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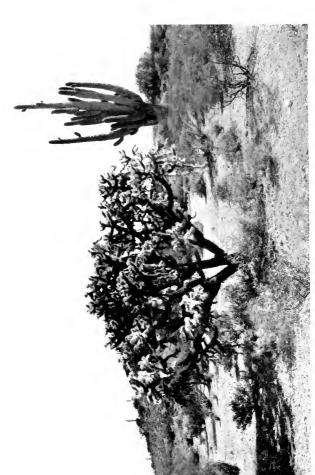












A Cactus Desert in Arizona. Photograph by D. T. McDougal.

# THE CACTACEAE

# DESCRIPTIONS AND ILLUSTRATIONS OF PLANTS OF THE CACTUS FAMILY

BY

N. L. BRITTON AND J. N. ROSE

VOLUME I



THE CARNEGIE INSTITUTION OF WASHINGTON
WASHINGTON, 1919

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# THE CACTACEAE

Descriptions and Illustrations of Plants of the Cactus Family

# THE CACTACEAE

# INTRODUCTION.

The writers began field, greenhouse, and herbarium studies of the Cactaceae in 1904 and in the years following they made studies and collections over wide areas in the United States, Mexico, and the West Indies. It was first intended that these should be followed by a general description of the North American species only, but a plan for a more complete investigation of the family was proposed by Dr. D. T. MacDougal in January 1911. This was approved by the trustees of the Carnegie Institution of Washington at its next regular meeting and a grant was made to cover the expenses of such an investigation. Dr. Rose was given temporary leave of absence from his position as Associate Curator in charge of the Division of Plants, United States National Museum, and became a Research Associate in the Carnegie Institution of Washington, with William R. Fitch and Paul G. Russell as assistants; Dr. Britton, Director-in-Chief of the New York Botanical Garden, was appointed an honorary Research Associate, while R. S. Williams, of the New York Botanical Garden, was detailed to select and preserve the specimens for illustration. Work under this new arrangement was begun January 15, 1912, and thus several lines of investigation were undertaken in a comprehensive way.

- 1. Reexamination of type specimens and of all original descriptions: This was necessary because descriptions had been incorrectly interpreted, plants had been wrongly identified, and the errors perpetuated; thus the published geographical distribution of many species was faulty and conclusions based on such data were unreliable. Not only had specific names been transferred to plants to which they did not belong, but generic names were interchanged and the laws of priority ignored. Many valid species, too, had dropped out of collections and out of current literature and had to be restored.
- 2. Assembling of large collections for greenhouse and herbarium use: Extensive greenhouse facilities were furnished by the New York Botanical Garden and the United States Department of Agriculture, while the herbaria and libraries of the United States National Museum and of the New York Botanical Garden furnished the bases for the researches. The New York Botanical Garden has also cooperated in contributing funds in aid of the field operations, in clerical work, and a large number of the illustrations used have been made there, the paintings and line drawings mostly by Miss Mary E. Eaton.
- 3. Extensive field operations in the arid parts of both Americas: Many of these deserts are almost inaccessible, while the plants are bulky and if not handled carefully are easily destroyed. Many plants require several years to mature, in some cases many years to flower in cultivation. Through these explorations were obtained the living material for the greenhouse collections and for exchange purposes, as well as herbarium material for permanent preservation. Of much importance, also, were field observations upon the plants as individuals, their form, habit, habitat, and their relations to other species.

Early in 1912 Dr. Rose went to Europe to study the collections there and to arrange for exchanges with various botanical institutions having collections of these plants. He spent considerable time at London, mainly at the Royal Botanic Gardens, Kew, where through the courtesy of the Director, Sir David Prain, he was able to examine the greenhouse, illustrative, and herbarium material for which this institution has long been famed. The collection at the British Museum of Natural History and that of the Linnaean Society of London were examined. At Paris he studied the collections at the Natural History Museum, many of which have historic interest; one of his interesting discoveries there was that the Pereskia bleo, collected by Baron Friedrich Alexander von Humboldt in Colombia, is a very different species from the plant which for nearly a century has been passing in our collections and literature under that name. He also visited the famous botanical garden of the late Sir Thomas Hanbury, at La Mortola, Italy, and through the courtesy of Lady Hanbury was given every possible facility for the study of this collection; Mr. Alwin Berger, who was then curator in charge, had brought together one of the most extensive representations of this family to be found growing in the open in any place in the world. Here in the delightful climate of the Riviera were grown many species which were apparently just as much at home as they would have been in their desert habitats. Dr. Rose also visited Rome, Naples, Venice, and Florence, where he saw smaller collections in parks and private gardens. At Munich he examined certain types in the Royal Botanical Museum, then under the charge of Dr. L. Radlkofer, and saw some interesting species in the Royal Botanical Garden then being organized by Dr. K. Goebel. At Berlin he examined the herbarium and living specimens in the Berlin Botanical Garden, through the courtesy of Dr. A. Engler, and the West Indian collection through the courtesy of Dr. I. Urban. He then went to Halle and saw L. Quehl's collection of mammillarias; to Erfurt, where he saw the Haage and Schmidt, and Haage Jr. collections; to Darmstadt to see the Botanical Garden under Dr. J. A. Purpus; and to Antwerp to see DeLaet's private collection.

In 1913 Dr. Britton and Dr. Rose visited the West Indies. Dr. Britton, who was accompanied by Mrs. E. G. Britton, Miss D. W. Marble, and Dr. J. A. Shafer, collected on St. Thomas and the other Virgin Islands, Porto Rico, and Curacao. At the latter island he rediscovered the very rare *Cactus mammillaris*, which had not been in cultivation for many years. Dr. Rose, who was accompanied by William R. Fitch and Paul G. Russell, also stopped at St. Thomas, and collected on St. Croix, St. Christopher, Antigua, and Santo Domingo.

In 1914 and 1915 Dr. Britton again visited Porto Rico and, assisted by Mr. John F. Cowell and Mr. Stewardson Brown, explored the entire southwestern arid coast and the small islands Desecheo, Mona, and Muertos.

In 1914 Dr. Rose went to the west coast of South America, making short stops at Jamaica and Panama. He made extensive collections in central and southern Peru, central Bolivia, and northern and central Chile. At Santiago, Chile, he examined a number of Philippi's types in the National Museum and obtained some rare specimens from the Botanical Garden through the courtesy of Johannes Sohrens.

In 1915 Dr. Rose, acompanied by Paul G. Russell, visited Brazil and Argentina on the east coast of South America, collecting extensively in the semiarid parts of Bahia, Brazil, and in the region about Rio de Janeiro, so rich in epiphytic cacti. In the deserts about Mendoza and Córdoba, in Argentina, collections were also made. Here he also arranged for exchanges with the leading botanists and collectors. The following persons have made valuable contributions from the regions visited: Dr. Leo Zehntner, Joazeiro, Brazil; Dr. Alberto Lofgren, Rio de Janeiro, Brazil; Dr. Carlos Spegazzini, La Plata, Argentina; Dr. Cristóbal M. Hicken, Buenos Aires, Argentina; and Dr. Carlos S. Reed, Mendoza, Argentina.

In October and November 1916, Dr. Rose, accompanied by Mrs. Rose, visited Curacao and Venezuela, studying especially the cactus deserts about La Guaira and Puerto Cabello. A number of photographs were taken by Mrs. Rose.

While *en route* for Venezuela, arrangements were made with Mr. Harold G. Foss to make a collection of cacti at Coro, Venezuela. Among the specimens obtained were species not found farther east in Venezuela, so far as known.

In 1916 Dr. Britton, assisted by Mr. Percy Wilson, studied the cacti of Havana and Matanzas Provinces and those of the Isle of Pines, Cuba.

In 1918 Dr. Rose, assisted by George Rose, visited Ecuador on behalf of the United States Department of Agriculture, aided by the Gray Herbarium of Harvard University and the New York Botanical Garden; about thirty rare or little-known species were obtained.

Through the expenditure of about \$2,400, contributed by Dr. Britton, a very important collection of cacti was made by Dr. J. A. Shafer during a six months' exploration from November 1916 to April 1917 of the desert regions of northwestern Argentina, southeastern Bolivia, northeastern Argentina, and adjacent Uruguay and Paraguay. Fortunately, for the purposes of this work, this collection was brought back to New York by Dr. Shafer in time for the information yielded by it and by his field observations to be used in the manuscript. It has given us first-hand information concerning over 120 species of cacti as to which we have previously known little.

There are still a few cactus regions which ought to be explored, but the following summary will show the wide field from which we have obtained information.

Our field investigations have covered practically all the cactus deserts of Mexico. The most important of these are the vicinities of Tehuacán and Tomellín, the plains of San Luis Potosí, the chalky hills surrounding Ixmiquilpan, the lava fields in the Valley of Mexico and above Cuernavaca, the deserts of Querétaro, the west coast of Mexico extending from the United States border to Acaponeta, and the seacoast and islands of Lower California, other regions in Mexico containing cacti, but not in such great abundance as the foregoing, are those about Pachuca, Oaxaca City, Mitla, Jalapa, Iguala, Chihuahua City, and Guadalajara. All the work in Mexico, however, was done prior to 1912, for, owing to political disturbances, no field work there has been feasible since that time.

In the United States our work has extended over the cactus regions of Florida, Texas, New Mexico, Arizona, southern California, western Kansas, and southeastern Colorado.

In the West Indies we have explored all of the Greater Antilles, the Bahamas, the Virgin Islands, St. Christopher, Antigua, Barbados, and Curacao.

In South America our field study included the most important deserts of Peru, Bolivia, and Chile, and parts of Brazil, Venezuela, Ecuador, and Argentina. The cactus deserts of South America are so extensive and so remote from one another that it was possible to visit only a part of them in the four seasons allowed for their exploration.

Among many enthusiastic volunteers whose contributions of specimens and data have greatly supplemented our own collections and field studies, the following deserve especial mention:

Mr. Henry Pittier has made valuable sendings from Colombia, Venezuela, Panama, Costa Rica, and Mexico; Mr. O. F. Cook, from Guatemala and Peru; Mr. G. N. Collins, the late Federico Eichlam, Mr. R. H. Peters, Mr. C. C. Deam, Mrs. T. D. A. Cockerell, Baron H. von Turckheim, and the late Professor W. A. Kellerman have sent important collections from Guatemala; Mr. A. Tonduz, Mr. Otón Jiménez, Dr. A. Alfaro, Mr. C. Wercklé, and Mr. Alfred Brade, local collectors and naturalists in Costa Rica, have sent much good material from their country; Mr. William R. Maxon has sent new and rare material from Costa Rica, Guatemala, and Cuba; Professor C. Conzatti and his son, Professor Hugo Conzatti, Dr. C. A. Purpus, Dr. Elswood Chaffey, Mrs. Irene Vera, M. Albert de Lautreppe, and the late Mr. E. A. H. Tays have sent us many interesting specimens from Mexico; Mr. W. E. Safford made a valuable collection in Mexico in 1907; E. W. Nelson and E. A. Goldman, who have collected so extensively in Mexico and the Southwest, have obtained many herbarium and living specimens for our use; Mrs. Gaillard, who lived at Panama several years while the late Colonel D. D. Gaillard was a member of the Isthmian Canal Commission, collected interesting cacti, including Epiphyllum gaillardae; the late Dr. H. E. Hasse sent specimens from southern California and Arizona; C. R. Orcutt, the well-known cactus fancier, has aided us in many ways besides sending us specimens from his collections; Dr. R. E. Kunze has frequently sent specimens, especially from Arizona; General Timothy E. Wilcox, for whom Wilcoxia was named, has sent us specimens from the Southwest, while his son, Dr. G. B. Wilcox, contributed several sendings from the west coast of Mexico and Guatemala; Dr. D. T. MacDougal has sent many specimens from all over the Southwest, especially from Mexico, Arizona, and southern California; he has made several excursions into remote deserts, which have yielded interesting results, and has contributed many excellent photographs, quite a number of which are reproduced in this report (Plate 1, etc.). Professor F. E. Lloyd, while located in Arizona and in Zacatecas, Mexico, made large collections of living, herbarium, and formalin material, often accompanied by valuable field notes, sketches, and photographs. Dr. Forrest Shreve has sent specimens, especially from northern Arizona and Mr. W. H. Long from New Mexico; Mr. S. B. Parish and Mr. W. T. Schaller have furnished interesting specimens and valuable notes on southern California species; Professor J. J. Thornber has made valuable contributions of material and notes from Arizona; Mr. M. E. Jones, Mr. I. Tidestrom, Mr. Thomas H.

Kearney, and Professor A. O. Garrett have all sent specimens from Utah; Professor T. D. A. Cockerell and Mr. Merritt Cary have sent specimens from Colorado; Dr. P. A. Rydberg has brought many specimens from the Rocky Mountain region; Messrs. Paul C. Standley, E. O. Wooton, Vernon Bailey, and H. L. Shantz have sent specimens from the southwestern United States; Brother Leon, of the Colegio de la Salle, Havana, and Dr. Juan T. Roig, of the Estacion Agronomica, Santiago de las Vegas, Cuba, have contributed Cuban specimens, and Dr. J. A. Shafer has collected widely in Cuba; Mr. William Harris, of Hope Gardens, Jamaica, has collected for us in Jamaica; Dr. John K. Small has obtained collections from nearly all over the southeastern United States, aided by Mr. Charles Deering. Dr. Henry H. Rusby and Dr. Francis W. Pennell have contributed plants and specimens from Colombia, collected in 1917 and 1918. Mr. Frederick V. Coville, of the United States Department of Agriculture, has made many valuable suggestions during the progress of the investigation.

In our studies we have also had use of the cacti of the following American collections: Herbarium of the Missouri Botanical Garden at St. Louis; the Gray Herbarium of Harvard University; the Rocky Mountain Herbarium at Laramie, Wyoming; the collection of the United States Department of Agriculture; the herbarium of the University of California, especially the Brandegee collection; and

the herbarium of the Field Museum of Natural History.

The types of the new species described in this work are deposited in the herbaria of the New York Botanical Garden and the United States National Museum, unless otherwise indicated.

In greenhouse collections many kinds of cacti grow very slowly, and flower only after many years' cultivation. We have a number of plants of this kind from various parts of America. It is hoped that some of them may bloom during the period of publication of this book and thus enable us to include them in an appendix.



Fig. 1.-Pereskia pereskia. Grown as a hedge.

#### Order CACTALES.

Perennial, succulent plants, various in habit, mostly very spiny, characterized by specialized organs termed areoles. Leaves usually none, except in Pereskia and Pereskiopsis, where they are large and flat but fleshy, and in Opinitia and its relatives, where they are usually much reduced and mostly caducous, terete, or subulate. Spines very various in size, form, arrangement, and color, sometimes with definite sheaths. The areoles are peculiar and complex organs, situated in the axils of leaves when leaves are present, and bearing the branches, flowers, spines, glochids, hairs, or glands; in some genera two kinds of areoles occur, either distinct or united by a groove. Flowers usually perfect, either regular or irregular, usually solitary but sometimes clustered, sometimes borne in a specialized terminal dense inflorescence called a cephalium; perianth-tube none, or large and long, the limb spreading or erect, short or elongated, the lobes few or numerous, often intergrading in shape and color, but sometimes sharply differentiated into sepals and petals; stamens commonly numerous, elongated or short, sometimes clustered in series, the filaments usually borne on the throat of the perianth, the small oblong anthers 2-celled; style one, terminal, short or elongated; stigma-lones 2 to many, usually slender; ovary 1-celled, distinct, or immersed in a branch or forming a part of a branch; ovules numerous. Fruit a berry, often juicy and sometimes edible, sometimes dry, in one species described as capsular and dehiscing by an operculum, in others opening by a basal pore. Seeds various; cotyledons two, accumbent, sometimes minute knobs, often broad or elongated; endospern little or copious; radicle terete.

The order consists of the following family only:

Family CACTACEAE Lindley, Nat. Syst. ed. 2.53. 1836.

Characters of the order as given above. The family is composed of three tribes.

# KEY TO TRIBES.

	1. Pereskieae
Leaves (except in Pereskiopsis) terete or subterete, usually small, often wanting on the vegetative paris;	
flowers sessile.	
Areoles with glochids (except in Mahnenia); vegetative parts bearing leaves, which are usually	
small and fugacious; flowers rotate (petals erect in Nopalea)	2. Opuntieae
Areoles without glochids; usually no leaves on the vegetative parts (except cotyledonary); flowers	
with definite tubes (except Rhipsalis)	3. Cereene

#### Tribe 1. PERESKIEAE.

Stems and foliage as in other dicotyledonous plants; inflorescence in some species compound; flowers more or less stalked, their parts all distinct; glochids wanting; ovule with short funicle; testa of seed thin, brittle.

The genus *Pereskia*, the only representative of this tribe, is, on account of its similarity to other woody flowering plants, considered the nearest cactus relative to the other families, but this relationship is in all cases remote.

The nearest generic relatives of *Pereskia* in the cactus family are doubtless the following: *Pereskiopsis*, some of whose species were first assigned to the genus *Pereskia*, but they have different foliage and the areoles often bear glochids.

Opuntia, whose species have leaves, though much reduced and usually caducous, otherwise very different; but some of the species of Opuntia were first referred to Pereskia.

Mailbuenia (two of whose species have only recently been taken out of Pereskia), whose seeds are similar but the areoles lack glochids, otherwise very different.

This tribe has a wide geographic distribution, but is found wild only in the tropics.

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1. PERESKIA (Plumier) Miller, Gard. Dict. Abr. ed. 4. 1754.
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Leafy trees, shrubs, or sometimes clambering vines, branching and resembling other woody plants: spines in pairs or in clusters in the axils of the leaves, neither sheathed nor barbed; glochids (found only in the Opunticae) wanting; leaves afternate, broad, flat, deciduous, or somewhat fleshy; flowers solitary, corymbose, or in panicles, terminal or axillary, wheel-shaped; stamens numerous; style single; stigma-lobes linear; seeds black, glossy, with a brittle shell, the embryo strongly curved; the cotyledons leafy; seedlings without spines.

PERESKIA. 9

Type species: Cactus pereskia Linnaeus.

In 1898 about 25 names had been proposed in *Pereskia*, but, in his monograph published that year, Karl Schumann accepted only 11 species. Several new ones have been proposed since the publication of Schumann's monograph.

The species are native in Mexico, the West Indies, Central America, and South America. Some of the species are much used as stocks for growing the various forms of Zygocactus, Epiphyllum, and other cacti requiring this treatment; P. pereskia is most used and P. grandifolia next. Several species are widely cultivated as ornamentals in tropical regions; they do not flower freely under glass in northern latitudes. All species studied by us in the living state grow readily from cuttings.

The typical species seems to have been first introduced into Europe from the West Indies in the latter part of the sixteenth century. A straight-spined species was first described and figured by L. Plukenet in 1696, who called it a portulaca, and the next year by Commerson as an apple (Madus). In 1703 C. Plumier described the genus Pereskia, basing it upon a single species. The genus was repeatedly recognized by Linnaeus in his earlier publications, and by some pre-Linnaean botanists, but in 1753 Linnaeus merged it into Cactus along with a number of other old and well-established genera; but it was retained by Philip Miller in 1754 in the fourth edition (abridged) of his Gardeners' Dictionary and has since been generally recognized as a genus by botanical and horticultural authors.

The name is variously spelled *Peirescia*, *Peireskia*, *Perescia*, and *Pereskia*. Named for Nicholas Claude Fabry de Peiresc (1580-1637).

#### KEY TO SPECIES.

Climbing vines, the twigs with a short pair of reflexed spines from each areole, the stem with acicular spines (Series 1, Typicae)	1	P bereckis
Shrub or trees with slender straight spines (Series 2. Grandifoliae).  Petals toothed or fimbriate.		peresana
Petals somewhat toothed	2.	P. autumnalis
Species from Mexico: ovary turbinate	3. 4.	P. lychnidiflora P. nicoyana
Branches and leaves very easily detached Branches and leaves not easily detached. Axils of sepals bearing long hars and bristles.	5.	P. zehntneri
Leaves lanceolate. Leaves orbicular		
Axils of sepals not bearing long hair and bristles.  Flowers white.  Flowers not white.	8.	P. weberiana
Petals yellow.  Leaves lanceolate to oblong or obovate  Leaves orbicular or broadly ovate	9. 10.	P. guamacho P. colomhiana
Petals red or purple.  Spines few or none  Very spiny, at least on old branches.	11.	P. tampicana
Flowers terminal. Flowers panicled. Fruit naked, broadly truncate.	1.7	P Man
Fruit leaf-bearing, not truncate.		
Flowers solitary	14.	P. babiensis P. grandifolia P. zinniaeflora
Flowers usually axillary and solitary.  Leaves 1 cm. long or longer, obtuse or acute.		
Flowers 2 to 5 together, I cm. long; South American species Flowers solitary, 1.5 cm. long; petals elliptic-oboyate; Cuban		P. horrida
species Leaves emarginate, 1 cm. long or less, petals oboyate		P. cal ensis P. portalacifolia
Affinity unknown		P. conzuttii

#### Series 1. TYPICAE.

Consists of only the typical species, which is widely distributed, and much cultivated throughout tropical America. Schumann regarded it as a subgenus under the name Eupereskia.

1. Pereskia pereskia (Linnaeus) Karsten, Deutsch. Flora 888. 1882.

Cactio perebit Linnaeus, Sp. Pl. 469, 1753.

Perebit audicat Miller, Gard. Dice, ed. 8, 1768.
Cactio Incidus Salisbury, Prodt. 349, 1796.
Pere bit alongo pina Haworth, Sp. Pl. Succ., 178, 1812.
Pere bit alongo pina Haworth, Sp. Pl. Succ., 178, 1812.
Pere bit pinguan, Lemaite, Hort, Univ., 2:40, 1841.
Perebit pinguan, Lemaite, Hort, Univ., 2:40, 1841.
Perebit pindulata Lemaite, Illiustr, Hort, Sr. Mist, 11, 1858.
Perebit pintun Spegazzini in Weingatt, Monatschr, Kalteenk, 14:134. 1904.
Perebit godinijana Sander, Gard. Chron, Ill. 13:257, 1908.

Shrub, at first erect, but the branches often long, clambering, and forming vines 3 to 10 meters long; spines on lower part of stem solitary or 2 or 3 together, slender and straight; spines in the axils of the leaves paired, tarely in threes, short, recurved; leaves short-perioled, lanceolate to obliong, or ovate, short-acuminate at the apex, tapering or rounded at base, 7 cm. long or less; flowers in panicles or corymbs, white, pale yellow, or pinkish, 2.5 to 4.5 cm. broad; ovary leafy and often spiny; fruit light yellow, 1.5 to 2 cm. in diameter, when mature quite smooth; seeds black, somewhat flattened, 4 to 5 mm. in diameter; hilum basal, circular, depressed, or crater-shaped.

The plant and fruit have several common names, one of which, blade apple, was in use as early as 1697. Lemon vine, Barbados gooseberry, and West Indian gooseberry are three others, with various French and Dutch modifications. In Argentina it is called sacharosa, according to Sir Joseph Hooker (Curtis's Bor. Mag. 116: pl. 7147), but this name is properly applied only to the *P. sacharosa* of Grisebach, native of Argentina, a distinct species, which Hooker thought identical with this.

The berries are eaten throughout the West Indies and the leaves are used as a pot herb in Brazil. The species was in cultivation in the Royal Gardens of Hampton Court in 1696 and has been at Kew ever since its establishment in 1760, but did not flower until 1889. In Washington we have one plant among a dozen which flowers abundantly each year; three plants at New York bloom annually.

In tropical America the plant climbs over walls, rocks, and trees, and at flowering time is covered with showy, fragrant blossoms, followed by beautiful clusters of yellow berries. In La Plata it is grown sometimes for hedges (see fig. 1), but its strong, almost offensive odor makes it objectionable for growing near habitations.

Type locality: Tropical America.

Distribution: West Indies and along the east and north coasts of South America; found also in Florida and Mexico, but perhaps only as an escape; widely grown for its fruit.

This species consists of several races, differing in shape and size of the leaves and in color of the flowers. One of these races, with ovate-orbicular leaves rounded at the base, had heretofore been known to us only in cultivation, but in October 1916, while collecting in Venezuela, Dr. Rose found this broad-leafed form common in the coastal thickets near Puerto Cabello.

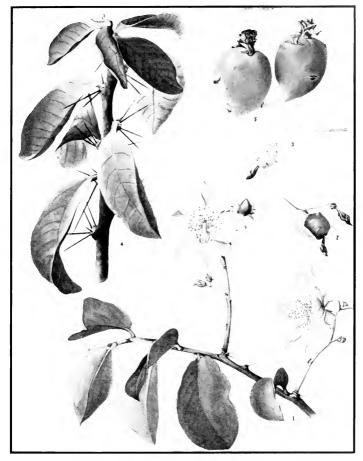
Pereskia lanceolata (Forster, Handb. Cact. 513. 1846), P. acardia Parmentier (Pfeiffer, Enum. Cact. 176. 1837), and P. brasiliensis Pfeiffer (Enum. Cact. 176. 1837), usually referred as synonyms of P. aculeata, were not formally published in the places above cited.

The following varieties, based on the shape of the leaves, are recorded under *P. aculeata: lanceolata* Pfeiffer (Enum. Cact. 176. 1837); *latifolia* Salm-Dyck (Hort. Dyck. 202. 1834, name only); *rotundifolia* Pfeiffer (Enum. Cact. 176. 1837); *rotunda* (Suppl. Dict. Gard. Nicholson 589. 1901) is perhaps the same as *rotundifolia*.

Pereskia aculeata rubescens Pfeiffer (Enum. Cact. 176. 1837) is described with glaucousgreen leaves above, tinged with red beneath.

Near the last belongs *Pereskia godseffiana*, described as a sport in the Gardeners' Chronicle in 1908. It is a very attractive greenhouse plant, often forming a round, densely branched bush, but is sometimes grown as a climber, as a basket plant, or in the form

BRITTON AND ROSE PLATE II



- Flowering branch of Pereskia pereskia.
   Fruits of the same.
- 4. Leafy branch of Pereskia sacharosa.
- 5. Proliferous fruit of the same.

(All 2 3 natural size.)



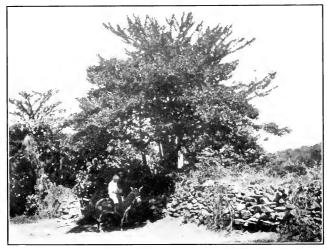
PERESKIA. 11

of a pyramid. It is especially distinguished by the rich coloration of the leaves, which are variously mottled or blotched above with crimson, apricot-yellow, and green, but of a uniform purplish crimson beneath. We have seen this form in the New York Botanical Garden, where it is grown only as a bush. It was exhibited first at Ghent, Belgium, in 1908, and is supposed to have originated in Queensland, Australia.

Pereskia longispina rubescens Pfeiffer and P. longispina rotundifolia Salm-Dyck were given by Walpers (Repert. Bot. 2: 283. 1843) as synonyms of P. aculeata, but they were not

described.

Illustrations: Stand. Cycl. Hort. Bailey 5: pl. 87; Blühende Kakteen 2: pl. 86; Bot. Reg. 23: pl. 1928; Curtis's Bot. Mag. 116: pl. 7147; Gard. Chron. III. 29: f. 61; Plumier, Nov. Pl. Amer. pl. 26, in part; Safford, Ann. Rep. Smiths. Inst. 1908: f. 10; Schumann, Gesamtb.



Ftg. 2 .-- Pereskia autumnalis.

Kakteen f. 109; Garten-Zeitung 4: 182. f. 42. No. 5; Gard. Chron. III, 20: f. 108; Stand Cycl. Hort. Bailey 2: f. 714, all as *P. aculeata*. Descourtilz, Fl. Med. Antill. ed. 2. 4: pl. 294, as Cactier a Fruits Feuilles; Vellozo, Fl. Flum. 5: pl. 26; London, Encycl. Pl. ed. 3.413, as Cactus pereskia; Gard. Chron. III. 43: f. 114; Mollers Deutsche Gart. Zeit. 23: 256. f. 15, as *P. godseffiana*.

Plate II, figure 1, of this volume is a flowering branch of a plant at the New York Botanical Garden obtained from M. Simon, of St. Ouen, Paris, France, in 1901; figure 2, fruit of same plant; figure 3, fruit of another plant. Text-figure 1, from a photograph taken by Paul G. Russell at La Plata, Argentina, in September 1915, shows the plant used as a hedge.

Series 2. GRANDIFOLIAE.

In this series we include 18 species, all tropical American, both continental and insular. Schumann. regarding the series as a subgenus, applied to it the name Ahoplocarpus.

Pereskia autumnalis (Eichlam) Rose, Contr. U. S. Nat. Herb. 12:339. 1909.
 Pereskiopsis autumnalis Eichlam, Monatsschr. Kakteenk. 19:22. 1909.

Tree, 6 to 9 meters high, with a large, round, much branched top, the trunk usually very definite and 40 cm. or more in diameter, often covered with a formidable array of spines; young branches cherry brown, smooth; spines in the axils of the leaves usually solitary, sometimes in threes, long and slender, 3 to 4 cm., rarely 16 cm. long; leaves thickish, oblong to orbicular, 4 to 8 cm. long, rounded or somewhat narrowed at base, mucroantely tipped; flowers solitary, near the tops of the branches, short-peduncled; ovary covered with leafy scales; flowers 4 to 5 cm. broad; petals entire, orange-colored; stamens numerous; fruit globular, 4 to 5 cm. in diameter; fleshy, glabrous, bearing small, scattered leaves, these naked in the axils; seeds black, glossy, 4 mm. long.

Type locality: In Guatemala.

Distribution: Widely distributed in Guatemala, usually at an altitude of 120 to 300 meters; also common in Salvadot where it is much planted for hedges.

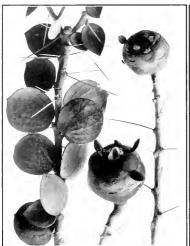




Fig. 3.—Pereskia autumnalis, X0.5,

Fig. 4.-Pereskia lychnidiflora

The plant, so far as we know, has no common name and no use is made of its fruit. Illustrations: Contr. U. S. Nat. Herb. 12: pl. 52 to 54; Safford, Ann. Rep. Smiths. Inst. 1908: pl. 10, f. 1; Monatsschr. Kakteenk. 21:37, and 25: 35, the last two as Pereskiopsis automalis: Engler and Drude, Veg. Erde 13: f. 10, as Pereskia guatamalensis.

Text-figures, 2 and 3 are copied from the above-cited illustrations. The original photographs were obtained by O. F. Cook in Guatemala.

## 3. Pereskia lychnidiflora De Candolle, Prodr. 3:475. 1828.

Evidently a tree or shrub; branches cylindric, woody; leaves large, 4 to 7 cm. long, oval to oblong, pointed, rounded at base, sessile, fleshy, with a prominent midven; axils of leaves each bearing a stout spine 2 to 5 cm. long and several long hairs; flowers large, 6 cm. broad, solitary, borne at the ends of short, stout branches; petals broadly cuneate, laciniate at the apex; ovary turbinate, hearing small leaves.

Type locality: In Mexico. Distribution: Mexico.

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This species was described by De Candolle from Mociño and Sessé's drawing, but it has never been collected since, so far as we can learn. Its large flowers with laciniate petals must make this a very striking species and it is surprising that it has not been rediscovered. Schumann thought it might be the same as *P. nicoyana* of Costa Rica, but a study of recent Costa Rican collections indicates that the species are distinct. The measurements given in the description are taken from De Candolle's plate, and may require some modification. *Cactus fimbriatus* Mociño and Sessé (De Candolle, Prodr. 3: 475. 1828) was published only as a synonym of this species.

Illustrations: Mém. Mus. Hist. Nat. Paris 17: pl. 18; Forster, Handb. Cact. ed. 2, 1003. f. 136; Safford, Ann. Rep. Smiths. Inst. 1908; 545. f. 11.

Text-figure 4 is copied from the first illustration above cited.

4. Pereskia nicoyana Weber, Bull. Mus. Hist. Nat. Paris 8:468. 1902.

Tree, usually about 8 meters high; branches rigid, stout, covered with smooth brown bark; spines writing or single, long (4 cm. long), stout and porrect; leaves in fascicles on old branches, but alternate on young shoots, lanceolate or oblanceolate, subsessile, the lateral veins almost parallel and some-



Fig. 5.—Pereskia nicoyana. X0.6.

Fig. 6-Pereskia zehntneri. X0.6.

times seeming to come from the base, acute, bright green, and somewhat shining; axils of the young leaves containing long white hairs; petals reddish yellow, fimbriate; ovary pyriform, bearing 8 to 12 spreading leaves, except the uppermost ones, which are much smaller and connivent.

Type locality: Gulf of Nicoya, Costa Rica.

Distribution: Costa Rica.

The spines, hairs in the axils of the leaves, and fimbriate petals indicate a relationship to the little-known *P. lychnidiflora*.

Mr. H. Pittier informs us that this species is common in the open coastal forests along the Pacific side of Costa Rica. The plant illustrated by Mr. Pittier, referred to below, has a long, slender trunk and is very spiny.

According to Mr. W. E. Safford, it has long, slender spines and the habit of the Osage orange, and is used as a hedge plant in Costa Rica, where it is known as matéare or puipute. *Illustration:* Pittier, Pl. Usuales Costa Rica pl. 2.

Text-figure 5 was drawn from a plant obtained by Mr. C. Wercklé at San José, Costa Rica, in 1912.

5. Pereskie zehntneri sp. nov. (See Appendix following page 226).

Shrub, 2 to 3 meters high, with a central erect trunk, very spiny; branches numerous, horizontal, usually in whorls, sometimes as many as 10 in a whorl; branches terete, green, fleshy, very easily detached from the stem; leaves stiff, fleshy, numerous, small, 2 to 4 cm. long, ovate to orbicular, acute, standing at right angles to the branches; areoles large, filled with short white wool and numerous slender white spines; flowers at tops of branches, large, 7 to 8 cm. broad, bright red, appearing in November: petals broad, retuse; ovary borne in the upper end of the branch, very narrow, 3 to 4 cm. long, bearing the usual leaves, areoles, and spines of the branches.

Collected by Dr. Leo Zehntner (Nos. 567 and 630, type) November 15 and 16, 1912, at Bom Jesus da Lapa, Bahia, Brazil, on the Rio Sao Francisco.

This is a very rare plant and seen in only one locality, in soil of a peculiar chalky formation. Living plants were taken by Dr. Zehntner to the Horto Florestal, Joazeiro, Brazil, where they grew well, and whence Dr. Rose obtained specimens in 1915 which were shipped to the United States under No. 19722.

The plant is known in Bahia under the name quiabento. It is probably not a true *Pereskia*; it suggests in its habit and foliage some of the Mexican species of *Pereskiopsis*, but it may represent a distinct genus.

Text-figures 6 and 7 are from the type plant above cited.

Pereskia sacharosa Grisebach, Abh. Ges. Wiss. Gottingen 24:141. 1879.

Pereskia amapola Weber, Dict. Hort. Bois 938. 1898. Pereskia argentina Weber. Dict. Hort. Bois 938. 1898. Pereskia amapola argentina Weber in Weingatt. Mon-

assehr. Kakteenk. 14: 87. 1894.
Small tree or shrub, 6 to 8 meters high; branches green and smooth, but in age becoming yellowish or light brown; leaves lanceolate to oblanceolate, 8 to 12 cm. long, cuneate at base, more or less pointed at apex; young areole with 1 to 3 spines, the longest 5 cm. long, the others when present nor over half as long, all acicular and dark in age; older areoles often with 6 or more spines; pedicels sometimes 10 mm. long; flowers in terminal clusters, either white or



Fig. 7.—Pereskia zehntneri. Photograph by Paul G. Russell.

rose-colored and very showy, 8 cm. broad, open at midday; sepals about 8, 1 or 2 petal-like, the others scale-like, the outer sepals and upper scales bearing long hairs; petals 8, rose-colored, oblanceolate, 3 cm. long; stamens free from the petals, numerous, unequal, erect; filaments, style, and stigma-lobes white; ovules borne on the lower part of ovary; ovary bearing small leaves, their axils filled with short wool and occasionally bearing a spine; fruit hard, 2.5 to 4 cm. in diameter, more or less tapering at base, many-seeded, leafless or nearly so, sometimes proliferous.

Type locality: Cobos, Oran, Argentina.

Distribution: Paraguay and Argentina.

Schumann (Gesamtb. Kakteen 765. 1898) gives Opuntia sacharosa Grisebach as a synonym of this species, but erroneously, since it was never taken up by Grisebach as an Opuntia. The Index Kewensis refers this species to P. aculeata. doubtless following Hooker's references in Curtis's Botanical Magazine for 1890 in regard to Argentine plants, which even then were little known.

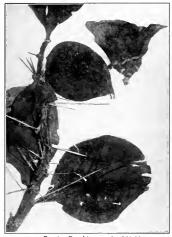
The common name of this plant in Argentina is sacharosa. It is sometimes used as a hedge plant.

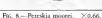
Plate II, figure 4, represents a leafy branch of a plant given to the New York Botanical Garden by Frank Weinberg in 1903; figure 5 shows its fruit.

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# 7. Pereskia moorei sp. nov.

A much branched shrub abour 1 meter high, covered with brown bark; branches stour; leaves orbicular or obovate-oblong, rounded or apiculate at the apex, somewhat cunearely narrowed at the base, thick and fleshy, 4 to 8 cm. long, 3.5 to 6 cm. wide; areoles suborbicular, 4.5 mm. in diameter, the wool gray; spines at each areole mostly 2 to 4, very unequal, the longest 7.5 cm. long or less, ashy gray, blackish toward the apex; flowers purplish red, about 4.5 cm. long; ovary few-leafed, its leaves obovate-oblong, 2.5 to 3 cm. long, bearing 1 to 3 black spines about 5 mm. long in the axils; sepals narrowly oblong-obovate, bluntly acute, 2.5 cm. long, bearing long bristles in their axils: perals obovate, obtuse, 3.5 cm. long, rose-colored; stamens about 2 cm. long; areoles on the ovary large. filled with a mass of short, white wool and bearing an occasional short spine; fruit not known.





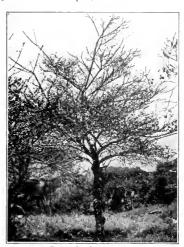


Fig. 9.-Pereskia guamacho.

Described from the specimen preserved in the herbarium of the British Museum of Natural History collected at Corumba, Brazil, by Spencer Moore, No. 955, who has kindly furnished us with data for this description, together with a sketch of the type specimen. Specimens were also collected at Corumba by F. C. Hoehne in 1908, No. 4863, who supposed it to be P. sacharosa.

Figure 8 is from a photograph of an herbarium specimen from Matto Grosso, Brazil, received from F. C. Hoehne in 1915.

# 8. Pereskia weberiana Schumann, Gesamtb. Kakteen 762. 1898.

Shrubby, much branched, glabrous, 2 to 3 meters high, the slender round branches about 3 mm. thick; leaves ovate to elliptic, about 3 cm. long and 2 cm. wide, sessile, acute at the apex, obtuse ar the base; areoles circular, slightly elevated, the wool short, whitish, fading brown; spines 3 to 6 at the lower areoles, solitary at the upper, 2 cm. long or less, terete, acicular, yellow or horn-colored; flowers clustered, white, about 1 cm. long or less; ovary about 2 mm. long, bearing a few white, woolly areoles; outer segments of the perianth triangular, acute, woolly at the axils, the inner spatulate to obovate; stamens a little longer than the petals; stigma-lobes 3 or 4, erect.

Type locality: Tunari Mountains,\* Bolivia, at 1,400 meters altitude.

Distribution: Bolivia, known only from the type locality.

This species is said to flower in May.

The description has been drawn from a cotype in the herbarium of the New York Botanical Garden, and from Professor Schumann's original account of the species in his Gesamtbeschreibung det Kakteen, p. 762. Dr. Kuntze obtained the specimens during his botanical exploration of Bolivia in 1892. The species was named, but not described, by Professor Schumann in Dr. Kuntze's Revisio Genera Plantarum (3\*: 107. 1893).

The material preserved is too imperfect to enable us to give an illustration of this plant.

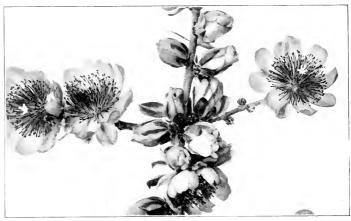


Fig. 10.—Pereskia guamacho. ×0.8.

#### 9. Pereskia guamacho Weber, Dict. Hort. Bois 938. 1898

Plant very spiny, usually a small shrub 1 to 3 meters high, but often a tree 10 meters high with a trunk up to 4 dm. in diameter and 3 meters long or more below the much branched top; areoles rather prominent, especially in age often standing out like small knobs on the branches, filled with brown felt, at first usually with only 1 to 4 spines along with a few short accessory ones, but in age often with 20 spines or more; spines somewhat divaricate, rigid, brown, the longer ones often 4 cm. long; leaves on young branches solitary, but on old wood growing in fascicles, acute, lanceolate to ovate or obovate with cuneare bases, usually about 3 cm. long, but sometimes 5 to 9 cm. long by 3 to 6 cm. broad, fleshy; flowers probably solitary, but so thickly set along the branches as to appear almost spicate, sessile, bright yellow, 4 cm. broad; ovary covered with small, lanceolate-acuminate leaves, these harry in the axils; stamens numerous; fruit globular, about 2 cm. in diameter, becoming naked, said to be orange-colored and edible; seeds black, flattened, 4 mm. broad.

Type locality: Basin of the Orinoco, Venezuela.

Distribution: Venezuela mainland and on Margarita Island.

This plant is very common not only in the flat land along the coast of Venezuela but also in the mountains. It is also widely grown in and about yards, for the leaves are supposed to have medicinal properties, and when properly grown as a hedge it forms a

<sup>\*</sup>Tunari Mountains, just northwest of Cochabamba, Bolivia, about at the site of Sacaba,

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most formidable protection. In the grazing regions of the country and along railways where wire fencing is employed, the trunks and larger branches are used for posts and smaller branches for intervening supports; these posts and stays, however, do not die, but in time grow to considerable size.

Although the wood, especially the branches, has little strength or endurance, it is used somewhat for making hanging baskets for orchids. It is known everywhere as guamacho, which was taken by Weber as the specific name for the plant.

Figures 9 and 10 are from photographs taken by Mr. H. Pittier at Carácas, Venezuela, in 1913.

Illustration: Carnegie Inst. Wash. 269: pl. II, f. 92, 93.

#### 10. Pereskia colombiana sp. nov.

A tree, 6 to 11 meters high, or sometimes smaller and shrub-like; main stem covered with clusters of slender spines, 2.5 to 7 cm. long; branches glabrous, either bearing spines or naked, covered

with light-brown bark; areoles small, woolly; leaves oblong to obliquely orbicular, short-petioled, unarmed at base, often broad above, usually acute, probably fleshy, glabrous, 4 cm. long or less; flowers bright yellow, opening about midday, borne on the old wood, solitary, sessile, 4 cm. broad; ovary covered with small ovate, acute leaves, these hairy in the axils; sepals oblong, obtuse, about 1 cm. long, entire on the margins; stamens numerous; fruit not known.

Collected by Herbert H. Smith at low altitudes near Santa Marta, Colombia, in April, 1898 to 1905 (No. 1886, type), and from the same locality by Justin Goudot in 1844, and by Francis W. Pennell in 1918 (No. 4765).

Mr. Smith remarks that the leaves are deciduous in March or April, and that the tree is leafless when in bloom in the spring.

Figure 11 is copied from a drawing of an herbarium specimen collected by Herbert H. Smith at Ronda, Santa Marta, Colombia.

## 11. Pereskia tampicana Weber, Dict. Hort. Bois 939. 1898.

Shrub; branches often without spines or the spines several, needlelike, black, 2 to 3 cm. long; areoles globular, appearing as knobs along the stem; leaves about 5 cm. long, petioled; flowers 2.5 cm. long; petals entire, rose-colored.



brana. X0.5

Type locality: Near Tampico, Mexico.

Distribution: Eastern Mexico, but known only from the type locality.

P. tampicana is not well known and has been reported only from Tampico, Mexico. Dr. E. Palmer made a careful search for it some years ago at the type locality, but in vain. In 1912 Dr. Rose examined the two small specimens of the species preserved in the herbarium of the Royal Botanical Garden of Berlin, and is convinced that it is a Pereskia and not a Pereskiopsis.

Pereskia rosea A. Dietrich (Allg. Gartenz. 19: 153. 1851; Opuntia rosea Schumann, Gesamtb. Kakteen 764. 1898) is supposed to have come from Mexico, but we have not been able to identify it; Schumann refers to it in a note under P. tampicana. Here he also takes up Pereskia zinniaeflora De Candolle (Prodr. 3: 475. 1828). Both these specific names are much older than P. tampicana, and should either of them be found identical with it, the name P. tampicana would be rejected.

# 12. Pereskia bleo (HBK.) De Candolle, Prodr. 3:475. 1828.

Cactus bleo Humboldt, Bonpland, and Kunth, Nov. Gen. et Sp. 6: 69. 1823. Pereskia panamensis Weber, Dict. Hort. Bois 739. 1898.

