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The Hunt Institute for Botanical Documentation, a research division of Carnegie Mellon University, specializes in the history of botany and all aspects of plant science and serves the international scientific community through research and documentation. To this end, the Institute acquires and maintains authoritative collections of books, plant images, manuscripts, portraits and data files, and provides publications and other modes of information service. The Institute meets the reference needs of botanists, biologists, historians, conservationists, librarians, bibliographers and the public at large, especially those concerned with any aspect of the North American flora.

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The New York Botanical Garden BRONX PARK · NEW YORK 58 · NEW YORK · LU 4-8500

April 5, 1965

Dr. Wilson Popenoe
Casa Popenoe
Antigua, Guatemala

Dear Dr. Popenoe:

It was a pleasure to hear you speak at the Annual Meeting last Thursday on a subject so dear to your heart- Guatemala. It makes me even more sorry that I will not be one of the party who will enjoy visiting you in October. All other considerations aside, I shall probably, at that time, be somewhere in the tropical rainforests along the Amazon collecting Laurels, if all goes well.

I was glad to have had a brief talk with you about Perseas; knowing now some of your problems I have xeroxed-with the author's permission, of course,- those parts of her publication which we were discussing last week. The manuscript should go to the printer next week. After that, it is only a question of time before the reprints will be available. You and the California people are on her list for copies.

You will note that in general Miss Kopp has used only those characters which are available from herbarium material. I have material which I collected in Chiapas representing new species of Persea. Since Dr. Miranda before his death had these in manuscript, I did not turn my sheets over to Miss Kopp for publication, although she has seen them. We are waiting to see what disposition will be made of Dr. Miranda's material and manuscript. It is a pity that he did not live to complete his monumental work on the Flora of Chiapas, for he had collected many new species besides Persea.

Should you have further questions I am sure Miss Kopp would be pleased to answer them. Her address is:
(Professionally, she is Miss Lucille E. Kopp)

Mrs. Robert F. Blum
11 Sunnywoods Drive
Huntington Station
Long Island, New York
New York

Perhaps on your next visit north you will allow more time for the Garden and we can go over some of the material here. In the meantime, our thanks go to you for providing a most interesting evening for the Members.

With all good wishes,

Sincerely yours,
Caroline K. Allen
Caroline K. Allen
Research Associate

KEY TO SPECIES OF SUBGENUS I

1. Pedicels more than 12 mm long; leaves ferrugineous-pubescent; ovary with dense, short, erect hairs persistent in young fruits; bracts subtending inflorescences broad, rounded at the tips, apiculate, glabrous within, scarious-margined; staminodia linear.....4. P. schiedeana.

1. Pedicels less than 8 mm long; leaves tawny-pubescent or glabrous; ovary with slightly crisped hairs, not persistent to fruiting stage; bracts subtending inflorescences narrow, attenuate, pubescent on both surfaces, not scarious-margined; staminodia sagittate.....2.

2. Leaves glabrous or sparsely tomentellous, primary nerves divergent at 45-70°; pubescence sparse throughout; branchlets with rough corky whitish bark.....3. P. steyermarkii.

2. Leaves sparsely to densely lanate-, subarachnoid-, or villous-pubescent, primary nerves divergent at 30-50°; pubescence mostly moderate to dense throughout; branchlets lacking rough, corky, whitish bark.....3.

3. Bark anise-scented; branchlet tips with subarachnoid pubescence; leaf-blades usually with granular waxy secretion on under surface.....1b. P. americana var. drymifolia.

3. Bark not aromatic; branchlet tips with tomentose or villous pubescence; leaf-blades glaucous on the under surface...4. Upper surface of leaves nitid, finely but obviously reticulate, the primary nerves impressed above.....
1c. P. americana var. nubigena.

4. Upper surface of leaves dull with obscure reticulation, the primary nerves plane above.....5.

5. Branchlets tomentose; leaf-blades 6-16 cm long, usually ovate; flowers less than 4.5 mm long.....2. P. floccosa.

5. Branchlets villous; leaf-blades 6-30 cm long, usually elliptic; flowers 4-6 mm long...1a P. americana var. americana.

Subgenus II. Eriodaphne Nees, Linnaea 8:50. 1833.

Sect. Eriodaphne Meissn. DC. Prodr. 15(1):43. 1864.

Subg. Heninersea Mez, Jahrb. Bot. Gart. Berl. 5:138. 1889.

Lectotype: P. cuneata Meissn. DC. Prodr. 15(1); 46. 1864.

Subg. Heterandra Mez. Jahrb. Bot. Gart. Berlin 5:140. 1889.

Lectotype: P. subcordata (R. and P.) Nees, Linn. 21: 492. 1848.

~~The~~ Inflorescences subterminal and lateral; flowers with outer perianth segments glabrous on the upper surface (except P. rigens, P. pallida, and P. cinerascens which are pubescent on both surfaces), usually pubescent on the lower surface; stamens of Series I and II, the anthers bilocular or quadriloculer; stamens of Series III, the filaments each with two sessile glands attached basally or at various heights on the filament, the anthers sterile, bilocular, or quadrilocular; gynoecium glabrous or pubescent. Infructescence mostly with patent perianth-segments or reflexed with the inner segments deciduous 1/2 the distance from the base.

Persea borbonia (L) Spreng. Syst. Veg. 2:268. 1825.

1. Persea americana Mill. Gard. Dict. ed. 8. 1768.

1a. Persea americana var. americana. Figure 2(2).

Laurus persea Linn. Sp. Pl. 370. 1753.

Persea edulis Rafin. Sylva Tellur. 134. 1838.

Persea gratissima Gaertn. Frucht. & Sem. 3:22. 1805.

