, ciliate; berries small, subglobose-oblong, glabrous; stigmas 2 to 4, minute, sessile.

Type in the U. S. National Herbarium, no. 798,447, collected in forests of Las Vueltas, Tucurrique, Costa Rica, altitude 635 meters, November, 1898, by A. Tonduz (no. 12773).

RANGE: Caribbean slope of central Costa Rica.

COSTA RICA: Pejivalle, Cartago, *Standley & Valerio* 46718. Las Pavas, Reventazón, *Pittier* 3186. Juan Vías, *Cook & Doyle* 311. Gloria de Juan Vías, *Pittier* 3659. Río Tuis, *Tonduz* 8168. Turrialba, *Tonduz* 2110, 4110, 8290.

14. *Piper smilacifolium* H. B. K. Nov. Gen. & Sp. 1: 56. 1815.

*Enckea smilacifolia* Kunth, *Linnaea* 13: 605. 1839.

*Piper discophorum* C. DC. Bull. Soc. Bot. Belg. 30<sup>1</sup>: 201. 1891.

TYPE LOCALITY: Caripe, Venezuela.

RANGE: Northern South America to Guatemala, at low altitudes.

COSTA RICA: Surubres, San Mateo (*Biolley* 4047, type of *P. discophorum*). Capulín, Río Grande de Tárcoles, *Standley* 40118, 40143. Matambú, Nicoya Peninsula, *Cook & Doyle* 695. Nicoya, *Tonduz* 13965. Punta Mala, *Tonduz* 6789. Tilarán, *Standley & Valerio* 44189. Hacienda de Guácimo, *Tonduz* 14660. La Palma, *Tonduz* 6733. Puerto Viejo and Sarapiquí River, *Biolley* 6915. Shirores, *Tonduz* 9275. Zhorquín, *Tonduz* 8556, 8594. Finca Montecristo, *Standley & Valerio* 48553. Limón, *Stevens* 850. Río Corozal, *Tonduz* 7142, 9981. Sipurio, *Tonduz* 8705.

15. *Piper san-joseanum* C. DC. *Linnaea* 37: 351. 1872.

*Piper marginatum* Auct., as to Costa Rica.

TYPE LOCALITY: Mount Aguacate, near San José, Costa Rica (*Oersted* 893, the type).

RANGE: Central Costa Rica on the Pacific slope, and Panama.

COSTA RICA: Mount Aguacate, *Oersted* 869, 892, 894. San Juan, Río Virilla, *Tonduz* 12728. Llanos de Turrúcares, *Pittier* 501. Boruca, *Tonduz* 4481, 4661. Rodeo de Pacaca, *Pittier* 1593, 3320, "3820." Carmona, Río Nandayuri, *Jiménez* 393. Escasú, *Standley* 32346. El Bolsón, Guanacaste, *Pittier* 2610. Libano, *Standley & Valerio* 44924. Tilarán, *Standley & Valerio* 44249, 45706. Los Conventillos, Salinas Bay, *Tonduz* 2875.

15a. *Piper san-joseanum* minor Trel., var. nov.

Smaller, with leaves 6.5×10 cm.

Type in the U. S. National Herbarium, no. 577,927, collected at Nicoya, Costa Rica, by A. Tonduz (no. 13695).

RANGE: Pacific lowlands of Costa Rica.

16. *Piper tuberculatum minus* C. DC. in DC. Prodr. 16<sup>1</sup>: 266. 1869.

TYPE LOCALITY: Santa Marta, Colombia (*Balbis*).

RANGE: Colombia to Guatemala.

COSTA RICA: Without locality, *Hoffmann* 749. Aguacaliente, *Oersted* 897. Alajuela, *Smith* 6747. Cartago, *Oersted* 898. San José, *Tonduz* 7306. Surubres, San Mateo, *Biolley* 7051. Sabana de las Chiquizás, *Pittier* 2958. Capulín, Río Grande de Tárcos, *Standley* 40169. Boca Culebra, *Pittier* 12081. Salinas Bay, *Pittier* 2925. Nicoya, *Tonduz* 13693. Bebedero, Guanacaste, *Standley & Valerio* 46680. Tilarán, *Standley & Valerio* 46568. Colonia Carmona, *Jiménez* 363.

17. *Piper corozalanum* Trel., sp. nov.

*Piper geniculatum* Auct., as to Costa Rica.

A glabrous or obscurely hirtellous shrub; leaves broadly subovate-elliptic abruptly short-acuminate, rounded at base and shorter on one side, 9 to 11×17 to 21 cm., pinnately nerved throughout, the nerves about 12×2; petiole scarcely 2+8 mm., winged to the end; spikes 2 to 3×120 to 140 mm.; peduncle 15 mm. long; bracts sublunulate; berries depressed, quadrately elongate with the rachis; stigmas 3, sessile.

Type in the U. S. National Herbarium, no. 796,338, collected along the Río Corozal, near Santo Domingo de Golfo Dulce, Costa Rica, April, 1896, by A. Tonduz (no. 10001; distributed also as J. D. Smith no. 7130).

RANGE: Pacific lowlands of Costa Rica.

COSTA RICA: Santo Domingo de Golfo Dulce, *Tonduz* 9895; distributed also as J. D. Smith 7146. Boca Zacate, Punta Mala, *Tonduz* 6824. Los Ayotes, Tilarán, *Standley & Valerio* 45571. La Tejona, Tilarán, *Standley & Valerio* 45934.

18. *Piper obumbratifolium* Trel., sp. nov.

A shrub, slightly puberulent on the axes and on the nerves beneath; leaves subovate-oblong or elliptic, gradually pointed rather than acuminate, unequally rounded at base or subcordulate on the shorter side, 10 to 15×27 to 30 cm., pinnately nerved nearly to the end, the nerves about 12×2; petiole 5+15 mm., winged to the end; spikes (very young) 2×13 mm., mucronate; bracts roundish-subpeltate, cillolate.

Type in the U. S. National Herbarium, no. 1,307,309 (also as no. 1,307,308), collected near Tilarán, Province of Guanacaste, Costa Rica, altitude 500 to 650 meters, January, 1926, by Paul C. Standley and Juvenal Valerio (no. 44387).

RANGE: Pacific slope of Costa Rica.

19. *Piper pseudobumbratum* C. DC. Anal. Inst. Fis.-Geogr. Costa Rica 9: 171. 1897.

TYPE LOCALITY: El Muelle, Río Sarapiquí, Costa Rica (*Biolley* 7438, the type).

RANGE: Caribbean slope of Costa Rica.

20. *Piper longepetiolatum* (C. DC.) Trel.

*Piper geniculatum longepetiolatum* C. DC. Bull. Soc. Bot. Belg. 30<sup>1</sup>: 201. 1891.

TYPE LOCALITY: El General, Costa Rica (*Tonduz* 3384, the type).

RANGE: Pacific slope of Costa Rica.

COSTA RICA: Los Palmares, *Tonduz* 3391.

21. *Piper sublineatum* Kuntze, Rev. Gen. 2: 565. 1891.

*Piper biolleyi* C. DC. Bull. Soc. Bot. Belg. 30<sup>1</sup>: 210. 1891.

TYPE LOCALITY: Angostura, Costa Rica (*Kuntze*).

RANGE: Caribbean slope of Costa Rica.

COSTA RICA: La Colombiana Farm, *Standley* ? 36679. Carrillo Road (*Tonduz* 2529, type of *P. biolleyi*). Chilamate, *Biolley* 7442. Santa Clara, Las Delicias, *Biolley* 10673. Tsaki, *Tonduz* 9528. Tuis, *Tonduz* 8161, 11526. Shirores, *Tonduz* 9278. Turrialba, *Smith* 4938; *Tonduz* 8385. Juan Viñas, *Cook & Doyle* 257, 289. El Muñeco, *Standley* 33671, 33677; *Standley & Valerio* 51045. Peñavalle, *Standley & Valerio* 46733. Peralta, *Stevens* 413, 535b.—Also, possibly

separable, from the Pacific slope: El General, *Tonduz* 3396. Cabeceras del Diquís, *Pittier* 10598. El Arenal, *Standley & Valerio* 45054, 45159, 45233. Los Ayotes, *Standley & Valerio* 45476. Tilarán, *Standley & Valerio* 44334.

22. *Piper brenesii* C. DC. Bot. Gaz. 70: 180. 1920.

TYPE LOCALITY: San Ramón, Costa Rica (*Brenes* 14190, the type).

RANGE: Pacific slope of Costa Rica.

23. *Piper seductum* Trel., sp. nov.

A glabrous shrub; leaves lanceolate, falcately acuminate, rounded at base, 4.5 to 6×13 to 15 cm., pinnately nerved from the lower half, the longer impressed nerves about 4×2, with shorter nerves upward, chartaceous; petiole scarcely 10 mm. long, winged on the lower leaves; spikes 3×60 to 70 mm.; peduncle 5 mm. long; berries triquetrous; stigmas 3, minute, sessile.

Type in the U. S. National Herbarium, no. 796,210, collected at Madre de Dios, Costa Rica, altitude 50 meters, October, 1896, by H. Pittier (no. 10308).

RANGE: Caribbean lowlands of Costa Rica.

24. *Piper asymmetricum* C. DC. Anal. Inst. Fis.-Geogr. Costa Rica 9: 172. 1897.

TYPE LOCALITY: Río Naranjo, Costa Rica (*Tonduz* 7661, the type).

RANGE: Caribbean border of Costa Rica and Nicaragua.

25. *Piper borucanum* C. DC. Bull. Soc. Bot. Belg. 30<sup>1</sup>: 219. 1891.

TYPE LOCALITY: Boruca, Costa Rica (*Tonduz* 3609, the type).

RANGE: Diquís Valley, Costa Rica.

COSTA RICA: Boruca, *Pittier* 4485. San Ramón, *Tonduz* 17778. Buenos Aires, *Pittier* 4899. Golfo Dulce, ? *Pittier* 9915.

26. *Piper prismaticum* C. DC. Linnaea 37: 342. 1872.

*Piper turrialvanum* C. DC. Linnaea 37: 342. 1872.

TYPE LOCALITY: Turrialba, Costa Rica (*Oersted* 886, the type).

RANGE: Upper Reventazón Valley, Costa Rica.

COSTA RICA: Turrialba (*Oersted* 901, type of *P. turrialvanum*). Pejivalle, *Standley & Valerio* 46764. La Hondura, *Standley* 36145, 37880; *Standley & Valerio* 51835.

26a. *Piper prismaticum magnifolium* (C. DC.) Trel.

*Piper turrialvanum magnifolium* C. DC. Anal. Inst. Fis.-Geogr. Costa Rica 9: 160. 1897.

TYPE LOCALITY: Río Naranjo, Costa Rica (*Tonduz* 7642, the type).

RANGE: Caribbean slope of northeastern Costa Rica.

COSTA RICA: Río Naranjo, *Tonduz* 7653. Guápiles, *Standley* 37154. Alto del Plito, *Tonduz* 7707. Trejos, Las Vueltas, Tucurrique, *Tonduz* 12857 (at Leningrad—the very long spike 10 mm. thick).

26b. *Piper prismaticum tilaranum* Trel., var. nov.

Leaves more elongate than in the type, and sublanceolate.

Type in the U. S. National Herbarium, no. 1,307,400, collected at La Tejona, north of Tilarán, Province of Guanacaste, Costa Rica, altitude 600 to 700 meters, January, 1926, by Paul C. Standley and Juvenal Valerio (no. 45767).

RANGE: Pacific slope of Costa Rica.

COSTA RICA: La Tejona, *Standley & Valerio* 45763, 45832, 45889.

26c. *Piper prismaticum villosulum* Trel., var. nov.

Sparsely and transiently soft-hairy, even on the upper leaf-surface.

Type in the U. S. National Herbarium, no. 1,307,545, collected at Finca Montecristo, below Cairo, Province of Limón, Costa Rica, altitude 25 meters, February, 1926, by Paul C. Standley and Juvenal Valerio (no. 48570).

RANGE: Reventazón Valley, Costa Rica.

COSTA RICA: Finca Montecristo, *Standley & Valerio* 48413, 48548. El Muñeco, *Standley & Torres* 50971, 51234.

27. *Piper arielianum* C. DC. Anal. Inst. Fis.-Geogr. Costa Rica 9: 166. 1897.

TYPE LOCALITY: Valley of La Estrella, Río Ariel, Talamanca, Costa Rica (*Tonduz* 9387, the type).

RANGE: Caribbean slope of Costa Rica.

28. *Piper cyanophyllum* Trel., sp. nov.

A small shrub, glabrous, or with subpuberulent twigs; leaves elliptic-ovate, bluntly subacuminate, rounded or the upper acutish at base, 2×8 to 5×10 cm., pinnately nerved nearly throughout, the nerves 8 or 10×2, slightly granular; petiole 5 mm. long, or on the lowest leaves 25 mm. long and winged to or beyond the middle; spikes (very young) as yet scarcely 1×4 mm., on an equilong filiform peduncle.

Type in the Candollean Herbarium, Geneva, collected along the Río Naranjo, Costa Rica, by A. Tonduz (no. 7576).

RANGE: Caribbean lowlands of Costa Rica.

29. *Piper guanacastense* C. DC. Linnaea 37: 356. 1872.

*Piper trinerve* Auct., as to Costa Rica.

TYPE LOCALITY: Guanacaste, Costa Rica (*Oersted* 862, the type).

RANGE: Pacific slope of Costa Rica.

COSTA RICA: Guanacaste, *Oersted* 863. Colonia Carmona, Guanacaste, *Jiménez* 362. Térraba, *Tonduz* 3599. Santo Domingo de Golfo Dulce, *Tonduz* 10021 (J. D. Smith 7128). Boruca, *Pittier* 4663, 4781; *Tonduz* 3597, 3606. Punta Mala, *Tonduz* 6788. Surubres, San Mateo, *Biolley* 7053. Buenos Aires, *Pittier* 4890. Palmar, *Pittier* 6748. Los Ayotes, Tilarán, *Standley & Valerio* 45478. Nicoya, *Tonduz* 13690. Matambú, *Cook & Doyle* 704.

30. *Piper acuminatissimum* C. DC. Bot. Gaz. 70: 189. 1920.

TYPE LOCALITY: San Carlos, Costa Rica (*Pittier* 16321, the type).

RANGE: Caribbean lowlands of Costa Rica.

COSTA RICA: San Carlos, *Koschny* in 1901.

31. *Piper urostachyum* Hemsl. Biol. Centr. Amer. 3: 57; 5: pl. 72. 1882.

*Piper lanuginosum* C. DC. Anal. Inst. Fis.-Geogr. Costa Rica 9: 159. 1897.

TYPE LOCALITY: Chontales, Nicaragua (*Tate* 319, the type).

RANGE: Caribbean region of Nicaragua and contiguous Costa Rica.

COSTA RICA: Boca Machado, San Juan Valley, *Pittier* 9636. Río Naranjo, *Tonduz* 7519 (type of *P. lanuginosum*). Limón, *Cook & Doyle* 432. La Colombiana Farm, *Stevens* 595; *Standley* 36960. Finca Montecristo, *Standley & Valerio* 48586. Guápiles, *Standley* 37209, 37284. Shirores, *Pittier & Tonduz* 9261. Río Tuis, *Tonduz* 8170.

32. *Piper arcte-acuminatum* Trel., sp. nov.

A small assurgent shrub, sparingly long-villous nearly throughout; leaves round-ovate, abruptly long-slender-acuminate, slightly inequilaterally shallow-cordate, 10 to 13×21 cm., submultiple-nerved from below about the middle, the nerves 7 or 8×2; petiole very short (5 mm.), sheathing below; spikes 3×70 mm. or more, scarcely caudate; peduncle filiform, 30 mm. long; bracts roundish-subpeltate, the pale margin ciliolate.

Type in the U. S. National Herbarium, no. 1,229,715, collected near Guápiles, Province of Limón, Costa Rica, altitude 300 to 500 meters, March, 1924, by Paul C. Standley (no. 37115).

RANGE: Caribbean piedmont of Costa Rica.

COSTA RICA: Guápiles, *Standley* 37093, 37230.



33. *Piper irazuanum* C. DC. *Linnaea* 37: 340. 1872.

*Piper pachystachyon* Auct., as to Costa Rica.

TYPE LOCALITY: Volcán de Irazú, Costa Rica (*Oersted* 866, the type).

RANGE: Central mountains of Costa Rica.

COSTA RICA: Volcán de Irazú, *Brade* 2003; *Tonduz* 4245. Volcán de Barba, *Tonduz* 1330. Rancho Flores, *Tonduz* 2089. Río Poás, *Tonduz* 1708. Mount Candelaria, *Hoffmann* 856.

33a. *Piper irazuanum suborbiculatum* Trel., var. nov.

Conspicuously differing in its obtuse-based or even cordulate leaves ranging from round-ovate or elliptic and 12×17 cm., to elliptic-oblong and 6×13 cm., exceptionally soft-pubescent even above, the thick spikes 50 to 100 mm. long.

Type in the U. S. National Herbarium, no. 1,307,274, collected near Finca La Cima, above Los Lotes, north of El Copey, Province of San José, Costa Rica, altitude 2,100 to 2,400 meters, December, 1925, by Paul C. Standley (no. 42681).

RANGE: Central mountains of Costa Rica.

COSTA RICA: El Copey, *Tonduz* 11904. Laguna de la Escuadra, El Copey, *Standley* 41951. San José, *Pittier* 4245. Las Nubes, *Standley* 38527, 38574, 38764. La Esperanza, Volcán de Irazú, *Standley* 35384.

34. *Piper candelarianum* C. DC. *Linnaea* 37: 357. 1872.

*Piper globosum* C. DC. *Linnaea* 37: 357. 1872, not Poir.

*Piper psilocladum* C. DC. *Bull. Soc. Bot. Belg.* 30<sup>r</sup>: 211. 1891.

*Piper phthinotrichon* Auct., as to Costa Rica.

*Piper lanceolatum* Auct., as to Costa Rica.

TYPE LOCALITY: Mount Candelaria, near San José, Costa Rica (*Oersted* 828, the type).

RANGE: Through Costa Rica in differing but scarcely definable forms.

COSTA RICA: Mount Candelaria, *Oersted* 861 (type of *P. globosum* C. DC.). Cabagra, *Pittier* 6532. Carrillo Road, *Biolley* 3180 (type of *P. psilocladum*). El Muñeco, Río Navarro, *Standley* 33569, 33953; *Standley & Valerio* 50902, ? 51112, 51263. Navarrito, *Lankester* 740. Orosi, *Standley* 39853. Río Reventado, *Cooper* 379 (J. D. Smith 5916). San Blas de Tarrazú, *Jiménez* 1093. Santa María de Dota, *Tonduz* 2273; *Standley* 41744, 41865, 42837; *Standley & Valerio* 43333, 44075. Tuis, *Tonduz* 8174, 11521. Las Vueltas, *Tonduz* 12736. El Arenal, *Standley & Valerio* 45157, 45207. Naranjos Agrios, *Standley & Valerio* 46464, 46529. La Tejona, *Standley & Valerio* 45838. Tilarán, *Standley & Valerio* 46646. Boruca, *Tonduz* 4108. Golfito, *Pittier* 9911.

34a. *Piper candelarianum angustatum* Trel.

*Piper sepium glabrum* C. DC. *Bot. Gaz.* 70: 179. 1920; not *P. glabrum* Mill.

TYPE LOCALITY: Upper Diquís Valley, Costa Rica (*Pittier* 10570, the type).

RANGE: Upper Pacific slope of Costa Rica.

COSTA RICA: La Palma, *Tonduz* 6755.

34b. *Piper candelarianum latifolium* C. DC. *Anal. Inst. Fis.-Geogr. Costa Rica* 9: 167. 1897.

TYPE LOCALITY: Puerto Viejo and Sarapiquí River, Costa Rica (*Biolley* 7439, the type).

RANGE: Caribbean slope of Costa Rica.

COSTA RICA: Río Zhorquín, *Tonduz* 8525. Hamburg Finca, *Standley & Valerio* 48668.

34c. *Piper candelarianum sepium* (C. DC.) Trel.

*Piper sepium* C. DC. *Anal. Inst. Fis.-Geogr. Costa Rica* 9: 168. 1897.

TYPE LOCALITY: Turrialba, Costa Rica (*Tonduz* 8345, the type).

RANGE: Costa Rica.

COSTA RICA: El Coyolar, Alajuela, *Standley* 39980, 40015.

35. *Piper artanthopse* C. DC. Journ. Bot. Brit. & For. 4: 161. 1866.

*Piper oerstedii* C. DC. Linnaea 37: 359. 1872.

TYPE LOCALITY: Mount Aguacate, Costa Rica (*Hoffmann* 687, the type).

RANGE: Pacific slope of Costa Rica.

COSTA RICA: Mount Aguacate, *Hoffmann* 776. Without locality, *Oersted* 884 (type of *P. oerstedii*). About San Ramón, *Brenes* 14188, 14512, 17767.

36. *Piper curtispicum* C. DC. Anal. Inst. Fis.-Geogr. Costa Rica 9: 170. 1897.

TYPE LOCALITY: Río Naranjo, Costa Rica (*Tonduz* 7522, the type).

RANGE: Caribbean lowlands of Nicaragua and Costa Rica.

COSTA RICA: With the type, *Tonduz* 7539 in part.

37. *Piper ripicola* C. DC. Anal. Inst. Fis.-Geogr. Costa Rica 9: 171. 1897.

TYPE LOCALITY: Río Coto, Golfo Dulce, Costa Rica (*Pittier* 9988, the type; distributed also as *J. D. Smith* 7143).

RANGE: Pacific lowlands of southern Costa Rica.

38. *Piper pubinerve* C. DC. Bot. Gaz. 70: 172. 1920.

TYPE LOCALITY: El General, Costa Rica (*Pittier* 10607, the type).

RANGE: Upper Diquís Valley, Pacific slope of Costa Rica.

39. *Piper cuspidispicum* Trel., sp. nov.

*Piper singulare* Auct., as to Costa Rica.

A shrub, glabrous except for the nerves, these puberulent beneath; leaves broadly ovate, acuminate, rounded at base, 9 to 10×14 to 15 cm., or 13×16 cm., multiple-nerved from below the middle, the nerves 4 or 5×2; petiole 20 to 30 mm. long (or 50 mm. in the rounder leaves), winged; spikes 10×20 mm., filiformly caudate; peduncle 10 mm. long; bracts lunulate, glabrate; stigmas 2, thick, on an elongate style.

Type in the U. S. National Herbarium, no. 1,229,390, collected on Cerro de la Carpintera, Province of Cartago, Costa Rica, altitude 1,500 to 1,850 meters, February, 1924, by Paul C. Standley (no. 35642).

RANGE: Upper Reventazón Valley, Caribbean slope of Costa Rica.

COSTA RICA: La Carpintera, *Standley* 35671, 35701; *Pittier* 125. Yerba Buena, Heredia, *Standley & Valerio* 49950, with larger leaves.

40. *Piper viridispicum* Trel., sp. nov.

A small shrub, sparsely crisp-villous throughout; leaves obliquely subelliptic-ovate or obovate, short-acuminate, inequilateral at base with one side subacute, 12×21 cm. or the lower much reduced, pinnately nerved from below the middle, the nerves about 4×2; petiole 5+5 to 10+3 mm. long, winged; spikes 6×20 mm., green; berries subglobose; stigmas 3, thick, on a stout style.

Type in the U. S. National Herbarium, no. 1,307,534, collected at Finca Montecristo, below Cairo, Province of Limón, Costa Rica, altitude 25 meters, February, 1926, by Paul C. Standley and Juvenal Valerio (no. 48536).

RANGE: Lower Reventazón Valley, Caribbean slope of Costa Rica.

COSTA RICA: With the type, *Standley & Valerio* 48599.

41. *Piper dryadum* C. DC. Bull. Soc. Bot. Belg. 30<sup>1</sup>: 221. 1891.

TYPE LOCALITY: Siquirres, Costa Rica (*Pittier* 3193, the type).

RANGE: Pacific lowlands of Costa Rica.

42. *Piper rufescens* C. DC. Bull. Soc. Bot. Belg. 30<sup>1</sup>: 218. 1891.

*Piper nemorense* C. DC. Bull. Soc. Bot. Belg. 30<sup>1</sup>: 222. 1891.

*Piper marequitense* Auct., as to Costa Rica.

TYPE LOCALITY: Juan Vías, Costa Rica (*Tonduz* 1850, the type).

RANGE: Central divide of Costa Rica.

COSTA RICA: Juan Vías, *Tonduz* 1849 (type of *P. nemorense*); *Cook & Doyle* ? 353. El Muñeco, Cartago, *Standley* 33473, 33584; *Standley & Valerio* 50942,

51109 with some leaves subcordate. La Hondura, *Standley* 36124, 38162 with subvillous pubescence. La Palma, *Tonduz* 12664. Without locality, *Kuntze* 2254. Las Cóncevas, *Lankester* K34.

43. *Piper pachystylum* Trel., sp. nov.

A glabrous, somewhat granular-punctulate shrub; leaves elliptic, subacuminate, slightly inequilaterally acute at base, 9×18 cm., submultiple-nerved from the lower half, the nerves 4×2; petiole 15 to 30 mm. long, somewhat winged; spikes 2 to 3×30 to 40 mm.; peduncle filiform, 10 mm. long; ovary obovoid with a short thick style.

Type in the Botanical Garden Herbarium, Brussels, collected at Palmar, Río Grande de Térraba, Costa Rica, by H. Pittier and A. Tonduz (no. 6717).

RANGE: Pacific slope of Costa Rica.

COSTA RICA: Cabagra, near Buenos Aires, *Pittier* 6534.

44. *Piper viridifolium* Trel., sp. nov.

A shrub, hirtellous on the nerves beneath and occasionally below the petioles; leaves elliptic, short-acuminate, the narrowed base rounded or subcordate, 8×16 to 12×22 cm., pinnately nerved from below the middle, the nerves 6×2, dark green above, paler beneath; petiole 10 to 20 mm. long, winged; spikes 6×40 mm.; peduncle slender, 20 mm. long; bracts concave-inflexed; berries depressed, somewhat elongate with the rachis; stigmas 2 or 3, short, on an elongate style.

Type in the U. S. National Herbarium, no. 1,307,622, collected at El Muñeco, Province of Cartago, Costa Rica, altitude 1,400 to 1,500 meters, March, 1926, by Paul C. Standley and Juvenal Valerio (no. 51034).

RANGE: Upper Reventazón Valley, Caribbean slope of Costa Rica.

COSTA RICA: El Muñeco, *Standley & Valerio* 51056. Cartago, *Standley & Valerio* 47109.

45. *Piper annulatum* Trel., sp. nov.

A shrub; leaves elliptic-ovate, acuminate, acute at base, 12×22 cm., subpinnately nerved from below the middle, the nerves 5×2 with the lowermost basal, sparsely white-villous on the nerves beneath; petiole 20 mm. long, transiently subvillous, winged; spikes 4×95 mm., subannularly flowered; peduncle thick, 10 mm. long, transiently subtomentose-villous; bracts triangular-subpeltate, pale-margined, fimbriate; berries ellipsoid, slightly elongate with the rachis; stigmas 3, recurving, on a short style.

Type in the U. S. National Herbarium, no. 1,229,383, collected on Cerro de la Carpintera, Province of Cartago, Costa Rica, altitude 1,500 to 1,800 meters, February, 1924, by Paul C. Standley (no. 35500).

RANGE: High divide of central Costa Rica.

46. *Piper pseudopropinquum* C. DC. *Linnaea* 37: 341. 1872.

TYPE LOCALITY: Turrialba, Costa Rica (*Oersted* 820, the type).

RANGE: Divide of central Costa Rica.

COSTA RICA: Páramo de Abejónal, *Tonduz* 7789. Los Frailes, *Tonduz* 7875. Alajuelita, *Tonduz* 1472. Santa María de Dota, *Standley* 41745, 41802, 42537; *Standley & Valerio* 43279, 43280, 43332.

47. *Piper labeculatum* Trel., sp. nov.

A glabrous black-punctulate herb; leaves elliptic or the lower ovate, short-acuminate, subequally rounded at base or very abruptly subacute, 8 to 11×16 cm., pinnately nerved from below the middle or somewhat higher, the nerves about 5×2; petiole 10 to 25 or even 45 mm. long, winged to beyond the middle; spikes (still very young) 2×15 or 3×60 mm., mucronate, on a short peduncle.

Type in the U. S. National Herbarium, no. 1,307,343, collected at El Arenal, Province of Guanacaste, Costa Rica, altitude 485 to 600 meters, January, 1926, by Paul C. Standley and Juvenal Valerio (no. 45053).

RANGE: Pacific slope of Costa Rica.

COSTA RICA: El Silencio, Guanacaste, *Standley & Valerio* 44656. Tilarát, ? *Standley & Valerio* 44361. El Arenal, *Standley & Valerio* 45211.

48. *Piper submultiplinerve* C. DC. Bot. Gaz. 70: 184. 1920.

TYPE LOCALITY: Valley of Los Arcángelos, Volcán de Irazú, Costa Rica (*Pittier* 13626, the type; "13062").

RANGE: Volcanic mountains of central Costa Rica.

COSTA RICA: San Pablo de Tarrazú, *Jiménez* 1091.

49. *Piper nudifolium* C. DC. Bull. Soc. Bot. Belg. 30<sup>1</sup>: 205. 1891.

TYPE LOCALITY: Río Grande de Térraba, Costa Rica (*Pittier* 3613, the type).

RANGE: Diquís Valley, Pacific slope of Costa Rica.

COSTA RICA: Palmares, Río Grande de Térraba, *Pittier* 3663, 6717, ?12664. Río Hacúm, Buenos Aires, *Pittier* 4891. Río Hur, *Pittier* 11971.

50. *Piper chirripoense* C. DC. Bot. Gaz. 70: 186. 1920.

TYPE LOCALITY: Chirripó, Costa Rica, at 100 meters (*Pittier* 16061, the type).

RANGE: Caribbean lowlands of Costa Rica.

51. *Piper calcaratum* C. DC. Bot. Gaz. 70: 188. 1920.

*Piper calcaratum* C. DC.; Urban, Symb. Ant. 7: 182. 1912, name only.

TYPE LOCALITY: Las Vueltas, Tucurrique, Costa Rica (*Tonduz* 13185, the type).

RANGE: Reventazón Valley, Costa Rica.

52. *Piper jubatum* Trel., sp. nov.

A shrub, crisp-hairy on the petioles and the stem below; leaves elliptic, short-acuminate, the narrowed base slightly inequilaterally cordulate, 6 to 9.5 × 15 to 17 cm., pinnately nerved from below the upper third, the nerves 6 or 7 × 2 and appressed-pubescent beneath; petiole 10 to 15 mm. long, winged; spikes 3 × 60 mm., sterile upward, drying green; peduncle 10 mm. long, obscurely velvety; bracts concave-incurved; berries rather large, subglobose; stigmas 3, short, on a rather short style.

Type in the U. S. National Herbarium, no. 1,229,419, collected at La Colombiana Farm, Province of Limón, Costa Rica, altitude 70 meters, March, 1924, by Paul C. Standley (no. 36812).

RANGE: Caribbean lowlands of Costa Rica.

COSTA RICA: With the type, *Standley* 36779, 36858. Guápiles, *Standley* ?37032, 37124, 37216, 37322.

53. *Piper altevaginans* Trel., sp. nov.

A shrub, crisp-puberulent on the nerves beneath and the petioles, and the stem below them striately crisp-pubescent; leaves elliptic, gradually acute, or short-acuminate, small for the group (3.5 to 5.5 × 8 to 12 cm.), pinnately nerved from below the upper third, the nerves 5 or 6 × 2, granular beneath between the nerves; petiole 3 to 10 or 15 mm. long, winged to the end; spikes scarcely 3 × 30 mm., blunt-mucronate; peduncle 10 mm. long, crisp-pubescent; bracts roundish-subpeltate, ciliolate.

Type in the U. S. National Herbarium, no. 1,229,438, collected near Guápiles, Province of Limón, Costa Rica, altitude 300 to 500 meters, March, 1924, by Paul C. Standley (no. 37316).

RANGE: Caribbean piedmont of central Costa Rica.

54. *Piper pexum* Trel., sp. nov.

A shrub, subvillous-hirsute on the axes and on the nerves beneath; leaves lance-elliptic or ovate, subfalcately acuminate, obliquely cordulate, 5.5 to 7 × 14

to 15 cm., pinnately nerved from below the middle, the nerves some 5+4; petiole 5+2 to 15 mm. long, winged to the middle; spikes 5×95 mm., submucronate; peduncle 10 to 15 mm. long; bracts triangular-subpeltate, ciliate; berries subglobose; stigmas 3, short, on a very short style.

Type in the U. S. National Herbarium, no. 1,307,264, collected along Río Blanco, near El Copey, Province of San José, Costa Rica, altitude 1,800 to 1,900 meters, December 16, 1925, by Paul C. Standley (no. 41887).

RANGE: Central divide of Costa Rica.

55. *Piper operosum* Trel., sp. nov.

A shrub, glabrous except for a hirsute line on the back of the petioles and the stem below, and the appressed-pubescent nerves beneath; leaves elliptic, subacuminate, the somewhat oblique, narrowed base slightly cordulate, 5.5 to 7.5×14 to 16 cm., pinnately nerved from below the upper third, the nerves about 6×2; petiole some 13+2 mm., winged; spikes 3×40 mm., with slender sterile tip; peduncle 5 to 10 mm. long; bracts lunulately inflexed; stigmas 2, on a conical style.

Type in the U. S. National Herbarium, no. 1,307,491, collected near Pejivalle, Province of Cartago, Costa Rica, altitude 900 meters, February, 1926, by Paul C. Standley and Juvenal Valerio (no. 47135).

RANGE: Upper Reventazón Valley, Caribbean slope of Costa Rica.

COSTA RICA: With the type, *Standley & Valerio* 46758.

56. *Piper subsericeum* Trel., sp. nov.

A shrub, sparsely short-silky on the axes and the nerves of the leaves; leaves lance-ovate, long-acuminate, slightly oblique-rounded at base, pinnately nerved from below the middle, the nerves some 6+5; petiole 10 mm. long, winged; spikes as yet very young and minute, submucronate.

Type in the U. S. National Herbarium, no. 1,307,551, collected at Finca Montecristo, below Cairo, Province of Limón, Costa Rica, altitude 25 meters, February, 1926, by Paul C. Standley and Juvenal Valerio (no. 48636).

RANGE: Caribbean lowlands of Costa Rica.

57. *Piper zhorquinense* C. DC. *Anal. Inst. Fis.-Geogr. Costa Rica* 9: 159. 1897.

*Piper submarginense* C. DC. in Donn. Smith, *Enum. Pl. Guat.* 6: 39. 1903 name only.

TYPE LOCALITY: Río Zhorquín, Costa Rica (*Tonduz* 8523, the type).

RANGE: Lower Caribbean slope of Costa Rica.

COSTA RICA: With the type, *Tonduz* 6635, "8543," 8548, 8585. Tsaki, *Pittier* 9531. Shirores, *Tonduz* 9262, 9263, 9273. Río Ariei, *Tonduz* 9381, 9382. Las Vueltas, *Tonduz* 13185bis (distributed also as J. D. Smith 7563; type of *P. submarginense*). Trejos, Tucurrique, *Tonduz* 12868. Carrillo Road, ? *Tonduz* 2523.

58. *Piper detonsum* Trel., sp. nov.

A shrub, somewhat crisp-hirtellous on the axes and petioles, and on the nerves beneath; leaves elliptic-sublanceolate, acuminate, nearly equilaterally subacute at base, 5.5 to 7×17 cm., pinnately nerved from below the upper third, the pale nerves about 6×2; petiole 10 to 15 mm. long, winged; spikes 3×30 to 50 mm., pointed; peduncle 10 to 15 mm. long; bracts concave-inflexed; berries subglobose or depressed-ellipsoid; stigmas 2, on a deciduous style.

Type in the U. S. National Herbarium, no. 1,307,305, collected near Tilarán, Province of Guanacaste, Costa Rica, altitude 500 to 650 meters, January, 1926, by Paul C. Standley and Juvenal Valerio (no. 44314).

RANGE: Pacific slope of Costa Rica.

COSTA RICA: Tilarán and vicinity, *Standley & Valerio* 44451, 44601, 44650a, 44656 in part, 44765, 44895, 45156, 45180, 45354, 45375, 45424, 45515, 45540, 45765, 45877, 45896, 45898, 46186, 46189, 46483, 46484, 46538.

59. *Piper impube* Trel., sp. nov.

A small glabrous shrub; leaves oblong, subacute at both ends, 3 to 4×10 to 14 cm., pinnately nerved from below the middle, the nerves about 4×2; petiole 1 cm. long, winged; spikes (young) 3×8 mm., caudate, on a slender equilong peduncle; bracts concave-inflexed.

Type in the U. S. National Herbarium, no. 1,307,457, collected at Naranjos Agrios, Province of Guanacaste, Costa Rica, altitude 600 to 700 meters, January 29, 1926, by Paul C. Standley and Juvenal Valerio (no. 46494).

RANGE: Pacific slope of Costa Rica.

COSTA RICA: Quebrada Serena, Tilarán, *Standley & Valerio* 46153, 46224, 46235.

60. *Piper figlinum* Trel., sp. nov.

A shrub, crisp-villous on and below the petioles, and toward the base of the leaves beneath; leaves long-lanceolate, gradually pointed, somewhat inequilaterally obtuse at base, 4.5 to 5×12 to 17 cm., pinnately nerved from below the middle, the nerves about 5×2; petiole 10 to 20 mm. long, winged; spikes (very young) 2×20 mm., with filiform apex, drying red.

Type in the U. S. National Herbarium, no. 1,307,280, collected near Santa María de Dota, Province of San José, Costa Rica, altitude 1,500 to 1,800 meters, December, 1925, by Paul C. Standley and Juvenal Valerio (no. 43112).

RANGE: High divide of central Costa Rica.

61. *Piper tarrazuense* Trel., sp. nov.

A shrub, glabrous except for the transiently crisp-pubescent petioles and twigs below and the puberulent nerves beneath; leaves lanceolate, acuminate, slightly inequalilateral at base with at least the longer side rounded, 4.5 to 5×15 cm., glandular-granular beneath, pinnately nerved from below the middle, the nerves 4×2; spikes slender and elongate; peduncle 15 mm. long; bracts concave-inflexed; berries depressed-ellipsoid; stigmas 3, on a tapering style.

Type in the U. S. National Herbarium, no. 1,080,654, collected at San Pablo de Tarrazú, Costa Rica, by Otón Jiménez (no. 1095).

RANGE: Mountains of central Costa Rica.

62. *Piper subzhorquinense* C. DC., sp. nov.

*Piper subzhorquinense* C. DC. in herb.

A shrub, sparsely subtomentulose on and below the petioles; leaves narrowly lanceolate, gradually subattenuate, the narrowed base obtuse, 4.5 to 6×17 to 20 cm., pinnately nerved from below about the upper fourth, the nerves about 6×2, sparsely crisp-pubescent on the nerves beneath; petiole 5 to 10 mm. long, winged to above the middle; spikes 3×25 to 40 mm., with a glabrate filiform sterile tip 3 to 10 mm. long; peduncle filiform, 10 mm. long; ovary glabrate; stigmas 3, on an evident style.

Type in the U. S. National Herbarium, no. 577,384, collected at Cañas Gordas, Costa Rica, altitude 1,100 meters, February, 1897, by H. Pittier (no. 11029).

RANGE: Southeastern Costa Rica.

COSTA RICA: With the type, ? *Pittier* 11024, 11030.

63. *Piper ripense* C. DC. Anal. Inst. Fis.-Geogr. Costa Rica 9: 169. 1897.

TYPE LOCALITY: Puerto Viejo, Costa Rica (*Biolley* 7444, the type).

RANGE: Caribbean piedmont of Costa Rica.

64. *Piper sinugaudens* C. DC. Bot. Gaz. 70: 188. 1920.

TYPE LOCALITY: Buena Vista, Costa Rica (*Cook & Doyle* 150, the type).

RANGE: Santa Clara piedmont, Caribbean slope of Costa Rica.



65. *Piper calvirameum* C. DC. Bull. Soc. Bot. Belg. 30<sup>1</sup>: 200. 1891.

TYPE LOCALITY: Carrillo Road, Costa Rica (*Biolley* 3182, the type).

RANGE: Caribbean piedmont of Costa Rica.

COSTA RICA: Aragón, *Pittier* 13235. Guápiles, *Standley* 37191, 37068, 37079. Finca Montecristo, *Standley & Valerio* 48563. Trejos, Las Vueltas, ? *Tonduz* 12868. Santa Clara, Las Delicias, *Biolley* 10672, 10674, 10677. Tuis, *Tonduz* 11520. Río Naranjo, *Tonduz* 7552.

66. *Piper brevistylum* C. DC. Anal. Inst. Fis.-Geogr. Costa Rica 9: 158. 1897.

TYPE LOCALITY: Puerto Viejo and Sarapiquí River, Costa Rica (*Biolley* 7436, the type).

RANGE: Caribbean piedmont of Costa Rica.

67. *Piper orosianum* Trel., sp. nov.

A shrub, glabrous except for the obscurely and evanescently crisp-puberulent nodes, petioles, and nerves beneath; leaves lance-elliptic, gradually acuminate, nearly equilaterally acute at base, 5.5 to 6×16 to 18 cm., pinnately nerved from below about the middle, the nerves about 5×2, glossy green, drying rather papery; petiole scarcely 10+2 mm. long, winged to the middle; inflorescence unknown.

Type in the U. S. National Herbarium, no. 1,229,723, collected at Orosí, Province of Cartago, Costa Rica, March, 1924, by Paul C. Standley (no. 39764).

RANGE: Upper Reventazón Valley, Costa Rica.

68. *Piper arcessitum* Trel., sp. nov.

A shrub, glabrous except for the velvety nerves beneath; leaves narrowly elliptic, attenuate or acuminate with an abrupt filiform tip 2 to 5 mm. long, the narrowed base cordulate, 5 to 6.5×16 to 22 cm., pinnately nerved from below the middle, the nerves about 6×2; petiole 15 to 20 mm. long, winged; spikes 4×25 mm.; peduncle 5 mm. long; bracts concave-inflexed; stigmas 2 or 3 on a rather slender style.

Type in the U. S. National Herbarium, no. 1,307,650, collected at El Muñeco, Province of Cartago, Costa Rica, altitude 1,400 to 1,500 meters, March, 1926, by Paul C. Standley and Rubén Torres (no. 51357).

RANGE: Upper Reventazón Valley, Caribbean slope of Costa Rica.

COSTA RICA: With the type, *Standley & Valerio* 50949. Juan Viñas, *Tonduz* 1870.

69. *Piper collostachyum* C. DC. Bull. Soc. Bot. Belg. 30<sup>1</sup>: 212. 1891.

TYPE LOCALITY: Valley of El General, Costa Rica (*Tonduz* 3382, the type).

RANGE: Pacific slope of Costa Rica.

COSTA RICA: With the type, *Tonduz* 3386, 3389, 3390. Without locality, *Pittier* 7539 in part. Madre de Dios, *Pittier* 6308.

70. *Piper tonduzii* C. DC. Anal. Inst. Fis.-Geogr. Costa Rica 9: 170. 1897.

*Piper nanum* C. DC. Bot. Gaz. 70: 180. 1920.

TYPE LOCALITY: Shirores, Talamanca, Costa Rica (*Pittier* 9280, the type).

RANGE: Caribbean slope of Costa Rica.

COSTA RICA: Las Vueltas, *Tonduz* 13186. Guápiles, *Standley* 37156, 37348. Pejivalle, *Standley & Valerio* 47077. Guácimo, *Tonduz* 14659, the type of *P. nanum*. La Colombiana Farm, *Standley* 36884. Finca Montecristo, *Standley & Valerio* 48436. Estrella, *Lankester* K85.

70a. *Piper tonduzii* semiherbaceum Trel., var. nov.

A low, spreading, dingy-villous half-shrub; leaves lanceolate, somewhat falcately subacuminate, obliquely cordulate, 4×12 cm., pinnately nerved from below the upper third, the nerves 4 or 5×2, rugose, impressed-punctulate and



glabrate above; petiole scarcely 8+2 mm. long, winged below; spikes 4×40 mm.; peduncle 5 to 7 mm. long; bracts lunulate-inflexed, ciliate; berries large, depressed, elongate with the rachis; stigmas 2, on a deciduous style.

Type in the U. S. National Herbarium, no. 1,307,443, collected at Quebrada Serena, near Tilarán, Province of Guanacaste, Costa Rica, altitude 700 meters, January 27, 1926, by Paul C. Standley and Juvenal Valerio (no. 46261).

RANGE: Pacific slope of Costa Rica.

COSTA RICA: About Tilarán, *Standley & Valerio* 44751, 46160, 46261.

71. *Piper pallidifolium* C. DC. Bot. Gaz. 70: 176. 1920.

TYPE LOCALITY: Banks of the Río Ariel, Costa Rica (*Pittier* 9392, the type).

RANGE: Caribbean lowlands of Costa Rica.

72. *Piper aereum* Trel., sp. nov.

