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OF THE

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VOL. 43

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New species of *Opuntia*

DAVID GRIFFITHS

(WITH PLATES 2 AND 3)

A living assemblage of 2,400 collection-numbers of *Opuntia* has been established at Chico, California. The majority of the plants have reached fruiting condition. The plantation represents in the largest measure my own field work supplemented by donations, purchases from other collectors, and introductions through the Office of Seed and Plant Introduction of the United States Department of Agriculture. All of the species described below have been propagated vegetatively in this collection, have been studied in their native habitat in all but one instance, and the majority of them have been grown to maturity from seed, either from the type or from previous collections.

Opuntia humistrata sp. nov.

A densely pruinose, prostrate to ascending species, with long radiating, branched, reclining, tangled arms, 30 cm. high, and forming bunches a meter in diameter; joints obovate to elliptical, broadly to sharply rounded above, and stipitate based, or widest at middle, and long, attenuated above and below, commonly 6×15 cm., but may be 5×18 cm., and again commonly 5×10 cm., surface flat, only very slightly raised at areoles even when young, at first dull medium to yellowish green, strongly turgid, with slight tinge of red about areoles of the edges especially, in the main densely pruinose; leaves reddish tinged, circular in section, subulate, cuspidate, 5 mm. long, mostly ascending, and finally curving inwardly; areoles at first tawny with light brown wool, which is soon obliterated by the spicules, subcircular to broadly obovate, 2 mm. in diameter, soon becoming 3 to 4 mm. in diameter; spicules brown, but in places may appear dirty yellowish, 2 to 3 mm. long, and completely filling areole with a compact truncate tuft 3 mm. long; spines none; flowers purplish, similar to those of *Opuntia basilaris* Engelm. & Bigel., but usually smaller; fruit subglobose or more elongate, greenish or white with a blush of red, dry.

This species belongs to the *Opuntia basilaris* group, and it is dis-

tinguished from *O. brachyclada* Griffiths by its much wider, different-shaped joints; and from *O. basilaris* by its much smaller as well as different shaped joints. The branching in this species is more truly basilate than in *O. basilaris* when it is young but as the plants increase in size this characteristic is lost in the main branches. Its distribution seems to be confined to the floor of the mountain valleys of the San Bernardino region of California. While in the type the spicules are decidedly brown like those of the majority of *O. basilaris*, they may be entirely yellow. Indeed the species varies in coloration of the entire plant.

The type is preserved under my collection No. 10787, and was collected in the mountain cañons above San Bernardino, California, September 17, 1912. The description was drawn in the main from cultivated plants, grown at Chico, California, July 28, 1914.

Opuntia deltica sp. nov.

A tall, erect, tree-like form, often reaching a height of 2-3 m., with a distinct trunk, rather loose and open branched; joints obovate but often widest at middle, about 17×26 cm., light, rather yellowish green, with a little bloom, sharply rounded above and contracted below into a short stipitate base; areoles bright, dark brown, broadly obovate to subcircular, 4-6 mm. long, 2.5-4 cm. apart on sides of joint and 1 cm. on edges; spicules prominent, scattered through entire areole, but more numerous above, the longer 1 cm. in length, unequal, scattered, yellow, formidable; spines yellowish, one to four, mostly two, increasing slightly in age, when two, one erect, other recurved, the upper the larger, flattened, often twisted, not annular, 3 cm. long; flowers yellow, becoming deeper yellow with slight tinge of red only late in the day, 7-8 cm. in diameter when fully opened, slightly greenish tinged within, reddish when closed and bud greenish with only a slight tinge of red in edges of occasional bud scales, filaments greenish, style white, stigma long, five- to seven-parted, very light greenish tinged, almost white; fruit deep purplish red all way through, obovate with wide, nearly flat umbilicus, about 4×4.5 cm., areoles large, subcircular, tawny, 3 mm. long and ten to fifteen in number, spicules yellow, 2-3 mm. or even 5 mm. long, but quite distinct from the fugacious spines which may reach extreme length of 2 cm., widely spreading, five to ten in number.