Persea gratissima β praecox Nees, Syst. Laur. 129. 1836.

Persea gratissima var. δ macrophylla Meissn. DC. Prodr. 15(1): 53. 1864.

Persea gratissima var. α vulgaris Meissn. Ibid.

Persea persea (L) Cockerell, Bull. Torr. Bot. Club. 19:95. 1892.

Persea leiogyna Blake, Journ. Wash. Acad. Sci. 10:19. 1920.

Persea americana var. angustifolia Miranda, Anal. Instit. Biol. Mex. 17:129. 1946.

Trees to 40 m; branchlets slender, moderately pubescent with tawny to subferrugineous, subcrisped hairs, not aromatic; petioles 1-6 cm long, slender, canaliculate, sparsely to moderately pubescent with tawny, subcrisped hairs; leaf-blades 6-30 cm long, 3.5-19 cm wide, chartaceous to subchartaceous, narrowly to broadly elliptic to subrotund, sometimes subovate or subobovate, the tips mostly acuminate, occasionally acute, the bases acute to obtuse to round, the upper surface glabrescent, the lower surface glaucous, occasionally

pruinose, sparsely to moderately tawny-pubescent with erect, subcrisped hairs, the costa slightly impressed or plane above, the 6-9 pairs of primary nerves divergent at 40-50°, plane above, prominent beneath, reticulation obscure. Inflorescences subterminal, multiple, compact or loose, shorter than their subtending leaves; peduncle 1-7 cm. long, tawny-tomentellous; pedicels 2-5 mm long, slender, tawny-tomentellous; flowers 5-8.2 mm long; outer perianth-segments 4-6 mm long, 1.2-3 mm wide, elliptic to obovate-elliptic, tawny-tomentellous on both surfaces, the tips acute; inner perianth-segments 4.5-6 (-8) mm long, 1.3-3 mm wide, equal to or slightly longer than the outer segments, tawny-tomentellous on both surfaces, the tips acute; stamens about 3.5 mm long, the filaments about 2.3 mm long, the anthers about 1.2 mm long, the filaments of Series I and II pubescent, slender, the anthers quadrilocular; filaments of Series III slender, pubescent, the glands stalked, subbasally attached to the filaments, the anthers quadrilocular, the upper locules laterally dehiscent, the lower extrorse; staminodia of Series IV broadly sagittate; gynoecium pubescent in varying amounts, the ovary subglobose, ovoid, or pyriform; style 1.5-3 mm long; stigma triangular, slightly peltate. Infructescence bearing few fruits; perianth-segments caducous; fruits 5-15 cm long, broadly or narrowly pyriform, green.

Vernacular names: Abacate, aguacate, aguacate de mico, aguacate veranero, aguacatillo, alligator pear, avaicatier buerre vegetal, avoca, avocado, avocatier, bois patat, butter pear, cura aguacate, el choro, huira palta, on aguacate, palto, pear, violette.

Distribution: Widely cultivated in the Tropics and subtropics of the Old and New World.

LECTOTYPE: Description in Clus. Hist. 1:2. 1601.

Important collections examined:

UNITED STATES: Florida: Dade Co.: Popenoe 198 (US) (Paratype of P. leiogyna Blake), 219 (US) (Holotype of P. leiogyna Blake), Plant Introduction Garden at Miami.

MEXICO: Vera Cruz: Liebmann 86, (US) Colipa; Schiede 1139, (B) Misantla (Syntype of P. gratissima var. β macrophylla Meiss.) Puebla: Miranda 3482 (NY, UNA) (Type of P. americana var. augustifolia Miranda). Loc. not found: Liebmann 760 (Laur. 13) (C, US), S. Pablo.

CENTRAL AMERICA: Oersted 2, (B) in monte Baba (?Barba), (Syntype of P. gratissima var. β marcophylla Meiss); Oersted 3 (B,C); Oersted 6 (C), 7 (C), St. Thomas.

CUBA: Liebmann Laur. 87 (C).

PUERTO RICO: Sintenis 759b, (GH, US), Puerto Real.

ST. THOMAS: Eggers 371, (B) Lilienthal; Eggers sn, (C) near S. Peter, Mar 1873; Eggers sn, (C) Mar 1877; Eggers sn,

(US) Aug 1881.

ST. CROIX: Eggers 204, (C), 713 (C).

GUADELOUPE: Isern sn, 1787 (C).

MARTINIQUE: Hahn, 578 (P), 350 (B,GH, US).

TRINIDAD: Kuntze 672 (NY), 799 (NY); Sieber 69 (MO), 307 (B, MO).

COLOMBIA: Mutis 1455 (US); Triana 1019 (NY, US).

VENEZUELA: Bolivar: Schomburgk 740, attributed to Rorima (GH).

PERU: Loreto: Poeppig 2446, (MO), Yurimaguas (Isotype of P. gratissima var. β praecox Nees), (Syntype of P. gratissima var. γ macrophylla Meissn.). Loc. non cit.: Dombey sn (B, NY).

BOLIVIA: De Colonias or Beni: Rusby 2533, (NY), Junction of Rivers Beni and Madre de Dios.

BRAZIL: Minas Geraes: Schwacke sn, (Herb no. 4847)(R), Ouro Preto; Warming 700, (C), Lagoa Santa. Rio de Janeiro: Glaziou 1286 (C, UC); Schwacke 1804 (R). Loc. non cit.: Glaziou 814 (C), 1515 (C).

Many variants recognized here as synonyms of P. americana var. americana were previously given specific status. Several of them require some discussion.

