

#### 4. DIOON Lindl.

Lindley, [J.] Bot. Beg. Misc. no. 82, append., p. 59 (1843); Lemaire, [C.] Illus. Hort. 2:91-94 (1855); Miquel, [F. A. W.] Prodr. Cycad. 10, 22 (1861); De Candolle, A., Prodr. 16<sup>2</sup>:537 (1868); Standley, [P. C.] Contr. U. S. Nat. Herb. 23<sup>1</sup>:48 (1920); Schuster, [J.] Pflanzenreich 4<sup>1</sup>:124-128 (1932).

Stem a stout, unbranched, aerial trunk 1-3 m. high, rarely up to 16 m. (in D. spinulosum), with an armor of persistent leaf bases which is conspicuous down to the ground even in plants a thousand years old. Leaves many in a crown, 1-3 m. long; petiole unarmed except in D. spinulosum. Leaflets lanceolate or linear, rigid, entire or spinose-toothed, with the base as wide as the rest of the leaflet; venation "parallel" (dichotomous). Vernation of entire leaf perfectly straight.

Male cones solitary, mostly cylindrical, sessile. Microsporophylls closely imbricate, flat, long, broadly cuneate from a narrow base, short stalked, the tip pointed or rounded. Microsporangia covering most of the lower surface, sometimes separated into two groups by a sterile middle line. Female cones solitary, ovoid or cylindrical, very short stalked, the upper megasporophylls rather loose. Megasporophylls loosely imbricate, unequally peltate, broadly ovate or lanceolate, short stalked, the outer part rounded or acute above. During growth some of the ovules pull out parts of the sporophyll and appear to be stalked. Seeds white or cream-colored.

The genus includes at least 5 species and is probably confined to Mexico. Cultivated plants seem to be responsible for reports of a wider distribution. Lindley named the genus Dion, an impossible contraction derived from δύο (two) and ωον (egg). Since all cycads except most species of Cycas have two ovules on each megasporophyll,

the name Dioon is not particularly appropriate. Type species:  
D. edule Lindl. Next to Cycas the megasporophylls are more leaf-  
like than those of other cycads and are grouped in a less compact  
cone.

Dioon is more widely distributed in Mexico than the records  
of ~~1910~~<sup>1909</sup> indicate. Dr. J. N. Rose labeled specimens, most of them  
collected by Dr. C. A. Purpus, D. pinoi, D. madrense, D. australis,  
D. pallida, and D. tellegii. He distributed leaves of some of  
these, but died before making any descriptions. He may have been  
waiting for more complete material. I have received rather complete  
material of D. madrense and some material of D. pinoi. The others  
should not be described until more material is available.

Eliminate all of these new Rose Dionysia except  
madrense and pinoi which I have been  
describing. Don't mention tellegii unless  
these specimens prove to be new. I also  
sincerely hope in "publizing" these the  
author is doing even worse than that he  
critiques in the introduction who published  
happens very unfortunately. Actual Dionysia  
if more and more are available with by  
is but a small Dionysia; any one doing  
would be Dionysia to some Dionysia

Key to the Species

I. Petioles without spines

A. Leaflets of adult plants entire; seeds with a narrow pit at the chalaza . . . . . 1. D. edule

B. Leaflets with 1 or 2 (sometimes 3) strong spines on the upper border and occasionally with 1 or 2 on the lower border; seeds with a narrow pit at the chalaza . . . . . 2. D. purpusii

C. Leaflets with 2 or 3 (sometimes 4) strong spines on the upper border and occasionally with 1 or 2 on the lower border; seeds with a broad pit at the chalaza . . . . . 3. D. pinoi

D. Leaflets in upper half of leaf with 1 or occasionally 2 sharp but weak spines on the upper border, very few or none on the lower border; seeds with a broad pit at the chalaza . . . . . 4. D. madreense

II. Petioles with spines; leaflets with 5-8

strong spines on the upper border and 4-7 on the lower border; seeds without a pit at the chalaza . . . . . 5. D. spinulosum

1. Dioon edule Lindl.

Lindley, J., Bot. Reg. Misc. no. 82, append., p. 59 (1843); Lemaire, C., Illus. Hort. 2:91-94 (1855); Miquel, F. A. W., Prodr. Syst. Cycad. 10, 22 (1861); Hooker, J. D., Bot. Mag. 101: t. 6194 (1875); Chamberlain, C. J., Bot. Gaz. 42:321-358 (1906) and 47: 215-236 (1909).

