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A REVISION OF THE *EUPHORBIA DIOSCOREOIDES* COMPLEX (EUPHORBIACEAE)

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ABSTRACT

A revision of the *Euphorbia dioscoreoides* complex (subgenus *Agaloma*) is provided. *Euphorbia dioscoreoides* ssp. *attenuata* and *E. eglandulosa*, both from México, are proposed as new; *E. digitata* is reduced to synonymy under *E. subpeltata*. Representative specimens are cited, and distributional and ecological data are provided.

Key words: *Euphorbia*, subgenus *Agaloma*, Euphorbiaceae, México, revision.

RESUMEN

Se presenta una revisión taxonómica del *Euphorbia dioscoreoides* complejo (subgénero *Agaloma*). Se describen una especie nueva, *Euphorbia eglandulosa*, y una subespecie nueva, *Euphorbia dioscoreoides* ssp. *attenuata*, los dos de México. Se reduce *E. digitata* como sinónimo de *E. subpeltata*. Especímenes son citados, y datos ecológicos y distribucionales son proporcionados.

Palabras clave: *Euphorbia*, subgénero *Agaloma*, Euphorbiaceae, México, revisión.

Euphorbia L., sensu lato, with as many as 2,000 species, is the largest genus in the family Euphorbiaceae and one of the largest among the flowering plants. The subgenus *Agaloma* (Raf.) House is one of nine subgenera recognized by Wheeler (1943) and is distinguished from other members of *Euphorbia* by its involucrel appendages and minute, usually glanduliform stipules. This subgenus comprises about 150 New World species and is most diverse in México and Central America where approximately 85 mostly endemic species occur. The taxa treated in this paper belong to *Agaloma* and include *Euphorbia dioscoreoides* Boiss. and its close relatives.

These taxa share the following diagnostic characters, the combination of which distinguishes them from other members of the subgenus *Agaloma*: leaves with long, slender, peltately attached petioles; cyathia subtended by a pair of linear-filiform opposite leaves; and involucrel appendages divided into three to nine segments. The leaf surfaces are essentially glabrous, and with the exception of *E. dioscoreoides* ssp. *dioscoreoides*, the proximal margin of the leaf is usually ciliate. The exact phylogenetic relationships between the individual members of the *Euphorbia dioscoreoides* complex are not yet elucidated, and its relationship to other members of *Agaloma* is also not obvious, but the long-petiolate leaves, relative lack of bracteoles be-

tween the staminate flowers, and deeply pitted seeds warrant its placement in section *Cyttarospermum* Boiss. [Note: Many authors incorrectly apply the name *Adenopetalum* (Klotzsch & Garcke) Benth. & Hook.f. (published 1880) to this section. However, at the sectional rank *Cyttarospermum* (published 1862) has nearly twenty years priority. The type of both sections is the same, namely *Euphorbia graminea* Jacq.]

The *Euphorbia dioscoreoides* complex is restricted to México, ranging from Sonora to Tamaulipas south to Chiapas. As here defined it consists of three species, one comprising two subspecies. Of these, one species has gone virtually unrecognized since it was described by Sereno Watson over one hundred years ago; one species and one subspecies are here described as new. These taxa are very similar vegetatively, but can readily be separated from each other on the basis of involucrel-appendage characters (Fig. 1–4). Although nearly all of the specimens that I have examined were previously identified as *Euphorbia dioscoreoides*, the nomenclaturally typical taxon, *E. dioscoreoides* ssp. *dioscoreoides*, is known only from a relatively small area in the states of México and Michoacán. The following key will distinguish the members of this complex:

1. Cyathia paired (rarely solitary), only 1–2 per cyathium-bearing branchlet; subcyathial leaves usually appearing whorled,

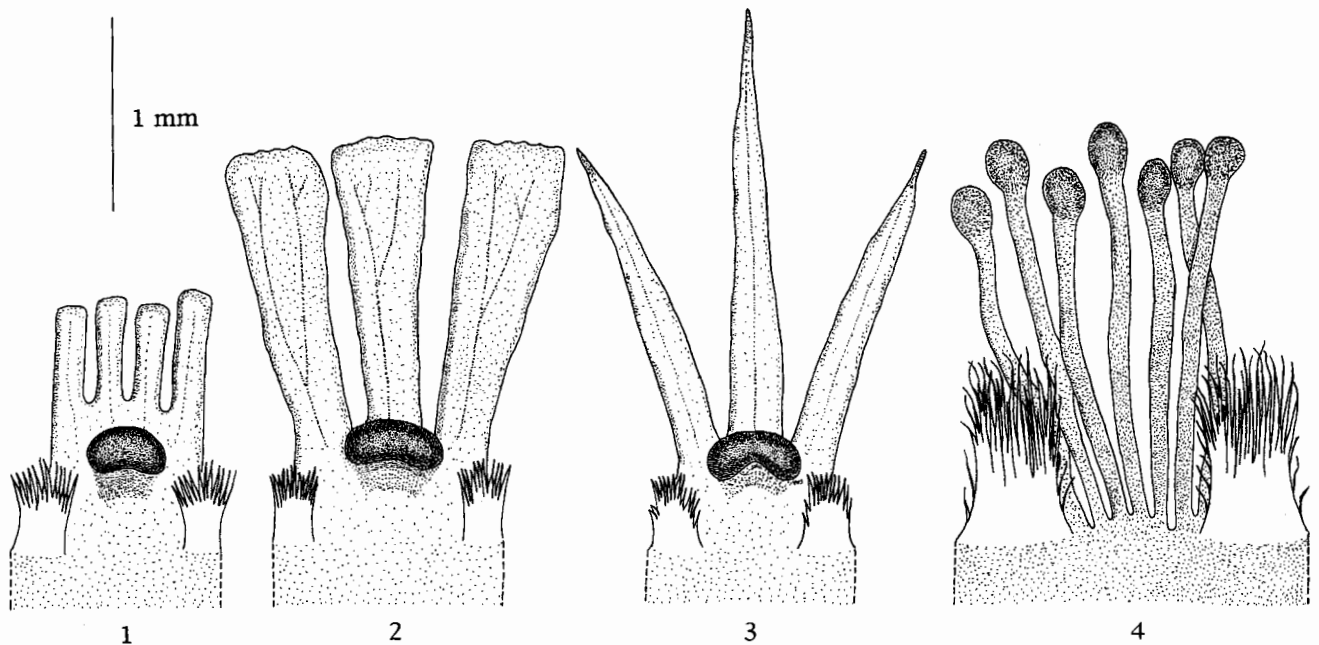


Fig. 1-4. Involucral appendages of species belonging to the *Euphorbia dioscoreoides* complex.—1. *Euphorbia subpeltata* (Kenoyer & Crum 4111).—2. *Euphorbia dioscoreoides* ssp. *dioscoreoides* (Hinton et al. 13132).—3. *Euphorbia dioscoreoides* ssp. *attenuata* (Dieterle 4300).—4. *Euphorbia eglandulosa* (Pringle 8393).

often white; the majority of involucral appendages 5-9-parted; involucral glands lacking or vestigial.