Blake described P. leiogyna from the "Trapp avocado", a clone origination in Cuba, and a well-known "variety" among

the avocado growers. It is characterized by the sparsely pubescent perianth, and glabrous ovary and staminodes. There are no distinguishing vegetative characters. By careful inspection it is possible to find a few small hairs on the ovary, indicating an incomplete supression of the pubescent condition. It is a form which has been perpetuated by cultivation, and though sparsely pubescent, still in the range of variation of var. americana.

As the name implies, the leaves of P. americana var. augustifolia are narrow. It, too, appears to be a horticultural variant.

Meissner recognized four varieties within the species he referred to as P. gratissima, and cited specimens under each. Every collection cited by Meissner as var. γ macrophylla is also found listed under var. α vulgaris, which synonymizes the former.

The whole P. americana complex needs much genetic and field study before many of the problems can be solved. Its origin is in the Honduras – Guatemala – southern Mexico area as indicated by the natural occurrence of the greatest number of species and individuals of this subgenus.

Because in his original description of P. americana Miller refers to the Clusius' publication in which a clear description of the avocado is given, (Clus. Hist. 1:2. 1601)

has been selected as lectotype.

Historically important specimens are cited here. The remaining are listed only in the exsiccatae.

1b. Persea americana var. drymifolia (Schlecht. and Cham.) Figure 2(3).
Blake, Journ. Wash. Acad. Sci. 10:15. 1920.

Persea drymifolia Schlecht. and Cham., Linn. 6:365. 1831.

Persea gratissima var. β oblonga Meissn. DC. Prodr. 15(1):53. 1864.

Persea gratissima var. drymifolia (Schlecht. and Cham.) Mez, Jahrb. Bot. Gart. Berl. 5:147. 1889.

Persea gratissima var. melanocarpa Phil. Anal. Univ. Chile, 91:501. 1895.

Trees to 10 m tall; branchlets slender, pubescent with pale, tawny, flexuous, almost erect hairs giving an arachnoid appearance, the bark aromatic; leaf-blades 6-20 cm long, 4.5-10 cm wide, the lower surface sparsely to moderately pubescent with flexuous suberect hairs, glaucous, frequently ceriferous in the form of obvious granules, the 6-9 pairs of primary nerves divergent at 35-50°, slightly impressed above, prominent beneath, secondary and tertiary nerves prominulous beneath. Inflorescences as in var. americana; bracts subtending the multiple inflorescences ferrugineous-pubescent on both surfaces with flexuous hairs, the small bracts subtending the cymes and individual flowers pubescent on both surfaces;

pedicels 5 mm long, tawny-flexuous pubescent; flowers 4.5-9 mm long, flexuous-pubescent; outer perianth-segments 4.2-7.8 mm long, 1.5-2.5 mm wide, pubescent on both surfaces; inner perianth-segments 4.5-9 mm long, 1.6-2.5 mm wide, pubescent on both surfaces; stamens similar to var. americana; gynoecium pubescent. Infructescence bearing few fruits; perianth reflexed, retained longer than in var. americana; fruits black.

Vernacular names: Aguacate de anis, aguacate oloroso, Steets.

Distribution: Widely cultivated.

Type collection: Schiede 1140, Papantla, Vera Cruz, "flores flavescentes. Aguacate oloroso Papantlensium. Quae differe videtur a Lauro Persea acdt." Folia trita odorem aromaticum spargunt." (HOLOTYPE: B, isotype MO, fragment at A).

Additional collections examined:

MEXICO: Tamaulipas: Meyer and Rogers 2904 (NY, MO, U). Dulces Nombres. Michoacan: Woronow 27747 (F), Uruapan. Mexico: Halsted sn (NY), Mountains of Toluca. San Luís Potosi: Schaffner 116 (GH), in mountains near Santa María del Río; Schaffner 572 (F, M, NY, US); Pringle 5115 (A, GH), limestone ledges near Las Canoas. Puebla: Seler 3790 (US), Huauchinango. Vera Cruz: Popenoe, Crawford and Williams 14386,

(GH, MO, US), above Aquila; Popenoe and Williams 14387 (GH, US). Oaxaca: Conzatti and González 1081 (GH). Chiapas: Souviron and Erlanson 69 (US), San Andres, nw of San Cristobal; Souviron 86 (US), between San Cristobal and Tenejapa. Loc. non cit.: Aschenborn 110 (Syntype of P. floratissima var. β oblonga Meissn) (B); Ehrenberg sn (B); Halsted sn (NY); Kerber 306 (US); Schaffner 5307 (B); Liebmann (B) (Lauraceae 88), Tule.

The characters by which var. drymifolia can be separated from var. americana are the anise-scented vegetative parts, the longer laxly appressed pubescence which gives a somewhat arachnoid appearance to the branchlet-tips and flowers, the granular waxy deposits on many specimens, and the black edible fruits with reflexed, more persistent perianth-segments.

Though most of the collections represent cultivated plants, some from Vera Cruz, Puebla, and Chiapas might have been obtained from native trees.

Included in the citations are two Popenoe et al collections from Vera Cruz which do not have the anise odor or the typical pubescence of this variety. They are possibly the progeny of natural crosses between P. floccosa and P. americana var. drymifolia.

Collections which may be native or which are historically important have been cited here. The remaining examined collections are noted only in the exsiccatae.

1c. Persea americana var. nubigena (L. O. Williams) Kopp stat. nov.

Persea nubigena L. O. Williams, Ceiba 1:55. 1950.

Persea gigantea L. O. Williams, Ceiba 4:39. 1953.