Stem stout, in larger plants commonly 1-1.5 m. tall and 20-30 cm. in diameter, sometimes reaching a length of 3 m. Stems of older plants leaning or prostrate, frequently with buds at base. Leaves 15-20 in a crown, rarely up to 35, very flat, rigid, about 1.6 m. long in plants with stems 30 cm. high, dark green, pilose when young, becoming glabrous. Petiole varying in length with age of plant, naked, without spines. In seedlings with 3 or 4 leaves petiole up to 30 cm. long; in plants 20 years old seldom reaching 20 cm. and usually not more than 10 cm. long. Rachis convex above, flat beneath. In plants with stems 30 cm. high leaflets about 120 on each side, up to 11 cm. long and 8 mm. wide, with 11-13 veins showing scarcely a single dichotomy beyond the base. In plants 1 m. or more in height largest leaflets reaching 18 cm. in length and 9 mm. in width. Leaflets linear-lanceolate, pungent, always paired, the upper pair connate throughout most of its length. Lower leaflets smaller than the others but not reduced to spines. Lowest leaflets longer in seedlings, usually half as long as leaflets in middle of leaf. In plants 20 years old lowest leaflets only 1 cm. long, next leaflets twice as long, the others increasing gradually up to the maximum length. Leaflets of older plants perfectly entire, those of seedlings with several spines near the tip, a condition which gradually disappears as the plant becomes older.

Male cones cylindric, 10-20 cm. long and 7-11 cm. in diameter just before shedding of pollen, when the length may become doubled. Microsporophylls apparently in vertical rows, although really strictly spiral in arrangement, cuneate, terminating in a sharp point which curves upward and is hairy on the exposed portion. Microsporangia averaging about 300, mostly in sori of 3 or 4, occasionally 5. Female cones ovoid, 20-30 cm. long, 10-20 cm. in diameter. Megasporophylls broadly lanceolate, acute, 10-20 cm. long, densely covered with light brown wool. Seeds white or cream-colored, averaging 3 cm. in length and 2 cm. in diameter, very smooth, with a narrow deep pit at the chalazal end. Diameter of pit variable, even in seeds from the same cone, as the following data show:

| Source of seed | Number counted | Diameter range | Average diameter |
|----------------|----------------|----------------|------------------|
| Chavarrillo    | 15             | 1-4 mm.        | 2.2 mm.          |
| Pascon         | 66             | 1-4 mm.        | 2.5 mm.          |
| Huatusco       | 13             | 1.5-4.5 mm.    | 3.0 mm.          |
| Tepatate       | 11*            | 1-5 mm.        | 3.9 mm.          |

\*From the same cone

Geographic distribution: Abundant at Chavarrillo, near Jalapa, State of Veracruz, also at Palmar and Colorado and between these places, also at Huatusco; Pascon, in the mountains west of Tampico; Tepatate, near Jacala, State of Hidalgo; Nuevo León; Tamulipas; Tampacoalá, near Hacienda de Limón; Victoria, Sierra Madre. Growing in dry situations in bright sunlight; associated with various xerophytic shrubs, small cacti, bromeliads, and ferns.

In a patch of Dioon edule it is easy to pick out a plant here and there with leaflets narrower or broader than the average.

Herbarium taxonomists have described such fluctuations as var. angustifolium and var. latipinum. In very dry places the rachis, especially near the tip, may elongate so slightly that the leaflets overlap, thus affording an opportunity for var. imbricatum. In damp shaded places the leaflets may be rather widely separated, affording still another opportunity which, so far as I have noted, has not yet been utilized.

## 2. Dioon purpusii Rose

Rose, J. N., Contr. U. S. Nat. Herb. 12:260-261 (1909).