A tree, sometimes 7 meters high; trunk 10 cm. in diameter or less, when old becoming naked, but young shoots often bear large fascicles of spines (sometimes 25 or more); young branches red, leafy, its spines in fascicles of 5 and 6, but young shoots often bear but 1 to 4, black, acicular, up to 2.5 cm.

long; leaves thin, oblong to oblanceolate, 16 to 21 cm. long, 4 to 5.5 cm. wide, acuminate, cuneate at base, tapering into petioles 2 to 3.5 cm. long; arcoles circular, bearing when young a little wood, but soon becoming naked; callys turbinate, somewhat angled, naked, with linear deciduous sepals; petals 12 to 15, rose-colored, obovate, 3.5 cm. long; style longer than the stamens, red, thick; stigmalobes 5 to 7; ovary depressed; fruit yellow, truncate, 5 to 6 cm. long; seeds 6 mm. long, black, shining.

Type locality: Near Badillas, on the Magdalena River, Colombia, South America. Distribution: Northwestern South America and throughout Panama.

This species was collected by Bonpland during Humboldt's trip through the New World and was described and published by Kunth in 1823. Dr. Rose examined two of the original specimens in the herbarium of the Museum of Natural History at Paris, one being the specimen given by Bonpland and the other the specimen in the Kunth Herbarium.



Fig. 12.—Pereskia bleo.

which is kept distinct from the general herbarium. The only other representatives of this species from South America which we have seen are a specimen in the herbarium of the same museum, which was collected by Justin Goudot in Colombia in 1844, and one collected in 1852, by I. F. Holton at San Juancito, Colombia, preserved in the Torrey Herbarium and one recently brought by Francis W. Pennell from Boca Verde, Rio Sinu, Colombia.

Heretofore *Pereskia bleo* has been considered one of the most common species, for many living collections as well as herbaria contain many specimens under that name; the plant which has been known as *P. bleo*, however, is *P. grandifolia* Haworth, now known to be a native of Brazil and not found wild in Colombia.

Since determining that the so-called *Pereskia bleo* of our gardens and of Brazil is not the true *P. bleo* of Humboldt, we have become convinced that *P. panamensis* Weber is the same as *P. bleo;* Mr. Pittier's exhaustive exploration of Panama has strengthened our conclusions, for he has traced this species as far south as the Colombian border. Humboldt's plant came from northern Colombia.

In Panama the plant is known under the name ñajú de Culebra.

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Illustrations: All illustrations referred to this species which we have examined are cited under P. grandifolia.

Figure 12 is from a photograph taken by Henry Pittier, near Chepo, Panama, October 30, 1911.

#### Pereskia bahiensis Gürke, Monatsschr. Kakteenk. 18:86. 1908.

Shrub or tree, sometimes 8 meters high, with a more or less definite trunk, sometimes 1 meter or more long and 1.5 to 2 dm. in diameter, and a large, rounded, much branched top; spines on new growth wanting, but on old wood 5 to 40 at an areole, some of them 5 to 9 cm. long; young branches

green; leaves lanceolate, 6 to 9 cm. long, deciduous, somewhat pointed, narrowed at base into short petioles; flowers in small panicles, rosecolored; ovary bearing large leaves with cuneate bases; fruit often proliferous, yellowish when mature, more or less irregularly angled, bearing large leaves 3 to 4 cm. long, which ultimately fall away; seeds black, oblong, 5 mm. long.

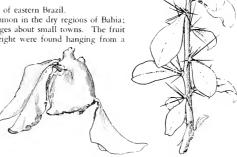
Type locality: In the southeast catinga between Rio Paraguacu at Tambury and Rio das Contas at Caldeirao, Bahia, Brazil.

Distribution: Dry parts of eastern Brazil.

This species is very common in the dry regions of Bahia; and is often planted for hedges about small towns. The fruit is proliferous; as many as eight were found hanging from a

single peduncle; it is said to be edible, but while half-ripe is very astringent. The perfect fruits can seldom be found, because the birds peck into them for the large black seeds

Called in Brazil, according to Dr. Leo Zehntner, Iniabanto, Espinha de Sao Antonio, and Flor de Cera. He also says: "I think Iniabanto



Figs. 13, 14.—Pereskia bahiensis. ×0.5.

is the best and ought to be generalized. It is derived from Iniabo= Okra=Hibiscus esculentus, without doubt because the leaves of the pereskias are sometimes eaten by people, giving a mucilaginous dish like that of the Hibiscus fruit."

Illustration: Monatsschr. Kakteenk. 18: 87.

Figure 13 is from a specimen, preserved in formalin, collected by J. N. Rose near Machado Portello, Bahia, Brazil, in June 1915; figure 14 is from a plant from the same place; figure 15 is from a photograph obtained by J. N. Rose at Barrinha, Bahia, in June 1915.

### 14. Pereskia grandifolia Haworth, Suppl. Pl. Succ. 85. 1819.

Caetus 105a Vellozo, Fl. Flum. 206. 1825. Pereskia ochnacarpa Miquel, Bull. Sci. Phys. Nat. Neerl. 48. 1838. Caetus grandiflorus Link, Enum. Hort. Berol. 2: 25. 1822.

Tree or shrub, 2 to 5 meters high, usually with a definite, very spiny, woody trunk up to 1 dm. in diameter, the branches fleshy, glabrous, elongated, usually with 1 or 2 acicular spines at the areoles; leaves oblong, obtuse or acute, somewhat narrowed at base, 8 to 15 cm. long; petioles short; inflorescence terminal, usually few-flowered; 3.5 to 4 cm. broad; sepals green, petals rose-colored, sometimes white; filaments red; style and stigma-lobes white; ovary leaf-bearing; fruit described as large, pear-shaped, many-seeded; seeds black.

Type locality: In Brazil.

Distribution: Brazil, widely planted and subspontaneous throughout the West Indies.

The plant is extensively used for hedges in tropical America. It is planted by pushing cuttings into the ground, its spiny stems soon forming a capital barrier.

Illustrations: Vellozo, Fl. Flum. 5: pl. 27, as Cacius rosa. Amer. Garden II: 462; Blühende Kakteen 3: 137, pl. 137; Curtis's Bot. Mag. 63: pl. 3478; Cycl. Amer. Hort. Bailey I: f. 309; Dict. Hort. Bois f. 678; Edwards's Bot. Mag. 17: pl. 1473; Engler and Prantl, Pflanzen fam. 3<sup>6a</sup>: f. 57, J, f. 71; Gard. Chron. III. 20: f. 75; Karsten, Deutsch. Fl. 887. f. 9, ed. 2. 2: 456 f. 605, No. 9; Martius, Fl. Bras. 4<sup>2</sup>: pl. 63; Pfeiffer and Otto, Abbild. Beschr. Cact. I: pl. 30; Reichenbach, Fl. Exot. pl. 328; Rümpler, Sukkulenten f. 128; Watson, Cact. Cult. f. 6, in part; 222. f. 87; ed. 3 f. 65; Loudon, Encycl. Pl. ed. 3. 1202 f. 17371; Van Geél, Sert. Bot. 4: pl. I, all as Pereskia bleo. Dict. Gard. Nicholson 3: 75. f. 81; Monatsschr. Kakteenk. 15: 81.

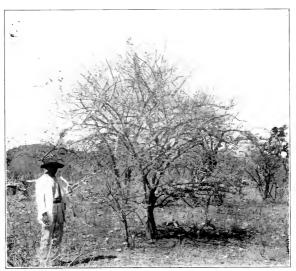


Fig. 15-Pereskia bahiensis. Photograph by Paul G. Russell.

Plate III, figure 1, represents a flowering branch of a plant obtained by N. L. Britton on St. Christopher in 1901. Figure 16 is from a photograph of the plant used as a hedge near Rio de Janeiro, Brazil.

### 15. Pereskia zinniaeflora De Candolle, Prodr. 3: 475. 1828.

Shrub; leaves oval to oblong, 2 to 4 cm. long, acuminate, cuneate at base; spines on young branches 1 or 2 at an arcole, on old branches 4 or 5, all short, less than 1 cm. long; flowers broad, 5 cm. wide, rose-red; petals entire, obtuse or retuse; style and stamens very short; ovary truncate, bearing small, stalked leaves.

Type locality: In Mexico. Distribution: Mexico.

Nicholson associates this species with Pereskia bleo, that is, P. grandifolia, but the relationship is not close. The measurements of the flower given above are taken from

BRITTON AND ROSE PLATE III



1. Flowering branch of Pereskia grandifolia. 2. Leafy branch or Pereskiopsis chapistle.

3. Leafy branch of Pereskiopsis pititache. (All three-fourths size.)



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De Candolle's plate cited below, and may not be quite correct. This species, so far as we are aware, has not been again collected.

Cactus zinniae[lora Mociño and Sessé (De Candolle, Prodr. 3: 475. 1828) was given as a synonym.

Illustrations: Forster, Handb. Cact. ed. 2. f. 135; Mém. Mus. Hist. Nat. Paris 17; pl. 17; Rümpler, Sukkulenten f. 127; Suppl. Dict. Gard. Nicholson f. 624; Watson Cact. Cult. ed. 1 and 2. 223. f. 88; ed. 3 f. 64; Dict. Gard. Nicholson 4: 586. f. 55.

Figure 17 is a copy of the second illustration above cited.





Ftg. 16.—Pereskia grandifolia. Exposed branches are shown above the other foliage.

Fig. 17.- Pereski, zioniaeflori

### 16. Pereskia humboldtii, nom. nov.

Cactus horridus Humboldt, Bonpland, and Kunth, Nov. Gen. et Sp. 6: 70. 1823. Not Salisbury, 1796. Pereskia horrida De Candolle, Prodr. 3: 475. 1828

Tree, 4 to 6 meters high, with terete slender branches; spines often solitary, sometimes 2 or 3, slender, dark in color, unequal, the longest 2 to 3 cm. long; leaves solitary, alternate, narrowly oblong, 3 cm. long, subsessile, entire, glabrous; flowers 3 to 5 together in upper axis, about 10 mm. long; calyx described as 5-toothed and persistent; petals 5 or 6, red, lanceolate, spreading; fruit fleshy, many-seeded.

Type locality: "Ad flumen Marañon prov. Jaen de Bracamoros." (Schumann says this locality is in Peru.)

Distribution: Northwestern South America.

The above description is compiled from Kunth's original description and from notes made by Dr. Rose upon the type material in the herbarium of the Museum of Natural History at Paris, in which there are specimens from both Bonpland and Kunth. Both of these sheets lack flowers and fruit, and only Kunth's bears leaves. So far as we are aware,

no other material of this species has been collected since Humboldt's time except that in 1912 Dr. Weberbauer wrote that he had visited the Marañon, at Humboldt's locality, and had collected a single specimen, which had been sent to the Botanical Museum at Berlin.

### 17. Pereskia cubensis Britton and Rose, Torreya 12:13. 1912.

A tree, 4 meters high, with a trunk 2.5 dm. in diameter and a large, flat, much branched top; bark brownish, rather smooth, marked here and there by black bands (representing the old areoles), these broader than high; young branches slender, smooth, with light-brown bark; spines from young areoles 2 or 3, needle-like, brownish, 2 to 4 cm. long, from old areoles very numerous (25 or more), and much longer (5 cm. or more long); leaves several at each areole, sessile, bright green on both sides, oblanceolate to oblong or obovate, 1 to 4 cm. long, 10 to 12 mm. wide, acute at both ends or obtuse at the apex, fleshy, the midvein broad, the lateral veins very obscure; peduncle very short, jointed near the base, bearing 1 to 3 leaf-like bracts; flowers terminal and also avillary, solitary; sepals 5, obtuse or rounded, ovare-oblong to orbicular, unequal, 7 to 9 mm. long, the larger ones with broad purple margins; petals 8, about 15 mm. long, deep reddish purple, obovate-elliptic, rounded; stamens many, about 6 mm. long; anthers light yellow; ovary turbinate, naked, spineless; fruit not seen.



Fig. 18.—Pereskia cubensis.

Fig. 19.—Pereskia cubensis.

Type locality: In Cuba.

Distribution: Near the southern coast of eastern and central Cuba.

The tree is abundant on the plain between Guantánamo and Caimanera, Oriente, where the type specimens were collected; it also inhabits coastal thickets at Ensenada de Mora, in southwestern Oriente, the plants of this colony bearing leaves with less acute apices than those of the typical ones. A single plant was also observed on La Vigia Hill, at Trinidad, province of Santa Clara, which had shorter and smaller leaves than either of the other two. The description of the flower is from one of a plant collected by N. L. Britton and J. F. Cowell at Ensenada de Mora, southern Oriente, Cuba, in 1912, and brought to the New York Botanical Garden, where it flowered in May 1917.

Dr. Rose finds that the plant in De Candolle's herbarium which represents the *Pereskia portulacifolia* of the Prodromus is undoubtedly *Pereskia cubensis*. It was collected as early as 1821.

Illustration: Journ. N. Y. Bot. Gard. 10: f. 22.

Figure 18 is from a photograph taken by Dr. M. A. Howe in the colony of this tree at Nuevaliches, near Guantánamo, Cuba, studied by Dr. N. L. Britton in 1909; figure 19 represents a leafy branch of the same plant.

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18. Pereskia portulacifolia (Linnaeus) Haworth in De Candolle, Prodr. 3:475. 1828.

Cactus portulacifolius Linnaeus, Sp. Pl. 469. 1753.

A tree, 5 to 6.6 meters high, the branches terete, very spiny; spines acicular, sometimes almost bristle-like, 2 cm. long, on old wood in clusters of 7 to 9, but on new growth usually solitary; leaves

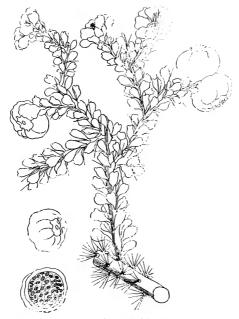


Fig. 20.—Pereskia portulacifolia. X0.66.

only 1 cm. long or less, cuneate at base, often retuse at apex; peduncles short but definite, 2 to 5 mm. long, bearing several small spatulate to broadly obovate leaves; flowers rose-colored, about 3 cm. broad; sepals about 3, ovate to shortly oblong, obtuse, fleshy, 8 mm. or less long; petals oblong, about 2 cm. long, thin, obtuse; ovary small, truncate, naked or bearing a single small leaf; immature fruit hard, depressed, 2 cm. long, 2.5 cm. broad, smooth, naked, or with a single small leaf 5 to 6 mm. long, with a broad sear at the top 8 to 10 mm. in diameter; fruit globular, naked; seeds large, black.

Type locality: Tropical America, doubtless Hispaniola. Distribution: Haiti.

The usual reference for the first publication of the plant under *Pereskia* is Haworth's Synopsis (Syn. Pl. Succ. 199. 1812), but it was not here formally transferred from the genus *Cactus*. His statement is: "Cactus portulacifolius is another species of this genus."

Our knowledge of this plant is drawn from the illustration below cited and descriptions, and from a fragmentary specimen collected by W. Buch near Gonaives, Haiti, in 1900,

where it grows on dry calcareous rocks, and one obtained by Paul Bartsch at Tomaseau in April 1917. Dr. Bartsch states that the flower reminds one very much of a rose and the fruit is pendent like a green plum.

Lunan in 1814 (Hort, Jam. 2: 236) described a tree nearly a foot in diameter, growing at a residence near Spanish Town, Jamaica, stating that it differed from *Pereskia* by the absence of tufts of leaves on its fruit. His description points to *Pereskia portulacifolia*, but nothing is known of the species in Jamaica at the present day; according to Grisebach, Macfadven recorded it as cultivated there.

Illustration: Plumier, Pl. Amer. ed Burmann pl. 197, f. 1.

Figure 20 is copied from the illustration above cited.

### 19. Pereskia conzattii sp. nov.

Tree, 8 to 10 meters high; bark of stems and branches brown and smooth; leaves orbicular to obovate, acute, 1 to 2.5 cm. long; areoles small, with short white wool and a few long hairs; spines 2 to 6 on young branches, 10 to 20 on main stem; acicular, 2 to 2.5 cm. long, at first yellowish brown, dark brown in age; flowers not known; ovary bearing small scales; fruit naked, pear-shaped, more or less stalked at base, 3 to 4 cm. long; seeds black, glossy, 3 mm. long, with a small white hilum.

Collected at Salina Cruz and Tehuantepec, Oaxaca, Mexico, in February and April, 1913, by Professor C. Conzatti; probably also in Guatemala.

### Species Unknown to Us.

Pereckia affinis and P. haageana Meinshausen, Wochenschr, Gartn. Pflanz. 2:118. 1859.

Pereskia cruenta, P. grandiflora, and P. (?) plantaginea, the first two given as synonyms and the last merely mentioned by Pfeiffer (Enum. Cact. pp. 176, 177, and 179) can not be identified. The same is true of P. grandispina Forbes (Journ. Hort. Tour Germ. 159, 1837).

Pereskia recurvifolia and P. galeottiana are two names marked with an asterisk by Lemaire (Cactées 95, 1868), indicating that they are new. So far as we know they were never described.

Tribe 2. OPUNTIEAE.

Plants usually very fleshy, never epiphytic, branched (usually much branched), one to many jointed; joints diverse in structure, terete, compressed, or much flattened, with irregularly scattered areoles, ribless, except one species; leaves usually calcuous, but in some species more or less persistent, small or minute, subulate or cylindric, in one genus broad and flat; areoles usually glochidiferous (except in Maibhenia; in Grusonia only those of the ovary), mostly spine-bearing; spines usually slender, straight or nearly so, sometimes sheathed; corolla mostly rotate (sepals and petals in Nopalea erect); flowers sessile, diurnal, one from an areole; fruit usually a fleshy berry, sometimes dry, tarely capsular; seed white or black, globular, flattened or even winged, with a thin or hard testa; cotyledons large, elongated.

This tribe contains 7 genera and at least 300 species, various in habit, flower, fruit, and seeds. It is more closely related to the *Pereskieae* than to the *Cereeae*. The following characters possessed by some or all genera of the *Opuntieae* are wanting in the *Cereeae*:

Leaves on the stem (see also *Harrisia* and *Hylocereus*); glochids in the areoles; sensitive stamens; sheathed spines; winged, white, and bony-covered seeds; the separation of withering calyx, stamens, and style from the ovary; areoles irregularly distributed over the stem in all the genera except *Grusonia*, in which they are arranged on ribs as in many of the *Gereeae*.

The tribe is distributed throughout the cactus regions of the Americas, but the genera, except *Opuntia*, are localized.

KEY TO GENERA.

eaves broad and flat	 		.1.	Pereskiopsis
eaves subulate or cylindric. Seeds broadly winged			2.	Pterocactus
Seeds wingless.				
Stamens much longer than the petals.				
Petals erect: joints flat			3. 3	Nopalea
Petals erect; joints flat			4.	Tacinga
Stamens shorter than the petals.				
Joints flat to terete, not ribbed.				
Testa of the seed thin, black, shining			5.	Maibuenia
Testa thick, pale, dull		Acces to the con-	6.	Opuntia
Toing agent longitudinally ribbed			7. 4	Grusonia

### 1. PERESKIOPSIS Britton and Rose, Smiths. Misc. Coll. 50:331. 1907.

Trees and shrubs, in habit and foliage similar to Peretkia; old trunk forming a solid woody cylinder covered with bark and resembling the ordinary dicotyledonous stem; areoles circular, spine-bearing or sometimes spineless, also bearing hairs, wood, and usually glochids; flowers similar to those of Opuntia; ovary sessile (one species described as pedunculate), with leaves at the areoles (except in one species); fruit red, juicy; seeds bony, few, covered with matted hairs.

Type species: Opuntia brandegeei Schumann.

The plants are common in hedges and thickets of Mexico and Guatemala.

As to the number of species to be recognized in this genus we are uncertain; about 16 have been described. In our first discussion of the genus (op. cit.) we recognized 11 species, including several known only from descriptions. There now seem to be at least 10 species, of which 8 are in cultivation in Washington and New York. Two of the plants were described, as early as 1828, as species of Pereskia, and here they remained with 2 later-described species until, in 1898, Dr. A. Weber transferred them to Opuntia, placing them in a new subgenus, Pereskiopuntia. The same year Dr. Karl Schumann adopted Weber's conclusions, publishing his treatment of the subgenus and assigning 5 species to it.

In its large leaves and woody, spiny stems, this group suggests *Pereskia*, but it has glochids and different flowers, fruit, and seeds; in flowers, fruit, seeds, and glochids it resembles *Opuntia*, but on account of habit and foliage must be excluded from that genus.

In view of these differences, Britton and Rose in 1907 established the genus Pereskiopsis and listed 11 species, 4 of which had been originally described as species of Pereskia and 5 as species of Opuntia. Since then we have grown most of these plants along with the pereskias and opuntias so as to compare them. Unfortunately we are not able to describe all the species fully, for they have never been known to flower in cultivation, although some of the species, at least, bloom freely in the wild state. The leaves on the lower parts of shoots are sometimes broader and shorter than those on the upper parts, and in greenhouse cultivation the leaves of some species are narrower than when the plants are growing under natural conditions.

The generic name is from the Greek and signifies resembling Pereskia.

#### KEY TO SPECIES.

Stems, ovary, and often the leaves more or less pubescent.	
Normal leaves long-acuminate, narrow, with narrow cuneate bases	1. P. velutina
Normal leaves abruptly pointed, somewhat cuneate at base	2. P. diguetii
Stems, ovary, and leaves glabrous.	
Leaves, at least some of them, not much longer than broad.	
Fruit without leaves, at least so figured	3. P. opuntiaeflora
Fruit with leaves subtending the areoles.	
Areoles white, with few glochids or none.	
Leaves orbicular or nearly so, rounded or apiculate	4. P. rotundifolia
Leaves, at least the upper ones, oboyate or elliptic, acute at both ends.	5. P. chapistle
Areoles dark, filled with numerous brown glochids	
Leaves, at least some of them, twice as long as broad or longer.	
Leaves spatulate.	7. P. spathulata
Leaves elliptic to oblong, or obovate.	•
Leaves pale green, glaucous	8. P. bititache
Leaves bright green, shining.	
	9. P. aquosa
Glochids few, yellow	10. P. kellermanii

## 1. Pereskiopsis velutina Rose, Smiths. Misc. Coll. 50:333. 1907.

Stems weak and spreading, forming compact bushes 9 to 12 dm. high or sometimes higher; old stems with cherry-brown bark; young branches green, borne nearly at right angles to the old stem, velvery-pubescent; areoles bearing long white hairs and several short spines and some glochids; leaves elliptic to ovate-elliptic, 2 to 6 cm. long by 1.5 to 2.5 cm. broad, acuminate, or acute at both ends, dull green, more or less velvety-puberulent on both surfaces, when very young brighter green; flowers sessile on the second-year branches; ovary obovoid to oblong, pubescent; bearing large

leaves and areoles similar to those of the stem; leaves on ovary spreading or ascending and persisting after the flower falls; flower-bud (above the ovary) 2 to 3 cm. long, acute; sepals green or deep red tinged with yellow; petals bright yellow.

Type locality: In hedges about city of Querétaro, Mexico.

Distribution: Table-lands of central Mexico.

This plant is called by the natives nopaleta and cola de diablo.

Illustration: Smiths. Misc. Coll. 50: pl. 44. Figure 21 is from a photograph of type plant.

 Pereskiopsis diguetii (Weber) Britton and Rose, Smiths. Misc. Coll. 50: 332. 1907.

Opuntia diguetti Weber, Bull. Mus. Hist. Nat. Paris 4: 166. 1898.

Tall shrub, larger than the preceding species; old stems reddish; branches pubescent; areoles when young filled with long, white, cobwebby hairs, when old large and filled with short black wool; leaves elliptic to obovate, 3 to 5 cm. long, usually abruptly pointed, more or less cuneate at the base; spines usually 1, rarely as many as 4, at first nearly black, in time becoming lighter, sometimes nearly 7 cm. long; glochids brownish, not very abundant; flowers yellow; fruit 3 cm. long, red, pubescent, its areoles often bearing spines as well as glochids; seeds white, 5 mm. broad, covered with matted hairs.

Type locality: Near Guadalajara, Mexico.

Distribution: Central Mexico.

Common in hedges near Guadalajara and Oaxaca, Mexico. According to W. E. Safford, it is known in Guadalajara as tasajillo and alfilerillo.

Figure 22 represents a leafy branch of a plant collected by W. E. Safford in Guadalajara, Mexico, in 1907.

 Pereskiopsis opuntiaeflora (De Candolle) Britton and Rose, Smiths. Misc. Coll. 50: 332. 1907.

> Pereskia opuntiaeflora De Candolle, Prodr. 3: 475. 1828. Opuntia golziana Schumann, Gesamtb. Kakteen 654. 1898.

Shrubby, glabrous; leaves obovate, mucronate, often in pairs; spines, when present, solitary, clongated, 2 to 3 times as long as the leaves; flowers subterminal, short-pedunculate; petals numerous, ovate, subacute, reddish yellow, arranged in two series; ovary leafless, bearing areoles filled with glochids.

Type locality: In Mexico.

Distribution: Known only from the original description.

This description is drawn from De Candolle's

original description and illustration; otherwise nothing is known of the plant.

This species, as illustrated by De Candolle, is unlike anything we know. In its pedunculate fruit it is like *Pereskia*, but its leafless ovary and its areoles filled with glochids would exclude it from that genus. In a general way the illustration looks more like a *Pereskio psis*, and we suspect that the delineation is incorrect or that the leaves had fallen away from the

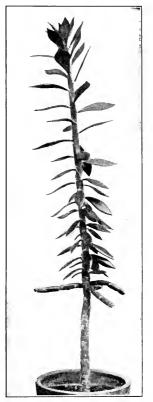


Fig. 21.-Pereskiopsis velutina.

specimen drawn.

Cactus opuntiaeflorus Mociño and Sessé (Pfeiffer, Enum. Cact. 178. 1837) was published as a synonym of Pereskia opuntiaeflora.

Illustrations: Förster, Handb. Cact. ed. 2. f. 137; Mém. Mus. Hist. Nat. Paris 17: pl. 19, both as Pereskia opuntiaeflora.

Figure 23 is copied from the second illustration above cited.

### 4. Pereskiopsis rotundifolia (De Candolle) Britton and Rose, Smiths. Misc. Coll. 50: 333. 1907.

Pereskia rotundifolia De Candolle, Prodr. 3: 475. 1828. Opuntia rotundifolia Schumann, Gesamth. Kakteen 652. 1898.

Stems thick, more or less woody; branches slender, glabrous; leaves nearly orbicular, mucronate; spines elongated, solitary; flowers 3 cm. broad, borne on the second-year branches; petals reddish yellow, broad, with mucronate tips; ovary leafy; fruit obovoid, red, leafy.



Fig. 22.—Pereskiopvis diguetii. ×0.5



Fig. 23.—Pereskiopsis opuntiaeflora. X0.5.



rotundifolia. ×0.5.

Type locality: In Mexico.

Distribution: Known only from the original description and, apparently, from Oaxaca. Cactus frusceens Mociño and Sessé (Pfeiffer, Enum. Cact. 178. 1837) and Cactus roundifolia Mociño and Sessé (De Candolle, Prodr. 3: 475. 1828) were given as synonyms of Pereskia rotundifolia, but were never published.

Illustrations: Mém. Mus. Hist. Nat. Paris 17: pl. 20, as Pereskia rotundifolia; Schumann, Gesamtb. Kakteen f. 99, as Opuntia rotundifolia.

Figure 24 is copied from the first illustration above cited; figure 25 is from a photograph taken by Dr. MacDougal at Oaxaca, Mexico, in 1906.

# 5. Pereskiopsis chapistle (Weber) Britton and Rose, Smiths. Misc. Coll. 50: 331. 1907.

Opuntia chapistle Weber in Gosselin, Bull. Mus. Hist. Nat. Paris 10: 388. 1904.

A large, branching shrub, sometimes 3 to 4 meters high, the branches widely spreading, glabrous: spines single, white, long (6 cm. long), very stout; leaves fleshy, somewhat persistent, obovate to elliptic, sometimes nearly orbicular, 3 to 4 cm. long; glabrous; flowers yellow; fruit red.

Type locality: In Oaxaca.

Distribution: Oaxaca and perhaps Morelos, Mexico.

Illustrations: Bull. Soc. Nat. Acclim. France 52: f. 10, as Opuntia chapistle. Smiths. Misc. Coll. 50: pl. 43.

Plate III, figure 2, represents a leafy branch of a plant collected by Dr. Rose at Cuernavaca, Mexico, in 1906.



Fig. 25.—Pereskiopsis, apparently P. rotundifolia, with other cacti in the background.

6. Pereskiopsis porteri (Brandegee) Britton and Rose, Smiths. Misc. Coll. 50: 332. 1907.

Opuntia rotundifolia Brandegee, Zoe 2: 21. 1891. Not Pereskia rotundifolia De Candolle, 1828.

Opuntia porteri Brandegee in Weber, Dict. Hort. Bois 899. 1898.

Opuntia brandegeei Schumann, Gesamtb. Kakteen 653. 1898. Pereskiopsis brandegeei Britton and Rose, Smiths. Misc. Coll. 50: 331. 1907.

Stems stout, woody, branching, 6 to 12 dm. high, 3 cm. in diameter, the old areoles bearing 3 to 8 stout spines 3 to 5 cm. long, but on the trunk often 15 to 20 spines from an areole; first and second year branches usually short, spineless, or with 1 or 2 brown spines, those of the first year green, the

second-year brownish; areoles bearing numerous small, brown glochids; leaves sessile, 2 to 3 cm. long, obovate, acute, fleshy, in greenhouse specimens sometimes much narrower; flowers about 4 cm. in diameter; sepals few, spatulate, short; petals few, yellow, broad, entire; fruit joint-like, oblong, 4 to 5 cm. long, orange-colored, with large areoles bearing brown glochids; seeds 1 or few, covered with white deciduous hairs.

Type locality: In Sinaloa, Mexico.

Distribution: Common in the Cape region of Lower California and in the State of Sinaloa, Mexico.

Figure 26 shows a leafy twig of a plant sent in 1904 from the Missouri Botanical Garden to the New York Botanical Garden as Opuntia brandegeei, which had been received by the Missouri Botanical Garden from Mrs. Katharine Brandegee in 1901.

7. Pereskiopsis spathulata (Otto) Britton and Rose, Smiths. Misc. Coll. 50:333. 1907.

> Pereskia spathulata Otto in Pfeiffer, Enum. Cact. 176. 1837. Opuntia spathulata Weber, Bull. Mus. Hist. Nat. Paris 4: 165. 1898.



porteri. ×0.66.

Branching shrub, 1 to 2 meters high; branches few, glaucescent, deflexed; leaves spatulate, thick, green, 2.5 to 5 cm. long; areoles distant, woolly, hairy when young; spines 1 or 2, rigid, white below, 2.5 cm. long; glochids brown, borne in the upper part of the areoles; flowers red; seeds white.

Type locality: In Mexico.

Distribution: Probably southern Mexico, but no definite locality is known.

There is some confusion in the literature of this species; Schumann describes it as pubescent, while in the original description nothing is said about pubescence; this error is probably due to a misidentification, for Dr. Rose found in the Museum of Paris two specimens collected by Diguet at Guadalajara, Mexico, which were labeled Opuntia spathulata, and which have pubescent branches and leaves; these are undoubtedly O. diguetii.

Pereskia crassicaulis Zuccarini (Pfeiffer, Enum. Cact. 176. 1837) was never published,

simply being given as a synonym of P. spathulata.

Illustration: Möllers Deutsche Gärt. Zeit. 25: 488, f. 22, No. 1, as Pereskia spathulata.

8. Pereskiopsis pititache (Karwinsky) Britton and Rose, Smiths. Misc. Coll. 50: 332. 1907.

Pereskia pititache Karwinsky in Pfeiffer, Enum. Cact. 176. 1837

Pereskia calandriniaefolia Link and Otto in Salm-Dyck, Cact. Hort. Dyck. 1849. 252. 1850. (According to Schumann.)

Opuntia pititache Weber, Bull. Mus. Hist. Nat. Paris 4: 166. 1898.

Stems rather low and somewhat branching; bark light brownish and flaking off; arcoles on main trunk each bearing 1 to 4 slender acicular spines and a small cluster of yellowish glochids; branches, even when several years old, bearing a single long, acicular spine from an areole and no glochids; young and growing branches rather slender and green, their areoles small, black in the center, with long, white hairs from their margins and no spines; leaves obovate or oblong-obovate, 4 cm. long or less, pale green, thin, acute or bluntish at the apex, narrowed at the base.

Type locality: In Mexico.

Distribution: Uncertain, but reported from southern Mexico.

In the original description this species is said to have a very spiny, erect woody trunk, the branches spreading nearly horizontally, the spines unequal, 3 to 6, 25 to 37 mm. long, the leaves fleshy, green, lanceolate to ovate, 37 mm. long, 16 mm. broad. It was named by Baron Wilhelm von Karwinsky and probably collected by him in Mexico, but no definite locality was given; Weber states it is from Tehuantepec, while Schumann gives Tehuacán on a statement of Weber.

Pereskia calandriniaefolia we have referred here, following Schumann, but the original description is somewhat different from that of *P. piitache*, the leaves being described as spatulate to lanceolate, strongly narrowed below, 7.5 cm. long.

Our description is mostly drawn from specimens growing in the New York Botanical Garden obtained from M. Simon, of St. Ouen, Paris, in 1901.

Illustrations: Abh. Bayer, Akad. Wiss. München 2: pl. 1, sec. 6, f. 1, 2; pl. 2, f. 9, both as Pereskia pititache. Deutsche Gärt Zeit. 8: 33, as Pereskia calandriniaefolia.

Plate III, figure 3, represents a leafy shoot of a plant sent by M. Simon, of St. Ouen, Paris, France, to the New York Botanical Garden in 1901.

 Pereskiopsis aquosa (Weber) Britton and Rose, Smiths. Misc. Coll. 50: 331. 1907.

Opuntia aquosa Weber, Bull. Mus. Hist. Nat. Paris 4: 165. 1898.

Shrub, with glabrous, glaucous, green branches, the young shoots with long white hairs at the areoles; leaves bright green, nearly elliptic, acute, about twice as long as wide, narrowed at the base, glabrous; spines usually solitary, standing at right angles to the stem, white; glochids few, yellow; flowers yellow; outer petals blotched with red; fruit pear-shaped, 4 to 5 cm. long, 2 to 2.5 cm. in diameter, yellowish green.



Fig. 27.—Pereskiopsis aquosa. ×0.66.

Type locality: Guadalajara, Mexico.

Distribution: In hedges about Guadalajara, Mexico.

The fruit, called in Mexico tuna de agua and tasajillo, is used in making a cooling drink and for preserves.

Opuntia spathulata aquosa (Bull. Mus. Hist. Nat. Paris 4: 165. 1898) was given as a synonym of this species, but was never published.

Illustration: Safford, Ann. Rep. Smiths. Inst. 1908: pl. 10, f. 2

Figure 27 represents a leafy shoot of the plant collected by W. E. Safford near Guadalaiara, Mexico, in 1907.

### 10. Pereskiopsis kellermanii Rose, Smiths. Misc. Coll. 50: 332. 1907.

Stem glabrous, herbaceous, weak, and clambering over shrubs to a length of 4 to 5 meters, about 2 cm. in diameter; second-year branches usually at right angles to main stem, with cherry-red bark; old stem bearing several slender, acicular brown spines, sometimes only 1, sometimes wanting, and numerous brown glochids; young branches green, fleshy, their areoles circular, white, filled with

long white hairs, brown glochids, and often with several acticular brown spines; spines on wild plants often stout, usually solitary, nearly black, 2 to 3 cm. long; leaves various, shining green, glabrous, thickish, elliptic and two or three times as long as wide, or suborbicular, acute at the apex, narrowed at the base, 5 cm. long or less, 2 to 2.5 cm. broad; flowers not known; fruit red, glabrous, leafy, 3 to 6 cm. long, bearing large areoles filled with brown glochids; seeds covered with matted hairs.



Figs. 28, 29, and 30.—Pereskiopsis kellermanii, showing three leaf forms. ×0.5.

Type locality: Trapichite, Guatemala. Distribution: Guatemala.

Figures 28, 29, and 30 are copied from sketches of the leaf-forms of the type plant, made by W. A. Kellerman in Guatemala in 1908.

11. Pereskiopsis scandens sp. nov. (Appendix following page 226).

### 2. PTEROCACTUS Schumann, Monatsschr. Kakteenk. 7:6. 1897.

Stems low, more or less branched above, cylindric, from tuber-like and often greatly enlarged roots: leaves minute, caducous; spines weak, several or many at each areole; glochids small, caducous as in Opantia: flower terminal, regular, without tube; perianth-segments several, erect; filaments and pistil shorter than the petals; ovary nearly turgid, bearing numerous small clusters of spines; fruit dry, capsular, dehiscent; seeds winged, white; embryo curved.

Type species: Pterocactus kuntzei Schumann.

Four species have already been described, but three of these we have combined and the fourth is referred to *Opuntia*. Three additional species, however, are here described. The generic name refers to the winged seeds.

This is a remarkable genus, and it is surprising that it remained unrecognized so long, for one of its species was known as long ago as 1837; the fruit and seeds, however, seem not to have been known until about 1897. In habit the plants are nearest some of the anomalous species of *Opuntia*, having large roots and short, weak stems like *Opuntia* chaffeyi. of Mexico; the seeds, however, differ, not only from those of *Opuntia*, but from those of all other cactus genera, in being winged. The fruit, according to Schumann, although we have not been able to confirm his observation definitely, is a capsule with an operculum. Another peculiarity is that the fruit is borne in the end of the stem or branch.

While this genus has good characters, it is no more distinct than many others and does not deserve the relative importance given to it by T. von Post and Otto Kuntze in Lexicon Generum Phanerogamarum, who treat it as one of the only three cactus genera to be conserved, in their view.

### KEY TO SPECIES.

Seeds narrowly winged; spines up to 2 cm. long	= 1. P. bickenii
Joints strongly tuberculate.	2. P. fischeri
Ovary densely covered with weak spines; wing of seed 1 mm. wide Ovary loosely covered with stiff spines; wing of seed 2 mm. wide	3. P. pumilus 4. P. tuberosus





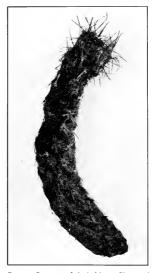


Fig. 33.—Pterocactus fischeri. ×1.12. Photograph by Paul G. Russell.

### 1. Pterocactus hickenii sp. nov.

Rootstocks moniliform, consisting of at least 4 joints widely separated; joints above ground 2 or 3, 2 to 3 cm. long, almost hidden by the spines; spines from each areole numerous, slender, yellow above, brown at base; glochids numerous; fruit and flower not known; seeds thick, 5 mm. in diameter, with narrow lateral wing.

Collected by Cristóbal M. Hicken (No. 3284) January 10, 1914, near Comodoro Rivadavia, southeastern Chubut, Argentina.

Figures 31 and 32 represent a plant and a seed from the specimen above cited.







Figs. 34, 35, 36.—Seeds of rhree species of Pterocactus. Natural size.

### 2. Pterocactus fischeri sp. nov.

Stems low, 1 dm. high or less; spreading or erect, cylindric, 1.5 cm. in diameter, tuberculate; leaves minute, acute; tubercles about as long as broad, arranged in spiral ridges somewhat resembling those of Opuntia whipplei; spines numerous, the radials 12 or more, white, setaceous, 6 mm. long, spreading, centrals usually 4, 1 to 1.5 cm. long, brownish, the tips and bases often yellowish;

glochids numerous, yellowish, 3 to 4 mm. long; flowers, in only specimen seen, terminal, almost continuous with the stem; ovary tuberculate and spiny like the stem, deeply umbilicate; seed one, large, flat-winged.

Collected by Walter Fischer in 1914 in the Province of Rio Negro, Argentina, and given to Dr. Rose during his visit to Argentina in 1915 by Professor Cristóbal M. Hicken.

While this species resembles some of the species of Cylindropuntia of the United States,

the spines are not sheathed.

Figure 33 is from a photograph of the specimen above cited; figure 34 shows a seed of the same specimen.

# 3. Pterocactus pumilus sp. nov.

Plants low, usually prostrate or ascending; joints cylindric, 1 cm. in diameter, covered with weak appressed spines; areoles very woolly; flower terminal; ovary sunk in the apex of the terminal joint, somewhat umbilicate; ovules several; seed flattened, 7 mm. in diameter, very thin.

Collected by Cristóbal M. Hicken (No. 3286), January 8, 1914, at Puerto Piramides, Chubut, Argentina.

Figure 35 shows a seed of above specimen.

### Pterocactus tuberosus (Pfeiffer).

Opuntia tuberosa Pfeiffer, Enum. Cact. 146. 1837. Opuntia tuberosa albispina Salm-Dyck in Förster, Handb, Cact. ed. 2, 911. 1885.

Pterocactus kuntzei Schumann, Monatsschr. Kakteenk. 7: 6. 1897

Pterocactus kurtzei Schumann in Engler and Prantl, Pflanzenfam. Nachtr. 259. 1897.

Pterocactus decipiens Gürke, Monatsschr. Kakteenk. 17: 147. 1907.

Roots tuber-like, single or in clusters, usually small but sometimes large and thick, up to 12 cm. long by 8 cm. in diameter, deep-seated, giving off several erect stems, these branching at surface of the ground; terminal branches purplish, turgid, 3 to 40 cm. long, 1 cm. in diameter, more or less clavate; areoles numerous, small, bearing numerous small white appressed spines; flowers terminal, 2 to 3 cm. long; petals long, lanceolate, apiculate, yellow; ovary with numerous areoles bearing long bristles; ovules numerous; fruit dry; seeds large, flat, winged, 10 to 12 mm. in diameter.

Type locality: Near Mendoza, Argentina. Distribution: Western provinces of Argen-Fig. 37.—Pterocactus tuberosus. Natural size. Photograph tina, chiefly in the mountains.



by Paul G. Russell.

We have not seen the type of P. kuntzei. which is doubtless at Berlin, but we have examined cotypes in the Kurtz Herbarium at Córdoba, Argentina, and at New York.

Opuntia tuberosa, described from Mendoza as long ago as 1837, has long been a puzzle to botanists, who have tried to associate it with various opuntias. Dr. Rose, who visited Mendoza in 1915, found a tuberous-rooted cactus in the mountains above that city, which we are convinced is the plant described by Pfeiffer. There is no doubt, on the other

NOPALEA,

33

hand, that it is *Pterocactus kuntzei*, from the same region, which was described as new by Schumann in 1897.

Opuntia alpina Gillies (Pfeiffer, Enum. Cact. 146. 1837) was not published, but was given as a synonym of Opuntia tuberosa. Schumann referred both names to Opuntia platyacantha.

Illustrations: Monatsschr. Kakteenk. 7: 7; Schumann, Gesamtb. Kakteen f. 107; Haage and Schmidt, Cat. Gen. 230, 1908; De Laet, Cat. Gén. f. 74; all as *Pterocactus kuntzei*; Blühende Kakteen 3: pl. 140, as *P. decipiens*.

Figure 36 shows a seed of a plant, collected by Dr. Rose near Mendoza, Argentina, in 1915; figure 37 is from a photograph of same plant; figure 38 is from a photograph taken by Dr. Carlos Spegazzini.

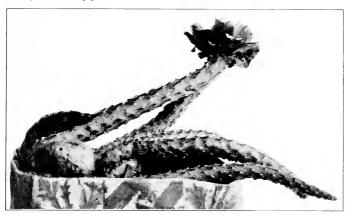


Fig. 38.—Pterocactus tuberosus.

## 3. NOPALEA Salm-Dyck, Cact. Hort. Dyck. 1849. 63. 1850.

Much branched cacti with definite cylindric trunks; roots so far as known fibrous; branches or joints flattened, fleshy, often narrow; glochids usually less abundant than in Opuntia: spines solitary or in clusters at the areoles, sheathless; leaves small, subterete, soon deciduous; areoles bearing white wood, glochids, and often spines; flowers originating in the areoles usually at or near the edges of the joints; sepals ovate, erect; petals red or pinkish, erect, closely appressed against the numerous stamens and the style; filaments and style slender, much longer than the petals; ovary more or less tuberculate, naked or spiny, with a very deep umbilicus; fruit a juicy berry, red, edible, usually spineless; seeds numerous, flat, covered by a hard bony aril.

Nopalea is closely related to Opuntia, with which it is sometimes united; the erect petals and elongated filaments and style are constant in Nopalea, however.

Three species were included by Salm-Dyck in this genus when it was described, of which *Opinitia cochenillifera* Linnaeus was the first and is therefore considered the type.

Karl Schumann described five species in his monograph, but since then two species, N. guatemalensis and N. Intea, have been described by Dr. Rose, and one, N. inaperta, by Dr. Griffiths. N. moniliformis (Linnaeus) Schumann, based on plate 198 of Plumier, is Opuntia moniliformis (Linnaeus) Steudel.

The species are natives of Mexico and Guatemala, and have been accredited to Cuba, although none has recently been observed wild on that island. Some of them are widely

cultivated and may be found throughout the warmer parts of the world. Two are of some economic importance and two or three are grown as ornamentals.

The name Nopalea is doubtless from nopal, the common name of Mexicans for certain opuntias and nopaleas.

#### KEY TO SPECIES

Nopolea cocerfera Lemaire, Cacetes 89. 1868.