Trees to 40 m tall; branchlets sparsely tomentellous, not aromatic; petioles slender, strongly canaliculate, glabrous to sparsely tomentellous; leaf-blades 11-21 cm long, 4-13 cm wide, subchartaceous, elliptic to subrotund, the tips acuminate, the bases acute to obtuse, the upper surface nitid, finely reticulate, the lower surface pilose, pruinose, occasionally glaucous, the costa impressed above, the 6-9 pairs of primary nerves impressed above (in mature leaves), prominent beneath, divergent at 30-50 (-60°), impressed above, prominent beneath, the tertiary nerves frequently impressed above, prominent beneath, the reticulation prominulous on both surfaces.

Vernacular names: "aguacate de monte"; "aguacate de montana".

Distribution: In cloud forests of Guatemala and Honduras at 1500-2800 m.

Type collection: L. O. Williams and A. Molina 16833, Dept. Chimaltenango, Cerro Chichoy near Chichoy, "Flowers pale greenish yellow, Tree 20 m. in cloud forest along road." Alt. 2800 m. (HOLOTYPE: EAP, isotype, F).

Additional collections examined:

GUATEMALA: Chimaltenango: Collins and Kempton 17 (US), above Tecpan; Popenoe and Williams 13200 (MO), 13201 (MO) from along Chichoy ridge road between Tecpan and Eucuentros (Paratypes of P. nubigena). Jalapa: Steyermark 32627, (F), vicinity of Soledad, Montaña Miramundo, between Jalapa and Mataquescuintla; Williams and Molina 15539 (F), above Miramundo above Mataquescuintla.

HONDURAS: Morazán: *Carr sn (F), *Molina 464 (MO), *1438 (F, GH), *2772 (F, US), *Shank 56 (F), *Standley and Williams 665 (F), *687 (F), Standley *4848 (F), *14086 (F), *15649 (F), *23074 (F, NY, US), Standley, Williams and Molina 8023a (F), 8030 (F), 8035 (F), Williams and Molina *11100 (F, GH), *12628 (MO), *12774 (MO), cloud forest of Mt. Uyuca, drainage of the Río Yeguare. El Paraíso: Williams 15757 (F, US), on Montañuela de Los Arados south of Güinope. *Paratype of P. gigantea L. O. Williams.

Williams described the Guatemalan and the Honduran material as different species, but here they are considered to be convarietal. The leaves of all Guatemalan representatives of the species are elliptic, and those of the Honduran representatives range from elliptic to rotund. There is no gradual change from narrow-to broad-leaved forms which can be geographically correlated. All of the Honduran collections came from a small area, and many branchlets bear mature leaves of the narrow, intermediate, and broad forms. The

narrow leaves have the same characteristics as the collections from Guatemala and cannot be separated from them. The apparent disjunction in distribution is a small one and is probably due to limited collection in the intervening areas.

This variety links P. americana var. americana with P. floccosa. The primary nerves witch are more narrowly divergent from the costa and the presence of pubescence on the leaves distinguish it from P. steyermarkii; the pilose pubescence and smaller flowers separate it from P. floccosa. The coarser texture of the leaves of var. nubigena, due to more prominent reticulation and impressed nerves on the upper leaf-surface, make it readily distinguishable from var. americana.

2. Persea floccosa Mez, Jahrb. Bot. Gart. Berl. 5:148. 1889. Figure 2(4).

A tree to 25 m; branchlets slender to moderately coarse, sparsely to densely tawny-tomentose, soon becoming thickened and lenticulate, solid at the internodes, the bark not aromatic; petioles 2.5-5 cm long, slender, canaliculate; leaf-blades 6-16 cm long, 3-10 cm wide, chartaceous to subcoriaceous, ovate to elliptic to subrotund, the tips subacuminate to acute to obtuse, the bases acute to obtuse, the upper surface glabrescent, the lower surface frequently pruinose, tawny-tomentose, the costa impressed above, prominent beneath, the

6-8 pairs of primary nerves divergent at 40-50°, impressed above, prominent beneath, the secondary nerves also impressed above and prominent beneath, the reticulation obscure above, prominulous beneath. Inflorescences subterminal, multiple, paniculate, slightly longer than the subtending leaves; peduncle 4.5-6 cm long, slender, densely tawny-tomentose; pedicels 3-5 mm long, slender, moderately to densely tawny-tomentose; flowers 4.5 mm long; outer perianth-segments 3.8 mm long, 2 mm wide, elliptic, moderately to densely tawny-tomentose on both surfaces; inner perianth-segments 4.5 mm long, 2 mm wide, densely to moderately tawny-tomentose on both surfaces; filaments of Series I and II densely tomentose, the anthers quadrilocular, oblong, dorsally tomentose; filaments of stamens of Series III densely tomentose, the glands stipitate, subbasally adnate to the filament, the anthers oblong, laterally dehiscent, quadrilocular; staminodia (Series IV) sagittate, apiculate, lacking a terminal tuft of hairs; gynoecium with dense subcrisped tawny-pubescence, the ovary ellipsoid; style about 2 mm long; stigma triangular-peltate. Infructescence with few fruits; peduncle and pedicel thickened; perianth-segments deciduous; fruits to 5.5 mm in diameter, subglobose, lenticellate.

Vernacular name: Aguacate cimarón.

Distribution: At 2100-2800 m alt. in the Mexican states

of Puebla, Chiapas, and probably also in Oaxaca.

Type collection: F. M. Liebmann 758 (Lauraceae 85), Chinantla, Puebla, 7-8000 ft. May 1841. (HOLOTYPE: C, Isotypes B, C).

Additional collections examined:

Chiapas: Matuda 4545 (A, NY), Ventana, near Siltepec; Matuda 4559 (A, MO, NY), Rodeo, near Siltepec.