This is another species peculiar to the delta of the Rio Grande. It is not so conspicuously a tree as *O. alta* Griffiths, for it appears

to be less woody, more spreading and therefore more easily broken down. Like so many other species, when grown from cuttings it forms a hemispherical shrub, at least for five or six years, and only very remotely suggests a tree form. It is often a low-spreading to hemispherical shrub in its native heath, but when unmolested it assumes the form of a tree. The plants from which our specimens were secured were 3 m. high but have not gotten over 1.5 m. in any of our plantations up to this time after five years of cultivation. The species was secured originally in the vicinity of Brownsville, Texas, in 1908, and has been propagated vegetatively since that time at Brownsville and San Antonio, as well as at Chico, California. The type bears my collection number 10501.

✓ *Opuntia laxiflora* sp. nov.

A hemispherical shrub, 1 m. high and about 2 m. in spread of branch, main arms ascending or resting on edge, and secondary ones erect from them, open, lax in habit of growth; joints long-obovate, mostly rather sharply rounded above, long contracted below into a strong stipitate base, light yellowish green, with some bloom, about 15×30 cm., prominently raised, tubercular at areoles for 2 years, with those on the margins very decidedly raised until the margins of the joints often appear notched between the areoles; leaves subulate, cuspidate, 8 mm. long, recurved at tip; areoles brown, subcircular, 4-5 mm. in diameter, 4 cm. apart; spicules yellow, abundant, formidable, unequal, mostly scattered through upper and lateral margins of areole, 7-8 mm. long, continuing to develop the second year, when they are frequently decidedly brown; spines yellow, one to four, mostly two, increasing in age to six, faintly annular, flattened, slightly deeper colored at base, when two, the upper porrect, and lower reflexed, the upper 2 cm. in length; flowers (late in the day), 8 cm. in diameter when fully opened, decidedly purple, the midribs of petals deep orange-red, and the margins purple, exteriorly petals have a strong orange cast also, but purple impression is given of the whole, lax, petals long, obovate, cuspidate, pointed, tapering to almost cuneate below, 5-6 cm. long, eroded-wavy above, light yellowish green with only a tinge of red in the apex of an occasional sepal in the bud, filaments tinged purplish below, style white, stigma light green, with six long linear divisions, ovary obovate, 3-4 cm. in length, its areoles prominent, tawny to gray, with a pronounced protuberance of wool, 1-1.5 mm. high, spicules of same character as on joints, but there are two to seven or eight bristles 1.5 cm.

long identical with spicules, except in size, but are more fugacious even than the spicules; fruit when mature purplish red throughout.

This species is more closely related to *Opuntia cyanella* Griffiths, from which it differs very decidedly in laxness, shape, and tint of flower, color, shape, and character of joints and nature of spination. The flowers are decidedly purplish when they first open at 8 A.M.; but purple coloration exists only toward the base of the petals on the inside of the flower. They turn more purple as the day advances. There are really in each petal when the flower first opens, a small marginal area of purplish red and a larger midrib area of orange-red tint. In sunlight, they are fully opened by ten o'clock, but in the shadow of the joints, the opening is retarded by an hour; or sometimes it may not be fully opened before noon, if shading is heavy.

The type is No. 9915 DG, collected at Loma Alta, near Brownsville, Texas, August 18, 1912. The description was drawn in the main from cultivated plants grown at Chico, California, July 25, 1914. The plants at this place blossomed profusely from cuttings the second year.

✓ *Opuntia zuniensis* sp. nov.

A low, prostrate, reclining species, 30 cm. high and sometimes 1 m. in diameter, the main branches most commonly resting on edge, or at times prostrate and the secondary ones erect from them, but usually only one or two joints in height; joints ovate obovate, pointed above and below, having a little bloom when young but losing this and becoming decidedly yellowish-green in age, 11-12 × 18-23 cm.; areoles obovate, commonly 6-7 mm. long on edges of joints, shorter and more nearly subcircular on sides, especially toward the base of joint, brown; spicules yellow, 3 mm. long, in a compact crescentic tuft in upper angle of areole, in age filling entire areole and becoming often a cm. in length; spines white but on apex of current year's growth their bases vary from light straw-colored to dark brown, but the general impression given by even these is brown-tawny and even they are more or less white distally, flattened, slightly twisted, seldom even faintly annular, porrect-spreading, usually about six on apex of current year's growth, the lower one about 2 cm. long and sloping down, the others stouter and varying from 2-5 cm., increasing in both length and numbers in age; flowers yellow, about 7 cm. in diameter when fully opened, having a little red at base of petals when first opened

which becomes more prominent later, the whole turning light orange-red as day advances; fruit a dull, light yellowish-red, rind greenish, pulp colorless, areoles small, 1.5 mm. in diameter, gray-tawny, spicules yellow, protruding from wool 1-2 mm.; fugacious spines 5-8 mm. long and two to six in number with a distinct tendency to whitening at complete maturity, and rarely accompanied by an occasional true white spine.