. *Euphorbia eglandulosa*

1' Cyathia not paired, usually more than 2 per cyathium-bearing branchlet; subcyathial leaves opposite, green to red but not white; the majority of the involucral appendages 3-5-parted; involucral glands fully developed.

2. Involucral appendages mostly 4-5-parted, the portion extending beyond the gland 1.2 mm or less in length. *Euphorbia subpeltata*

2' Involucral appendages 3-parted, the portion extending beyond the gland greater than 1.2 mm in length.

3. Leaf margin ciliate proximally (at least when young); divisions of the involucral appendages narrowed, sometimes abruptly, to an attenuate apex.

. *Euphorbia dioscoreoides* ssp. *attenuata*

3' Leaf margin glabrous; divisions of the involucral appendages not narrowed, the apex obtuse to truncate and frequently irregularly crenate.

. *Euphorbia dioscoreoides* ssp. *dioscoreoides*

EUPHORBIA DIOSCOREOIDES Boiss., *Centuria Euphorbiarum* 22. 1860. *Eumecanthus dioscoreoides* (Boiss.) Millsp., *Field Mus. Pub. Bot. ser. 2: 414*. 1916.

Erect, leafy, taprooted annual to 1.3 m, usually 80 cm or less; branchlets slender, glandular-pilose with multicellular trichomes 0.3-1.0 mm long; cauline leaves alternate; stipules inconspicuous, gland-like, 0.1-0.3 mm long, quickly deciduous; petioles mostly longer than the blade, slender, 1.9-7.5 cm long, glandular-pilose proximally, glabrous distally, peltately attached; blades entire, membranous, penninerved, lanceolate to ovate to deltoid, 1.8-4.4 cm long, 1.0-3.9

cm wide, acute to mucronulate at the apices, rounded to truncate at the bases, the surfaces essentially glabrous and the margins glabrous or ciliate proximally with multicellular trichomes 0.2-0.4 mm long; cyathia borne in axillary monochasial cymes 1.3-6.1 cm long, axes of the cymes glabrous or distally glandular-pilose; subcyathial leaves opposite, linear filiform, 0.3-1.4 cm long, stipules inconspicuous, ca. 0.2 mm long; peduncle 1-3 mm long, glabrous; involucre obconic-campanulate, 1.0-1.4 mm long excluding the appendages, attenuate to truncate at base; involucral lobes inconspicuous, ca. 0.3 mm long, fimbriate at the apex; involucral appendages 3-parted, white to green and frequently suffused with wine red coloration; involucral glands 5, reniform, often wrinkled, the radial axis (length) 0.1-0.2 mm, the tangential axis (width) 0.3-0.5 mm; bracteoles few per cyathium, filiform and often divided above; staminate flowers ca. 20-30, androphores glabrous; gynophore glabrous or pubescent at its base, elongating to 7.1 mm in fruit; ovary glabrous, roundly 3-lobed; styles 3, biparted, filiform, 0.6-1.1 mm long; capsule strongly 3-lobed, 2.7-3.4 mm long, 3.1-4.0 mm wide; columella 1.9-2.9 mm long; seeds ecarunculate, ovoid, flattened at the base, 2.0-2.5 mm long, 1.4-1.7 mm in diameter, blackish, with numerous coarse tubercles interspersed with several regular to irregular longitudinal rows of 3-5 shallow isodiametric depressions, the sides of which are beset with numerous minute tubercles and the bottoms of which commonly contain a minute, sharply punctiform pit.

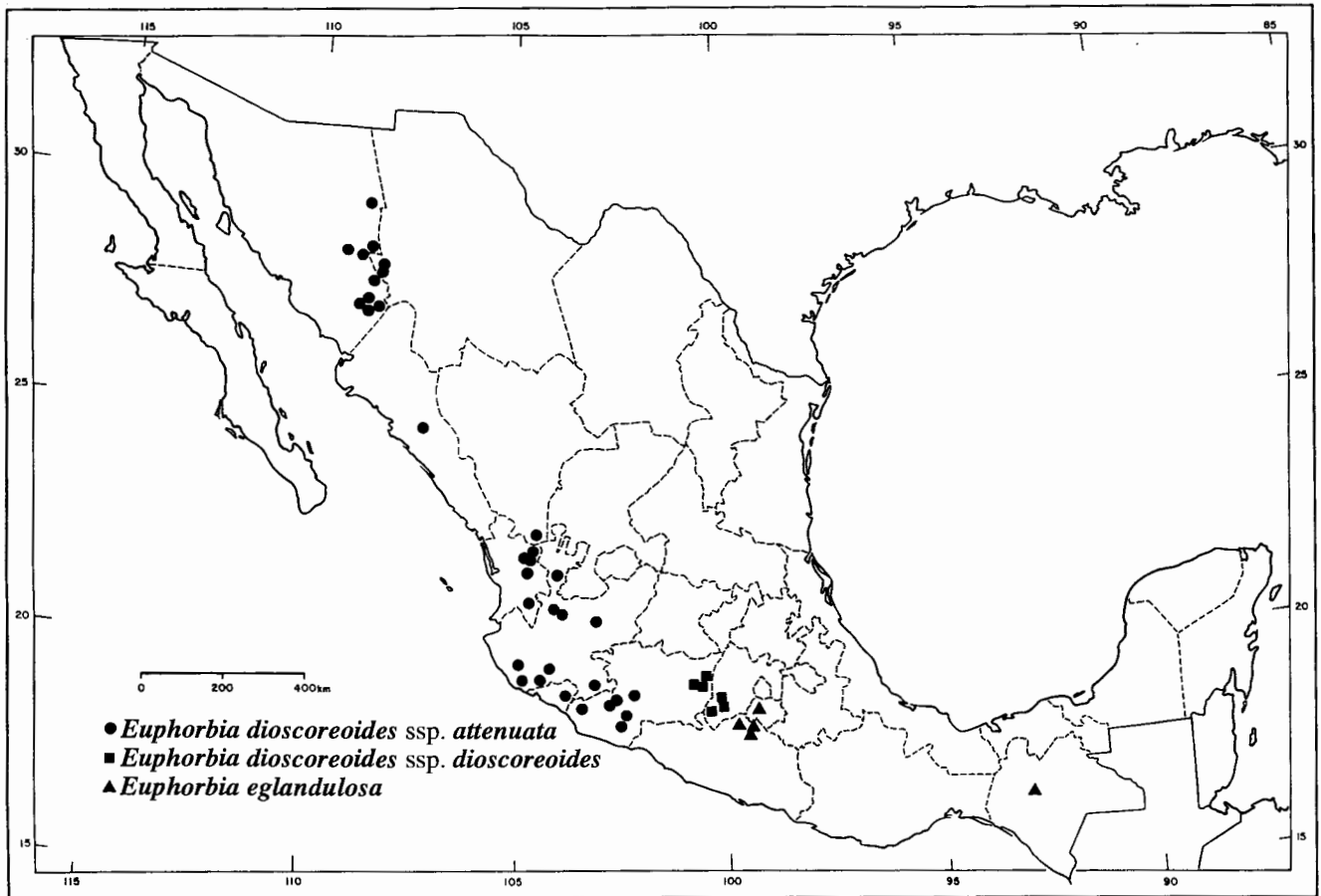


Fig. 5. Distribution of *Euphorbia dioscoreoides* and *Euphorbia eglandulosa*.