One of the "wild avocados", P. floccosa exhibits the typical floral and inflorescence structure of P. americana, but the flowers are smaller, the young fruits more globose, and the pubescence floccose as indicated by the specific epithet. The texture of the leaves is similar to those of P. americana var. nubigena, and its relationship lies here.

3. Persea steyermarkii C. K. Allen, Journ. Arn. Arb. 26:286. 1945. Figure 2(5).

A tree to 10 m; branchlets glabrous, terete, castaneous, soon becoming rough, corky, and gray, solid at the internodes, the bark not odoriferous; petioles 0.8-2.5 cm long, slender, glabrous; leaf-blades 5.5-10 cm long, 2.5-4.5 cm wide, chartaceous to subcoriaceous, the tips acute to obtuse, the bases acute, the upper surface glabrous, dull, the lower surface glaucous and sparsely tomentellous, the costa slightly impressed above, prominent beneath, the 7-10 pairs of primary nerves divergent at 45-70°, prominulous on both surfaces, the

reticulation obscure on both surfaces. Inflorescences subterminal, each branch usually reflexed; peduncles 2-3 cm long, glabrous, slender, the racheae 1.5-3 cm long; pedicels 5-8 mm long, sparsely tomentellous; flowers 3.5-6 mm long, "sweet-smelling" (Steyermark); outer perianth-segments 4-4.6 mm long, 1.8-2.0 mm wide, acute at the tips, elliptic, reflexed at anthesis, sparsely tomentose on both surfaces; inner perianth segments 6 mm long, 2.5 mm wide, acute at the tips, reflexed at anthesis, sparsely tomentose on both surfaces; stamens about 4.5 mm long, the filaments 3 mm long, the anthers 1.5 mm long, the filaments of Series I and III sparsely to moderately pubescent, the anthers oblong-ovate, quadrilocular, sparsely pubescent dorsally; filaments of stamens of Series III pubescent, the glands stipitate, subbasally adnate to the filament, the anthers quadrilocular, laterally or extrorsely dehiscent; staminodia of Series IV broadly sagittate, lacking a terminal tuft of hairs; gynoecium sparsely to moderately tomentose, the ovary globose or subglobose; style 2.3 mm long, slender; stigma triangular-peltate. Infructescence with few fruits; perianth-segments reflexed, deciduous; fruits globose (to 5 cm in diameter fide Tucker), to broadly pyriform.

Vernacular name: Aguacate de montaña.

Distribution: Mountain slopes of Guatemala and El

Salvador 1300-4000 m alt.

Type collection: J. A. Steyermark 37061, Dept. San Marcos: trail between Finca El Porvenir and San Sebastian, Volcán Tajumulco, alt. 1300-4000 m, March 1, 1940: "..... Leaves ascending, erect, coriaceous, pale or olive-green above, blue-silvery green beneath with depressions between side veins, margins revolute. Petals yellow-greenish. Pedicels pale green. Anthers deep yellow." (HOLOTYPE: F, fragment at A).

Additional collections examined:

GUATEMALA: El Quiché: Sharp 4678, (F), moist forest along Río from Chajul toward Cotzal. Zacapa: Steyermark 43296 (A, F), middle and upper south-facing slopes of Volcán Gemelos. Jalapa: Steyermark 32682 (F), between Miramundo and summit of Montaña Miramundo, between Jalapa and Mataquescuintla, in cloud forest.

EL SALVADOR: Chalatenango: Tucker 1092 (A), East side of Los Esesmiles, on edge of a stand of young pines.

The flower, fruit, and inflorescence form indicate a close relationship to P. americana, but the smaller inflorescence, the shorter pubescence, the more widely divergent primary nerves, and the development of cork on two-year-old branchlets are the most obvious distinguishing characteristics of P. steyermarkii.

4. Persea schiedeana Nees. Syst. Laur. 130. 1836. Figure 2 (1).

Persea species, (No. 1141), gratissimae similior. Schlecht. in Linn. VI(2):365 .

Persea gratissima var. δ Schiedeana (Nees) Meissn. DC. Prodr. 15 (1):53. 1864.

Persea pittieri Mez, Engl. Bot. Jahrb. 30, Beibl. 67:15. 1901.

A tree to 30 m; branchlets thick, roughened by leaf-scars and bud-scale scars, densely ferrugineous-villous; petioles 2-4 (-8) cm long, slender, canaliculate, densely ferrugineous-villous; leaf-blades 8-31 cm long, 4.5-20 cm wide, chartaceous to subcoriaceous, broadly elliptic to obovate, the tips rounded to short acuminate, the bases obtuse to truncate to round, the upper surface glabrescent, the lower surface densely to moderately ferrugineous-villous, the costa impressed above, prominent beneath, the 9-13 pairs of primary nerves divergent at 40-60°, plane on the upper surface, prominent beneath, the reticulation obscure to prominent on the lower surface, obscure above. Inflorescences multiple, subterminal, subtended by broad, round-tipped, apiculate, scarious-margined bracts to 2 cm long, the upper surface glabrous, the lower surface densely covered with ferrugineous, subappressed, subcrisped hairs; peduncles 2-7 cm long, densely tawny-to ferrugineous-pubescent; pedicels 1.2-1.5 cm long, slender, densely tawny-