A glabrous shrub; leaves lance-oblong, gradually acute, obliquely rounded or subtruncate at base, 3 to 6×10 to 15 cm., submultiple-nerved from below the middle, with 3 or 4 nerves on each side, bronzing beneath; petiole 15 to 30 mm. long, winged; spikes 4×120 mm.; peduncle 15 mm. long; bracts lunulate-incurved, glabrous; ovary slightly pointed.

Type in the U. S. National Herbarium, no. 1,229,481, collected near Orosi, Province of Cartago, Costa Rica, March 30, 1924, by Paul C. Standley (no. 39842).

RANGE: Upper Reventazón Valley, Costa Rica.

COSTA RICA: El Muñeco, Río Navarro, *Standley* 33650; *Standley & Valerio* 50891, 50970, 51205, 51210; *Standley & Torres* 51379.

73. *Piper deflexispicum* Trel., sp. nov.

A subvelvety shrub; leaves ovate, subacuminate, obliquely truncate-subcordulate or equilaterally rounded at base, 7 to 9×14 to 18 cm., submultiple-nerved with 2 upcurved nerves on each side from the lower half and 2 or 3 from the base, the nerves subvillous beneath toward the base; petiole 20 to 45 mm. long, winged; spikes pendent, 5×120 to 140 mm.; peduncle filiform, 20 to 25 mm. long; bracts quadrately subpeltate, fimbriulate; berries obovoid, pointed; stigmas 3, filiform, subsessile.

Type in the U. S. National Herbarium, no. 1,307,512, collected at Viento Fresco, Province of Alajuela, Costa Rica, altitude 1,600 to 1,900 meters, February 13, 1926, by Paul C. Standley and Rubén Torres (no. 47764).

RANGE: High central divide of Costa Rica.

COSTA RICA: With the type, *Standley & Torres* 47779. About Fraijanes, *Standley & Torres* 47568, 47576, 47593. El Muñeco, Río Navarro, Cartago, ?*Standley & Torres* 51349. Cerros de Zurquí, Heredia, *Standley & Valerio* 50354. Yerba Buena, *Standley & Valerio* 49899, with bronzing leaves. Cerro de las Caricias, *Standley & Valerio* 51963, 52049. Orosi, *Standley* 39723.

74. *Piper escasuense* Trel., sp. nov.

A glabrous shrub; leaves ovate or elliptic-ovate, acuminate, equilaterally shallowly and openly cordate, 6 to 10×15 to 18 cm., submultiple-nerved from below the middle, the nerves 4 or 5×2, drying thin; petiole 25 to 45 mm. long, the longest winged to or beyond the middle; inflorescence unknown.

Type in the U. S. National Herbarium, no. 1,229,677, collected on Cerro de Piedra Blanca, above Escasú, Province of San José, Costa Rica, January 31, 1924, by Paul C. Standley (no. 32627).

RANGE: High central divide of Costa Rica.

75. *Piper tacamahaca* Trel., sp. nov.

A glabrous shrub; leaves lanceolate, subacuminate, and acute-based above, the lower ovate and cordate, 3.5×10, 5×13, or 8×15 cm., submultiple-nerved.

with 4 to 6×2 nerves from below the middle or upper third, drying firm and blue-green, or bronzing beneath; petiole 10 to 20 mm. long, not winged; spikes 2×60 mm.; peduncle 10 mm. long; bracts roundish-subpeltate, glabrous.

Type in the U. S. National Herbarium, no. 1,229,355, collected at La Ventolera, southern slope of Volcán de Poás, Costa Rica, altitude 1,700 meters, February, 1924, by Paul C. Standley (no. 34578a).

RANGE: Central mountains of Costa Rica.

COSTA RICA: With the type, *Standley* 34533, 34666, 34736. Cerro de la Carpintera, Cartago, *Standley* 35772. Volcán de Poás, ? *Pittier* 2958.

76. *Piper subvariabile* Trel., sp. nov.

A shrub, essentially glabrous; leaves lance- or elliptic-ovate, gradually pointed, subequilaterally shallowly cordate, 9 to 12×18 to 24 cm., submultiple-nerved from below the upper third, the nerves 4 or 5×2; petiole 20 to 25 mm. long, not winged; spikes 3×70 mm.; bracts inconspicuous, concave; berries minute, obpyramidally triquetrous; stigmas minute, sessile.

Type in the U. S. National Herbarium, no. 1,307,334, collected near Tilarán, Province of Guanacaste, Costa Rica, altitude 500 to 650 meters, January, 1926, by Paul C. Standley and Juvenal Valerio (no. 44970).

RANGE: Pacific slope of Costa Rica.

COSTA RICA: About Tilarán, *Standley & Valerio* 44294, 45401, 45682, 45798, 46492, 46610, 46644.

77. *Piper caeruleifolium* Trel., sp. nov.

A glabrous shrub; leaves ovate, acuminate, very slightly obliquely rounded at base, 3.5 to 6×9 to 13 cm., submultiple-nerved from below the upper third, the nerves 4 or 5×2, drying rather firm and bluish; petiole 10 mm. long, not winged; spikes 3.5×65 mm.; peduncle 10 mm. long; bracts inconspicuous, roundish-subpeltate, ciliate; berries oblong-triquetrous; stigmas 3, sessile.

Type in the U. S. National Herbarium, no. 1,307,425, collected at Quebrada Serena, near Tilarán, Province of Guanacaste, Costa Rica, altitude 700 meters, January, 1926, by Paul C. Standley and Juvenal Valerio (no. 46134).

RANGE: Pacific slope of Costa Rica.

COSTA RICA: With the type, *Standley & Valerio* ?46111, 46234. Capulín, ? *Standley* 40152.

78. *Piper corrugatum* Kuntze, Rev. Gen. Pl. 2: 565. 1891.

*Piper tsakianum* C. DC. Anal. Inst. Fis.-Geogr. Costa Rica 9: 174. 1897.

TYPE LOCALITY: Limón, Costa Rica (*Kuntze* 2022, the type).

RANGE: Caribbean lowlands of Costa Rica.

COSTA RICA: Tsaki, *Tonduz* 9532, the type of *P. tsakianum*. Tsuritkub, *Tonduz* 8612, 8721.

79. *Piper gibbosum* C. DC. Bull. Soc. Bot. Belg. 30<sup>1</sup>: 212. 1891.

TYPE LOCALITY: Rancho Flores, Pacific slope of Volcán de Barba, Costa Rica (*Tonduz* 2088, the type).

RANGE: Central mountains of Costa Rica.

80. *Piper paulownifolium* C. DC. Anal. Inst. Fis.-Geogr. Costa Rica 9: 173. 1897.

*Piper tiliaefolium paulownifolium* C. DC. Candollea 1: 154. 1923.

TYPE LOCALITY: La Palma, Costa Rica (*Pittier* 6739, the type).

RANGE: Caribbean slope of Costa Rica; and, perhaps in a differentiable form, Panama.

COSTA RICA: Río de las Vueltas, *Tonduz* 12778, 12940. Río Tuis, *Pittier* 8122, 8165, 11268; *Tonduz* 11525 (J. D. Smith 7334). Río Ariel, *Pittier* 9393. Puerto Viejo and Sarapiquí River, *Biolley* 6916, 7441. Finca Montecristo, *Standley & Valerio* 48541, 48551, 48557. Río Naranjo, *Tonduz* 7627

**81. *Piper omega* Trel., sp. nov.**

A shrub, glabrous or the nerves puberulent beneath near the end; leaves ovate, acuminate, cordate, the larger with omega-shaped sinus, the margin connate across the petiole, 11×20 to 19×35 cm., multiple-nerved with 2 strong ascending nerves on each side from the lower half and 5 or 6 from the base, the nerves salient and pale beneath; petiole 40 to 90 mm. long, on the larger leaves winged below the middle; spikes (young) 3×80 mm.; peduncle 20 mm. long.

Type in the U. S. National Herbarium, no. 1,229,449, collected at La Hondura, Province of San José, Costa Rica, altitude 1,300 to 1,700 meters, March, 1924, by Paul C. Standley (no. 37800).

RANGE: Central Costa Rica.

COSTA RICA: With the type, *Standley* 36536. El Muñeco, Río Navarro, *Standley & Valerio* 50940. Peralta, *Stevens* 323, 370.

**82. *Piper carrilloanum* C. DC. Bull. Soc. Bot. Belg. 30<sup>1</sup>: 209. 1891.**

TYPE LOCALITY: Carrillo Road, Costa Rica (*Tonduz* 2525, the type).

RANGE: Caribbean piedmont of Costa Rica.

COSTA RICA: Carrillo Road, *Tonduz* 2526.

**83. *Piper vallicolum* C. DC. Bull. Soc. Bot. Belg. 30<sup>1</sup>: 222. 1891.**

TYPE LOCALITY: Río Jaris, Pacaca, Costa Rica (*Pittier* 3298, the type).

RANGE: Pacific slope of Costa Rica.

COSTA RICA: Buenos Aires, *Pittier* 4892; *Tonduz* 4893. El Arenal, ? *Standley & Valerio* 45040, 45199. Punta Mala, *Tonduz* 6806, 6821. El General, *Tonduz* 3600. San Pablo de Tarrazú, ? *Jiménez* 1092.

**84. *Piper aragonense* Trel., sp. nov.**

*Piper multiplinervium* Auct., as to Costa Rica.

A scandent shrub, slightly puberulent on the axes, petiole, and lower side of the leaf; leaves ovate or round-ovate, abruptly acuminate, subtruncate at base, 6×9 to 10×15 cm., multiple-nerved, with 2 or 3 basal nerves and a branch from below the middle of the midrib, on each side; petiole 15 to 25 mm. long, winged to the blade; spikes 2×100 to 150 mm.; peduncle 15 mm. long; bracts rounded-subpeltate; berries minute, subglobose, glabrous; stigmas 3, sessile.

Type in the U. S. National Herbarium, no. 796,497, collected at Aragón, near Turrialba, Costa Rica, altitude 700 meters, October 20, 1894, by A. Tonduz (no. 9021).

RANGE: Caribbean slope of Costa Rica.

COSTA RICA: Turrialba, *Pittier* 9022. Tsuritkub, *Tonduz* 8681. Without locality, "*Tonduz* 8866." Carrillo, *Pittier* 1195. Las Vueltas, *Tonduz* 12790.

**85. *Piper perpuberulum* Trel., sp. nov.**

An obscurely and transiently puberulent, fragrant shrub; leaves ovate or round-ovate, rather abruptly acuminate, subtruncately rounded at base, 6×9 to 9.5×12 cm., multiple-nerved with one nerve on each side from near the middle of the midrib and about 3 from the base; petiole 15 to 20 or 30 mm. long, winged; spikes 3×13 mm.; peduncle 20 to 25 mm. long; bracts round-subpeltate; berries depressed-globose; stigmas 3, sessile.

Type in the U. S. National Herbarium, no. 798,330, collected at Talamanca, Costa Rica, March, 1894, by H. Pittier and A. Tonduz (no. 8680).

RANGE: Costa Rica.

COSTA RICA: La Verbena, San José, *Tonduz* 8866.

**86. *Piper cercidiphyllum* Trel., sp. nov.**

A glabrous shrub; leaves round-ovate, subacuminate, subtruncate at base, 12 to 15×12 to 15 cm., multiple-nerved, with a branch from the middle of the midrib on each side and about 4 from the base; petiole 20 to 30 mm. long,

involute but scarcely winged; spikes  $3 \times 100$  to 120 mm.; peduncle 10 mm. long; bracts rounded-subpeltate; berries short-oblong; stigmas 3, minute, sessile.

Type in the U. S. National Herbarium, no. 1,307,421, collected along Quebrada Grande, near Tilarán, Province of Guanacaste, altitude 650 meters, January, 1926, by Paul C. Standley and Juvenal Valerio (no. 46110).

RANGE: Pacific slope of Costa Rica.

COSTA RICA: Golfito, Golfo Dulce, ? *Pittier* 9912 (J. D. Smith 7133).

87. *Piper dumetorum* C. DC. Anal. Inst. Fis.-Geogr. Costa Rica 9: 172. 1897.

TYPE LOCALITY: Turrialba, Costa Rica (*Tonduz* 8366, the type; "6366").

RANGE: Upper Reventazón Valley, Costa Rica.

88. *Piper zentanum* C. DC. Bot. Gaz. 70: 170. 1920.

TYPE LOCALITY: Hacienda de Zent, Costa Rica (*Tonduz* 14649, the type).

RANGE: Caribbean lowlands of Costa Rica.

89. *Piper cyphophyllum* C. DC. Anal. Inst. Fis.-Geogr. Costa Rica 9: 167. 1897.

*Piper gibbifolium* C. DC. Bot. Gaz. 70: 181. 1920.

TYPE LOCALITY: "Costa Rica" (*Pittier* 895, the type, at Brussels).

RANGE: Caribbean lowlands of Costa Rica.

COSTA RICA: Hacienda de Zent, *Tonduz* 14649 in part, the type of *P. gibbifolium*. Finca Montecristo, *Standley & Valerio* 48617.

90. *Piper falcigerum* Trel., sp. nov.

A shrub, glabrous or with the nerves exceptionally puberulent beneath; leaves lanceolate, falcately attenuate, obliquely subcordulate, 9 to  $11 \times 25$  to 30 cm., submultiple-nerved with 5 to 6 strong nerves on each side from below the upper third and 2 to 4 delicate ones from the base; petiole 10 to  $15+3$  mm. long, not winged; stipules about equaling the petiole; inflorescence unknown.

Type in the U. S. National Herbarium, no. 1,307,323, collected at El Silencio, near Tilarán, Province of Guanacaste, Costa Rica, altitude 750 meters, January 13, 1926, by Paul C. Standley and Juvenal Valerio (no. 44747).

RANGE: Pacific slope of Costa Rica.

COSTA RICA: La Tejona, Tilarán, *Standley & Valerio* 45817.

91. *Piper sublaevifolium* Trel.

*Piper laevifolium* C. DC. Anal. Inst. Fis.-Geogr. Costa Rica 9: 169. 1897.

Not *P. laevifolium* Blume.

TYPE LOCALITY: Boca de Zhorquín, Talamanca, Costa Rica (*Tonduz* 8586, the type).

RANGE: Caribbean lowlands of Costa Rica.

92. *Piper sinuatifolium* Trel., sp. nov.

A shrub, glabrous except for the appressed-pubescent nerves; twigs white-granular; leaves sinuately obliquely ovate-elliptic, subacuminate, the very inequilateral base subcordulate,  $15 \times 25$  cm., pinnately or submultiple-nerved with about  $8+7$  nerves; petiole  $15+3$  mm. long, not winged; spikes (young)  $2 \times 35$  mm., with granular peduncle 7 mm. long; bracts roundish-subpeltate.

Type in the U. S. National Herbarium, no. 1,307,377, collected at Los Ayotes, near Tilarán, Province of Guanacaste, Costa Rica, altitude 600 to 700 meters, January 21, 1926, by Paul C. Standley and Juvenal Valerio (no. 45537).

RANGE: Pacific slope of Costa Rica.

93. *Piper melanocladum* C. DC. Bot. Gaz. 70: 176. 1920.

TYPE LOCALITY: Río Ariei, Costa Rica (*Pittier* 9370, the type).

RANGE: Caribbean slope of Costa Rica.

COSTA RICA: Las Vueltas, *Tonduz* 13148. Hamburg Finca, *Standley & Valerio* 48658. Pejivalle, *Standley & Valerio* 47139.

94. *Piper tortuosipilum* Trel., sp. nov.

A shrub, very sparsely crisp-villous throughout for a time, with long soft hairs; leaves elliptic-ovate or subquadrate, sharply acuminate, inequilaterally cordulate with one side shorter, 8×15 to 10×22 cm., submultiple-nerved from below the middle, the nerves about 5+6; petiole 10+3 mm. long; spikes 3×90 to 100 mm., pointed; peduncle 10 mm. long; bracts transversely subpeltate, subciliolate; stigmas 3, minute, sessile.

Type in the U. S. National Herbarium, no. 1,307,618, collected at El Muñeco, Province of Cartago, Costa Rica, altitude 1,400 to 1,500 meters, March, 1926, by Paul C. Standley and Juvenal Valerio (no. 51026).

RANGE: Mountains of central Costa Rica.

COSTA RICA: El Muñeco, *Standley* 33941, 33944; *Standley & Valerio* 50973, 51017, 51239, 51256. La Estrella, *Standley* 39187. Orosi, *Standley* 39747. Peralta, *Stevens* 331, 336. La Hondura, *Standley* 37758, 37794.

95. *Piper gracilipedunculum* Trel., sp. nov.

A glabrous shrub; leaves elliptic-subobovate, acuminate, equilaterally acute at base, 5 to 6.5×10 to 15 cm., pinnately nerved from below the middle, the nerves 3×2 with the uppermost looping into 1 or 2 shorter nerves above; petiole 10 mm. long, winged at base; spikes 3×25 mm., mucronate; peduncle slender, 10 mm. long; bracts roundish or triangular-subpeltate, ciliolate; stigmas 3, sessile; berries depressed, somewhat elongate with the rachis.

Type in the U. S. National Herbarium, no. 1,307,496, collected at Fraijanes, Province of Alajuela, Costa Rica, altitude 1,500 to 1,700 meters, February, 1926, by Paul C. Standley and Rubén Torres (no. 47519).

RANGE: Central highlands of Costa Rica.

COSTA RICA: With the type, *Standley & Torres* 47582, 47604. La Palma, *Standley* 33159. Santa María de Dota, *Standley* 42095. Yerba Buena, *Standley & Valerio* 49198.

96. *Piper surubresanum* Trel., sp. nov.

A glabrous shrub; twigs somewhat pale-granular at the nodes; leaves elliptic, acuminate at both ends, 7×13 to 15 cm., submultiple-nerved from below the upper third, the stronger nerves about 5×2, drying thin, paler beneath; petiole scarcely 10 mm. long, involute, not winged; spikes (young) 2×40 mm., drying red; peduncle scant 10 mm. long; bracts triangular-subpeltate, glabrate.

Type in the U. S. National Herbarium, no. 861,103, collected along Río Surubres, San Mateo, Costa Rica, altitude 250 meters, February 14, 1909, by P. Brolley (no. 17353).

RANGE: Pacific slope of Costa Rica.

COSTA RICA: Río Surubres, *Brolley* 2655. About Tilarán, *Standley & Valerio* 45726, 46098, 46111.

97. *Piper decurrens* C. DC. Journ. Bot. Brit. & For. 4: 215. 1866.

TYPE LOCALITY: Mount Candelaria, Costa Rica (*Hoffmann* 853, the type).

RANGE: Mountains of central Costa Rica.

COSTA RICA: Río Poás, *Tonduz* 1707. La Ventolera, Volcán de Poás, *Standley* 34665, 34725, 34734, 34735.

98. *Piper micranthera* C. DC. Linnaea 37: 354. 1872.

TYPE LOCALITY: La Barranca, Nicaragua [Costa Rica], *Oersted* 877, the type.

RANGE: Pacific slope of Costa Rica.

99. *Piper opacibracteum* Trel., sp. nov.

A glabrous shrub, sometimes epiphytic; leaves lance-oblong, slender-acuminate, subequilaterally rounded at base, 4 to 5×15 cm., pinnately nerved from below the middle, the nerves about 5×2, drying hard-papery and green; petiole 5 mm.

long, not winged; spikes  $3 \times 70$  mm., drying brown; peduncle scant 5 mm. long; bracts rounded-subpeltate, ciliolate.

Type in the U. S. National Herbarium, no. 1,307,414, collected at La Tejona, near Tilarán, Province of Guanacaste, Costa Rica, altitude 600 to 700 meters, January 25, 1926, by Paul C. Standley and Juvenal Valerio (no. 45899).

RANGE: Pacific slope of Costa Rica.

COSTA RICA: Tilarán, *Standley & Valerio* 45844.

100. *Piper unguiculiferum* Trel., sp. nov.

A glabrous shrub; leaves lance-elliptic, acuminate, subequilaterally rounded at base with the margin typically unguiculately inrolled, 6 to  $8 \times 17$  to 18 cm., submultiple-nerved from the lower half, the nerves  $4 \times 2$ ; petiole scant 10 mm. long, not winged; spikes  $2 \times 80$  mm.; peduncle scant 10 mm. long; bracts roundish-subpeltate, ciliolate.

Type in the U. S. National Herbarium, no. 1,307,485, collected at Pejivalle, Province of Cartago, Costa Rica, altitude 900 meters, February, 1926, by Paul C. Standley and Juvenal Valerio (no. 47003).

RANGE: Upper Reventazón Valley, Costa Rica.

101. *Piper xiroresanum* C. DC. Anal. Inst. Fis.-Geogr. Costa Rica 9: 169. 1897.

TYPE LOCALITY: Shirores, Talamanca, Costa Rica (*Tonduz* 9271, the type).

RANGE: Caribbean piedmont of Costa Rica.

102. *Piper terrabanum* C. DC. Bull. Soc. Bot. Belg. 30<sup>1</sup>: 217. 1891.

TYPE LOCALITY: Térraba, Costa Rica (*Tonduz* 3604, the type).

RANGE: Pacific slope of Costa Rica.

COSTA RICA: Boruca, *Tonduz* 4664, 6855, 6862. Palmar, *Tonduz* 6750. Rodeo de Pacaca, *Pittier* 3266.

103. *Piper longistipulum* C. DC. Bot. Gaz. 70: 175. 1920.

TYPE LOCALITY: Río Naranjo, Costa Rica (*Pittier* 8001, the type).

RANGE: Caribbean border between Costa Rica and Nicaragua.

104. *Piper peltaphyllum* C. DC. Bull. Soc. Bot. Belg. 30<sup>1</sup>: 220. 1891.

TYPE LOCALITY: Carrillo Road, Costa Rica (*Pittier* 2522, the type).

RANGE: Caribbean piedmont of Costa Rica.

104a. *Piper peltaphyllum lasvueltasanum* C. DC. Bot. Gaz. 70: 172. 1920.

TYPE LOCALITY: Las Vueltas, Tucurrique, Costa Rica (*Tonduz* 13189, the type).

RANGE: Caribbean slope of Costa Rica.

COSTA RICA: Río Tuis, *Tonduz* 8164.

105. *Piper veraguense* C. DC. in DC. Prodr. 16<sup>1</sup>: 294. 1869.

TYPE LOCALITY: "Costa Rica and Veragua," Costa Rica and Panama (*Warscewicz* in Herb. Boissier).

Not recently recognized, and very possibly a prior name for the preceding species.

106. *Piper copeyanum* (C. DC.) Trel.

*Piper pulchrum copeyanum* C. DC. Bot. Gaz. 70: 189. 1920.

*Piper pulchrum costaricense* C. DC. Bull. Soc. Bot. Belg. 29<sup>1</sup>: 70. 1890; 30<sup>1</sup>: 213. 1891. Not *P. costaricense* C. DC.

TYPE LOCALITY: Santa Rosa de Copey, Costa Rica (*Tonduz* 12198, the type).

RANGE: High divide of central Costa Rica.

COSTA RICA: Santa Rosa de Copey, *Tonduz* 12247. El Copey, *Tonduz* 11890. Santa María de Dota, *Pittier* 2272; *Standley* 42831; *Standley & Valerio* 43258. El Muñeco, *Standley* 33649. Escasú, *Standley* 32626. Aserri to Tarbaca, *Standley* 41390. La Estrella, Cartago, *Standley* 39235. Río Poás, *Tonduz* 1743.



La Ventolera, Volcán de Poás, *Standley* 34662. Río Achiote to Sabana de las Chiquizás, *Pittier* 793.

107. *Piper sagittifolium* C. DC. Anal. Inst. Fis.-Geogr. Costa Rica 9: 171. 1897.

TYPE LOCALITY: Río Naranjo, Costa Rica (*Tonduz* 7588, the type).

RANGE: Caribbean lowlands of Costa Rica and adjacent Nicaragua.

COSTA RICA: Valley of Aguas Buenas, *Pittier* 11035.

108. *Piper glabrifolium* C. DC. Anal. Inst. Fis.-Geogr. Costa Rica 9: 163. 1897.

TYPE LOCALITY: Río Naranjo, Costa Rica (*Tonduz* 7553).

RANGE: Caribbean lowlands of northeastern Costa Rica.

109. *Piper pseudo-glabrifolium* Trel., sp. nov.

*Piper glabrifolium* Auct., p. p., as to Costa Rica.

Closely resembling *P. glabrifolium*, but the elliptic leaves not at all pandurately contracted.

Type in the DeCandolle Herbarium, collected at Santa María de Dota, Costa Rica, by A. Tonduz (no. 7853).

RANGE: High divide of central Costa Rica.

110. *Piper pacacatum* Trel.

*Piper nobile minus* C. DC. Bull. Soc. Bot. Belg. 30<sup>1</sup>: 208. 1891.

TYPE LOCALITY: Rodeo de Pacaca, Costa Rica (*Pittier* 3239, the type).

RANGE: Pacific slope of Costa Rica.

COSTA RICA: Lagarto to Boruca, *Pittier* 4488. Buenos Aires, *Pittier* 6533. San Ramón, ? *Tonduz* 17779.

111. *Piper subfuscum* C. DC. Journ. Bot. Brit. & For. 4: 217. 1866.

*Piper tablazosense* C. DC. Bot. Jahrb. Engler 10: 288. 1888.

TYPE LOCALITY: Alto de la Cruz, Mount Candelaria, Costa Rica (*Hoffmann* 544, the type).

RANGE: High divide of central Costa Rica.

COSTA RICA: Tablazos, *Lehmann* 1752, type of *P. tablazosense*.

112. *Piper ceibense* C. DC. Anal. Inst. Fis.-Geogr. Costa Rica 9: 163. 1897.

TYPE LOCALITY: Buenos Aires, Río Ceibo, Costa Rica (*Pittier* 4902, the type; "6902").

RANGE: Pacific slope of Costa Rica.

COSTA RICA: Cabeceras del Diquís, *Pittier* 10564. Golfito, Golfo Dulce, *Pittier* 9910.

113. *Piper neurostachyum* C. DC. Bull. Soc. Bot. Belg. 30<sup>1</sup>: 213. 1891.

TYPE LOCALITY: Juan Viñas, Costa Rica (*Pittier* 1869, the type).

RANGE: Reventazón Valley, Costa Rica.

COSTA RICA: Las Vueltas, *Tonduz* 12907 (J. D. Smith 7564). Boca de Zhorquín, *Tonduz* 8641.

114. *Piper escuadratum* Trel., sp. nov.

A shrub, glabrous except for the puberulent nerves beneath; leaves broadly ovate, obscurely subacuminate, nearly equilaterally deeply cordate with V-shaped sinus about equaling the petiole, 24×35 cm., multiple-nerved with about 4 ascending nerves on each side of the lower half of the midrib and as many more spreading from the base; petiole 6 cm. long, rather narrowly winged; spikes (young) 4×50 mm.; peduncle 1 cm. long; bracts quadrangularly subpeltate, glabrous.

Type in the U. S. National Herbarium, nos. 1,307,266–1,307,267, collected in dense oak and bamboo forest near Laguna de la Escuadra, northeast of El Copey, Province of San José, Costa Rica, altitude 2,000 to 2,200 meters, December 16, 1925, by Paul C. Standley (no. 41965).

RANGE: High divide of central Costa Rica.



**115. *Piper irrasum* Trel., sp. nov.**

A shrub; twigs crisp-velvety; leaves subelliptic-ovate, short-acuminate, nearly equilaterally deeply cordate with nearly closed sinus about equaling the petiole, 20×30 cm., submultiple-nerved, with 4 upcurved nerves on each side from below the upper third and as many more from the base, crisp-velvety beneath; petiole crisp-velvety, 70 mm. long; spikes 7×360 mm.; peduncle 15 mm. long, glabrescent; bracts triangular-subpeltate, ciliate; berries short-oblong, truncate; stigmas 3, small, sessile.

Type in the U. S. National Herbarium, no. 1,307,609, collected at El Muñeco, Río Navarro, Province of Cartago, Costa Rica, altitude 1,400 to 1,500 meters, March 6, 7, 1926, by Paul C. Standley and Juvenal Valerio (no. 50961).

RANGE: Upper Reventazón Valley, Costa Rica.

**116. *Piper palmanum* Trel., sp. nov.**

A tree 5 to 10 meters tall; leaves broadly ovate, obtuse, nearly equilaterally deeply cordate with overlapping rounded lobes shorter than the petiole, 36×50 cm., multiple-nerved with 4 upcurved branches on each side of the midrib from below the upper third and as many more from the base, the nerves villous beneath; petiole sparsely villous, with a few fleshy emergences, winged, 80 mm. long; spikes 7 to 12×450 mm.; peduncle 30 mm. long, glabrous; bracts triangular-subpeltate, ciliate; berries oblong, truncate; stigmas 3, broad, sessile.

Type in the U. S. National Herbarium, nos. 1,229,340–1,229,342, collected at La Palma, Province of San José, Costa Rica, altitude 1,600 meters, February 3, 1924, by Paul C. Standley (no. 33112).

RANGE: High mountains of central Costa Rica.

**117. *Piper aserrianum* Trel., sp. nov.**

A shrub; twigs brown-tomentose-villous; leaves broadly ovate, obtuse, subequilaterally deeply cordate with narrow or closed sinus surpassing the petiole, 27×40 cm., multiple-nerved, with 4 ascending nerves on each side from below the upper third and as many more from the base, the nerves crisp-villous beneath; petiole brown-villous, 30 to 70 mm. long; spikes (young) 4×70 mm., with glabrate peduncle 10 mm. long.

Type in the U. S. National Herbarium, no. 1,229,695, collected between Aserri and Tarbaca, Province of San José, Costa Rica, altitude 1,600 to 1,900 meters, February 12, 1924, by Paul C. Standley (no. 34151).

RANGE: High mountains of central Costa Rica.

COSTA RICA: Fraijanes, Alajuela, *Standley & Torres* 47595. Cerro de la Carpintera, *Standley* 35638.

**118. *Piper cincinnatum* Trel., sp. nov.**

A shrub; twigs sparingly soft-hairy or glabrescent, fleshy-warty at the nodes; leaves broadly elliptic, short-acuminate, somewhat inequilaterally cordate with open sinus, 24×40 cm., multiple-nerved, with 4 upcurved nerves on each side from below the upper third and 2 or 3 from the base, substellate-hairy beneath especially on the midrib; petiole longer than the lobes, 70 to 90 mm., winged, dorsally hairy, with numerous fleshy emergences; inflorescence unknown.

Type in the U. S. National Herbarium, no. 1,229,263, collected at La Colombiana Farm of the United Fruit Co., Province of Limón, Costa Rica, altitude 70 meters, March 6, 7, 1924, by Paul C. Standley (no. 36778).

RANGE: Caribbean lowlands of central Costa Rica.

**119. *Piper clavuliger* Trel., sp. nov.**

A shrub or small tree 3 to 7 meters tall; twigs glabrous, with fleshy emergences about the nodes; leaves round-ovate, obtuse or short-pointed, nearly equilaterally deeply cordate with narrow sinus subequal to the petiole, 30×45

cm., multiple-nerved, with 5 upcurved nerves on each side from the lower half and as many from the base, puberulent on the nerves beneath and with emergences on the midrib; petiole as much as 100 mm. long, winged, glabrous, with oblong emergences; spikes (young)  $4 \times 90$  mm., becoming  $5 \times 250$  mm., with subpuberulent peduncle 30 to 55 mm. long.

Type in the U. S. National Herbarium, no. 1,307,489, collected in the vicinity of Pejivalle, Province of Cartago, Costa Rica, altitude 900 meters, February 7, 8, 1926, by Paul C. Standley and Juvenal Valerio (no. 47088).

RANGE: Caribbean slope of Costa Rica.

COSTA RICA: El Muñeco, Cartago, *Standley* 33919; *Standley & Valerio* 51033. La Hondura, *Standley* 37771.

120. *Piper cenocladum* C. DC. Anal. Inst. Fis.-Geogr. Costa Rica 9: 168. 1897.

TYPE LOCALITY: Tsaki, Talamanca, Costa Rica (*Tonduz* 9533, the type).

RANGE: Caribbean slope of Costa Rica.

COSTA RICA: Las Vueltas, Tucurrique, *Tonduz* 12857 (J. D. Smith 7565). Finca Montecristo, *Standley & Valerio* 48559.

121. *Piper signatum* Trel., sp. nov.

A shrub, sparsely villous nearly throughout; leaves elliptic above the lateral sinus, subobovate because of the single pendent auricle which surpasses the petiole, short-acuminate, 13 to  $15 \times 30$  cm., submultiple-nerved, with about 4 upcurved nerves from below the middle on each side and as many more spreading from the base on the auricled side; petiole 30 to 40 mm. long, winged; spikes pendent,  $12 \times 250$  mm.; peduncle thick, 20 mm. long, glabrous; bracts lunulately subpeltate; berries suboblong, truncate; stigmas 3; sessile.

Type in the U. S. National Herbarium, no. 1,307,608, collected at El Muñeco. Río Navarro, Province of Cartago, Costa Rica, altitude 1,400 to 1,500 meters, March 6, 7, 1926, by Paul C. Standley and Juvenal Valerio (no. 50958).

RANGE: Upper Reventazón Valley, Costa Rica.

COSTA RICA: El Muñeco, *Standley* 33447, 33466, 33575; *Standley & Torres* 51006. Orosí, *Standley* 39727.

122. *Piper ciliatifolium* Trel., sp. nov.

A softly subhirsute shrub; leaves elliptic above the lateral sinus, but obovate because of the single auricle as long as the petiole, gradually pointed,  $15 \times 30$  cm., submultiple-nerved, with about 4 upcurved nerves from each side of the lower half and as many more from the base on the auricled side, long-ciliate; petiole 30 mm. long, winged; inflorescence unknown.

Type in the U. S. National Herbarium, no. 1,229,416, collected at La Colombiana Farm, Province of Limón, Costa Rica, altitude 70 meters, March 6, 7, 1924, by Paul C. Standley (no. 36770).

RANGE: Reventazón lowlands, Costa Rica.

123. *Piper bullulaefolium* Trel., sp. nov.

A velvety-subtomentose shrub; leaves elliptical-subovate above the lateral sinus, subobovate from the (usually) single pendent article equaling the petiole, gradually subacuminate, 10 to  $15 \times 20$  to 30 cm., submultiple-nerved with about 4 upcurved nerves from the lower half on each side and about as many radiating from the base in the auricle, bullulate-rugose; petiole 40 to 50 mm. long; spikes (young)  $2 \times 180$  mm., with peduncle 15 mm. long; bracts roundish-subpeltate, ciliate.

Type in the U. S. National Herbarium, no. 1,307,368, collected at Los Ayotes, near Tilarán, Province of Guanacaste, Costa Rica, altitude 600 to 700 meters, January 21, 1926, by Paul C. Standley and Juvenal Valerio (no. 45363).

RANGE: Pacific slope of Costa Rica.

COSTA RICA: About Tilarán, *Standley & Valerio* 44657, 46463 with biauriculate base.

124. *Piper tinctum* Trel., sp. nov.

Close to the foregoing but villous and not bullulate; spikes 4 to 5 × 350 mm.; peduncle 30 mm. long.

Type in the U. S. National Herbarium, no. 1,307,372, collected at Los Ayotes, near Tilarán, Province of Guanacaste, Costa Rica, altitude 600 to 700 meters, January 21, 1926, by Paul C. Standley and Juvenal Valerio (no. 45460).

RANGE: Pacific slope of Costa Rica.

COSTA RICA: Vicinity of Tilarán, *Standley & Valerio* 45280, 45800.

125. *Piper biseriatum* C. DC. Bot. Gaz. 70: 178. 1920.

TYPE LOCALITY: Cañas Gordas, Costa Rica (*Pittier* 11036, the type).

RANGE: Eastern Costa Rica, toward Panama.

126. *Piper dasypogon* C. DC. Bot. Gaz. 70: 187. 1920.

TYPE LOCALITY: Buenos Aires, Costa Rica (*Pittier* 10641, the type).

RANGE: Diquís Valley, Pacific slope of Costa Rica.

127. *Piper magnilimbus* C. DC. Bot. Gaz. 70: 177. 1920.

*Piper obliquum* Auct., as to Costa Rica.

TYPE LOCALITY: Cañas Gordas, Costa Rica (*Pittier* 11032, the type).

RANGE: Eastern Costa Rica.

COSTA RICA: With the type, *Pittier* 11073, "11037."

128. *Piper fimbriulatum* C. DC. Bull. Soc. Bot. Belg. 30<sup>1</sup>: 207. 1891.

TYPE LOCALITY: El General, Costa Rica, *Tonduz* 3393 ("3398") the type.

RANGE: Pacific slope of Costa Rica.

129. *Piper pentagonum* Trel., sp. nov.

A shrub; twigs crisp-velvety; leaves subpandurately obovate, short-acuminate, unequally cordate with narrow sinus, the longer lobe half as long as the petiole, 12 to 15 × 22 to 25 cm., multiple-nerved, with 3 to 4 upcurved branches on each side from below the upper third and as many more spreading from the base, hirtellous on the nerves beneath; petiole 60 to 80 mm. long, winged, crisp-hirtellous; spikes (young) 3 × 65 mm., mucronate, on a hirtellous peduncle 5 mm. long; bracts roundish-subpeltate.

Type in the U. S. National Herbarium, no. 1,307,543, collected at Finca Montecristo, Río Reventazón below Cairo, Province of Limón, Costa Rica, altitude 25 meters, February 18, 19, 1926, by Paul C. Standley and Juvenal Valerio (no. 48559).

RANGE: Caribbean lowlands of Costa Rica.

130. *Piper pseudo-fimbriulatum* Trel., sp. nov.

A shrub; twigs transiently hairy; leaves broadly elliptic, blunt-acuminate, deeply laterally cordate with overlapping lobes, 20 × 35 cm., submultiple-nerved with 3 or 4 upcurved nerves from the lower half of each side and 4 or 5 spreading from the base, the nerves stiff-villous beneath; petiole 80 + 10 or 15 mm. long, winged; spikes 4 × 300 mm. or more; peduncle 10 to 15 mm. long; bracts subpeltate, long-fimbriate.

Type in the U. S. National Herbarium, no. 577,121, collected at El General, Costa Rica, altitude 600 meters, February, 1891, by H. Pittier (no. 3601).

RANGE: Pacific slope of Costa Rica.

COSTA RICA: Boruca to Térraba, ? *Pittier* 4657.

131. *Piper exiguispicum* Trel., sp. nov.

A shrub ?; twigs densely subtomentose; leaves broadly obovate-elliptic, sharp-acuminate, unequally laterally cordate with the larger lobe surpassing the petiole, 20 × 23 cm., submultiple-nerved with about 4 upcurved branches from

the lower half on each side and 2 to 4 from the base, more or less persistently pubescent on both sides; petiole 45+10 or 15 mm. long, densely hairy, winged; spikes cordlike, 2.5×220 mm.; peduncle 25 to 30 mm. long, loosely hairy; bracts subpeltate, rusty-hairy.

Type in the U. S. National Herbarium, no. 798,333, collected at Boca de Zhorquín, Talamanca, Costa Rica, March, 1894, by A. Tonduz (no. 8641).

RANGE: Caribbean slope of Costa Rica.

132. *Piper perlongipes* Trel., sp. nov.

A somewhat pubescent shrub, very suggestive of *P. auritum amplifolium*; leaves ovate-acute, unequally laterally cordate with overlapping lobes, on winged petiole 30 to 40 mm., longer on one side; spikes 3 to 4×300 mm.; peduncle slender, 90 mm. long.

Type in the U. S. National Herbarium, no. 1,307,477, collected at Pejivalle, Province of Cartago, Costa Rica, altitude 900 meters, February 7, 8, 1926, by Paul C. Standley and Juvenal Valerio (no. 46834).

RANGE: Reventazón Valley, Costa Rica, perhaps also represented from Chinandega, Nicaragua, *Baker* 85.

COSTA RICA: Tuis, *Tonduz* 8166, 11519. Shirores, *Tonduz* 9264.

133. *Piper auritum amplifolium* C. DC. in DC. Prodr. 16<sup>1</sup>: 321. 1869.

TYPE LOCALITY: "Costa Rica" (*Hoffmann* 761, the type).

RANGE: Widespread through Central America in various scarcely distinguishable forms.

COSTA RICA: Limón, *Pittier* 12689. Finca Montecristo, *Standley & Valerio* 48450. Hacienda de Zent, *United Fruit Co.* 257. Río San Juan, *Oersted* 827. Puerto Viejo and Sarapiquí River, *Biolley* 7443. Carrillo Road, *Pittier* 1194, 2528. Las Vueltas, *Tonduz* 12859. Tuis, *Tonduz* 11519 (J. D. Smith 7331). Juan Viñas, *Cook & Doyle* 304, 364. Mount Aguacate, *Oersted* 826. Las Pavas, *Standley* 36069. San José, *Tonduz* 3174. Río Birrís, *Pittier* 3202. Pacific slope, *Biolley* 17554. Surubres, San Mateo, *Pittier* 7052. Quebrada Grande, Tilarán, *Standley & Valerio* 46114. Río Corozal, Santo Domingo de Golfo Dulce, *Tonduz* 9929 (J. D. Smith 7135). Punta Mala, *Tonduz* 6796.

134. *Piper auritifolium* Trel., sp. nov.

A shrub resembling *P. auritum*, with microscopically papillate stem; leaves 12 to 13×20 to 23 cm., sparsely appressed-pubescent above but quite glabrous beneath; spikes (young) 2×50 to 100 mm., the glabrous peduncle 10 mm. long.

Type in the U. S. National Herbarium, no. 1,307,561, collected at Hamburg Finca, Río Reventazón below Cairo, Province of Limón, Costa Rica, altitude 50 meters, February 19, 1926, by Paul C. Standley and Juvenal Valerio (no. 48773).

RANGE: Caribbean lowlands of Costa Rica.

135. *Piper silvicola* C. DC. Anal. Inst. Fis.-Geogr. Costa Rica 9: 159. 1897.

TYPE LOCALITY: Río Naranjo, Costa Rica (*Tonduz* 7611, the type).

RANGE: Lowlands of northeastern Costa Rica.

COSTA RICA: Río Naranjo, ? *Tonduz* 7536.

136. *Piper mirabile* Trel., sp. nov.

A thick-trunked tree 6 to 7 meters tall, essentially glabrous except for the puberulent nerves beneath; leaves elongate-elliptic, obscurely blunt- or emarginulate-acuminate, obliquely rounded at base or obscurely subcordulate, 10 to 12×20 to 25 cm., submultiple-nerved with about 3 impressed upcurved nerves on each side of the lower half and 2 or 3 from the base, bronzing; petiole 40 to 50 mm. long, somewhat fleshy-warty like the twig, winged; spikes pendent, 6 to 8×370 mm.; bracts suborbicular, ciliate-fimbriate; ovary depressed-ellipsoid; stigmas 3, sessile.

Type in the U. S. National Herbarium, no. 1,181,894, collected at Santa Clara de Cartago, Costa Rica, altitude 1,950 meters, July 20, 1923, by William R. Maxon and A. D. Harvey (no. 8246).

RANGE: Upper Reventazón Valley, Costa Rica.

137. *Piper evasum* Trel., sp. nov.

A shrub, essentially glabrous except for the tomentulose fleshy-warty twigs and petioles and the pubescent nerves beneath; leaves regularly elliptic, subacuminate, equilaterally cordate with open sinus scarcely 15 mm. deep, 16×34 cm., submultiple-nerved with about 5 upcurved nerves from below the upper third on each side and about 2 from the base; petiole 30 mm. long, thick and winged; inflorescence unknown.

Type in the U. S. National Herbarium, no. 1,307,366, collected at El Arenal, Province of Guanacaste, Costa Rica, altitude 500 meters, January 18, 1926, by Paul C. Standley and Juvenal Valerio (no. 45280).

RANGE: Pacific slope of Costa Rica.

138. *Piper longevillosum* Trel., sp. nov.

A soft shrub with long-villous twigs; leaves broadly elliptic, subacuminate, slightly inequilaterally cordate with shallow sinus or subauriculate with the larger lobe covering the petiole, 12×18 to 15×22 cm., submultiple-nerved with about 4 upcurved nerves from the lower half on each side and as many more from the base; petiole 40 mm. long, winged, villous like the base of the nerves beneath; inflorescence unknown.

Type in the U. S. National Herbarium, no. 1,307,322, collected at El Silencio, near Tilarán, Province of Guanacaste, Costa Rica, altitude 750 meters, January 18, 1926, by Paul C. Standley and Juvenal Valerio (no. 44696).

RANGE: Pacific slope of Costa Rica.

139. *Piper pittieri* C. DC. Bull. Soc. Bot. Belg. 29<sup>2</sup>: 69. 1890; 30<sup>1</sup>: 204. 1891.

TYPE LOCALITY: Between Turrialba and Río Birris, on Volcán de Irazú, Costa Rica, at 2,400 meters altitude (*Pittier* 376, the type).

RANGE: Central mountains of Costa Rica.

COSTA RICA: Turrialba, *Pittier* 13234 (J. D. Smith 7507). Achiote, Volcán de Poás, *Tonduz* 10794; *Standley* 34612. Laguna del Reventado, Volcán de Irazú, 3,000 meters, noted as the highest Costa Rican altitude for a *Piper*, *Pittier* 14116; *Tonduz* 4244. Cerro de las Caricias, Heredia, *Standley & Valerio* 52235. Cerro de las Lajas, *Standley & Valerio* 51555.