Euphorbia dioscoreoides is rather widely distributed along the Pacific slope of México, ranging from Sonora and Chihuahua southward to Michoacán and México (Fig. 5). As here treated, it consists of two geographically segregated subspecies. These are morphologically distinct, and I have seen no intermediates. Both are summer-fall annuals whose growth corresponds with the summer monsoon season.

EUPHORBIA DIOSCOREOIDES Boiss. ssp. **DIOSCOREOIDES**—
TYPE: “Nova Hispaniâ” (holotype G, not seen; fragment [of the holotype] F!).

Euphorbia peltata Sessé & Moçño, Fl. Mexic. [in *La Naturaleza*, ser. 2, vol. 2]: 133. 1894; non *E. peltata* W. Roxburgh, 1832. *Euphorbia mocinoi* Oudejans, Phytologia 67: 47. 1989.—TYPE: According to the protologue, this species is based on a Mexican Sessé and Moçño collection from “Oppido Nandio, prope Zitacuuarum [Michoacán]. Floret Augusto.” At the Field Museum [#849380]!, there is a portion of a Sessé and Moçño collection representing *E. dioscoreoides* ssp. *dioscoreoides* that was distributed as *Euphorbia peltata*. This was taken from a Sessé and Moçño specimen (MA 1756) at the Real Jardín Botánico Herbarium in Madrid, Spain and presumably represents type material.

Leaf margins glabrous; divisions of the involucrel appendages 3, 1.4–2.4 mm long, oblong to obovate, obtuse to truncate and frequently irregularly crenate at

apex. An excellent illustration of this subspecies can be found in Boissier (1866: table 37).

Tropical deciduous forest and oak woodland in eastern Michoacán and the southwest portion of the state of México. It is replaced in western Michoacán by ssp. *attenuata*. In addition to occupying different geographical ranges, subspecies *attenuata* and *dioscoreoides* also have different elevational preferences; subspecies *dioscoreoides* ranges from 950 m to 1550 m while ssp. *attenuata* primarily ranges from 90 m to 920 m. July to October.

Additional specimens examined.—MEXICO. MEXICO: Distr. Temascaltepec, Plaza de Gallos, 950 m, 17 Sep 1932, *Hinton 1751* (F, GH, LL, NY, RSA, US); Distr. Temascaltepec, Puerto Salitre, 1300 m, 20 Sep 1932, *Hinton 1787* (GH, LL, NY, RSA); Distr. Temascaltepec, Tenayac, 1400 m, 27 Sep 1933, *Hinton 4840* (GH, NY, US), 18 Oct 1935, *Hinton et al. 8366* (LL, NY, RSA, US); Sto. Tomás, 1100 m, 31 Aug 1952, *Matuda et al. 27151* (MEXU), *Matuda et al. 27160* (MEXU); Progreso, Luvianos, Cerro de la Culebra, 1300 m, 7 Sep 1954, *Matuda et al. 31498* (MEXU[2 sheets]); km 49 S of Temascaltepec on rd to Estanco, 18°55'N, 100°15'W, 1350 m, 3 Sep 1965, *Roe et al. 1653* (DAV, F, MICH); 16 km al E de Luvianos, sobre la carr. a Tejuipilco, 1350 m, 3 Sep 1965, *Rzedowski 20751* (DS, MICH, NY); 0.5 km W of Santa Bárbara power plant, 4 mi W of Santo Tomás de los Plátanos, 3500 ft, 11 Sep 1976, *Webster 21200* (RSA).—MICHOCAN: Distr. Zitácuaro, Zitácuaro–San José Purúa, 1550 m, 22 Aug 1938, *Hinton et al. 13132* (ARIZ, GH, LL,

MICH, NY, RSA, TEX, US); Mpio. Tiquicheo, en El Puerto Colorado, 2 km al N de Iranche, 7 Sep 1978, *Soto Núñez 975* (MEXU, MO); 20 km al NE de Tuzantla, carr. Zitácuaro–Huetamo, 1240 m, 19 Aug 1980, *Soto Núñez & Cortés A. 2345* (MEXU, MO).

Euphorbia dioscoreoides and *E. peltata* are apparently based on the same Sessé and Moçoiño collection made over two hundred years ago. The collectors and exact type locality of *E. dioscoreoides* were most likely unknown to Boissier, who described it on the basis of a specimen in Pavón's herbarium from "Nova Hispaniâ." This specimen, the holotype, was incorporated into Boissier's herbarium, and according to Dr. Rogers McVaugh (pers. comm., 1994), it bears a printed label "Nueva España Herb. Pavon" and a name added by Boissier, "*E. peltata*." Although Sessé and Moçoiño took part in their Mexican expedition during the late 18th and early 19th centuries, it was not until the late 19th century that their manuscripts on the flora of México were published. In the meantime, their herbarium collections had been disseminated to various people and institutions. Many of the specimens are known to have found their way into Pavón's herbarium (McVaugh, 1961: 173), and, as discussed by McVaugh (1987: 169), it was Pavón's custom to include with the specimen a small ticket containing virtually no information except the name originally given to the plant by Sessé and Moçoiño. It seems probable that Boissier added the name from the ticket onto the label, and it is therefore a fair assumption that this is the *Euphorbia peltata* of Sessé and Moçoiño. A comparison between a fragment of the holotype of *E. dioscoreoides* and a fragment of a Sessé and Moçoiño collection labeled as *E. peltata* (both at F) shows them to be identical in all respects.

The type locality of *Euphorbia peltata* is reported as "Oppido Nandio, prope Zitacuorum." This location is about 6 km south-southwest of Zitácuaro, Michoacán. McVaugh (1977: 190) states that Sessé and another member of his expedition, Castillo, probably visited this area in August of 1792, and it is likely that the type was collected then. Modern collections of *E. dioscoreoides* ssp. *dioscoreoides* from the vicinity of Zitácuaro are known (e.g., *Soto Núñez & Cortés A. 2345* and *Hinton et al. 13132*).

EUPHORBIA DIOSCOREOIDES Boiss. ssp. **attenuata** V.W. Steinmann, ssp. nov.—TYPE: México, Chihuahua, Río Mayo, Guasaremas, 20 Aug 1936, *Gentry 2401* (holotype ARIZ[#313757]!; isotypes ARIZ[#70037]!, GH!, MEXU!, US!)

Annual erecta; *Euphorbiae dioscoreoidi* affinis, a qua foliis ad basim ciliatis et segmentis involucribus attenuatis differt.

Leaves ciliate proximally; divisions of the involucrial appendages 3(–4), 1.3–3.1 mm long, generally lanceolate, attenuate at apex.

