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

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 eglandulosa

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


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, pinnierved, lanceolate to ovate or 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, filaminate 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.
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 mocinoi Oudejans, Phytologia 67: 47. 1989.-**TYPE:** According to the protologue, this species is based on a Mexican Sesse & Moçoio collection from “Oppido Nandio, prope Zitacuaro [Michoacán]. Floret Augusto.” At the Field Museum [#849380], there is a portion of a Sesse & Moçoio collection representing E. dioscoreoides ssp. dioscoreoides that was distributed as Euphorbia peltata. This was taken from a Sesse & Moçoio specimen (MA 1756) at the Real Jardín Botánico Herbarium in Madrid, Spain and presumably represents type material.

Leaf margins glabrous; divisions of the involucral appendages 3, 1.4–2.4 mm long, oblone 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 s. p. *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, Temayac, 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 Culabra, 1300 m, 7 Sep 1954, Matuda et al. 34938 (MEXU); 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 Tejupilco, 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 21269 (RSA).—**MICHOACÁN:** Distr. Zitácuarro, Zitácuarro–San José Purda, 1550 m, 22 Aug 1938, Hinton et al. 13132 (ARIZ, GH, LL.
Euphorbia dioscoreoides and *E. peltata* are apparently based on the same Sessé and Moñino 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 Hispaniæ.” 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. Pavón” and a name added by Boissier, “*E. peltata*.” Although Sessé and Moñino 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 Moñino. 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 Moñino. A comparison between a fragment of the holotype of *E. dioscoreoides* and a fragment of a Sessé and Moñino 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 Zitacuarum.” 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* spsp. *dioscoreoides* from the vicinity of Zitácuaro are known (e.g., Soto Núñez & Cortés A. 2345 and Hinton et al. 13132).

The 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, turgescent summer annual, almost hydrophytic in character, wilting quickly under the noonday suns.”

May to November.

**Paratypes.**—Mexico. Chihuahua: Barriaca between La Bufo and Batopilas, along arroyo to Guimivo, N side of Río Batopilas, 2580 ft, 16 Aug 1971, Bye 1868 (MEXU); Río Bonito, 25 Aug 1936, Leyeuer 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).—Durangn: Sierra Madre near Huasemat, 15 Aug 1897, Rose 2313 (F, GH, NY, US).—Jalisco: Mpio. El Limón, near San Juan de la Villa, on the rd between El Grullo[O] and Venustian[Venustiano] Carranza, 850 m, 8 Oct 1989, Bartolomew 2784 (CAS, GH, MEXU); Mpio. Tomatlián, 3.4 mi (5.4 km) S of jet to Tomatlián and Hwy 200 on Hwy 200, 9 Sep 1985, Cowen et al. 5638 (CAS, TEX); Mpio. Jilotián of los Dolores, a 3 km of Pueblo Viejo, 22 km al O de Tepalcatepe, camino Tepalcatepe, Mich.—Jilotián of the Dolores, 21 Sep 1983, Lott 1902 (MEXU, MICH); Mpio. La Huerta, Rancho Cuimxalma, NE of MEX 200 on the rd to Cumbres along the Río Cuimxalma, 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 Durazon, Jalisco, 500–550 m, 1 Aug 1957, McVaugh 15985 (MICH); below Presa de Santa Rosa, in the barranca of the Río Grande of Santiago N of Amatitán, 750–800 m, 1 Sep 1960, McVaugh 18353 (MICH), McVaugh 18570 (MICH); 3 km al S de Jilotián of los Dolores, 750 m, 9 Aug 1987, Ornelas U. 982 (HUMO); Bolaños, 10–19 Sep 1897, Rose 3889 (US); 45 mi (72 km) 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, Villareal 6677 (MEXU).—Michoacán: 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); Caño El Marqués, 6 mi N of Nueva Italia, near the bridge on Río Cupatitizío, ca. 400 m, 18 Sep 1958, McVaugh 18000 (MEXU, MICH, US); Mpio. Arteaga, 40 km al S of 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 Victoría (antes Chínica), car. Coalcomán–Comilla, 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. Aguamilpa, 200 m, 20 Aug 1993, Casazda et al. 18624 (MICH); Mpio. Nayar, Jesús María, camino a La Mesa, cerca del arroyo El Fraile, 600 m, 3 Aug 1977, Collunga y Zicamico 16 (CAS); Valley of the Río Jesús María near Jesús María, 600–700 m, 20 Sep 1960, Feddem 13225 (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–Ranchito Viejo, 22°27’N, 104°26’W, 700 m, 22 Sep 1989, Flores F. 1239 (DAV, MO); Mpio. Nayar, P.H. Aguamilpa, ca. 20 km al SE de la Cortina o a 5 km al N del poblado Colorado de la Mora, en...
blades entire, membranous, peninnerved, 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; calytra borne in pairs at the ends of axillary branchlets 1.0–1.3 cm long, the axes of the branchlets glandular-pilosous 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-pilosous; involucral obconical-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 striose without, glabrous within; involucral lobes white, conspicuous. to 1.1 mm, fimbriate at apex; involucral glands absent or vestigial; involucral 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; stamine flowers ca. 30–40, androphores glabrous; gynophore glabrous, elongating to 4.0 mm in fruit; ovary glabrous, roundly 3-lobed; styles 3, bi-parted, filiform, 1.6–2.2 mm long; capsule strongly 3-lobed, 2.6–3.1 mm long, 3.6–4.2 mm wide; columnella i.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 puctiform 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 Chirelade, 860 m, 26 Sep 1988, *Bredero 7033* (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* (DAOV); 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, *Catalan 112* (MEXU); 4 km NNE of San Nicolás de los Banos, 16 km al norte, ca. 1380 m, 24 Sep 1990, *Van Devender 91-125* (ARIZ, RSA); Mpio. Yécora, Agua Amarilla (Los Pinos), 15 km WNW of Tepoca, 24.7 km NNW of San Nicolás de los Banos, 16 km al norte, ca. 1380 m, 24 Sep 1990, *Van Devender 95-781* (ARIZ, RSA); Mpio. Onavas, 6.3 km (by rd) W of Tepoca, ca. 2 km SW of Mex. Hwy. 16, 28°27'33.4"N, 109°19'11"W, 850 m, 15 Aug 1994, *Wilson 94-05* (ARIZ).
Euphorbia digitata

like, quickly deciduous; petioles mostly longer than glands while possessing well-developed involucral appendages.

Euphorbia subpeldata

monochasial or partially dichasial cymes 1.5-6.1 cm long; involucral 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; stamine 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; columnella 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 graysish-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 Potosi 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.

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

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

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 species 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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LITERATURE CITED