140. *Piper trimetrale* C. DC. Anal. Inst. Fis.-Geogr. Costa Rica 9: 159. 1897.

TYPE LOCALITY: Río Tuis, Costa Rica (*Tonduz* 8169, the type).

RANGE: Reventazón Valley, Caribbean slope of Costa Rica.

141. *Piper riparense* C. DC. Anal. Inst. Fis.-Geogr. Costa Rica 9: 173. 1897.

TYPE LOCALITY: Buenos Aires, Río Hacúm, Costa Rica (*Tonduz* 4893, the type).

RANGE: Diquís Valley, Pacific slope of Costa Rica.

142. *Piper euryphyllum* C. DC. Bot. Gaz. 70: 178. 1920.

*Piper triseriale* C. DC. Bot. Gaz. 70: 187. 1920.

TYPE LOCALITY: La Palma, Costa Rica (*Tonduz* 12666, the type).

RANGE: High mountains of central Costa Rica.

COSTA RICA: La Palma, *Pittier* 12663, type of *P. triseriale*.

143. *Piper otophorum* C. DC. Bull. Soc. Bot. Belg. 30<sup>1</sup>: 220. 1891.

TYPE LOCALITY: Siquirres, Costa Rica (*Pittier* 3183, the type).

RANGE: Caribbean lowlands of northeastern Costa Rica.

COSTA RICA: Río Naranjo, *Tonduz* 7551.

144. *Piper auriculiferum* Trel., sp. nov.

A shrub, slightly pubescent on the nerves beneath, the twigs white-granular; leaves inequilaterally sublanceolate- or oblanceolate-elliptic, acuminate, laterally semicordate with the lobe or auricle equaling and covering the petiole, 6.5 to 8×15 to 18 cm., submultiple-nerved with about 5 upcurved nerves from below the middle on each side and 2 spreading from the base; petiole 10 mm. long, scarcely winged; spikes 4×60 mm.; peduncle 10 mm. long; bracts triangular-subpeltate; berries round-oblong, convallately truncate; stigmas 2, sessile.

Type in the U. S. National Herbarium, no. 1,307,316, collected at El Silencio, near Tilarán, Province of Guanacaste, Costa Rica, altitude 750 meters, January 13, 1926, by Paul C. Standley and Juvenal Valerio (no. 44648).

RANGE: Pacific slope of Costa Rica.

145. *Piper bauritum* C. DC. Anal. Inst. Fis.-Geogr. Costa Rica 9: 161. 1897.

TYPE LOCALITY: Shirores, Talamanca, Costa Rica (*Tonduz* 9270, the type).

RANGE: Caribbean slope of Costa Rica.

146. *Piper insolens* Trel., sp. nov.

A shrub; twigs for a time dingy-villous; leaves obliquely lance-ovate, falcate-acuminate, bicordulate with lateral sinus, 6 to 7×14 to 16 cm., pinnately nerved from below the middle, the nerves 5 or 6×2, sparingly dingy-villous above, the nerves densely crisp-hairy beneath; petiole 10 mm. long, covered by the blade, villous, not winged; spikes noted as greenish white.

Type in the U. S. National Herbarium, no. 1,307,288, collected at Santa María de Dota, Province of San José, Costa Rica, altitude 1,600 meters, January, 1926, by Paul C. Standley and Juvenal Valerio (no. 43306).

RANGE: High divide of central Costa Rica.

147. *Piper disparifolium* Trel., sp. nov.

A nodose shrub, glabrous except for the obscurely appressed-puberulent nerves beneath; leaves lance-ovate, acuminate, obliquely cordulate, 8 to 10×20 to 22 cm., pinnately nerved from below the middle, the nerves 6 or 7×2; petiole 8+2 mm. long, not winged; spikes (young) 2×30 mm.; peduncle 10 mm. long; bracts roundish-subpeltate, cillolate.

Type in the U. S. National Herbarium, no. 1,307,484, collected at Pejivalle, Province of Cartago, Costa Rica, altitude 900 meters, February 7, 8, 1926, by Paul C. Standley and Juvenal Valerio (no. 46993).

RANGE: Upper Reventazón Valley, Costa Rica.

COSTA RICA: El Muñeco, Río Navarro, Cartago, *Standley & Valerio* 51018. Pejivalle, *Standley & Valerio* 47082. Peralta, *Stevens* 372.

148. *Piper celatipetiolum* Trel., sp. nov.

A glabrous shrub; leaves elliptic-ovate or subobovate, falcate-acuminate, very unequally cordulate, 7 to 7.5×16 cm., pinnately nerved from below the upper third, the nerves about 6×2; petiole 5 mm. long, granular-papillate; spikes 3×45 to 55 mm.; peduncle 10 mm. long; bracts triangular-subpeltate; berries obconical, truncate; stigmas 3, minute, sessile.

Type in the U. S. National Herbarium, no. 1,229,492, collected at Capulín, Province of Alajuela, Costa Rica, altitude 80 meters, April 2, 1924, by Paul C. Standley (no. 40178).

RANGE: Pacific lowlands of Costa Rica.

149. *Piper subaspericaule* C. DC. Anal. Inst. Fis.-Geogr. Costa Rica 9: 162. 1897.

*Piper trichocladum* C. DC. Anal. Inst. Fis.-Geogr. Costa Rica 9: 167. 1897.



TYPE LOCALITY: Río Naranjo, Costa Rica (*Tonduz* 7625, the type; this is also the type of *P. trichocladum*).

RANGE: Caribbean lowlands of Costa Rica and Nicaragua.

COSTA RICA: Río Naranjo, *Tonduz* 7660.

150. *Piper virgultorum* C. DC. Bot. Gaz. 70: 173. 1920.

TYPE LOCALITY: Tsuritkub, Talamanca, Costa Rica (*Tonduz* 8650, the type).

RANGE: Caribbean slope of Costa Rica.

COSTA RICA: Boca de Zhorquín (*Tonduz* 8570; ? 8577). Las Vueltas, ? *Tonduz* 12823. La Florida, ? *Lankester*, in 1925. Without definite locality, *Brade* 2439. Turrialba, ?*Tonduz* 4113.

151. *Piper chrysostachyum* C. DC. Bull. Soc. Bot. Belg. 30<sup>1</sup>: 207. 1891.

TYPE LOCALITY: Río Surubres, San Mateo (*Biolley* 4073, the type).

RANGE: Pacific slope of Costa Rica.

COSTA RICA: Buenos Aires, *Pittier* 6526, 6535. Río La Barranca, San Juan de San Ramón, *Tonduz* 17777.

152. *Piper vicinum* Trel., sp. nov.

General characters of *P. chrysostachyum*, but the nerves subpubescent beneath, and with glabrous bracts and pistils.

Type in the U. S. National Herbarium, no. 577,145, collected at "Yuavin," [?Zhorquín], Costa Rica, altitude 700 meters, March, 1892, by A. Tonduz (no. 6635).

RANGE: Caribbean slope of Costa Rica.

153. *Piper pelliticaule* Trel., sp. nov.

A shrub; twigs brown-puberulent and with intermingled longer straight hairs; leaves broadly elliptic, acutely short-acuminate, unequally rounded at base, 8 to 10.5×16 to 19 cm., pinnately nerved from below the middle, the nerves about 6+7, evanescently somewhat hirtellous above, tomentulose and villous-hirsute on the nerves beneath; petiole 10 or 15+3 mm. long, brown-hirtellous, winged at base; inflorescence unknown.

Type in the U. S. National Herbarium, no. 1,307,499, collected at Fraijanes, Province of Alajuela, Costa Rica, altitude 1,600 meters, February 12, 13, 1926, by Paul C. Standley and Rubén Torres (no. 47539).

RANGE: High central divide of Costa Rica.

COSTA RICA: Río Virilla. ? *Tonduz* 17770.

154. *Piper anisophyllum* Trel., sp. nov.

*Piper dilatatum acutifolium* C. DC. Bull. Soc. Bot. Belg. 30<sup>1</sup>: 217. 1891.

TYPE LOCALITY: El General, Costa Rica (*Tonduz* 3385, the type).

RANGE: Pacific slope, Costa Rica.

COSTA RICA: With the type, *Tonduz* 3392. Tilarán, Guanacaste, *Standley & Valerio* 44228. Boruca, *Pittier* 6747.

155. *Piper pseudodilatatum* C. DC. Anal. Inst. Fis.-Geogr. Costa Rica 9: 165. 1897.

TYPE LOCALITY: Punta Mala, Costa Rica (*Tonduz* 6797, the type).

RANGE: Pacific lowlands of Costa Rica.

156. *Piper zacatense* C. DC. Anal. Inst. Fis.-Geogr. Costa Rica 9: 161. 1897.

TYPE LOCALITY: Boca Zacate, Costa Rica (*Pittier* 6828, the type).

RANGE: Pacific lowlands of Costa Rica.

156a. *Piper zacatense percaudatum* C. DC. Anal. Inst. Fis.-Geogr. Costa Rica 9: 161. 1897.

TYPE LOCALITY: Golfito, Golfo Dulce, *Pittier* 9914, the type; distributed also as J. D. Smith 7132.



RANGE: Pacific lowlands of Costa Rica.

COSTA RICA: Río Corozal, Santo Domingo, *Pittier* 10002 (J. D. Smith 7131).  
Río Colorado, Golfo Dulce, *Pittier* 9991 (J. D. Smith 7144).

157. *Piper uvitanum* C. DC. Bot. Gaz. 70: 182. 1920.

TYPE LOCALITY: La Uvita, Limón, Costa Rica (*Pittier* 12690, the type).

RANGE: Caribbean lowlands of Costa Rica.

COSTA RICA: Limón, *Debeaux* 59.

158. *Piper alajuelanum* Trel., sp. nov.

A shrub, glabrous except for the obscurely puberulent nerves beneath; leaves obliquely subelliptic-oblong, acuminate, rounded at least on one side at base, 5 to 7×12 to 16 cm., pinnately nerved from below the middle, the nerves 5 or 6×2, cancellately venulose; petiole 10 mm. long, not winged; spikes 2 to 3×85 mm.; peduncle slender, 10 to 15 mm. long, white-granular like the twigs; bracts lunulate-subpeltate, ciliolate.

Type in the U. S. National Herbarium, no. 796,164, collected at Nuestro Amo, Alajuela, Costa Rica, altitude 800 meters, February, 1911, by Otón Jiménez (no. 988).

RANGE: Pacific slope of Costa Rica.

159. *Piper villosisquamulum* Trel., sp. nov.

A shrub; twigs glabrous, pale-granular; leaves obliquely elliptic, long-acuminate, rounded at base or subcordulate at least on one side, 6 to 8×18 to 23 cm., pinnately nerved from below the middle, the nerves about 7+6, loosely and deciduously villous beneath with the veins appressed-pubescent; petiole 8+2 mm. long, glabrous, winged only at base; spikes filiform, 2×150 mm.; peduncle 10 to 15 mm. long, obscurely velvety or glabrous; bracts roundish-subpeltate, ciliolate; ovary round-truncate; stigmas 3, minute, sessile.

Type in the U. S. National Herbarium, no. 1,229,448, collected at La Hondura, Province of San José, Costa Rica, altitude 1,300 to 1,700 meters, March 16, 1924, by Paul C. Standley (no. 37799).

RANGE: High central divide of Costa Rica.

COSTA RICA: With the type, *Standley* 37757.

160. *Piper rhodostachyum* Trel., sp. nov.

A small crisp-villous shrub; leaves obliquely lanceolate, falcate-attenuate, subcordulate on one side, 3×10 cm., subrugose, pinnately nerved from below the middle, the nerves 4+3, prominent beneath; petiole scarcely 2+2 mm. long; spikes (young) 2×15 mm., pink.

Type in the U. S. National Herbarium, no. 1,318,150, collected at Reventazón, Costa Rica, August 4, 1927, by C. H. Lankester (no. 1163).

RANGE: Reventazón Valley, Costa Rica.

161. *Piper polytrichum* C. DC. *Candollea* 1: 110. 1923; Schroeder, *Candollea* 3: 138. 1926.

TYPE LOCALITY: Cañas Gordas, Costa Rica (*Pittier* 11070, the type; "10070").

RANGE: Mountains of southeastern Costa Rica.

COSTA RICA: With the type, *Pittier* 11071.

162. *Piper nigricaulis* Trel., sp. nov.

A shrub; twigs blackening, sparsely crisp-pubescent; leaves elliptic-subobovate, unequally cordulate, 5×13 to 15 cm., pinnately nerved from below the middle, the nerves 6×2, transiently somewhat hairy on both sides and persistently pubescent on the nerves; petiole 5+2 mm. long, hairy, winged at base; spikes 3×50 to 88 mm.; peduncle slender, 10 mm. long, glabrate; bracts lunulate-subpeltate, ciliolate; berries obpyramidal-triangular; stigmas 3, sessile.

Type in the U. S. National Herbarium, no. 577,290, collected at Santo Domingo de Golfo Dulce, Costa Rica, March, 1910, by A. Tonduz (no. 9959). Distributed also by John Donnell Smith as no. 7139 (sheets 596,520 and 596,522 in the U. S. National Herbarium).

RANGE: Pacific coast region of Costa Rica.

163. *Piper scleromyelum* C. DC. Anal. Inst. Fis.-Geogr. Costa Rica 9: 167. 1897.

TYPE LOCALITY: Tsuritkub, Talamanca, Costa Rica (*Tonduz* 8675, the type).

RANGE: Caribbean slope of Costa Rica.

164. *Piper subsessilifolium* C. DC. Bull. Soc. Bot. Belg. 30<sup>1</sup>: 216. 1891.

*Piper subsessilifolium palmanum* C. DC. Bot. Gaz. 70: 183. 1920.

TYPE LOCALITY: Río Navarrito, Costa Rica, *Pittier* 2436 ("2435"), the type.

RANGE: Mountains of central Costa Rica.

COSTA RICA: La Palma, *Tonduz* 12662, type of var. *palmanum*. Alto de la Estrella, Cartago, *Standley* 39108, 39232 with lance-oblong leaves 3.5 to 4.5×13 to 15 cm. El Muñeco, Río Navarro, *Standley* 33426, 33436, 33567, 33628, 33651; *Standley & Torres* 51110; *Standley & Valerio* 51027. La Hondura, *Standley* 36496, with narrow leaves.

165. *Piper concepcionis* Trel., sp. nov.

A spreading or subrepent, essentially glabrous shrub; leaves oblong- or ovate-elliptic, acuminate, nearly equilaterally rounded at base, 8 to 13×20 to 25 cm., pinnately nerved from below the middle, the nerves 5 or 6×2, congested below; petiole 10 to 20 mm. long, not winged; spikes (young) 2×35 mm., drying red, with peduncle 5 mm. long; bracts lunulate-subpeltate.

Type in the U. S. National Herbarium, no. 798,403–798,404, collected at La Concepción, plains of Santa Clara, Costa Rica, February, 1896, by John Donnell Smith (no. 6749).

RANGE: Caribbean piedmont of Costa Rica.

COSTA RICA: Guápiles, *Standley* 37123, 37131, 37319.

166. *Piper arundinetorum* Trel., sp. nov.

A weak subscandent glabrous shrub; leaves narrowly elliptic, acuminate, subobtuse at the convallate base, 4 to 6×13 to 16 cm., submultiple-nerved from the lower half, the nerves 5×2, drying bright green and veiny; petiole 5 mm. long, not winged; spikes 3×40 mm.; peduncle 10 mm. long; bracts triangular-subpeltate, the pale margin coarsely fimbriate; berries oblong-truncate; stigmas 2, minute, sessile.

Type in the U. S. National Herbarium, no. 1,307,268, collected in oak and bamboo forest, near Laguna de la Escuadra, El Copey, Province of San José, Costa Rica, altitude 2,100 meters, December 16, 1925, by Paul C. Standley (no. 41967).

RANGE: Central mountains of Costa Rica.

167. *Piper sulcinervosum* Trel., sp. nov.

A shrub; twigs somewhat crisp-pubescent; leaves elongate-lanceolate, long-acuminate, the narrowed base nearly equally subobtuse, 5.5 to 7×17 to 18 cm., submultiple-nerved from the lower third, the sulcate nerves 5 or 6×2 with the lower congested, and slightly hairy above; petiole 3 to 7 mm. long, somewhat crisp-pubescent, not winged; spikes (young) 3×40 mm., purple; peduncle 7 mm. long, slightly crisp-pubescent; bracts roundish-subpeltate, cillolate.

Type in the U. S. National Herbarium, no. 1,229,701, collected on Cerro de la Carpintera, Province of Cartago, Costa Rica, altitude 1,500 to 1,800 meters, February, 1924, by Paul C. Standley (no. 35569).

RANGE: Upper Reventazón Valley, Costa Rica.

COSTA RICA: Cerro de la Carpintera, *Standley* 35634, 35707. Orosi, Cartago, *Standley* 39674.

168. *Piper pendens* Trel., sp. nov.

A small pendent epiphytic shrub; twigs transiently crisp-pubescent; leaves elongate-lanceolate, gradually long-acuminate, subequally rounded at base, 3.5 to 4.5×12 to 15 cm., pinnately submultiple-nerved from below the middle, the impressed nerves about 5×2, approximate downward and sparsely velvety beneath, drying thin and paler beneath; petiole 5 mm. long, crisp-pubescent, not winged; spikes (young) 2×35 mm., sharp-mucronate, dark red; peduncle 10 mm. long, crisp-pubescent; bracts roundish-subpeltate.

Type in the U. S. National Herbarium, no. 1,307,584, collected at Yerba Buena, San Isidro, Province of Heredia, Costa Rica, altitude 2,000 meters, February 22, 28, 1926, by Paul C. Standley and Juvenal Valerio (no. 49822).

RANGE: High central divide of Costa Rica.

168a. *Piper pendens infaustum* Trel., var. nov.

A terrestrial shrub with less gradually acuminate leaves.

Type in the U. S. National Herbarium, no. 1,229,361, collected at El Muñeco, south of Navarro, Province of Cartago, Costa Rica, altitude 1,400 meters February 8, 9, 1924, by Paul C. Standley (no. 33651).

RANGE: Upper Reventazón Valley, Costa Rica.

169. *Piper pseudo-aduncum* C. DC. Anal. Inst. Fis.-Geogr. Costa Rica 9: 166. 1897.

TYPE LOCALITY: Puerto Viejo and Sarapiquí River (*Biolley* 6914, the type).

RANGE: Caribbean slope of Costa Rica.

170. *Piper bryogetum* C. DC. Bot. Gaz. 70: 175. 1920.

*Piper bryogeton* C. DC. Candollea 1: 85. 1923.

TYPE LOCALITY: Trejos, Las Vueltas, Tucurrique, Costa Rica (*Pittier* 12939).

RANGE: Caribbean slope of Costa Rica.

COSTA RICA: Hacienda de Zent, *Pittier* 14652. Río Hondo, Santa Clara, *Cook & Doyle* 563.

171. *Piper matinanum* C. DC. Anal. Inst. Fis.-Geogr. Costa Rica 9: 170. 1897.

TYPE LOCALITY: Matina, Costa Rica (*Pittier* 9759).

RANGE: Caribbean lowlands of Costa Rica.

172. *Piper cabagranum* C. DC. Anal. Inst. Fis.-Geogr. Costa Rica 9: 173. 1897

TYPE LOCALITY: Cabagra, near Buenos Aires, Costa Rica (*Pittier* 6528, the type).

RANGE: Diquís Valley, Costa Rica.

173. *Piper blepharilepidum* Trel., sp. nov.

A shrub; twigs slender, glabrous, green-granular; leaves subelliptic, acuminate, inequilaterally obtuse at base, 4 to 6×11 to 15 cm., pinnately nerved from the lower half, the nerves about 5+4, sparingly appressed-pubescent beneath, drying green and green-granular; axillary scales long-ciliate; petiole 3+2 mm. long, glabrous, pale-granular, not winged; spikes (young) 2×50 mm.; peduncle 5 to 15 mm. long, glabrous, pale-dotted; bracts roundish-subpeltate, ciliolate.

Type in the U. S. National Herbarium, no. 1,307,434, collected at Quebrada Serena, Tilarán, Province of Guanacaste, Costa Rica, altitude 700 meters, January 27, 1926, by Paul C. Standley and Juvenal Valerio (no. 46217).

RANGE: Pacific slope of Costa Rica.

174. *Piper epigynium* C. DC. Linnaea 37: 346. 1872.

TYPE LOCALITY: Turrialba, Costa Rica (*Oersted* 858, the type).

RANGE: Reventazón Valley, Costa Rica.

175. *Piper oppressum* Trel., sp. nov.

A nearly glabrous shrub; leaves lance- or subovate-elliptic, long-acuminate, subobliquely acute at base, 5 to 7.5×13 to 16 cm., pinnately nerved from the lower half, the nerves (4 or 5×2) with some short intermediates and at most obscurely appressed-pubescent beneath; petiole slender, 10 to 20 or 30 mm. long, the longest narrowly winged to the end; spikes 2×30 to 40 or even 80 mm.; peduncle 5 mm. long; bracts inconspicuous, glabrous.

Type in the U. S. National Herbarium, no. 474,585, collected at Matambú, Nicoya Peninsula, Costa Rica, altitude 600 meters, May 23, 1903, by O. F. Cook and C. B. Doyle (no. 697).

RANGE: Pacific coast region of northern Costa Rica.

COSTA RICA: Nicoya, *Tonduz* 13962.

176. *Piper esquivelanum* Trel., sp. nov.

An essentially glabrous shrub, copiously brown-granular throughout; leaves ovate-elliptic, subacuminate, equilaterally acute at base, 6 to 7.5×13 to 15 cm., pinnately nerved from the lower half, the nerves about 4×2, microscopically puberulent on the nerves beneath; petiole 15 mm. long, winged toward the base; spikes 3×55 mm., slightly mucronate; peduncle 5 mm. long; bracts concave; berries subglobose; stigmas 3, sessile.

Type in the U. S. National Herbarium, no. 1,307,339, collected at El Arenal, Province of Guanacaste, Costa Rica, altitude 485 to 600 meters, January 18, 19, 1926, by Paul C. Standley and Juvenal Valerio (no. 45042).

RANGE: Pacific slope of Costa Rica.

COSTA RICA: El Silencio, Guanacaste, *Standley & Valerio* 44644.

177. *Piper machadoanum* C. DC. Anal. Inst. Fis.-Geogr. Costa Rica 9: 166. 1897.

*Piper dichotomum* Auct., as to Nicaragua.

TYPE LOCALITY: Boca Machado, San Juan Valley, Nicaragua (*Pittier* 9638, the type).

RANGE: Caribbean lowlands of northern Costa Rica and adjacent Nicaragua.

COSTA RICA: Santa Clara. Las Delicias, *Biolley* 10676. Finca Montecristo, *Standley & Valerio* 48415, 48485, 48503, 48534, 48574, 48583. Hamburg Finca, *Standley & Valerio* 48667, 48690, 48715, 48743, 48757, 48777, 48819. La Colombiana Farm, *Standley* 36796, 36962, 36982.

178. *Piper brachistopodum* C. DC. Bot. Gaz. 70: 182. 1920.

TYPE LOCALITY: Las Vueltas, Tucurrique, Costa Rica (*Tonduz* 13143, the type).

RANGE: Caribbean slope of Costa Rica.

COSTA RICA: Las Vueltas, *Tonduz* 13128.

179. *Piper nodosum* C. DC. Bot. Gaz. 70: 185. 1920.

TYPE LOCALITY: Cañas Gordas, Costa Rica (*Pittier* 11072, the type).

RANGE: Mountains of southeastern Costa Rica.

180. *Piper coactoris* Trel., sp. nov.

A shrub; twigs evanescently hairy, copiously pale-granular near the nodes; leaves lance-elliptic, long-acuminate, inequilaterally acute at the base, 5.5 to 8×18 cm., pinnately nerved from below the middle, the nerves 5 or 6×2, rugose, roughened beneath by subappressed hairs; petiole 10+2 or 5 mm. long, glabrate, pale-granular, scarcely winged; spikes 3×60 to 85 mm., mucronate; peduncle 10 mm. long, pale-granular; bracts transversely subpeltate, ciliolate; berries oblong-subquadrate; stigmas minute, sessile.

Type in the U. S. National Herbarium, no. 1,307,517, collected at Viento Fresco, Province of Alajuela, Costa Rica, altitude 1,600 to 1,900 meters, Feb-

ruary 13, 1926, by Paul C. Standley and Reubén Torres (no. 47935). Dedicated to the junior collector.

RANGE: High central divide of Costa Rica.

COSTA RICA: Viento Fresco, *Standley & Torres* 47776. Fraijanes, *Standley & Torres* 47535, 47583. San Isidro, Heredia, *Standley & Valerio* 49689, 49722, 52054.

181. *Piper villistipulum* Trel., sp. nov.

A shrub; twigs glabrous, pale-granular; leaves somewhat obliquely elliptic, acuminate, inequilaterally acute at base, 6 to 8.5×17 to 22 cm., pinnately nerved from below the middle, the nerves 6 or 7×2, sparsely upcurved-hirsute on the nerves and principal veins beneath, the caducous stipules villous; petiole 15 or 10+5 mm. long, winged at base only, pale-granular; spikes (young) 2×40 mm., mucronate; peduncle 5 to 10 mm. long, glabrous; bracts round-subpeltate, cilliolate.

Type in the U. S. National Herbarium, no. 1,229,686, collected at El Muñeco, south of Navarro, Province of Cartago, Costa Rica, altitude 1,400 meters, February 8, 9, 1924, by Paul C. Standley (no. 33438).

RANGE: Upper Reventazón Valley, Costa Rica.

COSTA RICA: With the type, *Standley* 33942; *Standley & Valerio* 51014, 51030, 51103, 51245.

182. *Piper tabanicidum* Trel., sp. nov.

A shrub; twigs sparsely and transiently pale-villous, green-granular; leaves elliptic, acuminate, slightly inequilaterally obtuse at base, 4.5 to 7.5×15 to 16, or 9×21 cm., pinnately nerved from the lower half, the nerves pale, about 5×2, upcurved-pubescent beneath, deep glossy green; petiole about 10+2 mm. long, subhirsute, green-granular, winged at base; spikes 3 to 4×40 to 50 mm.; peduncle 5 to 10 mm. long, glabrous; bracts concave-inflexed; berries depressed-globose, velvety; stigmas 3, sessile.

Type in the U. S. National Herbarium, no. 1,307,383, collected at Tilarán, Province of Guanacaste, Costa Rica, altitude 600 meters, January, 1926, by Paul C. Standley and Juvenal Valerio (no. 45676).

RANGE: Pacific slope of Costa Rica.

COSTA RICA: About Tilarán, *Standley & Valerio* 44241, 44287, 44996, 46122, 46145, 46248, 46360, 46593. Libano, Guanacaste, *Standley & Valerio* 44896, 44925.

"Fruit used formerly to kill maggots in wounds of horses and cattle."

183. *Piper barbuiatum* C. DC. *Candollea* 1: 124. 1923; Schroeder, *Candollea* 3: 135. 1926.

*Piper hostmannianum* Auct., as to Costa Rica.

TYPE LOCALITY: Nicoya, Costa Rica (*Tonduz* 13697, the type).

RANGE: Pacific lowlands of northern Costa Rica (and Nicaragua?).

COSTA RICA: With the type, *Tonduz* 13964.

184. *Piper umbricola* C. DC. *Bull. Soc. Bot. Belg.* 30<sup>1</sup>: 215. 1891.

TYPE LOCALITY: Rodeo de Pacaca, Costa Rica (*Pittier* 3238, the type).

RANGE: Pacific slope of Costa Rica.

COSTA RICA: Buenos Aires, *Tonduz* 4900. Terraba, *Pittier* 3594. San Ramón, *Tonduz* 17780.

185. *Piper disparipes* Trel., sp. nov.

A shrub, glabrous except for the minutely puberulent nerves beneath; twigs pale-granular; leaves subelliptic-oblong, acuminate, the narrowed base inequilaterally subacute, 6 to 7×16 to 20 cm., pinnately nerved from below the middle, the nerves about 5×2, drying rather thin and yellowish; petiole 5+3

to 8+5 mm. long, pale-granular, scarcely winged; spikes 3×90 mm.; peduncle 5 mm. long; bracts roundish-subpeltate, ciliolate; berries cubic; stigmas 2, minute, sessile.

Type in the U. S. National Herbarium, no. 1,307,327, collected at El Silencio, Tilarán, Province of Guanacaste, Costa Rica, altitude 750 meters, January 13, 1926, by Paul C. Standley and Juvenal Valerio (no. 44766).

RANGE: Pacific slope of Costa Rica.

COSTA RICA: Naranjos Agrios, Tilarán, *Standley & Valerio* 46406.

186. *Piper papulatum* Trel., sp. nov.

A shrub, glabrous except for the obscurely rough-puberulent nerves beneath; twigs white-papillate; leaves subovate-elliptic, gradually acuminate, inequilaterally rounded at base, 4 to 5×13 to 9×20 cm., pinnately nerved from the lower half, the nerves 4 or 5×2, drying thin; petiole 6+4 mm. long, closely white-papillate, winged at base; spikes 3×75 mm., blunt; peduncle 5 mm. long; bracts roundish-subpeltate.

Type in the U. S. National Herbarium, no. 1,229,493, collected at Capulín, Río Grande de Tárcoles, Province of Alajuela, Costa Rica, altitude 80 meters, April 2, 1924, by Paul C. Standley (no. 40181).

RANGE: Pacific lowlands of Costa Rica.

187. *Piper imparipes* Trel., sp. nov.

A shrub, somewhat puberulent on the axes and the nerves beneath; twigs green-dotted; leaves suboblong-elliptic, acuminate, inequilaterally subacute at base, 6 to 7×16 to 18 cm., pinnately nerved from the lower half, the nerves about 5+4, drying glossy and rather thin; petiole 7+5 mm. long, winged at base; spikes 3×75 mm., obtuse, pale green; peduncle 5 mm. long; bracts roundish- or triangular-subpeltate, ciliolate.

Type in the U. S. National Herbarium, no. 1,229,673, collected at La Verbena, Province of San José, Costa Rica, altitude 1,200 meters, January 29, 1924, by Paul C. Standley (no. 32244).

RANGE: High central divide of Costa Rica.

188. *Piper leptocladum* C. DC. Anal. Inst. Fis.-Geogr. Costa Rica 9: 164. 1897.

*Piper dilatatum leptocladum* C. DC. Candollea 1: 96. 1923.

TYPE LOCALITY: Río Tuis, Costa Rica (*Pittier* 8160, the type).

RANGE: Reventazón Valley, Costa Rica.

189. *Piper pubens* Trel., sp. nov.

A shrub; twigs evanescently appressed-soft-hairy, finely pale-granular; leaves lance- or ovate-elliptic, long-acuminate, obliquely subacute at base, 5 to 6.5×15 cm., pinnately nerved from the lower half, the nerves about 5×2, finely granular but scarcely roughened above, paler beneath, with the nerves coarsely appressed-hispid, drying thin and microscopically punctulate; petiole 10 or 15+2 mm. long, transiently crisp-hairy, winged at base; spikes (young) 2×65 mm., slender-mucronate; peduncle slender, 10 mm. long, glabrate; bracts round-subpeltate, glabrous.

Type in the U. S. National Herbarium, no. 1,229,473, collected at La Estrella, Province of Cartago, Costa Rica, March 26, 1924, by Paul C. Standley (no. 39329).

RANGE: Upper Reventazón Valley, Costa Rica.

COSTA RICA: With the type, *Standley* 39197.

190. *Piper subdivaricatum* Trel., sp. nov.

A shrub; twigs thinly upcurved-hirsute, pale-granular; leaves lanceolate, attenuate, inequilaterally obtuse at base, 4 to 4.5×13 to 15 cm., pinnately nerved from below the middle, the nerves about 6+5, sparsely appressed-hispid on the



nerves beneath and glandular-punctulate between them; petiole scarcely 3+2 mm. long, subhirsute, becoming pale-granular, winged at base; spikes (young) 2×25 mm., short-peduncled; bracts roundish-subpeltate, ciliolate.

Type in the U. S. National Herbarium, no. 1,229,710, collected at La Hondura, Province of San José, Costa Rica, altitude 1,500 meters, March 2-4, 1924, by Paul C. Standley (no. 36489).

RANGE: High central divide of Costa Rica.

191. *Piper rotundibaccum* Trel., sp. nov.

A shrub; twigs retrorsely crisp-pubescent, becoming finely pale-granular; leaves lanceolate, gradually long-acuminate, inequilaterally obtuse at base, 3.5 to 4.5×10 to 13 cm., obscurely subrugose, pinnately nerved from the lower half, the nerves about 4×2, appressed-hirsute beneath; petiole scant 5 mm. long, hispid or granular, not winged; spikes slender-mucronate, in fruit 5×50 to 60 mm.; peduncle 15 mm. long, hirtellous; bracts triangular-subpeltate, ciliate-lacerate; berries rather large, globose, umbilicate; stigmas 2, sessile.

Type in the U. S. National Herbarium, no. 1,307,279, collected at Quebradillas, Santa María de Dota, Province of San José, Costa Rica, altitude 1,800 meters, December 24, 1925, by Paul C. Standley (no. 42902).

RANGE: High central divide of Costa Rica.

COSTA RICA: Near Santa María de Dota, *Standley* 42891. San Pedro Montes de Oca to Curridabat, *Standley* 41285.

191a. *Piper rotundibaccum fraijanesanum* Trel., var. nov.

Leaves becoming subovate, variable at base and sometimes cordulate; berries scarcely umbonate.

Type in the U. S. National Herbarium, no. 1,307,511, collected at Fraijanes, Province of Alajuela, Costa Rica, altitude 1,600 meters, February 12, 13, 1926, by Paul C. Standley and Rubén Torres (no. 47669).

RANGE: High central divide of Costa Rica.

COSTA RICA: About Fraijanes, *Standley & Torres* 47521, 47543, 47569.

192. *Piper zonulatispicum* Trel., sp. nov.

A shrub; twigs slender, transiently retrorsely appressed-hispid, becoming pale-granular; leaves lanceolate, gradually long-acuminate, unequally rounded at base, 3.5 to 4.5×11 to 14 cm., pinnately nerved from below the middle (nerves about 4×2), somewhat rugose in age, paler beneath, with the nerves appressed-hispid; petiole 5+2 mm. long, appressed-scabrid, not winged above the base; spikes 2×55 mm., pointed, conspicuously pale-banded by the rounded-subpeltate ciliolate bracts; peduncle 10 to 15 mm. long, glabrous; ovary subglobose-truncate; stigmas 3, minute, sessile.

Type in the U. S. National Herbarium, no. 1,307,636, collected at El Muñeco, Río Navarro, Province of Cartago, Costa Rica, altitude 1,500 meters, March 6, 7, 1926, by Paul C. Standley and Juvenal Valerio (no. 51116).

RANGE: Upper Reventazón Valley, Costa Rica.

COSTA RICA: With the type, *Standley* 33641; *Standley & Valerio* 51335. Oroquí, *Standley* 39812, 39893.

193. *Piper ejuncidum* Trel., sp. nov.

A slender shrub; twigs retrorse-hirtellous, more hairy beneath the nodes; leaves lanceolate, long-attenuate, inequilaterally obtuse at base or semicordulate, 2.5 to 3.5×9 to 12 cm., pinnately nerved from below the middle, the nerves about 5×2, crisp-pubescent beneath; petiole 8 or 10+2 mm. long, crisp-hispid, not winged; spikes 2×30 mm.; peduncle filiform, 20 mm. long, crisp-hirtellous; bracts roundish-subpeltate, ciliate.

Type in the U. S. National Herbarium, no. 1,307,670, collected on the Cerro de las Caricias, above San Isidro, Province of Heredia, Costa Rica, altitude



2,300 meters, March 11, 1926, by Paul C. Standley and Juvenal Valerio (no. 52220).

RANGE: High central divide of Costa Rica.

COSTA RICA: Above San Isidro, *Standley & Valerio* 49773, 49784, 49863, 50260, 52095. Santa María de Dota, *Standley* 42391.

194. *Piper dotanum* Trel., sp. nov.

A slender, spreading or subscandent, glabrous, pale-granular shrub; leaves lance-oblong, long-attenuate, somewhat unequally rounded at base, 2.5 to 3×8 to 11 cm., pinnately nerved from below the middle, the nerves about 4×2, dark green; petiole 3 mm. long, not winged; spikes 3×50 mm., blunt-mucronate; peduncle 10 mm. long; bracts roundish-subpeltate, glabrous.

Type in the U. S. National Herbarium, no. 1,307,252, collected at Santa María de Dota, Province of San José, Costa Rica, altitude 1,500 to 1,800 meters, December, 1926, by Paul C. Standley (no. 41739).

RANGE: High central divide of Costa Rica.

COSTA RICA: With the type, *Standley* 41849.

195. *Piper pseudo-albuginiferum* Trel., sp. nov.

A delicate shrub; twigs transiently and sparsely crisp-pubescent; leaves lanceolate, long-acuminate, unequally rounded at base or subcordulate, 3 to 5×11 to 13 cm., pinnately nerved from below the middle, the nerves 4×2 and sub-appressed-pubescent beneath; petiole 5+3 mm. long, somewhat crisp-pubescent, not winged; spikes (young) 2×30 mm., blunt, mucronate; peduncle 5 mm. long, glabrate; bracts transversely subpeltate, ciliolate, snowy on the back.

Type in the U. S. National Herbarium, no. 1,307,605, collected at El Muñeco, Río Navarro, Province of Cartago, Costa Rica, altitude 1,500 meters, March 6, 7, 1926, by Paul C. Standley and Juvenal Valerio (no. 50948).

RANGE: Upper Reventazón Valley, Costa Rica.

196. *Piper verruculigerum* Trel., sp. nov.

An essentially glabrous, slender, white-granular shrub; leaves lanceolate or elliptic-lanceolate, sharply and falcately long-acuminate, unequally rounded at base, 4 to 5×10 to 15 cm., pinnately nerved from below the middle, the nerves 5+4; petiole 5 mm. long, winged below; spikes scarcely 2×50 mm.; peduncle becoming 15 mm. long; bracts roundish-subpeltate, ciliolate.

Type in the U. S. National Herbarium, no. 1,307,440, collected at Quebrada Serena, Tilarán, Province of Guanacaste, Costa Rica, altitude 700 meters. January 27, 1926, by Paul C. Standley and Juvenal Valerio (no. 46239).

RANGE: Pacific slope of Costa Rica.

COSTA RICA: About Tilarán, *Standley & Valerio*, 44487, 45043, 45212, 45549, 45679, 45711, 45724, 45940, 46188, ? 46217, 46233, 46420, 46458.

197. *Piper verruculosum* C. DC. Journ. Bot. Brit. & For. 4: 215. 1866.

*Piper nudicaule* C. DC. Anal. Inst. Fis.-Geogr. Costa Rica 9: 162. 1897.

TYPE LOCALITY: Mount Candelaria, Costa Rica (*Hoffmann* 8, the type).

RANGE: High central divide of Costa Rica.

COSTA RICA: Tablazo, *Tonduz* 7922, the type of *P. nudicaule*. Páramo del Abejónal, *Tonduz* 7815.

198. *Piper carpinteranum* C. DC. Anal. Inst. Fis.-Geogr. Costa Rica 9: 165. 1897.

TYPE LOCALITY: Cerro de la Carpintera, Costa Rica (*Pittier & Tonduz* 4348, the type).

RANGE: Upper Reventazón Valley, Costa Rica.

COSTA RICA: Cerro de la Carpintera, *Standley* 34427, 35551, 35669, 35571. El Muñeco, Río Navarro, Cartago, *Standley* 33629. Alto de la Estrella, Cartago, *Standley* 39309.

199. *Piper silvivagum* C. DC. Anal. Inst. Fis.-Geogr. Costa Rica 9: 162. 1897.  
 TYPE LOCALITY: Boca del Río Zhorquín, Costa Rica (*Tonduz* 8595, the type).  
 RANGE: Caribbean lowlands of Costa Rica.  
 COSTA RICA: Shirores, *Tonduz* 9272. Tuis, *Tonduz* 11518.
200. *Piper reptabundum* C. DC. Bot. Gaz. 70: 169. 1920.  
 TYPE LOCALITY: Shirores, Talamanca, Costa Rica (*Tonduz* 9277, the type).  
 RANGE: Caribbean lowlands of Costa Rica.
201. *Piper flavirameum* C. DC. Bot. Gaz. 70: 181. 1920.  
 TYPE LOCALITY: La Palma, Costa Rica (*Pittier* 12510, the type).  
 RANGE: High central divide of Costa Rica.
202. *Piper pilibaccum* C. DC. Bot. Gaz. 70: 179. 1920.  
 TYPE LOCALITY: Matambú, Nicoya Peninsula, Costa Rica (*Cook & Doyle* 702, the type).  
 RANGE: Pacific lowlands of northwestern Costa Rica.
203. *Piper urophyllum* C. DC. Anal. Inst. Fis.-Geogr. Costa Rica 9: 170. 1897.  
*Piper sarapiquinum* C. DC. Anal. Inst. Fis.-Geogr. Costa Rica 9: 166. 1897.  
 TYPE LOCALITY: Río Tuis, Costa Rica (*Tonduz* 8159, the type).  
 RANGE: Caribbean slope of Costa Rica.  
 COSTA RICA: Tuis, *Tonduz* 11524. Cartago, *Polakowsky* 385. Río de las Vueltas, *Tonduz* 12764. Tsaki, *Tonduz* 9537. Talamanca, *Tonduz* 9284. Shirores, *Tonduz* 9266, 9276; *Pittier* 8275. Río Sarapiquí, *Biolley* 7437, type of *P. sarapiquinum*. Matina, *Pittier* 9742. Finca Montecristo, *Standley & Valerio* 48552. Siquirres, *Pittier* 3189.
204. *Piper catacryptum* Trel., sp. nov.  
 Differs from *P. urophyllum* in its firmer, relatively broader leaves.  
 Type in the U. S. National Herbarium, no. 38,069, collected at Rodeo de Pacaca, Costa Rica, January 12, 1891, by H. Pittier (no. 3293).  
 RANGE: Pacific slope of Costa Rica.  
 COSTA RICA: Rodeo de Pacaca, *Pittier* 3266. El Arenal, *Standley & Valerio* 45224, 45266. Tilarán, *Standley & Valerio* 44305, 45704, 46645. La Tejona, *Standley & Valerio* 45818, 45858, 45913. El Silencio, *Standley & Valerio* 44594. Naranjos Agrios, *Standley & Valerio* 46422, 46491, 46530 with parasitized (?) spike 5 mm. thick, as also in no. 45858.
205. *Piper tractifolium* Trel., sp. nov.  
 A glabrous shrub; leaves lance-elliptic, acuminate, equilaterally acute at base, 3 to 4×7 to 11 cm., pinnately nerved from below the middle, the nerves 4×2, drying firm, dark green and glossy above, pale and somewhat glandular-granular beneath; petiole 10 mm. long, not winged; spikes 3×35 mm., mucronate; peduncle filiform, 10 mm. long; bracts triangular- or lunulate-subpeltate, ciliate-lacerate; berries depressed-globose; stigmas 3, large, sessile.  
 Type in the U. S. National Herbarium, no. 1,307,663, collected on the Cerro de las Caricias, above San Isidro, Province of Heredia, Costa Rica, altitude 2,200 meters, March 11, 1926, by Paul C. Standley and Juvenal Valerio (no. 52052).  
 RANGE: High central divide of Costa Rica.  
 COSTA RICA: Vicinity of San Isidro, *Standley & Valerio* 49918, 49952, 51945, 51957; 49122, 50064, with subobovate-lanceolate leaves.
- 205a. *Piper tractifolium pubescens* Trel., var. nov.  
 A form with thinner leaves 4×12 cm., the nerves beneath and the young axes sparsely crisp-pubescent.

Type in the Botanical Garden Herbarium, Brussels, collected at La Palma, Costa Rica, by H. Pittier (no. 736).

RANGE: High central divide of Costa Rica.

206. *Piper concinnifolium* Trel., sp. nov.

*Piper concinnum* Auct., as to Costa Rica.

*Piper mombachanum* Auct., as to Costa Rica.

A glabrous shrub; leaves lanceolate or lance-elliptic, acuminate, subequilaterally acute at base, 3 to 4.5×8 to 11 cm., pinnately nerved from far below the middle, the long-ascending nerves 2×2, with shorter nerves up to the upper fourth of the midrib, drying thin and veiny; petiole slender, 10 mm. long, not winged; spikes 1 to 2×40 mm.; peduncle 5 mm. long; bracts inconspicuous, concave, subciliate; stigmas 3, minute, sessile.

Type in the U. S. National Herbarium, no. 716,434, collected in the Colinas de Piedades, San Ramón, Costa Rica, altitude 1,100 meters, June 4, 1901, by A. M. Brenes (no. 14194).

RANGE: Pacific slope of Costa Rica.

COSTA RICA: About San Ramón, *Brenes*, 17765, 17769, 17782, 17783, 17784. Madregal de San Mateo, ? *Jiménez* 1073. Los Ayotes, Tilarán, Guanacaste, *Standley & Valerio* 45478.

207. *Piper elliptico-lanceolatum* (C. DC.) Trel.