This subspecies occurs in deciduous and semideciduous tropical forests (with a single Sonoran pine-oak woodland record) from Sonora and Chihuahua to western Michoacán from 90 to 1220 m. Frequently in mesic and shady habitats. Gentry (1942: 171) says of this subspecies (misidentified as *E. uniglandulosa*), "a slender, turgescens summer annual, almost hydrophytic in character, wilting quickly under the noonday suns." May to November.

Paratypes.—MEXICO. CHIHUAHUA: Barranca between La Bufa and Batopilas, along arroyo to Guimivo, N side of Río Batopilas, 2580 ft, 16 Aug 1971, *Bye 1868* (MEXU); Río Bonito, 25 Aug 1936, *LeSueur 759* (F, GH, TEX); near Batopilas, Hacienda San Miguel, Sep 1885, *Palmer 134* (F, GH, MEXU, NY[2 sheets], US[2 sheets]).—COLIMA: Rte. 110, 11 km E Colima, 8 Sep 1970, *Burch 2784* (DAV, MO), *Burch 2785* (DAV, MO).—DURANGO: [Sierra Madre near Huasemote], 15 Aug 1897, *Rose 2313* (F, GH, NY, US).—JALISCO: Mpio. El Limón, near San Juan de la Villa, on the rd between El Grull[o] and Venustina[Venustiano] Carranza, 850 m, 8 Oct 1985, *Bartholomew 2784* (CAS, GH, MEXU); Mpio. Tomatlán, 3.4 mi (5.4 km) S of jct to Tomatlán and Hwy 200 on Hwy 200, 9 Sep 1985, *Cowan et al. 5638* (CAS, TEX); Mpio. Jilotlán de los Dolores, a 3 km de Pueblo Viejo, 22 km al O de Tepalcatepec, camino Tepalcatepec, Mich.–Jilotlán de los Dolores, 21 Sep 1983, *Lott 1902* (MEXU, MICH); Mpio. La Huerta, Rancho Cuixmala, NE of MEX 200 on the rd to Cumbres along the Río Cuixmala, near Cumbres 2, 19°27'N, 104°56'W, 20 Aug 1991, *Lott 3815* (CAS, F, MICH, TEX, UCR); hills above the river (a tributary of Río Cihuatlán), ca. 11 mi N of bridge of Río Cihuatlán on rd from Santiago, Colima to Durazno, Jalisco, 500–550 m, 1 Aug 1957, *McVaugh 15985* (MICH); below Presa de Santa Rosa, in the barranca of the Río Grande de Santiago N of Amatitán, 750–800 m, 1 Sep 1960, *McVaugh 18535* (MICH), *McVaugh 18570* (MICH); 3 km al S de Jilotlán de los Dolores, 750 m, 9 Aug 1987, *Ornelas U. 982* (HUMO); Bolaños, 10–19 Sep 1897, *Rose 3689* (US); 45 mi [NW] of Guadalajara, Barranca de Santa Rosa, 3800 ft, 18 Sep 1960, *Templeton 8825* (MICH, RSA); Mpio. Amatitán, Barranca Santa Rosa, orilla Río Santiago, 660 m, 4 Aug 1974, *Villarreal 6677* (MEXU).—MICHOCACAN: 11–13 km WSW of Apatzingán, along rd to Dos Aguas and Aguililla, ca. 300 m, 5–9 Sep 1972, *Dieterle 4300* (MICH); Distr. Apatzingán, Aguaje, 300 m, 19 Sep 1939, *Hinton et al. 15196* (ARIZ, GH, LL, MO, NY, RSA, TEX, US), 13 Oct 1939, *Hinton et al. 15327* (ARIZ, GH, LL, NY, RSA, TEX, US); Cañón El Marqués, 6 mi N of Nueva Italia, near the bridge on Río Cupatitzio, ca. 400 m, 18 Sep 1958, *McVaugh 18000* (MEXU, MICH, US); Mpio. Arteaga, 40 km al S de Nueva Italia, camino a Arteaga, 800 m, 19 Oct 1982, *Martínez S. et al. 2361* (DAV); slopes ca. 5.7 mi from Arteaga (kms. 145–146) on rd to Playa Azul, ca. 600 m, 11 Sep 1961, *Moore & Bunting 8764* (TEX); en la desv. a Villa Victoria (antes Chiniçuila), carr. Coalcomán–Colima, 760 m, 27 Aug 1980, *Soto Núñez & Cortés A. 2529* (MEXU, MO); Mpio. Gabriel Zamora, carr. Uruapan–Nueva Italia, Barranca Honda, 16 Oct 1979, *Soto Núñez y Silva 1830* (MEXU, MO).—NAYARIT: Mpio. Nayar, Terreno de José Luis Hernández, ca. 7 km al E de la Cortina, embalse de P.H. Aguamilpa, 200 m, 20 Aug 1993, *Calzada et al. 18624* (MICH); Mpio. Nayar, Jesús María, camino a La Mesa, cerca del arroyo El Fraile, 600 m, 3 Aug 1977, *Colunga & Zizumbo 16* (CAS); Valley of the Río Jesús María near Jesús María, 600–700 m, 20 Sep 1960, *Feddema 1325* (MICH); Mpio. Nayar, 39.9 km al NE de Jesús María, 22°16'N, 104°30'W, 920 m, 14 Sep 1989, *Flores F. 964* (DAV, MO); Mpio. Nayar, 2 km al S de San Juan Peyotán, camino San Juan Peyotán–Rancho Viejo, 22°27'N, 104°26'W, 700 m, 22 Sep 1989, *Flores F. 1239* (DAV, MO); Mpio. Nayar, P.H. Aguamilpa, ca. a 20 km al SE de la Cortina o a 5 km al N del poblado Colorado de la Mora, en

