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WILLIAM TRELEASE,
Director.

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[11] Rept. Mo. Bot. Gard. **5**:18. **9**:19. **11**:20. **16**:29. **19**:23.

SCIENTIFIC PAPERS.

ILLUSTRATED STUDIES IN THE GENUS OPUNTIA—IV.

BY DAVID GRIFFITHS.

Among a thousand members of the genus *Opuntia* collected between Ejutla and the Canadian boundary, now in cultivation, the following appear not to have been previously described:

Opuntia Bentonii, sp. nov.

An open-branching, erect species, closely resembling *O. Lindheimeri* in habit; joints distinctly obovate, 17 to 18 by 27 to 28 cm. (last year's growth), thin, with vascular system distinctly traceable for two or three years, dull dark green; areoles elliptical to obovate, 5 to 6 mm. long, tawny when young but soon becoming black; leaves subulate, cuspidate-pointed, recurved, 5 mm. long; spicules yellow, unequal, scattered in upper portion of areole and fringing it or scattered through its entire area; spines not numerous, confined to an irregular distribution on edges of joints, yellow, annular, translucent, bonelike, flattened, erect to recurved, 1 to 4 or 5, longest 2½ cm. long and others shorter; flowers light yellow, large, 9 to 10 cm. in diameter, petals broadly obovate, rounded, mucronate, filaments greenish yellow, pistil 3 cm. long, style greenish white, stigma yellowish green, 7-parted; ovary obovate, slightly tuberculate when young, about 5 cm. long, with sub-circular areoles 2 to 3 mm. in diameter, bearing yellow spicules and a few fugacious, yellow, delicate spines; fruit obovate-pyriform, purplish red throughout, insipid, umbilicus broad, flat, slightly raised to slightly depressed with a slight pit in center.

The species is most closely related to *O. texana*, but differs in shape, thickness and texture of joints, distribution and number of spines, and other minor details. It has turned up frequently during the past six years from Fernandina, Florida, to the mouth of the Brazos, always in cultivation in the eastern portion of this range and native in southwestern Louisiana and Texas. The first collection of it was made at McClenny, Florida, April 26, 1906, by Mr. Harmon Ben-

ton. This collection has been grown by vegetative propagation since. The last planting was made in the spring of 1908, and plants from this setting with single-joint cuttings bloomed profusely the second year and at the end of the fourth season's growth are about four feet high and seven to eight feet in diameter. It is perfectly hardy at San Antonio, Texas, but at the beginning of the fourth growing season showed signs of decay of central joints, indicating a breaking down, more or less common, which precedes in many cases a more rapid decay resulting in the death of the main trunk. This simply is an indication that the species in this situation is not long lived. It is a common phenomenon in many introduced species.

The type specimen is one prepared April 24, 1910, from a cultivated specimen, numbered 8374 D. G., and collected originally by Harmon Benton at McClenny, Florida, April 26, 1906.—Plates 1 and 2.

Opuntia Gregoriana, sp. nov.

An erect, quite compactly branched, grayish green plant, a meter or more high, 1½ meters or more in spread of branch; joints obovate, glaucous, with a tinge of purple about the upper marginal areoles, about 14 by 21 cm. and again 12 by 17 cm. and even smaller than this, uniform in general outline; areoles brown, prominent, but not protruding much, ovate to obovate, about 3 mm. long on sides of joints but sub-circular and often 6 mm. long on edges, even in current year's growth, increasing some in size with age; spicules unequal, scattered through entire areole but more numerous above, variable, the longest about 6 mm., not increasing much after first year, often becoming 1 cm. long at tip of joint, yellow, but sometimes brownish tinged; spines not numerous, confined to edges and upper areoles of joints, 1 to 3 and at times as high as 6, yellowish or bleached, white distally with translucent tips and tinted bases, flattened, sometimes twisted, not annular or at most only very faintly so, commonly 3 cm. long but ranging from 1 to 4 cm.; flowers yellow; fruit deep purplish red all the way through, obovate to pyriform, slightly pitted at apex with sub-circular, tawny, remote areoles bearing a tuft of unequal, centrally-located spicules 3 or 4 mm. long, about 4 by 7 cm.

The species should probably be classed with *O. Engelmannii,* but the joints are very distinct in outline and the spines are few in number for this group.

The type was prepared at Chico, California, September 9, 1911, from cultivated specimens collected near El Paso, Texas, July 29, 1905. Both the type specimen and the original collection bear my serial number 8020. Two generations of this have been grown by vegetative propagation since its collection.—Plate 3.