*Piper aequale elliptico-lanceolatum* C. DC. Bot. Gaz. 70: 171. 1920.

TYPE LOCALITY: Colinas de Piedades, San Ramón, Costa Rica (*Brenes* [not *Pittier*] 14185, the type).

RANGE: Pacific slope of Costa Rica.

COSTA RICA: With the type, *Brenes* 14186, 14482. Cabagra, *Pittier* 6530. Cañas Gordas, ? *Pittier* 11202. Colinas de Chirripó, ? *Tonduz* 14655.

208. *Piper diquisanum* C. DC. Bot. Gaz. 70: 185. 1920.

TYPE LOCALITY: Headwaters of the Río Diquís, Costa Rica (*Pittier* 10567, the type).

RANGE: Pacific slope of Costa Rica.

COSTA RICA: With the type, *Pittier* 10599.

209. *Piper tenuispicum* C. DC. Bot. Gaz. 70: 170. 1920.

TYPE LOCALITY: Trejos, Las Vueltas, Tucurrique, Costa Rica (*Tonduz* 13187, the type).

RANGE: Caribbean slope of Costa Rica.

COSTA RICA: Juan Vías, *Cook & Doyle* 294, 295.

210. *Piper leptoneuron* C. DC. Bot. Gaz. 70: 184. 1920.

TYPE LOCALITY: Santa Clara, Las Delicias, Costa Rica (*Pittier* 10675, the type).

RANGE: Caribbean lowlands of Costa Rica.

COSTA RICA: Guápiles, *Standley* 37338. La Colombiana Farm, *Standley* 36740, 36756.

211. *Piper xanthostachyum* C. DC. Anal. Inst. Fis.-Geogr. Costa Rica 9: 169. 1897.

TYPE LOCALITY: Río Tuis, Costa Rica (*Tonduz* 8158, the type).

RANGE: Caribbean slope of Costa Rica.

212. *Piper stenocladum* C. DC. Anal. Inst. Fis.-Geogr. Costa Rica 9: 162. 1897.

TYPE LOCALITY: Boruca, Costa Rica (*Tonduz* 6747 in part, the type).

RANGE: Pacific slope of Costa Rica.

COSTA RICA: Valley of El General, ? *Tonduz* 3390.

**213. *Piper stenocladophorum* Trel., sp. nov.**

A shrub, glabrous except for the puberulent nerves beneath; leaves lanceolate-suboblong, acuminate, acute at base, 5 to 5.5×15 to 17 cm., pinnately nerved from the lower half, the nerves 4×2; petiole 10 mm. long, not winged; spikes 3×85 mm.; berries round, umbilicate.

Type in the Botanical Garden Herbarium, Brussels, collected at Turrialba by A. Tonduz (no. 8316).

RANGE: Reventazón Valley, Costa Rica.

**214. *Piper costaricense* C. DC. in DC. Prodr. 16<sup>1</sup>: 328. 1869.**

TYPE LOCALITY: Agucate, Costa Rica (*Hoffmann* 678, the type).

RANGE: Mountains of central Costa Rica.

COSTA RICA: Volcán de Poás, *Pittier* 2958; *Tonduz* 10795. Río Poás, *Pittier* 2387. Turrialba, ? *Tonduz* 41112. Río Ciruelas, *Tonduz* 2204. Las Cóncevas, ? *Lankester* K5.

**215. *Piper heptaneurum* Trel., sp. nov.**

A nodose glabrous shrub; leaves lance-oblong, caudate, acute-based, 4×12 cm., firm and glossy, pinnately 7 nerved from the lower third; spikes (young) 2×25 mm.

Type in the U. S. National Herbarium, no. 796,288, collected at Turrialba, Costa Rica, altitude 200 meters, May 6, 1891, by A. Tonduz (no. 4112).

RANGE: Reventazón Valley, Costa Rica.

**216. *Piper pablense* Trel., sp. nov.**

A glabrous shrub; leaves lance- or subrhombic-ovate, acuminate, subcuneate. 4 to 5×8 to 10 cm., subpinnately nerved from below the middle, the nerves about 3×2, drying thin; petiole 10 mm. long, slender, not winged; spikes (young) 2×30 mm.; peduncle filiform, 5 mm. long; bracts rounded-subpeltate, ciliolate.

Type in the U. S. National Herbarium, no. 1,080,653, collected at San Pablo de Tarrazú, Costa Rica, March, 1918, by Otón Jiménez (no. 1094).

RANGE: Pacific slope of Costa Rica.

**217. *Piper carnosicaule* Trel., sp. nov.**

A glabrous shrub; twigs drying very sulcate; leaves subelliptic, long-acuminate, inequilaterally acute at base, 3.5 to 4.5×9 to 12 cm., pinnately nerved from below the middle, the nerves 5+4; petiole 5+2 mm. long, succulent, not winged; spikes 2×55 mm., obtuse; peduncle scant 10 mm. long, succulent; bracts lunulate, inconspicuous; berries oblong-trigonous; stigmas 3, linear, sessile, deciduous.

Type in the U. S. National Herbarium, no. 1,307,625, collected at El Muñeco, Río Navarro, Province of Cartago, Costa Rica, altitude 1,500 meters, March 6, 7, 1926, by Paul C. Standley and Juvenal Valerio (no. 51050).

RANGE: Upper Reventazón Valley, Costa Rica.

**218. *Piper coarctatum* Trel., sp. nov.**

A glabrous shrub; leaves lance-elliptic, attenuate, nearly equilaterally acute at base, 2.5 to 4×7 to 12 cm., submultiple-nerved from the lower third, the nerves 3×2, drying green and coriaceous; petiole 5 mm. long, grooved but scarcely winged; spikes 3×90 mm.; peduncle 5 to 7 mm. long; berries subglobose, protruding, subpapillate.

Type in the U. S. National Herbarium, no. 1,229,688, collected at El Muñeco, Río Navarro, Province of Cartago, Costa Rica, altitude 1,400 meters, February 8, 9, 1924, by Paul C. Standley (no. 33578).

RANGE: Upper Reventazón Valley, Costa Rica.

COSTA RICA: Cervantes, Cartago, *Nogueira* 11031.

219. *Piper tuisanum* C. DC. Anal. Inst. Fis.-Geogr. Costa Rica 9: 163. 1897.  
 TYPE LOCALITY: Río Tuis, Costa Rica (*Pittier* 8073, the type.)  
 RANGE: Caribbean slope of Costa Rica.
220. *Piper striatum* C. DC. Linnaea 37: 345. 1872.  
*Piper littorale* C. DC. Anal. Inst. Fis.-Geogr. Costa Rica 9: 165. 1897.  
 TYPE LOCALITY: "Nicaragua ad flumen San José et ad Ar. Gramara," Granada (*Oersted* 896, the type).  
 RANGE: Caribbean boundary region between Costa Rica and Nicaragua.  
 COSTA RICA: Puerto Viejo, Talamanca, *Tonduz* 8736, type of *P. littorale*. Boca Banana, *Tonduz* 9130. Limón, *Tonduz* 9794; *Pittier* 3643; *Cook & Doyle* 438.
221. *Piper guacimonum* (C. DC.) Trel.  
*Piper sepium guacimonum* C. DC. Bot. Gaz. 70: 179. 1920.  
 A shrub; twigs short-jointed, transiently puberulent; leaves elliptic, the lower ovate or suborbicular, rounded at base, 3.5 to 6×6.5 to 10.5 cm., pinnately or submultiple-nerved from below about the middle, the pale nerves 4 or 5×2, somewhat hirsute on the nerves beneath and dark-punctulate between them; petiole 10 to 20 mm. long, sparsely crisp-hairy, winged to or beyond the middle; inflorescence unknown.  
 Type in the herbarium of the Botanical Garden, Berlin, collected at Guácimo, Costa Rica, by A. Tonduz (no. 14656).  
 RANGE: Caribbean lowlands of Costa Rica.
222. *Piper poasanum* C. DC. Bull. Soc. Bot. Belg. 30: 206. 1891.  
 TYPE LOCALITY: Volcán de Poás (*Pittier* 2386, the type).  
 RANGE: High mountains of central Costa Rica.  
 COSTA RICA: Volcán de Poás, *Pittier* 247. Las Nubes, *Standley* 38556, 38870. La Estrella, Cartago, *Standley* 39175, 39364.
223. *Piper silvanorum* Trel., sp. nov.  
 A soft-wooded shrub; twigs very evanescently and sparingly hairy, pale-granular; leaves ovate, subacuminately attenuate, rounded or exceptionally subacute at base, 6 to 8×11 to 15, or becoming 11×20 cm., pinnately nerved from the lower half, the nerves 5×2, appressed-pubescent on the nerves beneath and somewhat granular between them, somewhat succulent; petiole 15 to 20 or 30 mm. long, thinly subvillous but glabrescent, winged to the middle; spikes 4 to 5×50 to 60 mm., mucronate; peduncle 15 to 20 mm. long, glabrous; bracts roundish-subpeltate, ciliolate.  
 Type in the U. S. National Herbarium, no. 1,229,454, collected in wet forest at Las Nubes, Province of San José, Costa Rica, altitude 1,500 to 1,900 meters, March 21, 1924, by Paul C. Standley (no. 38500).  
 RANGE: High mountains of central Costa Rica.  
 COSTA RICA: Above San Isidro, Heredia, *Standley & Valerio* 49917, 50026, 50043, 51562, 52116, 52230.
224. *Piper linearifolium* C. DC. Linnaea 37: 355. 1872.  
*Piper lineatum* Auct., as to Costa Rica.  
*Piper persicariaefolium* Auct., as to Costa Rica.  
 TYPE LOCALITY: Hacienda Santa Rosa, Guanacaste, Costa Rica (*Oersted* 868, the type).  
 RANGE: Central Costa Rica.  
 COSTA RICA: Uzarrás, *Oersted* 835. Punta Mala, *Tonduz* 6787. Río Ceibo, *Tonduz* 3612, 4896. Río Corozal, Santo Domingo de Golfo Dulce, *Tonduz* 9931 (*J. D. Smith* 7136). La Hondura, *Standley* 36171, 37562. Pejivalle, *Standley & Valerio* 46836. Turrialba, *Tonduz* 4104, 8410. Juan Viñas, *Tonduz* 1848; *Cook*

& Doyle 305, 312. Río Tuis, *Tonduz* 8162, 11529. Las Vueltas, Tucurrique, *Tonduz* 12817. Shirores, *Tonduz* 9279. Carrillo Road, *Biolley* 3179. Carrillo, *Cooper* 559; *Pittier* 1193. Río Zent, *United Fruit Co.* 347. Siquirres, *Carleton* 400.

225. *Piper pseudo-lanceaefolium* Trel., sp. nov.

*Piper lanceaefolium* Auct., as to Costa Rica.

A shrub; twigs sparsely villous or glabrescent; leaves somewhat inequilaterally lanceolate, sharply long-acuminate, acute-based or with one side obtuse or subcordulate, 5×13 to 16 cm., subpinnately nerved from the lower half, the impressed nerves 7 or 8×2, approximate downward, rugose or veiny, somewhat appressed-pubescent or the upper side glabrous; petiole 5+2 mm. long, pubescent, winged; spikes 3×125 to 150 mm., curved; peduncle slender, 20 to 30 mm. long, glabrate; bracts triangular-subpeltate, ciliate; berries obpyramidal-trigonous, small; stigmas 3, minute, sessile.

Type in the U. S. National Herbarium, no. 798,273, collected at La Palma, Costa Rica, altitude 1,450 meters, September, 1898, by A. Tonduz (no. 12665).

RANGE: High central divide of Costa Rica.

COSTA RICA: Santa María de Dota, *Standley* 41822; *Standley & Valerio* 43481. Cerro de la Carpintera, *Standley* 35479. La Estrella, *Standley* 39239. Cerro de las Lajas, Heredia, *Standley & Valerio* 51410. Cerro de Zurquí, Heredia, *Standley & Valerio* 48046, 50622. Vara Blanca, between Volcán de Poás and Barba, *Mason & Harvey* 8375. Río Poás, *Pittier* 2388.

226. *Piper celtidifolium* H. B. K. *Nov. Gen. & Sp.* 1: 50. 1815.

*Piper aduncum* Auct., as to Costa Rica.

*Piper angustifolium* Auct., as to Costa Rica.

? *Piper confusum* Auct., as to Costa Rica.

*Piper elongatum* Auct., as to Costa Rica.

TYPE LOCALITY: Caripe to Cumanacoa, Venezuela (*Bonpland*, in *Herb. Willdenow*, no. 664, the type).

RANGE: The Guianas, coastwise to Panama and Nicaragua, chiefly on the Caribbean side of the Continent.

COSTA RICA: Without locality, *Endres* 193. Boca Banana, *Tonduz* 9131. Boruca, *Tonduz* 3610, 4492, 6837. Buenos Aires, *Pittier* 3603; *Tonduz* 4897. Cañas Gordas, *Pittier* 11038. Carmen, *Standley & Valerio* 48393. Carrillo Road, *Tonduz* 2524. Cartago, *Oersted* 814. Curridabat, *Standley* 41276. Echeverría, *Pittier* 2548. Escasú, *Standley* 32362. Juan Viñas, *Cook & Doyle* 293; *Tonduz* 1858; ? *Pittier* 3187. La Carpintera, *Standley* 34517, 35773. Las Cóncevas, *Lankester* K312. La Colombiana Farm, *Standley* 36643. La Verbena, *Standley* 32300; *Tonduz* 8868. Las Pavas, *Pittier* 3185. Las Vueltas, Tucurrique, *Tonduz* 12748 (J. D. Smith 7562). Pejivalle, *Standley & Valerio* 46803, 46835, 46837. Peralta, *Stevens* 349. Piedra Blanca road, *Tonduz* 92b. Río Birris, *Pittier* 3190. Río María Aguilar, *Standley* 38939. Río Naranjo, *Tonduz* 7534. Rodeo de Pacaca, *Pittier* 1589, 3280; *Tonduz* 1595. San Francisco de Guadalupe, *Tonduz* 1773, 7132, 8021, 17953. San José, *Pittier* 3025; *Standley* 33248, 34820, 47356; *Tonduz* 780 (J. D. Smith 7299), 3024. San Pedro Montes de Oca to Curridabat, *Standley* 41276. San Sebastián, *Standley* 32700. Santo Domingo de Golfo Dulce, *Tonduz* 9970 (J. D. Smith 7141). Tres Ríos, *Pittier* 92. Tuis, *Tonduz* 11528 (J. D. Smith 7336). Shirores, *Tonduz* 9267. Zapote, *Standley* 40236.

227. *Piper disparispicum* Trel., sp. nov.

A shrub; twigs gray-hirsute; leaves lance-oblong, gradually pointed rather than acuminate, inequilaterally cordulate, 6×19 cm., scabrid, the nerves beneath upcurved-hirsute; peduncle 15 mm. long.



Type in the U. S. National Herbarium, no. 1,229,336, collected at Escasú, Province of San José, Costa Rica, altitude 1,250 meters, January 29, 1924, by Paul C. Standley (no. 32319).

RANGE: High central divide of Costa Rica.

228. *Piper aduncifolium* Trel., sp. nov.

*Piper hirsutum subsessilifolium* Auct., as to Costa Rica.

*Piper hispidum olfersianum* Auct., as to Costa Rica.

A shrub; twigs subretroscely hispid; leaves broadly elliptic-suboblong, acuminate, subequilaterally rounded at base or somewhat cordulate, 5 to 7.5×14 to 16 cm., pinnately nerved from the lower half, the nerves about 7×2, gradually approximate downward, granular-scabrous above and somewhat hispid on the nerves, loosely silky beneath with upcurved-pubescent nerves; petiole 5 mm. long, hispid, not winged; spikes 3×115 mm., either straight or arcuate; peduncle 10 mm. long, hispid; bracts transversely subpeltate.

Type in the U. S. National Herbarium, no. 796,393, collected at Carrillo, Costa Rica, altitude 300 meters, September 8, 1889, by H. Pittier (no. 1196).

RANGE: Caribbean piedmont of Costa Rica.

COSTA RICA: Carrillo Road, *Tonduz* 2532. Santa Clara, Las Delicias, *Biolley* 10671.

229. *Piper cartagoanum* C. DC. *Linnaea* 37: 350. 1872.

TYPE LOCALITY: Cartago, Costa Rica (*Oersted* 829, the type).

RANGE: Upper Reventazón Valley, Costa Rica.

230. *Piper sepicola* C. DC. *Bull. Soc. Bot. Belg.* 30<sup>1</sup>: 202. 1891.

TYPE LOCALITY: Turrialba, Costa Rica (*Tonduz* 4114, the type).

RANGE: Upper Reventazón Valley, Costa Rica.

231. *Piper gonagricum* Trel., sp. nov.

A shrub; twigs glabrescent and pale-granular; leaves ovate or lance-ovate, acuminate, equilaterally or obliquely obtuse at base, 4 to 5×9 to 10 cm., pinnately nerved from the lower half, granular-scabrous above, the nerves about 5×2, hirsute beneath; petiole 5 or 4+4 mm. long, sparsely hirsute, becoming somewhat granular; spikes 3 to 4×50 to 85 mm.; peduncle 5 to 10 mm. long, glabrate; bracts rounded-subpeltate, ciliolate; berries subcylindric, puberulent; stigmas 3, minute, sessile.

Type in the U. S. National Herbarium, no. 1,307,566, collected at Yerba Buena, above San Isidro, Province of Heredia, Costa Rica, altitude 2,000 meters, February, 1928, by Paul C. Standley and Juvenal Valerio (no. 49082).

RANGE: High central divide of Costa Rica.

COSTA RICA: Cerro de Zurquí, San Isidro, *Standley & Valerio* 50261. El Tablazo, *Tonduz* 7921. Zurquí, *Standley & Valerio* 48028, 48142.

232. *Piper pejivallense* Trel., sp. nov.

A shrub; twigs hispid; leaves subelliptic-ovate, acuminate, inequilateral at base with the shorter side acute, 4 to 5×9.5 to 10.5 cm., pinnately nerved from the lower half, microscopically granular above and lepidote, the nerves about 5+4, pale-hirsute beneath; petiole 5 to 10 mm. long, not winged, hirtellous or hispid; spikes 3×70 mm.; peduncle 5 to 10 mm. long, hirtellous; bracts subtriangular-subpeltate, ciliate; berries oblong, puberulent; stigmas 3, minute, sessile.

Type in the U. S. National Herbarium, no. 1,307,472, collected at Pejivalle, Province of Cartago, Costa Rica, altitude 900 meters, February 7, 8, 1926, by Paul C. Standley and Juvenal Valerio (no. 46727).

RANGE: Upper Reventazón Valley, Costa Rica.

COSTA RICA: Pejivalle, *Standley & Valerio* 47070.



**233. *Piper curvipilum* Trel.**

*Piper hirsutum pallescens* C. DC. Bull. Soc. Bot. Belg. 30<sup>1</sup>: 204. 1891.

TYPE LOCALITY: Aguacaliente, Costa Rica (*Tonduz* 2530, the type).

RANGE: Reventazón Valley, Costa Rica.

COSTA RICA: Tuis, *Tonduz* 8163, 11527 (J. D. Smith 7335). Las Vueltas, *Tonduz* 12781, 13126. Aragón, *Tonduz* 9013. Suerre, Santa Clara, J. D. Smith 6750. Cuesta de La Vieja, *Cook & Doyle* ? 108, 109.

**234. *Piper pergeniculatum* Trel., sp. nov.**

A nodose shrub; twigs zig-zag, dingy-hispid; leaves elliptic-oblong, acuminate, subequilaterally acute at base, 6 × 15 to 16 cm., pinnately nerved from the lower half, the nerves about 6 × 2, scabrous above, softly appressed-pubescent beneath; petiole 10 mm. long, hispid, not winged; spikes 3 × 70 mm.; peduncle 10 mm. long, hispid; bracts round- or transversely subpeltate, ciliolate.

Type in the U. S. National Herbarium, no. 798,238, collected at Cañas Gordas, Costa Rica, altitude 1,100 meters, February, 1897, by H. Pittier (no. 11033).

RANGE: Caribbean slope of eastern Costa Rica.

**235. *Piper genuflexum* Trel., sp. nov.**

A shrub; twigs zig-zag, white villous-hirsute; leaves elliptic-oblong, acuminate, nearly equilaterally acute at base, 4 to 6 × 13 to 16 cm., pinnately nerved from the lower half (nerves about 5 × 2), white-scabrous above, the nerves hispid on both sides; petiole scarcely 10 mm. long, hispid, not winged; spikes 3 × 75 mm.; peduncle 5 mm. long, subhispid; bracts lunulate-subpeltate, white-ciliate.

Type in the U. S. National Herbarium, no. 796,263, collected at Santa Rosa del Copey, Costa Rica, altitude 1,800 meters, February, 1928, by A. Tonduz (no. 11687).

RANGE: Pacific slope of Costa Rica.

COSTA RICA: La Uruca, ? *Tonduz* 6354.

**236. *Piper echeverrianum* Trel., sp. nov.**

*Piper hirsutum magnifolium* Auct., as to western Costa Rica.

A shrub; twigs retrorsely hispid; leaves elliptic, acuminate, inequilaterally acute at base, 6 to 7.5 × 13 to 15 cm., pinnately nerved from the lower half (the nerves about 6 + 5), granular-scabrous and somewhat lepidote above, dark-granular beneath with hispid nerves, becoming rugose; petiole some 10 + 3 mm. long, sparsely hirsute, not winged; spikes about 3 × 80 to 150 mm.; peduncle 5 to 10 mm. long, glabrate; bracts round-subpeltate, dingy-ciliolate; berries oblong, puberulent; stigmas 3, minute, sessile.

Type in the U. S. National Herbarium, no. 796,295, collected at Echeverría, Costa Rica, May, 1890, by H. Pittier (no. 2547).

RANGE: Pacific slope of Costa Rica.

COSTA RICA: El General, *Pittier* 3387, 3388, 3394. San Ramón, *Brenes* 14195; *Tonduz* 17774. Buenos Aires, *Pittier* 3607 in part, 4895, 4903. Alajuela *Alfaro* 498 (J. D. Smith 5919). Térraba, *Tonduz* 3595; *Pittier* 3608. Nicoya, ? *Tonduz* 13691. La Argentina, ? *Jiménez* 1139.

**237. *Piper reventazonis* Trel., sp. nov.**

A shrub; twigs subvillous-hirsute; leaves elliptic-subovate, acuminate, obliquely obtuse at base, 5 to 7 × 11 to 15 cm., pinnately nerved from the lower half, nerves about 5 × 2, rugose, scabrous above from the bases of long hairs, loosely soft-hirsute beneath; petiole 8 + 2 mm. long, hirsute; spikes 2 × 80 to 100 mm.; peduncle 10 mm. long, hispid; bracts lunulate-subpeltate, ciliolate.

Type in the U. S. National Herbarium, no. 474,115, collected at Juan Viñas, Costa Rica, altitude 1,000 meters, April 25, 1903, by O. F. Cook and C. B. Doyle (no. 306).

RANGE: Upper Reventazón Valley, Costa Rica.

COSTA RICA: Juan Viñas, *Cook & Doyle* 349; *Pittier* 1868, 3187.

238. *Piper pseudofulgineum* C. DC. *Linnaea* 37: 355. 1872.

TYPE LOCALITY: Mount Candelaria, Costa Rica (*Oersted* 887, the type).

RANGE: Central Costa Rica.

239. *Piper bisasperatum* Trel., sp. nov.

A shrub; twigs quickly glabrescent, with intermingled coarse and fine warts; leaves obliquely ovate, acuminate, obtuse at base, 6 to 8×15 cm., pinnately nerved from the lower half, the nerves about 6+5, becoming rugose, granular-roughened, with caducous pubescence, the somewhat punctulate lower side hirsute on the nerves; petiole 12+3 mm. long, subvillous but glabrescent and granular, not winged; spikes 3×60 mm.; peduncle 10 mm. long, minutely roughened; bracts rounded-subpeltate, ciliate.

Type in the U. S. National Herbarium, no. 1,229,396, collected on the Cerro de la Carpintera, Province of Cartago, Costa Rica, altitude 1,500 to 1,850 meters, February, 1924, by Paul C. Standley (no. 35723).

RANGE: Mountains of central Costa Rica.

COSTA RICA: Cerro de la Carpintera, *Pittier & Tonduz* 4349; *Standley* 34272, 35582, 35587, 35692, 35739. San Isidro Coronado, *Alfaro* 34002, 34012. Yerba Buena, above San Isidro, *Standley & Valerio* 49226, 49697, 49714. Cerros de Zurquí, *Standley & Valerio* 50293, 50413. Cerro de las Caricias, *Standley & Valerio* 52002, 52030, 52053, 52110, 52185. El Muñeco, *Standley & Valerio* 51241, 51251. La Estrella, Cartago, ? *Standley* 39219, 39228, 39339.

240. *Piper pavasense* Trel., sp. nov.

A shrub; twigs hispid-hirsute; leaves subelliptic, acuminate, inequilaterally rounded at base, 6 to 9×15 to 16 cm., pinnately nerved from the lower half, the nerves about 6+5, scabrous above from the bases of deciduous appressed hairs, granular beneath and hirsute on the nerves, becoming subrugose; petiole 5+3 mm. long, hirsute, not winged; spikes 3×70 mm.; peduncle 10 mm. long, hispid or subglabrescent; bracts roundish-subpeltate, ciliolate.

Type in the U. S. National Herbarium, no. 796,372, collected at Las Pavas, Province of San José, Costa Rica, altitude 900 meters, May, 1890, by H. Pittier (no. 3188).

RANGE: Mountains of central Costa Rica.

COSTA RICA: Las Pavas, *Pittier* 3184, with subvillous pubescence; 3192; 3194, with acute-based leaves 9 to 10.5×19 to 20 cm., the nerves beneath scarcely more than puberulent.

241. *Piper talamancaum* Trel., sp. nov.

*Piper hirsutum pallens* Auct., p. p.

A shrub; twigs gray-subvillous; leaves inequilaterally lance-elliptic, acuminate, subacute at base, 6 to 8×16 to 18 cm., pinnately nerved from the lower half, the nerves about 6+5, somewhat rugose, scabrous above from the bases of appressed hairs, upcurved-hairy on the nerves beneath; petiole 10 mm. long, white-hairy, not winged; spikes 2 to 3×70 to 80 mm.; peduncle 5 mm. long, hirsute.

Type in the U. S. National Herbarium, no. 577,234, collected at Shirores, Province of Talamanca, Costa Rica, altitude 100 meters, February, 1895, by A. Tonduz (no. 9274); also sheet no. 796,389.

RANGE: Caribbean slope of Costa Rica.

COSTA RICA: Shirores, *Tonduz* 9284. Río Zhorquín, *Tonduz* 8587, 8592. Siquirres, ? *Pittier* 3181.

242. *Piper cookii* Trel., sp. nov.

A shrub; twigs drying dark, for a time rusty-subvillous; leaves inequilaterally lanceolate, acuminate, the narrowed base subobtuse, 4 to 5×10 to 12 cm., pinnately nerved from the lower half, the nerves about 5+4, granular-scabrous above, paler beneath with appressed-pubescent nerves; petiole 5+2 mm. long, rusty-hirsute, not winged; spikes (young) 2×55 mm.; peduncle 10 mm. long, soft-hairy; bracts rounded-subpeltate, ciliolate.

Type in the U. S. National Herbarium, no. 474,200, collected at Turrialba, Costa Rica, by O. F. Cook and C. B. Doyle (no. 376).

RANGE: Reventazón Valley, Costa Rica.

243. *Piper tsuritkubense* Trel., sp. nov.

*Piper hirsutum magnifolium* Auct., in part as to Costa Rica.

A shrub; twigs hispid-hirsute; leaves obliquely elliptic-ovate, acuminate, rounded or exceptionally acute at base, 6 to 9×13 to 19 cm., pinnately nerved from the lower half or two-thirds, the nerves about 6+5, at most obscurely rugose, white-scabrous above, the nerves beneath hirsute; petiole 5+3 to 10+5 mm. long, hispid-hirsute, not winged; spikes 3×100 mm.; peduncle 10 mm. long, hispid; bracts lunulate-subpeltate, ciliolate.

Type in the U. S. National Herbarium, no. 796,368, collected at Tsuritkub, Talamanca, Costa Rica, March, 1894, by A. Tonduz (no. 8616).

RANGE: Lower Caribbean slope of Costa Rica.

COSTA RICA: Tsuritkub, *Tonduz* 8609, 8654, 8718. Puerto Viejo and Sarapiquí River, *Biolley* 6917, acute-based; 7435. Tuis, *Tonduz* 8074, acute-based; 16527. Boca de Zhorquín, *Tonduz* 8587. Las Vueltas, Tucurrique, *Tonduz* 13127. Tsaki, *Tonduz* 9534, 9535. Hacienda de la Estrella, *United Fruit Co.* 184. Río Honda, Santa Clara, *Cook & Doyle* 486.

244. *Piper subquadratum* Trel., sp. nov.

A glabrous shrub with pale-granular rooting branches; leaves subquadrately elliptic-ovate, acuminate, obliquely obtuse at base, 5 to 7×12 cm., pinnately nerved from below the middle, the nerves 4 or 5×2, more or less granular and lepidote above; petiole about 5 mm. long; spikes some 2×70 mm.; peduncle scant 5 mm. long.

Type in the U. S. National Herbarium, no. 796,209, collected at Río Arieli, Talamanca, Costa Rica, February, 1895, by A. Tonduz (no. 9387 in part).

RANGE: Caribbean slope of Costa Rica.

COSTA RICA: Tsaki, *Tonduz* 9536. Puerto Viejo and Sarapiquí River, *Biolley* 6914. La Palma, ? *Pittier* 12546.

245. *Piper machucanum* Trel., sp. nov.

A shrub; twigs rusty-subvillous; leaves lance-ovate, acuminate, inequilaterally obtuse or exceptionally acute at base, 7×16 to 9×20 cm., pinnately nerved from the lower half, the nerves about 6+5, scabrous above from the bases of long white hairs, and with soft long hairs beneath, becoming rugose; petiole about 7+3 mm. long, hispid; spikes 2 to 3×60 to 120 or 150 mm.; peduncle 10 mm. long, hispid; bracts rounded-subpeltate.

Type in the Botanical Garden Herbarium, Brussels, collected at San Mateo, on the Río Machuca, Costa Rica, by P. Biolley (no. 4068, "1168").

RANGE: Lower Pacific slope of Costa Rica.

COSTA RICA: Punta Mala, ? *Tonduz* 6784, 6820.

246. *Piper laevius* (C. DC.) Trel.

*Piper hirsutum laevius* C. DC. Bull. Soc. Bot. Belg. 30<sup>1</sup>: 204. 1891.

TYPE LOCALITY: Puntarenas, Costa Rica (*Pittier* 496, the type).

RANGE: Pacific coast of Costa Rica.

**247. *Piper granulatum* Trel., sp. nov.**

A shrub; twigs retrorsely white-hairy; leaves lanceolate, acuminate, obliquely rounded at base, 3.5 to 4.5×12 cm., pinnately nerved from the lower half, the nerves about 5+4, granular-scabrous above, subappressed-hirsute on the nerves beneath; petiole 10 mm. long, hirsute, not winged; spikes 3×80 to 90 mm.; peduncle scant 10 mm. long, white-hairy; bracts rounded-subpeltate, ciliolate; berries oblong, glabrate; stigmas 3, minute, sessile.

Type in the U. S. National Herbarium, no. 796,264, collected at Buenos Aires, Costa Rica, altitude 250 meters, February, 1891, by H. Pittier (no. 3593).

RANGE: Pacific slope of Costa Rica.

COSTA RICA: Buenos Aires, *Tonduz* 4894. Boruca, *Tonduz* 3598, 3614. Santiago, San Ramón, ? *Tonduz* 17768. Quebrada de la Ardilla, San Marcos, *Tonduz* 7556. Cabagra, *Tonduz* 6531.

**248. *Piper anguillaespicum* Trel., sp. nov.**

A shrub; twigs glabrous, somewhat pale-granular; leaves elongate-lanceolate, subcaudately pointed, subacute at base, 4×13 cm., pinnately nerved from below the middle, the impressed nerves about 6×2, granular-roughened and at first short-hairy above, appressed-hispid beneath; petiole 5 mm. long, hirtellous and granular, not winged; spikes flexuous, filiform, 2×90 mm., with slender sterile tip; peduncle 15 mm. long, glabrescent and granular; bracts roundish-subpeltate, minute, ciliolate; ovary subglobose, roughened; stigmas 3, minute, sessile.

Type in the U. S. National Herbarium, no. 1,080,176, collected near San Ramón, Costa Rica, altitude 900 to 950 meters, by A. M. Brenes (no. 14197).

RANGE: Pacific slope of Costa Rica.

**249. *Piper dumeticola* C. DC. Anal. Inst. Fis.-Geogr. Costa Rica 9: 164. 1897.**

TYPE LOCALITY: Boruca, Costa Rica (*Tonduz* 4490, the type).

RANGE: Pacific slope of Costa Rica.

COSTA RICA: Boruca, *Tonduz* 4106, 4107, 4491, 4780. Rodeo de Pacaca, *Pittier* 3297. El Bolsón, Guanacaste, *Pittier* 2611. Los Frailes, *Tonduz* 7876. San Marcos, *Tonduz* 7554, 7761.

**250. *Piper oblanceolatum* Trel., sp. nov.**

A shrub; twigs snowy-villous but glabrescent; leaves oblanceolate, acuminate, the narrowed base obliquely rounded, 4.5×15 cm., pinnately nerved from below about the middle, the nerves 6×2, scabrous above, soft-hairy on the nerves beneath with the hairs spreading near the base; petiole 4+2 mm. long, white-villous, not winged; spikes (young) 2×20 mm., on short hairy peduncles; bracts transversely subpeltate, ciliate-lacerate.

Type in the U. S. National Herbarium, no. 1,307,380, collected at Los Ayotes, Tilarán, Province of Guanacaste, Costa Rica, altitude 650 meters, January 21, 1926, by Paul C. Standley and Juvenal Valerio (no. 45558).

RANGE: Pacific slope of Costa Rica.

COSTA RICA: Guanacaste, *Pittier* 2611. Rodeo de Pacaca, *Pittier* 3297.

**250a. *Piper oblanceolatum fragilicaule* Trel., var. nov.**

Leaves lanceolate, the nerves beneath as well as the petiole appressed-hispid.

Type in the U. S. National Herbarium, no. 1,307,361, collected at El Arenal, Province of Guanacaste, Costa Rica, altitude 500 meters, January 18, 19, 1926, by Paul C. Standley and Juvenal Valerio (no. 45228).

RANGE: Pacific slope of Costa Rica.

**251. *Piper comatum* Trel.**

*Piper hirsutum longepilosum* C. DC. Anal. Inst. Fis.-Geogr. Costa Rica 9: 160. 1897. Not *P. longepilosum* C. DC.

**TYPE LOCALITY:** Río Corozal, Santo Domingo de Golfo Dulce, Costa Rica (*Tonduz* 9932, the type).

**RANGE:** Pacific lowlands of Costa Rica.

**COSTA RICA:** Río Corozal, *Tonduz* 7137. Matina, *Pittier* 10309.

252. *Piper salinasanum* C. DC. Bull. Soc. Bot. Belg. 30': 214. 1891.

**TYPE LOCALITY:** Salinas Bay, Costa Rica (*Pittier* 2775, the type).

**RANGE:** Pacific lowlands of northwestern Costa Rica.

**COSTA RICA:** Nicoya, *Cook & Doyle* 668. Capulín, Río Grande de Tárcoles, *Standley* 40165.

253. *Piper griseo-pubens* Trel., sp. nov.

A shrub; twigs subcrisply hirtellous, but glabrescent; leaves elliptic-ovate or subobovate, short-acuminate, 6 to 6.5×12 to 13 cm., pinnately nerved from below the middle, the nerves about 6+5, appressed-pubescent above with hard-based soft pale hairs, softly appressed-pubescent beneath; petiole 7+4 mm. long, somewhat crisp-hirtellous, not winged; spikes (very young) 1×10 mm., gray-pubescent.

Type in the U. S. National Herbarium, no. 1,307,328, collected at Líbano, Province of Guanacaste, Costa Rica, altitude 300 meters, January 15, 1926, by Paul C. Standley and Juvenal Valerio (no. 44879).

**RANGE:** Pacific slope of Costa Rica.

253a. *Piper griseo-pubens revocabile* Trel., var. nov.

Leaves ovate to subquadrately oblanceolate-obovate, 6 to 8×14 to 18 cm.; spikes 3×50 mm.

Type in the U. S. National Herbarium, no. 1,307,333, collected at Tilarán, Province of Guanacaste, Costa Rica, altitude 600 meters, January, 1926, by Paul C. Standley and Juvenal Valerio (no. 44943).

**RANGE:** Pacific slope of Costa Rica.

254. *Piper leucophlebium* Trel., sp. nov.

A shrub; twigs villous-hirsute, but glabrescent and slightly granular; leaves broadly lanceolate, subfalcate-acuminate, inequilaterally obtuse at base, 6 to 7.5×14 to 20 cm., pinnately nerved from the lower half, the pale nerves about 7+6, becoming rugose, scabrous above from the bases of fine long white hairs, softly villous-hirsute beneath; petiole 10 or 12+3 mm. long, upcurved-hairy, not winged; spikes 3×60 to 70 mm.; peduncle 5 mm. long, retrorsely subvillous; bracts roundish-subpeltate, ciliolate.

Type in the U. S. National Herbarium, no. 1,307,301, collected at Tilarán, Province of Guanacaste, Costa Rica, altitude 600 meters, January, 1926, by Paul C. Standley and Juvenal Valerio (no. 44277).

**RANGE:** Pacific slope of Costa Rica.

**COSTA RICA:** About Tilarán, *Standley & Valerio* 45908, 46596.

255. *Piper scalpens* Trel., sp. nov.

*Piper hirsutum parvifolium* Auct., p. p.

A shrub; twigs sparsely gray-hispid, granular-roughened; leaves lanceolate or subelliptic-oblong, acuminate, obliquely rounded or subacute at base, 4×9 to 11 cm., pinnately nerved from the lower half, the nerves 4 or 5×2, very white-scabrous above, minutely punctulate beneath and hispid on the nerves; petiole 5+2 mm. long, hairy, not winged; spikes 3×70 mm.; peduncle 5 mm. long, somewhat hairy; bracts round-subpeltate, ciliolate.

Type in the U. S. National Herbarium, no. 796,405, collected at San José, Province of San José, Costa Rica, altitude 1,100 meters, July, 1896, by A. Tonduz (no. 10154). Also distributed by John Donnell Smith as no. 7312.

**RANGE:** High central divide of Costa Rica.

256. *Piper spicilongum* Trel., sp. nov.

A shrub; twigs appressed-hispid; leaves elliptic-ovate or subobovate, acuminate, obliquely obtuse at base, 6 to 11×15 to 19 cm., pinnately nerved from the lower half, the nerves about 6×2, obscurely rugose, granular and lepidote above, the nerves beneath hispid; petiole 10 to 20 mm. long, hispid, not winged; spikes 2 to 3×125 mm.; peduncle about 10 mm. long, hispid; bracts rounded-subpeltate.

Type in the U. S. National Herbarium, no. 796,390 (also represented by no. 796,391), collected at Santo Domingo de Golfo Dulce, Costa Rica, March, 1896, by A. Tonduz (no. 9962). Distributed also by John Donnell Smith as no. 7140.

RANGE: Pacific lowlands of Costa Rica.

COSTA RICA: Surubres, San Mateo, *Biolley* 1051.

257. *Piper trichophlebium* Trel.

*Piper hirsutum tonduzii* C. DC. Bull. Soc. Bot. Belg. 30<sup>1</sup>: 203. 1891. Not *P. tonduzii* C. DC.

TYPE LOCALITY: Aserrí, Costa Rica (*Tonduz* 1270, the type).

RANGE: High central divide of Costa Rica.

COSTA RICA: San Pedro Road, San José, *Tonduz* 1409. La Palma, *Standley* 33094; *Tonduz* 12588. La Palma to La Hondura, *Maxon & Harvey* 7992. La Hondura, *Standley* 36133, 36578. Carrizal, Volcán de Barba, *Pittier* 792. Alajuelita, *Tonduz* 1467. Río Ciruelas, *Tonduz* 2198. San José, *Pittier* 10654. Río María Aguilar, San José, *Standley* 38957. Aguacaliente, *Pittier* 64.

258. *Piper caudatifolium* Trel., sp. nov.

A shrub; twigs sparsely hispid or subglabrescent and finely pale-granular; leaves lance- or oblong-elliptic, long-acuminate, obliquely rounded at base, 3 to 4×9 to 10 cm., pinnately nerved from the lower half, granular-scabrous, the nerves about 5×2, with spreading rusty hairs beneath; petiole 5+2 mm. long, hispid, not winged; spikes 2 to 3×60 to 80 mm.; peduncle 5 mm. long, glabrate; bracts round-subpeltate, ciliolate; berries oblong, puberulent; stigmas 3, minute, sessile.

Type in the U. S. National Herbarium, no. 796,382, collected at Las Pavas, Province of San José, Costa Rica, altitude 800 meters, November, 1890, by H. Pittier (no. 3191).

RANGE: Mountains of central Costa Rica.

259. *Piper torresanum* Trel., sp. nov.

*Piper hirsutum pallescens* Auct., p. p.

A shrub; twigs glabrous, scarcely granular; leaves lanceolate, acuminate, rounded or subacute at base, 4 to 6×13 to 15 cm., pinnately nerved from the lower half, the nerves about 5×2, white-scabrous above and somewhat hispid on the nerves, the nerves beneath appressed-gray-pubescent; petiole 5 to 7+3 mm. long, white-hispid, not winged; spikes (young) 3×50 mm.; peduncle 5 mm. long, glabrous; bracts round-subpeltate, ciliolate.

Type in the U. S. National Herbarium, no. 796,388, collected on the Río Torres, San Francisco de Guadalupe, Costa Rica, altitude 1,170 meters, November 25, 1894, by A. Tonduz and H. Pittier (no. 8971).

RANGE: High central divide of Costa Rica.

COSTA RICA: Tablazo, ? *Tonduz* 7921.

260. *Piper inhorrescens* Trel., sp. nov.

A shrub; twigs dingy-subtomentose, pale-granular when denuded; leaves lanceolate, acuminate, inequilaterally rounded at base, 3.5 to 4.5×9 to 13 cm., pinnately nerved from the lower half, the nerves about 6+5, pubescent above with soft hairs but becoming very rough in age from their enlarging granular bases, dingy hirsute-villous beneath; petiole 5+2 to 5 mm. long, crisp-hairy,



not winged; spikes  $4 \times 75$  mm.; peduncle 10 mm. long, crisp-pubescent; bracts roundish-subpeltate, ciliolate.

Type in the U. S. National Herbarium, no. 1,229,707, collected at Las Pavas, Province of San José, Costa Rica, altitude 1,070 meters, February 29, 1924, by Paul C. Standley (no. 36083).

RANGE: High central divide of Costa Rica.

COSTA RICA: Las Pavas, *Standley* 36068. La Verbena, *Standley* 32204.

**261. *Piper squali-pelliculum* Trel., sp. nov.**

*Piper salinasanum subscabrifolium* C. DC. Anal. Inst. Fis.-Geogr. Costa Rica 9: 164. 1897.

*Piper salinasanum subscabridifolium* C. DC. Candollea 1: 275. 1923. (Name only.)

A shrub; twigs loosely soft-hirsute to subglabrescent and pale-granular; leaves inequilaterally lanceolate, long-attenuate, the longer side somewhat cordulate, 7 to  $8 \times 20$  cm., pinnately nerved from below the middle, the nerves about  $5 \times 2$ , becoming rugose, shagreen-roughened above from the bases of pointed hairs, the nerves beneath soft-hirsute; petiole about  $5+5$  mm. long, soft-hirsute, not winged; spikes  $3 \times 90$  mm.; peduncle 10 mm. long, sparsely soft-hairy and pale-granular; bracts transversely subpeltate, ciliate.

TYPE LOCALITY: Río Virilla, San José (*Tonduz* 10126, the type).

RANGE: High central divide of Costa Rica.

COSTA RICA: Near San José, *Tonduz* 7300, 12729. La Palma, *Standley* 38216.

**262. *Piper verbenanum* C. DC. Anal. Inst. Fis.-Geogr. Costa Rica 9: 165. 1897.**

*Piper salinasanum verbenanum* C. DC. Candollea 1: 97. 1923.

*Piper mollicomum* Auct., as to Costa Rica.

TYPE LOCALITY: La Verbena, near Alajuelita, San José, Costa Rica (*Tonduz* 8867, the type).

RANGE: High central divide, Costa Rica.

COSTA RICA: La Verbena, *Tonduz* 8869, 8870; *Standley* 32208, 32228, 32294. Cerro de la Carpintera, *Hoffmann* 349.

**263. *Piper valetudinarii* Trel., sp. nov.**

A shrub; twigs subretroscely or crisp-hispid; leaves lance-ovate, acuminate, obliquely rounded at base or subcordulate, 5 to  $7 \times 13$  to 15 cm., pinnately nerved from the lower half, the nerves about  $5 \times 2$ , white-scabrous above, granular beneath and upcurved-hispid on the nerves, little rugose; petiole scant  $7+4$  mm. long, hispid, not winged; spikes  $3 \times 60$  to 70 mm.; peduncle 10 to 15 mm. long, hispid; bracts roundish-subpeltate, ciliate.