Cañada del Río Grande de Santiago, 200 m, 5 Oct 1993, *Flores F. et al.* 2960 (MICH); mountains 10 mi SE of Ahuacatlán, on the rd to Barranca del Oro and Amatlán, S-facing slopes, 1100–1300 m, 17–18 Nov 1959, *McVaugh & Koelz* 767 (MICH); Mpio. Nayar, 7 km al W de Jesús María, carr. a la Mesa del Nayar, 22°15'N, 104°38'W, 630 m, 28 Jul 1990, *Ramírez R.* 465 (MICH, MO); Mpio. Nayar, Vereda a 7 km de Jesús María, camino a la Mesa del Nayar, 22°15'N, 104°33'W, 790 m, 5 Sep 1991, *Ramírez* 1023 (MICH, MO); Mpio. Nayar, 2 km al N de Rancho Viejo, brecha a San Juan Peyotán, 22°20'N, 104°21'W, 710 m, [without date], *Tenorio L.* 16315 (DAV, MO).—SINALOA: Culiacán, 14 Sep 1904, *Brandege* s.n. (POM, UC, US), 17 Sep 1904, *Brandege* s.n. (GH).—SONORA: 24 km SE of Bamora on rd to Yécora (via Trigo), 790 m, 24 Aug 1984, *Breedlove* 61013 (CAS); Sierra de Alamos, Agua Marina, 1000 ft, 15 Sep 1959, *Gentry* 17818 (US); Santa Ana de Yécora, 28°23'N, 109°19'W, 745 m, 23 Sep 1977, *Goldberg* 77–199 (ARIZ); 3 km SW of Santa Bárbara, 27°06.5'N, 108°44'W, 1250 m, 14 May 1990, *Jenkins* 90–153 (ARIZ); Mpio. Alamos, Upper Río Cuchujaqui, Arroyo Verde, 27°07'N, 108°42.5'W, 850 m, 6 Oct 1990, *Jenkins* 90–222 (ARIZ); side canyon ca. 100 yds from the Río Mayo, 27°59'N, 108°35'W, 600 m, 25 Sep 1991, *Jenkins* 91–125 (ARIZ); Arroyo Verde, near Santa Bárbara, 27°06'N, 108°42.5'W, 940 m, 22 Oct 1995, *Jenkins* 95–311 (ARIZ); Agua Caliente drainage between Rancho El Alamo and Buena Vista, 29°36'N, 108°56'W, ca. 950 m, 26 Sep 1991, *Joyal* 1777 (ASU, MEXU); Cerro Verde, below and along Río San Javier, 28°34'N, 109°43'50"W, 500–600 m, 8 Oct 1988, *Martin et al.* s.n. (ARIZ); El Guayabo crossing of Río Cuchujaqui, 2.6 km NE of Sabinito Sur, 14 km (by air) ESE Alamos, 27°00'05"N, 108°47'08"W, 350 m, 27 Aug 1993, *Martin et al.* s.n. (ARIZ); Mpio. Nacorí Chico, El Río Bonito about La Nopalera, 4 Oct 1939, *Muller* 3628 (GH,LL); Río Cuchujaqui, 12 mi (by rd) E of Alamos and ca. 1.5 mi E of Sabinito Sur, 27°00'30"N, 108°47'W, 400 m, 6 Sep 1989, *Sanders* 9364 (CAS, MO, RSA, TEX, UCR); Alamos, W side of town, ca. 300 m S of the airport, 27°02'N, 108°56'45"W, 400 m, 19 Aug 1992, *Steinmann & Smith* s.n. (ARIZ, MEXU); Mpio. Alamos, ca. 29 km NNE of Alamos and 5 km E of Los Camotes along the rd to Las Chinacas, 27°16'N, 108°47'15"W, 400 m, 18 Aug 1994, *Steinmann* 94–56 (ARIZ, MEXU, RSA); Arroyo El Cobre, near Choquincahui, 26°58'48"N, 108°40'53"W, 560 m, 23 Sep 1994, *Van Devender* 94–732 (ARIZ, RSA); Mpio. Yécora, Agua Amarilla (Los Pintos), 15 km WNW of Tepoca, 24.7 km WNW of San Nicolás on Mex. 16 at km 200, ca. 28°08'20"N, 109°20'23", ca. 900 m, 6 Sep 1995, *Van Devender* 95–781 (ARIZ, RSA); Mpio. Onavas, 6.3 mi (by rd) W of Tepoca, ca. 2 km SW of Méx. Hwy. 16, 28°27'36.4"N, 109°19'11"W, 850 m, 16 Aug 1994, *Wilson* 94–05 (ARIZ).

Euphorbia eglandulosa V.W. Steinmann, sp. nov.—

TYPE: México, Guerrero, limestone ledges of mountains above Iguala, 2500–3000 ft, 10 Oct 1900, *Pringle* 8393 (holotype MEXU[#18410]!; isotypes F[2 sheets]!, GH!, MEXU[#18408]!, MICH!, MO!, NY!, POM!, UC[2 sheets]!, US!).

Annual erect; *Euphorbiae dioscoreoidi* affinis, a qua foliis ad basim ciliatis, segmentis involucribus lineari-filiformibus, et glandulis involucribus nullis vel reductis differt.

Erect, leafy, taprooted annual to ca. 1 m tall; stems to 4 mm thick and unbranched at the base; stems and branchlets densely glandular-pilose with multicellular trichomes up to 1.1 mm; cauline leaves alternate; stipules 0.2–0.4 mm long, glanduliform, quickly deciduous; petioles longer than blades, slender, 2.1–4.3 cm long, densely glandular-pilose, peltately attached;

blades entire, membranous, penninerved, broadly ovate, 1.9–3.2 cm long, 1.6–2.8 cm wide, mucronulate at the apices, truncate at the bases, the surfaces essentially glabrous and the margins ciliate proximally with multicellular trichomes 0.2–0.5 mm long; cyathia borne in pairs at the ends of axillary branchlets 1.0–1.3 cm long, the axes of the branchlets glandular-pilose at least along the proximal half; leaves of the cyathium-bearing branchlets 4 (rarely 2 by reduction of one pair), pseudowhorled, green or white, linear-filiform, 3.4–6.2 mm long, stipules filiform, 0.2–0.5 mm long; peduncles 2–3 mm, glabrous or glandular-pilose; involucre obconic-campanulate, usually wider than long, 1.3–2.0 mm long, 1.5–2.9 mm wide, white and tinged with purple or pink, rounded to truncate at base, glabrous or sparsely strigose without, glabrous within; involucrial lobes white, conspicuous, to 1.1 mm, firm-ribrate at apex; involucrial glands absent or vestigial; involucrial appendages 5, white, divided into 5–7(–9) linear segments 1.6–1.9 mm long, these often dilated at the apex; bracteoles several per cyathium, generally united proximally and divided into filiform divisions distally; staminate flowers ca. 30–40, androphores glabrous; gynophore glabrous, elongating to 4.0 mm in fruit; ovary glabrous, roundly 3-lobed; styles 3, biparted, filiform, 1.6–2.2 mm long; capsule strongly 3-lobed, 2.6–3.1 mm long, 3.6–4.2 mm wide; columella 1.8–2.5 mm long; seeds ecarunculate, ovoid, flattened at the base, 2.1–2.5 mm long, 1.6–1.8 mm in diameter, brown to blackish, with numerous coarse tubercles interspersed with several regular to irregular longitudinal rows of 3–5 shallow isodiametric depressions, the sides of which are beset with numerous minute tubercles and the bottoms of which commonly contain a minute, sharply punctiform pit.

Mostly tropical deciduous forest, Morelos and northern Guerrero and one disjunct locality in Chiapas (Fig. 5), often in rocky areas, the substrate frequently referred to as limestone, 600 to 2100 m. August to October.