This belongs to the phaeacantha group and differs from previously described species in shape of joints, color of, as well as appendages, of the joints, and nature of flower, fruit and seed. The species was collected near Zuni, New Mexico, August 31, 1911, and the type bears my collection number 10345. It grows commonly in the open sage brush areas of the region, especially eastward and northward, and is probably the most common species of the region. The description applies to one form of the species, the other forms having spines decidedly brown, and the whole plant body, as well as the fruit, darker colored. The description is drawn in the main from plants propagated vegetatively at Chico, California, under field conditions, although it was also grown for a time in a sash house and in field at San Antonio, Texas.

✓ *Opuntia flexospina* sp. nov.

An erect to ascending bushy species, 50-100 cm. high and having a spread of about 2 m. when fully grown; joints broadly obovate, about 15-16 × 20-22 cm., yellowish green with little or no bloom, raised at areoles, smooth; areoles large, prominent, broadly obovate, 5-6 mm. long on edges of joints, slightly smaller on sides, enlarging in size to subcircular, and often 8-10 mm. in diameter, dark brown; spicules yellow with some brown mottling, scattered throughout the areole, but more numerous above and on edges of areole, giving general impression of being scattered, divergent, 5-7 mm. long, increasing in age to 10 mm. in length and filling entire areole; spines at first porrect but soon bent downward parallel with sides of joint, and commonly tightly recurved on edges, one or two, mostly one on sides and two or three on edges at one year of age, increasing in numbers in age to six to ten, and all sloping down to tightly recurved, 3.5 cm. long at one year old but becoming 5 cm. in age, yellow, with or without brighter brown bases, more or less flattened; flowers deep yellow with blushes of red, filaments greenish below and tinged with red above, style red below and fading upward, stigma dark green, eight- to ten-parted, bud pointed, dull, light reddish, with touches

of dull, olive-green; fruit purplish red throughout, bearing light, tawny areoles 2-3 mm. in diameter, and spicules of same nature as those of the stem, 3-5 mm. long, fugacious spines being only slightly longer and consequently scarcely distinguishable from the spicules, umbilicus broad, nearly flat, pulp small in amount, acid, and not palatable, simply obovate to pyriform, about $3-3.5 \times 4-5$ cm.; seeds small.

The species inhabits the dry, gravelly hills in the vicinity of Laredo, Texas, where it was collected in June, 1911, under my inventory number 10301. It is rather common and easily recognized in vegetative condition by the nature of its spines. The first collections were made in 1908 but the living material of this was lost at both San Antonio and Brownsville, Texas. Mature plants have been grown from the type collection, however, at Chico, California.

✓ *Opuntia curvospina* sp. nov.

An erect arborescent species, growing into a symmetrical tree form 5-8 feet high, having a distinct cylindrical trunk and a symmetrical, rounded top; joints subcircular, about 8-22 cm. in diameter, smooth, scarcely at all raised at areoles after the first year, glaucous-gray-green, yellowish-green in age; areoles large, prominent, at first light-brown but dark-brown second year, obovate, on edges of joints 5 mm. long, enlarging in age to sub-circular and 5-8 mm. in diameter; spicules yellow, irregular in length on edges of joints, about 3 mm. long in upper part and 5-8 mm. on lower edges of areole, making a nearly complete zone around the central, prominent wool, not increasing perceptibly in age for the wool develops rapidly into a columnar structure bounded by the marginal spicules and protrudes often 1 mm. or more above them; spines numerous, formidable, on second year's wood about six, four of which are yellow, often slightly tinted at base, the other two shorter, white or nearly so, diverging or bent in all directions, the four yellow centrals 4-5 cm. long, flattened, annular, twisted, bent, and curving in various directions, in age increasing to eight or more and formidable; flowers yellow, 6-7 cm. in diameter with a little dull red at the bases of the mid-ribs, and developing a little more red in center as the day advances but never becoming prominently red-centered, petals cuneiform, broadly rounded, cuspidate above, filaments yellow, style white, stigma white, large, slightly flattened, nine- or ten-parted, buds light gray-green with blush of red, uniformly distributed in upper portions of sepals; fruit dull red on outside with abundant bloom,

rind greenish, and pulp nearly colorless, oval in outline, 3.5-4 × 4.5-5.5 cm., slightly to deeply pitted, areoles tawny, subcircular, with prominent wool 1-2 mm. in diameter, spicules yellow, 1-2 mm. long, fugacious spines, delicate, 10 cm. long. [PLATE 2.]