Opuntia incarnadilla, sp. nov.

An erect, compactly-branched, arborescent species with a distinct cylindrical trunk 20 to 30 cm. in diameter, 2 to 3 or 4 meters or more high; joints of a striking blue-green with some bloom in the fall but much brighter in color in the spring, uniformly and regularly obovate, about 15½ by 28½ cm., smooth, flat, broadly rounded above and tapering uniformly below; areoles oval to obovate, 2 to 4 mm. long, enlarging in age to about 6 mm. in diameter, the lower usually unarmed and about 2 cm. apart; wool brown turning gray to dirty black; spicules yellow, very inconspicuous even on old joints when they are slightly darkened, scarcely visible up to 18 months old; spines white with translucent bonelike tips, short, stout, erect or when young bonelike throughout, bent, twisted, flattened, erect or recurved, irregularly distributed, commonly none below, 1 to 2 above and 2 to 4 on edges of the joints, with an occasional joint with entire side armed with 1 to 4, seldom 2 cm. long and from that down to 8 mm., increasing with age on old stems both in length and numbers; fruit bright deep red all through, palatable, oval to subglobose with comparatively large areoles filled with prominent brown wool, a few inconspicuous spicules in the center and 5 or 6 fugacious, delicate spines below which are commonly 6 to 8 mm. long.

The species is characterized by its beautiful blue-green color, uniformity of joint outline, and habit especially. It should be placed with the mansa or large cultivated Mexican species. In California it has made a growth of four feet high by about the same measurement in spread of branch, in four years, and produced a few fruits the third season and a small crop the fourth. At Brownsville, Texas, it is perfectly hardy but does not grow as well, and has not yet produced any fruit, although the plants are the same age as those at Chico, California. The spicules are much more numerous at Brownsville.

The type specimen bears my serial number 8074 and was prepared from cultivated specimens at Chico, California, Sep-

tember 11, 1911. The cuttings from which these plants were grown were collected by myself under the same number at Hepasote, Mexico, August 21, 1905. The description is a compilation of several sets of notes on the cultivated plants. —Plates 4 and 5.

Opuntia vexans, sp. nov.

An arborescent, cylindrical-jointed species with the habit of *O. arborescens* and about equal to that species in stature, reaching in rare instances a height of 3 meters and having a spread of about the same diameter; joints cylindrical, usually more or less curved, somewhat clavate when young on account of the gradual narrowing toward the base, varying in length from 10 to 40 cm., and 2 to 3 cm. in diameter, tuberculate, the tubercles about 5 mm. high and normally 3 cm. long, the upper crest abrupt and less than one-third the entire length, the highest point being at the upper extremity of the areole, the lower slope twice as long or longer and gradual; areoles oval, gray, acutely angled above, 6 to 7 mm. long, enlarging by formation of new structures above, and becoming sub-circular or obovate and 6 mm. or more in diameter, forming mostly a flat cushion 1 to 2 mm. high, at 2 or 3 years of age; spicules yellow, in a small triangular tuft less than 1 mm. long in upper part of areole, not increasing in age; leaves long, cylindrical, subulate, cuspidate-pointed, 1.5 cm. long, usually tinged at tip; spines reddish-brown, with rather close, gray to silvery sheaths, variable, 4 to 10 on current year's joints, increasing to 30 or more in age, erect, diverging in all directions, commonly 4 to 10 mm. long; flowers delicate light purple, 5½ to 7 cm. in diameter when fully opened, inner row of petals 8, obovate-spatulate, rounded to retuse and minutely cuspidate above, filaments greenish purple, more deeply colored distally, style purple, fading below to almost white, stigma white, 7 to 8-parted; fruit dry, obovate, tubercled at first, becoming less so in age but never smooth, greenish yellow when ripe, drying upon the plant and then falling off, obovate, 22 × 35 mm. or subglobose and 22 × 25 mm., armed with the usual bunch of spicules, and 1 to 3 or 4 delicate, fugacious, hairlike spines sheathed at their tips only.

The species belongs to the *O. arborescens* group and is commonly confused with that species, from which it differs in the character of its fruits and tubercles especially, and agrees with it in form and grosser aspects. It is one of the best ornamental species of the group and is readily propagated from cuttings and less so from seed. At Chico, California, it makes two crops of fruit usually, and at San An-

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