Paratypes.—MEXICO. CHIAPAS: Mpio. Chiapa de Corzo, slope above El Chorreadero, 860 m, 26 Sep 1988, *Breedlove* 70137 (CAS), 31 Oct 1988, *Breedlove* 70833 (CAS).—GUERRERO: Taxco Viejo, 18 Sep 1937, *Abbott* 413 (GH); 16 km (by rd) from Iguala on rd to Taxco, 1260 m, 1 Oct 1983, *Anderson* 12924 (DAV); Mpios. Iguala & Buenavista, Cañón de la Mano, entre Los Amates y El Naranjo, 10 km al N de Iguala por el ferrocarril, 900–1000 m, 13 Sep 1986, *Catalán H.* 112 (MEXU); 4 km S of Acuitlapan, along rd to Acapulco, 21 Aug 1943, *Clausen et al.* 6044 (MEXU); on rd from Iguala to Teloloapan, 8 Sep 1954, *Dressler* 1799 (GH); along Cuernavaca-Taxco Rd, ca. 10 mi from Taxco, 5500 ft, 19 Aug 1935, *MacDaniels* 109 (F); Iguala Canyon, 2500 ft, 21 Sep 1905, *Pringle* 13606 (ARIZ, CAS, F, GH, MICH, TEX, US); Ahotla, 600 m, Sep 1926, *Reko* 4983 (US); 8 km al NW de Iguala, carr. Iguala-Taxco, 920 m, 14 Oct 1981, *Soto Núñez & Silva R.* 3326 (MEXU); Mpio. Teloloapan, Xalostoc 30 km al NW de Iguala, carr. a Teloloapan, 1420 m, 25 Aug 1982, *Tenorio L.* 1481 (MEXU, MO); W of Iguala, Los Sabinos Canyon, 16 Sep 1945, *Turner* 1773 (NY); mountainside

10 mi N of Taxco, 21 Aug 1947, *Webster et al. 17M922* (F, MEXU, TEX); ca. 15 mi SE of Tonatico, ca. 18°42'N, 99°35'W, 4700–4800 ft, 3 Nov 1970, *Webster & Breckon 16179* (DAV); ca. 14 mi (by rd) S of Taxco, rd to Iguala, ca. 18°25'N, 99°35'W, 3600 ft, 4 Nov 1970, *Webster & Breckon 16219A* (DAV); ca. 14 mi by rd S of Taxco, rd to Iguala, ca. 18°25'N, 99°35'W, 3600 ft, 4 Nov 1970, *Webster & Breckon 16222* (DAV, MEXU).—MORELOS: Tequesquitengo, 16 Sep 1941, *Miranda 1566* (MEXU); El Mogote, 8 Oct 1966, *Vázquez S. 883* (MEXU); Barranca de Tecolote, 2100 m, 10 Sep 1992, *Vázquez S. 3831* (MEXU).

This species is unusual in that the involucre are frequently wholly glandless, though in some collections (e.g., *Reko 4983*) vestigial glands are present. Many species of the subgenus *Agaloma* have involucre on which the gland number is reduced, sometimes to one, but in these instances the accompanying involucre appendage is also lacking. This species is unique among the *Euphorbia* known to me in lacking glands while possessing well-developed involucre appendages.

EUPHORBIA SUBPELTATA S. Watson, Proc. Amer. Acad. 26: 146. 1891. *Eumecanthus subpeltatus* (S. Watson) Millsp., Field Mus. Pub. Bot. ser. 2: 415. 1916.—TYPE: México, San Luis Potosí, Tamasopo Canyon, limestone ledges, [24 Sep 1890], *Pringle 3272* (holotype GH!; isotypes ARIZ!, F!, LL!, MO!, NY[2 sheets]!, POM!, RSA!, UC!, US[2 sheets]!).

Euphorbia digitata S. Watson, Proc. Amer. Acad. 26: 146. 1891. *Eumecanthus digitatus* (S. Watson) Millsp., Field Mus. Pub. Bot. ser. 2: 414. 1916.—TYPE: México, San Luis Potosí, near Las Palmas, 14 Oct 1890, *Pringle 3525* (holotype GH!, isotype F!).

Shrub, perennial herb, or annual, 20–150 cm tall, the root often thickened and tuberous; branches slender, glabrous or glandular-pilose; cauline leaves alternate; stipules inconspicuous, ca. 0.3 mm long, gland-like, quickly deciduous; petioles mostly longer than the blades, slender, 0.9–5.7 cm long, peltately attached; blades entire, membranous to subcoriaceous, penninerved, nearly orbicular to ovate to lanceolate, 0.9–4.6 cm long, 0.7–2.4 cm wide, acute to obtuse at the apices, rounded to truncate (rarely cordate) at the bases, the surfaces essentially glabrous and the margins glabrous or ciliate proximally with puberulent trichomes 0.1–0.2 mm long; cyathia borne in axillary monochasial or partially dichasial cymes 1.5–6.1 cm long, the axes of the cymes glabrous or distally glandular-pilose; subcyathial leaves opposite, linear-subulate to filiform, 0.5–1.9 cm long, with minute filiform stipules 0.2–0.5 mm long; peduncles 1–3 mm long, glabrous; involucre campanulate, 0.9–1.3 mm long excluding the appendages, green to red-tinged, the base generally attenuate when young and becoming rounded to truncate in age, glabrous or sometimes sparsely strigose distally outside, strigose on the distal half inside; involucre lobes inconspicuous, ca. 0.3 mm long, fimbriate at the apex; involucre appendages (2–)3–5(–

6)-parted, glabrous, the divisions resembling fingers, oblong, rounded-obtuse at the apex, 0.4–1.0(–1.2) mm long; involucre glands 5, reniform, the radial axis (length) 0.2–0.3 mm, the tangential axis (width) 0.5–0.6 mm; bracteoles several per cyathium, divided into filiform divisions above; staminate flowers ca. 20–30, androphores glabrous; gynophore glabrous or rarely distally glandular-pilose, elongating to 10 mm in fruit; ovary glabrous, roundly 3-lobed; styles 3, biparted, filiform, 0.6–1.0 mm long; capsule strongly 3-lobed, 2.3–3.0 mm long, 3.2–4.1 mm wide; columella 1.7–2.2 mm long; seeds ecarunculate, spheroidally ovoid, 1.7–2.1 mm long, 1.3–1.6 mm in diameter, brown to grayish-black, with numerous coarse tubercles interspersed with several regular to irregular longitudinal rows of 3–5 shallow isodiametric depressions, the sides of which are beset with numerous minute tubercles and the bottoms of which commonly contain a minute, sharply punctiform pit.

Tropical forest, oak woodland, and pine-oak woodland, commonly in disturbed habitats and frequently on limestone substrates. This species ranges from central Coahuila to southwestern Tamaulipas, southward through San Luis Potosí to Guanajuato, Querétaro, and Hidalgo; it also occurs in Morelos, Guerrero, and Oaxaca (Fig. 6). Reproductive from April to November and in February, so far as is known. 250–1600 m.