Type in the U. S. National Herbarium, no. 471,728, collected near the hospital at San José, Costa Rica, January 2, 1893, by A. Tonduz (no. 7235); also represented by no. 796,362.

RANGE: High central divide of Costa Rica.

**264. *Piper submolle* Trel., sp. nov.**

A shrub; twigs rather soft-hairy; leaves lanceolate, gradually attenuate, almost equilaterally rounded at base,  $5.5$  to  $7 \times 17$  to 20 cm., pinnately nerved from the lower half, the nerves about  $6 \times 2$ , white-scabrous above from the bases of rather short and soft hairs, the nerves beneath appressed-hairy; petiole 10 mm. long, soft-hairy, not winged; spikes  $3 \times 80$  mm., zonulate; peduncle 7 mm. long, appressed-pubescent; bracts conspicuous, triangular-subpeltate; berries obconic; stigmas 3, minute, sessile.

Type in the U. S. National Herbarium, no. 1,307,521, collected at Carmen, Province of Limón, Costa Rica, altitude 30 meters, February 20, 1896, by Paul C. Standley and Juvenal Valerio (no. 48363).

RANGE: Caribbean lowlands of Costa Rica.



**265. *Piper carminis* Trel., sp. nov.**

A shrub; twigs retrorsely hirsute, pale-granular about the nodes; leaves obliquely broadly elliptic, acuminate, obtuse at base, 4.5 to 7×11 to 14 cm., pinnately nerved from the lower half, the nerves about 5×2, white-granular and with scattered soft hard-based hairs above, appressed-rough-hairy on the nerves beneath; petiole 3 or 5+3 mm. long, upcurved-hirsute, not winged; spikes 2.5×55 mm.; peduncle 5 mm. long, verruculose-hispid; bracts roundish-subpeltate, ciliolate.

Type in the U. S. National Herbarium, no. 1,307,522, collected at Carmen, Province of Limón, Costa Rica, altitude 30 meters, February 20, 1926, by Paul C. Standley and Juvenal Valerio (no. 48383).

RANGE: Caribbean lowlands of Costa Rica.

**266. *Piper coronatibracteum* Trel., sp. nov.**

A shrub; twigs sparsely upcurved-hirsute; leaves subovate-elliptic, acuminate, inequilaterally obtuse at base, 4.5 to 7×10 to 13 cm., pinnately nerved from the lower half, the nerves about 6+5, roughish appressed-pubescent above with short thick-based hairs, the nerves beneath upcurved-hirsute; petiole scarcely 4+4 mm. long, upcurved-hirsute, not winged; spikes (young) 3×55 mm.; peduncle 10 mm. long, glabrescent; bracts round-subpeltate, brown, with a conspicuous narrow fimbriulate white margin.

Type in the U. S. National Herbarium, no. 1,307,565, collected at Hamburg Finca, Province of Limón, Costa Rica, altitude 55 meters, February 19, 1926, by Paul C. Standley and Juvenal Valerio (no. 48844).

RANGE: Caribbean lowlands, Costa Rica.

COSTA RICA: Finca Montecristo, *Standley & Valerio* 48651. Carmen Station, *Standley & Valerio* 48383.

**267. *Piper subhirsutum* Trel., sp. nov.**

A shrub; twigs transiently hispid, pale-granular; leaves lance-elliptic, acuminate, inequilaterally obtuse at base, 5×12.5, becoming 8×18 cm., pinnately nerved from the lower half, the nerves about 6+5, granular and very lepidote above, punctulate beneath and with upcurved-hispid nerves; petiole 10+5 mm. long, hispid-hirsute, not winged; spikes 3×100 mm.; peduncle 10 mm. long, hirtellous; bracts roundish-subpeltate, ciliolate.

Type in the U. S. National Herbarium, no. 1,229,406, collected at La Colombiana Farm, Province of Limón, Costa Rica, altitude 70 meters, March 6, 7, 1924, by Paul C. Standley (no. 36642).

RANGE: Caribbean lowlands, Costa Rica.

COSTA RICA: Limón, *Stevens* 896.

**267a. *Piper subhirsutum tomentosicaule* Trel., var. nov.**

Differs in its dingy-subtomentose axes and brown-velvety nerves.

Type in the U. S. National Herbarium, no. 1,229,421, collected at La Colombiana Farm, Province of Limón, Costa Rica, altitude 70 meters, March, 1924, by Paul C. Standley (no. 36821).

RANGE: With the type.

**268. *Piper scintillans* Trel., sp. nov.**

A shrub; twigs retrorsely white-hispid; leaves subelliptic-ovate or subquadrately obovate, acuminate, with the narrowed base inequilateral and acute at least on one side, 8 to 10×18 to 21 cm., pinnately nerved from the lower half, the nerves about 6×2, glistening-punctulate above, microscopically scintillating beneath and with upcurved-hirsute nerves; petiole 5+3 mm. long, upcurved-hirsute, not winged; spikes 3×80 to 100 mm.; peduncle scarcely 10 mm. long, hirtellous; bracts subpeltate.

Type in the U. S. National Herbarium, no. 1,307,564, collected at Hamburg Finca, Province of Limón, Costa Rica, altitude 50 meters, February 19, 1926, by Paul C. Standley and Juvenal Valerio (no. 48828).

RANGE: Caribbean lowlands, Costa Rica.

COSTA RICA: Finca Montecristo, *Standley & Valerio* 48401, 48468, 48508, 48554, 48637. La Colombiana Farm, *Standley* 36642, 36707, 36746, 36792, 36814, 36984. Hacienda Parismina, ? *Jiménez* 1042.

269. *Piper fusco-granulatum* Trel., sp. nov.

A shrub; flowering internodes rather short and moderately stout, brownish-hirsute; leaves elliptic, sharply acuminate, obliquely subcordate, about 9×18 cm., pinnately nerved from below the middle, the nerves 6×2, becoming slightly rugose, brown-granular and with hirtellous nerves above, softly crisp-pubescent beneath; petiole 10+3 mm. long, hispid, not winged; spikes 3×100 mm.; peduncle 10 mm. long, hispid; bracts rounded-subpeltate, ciliolate; berries oblong; stigmas 3, sessile.

Type in the U. S. National Herbarium, no. 861,553, collected at Hacienda de Zent, Costa Rica, by the United Fruit Company (no. 269).

RANGE: Caribbean lowlands of Costa Rica.

COSTA RICA: Victoria Farm, near Hacienda de Zent, *Tonduz* 14654.

270. *Piper baculiferum* Trel., sp. nov.

A shrub; twigs hispid, becoming pale-granular; leaves obliquely subelliptic, somewhat acuminate, inequilaterally obtuse at base, 4.5 to 6×9 to 12 or even 8×16 to 19 cm., pinnately nerved from the lower half, the nerves about 5+4, granular and very lepidote above, minutely granular beneath with subappressed-hirsute nerves; petiole scant 7+3 mm. long, sparsely subhirsute; spikes 2.5 to 3×90 to 115 mm.; peduncle slender, 10 to 25 mm. long, hirtellous and pale-punctulate; bracts roundish-subpeltate, ciliolate.

Type in the U. S. National Herbarium, no. 1,307,342, collected at El Arenal, Province of Guanacaste, Costa Rica, altitude 500 meters, January 18, 19, 1926, by Paul C. Standley and Juvenal Valerio (no. 45052).

RANGE: Pacific slope of Costa Rica.

COSTA RICA: El Arenal, *Standley & Valerio* 45154, 45192, 45226, 45264. Naranjos Agrios, Guanacaste, *Standley & Valerio* 46462.

271. *Piper rectamentum* Trel., sp. nov.

A shrub; twigs canescently upcurved-hispid with hard-based hairs; leaves subelliptic, short-acuminate, inequilaterally obtuse or subacute at base, 4.5 to 6×12 to 14 cm., pinnately nerved from the lower half, the nerves about 5×2, granular-scabrid above, white-areolate beneath with the nerves arcuate-hispid; petiole 10 to 15 mm. long, ashen, not winged; spikes 3×110 mm.; peduncle 10 mm. long, gray-hispid; bracts round- or triangular-subpeltate, ciliolate.

Type in the U. S. National Herbarium, no. 1,307,363, collected at El Arenal, Province of Guanacaste, Costa Rica, altitude 500 meters, January 18, 19, 1926, by Paul C. Standley and Juvenal Valerio (no. 45237).

RANGE: Pacific slope of Costa Rica.

272. *Piper punctiunculatum* Trel., sp. nov.

A shrub; twigs scabro-hispid; leaves obliquely elliptic, acuminate, inequilaterally obtuse or subacute at base, 6 to 10×13 to 19 cm., pinnately nerved from the lower half, the nerves about 6+5, microscopically white-punctulate and lepidote above, the nerves subappressed-hispid beneath and the surface punctulate; petiole 8 to 10+2 to 5 mm. long, hispid, brown-granular, not winged; spikes 2.5 to 3×80 to 115 mm.; peduncle about 5 mm. long, glabrescent and granular-roughened; bracts round-subpeltate, ciliolate.

Type in the U. S. National Herbarium, no. 1,307,393, collected at Tilarán, Province of Guanacaste, Costa Rica, altitude 600 meters, January, 1926, by Paul C. Standley and Juvenal Valerio (no. 45712).

RANGE: Pacific slope of Costa Rica.

COSTA RICA: About Tilarán, *Standley & Valerio* 44975, 45048, 46084. Los Ayotes, *Standley & Valerio* 44725, 45473.

273. *Piper emollitum* Trel., sp. nov.

A shrub; twigs evanescently pubescent, pale-granular; leaves lance-oblong, acuminate, inequilaterally acute at base, 5 to 7.5×18 to 20 cm., pinnately nerved from below the upper third, the nerves about 6×2, finely granular and lepidote, the nerves beneath appressed-hispid at least upward; petiole 10 mm. long, glabrous, granular; spikes 3×60 to 70 mm.; peduncle 10 mm. long, glabrous, pale-dotted; bracts roundish-subpeltate, ciliolate.

Type in the U. S. National Herbarium, no. 1,307,315, collected at El Silencio, Tilarán, Province of Guanacaste, Costa Rica, altitude 750 meters, January 13, 1926, by Paul C. Standley and Juvenal Valerio (no. 44650).

RANGE: Pacific slope of Costa Rica.

COSTA RICA: About Tilarán, *Standley & Valerio* 44637, 46205.

274. *Piper injucundum* Trel., sp. nov.

A shrub; twigs drying dark, softly appressed- or crisp-pubescent; leaves subelliptic, acuminate, slightly inequilaterally obtuse or subacute at base, 5.5 to 7×12 to 14 cm., pinnately nerved from the lower half, the nerves 4×2, dark-granular and finely lepidote above, appressed-pubescent on the nerves beneath, drying thin and bronzed beneath; petiole 3 to 5 mm. long, crisp-pubescent; spikes (young) 2×20 mm., on short glabrate peduncles; bracts round-subpeltate, the fuscous margin ciliate.

Type in the U. S. National Herbarium, no. 1,307,649, collected at El Muñeco, Río Navarro, Province of Cartago, Costa Rica, altitude 1,500 meters, March 6, 7, 1926, by Paul C. Standley and Juvenal Valerio (no. 51351).

RANGE: Upper Reventazón Valley, Costa Rica.

274a. *Piper injucundum praepubinervium* Trel., var. nov.

Pubescence less crisp, the nerves granular-puberulent above.

Type in the U. S. National Herbarium, no. 1,307,627, collected at El Muñeco, Río Navarro, Province of Cartago, Costa Rica, altitude 1,500 meters, March 6, 7, 1926, by Paul C. Standley and Juvenal Valerio (no. 51067).

RANGE: Upper Reventazón Valley, Costa Rica.

COSTA RICA: El Muñeco, *Standley & Torres* 51189. Pejivalle, Cartago, *Standley & Valerio* 46856, 46900, 46981, 47162.

274b. *Piper injucundum praecalvinervium* Trel., var. nov.

Pubescence less crisp than in the type, the twigs becoming pale-granular especially at the nodes; young spikes 2×40 mm. with sterile gray-hairy tip 2 mm. long.

Type in the U. S. National Herbarium, no. 1,307,628, collected at El Muñeco, Río Navarro, Province of Cartago, Costa Rica, altitude 1,500 meters, March 6, 7, 1926, by Paul C. Standley and Rubén Torres (no. 51101).

RANGE: Upper Reventazón Valley, Costa Rica.

275. *Piper albuginiferum* Trel., sp. nov.

A shrub; twigs retrorsely hispid; leaves lance-elliptic, acuminate, inequilaterally rounded at base, 4 to 5×10 to 11 cm., pinnately nerved from below the upper third, rugose, white-granular-scabrous, the nerves about 6+5, beneath upcurved-white-hispid; petiole 3+3 mm. long, upcurved-hispid, not winged; spikes (young) 2×30 mm., with sterile tip 2 mm. long; peduncle 5 mm. long.

glabrate, obscurely punctulate; bracts sublunulately subpeltate, ciliolate, the snowy margin forming a conspicuous prominence when young.

Type in the U. S. National Herbarium, no. 1,307,629, collected at El Muñeco, Río Navarro, Province of Cartago, Costa Rica, altitude 1,500 meters, March 6, 7, 1926, by Paul C. Standley and Rubén Torres (no. 51102).

RANGE: Upper Reventazón Valley, Costa Rica.

**276. *Piper phanerolepidum* Trel., sp. nov.**

A shrub; twigs hispid, pale-granular at the nodes; leaves narrowly lanceolate and subacute at base to ovate and rounded at base, gradually acuminate, 4 to 5×10 to 12 or 14 cm., pinnately nerved from the lower half, the nerves 5+4, salient beneath and appressed-hispid, the upper surface coarsely white-scabrous; petiole 5 to 7 mm. long, appressed-hairy or glabrescent and pale-granular; spikes 3×50 to 60 mm.; peduncle 10 mm. long, glabrous and pale-granular; bracts rounded-subpeltate, small but with conspicuous pale-ciliolate margin.

Type in the U. S. National Herbarium, no. 1,229,352, collected at El Muñeco, Río Navarro, Province of Cartago, Costa Rica, altitude 1,400 meters, February 8, 9, 1924, by Paul C. Standley (no. 33570).

RANGE: Upper Reventazón Valley, Costa Rica.

COSTA RICA: El Muñeco, *Standley* 33448; *Standley & Valerio* 51039.

**277. *Piper lanatibracteum* Trel., sp. nov.**

*Piper hirsutum carpintera* C. DC. Anal. Inst. Fis.-Geogr. Costa Rica 9: 160. 1897.

A shrub; twigs glabrous or quickly glabrescent, pale-granular; leaves lance-ovate or elliptic, sharply acuminate, inequilaterally obtuse at base, 4.5 to 5×10 to 12 cm., pinnately nerved from the lower half, coarsely white-granular-scabrous above, the nerves about 5+4, divaricately hirsute beneath; petiole about 5+2 mm. long, hirtellous or glabrescent and pale-granular, not winged; spikes 4×60 to 65 mm.; peduncle 3 to 6 mm. long, glabrate, pale-granular; bracts round-subpeltate, rather large, sublunulately ciliate.

Type in the U. S. National Herbarium, no. 1,229,345, collected at El Muñeco, Río Navarro, Province of Cartago, Costa Rica, altitude 1,400 meters, February 8, 9, 1924, by Paul C. Standley (no. 33419).

RANGE: Upper Reventazón Valley and high divide, Costa Rica.

COSTA RICA: El Muñeco, *Standley & Torres* 51119. Cartago, *Torres* 56. Cerro de la Carpintera, *Pittier* "4339," 4349, type of *Piper hirsutum carpintera*; *Standley* 35739. San Isidro Coronado, *Alfaro* 34002, 34012.

**278. *Piper lanosibracteum* Trel., sp. nov.**

A shrub; twigs from retrorsely hispid glabrescent and finely pale-granular; leaves lance-ovate or elliptic, acuminate, unequally rounded at base, 4.5 to 5.5×10 to 15 cm., pinnately nerved from the lower half, the nerves about 5+4, dark-punctulate and finely scabrous above, the nerves upcurved-hispid beneath; petiole 5+3 or 10 mm. long, upcurved-hirsute; spikes 3 to 4×60 to 80 mm.; peduncle 15 to 20 mm. long, hirtellous; bracts round-subpeltate, rather large, sublunulately ciliate.

Type in the U. S. National Herbarium, no. 1,307,575, collected on the Río Reventado, Cartago, Costa Rica, altitude 1,500 meters, February 26, 1926, by Paul C. Standley and Juvenal Valerio (no. 49457).

RANGE: Upper Reventazón Valley, Costa Rica.

COSTA RICA: Río Reventado, *Standley & Valerio* 49435, 49450, 49482.

**279. *Piper pullibracteatum* Trel., sp. nov.**

A shrub; twigs glabrous, obscurely glandular-punctulate, becoming pale-granular; leaves lanceolate-oblongate, long-acuminate, inequilaterally acute

at base, 4 to 5×13 to 15 cm., pinnately nerved from somewhat below the middle, the nerves about 6+5, granular-scabrous above, dark-punctulate beneath with the nerves spreading-hirsute; petiole 7+3 mm. long, glabrate, finely granular, not winged; spikes (young) 3×40 mm.; peduncle 5 mm. long, glabrous, slightly punctulate; bracts roundish-subpeltate, conspicuous, brown, ciliate.

Type in the U. S. National Herbarium, no. 1,229,471, collected at La Estrella, Province of Cartago, Costa Rica, March 26, 27, 1924, by Paul C. Standley (no. 39236).

RANGE: Upper Reventazón Valley, Costa Rica.

COSTA RICA: Cerro de la Carpintera, *Standley* 35496.

280. *Piper fusco-bracteatum* Trel., sp. nov.

A shrub; twigs from staring-hispid glabrescent and pale-granular; leaves lanceolate, attenuate, inequilaterally obtuse at base, 5.5 to 7×15 to 18 cm., pinnately nerved from the lower half, the nerves about 5×2, granular-scabrous above, spreading-hirsute on the nerves beneath and sparsely hirtellous between them; petiole 10, 10+2, or 15 mm. long, upcurved-subhirsute, pale-granular, not winged; spikes 3×60 mm.; peduncle 5 mm. long, glabrous, somewhat granular; bracts conspicuous, roundish-subpeltate, brown, ciliate.

Type in the U. S. National Herbarium, no. 1,229,678, collected on the Cerro de Piedra Blanca, Escasú, Province of San José, Costa Rica, January 31, 1924, by Paul C. Standley (no. 32631).

RANGE: High central divide of Costa Rica.

281. *Piper curridabatanum* Trel., sp. nov.

A shrub; twigs at most transiently pilose at the nodes, green- or pale-granular; leaves lanceolate, acuminate, inequilaterally acute at base, 4.5 to 6.5×12 to 16 cm., pinnately nerved from below the middle, the nerves about 5×2, minutely granular-roughened and at length lepidote above, the nerves hirsute beneath; petiole 12+3 to 18+3 mm. long, transiently hirsute, granular; spikes becoming 4×80 mm.; peduncle 5 to 7 or exceptionally 15 mm. long, glabrous, granular; bracts rounded-subpeltate, brown, ciliate; berries subquadrately obovoid, papillate, black; stigmas 3, sessile.

Type in the U. S. National Herbarium, no. 1,229,339, collected between San Pedro Montes de Oca and Curr.dabat, Province of San José, Costa Rica, altitude 1,200 meters, February 2, 1924, by Paul C. Standley (no. 32787).

RANGE: High central divide of Costa Rica.

282. *Piper capacibracteum* Trel., sp. nov.

A shrub; twigs retrorse-upcurved, hirsute-subvillous; leaves lanceolate, long-acuminate, inequilaterally obtuse at base, 4.5 to 6.5×14 to 16 cm., pinnately nerved from the lower half, the nerves about 6+5, appressed-pubescent above, becoming granular-scabrous softly hairy beneath, becoming more or less rugose; petiole about 10+5 mm. long, upcurved-hairy; spikes 4×75 mm.; zonate; peduncle 15 to 20 mm. long, retrorsely hispid; bracts roundish-subpeltate, large, pale, ciliate.

Type in the U. S. National Herbarium, no. 1,307,249, collected between Aserrí and Tarbaca, Province of San José, Costa Rica, altitude 1,200 to 1,700 meters, December 6, 1925, by Paul C. Standley (no. 41397).

RANGE: High central divide of Costa Rica.

COSTA RICA: Santa María de Dota, *Standley & Valerio* 43121, 43245, 43246, 41812, 41839, 41861, 42457, 42836, with shorter peduncle and subacute leaf-base. Peralta, *Stevens* 477.

283. *Piper ventoleranum* Trel., sp. nov.

A shrub; twigs glabrous or quickly glabrescent, pale-granular; leaves lanceolate, caudate, inequilaterally subacute at base, 4.5 to 7×15 to 17 cm., pinnately nerved from the lower half, the nerves about 6+5, minutely granular-roughened above, the nerves beneath typically subappressed-hirsute; petiole 10+2 or 15 mm. long, mostly glabrate, not winged; spikes 3 to 4×80 to 95 mm.; peduncle 10 mm. long, somewhat granular; bracts rounded-subpeltate, cinereous, ciliate.

Type in the U. S. National Herbarium, no. 1,229,373, collected at La Ventolera, southern slope of Volcán de Poás, Costa Rica, altitude 1,700 meters, February 17, 18, 1924, by Paul C. Standley (no. 34712).

RANGE: Central volcanoes of Costa Rica.

COSTA RICA: In the type locality, *Standley* 34707; 34724, with larger leaves, becoming 7.5×20 cm.; 34663, with hairy petiole.

284. *Piper perhispidum* C. DC. Bot. Gaz. 70: 183. 1920.

TYPE LOCALITY: Río Barranca, San Juan de San Ramón, Costa Rica (*Tonduz* 17771, the type).

RANGE: Pacific slope of Costa Rica.

285. *Piper domingense* C. DC. Anal. Inst. Fis.-Geogr. Costa Rica 9: 161. 1897.

TYPE LOCALITY: Santo Domingo de Golfo Dulce, Costa Rica (*Tonduz* 10034, the type; distributed also as J. D. Smith 7129).

RANGE: Pacific coast region of Costa Rica.

286. *Piper flavescens* (C. DC.) Trel.

*Piper pseudovelutinum flavescens* C. DC. Bull. Soc. Bot. Belg. 30<sup>1</sup>: 203. 1891.

TYPE LOCALITY: Río Tlirí, near San José, Costa Rica (*Tonduz* 3175, the type).

RANGE: High central divide of Costa Rica.

287. *Piper suberythrocarpum* C. DC. Anal. Inst. Fis.-Geogr. Costa Rica 9: 160. 1897.

TYPE LOCALITY: Río Naranjo, Costa Rica (*Tonduz* 7550, the type).

RANGE: Caribbean lowlands of Costa Rica and adjacent Nicaragua.

288. *Piper pileatum* Trel., sp. nov.

*Piper burenii* Auct., as to Costa Rica.

A shrub; twigs densely dingy-hispid; leaves lanceolate, subfalcately acuminate, inequilaterally acute at base or one side rounded or subcordulate, 4 to 6×12 to 16 cm., pinnately nerved from below the middle, the nerves 4 or 5×2, bullulate, scabrous, sparsely white-villous, especially beneath; petiole 8 to 12+3 mm., dingy-villous, not winged; spikes 3×100 mm.; peduncle 10 to 15 mm. long, hispid; bracts roundish-subpeltate, gray-ciliate.

Type in the herbarium of the New York Botanical Garden, collected at El Copey, Costa Rica, altitude 1,800 meters, February, 1898, by A. Tonduz (no. 11895). Duplicate in the U. S. National Herbarium.

RANGE: Pacific slope of Costa Rica.

COSTA RICA: El Copey, *Jiménez* 1089; *Tonduz* 11895. Buenos Aires, *Tonduz* 3593, "3693." El General, *Tonduz* 3383. Cañas Gordas, ? *Pittier* 11033. Tremendal, San Ramón, *Tonduz* 17773. San Marcos, *Tonduz* 7555.

288a. *Piper pileatum obliquum* Trel., var. nov.

Differs in its broadly lanceolate leaves being very oblique, with the distinctly longer side rounded at base.

Type in the U. S. National Herbarium, no. 796,376, collected at El Copey, Costa Rica, altitude 1,800 meters, February, 1898, by A. Tonduz (no. 11675).

RANGE: Pacific slope of Costa Rica.



289. *Piper rugosifolium* Trel., sp. nov.*Piper hirsutum pallescens* Auct., p. p.

A shrub; twigs retrorsely rusty-hirsute with upcurved hairs; leaves obliquely lanceolate, subcaudately acuminate, rounded at base or with one side acute, 4 to 4.5×9 to 11 cm., pinnately nerved from below the middle, the nerves about 6+5, rugose, coarsely granular-scabrous above from the bases of slender hairs, beneath dingy-hairy, at least as to the nerves; petiole 5 to 10 mm. long, retrorsely long-hirsute, not winged; spikes 3×70 mm., mucronate; peduncle 5 mm. long, curved-hirsute; bracts roundish-subpeltate, ciliolate.

Type in the U. S. National Herbarium, no. 1,307,251, collected at Finca Las Cóncevas, Province of Cartago, Costa Rica, altitude 1,300 meters, December 7, 8, 1925, by Paul C. Standley (no. 41533).

RANGE: Mountains of central Costa Rica.

COSTA RICA: Cerro de la Carpintera, *Standley* 34262. Río Reventado, *Standley & Valerio* 49441. Cervantes, *Tonduz* 10431. Los Frailes, *Tonduz* 17876. San Marcos, *Tonduz* ? 7555, 17761. Dulce Nombre, *Standley* 35928. El Muñeco, Río Navarro, *Standley & Torres* 50920. Cartago, *Standley* 35467. Río Reventazón, *Rowlee & Stark* 754.

290. *Piper pseudopsis* C. DC. Anal. Inst. Fis.-Geogr. Costa Rica 9: 164. 1897.*Piper bredemeyeri* Auct., as to Costa Rica.

TYPE LOCALITY: San José, Costa Rica (*Tonduz* 1088, the type).

RANGE: High central divide of Costa Rica.

COSTA RICA: San José, *Brade* 2037; *Standley* 33274, 41215, 47365; *Tonduz* 2847. Río María Aguilar, *Tonduz* 6957 (J. D. Smith 7298). San Francisco de Guadalupe, *Tonduz* 444, 1795, 8026, 12730. San Sebastián, *Standley* 32684, 49350. Río Reventado, Cartago, *Standley & Valerio* 49498. Finca Las Cóncevas, Cartago, *Standley* 41494.

## 4. PEPEROMIA Ruiz &amp; Pavon

## KEY TO SPECIES

1. Leaves alternate (the uppermost sometimes congested because of shortened internodes, or the lowest rarely opposite)-----2.
- Leaves opposite or whorled-----95.
2. Leaves or some of them distinctly peltate-----3.
- Leaves not peltate above the very base-----9.
3. Leaves basal; spikes filiform, subpaniculate-----7. *P. sciaphila*.
- Leaves cauline; spikes mostly stouter-----4.
4. Stem comparatively short and stout, few-leaved-----5.
- Stem elongate and leafy-----6.
5. Pilose-----10. *P. tecticola*.
- Glabrous-----9. *P. chambesyana*.
6. Leaves drying thin; pubescent-----8. *P. amphitricha*.
- Leaves drying coriaceous-----7.
7. Leaves 10 to 15 cm. long-----8.
- Leaves mostly 4 to 6 cm. long; glabrous-----90. *P. peltilimba*.
8. Leaves ciliate; spikes axillary-----89. *P. ciliifera*.
- Glabrous; spikes terminal-----88. *P. parmata*.
9. Spikes in leafless panicles; veining plinnate-----10.
- Spikes not paniculate-----28.
10. Panicle compound; spikes very short-----68. *P. poasana*.
- Panicle simple or spikes elongate-----11.



11. Spikes 2 to 3 cm. long; drying dark.....	12.
Spikes longer; stem leafy.....	17.
12. Stem short, few-leaved.....	13.
Stem elongate and leafy; hairy.....	76. <i>P. guapilesiana</i> .
13. Scape very short; leaves subelliptic.....	71. <i>P. breviscapa</i> .
Scape elongate.....	14.
14. Leaves subspatulate-oblongate; glabrous.....	72. <i>P. subacaulis</i> .
Leaves elliptic-oblongate or obovate.....	15.
15. Leaves over 20 cm. long; glabrous.....	70. <i>P. atirroana</i> .
Leaves 10 to 15 cm. long.....	16.
16. At most puberulent.....	69. <i>P. brevicaulis</i> .
At least locally hairy.....	93. <i>P. compotrix</i> .
17. At least transiently hairy.....	18.
Glabrous.....	20.
18. Leaves obtuse at base, elliptic.....	78. <i>P. pothifolia</i> .
Leaves acute at base.....	19.
19. Leaves elliptic.....	79. <i>P. substriata</i> .
Leaves oblongate-obovate.....	92. <i>P. tsakiana</i> .
20. Leaves sessile.....	21.
Leaves obviously petioled.....	22.
21. Leaves rather blunt, subspatulate.....	73. <i>P. sessilifolioides</i> .
Leaves pointed, narrowly oblongate.....	74. <i>P. venabulifolia</i> .
22. Leaves rather blunt, subelliptic.....	101. <i>P. navarrana</i> .
Leaves acuminate.....	23.
23. Leaves elliptic.....	24.
Leaves lanceolate to elliptic oblongate.....	26.
24. Spikes about 40 mm. long.....	25.
Spikes longer.....	99. <i>P. dotana</i> .
25. Leaves 10 to 15 cm. long.....	100. <i>P. isidroana</i> .
Leaves 6 to 10 cm. long.....	103. <i>P. tremendalensis</i> .
26. Spikes drying dark.....	27.
Spikes drying pale.....	75. <i>P. lancilimba</i> .
27. Scutulum of ovary elongate.....	91. <i>P. acutilimba</i> .
Scutulum rounded; berries oblong.....	110. <i>P. calvifolia</i> .
28. Leaves pinnately nerved or else spikes paired.....	29.
Leaves essentially palmately nerved.....	49.
29. Leaves appreciably cordate or obtuse at base.....	30.
Leaves appreciably acute at base unless very small.....	36.
30. Leaves cordate or else spikes not paired.....	31.
Spikes paired if leaves cordate.....	34.
31. Leaves over 10 cm. long.....	94. <i>P. platyphylla</i> .
Leaves 5 to 10 cm. long.....	32.
Leaves 4 to 6 cm. long.....	33.
32. Stem elongate and leafy.....	20. <i>P. vinasiana</i> .
Stem thick, naked below.....	11. <i>P. lignescens</i> .
33. Leaves round-ovate.....	12. <i>P. aguacatensis</i> .
Leaves elliptic-ovate.....	14. <i>P. tenuifolia</i> .
Leaves ovate, subunguiculate.....	15. <i>P. nicoyana</i> .
34. Leaves fully twice as long as broad.....	35.
Leaves shorter; berries stipitate.....	6. <i>P. podocarpa</i> .
35. Glabrous.....	95. <i>P. scutellata</i> .
Crisp-puberulent.....	96. <i>P. donnell-smithii</i> .
Somewhat hairy.....	97. <i>P. calvicaulis</i> .

36. Leaves over 20 cm. long	77. <i>P. queserana</i> .
Leaves commonly 10 to 15 cm. long	37.
Leaves commonly 6 to 10 cm. long	39.
Leaves commonly 4 to 6 cm. long	43.
37. Leaves spatulate or elliptic-obovate, blunt	106. <i>P. mentiens</i> .
Leaves subelliptic, pointed	38.
38. Erect, drying green	98. <i>P. cacuminicola</i> .
Repent-pendent, darkening	84. <i>P. glaberrima</i> .
39. Glabrous	40.
Petioles and nodes somewhat hairy	81. <i>P. longibacca</i> .
Nerves villous beneath	82. <i>P. orientalis</i> .
40. Repent-pendent, drying dark	41.
Stoloniferous-erect	42.
41. Leaves lanceolate, pointed, petioled	83. <i>P. naranjoana</i> .
Leaves elliptic, bluntish, sessile	80. <i>P. glabricaulis</i> .
42. Leaves elliptic, subacute	102. <i>P. durandi</i> .
Leaves round-obovate, very blunt	107. <i>P. pyrolaefolia</i> .
43. Repent-pendent, or drying dark	44.
Stoloniferous-erect, drying yellow-green	47.
44. Leaves sessile, glabrous	84. <i>P. glaberrima</i> .
Leaves short-petioled	45.
45. Leaves sublanceolate	46.
Leaves broadly elliptic	86. <i>P. tilarana</i> .
46. Essentially glabrous	87. <i>P. borucana</i> .
Somewhat hairy at nodes	85. <i>P. circumscissa</i> .
47. Leaves very obtuse	108. <i>P. pseudo-alpina</i> .
Leaves blunt-acuminate	48.
Leaves acute at both ends	19. <i>P. bistortaefolia</i> .
48. Spikes 60 to 80 mm. long	104. <i>P. pachyphlebia</i> .
Spikes longer and slenderer	105. <i>P. peninsularis</i> .
49. Leaves appreciably obtuse at base	30.
Leaves appreciably acute at base, unless very small or with a single spike	50.
50. Leaves distinctly longer than broad	51.
Leaves approximately isodiametric	78.
51. Bracts ciliate	52.
Bracts not ciliate	53.
52. Leaves scarcely 2 by 4 cm.	21. <i>P. costaricensis</i> .
Leaves becoming 4 by 7 cm.	22. <i>P. fimbribractea</i> .
53. Not black-punctulate, even if granular	54.
Conspicuously black-punctulate	77.
54. Leaves drying rather thin	55.
Leaves, unless very small, opaquely coriaceous	67.
55. Leaves subovate	56.
Leaves elliptic or elliptic-obovate	39. <i>P. erythrophlebia</i> .
Leaves lance-elliptic	57.
Leaves rhombic-elliptic	18. <i>P. cooperi</i> .
Leaves lanceolate or oblanceolate	62.
56. Leaves cordate, appressed-pubescent	33.
Leaves round-based, hairy	35. <i>P. montecristana</i> .
Leaves acute-based, puberulent	52. <i>P. tenuicaulis</i> .
57. Glabrous	58.
Puberulent or pubescent	60.

58. Leaves 6 to 10 cm. long	25. <i>P. crispipetiola</i> .
Leaves 3 to 6 cm. long	59.
59. Nerves scarcely raised	27. <i>P. herediana</i> .
Inner nerves salient	28. <i>P. munyecoana</i> .
60. Leaves 6 to 10 cm. long	26. <i>P. carpinterana</i> .
Leaves 5 to 6 cm. long	61.
61. Spikes filiform	16. <i>P. subdita</i> .
Spikes stouter; bracts dark-punctulate	48. <i>P. tuisana</i> .
62. Spikes without pseudo-pedicels	63.
Spikes with long pseudo-pedicels	31. <i>P. pseudopedicellata</i> .
63. Leaves granular beneath	64.
Leaves scarcely granular	65.
64. Leaves lance-elliptic or obovate	30. <i>P. vueltasana</i> .
Leaves lance-oblong	33. <i>P. pilulifera</i> .
65. Leaves finely pale-mottled beneath	34. <i>P. niveo-punctulata</i> .
Leaves not pale-punctulate	66.
66. Petioles sublatately decurrent	32. <i>P. dyscrita</i> .
Petioles not decurrent	42. <i>P. stenophylla</i> .
67. Leaves 4 to 6 cm. long	68.
Leaves 1 to 2.5 cm. long	71.
Leaves scarcely over 1 cm. long	75.
68. Leaves rhombic-elliptic	37. <i>P. chrysocarpa</i> .
Leaves lance-elliptic	69.
69. Spikes without pseudo-pedicels	70.
Spikes with short pseudo-pedicels	41. <i>P. brachypus</i> .
70. Leaves green on both sides	36. <i>P. san-joseana</i> .
Leaves red-purple beneath	40. <i>P. versicolor</i> .
71. Essentially glabrous	72.
Leaves obscurely hairy or ciliate	43. <i>P. stenophyllopsis</i> .
Young growth pubescent	44. <i>P. fissispica</i> .
72. Leaves lanceolate or elliptic	38. <i>P. psiloclada</i> .
Leaves oblong	73.
Leaves subrhombic	74.
73. Berries sessile	50. <i>P. hylophila</i> .
Berries stipitate	5. <i>P. tenuipes</i> .
74. Leaf-base subcuneate	47. <i>P. fraijanesana</i> .
Leaf-base merely acute	46. <i>P. zurquiana</i> .
75. Leaves oblong-subovate	51. <i>P. tenellaeformis</i> .
Leaves oblong-obovate; glabrous	57. <i>P. incisa</i> .
Leaves elliptic-obovate; hairy	54. <i>P. tonduzii</i> .
Leaves elliptic; plant stoloniferous-erect	76.
76. Stem loosely hairy	53. <i>P. punctataefolia</i> .
Stem pubescent	55. <i>P. oerstedii</i> .
77. At most ciliate-lined	23. <i>P. jimenesana</i> .
More or less hairy	24. <i>P. filicaulis</i> .
78. Leaves drying rather thin	79.
Leaves drying coriaceous	88.
79. Leaves 4 to 6 cm. long	29. <i>P. virillana</i> .
Leaves usually 2.5 to 4 cm. long	80.
Leaves usually 1 to 2.5 cm. long	81.
Leaves scarcely 1 cm. long	85.
80. Leaves cordate, acute	12. <i>P. aguacatensis</i> var.
Leaves reniform, very obtuse	13. <i>P. lagartana</i> .

81. Glabrous.....82.  
 Puberulent; anthers small.....17. *P. filispica*.  
 Puberulent; anthers large.....61. *P. cryptolepida*.  
 Sparsely soft-hairy.....2. *P. barbensis* var.
82. Leaves subacute; pellucid.....1. *P. pellucida*.  
 Leaves very obtuse.....83.
83. Drying brown; anthers large.....62. *P. megalanthera*.  
 Drying green.....84.
84. Leaf-base obtuse; anthers large.....60. *P. delecta*.  
 Leaf-base usually acute.....59. *P. rejecta*.
85. Leaves round or round-obovate.....86.  
 Leaves round- or reniform-ovate.....87.
86. Glabrous or few-haired.....4. *P. delicatissima*.  
 Velvety or crisp-pubescent.....58. *P. rotundifolia*.
87. Leaves round-ovate.....56. *P. silvivaga*.  
 Leaves subelliptic-ovate.....2. *P. barbensis*.  
 Leaves reniform-ovate.....3. *P. late-ovata*.
88. Leaves 1 to 2.5 or even 4 cm. long.....89.  
 Leaves scarcely over 1 cm. long.....95.
89. Creeping.....90.  
 With erect stems.....92.
90. Anthers relatively large.....81.  
 Anthers minute.....91.
91. Glabrous.....63. *P. reptabunda*.  
 Somewhat puberulent.....67. *P. calyculata*.  
 Crisp-pubescent.....109. *P. pseudo-casaretti*.
92. Stems subsimple.....93.  
 Stems much branched.....45. *P. multifida*.
93. Leaves round-ovate, subacute.....49. *P. chlorostachya*.  
 Leaves suborbicular, obtuse.....64. *P. san-ramonensis*.  
 Leaves subobovate.....94.
94. Spikes without pseudo-pedicels.....65. *P. congestifolia*.  
 With pseudo-pedicels.....66. *P. candelaber*.
95. Leaves opposite, very obtuse.....96.  
 Leaves whorled, or acute if exceptionally opposite.....98.
96. Creeping.....97.  
 Erect; leaves round, 1 to 1.5 cm. in diameter.....123. *P. esperanzana*.
97. Leaves round, scarcely 1 cm. in diameter.....131. *P. cyclophylla*.  
 Leaves round-elliptic, larger.....130. *P. pirrisana*.
98. Leaves obovate.....99.  
 Leaves subquadrately elliptic, or small if not quadrate.....104.  
 Leaves lanceolate or oblanceolate to elliptic.....107.  
 Leaves, at least above, oblong or linear.....118.
99. Rachis of spike hirtellous.....100.  
 Rachis of spike glabrous.....101.
100. Leaves emarginulate.....129. *P. subemarginulata*.  
 Leaves scarcely emarginulate.....136. *P. pseudo-hoffmannii*.
101. Leaves round-obovate.....102.  
 Leaves elliptic-obovate.....103.
102. Creeping and delicate.....135. *P. hoffmannii*.  
 With erect branches.....132. *P. imbricata*.
103. Erect; very glandular-granular.....134. *P. sepicola*.  
 Creeping; not glandular.....133. *P. pseudo-tetraphylla*.

104. Leaves 1.5 to 2.5 cm. long; rachis glabrous.....	105.
Leaves 1 to 1.5 cm. long; rachis hirtellous.....	126. <i>P. cartagoana</i> .
Leaves scarcely 1 cm. long.....	106.
105. Peduncle 30 mm. long.....	118.
Peduncle scant 25 mm. long.....	121. <i>P. emiliana</i> .
106. Bracts golden-granular.....	127. <i>P. reflexaefolia</i> .
Bracts not golden-granular.....	128. <i>P. compaginata</i> .
107. Leaves 6 to 10 cm. long.....	108.
Leaves 2.5 to 6 cm. long.....	110.
Leaves 1 to 2.5 cm. long.....	114.
108. Leaves relatively thin.....	109.
Leaves coriaceous.....	116. <i>P. guanacastana</i> .
109. Leaves broadly elliptic.....	115. <i>P. nemoralis</i> .
Leaves relatively narrow.....	112. <i>P. martagonifolia</i> .
110. At most puberulent.....	111.
More or less pubescent.....	112.
111. Leaves whorled, acuminate.....	113. <i>P. turialvensis</i> .
Leaves whorled, acute.....	111. <i>P. jarisiana</i> .
Leaves opposite or whorled.....	119. <i>P. palmana</i> .
112. Leaves glabrous.....	113.
Leaves somewhat hairy.....	118. <i>P. stipitifolia</i> .
113. Internodes somewhat hairy.....	114. <i>P. barbana</i> .
Internodes glabrous.....	117. <i>P. barbinodis</i> .
114. Glabrous.....	115.
Subpuberulent.....	116.
More or less hairy.....	117.
115. Leaves attenuate at both ends.....	124. <i>P. aguacalientis</i> .
Leaves more elliptic.....	125. <i>P. pseudo-boliviensis</i> .
116. Peduncle scarcely 1 cm. long.....	119. <i>P. palmana</i> var.
Peduncle distinctly longer.....	121. <i>P. emiliana</i> .
117. Leaves oblanceolate.....	122. <i>P. olivacea</i> .
Leaves lance-elliptic.....	120. <i>P. copeyana</i> .
118. At most minutely puberulent.....	119.
At least locally pubescent.....	138. <i>P. oblongifolia</i> .
119. Upper leaves elliptic-oblong.....	139. <i>P. muscisedens</i> .
Upper leaves oblong.....	137. <i>P. amphoterophylla</i> .
Upper leaves linear.....	140. <i>P. pittieri</i> .

1. *Peperomia pellucida* (L.) H. B. K. Nov. Gen. & Sp. 1: 64. 1815.

*Piper pellucidum* L. Sp. Pl. 30. 1753.

TYPE LOCALITY: Martinique?

RANGE: Throughout the West Indies, and on the continent from Mexico to the Andes, commonly in the more whitened-leaved *P. pellucida pygmaea* Miq.<sup>3</sup> (*P. pygmaea* Kunth<sup>4</sup>), the type of which is from Loja, Ecuador. Also introduced as a weed into Africa.

COSTA RICA: La Colombiana Farm, Standley 36676. Below Cairo, Standley & Valerio 48872, 48995, 49020. Boca de Zhorquín, Tonduz 8620. Hacienda de Zent, Tonduz 1465. Mano de Tigre Road, Tonduz 4658. Boruca, Pittier 4659. Lagarto, Pittier 4486. Rancho Redondo, Volcán de Irazú, Pittier 1141.

<sup>3</sup> Syst. 81. 1843.

<sup>4</sup> Syn. 1: 117. 1923.

2. *Peperomia barbensis* (Dahlst.) Trel.

*Peperomia hispidula barbensis* Dahlst. Svensk. Vet. Akad. Handl. 33<sup>2</sup>: 14. 1900.

*Peperomia hispidula* Auct., as to Costa Rica.

TYPE LOCALITY: Volcán de Barba, Costa Rica (*Hoffmann* 54, the type).

RANGE: Mountains of central Costa Rica.

COSTA RICA: Finca La Cima, El Copey, *Standley* 42634. Tablazo, *Brade* 2016.

2a. *Peperomia barbensis* alajuelana Trel., var. nov.

A medium-sized, erect or assurgent, branching herb; stem slender (1 to 2 mm.), soft-villous; leaves alternate, round-elliptic or subrhombic-ovate, obtuse or subacute at both ends, small (1×1 to 1.5×2 to 2.5 cm., or exceptionally lance-elliptic and 4 cm. long), rather sparsely villous with articulate hairs, multiple-nerved, the branches of the midrib about 3×2; petiole 5 to 20 mm. long, loosely villous; spikes terminal and opposite the leaves, extremely slender, 10 to 15 mm. long, loosely flowered; peduncle equaling the spike, sparsely villous; bracts round-peltate; berries ellipsoid, with slender stipe and style; stigma apical.