Often tall plants, 3 to 4 meters high, with trunks up to 2 dm. thick; branches of ascending or spreading oblong joints, sometimes 5 dm. long; green, bright green at first; spines none or rarely minute ones develop on the older joints; glochids numerous, caducous; leaves small, awl-shaped, soon deciduous; flowers appearing from the tops of the joints, usually in great abundance; flower, from base of ovary to tip of style, 5.5 cm. long, ovary nearly globular, 2 cm. long, with low diamond-shaped tubercles, its areoles bearing many glochids; sepals broadly ovate, acute, scarlet; petals a little longer than the sepals, otherwise similar, persistent; stamens pinkish, exserted 1 to 1.5 cm. begoth the petals; stigma-lobes 6 or 7, greenish, exserted beyond the stamens; style swollen just above its base into a broad disk; fruit red, about 5 cm. long, rarely maturing in greenhouse plants; seeds about 5 mm. long and 3 mm. wide.

Type locality: Jamaica and tropical America.

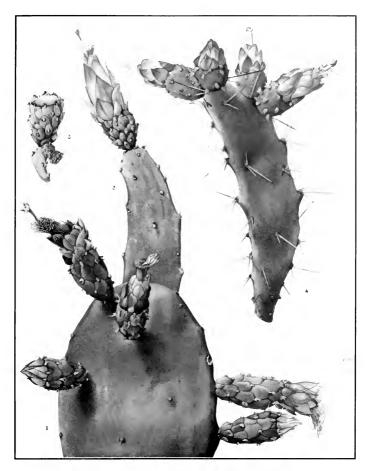
Distribution: Cultivated in the West Indies and tropical America; its original habitat unknown.

Opuntia magnifolia Noronha (Verhandl, Batav. Genootsch. 5\*: 22. 1790), published without description, is referred to this species by Schumann and others. The name Opuntia mexicana, although it has been used for more than one species, first appeared in Pfeiffer's Enumeratio (p. 150. 1837) as a synonym of O. cochemillifera. Cactus subinermis Link (Steudel, Nom. ed. 2. 1: 246. 1840) is given as a synonym of Opuntia cochemillifera.

The specific name of this plant was given because it is one of the species of cactus from which cochineal was obtained. Cochineal was long supposed to be a vegetable product; it was not until 1703 that, by the aid of the microscope, it was definitely determined to be of insect origin. The cochineal industry is of prehistoric origin. The Spaniards found it well established when they conquered Mexico in 1518, and began at once to export the product. As early as 1523 Cortez was ordered to obtain and send to Spain as much as he possibly could, while during the early colonial days it was one of the chief articles of tribute to the crown. From Mexico and Peru the industry was taken to southern Spain, India, Algiers, South Africa, New Granada (Colombia), Jamaica, and the Canary Islands. The industry grew rapidly and was very profitable. The greatest source of the cochineal was probably the Canary Islands. In about the year 1868 more than 6,000,000 pounds, valued at \$4,000,000, were exported from these islands alone, of which the largest part was sent to England.

The cochineal insects were placed on the joints or branches of the cactus plants, where they rapidly multiplied and in about four months were collected by brushing them off into baskets or bags. Then, after being dried in various ways, they became the cochineal of commerce. Two or three such collections were made each year.

BRITTON AND ROSE PLATE IV



Upper part of flowering joint of Nopalea cochenillifera
 Upper part of flowering joint of Nopalea aubers.

3. Fruit of Nopalia aubert. 4. Flowering joint of Nopalea dejecta-

All three-fourths size

NOPALEA, 35

The cactuses upon which the cochineal was raised were often grown in large plantations called nopalries, sometimes containing 50,000 plants in rows about 4 feet apart.

Since the introduction of the aniline dyes, the cochineal industry has almost disappeared. The cochineal colors, while brilliant and attractive, are not very permanent.

According to J. J. Johnson, this plant was introduced into cultivation in England, in 1688; but according to Ray it was growing in Chelsea before that time.

Illustrations: Hernandez, Nov. Pl. Hist. 78 and 479. f. 1. 1651, as Nopalnochetzli; Andrews, Bot. Rep. 8: pl. 533; Curtris's Bot. Mag. 54: pl. 2741, 2742; Descourtilz, Fl. Pict. Antilles 7: pl. 516, all as Cactus cochenillifer. Cycl. Amer. Hort. Bailey 1: 205. f. 308; Gard. Chron. III. 34: 92. f. 41; Pfeiffer and Otto, Abbild. Beschr. Cact. 1: pl. 24, all as Opuntia cochenillifera; Förster, Handb. Cact. ed. 2 f. 3, as Opuntia coccifera; Dillenius, Hort. Elth. pl. 297, as tuna, etc.; Agr. Gaz. 25: pls. opp. p. 884; Amer. Garden 11: 457; Martius, Fl. Bras. 47: pl. 60. Schumann Gesamtb. Kakteen f. 109, B. Loudon, Encycl. Pl. ed. 1 and 3. 412 f. 6888, as Cactus cochenillifer; Contr. U. S. Nat. Herb. 8: pl. 48 as spineless opuntia; Knorr, Thesaurus pl. 0, 1.

Plate IV, figure I, shows a plant which flowered in the New York Botanical Garden in

2. Nopalea guatemalensis Rose, Smiths. Misc. Coll. 50; 330, 1907.

Tree-like, 5 to 7 meters high, branched, sometimes nearly to the base; joints bluish green, ovate to bolong, 15 to 20 cm. long; arcoles numerous, filled with short white wool; spines 5 to 8, unequal, nearly or quite porrect, white or sometimes rose-colored, the longest 2.5 to 3 cm. long; leaves small, linear, reflexed; flower, including ovary, 5 to 6 cm. long; sepals ovate, thickened; petals red; fruir 4 to 5 cm. long, clavate, red, more or less tuberculate, deeply umbilicate, without prominent glochids; seeds irregular, 4 mm. broad.

Type locality: El Rancho, Guatemala.

Distribution: Arid valleys of Guatemala.

Illustrations: Safford, Ann. Rep. Smiths. Inst. 1908: f. 13, 14; Smiths. Misc. Coll. 50: pl. 41, 42.

Figure 39 illustrates joints of a plant obtained from Frank Weinberg in 1910.

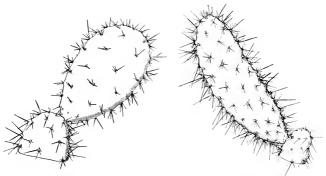


Fig. 39.—Nopalea guatemalensis. X0.4.

Fig. 40.—Nopalea lutea, X0.4.

#### 3. Nopalea lutea Rose, Contr. U. S. Nat. Herb. 12: 405. 1909.

More or less arborescent, 5 meters high or less, with a short, definite trunk and several large, lateral, more or less spreading branches; joints obovate to elliptic or oblong, 10 to 22 cm. long, pale green, slightly glaucous; areoles about 2 cm. apart, large, filled with short brown wood; spines weak, yellow, acicular or bristle-like, the longest 4 cm. long; flowers 5 cm. long; petals red, 2 cm. long.

ovary with numerous prominent arcoles filled with yellow bristles; fruit red, 4 cm. long; seeds 4 to 5 mm. in diameter.

Type locality: Near El Rancho, Guatemala.

Distribution: Guatemala, Honduras, and Nicaragua.

This species, although not discovered until 1907, is very common, extending from altitude 300 meters at El Rancho to altitude 1,100 meters near Aguas Calientes. Accord-



Fig. 41.-Nopalea dejecta.

ing to Mr. Charles C. Deam, who has explored extensively in Guatemala, the plant when growing on river sand-bars is low, but in rich soil is tall.

Our reference of this species to Nicaragua is based on a specimen collected by A. S. Oersted in 1845-1848 between Granada and Tipitapa. The joints of this, however, are nearly orbicular or a little longer than broad, with numerous brown spines and glochids. More material may show that this specimen should be referred elsewhere.

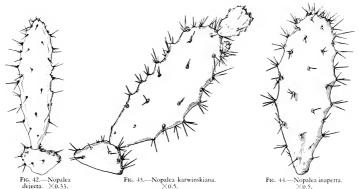
Illustration: Contr. U. S. Nat. Herb. 12: pl. 58.

Figure 40 shows a joint of a plant from Guatemala, received from F. Eichlam in 1911.

- 3a. Nopalea gaumeri sp. nov. (See Appendix, p. 216.)
- 4. Nopalea auberi (Pfeiffer) Salm-Dyck, Cact. Hort. Dyck. 1849. 64. 1850.

Opuntia auberi Pfeiffer, Allg. Gartenz. 8: 282. 1840.

Often 8 to 10 meters high, with a cylindric, jointed trunk, never very spiny, but the areoles bearing tufts of brown glochids; branches often at right angles to the stem; joints narrow, thick, 3 dm. long, bluish green and glaucous; areoles circular, about 2 mm. broad, bearing short white wood and later a tuft of brown glochids; spines, when present, 1 or 2, subulate, the upper one about twice as long as the other, white or nearly so, with brownish tips, the longest one 2 to 3 cm. long; flowers from base of ovary to tip of style about 9 cm. long; petals erect, closely embracing the stamens, rose-pink, ovate-lanceolate, acuminate, 2 to 3.5 cm. long; filaments 12 to 15 mm. longer than the petals, white below, but the exposed parts pinksh; anthers dehiscing before maturing of stigma; style stout, light pink with a large, white, circular disk just above the constricted base; stigma-lobes green; ovary 4 cm. long, with low but very district tubercles and a deep umbilicus, its areoles bearing many brown glochids, these sometimes 10 mm. long.



Type locality: Erroneously cited as Cuba. Distribution: Central and southern Mexico. Illustration: Addisonia 1: pl. 10.

Opuntia auberi was described as from Cuba, but as no Nopalea is known from Cuba we have been unable to account for this reference. The following incidents may explain it:

return. The following incidents may separal not be supported by the first property of th

Plate IV, figure 2, represents a flowering joint of a plant obtained by W. E. Safford at Guadalajara, Mexico, in 1907; figure 3 shows young fruit of the same plant; plate v is from a photograph taken by Dr. MacDougal near Mitla, Mexico, in 1906.

5. Nopalea dejecta Salm-Dyck, Cact. Hort. Dyck. 1849. 64. 1850.

Opuntia dejecta Salm-Dyck, Hort. Dyck. 361. 1834.

Nopalea angustifrons Lindberg, Act. Soc. Sc. Fenn. 10:123. 1871.

Plant 1 to 2 m. high, with a definite trunk, very spiny, the old areoles often bearing 6 or 8 spines; joints narrow, 10 to 15 cm. long, only moderately thick, often drooping, bright green even in age, bearing usually two somewhat spreading spines at an areole; spines at first pale yellow or pinkish, in age gray, the longest 4 cm. long; flower, including ovary and style, 5 cm. long; sepals obtuse; petals erect, dark red; stamens long-exserted, dark red.

Type locality: Erroneously cited as Havana, Cuba.

Distribution: Common in cultivation in tropical America; perhaps native in Panama. Opuntia diffusa and O. borizontalis are both given by Pfeiffer (Enum. Cact. 159: 1837) as synonyms of this species. Illustrations: Agr. Gaz. N. S. W. 25: pl. opp. p. 138; Roig, Cact. Fl. Cub. pl. [6], this last as Nopalea auberi: Act. Soc. Sc. Fenn. 10: pl. 2, as Nopalea augustifrons.

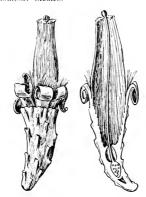
Plate IV. figure 4, shows a flowering joint of a plant obtained from Mr. S. F. Curtis in 1897. Figure 41 is from a photograph taken by Dr. Juan T. Roig in the Havana Botanical Garden, Cuba; figure 42 shows a joint of a plant collected by Mr. J. F. Cowell at Panama in 1905.

### 6. Nopalea karwinskiana (Salm-Dyck) Schumann, Gesamtb. Kakteen 752. 1898.

Opuntia karwinskiana Salm-Dyck, Cact. Hort. Dyck. 1849. 239. 1850.

A tree, 2 meters high or more, with a definite jointed terete spiny trunk; joints oblong, 1.5 to 3 dm. long, light dull green, only slightly glaucous; leaves elongated, acute; areoles distant; spines 3 to 7 from an areole, porrect, 1 to 2 cm. long, pale yellow to nearly white; glochids yellow, numerous, caducous; flowers red, 11 to 12 cm. long; ovary deeply umbilicate, 3 cm. long.

Type locality: In Mexico. Distribution: Mexico.



Figs. 45, 46.—Flower of Tacinga funalis. X0.9. Drawing by A. Löfgren.



Figs. 47, 48.—Tacinga funalis. X0.6.

This species was sent from Mexico by Karwinsky, who supposed it was an *Opuntia*. When described by Salm-Dyck in 1850 it had not flowered. It was re-collected by Edmund Kerber near Colima, Mexico, and flowered for the first time in cultivation in 1879.

Our description is drawn chiefly from a plant now in the New York Botanical Garden, obtained from M. Simon, of St. Ouen, Paris, France. In the original description it is stated that the young spines are 2 to 4 and rose-colored, but afterwards 18 to 20, gray and deflexed. O. nopalilla Karwinsky (Salm-Dyck, Cact. Hort. Dyck. 1849. 68. 1850) was first given as a synonym of this species.

Figure 43 represents a joint with young fruit, from a plant sent by M. Simon, St. Ouen, Paris, France, in 1901.

### 7. Nopalea inaperta Schott in Griffiths, Monatsschr. Kakteenk. 23: 139. 1913.

Described as 5 to 7 meters high, but in cultivation much smaller, diffusely branched, often bush-like; trunk very spiny; terminal joints rather small, obovate, 6 to 17 cm. long, strongly tuberculate, bright green; spines usually 3 to 6 at arecoles of young joints, more at old ones, yellowish

BRITTON AND ROSE PLATE V



Nopalea auberi as it grows near Mitla, Mexico. Photographed by D. T. MacDougal.



TACINGA. 39

brown, 2 cm. long or less; flowers rather small, including ovary and stamens 4 cm. long; filaments numerous, long-exestred; style much longer than the stamens; stigma-lobes 5, green; fruit small, red, 1.5 cm. long.

Type locality: In Yucatán, Mexico.

Distribution: Yucatán.

Dr. Griffiths states that he found this species in the Albert S. White Park, Riverside, California, in 1904. In the Bulletin of the New Mexico Agricultural Experiment Station No. 60 he describes and illustrates it, but without specific name. Later he identified it as the same as one of Schott's specimens from Yucatán, and then published it as above.

Dr. Griffiths compares it with N. auberi, but its nearest relative is N. karwinskiana, from which it differs in its smaller and more tuberculate joints and much smaller flowers.

Illustration: N. Mex. Agr. Exp. Sta. Bull. 60: pl. 3, f. 1, as Nopalea.

Figure 44 shows a joint from a plant obtained by Dr. David Griffiths at Riverside.

### 4. TACINGA gen. nov.

Long, clambering, or climbing cacti, more or less branched; old stems smooth, brown: branches faintly ribbed, terere; young branches green, each tipped with a tuft of long wool or soft bairs; are-oles small but conspicuous, black, the margin giving off long, white, cobwebby hairs; leaves minute, soon deciduous, 3 to 4 mm. long; spines sometimes present, on young joints 2 or 3, reflexed, appressed, brown, 2 to 3 mm. long, not seen on old branches; glochids from the upper parts of the areoles, pale yellow, numerous, caducous, falling in showers at the slightest jarring of the branch; flower-buds acute; flowers usually terminal, opening in the evening or at night; ovary narrow, bearing numerous arcoles, the umbilicus very deep; petals few, spreading or recurved; a row of hairs between the petals and the stamens; stamens and style erect, much longer than the petals; fruit oblong, the upper half sterile, bearing areoles but no spines; seeds nearly globular, white, covered with a bony aril.

This genus is intermediate between Opuntia and Nopalea, having the erect, non-sensitive stamens of the latter, and the areoles, leaves, and glochids of the former. From Opuntia it differs in its narrow, green, recurved petals, in having one or possibly more rows of hairs between the stamens and the petals, in the clambering or climbing habit, and its very caducous glochids.

Only one species is known, this a common and characteristic plant of the catinga\* in Bahia, Brazil, whence the anagramatic name.

### 1. Tacinga funalis sp. nov.

At first erect, then climbing over shrubs or through trees, 1 to 12 meters long, somewhat branching; old stems woody, slender; branches usually reddish, the areoles borne on low ribs; glochids short; flower, including ovary, 7 to 8 cm. long; sepals about 10, short, ovate, acute, 5 to 15 mm. long; petals about 7, green, 4 cm. long, acute, revolute;

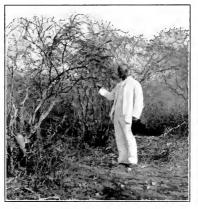


Fig. 49.—Tacinga funalis. Showing how it climbs over bushes.

stamens erect, connivent, not sensitive; anthers narrow, elongated; style elongated, thread-like, most slender below, a little longer than the stamens, 4.5 cm. long, cream-colored; stigma-lobes 5, green; fruit 4 to 5 cm. long; seeds 3 to 4 mm. broad.

<sup>\*</sup>Catinga or caatinga is the common Brazilian name for the thorn-bush desert region in Bahia, Brazil. Dr. Albert Lötgren says that the name (best spelled caatinga) is of Indian origin, meaning caa—wood, forest; unga—white, clear; a forest in which one can see far.

Common in the dry parts of Bahia, Brazil, where it was collected by Rose and Russell in 1915 (No. 19723, type). Dr. Zehntner thinks there may be a second species, as he has found one with purple flowers; specimens from southern Bahia had purple buds, but the open flowers were not seen. The type comes from Joazeiro, northern Bahia.

Dr. Rose studied this species in the field and believed it to be new. On reaching Rio de Janeiro, he found that Dr. A. Löfgren had also studied it, referring it, however, to

Opuntia, using the above specific name.

Figures 45 and 46 are copied from drawings of the flowers given to Dr. Rose by Dr. Löfgren; figures 47 and 48 are from twigs of the plant grown at the New York Botanical Garden; figure 49 is from a photograph of the type plant.

## 5. MAIHUENIA Philippi, Gartenflora 32: 260. 1883.

Plants low, cespitose, often forming small, dense mounds; stems jointed; joints small, globular or short-cylindric; leaves small, usually terete, persistent; leaves of seedlings terete, ascending, with 2 long white bristles in the axils; arcoles filled with white wool; spines 3, the central one elongated, the 2 lateral ones small and very short; glochids wanting; flowers large for the size of the plant, yellow or red, usually terminal; petals distinct; flower-tube none; stamens and style much shorter than the petals; fruit juicy (described as dry in one species), oblong to obovoid, bearing small scattered, ovate, persistent leaves; wall of fruit thin; cotyledons linear; seed black, shiring, with a brittle testa.

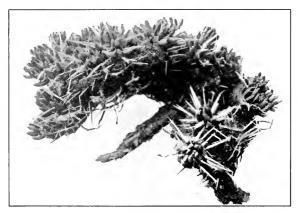


Fig. 50.-Maihuenia valentinii.

Type species: Opuntia poeppigii Otto.

There are five species described, rather closely related, natives of the high mountains of Chile and Argentina.

The generic name is derived from maihuen, the native name of the plant.

This is a small, localized genus; it is perhaps nearest *Opuntia*, but is without glochids and has different seeds. The first species was described in 1837, and a second in 1864, both as *Opuntia*. Weber in 1898 transferred them to *Pereskia*, proposing a new subgenus for them, but they are much less like *Pereskia* than *Opuntia*, for, except as to the seeds, they have little in common with *Pereskia*; in habit, leaves, spines, flowers, and fruits they are quite unlike any of the pereskias.

#### KEY TO SPECIES

KEY TO SPECIES.	
Joints subglobose 1. M. patagonica	
Joints oblong to cylindric.	
Leaves linear, 4 to 6 mm. long 2. M. poeppigii	
Leaves ovate to subulate, 2 to 4 mm. long.	
Joints spineless below	
Joints spiny all over.	
Leaves on the ovary with white hairs	
in their axils 4. M. valentinii	
Leaves on the ovary without hairs in	- 1
their axils	(3
A Marth and a construction (DETERMINE)	١

### Maihuenia patagonica (Philippi).

Opuntia patagonica Philippi, Linnaea 33: 82. 1864. Pereskia philippii Weber, Dict. Hort. Bois 939. 1898. Maihuenia philippii Weber in Schumann, Gesamtb. Kakteen 757. 1898.

Low, much branched, and dense, resembling Sempervirum tomentosum in habit; joints subglobose, 1 to 1.5 cm. in diameter; leaves subulate, green; young areoles bearing white hairs; spines weak, hardly pungent, white, the longest

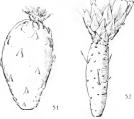


Fig. 51.—Maihuenia poeppigii. ×0.75. Fig. 52.—Maihuenia brachydelphys. ×0.75.

10 to 15 mm. long; flowers 2.8 to 3 cm. long; fruit 8 to 10 mm. long, thicker than long; leaves on the ovary ovate to lanceolate, fleshy, naked in their axils, except some of the upper ones; seeds round, 3 to 4 mm. in diameter.

Type locality: In southern Argentina.

Distribution: Near snow-line on southern mountain ranges of Argentina and Chile.

Opuntia philippii Haage and Schmidt, without description, is given by Weber (Dict. Hort. Bois 939, 1898) as a synonym of this species.

This is called by the natives espina blanca.

#### Maihuenia poeppigii (Otto) Weber in Schumann, Gesamtb. Kakteen 755. 1898.

Opuntia poeppigii Otto in Pfeiffer, Enum. Cact. 174. 1837. Opuntia maihuen Remy in Gay, Fl. Chilena 3: 29. 1847. Pereskia poeppigii Salm-Dyck, Cact. Hort. Dyck. 1849. 232. 1850.

Shrubby, much branched, prostrate, forming dense cespitose masses 1 meter broad; joints spiny to the bases, cylindric, 6 cm. long or more, 1.5 cm. in diameter; leaves cylindric, green, 4 to 6 mm. long; spines 3 from each areole, the 2 laterals very short, the central one 1.5 to 2 cm. long; flowers terminal, yellow; fruit oblong to obovoid, about 5 cm. long and 3 cm. thick.

Type locality: In Chile, without definite locality.

Distribution: High mountains of Chile.

Illustrations: Schumann, Gesamtb. Kakteen f. 108, B, C.; Gartenflora 30: 412, as Pereskia poeppigii; Gartenflora 32: pl. 1129, f. 1 to 4, as Opunta poeppigii; Dict. Gard. Nicholson 3: f. 82, as Pereskia poeppigii.

Figure 51 is from a fruit obtained by Dr. Rose at the National Museum of Chile, Santiago, in 1914.

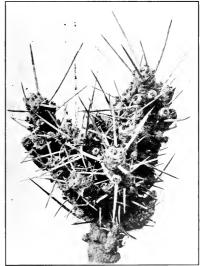


Fig. 53.-Maihuenia tehuelches

3. Maihuenia brachydelphys Schumann, Gesamtb. Kakteen 756. 1898.

Opuntia brachydelphis Schumann in Just, Bot. Jahresb, 261: 343. 1898.

Cespitose, prostrate; joints cylindric or nearly ellipsoid, naked below, 2 cm. long; spines 2 or 3, one much stouter and longer, yellow except at base and there brown; leaves terete, 2 to 3 mm. long; areoles circular, full of white wool; flowers usually from the tips of joints, red, 3.5 cm. long.

Type locality: Pasco Cruz, Argentina, 34 south latitude, province of Mendoza.

Distribution: Western Argentina.

Opuntia brachydelphys Schumann is mentioned by Kuntze (Rev. Gen. Pl. 32: 107. 1898) by name only.

Illustration: Schumann, Gesamtb. Kakteen f. 108, A.

Figure 52 is copied from Schumann's illustration above cited.

Mammillaria brachydelphis is a clerical error for Opuntia brachydelphis.

4. Maihuenia valentinii Spegazzini, Anal. Mus. Nac. Buenos Aires Il. 4: 289. 1902.

Shrubby, 1 to 2.5 dm. high, dull green; joints cylindric, somewhat clavate, 1 to 3.5 cm. long; leaves ovate, small; spines 3, the central much larger, 2 to 6 cm. long; flowers from near the ends of the branches, 2 cm. broad, the sepals reddish, the petals white to light yellow; stamens indefinite; filaments white; style 6 mm. long, white, longer than the stamens; stigma-lobes 5, short, 2 mm. long, purplish; ovary globular to obconic, 5 to 8 mm. long, bearing numerous triangular fleshy leaves with long white hairs and sometimes 1 or 2 spines in their axils; fruit unknown.

Type locality: Near Trelew, Chubut, Argentina.

Distribution: Territory of Chubut, southern Argentina.

Related to M. tehuelches and M. poeppigii, but said to be very distinct.

Figure 50 is from a photograph furnished by Dr. Carlos Spegazzini.

5. Maihuenia tehuelches Spegazzini, Anal. Mus. Nac. Buenos Aires 11. 4: 288. 1902.

Shrubby, 2 to 3 dm. high, with many intricate branches, dull green; joints cylindric, ellipsoid to somewhat clavate, 2 to 8 cm. long by 10 to 12 cm. in diameter; leaves ovate, small, 2 to 4 mm. long; spines 3, the central one erect, 2 to 4 cm. long, the 2 lateral ones only 5 to 10 mm. long; flowers at the apex of the branches, 35 to 45 mm. broad, white to yellowish white; fruit globose, naked, dry, 2 cm. in diameter; seeds black, 3 mm. broad.

Type locality: Between San Julián and Río Deseado, Argentina.

Distribution: Dry, rocky deserts, southwestern Argentina.

Figure 53 is from a photograph furnished by Dr. Carlos Spegazzini.

OPUNTIA (Tournefort) Miller, Gard, Dict. Abridg. ed. 4. 1754.

Cactodendron Bigelow, Pac. R. Rep. 3: 102; 4:7, 11, iii. 1856. Consolea Lemaire, Rev. Hort. 1862: 174. 1862.

Tephrocactus Lemaire, Cact. 88. 1868.

Ficindica St. Lager, Ann. Soc. Bot. Lyon 7: 70. 1880. Cactus Lemaire † Cactées 86. 1868. Not Linnæus, 1753.

Cacti, sometimes with definite trunks, or more often much branched from the base, the branches often spreading, reclining, or prostrate, sometimes clambering, but never climbing (one species known with annual stems); roots fibrous or rarely tuberous and large and fleshy; ultimate branches (joints or pads) cylindric to globose or flattened, usually very fleshy, sometimes woody; areoles axillary, bearing spines, barbed bristles (glochids), hairs, flowers, and sometimes glands; leaves usually small, terete, mostly early deciduous; spines solitary or in clusters, terete or flattened, naked or sheathed, variously colored; glochids usually numerous, borne above the spines; flowers usually one at an areole; ovary inferior, one-celled, many-ovuled, beating leaves, the areoles often with spines and glochids; sepals green or more or less colored, usually grading into the petals; petals usually of various shades and combinations of green, yellow, and red (rarely white), widely spreading; stamens much shorter than the petals, sensitive; style single, thick; stigma-lobes short; fruit a berry, dry or juicy, often edible, spiny or naked, globular, ovoid or ellipsoid; seed covered by a hard, bony aril, white, flattened; embryo curved; cotyledons 2, large.

The species grow naturally from Massachusetts to British Columbia south to the Strait of Magellan. Several have been naturalized and have become very abundant locally in the Old World and in Australia.

<sup>[</sup>Lemaire in his Les Cactees, published in 1868, takes up the name Cacinas for certain of the low, depressed, much branched or cespitose species of Opanias. He lists a number of these on pages 87 and 88, but as they are not connected through published species their identification is made only by inference.

OPUNTIA. 43

The type species is Cactus opuntia Linnaeus.

Karl Schumann recognized 131 species in his "Gesamtbeschreibung der Kakteen," published during the years 1897 and 1898. Many have been described since this monograph was published.

The name Opuntia was that of a town in Greece, where some cactus-like plant is said to have grown.

The genus is important economically. It furnishes the well-known tuna fruit largely imported into our eastern cities from Italy and which is common in the markets of Mexico. Some species are used for hedges, the branches of others are cooked like spinach, and still others furnish forage for stock.

The species are numerous and very diverse, and have at various times been grouped by authors into several genera, while other species, now referred by us to *Nopalea, Maihuenia*, and *Pereskiopsis*, were included in *Opuntia*.

The following genera now referred to *Opuniu* have been regarded as distinct from it: *Consolea* was described by Lemaire in 1862. He described five species, of which *C. rubescens* is the first and therefore the type. This group is a striking one, characterized by a pronounced cylindric trunk in old plants, with an unjointed central woody axis, peculiar semaphore-like branches at the top, and very small flowers. There are eight species of this group, described under our series *Spinosissimae*. They are confined to the West Indies, although *C. rubescens*, the spineless race of *Opuniu catacantha*, was originally described as from Brazil—doubtless erroneously.

Tephrocactus was described by Lemaire in 1868, and to it he referred eight species of Opuntia. T. diadematus is the type species. Schumann included it in Opuntia as a subgenus, with 15 species. They are all South American, chiefly in Argentina and Bolivia.

Ficindica was established by St. Lager in 1880, based on Opuntia ficus-indica, which is clearly congeneric with Opuntia opuntia.

In 1856 the name *Cactodendron* was proposed in an account of Whipple's Expedition, published in volumes 3 and 4 of the Pacific Railroad Reports. It was apparently not intended to be a formal publication, but as a definite species is indicated, the name is published. It will be of interest to record here the evidence upon which we reach this conclusion:

Cactodendron Bigelow Pac. R. Rep. 3: 102; 4:7, 11; Additional Notes and Corrections iii. 1856.

"There are \* \* \* \* Opuntia of many varieties; some with wide leaf-like joints, others of shrubby form and woody fibre, which the botanist proposes to name Cactodendron." Pac. R. Rep. 3: 102.

"Immediately on our entrance into this valley (November 19 [1856]) we found and collected a new species of Opuntia, with prostrate, nearly terete joints, entirely devoid of woody fibre; \* \* \* ... Lieutenant Whipple discovered the first specimen of our new Cactodendron, as we were pleased to call it, to distinguish it from the O. arborescens," Pac. R. Rep. 4: 7.

"The arborescent *Opuntia*, first found near Zuni, which, to distinguish from the true *O. arborescens*. we called *Cacto-dendron*, finds its western limits near the termination of this region." Pac. R. Rep. 4:10.

"15. 'New arboresent *Opuntia*,' called also 'our new *Cactodendron*,' pages 7 and 11, is *Opuntia* whipplei, E. & B., new species." Pac. R. Rep. 4: Additional Notes and Corrections iii.

Opuntias are known under a great variety of names. Among the names for the flatjointed species, the most common are: prickly pear in the United States; tuna in Mexico; sucker and bullsucker in the Lesser Antilles. For the round-stemmed forms we have: cane cactus, and such Mexican names as cholla and tasajo. Dr. David Griffiths has published a list of names used in Mexico.

The genus *Opuntia*, as understood by us, is composed of at least 250 species, but more than 900 names are to be found in literature. No type specimens of many of the species

were preserved by their authors, some have, apparently, been lost, and some, which are probably preserved, we have been unable to study.

The genus shows a great range in stem structure, varying from cylindric to broad and flat. These extremes suggest different generic types, but these characters can not be used except in the most general way, for some species have both rounded and flattened stems. Some with round stems have flowers which suggest a closer relationship with the species with flattened stems.

The habits of some of the species are very characteristic, while others show a wide range of forms. Many of the erect or tree-like forms, when grown from cuttings, develop bushy habits much unlike their normal shapes.

The spines, while somewhat constant in color in some species, vary considerably in others, and the number of spines is rather inconstant. Species which are normally abundantly spined are sometimes naked when cultivated, while species which are normally naked sometimes develop spines in cultivation; cultivated specimens usually have weaker spines and sometimes decidedly different ones from wild plants.

The flowers often vary greatly in color, as is seen especially in O. versicolor and O. lindheimeri, which show wide ranges of color forms. Some flowers vary in color during the day.

We group the species known to us into 3 subgenera, 46 series, and with the following characteristics:

### KEY TO SUBGENERA AND SERIES OF OPUNTIA.

```
A. Joints all terete, elongated or short, cylindric to globose.
     C. Spines with papery sheaths.
         D. Spines, at least some of them, solitary, sometimes several,
                    acicular; ultimate branches slender, rarely more
                    than 1 cm. thick.
           E. Stem and branches conspicuously marked by flattened,
diamond-shaped tubercles; fruit dry, covered with
         . Series 1. Ramosissimae (N. A.)
       E. Ultimate branches not over 2 cm. thick...... Series 3. Thurberianae (N. A.)
         EE. Ultimate branches 2 cm. thick or more.
            F. Fruit dry Series 4. Echnocanpae (N. A.)
              CC. Spines without sheaths.
         D. Joints not tuberculate, or with broad or flat tubercles.
           EE. Areoles neither long-woolly nor long-hairy.
             F. Joints clavate or crested ....... Series 9. Clavarioides (S. A.)
            FF. Joints neither clavate nor crested.
              G. Low, slender species, scarcely, if at all, tuberculate ... Series 10, S.dmianae (S. A.) GG. Tall, stout species, the tubercles broad or flat;
                                                     ..... Series 11. Subulatae (S. A.)
                    leaves large .
         DD. Joints strongly tuberculate, the tubercles elevated.
              Tall, shrubby species; joints cylindric...................... Series 12. Miquelianae (S. A.)
           EE. Low, prostrate species; joints clavate (transition to
                                                              Series 13. Claratae (N. A.)
                     Tephrocactus)
    BB. Branches 1 to few-jointed, the short joints usually clustered. . . . Subgenus 2. TEPHROCACTUS (S. A.)
        C. Joints, at least some of them, cylindric, tuberculate, the
                     tubercles contiguous (transition to Cylindropuntia) Series 1. Il eherianae
      CC. Joints globose to oblong, mostly little, if at all, tuberculate.
          D. Areoles normally bearing many long white hairs, which often
               cover the whole plant . . . . . . . . . . . . . . . . . Series 2. Floccosae
         DD. Areoles without hairs.
            E. Spines, when present, at least some of them, modified into
                                                            Series 3. Glomeratae
                flat, papery processes ......
           EE. Spines, when present, all subulate or acicular, terete or
               somewhat flattened . . . . . . . . . . . . . . . . . Series 4. Pentlandianae
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OPUNTIA. 45

# KEY TO SUBGENERA AND SERIES OF OPUNTIA—continued.

KET TO SUBGENERA AND SERIES OF OTC	iviin commuca.
AA. At least some of the joints flat or compressed B. Stems perennial, stout or slender.	Subgenus 3. PLATYOPUNITA (P)
C. Plants branching from near or at the base, not forming erect, cylindric unjointed trunks; flowers mostly large.	
<ul> <li>D. Epidermis glabrous or pubescent, not papillose-tuberculate when dry.</li> </ul>	
E. Flowers perfect; petals obovate to oblong.	
<ul> <li>F. Fruit a juicy berry (exceptions in Series 5, Basilares).</li> <li>G. Joints readily detached.</li> </ul>	
H. Joints very readily detached; low, mostly small-	
jointed species.  I. Joints little flattened, subterete (transition to	
Cylindropuntia)  11. At least the ultimate joints distinctly flattened.	Series 1. Pumilae (N. A.; S. A.) 100.
J. Ultimate joints or all joints turgid	Series 2. Curavsavicae (N. A.; S. A.) 102. Series 3. Aurantiacae (S. A.) 106.
JJ. Ultimate joints flat and thin	
larger-jointed species	Series 4. Tunae (N. A.; S. A.) 110.
GG. Joints not readily detached, persistent.	
H. Areoles small, 1 to 2 mm. in diameter, not ele-	
vated, mostly close together	Series 5. Basilares (N. A.) 118.
HH. Areoles larger, mostly distant.	
<ol> <li>Prostrate or spreading species; joints relatively small. (O. anstrina suberect.)</li> </ol>	
J. Joints not tuberculate.	
K. Flowers small, brick-red	Series 6. Inamoenae (S. A.) 125.
KK. Flowers large, yellow	Series 7. Tortispinae (N. A.) 126.
JJ. Joints strongly tuberculate	Series 8. Sulphurese (S. A.) 133.
II. Bushy, depressed or tall species.	
J. Spines, when present, brown or yellow (white	
in O. setispina).	
K. Spines brown, at least at the base or tip.	
L. Bushy or depressed species.	
M. Fruit very small	Series 9. Strigiles (N. A.) 150.
MM. Fruit large. N. Spines acicular	Soules 10 Sylichings (N. A.) 136
NN. Spines subulate	Series 11 Physic mthre (N. A.) 130
LL. Tall species, sometimes with a definite	Selles 11. Progentanione (IN. II.) 15%.
trunk (O. galapageia sometimes de-	
pressed).	
M. Spines several at each areole	Series 12. Elationes (N. A.; S. A.) 149.
MM. Spines, when present, 1 to few at each	(
areole	Series 13. Elatae (S. A.) 156.
KK. Spines, if any, yellow, at least partially.	
L. Epidermis glabrous.	
M. Areoles close together, bearing long	
brown wool	Series 14. Scheerianae (N. A.) 159.
MM. Areoles distant, without long wool	Series 15. Dillentanae (N. A.) 159.
LL. Epidermis, at least that of the ovary, pub- escent.	Series 16 Macdongalianae (N. A.) 169.
JJ. Spines, when present, white (or faintly yellow).	belies to. Harmong.mann (11111) to
K Enidermis pubescent.	
L. Spines, when present, acicular	Series 17. Tomentosae (N. A.) 172.
L. Spines, when present, acicular LL. Spines several, setaceous, flexible	Series 18. Leucotrichae (N. A.) 174.
KK. Epidermis glabrous.	
L. Areoles bearing long, soft hairs	Series 19. Orbiculatae (N. A.) 176.
LL. Areoles without long hairs.	
M. Joints green or bluish green.	
N. Joints green or buists green.  N. Spineless, or with few, usually short, spines.  NN. Spiny, at least old joints so.  MM. Joints blue.  FF. Fruit dry, not juicy.  EE. Flowers directous; petals very narrow.  DD. Epidermis densely papillose-tuberculate when dry.	S -1 20 Firm in line (N. A - S. A.) 177
spines	Series 21. Strobt countly (N. A.; S. A.) 17.
NN. Spiny, at least old joints so	Series 22. Polyetta (N. A., S. A.) 161.
MM. Joints blue	Suring 22 Poly sembles (N. A.) 191.
FF. Fruit dry, not juicy	Series 24 Stenubet de (N. A.) 200
DD Enidermic densely papillose tuberculate when dry	Series 25 Palmadorae (S. A.) 201
CC. Plants with erect, unjointed trunks, the branches with flat joints;	
flowers mostly small.	
D. Flowers small; joints spreading.	
E. Joints all flat, relatively thick	Series 26. Spinosissimae (N. A.) 202.
EE. Some joints terete, others flat and very thin	Series 27. Brasilienses (S. A.) 209.
DD. Flowers large; joints ascending	Seties 28. Ammophilae (N. A.) 211.
BB. Stems annual, very slender	Series 29. Chaffeyanae (N. A.) 213.

<sup>\*</sup> The page references (as 99, etc.) were not in the original printing but were added here for convenience.

### Subgenus 1. CYLINDROPUNTIA.

Includes the many-jointed species in which none of the joints is at all flattened.

#### Series 1. RAMOSISSIMAE.

The series consists of a single bushy species, with slender joints, the nearly flat tubercles diamond-shaped and contiguous, the acicular spines, when present, usually only 1 at an areole.

1. Opuntia ramosissima Engelmann, Amer. Journ. Sci. II. 14: 339. 1852.

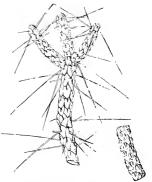
Opuntia tersellata Engelmann, Proc. Amer. Acad. 3: 309. 1856.

Frutescent, bushy, sometimes 2 meters high, the branches gray, often widely spreading, and 9 cm. long; tubercles low, slightly convex, 4-angled to 6-angled, giving the surface an appearance of being

covered with diamond-shaped plates; leaves ovoid, 1 to 3 mm. long, acute; areoles on young shoots circular, with white or tawny wool and pale glochids, the upper part in age compressed into the narrow slit between the two adjoining tubercles, the lower part depressed-linear, with a slightly elevated border; spines often wanting, but when present abundant, usually one at each areole, rarely 2, porrect, acicular, sometimes 6 cm. long, usually reddish when young, covered by loose, yellow, papery sheaths; flowers, including ovaries, 3 to 4 cm. long; sepals subulate, similar to the leaves of the ovary, but longer; petals greenish yellow, tinged with red, obovate, aristulate, about 1 cm. long; stamens greenish yellow; anthers orange-colored; style and stigma-lobes cream-colored; ovary narrowly obconic, covered with emarginate tubercles, the areoles bearing wool and long glochids, but no spines; fruit dry, obovate, 2 to 2.5 cm. long, covered with clusters of weak, slender spines, appearing like a bur; seeds few, white, 5 mm. broad.

Type locality: In California, near the Colorado River.

Distribution: Southern Nevada, western Arizona, southeastern California, northwestern



Figs. 54, 55.—Opuntia ramosissima ×0.75.

Sonora and probably northeastern Lower California.

The flowers of this species have been described as purple, apparently erroneously.

This species is found in the most arid deserts of the southwestern part of the United States, usually growing on low hills, and is confined chiefly to the lower Colorado; it is here rather inconspicuous and might easily be overlooked. It is one of the least succulent species of the genus, the terminal shoots soon becoming hard, and hence the plant is difficult to propagate from cuttings, and is rarely found in greenhouse collections.

Opnatia testellata denudata according to C. R. Orcutt, is only a form—spiny joints frequently occurring on the same plant with the spincless form; it is common in the Mojave Desert, California. It was mentioned by Alverson (Cact. Cat. 6) while O. ramosissima denudata is listed by Weinberg (Cacti 22). O. ramosissima cristata is mentioned by Schelle (Handh, Kakteenk, 41, 1907).

Opuntia tessellata cristata Schumann (Monatsschr. Kakteenk. 8:70. 1898) is a striking monstrosity which Schumann has described and figured.

Illustrations: Cact. Journ. 1: pl. for February, pl. [1]; Cycl. Amer. Hort. Bailey 3: f. 1549; Pac. R. Rep. 4: pl. 21; 24, f. 20, all as *Opuntia tessellata*. Monatsschr. Kakteenk. 8: 71, as *Opuntia tessellata cristata*; Stand. Cycl. Hort. Bailey 4: f. 2596, 2610.

Figure 54 represents a spiny branch drawn from a specimen sent by Mr. S. B. Parish from Barstow, California, in 1915; figure 55 shows a portion of an unarmed branch sent by the same collector from the same locality.

### Series 2. LEPTOCAULES.

Bushy species, with slender joints, the ultimate ones 4 to 15 mm. thick, often readily detached; the flowers small.

Inhabitants of the southwestern United States, Mexico, northern South America, and one species in Santo Domingo.

47 OPUNTIA

O. kleiniae

### KEY TO SPECIES.

Ultimate joints short, usually at right angles to the branches, 4 to 7 mm. thick. Bushy plants, 1.5 meters high or less; fruit small, fertile.

Branches scarcely if at all tuberculate.

Leaves ovoid to ovoid-subulate; young areoles long-hairy..... 2. O. mortolensis 3. O. leptocaulis Leaves linear; areoles not long-harry... Branches long-tuberculate. 1. O. tesato Elongated plants, up to 2 meters long; fruit larger, sterile... 5. O. caribaea Ultimate joints longer, 8 to 15 mm, thick, usually at an acute angle to the branches. 5. O. arbuscula

Joints only slightly tuberculate..... Joints manifestly tuberculate.....

Opuntia mortolensis sp. nov.

Slender, 6 dm. high or less, dull green, with dark blotches below the areoles, the ultimate twigs short, sometimes only 2 cm. long, 4 to 5 mm. thick, scarcely tuberculate; leaves ovate to ovatesubulate, 2 to 4 mm. long, green, with acute bronze-colored tips; young areoles with numerous, early deciduous, weak white hairs sometimes longer than the leaves, and several brown glochids; areoles of old branches with solitary acicular spines 3 to 5 cm. long, these with tightly fitting brownish sheaths; flowers and fruit unknown.

Described from No. 25360, New York Botanical Garden, received from the garden of Sir Thomas Hanbury, La Mortola, Italy, in 1906. Mr. Berger has referred this specimen to Opuntia leptocaulis longispina, but this was considered by Dr. Engelmann as the "usual western form" of O. leptocaulis.

An herbarium specimen collected by Rose, Standley, and Russell at Empalme, Sonora, Mexico, March 11, 1910 (No. 12644), appears to be referable to this species.

The short leaves and long-hairy young areoles appear to distinguish this plant from O. leptocaulis.

Illustrations: Gard. Chron. III, 34: f. 37, as O puntia leptocaulis longispina.

Plate VI, figure 1, represents a branch of a plant sent from La Mortola, Italy, in 1906; figure 2 shows a leafy twig of the same plant.

Opuntia leptocaulis De Candolle, Mém. Mus. Hist. Nat. Paris 17: 118, 1828.

Opuntia ramulifera Salm-Dyck, Hort. Dyck. 360. 1834. Opuntia gracilis Pfeiffer, Enum. Cact. 172. 1837. Opuntia fragilis frutescens Engelmann, Bost. Journ. Nat. Hist. 5: 245. 1845. Opuntia virgata Link and Otto in Förster, Handb. Cact. 506. 1846. Opuntia raginata Engelmann in Wislizenus, Mem. Tour North. Mex. 100. 1848. Opuntia californica Engelmann in Emory, Mil. Reconn. 158. 1848. Opuntia frutescens Engelmann, Bost. Journ. Nat. Hist. 6: 208. 1850. Opuntia frutescens brevispina Engelmann, Proc. Amer. Acad. 3: 309. 1856. Opantia fratescens longispina Engelmann, Proc. Amer. Acad. 3: 309. 1856. Opantia leptocaulis brevispina S. Watson, Bibl. Index 1: 407. 1878. Opantia leptocaulis suganda S. Watson, Bibl. Index 1: 407. 1878. Opantia leptocaulis sufanta S. Watson, Bibl. Index 1: 407. 1878. Opantia leptocaulis stipata Coulter, Contr. U. S. Nat. Herb. 3: 456. 1896.

Opuntia leptocaulis longispina Berger, Bot. Jahrb. Engler 36: 459. 1905. Usually bushy, often compact, 2 to 20 dm. high, but sometimes with a short, definite trunk 5 to 8 cm. in diameter, dull green with darker blotches below the areoles, with slender, cylindric, ascending, hardly tuberculate branches; branches, especially the fruiting ones, thickly set with short, usually spineless joints spreading nearly at right angles to the main branches, very easily detached; leaves green, awl-shaped, 12 mm. long or less, acute; spines usually solitary at young areoles, very slender, white, at areoles of old branches 2 or 3 together, 2 to 5 cm. long or less; sheaths of spines closely fitting or loose and papery, yellowish brown to whitish; areoles with very short white wool; flowers greenish or yellowish, 1.5 to 2 cm. long including the ovary; sepals broadly ovate, acute, or cuspidate; ovary obconic, bearing numerous small woolly brown areoles subtended by small leaves, its glochids brown; fruit small, globular to obovate or even clavate, often proliferous, red or rarely yellow, 10 to 18 mm. long, turgid, slightly fleshy; seeds compressed, 3 to 4 mm. broad, with narrow, often acute, margins.

Type locality: In Mexico.

Distribution: Southwestern United States and Mexico.

This species has a wide distribution for an Opuntia, extending from southern United States to Puebla, Mexico.

The great variation in the length of the spines and in the character of the spine sheaths has led to the description of several varieties. These all seem to us to merge into the one species, as above indicated. It sometimes hybridizes with O. imbricata. See C. B. Allaire's

plant from San Antonio, New Mexico.

The following names, Opuntia leptocaulis laetevirens Salm-Dyck (Hort. Dyck. 184. 1834), O. grazilis subpatens Salm-Dyck (Cact. Hort. Dyck. 1849. 73. 1850), and O. leptocaulis major Toumey (Cycl. Amer. Hort. Bailey 3: 1152. 1901) are printed but not described. O. stipata (Schumann, Index Gesemtb, Kakteen 830. 1898) refers to O. leptocaulis stipata.

Illustrations: Bull. Torr. Club 32: pl. 10, f. 9; Rep. Mo. Bot. Gard. 19: pl. 21, in part; Safford, Ann. Rep. Smiths. Inst. 1908: f. 12; Emory, Mil. Reconn. app. 2 f. 12; Pac. R. Rep. 4: pl. 20, f. 1; pl. 24, f. 13 to 15, all as Opuntia vaginata. Cact. Journ. 1: 154, as Opuntia

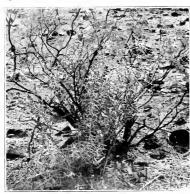




Fig. 56—Opuntia leptocaulis in the foreground.

Fig. 57—Opuntia leptocaulis. ×0.4. Fig. 58.—Opuntia caribaea. ×0.66.

frutescens. Pac. R. Rep. 4: pl. 20, f. 4, 5; pl. 24, f. 19, all as Opuntia frutescens brevispina. Pac. R. Rep. 4: pl. 20, f. 2, 3; pl. 24, f. 16 to 18, all as Opuntia frutescens longispina. Emory, Mil. Reconn. 158. No. 11, as Opuntia californica; Gartenwalt 11: 75, as O. vaginata; Carnegie Inst. Wash. 269: pl. 10, f. 89; pl. 11, f. 96, Stand. Cycl. Hort. Bailey 2: f. 717; Schelle, Handb. Kakteenk, 41. f. 2; Möllers Deutsche Gärt. Zeit. 25: 475. f. 9, No. 21.

Plate VI, figure 3, represents a fruiting branch from a plant collected by Dr. Rose near Sierra Blanca, Texas, in 1913; figure 4 shows a fruiting branch from another Texas plant obtained by the same collector. Figure 56 is from a photograph taken by Dr. MacDougal near Tucson, Arizona, in 1913; figure 57 represents a branch with young leafy shoots, of a specimen collected by Dr. Rose in 1913 at Laredo, Texas.

4. Opuntia tesajo Engelmann in Coulter, Contr. U. S. Nat. Herb. 3: 448. 1896.

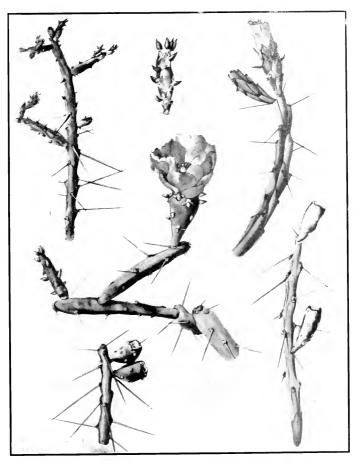
Bushy, 3 dm. broad and high; joints slender, indistinctly tuberculate, 2 to 5 cm. long; a recles 5 to 6 mm. apart; leaves awl-shaped, 2 to 4 mm. long, often red; spines at first 2, small, dark brown, 4 to 8 mm. long, either erect or reflexed; later a long central spine develops, this porrect, 5 cm. long, yellow near the tip; flowers yellow, small, 1.5 to 1.8 cm. long, including the ovary; style whitish; stigmalobes 5, yellowish.

Type locality: In Lower California.

Distribution: Central part of Lower California.

The type of this little-known species should be in the herbarium of the Missouri Botanical Garden, at St. Louis, but it can not now be found. The species has been in cultivation at La Mortola, Italy, but it does not do well under cultivation. Dr. C. A. Purpus, who has collected the plant in Lower California, regarded it as related to O. ramosissima, claiming that the stems have the peculiar marking of that species. This relation-

PLATE VI BRITTON AND ROSE



Branches of Opuntia mortolensis.
 Hranches of Opuntia leptocaulis.

- 5. Flowering branch of Opuntia arbuscula.6. Flowering branch of Opuntia kleiniae.

All three-fourths size

ship, however, is not shown in the La Mortola plant. With only a very meager description published and no type specimen preserved, it is difficult to decide the relationship of this species. No exact type locality is cited for it, but it is said to grow "among rocks, especially towards the west coast, and in the more central portions" of Lower California, where it was first collected by W. M. Gabb in 1867.

We refer this species with hesitation to the series Leptocaulis.

Opuntia tenajo (Just's Bot. Jahresb. 24°: 380. 1896) is doubtless an error in spelling for O. tesajo.

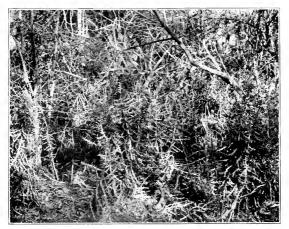


Fig. 59.—Opuntia caribaea forming dense thickets.

#### 5. Opuntia caribaea sp. nov.

Steins 1 to 3 meters high, forming thickers in open woods and waste grounds; ultimate joints horizontal, 5 to 10 cm. long, much thicker than in O. leptocanlis, with short, elevated tubercles; areoles large, bearing white wool and a few long caducous hairs; spines 1 to 3, porrect, acciudat, 2 to 3 cm. long, covered with thin, brown, papery sheaths; glochids dark brown; leaves small, 1 to 2 mm. long, acute; flowers not known; fruit red, 1.5 to 2 cm. long, usually naked but sometimes bearing short spines from the upper areoles, so far as known always sterile.

Very common on the cactus plain about Azua and also near Barahona, Santo Domingo; collected near Azua, March 1913, by Rose, Fitch, and Russell (No. 3837, type); also by Paul Bartsch in Haiti, 1917; also on the northern coast of Venezuela, and on Margarita Island, and apparently in Trinidad, as indicated by a colored drawing in the Kew herbarium received in 1825 from David Lockhart. Dr. Britton endeavored to find this plant in Trinidad in 1920 and 1921 but failed and he could not learn anything about it. It appears probable that the drawing sent by Mr. Lockhart to Kew in 1825 was made from a Venezuelan plant.

The plant grows in great abundance in Santo Domingo with other cacti, and certainly appears to be indigenous. Its nearest relative is O. leptocaulis, from which it differs in its greater size, thicker joints, and larger fruit.

Figure 58 represents a joint of a plant collected by Rose, Fitch, and Russel at Azua, Santo Domingoo, in 1913; figure 59 is from a photograph of the type plant taken by Paul G. Russell.

6. Opuntia arbuscula Engelmann, Proc. Amer. Acad. 3: 309. 1856.

Opuntia neoarbuscula Griffiths, Rep. Mo. Bot. Gard. 19: 260, 1908.

Forming a bush 2 to 3 meters high, often with a rounded, very compact top with numerous short branches; trunk short, 10 to 12 cm. in diameter, with several woody branches; ultimate joints 5 to 7.5 cm. long, 8 mm. in diameter, with low, indistinct tubercles; leaves small; spines usually 1, but sometimes several, especially on old joints, portect, up to 4 cm. long, covered with loose straw-colored sheaths; flowers greenish yellow tinged with red, 3 5 cm. long; fruit often proliferous, sometimes only one-secded.

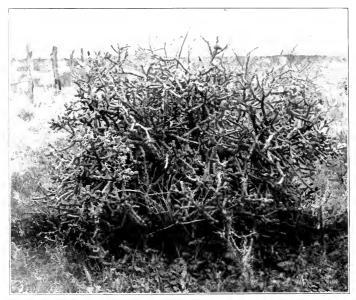


Fig. 60.-Opuntia arbuscula.

Type locality: On the lower Gila near Maricopa village.

Distribution: Arizona and Sonora.

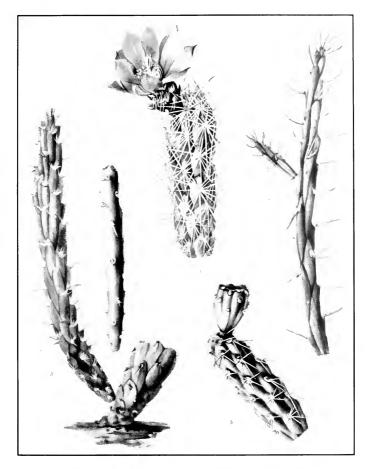
Opuntia congesta Griffiths (Rep. Mo. Bot. Gard. 20: 88, pl. 2, f. 4, 7; pl. 8; pl. 13, f. 5. 1909), from the description, is near this species and probably a race of it.

Races of the species differ in size, in armament, in the length of the tubercles, and in size and shape of the fruit.

Illustrations: Ariz. Agr. Exp. Sta. Bull. 67: pl. 6, f. 2; Bull. Torr. Club 32: pl. 9, f. 3; Plant World 11<sup>th</sup>: f. 11; Rep. Mo. Bot. Gard.19: pl. 22; 19: pl. 23, in part, this last as *Opuntia neoarbuscula*; Carnegie Inst. Wash. 269: pl. II, f. 95.

Plate VI, figure 5, represents a flowering branch from Professor J. W. Toumey's collection at Tucson, Arizona. Figure 60 is from a photograph taken by Dr. MacDougal near Tucson, Arizona, in 1906; figure 61 is from a photograph taken by George B. Sudworth in Santa Rita Mountains, Arizona; figure 62 shows a fruiting branch from the same collection.

PLATE VII BRITTON AND ROSE



- Leafy branch of Opuntia kleinize.
   Terminal branch of Opuntia vivipasa.
   Branch of Opuntia parryi.
   (All three-fourths size.)

OPUNTIA, 51

#### 7. Opuntia kleiniae De Candolle, Mém. Mus. Hist. Nat. Paris 17: 118. 1828.

Opuntia wrightii Engelmann, Proc. Amer. Acad.3: 308. 1856.

Opuntia caerulescens Griffiths, Rep. Mo. Bot. Gard. 20: 86. 1909.

Stems pale, glaucous, sometimes 2.5 meters tall, woody at base; tubercles long; areoles large, a little longer than wide, filled with white wool from the very first; spines usually 1, but sometimes more, from the base of the areole, covered with yellow sheaths, on old joints accompanied by several bristle-like spines from the lower margin of the areole; glochids yellow to brown; leaves linear, 15 mm. long, acute; flowers 3 cm. long, purplish; petals broad, rounded at apex; fruit red, 2 to 2.5 cm. long, long persisting; seeds 4 to 5 mm. broad.

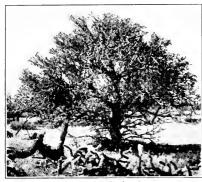


Fig. 61.—Opuntia arbuscula.



Fig. 62.—Opuntia arbuscula, X0.75.

Type locality: In Mexico.

Distribution: Texas to central Mexico.

Opuntia kleiniae was originally described as without tubercles on the stems, which has raised the question whether the plant bearing this name is properly referred; in this respect O. arbuscula answers the description better, but it is very doubtful whether O. arbuscula could have been known at that time.

Opuntia kleiniae has long been in cultivation and is to be seen in most collections.

In 1910 Dr. Rose collected near Alamos, Mexico, an *Opuntia* very similar in habit and joints to *O. kleiniae*, but much more spiny.

Opuntia kleiniae cristata (Cat. Darrah Succ. Manchester 55. 1908) is a garden form. O. kleiniae laetevirens Salm-Dyck (Cact. Hort. Dyck. 1849. 73. 1850) is only a name.

Illustrations: Abh. Bayer. Akad. Wiss. München 2:pl. 1, sec. 7, f. 9; Rep. Mo. Bot. Gard. 19: pl. 21, in part; 20: pl. 6, in part, this last as *Opuntia caerulescens*.

Plate VI, figure 6, represents a flowering branch of a specimen obtained from M. Simon, of St. Ouen, Paris, France, in 1901; plate VII, figure 1, represents a leafy branch of a specimen collected by Dr. Rose at Ixmiquilpan, Mexico, in 1905.

Two remarkable opuntias were collected in Lower California by Dr. Rose in 1911, but as they were not in flower or fruit, and have not developed flowers since they were brought into cultivation, we are unable to describe them fully; they are doubtless of this relationship and their characters are given as follows:

# OPUNTIA Sp.

Stems 1.3 to 2 meters high, rather weak, often clambering over bushes, 10 mm. in diameter, woody below, pale, when dry the white epidermis peeling off; lateral branches numerous, horizontal, short (2

to 6 cm. long); areoles on old stems bearing 3 or 4 long (2 to 4 cm. long) needle-like brownish spines; young areoles usually with a single spine cach, filled with brown wool; glochids brown, numerous sheaths on young spines straw-colored, soon deciduous; flowers and fruit unknown.

Description based on field notes and on living and herbarium specimens.

Collected by Dr. Rose on Santa Cruz Island, Gulf of California, April 1, 1911 (No. 16845).

#### OPUNTIA Sp.

Procumbent, forming an indeterminable mass of spiny branches, 3 to 10 dm. in diameter; old stems woody, smooth, brown, and shiny, 2 cm. in diameter: branches 10 to 20 cm. long, bluish green; spines of two kinds; the 2 to 4 principal ones long (2 to 3 cm. long), needle-like, at first covered with thin yellow sheaths, straw-colored when young, becoming purplish, finally fading to gray; secondary spines 4 to 6, radial, inconspicuous; glochids brownish; flowers and fruit unknown.

Description based on field notes and living and herbarium specimens.

Collected by Dr. J. N. Rose on East San Benito Island, off the coast of Lower California, March 9, 1911 (No. 16085). This is, doubtless, the plant referred to by Walton (Cact. Journ. 2: 137, 1899) as O. ramosissima, but it is not that species.

#### Series 3. THURBERIANAE.

Bushy, arborescent, or depressed species, with slender joints, the ultimate ones tuberculate, about 2 cm, thick or less, the arcoles bearing several spines. We recognize 8 species, 7 of them natives of the southwestern United States and northern Mexico, and 1 in Lower California.

#### KEY TO SPECIES

Bushy or arborescent species, 6 dm. high or higher. Tubercles narrowly oblong, 1 cm. long or more.			
Joints readily detached	8.	0.	riripara
Joints not readily detached.			
Longer spines 2.5 cm, long or longer.			
Flowers orange to scarlet	. 9,	0.	tetracantha
Flowers purple			
Spines 2 cm. long or less			
Tubercles low, oblong, 6 to 8 mm. long	12.	0.	clavellina
Depressed species, 6 dm, high or less,			
Spines yellow or brown; flowers green or ringed with yellow.			
Spines yellow, up to 5 cm. long; petals 1 to 1.5 cm. long			
Spines brown, 2.5 cm, long or less; petals 2 to 2.5 cm, long	14.	0.	viridiflora
Spines white; flowers yellow	15.	O.	whipplei

# 8. Opuntia vivipara Rose, Smiths. Misc. Coll. 52: 153. 1908.

Plant 2 to 3.5 meters high, usually several strong branches from the base, 8 to 10 cm. in diameter, much branched above, but not compactly so; old stems with rather smooth bark; young branches bluish green, slender, 1 to 2 cm. long, 10 to 12 mm. in diameter; tubercles low, oblong, 15 to 20 mm. long; areoles when young bearing a dense cushion of yellow wool with few or no glochids; spines 1 to 4, 2 cm. long or less, porrect or ascending, covered with straw-colored sheaths; leaves much terete, acute, burple; flowers numerous, borne in clusters at the top of the branches, purplish; ovary strongly tuberculate, bearing white deciduous bristles; fruit oblong, 4 to 6 cm. long, smooth, with a somewhat depressed umbilitous, yellowish green, spineless; seeds white, very thick, 5 mm. long.

Type locality: Near Tucson, Arizona.

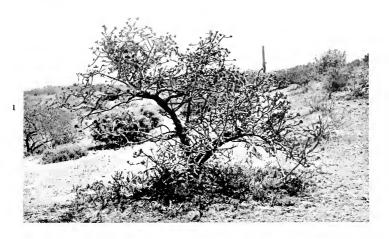
Distribution: Known only from type locality.

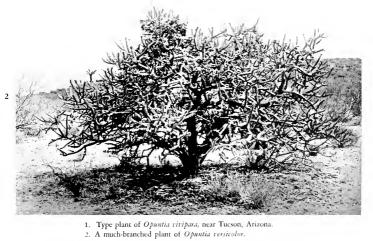
The relationship of this species is doubtful; it resembles certain garden forms of O. tetracantha, but differs from typical forms of that species in its much larger fruit and seeds, different armament, and habit. The type grew associated with O. spinosior and O. tersicolor, but there is no indication that it is the result of hybridization of those species.

Illustrations: Smiths. Misc. Coll. 52: pl. 12; Plant World 1110; f. 12.

Plate VII. figure 2, represents a branch drawn by L. C. C. Krieger at the Desert Botanical Laboratory, Tucson, Arizona; plate VIII, figure 1 is from a photograph of the type plant taken by Dr. MacDougal in 1908.

PLATE VIII BRITTON & ROSE







### Opuntia tetracantha Toumey, Gard. and For. 9: 432. 1896.

Low bush, 5 to 15 dm. high, branctung; central stem woody, 5 to 8 cm. in diameter; young joints 23 to 30 cm. long, 10 to 15 mm. in diameter, purplish; tubercles at first prominent, elongated, 16 to 22 mm. long; areoles bearing wool, light brown glochids, prominent glands and spines; spines 3 to 6, usually 4, slender, somewhat deflexed, 2 to 3.5 cm. long; flowers greenish purple, 1.5 to 2 cm. broad; fruit 2 to 2.5 cm. long, yellowish orange to "scarlet," nearly smooth, but farely bearing a few spines, deeply umbilicate; seeds 3 to 5 mm. broad, with irregular faces and a thick, spongy commissure.

Type locality: Five miles east of Tucson, Arizona.

Distribution: Known only from the region about Tucson, Arizona.

The species was originally compared by Mr. Toumey with O. thurberi, with which he thought it to be closely associated, but differing in "its longer, more strongly deflexed spines, smaller and different-colored flowers."

The type specimen was not indicated, but Tourney's own plant, collected in 1895, which was recently purchased by the U. S. National Herbarium, is doubtless the type.

Illustration: Bull. Torr. Club 32: pl. 9, f. 2.

Plate 1x, figure 1, shows a joint painted by L. C. C. Krieger at the Desert Botanical Laboratory, Tucson, Arizona.

### 10. Opuntia recondita Griffiths, Monatsschr. Kakteenk. 23: 131. 1913.

"A stout broad-branched shrub, 1 to 1.5 meters in height; trunk cylindric, 4 to 7 cm. in diameter, with constrictions corresponding to each year's growth, with gray bark, and having a few lateral, easily detachable, weakly spined joints about 10 cm. long, the remaining joints being 20 to 30 cm. long, very spiny, in the second year about 2 cm. in diameter, tuberculate; tubercles forming a ridge, flattening out below, above extending precipitously, about 2 to 5 cm. long, 5 to 6 mm. wide, and 4 to 5 mm. high, remaining recognizable three years, and then disappearing; areoles broadly obovate, 5 to 6 mm. in the longest diameter, in age becoming larger and more prominent, forming new wool for

several years; glochids yellow, in a thick 3 mm. long cluster on the upper part of the areole, also smaller clusters on the other parts of the areole, mostly at the base of the longest and most central spine; spines first 2 to 4, later 6 to 8 or 10, upright, spreading, 2.5 to 5 cm. long, in cross-section weakly circular, gray at the base, becoming deep reddish brown at the tips, surrounded the entire length by a loose, comparatively bright sheath; between the spines are scattered a few dirty-black, sheathless bristles about 6 mm. long; leaves subulate, finely tipped, terete, 12 to 20 mm. long.

"Flowers bright purple, when open about 2.5 cm. in diameter; petals finely and irregularly serrate, inconspicuously but finely irregularly notched; sepals thick, triangular pointed, greenish purple, anthers greenish with purple tinge; pistil greenish at base, with purple tinge above; stigma-lobes 6, white; ovary obovoid, tuberculate, with small areoles, 2 mm. in diameter, short greenish brown glochids 1 to 2 mm. long, and 1, 2, or 3 brown, caducous spines sheathed in part; fruit not deciduous, 3 to 3.5 by 2 to 2.4 cm., large, greenish yellow with a reddish tinge on the outermost side, only weakly tuberculate in the second year, with projecting brownish glochids 3 mm. long; seeds white, thick, mostly flat but often lightly angled with narrowly thickened edges, and often somewhat concave."

Type Locality: La Perla, Mexico.

Distribution: Known only from type locality, and, to us, only from the description of which the above Fig. 63.—Opuntia thurberi. Natural size. is a translation by Mr. Russell.



#### Opuntia thurberi Engelmann, Proc. Amer. Acad. 3: 308. 1856.

Large bushy plants, 2 to 4 meters high: joints slender, elongated, 1.5 to 2.5 dm. long, 10 to 12 cm. in diameter; tubercles 1.5 to 2 cm. long, flattened laterally; leaves linear, 6 to 8 mm. long, spreading; spines 3 to 5, short (10 to 12 mm. long), spreading, covered with thin, brown, papery sheaths, the lowest one stoutest; flowers 3.5 cm. broad, brownish; fruit 2 cm. to 3 cm. long, spineless; seeds nearly globular, 4 mm. in diameter.

Type locality: Bacuachi, Sonora, Mexico.

Distribution: Western coast of Mexico.

Opuntia thurberi has long been one of our least-known species. The type, which is but a fragment, has not been clearly associated with any recent collections, but we are disposed now to believe that specimens collected on the west coast of Mexico by Dr. Rose in 1910 belong here. If we are correct, it ranges from Sonora to Sinaloa, Mexico. It is sometimes associated with Opuntia versicolor in its northern range, but is not so stout and has fewer and longer spines.

Figure 63 is from a photograph of the type specimen.

# 12. Opuntia clavellina Engelmann in Coulter, Contr. U. S. Nat. Herb. 3: 444. 1896.

Plant 1 meter high or less, rather openly branched; ultimate joints slender, spreading or ascending, somewhat clavate, 5 to 10 cm. long, a little over 1 cm. in diameter; tubercles prominent, elongated; spines 3 to 6 in a cluster, very long, covered with loose straw-colored or brown sheaths, the central one much longer and porrect; flowers yellow; fruit clavate, short, tuberculate.

Type locality: near Misión Purísima, Lower California.

Distribution: Interior of central Lower California.

The above description is based on the original one and on the type. If the plant illustrated as cited below belongs here, this is a very distinct species, which was referred, however, by Mrs. Brandegee to *Opuntia molesta* Brandegee.

Illustration: Contr. U. S. Nat. Herb. 16: pl. 129, A. Karsten and Schenck, Vegetationsbilder 13: pl. 18, in part.

Of this series there is another peculiar Lower California species, perhaps nearest O. clarellina, but of different habit and spines. It also suggests O. tetracantha of Arizona. It was obtained first by Dr. Rose in 1911, but was without flowers or fruit. It may be characterized as follows:

#### OPUNTIA Sp.

Stems slender (1 to 1.5 cm. in diameter), weak, often clambering over bushes, pale green in color, terete, pointed, 6 to 7 dm. long; areoles set on low tubercles, circular; chief spines 2 to 6, only slightly spreading, nearly equal, 1.5 to 2.5 cm. long, clothed with loose straw-colored sheaths (rose-colored when very young); accessory spines 3 or 4, almost bristle-like, borne from the lower parts of the areoles; glochids short, greenish when young, yellow in age; flowers and fruit not seen.

Collected by Dr. J. N. Rose on Cerralvo Island, off southern Lower California, April 19, 1911 (No. 16875), and also by Nelson and Goldman on the same island in 1906 (No. 7524).

# 13. Opuntia davisii Engelmann and Bigelow, Proc. Amer. Acad. 3: 305. 1856.

Plants low, 3 to 5 dm. high, much branched, their dense covering of straw-colored spines making the conspicuous objects in the landscape; terminal joints slender, 6 to 8 cm. long, about 1 cm. in diameter, strongly tuberculate; spines 6 to 12, unequal, the longest ones 4 to 5 cm. long, acicular, covered with thin sheaths; glochids numerous, yellow; flowers, including ovary, 3.5 cm. long; petals olive-green to yellow, broad, with rounded mucronate tips; ovary with large areoles bearing a few spines each; fruit 3 cm. long, somewhat tuberculate, naked; seeds not known.

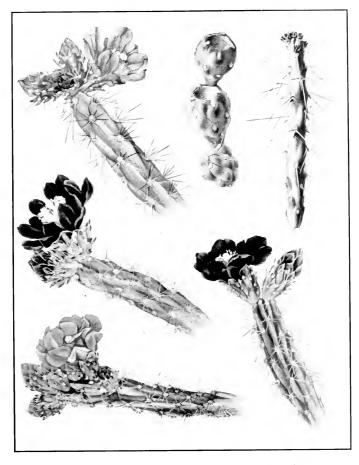
Type locality: Upper Canadian, about Tucumcari Hills, near the Llano Estacado.

Distribution: Western Texas and eastern New Mexico.

For many years this plant was not collected and the name was confused with other species, so that at one time it was supposed to extend as far west as California. It is now believed to have a rather circumscribed range. It is first seen going west on the Texas & Pacific Railroad about Colorado, Texas.

The plant was named for Jefferson Davis, who was Secretary of War when Whipple's report was made.

BRITTON AND ROSE PLATE IX



Joint of Opuntia tetracantha.
 2 to 5. Flowering joints of Opuntia very color.
 Proliferous fruits of Opuntia fulgida. (All three-fourths size.)

*Illustrations:* Curtis's Bot. Mag. 108: pl. 6652; Pac. R. Rep. 4: pl. 16. Figure 64 is copied from the second illustration above cited.

# 14. Opuntia viridiflora sp. nov.

A low, round, bushy plant 30 to 60 cm. high: terminal joints 5 to 7 cm. long, 1.5 to 2 cm. thick, often quite fragile; tubercles prominent, flattened from the sides: arcoles circular, fllled with short, yellow or dull-gray wool; spines 5 to 7, somewhat spreading, the longest ones 2 cm. long, dark brown in color; glochids numerous, very short, yellow: flowers at tips of branches in clusters of 3 to 8, 3.5 to 4.5 cm. long (including ovary). "green, tinged with red"; fruit strongly tuberculate, except for a few long, deciduous bristles, with a deep umblitues: seeds smooth, white, 5 mm. broad.

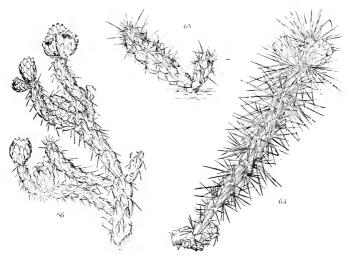


Fig. 64.—Opuntia davisii. ×0.5. Fig. 65.—Opuntia viridiflora, ×0.5. Fig. 66.—Opuntia whipplei. ×0.5.

Collected in the vicinity of Santa Fé, New Mexico, altitude about 2,225 meters, by Paul C. Standley, July 6, 1911 (No. 6493, type) and at the same locality by T. D. A. Cockerell in 1912, and by J. N. Rose in 1913 (No. 18776). It is quite common on the hills just north of Santa Fé about Fort Marcy, where it is one of the dominant plants, but it was not observed elsewhere in that region.

This species differs from Opuntia imbricata with which it is found, in its much lower stature, more bushy habit, in its branches, spines, and smaller, differently colored flowers, different fruit, and smaller seeds.

Figure 65 represents two joints of a specimen collected by Dr. Rose at the type locality in 1913.

# 15. Opuntia whipplei Engelmann and Bigelow, Proc. Amer. Acad. 3: 307. 1856.

Opuntia whipplei laevior Engelmann, Proc. Amer. Acad. 3: 307. 1856.

Low, much branched, with long, fibrous roots; areoles prominent, flattened laterally, 10 to 15 cm. long, circular, filled with light-brown wool; glochids pale yellow, short; spines about 12, the longest

about 2 cm. long, dark brown, covered with lighter colored papery sheaths; flowers yellow, small (2 cm. broad); young ovary bearing brown spines in the axils of the leaves; fruit strongly tuberculate, spineless, 2.5 to 4 cm. long, with a deeply depressed umbilicus, sometimes with only one seed but usually many; seeds small, 4 mm. broad, smooth.

Type locality: About Zuni, New Mexico.

Distribution: Northern New Mexico and Arizona to southwestern Colorado and probably southern Utah. Also reported by Coulter in southern California, Lower California, and Sonora, but not to be expected there.

Illustration: Pac. R. Rep. 4: pl. 24, f. 9, 10. Bull. Agr. Exper. Sta. N. Mex. 78: pl. 11, 12,; North Amer. Fauna 7: pl. 9; Pac. R. Rep. 4: pl. 17, f. 1 to 4; Stand. Cycl. Hort. Bailey 4: f. 2609.

Figure 66 is copied from the first illustration above cited.

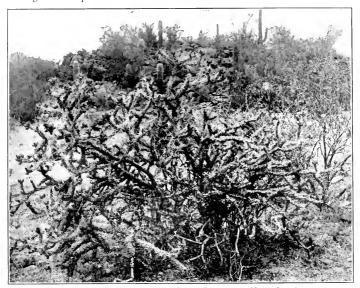


Fig. 67.—Opuntia aconthocarpa in the foreground. Photographed by MacDougal.

#### Series 4, ECHINOCARPAE.

Dry-fruited, rather stout-jointed, bushy or depressed species, the areoles bearing several spines, the flowers red, yellow, or yellowish. Four species, inhabiting the southwestern United States, Sonora, and Lower California.

#### KEY TO SPECIES.

Tubercles elongated, 2 to 3 times as long as wide.		
Fruit long-spiny, strongly tuberculate	16.	O. acanthocarpa
Fruit short-spiny, little tuberculate.	17.	O. parryi
Tubercles short, less than twice as long as wide.		
Spines with white or straw-colored sheaths	18.	O. echinocarpa
Spines with vellow-brown sheaths.	19.	O. serpentina

# 16. Opuntia acanthocarpa Engelmann and Bigelow, Proc. Amer. Acad. 3: 308. 1856.

Much branched, 1.5 to 2 meters high; branches becoming woody, alternate, making a narrow angle with the trunk; terminal joints 4 to 8 cm. long, strongly tuberculate; tubercles elongated, flattened laterally; spines 8 to 25, acicular, dark brown, covered with thin and lighter colored sheaths, 2 to 3 cm. long; glochids numerous, yellow; flowers large, red to yellow, 5 cm. long, and when fully open nearly as broad; ovary rather short, turbinate, with few prominent tubercles; fruit dry, about 3 cm. long, naked below, tuberculate above, each tubercle crowned by a cluster of 10 to 12 stout spines; umbilicus broad and somewhat depressed; seeds 5 to 6 mm. broad, sharply angular.

Type locality: On the mountains of Cactus Pass, Arizona, about 500 miles west of Santa Fé, New Mexico.

Distribution: Arizona and California; reported also from Utah, Nevada, and Sonora. Illustrations: N. Amer. Fauna 7: pl. 7, 8; Pac. R. Rep. 4: pl. 18, f. 1 to 3; pl. 24, f. 11. Stand, Cvcl. Hort. Bailey 4: f. 2606; Gartenwelt 11: 75.

Figure 67 is from a photograph by Dr. MacDougal of a plant near Pictured Rocks, Tucson Mountains, Arizona.

# 17. Opuntia parryi Engelmann, Amer. Journ. Sci. II. 14: 339. 1852.

Cactus parryi Lemaire, Cactées 88. 1868. Opuntia bernardina Engelmann in Parish, Bull. Torr. Club 19: 92. 1892.

Low and bush-like, 2 to 4 dm. high; joints cylindric, 7 to 30 cm. long by 1.5 to 2 cm. in diameter. strongly tuberculate; tubercles 1 to 1.5 cm. long; areoles rather large, bearing light-brown wool, yellow glochids, and spines; spines about 10, dark brown, the longer ones 3 cm. long, covered with loose sheaths; flowers, several near together at ends of branches, 4 cm. long; sepals greenish or dull red; petals yellow, obtuse; stigma-lobes cream-colored; ovary tuberculate; fruit dry, ovoid, 2 cm. long. strongly umbilicate, when mature and fertile plump, otherwise more or less tuberculate; areoles on the fruit large, filled with wool and glochids, those at top of fruit often with short spines; seeds white, 4 to 6 mm. broad, beaked, the margins channeled.

Type locality: Near San Felipe, eastern slope of California Mountains-San Jacinto Mountains.

Distribution: Interior valleys of southern California.

This is common in some of the interior valleys of southern California, although its range has not been very definitely determined. It was first collected by Dr. C. C. Parry in 1851 and named for him by Dr. Engelmann in 1852; but when the latter again took up this name a few years later, he associated it with a very different species, which most later writers and dealers accepted as the true Opuntia parryi. Later on Dr. Engelmann segregated a species which he named O. bernardina, including therein Parry's specimen, but this was not published until after his death. We therefore regard O. bernardina as a synonym of O. parryi, while the O. parryi of most collections becomes O. parishii. We are under obligation to Mr. C. R. Orcutt for first calling our attention to this confusion.

Mr. Orcutt thinks that this species is near O. serpentina; but the former has larger flowers, different spines, much less spiny fruit, and is of different habit.

Opuntia bernardina cristata Schumann (Monatsschr. Kakteenk. 12: 20. 1902), an abnormal form, has been described.

Plate VII, figure 3, is from a plant collected by W. T. Schaller at Pala, California, showing a leafy joint.

#### Opuntia echinocarpa Engelmann and Bigelow, Proc. Amer. Acad. 3: 305. 1856.

Opuntia echinocarpa major Engelmann, Proc. Amer. Acad. 3: 305. 1856. Opantia econocopa major Engentanti, Froc. Amer. Acad. 5: 305. 1800.
Carius echionocopa Lemaite. Cactées 88. 1868.