This species is more closely related to *O. chlorotica* Engelm. & Bigel. (PLATE 3) than any other described, but it is a larger, more robust plant throughout and possesses very different spination. The seeds and the fruits are also quite different. It is apparently quite widely distributed in the California-Nevada-Arizona Desert. The type was collected between Nipton, California, and Searchlight, Nevada, in April, 1912, under my inventory number 10530, when young plants were transferred into cultivation and are still growing, slowly but vigorously.

✓ *Opuntia semispinosa* sp. nov.

An erect shrub 1-1.5 m. high and having a spread under normal conditions of 2 m. or more, either open or compactly branched, growing mostly in thickets but occasionally isolated individuals; joints obovate, mostly pointed above and below, about 12 × 25 cm., dark green with a little bloom; areoles broadly obovate to subcircular, 5 mm. in length, enlarging to subcircular or even transversely elongated and often 6-8 mm. in diameter, dirty tawny-gray but a lighter tawny with prominent wool when young; leaves subulate, terete, cuspidate, reddish tipped, 8-10 mm. long; spicules yellow, numerous, formidable, occupying one half of areole, very unequal, the upper crescentic, compact, first developed tuft 4 mm. long, the others below more scattering towards center of areole 1 cm. long, continuing to increase with age, especially in numbers; spines white and some of the more central larger ones brownish tinged at base, tips yellowish or simply translucent-bonelike, some flattened, angular, twisted, at one or two years very faintly when at all annular, usually no trace of annulation; flowers 6-7 cm. in diameter, yellow with tinge of red in the upper part of ribs making them appear a trifle deep-yellow to orange in the upper part of the ribs and lighter-greenish tinged in center, filaments yellow, greenish at very base, style light-red, very large, sometimes 1 cm. in diameter at the largest point, stigma light green, eight- to ten-parted, buds light olive with a tinge of red in the tip, the outer sepals being mostly recurved in bud; fruit purplish red throughout, about 34 × 50 mm., obovate with broad, nearly flat umbilicus, areoles large, 3-4 mm. in diameter with prominent tawny wool; spicules yellow, about 2 mm. long, fugacious spines, conspicuous, numerous, 4-12 mm.

long and often ten to twelve in number, yellow or often with brownish zone toward the apex.

This is a common, conspicuous species in the coastal region of California and is likely to be confused on the one hand with *O. occidentalis* Engelm. & Bigel., which has similar joints but is quite a different plant growing farther inland, and on the other hand with *O. littoralis* (Engelm.) B. & R., which has more subcircular joints and more yellowish translucent spines. The species is very interesting inasmuch as it often has many joints or portions of joints practically destitute of spines, while neighboring areoles are normally spiny. The plant has been in cultivation with me since 1904. The spineless characteristic of a portion of the plant body is exceedingly interesting and it was thought for a time that it might prove of economic value, but vegetative propagation made every year or two since that time has failed to produce any marked change in the degree of spinelessness which the plant bears in nature. In four generations grown vegetatively from single joint cuttings no increase in spineless area was observable at either San Antonio or Brownsville.

Several collections have been made of the species between Santa Barbara and Tija Juana but my inventory number 10353 is designated as the type. It was collected at San Pedro, California, September 22, 1911, and is a plant showing very little of the spineless variation.

✓ *Opuntia pyrocarpa* sp. nov.