Type in the U. S. National Herbarium, no. 1,251,258, collected at Fraijanes, Province of Alajuela, Costa Rica, altitude 1,500 to 1,700 meters, February 12, 13, 1926, by Paul C. Standley and Rubén Torres (no. 47695).

RANGE: Mountains of central Costa Rica.

COSTA RICA: Cerro de las Vueltas, altitude 2,700 to 3,000 meters, *Standley & Valerio* 43769.

3. *Peperomia late-ovata* Trel., sp. nov.

A small delicate repent-assurgent arboricolous herb; stem filiform, sparsely villous to glabrescent; leaves alternate, reniform-ovate, obtuse, rounded at base or slightly cordulate, minute (3 to 8×4 to 8 mm.), sparsely villous with articulate hairs, 3 or 5 nerved, with the midrib obscurely branched; petiole very short (1 mm.), glabrate; spikes terminal, extremely slender, scarcely 15 mm. long, loosely flowered; peduncle about 10 mm. long; bracts round-peltate; berries subclavate-oblong, with slender stipe and style; stigma apical.

Type in the U. S. National Herbarium, no. 1,251,136, collected at Laguna de la Chonta, near Santa María de Dota, Province of San José, Costa Rica, altitude 2,000 to 2,100 meters, December 18, 1925, by Paul C. Standley (no. 42310).

RANGE: Central mountains of Costa Rica.

COSTA RICA: At type locality, *Standley* 42183, 42194, 42201, 42246. San José, *Standley* 38629, 38780.

3a. *Peperomia late-ovata* glabrata Trel., var. nov.

Differs in being almost glabrous.

Type in the U. S. National Herbarium, no. 1,229,662, collected at Las Nubes, Province of San José, Costa Rica, altitude 1,500 to 1,900 meters, March 20-22, 1924, by Paul C. Standley (no. 38489).

RANGE: Central mountains of Costa Rica.

COSTA RICA: Laguna de la Escuadra, near El Copey, *Standley* 42083. Finca La Cima, near El Copey, *Standley* 42652.

4. *Peperomia delicatissima* Trel., sp. nov.

*Peperomia emarginella glabrior* C. DC. Anal. Fis.-Geogr. Costa Rica 9: 177. 1897.

An extremely delicate arboricolous herb, creeping among mosses; stem filiform, glabrous; leaves alternate, orbicular, sometimes emarginulate, obscurely 3 nerved, minute (3 mm.), with a few long white hairs toward the apex; petiole 2 to 3 mm. long, glabrous; spikes terminal, 2 cm. long; peduncle glabrous, 8 mm. long; bracts round-peltate; ovary ovoid; stigma oblique.



Type in the DeCandolle Herbarium, collected at Río Naranjo, Costa Rica, altitude 200 to 250 meters, by A. Tonduz (no. 8002).

RANGE: Caribbean lowlands of northern Costa Rica.

COSTA RICA: Pejivalle, *Standley & Valerio* 46979, 47249. Guápiles, *Standley* 37546. Río Rosario, Llanos de Santa Clara, *Pittier* 13424 (distributed as *Lemna minor* by J. D. Smith, no. 7605).

5. *Peperomia tenuipes* Trel., sp. nov.

A small stoloniferous glabrous herb; stem slender (1 mm.); leaves alternate, elliptic-oblong or the lower elliptic, emarginate, acute-based, small (5×12 to 8×16, or the lower 10×14 mm.), 1 nerved, coriaceous; petiole 3 mm. long; spikes terminal, 1×35 mm., rather loosely flowered, the flowers between anastomosing ridges; peduncle 5 mm. long; bracts round-peltate; berries obovoid, on equilong filiform pedicels, with a conspicuous oblique stylopodium; stigma apical.

Type in the U. S. National Herbarium, no. 577,942, collected on Cerro de las Caricias, above San Isidro, Province of Heredia, Costa Rica, September, 1900, by H. Pittier (no. 14042).

RANGE: Central mountains of Costa Rica.

6. *Peperomia podocarpa* C. DC. Anal. Inst. Fis.-Geogr. Costa Rica 9: 175. 1897.

TYPE LOCALITY: El General, Costa Rica (*Pittier* 10595, the type).

RANGE: Central mountains of Costa Rica.

7. *Peperomia sciaphila* C. DC. Anal. Inst. Fis.-Geogr. Costa Rica 9: 175. 1897.

*Peperomia schizostachya* Trel. Bot. Gaz. 73: 138. 1922.

*Peperomia ovato-peltata* Auct., as to Costa Rica.

TYPE LOCALITY: Río Virilla, San José, Costa Rica (*Tonduz* 9630, the type).

RANGE: High central divide of Costa Rica.

COSTA RICA: Río Virilla, *Tonduz* 10106 (J. D. Smith 7273); *Hoffmann* 521. Mount Candelaria, *Endres*.

8. *Peperomia amphitricha* Trel., sp. nov.

*Peperomia lanceolato-peltata* Auct., p. p., as to Costa Rica.

A repent arboricolous herb; stem slender (2 mm.), at least transiently sparsely white-villous, rooting from many nodes; leaves alternate, peltate about 1 cm. above the rounded base, round-ovate, acuminate, moderate (3.5 to 4 or 5×5 to 7 cm.), drying thin but opaque, obscurely about 7 nerved, paler beneath, with sparse soft white hairs on both faces; petiole 2 to 4 cm. long, sparsely villous; spikes terminal, long (2×100 mm. or more); peduncle elongate (3 to 4 cm.), sparsely villous; bracts round-peltate; berries subglobose; stigma oblique.

Type in the U. S. National Herbarium, no. 1,251,160, collected at Quebradillas, near Santa María de Dota, Province of San José, Costa Rica, altitude 1,800 meters, December 24, 1925, by Paul C. Standley (no. 43089a).

RANGE: Central mountains of Costa Rica.

COSTA RICA: Cerro de Piedra Blanca, near Escasú, *Standley* 32632.

8a. *Peperomia amphitricha* santa-rosana Trel., var. nov.

*Peperomia lanceolato-peltata* Auct., p. p., as to Costa Rica.

An assurgent terrestrial herb; stem rather slender (2 to 3 mm.), transiently sparsely hairy, rooting from the lower nodes; leaves alternate, peltate toward the rounded base, round-ovate, somewhat obliquely acuminate, moderately small (2×3.5, 3×4.5, or 4×6 cm.), 5 or 7 nerved, paler and sparsely crisp-hairy beneath; petiole moderately long (2 to 4 cm.), very sparsely villous, clasping-decurrent; spikes terminal or opposite the leaves, elongate (2×80 to 120 mm.), rather loosely flowered; peduncle elongate (3 to 4 cm.), villous,

especially upward; rachis villous; bracts round-peltate; berries glabrous; stigma suboblique.

Type in the De Candolle Herbarium, Geneva, collected at Santa Rosa de Copey, Province of San José, Costa Rica, by A. Tonduz (no. 12225).

RANGE: Central mountains of Costa Rica.

COSTA RICA: Río Blanco, near El Copey, *Standley* 41889. Finca La Cima, near El Copey, *Standley* 42620.

9. *Peperomia chambesyana* Trel., sp. nov.

*Peperomia arifolia acutifolia* C. DC.; Trel. Bot. Gaz. 73: 142. 1922.

A moderately small, glabrous herb; stem short and comparatively stout (4 mm.); leaves alternate, few at top of the stem, ovate, acute, round-based, peltate, 3.5×5 to 6 cm., about 7 nerved; petiole slender, 6 to 8 cm. long; spikes few, from the upper axils, 2×70 mm.; peduncle 7 cm. long; bracts round-ovate, peltate.

Cultivated at Chambésy, Switzerland, in 1898, from seed ascribed to Costa Rica; otherwise unknown. The type is a specimen in the DeCandolle Herbarium at Geneva.

10. *Peperomia tecticola* C. DC. Anal. Inst. Fis.-Geogr. Costa Rica 9: 175. 1897.

TYPE LOCALITY: San José, Costa Rica (*Tonduz* 7262, the type).

RANGE: High central divide of Costa Rica.

COSTA RICA: San José, *Tonduz* 7309.

10a. *Peperomia tecticola muricola* Trel. Bot. Gaz. 73: 143. pl. 3. 1922.

*Peperomia lanceolato-peltata* Auct., p. p., as to Costa Rica.

TYPE LOCALITY: San Juan, Costa Rica (*Tonduz* 10146, the type).

RANGE: High central divide of Costa Rica.

COSTA RICA: Río Virilla, *Hoffmann* 204, 414.

10b. *Peperomia tecticola tilirina* Trel., var. nov.

*Peperomia puberula* Auct., as to Costa Rica.

A form with even longer and more filiform petioles and more ovate-oblong leaves.

Type in the U. S. National Herbarium, no. 796,722, collected along Río Tilirí, Province of San José, Costa Rica, December, 1890, by A. Tonduz (no. 3208).

RANGE: High central divide of Costa Rica.

11. *Peperomia lignescens* C. DC. Journ. Bot. Brit. & For. 4: 137. 1866.

TYPE LOCALITY: Unspecified (*Hoffmann*).

RANGE: Mountains of southern Costa Rica.

COSTA RICA: Terraba, *Pittier* 3605 in part. El General, *Pittier* 3399.

11a. *Peperomia lignescens carthaginensis* (C. DC.) Trel.

*Peperomia carthaginensis* C. DC. Linnaea 37: 377. 1872.

TYPE LOCALITY: Cartago, Costa Rica (*Oersted* 925, the type).

RANGE: Central mountains of Costa Rica.

COSTA RICA: Río Virilla, *Tonduz* 1378. Torres, *Tonduz* 8425. San José, *Pittier* 3006. Desamparados, *Tonduz* 1690. Curridabat, *Pittier* 3045. Boruca, *Pittier* 4783. Aserrí to Tarbaca, *Standley* 41351, 41395. San Marcos, *Jiménez*, in 1926. Pozo Azul de Pirris, *Lankester* 1172.

11b. *Peperomia lignescens subcuneilimba* Trel., var. nov.

Erect, thick-stemmed, with very short internodes, glabrous; leaves caducous except at the summit, lanceolate, acute or exceptionally obtuse-based, 2×4 to nearly 3×6 cm., black-punctulate; spikes terminal (or from an upper axil), 2×110 mm.; petiole long (3 to 7 cm.) and slender; peduncle 25 mm. long; berries globose, with pseudocupule, mucronate; stigma terminating the beak.

Type in the U. S. National Herbarium, no. 1,251,105, collected at Santa María de Dota, Province of San José, Costa Rica, altitude 1,500 to 1,800 meters, December, 1925, by Paul C. Standley (no. 41564).

RANGE: Central mountains of Costa Rica.

COSTA RICA: Type locality, *Standley* 42115.

12. *Peperomia aguacatensis* C. DC. *Linnaea* 37: 376. 1872.

TYPE LOCALITY: Mount Aguacate, Costa Rica (*Oersted* 217, the type).

RANGE: Pacific slope of Costa Rica.

12a. *Peperomia aguacatensis orosiana* Trel., var. nov.

A rather small, repent, arboricolous herb; stem slender (2 mm.), rooting from many nodes, transiently slightly crisp- or appressed-pubescent; leaves alternate, round-ovate, acuminate, rounded at base or cordulate, rather small (2×3 to 4×5 cm.), 5 or obscurely 7 nerved, for a time appressed-pubescent above; petiole short (1 to 2 cm.), slightly soft-pubescent; spikes few, terminal and axillary, rather small (2×30 to 40 mm.), closely flowered; peduncle 1.5 to 2 cm. long, bracted near the middle, glabrate; bracts round-peltate; berries oblong, obtuse; stigma nearly apical.

Type in the U. S. National Herbarium, no. 1,229,331, collected at Orosi, Province of Cartago, Costa Rica, March 30, 1924, by Paul C. Standley (no. 39779).

RANGE: Central mountains of Costa Rica.

12b. *Peperomia aguacatensis picta* Trel., var. nov.

Stem and leaves blotched with dark red.

Type in the U. S. National Herbarium, no. 1,251,340, collected at El Muñeco, south of Navarro, Province of Cartago, Costa Rica, altitude 1,400 to 1,500 meters, March 6, 7, 1926, by Paul C. Standley and Juvenal Valerio (no. 51660).

RANGE: Central mountains of Costa Rica.

12c. *Peperomia aguacatensis urocarpoides* Trel., var. nov.

A delicate creeping herb with the stem, petiole, and peduncle minutely crisp-pubescent; leaves ovate, subacuminate, round-based, 2.5 to 3×3 to 4 cm., 5 nerved.

Type in the DeCandolle Herbarium, collected at Victoria, Planas de Zent, Costa Rica, by H. Pittier (no. 16084).

RANGE: Caribbean lowlands of Costa Rica.

13. *Peperomia lagartana* C. DC. *Anal. Inst. Fis.-Geogr. Costa Rica* 9: 177. 1897.

TYPE LOCALITY: Boruca to Lagarto, Province of Puntarenas, Costa Rica (*Tonduz* 4660, the type).

RANGE: Upper Pacific slope of Costa Rica.

The name sometimes is spelled *lagartoana*.

14. *Peperomia tenuifolia* C. DC. *Linnaea* 37: 371. 1872.

TYPE LOCALITY: Mount Aguacate, Province of Alajuela, Costa Rica (*Oersted* 1001, the type).

RANGE: Pacific slope of Costa Rica.

15. *Peperomia nicoyana* C. DC. *Candollea* 1: 341. 1923; 2: 188. 1925.

TYPE LOCALITY: Nicoya, Costa Rica (*Tonduz* 13692, the type).

RANGE: Lowlands of northwestern Costa Rica.

16. *Peperomia subdita* Trel., sp. nov.

A rather small hirsute herb; stem slender (2 mm.), nodose; leaves alternate above, opposite below, subrhombic-lanceolate, bluntly and slightly acuminate at both ends, moderate (scarcely 2.5×6 cm.), drying rather thin, about 5 nerved; petiole short (5 mm.); spikes terminal, paired on a filiform stalk 2

cm. long, filiform and moderately elongate (scarcely 1×50 mm.), loosely flowered; peduncle filiform, 1 cm. long; bracts round-peltate; ovary conic-ovoid; stigma apical.

Type in the U. S. National Herbarium, no. 796,574, collected at La Estrella, Province of Cartago, Costa Rica, altitude 1,300 meters, April, 1888, by J. J. Cooper (no. 192); distributed by John Donnell Smith as no. 5927.

RANGE: Upper Reventazón Valley, Costa Rica.

COSTA RICA: Santiago, *Maxon* 109. Finca Las Cóncavas, *Standley* 41516.

17. *Peperomia filispica* C. DC. Anal. Inst. Fis.-Geogr. Costa Rica 9: 177. 1897.

TYPE LOCALITY: Alto de Ochomogo, Costa Rica (*Pittier* 10386, the type).

RANGE: Central mountains of Costa Rica.

Scarcely more than a form of *P. cooperi*, with smaller and rounder leaves.

18. *Peperomia cooperi* C. DC. Bull. Soc. Bot. Belg. 30': 226. 1891.

*Peperomia dendrophila* Auct., as to Costa Rica.

*Peperomia petiolaris* Auct., as to Costa Rica.

TYPE LOCALITY: La Estrella, Province of Cartago, Costa Rica (*Cooper* 141, the type).

RANGE: Central mountains of Costa Rica.

COSTA RICA: La Estrella, *Cooper* 142, 192 in part. Finca Las Cóncavas, *Lankester* 259; *Standley* 41513. Río Tilirí, *Pittier* 3207. San Juan, Río Virilla, *Tonduz* 945 bis. La Verbena, Alajuelita, *Tonduz* 8866. San José, *Hoffmann* 823. San Francisco de Guadalupe, *Pittier* 7161.

19. *Peperomia bistortaefolia* Trel., sp. nov.

A rather small erect glabrous herb; stem rather slender (1 to 3 mm.); leaves alternate, narrowly lanceolate or lance-oblong, gradually subobtuse, cuneate, moderately small (about 1×6 cm.), pinnately nerved, drying subcoriaceous, more or less revolute, dull, yellow and granular beneath; petiole scarcely 5 mm. long and winged to the base or quite suppressed; spikes terminal, scarcely 2×40 mm., rather loosely flowered; peduncle filiform, 15 to 20 mm. long; bracts round-peltate, comparatively large; ovary round-ovoid, apiculate; stigma essentially apical.

Type in the U. S. National Herbarium, no. 1,251,183, collected at Cerro de las Vueltas, Province of San José, Costa Rica, altitude 2,700 to 3,000 meters, December 30, 1925, by Paul C. Standley and Juvenal Valerio (no. 44008).

RANGE: High central divide of Costa Rica.

COSTA RICA: At type locality, *Standley & Valerio* 43693.

20. *Peperomia vinasiana* C. DC. Bull. Soc. Bot. Belg. 30': 231. 1891.

TYPE LOCALITY: Juan Viñas, Province of Cartago, Costa Rica (*Pittier* 2199, the type).

RANGE: Reventazón Valley, Costa Rica.

The name sometimes is spelled *vinasana*.

20a. *Peperomia vinasiana macrocarpa* (C. DC.) Trel.

*Peperomia macrocarpa* C. DC. Candollea 1: 339. 1923.

TYPE LOCALITY: Las Vueltas, Province of Cartago, Costa Rica (*Tonduz* 13134, the type).

RANGE: Caribbean slope of Costa Rica.

21. *Peperomia costaricensis* C. DC. Bull. Soc. Bot. Belg. 30': 228. 1891.

TYPE LOCALITY: División to Alto del Palmital, Costa Rica (*Pittier* 3602, the type).

RANGE: Upper Reventazón Valley, Costa Rica.

COSTA RICA: Turrialba, *Tonduz* 8429.

Unique among Costa Rican *Peperomias*, except for the next species, in its fimbriate bracts.

22. *Peperomia fimbribractea* Trel., sp. nov.

A stoloniferous assurgent arboricolous herb; stem moderate (3 mm.), short-villous; leaves alternate, round- or subrhombic-elliptic, rather acute at both ends, moderate (2×3, 3×4, or 3.5 to 4×5 to 6 cm.), finely appressed-hairy on both faces, about 5 nerved by transmitted light; petiole 1 to 2 mm. long, villous; spikes terminal, 3×70 mm. or more, densely flowered; peduncle 2 cm. long, with spreading hairs; bracts round-peltate, ciliate; berries pale, globose, obliquely short-mucronate; stigma oblique on the mucro.

Type in the U. S. National Herbarium, no. 1,229,256, collected at Dulce Nombre, Province of Cartago, Costa Rica, altitude 1,400 meters, February 27, 1924, by Paul C. Standley (no. 35897).

RANGE: Upper Reventazón Valley.

COSTA RICA: El Muñeco, Río Navarro, *Standley* 33414, 33752; *Standley & Torres* 51704; *Standley & Valerio* 51659. Finca Las Cóncavas, *Standley* 4144'. La Estrella, Cartago, *Standley* 39264. La Hondura, *Standley* 33363. Los Ayotes, near Tilarán, Guanacaste, *Standley & Valerio* 45481.

22a. *Peperomia fimbribractea sparsipila* Trel., var. nov.

Leaves elliptic- or round-obovate, with fewer and shorter hairs.

Type in the U. S. National Herbarium, no. 1,229,208, collected on Cerro de Piedra Blanca, near Escasú, Province of San José, Costa Rica, January 31, 1924, by Paul C. Standley (no. 32469).

RANGE: Central mountains of Costa Rica.

23. *Peperomia jimenesana* (C. DC.) Trel.

*Peperomia caulibarbis jimenesana* C. DC. Anal. Inst. Fis.-Geogr. Costa Rica 9: 176. 1897.

*Peperomia glabella barbulata* C. DC. Candollea 1: 325. 1923.

*Peperomia melanostigma* Auct., as to Costa Rica.

TYPE LOCALITY: Jiménez, Llanos de Santa Clara, Province of Limón, Costa Rica (*J. D. Smith* 4929, the type).

RANGE: Across central Costa Rica.

COSTA RICA: La Colombiana Farm, *Standley* 36930, 36939. La Concepción, *J. D. Smith* 6743. Shirores, *Pittier* 8220. Agua Dulce, *Pittier* 11034 (type of *P. glabella barbulata*). Guápiles, *Standley* 37435, 37436, 37477, 37489, 37499, 37510. El Arenal, *Valerio* 30; *Standley & Valerio* 45311. Pejivalle, *Standley & Valerio* 47311, 47320. El Muñeco, Río Navarro, *Standley* 33463, 33609. La Hondura, *Standley* 37969. Zurquí, *Standley & Valerio* 48306, 48342. San Isidro Coronado, *Alfaro* 32401 in part, 32402, 32404, 32405, 34005 in part. El General, *Pittier* 3399. Térraba, *Pittier* 3605 in part. About Tilarán, Guanacaste, *Standley & Valerio* 44282, 44282a, 44336, 44424, 44629, 44807, 45311, 45596, 45607, 46044.

24. *Peperomia filicaulis* C. DC. Anal. Inst. Fis.-Geogr. Costa Rica 9: 176. 1897.

TYPE LOCALITY: Puerto Viejo and Sarapiquí River, Costa Rica (*Biolley* 7434, the type).

RANGE: Caribbean lowlands of Costa Rica.

COSTA RICA: Hamburg Finca, Cairo, *Standley & Valerio* 48862, 48880, 49900. Finca Montecristo, Cairo, *Standley & Valerio* 48985, 48988. La Colombiana Farm, *Standley* 36839.

25. *Peperomia crispipetiola* Trel., sp. nov.

A rather large, glabrous, arboricolous herb of the aspect of *P. glabricaulis*; stem moderate (3 mm.), rooting from the nodes; leaves alternate, broadly

elliptic, acuminate, acute-based, rather large (4 to 4.5×8 to 10 cm.), pinnately veined from near the base, the branches of the midrib about 3×2, dark-granular; petiole very short (3 mm.), crisp-winged to the base; spikes solitary, opposite the leaves, filiform, about 1×120 mm., rather loosely flowered; peduncle 1 cm. long; bracts round-ovate; berries globose, dark red, glandular; stigma subapical.

Type in the U. S. National Herbarium, no. 1,229,287, collected at Guápiles, Province of Limón, Costa Rica, altitude 300 to 500 meters, March 12, 13, 1924, by Paul C. Standley (no. 37455).

RANGE: Caribbean piedmont of Costa Rica.

26. *Peperomia carpinterana* C. DC. Anal. Inst. Fis.-Geogr. Costa Rica 9: 175. 1897.

TYPE LOCALITY: La Carpintera, Province of Cartago, Costa Rica (*Pittier & Tonduz* 6903, the type).

RANGE: Central mountains of Costa Rica.

26a. *Peperomia carpinterana sparsipila* Trel., var. nov.

A rather tall (1.5 meters) branching herb; stem rather stout (2 to 5 mm. or more), few-haired near the nodes; leaves alternate, round-elliptic or the uppermost lanceolate, acuminate, acute-based, rather large (2×5 to 4×6 cm.), 5 or the lower 7 nerved, paler and with the nerves villous beneath; petiole short (5 to 10 mm.), loosely villous on the back; spikes terminal and opposite the leaves, 2×70 mm. or more, loosely subverticillately flowered; peduncle about 5 mm. long, glabrous; bracts round- or elliptic-peltate; ovaries immersed, subovoid, subscutulate with the stigma central on the scutulum.

Type in the U. S. National Herbarium, no. 1,229,254, collected on Cerro de la Carpintera, Province of Cartago, Costa Rica, altitude 1,500 to 1,850 meters, February, 1924 by Paul C. Standley (no. 35690).

RANGE: Central mountains of Costa Rica.

COSTA RICA: At type locality, *Standley* 34402.

27. *Peperomia herediana* Trel., sp. nov.

An erect forking glabrous herb; stem moderate (3 to 5 mm.); leaves alternate, elliptic or lance-ovate, caudate, rather acute-based, moderate (2×5 to 3×6 cm.), drying rather opaque, 5 or 7 nerved, pale-granular beneath; petiole scarcely 5 mm. long, sublately decurrent; spikes axillary toward the top, filiform (1×60 mm. or more), red-green, rather loosely subannularly flowered; peduncle slender, 1 cm. long; bracts round-peltate; ovary obovoid; stigma subapical.

Type in the U. S. National Herbarium, no. 1,251,293, collected at Yerba Buena, Province of Heredia, Costa Rica, altitude 2,000 meters, February, 1926, by Paul C. Standley and Juvenal Valerio (no. 49260).

RANGE: Central mountains of Costa Rica.

COSTA RICA: Type locality, *Standley & Valerio* 50200, 51696. Cerro de las Caricias, *Standley & Valerio* 52337, 52451.

28. *Peperomia munyecoana* Trel., sp. nov.

An openly branching, erect, glabrous, epiphytic herb; stem moderate (3 to 4 mm.), angular, silvery-exfoliating; leaves alternate, elliptic, subacute at both ends, rather large (2.5×5 to 3.5×7 cm.), drying firm and opaque, 5 or 7 nerved, with the inner nerves salient, paler and pale-granular beneath; petiole scarcely 7 mm. long, sublately decurrent; spikes terminal and opposite the leaves, 2 to 3×110 mm., green, rather closely flowered; peduncle 15 mm. long; bracts round-peltate; berries globose; stigma subapical.

Type in the U. S. National Herbarium, no. 1,251,352, collected at El Muñeco, Río Navarro, Province of Cartago, Costa Rica, altitude 1,400 to 1,500 meters, March 6, 7, 1926, by Paul C. Standley and Rubén Torres (no. 51754).



RANGE: Upper Reventazón Valley, Costa Rica.

COSTA RICA: At type locality, *Standley & Torres* 51696; *Standley* 33698, 33701, 33949. Pejivalle, *Standley & Valerio* 47216.

29. *Peperomia virillana* Trel., sp. nov.

*Peperomia nuda* Auct., as to Costa Rica.

A very obscurely puberulous, apparently assurgent, delicate herb; stem slender (2 mm.); leaves alternate, broadly elliptic or elliptic-ovate, somewhat acuminate, rounded or the longer subacute at base, moderate (2 to 4×3 to 6 cm.), 3 or 5 nerved, drying very thin; petiole 5 to 10 or the lower 20 mm. long; spikes mostly terminal, very slender and long (1×120 to 150 mm. or more), loosely flowered; peduncle 1 to 2 cm. long; bracts round-peltate; ovary ovoid, submucronate; stigma subapical.

Type in the DeCandolle Herbarium, collected at San Juan, Río Virilla, Province of Cartago, Costa Rica, by A. Tonduz (no. 945b).

RANGE: High central divide of Costa Rica.

30. *Peperomia vueltasana* Trel., sp. nov.

A moderately small, assurgent, glabrous herb; stem rather slender (2 mm.), rooting from the lower nodes; leaves alternate, lanceolate or oblanceolate and gradually acute at both ends or somewhat mucronate, the lower reduced and bluntly obovate, moderate (2 to 3×4 to 6 cm.), drying thin, 5 nerved; petiole about 10 mm. long, slender; spikes terminal, moderately slender and elongate (2×50 to 80 mm.), closely flowered; peduncle 2 cm. long; bracts round-peltate; berries round-ovoid, obliquely mucronate; stigma anterior.

Type in the U. S. National Herbarium, no. 798,293, collected at Las Vueltas, Tucurrique, Province of Cartago, Costa Rica, altitude 700 meters, January, 1899, by A. Tonduz (no. 13130).

RANGE: Caribbean slope of Costa Rica.

COSTA RICA: At type locality, *Tonduz* 12897. Orosí, *Standley* 39668.

31. *Peperomia pseudopedicellata* Trel., sp. nov.

A repent-assurgent, divaricately forking, glabrous, arboricolous herb; stem moderate (3 to 4 mm.); leaves alternate, lanceolate, sharp-acuminate, acute-based, moderate (1.5×5, 2×6, or 2.5 to 3×8 cm.), drying rather opaque, 5 nerved, with the 3 inner nerves salient, paler and pale-granular beneath; petiole 5 to 8 mm. long, sublately decurrent onto the stem; spikes terminal and from the upper axils, 2×90 to 100 mm., loosely flowered, the denuded rachis beset with pellucid pseudo-pedicels 1 or 1.5 mm. long; peduncle scarcely 10 mm. long; bracts round-peltate.

Type in the U. S. National Herbarium, no. 1,229,306, collected at La Hondura, Province of San José, Costa Rica, altitude 1,300 to 1,700 meters, March 16, 1924, by Paul C. Standley (no. 37762).

RANGE: Central mountains of Costa Rica.

32. *Peperomia dyscrita* Trel., sp. nov.

*Peperomia alata* Auct., as to Costa Rica.

A moderately small, assurgent, glabrous herb; stem zigzag, slender (2 mm.), rooting from the lower nodes; leaves alternate, narrowly lanceolate, acutely long-attenuate at apex, acute-based, moderate (1.5 to 2×8 to 10 cm.), 5 or 7 nerved; petiole scarcely over 5 mm. long, decurrent from the margins; spikes terminal, filiform and rather long (1×80 mm.); peduncle scarcely 10 mm. long; bracts round-peltate.

Type in the herbarium of the Jardin Botanique de l'État, Brussels, collected at Río Naranjo, Province of Cartago, Costa Rica, by A. Tonduz (no. 7518).

RANGE: Central mountains of Costa Rica.

COSTA RICA: At type locality, *Tonduz* 7512. Naranjo, *Oersted*. San Marcos, *Tonduz* 7957. Pejivalle, *Standley & Valerio* 47266, 47270. El Muñeco, Río Navarro, *Standley & Torres* 51687.

33. *Peperomia pilulifera* Trel., sp. nov.

A rather small, assurgent-erect, glabrous, arboricolous herb; stem rather slender (2 to 3 mm.); leaves alternate, lanceolate, or elliptic when reduced, gradually acute at apex and more abruptly at base, moderate (1×2.5 to usually 1.5 to 2×6 to 8 cm.), subpalmately 5 nerved with the midrib faintly branching, drying thin, conspicuously glandular-granular beneath; petiole scarcely 3 mm. long, winged to the base and clasping-decurrent; spikes opposite the leaves, scant 2×40 mm., somewhat loosely flowered, with short thick pseudo-pedicels; peduncle scarcely 1 cm. long; bracts round-peltate, moderately small; berries globose, red, somewhat granular; stigma subapical.

Type in the U. S. National Herbarium; no. 1,229,282, collected at Guápiles, Province of Limón, Costa Rica, altitude 300 to 500 meters, March 12, 13, 1924, by Paul C. Standley (no. 37439).

RANGE: Caribbean piedmont of Costa Rica.

34. *Peperomia niveo-punctulata* Trel., sp. nov.

A rather small, tufted, erect, glabrous, arboricolous herb; stem slender (2 mm.); leaves lanceolate, gradually acute at both ends, moderate (1×4.5, 2×7, or 2.5×5.5 cm.), subpalmately 5 nerved with the midrib faintly branched, drying thin, closely pale-punctulate but not granular beneath; petiole about 5 mm. long, clasping-decurrent; spikes terminal or opposite the leaves, about 1×55 mm., somewhat loosely or subannularly flowered; peduncle 5 mm. long; bracts round-peltate, relatively large; berries globose, smooth, subapiculate; stigma subapical.

Type in the U. S. National Herbarium, no. 1,229,305, collected at Guápiles, Province of Limón, Costa Rica, altitude 300 to 500 meters, March 12, 13, 1924, by Paul C. Standley (no. 37552).

RANGE: Caribbean piedmont of Costa Rica.

35. *Peperomia montecristana* Trel., sp. nov.

A small, somewhat tufted, arboricolous herb; stem slender (1 mm.), loosely long-villous; leaves alternate, ovate or elliptic-ovate, blunt-acuminate, rounded at base rather small (1.5×2 to 2×4 cm.); 5 nerved, appressed-hairy, especially on the paler lower side, drying green and membranous; petiole short (5 to 10 mm.); spikes terminal, 1×30 to 50 mm., loosely flowered; peduncle scarcely 5 mm. long, villous with straight hairs; bracts round-peltate, thin and large; ovary immersed, ovoid, scutulate; stigma anterior, on the scutulum.

Type in the U. S. National Herbarium, no. 1,251,288, collected at Finca Montecristo, Río Reventazón, Province of Limón, Costa Rica, altitude 25 meters, February 18, 19, 1926, by Paul C. Standley and Juvenal Valerio (no. 49017).

RANGE: Caribbean lowlands of Costa Rica.

36. *Peperomia san-joseana* C. DC. *Linnaea* 37: 372. 1872.

TYPE LOCALITY: About San José, Costa Rica (*Oersted* 952, the type).

RANGE: Central mountains of Costa Rica.

COSTA RICA: San José, *Tonduz* 7226 (in some herbaria labeled as from Río Naranjo); *Standley* 41239. Camino de Hatillo, *Standley* 32156. San Pedro Montes de Oca to Curridabat, *Standley* ?32831, 41300. San Isidro Coronado, *Alfaro* 34004. Aguacaliente, *Pittier* 2553. Boruca, *Tonduz* 4809. Cabagra, *Tonduz* 6891. Siquirres, *Pittier* 4249. La Palma, ?*Standley* 33200, 38150. Golfito, ?*Pittier* 9907.

37. *Peperomia chrysocarpa* C. DC. Bull. Soc. Bot. Belg. 29<sup>2</sup>: 70. 1890; 30<sup>1</sup>: 227. 1891.

TYPE LOCALITY: About San José, Costa Rica (*Tonduz* 1384, the type).

RANGE: Central mountains of Costa Rica.

COSTA RICA: San José, *Biolley* 58. Rancho Flores, *Tonduz* 2343. Cartago, *Cooper* 186 (J. D. Smith 5928). Santa María de Dota, *Standley* 41723, 41855; *Standley & Valerio* 43188, 43367a.

38. *Peperomia psiloclada* C. DC. Anal. Inst. Fls.-Geogr. Costa Rica 9: 176. 1897.

*Peperomia psiloclada magnifolia* C. DC. Candollea 1: 350. 1923.

TYPE LOCALITY: El Tablazo, Costa Rica (*Pittier* 8040, the type).

RANGE: Central mountains of Costa Rica.

COSTA RICA: Santiago, San Ramón, *Brenes* 14179. La Hondura, *Standley* 37763. Santa Rosa de Copey, *Tonduz* 12222 (type of *P. psiloclada magnifolia*), 12226, 12332. Yerba Buena, near San Isidro, *Standley & Valerio* 49273. Santa María de Dota, *Standley* 43098. Cerro de Piedra Blanca, Escasú, *Standley* 32470, 32531, 32616, 32658. San Sebastián, *Standley* 49377. La Verbena, *Standley* 32303. San Pedro Montes de Oca to Curridabat, *Standley* 32774. San Isidro Coronado, *Alfaro* 32401, 32405. San José, *Standley* 33308, 41203. La Ventolera, Volcán de Poás, *Standley* 34740. La Palma, ? *Standley* 38149.

39. *Peperomia erythrophlebia* Trel., sp. nov.

A rather small, somewhat clustered, erect, glabrous, arboricolous herb; stem 2 mm. thick, with short internodes, leafless below; leaves alternate, elliptic or elliptic-obovate, obtuse, acute-based, 6×11 to 10×15 mm., palmately 5 nerved with the midrib very obscurely branched, paler beneath with red nerves; petiole 1 to 2 mm. long; spikes terminal and from the upper axils, 2×25 to 45 mm., closely flowered; peduncle 10 to 15 mm. long; bracts round-peltate.

Type in the U. S. National Herbarium, no. 1,229,226, collected at El Muñeco, Río Navarro, Province of Cartago, Costa Rica, altitude 1,400 meters, February 8, 9, 1924, by Paul C. Standley (no. 33418).

RANGE: Upper Reventazón Valley, Costa Rica.

40. *Peperomia versicolor* Trel., sp. nov.

A small stoloniferous-erect glabrous epiphytic herb; stem 2 mm. thick, with short internodes; leaves alternate, lanceolate, acute at both ends, 1 to 1.5×2 to 3 cm., 3 or obscurely 5 nerved, thin-coriaceous, opaque, purple-red beneath; petiole 3 mm. long, clasping-decurrent; spikes terminal and axillary, as yet 1×20 mm.; peduncle 5 mm. long; bracts round-peltate.

Type in the U. S. National Herbarium, no. 1,251,235, collected at Pejivalle, Province of Cartago, Costa Rica, altitude 900 meters, February 7, 8, 1926, by Paul C. Standley and Juvenal Valerio (no. 47270).

RANGE: Reventazón Valley, Costa Rica.

41. *Peperomia brachypus* Trel., sp. nov.

A rather small, erect or recurving, glabrous, arboricolous herb; stem moderately slender (2 to 3 mm.), rooting from the nodes below; leaves alternate, lance-elliptic, acutish at both ends, moderate (1.5×4 to 2×6.5 cm.), fleshy, drying dull-olivaceous, 5 nerved; petiole short (scarcely 10 mm.), obscurely decurrent; spikes terminal, 2×70 to 80 mm., closely flowered, with short stout pseudo-pedicels; peduncle 10 to 15 mm. long; bracts round-peltate; berries globose, slightly apiculate; stigma subapical.

Type in the U. S. National Herbarium, no. 1,229,200, collected along the Camino de Hatillo, near San José, Province of San José, Costa Rica, altitude 1,200 meters, January 29, 1924, by Paul C. Standley (no. 32159).

RANGE: Mountains of central Costa Rica.

COSTA RICA: Cartago, *Standley* 33323.

42. *Peperomia stenophylla* C. DC. Bull. Soc. Bot. Belg. 30<sup>1</sup>: 228. 1891.

TYPE LOCALITY: El General, Province of Puntarenas, Costa Rica (*Pittier* 3398, the type).

RANGE: Pacific mountains of Costa Rica.

COSTA RICA: At type locality, *Pittier* 3400.

42a. *Peperomia stenophylla paradendrophila* Trel., var. nov.

*Peperomia dendrophila* Auct., as to Costa Rica.

A small stoloniferous glabrous herb; stem slender (1 to 2 mm.); leaves alternate, narrowly lanceolate or oblanceolate, equally acute at both ends or long-cuneate, rather small (1 to 1.5×3.5 to 4 cm.), 5 to 7 nerved, with the innermost nerves from above the base, pale beneath; petiole filiform, 5 to 10 mm. long; spikes terminal, moderately slender and elongate (1×25 to 40 mm.), closely flowered; peduncle filiform, elongate (2 cm.); bracts round-peltate; berries in pits separated by anastomosing ridges, round-ovoid, submucronate; stigma anterior.

Type in the U. S. National Herbarium, no. 798,282, collected at Tuis, Province of Cartago, Costa Rica, altitude 650 meters, November, 1897, by A. Tonduz (no. 11531).

RANGE: Caribbean slope of Costa Rica.

43. *Peperomia stenophyllopsis* Trel., sp. nov.

A small, essentially glabrous, stoloniferous-repent, arboricolous herb; leaves alternate, lanceolate or the larger elliptic, bluntly or emarginately acuminate, acute at base, small (scarcely 1×3 to 1.5×4, or on sterile stems 1.5 to 2.5×4 to 5 cm.), 3 or 5 nerved, ciliolate upward or obscurely hairy; petiole 5 to 10 mm. long, clasping-decurrent; spikes terminal, slender, scarcely 30 mm. long; peduncle scant 1 cm. long; bracts round-peltate; berries globose, submucronate; stigma subapical.

Type in the U. S. National Herbarium, no. 1,251,248, collected at Fraijanes, Province of Alajuela, Costa Rica, altitude 1,500 to 1,700 meters, February 12, 13, 1926, by Paul C. Standley and Rubén Torres (no. 47590).

RANGE: Mountains of central Costa Rica.

COSTA RICA: At type locality, *Standley & Torres* 47667.

44. *Peperomia fissispica* Trel., sp. nov.

A diffuse, sparingly branched, terrestrial herb; stems slender (1 to 3 mm.), with shortened internodes upward, transiently upcurved-hirsute; leaves (fallen below) alternate, lance- to round-elliptic, subacute at both ends, rather small (0.6×1.2 to 1.5×3 cm.), rather coriaceous, indistinctly 1 or 3 nerved, evanescently hairy, paler and pale-granular beneath; petiole about 5 mm. long, somewhat hairy; spikes terminating short branches with reduced leaves, small (as yet 1×10 mm.), teratologically bifid, closely flowered; peduncle scarcely 5 mm. long, pubescent; bracts round-peltate, relatively large.

Type in the U. S. National Herbarium, no. 1,229,250, collected at Finca del Volcán de Turrialba, Costa Rica, altitude 2,000 to 2,400 meters, February 22, 1924, by Paul C. Standley (no. 35055).

RANGE: Central mountains of Costa Rica.

45. *Peperomia multifida* Trel., sp. nov.

A rather small, erect, repeatedly forking, glabrous, arboricolous herb; stem moderately slender (1 to 3 mm.); leaves mostly alternate but frequently opposite near the top, round-ovate, acute, rounded at base, rather small (1×1.2 to 1.5×1.8 cm.), coriaceous and opaque, obscurely 3 or 5 nerved, yellowish and

somewhat pale-granular beneath; petiole 3 to 5 mm. long, often clasping-decurrent; spikes several, terminal and from the upper axils, small (as yet scarcely  $1 \times 15$  mm.); peduncle very short (3 mm.); bracts round-peltate.

Type in the U. S. National Herbarium, no. 1,229,243, collected on Cerro de la Carpintera, Province of Cartago, Costa Rica, altitude 1,500 meters, February, 1924, by Paul C. Standley (no. 34349).

RANGE: Central mountains of Costa Rica.

COSTA RICA: At type locality, *Standley* 34368, 34403, 34452, 35621. Las Nubes, *Standley* 38744, 38803.

46. *Peperomia zurquiana* Trel., sp. nov.

A rather small, repent or stoloniferous, glabrous, arboricolous herb; stem slender (scarcely 2 mm.), red; leaves alternate, elliptic to ovate or the lower orbicular, emarginately subacute, often acute at base, rather small ( $8 \times 15$  to  $15 \times 15$  to 20 mm.), coriaceous and opaque, rather indistinctly 3 nerved, yellowish and granular beneath; petiole 5 mm. long; spikes terminal, elongate, loosely flowered; peduncle 5 mm. long; bracts subelliptic-peltate; ovary immersed, ovoid; stigma subapical.

Type in the U. S. National Herbarium, no. 1,251,324, collected on Cerros de Zurquí above San Isidro, Province of Heredia, Costa Rica, altitude 2,000 to 2,400 meters, March 3, 1926, by Paul C. Standley and Juvenal Valerio (no. 50758).

RANGE: Central mountains of Costa Rica.

COSTA RICA: Yerba Buena, above San Isidro, *Standley & Valerio* 50211. Cerro de las Caricias, *Standley & Valerio* 52321, 52449.

47. *Peperomia fraijanesana* Trel., sp. nov.

A stoloniferous, erect, somewhat forking, glabrous herb; stem moderately slender (2 to 3 mm.), dark red; leaves alternate, round- or rhombic-elliptic or subobovate, rounded at apex or shortly blunt-acuminate, acute-based or cuneate, moderately small ( $1.5 \times 2$ ,  $2 \times 3$ , or  $3 \times 4$  cm.), 5 nerved, drying rather thin but firm, the yellow lower surface for a time brown-punctulate; petiole 5 to about 10 mm. long; spikes noted as pale green.

Type in the U. S. National Herbarium, no. 1,251,249, collected at Fraijanes, Province of Alajuela, Costa Rica, altitude 1,500 to 1,700 meters, February 12, 13, 1926, by Paul C. Standley and Rubén Torres (no. 47596).

RANGE: Central mountains of Costa Rica.

47a. *Peperomia fraijanesana subrhombica* Trel., var. nov.

A rather small, erect, pseudo-dichotomous, glabrous, arboricolous herb; stem moderately slender (1 to 3 mm.), dark red; leaves alternate, subrhombically obovate, obtuse, acute at base, rather small ( $1 \times 1.8$  to  $1.5 \times 2$  to 2.5 cm.), coriaceous and opaque, 3 or 5 nerved, yellow and obscurely granular beneath; petiole about 5 mm. long, clasping-decurrent; spikes terminal and from the uppermost axils, as yet young and very small; bracts round-peltate.

Type in the U. S. National Herbarium, no. 1,251,251, collected at Fraijanes, Province of Alajuela, Costa Rica, altitude 1,500 to 1,700 meters, February 12, 13, 1926, by Paul C. Standley and Rubén Torres (no. 47602).

RANGE: Mountains of central Costa Rica.

47b. *Peperomia fraijanesana san-isidroana* Trel., var. nov.

A rather small, erect, repeatedly forking, arboricolous herb; stem moderate (1 to 2 or at base 4 mm. thick), red, with mostly short sulcate internodes, transiently and sparsely soft-villous or cobwebby; leaves alternate or (exceptionally) subopposite at the branching nodes, subrhombically elliptic, obtuse, acute at base, rather small ( $1 \times 1.5$  to scarcely  $2 \times 3$  cm.), coriaceous and opaque,

3 nerved, yellow and obscurely granular beneath; petiole 5 to 10 mm. long, clasping-decurrent; spikes terminal and axillary, as yet small; bracts round-peltate.