Dopantia echionocopa moda Coulter, Contr. U. S. Nat. Herb. 3: 446. 1806.
Opantia echionocopa parler Coulter, Contr. U. S. Nat. Herb. 3: 446. 1806.
Opantia echionocopa robartior Coulter, Contr. U. S. Nat. Herb. 3: 446. 1806.
Opantia echiocopa robartior Coulter, Contr. U. S. Nat. Herb. 3: 446. 1806.
Opantia echiocopa control Grantia Contr. U. S. Nat. Herb. 3: 446. 1806.

Plant usually low, but sometimes 1.5 meters high, much branched and widely spreading, with a short woody trunk 2 to 3 cm. in diameter, in age with nearly smooth bark; joints short, turgid. strongly tuberculate; spines numerous, when young bright yellow, when older brownish, or in age grayish, unequally covered with thin papery sheaths; flowers yellowish, but the sepals often tipped with red; ovary short, turbinate, densely spiny especially in the upper part; fruit dry, very spiny; seeds somewhat angular, 4 mm. broad.

Type locality: In the Colorado Valley near the mouth of Bill Williams River.

Distribution: Nevada, Utah, Arizona, California, and Lower California.

Coulter has described three varieties of this species, none of which is quite typical, but without seeing more specimens we can only refer them all to the species proper. His variety parkeri seems more like a very spiny form of O. parryi. O. parkeri Engelmann (Coulter, Contr. U. S. Nat. Herb. 3: 446, 1896) was published as a synonym.

Mrs. Brandegee thought *Opuntia echinocarpa nuda* very near *O. alcahes*, if not identical with it (Erythrea 5: 122).

Illustrations: Pac. Ř. Rep. 4; pl. 18, f. 5 to 10; pl. 24, f. 8; Monatsschr. Kakteenk. 23: 132, the last as Opuntia deserta.

Plate vii, figure 4, is from a plant collected by Dr. Rose near the Salton Sink, California, showing a flowering joint.

19. Opuntia serpentina Engelmann, Amer. Journ. Sci. II. 14: 338. 1852.

Cerens californicus Torrey and Gray, Fl. N. Amer. 1: 555. 1840. Not Opuntia californica Engelmann. 1848.

Opuntia californica Coville, Proc. Biol. Soc. Washington 13: 119. 1899.

Ascending, erect, or prostrate; branches slender, 2 to 2.5 cm. in diameter, bluish green, strongly tuberculate; leaves minute; tubercles elevated, 1 to 1.5 cm. long, longer than broad, flattened; spines 7 to 20, brown, covered with yellowish-brown papery sheaths about 1 cm. long; glochids light brown; flowers close together at the top of short branches, about 4 cm. broad, greenish yellow, the outer petals tinged with red; ovary strongly tuberculate, spiny, with a depressed umbilitous; fruit dry, very spiny.

Type locality: Near the seacoast about San Diego, California. Distribution: Southern California and northern Lower California.

Cactus californicus Nuttall, although given in the Index Kewensis (1: 367), was never published by Nuttall, although he did have the name in manuscript, as stated in Torrey and Gray's "Flora" in the place cited above, where it was taken up as a Cereus.

Figure 68 is from a plant collected by Mr. G. Sykes neat San Diego, California.

### Series 5. BIGELOVIANAE.

We recognize two species in this series, natives of the southwestern United States and Lower California. They are low, bushy plants, with short definite trunks densely covered with short, stout, very spiny branches, the spines white, straw-colored, or yellow, the tubercles, at least those of young shoots, little if any longer than broad, and considerably elevated. Their fruits are fleshy betries.

# KEY TO SPECIES.

Larger spines numerous; upper tubercles on fruit larger than lower ones. 20. O. bigelorii Larger spines + to 6; tubercles on fruit all alike . . . . . . . . . . . . . . . . . 21. O. ciribe

Opuntia bigelovii Engelmann, Proc. Amer. Acad. 3: 307. 1856.

Usually with a central, crect trunk, 1 meter high or less, with short lateral braches, the upper ones erect; joints usually 5 to 15 cm. long, very turgid, with closely set arcoles and almost impenentable armament; tubercles slightly



Fig. 68.—Opuntia serpentina. ×0.66

elevated, påle green, somewhat 4-sided, about as long as broad, 1 cm, broad or less; spines, as well as their papery sheaths, påle yellow; flowers several, borne at the tips of the branches, 4 cm. long including the ovary; sepals orbicular, about 1 cm. in diameter, tinged with red; petals about 1.5 cm. long, påle magenta to crimson; ovary 2 cm. long, its large areoles bearing brown wool and several acicular spines; fruit usually naked, strongly tuberculate, the upper tubercles larger than the lower.

Type locality: Bill Williams River, Arizona.

Distribution: Southern Nevada, Arizona, California, northern Sonora, and northern Lower California.

Illustrations: Ann. Rep. Bur. Amer. Ethn. 26: pl. 12; Contr. U. S. Nat. Herb. 16: pl. 128, B; Hornaday, Camp-fires on Desert and Lava, facing p. 154; Journ. N. Y. Bot. Gard. 5: f. 16; Pac. R. Rep. 4: pl. 19; Plant World 11<sup>11\*</sup>: f. 10. MacDougal, Bot. N. Amer. Des. pl. 47; Shreve, Veg. Des. Mt. Range pl. 4; Contr. U. S. Nat. Herb. 16: pl. 10; Stand. Cycl. Hort. Bailey 4: f. 2607; Karsten and Schenck, Vegetationsbilder 4: pl. 40, B.

Figure 69 is from a photograph by Dr. MacDougal of a plant in Pima Canyon, Santa Catalina Mountains, Arizona; figure 70 is copied from the Pacific Railroad Report above cited.

# 21. Opuntia ciribe Engelmann in Coulter, Contr. U. S. Nat. Herb. 3: 445. 1896.

One meter high or less, with numerous stout branches densely armed; ultimate joints 4 to 5 cm. in diameter, strongly and regularly tuberculate, 3 cm. in diameter; tubercles about as long as broad





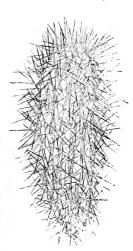


Fig. 70.—Opuntia bigelovii. X0.66.

(5 to 7 cm. broad); larger spines 4 to 6, stout, 2 to 3 cm. long, covered with loose yellow sheaths, accompanied by several bristle-like spines or hairs; glochids numerous; flowers yellow; ovary somewhat bristly; fruit strongly tuberculate, 3 to 4 cm. long, spineless.

Type locality: Comondu and Loreto northward to beyond Rosario, Lower California. Distribution: Central Lower California.

Opuntia ciribe is near O. bigelovii, but differs from it in having less spiny stems and globular, slightly different fruits.

Figure 71 is from a photograph of a plant collected by Dr. Rose at the head of Concepción Bay, Lower California; figure 72 is from a drawing of a joint from the same plant.

Je





Ftg. 71.-Opuntia ciribe.

Fig. 72.—Opuntia ciribe. X0.8.

### Series 6. IMBRICATAE.

The typical species are tall, much branched, very spiny. The terminal joints are fleshy and strongly tuberculate, the tubercles large and flattened laterally. The fruit is either smooth or strongly tuberculate. We recognize 8 species, natives of Mexico and southwestern United States.

#### KEY TO SPECIES.

oints cylindric; tubercles much flattened laterally.		
Fruit smooth or but slightly tuberculate.		
Branches very stout, 5 cm. thick or more	. 22.	O. cholla
Branches relatively slender, 2 cm. thick or less.		
Plant glaucous; spines 4 at an areole	23.	O. calmalliana
Plant not glaucous; spines more than 4 at an areole	24.	O. versicolor
Fruit manifestly tuberculate.		
Tall species, up to 2 or 4 meters high,		
Flowers small; petals 1.5 cm, long	. 25.	O. lloydii
Flowers large; petals 2 to 3 cm, long		O. imbricata
Low species, 6 dm, high or less,		
Flowers yellow	27.	O. tunicata
Flowers rose-colored	28.	O. pallida
oints clavate; tubercles not much flattened laterally		

#### 22. Opuntia cholla Weber, Bull. Mus. Hist. Nat. Paris 1: 320. 1895.

Usually tree-like, 1 to 3 meters high, with a definite trunk 7 to 15 cm. in diameter; trunk very spiny at first and becoming more spiny each year for some time, but in age spineless and developing a smooth, brownish yellow bark; top of plant often dense and broad; joints often in whost, borizontal, pale, with large compressed tubercles; spines usually numerous, more or less porrect, covered with loose brownish sheaths; glochids numerous, yellow; flowers rather small, 3 cm. broad, deep purple; fruit often 4 to 5 cm. long, usually proliferous, often in long chains of 8 to 12 individuals or forming compound clusters; seeds numerous, very small, often abortive

Type locality: In Lower California. Distribution: Lower California.

This is one of the commonest opuntias in southern Lower California and was usually seen by Dr. Rose at every locality visited south of Magdalena Bay on the west coast and on the east coast as far north as Muleje. It is undoubtedly the plant referred to O. prolifera by Mr. Brandegee, but it differs in habit and armament from that species; the fruit of O. prolifera is nearly or quite devoid of seeds, white this species often has numerous small ones. In this species, as in a few other opuntias, the fruits are quite proliferous, hanging on for a number of years and usually remaining green. They are, however, easily detached, and on falling to the ground, readily

take root and start new colonies. Our illustration shows some of the fruits which have already rooted and have developed young joints.

The plant here described is the true "cholla" of the people of Lower California, and is the plant cultivated under that name by A. Berger at La Mortola from a cutting of Weber's type specimen, and by the late Mr. Darrah at Manchester, England.

Illustrations: Contr. U. S. Nat. Herb. 16: pl. 128, A; Karsten and Schenk, Vegetations-bilder 13: pl. 17, B.

Figure 73 is from a photograph of a plant collected by Dr. Rose at Cape San Lucas; figure 74 represents a joint of the same plant; figures 75 and 76 represent its proliferous fruits developing new joints.

Opuntia chella (Index Kew. Suppl. 1: 302) is a typographical error for O. cholla.

 Opuntia calmalliana Coulter, Contr. U. S. Nat. Herb. 3: 453. 1896.

"Habit and height unknown; joints cylindrical, 1 to 2 cm. in diameter,



Fig. 73.—Opuntia cholla.

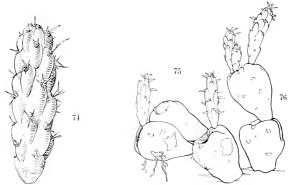
glaucous, with linear-oblong crested (mostly distinct) tubercles 20 to 25 mm. long; pulvini densely covered with yellowish wool, and with a penicillate tuft of whitish bristles at upper edge; spines usually 4, the upper one stout and porrect, reddish with yellowish tip (as are all the spines), 2 to 2.5 cm. long (occasionally 1 to 2 short upper ones added), the usually 3 (sometimes 4) lower ones more slender and sharply deflexed, 1 to 1.5 cm. long (occasionally one of them longer); flowers apparently urple; ovary covered with very prominent woolly pulvini which are more or less bristly and spiny, but ripening into a smooth juicy obvoate fruit; seeds discoid and beaked, irregularly angular, with broad commissure, about 4 mm. broad.' (Coulter, l. c.)

Type locality: Calmalli, Lower California.

Distribution: Lower California.

Type in the Brandegee Herbarium, University of California.

Referred by Mrs. Brandegee (Erythea 5: 122) to O. molesta Brandegee. It is closely related to O. molesta, but its spines are different, though on the same general plan, and its seeds are quite different.



Figs. 74, 75, 76.—Opuntia cholla. ×0.66.

Opuntia versicolor Engelmann in Coulter, Contr. U. S. Nat. Herb. 3: 452. 1896.
 Opuntia arborescens versicolor E. Dams, Monatsschr. Kakteenk. 14: 3. 1904.

Bush of tree-like, 2 to 4 meters high, with a large, open top sometimes 5 meters broad; trunk and larger stems woody throughout, except the younger branches; terminal joints 10 to 20 cm. long, 2.5 cm. in diameter, variously colored, not strongly tuberculate when living; tubercles 1.5 cm. long; spines 5 to 11, 5 to 25 mm. long, dark colored, with close-fitting sheaths; glochids reddish brown; flowers variously colored, yellow, greenish, reddish, or brown, 3 to 5.5 cm. broad; ovary tubercule; with large areoles bearing wool, glochids, and long deciduous bristles; fruit persisting for months, sometimes for a year, 2.5 to 4 cm. long, at first somewhat tuberculate, becoming pear-shaped or globose, sometimes proliferous; seeds white, 5 mm. broad.

Type locality: Tucson, Arizona.

Distribution: Arizona and northern Mexico.

This species is common on the lower foothills and is only rarely found on the mesas. It is of slow growth, propagating almost entirely from seed. As the name suggests, it has flowers of many colors; each plant has its own color and the color of the flowers is to a greater or less extent paralleled in that of the branches. The contrast in color shown by a colony of these plants is very striking and one's first impression is that more than one species exists.

Named specimens of this species were distributed by the late Dr. C. G. Pringle in 1881, but the species was not published until 1896.

Illustrations: Ariz. Agr. Exp. Sta. Bull. 67: pl. 6, f. 1; Bull. Torrey Club 32: pl. 9, f. 4 to 8; Hornaday, Camp-fires on Desert and Lava, pl. facing p. 18, 116, 320; N. Mex. Agr. Exp. Sta. Bull. 60: pl. 6, f. 1; Plant World 11<sup>10</sup>: f. 8; Sargent, Man. Trees N. Amer. f. 561; Carnegie Inst. Wash. 269: pl. 8, f. 81; pl. 9; MacDougal Bot. N. Amer. Des. pl. 58; Plant World 9<sup>12</sup>: f. 50.

Plate VII, figure 5, represents a fruiting joint; plate VIII, figure 2, is from a photograph taken by Dr. MacDougal near the base of the Santa Catalina Mountains, Arizona; plate IX, figures 2 to 5, are paintings made at the Desert Laboratory, Tucson, Arizona, by Kako Morita, showing the range in color of the flowers.

### 25. Opuntia Iloydii Rose, Contr. U. S. Nat. Herb. 12: 292. 1909.

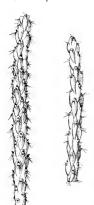
Much branched, 2 to 3 meters high and nearly as broad; joints terete, 2 cm. in diameter; tubercles prominent, oblong; spines few, on last year's joints 3, reddish, 1.5 cm. long; leaves terete, 6 to 8 mm. long; flowers 3 cm. long, opening after midday; petals 15 mm. long, dull purple; filaments olive-green below, purplish above; style ose-colored; stigma-lobes white; ovary yellowish, strongly tuberculate, naked: fruit 3 cm. long, yellow to orange, slightly tuberculate.

Type locality: On foot slopes, Hacienda de Cedros, Zacatecas, Mexico.

Distribution: Central Mexico.

According to F. E. Lloyd, for whom this species was named, it is known to the Mexicans as tasajo macho.

We have had this plant in cultivation for several years, but it does not grow well under glass; these specimens have white areoles; no glochids are developed the first year, but on



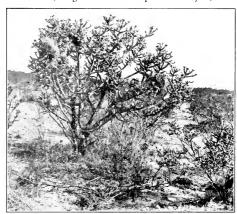


Fig. 77.—Opuntia Lloydii

Fig. 78.—Opuntia Lloydii. Photograph by F. E. Lloyd

old branches dark-brown bunches of glochids are developed in the upper edges of the areoles, and the several brownish spines are acicular.

Illustration: Contr. U. S. Nat. Herb. 12: f. 34; pl. 25.

Figure 77 represents two joints of the type specimen; figure 78 is from a photograph of the type plant.

### 26. Opuntia imbricata (Haworth) De Candolle, Prodr. 3: 471. 1828.

Gereus imbricatus Haworth, Rev. Pl. Succ. 70, 1821.
Gartine Vilor Torrey, Ann. 152, 1825. Not Lamarck. 1783.
Gartine Vilor Torrey, Ann. 152, N. Y. 2: 202. 1828. Not Humboldt, Bonpland, and Kunth. 1823.
Opinitia rosea De Candolle, Prodr. 3: 471. 1828.
Opinitia existipens De Candolle, Mem. Mus. Hist. Nat. Paris 17: 118. 1828.
Opinitia existifiat a guistior De Candolle, Mem. Mus. Hist. Nat. Paris 17: 118. 1828.
Opinitia existifiat a miguistior De Candolle, Mem. Mus. Hist. Nat. Paris 17: 118. 1828.
Opinitia existifiat a principe De Candolle, Mem. Mus. Hist. Nat. Paris 17: 118. 1828.
Opinitia existifiat selfata Lemaitre. Cact. Gen. Nov. Sp. 67. 1839.
Opinitia existifiat selfata Lemaitre. Cact. Gen. Nov. Sp. 67. 1839.
Opinitia existifiat viriatior Salm-Dyck. Cact. Hort. Dyck. 1840. 48. 1845.
Opinitia imbricata crassitor Salm-Dyck. Cact. Hort. Dyck. 1849. 73. 1850.
Opinitia imbricata temaior Salm-Dyck. Cact. Hort. Dyck. 1849. 73. 1850.
Opinitia imbricata temaior Salm-Dyck. Cact. Hort. Dyck. 1849. 73. 1850.
Cattus imbricata temaior Salm-Dyck. Cact. Hort. Dyck. 1849. 73. 1850.
Cattus imbricatus Lemaine, Cactées 88. 1868.

Opuntia texam: Griffiths, Rep. Mo. Bot. Gard. 22: 28, 1912. Opuntia magna. Griffiths, Proc. Biol. Soc. Washington 27: 25, 1914. Opuntia pinotecta Griffiths, Proc. Biol. Soc. Washington 27: 24, 1914.

Tree-like, often 3 meters high or higher, with a more or less definite woody trunk 2.5 cm. in diameter; ultimate joints 2 to 3 cm. in diameter, strongly tuberculate; leaves 8 to 24 mm. long, terete; tubercles 2 to 2.5 cm. long, flattend laterally; spines 8 to 30, 2 to 3 cm. long, brown, covered with papery sheaths; flowers borne at ends of branches, 4 to 6 cm. long, sometimes 8 to 9 cm. broad, purple; ovary ruberculate, bearing a few bristles from some of the upper areoles; fruit naked, yellow, 2.5 to 3 cm. long, strongly tuberculate or, when long persistent, smooth; seeds 2.5 to 3.5 mm. in diameter.

Type locality: Unknown; introduced into England by Loddiges in 1820.

Distribution: Central Colorado to Texas, Oklahoma, New Mexico, and central Mexico. Rdyberg (Fl. Rocky Mountains 576. 1917) reports this species from Utah under the name of Opunita arborescens; we have seen no specimens of it from Utah.

The plant is hardy in southwestern Kansas, and has been recorded as a native of that State; it has existed through three winters out of doors at the New York Botanical Garden, but has made little growth.

We have followed Schumann and Weber in uniting Opuntia arborescens and O. imbricata. As thus treated, the species has a wide geographic distribution, and in our view consists of many slightly differing races. In its northern limits it is much smaller than in its southern range.

Opuntia cristata tenuior Salm-Dyck (Cact. Hort. Dyck. 1844. 49. 1845, name only), O. decipiens major Hort. in Salm-Dyck (Cact. Hort Dyck. 1844. 49. 1845, as synonym), O. cristata Salm-Dyck (Cact. Hort. Dyck. 50. 1842), and O. stellata Salm-Dyck (Cact. Hort. Dyck. 50. 1842) are unpublished names. O. ruthei is a garden name mentioned by Berger.

Opuntia exuviata major (Salm-Dyck, Cact. Hort. Dyck. 1844. 49. 1845) is an unpublished name.

Opuntia cardenche Griffiths (Rep. Mo. Bot. Gard. 19: 259. pl. 21, in part. 1908) is described as standing between Opuntia kleiniae and O. imbricata, being stouter than the one and more slender than the other. It resembles very closely specimens collected by

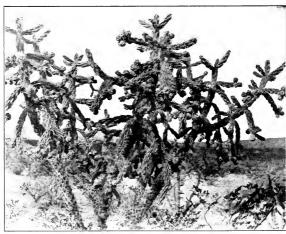


Fig. 79. Opuntia imbricata.

OPUNTIA, 65

Dr. Rose at Ixmiquilpan, Mexico, in 1905, which we have referred to O. kleiniae.

Opuntia galeottii de Smet (Miquel, Nederl, Kruidk, Arch. 4: 337. 1858) and O. costigera Miquel (Nederl, Kruidk, Arch. 4: 338. 1858), if really from Mexico, may belong here, but the descriptions are indefinite. Dr. Schumann did not know them.

Opuntia mendocienses (Cat. Darrah Succ. Manchester 56. 1908) is said to be "probably only a form of O. imbricata."

Opuntia undulata Link and Otto (Verh. Ver Beförd. Gartenb. 6: 434. 1830) was not published. According to Pfeiffer, it is the same as O. exuviata, which we refer here.

Opuntia decipiens minor (Pfeiffer, Enum. Cact. 172. 1837) is unpublished.

Cactus subquadriflorus Mociño and Sessé (De Candolle, Prodr. 3: 471. 1828), given as a synonym of Opunita rosea, doubtless belongs here. Schumann's reference, C. quadriflorus, is incorrect. C. subquadriflolius (Cactaceae 3: 65) is a clerical error





Fig. 80.—Opuntia tunicata.

Fig. 81.—Opuntia paliida

Illustrations: Agr. Gaz. N. S. W. 22: pl. opp. p. 696; Bull, U. S. Dept. Agr. 31: pl. 5; pl. 6, f. 1; Cact. Mex Bound. pl. 73, f. 7, 8. Curtis's Bot. Mag. 135: pl. 8290; N. Mex. Agr. Exp. Sta. Bull. 60: pl. 7, f. 2; Förster, Handb. Cact. ed. 2. f. 134; Mém. Mus. Hist. Nat. Paris 17: pl. 15; W. Watson, Cact. Cult. f. 85, the last three as Opuntia rosea. W. Watson, Cact. Cult. f. 8, in part, this as Opuntia decipiens. Ann. Rep. Bur. Amer. Ethn. 26: pl. 8, f. a; Cact. Mex. Bound. pl. 75, f. 16, 17; Gard. Chron. III. 34: f. 36; Gard. and For. 9: f. 1; Illustr. Fl. 2: f. 2533; ed. 2. 2: f. 2992; N. Mex. Agr. Exp. Sta. Bull. 78: pl. [10]; Pac. R. Rep. 4: pl. 17, f. 5, 6; pl. 18, f. 4; pl. 24, f. 12; Rep. Mo. Bot. Gard. 22: pl. 7, in part; all as Opuntia arborescens. Rep. Mo. Bot. Gard. 22: pl. 6, 7, in part; these two as Opuntia vexans. Dict. Gard. Nicholson Suppl. 179. f. 195, as Opuntia decipiens; Dict. Gard. Nicholson 4: 581. f. 52, as O. rosea; Stand. Cycl. Hort. Bailey 4: f. 2608; Engler and Drude, Veg. Erde 13: f. 28, in part; Gartenwelt 4: 159, as O. arborescens: Bot. Jahrb. Engler 58: Beibl. 129: 33, f. 10.

Plate XI, figure 1, represents a joint of a plant collected by W. L. Bray in western Texas. Figure 79 is from a photograph taken by Professor F. E. Lloyd in Zacatecas, Mexico, in 1908.

27. Opuntia tunicata (Lehmann) Link and Otto in Pfeiffer, Enum. Cact. 170. 1837.

Cactus tunicatus Lehmann, Ind. Sem. Hort. Hamb. 6. 1827.

Opuntia stapeliae De Candolle, Mém. Mus. Hist. Nat. Paris 17: 117. 1828.

Opuntia hystrix Grisebach, Cat. Pl. Cub. 117. 1866.

Opuntia perrita Griffiths, Rep. Mo. Bot. Gard. 22: 33. 1912.

Very variable, sometimes low and spreading from the base and torming broad clumps, at other times 5 to 6 dm. high, with a more or less definite woody stem and numerous lateral branches; joints easily detached, sometimes short and nearly globular to narrowly oblong, 10 to 15 cm. long, strongly tuberculate; spines reddish, normally 6 to 10, elongated, 4 to 5 cm. long, covered with thin, white, papery sheaths; flowers 3 cm. long, yellow; petals obtuse; ovary often bearing long spines at the areoles, but usually naked.

Type locality: In Mexico.

Distribution: Highlands of central Mexico; also in Ecuador, Peru, and northern Chile. Opantia stapeliae has long puzzled collectors and students of cacti. We are convinced now that it is only starved or stunted greenhouse specimens of the common O. tunicata. When grown in cultivation, O. tunicata takes on abnormal shapes, for the joints, which break off easily, rarely grow to their full size. In its native home many small dwarf plants are found everywhere about the larger plants. We have discussed this explanation of O. stapeliae with Mr. A. Berger, and he agrees with our conclusion.

No specimens of the type of *O. stapeliae* are preserved in the De Candolle Herbarium. The plant figured as *Opuntia stapeliae* (?) by Goebel in Pflanzenbiologische (f. 36) does not belong here. It is erect, has strongly tuberculate joints, very short spines and narrow elongated leaves.

Cereus tunicatus (Pfeiffer, Enum. Cact. 170. 1837) is given as a synonym of Opuntia tunicata, but has never been formally taken up.

We believe *Opuntia bystrix* Grisebach, collected by C. Wright in Cuba, belongs here, probably being an escape from a garden. Dr. Rose examined the specimens in the Krug and Urban Herbarium in Berlin in 1912; the loose sheaths of the spines of these specimens are now brown, while the flowers seemed a little smaller than those of the Mexican specimens. The flowers were described as red.

Opuntia furiosa Wendland (Pfeiffer, Enum. Cact. 170. 1837) is referred to O. tunicata by Pfeiffer, while Salm-Dyck refers it to his variety O. tunicata laevior (Cact. Hort. Dyck. 1849, 73, 1850).

Illustrations: Bull. U. S. Dept. Agr. 31:pl. 4; Cact. Journ. 1: October; The Garden 62: 425; Safford, Ann. Rep. Smiths. Inst. 1908: pl. 10, f. 5; Schumann, Gesamtb. Kakteen f. 2; Rep. Mo. Bot. Gard. 22: pl. 13, 14, these two as Opuntia perrita. Garden 13: 107\*, as Opuntia exuviata; Möllers Deutsche Gärt. Zeit. 25: 476. f. 9, No. 7; Goebel, Pflanz. Schild. 1: f. 36, as O. Stapeliae; Contr. U. S. Nat. Herb. 10: pl. 17, f. A.

Plate X, figure 1, represents a joint of a plant collected by Dr. Rose near Cuzco, Peru. Figure 80 is from a photograph of the same plant.

28. Opuntia pallida Rose, Smiths. Misc. Coll. 50: 507. 1908.

Stems 5 cm. in diameter, about 1 meter high, with widely spreading branches, the whole plant of the broader than high; old areoles very spiny, often bearing 20 spines or more, often 3 to 4 cm. long, with white, papery sheaths; young areoles bearing few spines; ovary tuberculate, the areoles either naked or bearing a few bristly spines; flowers pale rose-colored; petals 15 mm. long.

Type locality: Near Tula, Hidalgo, Mexico.

Distribution: State of Hidalgo, Mexico.

This species is known only from near Tula, Mexico, where it was discovered by Dr. J. N. Rose in 1905, and afterwards collected near the same station by Mr. E. W. Nelson. It grows interspersed with O. imbricata, but is much lower in stature and has smaller leaves and lighter-colored flowers. It is much like O. tunicata, but that species has yellow flowers and is always smaller.

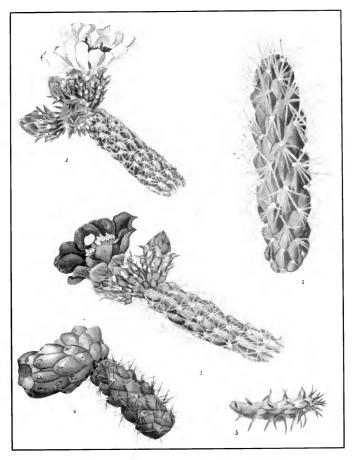
Illustration: Contr. U. S. Nat. Herb. 10: pl. 17, A.

Figure 81 is from a photograph of the type specimen.

29. Opuntia molesta Brandegee, Proc. Cal. Acad. II. 2: 164. 1889.

Stems 1 to 2 meters high, or in cultivation only 6 dm. high, with few, long, spreading branches; joints clavate to subcylindric, 10 to 40 cm. long, sometimes as much as 4 cm. in diameter at the top, "This illustration is very poor and is only tentatively referred here. If native to Califoroia, as one might infer from the account which accompanies the illustration, it may refer to a form of Openita prolifer a Or. echinocarps.

BRITTON AND ROSE PLATE X



1. Joint of Opuntia tunneata.

2 to 5. Joints of Opuntia spinosior. (All three-fourths size.)

OPLINTIA.

pale green, with low, broad tubercles, these elongated and often 4 cm. long or more; leaves linear, 10 mm. long or less; spines few, 6 to 10, unequal, the longest ones 2.5 to 5 cm. long, straw-colored, with loose, papery sheaths; flowers purple, 5 cm. in diameter; fruit ovoid, 2.5 cm. long, somewhat spiny or naked; seeds 6 mm. in diameter, irregular in shape.

Type locality: San Ignacio, Lower California.

Distribution: Lower California.

The type of the species is deposited in the Brandegee Herbarium, now a part of the herbarium of the University of California. Living plants have been distributed by A. Berger from La Mortola, Italy, and are now to be found in various collections.

In the Index Kewensis, first supplement, this species is wrongly entered as Opuntia modesta!

Figure 82 is from a photograph of a plant sent from La Mortola, Italy, to the New York Botanical Garden in 1913.

#### Series 7. FULGIDAE.

Much branched, bushy plants, usually with the terminal joints very fleshy, the tubercles broad and low, about as broad as long. The species, of which we recognize five, inhabit the southwestern United States and western Mexico.

## KEY TO SPECIES

Joints very readily detached, freely falling......30, O. fulgida Joints not very readily detached, persistent. Spines brown or reddish, at least at base Branches slender; fruit not proliferous ...31. O. spinosior

Branches stout; fruit proliferous......32. O. prolifera Spines white or yellow

Spines white; petals greenish yellow, 1 cm.

30. Opuntia fulgida Engelmann, Proc. Amer. Acad. 3: 306. 1856.

> Opuntia mamillata Schott in Engelmann, Proc. Amer. Acad. 3: 308. 1856. Opuntia fulgida mamillata Coulter, Contr. U. S. Nat.

Herb. 3: 449. 1896. Plant sometimes 3 meters high or even more, with a rather definite woody trunk 10 to 20 cm. in diameter, much branched, sometimes almost from the base, and forming a compact flattened crown; terminal joints 10 to 20 cm. long, 3 to 5 cm. in diameter, very succulent, strongly tuberculate, easily breaking off; spines 2 to 12, yellowish to brown, 2.5 to 3.5 cm. long, acicular, covered with loose, papery sheaths; glochids small, whitish to light yellow; flowers light rose, 2.5 to 3 cm. broad; petals few, obtuse; stamens and style very



Fig. 82.-Opuntia molesta.

short; fruit at first tuberculate, in age smooth, somewhat pear-shaped, 2 to 5 cm. long, green, usually very proliferous; seeds rather small, 4 mm. broad, often wanting.

Type locality: Mountains of western Sonora, Mexico.

Distribution: Gravelly and sandy situations, southern Arizona, Sonora, and Sinaloa.

We consider O. mamillata as synonymous with O. fulgida; in herbarium and greenhouse specimens we can find no constant differences. Professor J. J. Thornber, who has long studied this group, says there is no difference between the flowers and fruits, and that there is no difference in distribution (Ariz. Agr. Exp. Sta. Bull. 67: 501). In the field, however, one can see two rather distinct forms which differ in armament, the typical plant being the more spiny.

This is one of the most characteristic opuntias of southern Arizona, being very abundant on the valley slopes and lower foothills. It often forms dense colonies almost to the exclusion of other cacti, or it may be associated with other species, especially of Opuntia. It is a most troublesome plant to come in contact with, for, as the sharp, barbed spines pierce the flesh, the joints easily break loose from the plant and are detached with difficulty from the unfortunate victim.

The flowering season extends from early spring to September. The fruit is markedly proliferous, often developing in chains, and so persisting for several years, possibly eight or ten years, as suggested by Professor D. S. Johnson. They grow in chains of 8 or 9 fruits (12 to 14 have been reported), several chains hanging from a single joint and forming a large cluster. We have seen as many as 38 fruits (40 to 50 have been reported) in a single cluster, and doubtless under favorable conditions many more would be found. These juicy fruits, usually spineless, are much sought by grazing animals.

According to Professor Johnson, who has studied this species several years, the seeds are not known to germinate in nature. Only by cutting away a part of the hard, bony coat could they be made to germinate in the greenhouse. The species is propagated easily by the terminal joints, which come off readily and are transported far and wide like burs, and soon strike root on reaching the soil. New plants are also started occasionally by the fruits themselves.

This species appears to hybridize with O. spinosior.

Illustrations: Åriz, Agr. Éxp. Sta. Bull. 67: pl. 1, f. 2; Bull. Torr. Club 32: pl. 9, f. 1; Cact. Mex. Bound. pl. 75, f. 18; Gard. and For. 8: f. 46; Hornaday, Camp-fires on Desert and Lava opp. p. 42, 320; Lumholtz, New Trails in Mex. opp. p. 18; Monatsschr. Kakteenk. 18: 153; Nat. Geogr. Mag. 21: 710; N. Mex. Agr. Exp. Sta. Bull. 60: pl. 6, f. 2; Plant World 11°: f. 1, in part; 11°: f. 9, in part; Sargent, Man. Trees N. Amer. f. 559; Ariz. Agr. Exp. Sta. Bull. 67: pl. 5, f. 1; Cact. Mex. Bound. pl. 75, f. 19; Lumholtz, New Trails in Mex. opp. p. 152; Nat. Geogr. Mag. 21: 710; Plant World 11°: f. 1, in part; 11°: f. 9, in part, the last six as Opuntia mamillata; Carnegie Inst. Wash. 269: Frontispiece; pl. 1 to 7; pl. 8, f. 76 to 79; pl. 12. MacDougal, Bot. N. Amer. Des. pl. 57, as Opuntia mamillata; McDougal, Bot. N. Amer. Des. pl. 87.

Plate IX, figure 6, represents the proliferous fruit; plate XII, figure 1, is from a photograph taken by Dr. MacDougal near Tucson, Arizona, showing the typical plant to the left and the less spiny plant to the right.

### 31. Opuntia spinosior (Engelmann) Toumey, Bot. Gaz. 25: 119. 1898.

Opuntia whipplei spinosior Engelmann, Proc. Amer. Acad. 3: 307. 1856.

Plants 2 to 4 meters high, tree-like in habit, with a more or less definite, woody trunk, openly branched; ultimate joints 1 to 3 dm. long, 1.5 to 2.5 cm. in diameter, often bright purple, strongly tuberculate; tubercles about 6 to 12 mm. long, longer than broad, more or less flattened laterally; spines 6 to 12, but on old branches sometimes as many as 25, 10 to 15 mm. long, divergent, gray to brownish, covered with thin sheaths; glochids yellowish white; flower-buds short, acute; flowers 5 to 6 cm. broad, purple to pink, yellow, or even white; petals about 10, broad at apex, narrowed at base; style thick, cream-colored or pinkish; ovary tuberculate, bearing small, purple leaves and long, white, easily detached bristles; fruit strongly tuberculate, spineless, yellow, globose to broadly oblong, 2.5 to 4 cm. long, with a depressed umbilicus; seeds white, 4 mm. broad, smooth, with a very indistinct marginal band.

Type locality: South of the Gila River.

Distribution: Arizona, western New Mexico, and northern Mexico.

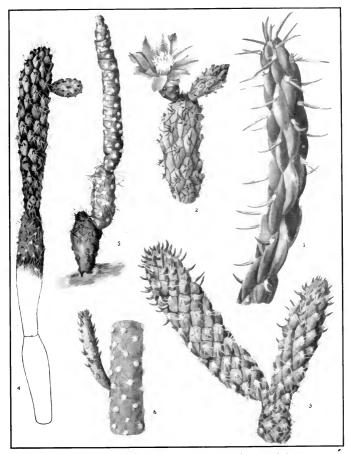
Opuntia spinosior neomexicana (Toumey, Bot. Gaz. 25: 119. 1898) seems to be a yellow-flowered form of this species. Mr. Toumey writes that his original material of this variety came from the low foothills north of the Rillito River near Tucson.

Opuntia spinosior was described by Engelmann in 1856 as a variety of O. whipplei, to which it is only remotely related, but it was not separated until 1898, when it was described as distinct by Professor J. W. Toumey.

This plant is sometimes found in the trade as *Opuntia arborescens spinosior* (see Grässner).

Illustrations: Ariz. Agr. Exp. Sta. Bull. 67: pl. 1, f. 1; pl. 5, f. 2; Gard. and For. 9: f. 1; N. Mex. Agr. Exp. Sta. Bull. 60: pl. 7, f. 1; Plant World 11<sup>10</sup>: f. 7; Sargent, Man. Trees N.

PLATE XI BRITTON AND ROSE



Leafy branch of Opuntia imbricata.
 Flowering branch of Opuntia prolifera.
 6, Opuntia vestita.
 (All three-fourths size.)

Amer. f. 560. Emory, Mil. Reconn. App. 2. f. 10, as Opuntia arborescens; Shreve, Veg. Des.

Mt. Range pl. 2, A.

Plate X, figures 2 and 3, are from paintings showing different flower-colors, made at the Desert Laboratory, Tucson, Arizona; figure 4 represents a fruiting joint of a plant collected by F. Gilman at Sacaton, Arizona; and figure 5 represents a leaf-bearing joint of the same plant; plate XII, figure 2, is from a photograph of the plant in the Tucson Mountains, Arizona, by Dr. MacDougal.

# 32. Opuntia prolifera Engelmann, Amer. Journ. Sci. II, 14: 338. 1852.

Stems 1 to 2 meters high, the trunk and old branches terete and woody; terminal joints 3 to 12 cm. long, easily breaking off, fleshy, covered with short, more or less turgid tubercles; spines 6 to 12, brown, 10 to 12 mm. long; glochids pale; flowers small; sepals orbicular, obtuse, dark red; petals red; filaments yellow; style stout; stigma-lobes red; ovary 1 cm. long; strongly tuberculate; upper areoles bearing 2 to 6 reddish spines or the joints naked throughout; fruit proliferous, 3 to 3.5 cm. long and often without seeds; seeds, if present, large, regular, 6 mm. broad.

Type locality: Arid hills about San Diego, California.

Distribution: Southern California and coast of Lower California.

The range of this species is not well known. We have referred here, with some doubt, specimens collected by Dr. Rose on Guadalupe Island, off the coast of Lower California, as well as specimens from the south end of Lower California, but we have seen no flowers from these Lower California collections. A peculiar form less than 5 dm. high with bluish-green joints and small seeds, from near Newport, Orange County, California, deserves further study.

This species, although common in southern California, has never been fully and accurately described. It is often confused in collections with O. serpentina, with which it grows, although they are very different.

In greenhouse specimens the joints and spines are not well developed.

Illustration: Meehan's Monthly 3: pl. 1.

Plate XI, figure 2, represents a flowering joint of a plant collected by E. W. Nelson and E. A. Goldman in Lower California, which bloomed at the New York Botanical Garden in April 1914. Figure 83 represents a joint of a plant sent from La Mortola, Italy, in 1912; figure 84 is from a photograph of this plant.

Of this relationship, but of very different habit, is the species collected by Dr. Rose on West San Benito Island in 1911. Unfortunately no flowers or fruits could be obtained, and hence we have not named it here. It may be briefly characterized as follows:

#### OPUNTIA Sp.

Low, much branched plants; joints short (10 cm. long), thick, and fleshy; leaves cylindric, 10 mm. long, acute; areoles distant, circular, bearing brown wool, tawny glochids and numerous spines; spines 6 to 8, often 4 cm. long, slender, reddish brown, inclosed in loose, thin, brownish sheaths. Collected by Dr. J. N. Rose on West San Benito Island, off the west coast of Lower California, March 9, 1911 (No. 16043).

# 33. Opuntia alcahes Weber, Bull. Mus. Hist. Nat. Paris 1: 321. 1895.

Plant about 1 meter high, much branched, very spiny, especially when old; branches terete; spines on young joints about 12, short, covered with

white or very pale sheaths; tubercles prominent, diamond-shaped; leaves small, 1 cm. long, terete, somewhat bronzed; sepals small, brownish, closely imbricated, hardly spreading at tips; petals sometimes wanting, or, if present, about 1 cm. long, greenish yellow, obtuse; stamens numerous; stigma-lobes very short, 6 to 8, at first exserted beyond the sepals, yellowish; fruit globular, small, becoming turgid in age, yellowish, more or less proliferous, the umbilicus truncated or slightly depressed.

Type locality: In Lower California. Distribution: Lower California.



Plate XI, figure 3, represents a leaf-bearing joint of a plant obtained by the same collector on Espíritu Santo Island, Lower California; figure 4 is from a plant sent to the New York Botanical Garden from La Mortola, Italy, in 1906. Figure 85 is from a photograph of a plant collected by Dr. Rose at San Francisquito, Lower California.

### 34. Opuntia burrageana sp. nov.

Usually low and bushy, rarely 1 meter high; stems slender, 1 to 2 cm. in diameter, densely spiny; leaves small, 2 mm. long, green, early deciduous; old stem and branches terete; young joints cylindric





Fig. 84.—Opuntia prolifera

Fig. 85.--Opuntia alcahes.

to narrow-clavate, 15 cm. long or less; areoles closely set; tubercles rather low, not much broader than long; spines numerous, similar, spreading, rately 2 cm. long, all covered with thin, bright-yellow sheaths wool in areoles short, brown; glochids, when present, short, light yellow; flower 3 to 4 cm. broad; petals few, brownish red with green bases; filaments green; stigma-lobes white; ovary very spiny; fruit not proliferous, globular, 2 cm. in diameter, somewhat tuberculate, probably dry; seeds pale, 4 mm. in diameter.

Common on the hills along the coast of s uthern Lower California.

BRITTON AND ROSE PLATE XII





Plants of Opuntia fulgida.

A very open plant of Opuntia spinosior.

OPUNTIA. 71

The following specimens were collected by Dr. J. N. Rose in 1911: Near Pichilinque Island (No. 16533, type); near San José del Cabo (No. 1648); near Cape San Lucas (No. 16379); on Carmen Island (No. 16630); on San José Island (No. 16552).

Plate XIV, figure 1, is from a plant collected by Dr. Rose on San Josef Island, Lower California, in 1911, which flowered the next year at the New York Botanical Garden.

### Series 8. VESTITAE.

The series Vestitae contains three or perhaps four species, two of which possibly represent greenhouse forms of species of Tephrocatus, natives of the high Andes. They are low species with elongated cylindric joints sometimes arising from subglobose ones, and form a connecting link between the true species of Tephrocatus and Cylindropantia. Opantia restita in the field was supposed to be a form of O. pentlandii, but in cultivation it has developed quite differently: O. florcosa, a Tephrocatus, sometimes develops like the Vestitae: one specimen which we have grown shows a slender cylindric stem with few long hairs or none. Opantia boliviana and O. pentlandii, both from Bolivia and described at the same time by Salm-Dyck, and which we have united, seem to represent two forms of the same species, O. pentlandii being the abnormal form. The same condition seems to exist in O. verschaffeltii and its variety digitalis, the variety being the normal form. Schumann had these species in his series Teretes (our series Subulatae), but O. subulata and O. cylindrica are tall woody, much branched plants.

### KEY TO SPECIES

 Areoles with hairs; joints not or scarcely tuberculate.
 .35. O. restita

 Joints 1 to 1.5 cm. thick; spincs 2.5 cm. long or less; fruit mostly sterile
 .35. O. restita

 Joints 2.5 to 3 cm. thick; spincs up to 5 cm. long; fruit many-seeded
 .36. O. sbaleri

 Areoles without hairs; joints distinctly tuberculate
 .37. O. restitaffeltii

 Of this series?
 .38. O. bytophila

# 35. Opuntia vestita Salm-Dyck, Allg. Gartenz, 13: 388. 1845.

Opuntia teres Cels in Weber, Dict. Hort. Bois 898 1898.

Roots fibrous: stems much branched, weak, forming small clumps 3 dm. broad or less and nearly as high, fragile; joints short or elongated, becoming in greenhouse cultivation 2 dm. long or more, oblong or cylindric, 1 to 1.5 cm. thick, very spiny, easily breaking apart; arcoles circular, conspicuous, bearing short wool, spines, and several long hairs; spines about 6 in each cluster, acicular, brownish, 2 to 2.5 cm. long; leaves minute, acute; flowers small, including the ovary; 2 cm. long, deep red; petals 1 cm. long; areoles on ovary conspicuous, filled with white wool and long hairs; fruit red, usually sterile, globular or a little longer than broad, usually naked, generally truncate at apex, often bearing small spiny joints at the arcoles.

Type locality: In Bolivia.

Distribution: Common on the sterile hills about La Paz, Bolivia.

Specimens were collected by Miguel Bang some years ago and segregated as a new species by the late Karl Schumann, but this was never published; others were obtained by Dr. Rose in 1914, and living plants are now growing at the New York Botanical Garden. As seen wild, it is a strange little plant, growing in low clumps, its fragile stems easily breaking apart, especially at the terminal joints. The bright red fruits remain on the parent plant until they produce a number of spiny joints, often as many as five, which, after falling off, strike root and start new colonies.

Dr. Rose suspected at the time he collected his material that it might be *Opuntia vestita*, and suggested that it should be carefully compared with it. This he was not able definitely to prove in the field, but the living specimens sent to the New York Botanical Garden put out new branches which are long, slender, and cylindric, and are devoid of long acicular spines, quite unlike the wild plants but almost identical with the specimens received from La Mortola, Italy, some years ago as *O. vestita*.

Opuntia teres Cels must belong here, at least in part. Weber states that the flowers are very similar to O. vestita, while the fruit is said to be small, red, and proliferous, just as found in O. vestita. The leaves are described as 2 cm. long, however, and there is a possibility that O. exaltata may be partly represented in the description, as we find herbarium material of both species, from Bolivia, mounted on the same sheet.

Illustration: Möllers Deutsche Gärt, Zeit, 25: 476, f. 9, No. 8.

Plate XI, figure 5, shows the plant collected by Dr. Rose in 1914; figure 6 is from a plant received from La Mortola, Italy, in 1912.

### 36. Opuntia shaferi sp. nov

Plants in clusters of 2 to 4, erect, about 3 dm. high; joints terete, 2.5 to 3.5 cm. in diameter, elongated, very spiny; tubercles low, often indistinct; leaves deciduous, 6 mm. long; areoles 1 cm. apart or less, circular, white-felted; glochids numerous, whitish from the upper margin of the areole; spines about 6 at an areole, brownish, acicular, often 4 to 5 cm. long and

associated with long white hairs; flowers not known; fruit globular, about 2 cm. in diameter, bearing numerous large areoles, the areoles white-felted, with glochids and hairs, but no spines; seeds turgid, pointed at base, 4 mm. long.

Collected by J. A. Shafer among stones between Purmamaria and Tumbaya, Argentina, February 6, 1917 (No. 90).

Nearest O. vestita but less cespitose, taller and larger, and with fertile fruit.

37. Opuntia verschaffeltii Cels in Weber, Dict. Hort. Bois 898. 1898.

Opiotti i verichalfeltri digitalis Weber, Dict. Hort. Bois 898. 1898. Forms low, in dense clumps, much branched; joints globular to short-cylindric, 1 to 4 cm. long, somewhat tuberculate, pale green; spines 1 to 3, yellowish, weak, and bristle-like, 1 to 3 cm. long; in cultivated plants joints elongated, 6 to 21 cm. long, slender, 1 to 1.5 cm. in diameter, strongly tuberculate, spineless; glochids few, white; areoles narrow, longer than broad, filled with short white wool.