Additional specimens examined.—MEXICO. COAHUILA: Yerda Springs, Múzquiz, 18 Sep 1936, *Marsh 959* (F, MEXU, TEX[2 sheets]).—GUANAJUATO: Mpio. Atarjea, La Escalera, 1150 m, 18 Sep 1990, *Ventura & López 8746* (F, MEXU).—GUERRERO: Distr. Coyuca, Jaripo, 5 Nov 1934, *Hinton et al. 6924* (ARIZ, GH, LL, NY, RSA, US); Distr. Mina, Pino, 620 m, 7 Oct 1936, *Hinton et al. 9629* (A, GH, LL, NY, RSA, US); mountains near Iguala, 14 Sep 1900, *Pringle 9256* (GH, US); “El Viejo” 16 km al S de Río del Oro en la carr. Cd. Altamirano–Zihuatanejo, 26 Aug 1982, *Torres C. 1257* (MEXU, MO[2 sheets]); Mpio. Alcozauca, Amapilca, 1390 m, 6 Sep 1983, *Viveros & Casas 119* (MEXU).—HIDALGO: [Zimapan], *Coulter 1460* (GH); límites de Hidalgo–San Luis Potosí, hacia Tamazunchale, 700 m, 7 Nov 1979, *Hernández M. 3913* (MEXU); Mpio. Cardonal, Fondo de la Barranca de Tolantongo, 1400 m, 11 Sep 1981, *Hernández M. & Hernández M. 6464* (CAS, MEXU, TEX); Mpio. Cardonal, Cañada de la Piedra Cerrada, Barranca de Tolantongo, 28 Aug 1976, *Medrano et al. 9453* (MEXU); Sierra de la Mesa, Ixmiquilpan, Jul 1905, *Purpus s.n.* (UC); Mpio. Pisaflores, El Rayo 14 km al NE de Pisaflores, 920 m, 27 Oct 1982, *Tenorio L. 2394* (MEXU, MO).—MORELOS: Xochitepec, Sep 1934, *Yltonnet 1062* (CAS, MEXU[2 sheets], US); limestone hills near Yauatepec, 4500 ft, 28 Oct 1902, *Pringle 11166* (F, GH, MO, NY); Mpio. Tlaquiltenango, Sierra de Huautla, ca. 1 km S of Huautla, 18°23'46"N, 99°04'02"W, ca. 1100 m, 23 Sep 1995, *Steinmann 794* (ARIZ, DAV, F, GH, HUA, HUMO, MEXU, MO, NY, RSA, SLP, TEX).—NUEVO LEON: Between Iturbide and Linares, Hwy 58, lower Linares Canyon near bridge, 28 Aug 1987, *Bogler & Atkins 228* (MEXU, TEX); Dulces Nombres and just E of the border in Tamaulipas, 24°N, 99.5°–100.5°W, 1400 m, 23 Aug 1948, *Meyer & Rogers 3071* (GH, MO); 21 mi W of Linares, Santa Rosa Canyon, north slope of barranca, 3800 ft, 1 Nov 1964, *Ripley & Barneby 13564* (NY).—OAXACA: 9 km al NE de Cuicatlán, rumbo a Concepción Pápalo, 1020 m, 28 Aug 1980, *Glez. Medrano F-1628* (MEXU).—QUERE-

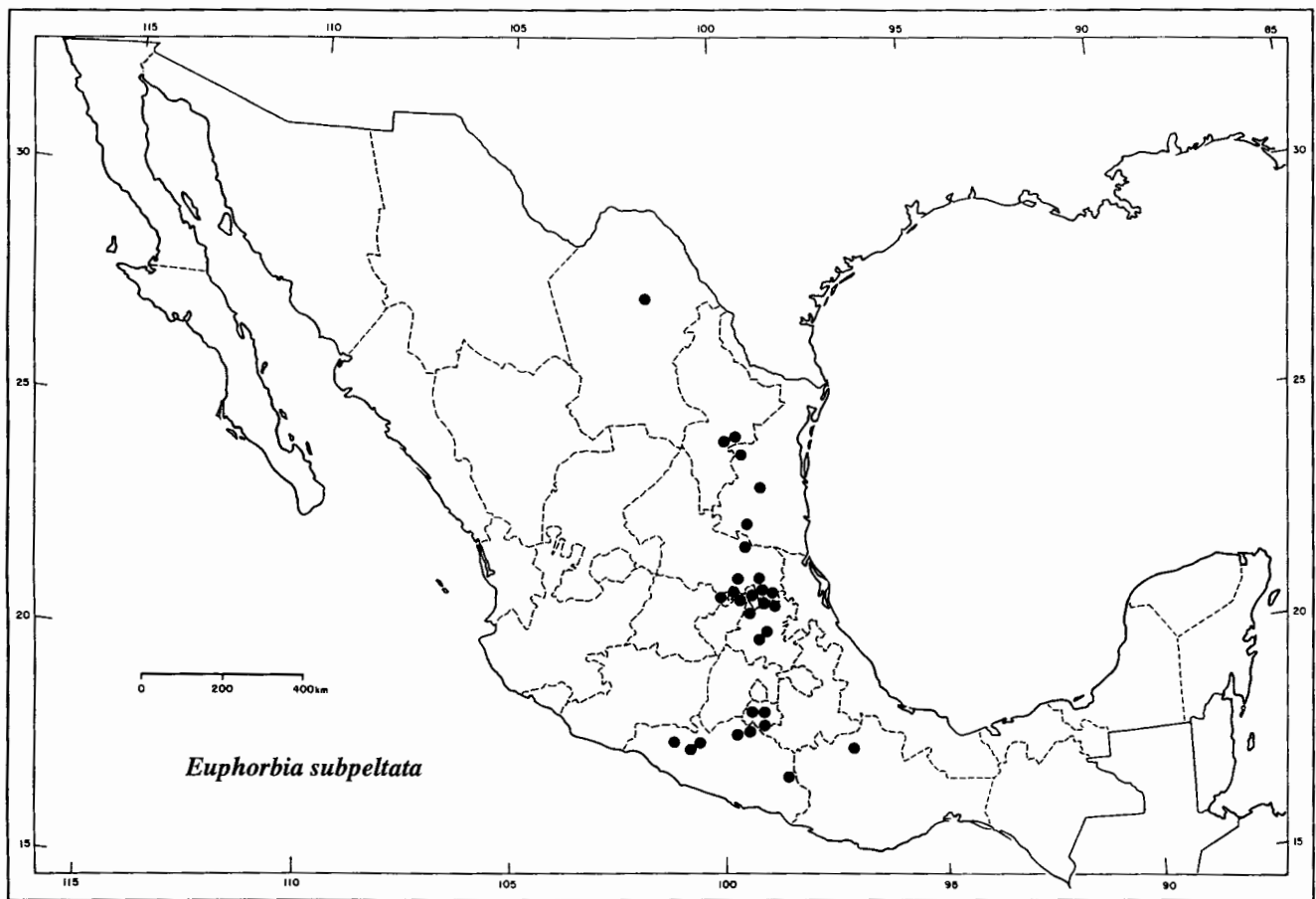


Fig. 6. Distribution of *Euphorbia subpeltata*.