to ferrugineous-tomentose; flowers 6-10 mm long; outer perianth segments 6-9.5 mm long, 2.2-3.3 mm wide, relatively broader than the inner segments, patent, lanceolate, the tips attenuate, densely tawny-tomentose on both surfaces; inner perianth-segments 5.5-8 mm long, 1.5-2.5 mm wide, lanceolate, the tips attenuate, densely tawny-tomentose on both surfaces (Though not shown by the measurements, the outer segments may be slightly longer, equal to or shorter than the inner.); stamens about 5 mm long, the filaments about 3.5 mm long, the anthers about 1.5 mm long, the filaments densely tawny-tomentose, the anthers of Series I and II oblong, quadrilocular; filaments of Series III densely tawny-tomentose, the glands with long stipes, subbasally attached, the anthers oblong, quadrilocular, laterally extrorsely dehiscent; staminodia of Series IV 1.5-2.5 mm long, linear; gynoecium densely pubescent with short, straight, erect, ferrugineous hairs, the ovary ellipsoid 2-3.5 mm long; style 1.8-3 mm long. Infructescence with few fruits; peduncles and pedicels thickened; perianth-segments persistent in young fruit; fruit obovoid to broadly obovoid at maturity, 5 cm long, the pubescence persistent in fruiting stage.

Vernacular names: Mexico: aguacatea; Guatemala: aguacate de monte, chalte, coyo, quiyo. British Honduras: "Wild Pear".

El Salvador: chute. Honduras: chute, guaco.

Distribution: Mostly in forests, occasionally in pastures 90-2000 m. in southern Mexico and Central America.

Type collection: C. J. W. Schiede, in sylvis Misantlae. (HOLOTYPE: B).

Additional collections examined:

MEXICO: Bourgeau 1885 (B, GH, US), Vallee de Cordova; Purpus 7074 (A, F, GH, MO, NY, UC, US), and Purpus 8153 (GH, UC), "Zacuapan" (presumably Axocuapan); Williams, L.O. 13509 (F), in the Alameda Orizaba; Woronow 3127 (F), Barranca de Fortin, Cordoba. Oaxaca: Conzatti and González 1097 (GH); Seler 1349 (GH, NY), Santa Catarina. Chiapas: Bosse 8490a (F), Copainala; Woronow and Juzepczuk 1666 (F), between Copainala and Coapilla. Loc. non cit.: Bourgeau 1883 (P), probably in Vera Cruz.

GUATEMALA: Huehuetenango: Steyermark 48767 (F), vicinity of Maxbal, north of Barillas, Sierra de los Cuchumatanes; Steyermark 82186 (F), nw of Malacatancito. Alta Verapaz: Cook and Doyle 21 (US) and 43 (US), Sepacuité; Standley 69432 (F), 90944 (F), 91294 (F), near Cobán; Standley 70335 (F), Cocolá Region, ne of Carchá; Standley 70956 (F), above Tamahu; Standley 92204 (F), 92487 (F), near San Juan Chamelco. Izabel: Kellerman 7145 (F, NY), Los Amates. Zacapa: Steyermark 43190 (A, F), Santa Rosalía de Mármol. Guatemala:

Aguilar 622 (F). Chiquimula: Steyermark 30520 (F), Volcán Ipala, near Amatillo.

BRITISH HONDURAS: Middlesex: Stevenson sn (US).

HONDURAS: Atlántida: Standley 55594 (F), Lancetilla Valley, near Tela. Yoro: Christine and Wolfgang von Hagen 1005 (F, NY), El Portillo Grande. Olancho: Standley 18624 (F), between Catacamas and La Presa. Christine and Wolfgang von Hagen 1232 (F, NY), Mont. de la Flor.

EL SALVADOR: Salvador Calderon 1497 (US), Ayutuxtepeque.

COSTA RICA: Guanacaste: Smith, Austin H327 (F, MO), Palmira, Region of Zarcero. Alajuela: Standley and Torres 47475 (US, Fragment at F), vicinity of Fraijanes. Heredia: Skutch 3606 (US), Vara Blanca de Sarapiquí. San José: Pittier 1156 (B), Vallee du Rancho Redondo near Volcan Irazú (Isotype or fragment of holotype of Persea pittieri Mez); Popenoe 987 (US), Jaboncillal, near San José; Popenoe 989 (F, US), Rancho Redondo near San José. Cartago: Jiménez 1211 (US), La Palma; Maxon and Harvey 8196 (US), Santa Clara de Cartago; Popenoe 996 (US), near Río Macho region of la Palma; Standley 34274 (US), Cerro de La Carpintera; Standley 39829 (US, fragment at F), Alto de La Estrella; Williams and Lankester 16168 (US), San Rafael; Williams and Allen 16470 (US), near La Cangreja, Cordillera de Talamanca. Loc. non cit.: Merkle (F, US) 1905.

PANAMA: Chiriqui: P. H. Allen, 1534 (MO), near Cerro Punta; Davidson 304 (F), Davidson 427 (A, F), Bajo Chorro, Boquete; Pittier 3132 (US), El Boquete.

Persea schiedeana is the most easily distinguished species in the Persea americana subgenus. The flowers are larger, and the leaves broader with parallel, not arcuate venation, as in specimens of related species. The characters most easily discerned are the broad, scarious-margined bud-scales, and the short, straight, stiff, persistent pubescence on the gynoecium. It is probably closest to P. americana var. nubigena.

5. Persea rigens C. K. Allen Journ. Arn. Arb. 26:297. 1945.

A tree to 35 m; branchlets terete, sparsely albescent-strigulose, solid at internodes, the bark not odoriferous; petioles 1.5-3 cm long, coarse, chanelled, glabrous; leaf-blades 12-30 cm long, 5-9.5 cm wide, subcoriaceous, the tips acute, the bases cuneate to obtuse, the upper surface glabrous, slightly nitid, the lower surface glabrous, the costa impressed above, prominent beneath, the 8-11 pairs of primary nerves divergent at 50-60°, slightly impressed above, prominent beneath, the reticulation prominulous on both surfaces. Inflorescences subterminal, fascicled in the axils of the proximal leaves about 1/2 the length of the subtending leaves; branches

paulo peltatum. Infructescentia ignota.