Type locality: In Bolivia. Distribution: Bolivia.

In 1914 Dr. Rose collected this species on the barren hills about La Paz. Bolivia, and from his observations it seemed to be only a form of Opuntia pentlandii. In cultivation, however, it behaves very differently from his specimens of the latter, and in fact has developed a phase very unlike its normal type but identical with other greenhouse specimens sent out by Mr. Berger some years ago under the name of O. verschaffeltii.

Opuntia digitalis Weber (Dict. Hort. Bois 898, 1898) was given as a synonym of O. verschaffeltii digitalis,

Figure 86 represents an elongated joint, from a greenhouse specimen; this grew from the short normal joint, collected by Dr. Rose near La Paz, Bolivia,

38. Opuntia hypsophila Spegazzini, Anal. Mus. Nac. Buenos Aires III. 4: 509. 1905.

Cespitose, branching, small, 5 to 10 cm. high, pale green; joints globose to cylindric, 1.5 to 3 cm. long; tubercles depressed; spines 3 to 5, subulate, weak, spreading, white at first, in age brownish; flowers and fruit unknown.

Type locality: In the Province of Salta, Argentina, in the Andes, at an altitude of 2,500 to 4,000 meters.

Distribution: Salta, Argentina.

We do not know this species, but Dr. Spegazzini thought it might be a Tephrocactus and associated it with Opuntia verschaffeltii digitalis.



### Series 9. CLAVARIOIDES.

This series is the same as the Etnberculatae of Schumann and contains but a single species, recorded as a native of Chile. According to Schumann, the stems are cylindric to clavate, not tuberculate, the leaves are small and caducous, and the spines are very small and appressed. The fruit is said to contain one woolly seed.

### Opuntia clavarioides Pfeiffer, Enum. Cact. 173. 1837.

Low, much branched, grayish brown, 4 dm. high or less, truncate or cristate at apex; joints not tuberculate, rather fragile, short-cylindric or clavate, 1.5 cm. in diameter; leaves minute, 1.5 mm. long, reddish, caducous; areoles minute, closely set, filled with wool and minute spines; spines 4 to OPUNTIA. 73

10, white, appressed; flowers 6 to 6.5 cm. long; sepals linear, pointed, reddish, petals light brown, narrowly spatulate, slightly crenare; ovary bearing minute leaves with wool and short bristles in their axils; flaments white, shorter than the petals; style white, with 7 stigma-lobes; fruit ellipsoid, 1.5 cm. long, one-seeded.

Type locality: In Chile.

Distribution: Originally described from Chile, but often referred to Mexico.

Very little is known of this species, although it was described as long ago as 1837, and it is rare in collections. We have never seen it in flower and have seen only one record of its flowering in cultivation. The peculiar structure of the stem, narrow petals and single lanate seed, join a combination of characters separating it from other opuntias. and lead Schumann to refer it to a distinct series which he calls Etuberculature. The question has been raised in our own minds if this is a true Opuntia. In cultivation the plant is usually grafted on some Platyopuntia.

Variety cristata is offered in the trade journals.

Opuntia microthele, Cereus clararioides, and Cereus sericeus are usually given as synonyms, but all these were cited by Pfeiffer (Enum. Cact. 173. 1837) as synonyms of this species

at the place commonly given as their first publication. The varieties fusciata Schumann (Monatsschr. Kakteenk. 10: 159. 1900), fustigiata Mundt (Monatsschr. Kakteenk. 3: 30. 1893), and monstruosa Monville (Labouret, Monogr. Cact. 489, 1853) are anomalous greenhouse forms.

Illustrations: Gartenflora 44; f. 7; Montsschr. Kakteenk. 3: 9; 16: 169; Schumann, Gesamtb. Kakteen f. 104; Gard. Chron. III. 30: f. 75, this last as Opuntia clararioides cristata: Garden 13: 107, as Opuntia clararioides cristata: Rother, Praktischer Leitfaden Kakteen 106; Möllers Deutsche Gärt. Zeit. 15: 67; 25: 476. f. 9, No. 19; Thomas, Zimmerkultur Kakteen 59; Wiener III. Gärt. Zeit. 28: f. 18; Monatsschr. Kakteenk. 32: 131.

Figure 87 is copied from the illustration used by Schumann cited above.

### Series 10, SALMIANAE.

This series (Fintescentes of Schumann), by some supposed to be composed of five species but here treated as containing but one, is confined to central South America. It is characterized by slender, bushy, often vine-like habit, terete branches, and red

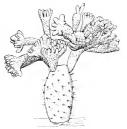


Fig. 87.—Opuntia clavarioides grafted on another species.

fruit, the latter crowned by proliferous spiny joints. Seeds are unknown. Greenhouse specimens often resemble Opuntia leptocaulis, but the flowers are somewhat larger, and the spines are not sheathed.

40. Opuntia salmiana Parmentier in Pfeiffer, Enum. Cact. 172. 1837.

Opuntia spegazzinii Weber, Dict. Hort, Bois 898. 1898.

Opuntia albiflora Schumann, Gesamth. Kakteen Nachtr. 152. 1903.

A bushy plant, 3 dm. to 2 meters high, much branched at base; branches often weak, terete, 1.5 cm. in diameter or less, often purplish, etuberculate; areoles small, bearing wool, yellow glochids, and spines; spines sometimes wanting, usually several, 1.5 cm. long or less, white; flowers 2 to 3.5 cm. broad, scattered along the stem; buds pinkish or even scarlet; petals obovate, pale yellow to white, sometimes tinged with pink; stamens and style short; stigma-lobes yellowish green; fruits sterile, clavate, scarlet, with few or no spines.

Type locality: In Brazil.

Distribution: Southern Brazil, Paraguay, and northern Argentina.

(Extend range to central Argentina and habit to rocky hillsides [according to W. B. Alexander] ).

After careful consideration, we have combined three species of Schumann's series Frutescentes into one. We have examined considerable living material and all the illustrations, but have found no grounds for separating the group into species. All were described as proliferous and sterile. O. spegazzinii was supposed to be unarmed, but this character is not constant; flower differences are described, but these are inconstant. One species, O. albiflora, has already been referred to synonymy.

Opuntia salmiana is said to have come from Brazil, but no definite locality is given for it, and it has not been collected there in recent times. If really from Brazil, and there is no good reason to question this reference, it is doubtless from the southern part, possibly on the border of Paraguay; indeed, O. albiflora, one of the three, was described from a Paraguay collection; the other, O. spegazzinii, is a native of the deserts of northern Argentina.

Cactus salmianus Lemaire (Cact. 87. 1868, name only), has been referred here as a synonym; as has also O. floribunda Lemaire (Cact. Gen. Nov. Sp. 68. 1839).

Opuntia schickendantzii Weber, included by Schumann in this relationship, we refer to our series Aurantiacae.





Fig. 88.-Opuntia salmiana

Fig. 89.-O. salmiana, ×0.6.

Opunia wagneri Weber in Gosselin (Bull. Mus. Hist. Nat. Paris 10: 393. 1904), described without flower or fruit, is probably to be referred here; at least Roland-Gosselin believed it to be of this group. We have not seen any of the specimens from Chaco, Argentina, obtained by M. Emile Wagner in 1902.

Illustrations: Blühende Kakteen 3: pl. 123; Curtis's Bot. Mag. 76: pl. 4542; Fl. Serr. 7: pl. 670; Jard Fleur. 2: pl. 194; Loudon, Encycl. pl. ed. 3. f. 19406; Pfeiffer and Otto, Abbild. Beschr. Cact. 1: pl. 6; Castle, Cactaceous plants f. 15; Blühende Kakteen 2: pl. 103, this last as Opunita spegazzinii; Hogg, Veg. King. 340. f. 111.

Figure 88 is from a plant in the greenhouses of the United States Department of Agriculture at Washington; figure 89 represents a joint of a plant collected by Dr. Rose at Córdoba, Argentina, in 1915.

OPUNTIA. 75

OPUNTIA MALDONADENSIS Arechavaleta, Anal. Mus. Nac. Montevideo 5: 286. 1905.

Cespitose, erect; branches cylindric, entangled or intertwined; joints 3 to 10 cm. long, about 2 cm. in diameter, the terminal ones obovate-spherical, dark green to olive-colored; areoles each surrounded by a violet blotch, small or prominent, orbicular; spines 5 or more, stout, spreading, elongated, unequal, the longest one 2 to 2.5 cm. long, reddish to brown; flowers and fruit unknown.

Type locality: Punta Ballena, near Maldonado, Uruguay.

Distribution: Uruguay.

This species, referred to the subgenus Cylindropuntia by Arechavaleta, inhabits the coast of Uruguay and is known to us only from description; we append it to the series Salmianae, but its nearest relationship may be elsewhere.

### Series 11. SUBULATAE.

This series is confined to South America and represents a very distinct group, differing greatly from the tall cylindric-jointed species of North America. They lack sheaths to the spines, and the typical species has elongated persistent leaves. Although several of the species have long been in cultivation, at least two of them being known only from garden plants; for a long time the flowers were unknown and the plants were as frequently called Cereus or Pereskia as Opuntia,

### KEY TO SPECIES

Leaves long-persisting, elongated.	
Leaves up to 12 cm. long; spines yellowish white	
Leaves 1 to 7 cm. long; spines brownish	
Leaves early deciduous, short.	
Stem I meter high; leaves 4 mm. long	
Stem 3 to 4 meters high; leaves 10 to 13 mm. long	44. O. cylindrica

### 41. Opuntia subulata (Mühlenpfordt) Engelmann, Gard. Chron. 19: 627. 1883.

Pereskita subulata Mühlenpfordt, Allg. Gartenz. 13: 347. 1845.

Opuntia ellemeetiana Miquel, Nederl. Krudk. Arch. 4: 337. 1858.\*
Opuntia segethii Philippi, Bot. Zeit. 26: 861. 1868.

Either with a simple etect stem or with several main branches from the base, 2 to 4 meters high; trunk 6 to 10 cm. in diameter, the old bark smooth and brown, its areoles bearing clusters of 8 spines or more; branches numerous, more or less clustered but not whorled, at first almost at right angles to main stem but soon erect, bright green; leaves persistent, green, nearly at right angles to branch, straight or somewhat bowed above, nearly terete, pointed, 5 to 12.5 cm. long, grooved on the under side; tubercles large, depressed, becoming obliterated on old branches, arranged in longitudinal or spiral lines, more or less diamond-shaped, but retuse at apex and pointed or attentuate below, 2 to 4 cm. long; areoles in the retuse grooves of the tubercles bearing a few short yellow spines or sometimes spineless, but usually having 1 or 2 slender spines; flowers borne toward the ends of the branches; sepals reddish, minute, 4 to 8 mm. long or less; petals broader than the sepals, orange or greenish yellow; style rose-red except the whitish base, including the stigma-lobes about 3 cm. long, about as long as the longest stamens; stigma-lobes 5 or 6, slender, orange-yellow; fruit oblong, more or less persistent, 6 to 10 cm. long, leafy, with a deep umbilicus, sometimes proliferous; seeds few, 10 to 12 mm. long.

Type locality: Valparaiso, Chile, but doubtless described from cultivated plants.

Distribution: Chile is usually given as the home of this plant, but it is not found wild there. It may be a native in Argentina.

This species has long been in cultivation, it having originally been sent from Valparaiso, but Dr. Rose did not find it wild there or in any other part of Chile. It is rarely seen in cultivation in Chile. For many years it passed as a species of Pereskia, but in 1883 Dr. George Engelmann pointed out that it could not be retained in that genus and transferred it to Opuntia. The leaves are the largest in the genus, and it has larger seeds than any other Opuntia.

We have referred Opuntia ellemeetiana (originally described from Chile), a species with very long leaves, to O. subulata, although we have never seen specimens. Schumann did not know it and only lists it.

We have been able more definitely to refer here Opuntia segethii, for we saw not only Philippi's type specimens in his herbarium, but also living specimens grown from Philippi's original stock. This type specimen was from plants cultivated at Santiago, but in a later publication he states that his species grows spontaneously near Arequipa. A part of this latter material is preserved in his herbarium at Santiago, which Dr. Rose was able to study; he also examined the Arequipa plant alive, and is convinced that it is quite different, being the plant common in Peru and Bolivia described below as Opuntia exaltata.

Illustrations: Engler and Prantl, Pflanzenfam. 3<sup>64</sup>: f. 56, L; Gard. Chron. III. 34: f. 33, 38; Monatsschr. Kakteenk. 8: 7; 9: 183; Schumann, Gesamtb. Kakteen f. 103; Neub. Gart. Mag. 1893: 291, this as Pereskia subulata: Bot. Zeit. 26: pl. 13, C. f. 1; Gartenflora 32: pl. 1129, f. 5, the last two as Opuntia segethii: Deutsche Gärt. Zeit. 8: 32, as Pereskia subulata: Haage and Schmidt, Haupt-Verz. Kakteen 1919: 169; Goebel, Pflanz. Schild. 1: f. 35; Möllers Deutsche Gärt. Zeit. 25: 476. f. 9, No. 15.

Figure 90 is from a photograph of a plant at the New York Botanical Garden grown from a cutting brought by Mrs. H. L. Britton from the Riviera, Italy, in 1907.

42. Opuntia exaltata Berger, Hort. Mortol. 410.

Stem 2 to 5 meters high, with a definite trunk 5 to 30 cm. in diameter when well grown, much branched; ultimate joints fleshy, easily detached, somewhat curved upward, clavate, strongly tuberculate; tubercles large, 1.5 to 3 cm. long, more or less diamond-shaped, elevated, and rounded; areoles rounded, filled with short white wool; glochids often wanting, when present brown; leaves fleshy, terete, 1 to 7 cm. long; spines on young joints 1 to 5, mostly 1 to 3, dark yellow or brownish, unequal, the longest ones 5 cm. long; spines on old wood numerous, sometimes 12 or more, often 13 cm. long, brown, with roughened tips; flowers, including ovaries, 7 cm. long; sepals and petals brick-red; outer sepals ovate, small, the inner ones passing into petals; petals 2 cm. long, broadly obovate to broadly spatulate, sometimes nearly truncare at apex; stamens numerous, short, pinkish above, nearly white below; style swollen below, pinkish; stigma-lobes greenish; ovary 4 cm. long, deeply umbilicate, with large flat tubercles; areoles on ovary circular, filled with short brown and white wool, long, loosely attached brown spines, and a few shorter glochids, and subrended by small, tardily deciduous leaves; fruit green, pear-shaped, 9 cm. long, usually sterile; seeds large, irregular, 10 mm. broad.

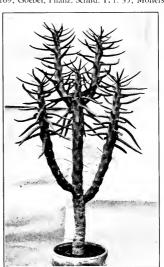


Fig. 90.—Opuntia subulata.

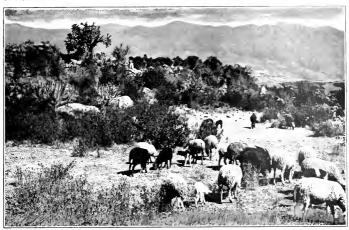
Type locality: Not cited; described from cultivated plants.

Distribution: Ecuador, Peru, Bolivia, and probably northern Chile.

This Opuntia is called pataquisca by the Cuzco and Arequipa Indians, and is also known as espina.

This species was the most widely distributed Opuntia seen by Dr. Rose on the west coast of South America; but it is difficult to decide whether it is really native there, for it is widely cultivated as a hedge plant in many places. It seems to be native along the upper Rimac of central Peru; at least it is well established on the hills. Although very common in southern Peru and about La Paz, Bolivia, it is probably introduced for it grows only about towns and cultivated fields and seems never to produce fertile fruit. About Cuzco it is likewise cultivated, but may be a native there also, for the fruit is generally fertile.

BRITTON AND ROSE PLATE





1. Opuntia exaltata as seen in the highlands of Peru.

2. Clump of Opuntia floccosa as it grows in the valleys of the Andes of eastern Peru.



OPUNTIA. 77

Opuntia maxillare Roezl (Morren, Belg, Hort. 24: 39. 1874), published without description and probably collected in the high mountains above Lima, may belong here.

Opinitia cumingii, of European gardens, belongs here. It was briefly mentioned in the journal of the Berlin Cactus Society (Monatsschr. Kakteenk. 7: 160. 1897), but not formally described. Schumann referred it to O. penlandii.

This species is near *Opuntia subulata*, but *probably* is distinct, although it is not always easy to distinguish them in greenhouse plants. Berger speaks of the similarity of the two as follows:

"This new species stands very close to O. subulata, and may be easily mistaken for it, but when grown side by side the differences are quite obvious. O exalluta is a taller plant with generally longer branches, and somewhat glaucous instead of grass-green. The tubercles are more clonged and differently marked. The leaves are shorter, the spines, when young, are not white, but yellowish brown, generally stouter and stiffer. I have not yet seen a flower of it. It is an old inhabitant of our gardens."

Plate XIII, figure 1, is from a photograph taken by Hiram Bingham, July 7, 1912, near Tipon, Cuzco Valley, Peru, showing the plant near the upper left-hand corner; plate XV, figure 1, represents a leaf-bearing joint of a plant sent to the New York Botanical Garden from La Mottola, Italy, in 1915; figure 2 represents the lower part of a fruiting branch obtained by Dr. Rose at Cuzco, Peru, in 1914.

### 43. Opuntia pachypus Schumann, Monatsschr. Kakteenk. 14: 26. 1904.

Plant about 1 meter high, much branched and candelabrum-like; branches cylindric, 3 to 5 cm. in diameter, either straight or curved, marked with broad tubercles; leaves subulate, pointed, constricted at the base, 4 mm. long, early deciduous; areoles circular, borne at the upper edges of the tubercles, 4 mm. in diameter, filled with short wool; spines 20 to 30, subulate, 5 to 20 mm. long; glochids yellow; flowers scarlet, 7 cm. long, including the ovary; petals variable, the longest ones 1.4 cm. long; style very thick, 9 mm. long; stigma-lobbes 5 mm. long; ovary more or less spiny.

Type locality: Near Santa Clara, Peru.

Distribution: Central Peru, near the coast.

We know this species only from the description and illustrations. In 1914 Dr. Rose made several unsuccessful efforts to find it at Santa Clara, the type locality.



Fig. 91.—Opuntia pachypus.

Illustrations: Engler and Drude, Veg. Erde 12: pl. 5<sup>b</sup>; Monatsschr. Kakteenk. 14: 27. Figure 91 is copied from the second illustration above cited.

### 44. Opuntia cylindrica (Lamarck) De Candolle, Prodr. 3: 471. 1828.

Cactus cylindricus Lamarck, Encycl. 1: 539. 1783. Cereus cylindricus Haworth, Syn. Pl. Succ. 183. 1812.

More or less branched, 3 to 4 meters high, the old trunk becoming smooth; joints cylindric, obtuse at apex, green, with slightly elevated tubercles; leaves deciduous, 10 to 13 mm. long terrete, acute; areoles depressed, filled with white wool, bearing some long hairs and at first 2 or 3, afterwards more, short white spines (spines often wanting on greenhouse plants); flowers appearing just below the ends of the terminal branches, small, inconspicuous, about 2.5 cm. broad, scarlet; petals small, erect, obtuse; stamens numerous; style slender, 2.5 cm. long; ovary strongly tuberculate, depressed at apex; fruit about 5 cm. long, yellowish green; seeds more or less angled, 4 to 6 mm. in diameter.

Type locality: In Peru.

Distribution: Highlands of Ecuador and Peru.

The home of this species is usually given by recent writers as Chile, but Lamarck, who described it first in 1783, said it came from Peru. Dr. Rose, who visited Peru and Chile in 1914, was not able to find it wild in either country but found it abundant in Ecuador in

1918. This species was introduced into England in 1799, but flowers were not known until about 1834.

There are two abnormal forms in cultivation which are offered under the names variety cristata and monstruosa. Several varieties of this species are given in catalogues: cristata (Haage and Schmidt, Haupt-Verzeichnis 1908: 228. 1908); cristata minor Haage and Schmidt (Verzeichnis Blumenzwiebeln 1913: 37. 1913); and robustior (Haage and Schmidt, Haupt-Verzeichnis 1908: 228. 1908).

Illustrations: Curtis's Bot. Mag. 61: pl. 3301; Carnegie Inst. Wash. 269: pl. 10, f. 88; Möllers Deutsche Gärt. Zeit. 25: 476. f. 9, No. 12; Gartenwelt 15: 539; Rother, Praktischer Leitfaden Kakteen 107; Cact. Journ. 1: 100; Schelle, Handb. Kakteenk. 42. f. 4, as Opuntia cylindrica cristata; Wiener Illustr. Gartenz. 29: f. 22, No. 10; De Laet, Cat. Gén. f. 88; Monatsschr. Kakteenk. 13: 71; Schelle, Handb. Kakteenk. 42. f. 3.

Plate XIV, figure 2, shows a leaf-bearing top of a plant grown at the New York Botanical Garden.

### Series 12. MIQUELIANAE.

Bushy plants, with elongated cylindric bluish joints; tubercles large, elevated; leaves minute, early deciduous. The series consists of but one species, confined to the deserts of northern Chile.

# 45. Opuntia miquelii Monville, Hort. Univ. 1: 218. 1840.\*

Opuntis pulrerulents Pfeiffer, Allg. Gattenz. 8: 407. 1840. Opuntis pulrerulents unqueli: Salm-Dyck. Cact. Hort. Dyck. 1844. 49. 1845. Opuntis geissei Philippi, Anal. Univ. Chie 85: 492. 1894. Opuntaroniflora Schumann, Gesamth. Kakteen 686. 1898.

Often growing in colonies 2 to 5 meters broad; stems cylindric, much branched, usually less than 1 meter high, but occasionally 1.5 meters high, with numerous lateral branches; branches rather short, usually only 8 to 20 cm. long, thick (5 to 6 cm. in diameter); old branches bluish green, with low tubercles sometimes 2 cm. long; young joints bright green, with high tubercles flattened laterally; spines tardily developing, but formidable on old branches, very unequal, in clusters of 10 or more, the longest ones nearly 10 cm. long, whitish in age; glochids numerous, brownish, caducous; leaves minute, 2 to 3 mm. long; arcoles circular, when young filled with white wool, in age somewhat elevated on the arcoles; flowers rather variable in length, 4 to 8 cm. long including the ovary, rose-colored to nearly white; petals broad, apiculate, 2 to 2.5 cm. long; filaments rose-colored; ovary strongly tuberculate; areoles filled with numerous brown glochids and subtended by minute leaves; style white; stigma-lobes green; fruit ovoid to oblong in outline, nearly white; umbilicus truncate; seeds small, 4 mm. broad.

Type locality: In South America, but no definite locality.

Distribution: Province of Atacama, Chile.

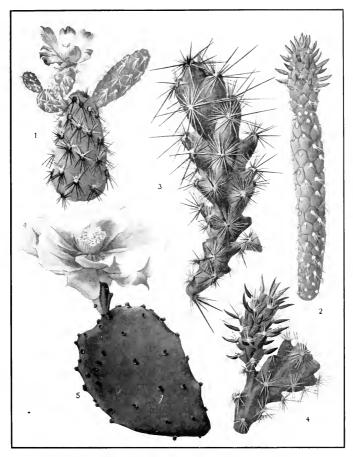
Opuntia miquelii and O. pulverulenta have long been considered identical. We have not seen the types of either, but are following such authorities as Salm-Dyck (in 1850), Labouret (1853), and Rümpler (1885) in uniting them. They seem to have been published in the same year.

Opuntia geissei, according to a statement made to Dr. Rose by Juan Söhrens, of Santiago, is the same as O. miquelii, and this the former was able to verify by later herbarium and field studies.

Opuntia rosiflora Schumann was based on Philippi's unpublished name O. rosea; while O. rosea was made by Philippi the type of O. geissei. This is clearly shown by Philippi's herbarium, where he has erased the name O. rosea and substituted O. geissei. Dr. Rose also obtained from William Geisse a part of Philippi's original specimen, which came, as the label states, from near Bandurrias, in the valley of Carrizal, in the Province of Atacama. Later on, while making field observations in Atacama, Dr. Rose found this species very common from north of Castillo to Vallenar. This is the general region of O. geissei (O. rosea and O. rosiflora) and in the river valley of the Huasco. Huasco, the type locality of O. miquelii, is 25 miles lower down this valley, and we have no hesitancy in uniting them all.

Although this species is not uncommon in cultivation, it has rarely been seen in flower, and we believe that the fruit has not heretofore been described.

PLATE XIV BRITTON AND ROSE



- Flowering branch of Opuntia burrageana.
   Opuntia cylindrica.

- 3, 4. Joints of *Opuntia stanlyi*.5. Flowering joint of *Opuntia macrorhiza*.

(all three-fourths size.)

OPUNTIA. 79

Dr. Rose observed a single plant infested by Loranthus aphyllus, the parasite which is so abundant on Cereus chiloensis.

Opuntia heteromorpha Philippi (Anal. Mus. Nac. Chile 1891<sup>2</sup>: 28. 1891) we refer here on the authority of Schumann, but we have seen no specimens, the type specimen being missing from the Philippi herbarium in Santiago; it was collected at Chiquito, Tarapaca, Chile.

Dr. Weber thought that Opuntia segethii belonged here, but we have referred it to O. subulata.

Opuntia carrizalensis Philippi is only mentioned by Schumann (Gesamtb. Kakteen Nachtr. 152, 1903). It is doubtless to be referred here.

Plate XVI, figure 1, is from a plant collected by Dr. Rose at Vallenar, Chile, in 1914.

### Series 13. CLAVATAE.

Here we include nine prostrate or spreading, low species, natives of the southwestern United States and Mexico, characterized by clavate joints and by sheathless spines, although rudimentary sheaths have been observed on young spines in some of the species; they appear to form a transition between the subgenus Cylindropuntia and the South American subgenus Tephrocactus, from which they differ essentially in having clavate joints.

### KEY TO SPECIES.

Spines flattened.		
Stems very stout.		
Stems hardly clavate; ovary very prickly	0.	murcia
Stems hardly clavate; ovary very prickly	0.	stanlyi
Stems more slender and weak.		
Spines brown, slender, long (4 to 6 cm. long)	0.	schottii
Spines stout, white, when old very flat.		
Bristles on ovary and fruit white	0.	clarata
Bristles on ovary and fruit white. 49. Bristles on ovary and fruit brown 50.	0.	parishii
Spines terete, elongated, and flexible, or the central ones somewhat flattened.		
Flowers pinkish or purple.		
Bristles on ovary numerous, brown	0.	pulchella
Bristles on ovary few, white	0.	vilis
Flowers yellow.		
Spines comparatively short, swollen at base	0.	bulbispina
Spines long and flexible, not swollen at base	0.	grahamii

# 46. Opuntia invicta Brandegee, Proc. Calif. Acad. II. 2: 163. 1889.

Plants growing in large clusters 2 meters in diameter and 2 to 5 dm. high, with many ascending or spreading branches; joints obovoid to clavate, dark green, 8 to 10 cm. long, strongly tuberculate; tubercles large, flattened laterally, 3 to 4 cm. long; areoles large, 1 to 1.5 cm. in diameter; leaves linear, 8 to 14 mm. long, reddish, curved, acute, deciduous; spines very formidable, when young reddish or purple with carmine-red bases, chestnut-brown at tips and grayish between, but in age dull in color; radial spines 6 to 10; central spines 10 to 12, much stouter than the radials, strongly flattened; wool white; glochids few, white, 2 to 4 mm. long; flowers yellow, 5 cm. in diameter; sepals ovate, acuminate; ovary 2 cm. in diameter, almost hidden by the numerous reddish, acicular spines; seeds yellowish, 2 mm. broad.

Type Locality: About San Juanico, Lower California.

Distribution: Central Lower California, at low elevations.

Mr. Brandegee has called attention to the strong resemblance in habit of this species to some of the species of *Echinocereus*, and Dr. Rose states that when he first saw it he supposed it to be some strange *Echinocereus*. It grows in great tufted masses and does not suggest in the remotest degree any of our North American opuntias. The species clearly belongs to Engelmann's series *Clavatae*, where it was placed by Schumann, who associated it with *O. cereiformis*, but it is undoubtedly much nearer to *O. stanlyi*. So far as we know, the plant has never been in the trade; it does not succeed well in cultivation. Considerable living material was brought back by the *Albatross* in1911, most of which was sent to the New York Botanical Garden; but some of the plants were sent to collections at St. Louis, Washington, and Los Angeles.

Illustration: Cact. Journ. 1: February.

Plate XVI, figure 2, represents a plant collected by Dr. Rose at San Francisquito,

Lower California, in 1911,

47. Opuntia stanlyi Engelmann in Emory, Mil. Reconn. 158. 1848.

Opuntia emorsi Engelmann, Proc. Amer. Acad. 3: 303. 1856.

Cactus emoryi Lematre, Cactées 88. 1868. Opuntia kunzet Rose, Smiths, Misc. Coll. 50: 505. 1908.

Stems low, usually less than 3 dm. high, much branched, creeping, forming broad, impenetrable masses 2 to 3 meters in diameter; joints 10 to 15 cm. long, clavate, more or less curved, strongly tuberculate; tubercles 3 to 4 cm. long, flattened laterally, 4 to 6 cm. apart; spines numerous, stout, elongated, somewhat roughened, reddish brown, the larger ones strongly flattened, 3.5 to 6 cm. long; flowers yellow, 5 to 6 cm. broad; fruit ovate, clavate at base, yellow, 5 to 6 cm. long, very spiny, with a depressed umbilicus; seeds flattened, 4.5 to 6.5 mm. in diameter.

Type locality: On the del Norte and Gila, New Mexico.

Distribution: Southwestern New Mexico to eastern Arizona and adjacent Mexico.

O. stanlyi was first found October 22, 1846, by W. H. Emory on his first trip across the continent; he reported the plant as abundant on the Del Norte and Gila. There has been much speculation as to what this species is, for no specimens were preserved. Dr. George Engelmann, who named the species, based it upon a sketch made by the artist of the expedition, Mr. J. M. Stanly. By a reference to Emory's itinerary we find that on October 22, 1846, he was in southwestern New Mexico. In 1908 Dr. Rose visited this region where he collected the various species of cacti to be found there. The only plant which we know from that part of New Mexico which could represent O. stanlyi is Opuntia emoryi: this was the conclusion reached by Wooton and Standley, who, in their Flora of New Mexico, have restored the name O. stanlyi.

We have referred Opuntia kunzei here because recent specimens sent in by Dr. Kunze have taken on a phase very much like the true O. stanlyi. There is a possibility that O. kunzei should be maintained, for we are not altogether convinced that certain material we have seen should be merged into O. stanlyi. To clear up this point, it is hoped that someone will collect and preserve a full series of specimens showing flowers, fruits, and seeds.

Illustrations: Emory, Mil. Reconn. App. 2. f. 9; Amer. Garden 11: 531?; Cact. Journ. 1: 154; Cact. Mex. Bound. pl. 70, 71, these last three as Opuntia emoryi; Hornaday, Campfires on Desert and Lava opp. p. 116, this as Opuntia kunzei. Schelle, Handb. Kakteenk. 38. f. 1, as Opuntia emoryi; Nat. Geogr. Mag. 21: pl. on p. 716, as O. kunzei.

Plate XIV, figure 3, represents a plant collected by Dr. R. E. Kunze near Gunsight Mountains, Arizona, in 1912; figure 4 shows a leaf-bearing joint of the same plant.

# 48. Opuntia schottii Engelmann, Proc. Amer. Acad. 3: 304. 1856.

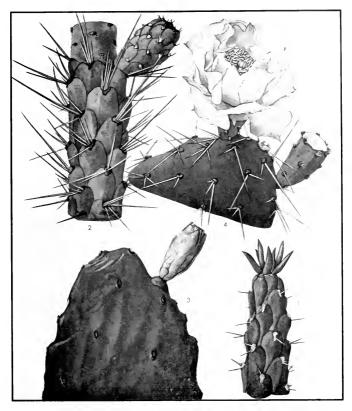
Prostrate, rooting from the arcoles, forming dense clusters sometimes 2 or 3 meters in diameter; joints clavate, curved, ascending, easily breaking off, 6 to 7 cm. long, 2 cm. in diameter at thickest part, strongly tuberculate; leaves subulate, bronze-colored, 6 to 8 mm. long, acuminate; areoles 1 to 1.5 cm. apart; spines white and sheathed when young, soon brown, the larger ones sometimes as many as 12, very slender, sometimes 6 cm. long, somewhat flattened; wool white when young, turning brown; glochids white when young, turning brown, 4 mm. long or less; flowers yellow, 4 cm. long including ovary; sepals narrow, acuminate; petals acuminate; fruit yellow, narrowly oblong in outline, a little narrowed at base, 4 cm. long, closely set with areoles bearing numerous short spines, bristles and white wool, the umbilicus depressed; seeds yellow, flattened, 4 mm. in diameter, notched at base.

Type locality: Arid soil near the mouth of the San Pedro and Pecos, western Texas. Distribution: Southern and western Texas and northern Mexico.

Opuntia schottii greggii Engelmann (Cact. Mex. Bound. 68. pl. 73, f. 4. 1859), which came from near San Luis Potosí, Mexico, where it was collected by Dr. J. Gregg, in December 1848, is much out of the range of the normal form and probably belongs elsewhere; but no specimens have been examined except the type, which is fragmentary. Engelmann at first considered it a distinct species.

Opuntia greggii occurs only in Schumann's Index (Gesamtb. Kakteen 829) with page references to O. schottii greggii.

BRITTON AND ROSE PLATE XV



Parts of joints of Opuntia exaltata.
 Upper part of joint of Opuntia macrarthra.
 Upper part of joint of Opuntia tortispina. (All three-fourths size.)



Illustration: Cact. Mex. Bound. pl. 73, f. 1 to 3.

Figure 92 represents joints of a plant collected by Dr. Rose at Langtry, Texas, in 1908.

49. Opuntia clavata Engelmann in Wislizenus, Mem. Tour North. Mex. 95. 1848.

Cactus clavatus Lemaire, Cactées 88. 1868.

Plants low, not over 1.5 dm. high, much branched at base, spreading, forming large patches sometimes 2 meters in diameter; joints short, 3 to 7 cm. long, turgid, ascending, clavate; arcoles close together; leaves subulate, 4 to 5 mm. long; spines pale, somewhat roughenced, the radial ones 6 to 12, slender and acicular, 4 to 16 mm. long; central spines 4 to 7, much longer than the radials, more or less flattened, the largest one dagger-like; glochids numerous, yellowish, 3 to 5 mm. long; flowers yellow, 3.5 to 4 cm. long; fruit 4 to 5 cm. long, with numerous areoles filled with yellow, radiating glochids; seeds white, 5 mm. broad.

Type locality: Albuquerque, New Mexico.

Distribution: New Mexico, chiefly in the central part of the State.

This is one of the most characteristic species of the genus and has no near relative except *O. parishii*, of the deserts of California and Nevada. It is a great pest to grazing stock.

Illustrations: Bull. Agr. Exper. Station N. Mex. 78: pl. [1, 2], Pac. R. Rep. 4: pl. 22, f. 1 to 3; pl. 24, f. 6. Stand. Cycl. Hort. Bailey 4: f. 2605.

Figure 93 represents joints of a plant collected by W. T. H. Long at Albuquerque, New Mexico, in 1915.

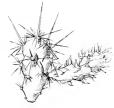


Fig. 94.—Opuntia schottii. x 0.75.



Fig. 93.—Opuntia clavata. x 0.75.

50. Opuntia parishii Orcutt, West Amer. Sci. 10: 81. 1896.

Stems low, creeping, rooting along the under surface and forming dense, broad clusters; terminal joints short, clavate, ascending but almost hidden under the dense armament; tubercles prominent but short, 5 to 7 mm. long; spines at first reddish but soon grayish and finally nearly white; radial spines numerous, slender; central spines about 4, strongly angled and more or less flattened, 2 to 4 cm. long; glochids numerous; flowers not known; fruit 5 cm. long, the numerous large areoles bearing many long yellow glochids and short spines forming a radiating band about the margin; seeds dark, 4 mm. broad.

Type locality: Mohave Desert.

Distribution: Southern California and Nevada.

The species here described is the *Opuntia parryi* as described by Engelmann in 1856, although he then suspected it was different from that species. It has been renamed *Opuntia parishii* by Orcutt, who wrote as follows:

"We propose this name for that interesting plant of the Mohave desert region, hitherto called O. parryi, and under which it has been well described. The Messrs, Parish have hardly earned this light honor in many laborious trips through these desert regions, and I take pleasure in dedicating this species to them; Opinita parryi (type from San Felipe), along with bernanlina and echinocarpa, and a bewildering host of nameless forms, I unhesitatingly class under serpennian!"

Illustrations: Cact. Journ. 1: 132; N. Amer. Fauna 7: pl. 10; Pac. R. Rep. 4: pl. 22, f. 4 to 7; pl. 24, f. 7, all as *Opuntia parryi*.

Figure 94 represents joints of a plant collected by S. B. Parish in southern California.

### 51. Opuntia pulchella Engelmann, Trans. St. Louis Acad. 2: 201. 1863.

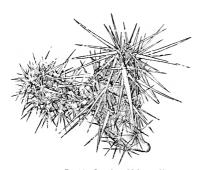
Low, 10 to 20 cm. high, densely branched, sometimes forming compact heads 6 dm. in diameter, main stem more or less definite, covered with areoles bearing yellow glochids 10 to 12 mm. long; lateral joints 5 to 6 cm. long, narrowly clavate, strongly tuberculate, purplish; areoles 6 to 8 mm. apart, 2 to 3 mm. broad; spines 10 to 16, slender, reddish, the longer ones 5 to 6 cm. long, somewhat flattened; flower 5 cm. long, when open, fully as broad; petals purple, 3 cm. long; ovary 2 cm. long, bearing numerous areoles filled with white wool and purple glochids 10 to 12 mm. long; fruit about 2.5 cm. long; seeds (according to Coulter) thick and round, 4 mm. in diameter, with broad flat commissure.

Type locality: Sandy deserts on Walker River, Nevada. Distribution: Nevada and Arizona.

The plant was first collected by Henry Engelmann in 1859, and brought to his brother,

Dr. George Engelmann. The species does not succeed well in cultivation under glass.

Illustration: Simpson's Rep. pl. 3; MacDougal, Bot. N. Amer. Des. pl. 26, as O. pusilla.
Figure 95 is from an herbarium specimen collected by Thomas H. Means, at Fallon, Churchill County, Nevada, in 1909.





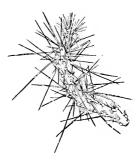


Fig. 95.—Opuntia pulchella. x 0.66.

### 52. Opuntia vilis Rose, Contr. U. S. Nat. Herb. 12: 293. 1909.

Low, creeping, often forming mats several meters in diameter and only 10 to 15 cm. high; joints prostrate, becoming erect or ascending, the ultimate vertical ones clavate, 5 cm. long, the others 2 to 4 cm. long, very turgid, pale green, with low tubercles; leaves terete, 2 to 3 mm. long, acute, red; young areoles bearing white wool; radial spines upward of 12, the number increasing with age by the addition of very small whitish ones; central spines on prostrate joints 4, reddish, white-tipped, 1 to 4 cm. long, terete, slightly scabrous, with a sheath 5 mm. long, those of clavate joints white, reddish on the upper surface at the base, and along the whole of the lower surface flattened; flowers 4 cm. long; petals brilliant purplish, 2 cm. long; filaments bright yellow with green bases; style white; stigma-lobes yellow; fruit pale green, blackening in drying, 2 to 2.5 cm. in diameter, 2.5 to 3 cm. long, tuberculate, especially about the margin of the umbilicus, spiny, fluted above, somewhat dry, with large white seeds.

Type locality: Foot-slopes and plains of Zacatecas, Mexico.

Distribution: State of Zacatecas, Mexico.

Illustrations: Contr. U. S. Nat. Herb. 12: pl. 27; f. 36.

Figure 96 is from a photograph of the type plant taken by F. E. Lloyd in Zacatecas, Mexico, in 1907.

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Fig. 96.—Opuntia vilis.

### 53. Opuntia bulbispina Engelmann, Proc. Amer. Acad 3: 304. 1856.

Stems low, forming wide-spreading clumps 6 to 12 dm. broad; joints ovoid in outline, 2 to 2.5 cm. long by 10 to 12 mm. in diameter; tubercles prominent, 6 to 8 mm. long; radial spines 8 to 12, acicular, 3 to 6 mm. long; central spines 4, much stouter than the radials, 8 to 12 mm. long, bulbose at base; flower and fruit not described in original description and as yet unknown.

Type locality: Near Perros Bravos, north of Sal-

tillo, Mexico.

Distribution: Coahuila and probably into Durango, Mexico.

The type of this species was collected by Josiah Gregg in 1848 and it has not with certainty been found since; it has been reported from one or two localities, but doubtless erroneously. At one time we supposed certain plants collected by Dr. Palmer in Chihuahua were to be thus referred. It is possible that specimens collected by Dr. Chaffey near Lerdo, Durango, may be referred here, as they have the short joints of this species, but the central spines are much longer, often reaching 2.5 to 3.5 cm. long. The type is deposited in the Engelmann Herbarium at St. Louis, and although the material is poor, it may yet serve to clear up this species definitely.

As stated by Coulter, this species has been regarded as the same as O. tunicata, a plant to which it is very remotely related.

Cactus bulbispinus Lemaire. (Cactées 88. 1868) was intended as a synonym of this species.

Illustration: Cact. Mex. Bound. pl. 73, f. 5, 6.

Figure 97 is copied from the illustration above cited.

 Opuntia grahamii Engelmann, Proc. Amer. Acad. 3: 304. 1856.

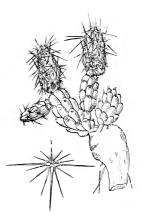


Fig. 97.—Opuntia bulbispina.

Roots at first thick and fleshy, becoming woody, 2 cm. thick or more; plant low, much branched, spreading, forming low mounds often half buried in the sand, sometimes giving off roots at the areoles; terminal joints erect, clavate, bright green, 3 to 5 cm. long, with large oblong tubercles; leaves thick, bronze-colored, ovate, acute, 3 to 4 mm. long; areoles about 3 mm. broad; wool white; spines 8 to 15, slender, slightly scabrous, terete or some of the larger ones slightly compressed, white when

young, soon reddish, the longest 3.5 to 6 cm. long; glochids numerous, slender, 4 mm. long or less, white, turning brown, persistent on the old stems; flowers yellow, 5 cm. broad; sepals ovate, acute, about 5 mm. long; fruit oblong to ovoid, 3 to 4.5 cm. long, its numerous areoles bearing white glochids and some slender spines; seeds beakless, 5 to 5.5 mm. in diameter, the commissure indistinct, linear.

Type locality: Near El Paso, Texas.

Distribution: Western Texas, New Mexico, and adjacent parts of Mexico.

This species was named for James Duncan Graham, Colonel, Corps of Engineers, United States Army, who died December 28, 1865, at Boston, Massachusetts. Colonel Graham was for a time chief of the scientific corps of the United States and Mexican Boundary Commission, and caused the specimens of this plant to be transmitted to Dr. George Engelmann.



Fig. 98.—Opuntia grahamii. x 0.75.

The plant succeeds rather well in cultivation under glass.

Illustrations: Cact. Mex. Bound. pl. 72; Schumann, Gesamtb. Kakteen f. 102.

Figure 98 represents joints of a plant collected by Dr. Rose on hills near Sierra Blanca, Texas, in 1913.

# Subgenus 2. TEPHROCACTUS.

Includes all the South American species of Opuntia which have short, oblong, or globular joints. It is hardly to be distinguished from the North American series Clavatase. Four series are recognized. The plants are confined to Peru, Chile, Bolivia, and Argentina. (See key to series, p. 44.)

### Series 1. WEBERIANAE,

Plants low, forming dense clumps: joints subcylindric, strongly tuberculate and bearing numerous spines. This series suggests Playopuntia, while the other series show closer relationship with the Cs/lindropuntia. Only one species known, inhabiting the dry part of northern Argentina.

55. Opuntia weberi Spegazzini, Anal. Mus. Nac. Buenos Aires III. 4: 509. 1905.

Densely cespitose, forming clumps 2 to 3 dm. in diameter and 10 to 18 cm. high; joints yellowish green, erect, cylindric, strongly tuberculate, 2 to 6 cm. long, 1.5 to 2 cm. in diameter, densely spiny;



Fig. 99.- Opuntia weberi as it grows wild,

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leaves described as wanting; tubercles spirally arranged, obtuse, somewhat 4-angled, 5 to 6 mm. broad; areoles somewhat depressed; spines 5 to 7, brown, 3 to 5 cm. long, flexuous, the upper ones erect; flowers borne near the top of the plant, small, solitary; ovary somewhat woolly below and with short spines above; flower rotate, yellow; fruit dry, white, 10 mm. in diameter; seeds somewhat contorted, bony, glabrous.

Type locality: In Sierra Pie de Palo, Province of San Juan, Argentina. Distribution: Mountains of Provinces of San Juan and Salta, Argentina.

This description, though largely drawn from Dr. Spegazzini's full account of this species, has been amplified from examination made of the type. Dr. Spegazzini refers it to

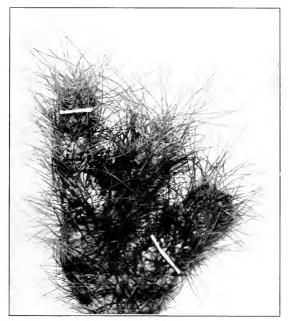


Fig. 100.—Opuntia weberi. Natural size.

the subgenus *Tephrocaetus*, and we have followed him in this; but it differs widely from any other known species of that group and its true affinity may be elsewhere. If the plant is leafless, as Dr. Spegazzini's description implies, this is a most interesting exception to the character of *Opuntia*.

Figure 99 is from a photograph of the plant at Molinos, Argentina; figure 100 is from a photograph of the type specimen in the collection of Dr. Spegazzini, to whom we are indebted for both of these illustrations.

### Series 2. FLOCCOSAE,

Low plants, forming dense clumps or mounds; joints short, thick, and fleshy, usually covered with long, white, silky hairs. The two species are common in the high valleys of the Andes of Peru and Bolivia.