Type in the U. S. National Herbarium, no. 1,251,318, collected at Yerba Buena, above San Isidro, Province of Heredia, Costa Rica, altitude 2,000 meters, February, 1926, by Paul C. Standley and Juvenal Valerio (no. 50226).

RANGE: Central mountains of Costa Rica.

COSTA RICA: At type locality, *Standley & Valerio* 49274, 50139. Cerro de las Caricias, above San Isidro, *Standley & Valerio* 52454.

48. *Peperomia tuisana* C. DC. Anal. Inst. Fis.-Geogr. Costa Rica 9: 176. 1897.

TYPE LOCALITY: Tuis, Province of Cartago, Costa Rica (*Tonduz* 8222, the type).

RANGE: Caribbean slope of Costa Rica.

49. *Peperomia chlorostachya* Trel., sp. nov.

A moderately small, repent, arboricolous herb; stem slender (1 to 2 mm.), rooting from the nodes, at first velvety; leaves alternate, round-ovate, acute, rounded or cordulately subtruncate at base, rather small (1.2×1.5 to 1.5×2 cm.), coriaceous and opaque, 1 nerved, yellowish and obscurely granular beneath, velvety at least on the midrib; petiole 5 to 15 mm. long, at first velvety; spikes terminal, small (scarcely 2×20 mm.), rather closely flowered, with some pseudopedicels; peduncle 15 mm. long, velvety; bracts round-peltate; anthers inconspicuous; ovary ovoid, submucronate; stigma oblique.

Type in the U. S. National Herbarium, no. 1,251,176, collected on Cerro de las Vueltas, Province of San José, Costa Rica, altitude 2,700 to 3,000 meters, December, 1925, by Paul C. Standley and Juvenal Valerio (no. 43513).

RANGE: High central mountains of Costa Rica.

COSTA RICA: Finca La Cima, near El Copey, *Standley* 42766.

50. *Peperomia hylophila* C. DC. Anal. Inst. Fis.-Geogr. Costa Rica 9: 176. 1897.

*Peperomia irazuana* C. DC. Anal. Inst. Fis.-Geogr. Costa Rica 9: 180. 1897.

TYPE LOCALITY: La Carpintera, Province of Cartago, Costa Rica (*Pittier* 4406, the type).

RANGE: Central mountains of Costa Rica.

COSTA RICA: At type locality, *Pittier* 4407, 4408 (type of *P. irazuana*); *Polakowsky* 206, 207. Mount Barba, *Hoffmann* 56. Vara Blanca to La Concordia, between Volcán de Poás and Volcán de Barba, *Maxon & Harvey* 8416. El Muñeco, Río Navarro, *Standley & Torres* 51721. Las Nubes, *Standley* 38548, 38630, 38743. La Palma, *Standley* 38031, 38232.

50a. *Peperomia hylophila personata* Trel., var. nov.

Rather small, assurgent, forking, glabrous; leaves congested upward, elliptic-obovate, obtuse or emarginulate, acute at base or cuneate, 1 to 1.5×2.5 cm., 3 nerved, coriaceous, drying yellow beneath and granular; spikes scarcely 2×35 mm.; peduncle 5 mm. long.

Type in the U. S. National Herbarium, no. 796,619, collected on Volcán de Poás, Province of Alajuela, Costa Rica, altitude 2,300 meters, March, 1896, by John Donnell Smith (no. 6744).

RANGE: Central mountains of Costa Rica.

COSTA RICA: La Palma, *Standley* 32933.

51. *Peperomia tenellaeformis* Trel., sp. nov.

A small stoloniferous epiphytic herb; stem slender (1 mm.), glabrous, with short internodes; leaves alternate, oblong-subovate, rather obtuse at both ends



or acutish at base, small (3 to 4×8 to 12 mm.), 3 nerved, rather firm, somewhat pubescent near the margin; petiole 2 to 3 mm. long, clasping-decurrent, glabrous; spikes terminal, 1×35 mm., loosely flowered with pseudo-pedicels; peduncle scant 10 mm. long, glabrous; bracts round-peltate.

TYPE IN THE U. S. NATIONAL HERBARIUM, no. 1,229,218, collected at La Palma, Province of San José, Costa Rica, altitude 1,600 meters, February 3, 1924, by Paul C. Standley (no. 33135).

RANGE: Central mountains of Costa Rica.

COSTA RICA: Yerba Buena, above San Isidro, ? *Standley & Valerio* 50206 in part.

52. *Peperomia tenuicaulis* C. DC. Anal. Inst. Fis.-Geogr. Costa Rica 9: 177. 1897.

TYPE LOCALITY: Santo Domingo de Golfo Dulce, Province of Puntarenas, Costa Rica (*Pittier* 9986, the type; also distributed as J. D. Smith 7147).

RANGE: Pacific lowlands of Costa Rica.

COSTA RICA: Type locality, *Pittier* 10089; distributed also as J. D. Smith 7258.

53. *Peperomia punctataefolia* Trel., sp. nov.

A small arboricolous repent-assurgent herb; stem filiform, rooting below, loosely hairy; leaves alternate, elliptic or the lowest suborbicular, obtuse, rounded or acute at base, flat, small (3×4 to 4 or 5×10 to 12 mm.), at least transiently loosely hairy on both sides, more or less punctulate, obscurely 1 to 3 nerved by transmitted light; petiole 1 to 2 mm. long; spikes 1 to 2×20 to 25 mm., at length rather loosely flowered; peduncle loosely hairy, very slender, 5 to 10 mm. long; bracts round-peltate; ovary obovoid, bluntish; stigma oblique.

TYPE IN THE U. S. NATIONAL HERBARIUM, no. 1,229,311, collected at La Hondura, Province of San José, Costa Rica, altitude 1,300 to 1,700 meters, March 16, 1924, by Paul C. Standley (no. 37968).

RANGE: Caribbean slope of Costa Rica and in the central mountains.

COSTA RICA: At type locality, *Standley* 33364, 36287, 37843. Aserrí to Tarabaca, *Standley* 34198. Laguna de la Escuadra, *Standley* 42038. Guápiles, at 300 to 500 meters altitude, ? *Standley* 37437, 37500, 37509.

53a. *Peperomia punctataefolia munyecoana* Trel., var. nov.

Resembling the type, but in its more creeping form approaching *P. rotundifolia* in having nearly orbicular leaves.

TYPE IN THE U. S. NATIONAL HERBARIUM, no. 1,229,227, collected at El Muñeco, Río Navarro, Province of Cartago, Costa Rica, altitude 1,400 meters, February 8, 9, 1924, by Paul C. Standley (no. 33432).

RANGE: Upper Reventazón Valley, Costa Rica.

COSTA RICA: At type locality, *Standley* 33465, 33488, 33606, 33702; *Standley & Torres* 51669, 51722, 51735.

54. *Peperomia tonduzii* C. DC. Bull. Soc. Bot. Belg. 29<sup>2</sup>: 70. 1890; 30<sup>1</sup>: 229. 1891.

TYPE LOCALITY: Volcán de Barba, Costa Rica (*Pittier* 568, the type).

RANGE: Central mountains of Costa Rica.

COSTA RICA: Finca La Cima, near El Copey, *Standley* 42746. Laguna de la Chonta, near Santa María de Dota, *Standley* 42311.

55. *Peperomia oerstedii* C. DC. Linnaea 37: 375. 1872.

TYPE LOCALITY: Volcán de Irazú, Costa Rica (*Oersted* 977, the type).

RANGE: Central mountains of Costa Rica.

COSTA RICA: Quebradillas, near Santa María de Dota, *Standley* 43103.

55a. *Peperomia oerstedii punctata* (C. DC.) Trel.

*Peperomia punctata* C. DC. *Candollea* 1: 331. 1923; 2: 188. 1925.

TYPE LOCALITY: Turrialba, Province of Cartago, Costa Rica (*Pittier* 13376, the type).

RANGE: Reventazón Valley, Costa Rica.

COSTA RICA: Juan Viñas, *Cook & Doyle* 394. Pejivalle, *Standley & Valerio* 47319. Talamanca Valley, *Rowlee* 354.

56. *Peperomia silvivaga* C. DC. *Anal. Inst. Fis.-Geogr. Costa Rica* 9: 177. 1897.

*Peperomia serpens* Auct., as to Costa Rica.

TYPE LOCALITY: Forests of Turrialba, Province of Cartago, Costa Rica, altitude 570 meters (*Tonduz & Pittier* 8435, the type).

RANGE: Reventazón Valley, Costa Rica.

COSTA RICA: At type locality, *Tonduz & Pittier* 4246, 8434.

57. *Peperomia incisa* Trel., sp. nov.

A rather small, repent, glabrous, arboricolous herb; stem filiform; leaves alternate, obovate or oblong-obovate, notched, acute at base, small (5×7 to 7×13 mm.), opaque, indistinctly 3 nerved, impressed-punctulate beneath; petiole 3 to 5 mm. long; inflorescence unknown.

Type in the U. S. National Herbarium, no. 1,251,223, collected at Quebrada Serena, near Tilarán, Province of Guanacaste, Costa Rica, altitude 700 meters, January 27, 1926, by Paul C. Standley and Juvenal Valerio (no. 46318).

RANGE: Pacific slope of Costa Rica.

58. *Peperomia rotundifolia* (L.) H. B. K. *Nov. Gen. & Sp.* 1: 65. 1815.

*Piper rotundifolium* L. *Sp. Pl.* 30. 1753.

*Piper nummularifolium* Swartz, *Prodr. Veg. Ind. Occ.* 16. 1788.

*Peperomia nummularifolia* H. B. K. *Nov. Gen. & Sp.* 1: 66. 1815.

TYPE LOCALITY: Martinique.

RANGE: Widespread in differing forms through the West Indies, except for the Virgin Islands group, and on the mainland from Mexico to central South America. The type of *Piper rotundifolium* is from Martinique, and that of *Piper nummularifolium* from Jamaica. The specimens which Kunth identified with *P. rotundifolium* came from Caripe, Venezuela.

COSTA RICA: Río Hondo, plains of Santa Clara, *Cook & Doyle* 608. Victoria, Plains of Zent, *Pittier* 16083. Shirores, *Pittier* 9281. La Colombiana Farm, *Standley* 36838, 36938. Hamburg Finca, *Standley & Valerio* 48863, 48881, 48901, 48935. Finca Montecristo, *Standley & Valerio* 48989, 49022. El Muñeco, Río Navarro, ?*Standley & Torres* 51402. La Estrella, Cartago, ?*Standley* 39242, 39257, 39593. Carrillo Road, *Pittier* "566." Río Zhorquín, *Tonduz* 8526. Las Vueltas, *Tonduz* 13131. Río Naranjo, *Tonduz* 8046. Mount Aguacate, *Oersted* 995. La Palma, *Pittier* 723. El Arenal, Guanacaste, *Standley & Valerio* 45316. About Tilarán, Guanacaste, ?*Standley & Valerio* 44830, 44975a; *Valerio* 53.

59. *Peperomia rejecta* Trel., sp. nov.

A repent arboricolous herb with short erect branches; stem filiform, sparsely velvety; leaves alternate, orbicular or broad-elliptic, sometimes emarginulate, usually subacute at base, small (6×8 to 8×12 mm.), drying green but rather opaque, more or less evidently 3 nerved, very evanescently and sparsely velvety; petiole filiform, 4 to 10 mm. long, somewhat velvety; spikes terminal, as yet young and small (1×5 mm.); peduncle slender, scarcely equaling the spike, puberulent; bracts round-peltate.

Type in the U. S. National Herbarium, no. 1,251,316, collected at Yerba Buena, above San Isidro, Province of Heredia, Costa Rica, altitude 2,000 meters, February, 1926, by Paul C. Standley and Juvenal Valerio (no. 50219).

RANGE: Central mountains of Costa Rica.

COSTA RICA: At type locality, *Standley & Valerio* 50248.

60. *Peperomia delecta* Trel., sp. nov.

A repent arboricolous herb; stem filiform, rooting and with short branches from many nodes, somewhat sparsely velvety; leaves alternate, broadly elliptic or suborbicular, very obtuse and often emarginulate, usually rounded at base, rather small (8×10 to 15×15 mm.), drying thin and green, faintly 3 nerved, for a time with sparse fine appressed hairs; petiole 3 to 10 mm. long, velvety; spikes terminal, scarcely 1×10 mm., rather closely flowered; peduncle filiform, about equaling the spike, slightly velvety; bracts round-peltate, like the anthers comparatively large.

Type in the U. S. National Herbarium, no. 1,229,324, collected at Alto de la Estrella, Province of Cartago, Costa Rica, March 26, 27, 1924, by Paul C. Standley (no. 39097).

RANGE: Upper Reventazón Valley, Costa Rica.

61. *Peperomia cryptolepida* Trel., sp. nov.

A moderately small, repent, arboricolous herb; stem filiform, rooting from the nodes, transiently minutely puberulent; leaves alternate, broadly elliptic ranging to orbicular and subobovate, obtuse, somewhat acute-based, small (1×1 to 2×2.5 cm.), thin, dark green, 3 or 5 nerved by transmitted light, very obscurely puberulous; petiole 5 to 10 mm. long, puberulous; spikes terminal, small (scarcely 2×10 to 15 mm.), at first closely flowered; peduncle filiform, about 10 mm. long, glabrate; anthers pale, large, concealing the round-peltate bracts in anthesis.

Type in the U. S. National Herbarium, no. 1,251,287, collected at Hamburg Finca, Río Reventazón, below Cairo, Province of Limón, Costa Rica, altitude 55 meters, February 18, 19, 1926, by Paul C. Standley and Juvenal Valerio (no. 48932).

RANGE: Caribbean lowlands, Costa Rica.

COSTA RICA: Finca Montecristo, in the same region, *Standley & Valerio* 49016.

62. *Peperomia megalanthera* Trel., sp. nov.

A moderately small, repent, arboricolous herb; stem slender (1 to 2 mm.), rooting from the nodes, puberulent; leaves alternate, orbicular or broadly elliptic or ovate, rounded at both ends, rather small (1×1 to 2×2 or 2.5 cm.), coriaceous and opaque, 1 or very obscurely 3 or 5 nerved, essentially glabrous; petiole 3 to 12 mm. long, puberulent; spikes terminal, small (2×20 mm.), densely flowered; peduncle 6 mm. long, puberulent; bracts round- or elliptic-peltate; anthers pale, broad, 0.5 mm. long; ovary obovoid; stigma anterior.

Type in the U. S. National Herbarium, no. 1,229,313, collected at La Hondura, Province of San José, Costa Rica, altitude 1,300 to 1,700 meters, March 16, 1924, by Paul C. Standley (no. 37970).

RANGE: Central mountains of Costa Rica.

63. *Peperomia reptabunda* Trel., sp. nov.

A small creeping glabrous herb; stem slender (1 mm.); leaves alternate, round-obovate, frequently emarginulate, acute at base or cuneate, 1×1.5 to 2.5 cm., drying dull and coriaceous, 5 nerved, with the midrib somewhat branched; petiole 5 to 10 mm. long; spikes terminal, 1×30 mm., closely flowered; peduncle slender, 2 cm. long; bracts round-peltate; berries globose; stigma subapical.

Type in the U. S. National Herbarium, 798,443, collected at Las Vueltas, Tucurrique, Province of Cartago, Costa Rica, altitude 635 meters, by A. Tonduz (no. 12791).

RANGE: Caribbean slope of Costa Rica.

64. *Peperomia san-ramonensis* C. DC. *Candollea* 1: 332. 1923; 2: 188. 1925.

TYPE LOCALITY: Santiago, San Ramón, Province of Alajuela, Costa Rica (*Brenes* 14183, the type).

RANGE: Pacific slope of Costa Rica.

COSTA RICA: At type locality, *Brenes* 14181, 14185, 14186, 14534.

64a. *Peperomia san-ramonensis atricha* Trel., var. nov.

A minute plant with even the stem glabrous, that of the type being somewhat pubescent.

Type in the U. S. National Herbarium, no. 1,080,173, collected at Santiago, San Ramón, Province of Alajuela, Costa Rica, altitude 1,200 to 1,300 meters, June 2, 1901, by A. M. Brenes (no. 14191).

RANGE: Pacific slope of Costa Rica.

65. *Peperomia congestifolia* Trel., sp. nov.

A small, repent, essentially glabrous, arboricolous herb; stem filiform, frequently forking, with very short erect leafy branches; leaves alternate, few but crowded, round-obovate and rounded at both ends or broadly spatulate-cuneate, small (5 to 8×7 to 10 or 13 mm.), obscurely 1 nerved, coriaceous; petiole 3 mm. long, winged, sometimes slightly papillate; spikes terminal, minute (1×8 mm.), closely flowered; peduncle very slender, equaling the spike; bracts round-peltate; berries globose, slightly apiculate and subcalyculate; stigma oblique on the point.

Type in the U. S. National Herbarium, no. 1,229,294, collected at Guápiles, Province of Limón, Costa Rica, altitude 300 to 500 meters, March 12, 13, 1924, by Paul C. Standley (no. 37490).

RANGE: Caribbean piedmont of Costa Rica.

COSTA RICA: At type locality, *Standley* 37438.

66. *Peperomia candelaber* Trel., sp. nov.

A small, repent-assurgent, often arboricolous herb; stem slender (1 to 2 mm.), short, rooting below, sparsely velvety; leaves alternate, broadly elliptic, varying to round or ovate, typically obtuse at both ends, small (7×10 to 14×17 mm.), 3 nerved, obscurely puberulent beneath; petiole 3 to 6 mm. long, somewhat puberulent; spikes terminal and from several of the upper axils, divergent-upcurved, about 1×20 mm., rather loosely flowered, at length with pseudo-pedicels; peduncle filiform, about 5 mm. long, glabrate; bracts relatively large, round-peltate; berries subglobose, short-apiculate; stigma nearly terminal, slightly lobed.

Type in the U. S. National Herbarium, no. 1,229,215, collected at La Palma, Province of San José, Costa Rica, altitude 1,600 meters, February 3, 1924, by Paul C. Standley (no. 33010).

RANGE: High central divide of Costa Rica.

COSTA RICA: At type locality, *Standley* 33206, 33230.

67. *Peperomia calyculata* Trel., sp. nov.

A small, repent-assurgent, arboricolous herb; stem filiform, sparsely and transiently velvety; leaves alternate, broadly elliptic or the lowest subobovate, obtuse, mostly blunt-based, small (8×10 to 11×19 mm.), coriaceous, 5 nerved, glabrous, yellowish beneath; petiole scant 5 mm. long, velvety; spikes terminal or also from the upper axils, 2×15 to 20 mm., closely flowered; peduncle stout, 5 mm. long, glabrous; bracts round-peltate; berries globose, surrounded

by a membranous, about 6-lobulate cup; stigma apical, sessile, minute, somewhat lobed.

Type in the U. S. National Herbarium, no. 1,229,260, collected at La Hondura, Province of San José, Costa Rica, altitude 1,300 to 1,700 meters, March 2-4, 1924, by Paul C. Standley (no. 36568).

RANGE: Central mountains of Costa Rica.

Unique in *Peperomia* in its (normally?) calyculate flowers and minute apical stigma.

68. *Peperomia poasana* C. DC. Bull. Soc. Bot. Belg. 30<sup>1</sup>: 224. 1891.

TYPE LOCALITY: Volcán de Poás, Costa Rica (*Pittier* 63, the type).

RANGE: Central mountains of Costa Rica.

COSTA RICA: La Estrella, Cartago, *Cooper* 288, distributed as J. D. Smith 5922. La Palma, *Maxon* 360.

68a. *Peperomia poasana herediana* Trel., var. nov.

Leaves scarcely punctulate; midrib rosy; petiole clasping; peduncle rather stout.

Type in the U. S. National Herbarium, no. 1,251,310, collected at Yerba Buena, above San Isidro, Province of Heredia, Costa Rica, altitude 2,000 meters, February, 1926, by Paul C. Standley and Juvenal Valerio (no. 50197).

RANGE: Central mountains of Costa Rica.

COSTA RICA: At type locality, *Standley & Valerio* 50247. Cerro de Zurquí, *Standley & Valerio* 50857. Zurquí, *Standley & Valerio* 48323.

69. *Peperomia brevicaulis* Trel., sp. nov.

A moderately large, essentially glabrous, rhizomatous, arboricolous herb, with short erect few-leaved branches; stem stout (4 mm.); leaves alternate, lance-elliptic, acute at both ends, rather large (4 to 6×12 to 15 cm.), drying rather thin and dull, pinnately veined nearly throughout, the branches of the midrib about 5×2; petiole elongate (3 to 6 cm.), winged; spikes verticillate on solitary stalks scarcely 7 cm. long, small (1×10 to 20 mm.), obtuse; peduncles rather stout, scarcely 5 mm. long; bracts round-peltate; berries red, ellipsoid, subtruncate; stigma nearly apical.

Type in the U. S. National Herbarium, no. 1,229,328, collected at Orosi, Province of Cartago, Costa Rica, March 30, 1924, by Paul C. Standley (no. 39667).

RANGE: Upper Reventazón Valley, Costa Rica.

COSTA RICA: El Muñeco, in the same general region, altitude 1,400 meters, *Standley* 33837, 33926.

70. *Peperomia atirroana* Trel., sp. nov.

*Peperomia paniculata* Auct., as to Central America.

A sparingly puberulent, erect, subsimple herb growing on the ground; stem moderately stout (3 to 4 mm.), dull; leaves alternate, obovate-elliptic, characteristically obtuse, gradually narrowed below and decurrent on the petiole, large (6 to 9×12 to 18 or 21 cm.), slightly glossy, coriaceous, pinnately nerved nearly to the end, the branches of the midrib about 5×2, slightly revolute; petiole elongate (6 to 9 or 12 cm.), winged; spikes verticillately clustered about the upper part of elongate stout leafless branches, relatively thick and short (some 2 or 10 to 15 mm.), obtuse; peduncles very short (scarcely 5 mm.); bracts round-peltate; berries oblong, red, somewhat granular, rather abruptly narrowed to the apical stigma.

Type in the U. S. National Herbarium, no. 796,689, collected at Atirro, Province of Cartago, Costa Rica, altitude 600 meters, March, 1894, by John Donnell Smith (no. 4927).

RANGE: Reventazón Valley, Costa Rica.

71. *Peperomia breviscapa* Trel., sp. nov.

A rather large, obscurely papillose, short-stemmed, arboricolous herb; stem rather stout (5 mm.); leaves few, alternate, elliptic-oblong to elliptic-obovate, obtuse, gradually narrowed onto the petiole, large (8 to 11×25 to 30 cm.), slightly glossy, drying rather papery, pinnately nerved nearly to the end, the branches of the midrib about 10×2; petiole elongate (some 6 cm.), winged; spikes verticillately clustered about the upper part of elongate reddish branches (3 to 7 cm. long), greenish-white, 10 to 15 mm. long, obtuse; peduncles very short (scarcely 5 mm.); bracts round-peltate; berries oblong, red, somewhat granular, obliquely subtruncate; stigma nearly apical.

Type in the U. S. National Herbarium, no. 1,229,268, collected at La Colombiana Farm, Province of Limón, Costa Rica, altitude 70 meters, March 6, 7, 1924, by Paul C. Standley (no. 36888).

RANGE: Caribbean lowlands of Costa Rica.

COSTA RICA: At type locality, *Standley* 36754. Finca Montecristo, below Cairo, *Standley & Valerio* 48983.

72. *Peperomia subacaulis* Trel., sp. nov.

*Peperomia longifolia* Auct., as to Costa Rica.

A very short-stemmed, essentially glabrous herb; leaves lanceolate or oblanceolate, acute, gradually narrowed to the very short (10 mm.) petiole, large (5 to 5.5×25 cm.), pinnately nerved to the upper fourth, the branches of the midrib about 5×2; spikes verticillately subpaniculate on sometimes branched axillary stalks scarcely 5 cm. long below the spikes, the subpuberulous floriferous part nearly twice as long, small (scarcely 2×20 mm.), closely flowered; bracts small, round-peltate; berries ellipsoid, beakless; stigma essentially apical.

Type in the U. S. National Herbarium, no. 796,635, collected at Suerre, Llanuras de Santa Clara, Province of Limón, Costa Rica, altitude 300 meters, April, 1896, by John Donnell Smith (no. 6748).

RANGE: Caribbean piedmont of Costa Rica.

COSTA RICA: Guápiles, *Standley* 37466, 37488.

73. *Peperomia sessilifolioides* C. DC. *Candollea* 1: 409. 1923.

*Peperomia sessilifolia* C. DC. *Candollea* 1: 290. 1923. Not H. B. K.

TYPE LOCALITY: Río Naranjo, Costa Rica (*Pittier* 7835, the type).

RANGE: Caribbean lowlands of northern Costa Rica.

COSTA RICA: At type locality, *Pittier* "7625."

74. *Peperomia venabulifolia* Trel., sp. nov.

A moderate-sized erect glabrous arboricolous herb, forking at base; stem moderately stout (4 mm.); leaves alternate, narrowly oblanceolate, long-pointed, cuneate, sessile, 3×12 to 16 cm., pinnately veined from below the upper third, the branches of the midrib some 6 to 8×2; spikes rather few, 2 or 3 at each upper node of a slender stalk some 10 cm. long, elongate (2×100 mm. or more), rather closely flowered; peduncle scarcely 5 mm. long; bracts round-peltate; ovaries immersed; stigma anterior.

Type in the U. S. National Herbarium, no. 1,229,308, collected at La Hondura, Province of San José, Costa Rica, altitude 1,300 to 1,700 meters, March 16, 1924, by Paul C. Standley (no. 37774).

RANGE: Mountains of central Costa Rica.

75. *Peperomia lancilimba* C. DC. *Candollea* 1: 290. 1923; 2: 188. 1925.

*Peperomia lancifolia* Auct., as to Costa Rica.

TYPE LOCALITY: Volcán de Barba, Costa Rica (*Hoffmann* 61, the type).

RANGE: Central mountains of Costa Rica.

COSTA RICA: La Palma, *Standley* 33081, 33201. Cerro de la Carpintera, *Standley* 34367, 34426, 35686. Zurquí, *Standley & Valerio* 48322. Yerba Buena,



above San Isidro, *Standley & Valerio* 50192, 50209. Cerro de las Caricias, above San Isidro, *Standley & Valerio* 52310, 52463; passing into a more elongate leaf-form, f. *elongata*, through no. 52459.

76. *Peperomia guapilesiana* Trel., sp. nov.

A rhizomatous erect herb; stem moderately stout (5 mm.), yellowish-villous; leaves alternate, elliptic, rather blunt at both ends, large (3.5×5, 5×8, or 6×12 cm.), dull, granular, paler beneath and villous, especially on the nerves, pinnately veined from below the upper third, the branches of the midrib about 5×2; petiole very villous, short (2 cm.); spikes loosely verticillate at the nodes of a somewhat compound, very villous panicle about 15 cm. long on an equi-long stalk, rather small (scarcely 2×30 to 35 mm.), blunt; peduncle short (5 mm.), villous; bracts rounded-peltate; berries elongate-obovoid, pale-brown, not beaked; stigma oblique.

Type in the U. S. National Herbarium, no. 1,229,284, collected at Guápiles, Province of Limón, Costa Rica, altitude 300 to 500 meters, March 12, 13, 1924, by Paul C. Standley (no. 37446).

RANGE: Caribbean piedmont, Costa Rica.

COSTA RICA: At type locality, *Standley* 37549.

77. *Peperomia queserana* Trel., sp. nov.

*Peperomia adscendens* Auct., as to Costa Rica.

A glabrous epiphyte; stem coarse; leaves alternate, oblanceolate, acute, gradually tapered to the base, large (7 to 8×15 to 20 cm.), pinnately veined; petiole 3 to 5 cm. long; spike solitary at end of a 1-bracted stalk, 2 to 4×100 to 150 mm.; peduncle 15 mm. long; bracts round-peltate; berries subglabrous, truncate; stigma apical.

Type in the U. S. National Herbarium, no. 796,536, collected at La Quesera, Roble de Copey, near El Copey, Province of San José, Costa Rica, altitude 2,700 meters, April, 1898, by A. Tonduz (no. 12184).

RANGE: Central mountains of Costa Rica.

COSTA RICA: Laguna de la Escuadra, near El Copey, *Standley* 41955, 42019. Volcán de Barba, *Tonduz* 2200, "2209"; "*Pittier* 3309." Volcán de Irazú, *Tonduz* 4404, 6905. Volcán de Poás, *J. D. Smith* 6745. El General, *Tonduz* 3403.

78. *Peperomia pothifolia* Trel., sp. nov.

A rather large, erect, arboricolous herb; stem moderately stout (4 to 5 mm.), rather obscurely soft-hairy; leaves alternate, broadly elliptic, abruptly short-acuminate, obtuse at base, rather large (9 to 10×15 to 18 cm.), pinnately veined throughout, the branches of the midrib some 10 or 12×2, somewhat soft-hairy toward the base; petiole elongate (4 to 7 cm.), obscurely soft-hairy; spikes in a loose terminal panicle, slender and elongate (2×100 mm.), rather loosely subverticillately flowered; peduncle almost suppressed; bracts round-peltate; ovaries rounded, scutulate; stigma central on the scutulum.

Type in the U. S. National Herbarium, no. 1,229,276, collected at Guápiles, Province of Limón, Costa Rica, altitude 300 to 500 meters, March 12, 13, 1924, by Paul C. Standley (no. 37427).

RANGE: Caribbean piedmont, Costa Rica.

COSTA RICA: At type locality, *Standley* 37450, 37545.

79. *Peperomia substriata* C. DC. *Candollea* 1: 291. 1923; 2: 188. 1925.

TYPE LOCALITY: La Palma, Province of San José, Costa Rica (*Tonduz* 12473, the type).

RANGE: Central mountains of Costa Rica.

COSTA RICA: Volcán de Irazú, *Pittier* 4405.

80. *Peperomia glabricaulis* C. DC. Anal. Inst. Fis.-Geogr. Costa Rica 9: 178. 1897.

TYPE LOCALITY: Tsuritkub, Costa Rica (*Tonduz* 8689, the type).

RANGE: Caribbean slope of Costa Rica.

81. *Peperomia longibacca* C. DC. Candollea 1: 369. 1923; 2: 188. 1925.

TYPE LOCALITY: Nicoya, Costa Rica (*Tonduz* 13958, the type).

RANGE: Pacific slope of Costa Rica.

COSTA RICA: Cabagra, *Tonduz* 6531. Tilarán, Guanacaste, *Standley & Valerio* 44958, 44226.

Wrongly ascribed to Ecuador.

82. *Peperomia orientalis* Trel., sp. nov.

A rather large arboricolous herb, closely resembling *P. longibacca*; stem rather slender, glabrous; leaves alternate, elliptic or lance-oblong, acuminate, rather obtuse at base, large (3.5 to 5×10 to 11 cm.), about 5 nerved from below the middle, more or less brown-villous on the nerves beneath; petiole 5 to 10 mm. long, glabrescent; spikes 2, terminal on a short-bracted stalk, slender and elongate (2×100 mm.); peduncle 1 cm. long, glabrous; bracts round-peltate; berries subcylindric, obliquely truncate with acutely protracted scutulum; stigma central on the scutulum.

Type in the U. S. National Herbarium, no. 1,229,274, collected at La Colombiana Farm, Province of Limón, Costa Rica, altitude 70 meters, March 6, 7, 1924, by Paul C. Standley (no. 36943).

RANGE: Caribbean lowlands of Costa Rica.

COSTA RICA: Finca Montecristo, *Standley & Valerio* 48959, 49009, 49013. Hamburg Finca, *Standley & Valerio* 48883. Guápiles, *Standley* 37476. El Arenal, Guanacaste, *Valerio* 87. Río Hondo, Santa Clara, *Cook & Doyle* 548. Santa Clara, Las Delicias, *Biolley* 10655.

83. *Peperomia naranjoana* C. DC. Linnaea 37: 378. 1872.

TYPE LOCALITY: Naranjo, Cartago, Costa Rica (*Oersted* 974, the type).

RANGE: Upper Reventazón Valley, Costa Rica.

The name sometimes is spelled *narangoana*.

84. *Peperomia glaberrima* C. DC. Anal. Inst. Fis.-Geogr. Costa Rica 9: 178. 1897.

*Peperomia glaberrimea* C. DC. Candollea 1: 370. 1923; 2: 188. 1925.

TYPE LOCALITY: Santo Domingo de Golfo Dulce, Province of Puntarenas, Costa Rica (*Tonduz* 9943, the type).

RANGE: Pacific lowlands of southern Costa Rica.

COSTA RICA: At type locality, *Tonduz* 9533 (*J. D. Smith* 7148). Buenos Aires, *Pittier* 6525, 6531.

The name as first published was intended to be *glaberrimea*.

85. *Peperomia circumscissa* Trel.

*Peperomia pendula* C. DC. Anal. Inst. Fis.-Geogr. Costa Rica 9: 178. 1897.

Not *P. pendula* Willd.

TYPE LOCALITY: Turrialba, Province of Cartago, Costa Rica (*Pittier* 8433, the type).

RANGE: Caribbean slope of Costa Rica.

COSTA RICA: Atirro, *J. D. Smith* 6741. Las Vueltas, *Tonduz* 13132.

86. *Peperomia tilarana* Trel., sp. nov.

A moderately large, repent, arboricolous herb; stem moderate (3 to 4 mm.), somewhat hairy about the nodes; leaves alternate, elliptic, blunt-acuminate, subacute at base, moderate (2×3 to 3×5 cm.), drying coriaceous and opaque, pinnately 5 or 7 nerved from the lower part, somewhat pubescent beneath and

ciliate at base; petiole short (5 mm.), hirsute; spikes terminal, moderately elongate (12×60 mm. or more), closely flowered; peduncle 2 cm. long; bracts round-peltate; berries red, spreading, oblong, truncately scutulate; stigma median on the scutulum.

Type in the U. S. National Herbarium, no. 1,251,191, collected at Tilarán, Province of Guanacaste, Costa Rica, altitude 500 to 650 meters, January, 1926, by Paul C. Standley and Juvenal Valerio (no. 44217).

RANGE: Pacific slope of Costa Rica.

COSTA RICA: At type locality, *Standley & Valerio* 44349, 44394.

87. *Peperomia borucana* C. DC. Bull. Soc. Bot. Belg. 30<sup>1</sup>: 232. 1891.

TYPE LOCALITY: Boruca, Province of Puntarenas, Costa Rica (*Tonduz* 4109, the type).

RANGE: Pacific slope of Costa Rica.

COSTA RICA: El General, *Pittier* 10559.

88. *Peperomia parmata* Trel., sp. nov.

*Peperomia variegata* Auct., as to Costa Rica.

*Peperomia maculosa* Auct., as to Costa Rica.

A rather large, assurgent, glabrous herb; stem stout (5 mm.); leaves few, alternate, peltate above the shallowly concave base, ovate, abruptly short-acuminate, large (11×16 cm.), drying dull and opaque, obscurely multiple-nerved, the midrib on each side with about 4 basal branches and as many more distributed below the upper third; petiole long (12 cm.) and stout; spikes terminal and axillary, large (5×200 mm.), tapering, closely flowered, on stalks about 3 cm. long bearing 1 or 2 linear bracts about 3×80 mm.; peduncle 3 cm. long, bracts round-peltate; ovaries in rounded pits; berries granular, black, ovoid, beaked; stigma anterior at base of the beak.

Type in the U. S. National Herbarium, no. 796,648, collected along the Río Turrialba, Province of Cartago, Costa Rica, altitude 500 meters, March, 1894, by John Donnell Smith (no. 4926); through a crossing of labels distributed and listed as *P. magnoliaefolia*.

RANGE: Central mountains and Caribbean slope of Costa Rica.

COSTA RICA: Finca Las Cóncavas, *Standley* 41535. Santa María de Dota, *Standley & Valerio* 41761, 44103. Escasú, *Standley* 32502. La Palma, *Standley* 33105. Cervantes, *Noguera* 11031. Juan Viñas, *Pittier* 2010. Llanos de Alajuelita, *Tonduz* 1890.

89. *Peperomia ciliifera* Trel.

*Peperomia hernandifolia ciliifera* Trel. Bot. Gaz. 73: 145. 1922.

A rather large, repent, glabrate, sometimes arboricolous herb; stem 3 to 4 mm. thick; leaves alternate, broadly ovate, acuminate, peltate, 6×9 to 10×15 cm., ciliate, coriaceous, obscurely about 9 nerved; spikes single in the axils on a 1 bracted peduncle 3 to 6 cm. long, moderately large (3×100 mm.), closely flowered; bracts round-peltate; berries ellipsoid, granular-roughened, with recurved beak; stigma anterior at base of the beak.

TYPE LOCALITY: La Estrella, Province of Cartago, Costa Rica (*Cooper* 286, distributed by John Donnell Smith as no. 5917, type; labeled *Piper tuberculatum*). Type in U. S. National Herbarium.

RANGE: Mountains of central Costa Rica.

COSTA RICA: La Hondura, San José, *Standley* 37827; *Standley & Valerio* 51911, 51930.

89a. *Peperomia ciliifera filipes* Trel.

*Peperomia hernandifolia filipes* Trel. Bot. Gaz. 73: 145. pl. 4, f. 18. 1922. Somewhat smaller, and with smaller spikes on slenderer stalks.

**TYPE LOCALITY:** La Palma, San José, Costa Rica (*Tonduz* 12539, the type, in U. S. National Herbarium).

**RANGE:** Mountains of central Costa Rica.

**COSTA RICA:** At type locality, *Standley* 33105.

**90. *Peperomia peltilimba* C. DC.;** Trel., Bot. Gaz. 73: 145. 1922; *Candollea* 1: 373. 1923.

**TYPE LOCALITY:** San Ramón, Province of Alajuela, Costa Rica (*Brenes* 14178, the type).

**RANGE:** Central mountains of Costa Rica.

**COSTA RICA:** La Hondura, *Standley* 37828. Pejivalle, *Standley & Valerio* 47272. El Muñeco, Río Navarro, *Standley* 33519, 33700; *Standley & Valerio* 51649.

**91. *Peperomia acutilimba* C. DC., sp. nov.**

An assurgent or erect glabrous herb; stem rather slender (3 mm.) upward, much thicker below; leaves alternate, oblanceolate, sharply acuminate, cuneate, rather large (3.5 to 4×8 to 11 cm.), pinnately veined, the branches of the midrib about 8×2, lighter green beneath; petiole 5 to 10 mm. long; spikes paniced on slender bracted axillary stalks 4 to 8 cm. long, rather small (1×50 to 60 mm.), loosely flowered; peduncle 5 mm. long; bracts round-peltate; ovaries elongate-ovoid, in deep pits, filiform-beaked; stigma anterior, at base of the beak.

Type in the herbarium of the Jardin Botanique de l'État, Brussels, collected on Volcán de Poás, Costa Rica, altitude 2,300 meters, by H. Pittier (no. 249).

**RANGE:** Mountains of central Costa Rica.

**COSTA RICA:** Las Lajas, above San Isidro, *Standley & Valerio* 51515, 51679.

**92. *Peperomia tsakiana* C. DC.** Anal. Inst. Fis.-Geogr. Costa Rica 9: 178. 1897.

**TYPE LOCALITY:** Duruf Valley, Talamanca, Province of Limón, Costa Rica (*Pittier* 9383, the type).

**RANGE:** Caribbean slope of Costa Rica.

**COSTA RICA:** Tsaki, *Tonduz* 9540.

**92a. *Peperomia tsakiana victoriana* C. DC., var. nov.**

*Peperomia tsakiana victoriana* C. DC. *Candollea* 1: 413. 1923, name only.

Leaves smaller (scarcely 3×10 cm.); petiole and scape densely villous; spikes shorter (in fruit only 20 mm. long).

Type in the DeCandolle Herbarium, collected at Victoria, on the Zent, Costa Rica, by H. Pittier (no. 16085).

**RANGE:** Caribbean slope of Costa Rica.

**93. *Peperomia compotrix* Trel., sp. nov.**

A rhizomatous assurgent epiphytic herb; stem moderately stout (3 to 4 mm.), glabrescent; leaves alternate, oblanceolate to elliptic-obovate, bluntish, acute-based, rather large (4×8 to 12 or 7×14 cm.), dull, granular, paler beneath and sparingly hairy on the midrib, pinnately veined nearly throughout, the curved branches of the midrib about 6×2; petiole subglabrescent, 3 to 5 cm. long; spikes clustered at the upper nodes of a somewhat villous forking several-bracted panicle scant 15 cm. long, small (2×20 mm.), blunt; peduncles short (5 mm.), glabrate; bracts round-peltate; berries narrowly oblong, dark, slender-beaked; stigma anterior at base of the beak.

Type in the U. S. National Herbarium, no. 1,229,300, collected at Guápiles, Province of Limón, Costa Rica, altitude 300 to 500 meters, March 12, 13, 1924, by Paul C. Standley (no. 37542).

**RANGE:** Caribbean slope, Costa Rica.

**COSTA RICA:** Chitarría, Cartago, *Lankester*, February, 1926.

94. *Peperomia platyphylla* C. DC. *Candollea* 1: 368. 1923; 2: 188. 1925.

TYPE LOCALITY: Juan Viñas, Province of Cartago, Costa Rica (*Cook & Doyle* 269, the type).

RANGE: Caribbean slope of Costa Rica.

COSTA RICA: La Hondura, *Standley* 37898.

95. *Peperomia scutellata* C. DC. *Bull. Soc. Bot. Belg.* 30<sup>1</sup>: 230. 1891.

TYPE LOCALITY: División, Costa Rica (*Pittier* 3611, the type).

RANGE: Upper Reventazón Valley, Costa Rica.

96. *Peperomia donnell-smithii* C. DC. *Anal. Inst. Fis.-Geogr. Costa Rica* 9: 179. 1897.

TYPE LOCALITY: La Concepción, Llanos de Santa Clara, Province of Limón, Costa Rica (*J. D. Smith* 6742, the type).

RANGE: Caribbean lowlands of Costa Rica.

97. *Peperomia calvicaulis* C. DC. *Bull. Soc. Bot. Belg.* 36<sup>1</sup>: 231. 1891.

TYPE LOCALITY: Carrillo Road near La Laguna, Costa Rica (*Biolley* "Pittier" 3177, the type).

RANGE: Across central Costa Rica.

COSTA RICA: At type locality, *Pittier* 3176. Guápiles, *Standley* 37467. Finca Montecristo, *Standley & Valerio* 49021. El Arenal, Guanacaste, *Standley & Valerio* 45312, 45317. El Silencio, near Tilarán, Guanacaste, *Standley & Valerio* 44776, 44808, 44831. Pejivalle, *Standley & Valerio* 47242, 47271. Orosí, *Standley* 39962. El Muñeco, Río Navarro, *Standley* 33462.

97a. *Peperomia calvicaulis perexigua* Trel., var. nov.

More hairy than the type.

Type in the U. S. National Herbarium, no. 796,550, collected at Tsaki, Talamanca, Province of Limón, Costa Rica, altitude 200 meters, April, 1895, by A. Tonduz (no. 9543).

RANGE: Caribbean slope of Costa Rica.

97b. *Peperomia calvicaulis subpenninervis* C. DC., var. nov.

*Peperomia calvicaulis subpenninervis* C. DC. *Candollea* 1: 381. 1923, name only.

Leaves cordulate at the very base, 5 nerved, the upper branches of the midrib one-third above the leaf-base.

Type in the DeCandolle Herbarium, collected at Las Vueltas, Costa Rica, by H. Pittier (no. 12738).

RANGE: Caribbean slope of Costa Rica.

97c. *Peperomia calvicaulis hydnostachya* Trel., var. nov.

A moderate-sized glabrous repent herb; stem slender (2 mm.), rooting from the nodes; leaves alternate, elliptic-ovate, gradually and sharply very long-acuminate, rounded at base, rather large, 3×5 to (characteristically) 4 to 4.5×8 to 10 cm., 5 or 7 nerved nearly from the base; petiole 2 to 4 or 6 cm. long; spikes terminal, paired on rather slender stalks (1 to 2 cm. long) or in lateral pairs without such stalks, rather small (scarcely 2×30 mm.), closely flowered; peduncle about 1 cm. long; bracts round-peltate; berries narrowly oblong, persistently divergent on the rachis, flexuously long-beaked; stigma anterior at base of the slender beak.

Type in the U. S. National Herbarium, no. 577,461, collected at Tuis, Province of Cartago, Costa Rica, altitude 650 meters, November, 1897, by A. Tonduz (no. 11530).

RANGE: Caribbean slope of Costa Rica.

97d. *Peperomia calvicaulis ovata* Trel., var. nov.

Leaves becoming broadly ovate and as much as 4.5×6 to 7 cm.

Type in the U. S. National Herbarium, no. 1,251,212, collected at El Arenal, Province of Guanacaste, Costa Rica, altitude 485 to 600 meters, January 18, 1926, by Paul C. Standley and Juvenal Valerio (no. 45168).

RANGE: Across central Costa Rica.

COSTA RICA: Cerro de las Lajas, above San Isidro, *Standley & Valerio* 51678. El Muñeco, Río Navarro, *Standley* 33640.

98. *Peperomia cacuminicola* Trel., sp. nov.