Stem short, crowned by numerous leaves, these often 1 m. or more long, stiff and ascending, dark green and glabrous. Petiole somewhat tetragonal, without spines. Leaflets rather widely separated below, closely set above, linear-lanceolate, pungent, entire on the lower margin but usually with 1, 2, or rarely 3 sharp spine-like teeth on the upper margin, 5-9 cm. long, 9-11 mm. wide. Male cones 15-20 cm. long, the microsporophylls with ovate tips. Female cones ovoid, about 44 cm. long, 20 cm. in diameter near the base. Megasporophylls 10-15 cm. long, very woolly. Seeds about 4 cm. in diameter.

Collected by D. T. MacDougal and J. N. Rose in Tomellín <sup>Canyon,</sup> ~~Canyon,~~ Oaxaca, in 1906, and by C. A. Purpus in Sierra Mixteca, Puebla, in 1908. The specimens found by MacDougal and Rose were in a deep canyon well shaded by bushes and small trees.

The above description is based on that of Dr. Rose, with a few additions from cultivated specimens. The statement in the original description that the microsporophylls have recurved tips is incorrect, as is plainly shown by the specimens distributed by Dr. Rose. The piece of male cone on the type sheet (U. S. National Herbarium no. 454142) is mounted upside down. The sporangia would be on the adaxial face of the sporophyll if the tip were recurved. The tips turn upward, as in other species of Dioon.

Geographic distribution: Southern Puebla, northern Oaxaca, and in Chiapas.

In April, 1908, I traveled from Las Sedas to Tomellín and found at Santa Catarina a new species which had not yet been described. The leaves agree with Dr. Rose's description. A small

pit at the chalazal end of the seed is about the same as in D. adule, with an average diameter of 2.5 mm.

Edward Howard collected ~~some~~ specimens of Dioon in Chiapas, about 40 kilometers inland from the coast and about 160 kilometers north of Guatemala. I have examined leaves from two of these plants that were transplanted to southern California. In some leaves the spiny character is about as in Dr. Rose's description. One large plant has a trunk 2.1 m. tall and 30 cm. in diameter, with leaves 1.1 m. long, petiole 16-21 cm. long, and leaflets 8.5 cm. long and 11 mm. wide. The lowest leaflets have no spines, but the spiny character of the others is a little more pronounced than in D. purpusii. Specimens distributed by Dr. Rose show occasional spines on the lower border and spines lower down than in the type. Although most of the leaves of the Howard specimens have more spines than in the type, some agree very closely. If the description of D. purpusii were broadened by allowing the leaflets to have a few more spines, the specimens from Chiapas, as far as the leaves are concerned, could easily be included in it.



3. Dioon pinoi Rose sp. nov.

Stem in larger plants 4-5 m., occasionally up to 6 m. high. Leaves about 1 m. long. Petiole 7 cm. or more in length, somewhat tomentose; rachis densely tomentose on the lower side. Leaflets about 90 on each side, inserted obliquely, opposite or subopposite, most of them with 2 or 3 (sometimes 4) strong spines on the upper border and occasionally with 1 or 2 on the lower border, the lower leaflets not so spiny; sometimes revolute, tomentose on the margins, even on old leaves. Largest leaflets 9 cm. long and 10 mm. wide, the lowest about 1 cm. long; veins 12-15. Male cones not available. Female cones smaller than in D. edule. Megasporophylls 9-9.5 cm. long, 4.5-5 cm. wide at the base. Seeds 3.5 cm. long and 2.5 cm. wide. The pit at the chalaza was measured in only three seeds; in two it was circular, 5 and 6 mm. in diameter; in the other it was oval, 9 mm. by 7 mm.

Geographic distribution: <sup>2</sup> Lower region of Sierra Madre near Hacienda del Pinoi, Monserrato, Chiapas, Mexico.

This species was distributed but not described by J. N. Rose. The foregoing description is based on Dr. Rose's material in the U. S. National Herbarium, material in the New York Botanical Garden, and from both material and letters sent to me from Dr. C. A. Purpus, who made all the collections.