### KEY TO SPECIES

Spines	yellow, stout						56.	0.	floccosa
Spines	white, acicul	ar					57.	0.	lagopus

### 56. Opuntia floccosa Salm-Dyck, Allg. Garrenz. 13: 388. 1845.

- Opuntia tenilis Roezl in Morren, Belg. Hort. 24: 39. 1874. Opuntia floccosa denudata Weber, Dict. Hort. Bois 897. 1898.
- Opuntia hempeliana Schumann, Gesamth, Kakteen 690. 1898.

Plant growing in clumps or low mounds sometimes 1 to 2 meters in diameter, with hundreds of short, erect branches; joints oblong, 5 to 10 cm. long, usually hidden under a mass of long white hairs coming from the arcoles; spines usually one from an arcole, sometimes as many as three, yellow, 1 to 3 cm. long; leaves minute, green or pinkish; tubercles somewhat elevated, elongated; flowers, small, 3 cm. long, yellow; fruit globular, 3 cm. in diameter: seeds 4 mm. in diameter, with very narrow margins.

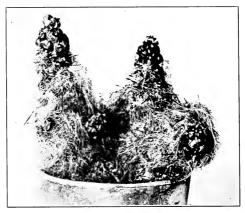


Fig. 101.—Opuntia floccosa.

Type locality: Said to be from vicinity of Lima, Peru, but doubtless only from the high mountains east of Lima.

Distribution: High mountain valleys and hills of the Andes from central Peru to central Bolivia.

O. floccosa is one of the most unusual and striking species of all the opuntias. One who is familiar only with the opuntias of North America would not suspect that it belongs to the genus. It does not grow on the hot meas in the low country, as one would expect, but in the high, cold valleys and hills near the top of the Andes. The following paragraph, taken from John Ball's notes, is interesting in this connection:

Reserving some remarks on the botany of this excursion, there is yet to be mentioned here one plant of the upper region so singular that it must attract the notice of every traveler. As we ascended from Casapalta we noticed patches of white, which from a distance looked like snow. Seen nearer at hand,

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they had the appearance of large, rounded, flattened cushions, some five or six feet in diameter, and a foot high, covered with dense masses of floss silk that glistened with a silvery lustre. The unwary stranger who should be tempted to use one of these for a sear would suffer from the experiment. The plant is of the cactus family, and the silky covering conceals a host of long, slender, needle-like spines, that penetrate the flesh, easily break, and are most difficult to extract. Unfortunately, the living specimen which I sent to Kew did not survive the journey.

- Dr. Rose found the plant very abundant in the Andes from 3,600 to 4,260 meters altitude, while others have reported it as high as 4,570 meters altitude. It is very common, forming everywhere great, conspicuous, usually white mounds. Dr. Rose also found it quite common between Cuzco and Juliaca, in southwestern Peru.
- Mr. O. F. Cook, in the Journal of Heredity (8: 113. 1917), who has named this plant the polar bear cactus, wrote of it as follows:

Many exposed slopes on the bleak plateaus of the high Andes are dotted with clumps of pure white cacti that look from a distance like small masses of snow. On closer view, the shaggy white hair of these cacti make them appear like small sheep or poodle-dogs, or like reduced caricatures of the denizens of the arctic regions. We are so accustomed to think of cacti primarily as desert plants, peculiarly adapted to hot, dry deserts, that they seem distinctly out of place on the cold plateaus of the high Andes of southern Peru.

While most of the plants are covered with long white hairs, plants without hairs are not uncommon. These naked plants, which are characteristic of the whole clump or colony, appear at first sight very unlike the other forms, but they grow in the same region and have the same kind of flowers and fruits. In cultivated plants few hairs are developed. The variety denudata Weber seems to be only one of these naked forms.

Opuntia involuta Otto (Förster, Handb. Cact. 505. 1846) was not published, but was given as a synonym of this species. It was used the year before (Salm-Dyck, Allg. Gartenz. 13: 388. 1845) as a synonym of O. restita.

Illustrations: Engler and Drude, Veg. Erde 12: pl. 14; Monatsschr. Kakteenk. 11: 41, 44, these last two as Opuntia hempeliana; Journ. Heredity 8: f. 3 to 8.

Plate XIII, figure 2, is from a photograph taken by Mr. O. F. Cook in the high mountains of eastern Peru. Figure 101 is from a photograph of a fragment of the plant collected by Dr. Rose in 1914, at Araranca, Peru.

### 57. Opuntia lagopus Schumann, Gesamtb. Kakteen Nachtr. 151. 1903.

Plants cespitose, growing in compact mounds; joints stout, cylindric, 10 cm. long, 3 to 3.5 cm. in diameter, densely covered with long white hairs; leaves minute, hidden under the wool, 7 mm. long; spines solitary, white, 2 cm. long, slender; glochids white, bristle-like; flowers probably red; fruit not known.

Type locality: Mountains of Bolivia above Arequipa, Peru.

Distribution: On the plains of the high Andes of Peru and Bolivia (altitude 4,000 meters).

This species is related to O. floccosa, with which it often grows, but it takes on a very different habit, growing in very dense, peculiar rounded mounds much higher than those formed by O. floccosa.

Illustration: Engler and Drude, Veg. Erde 12: pl. 14.

Figure 102 is from a photograph by H. L. Tucker, near Laxsa, Peru, in 1911.

### Series 3. GLOMERATAE.

Plants low, composed of globose or oblong joints, the spines, or some of them, modified into flat papery processes. We recognize two species, confined to western Argentina.

#### KEY TO SPECIES

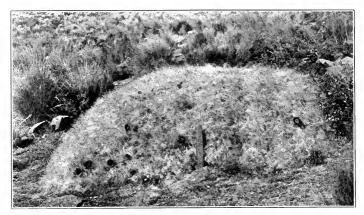


Fig. 102 .-- Opuntia lagopus, growing in a mound.

### Opuntia australis Weber, Dict. Hort. Bois 896. 1898.

Pterocactus valentinii Spegazzini, Anal. Soc. Cient. Argentina 48: 51, 1899.

Plants often with large roots, these 5 to 8 cm. long by 2 to 3 cm. in diameter and larger than the parts above ground; joints described as cu-cumber-shaped, usually 6 to 8 cm. long by 1 to 2 cm. in diameter, but apparently often much smaller, tuberculate; radial spines 10 to 15, spreading, white, short, 3 to 4 cm. long; central spines 1 or 2, much longer than the radials, 2 cm. long, erect, flattened, and somewhat papery; flowers yellow, 2 to 3 cm. broad; seeds said to be rugose.

Type locality: Between Santa Cruz River and the Strait of Magellan, Argentina. Distribution: The southernmost parts of Argentina.

We have recently examined three collections of this plant made by Carl Skottsberg in the Territory of Santa Cruz, which in the main agree with Weber's description. We have also seen *Pterocactus valentinii*, which is the same as Skottsberg's plant.

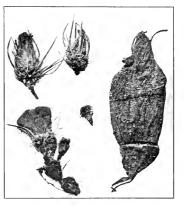


Fig. 103.—Opuntia australis. Showing large roots, joints, and flower. Natural size.

Dr. Spegazzini records this species as being in Santa Cruz, Argentina; but as he regards the plant collected there by him as only a variety of *O. darwinii*, we are inclined to believe he must have collected something else.

This species, which is found at the Strait of Magellan, extends farther south than any other cactus known to us.

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Figure 103 is from a photograph of an herbarium specimen collected by Carl Skottsberg in the Territory of Santa Cruz, Patagonia, in 1908.

### 59. Opuntia glomerata Haworth, Phil. Mag. 7: 111. 1830.

Opunita anticulata Otto, Allg. Gartenz. 1: 116 1835.

Gerem articulata Pietifer, Enum. Cact. 103. 1837.

Gerem syringacanthus Pietifer, Enum. Cact. 103. 1837.

Opunita playacantha Salm-Dyck in Pietifer, Allg. Gartenz. 5: 371. 1857.

Opunita tuberosa spinosa Pietifer, Enum. Cact. 146. 1837.

Opunita diadomata Lemaire, Cact. Aliq. Nov. 36. 1838.

Opunita diadomata Lemaire, Cact. Aliq. Nov. 36. 1838.

Opunita androla Pietifer, Gact. Aliq. Nov. 36. 1838.

Opunita androla playacanthe alimente, Cact. Gen. Nov. Sp. 72. 1839.

Opunita androla playacanthe Lemaire, Cact. Gen. Nov. Sp. 72. 1839.

Opunita androla mayor Lemaire, Cact. Gen. Nov. Sp. 72. 1839.

Opunita playacantha gyacthro Salm-Dyck. Cact. Hort. Dyck. 1849. 31.

Opunita playacantha gyacthro Salm-Dyck. Cact. Hort. Dyck. 1849. 71, 1850.

Opunita playacantha afelevaspina Salm-Dyck. Cact. Hort. Dyck. 1849. 215. 1850.

Opunita playacantha Pulppin. Gartenflora 21: 129. 1872.

Opunita syringacantha Schumann, Monatsschr. Kakteenk. 6: 156. 1896.

Forming low, spreading clumps, the branches either erect or prostrate; joints globular, 3 to 6 cm. in diameter, often in cultivated specimens even smaller, dull grayish brown, hardly tuberculate except in drying; areoles large, bearing numerous long, brown glochids; spines often wanting, when present 1 to 3, long, weak, thin and papery, hardly pungent, either white or brownish, sometimes 10 cm. long: flowers light yellow, small; fruit globose, 1 to 1.5 cm. long, dry, seeds corky.

*Type locality:* Brazil, according to Haworth, but erroneously.

Distribution: Western Argentina. It has also been referred to Brazil and Chile, but surely not found in Brazil, and we should not expect it to inhabit Chile. (Extend range to central and northern Argentina.—Appendix.)

The plant figured by Nicholson (Dict. Gard. 2: f. 755) as O. platyacantha hardly belongs here.

O. glomerata, which is common on the dry hills about Mendoza, is very variable, especially as to whether it is spine-bearing or not; while the spines—which are really not spines but thin ribbon-like processes—vary much as to their color, markings, and length. These variations are partly the cause of so many synonyms for the species. Dr. Rose, who visited the region in which this species grows, found wide variation in the size of the joints, as well as in the absence or presence of spines.

Tephrocactus diadematus Lemaire (Cact. 88. 1868), T. turpinii Lemaire (Cact. 88. 1868),



Fig. 104-Opuntia glomerata, x 0.5.

Opuntia polymorpha Pfeiffer (Enum. Cact. 103: 1837), and Opuntia turpinii polymorpha Salm-Dyck (Cact. Hort. Dyck. 1849. 71. 1850) are usually given as synonyms of Opuntia diademata, but none of them was actually published. Opuntia polymorpha Pfeiffer was used by Pfeiffer as a synonym for Cereus articulatus Pfeiffer.

Tephrocactus polyacanthus (Index Kewensis Suppl. 1: 421) was intended for T. platyacanthus Lemaire (Förster, Handb. Cact. ed. 2. 915. 1885).

Tephrocactus andicolus, T. calvus, and T. platyacanthus, all of Lemaire (Cact. 88. 1868), without descriptions, are referred here by inference.

Spegazzini (Anal. Mus. Nac. Buenos Aires III. 4: 511. 1905) describes three varieties of this species under O. diademata, from Argentina, as follows: mermis, oligacantba, and polyacantba; while Weber (Dict. Hort. Bois 896. 1898) under the same name describes var. calva, but these all seem to be forms of this very variable species.

The following varietal names, under *Opuntia glomerata* var. *albispina* Förster (Handb. Cact. 472, 1846), var. *flavispina* Salm-Dyck (Cact. Hort. Dyck. 1844. 43, 1845), and var. *minor* Salm-Dyck (Cact. Hort. Dyck. 1849. 71, 1850), are mentioned in the places cited, but not described.

Opuntia horizontalis Gillies (Pfeiffer, Enum. Cact. 145. 1837) was used as a synonym of Opuntia andicola, and should be referred here.

Opuntia pelaguensis (Salm-Dyck, Cact. Hort. Dyck. 1849. 71. 1850) was published as a synonym of Opuntia platyacantha deflexispina.

Opuntia andicola minor, an unpublished variety, is mentioned by name only in Monats-schrift für Kakteenkunde (10: 48. 1900).

Illustrations: Cact. Journ. 1: 100, as Opuntia andicola: Engler and Prantl, Pflanzenfam. 3<sup>cta</sup>: f. 56, K.; Gard. Chron. III. 34: f. 39; Monatsschr. Kakteenk. 13: 23, these three as Opuntia diademata. Cact. Journ. 1: February; Dict. Gard. Nicholson Suppl. f. 607; Förster, Handb. Cact. ed. 2. f. 125; Gard. Chron. III. 23: f. 129; 29: f. 63; Gartenflora 21: pl. 721, f. 2; Watson, Cact. Cult. ed. 1 and 2. 257. f. 97; ed. 3. f. 60, all as Opuntia papyracantha; Cact. Journ. 1: 105, as Opuntia plumosa nivea; Dict. Gard. Nicholson 2: 503. f. 755; Möllers Deutsche Gärt. Zeit. 25: 476. f. 9, No. 1, as O. platyacantha; Schelle, Handb. Kakteenk. 45. f. 7, as O. andicola; De Laet, Cat. Gén. f. 60; Rev. Hort. Belg. 40: after 186; Schelle, Handb. Kakteenk. 44. f. 6; Möellers Deutsche Gärt. Zeit. 25: 476. f. 9. No. 2, as. 2, as O. diademata.

Figure 104 represents a plant collected by Dr. Rose at Mendoza, Argentina, in 1915.

Opuntia schumannii Spegazzini (Anal. Mus. Nac. Buenos Aires III. 4:511. 1905, not Berger, 1904) is a homonym, and we hesitate to give it a new name until it is better known. The type comes from Salta, Argentina, from a region where we already have a number of species of Tephrocactus. Spegazzini, who described it, says it is related to O. diademata, which is now referred to O. glomerata, but is very distinct. It is without spines and the flowers are unknown.

# Series 4. PENTLANDIANAE.

Plants often growing in large mounds; joints globular to oblong; spines usually slender, acicular to subulate. Seventeen species are here recognized.

### KEY TO SPECIES

pines very long and stout, up to 15 to 20 cm. long	60. O. aoracantha
Spines appressed to the joints.	
Spines 12 to 20, flexuous; joints 7 cm. long.	61. O. raubbiana
Spines 6 or 7; joints 2 to 4 cm. long	62. O. suhterranea
Spines straight, not appressed.	
Spines flat or semiterete.	
Spines 7 to 10 cm, long	63. O. bickenii
Spines 6 cm. long or less.	0,11 01111111111111
Longer spines 1 to 3.	
Joints ellipsoid, 4 to 5 cm, thick	61 O Americai
Joints oblong, 1 cm. thick	
	O). O. mrapatana
Longer spines 4 or 5.  Spines gray	66 O decomposit
Spines yellow	67 O russellii
	O/. O. Minelli
Spines terete.	
Spines white, at least when young.  Joints tuberculate	60 0
	os. O. torrugata
Joints not tuberculate.	(0. 0
Joints oblong	70 O the
Joints globose	10. O. spraerica
Spines yellow to brown or nearly black.	71 0 1 11/1-11
Roots large and woody; spines nearly black	1. O. skottsbergn
Roots fibrous.	0 1 1 1 1
Spines purple-black	72. O. nigrispina
Spines yellow to brown.	
Plants forming large clumps.	6 - 1 10
Fruit about 2.5 cm. long, nearly unarmed.	73. O. pentlandii
Fruit 5 to 6 cm. long, copiously armed with long spines above	74. O. ignescens
Plants isolated, not forming clumps.	
Old joints globose; spines acicular	75. O. campestris
Joints all oblong; spines subulate	76. O. ignota

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60. Opuntia aoracantha Lemaire, Cact. Aliq. Nov. 34. 1838.

Cereus oratus Pfeiffer, Enum. Cact. 102. 1837. Not Opuntia orata Pfeiffer, Lc. 144. 1837. Opuntia formidabilis Walton, Cact. Journ. 1: 105. 1898.

Usually low, cespitose, forming clumps 2 to 5 dm. in diameter and sometimes 1 to 2 dm. high; branches grayish, either erect or prostrate, made up of 5 to 10, perhaps even more, globular joints; joints easily detached, freely rooting and starting new colonies, 5 to 8 cm. in diameter, strongly tuber-culate especially when young, the lower part spineless, the upper areoles large, spine-bearing; spines brown or blackish, 1 to 7, the longer ones 13 cm. long, straight, a little flattened, roughish to the touch: flowers white; fruit short-oblong, 3 cm. long, red, weakly tuberculate, bearing numerous areoles, usually naked but sometimes bearing a few short spines near the top, becoming dry; umbilicus of fruit broad and depressed; seeds white, flattened, 4 to 5 mm, broad, the margins thick and corky.

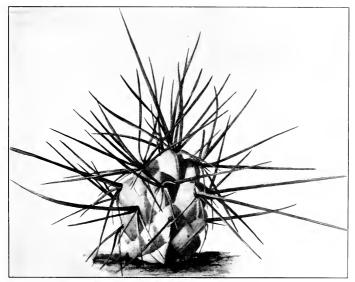


Fig. 105.-Opuntia aoracantha. x0.66,

Type locality: Not cited, but doubtless from Mendoza.

Distribution: Western provinces of Argentina, from Mendoza to Jujuy.

Opuntia gilliesii Pfeiffer (Enum. Cact. 102. 1837, as synonym) and Tephrocactus aoracanthus Lemaire (Cact. 89. 1868) are usually given as synonyms of this species, but they were not described in the places usually cited, and as here given. Opuntia acracantha Walpers (Report. Bot. 2: 354. 1843) is a typographical error.

O. aoracantha, although described nearly 80 years ago, is practically unknown in collections and has been very poorly described. The fruit has heretofore been unknown. Dr. Rose found it in 1915 in great abundance growing on dry, rocky hills west of Mendoza, although in but one locality. A bountiful supply of living material was sent home, several photographs

were taken, and fruit and seeds obtained.

Opunia tuberiformis Philippi (Anal. Mus. Nac. Chile 1891<sup>2</sup>: 28. 1891), referred here by Schumann, doubtless belongs elsewhere. It may possibly belong to some *Platyopuntia*, for it is described as having ovate joints only 5 mm. thick. It comes from the foot of the Andes in the Province of Tarapaca, Chile.

Illustrations: Gard. Chron. III. 34: f. 40; Monatsschr. Kakteenk. 12: 172; Schelle, Handb. Kakteenk. 44. f. 5; Cact. Journ. 1: 105, the last as O. formidabilis.

Figure 105 represents a joint of a plant collected by Dr. Rose at Mendoza, Argentina, in 1915.

# 61. Opuntia rauppiana Schumann, Monatsschr. Kakteenk. 9: 118.

Joints ellipsoid, rounded at each end, somewhat tuberculate, dark green or becoming grayish green, 7 cm. long by 4 cm. in greatest diameter; glochids yellow, 5 cm. long; spines 12 to 14, sometimes as many as 20, very weak, almost bristle-like, 2 cm. long, hardly pungent.

Type locality: In the Andes.

Distribution: Bolivia, according to Schumann.

Little is known of the habit of this plant, as only one joint is figured and this appears to be a sickly greenhouse specimen. It suggests some of the species which grow in large clumps like the one figured as Opunia grata by Fries.



Fig. 106.—Opuntia rauppiana.

Illustrations: Monatsschr. Kakteenk. 9: 118; Schumann, Gesamtb. Kakteen Nachtr. f. 36 (same).

Figure 106 is copied from the illustration above cited.

# 62. Opuntia subterranea R. E. Fries, Nov. Act. Soc. Sci. Upsal. IV. 11: 122. 1905.

Almost buried in the sand, simple or few-branched from a thick root 7 to 12 cm. deep: joints terete, 2 to 4 cm. long; tubercles low; spines 1 to 7, all radial, short, whitish, recurved, appressed; flowers lateral, brownish; ovary small, with a depressed umbilities, its areoles bearing small glochids and a little wool; fruit 12 to 15 mm. long; seeds 3 mm. broad, irregular.



Fig. 107.—Opuntia subterranea.

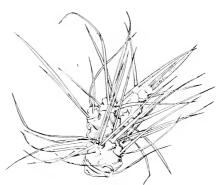


Fig. 108-Opuntia hickenii. x0.6.

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Type locality: Near Moreno, Jujuy, Argentina.

Distribution: Northern Argentina and adjacent Bolivia.

This peculiar little plant, heretofore known only from the type collection, was obtained by Dr. Shafer on stony plains at Villazón, Bolivia, in February 1917, but was not in bloom *Illustration:* Nov. Act. Soc. Sci. Upsal. IV. 1<sup>1</sup>: pl. 8, f. 4 to 8.

Figure 107 is copied from the illustration above cited.

### 63. Opuntia hickenii sp. nov.

Low, cespitose, forming clusters 1 meter in diameter; joints globular, 3 to 5 cm. in diameter, strongly tuberculate, the lower tubercles usually spineless; arcoles rather large, circular; spines 2 to 5, flat and thin, narrow, weak, pungent, 5 to 12 cm. long, silvery-colored but nearly black in age; flowers yellow; fruit not known.

Type in United States National Herbarium, No. 603229, from Puerto Madryn, Chubut, Argentina, collected by Cristóbal M. Hicken.

Common in Chubut and Rio Negro, southern Argentina, where it was collected several times by Dr. Hicken.

Figure 108 represents the type specimen above cited.

Mr. W. B. Alexander suggests that *Opuntia platyacantha* Spegazzini (not Salm-Dyck) is probably a synonym of this species.

A photograph of a plant from San Juan, Argentina, communicated by Dr. Spegazzini, indicates another species of this relationship.

### 64. Opuntia darwinii Henslow, Mag. Zool. Bot. 1: 466. 1837.

Low, perhaps not more than 2 to 4 cm. high, much branched at base from a more or less elongated woody root; joints normally few, nearly globular, about 3 cm. in diameter, or often nearly cylindric, frequently numerous and small and growing out from the main axis, then only 5 to 10 mm. in diameter; areoles large, filled with wool, the lower ones spineless; spines 1 to 3, nearly erect, the longest one 3 to 3.5 cm. long, yellow or reddish yellow, decidedly flattened; flowers originally described as larger than the joints, but certainly often much smaller: petals yellow, broad, with a truncate or depressed top and usually with a mucronate tip: oxary, in specimens seen, only 2 cm. long, covered with large woolly areoles; styles described as stout, with 9 thick radiating stigma-lobes.

Type locality: Port Desire, Patagonia, latitude 47° south.

Distribution: Southern Argentina.

This species seems to be common in that part of Patagonia known now as the Territory of Santa Cruz, Argentina. We have recently examined four separate collections made in this region, especially one from about Lake Buenos Aires and on the Fenix River by Carl Skottsberg, in 1907-1909.

The plant is in cultivation in Europe and is offered for sale by cactus dealers.

It was first collected by Charles Darwin, but only a single joint was taken, which was described and figured by Rev. J. S. Henslow. The illustration of the flowers seems too large, but otherwise represents fairly well the plant as we know it. The following interesting note is taken from Mr. Henslow's article as it appeared in the Magazine of Zoology and Botany, volume I, page 467:

I have named this interesting Cactus after my friend C. Darwin, Esq., who has recently returned to England, after a five years' absence on board H. M. S. Beagle, whilst she was employed in surveying the southernmost parts of South America. The specimen figured was gathered in the month of January, at Port Desire, lat. 47° S. in Patagonia. He recollects also to have seen the same plant in flower as far south as Port St. Julian in lat. 49° S. It is a small species growing close to the ground on arid gravelly plains, at no great distance from the sea. The flowers had on day arrested his attention by the great irritability which their stamens manifested upon his inserting a piece of straw into the tube, when they immediately collapsed round the pistil, and the segments of the perianth soon after closed also. He had intended to procure fresh specimens on the following day, and returned to the ship with the one now figured, but unfortunately she sailed immediately afterwards, and he was prevented from obtaining any more. The geographical position of this species is beyond the limits hitherto assigned to any of the order, which are not recorded as growing much south of

the tropic of Capricorn. The climate is remarkably dry and clear, hot in summer, but with sharp frosts during the winter nights. He found Cacti both abundant and of a large size, a little farther to the north at Rio-Negro in latitude 41° S.

Illustration: Mag. Zool. Bot. 1: pl. 14, f. 1.

Figure 109 is copied from a photograph of an herbarium specimen collected by Carl Skottsberg in Patagonia in 1908.

64a. Opuntia wetmorei sp. nov. (Appendix following page 226).

65. Opuntia tarapacana Philippi, Anal. Mus. Nac. Chile 18912: 27. 1891.

Opuntia rahmeri Philippi, Anal. Mus. Nac. Chile 1891<sup>2</sup>: 27. 1891. Low, cespitose plants; joints small, ovoid, about 2 cm. long by 1 cm. thick, bearing spines from white woolly arcoles at tips; spines usually 3, straight, 12 to 15 mm. long, white with yellowish tips: flowers yellow; petals 21 mm. long; ovary elongated. 2 cm. long.

Type locality: Calalaste, Chile.

Distribution: Known only from type locality, although Schumann in his Keys refers this species to Bolivia.

Although the type of this species is preserved in the Museum at Santiago, Chile, it is insufficient to enable us to give a very full description. It seems distinct from the other species of the control of the control



66. Opuntia atacamensis Philippi, Fl. Atac. 24. 1860.

? Pereskia glomerata Pfeiffer, Enum. Cact. 179. 1837. Not Opuntia glomerata Haworth. 1830.

Growing in large, dense clusters sometimes 6 dm. broad and 3 dm. high; joints ovoid, 2.5 cm. long by 2 cm. in diameter; areoles in 5 to 7 series, the lower ones with wool and very short spines; upper areoles each bearing 1 erect central spine 18 to 25 mm. long, yellow or reddish; radial spines 2 to 4, strongly appressed, 2 mm. long; flowers yellow.

Type locality: Profetas, Chile; also Puquios, 23° 50' south latitude.

Distribution: On the high central deserts of northern Chile at an altitude of 2,700 to 3,300 meters.

We have not seen the type of this species, and our reference of *Pereskia glomerata* here may not be correct.

Illustration: Nov. Act. Soc. Sct. Upsal. IV.11: pl. 1, as Opuntia grata.

Figure 110 represents a plant obtained by Dr. Rose at the Botanical Garden, Santiago, Chile, in 1914.

## 67. Opuntia russellii sp. nov.

Forming small, compact clumps 1 to 2 dm. in diameter; joints small, globular to obovoid, dull green to more or less purplish, 2 to 4 cm. long, very spiny near the top; leaves minute, acute, soon falling; prominent spines 3 to 6, yellow, 2 to 3 cm. long, slightly flattened; accessory spines 1 to several, 1 cm. long or less; glochids at first inconspicuous, but in time very abundant, sometimes 2 cm. long, somewhat persistent; flowers not known; fruit globular, 2 to 2.5 cm. in diameter, spineless; seeds pale, 4 mm. broad.

Collected by J. N. Rose and Paul G .Russell on the dry hills at Potrerillos, Mendoza,

OPUNTIA 95

Argentina, September 2, 1915 (No. 21002).

This is a common species in the foothills of the Andes, in the Province of Mendoza, where it forms low mounds along with other cacti.

Figure 111 represents joints of the type specimen above cited.

68. Opuntia corrugata Salm-Dyck, Hort. Dyck. 360. 1834.

Opuntia eburnea, Lemaire, Cact. Aliq. Nov. 35. 1838. Opuntia retrospinosa Lemaire, Cact. Aliq. Nov. 35. 1838. Opuntia parmentieri Pfeiffer, Allg. Gartenz. 6: 276. 1838.

More or less cespitose; joints 3.5 cm. long, 8 to 12 mm. in diameter, orbicular to cylindric, often erea, attenuate at both ends, light green, the terminal one often flattened; glochids minute, yellowish: spines 6 to 8, aciculat, 8 to 12 mm. long, white; flowers reddish; fruit red.

Type locality: None given.

Distribution: Northwestern Argentina, according to later writers.

Lemaire (Cact. 88. 1868) uses the names Cactus corrugatus and C. eburneus, both of which Schumann refers here.

Tephrocactus retrospinosus Lemaire (Cact. 88. 1868) is placed by Lemaire in his third section of Tephrocactus, but it is without description. It is doubtless the same as Opuntia retrospinosa Lemaire, which belongs here.

Tephrocactus rectrospinus (Index Kewensis Suppl. 1; 421) is a misspelling for T. rectrospinosus Lemaire.

Opuntia aulacothele Weber (Gosselin, Bull. Mus. Hist. Nat. Paris 10: 392. 1904), which was described without flowers or fruit, may be of this alliance. It comes from San Rafael, Argentina.

Opuntia cornigata, mentioned in Bailey's Standard Cyclopedia of Horticulture (4: 2367. 1916), is a misspelling of this name.

Opunia corrugata monvillei Salm-Dyck (Cact. Hort. Dyck. 1849. 72. 1850) was not described.

Opuntia longispina Haworth (Phil. Mag.7: 111. 1830), when first described, was supposed to have come from Brazil; the Index Kewensis refers it to Chile; while Schumann treats it in a note under O. corrugata as an Argentine species. It may not be an Opuntia but a Maihuenia.

Illustrations: Möllers Deutsche Gärt. Zeit. 25: 476. f. 9, No. 11; 488. f. 22, No. 8.

69. Opuntia ovata Pfeiffer, Enum. Cact. 144. 1837.

Opuntia ovallei Remy in Gay, Fl. Chilena 3: 29, 1847. Opuntia grata Philippi, Linnaea 30: 211, 1859. Opuntia monticola Philippi, Linnaea 33: 82, 1864.

Low, branching, cespitose plants; joints yellowish green, some deep purple when young, subcylindric to ellipsoid, 3 cm. long; spines 5 to 9, 4 to 10 mm. long, when young brownish, in age white; fruit ovoid; umbilicus curved outward.

Type locality: Mendoza, Argentina.

Distribution: Mountains of Argentina and Chile.



Fig. 112.—Opuntia ovata. x0,5.

Opuntia ovoides Lemaire (Cact. Gen. Nov. Sp. 73. 1839) and Cactus ovoides Lemaire (Cact. 88. 1868) are usually cited as synonyms for Opuntia ovata; they are unpublished names.

This species forms low clumps, each branch consisting of 2 to 5 joints. Dr. Rose found it abundant in the Andes above Mendoza and it has also been reported from the Chilean side of the Andes. Colonies differ in armament. In cultivation some of the joints are elongated and club-shaped.

Opuntia pusilla Salm-Dyck (Observ. Bot. 3: 10. 1822. Not Haworth, 1812) was referred by Schumann to O. corrugata. We have seen a photograph of Haworth's specimen (bearing the date November 8, 1824) which seems to answer to Salm-Dyck's plant which we would refer here.

Illustration: Schumann Gesamtb. Kakteen f. 105, as Opuntia grata.

Figure 112 shows joints of the plant collected by Dr. Rose in 1915 at Potrerillos, Argentina.

70. Opuntia sphaerica Förster, Hamb. Gartenz. 17: 167. 1861.

Opuntia dimorpha Förster, Hamb. Gartenz. 17: 167. 1861. Opuntia leonina Haage and Schmidt in Regel and Schmidt, Gartenflora 30: 413. 1881. Opuntia leucoph.tea Philippi, Anal. Mus. Nac. Chile 1891: 27. 1891. Opuntia orata leonina Schelle. Handb. Kakteenk. 46. 1907.

Opuntia corotilla Schumann in Vaupel, Bot. Jahrb. Engler Beibl. 111: 28. 1913.

Plants often erect, always low, usually few-branched, often forming large patches; joints usually globular, 12 to 40 cm. in diameter; areoles large, numerous, sometimes nearly hiding the surfaces of the joints with their short brown wool; spines variable as to number, sometimes few, sometimes numerous, brown at first, in age sometimes gray, 1 to 4 cm. long, usually stiff; flowers 4 cm. long, deep orange; petals obtuse; fruit globular, often very spiny; seed globular, white, 4 mm. in diameter, surrounded by a thin, broad band.

Type locality: Near Arequipa, Peru.

Distribution: Central Peru to central Chile.

The three illustrations cited below were made from the same cultivated plant. They look very much like a poor specimen of Opuntia glomerata, and, if such it should prove,

the name O. leonina should be referred to the synonymy of that species.

We have referred Opuntia dimorpha here with some hesitancy.

This plant often passes for Opuntia ovata and, from herbarium specimens we have seen, it has been so identified by Rudolph Philippi.

This species is very common in sandy places on hills, dry flats, and in mountain valleys, often covering the ground to the exclusion of all other plants. The joints readily break loose and, falling to the ground, start new colonies. We found the species very common both above and below Arequipa, Peru, where it is called corotilla; in central Chile it grows at lower altitudes but in similar situations. In Chile it is called leon or

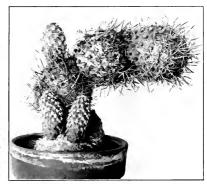


Fig. 113.-Opuntia sphaerica.

leoncito, which is probably the origin of the name Opuntia leonina.

Opuntia phyllacantha Haage and Schmidt (Regel and Schmidt, Gartenflora 30: 414. 1881), if it actually came from Chile, as stated, may belong here. The joints are more elongated, although the habit is somewhat similar. The illustration is poor and has doubtless been made from a greenhouse specimen. This name was given, with Salm-Dyck as authority, by Förster (Handb. Cact. 508. 1846), but without any description.

Illustrations: Cact. Journ. 1: 100; Förster, Handb. Cact. ed. 2. f. 133; Gartenflora 30: 413; Deutsche Gärt. Zeit. 7: 313, all as Opuntia leonina. Schelle, Handb. Kakteenk. 46. f. 8,

Figure 113 is from a photograph of joints of the plant collected by Dr. Rose above Arequipa, Peru, in 1914.

71. Opuntia skottsbergii sp. nov.

Roots thick and fleshy, sometimes 10 cm. long, the plant doubtless more or less cespitose; joints, at least some of them, globular, 3 cm. in diameter, almost hidden by the numerous closely set spines; areoles close together, small, at times producing long tufts of white wool; spines about 10, black except the yellowish tips, 1 to 2 cm. long; glochids numerous, elongated; flowers, including the very OPUNTIA.

spiny ovary, about 6 cm. long; petals about 3 cm. long, drying reddish or reddish green; areoles of the ovary bearing 5 to 7 spines, which are brown or blackish below and with more or less yellowish tips; fruit not known.

Collected near Lake Buenos Aires, Territory of Santa Cruz, Argentina, December 12, 1908, by Carl Skottsberg (No. 675); and again on the Rio Fenix, north of the locality above given, December 10, 1908 (No. 625, type).

This species belongs to the subgenus Tephrocactus, but is not closely related to any of the described species. The flower resembles very much the one figured by Henslow as O. darwinii, and it is possible that he may have had some of this species in his O. darwinii; the plant bodies, however, are so different that one could hardly confuse the two.

Figure 114 is copied from a photograph of the type specimen above cited.

### Opuntia nigrispina Schumann, Gesamtb. Kakteen 695. 1898.

Opuntia purpusea R. E. Fries, Nov. Act. Soc. Sci. Upsal. IV. 11: 123. 1905.

Described as a shrub, 1 to 2 dm. high and much branched, the branches upright; joints dull green or reddish violet, 2 to 4 cm. long, 1 to 2 cm. in diameter, oblong-ellipsoid, terete, when young bearing decurrent, spirally arranged tubercles; areoles 2 to 3 mm. in diameter, bearing abundant wool and

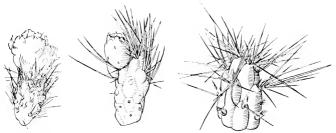


Fig. 114.—Opuntia skottsbergii. Fig. 115.—Opuntia nigrispina. x0.8. Fig. 116.—Opuntia pentlandii. x0.4.

glochids; spines 3 to 5 from upper areoles, 2.5 to 3 cm. long, straight, spreading, subterete, weak, purplish black; flowers small, purple, 2.2 to 2.5 cm. long; petals spatulate, 1.5 cm. long, 6 mm. broad; stigma-lobes 5; ovary 1 cm. long, obovoid, nearly smooth.

Type locality: On the puna of Humahuaca, Bolivia.

Distribution: Rare in stony mountains, altitude 3,500 meters, Jujuy, Argentina, and southern Bolivia.

Figure 115 represents a fruiting joint collected by J. A. Shafer at La Quiaca, Argentina, February 2, 1917 (No. 79).

### 73. Opuntia pentlandii Salm-Dyck, Allg. Gartenz. 13: 387. 1845.

Opuntia boliviana Salm-Dyck, Allg. Gartenz. 13: 388. 1845.

Cactus bolivianus Lemaire, Cactées 88. 1868

Cateris vortrainar l'entaire, Cateries 8s. 1808. Opantia pyrrhacantha Schumann. Gesanth. Kakteen 694. 1898. Opantia dactylifera Vaupel, Bot. Jahrb. Engler Beibl. 111; 29. 1913. Opantia catemiformis Grifiths. Bull. Torr. Club 43; 23-4. 1916. (From the description.)

Plant much branched, forming low, rounded, compact mounds sometimes a meter broad with hundreds of short stubby branches; joints obovoid to oblong-cylindric, plump, 2 to 10 cm. long, sometimes 4 dm. in diameter, more or less pointed, pale green or sometimes purplish, tuberculate; areoles small, circular, filled with short wool and yellow glochids, the upper ones sometimes also having spines; spines sometimes wanting, when present mostly from the upper areoles, erect, 2 to 10, usually bright yellow, sometimes brownish becoming dull brown, the longest one 7 cm. long; flowers very variable in color and size, lemon-yellow to deep red, 2 to 3 cm. long, sometimes 5 cm. broad when fully expanded; petals obtuse; filaments short; style thick; stigma-lobes very short; ovary short with few areoles; areoles on ovary subtended by minute leaves, filled with short wool, the upper ones with bristle-like spines; fruit globular to short-oblong. 2 to 3 cm. long. dry; seeds numerous, 4 to 5 mm. long. Type locality: In Bolivia.

Distribution: Very common on the high pampas of southeastern Peru and Bolivia, and adjacent Argentina.

Cactus pentlandii Lemaire (Cact. 88, 1868), name only, is supposed to apply to this species.

This is one of the most characteristic plants of the high pampas of the Andean region, mostly growing at elevations of 12,000 feet or higher, forming low, broad, compact clumps, sometimes made up of a hundred plants or more.

Illustrations: Watson, Cact. Cult. ed. 3. 106. f. 54; Deutsche Gärt. Zeit. 7: 312; Schelle, Handb. Kakteenk. 58. f. 16; ?Dict. Gard. Nicholson 2: f. 751; ?Förster, Handb. Cact. ed. 2. f. 124; ?W. Watson, Cact. Cult. f. 77, all as Opuntia boliviana; Monatsschr. Kakteenk. 24: 175, as Opuntia dactylifera; Möllers Deutsche Gärt. Zeit. 25: 476. f. 9. No. 14.

Figure 116 represents a joint of the plant collected in 1914 by Dr. Rose at Comanche, Bolivia; figure 117 shows a flowering joint collected by Dr. Rose in 1914, at Juliaca, Peru.

 Opuntia ignescens Vaupel, Bot. Jahrb. Engler Beibl. 111: 30. 1913.

Plants forming clumps 2 dm. high or less, with hundreds of erect or spreading joints; joints bluish green, 8 ro 10 cm. long, very fleshy, naked below; upper areoles very spiny; spines 6 ro 15 from each areole, nearly equal, 4 to 5 cm. long, erect, acicular, yellow; flows very showy, deep red; ovary oblong, 3 to 4 cm. long, naked below, but the upper areoles producing numerous spines 4 to 7 cm. long; fruit red, 7 cm. long, spiny and tuberculate above, terete below, with a deep umbilicus; seeds nearly globular, about 5 mm. in diameter.

Type locality: Near Sumbay, southern Peru.

Distribution: On the pampas of southern Peru and northern Chile, at altitude of 3,000 to 3,600 meters.



Fig. 117.—Opuntia pentlandii. x 0.4.

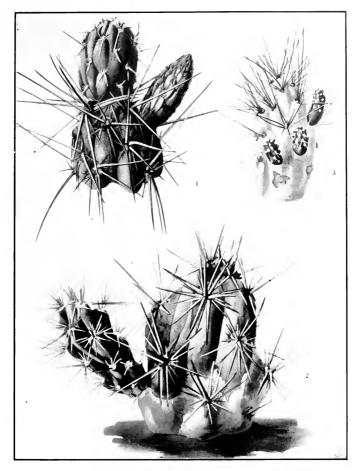


Fig. 118.—Opuntia ignescens, x 0.5.



Fig. 119.—Opuntia ignescens forming large mounds.

BRITTON AND ROSE PLATE XVI

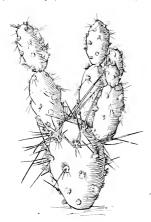


Top of Opuntia miquelii.
 Old and young joints of Opuntia invicts.
 Upper part of joint of Opuntia ignescens. (All three-fourths size.)

Plate XVI, figure 3, represents old and young joints of the plant collected above Ayrampl, Peru, by Dr. Rose in 1914. Figure 118 shows a fruit from the same plant; figure 119 is from a photograph taken by H. L. Tucker at Coropuna, Peru, in 1911.

# 75. Opuntia campestris sp. nov.

Much branched, often forming low, dense masses, 3 to 6 dm. in diameter; terminal joints readily breaking off; joints globular or a little longer than thick, 3 to 5 cm. long, with numerous prominent areoles, the tubercles conspicuous when young; leaves minute, 1 to 1.5 mm. long, caducous; glochids conspicuous, numerous, yellow; spines usually wanting at the lower areoles, present above, very unequal, 5 to 10, acicular, the longest once 3.5 cm. long; flowers rosy white to light yellow, 2 to 3 cm. long; ovary naked or spiny; fruit thicker than long, 2.5 cm. long, with deep umbilicus, often very spiny.



Common just below railroad station at Pampa de Arrieros, Peru, where it was collected by Dr. Rose, August 23, 1914 (No. 18957).

Figure 120 represents joints of the type specimen above cited.



Fig. 120.—Opuntia campestris. x0.8.

Fig. 121.—Opuntia ignota, x0.8.

### 76. Opuntia ignota sp. nov.

Low, much branched, spreading; joints small, narrow, 2 to 3 cm. long, more or less purplish; leaves million, often purplish; spines 2 to 7 from an areole, brownish, acicular, the longest ones 4 to 5 cm. long; glochids, when present, yellow; areoles large, full of grayish wool; flowers and frunt not seen.

Collected by Dr. Rose on the hills below the railroad station at Pampa de Arrieros, Peru, August 23, 1914 (No. 18974).

Plants grown in greenhouses are dark green and develop few spines or none.

This plant grows in the same region as O. campestris, but is quite different from it.

Figure 121 shows joints of the type specimen above cited.

76a. Opuntia alexanderi sp. nov. (Appendix following page 226).

# Subgenus 3. PLATYOPUNTIA.

Includes all the species with flattened joints; a few species have nearly terete joints; others have some of the joints terete. Twenty-eight series are recognized. The species are most abundant in North America, but several series are found only in South America, while others have tepresentatives in both Americas. (See Key to the Series, p. 45.)

#### Series 1. PUMILAE,

Low, spiny species, with slightly flattened, narrowly cylindric or linear-oblong, readily detached ultimate joints, the main stem terete. We know four species, the typical one in Mexico and Guatemala, one Venezuelan, one from Oaxaca, Mexico, and one Peruvian. In the structure of their joints they form a transitional series between Cylindropuntia and Platyopuntia, and might be included in either of these subgenera with about equal reason.

#### KEY TO SPECIES

Young areoles with only 1 to 3 spines; joints 2 to 3 cm. thick.		
Plant 1 to 5 meters high; joints tubercled; spines yellowish		
Plants about 2 dm, high; joints not tubercled; spines reddish to brown	77a.	O. de pau peral
Areoles with 3 to 7 spines; plants 1 to 4 dm. high.		
Joints 1 to 1.5 cm, thick; areoles not blotched; spines brownish		
Joints 2 to 3 cm, thick; young areoles dark-blorched; spines yellowish	79.	O. pascoensis

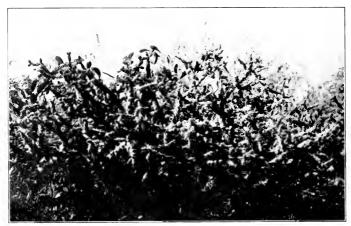


Fig. 122.—Opuntia pumila forming low thickets.

#### 77. Opuntia pumila Rose, Smiths. Misc. Coll. 50: 521. 1908.

Stems low, very much branched, the joints readily falling off when touched, 6 to 20 cm. long velvety-pubescent, terete or sometimes slightly flattened, turgid, bearing more or less prominent tubercles; areoles small, those of old stems bearing several slender spines, the longer ones 3 cm. long; areoles of young joints usually bearing 2 yellowish spines; ovary pubescent, with few spines or none; petals yellow, tinged with red, 15 mm. long; fruit globular, red, 15 mm. long.

Type locality: Near Oaxaca City, Mexico, on the road to Mitla.

Distribution: Central and southern Mexico.

When this species was described, attention was called to various forms which belonged here or to one or more related species. These we now refer to *O. pubescens*.

Illustration: Möllers Deutsche Gärt. Zeit. 25: 476. f. 9, No. 5.

Figure 122 is from a photograph of the type; figure 123 represents joints of the same.

OPUNTIA. IO1

77a. Opuntia depauperata sp. nov. (See Appendix, p. 216.)

78. Opuntia pubescens Wendland\* in Pfeiffer, Enum. Cact. 149. 1837.

Cactus pubescens Lemaire, Cactées 87, 1868.

Opuntia leptarthra Weber in Gosselin, Bull. Mus. Hist. Nat. Paris 10: 393. 1904.

Plants small, usually low, sometimes 4 dm. high, much branched; joints easily becoming detached, nearly terete, glabrous or pubescent, 3 to 7 cm. long; spines numerous, short, brownish; flowers lemonyellow but drying red; filaments greenish; style white; stigma-lobes cream-colored; fruit small, 2 to 2.5 cm. long, red, a little spiny, with a depressed unibilities; seeds small, 3 mm. in diameter.

Type locality: In Mexico.

Distribution: Northern Mexico to Guatemala.

This species was sent to the Exposition Universelle at Paris by the Mexican Government in 1889, and was there seen and described by Dr. Weber as *O. leptarthra*. A part of this material finally went to the Hanbury Garden at La Mortola, Italy, whence we obtained specimens in 1913 which prove to be identical with specimens obtained by Dr. Rose and others in Mexico and Guatemala in 1905 to 1909.

This is an insignificant species and hence has generally been overlooked in the region where so many more striking species are found. It is widely distributed, extending from the State of Tamaulipas, in Mexico, to Guatemala, a much greater range than that of most species. Its

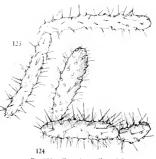


Fig. 123.—Opuntia pumila. x0.4. Fig. 124.—Opuntia pubescens. x0.75.

wide distribution is doubtless due to the fact that the joints, which are covered with barbed spines and are easily detached, fasten themselves to various animals and are scattered like burs over the country; each little joint thus set free starts a new center of distribution.

This is a difficult plant to grow in greenhouses, for the spreading or hanging branches soon become entangled with other plants and break off in attempts to free or move them; partly for this reason, doubtless, it rarely flowers in cultivation.

Opuntia angusta Meinshausen (Wochenschr. Gärtn. Pflanz. 1: 30. 1858) was unknown to Schumann. It was originally described as similar to the South American species, O. aurantiaca, and, if so, it must be near O. pubescens. if not identical with it, being a native of Mexico, where it was first collected by Karwinsky.