An ascending-spreading, shrubby species 60 cm. high and having a spread of 2 m. or more when full grown, the main branches commonly resting on their edges at base and ascending at their extremities; joints large, nearly as broad as long, about 22×25 cm. but contracted below into a very short but mostly evident stipitate base, medium green with considerable bloom; areoles long, obovate, not raised after the first season, about 6 mm. in length, brown, enlarging to subcircular in age; spicules brown, in a compact tuft 4 mm. long occupying the upper two-thirds of the areole and filling it in age; spines porrect, divergent, but mostly sloping down in age, one to three, mostly one or two, yellowish distally and gradually darkening to rather bright, light-brown proximally, the lower one-third of the joint unarmed, flattened, twisted, 3-4 cm. long; flowers 8 cm. in diameter,

yellow with light-red centers, filaments yellow, style white, stigma light-green, large, coarse, nine- to ten-parted, buds pointed, light greenish-red with color equally distributed through entire scale but their margins lighter, petals broad, pointed above and below and widest slightly above the middle, about 4×5.5 cm., irregularly toothed or even cleft; fruit long, pyriform, burnt carmine with a decidedly purple tinge, same color in interior, spicules brownish but usually with yellowish tips, unequal, surrounded by the end of the gray wool, also having one to three fugacious spines in lower part of areole 5-6 mm. long.

The species is delimited by its large, broad, stipitate joints, long pyriform fruits, large flowers with broad-pointed petals. The type was collected near Marble Falls, Texas, in July, 1908, under my collection number 9392 and has been grown to maturity from cuttings at Chico, California.

Opuntia squarrosa sp. nov.

A bushy, hemispherical shrub 1 m. high and 2 m. in diameter; joints subcircular, raised at areoles even the second year and pronouncedly so the first, deep blue-green with an abundant gray bloom turning more yellowish with age; leaves backward-curved and standing almost at right angles to the surface, subulate, cuspidate, 6 mm. long, slightly flattened; areoles broadly obovate, subcircular in age, dark dull-brown, 6 mm. long, becoming dirty gray-black; spicules very prominent, dark brown, spreading, scattered through nearly the entire areole, their tips slightly yellow, often 8-10 mm. long; spines variable in color, mostly yellowish distally and brown at base, mostly one or two, porrect, 1-2 cm. long, flattened, often twisted; flowers very large and showy, 9-10 cm. in diameter, their centers bright purple fading to yellow at margins, the backs of the petals orange, filaments tinged a little above, apex of style also tinted slightly, stigma light-green, eight-parted; buds light green, pointed with thick, heavy, recurved, prominent outer segments making the bud appear squarrose; fruit purplish red throughout.

The species is frequently met with in the lower Delta region of the Rio Grande in Mexico. It has not been reported from the United States but it probably occurs in the region of Brownsville. It is easily distinguished from other species of the Delta region by its blue-green color, brown spicules and spines, and large, striking flowers. The type was collected under my inventory number 9981 in April, 1910, about 12 leagues south of Matamoros, Mexico.

✓ *Opuntia anahuacensis* sp. nov.

A glossy, yellowish green, low, reclining to prostrate species, 45–50 cm. high and having a spread of 1.5 m.; joints obovate, thin, 13×27 cm., commonly bent over and more or less dished the second year, apex sharply rounded and base more or less stipitate; areoles obovate, at first light brown then dirty gray-black, upper half armed, enlarging in age and becoming sub-circular; spicules yellow, in a compact connivent tuft occupying one-half to two-thirds of the upper part of areole, about 2 mm. long, becoming more numerous in age and often 8 mm. in length; spines yellow, becoming white tardily, one or two porrect, 2–3 cm. long, flattened, twisted, the shorter lower two often recurved and only 1 cm. long; flowers canary-yellow, turning slightly darker yellow toward close of day; filaments yellow, style white, stigma white, six-parted; buds light bright-green with only a tinge of red in the upper part of the tardily recurved sepals; fruit deep, dark-purplish-red throughout, pyriform, about 4×7.5 cm., deeply pitted; spicules yellow, usually 2 mm. long or less, fugacious spines, mostly merging into the spicules on the one hand and becoming 6–8 mm. long on the other, two to four in number.

The species is characterized by its glossy yellowish green coloration and size and shape of its fruit. It is known to us only from a single collection made by Mr. C. B. Allaire near Anahuac, Texas, at the mouth of the Trinity River in Texas. My inventory number 9217 was assigned to it and it has been grown since at Chico, California, under this same number.

U. S. DEPARTMENT OF AGRICULTURE

Explanation of plates 2 and 3

PLATE 2

OPUNTIA CURVOSPINA Griffiths

Terminal joints and two ripe fruits, a little more than one third natural size, cultivated at Chico, California.

PLATE 3

OPUNTIA CHLOROTICA Engelm. & Bigel.

Terminal joints, about half natural size, three sevenths natural size, cultivated at Chico, California.