TARO: Mpio. Landa de Matamoros, aprox. 6 km de El Lobo, camino a Agua Zarca, 1470 m, 1 Jul 1988, *Carranza 705* (MICH, MO); Mpio. Arroyo Seco, 1 km al S de Arroyo Seco, 1020 m, 24 Jul 1988, *Carranza G. 863* (MEXU); Mpio. Landa de Matamoros, 7 km al W de Tilaco, camino a Santa Ines, 1050 m, 6 Sep 1985, *Fernández N. 3118* (TEX); Mpio. Landa de Matamoros, ca. 2 km al suroeste de Río Verdito, 1600 m, 14 Jul 1989, *González 755* (MO); Mpio. Landa de Matamoros, 1 km al noroeste de San Onofre, 850 m, 3 Aug 1991, *Rubio 2525* (MO); Mpio. Landa de Matamoros, 4 Km al S de El Lobo, sobre el camino a Agua Zarca, 1450 m, 16 May 1987, *Rzedowski 43256* (MEXU); Mpio. Jalpan de Serra, 1–2 km al Poniente de San Isidro, La Parada, 1250 m, 17 Aug 1990, *Servín 427* (MO, TEX); Mpio. Arroyo Seco, ca. 4 km (by rd) S of Arroyo Seco, 21°31'37"N, 99°40'38"W, ca. 900 m, 15 Sep 1995, *Steinmann 719* (ARIZ, DAV, HUMO, MEXU, NY, RSA, SLPM, TEX).—SAN LUIS POTOSÍ: Mpio. Aquismón, Tampaxal, 5 Jun 1979, *Alcorn 3152* (TEX); Axtlen, 20 Jan 1947, *Aquirre & Reko 350* (F); SW of Tamazunchale, 2.3 mi NE of the Hidalgo border on Highway 85, 590 m, 26 Oct 1985, *Bartholomew 3464* (CAS, GH, NY); 19 km de Xilitla a Cadereyta, 940 m, 3 May 1967, *Gómez-Pompa 2062* (GH, MEXU); route 85 at km 213 (northbound), ca. 10 mi N of Tamazunchale, 8 Apr 1976, *Harriman 12316* (MICH); 17 mi W Morelos, 1 Sep 1948, *Kenoyer & Crum 4055* (A); 9 mi on Xilitla Rd, 3 Sep 1948, *Kenoyer & Crum 4111* (A); Tamazunchale, 250 m, Jul 1937, *Lundell & Lundell 7240* (A, ARIZ, F, MICH); slopes above Cuesta de los Cedros, ca. 33 mi from Antiguo Morelos on rd to San Luis Potosí, 18 Sep 1948, *Moore & Woods s.n.* (A); 12 km al SE de Tamasopo, 750 m, 11 Sep 1967, *Rzedowski 24425* (DS, F, MICH, NY); Mpio. Xilitla, 3 km al NW de Huichihuayán, 820 m, 15 Feb 1982, *Tenorio L. 79* (MEXU, MO); Mpio. Xilitla, La Conchita, 2

km al NE de Xilitla, 680 m, 28 Oct 1982, *Tenorio L. 2463* (MEXU).—TAMAULIPAS: 9 mi W Victoria, 28 Aug 1948, *Kenoyer & Crum 3347* (A); Mpio. Hidalgo, along the rd to Dulces Nombres, Nuevo León, 8.8 mi (by rd) SW of the lowermost crossing of Mimbres creek and 8.2 mi (by rd) NE of Los Caballos, 24°01'50"N, 99°28'48"W, 1260 m, 21 Sep 1994, *Mayfield 2059* (RSA); 10 km NW of El Progreso which is 18 km NW of Ocampo, 23°N, 99°30'W, 1450 m, 22 Aug 1941, *Stanford et al. 1031* (ARIZ, CAS, GH, NY, MO, UC). Without locality: 1865–1866, *Hahn 314* (F).

A comparison between the type material of *Euphorbia digitata* and *Euphorbia subpeltata* reveals no differences of taxonomic merit between them, and the two are here considered synonymous. The leaves of *Pringle 3272* (the type of *E. subpeltata*) are nearly orbicular and obtuse to mucronulate (Fig. 7). *Pringle 3525* (the type of *E. digitata*) possesses leaves that are ovate-lanceolate and acute (Fig. 10). Although the two collections are superficially rather different, and it is understandable why Watson named them as separate species, the numerous collections now available illustrate the thorough continuum in leaf shape and provide evidence that the two entities cannot be maintained as distinct. The leaves of this species are highly variable in shape (Fig. 7–10), and the types merely represent extremes in leaf morphology and are otherwise very similar. The only collection that I have seen with

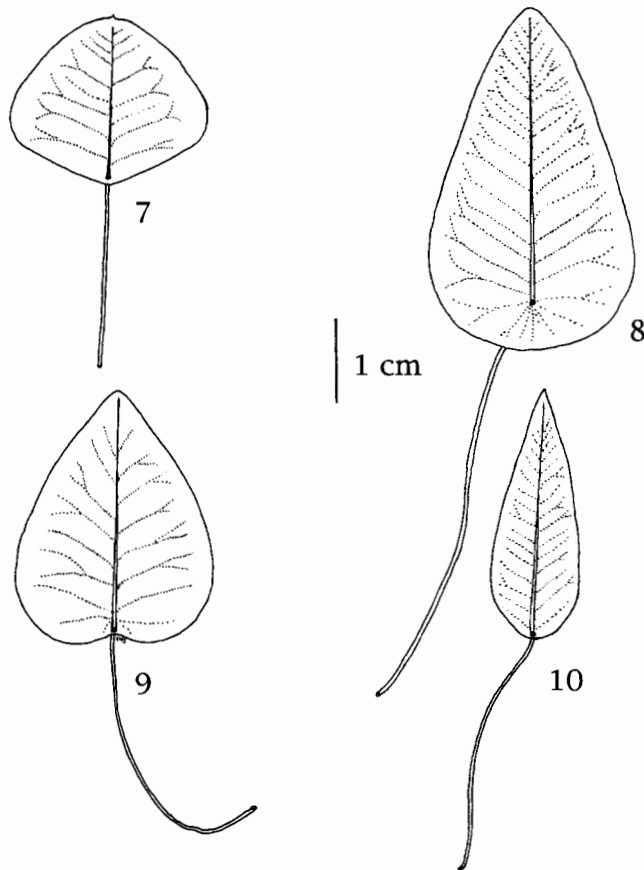


Fig. 7-10. Leaves of *Euphorbia subpeltata*.—7. Pringle 3272.—8. Lundell & Lundell 7240.—9. Steinmann 794.—10. Pringle 3525.

leaves closely matching the type of *E. subpeltata* is Stanford et al. 1031.

The plants in Morelos, Guerrero, and Oaxaca differ from plants throughout the northern range of this spe-

cies in that they are densely glandular-pilose and consistently summer-fall annuals. The northern plants are nearly always perennial herbs or shrubs, and although frequently glandular-pilose, this is never to such an extent as in the southern plants. The significance of these differences is not yet apparent, and the plants from Morelos, Guerrero, and Oaxaca are here referred to *Euphorbia subpeltata*.

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