Distribution: San Luis Potosi, Mexico.

Type collection: C. A. Purpus 5338, Bagre, Minas de San Rafael, San Luis Potosi, "small tree", June 1911 (HOLOTYPE: GH, isotypes B, F, MO, NY, UC, US).

Additional collections examined: Purpus 5338 (B, F, GH, NY, UC, US), Bagre, San Luis Potosi (Paratype).

The relationship of P. purpusii is with P. chamissonis. The pubescence is similar, the leaf-tips apiculate, the primary nerves narrowly divergent from the costa, the rachises short, and they are native to adjacent areas. The obvious differences are chiefly in size, P. purpusii being smaller in leaf and floral size, having shorter pubescence, and elliptic leaves which are relatively narrower than those of P. chamissonis.

33. Persea vesticula Standl. and Steyerm. Field Mus. Pub. Bot. 23:116. 1944.

Persea chiapensis Lundell, Wrightia 1:150. 1946.

Persea popenoei L. O. Williams, Ceiba 1:57. 1950.

A tree to 15 m; branchlets coarse, solid at internodes, subangular, densely cinnamoneous-tomentellous becoming glabrous, the bark not aromatic; petioles 1.5-2.5 cm long, canaliculate, striate, slender, densely cinnamoneous-

tomentellous; leaf-blades 8-17 cm long, 4-7 cm wide, subcoriaceous, elliptic to ovate, ~~elliptic to ovate~~, the tips mostly acuminate to acute to rarely obtuse, the bases acute to obtuse to truncate, the upper surface glabrous, slightly rugose, the lower surface densely cinnamoneous-to golden-tomentellous, except on the costa and nerves which are almost glabrous, the costa impressed above, prominent beneath, the 7-12 pairs of primary nerves divergent at 50-60°, slightly elevated above and prominent beneath, reticulation obscure on both surfaces. Inflorescences subterminal, broad, paniculate, and sometimes also axillary, equal to or exceeding the length of the subtending leaves; peduncles 4-11 cm long, densely cinnamoneous-tomentellous, the rachises 3.5-8 cm long; pedicels 2 mm long, cinnamoneous-tomentellous; flowers 5-6 mm long; outer perianth-segments 2.5-4.5 mm long, 2.5-3.5 mm wide, ovate, densely cinnamoneous-tomentellous without, glabrous within; inner perianth-segments 5-5.8 mm long, 2.5-3 mm wide, densely tomentellous on both surfaces; stamens about 4.5 mm long, the filaments 2.3 mm long, the anthers 2.2 mm long, the filaments of Series I and II sparsely pubescent, the anthers oblong, quadrilocular; filaments of stamens of Series III, pubescent, the glands subsessile, adnate to the basal 1/4 of the filament, the anthers oblong, quadrilocular, the upper locules laterally dehiscent, the lower extrorse;

staminodia of Series IV linear, small; gynoecium glabrous, the ovary slightly ovoid; style 1.8-2.2 mm long; stigma peltate. Infructescence multifructate; pedicels 5 mm long; perianth-segments persistent in their entirety, patent; fruit 8-12 mm long, globose, glaucous.

Distribution: Mountains of (Chiapas) Mexico, Guatemala, and Honduras at 21,000 to 33,000 m alt. In Honduras it is noted as found in cloud forests.

Type collection: J. A. Steyermark 36207, Dept. San Marcos: between La Vega ridge along Río Vega and northeast slopes of Volcán Tacaná, to 3 miles from Guatemala-Mexico boundary, in vicinity of San Rafael, alt. 2500-3000 m. Feb. 20, 1940 (HOLOTYPE: F, fragment at A).

Additional collections examined:

MEXICO: Chiapas: Matuda 5498 (MO, UC), Niquihuil near Motozintla (type of Persea chiapensis); Matuda 5526 (MO, UC), Carelas, near Motozintla (Paratype of Persea chiapensis).

GUATEMALA: Steyermark 43558 (F), El Progreso, between Finca Palamonte and summit of Volcán Santa Luisa (Paratype).

HONDURAS: Morazán: Williams and Molina 13338 (F, GH, US), 13349 (F, GH), 13692 (Isotypes of P. popenoei F, GH, US), and 13699 (F), also Williams, Molina and Merrill 15668 (F), above San Juancito. All of the collections from

Honduras are paratypes of P. popenoei L. O. Williams, except Williams and Molina 13692 which is an isotype.

There is no doubt that P. vesticula and P. chiapensis are synonyms.

Williams described P. popenoei and designated as type the specimen bearing flowers, which is P. caerulea. The remaining collections were either sterile or fruiting. In his discussion he recognizes the affinity of his species with P. vesticula, and differentiates mainly on the basis of leaf-base shape and inflorescence. There is a variation from acute to truncate in leaf-base shape, in the Mexico-Guatemalan, and in the Honduran material; the former has more leaves with truncated bases, and the latter leaves more often cuneate at their bases. The infructescences of the Honduran specimens appear simpler than the inflorescences of the Mexico-Guatemalan material. It is difficult, however, to compare the infructescence and the inflorescence because the latter always loses not only unfertilized flowers, but also branchlets of the panicle.

The relationship appears to be with P. donnell-smithii which also has the subterminal type of inflorescence; but the narrower leaves and shorter pubescence make P. vesticula appear distinct.

THE NEW YORK BOTANICAL GARDEN
BRONX • NEW YORK 10458 212/933-9400

December 30, 1968

Dr. Wilson Popenoe
Casa Popenoe
Antigua
Guatemala, C.A.