*Handwritten notes:*  
This plant is a fertile dioecious  
- the fruit is a capsule  
- the fruit is a capsule

4. Dioon madreense Rose sp. nov.

Stem an aerial armored trunk. Leaves 1 m. long. Petiole 10-25 cm. long, oval in transverse section with 2 indistinct grooves, smooth; rachis 50-80 cm. long, rounded below, with 2 distinct grooves above. On a plant with a stem 30 cm. high and 14 cm. in diameter, leaflets 80-90 on each side, the largest 9.7 cm. long, 5 mm. wide, with 10 veins; the lowest 3.5-4.5 cm. long, 3 mm. wide, with 6 veins. On larger plants, up to 100 leaflets on each side, the largest 18 cm. long, 7 mm. wide, with 12 veins; the lowest 8 cm. long, 4 mm. wide, with 8 veins. Leaflets narrowly linear, pungent; most leaflets in upper half of leaf with 1 or occasionally 2 small sharp but weak spines on the upper border, the leaflets of many leaves without a single spine on the lower border.

Male cones cylindric, 21.5 cm. long, 7.5 cm. in diameter (only one cone measured). Microsporophylls 3 cm. long, stalk the same length, exposed tip <sup>p</sup>ointed above and rounded below, very woolly. Microsporangia more or less separated into two groups of 60-80 each, mostly in sori of 3 or 4, occasionally 5. Female cones ovoid, up to 30 cm. long. Exposed surface of megasporophylls cuneate, 6 cm. long, 4 cm. wide at the bottom, rounded at the top, densely woolly. Seeds cream-colored, fleshy coat not more than 1 mm. thick; stony coat 2.5 cm. long, 2 cm. in diameter, smooth, with 14 bundles near the chalaza and 12 at the corona; chalazal pit circular or oval, about 4 mm. in diameter.

Geographic distribution: Near Los Mochis, Sinaloa, Mexico.

Coll. C. F. Edmunds. J. N. Rose collected material between Aguacate and Dolores in 1892. No. 2014.

*Dioon madreense* Rose

5. Dioon spinulosum Dyer

Dyer, W. T. T., in Hemsley's Biol. Centrali-amer. Bot. 3: 191 (1882-1886); Eichler, A. W., Gartenfl. 2:411 (1883); Chamberlain, C. J., Bot. Gaz. 48:401-413 (1909).

Stem taller and more slender than in D. edule, rarely branched; commonly 3-6 m. in height, occasionally 12 m., rarely reaching 16 m. On plants 2 m. in height, leaves reaching a maximum length of about 2 m.; dark green and glabrous. In damp shady places, leaves often 3 m. long. In seedlings petiole naked, up to 90 cm. in length, the lowest leaflets nearly as long as those higher up. Reduced leaflets appearing on older plants, becoming spines on plants about 10 years old. In plants with stems about 2 m. tall, leaflets about 120 on each side, up to 20 cm. long and 23 mm. wide, with some leaflets only 15 cm. long and 15 mm. wide. Leaflets long lanceolate, acuminate, pungent, with 5-8 sharp spines on the upper border and 4-7 on the lower border. Occasionally spines much reduced, most of the leaflets of some plants being entire. Such plants have been described as D. pectinatum.

Male cones long ovoid, about 25 cm. long and 10 cm. in diameter before the sudden elongation at shedding of pollen, when the length doubles. Microsporophylls long cuneate, the outer part gray woolly, curved upward, obtuse. Microsporangia up to 700, generally in sori of 4 or 5, sometimes 3, only slightly separated into two groups at the top. Female cones cylindrical-ovoid, up to 60 cm. long and 27 cm. in diameter, with average cones about one-fifth smaller. Megasporophylls more closely imbricated than in D. edule, the stalk irregularly triangular in transverse section and much wrinkled; outer part of sporophyll perpendicular to the stalk, gray woolly, rounded above in some specimens, in others

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nearly as pointed as in D. edule. Seeds white and smooth but slightly yellowish when mature; stony coat 4-5.5 cm. long, 2.5-3.5 cm. in diameter, the chalaza without a pit.

Geographic distribution: Northern limit apparently at Tierra Blanca, about 70 kilometers south of Veracruz. Very abundant beyond the Papaloapan River at Tuxtepec, about 120 kilometers south of Veracruz. The original description by Dyer gives Progreso, in Yucatan, as the locality and Eichler's description cites Cordoba, State of Veracruz. The species does not occur in either of these places except in cultivation.

This is the only species of Dioon in which the leaflets are gradually reduced to spines. The leaves are long and have a graceful curve, in striking contrast to the straight rigid leaves of the other species. The female cones are cylindrical-ovoid, while the megasporophylls are either rounded or acute.