A rather large, erect, simple, glabrous herb, similar in aspect to *P. dotana*; stem rather stout (5 to 6 mm. at base), (normally ?) membranous-winged below; leaves alternate, elliptic, acute or subacuminately pointed at both ends, rather large (5.5×13 cm.), pinnately few-veined from below the middle, drying thin and glossy, the lighter green lower surface with concolorous granules; petiole 1.5 to 2 cm. long, winged; spikes solitary, terminal, moderately stout and elongate (3×70 mm.), densely flowered; peduncle moderately slender, 20 mm. long; bracts round-peltate, red-glandular.

Type in the U. S. National Herbarium, no. 1,251,143, collected near Finca La Cima, north of El Copey, Province of San José, Costa Rica, altitude 2,100 to 2,400 meters, December 21, 22, 1925, by Paul C. Standley (no. 42637).

RANGE: Central mountains of Costa Rica.

99. *Peperomia dotana* Trel., sp. nov.

A rather large, rhizomatous, erect, subsimple, glabrous herb; stem stout (3 to 6 mm.); leaves alternate, subrhombic-lanceolate, pointed at both ends, rather large (6 to 7×13 cm.), thick, revolute, pinnately veined below, the delicate branches of the midrib about 5×2; petiole rather elongate (2.5 cm.); spikes about 4, scattered or bunched on slender axillary branches 5 or 6 cm. long, moderately slender and short (30 to 40 mm.); peduncles about 5 mm. long; bracts round-peltate; berries gray, ellipsoid, stout-beaked; stigma anterior at base of the beak.

Type in the U. S. National Herbarium, no. 1,251,135, collected at Laguna de la Chonta, near Santa María de Dota, Province of San José, Costa Rica, altitude 2,000 to 2,100 meters, December 18, 1925, by Paul C. Standley (no. 42280).

RANGE: Central mountains of Costa Rica.

COSTA RICA: Finca La Cima, above El Copey, *Standley* 42770. Cerro de las Vueltas, *Standley & Valerio* 43509.

100. *Peperomia isidroana* Trel., sp. nov.

A rather large, arboricolous, rhizomatous, erect, glabrous herb; stem rather stout (3 to 4 mm.); leaves alternate, elliptic or lance-elliptic, pointed at both ends, rather large (4.5 to 6×11 to 16 cm.), pinnately veined below, the branches of the midrib about 5×2; petiole rather short (1 to 2.5 or 3 cm.); spikes 2 to 5, scattered or clustered on slender axillary stalks 4 to 10 cm. long, elongate (2×6 to 10 mm.); peduncles scarcely 10 mm. long; bracts round-peltate; berries brown, ellipsoid, with rather slender beak; stigma anterior at base of the beak.

Type in the U. S. National Herbarium, no. 1,251,319, collected at Yerba Buena, above San Isidro, Province of Heredia, Costa Rica, altitude 2,000 meters, February, 1926, by Paul C. Standley and Juvenal Valerio (no. 50232).

RANGE: Central mountains of Costa Rica.

COSTA RICA: At type locality, *Standley & Valerio* 50244.

101. *Peperomia navarrana* Trel., sp. nov.

A rather large, rhizomatous, erect, glabrous, arboricolous herb; stem rather slender (3 to 4 mm.), reddish; leaves alternate, elliptic-obovate, rather obtuse, cuneate, rather large (4.5×10 to 5.5×15 cm.), pinnately nerved below, the delicate branches of the midrib about 6×2; petiole short (1.5 cm.); spikes about 3, scattered on slender axillary stalks about 6 cm. long, rather short



(30 to 60 mm.); peduncles about 5 mm. long; bracts round-peltate; berries gray, ellipsoid, stout-beaked; stigma anterior at base of the beak.

Type in the U. S. National Herbarium, no. 1,229,236, collected at El Muñeco, Río Navarro, Province of Cartago, Costa Rica, altitude 1,400 meters, February 8, 9, 1924, by Paul C. Standley (no. 33553).

RANGE: Upper Reventazón Valley, Costa Rica.

102. *Peperomia durandi* C. DC. Bull. Soc. Bot. Belg. 30<sup>1</sup>: 225. 1891.

TYPE LOCALITY: Volcán de Barba, Costa Rica (*Pittier* 2015, the type).

RANGE: Central mountains of Costa Rica.

COSTA RICA: Alajuelita, *Pittier* 2533. El General, *Pittier* 3402. La Palma, *Tonduz* 12541; *Standley* 33049. Cerro de las Lajas, above San Isidro, *Standley & Valerio* 51588. Yerba Buena, above San Isidro, *Standley & Valerio* 50153. Cerro de las Caricias, near San Isidro, *Standley & Valerio* 52399.

103. *Peperomia tremendalensis* Trel., sp. nov.

A rather small, succulent, glabrous herb; stem 1 to 4 mm. thick, with erect slender branches; leaves alternate, elliptic, subacute, mostly acute-based, 2.5 to 3×4 to 4×7 to 10 cm., drying coriaceous and dull green, inconspicuously pinnately veined; petiole 10 to 15 mm. long, winged; spikes subpaniculate on a slender stalk as much as 5 cm. long with deciduous bracts, rather slender and elongate (2×50 or 60 mm.); peduncle 10 to 20 mm. long; bracts round-peltate.

Type in the DeCandolle Herbarium, collected on Colinas de Tremendal, San Ramón, Province of Alajuela, Costa Rica, by A. Tonduz (no. 17788).

RANGE: Pacific slope of Costa Rica.

COSTA RICA: At type locality, *Tonduz* 17785. Santiago, *Tonduz* 17787, 17789. Cerro de Zurquí, above San Isidro, *Standley & Valerio* 50833. Cerro de las Lajas, above San Isidro, *Standley & Valerio* 51565.

104. *Peperomia pachyphlebia* Trel., sp. nov.

A rather small, succulent, glabrous herb, growing on tree trunks; stem thick (7 mm.), rooting from the nodes, with erect thinner branches; leaves alternate, elliptic or elliptic-obovate, subacute or slightly acuminate, acute at base, moderate (scarcely 3×5.5 cm.), on the erect branches, drying dull rugulose and coriaceous, conspicuously pinnately veined nearly throughout when dry, the prominent branches of the midrib 4 to 6×2; petiole 1 to 1.5 cm. long, winged; spikes terminal, solitary, moderately slender and long (2×70 to 90 mm.); peduncle 4 to 5 cm. long with a bract-scar about 1 cm. below the spike; bracts round-peltate; ovary elongate, long-beaked; stigma anterior near the base of the beak.

Type in the U. S. National Herbarium, no. 798,276, collected at La Palma, Province of San José, Costa Rica, altitude 1,460 meters, September, 1898, by A. Tonduz (no. 12606).

RANGE: Central mountains of Costa Rica.

COSTA RICA: Candelaria, *Hoffmann* 799.

105. *Peperomia peninsularis* Trel., sp. nov.

*Peperomia obtusifolia* Auct., p. p., as to Costa Rica.

A glabrous ascending herb, rooting at the lower nodes; stem moderately slender (2 to 3 mm.); leaves alternate, subelliptic, becoming acute or sub-acuminate, gradually acute at base, moderate (about 3×6 to 8 cm.), obscurely pinnately veined; petiole 1 to 3 cm. long; spikes terminal, solitary on a 1-bracted stalk 4 cm. long, slender, rather long (2 to 3×150 mm.); peduncle elongate (7 to 10 cm.); bracts round-peltate; berries broadly ellipsoid, rather slender-beaked; stigma anterior at base of the beak.

Type in the DeCandolle Herbarium, Geneva, collected at Nicoya, Costa Rica, by A. Tonduz (no. 13694).

RANGE: Nicoya Peninsula, northwestern Costa Rica.

106. *Peperomia mentiens* Trel., sp. nov.

A rather small, stoloniferous, glabrous herb; stem short and rather slender (3 to 4 mm.); leaves alternate, elliptic-spatulate, obtuse, more or less emarginate, cuneately attenuate, rather large (3 to 4.5×6 to 10 cm.), drying rather thin-coriaceous and dull, pinnately veined nearly throughout, the branches of the midrib about 8×2; petiole 3 to 6 cm. long, winged to about the middle; spikes terminal and axillary, moderately stout and long (3×75 to 110 mm.); peduncle long (9 to 12 cm.), characteristically with a deciduous reduced leaf 5 cm. below the spike; bracts small, round-peltate; berries fusiform-oblong, the short conical beak filiformly protracted; stigma anterior at base of the beak.

Type in the U. S. National Herbarium, no. 796,641, collected along Río Turrialba, Province of Cartago, Costa Rica, altitude 500 meters, March, 1894, by John Donnell Smith (no. 4926B).

RANGE: Caribbean slope of Costa Rica.

COSTA RICA: Peralta, *Storb* 516. Pejivalle, *Standley & Valerio* 47260, 47275. Guápiles, *Standley* 37551. El Arenal, Guanacaste, *Valerio* 31. La Colombiana Farm, *Standley* 36974.

106a. *Peperomia mentiens* lata Trel., var. nov.

A broader-leaved extreme, with leaves becoming 5 to 6.5×11 to 15 cm.

Type in the U. S. National Herbarium, no. 1,251,285, collected at Finca Montecristo, on the Río Reventazón, Province of Limón, Costa Rica, altitude 25 meters, February 18, 19, 1926, by Paul C. Standley and Juvenal Valerio (no. 49012).

RANGE: Lower Reventazón Valley, Costa Rica.

107. *Peperomia pyrolaefolia* Trel., sp. nov.

A rather small, assurgent, essentially glabrous herb; stem moderately thick (4 to 5 mm.), rooting from the nodes below; leaves alternate, suborbicular, sometimes emarginate, abruptly acute at base, moderate (4×4 to 4.5 or 6×7 cm.), drying dull, somewhat puberulent above at base, pinnately veined below, the branches of the midrib about 4×2; petiole 2 cm. long, winged; spikes terminal, moderately thick and elongate (2×70 to 120 mm.); peduncle 5 cm. long, bracted at about the middle; bracts round-peltate; berries ellipsoid, with a rather long tapering beak; stigma anterior on the beak.

Type in the U. S. National Herbarium, no. 798,283, collected at Limón, Province of Limón, Costa Rica, July, 1898, by H. Pittier (no. 12691).

RANGE: Caribbean lowlands of Costa Rica.

108. *Peperomia pseudo-alpina* Trel., sp. nov.

*Peperomia magnoliaefolia parrifolia* Auct., as to Costa Rica.

An essentially glabrous repent-assurgent mountain herb; stem rather slender (2 mm.), rooting from the lower nodes; leaves alternate, elliptic or elliptic-obovate, slightly emarginate at the somewhat contracted apex, acute at base or subcuneate, rather small (1.5 to 3×3 to 4.5 cm., or over 4×6 cm.), drying dull and subcoriaceous, subpinnately nerved from below the middle, the branches of the midrib 2 or 3×2; petiole about 1 cm. long; spikes terminal, 1 to 3 on a slender bracted stalk scarcely 2 cm. long, small (scarcely 2×30 mm.), closely flowered; peduncle about 1 cm. long; bracts round-peltate; berries ovoid, obliquely beaked; stigma anterior at base of the beak.

Type in the U. S. National Herbarium, no. 1,080,165, collected on Colinas de Piedades, San Ramón, Province of Alajuela, Costa Rica, altitude 1,100 to 1,200 meters, April 27, 1901, by A. M. Brenes (no. 14180).

**RANGE:** Central mountains of Costa Rica.

**COSTA RICA:** La Quesera to Roble de Copey, *Tonduz* "12222," 12223. Volcán de Barba, *Pittier* 2203. La Estrella, Cartago, *Cooper* 542 (J. D. Smith 5926). Aserrí to Tarbaca, *Standley* 34090, 41375. Santa María de Dota, *Standley* 41626, 43058; *Standley & Valerio* 43493. Cerros de Zurquí, above San Isidro *Standley & Valerio* 50744, 50807. Fraijanes, *Standley & Torres* 47559, 47589, 47685. Without locality, *Stork* 462.

109. *Peperomia pseudo-casaretti* C. DC. *Anal. Inst. Fis.-Geogr. Costa Rica* 9: 179. 1897.

*Peperomia scandens* Auct., as to Costa Rica.

**TYPE LOCALITY:** Shirores, Costa Rica (*Tonduz* 9282, the type).

**RANGE:** Caribbean slope of Costa Rica.

**COSTA RICA:** Tsaki, *Tonduz* 9538. Puerto Viejo, *Biolley* 7433. Santa Clara, Las Delicias, *Biolley* 10656. Guápiles, *Standley* 37434, 37445, 37454, 37508, 37550. Pejivalle, *Standley & Valerio* 42217, 47227, 47273. El Muñeco, Río Navarro, *Standley* 33608. Peralta, *Lankester* 882, and cultivated at Kew.

110. *Peperomia calvifolia* C. DC. *Candollea* 1: 290. 1923.

**TYPE LOCALITY:** Santiago, San Ramón, Province of Alajuela, Costa Rica. (*Brenes* 14182, the type).

**RANGE:** Mountains of central Costa Rica.

**COSTA RICA:** La Palma, *Standley* 38231. Pejivalle, *Standley & Valerio* 47243. El Muñeco, Río Navarro, *Standley & Valerio* 51381. Viento Fresco, Volcán de Poás, *Standley & Valerio* 48007.

110a. *Peperomia calvifolia abrupta* Trel., forma nov.

Leaves reduced (scarcely 3×7 cm.) and elliptic-subobovate.

Type in the U. S. National Herbarium, no. 1,229,643, collected at El Muñeco, Río Navarro, Province of Cartago, Costa Rica, altitude 1,400 meters, February 8, 9, 1924, by Paul C. Standley (no. 33955).

**RANGE:** Upper Reventazón Valley, Costa Rica.

111. *Peperomia jarisiana* C. DC. *Linnaea* 37: 382. 1872. (Erroneously spelled *darisiana* l. c. 304.)

**TYPE LOCALITY:** Mount Jaris, Province of San José, Costa Rica (*Oersted*, the type).

**RANGE:** Central mountains of Costa Rica.

112. *Peperomia martagonifolia* C. DC. *Ann. Cons. Jard. Genève* 21: 262. 1920 (name only); *Candollea* 1: 313. 1923; 2: 188. 1925; *Schroeder, Candollea* 3: 128. 1926.

*Peperomia penicillata magnifolia* Auct., as to Costa Rica.

**TYPE LOCALITY:** Santa Rosa de Copey, Province of San José, Costa Rica (*Tonduz* 12243, the type).

**RANGE:** Central mountains of Costa Rica.

**COSTA RICA:** At the type locality, *Tonduz* 12236. Cabagra, *Tonduz* 6892. Aserrí to Tarbaca, *Standley* 41389. Santa María de Dota, *Standley & Valerio* 43291, 43368a, 44062, 44108.

The nomenclature of this endemic Costa Rican species is confused through application in 1920 of the name (without description, but with reference to an unpublished Central American manuscript) to an Ecuadorean specimen collected by Sodiro; but that manuscript leaves no question that the name was intended to be connected with the type designated above.

112a. *Peperomia martagonifolia contempta* Trel., var. nov.

*Peperomia rupigaudens* Auct., as to Costa Rica.

*Peperomia penicillata magnifolia* Auct., as to Costa Rica.

A moderately large, glabrous, assurgent herb; stem moderately slender (2 to 3 mm.); leaves alternate or on some branches 2 to 4 at a node, lanceolate, subacuminate, gradually very acute at base, moderate (2×4 to 2.5×6 to 7 cm.), drying rather coriaceous, more or less distinctly 3 or usually 5 nerved; petiole slender, 1 to 2.5 cm. long; spikes terminal or axillary, filiform, elongate (60 to 90 mm.), closely flowered; peduncle 1 cm. long; bracts round-peltate; flowers separated by anastomosing ridges when dried; berries round-ovoid; stigma apical.

Type in the U. S. National Herbarium, no. 798,280, collected at San José, Costa Rica, June, 1891, by H. Pittier (no. 4249).

COSTA RICA: Along the Río de las Vueltas, Tucurrique, *Pittier* 12897. El Muñeco, Río Navarro, *Standley* 33653. Cerro de la Carpintera, *Standley* 34295, 34324, 35522.

112b. *Peperomia martagonifolia wercklei* (C. DC.) Trel.

*Peperomia wercklei* C. DC. *Candollea* 1: 306. 1923.

TYPE LOCALITY: San Cristóbal de Candelaria, Costa Rica (*Pittier* or *Werckle* 3688).

RANGE: Mountains of central Costa Rica.

112c. *Peperomia martagonifolia torresana* Trel., var. nov.

Leaves lance-elliptic, sharply acuminate, acute at base, 2.5 to 4×7 to 9 cm.; spikes 2 to 3×100 mm.

Type in the U. S. National Herbarium, no. 1,251,256, collected at Fraijanes, Province of Alajuela, Costa Rica, altitude 1,600 meters, February 12, 13, 1926, by Paul C. Standley and Rubén Torres (no. 47684).

RANGE: Central mountains of Costa Rica.

113. *Peperomia turrialvensis* C. DC. *Linnaea* 37: 380. 1872.

TYPE LOCALITY: Turrialba, Province of Cartago, Costa Rica (*Oersted* 1003, the type).

RANGE: Reventazón Valley, Costa Rica.

The name has been corrected recently to *turrialvensis*.

113a. *Peperomia turrialvensis brachystachya* Trel., var. nov.

A glabrous, rather tall, loosely branched, erect, arboricolous herb; stem slender (1 to 3 mm.); leaves 2, 3, or exceptionally 4, at a node, elliptic or lance-elliptic, or the largest obovate-elliptic, obtuse to obscurely acuminate, acute at base, moderatey small (1.5×3, 2×4.5, or 2.5×5.5 cm.), 5 nerved, drying thin, cillolate upward; petiole 5 to 10 mm. long; spikes from the upper axils, rather small (1×30 mm.), rather loosely flowered, with pseudo-pedicels; peduncle filiform, scarcely 1 cm. long; bracts round-peltate; berries globose, short-mucronate; stigma oblique.

Type in the U. S. National Herbarium, no. 1,251,103, collected at Finca Las Cóncevas, Province of Cartago, Costa Rica, altitude 1,200 to 1,300 meters, December 7, 8, 1925, by Paul C. Standley (no. 41544).

RANGE: Reventazón Valley, Costa Rica.

COSTA RICA: At type locality, *Standley* 41559.

114. *Peperomia barbana* C. DC. *Bull. Soc. Bot. Belg.* 29<sup>2</sup>: 70. 1890; 30<sup>4</sup>: 233. 1891.

TYPE LOCALITY: Las Esmeraldas, Volcán de Barba, Costa Rica (*Tonduz* 1331 in part, the type).

RANGE: Central mountains of Costa Rica.

COSTA RICA: At type locality, *Biolley* 7258.

115. *Peperomia nemoralis* C. DC. Anal. Inst. Fis.-Geogr. Costa Rica 9: 179. 1897.

TYPE LOCALITY: Shirores, Costa Rica (*Tonduz* 9268, the type).

RANGE: Caribbean slope of Costa Rica.

COSTA RICA: Tsaki, *Tonduz* 9539.

116. *Peperomia guanacastana* Trel., sp. nov.

A moderately large, tufted, glabrous, arboricolous herb; stem moderate (2 mm.), drying dull and pale; leaves commonly 2 at a node, broadly oblanceolate, acuminate, long-cuneate, moderately large (2 to 3×6 to 9 cm.), drying rather pale and coriaceous, 5 or obscurely 7 nerved, slightly revolute; petiole rather elongate (10 to 15 mm.); spikes terminal, rather slender and elongate (2×40 to 70 mm. or more), becoming reticulately ridged between the flowers, obtuse; peduncle long (4 to 5 cm.), and at first slender; bracts minute, round-peltate; ovary ovoid, rather pointed; stigma nearly apical.

Type in the U. S. National Herbarium, no. 1,251,211, collected at El Arenal, Province of Guanacaste, Costa Rica, altitude 485 to 600 meters, January 18, 19, 1926, by Paul C. Standley and Juvenal Valerio (no. 45065).

RANGE: Mountains of Guanacaste, Costa Rica.

COSTA RICA: At type locality, *Valerio* 85. El Silencio, near Tilarán, Guanacaste, *Standley & Valerio* 44838.

117. *Peperomia barbinodis* Trel., sp. nov.

Rather large but slender; stem hairy at the nodes; leaves 2 to 5 at a node, lanceolate, gradually tapered to both ends, prominently 3 nerved, 1 to 1.5×3 to 5 cm., somewhat ciliate; petiole scarcely 5 mm. long; spikes axillary and terminal, filiform, 30 to 50 mm. long, loosely flowered; peduncle 5 mm. long; bracts round-peltate; ovary ovoid, submucronate; stigma apical.

Type in the U. S. National Herbarium, no. 798,317, collected near Juan Vifias, Province of Cartago, Costa Rica, altitude 1,200 meters, December, 1896, by A. Tonduz (no. 10419).

RANGE: Reventazón Valley, Costa Rica.

The quite different *Peperomia oblongifolia* (no. 138, infra) is based on the same collection number.

118. *Peperomia stipitifolia* Trel., sp. nov.

A moderately tall, assurgent herb; stem moderate (2 to 4 mm.), appressed-soft-hairy, especially above; leaves opposite, or rather exceptionally 3 at a node upward, elliptic or lance-elliptic, subacute at both ends or obscurely acuminate, rather small (about 2×4 cm., reduced upward to 1×2 cm.), commonly 5 nerved, sparsely and softly appressed-hairy, paler beneath; petiole 2 cm. long, shortened upward, soft-hairy; spikes terminal and from the upper axils, 1.5×40 mm., rather closely flowered; peduncle 5 to 10 mm. long, pubescent; bracts round-peltate; ovaries immersed, ovoid; stigma subapical.

Type in the U. S. National Herbarium, no. 1,251,184, collected on Cerro de las Vueltas, Province of San José, Costa Rica, altitude 2,700 to 3,000 meters. December, 1925, by Paul C. Standley and Juvenal Valerio (no. 44013).

RANGE: Central mountains of Costa Rica.

COSTA RICA: Finca La Clima, near El Copey, *Standley & Valerio*, 42802.

119. *Peperomia palmana* C. DC. Bull. Soc. Bot. Belg. 29<sup>1</sup>: 71. 1890; 30<sup>1</sup>: 233. 1891.

*Peperomia palmana oppositifolia* C. DC. Anal. Inst. Fis.-Geogr. Costa Rica 9: 180. 1897.

TYPE LOCALITY: La Palma, Province of San José, Costa Rica (*Pittier* 724, the type).

RANGE: Central mountains of Costa Rica.

COSTA RICA: Vara Blanca, *Maxon & Harvey* 8333. Volcán de Barba, *Tonduz* 1331, 1332 in part, 2202 in part. Roble de Copey, *Tonduz* 12224. Santa Rosa de Copey, *Tonduz* 12221. El Tablazo, *Brade* 2002; *Tonduz* 7904, 7991 (type of *P. palmana oppositifolia*). Rancho Flores, *Tonduz* 2178. San Cristóbal de Candelaria, *Wercklé* 3689. Cartago, *Cooper* 471. La Estrella, Cartago, *Cooper* 5925; *Standley* 39258. Orosí, *Standley* 39778, 39896. Laguna de la Chonta, *Standley* 42162. Laguna de la Escuadra, *Standley* 41915, 41991, 42009. Finca La Cima, near El Copey, *Standley* 42638. Zurquí, *Standley & Valerio* 48324, 48347. Cerros de Zurquí, above San Isidro, *Standley & Valerio* 50861.

119a. *Peperomia palmana fragrans* C. DC. Bull. Soc. Bot. Belg. 30<sup>1</sup>: 233. 1891.

TYPE LOCALITY: Volcán de Turrialba, Costa Rica (*Lehmann* 1105, the type).

RANGE: Central mountains of Costa Rica.

119b. *Peperomia palmana oxystachya* (C. DC.) Trel.

*Peperomia oxystachya* C. DC. Anal. Inst. Fis.-Geogr. Costa Rica 9: 180. 1897.

TYPE LOCALITY: El Tablazo, Province of San José, Costa Rica (*Tonduz* 8041, the type).

RANGE: Central mountains of Costa Rica.

COSTA RICA: La Ventolera, Volcán de Poás, *Standley* 34652, 34695. Fraijanes, *Standley & Torres* 47560, 47578, 47597, 47680.

119c. *Peperomia palmana pseudo-oxystachya* Trel., var. nov.

Essentially glabrous; stem dark red; leaves commonly 4 or 5 at a node, subrhombic-ovate or elliptic, very blunt-attenuate, acute-based, 8×13, 10×20, or 12×27 mm., 3 or obscurely 5 nerved, the yellowish lower surface granular; spikes numerous, 1×25 mm.; peduncle 10 mm. long.

Type in the U. S. National Herbarium, no. 1,251,497, collected at Yerba Buena, above San Isidro, Province of Heredia, Costa Rica, altitude 2,000 meters, February 22, 28, 1926, by Paul C. Standley and Juvenal Valerio (no. 49222).

RANGE: Central mountains of Costa Rica.

COSTA RICA: At type locality, *Standley & Valerio* 49115, 50225.

120. *Peperomia copeyana* C. DC. Candollea 1: 312. 1923.

TYPE LOCALITY: Santa Rosa de Copey, Province of San José, Costa Rica (*Pittier* or *Tonduz* 12228, the type).

RANGE: Central mountains of Costa Rica.

121. *Peperomia emiliana* C. DC. Anal. Inst. Fis.-Geogr. Costa Rica 9: 179. 1897.

TYPE LOCALITY: La Emilia, Llanos de Santa Clara, Province of Limón, Costa Rica (*J. D. Smith* 6740, the type).

RANGE: Caribbean lowlands of Costa Rica.

COSTA RICA: La Colombiana Farm, *Standley* 36889.

122. *Peperomia olivacea* C. DC. Journ. Bot. Brit. & For. 4: 146. 1866.

TYPE LOCALITY: San José, Costa Rica (*Hoffmann* 810, the type).

RANGE: Central mountains of Costa Rica.

122a. *Peperomia olivacea perlongispica* Trel., var. nov.

Erect, hairy; leaves 2 to 4 at a node, round-obovate below, elliptic or lance-elliptic upward, commonly emarginulate, acute-based, 10×10, 13×20, or 9×24 mm.; spikes 2×250 mm.; berries globose, obliquely mucronate, with pseudo-cupule; stigma apical.



Type in the U. S. National Herbarium, no. 1,251,171, collected at Quebradillas, near Santa María de Dota, Province of San José, Costa Rica, altitude 1,800 meters, December 24, 1925, by Paul C. Standley (no. 43368).

RANGE: Central mountains of Costa Rica.

COSTA RICA: Santa María de Dota, *Standley* 41646, 41658, 43367; *Standley & Valerio* 43492. Aserrí to Tarbaca, *Standley* 34103. La Ventolera, Volcán de Poás, *Standley* 34598. El Muñeco, Río Navarro, *Standley* 33433, 33520, 33838. Orosi, *Standley* 39645.

123. *Peperomia esperanzana* Trel., sp. nov.

A rather large divaricately branched, arboricolous herb; stem moderately stout (2 to 4 mm.), densely crisp-pubescent or subglabrescent; leaves opposite, orbicular, 1 to 1.5 cm. in diameter, rather obscurely 5 nerved, sometimes crisp-pubescent at base and on the nerves; petiole scarcely 3 mm. long, crisp-pubescent; spikes terminal and axillary, 2×40 to 60 mm., rather loosely flowered, with stout pseudo-pedicels; peduncle about 5 mm. long, glabrous; bracts round-peltate; berries round-mucronate; stigma oblique.

Type in the U. S. National Herbarium, no. 1,229,251, collected at La Esperanza, Volcán de Irazú, Costa Rica, February 23, 1924, by Paul C. Standley (no. 35357).

RANGE: Mountains of central Costa Rica.

124. *Peperomia aguacalientis* Trel., sp. nov.

*Peperomia myrtilus* Auct., as to Costa Rica.

*Peperomia rhombea* Auct., as to Costa Rica.

Cespitose, succulent, glabrous; leaves commonly 4 at a node, lanceolate or lance-elliptic, bluntly subattenuate, subobtuse at base, 7 to 10×18 to 30 mm., drying opaque, more or less evidently 3 or 5 nerved; petiole 1 to 2 mm. long; spikes axillary and terminal, 1×10 to 20 mm.; peduncle filiform, 10 mm. long; bracts round-peltate; ovary ovoid, subacute; stigma nearly apical.

Type in the U. S. National Herbarium, no. 796,660, collected at Aguacaliente, Province of Cartago, Costa Rica, May, 1890, by H. Pittier (no. 2555; J. D. Smith distribution no. 4928).

RANGE: Caribbean slope of Costa Rica.

COSTA RICA: Gloria de Juan Viñas, *Pittier* 3657. Siquirres, *Pittier* 4248. Las Vueltas, ? *Tonduz* 13135. Dulce Nombre, near Cartago, *Standley* 35904.

125. *Peperomia pseudo-boliviensis* Trel., sp. nov.

*Peperomia boliviensis* Auct., as to Costa Rica.

A succulent glabrate repent herb; leaves commonly 3 at a node, subrhombic-elliptic or obovate, 1.5×2 to 2.5 cm., 3 or 5 nerved, very thick and impressed-punctulate; petiole scarcely 5 mm. long; spikes terminal, 1×40 to 80 mm.; peduncle 25 mm. long; bracts round-peltate; rachis glabrous; ovary ovoid; stigma apical.

Type in the herbarium of the Jardin Botanique de l'État, Brussels, collected at Turrialba, Province of Cartago, Costa Rica, by A. Tonduz (no. 8436).

RANGE: Reventazón Valley, Costa Rica.

Also cultivated at Berlin from seed received from Wercklé.

126. *Peperomia cartagoana* Trel.

*Peperomia reflexa pallida* C. DC. Bull. Soc. Bot. Belg. 30<sup>1</sup>: 235. 1891.

TYPE LOCALITY: San José, Costa Rica (*Pittier* 3198, the type).

RANGE: Central mountains of Costa Rica.

COSTA RICA: Candelaria, *Oersted* 991. Mount Aguacate, *Oersted* 992. San Marcos, *Pittier* 7766. Aguacaliente, *Pittier* 2534. El General, *Pittier* 3397. Curridabat, ? *Pittier* 3046. Cartago, ? *Carleton* 311; *Standley* 33324, 33334

Río Reventado, above Cartago, *Standley & Valerio* 49464, 49514, 49517, 49519, 49624, 49641. Dulce Nombre, near Cartago, *Standley* 35890. Guarco, *Torres* 75. Finca Las Cóncavas, *Standley* 41456, 41458a. San Isidro Coronado, *Alfaro* 32403. La Verbena, near San José, *Standley* 32231. Finca La Cima, near El Copey, *Standley* 42785.

127. *Peperomia reflexaefolia* Trel., sp. nov.

*Peperomia reflexa angustifolia* C. DC. Anal. Inst. Fis.-Geogr. Costa Rica 9: 180. 1897.

*Peperomia berlandieri* Auct., as to Costa Rica.

Type in the DeCandolle Herbarium, collected at La Esmeralda, Volcán de Barba, Costa Rica, by Biolley and Pittier (no. 7259); the type also of *Peperomia reflexa angustifolia* C. DC.

RANGE: Central mountains of Costa Rica.

COSTA RICA: At type locality, *Tonduz* 2201. Volcán de Poás, *J. D. Smith* 6746; *Standley* 34582. Cartago, *Cooper* 480 (*J. D. Smith* 5928b). La Estrella, *Cooper* 187, 421 (*J. D. Smith* 5923). Las Cóncavas, *Standley* 38989. Cerro de la Carpintera, *Standley* 34267. Aguacaliente, *Pittier* 2531, 2552. Candelaria, *Hoffmann* 796. Santa Rosa de Copey, *Tonduz* 12221. Fraijanes, Province of Alajuela, *Standley & Torres* 47603. Cerro de las Lajas, Heredia, *Standley & Valerio* 51439. Aserrí to Tarbaca, *Standley* 34130. Río Blanco, El Copey, *Standley* 41908. Quebradillas, Santa María de Dota, *Standley* 43089, 43092. Santa María de Dota, *Standley* 41731, 41864. San José, *Pittier* 2848; *Standley* 33309, 41209. San Sebastián, *Standley* 32723, 49378, Camino de Hatillo, *Standley* 32175, 32177, 32178. Río Tiribí, *Alfaro* 33976b.

128. *Peperomia compaginata* Trel., sp. nov.

A small stoloniferous arboricolous mountain herb with dwarf compactly branched tufts scarcely 5 cm. tall; stem slender (1 to 2 mm.), glabrous; leaves commonly about 4 at a node, crowded, subrhombic-elliptic or obovate, obtuse, subacute at base, minute (4×7 to 5×9 mm.), revolute, more or less 3 nerved, impressed-punctulate beneath, glabrous; petiole 1 to 2 mm. long, obscurely puberulent; spikes terminal, as yet small (1×10 mm.), nearly straight; peduncle shorter than the leaves; bracts round-peltate, the rachis apparently glabrous.

Type in the U. S. National Herbarium, no. 1,251,253, collected at Fraijanes, Province of Alajuela, Costa Rica, altitude 1,500 to 1,700 meters, February 12, 13, 1926, by Paul C. Standley and Rubén Torres (no. 47624).

RANGE: Mountains of central Costa Rica.

COSTA RICA: At type locality, *Standley & Torres* 47563.

129. *Peperomia submarginulata* (C. DC.) Trel.

*Peperomia reflexa submarginulata* C. DC. in DC. Prodr. 16<sup>1</sup>: 452. 1869.

TYPE LOCALITY: Mount Candelaria, Costa Rica (*Hoffmann* 21, the type, at Berlin).

RANGE: Central mountains of Costa Rica.

COSTA RICA: Santa Rosa de Copey, *Tonduz* 12227, 12246. San José, *Pittier* 2848. San Sebastián, *Standley* 32723, 49378. Juan Viñas, *Pittier* 378, 3304. Río Tilirí, *Tonduz*, 3209.

130. *Peperomia pirrisana* Trel., sp. nov.

Essentially glabrous, repent, arboricolous; stem drying deeply sulcate, 1 to 2 mm. in diameter; leaves opposite, round or round-elliptic, 1 to 2.5×1.5 to 3 cm., hard-papery, 3 nerved, revolute, convallate at base; petiole 1 to 2 mm. long, obscurely puberulent; inflorescence unknown.

Type in the U. S. National Herbarium, no. 1,318,153, collected at Pozo Azul de Pirrís, Costa Rica, August, 1927, by C. H. Lankester (no. 1166).

RANGE: Upper Reventazón Valley, Costa Rica.

131. *Peperomia cyclophylla* Miq. in Mart. Fl. Bras. 4: 219. 1852, name only: Seemann, Bot. Voy. Herald 198. 1856.

*Peperomia circinata* Auct., as to Costa Rica.

TYPE LOCALITY: Panama (*Seemann* 607, the type).

RANGE: Panama and the Pacific slope of Costa Rica. Represented by closely comparable forms in Salvador and Guatemala, the West Indies, and from Peru to Brazil in South America.

COSTA RICA: La Barranca, *Oersted* 930. Boruca, *Tonduz* 6859. Capulín, *Standley* 40200.

The nomenclature of this species is comparable with that of *Peperomia martagonifolia* C. DC. When first actually published, without description, the name was used for a Brazilian collection supposed to be conspecific with that from Panama on which the earlier written but then unpublished description was based.

132. *Peperomia imbricata* Trel., sp. nov.

A small, creeping-assurgent, glabrous, succulent herb; stem slender (1 mm.), with short internodes, very leafy; leaves 3 or 4 at a node, ascending-imbricate, obovate, commonly obtuse or recurved-emarginulate, rather blunt at base, minute (about 4×6 mm.), nerveless, concave in drying; petiole 1 to 2 mm. long; spikes terminal, small (1.5×10 mm.), curved, closely flowered; peduncle rather slender, somewhat shorter than the spike, drying red-brown; bracts round-peltate, transversely grooved.

Type in the U. S. National Herbarium, no. 796,733, collected at El Infiernillo, Juan Viñas, Province of Cartago, Costa Rica, November, 1890, by H. Pittier (no. 3178).

RANGE: Reventazón Valley, Costa Rica.

133. *Peperomia pseudo-tetraphylla* Trel., sp. nov.

A small glabrous succulent arboricolous herb, stoloniferous-tufted; stem slender (1 mm.), rooting below; leaves commonly 4 at a node, rather oblong-obovate, acute-based, emarginulate, minute (4×6 to 5×12 mm.), more or less evidently 1 nerved; petiole very short (1 to 2 mm.); spikes terminal, nearly straight, scarcely 2×20 to 30 mm., obtuse, closely flowered; peduncle filiform, about half as long as the spike (10 to 15 mm.); bracts round-peltate; berries sessile, ovoid, with pseudo-cupule and a slender style; stigma apical.

Type in the U. S. National Herbarium, no. 1,251,099, collected at Finca Las Cóncavas, Province of Cartago, Costa Rica, altitude 1,200 to 1,300 meters, December 7, 8, 1925, by Paul C. Standley (no. 41488).

RANGE: Mountains of central Costa Rica.

COSTA RICA: At type locality, *Standley* 41458. About Cartago, *Stork* 323, 397. La Estrella, Cartago, *Standley* 39559. El Muñeco, Río Navarro, *Standley* 33464, 33518, 33654; *Standley & Torres* 51691. Santa María de Dota, *Standley* 42122, 42397; *Standley & Valerio* 43189, 43358. Laguna de la Chonta, near Santa María de Dota, *Standley* 42191, 42258. Laguna de la Escuadra, near El Copey. *Standley* 42037. Finca La Cima, near El Copey, *Standley* 42607, 42679, 42708.

133a. *Peperomia pseudo-tetraphylla juvenalis* Trel., var. nov.

Small, glabrous, stoloniferous-tufted; leaves 2 to 5 at a node, obovate, emarginulate, 5 to 6×8 to 10 mm., glandular-granular beneath; spikes 2×25 mm.; peduncle filiform; ovary ovoid.

Type in the U. S. National Herbarium, 1,251,181, collected on Cerro de las Vueltas, Province of San José, Costa Rica, altitude 2,700 to 3,000 meters, December, 1925, by Paul C. Standley and Juvenal Valerio (no. 44003).

RANGE: Central mountains of Costa Rica.

COSTA RICA: At type locality, *Standley & Valerio* 43694.

134. *Peperomia sepicola* Trel., sp. nov.

Erect, branching, arboricolous, glabrous except for the puberulent stem (? and rachis); leaves about 5 at a node, crowded, obovate, sometimes emarginulate, rather acute at base, drying waxy, thick, and nerveless or 1 nerved, coarsely golden-granular beneath; petiole almost suppressed; inflorescence unknown.

Type in the DeCandolle Herbarium, Geneva, collected at San Ramón, Province of Alajuela, Costa Rica, by A. Tonduz (no. 17790).

RANGE: Pacific slope of Costa Rica.

135. *Peperomia hoffmannii* C. DC. *Journ. Bot. Brit. & For.* 4: 133. 1866.

TYPE LOCALITY: San José, Costa Rica (*Hoffmann* 415, the type).

RANGE: Central mountains of Costa Rica.

COSTA RICA: San José, *Polakowsky* 391; *Cook & Doyle* 1, 168. Zapote, near San José, *Standley* 40250. San Pedro Montes de Oca to Curridabat, *Standley* 32775. La Palma, *Standley* 38233. Río Tiribí, near San José, *Alfaro* 33976 (a), 33991. Volcán de Irazú, *Oersted* 958; *Lehmann* 1111. Río Naranjo, *Tonduz* 7227. San Juan, *Tonduz* 1416.

136. *Peperomia pseudo-hoffmannii* Trel., sp. nov.

A small repent arboricolous herb of the aspect of *P. hoffmannii* and *P. reflexaefolia* but the ciliate-ridged spikes 15 to 20 mm. long.

Type in the U. S. National Herbarium, no. 1,251,189, collected at Tilarán, Province of Guanacaste, Costa Rica, altitude 500 to 650 meters, January 10-31, 1926, by Paul C. Standley and Juvenal Valerio (no. 44198).

RANGE: Pacific slope of northwestern Costa Rica.

COSTA RICA: At type locality, *Standley & Valerio* 44216, 44395. Los Ayotes, Guanacaste, *Standley & Valerio* 45608.

136a. *Peperomia pseudo-hoffmannii lenticularis* Trel., var. nov.

Lenticularly fleshy leaves scarcely punctulate; curved spikes 20 to 30 mm. long, on peduncles 10 to 15 mm. long.

Type in the U. S. National Herbarium, no. 1,229,265, collected at La Colombiana Farm, Province of Limón, Costa Rica, altitude 70 meters, March 6, 7, 1924, by Paul C. Standley (no. 36837).

RANGE: Caribbean lowlands of Costa Rica.

COSTA RICA: At type locality, *Standley* 36830.

137. *Peperomia amphoterophylla* Trel., sp. nov.

*Peperomia galioides longifolia* Auct., as to Costa Rica.

A small branching assurgent herb; stem slender (1 to 2 mm.), for a time puberulent; leaves opposite or mostly 3 or 4 at a node, rather small, at base and on sterile shoots round or obovate and scarcely 3×4 mm., elsewhere oblong and elongate (4×20 to 30 mm.), rounded or emarginulate at apex, subacute at base, drying thin and flat, glabrous or subciliolate above, 3 or 5 nerved with the midrib branching at the middle, the shorter form granular-punctulate beneath; petiole very short (1 to 2 mm.), glabrous; spikes terminal and axillary, filiform and elongate (40 to 70 mm. long), loosely flowered; peduncle about 5 mm. long, glabrous; bracts round-peltate; berries sunken in pits in the rachis, dark, ovoid, scutulately pointed; stigma anterior.

Type in the U. S. National Herbarium, no. 796,599, collected at La Palma, Province of San José, Costa Rica, July, 1888, by P. Biolley (no. 939).

RANGE: Central mountains of Costa Rica.

COSTA RICA: Volcán de Barba, *Tonduz* 939b. About San José, ? *Oersted* 944; *Hoffmann* 187; *Pittier* 8430; *Standley* 41208. Alajuela, *Alfaro* 499 (J. D. Smith 5924). Río Torres, *Tonduz* 9772. Uruca, *Tonduz* 7255. Santa María de Dota, *Standley* 41609, 42823. Río Reventado, above Cartago, ? *Standley & Valerio* 49465. El Carmen, *Torres* 122.

137a. *Peperomia amphoterophylla glutineofructa* Trel., var. nov.

A small, branching, assurgent or erect, arboricolous herb; stem rather slender (1 to 3 mm.), red, puberulent upward; leaves commonly 3 or 4 at a node, spatulate-oblong and about 3×15 mm., the lowermost sometimes broader and some 5×10 mm., emarginulate, subacute at base, thick, drying rather coriaceous, yellow and glandular-punctulate beneath, obscurely ciliolate upward, pinnately veined by transmitted light; petiole very short (1 to 2 mm.), more or less puberulent; spikes terminal, and sparingly from the uppermost axils, about 1×40 mm., rather loosely flowered; peduncle about 5 mm. long, glabrous; bracts round-peltate; ovary immersed; berries globose, scutulately pointed, red, very viscid-glandular; stigma oblique.

Type in the U. S. National Herbarium, no. 1,251,182, collected on Cerro de las Vueltas, Province of San José, Costa Rica, altitude 2,700 to 3,000 meters, December, 1925, by Paul C. Standley and Juvenal Valerio (no. 44007).

RANGE: High mountains of central Costa Rica.

COSTA RICA: At type locality, *Standley & Valerio* 43527, 44014. Finca La Cima, near El Copey, *Standley* 42609, 42817. Cerro de Piedra Blanca, near Escasú, *Standley* 32507. Laguna de la Chonta, near Santa María de Dota, *Standley* 42166, 42234. Quebradillas, near Santa María de Dota, *Standley* 43059, 43090.

138. *Peperomia oblongifolia* C. DC. *Candollea* 1: 299. 1923; 3: 129. 1926.

TYPE LOCALITY: Quebrada Honda, Juan Viñas, Province of Cartago, Costa Rica (*Pittier* 10419, the type).

RANGE: Caribbean slope of Costa Rica.

COSTA RICA: Alto de Ochomogo, *Pittier* 10385.

139. *Peperomia muscisedens* C. DC. *Candollea* 1: 398. 1923.

*Peperomia muscicola* C. DC. *Candollea* 1: 298. 1923. Not *P. muscicola* Ridl.

TYPE LOCALITY: Las Vueltas, Province of Cartago, Costa Rica (*Tonduz* 13135, the type).

RANGE: Caribbean slope of Costa Rica.

140. *Peperomia pittieri* C. DC. *Bull. Soc. Bot. Belg.* 30<sup>1</sup>: 235. 1891.

TYPE LOCALITY: La Palma, Province of San José, Costa Rica (*Pittier* 722, the type).

RANGE: Central mountains of Costa Rica.

COSTA RICA: Cerro de las Caricias, *Pittier* 14043. La Hondura, *Standley* 36216. Zurquí, *Standley & Valerio* 48189. El Muñeco, Río Navarro, *Standley* 33412, 33487, 33964; *Standley & Torres* 51734. Viento Fresco, *Standley & Torres* 47762. Above San Isidro, *Standley & Valerio* 50206 in part, 50213, 50817, 51503, 52146.