Dear Dr. Popenoe:

Doctor Steere has referred to me your letter of November 27 concerning the Monograph of the genus Persea. I had another copy sent you which I hope has reached you by now. I am sorry that the first, sent at the request of Dr. Maguire after he had seen you in Antigua, did not reach you. Of course, there will be no charge; Doctor Kopp is happy to see that reprints go to those interested. I have her list and I believe she sent one to Dr. John Popenoe last year.

Thank you for mentioning your collections deposited in the National Arboretum Herbarium. Doctor Frederick Meyer told me of this excellent material which was not known to us at the time Doctor Kopp was doing her research. Until this fall, she has not been free to come to the New York Botanical Garden with sufficient regularity to warrant our borrowing your Persea collections. I have just now put a request through for a loan for this, and on my next trip to Washington, I shall stop by hoping to find other genera which should be helpful in furthering a monograph of Nectandra, Ocotea and Pleurothyrium begun in 1962, but periodically interrupted for contributions to various floras in the tropical area.

My best wishes for your continued interest in the Tropics and in the Avocadoes in particular; and for a happy holiday season.

Sincerely,

Caroline K. Allen

Caroline K. Allen
Research Associate

CKA:mi

CC: Dr. W. C. Steere

Antigua, Guatemala, 20 January 1969

Dr Caroline K. Allen,
New York Botanical Garden,
Bronx, New York.

Dear Doctor Allen:

Accept my cordial thanks for the copy of Dr. Kopp's monograph on the genus Persea. About the same time I received the copy which had been sent at the request of Dr. Maguire. I have delivered the latter to the herbarium of Escuela Agrícola Panamericana. I was told that a copy has not been received there.

I am glad you are going to see the material which was formerly in the herbarium of the Office of Foreign Plant Introduction of the Bureau of Plant Industry, USDA. I think I have told you in that herbarium - now at the National Arboretum, as you know - is an interesting "avocado" which I would very much like Dr Kopp to determine. It is a form which we cannot tie in with our horticultural "races" of avocados (formerly we called them types; I would refer you to the key I prepared for Bailey's Cyclopedia of Horticulture, many years ago, page 2556 in Vol.III). In that key, which more or less holds good to the present day (we have elaborated it a bit), the Mex can race of avocados is characterised by a definite anis odor in the leaves and fruit with a thin skin - not much thicker than that of an apple in most instances. The Guatemalan race is characterised by no anise odor and a thick, hard skin. Now, this curious wild avocado (it is not known horticulturally), has the anise odor of the Mexican and the thick, hard skin of the Guatemalan. Of course this upsets us horticulturists terribly. I have seen this form in several

places in Honduras and Costa Rica, never in Guatemala or Mexico. I am am anxious to know what Dr. Kopp would do with it! You know I am not a taxonomist, but I have seen a lot of avocados, wild and cultivated, and I would be inclined to make this form a variety of P. americana just as Dr. Kopp has done with drymifolia and nubigena (I fully agree with her reduction of nubigena and gigantea, which our good friend L.O. Williams described as species).

For years I have been searching for the wild prototypes, or whatever you would call them, of our three horticultural races. I am satisfied - I am sure everyone is satisfied, that the Mexican race is Mexican - Dr. Puppus wrote me many years ago that he was satisfied it was native around Huatusco, on the slopes of Orizaba, and I believe I have seen it there myself. The Guatemalan race I believe is derived from nubigena here in Guatemala (abundant near Tecpán, at about 8500 to 9400 feet), and I could never see any valid difference between our nubigena and the gigantea of Mt. Uyuca and nearby regions in Honduras, at an altitude of about 6000 feet.

But I had never felt too sure about the native home of the West Indian race, though I had seen a few trees near Boquete, Panama, on the slopes of the Chirqui volcano, and others near Santa Marta, Colombia, which I feared might be escapes from cultivation. There was a lot of variation in fruit form and size. Then, not many years ago, Paul Allen, whom you recall was a good botanist, found a wild avocado not far from Golfito in Costa Rica, which he believed was the origin of the West Indian race. I published a note on this - not a botanical description, in Ceiba a few years ago. I am sure you have this Journal in your library. I am not sure that Paul collected specimens of this, but Antonio Molina, botanist at Escuela Agrícola Panamerica, was over here yesterday says he feels pretty sure specimens were collected and are now in several herbaria.

Louis Williams, who arrived in Guatemala City yesterday and plans to spend a couple of months collecting in the Alta Verapaz, will doubtless know.

In a recent publication, I note that they have found avocado seeds in diggings in Peru, way south of Lima. But on the coast. I do not believe the avocado was native south of Ecuador, but I do think its limits may have been from Mexico to Colombia. Maybe it did not hop across the Isthmus of Panama until it was carried by man. I wish I could get back into the Sierra Nevado, close to Santa Marta, Colombia, again. You know the first record we have of the avocado in literature was in the Suma ge Geografia of the Bachiller Fernandez de Enciso, who saw it on the coast of Colombia, not far from Santa Marta.

Persea schiedeana certainly is not very close to americana, as Dr. Kopp points out, though two or three of the earlier botanists didnt find it out. I am glad Dr. Kopp calls floccosa "one of the wild avocados". It is certainly very close to amatigana, as she says.

Please pardon this dissertation from one who is not a taxonomist. I have gone into so much detail because I greatly hope Dr. Kopp can take a look at the material she did not see when she wrote the monograph, and answer the questions I have asked, even if she doesnt publish on those two forms which interest me so much.

With best regards, I remain

Faithfully yours,

Wilson Popenoe