Figure 124 represents joints of the Guatemalan plant, cultivated in the greenhouses of the United States Department of Agriculture, Washington, obtained in 1907.

### 79. Opuntia pascoensis sp. nov.

Stems erect and rigid, up to 3 dm. high; joints easily breaking apart, erect or ascending, terete or slightly flattened, 3 to 12 cm. long, 1.5 to 4 cm. broad, puberulent, hardly tuberculate but with faint upturned lunate depressions between the dark-blotched areoles; leaves minute; areoles somewhat elevated, filled with brown wool intermixed with longer white cobwebby hairs; spines 4 to 8 on young joints, more on older joints, acicular, yellow, 2 cm. long or less; glochids numerous, short, yellow, tardily developing; fruit globular, 1.5 cm. in diameter, naked below, spiny above. Doubtless of wide distribution, for the joints are easily detached and are distributed like burs, but so far only two collections have been reported.

<sup>\*</sup>Pfeiffer (Enum. Cact. 1837) frequently refers several of Wendland's species to Catal. h. Herrnh. 1835, but we can find no references to Wendland having published a catalogue of the Herrenhausen Garden either in 1835 or about that time. We have therefore cited all of Wendland's species so referred by Pfeiffer to the pages given in his Fountation.

Collected by Dr. and Mrs. J. N. Rose in central and southern Peru, in 1914, first from just below Matucana (No. 18653), and later at Pasco (No. 18812, type).

Plate XVII, figure 1, represents a joint of the type specimen above cited.

# Series 2. CURASSAVICAE.

This series is composed of 10, or perhaps 11, species of low plants, characterized by their fragile branches, the small joints separating and becoming detached very readily, more or less flattened or sub-terete. They mostly inhabit the southern United States and the West Indies; one is known from Ecuador; the original home of one of the species recognized is unknown.

#### KEY TO SPECIES

Spines acicular.  Joints oval, mostly not more than twice as long as wide; plants prostrate, little branched 80.	O con in micr
Joints oblong to linear, 2 to 8 times as long as wide; plants ascending or erect, much branched.	O. Caramanara
Joints narrowly linear, 1 to 2 cm. wide.	O tolori
Joints oblong to linear-oblong or obovate-oblong, 2 to 4 cm. wide.	O. Injion
Joints oblong to linear, 4 to 8 times as long as wide; spines 1 to 3 cm. long.	
Joints obtoing to fine at, 4 to 6 times as long as wide, spines 1 to 5 cm. long.	O reheur
Joints not tubercled	O. hestilar
Joints oblong to obovate-oblong, 2 to 3 times as long as wide; spines 3 to 5 cm. long 83.	O. beringer
	O. voringments
Spines subulate.	
Spines white.	O mulitain
Roots fibrous; spines at most of the areoles	O nemoralis
Koots tuberous; spines only at the upper areoles	O. nemorans
Spines brown.	
Joints oval to oblong.	O drammarlia
Joints scarcely repand; plant up to 2 dm	O to seri
Joints strongly repand; plant 1 dm. 87.  Joints linear-lanceolate. 88.	O. maryr
Joints linear-lanceolate	O. Junihima
Affinity uncertain	O. aarramana
80. Opuntia curassavica (Linnaeus) Miller, Gard. Dict. ed. 8. No. 7. 1768.	
Cactus curassaricus Linneaus, Sp. Pl. 469. 1753.	

Stems low, 5-jointed, light green, prostrate and creeping or hanging over rocks; joints oval to oblong, decidedly flattened but thick, 2 to 5 cm. long, glabrous; leaves minute, soon withering; areoles small, bearing short wool and longer, white cobwebby hairs; spines 4 to many, acicular, 2.5 cm. long or less, yellowish, becoming white in age; glochids tardily developing.



Fig. 125.-Opuntia curassavica. x0.75.

Type locality: Curacao Island.

Distribution: Curacao, Bonaire, and Aruba.

Haworth (Syn. Pl. Succ. 196. 1812) describes three varieties, major, media. and minor, and later (Rev. Pl. Succ. 71. 1821) also describes the variety longa. O. curassavica elongata Haworth (Salm-Dyck, Hort. Dyck. 184. 1834), a name only, is supposed to be the same as var. longa.

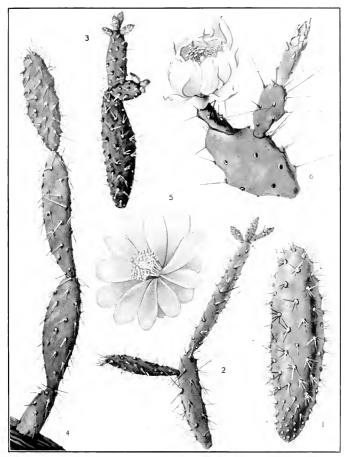
This is one of the oldest species of *Opuntia*, having been described and figured as early as 1696. For a long time it has been unknown, the name having been transferred to a similar species, *O. repens*. In 1913 Dr. Britton visited Curacao, its native home, and re-collected it. Its flowers have not been described, and several residents informed him that they had never seen it in flower; Dr. Britton did not find it in flower on Curacao, nor has it flowered with us in cultivation; Haworth, who wrote about it in 1812, speaks of its being a shy bloomer, saying he had seen it in flower but once. In early English books it is called pin pillow, because its turgid joints suggest pincushions filled with pins.

Illustrations: Bradley, Hist. Succ. Pl. ed. 2. pl. 4, as Opuntia minima americana, etc.; Commerson Hort. pl. 56, as Opuntia curassavica minima; Plukenet, Opera Bot. 3: pl. 281, f. 3, as Opuntia minor caulescens; Dillenius, Hort. Elth. 2: pl. 295, as tuna; Loudon, Encycl. Pl. 413. f. 6897, as Cactus curassavicus; Knorr, Thesaurus pl. 0.2.

Figure 125 represents the plant collected on Curacao by Dr. N. L. Britton and Dr. J. A. Shafer in 1913.

80a. Opuntia adjecta Small, sp. nov. (Appendix following page 226).

BRITTON AND ROSE FLATE XVII



Joint of Opuntia pascoensis.
 Joints of Opuntia taylori.

- 3, 4. Forms of Opuntia repens. 5. Flower of same.
- 6. Flowering joint of Opuntia drummondii. (All three-fourths size.)

# 81. Opuntia taylori Britton and Rose, Smiths. Misc. Coll. 50: 520. 1908.

Opuntia hattoniana Britton and Rose in Johnston and Tryon, Rep. Prickly-Pear Comm. 9". 1914.

Prostrate, widely branched; joints linear to linear-oblong, 12 cm. long or less, bright green, 1 to 2 cm. wide, turgid, glabrous or pubescent; arcoles 1 to 1.5 cm. apart, not elevated; spines acicular. 3 to 6 at each arcole, yellowish brown, becoming white, 4 cm. long or less; glochids yellowish brown, 3 mm. long; flowers yellow, small, the petals about 1 cm. long; ovary pyriform, 1 to 1.5 cm. long, is arcoles with few bristles and spineless.

Type locality: Between Gonaives and La Hotte Rochée, on road to Terre Neuve, Haiti. Distribution: Deserts of Haiti and of Azua, Santo Domingo.

This species, while similar to O. repens, has more terete joints.

It was first collected in 1905 in Haiti by Nash and Taylor, and upon this collection the species was based. In 1913 Rose, Fitch, and Russell collected it in the Azua desert of Santo Domingo. In this last collection the joints are pubescent, but otherwise the plants seem to be the same, although we at one time thought they might be distinct; in fact, in their report on the opuntias, Johnston and Tryon published the Santo Domingo plant as new, from notes given to them.

Plate XVII, figure 2, represents joints of the plant collected by Rose, Fitch, and Russell at Azua, Santo Domingo, in 1913.

# 82. Opuntia repens Bello, Anal. Soc. Esp. Hist. Nat. 10: 277. 1881.

Stems erect or ascending, 5 dm. high or less, commonly much branched, often forming dense, flat masses 4 meters in diameter, glabrous or pubescent, green or olive-green; joints oblong to linear 5 to 16 cm. long, 3.5 cm. broad or less, usually strongly flattened; arceles small, bearing brown wool and a few cobwebby white hairs; spines when very young pinkish, becoming brown, afterwards fading out, acicular, numerous, 3.5 cm. long, or less; glochids numerous, yellow, tardily developing; flowers 4 cm. broad, bright yellow, fading to salmon-colored; ovary and fruit with or without spines; fruit red, 2 to 3 cm. long, 1 to few-seeded.

Type locality: Near Guanica, Porto Rico.

Distribution: Porto Rico and its islands, Mona, Muertos, Vieques, and Culebra, to Virgin Gorda and St. Croix.

Opuntia repens has long been confused with O. curassavica. It was first collected on St. Thomas, where it is abundant and a troublesome weed, and was illustrated by Pfeiffer and Otto in the year 1843. It was described by Bello in 1881, who thought it might be a variety of O. spinosissima. According to Bello, it is called olaga in Porto Rico, which is a corruption of ohulaga; the name suckers is used for it in the Virgin Islands. The plant is freely distributed by its fragile, clinging joints. Unlike its relative, O. curassavica, this plant flowers freely, blooming in late spring and summer.

Opuntia repens Karwinsky in Salm-Dyck (Hort. Dyck. 361. 1834) has been published only as a synonym, and therefore does not invalidate the use of Bello's name.

The plant is recorded by Johnston and Tryon (Rep. Prickly-Pear Comm. 95. 1914) as O. curassavica taylori.

Illustration: Pfeiffer and Otto, Abbild. Beschr. Cact. 1: pl. 6, f. 2, as Opuntia curassavica.

Plate XVII, figure 3, represents joints of the plant collected near Guanica. Porto Rico, by Dr. Britton in 1913; figure 4 is from a plant obtained by the same collector the same year on Virgin Gorda; figure 5 is copied from the illustration above cited.

- 82a. Opuntia pestifer sp. nov. (See Appendix p. 217.)
- 83. Opuntia borinquensis sp. nov.

Plants few-branched, forming colonies often 2 meters across, 5 dm. high or less; joints readily detached, oblong to obovate-oblong, dull green, glabrous, compressed but turgid, 5 to 8 cm. long. 4 cm. wide or less, about 1.5 cm. thick; areoles small, 1 to 2 cm. apart, bearing 2 or 3 acicular spines,

the larger up to 6 cm. long, brown when young, fading white; leaves subulate, acuminate, 1 to 2 mm. long; fruit obovoid, subtruncate, 1.5 cm. long.

Limestone swale, Morillos de Cabo Rojo, Porto Rico (Britton, Cowell, and Brown, No. 4741), growing with *O. repens* Bello, from which it differs by its larger, broader, and flatter joints and much longer spines.

The only locality known for this plant is at the extreme southwestern corner of Porto Rico, where numerous colonies of it were observed. The region is a very dry one, rain falling there only at long intervals; the associated vegetation is of a highly xerophytic character.

Figure 126 represents joints of the type specimen above cited.

# 84. Opuntia militaris sp. nov.

Stems 3 dm. tall, the branches weak and more or less spreading; joints thick, narrowly oblong to obovate, 5 to 8 cm. long, somewhat shing when young, easily breaking apart; spines 1 or 2 from an areole, occasionally more, acicular, white, 1 to 2 cm. long; flower-buds pointed; flowers small, 3 cm. long; petals greenish to cream-colored, tinged with pink; ovary small, its small areoles without spines.

Collected by Dr. N. L. Britton, March 17 to 30, 1909, at the U. S. Naval Station, Guantánamo Bay, Oriente, Cuba (No. 1957).

Figure 127 represents joints of the type specimen above cited.

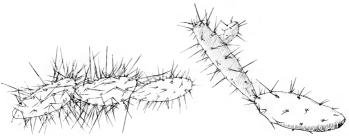


Fig. 126.-Opuntia borinquensis. x0.5.

Fig. 127.—Opuntia militaris. x0.5.

### 85. Opuntia nemoralis Griffiths, Monatsschr. Kakteenk. 23: 133. 1913.

Plants low, usually prostrate, forming clumps 1 meter in diameter, sometimes 3 dm. high; joints over to obovate, thick, 7 to 9 cm. long, green, but often with purple blotches about the areoles; spines 1 or 2, only from the upper areoles, 2 to 2.5 cm. long, mostly erect; glochids yellow; flowers yellow; fruit obovoid to pyriform, small, 3 cm. long, light red, truncate.

Type locality: Longview, Texas.

Distribution: Pine woods and fields about Longview, Texas.

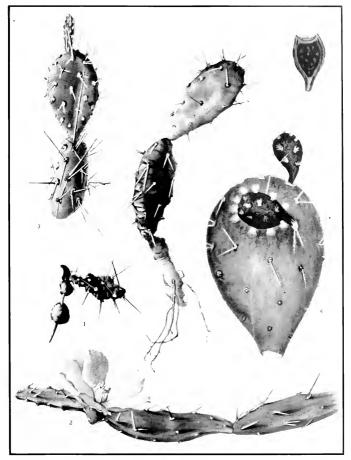
This species in habit, joints, and spines suggests the *Tortispinae*: but on account of having easily detached joints we have referred it to the *Curassaricae*, as indicated in the original description, placing it between the Cuban species *O. militaris* and the United States species *O. drummondii*. It is known only from the type specimens.

### 86. Opuntia drummondii Graham in Maund, Botanist 5: pl. 246. 1846.

Opuntia per-corri Le Conte in Engelman, Proc. Amer. Acad. 3: 346. 1856. Opuntia frustulenta Gibbes, Proc. Elliott Soc. Nat. Hist. 1: 273, 1859.

Plant prostrate or spreading, 2 dm. or less high, from thickened single or sometimes moniliform rose; joints rather variable, narrowly linear to broadly oblong, with entire margins, sometimes 12 cm. long and 5 to 6 cm. broad, usually light green, sometimes darker about the areoles; leaves 2 to

BRITTON AND ROSE PLATE XVIII



- 1. Two plants of Opuntia drummondii.
- 2. Joints of Opuntia retrorsa with flower.
- 3. Joints of Opuntia triacantha.
- 4, 5. Joint and section of fruit of Opuntia jamaicensis.

(All three fourths size)



6 mm. long; spines (if present) solitary or 2 to 4, brownish red or gray, 2 to 4 cm. long; flowers yellow. 6 cm. broad; petals obovate; fruit red, juicy but insipid, obovoid to clavate, 22 to 35 mm. long, 15 mm. in diameter at thickest part, bearing few areoles and no spines; umbilious slightly depressed in the center; seeds 1 to 8, about 4 mm. broad.

Type locality: Apalachicola, Florida.

Distribution: Sandy soil from northern Florida to Pamlico Sound, North Carolina.

In February 1916, Dr. J. K. Small visited the coastal islands near Charleston, South Carolina, for the purpose of collecting Gibbes's Opuntia frustulenta. He found this species very common on Folly Island and in the Isle of Palms, where it grows abundantly in the sand, and also very variable as to shape and size of joints. He says the joints break off easily and attach themselves to one's clothing like the sand spur, making progress over these islands difficult and painful. It is the common belief that this species rarely flowers. It

usually flowers when first brought into cultivation, but rarely afterward, this doubtless being due to unsuitable greenhouse conditions.

The fruit described was collected by Dr. J. K. Small, December 10, 1917, at Apalachicola, Florida, the type locality.

According to Professor L. R. Gibbes, it is known as dildoes about Charleston.

Illustrations: Maund, Botanist 5: pl. 246; Journ. Elisha Mitchell, Sci. Soc. 34: pl. 13, 14.

Plate XVII, figure 6, represents flowering joints of a plant sent from La Mortola, Italy, to the New York Botanical Garden in 1912; plate XVIII, figure 1, shows the plant collected by Dr. Small on the Isle of Palms, South Carolina, in 1916.

Herbarium specimens apparently representing a related species, were collected by W. L. McAtee at Cameron, Louisiana. in 1910 (No. 1955).



Fig. 128.—Opuntia tracyi.

86a. Opuntia impedata Small, sp. nov. (Appendix following page 226).

87. Opuntia tracyi Brirron, Torreya 11: 152. 1911.

Low, diffusely much branched, pale green, about 2 dm. high or less; older joints oblong to linear-oblong, flat, 6 to 8 cm. long, 1.5 to 2.5 cm. wide, about 1 cm. thick; young joints scarcely flattened or terete, 1 cm. thick; areoles elevated, 5 to 10 mm. apart; spines 1 to 4, acicular, light gray with darker tips, 3.5 cm. long or less; glochids numerous, brownish; corolla pure yellow, 4 cm. broad; ovary 1.5 cm. long, bearing a few triangular acute scales similar to the outermost sepals, which are 2 mm. long; sepals triangular-ovate, 5 to 15 mm. long, the outer green, the inner yellowish with a green blotch; petals obovate, apiculate, 2 to 2.5 cm. long; filaments yellow, 1 cm. long; anthers white.

Type locality: Biloxi, Mississippi.

Distribution: Southern Mississippi, southeastern Georgia to northern Florida.

Figure 128 is from a photograph of the plant collected by S. M. Tracy at Biloxi. Mississippi, in 1911.

88. Opuntia pusilla Haworth, Syn. Pl. Succ. 195. 1812.

Cactus puoillus Haworth, Misc. Nat. 188. 1805 Cactus foliosus Willdenow, Enum. Pl. Suppl. 35, 1813, Opuntia foliosa Salm-Dyck in De Candolle, Prodr. 3: 471, 1828.

Low, usually prostrate; joints narrow, more or less flattened, sometimes nearly terete, hardly tuber culate, light green in color; leaves 6 mm. long, linear, early deciduous; areoles remote; spines 1 or 2. subulate, usually brownish when young, in age straw-colored; flowers pale yellow, rather large for the plant; petals few, about 8, spreading, acute.

Type locality: Not cited.

Distribution: Usually assigned to South America, but not known from any definite locality; Schumann, in his Keys, however, says West Indies.

This species has usually passed under the name of O. foliosa, although all writers seem to agree that the older name, O. pusilla, was given to the same species. It may belong in the series Aurantiacae rather than in the Curassavicae.

Specimens distributed from European gardens as O. foliosa in recent years are not typical, and are probably referable to O. drummondii.

Tephrocactus pusillus Lemaire Cact. 88. 1868), an unpublished name, referred by Lemaire to his third section of Tephrocactus, may belong here. The Index Kewensis refers it to Opuntia pusilla.

Illustration: Pfeiffer and Otto, Abbild. Beschr. Cact. 1: pl. 18, as Opuntia foliosa.

Figure 129 is copied from the illustration above cited.

 Opuntia darrahiana Weber in Gosselin, Bull. Mus. Hist. Nat. Paris 10: 388. 1904.

Growing in masses, 2 to 2.5 dm. high,

3.5 to 4 dm. broad, very much branched, joints 7 to 8 cm. long by 4 to 5 cm. broad, bright green to seagreen; areoles somewhat elevated, especially when young. 1 cm. apart; spines 6, the two uppermost the longest, these 4 to 4.5 cm. long, all suberect, white or grayish white, more or less brownish at tip; glochids said to be wanting; flowers and fruit not known.

Type locality: Turks Islands.

Distribution: Known only from the type locality.

This species is known only from the Turks Islands, a small group at the southeastern end of the Bahaman Archipelago. It was introduced into Europe by the late Charles Durrah.

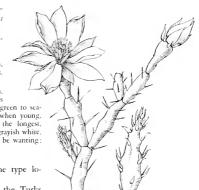


Fig. 129.—Opuntia pusilla.

We know the plant only from the above-cited description, and, so far as we have been able to learn, it is not now in cultivation, nor have we been able to find any herbarium specimens preserved. The opuntias known to us to inhabit Turks Islands are O. dillenii, O. nashii, and O. lucayana. The description of O. durrabiana does not agree with any of these. The species is referred to the series Curassavicae with doubt, but as this series has representatives in Florida, Cuba, and Hispaniola, the existence of one in the Bahamas is not improbable.

### Series 3. AURANTIACAE

The species of this series are low plants, mostly with readily detached joints; the main stems are often terete or turgid, the ultimate joints narrow and flat. They inhabit southeastern South America. During the expedition to Brazil and Argentina conducted by Dr. Rose in the summer of 1915, only a few of the species here grouped were found; Dr. Shafer collected several of them in the winter of 1916-17. Dr. Spegazzini has given us photographs of several.

We recognize 8 species, and have appended another, which may belong here.

#### OPLINTIA. 107

#### KEY TO SPECIES

Joints not conspicuously purple-blotched under the areoles.

Joints linear, elongated

Stem terete or subterete; branches mostly flat. Joints dark green, not tubercled. Joints tubercled, bluish green when young...... 91. O. sebickendantzii All the joints flat. Joints elongated, linear. ..92. O. kirka-loro .93. O. canina Joints linear-oblong Joints short, elliptic .94. O. monteridensi Joints with a long purplish blotch under each areole. Joints more or less spiny. Joints flattened.

Joints 2 to 3.5 cm. wide . . . . ... .95. O. retrorsa Joints 3.5 to 6 cm, wide. .96. O. utkilio Joints subterete, turgid. ... 96a. O. discolor 97. O. anacantha Joints spineless.. Perhaps of this series 98. O. grosseiana

99. Opuntia aurantiaca Lindley, Edwards's Bor Reg. 19: pl. 1606. 1833.

Opuntia aurantiaca extensa Salm-Dyck in Förster, Handb. Cact. 476. 1846.

Low, much branched, and spreading; stem terete or subterete, 1 to 2 cm. thick; joints very fragile, linear, 6 to 8 cm. long, 1.5 to 2.5 cm. broad, almost terete at base, dark green, shining; areoles somewhat elevated, filled with white wool; spines 2 or 3, brownish, 1 to 3 cm. long; flowers yellow, 2.5 cm. broad; fruit 2 to 2.5 cm. long.

Type locality: Chile (in error.) Distribution: Argentina and Uruguay.

Cactus aurantiacus Lemaire (Cact. 87. 1868) is usually cited in synonymy, but Lemaire only mentions the name as a species of Cactus. It is in fact Gillies's manuscript name, first published in the Botanical Register in 1833 as a synonym of O. aurantiaca.

O. extensa Salm-Dyck (Pfeiffer, Enum. Cact. 147. 1837) is also given as a synonym.

Remy states (Gay, Fl. Chilena 3: 25. 1847) that it grows in the cen-

tral provinces of Chile, but he prob-

Fig. 130 .- O

Fig. 131.—O. schickendantzii.

aurantiaca. ably had in mind some other plant, as O. aurantiaca is not known to be native of Chile by resident botanists.

Illustrations: Anal. Mus. Nac. Montevideo 5: pl. 34; Edwards's Bot. Reg. 19: pl. 1606. Figure 130 represents a joint from a plant found by Dr. Rose, in Argentina, in 1915.

91. Opuntia schickendantzii Weber in Schumann, Gesamtb. Kakteen 688. 1898.

Shrub-like, 1 to 2 meters high, much branched, grayish green; branches cylindric or flattened, somewhat tuberculate; leaves minute, 2 mm. long, reddish; spines 1 or 2, subulate, 1 to 2 cm. long; flowers 4 cm. in diameter, yellow; fruit green, sterile.

Type locality: In Tucuman, Argentina.

Distribution: Northern Argentina.

Figure 131 is from a photograph of a plant in Argentina contributed by Dr. Spegazzini.



Fig. 132.-Opuntia kiska-loro,

 Opuntia kiska-loro Spegazzini, Anal. Mus. Nac. Buenos Aires III. 4: 516. 1905.

Prostrate, rooting, forming spreading clumps 3 to 6 dm. high; joints flat, at first very narrow, becoming lanceolate, 20 cm. long, 4 cm. broad, shining green; spines 2 to 4, unequal, whitish, 4 to 6 cm. long; flowers orange, rather large, 3 to 6 cm. broad; filaments pale orange; stigma-lobes 6, flesh-colored; fruit 5 cm. long, deep violet-purple without, white within; seeds 5 mm. broad, pubescent.

Type locality: Deserts of La Rioja, Catamarca, Argentina.

Distribution: Northwest Argentina.

Figure 132 is from a photograph of the type plant sent by Dr. Spegazzini.

 Opuntia canina Spegazzini, Anal. Mus. Nac. Buenos Aites III. 4: 518. 1905.

At first erect, then decumbent, 1 to 3 meters broad; joints flat, very narrow, attenuate at both ends, 2.5 to 3.5 dm. long, 4.5 cm. broad, shining green; areoles on young joints unarmed; spines of areoles of older joints 1 or 2, sometimes 3, 1.5 to 3.5 cm. long, reflexed, subterete, grayish white with yellowish tips: flowers numerous, medium sized; ovary obovoid; corolla rotate, yellowish orange, 4 to 5 cm. broad; petals obovate, filaments yellow; stigma lobes 5; fruit obovoid, 2.6 to 2.8 cm. long, red without, white within; seeds 4 mm. broad, white, lanate.

Type locality: Near Pampablanca, Jujuy, Argentina.



Frg. 133,--Opuntia canina.

Distribution: Provinces of Jujuy and Tucuman, Argentina. Figure 133 is from a photograph sent by Dr. Spegazzini.

Opuntia. 109

94. Opuntia montevidensis Spegazzini, Anal. Mus. Nac. Buenos Aires III. 4: 515. 1905.

Cespitose, the branches 3 to 5 dm. high; joints 5 to 10 cm. long, obovate to elliptic; areoles not very prominent; spines usually 5, 3 longer and stouter, 2 very small, reflexed, and setiform, the 2 or 3 longer ones erect or spreading, 2 to 3 cm. long; flowers 4 to 5 cm. broad, orange-colored; fruit dark purple, clavate, 3.5 to 4 cm. long; seeds lanate.

Type locality: Cerro de Montevideo, Uruguay.

Distribution: Cerro de Montevideo, and near La Colonia, Uruguay.

95. Opuntia retrorsa Spegazzini, Anal. Mus. Nac. Buenos Aires III. 4: 517. 1905.

(?) Opuntia platynoda Griffiths, Bull. Torr. Club 43: 526. 1916.

Stems prostrate, intricately branched, creeping, rooting at the nodes; joints linear-lanceolate, more or less attenuate at each end, flattened; areoles somewhat prominent, each subtended by a long, dull purplish blotch; spines 1 to 3, reflexed, white below, with pinkish tips: flowers yellowish, 4 to 5 cm, broad; fruit about 2 cm. long, violet-purple on the outside, light rose on the inside; seeds 2 to 2.5 mm. broad, somewhat villous.



Fig. 134.—Opuntia retrorsa.

Type locality: In the Territory of the Chaco, Argentina.

Distribution: Northern Argentina.

Plate XVIII, figure 2, represents a plant from Argentina which flowered at the New York Botanical Garden in 1911. Figure 134 is from a photograph sent by Dr. Spegazzini.

96. Opuntia utkilio Spegazzini, Anal. Mus. Nac. Buenos Aires III. 4: 516. 1905.

Low, creeping plant, rooting at the joints, with elongated branches 5 to 15 dm. long; joints flat, elliptic-linear, 15 to 30 cm. long, 5 to 6 cm. broad; spines at first 2 or 3, the upper no longer, later more numerous, reflexed; flowers small, 3.5 to 4 cm. broad, yellowish; ovary obovoid, somewhat spiny; fruit small, 3 cm. long, fleshy, insipid, reddish violet both within and without; seeds suborbicular, 4 mm. broad, lanate.

Type locality: Province of Tucuman, Argentina.

Distribution: Northern Argentina.

Figure 135 is from a photograph sent by Dr. Spegazzini.

96a. Opuntia discolor sp. nov. (See Appendix, p. 218.)

97. Opuntia anacantha Spegazzini in Gosselin, Bull. Mus. Hist. Nat. Paris 10: 391. 1904.

Usually decumbent and rooting along the under surface, sometimes ascending and clambering, 1 to 2.5 meters long; joints unarmed, dark green except for purple spots under the areoles, elliptic to lanceolate, narrowed toward each end, 1.5 to 4 dm. long, 3.5 to 7 cm. broad; areoles small; flowers large, numerous, yellowish orange, 4 cm. long, 5 to 6 cm. in diameter; sepals large, reddish, obtuse, emarginate or even 2-lobed; petals 12, style white; stigma-lobes white or rose-colored; fruit 3 cm. long, ted, the pulp yellowish or white.

Type locality: In the southern Chaco, Argentina.

Distribution: Northeastern Argentina.

Figure 136 is from a photograph of a part of the type plant, received from Dr. Spegazzini.

98. Opuntia grosseiana Weber in Gosselin, Bull. Mus. Hist. Nat. Paris 10: 391. 1904.

Described as having joints intermediate between those of *Opuntia elata* and *O. anacantha*, and resembling these species.

Type locality: In Paraguay. Distribution: Paraguay.

Introduced from Paraguay by Hermann Grosse; known to us only from the description.

Series 3a. PISCIFORMES. (Appendix following page 226).

# Series 4. TUNAE.

Bushy, ascending, depressed, or erect plants, with rather large and more or less readily detached joints, bearing acicular or subulate, often numerous, yellow or white spines. The species inhabit the West Indies, Mexico, Guatemala, and northern South America.

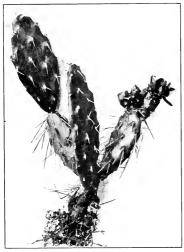




Fig. 135.-Opuntia utkilio,

Fig. 136.—Opuntia anacantha.

# KEY TO SPECIES

sints glabrous.		
Spines slender, acicular.		
Spines white.		
Joints dull.		
Joints dark green, repand; areoles somewhat elevated	. 99.	O. bella
Joints light green, not repand; areoles not elevated.		
		O. triacantha
Spines 1 to few at the areoles or often wanting; plant erect.		O. jamaicensis
Joints shining	101.t.	O. guatemalensi
Spines yellow, at least when young; plant bushy branched	102.	O. tuna
Spines stout, subulate.		
Spines white; joints relatively thick, turgid.	102d.	O. pennellii
Spines yellow, at least when young; joints relatively thin.		
Plants low, spreading, 2 dm. high or less.		
Joints repand; spines bright yellow.	103.	O. antillana

Opuntia. 111

Stems low, 10 to 12 dm. high, forming thickets; joints oblong, repand, 10 to 16 cm. long, dull dark green; arcoles 1 to 2 cm. apart, somewhat elevated, small, filled with short brown wool and glochids; leaves minute, 1.5 to 2.5 mm. long; spines white, 2 to 6, unequal, accular, the longer ones about 2 cm. long; flowers 5 cm. long, "sulphur-yellow turning to orange-red;" petals 20 to 22 mm. long; ovary deeply umbilicate; "fruit small, greenish yellow."



137.-Opuntia Bella in the foreground.

Type locality: Venticas del Dagua, Dagua Valley, western cordillera of Colombia. Distribution: Western Colombia.

The type is based upon plants collected by Mr. Henry Pittier in the State of Cauca, Colombia, in 1906, and grown ever since in Washington and New York. The species is very common in Cauca, forming with other cacti impenetrable thickets.

Figure 137 is from a photograph by Mr. Pittier of the type plant, taken near Cauca, Colombia, in 1906; figure 138 is from a photograph by the same collector, showing flowering and

fruiting joints; figure 139 represents a single joint.

100. Opuntia triacantha (Willdenow) Sweet, Hort. Brit. 172. 1826.

Cactus triacanthos Willdenow, Enum. Pl. Suppl. 34, 1813.

Stems half procumbent or clambering over rocks, sometimes even erect but always low; joints turgid, oblong, 4 to 8 cm. long, the terminal and often the second and third ones breaking off easily; spines usually 3, white but often drying yellowish, 4 cm. long or less; flowers, including the ovaries, 5 cm. long, brownish yellow to cream-colored, tinged with pink; petals obtuse; filaments and style pale green; fruit 2.5 cm. long, red, spineless.

Type locality: Not cited; cultivated in the Berlin Garden.

Distribution: Desecheo Island, Porto Rico; Lesser Antilles, St. Thomas to Guadeloupe.



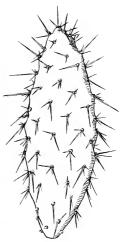


Fig. 138.—Opuntia bella. x0,75,

Fig. 139.—Opuntia bella. x0.66.

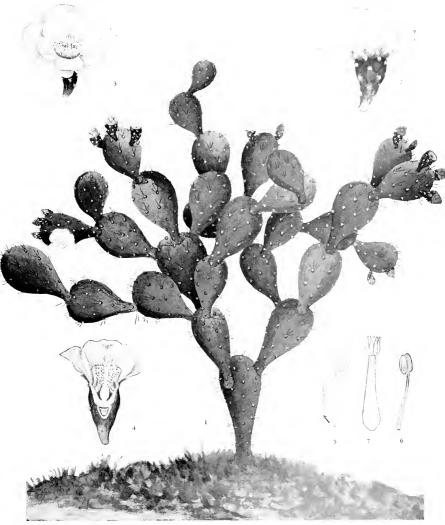
When published, the origin of these species was uncertain. It has been referred to the South American flora, but if our interpretation is correct it is a West Indian plant. It was introduced into cultivation in 1796.

This species is very common on flats or low hills and, so far as our observation goes, is never found very far inland in the Lesser Antilles.

Professor Schumann's description includes two species, one of which belongs here and one in the *Streptacanthae*, perhaps as Mr. Berger thinks to *O. amyclaea*—and a tall plant, 3.5 meters high, is now grown in Italy under that name. The Index Kewensis refers *O. triacantha* as a synonym of *O. curassavica*, which is erroneous if our interpretation of it is correct.

Plate XVIII, figure 3, represents joints of the plant collected on Antigua by Rose, Fitch, and Russell in 1913. Figure 140 is from a photograph taken on St. Christopher, British West Indies. by Paul G. Russell in 1913.





Opuntia jamaicensis.

An Opuntia collected by H. Pittier in Costa Rica and now growing in the cactus house of the U. S. Department of Agriculture has not been identified. It resembles somewhat Opuntia triacantha, but is much out of the range of that species and differs from it in some important respects. The joints are small, obovate to oblong, rounded at apex, dark green with purple bloches below the areoles, with low, broad tubercles; margin of the areole bearing short white hairs; spines usually wanting, but cultivated specimens bear a single short spine 6 to 7 mm. long from an areole.



Ftg. 140.-Opuntia triacantha.

#### t01. Opuntia jamaicensis Britton and Harris, Torreya 11: 130. 1911.

Erect, 1 meter high, with a short subcylindric trunk; branches several, ascending, joints dult green, obovate, much narrowed at base, flat, rather thin, readily detached, 7 to 13 cm. long, 5 to 7.5 cm. wide; areoles about 2.5 cm. apart; spines 1 to 5, usually only 2, acicular, unequal, white, 2.5 cm. long or less; flowers 4 cm. broad; petals 16 to 18; filaments greenish white; style white; stigma-lobes 7 or 8, creamy white; fruit pyriform, red, 3.5 to 4 cm. long; seeds 4 mm. broad.

Type locality: St. Catherine, Jamaica.

Distribution: Plain south of Spanish Town, Jamaica.

The following figures are from paintings by Miss H. A. Wood:

Plate XVIII, figure 4, shows a fruiting joint; figure 5 is of a section of the fruit; plate XIX, figure 1, shows the type plant about one-third natural size; figures 2, 3, and 4 are of the flowers; figures 5 and 6 show the stamens; figure 7 represents the style.

101a. Opuntia guatemalensis sp. nov. (See Appendix, p. 218.)

102. Opuntia tuna (Linnaeus) Miller, Gard. Dicr. ed. 8. No. 3. 1768.

Cactus turna Linnaeus, Sp. Pl. 468. 1753.
Cactus boridatis Salisbury, Prodt. 348. 1796.
Cactus boridits Haworth, Misc. Nat, 187. 1803.
Opuntia bumilis Haworth, Syn. Pl. Succ. 189. 1812.
Opuntia polyantha Haworth, Syn. Pl. Succ. 190. 1812.
Cactus polyantha Sims, Curtis's Bot. Mag. 53: pl. 2691. 1826.
Opuntia tuna humilior Salm-Dyck, Cact., Hort. Dyck. 1849. 66. 1860.
Opuntia multifora Nichoson, Dict. Gard. 2: 503. 1885.

Plants 6 to 9 dm. high or less; joints usually small, but sometimes up to 16 cm. long, obovare to oblong, light green, except above the arcoles and there brownish; leaves minute, fugacious; areoles large; spines 2 to 6, usually only 3 to 5, slightly spreading, light yellow; glochids yellow; flowers about 5 cm. broad; sepals orbicular, yellowish, with a purple stripe along the center; petals light yellow, slightly tringed with red, oblong, rounded at apex; filaments short, greenish below; style and stigma-lobes creaming the properties of the prope

colored or yellowish; ovary bright green, narrowed downward; fruit red, obovoid, about 3 cm. long; seeds 3 to 4 mm. broad.

Type locality: Jamaica.

Distribution: Southern side of Jamaica, West Indies.

Opuntia tuna is one of the old Cactus species. It was described by Linnaeus as Cactus tuna and by Philip Miller as Opuntia tuna. In the early part of the Nineteenth Century it was renamed Opuntia bunilis and also O. polyantba, and has long passed under the latter name. Opuntia tuna, however, is one of the common est Opuntia names in our botanical literature. This is due partly to the fact that the name was early transferred to Opuntia dillenii, one of the most common species, both wild and cultivated, and partly because tuna is the common



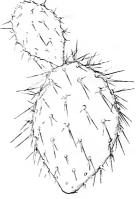


Fig. 141.—Opuntia tuna.

Fig. 142.—Opuntia tuna. x0.5.

Mexican name for opuntias, and many species have therefore been identified as O. tuna. So far as our studies indicate, this species is confined to the Jamaica lowlands.

Opuntia multiflora is referred here, although we do not know the plant. It is figured by Nicholson (Dict. Gard. Nicholson 2: f. 754); this figure is republished by Rümpler (Förster, Handb. Cact. ed. 2. f. 140), and by Knippel (Kakteen, pl. 28), both calling it Opuntia polyantha, while W. Watson (Cact. Cult. f. 79) uses the same illustration, calling it O, dillonii.

Opuntia maidenii Griffiths (Bull. Torr. Bot. Club 46: 201. 1919) described from a cultivated plant sent from Australia and grown at Chico, California, seems referable to this species.

Opuntia coccinea (Pfeiffer, Enum. Cact. 161. 1837) is given as a synonym of O. tuna. but it was never published; it is doubtless different from O. coccinea Rafinesque (Med. Fl. U. S. 2: 247. 1830), also unpublished. The following names seem to belong here, but were not formally published: Opuntia flexibilis (Pfeiffer, Enum. Cact. 161. 1837); O. tuna humilis Salm-Dyck (Cact. Hort. Dyck. 1844. 46. 1845); O. tuna laevior Salm-Dyck (Hort. Dyck. 186. 1834); and O. tuna orbiculata Salm-Dyck (Cact. Hort. Dyck. 1844. 47. 1845).

Illustrations: Loudon, Encycl. Pl. ed. 3. f. 6878, as Cactus tuna; Wiener Illustr. Gartenz. 10: f. 114, as Opuntia humilis: Blühende Kakteen 2: pl. 75; Förster, Handb. Cact. ed. 2. f. 130; Knippel, Kakteen 2: pl. 28, these three as Opuntia polyantha; Curtis's Bot. Mag. 53: pl.

2691, as Cactus polyanthos; De Candolle, Pl. Succ. Hist. 2: pl. 138<sup>fd</sup>), as Cactus opuntia polyanthos; Descourtilz, Fl. Med. Antil. pl. 513, as Cactus opuntia. Loudon, Encycl. pl. 411. f. 6880, as Cactus polyanthos; Monatsschr. Kakreenk. 6: 25, as Opuntia polyantha: Deutsche Gärt. Zeit. 7: 447, as O. humilis; Watson, Cact. Cult. ed. 3. f. 62; Cact. Journ. 2: 169; Useful Wild Plants U. S. Canada, opp. 18, 108, 174; Stand. Cycl. Hort. Bailey 4: f. 2599; Schelle, Handb. Kakteenk. 51. f. 13; Remark, Kakteenfreund 24.

Figure 141 is from a photograph of a plant collected by William Harris, near Kingston,

Jamaica, in 1913; figure 142 represents a joint of the same plant.

102a. Opuntia pennellii sp. nov. (See Appendix, p. 219.)

103. Opuntia antillana Britton and Rose, Brooklyn Bot. Gard. Mem. 1: 74. 1918.

Growing in dense clumps, often 1 meter broad, more or less prostrate; joints usually obovate, 7 to 20 cm. long, narrow and nearly terete at base; terminal joints easily breaking off; leaves conic-subulate, about 2 mm. long; areoles large, 2 to 3 cm. apart, containing soft brown wool; spines stout, terete, 3 to 6 at an areole, unequal, 1 to 6 cm. long, yellow but becoming gray to nearly white in age; glochids numerous, yellow; flowers 5 to 7 cm. long; petals broad, obtuse, yellow, turning reddish in age; fruit reddish purple, 4 cm. long.

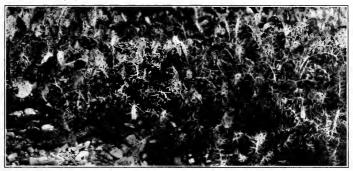


Fig. 143.-Opuntia antillana forming thickets,

Type locality: Near Basse Terre, St. Christopher, Rose, Fitch and Russell, No. 3230, February 2, 1913.

Distribution: St. Christopher, St. Croix, Tortola, St. Thomas, Porto Rico, and Hispaniola.

This species is one of the most widely distributed in the West Indies and, on some of the islands on which it' occurs, generally the most abundant. This is partly due to, the fact that the terminal joints are easily detached and maythus be widely scattered.

The question has frequently been raised in our minds whether this species may not be of hybrid origin. It has some resemblance to O. dillenii, but has much smaller joints and these very fragile. What the other parent would be is not so clear. The fragile joints would suggest O. triacantha or O. repens, but otherwise there is no close alliance with either of these. Owing to the fact that it is more common than any of these species, and is often not associated

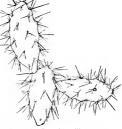


Fig. 144.-Opuntia antillana. x0.33.

with any of them, we believe it to be distinct. In the desert of Azua, Santo Domingo, this is the dominant cacrus, forming dense, impenertable thickers on the low coastal plain. In the wild state the Azua plant has the joints often bronzed or purple. On Tortola and St. Thomas it occurs with O. dillenii and O. repens, and is there called bull suckers.

Opuntia domingensis appears without description in Urban's Symbolae (8: 466. 1920). It was a manuscript name for which O. antillana was substituted.

Figure 143 is from a photograph taken by Paul G. Russell in 1913 near Azua, Santo Domingo; figure 144 represents joints of the type plant.

103.t. Opuntia caracasana Salm-Dyck. (See Appendix, p. 219.)

104. Opuntia wentiana sp. nov.

Opuntia tunoides Britton and Shafer in Boldingh, Fl. Ned, W. Ind. Eiland 300. 1913. Not O. tunoidea Gibbos

Plant erect, much branched, 1 to 2 meters high: joints obovate to elliptic, rather thin, up to 25 cm, long, usually rounded at apex, pale green, slightly glaucous: terminal joints somewhat fragile, leaves small and subulate; spines on young joints usually 3, afterwards 4 or 5, when young pale yellow but soon white: flowers small, 6 to 7 cm, long including the ovary; petals pale yellow, 3 cm, long, obovate, acute; style cream-colored; fruit small, red.

Type locality: Curação.

Distribution: Venezuela, and the neighboring islands, Margarita, Bonaire, Curação, and Aruba.

Dr. Rose found this plant repeatedly in Venezuela and writes of it as follows: Very common on only on the savannas along the coast but also on the neighboring hills along with Lemaireocereus. Cephalocereus, and other cactus genera; its more or less fragile joints, yellowish spines, bushy stature, and structure of flowers ally it with the Timae.

This species has been confused with the Jamaican *Opuntia tuna* (Linnaeus) Miller, which it resembles. Named in honor of Professor F. A. F. C. Went, distinguished Dutch botanist.

104.t. Opuntia aequatorialis sp. nov. (See Appendix, p. 219.)

105. Opuntia decumbens Salm-Dyck, Hort. Dyck. 361. 1834.

Opuntia puberula Pfeiffer, Enum. Cact. 156. 1837.

Stems low, often creeping or trailing, rarely over 4 dm. high; joints 1 to 2 dm. long, oval to oblong, covered with a short, soft pubescence; areole usually small, surrounded by a purple blotch, bearing yellow glochids and wool, the wool cobweb-like on very young joints; spines often wanting, usually solitary but sometimes numerous, slender or rather stout, 4 cm. long and yellow; flowers numerous, small, including the ovary about 4 cm. long; petals dark yellow; fruit deep purple, very juicy; seeds about 4 cm. broad.

Type locality: In Mexico.

Distribution: Guatemala and Mexico as far north as Mazatlan and Tamaulipas.

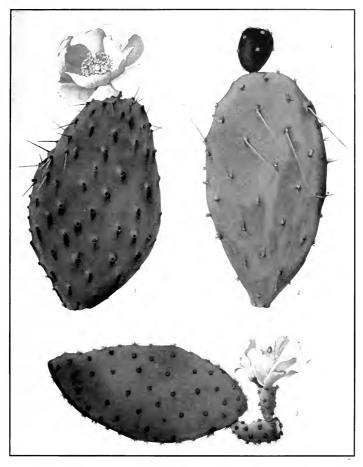
Opuntia repens Karwinsky (Salm-Dyck, Hort. Dyck. 361, 1834) and O. irrorata Martius are usually given as synonyms of this species, but as they were printed without descriptions, they should hardly be referred to synonymy.

The species has long been in cultivation, a colored illustration having been published in Curtis's Botanical Magazine in 1841. It grows luxuriously in greenhouses, flowering profusely in the spring.

We have referred here *Opuntia puberula* Pfeiffer, which seems to be different from the plant now grown in collections under that name. Pfeiffer's original description, based upon sterile plants alone, may be paraphrased as follows: Joints thick, obovate, 7.5 to 12.5 cm. long by 5 to 7.5 cm. broad, puberulent, green; areoles somewhat remote, each surrounded by a red spot, bearing in the upper part a bunch of short glochids and below 2 to 4 slender, white, divergent spines, the longer ones 8 mm. long; leaves 4 mm. long, acute, red at apex.

Labouret's description of 1853, of O. puberula Pfeiffer, is very similar to Pfeiffer's, except that he states that the spines are 9 cm. long. Both these descriptions answer very well to

BRITTON AND ROSE PLATE XX



Flowering and fruiting joints of Opuntia decumbens.
 Probable hybrid, with fruit and flower.
 (All three-quarters size.)

the plant which we know as *Opuntia decumbens*, originally described from plants growing in the Botanical Garden in Vienna.

Opuntia decumbens irrorata Forbes (Hort. Tour. Germ. 158. 1837) is doubtless the same as O. irrorata Martius (Pfeiffer, Enum. Cact. 154. 1837). These and O. decumbens longispina Salm-Dyck (Haage and Schmidt, Haupt-Verzeichnis 1912: 230. 1912) presumably belong here.

Opuntia parvispina Salm-Dyck (Cact. Hort. Dyck. 1849. 238. 1850), described from garden specimens of unknown origin, without flowers, has never been definitely placed. Schumann lists it among his unknown species, but attributes it to Mexico. Salm-Dyck states that it resembles O. puberula, but that it is glabrous.

Illustrations: Curtis's Bot. Mag. 68: pl. 3914; Blühende Kakteen 3: pl. 132; Bull. U. S. Dept. Agr. 31: pl. 7, f. 1, as Opuntia puberula: Mollers Deutsche Gart. Zeit. 25: 476. f. 9, No. 3.



Fig. 145.—Opuntia decumbens

Plate XX, figure 1, represents a flowering joint of a plant collected by Dr. MacDougal and Dr. Rose at Tehuacán, Mexico, in 1906; figure 2 represents a fruiting joint of a plant collected by William R. Maxon at El Rancho, Guatemala, in 1905. Figure 145 is from a photograph of the plant taken at Tomellín, Mexico, by Dr. MacDougal in 1906.

# 106. Opuntia depressa Rose, Smiths. Misc. Coll. 50: 517. 1908.

Low, creeping or spreading plant, sometimes 60 cm. high and forming a patch 3 to 4 meters in diameter; joints of a dark glossy yellowish green color, pubescent, when young, obovate, 20 cm long, usually with 1 long, sometimes curved spine at each areole; sometimes with 1 to 3 shorter ones, all yellowish; old joints oblong, 30 cm. long, beating 4 to 6 spines at each areole; flowers red; fruit small, globular, with large clusters of brown glochids, when immature with a broad, deep umbilitious.

Type locality: Near Tehuacán, Mexico.

Distribution: Southern Mexico.

This plant is very common about Tehuacán, growing with species of Agave. Beaucarnea, and Echinocactus.

Figure 146 is from a photograph taken by Dr. MacDougal of the type plant.



Fig. 146.—Opuntia depressa, in the foreground,

# Series 5. BASILARES.

We recognize eight species as forming this series. They are low or bushy, much branched plants, with flat, thin, broad joints, the areoles small, usually numerous and close together.

### KEY TO SPECIES

Joints papillose, not pubescent, Fruit juicy, red. Fruit dry or nearly dry Joints mostly manifestly pubescent.			 107. ( 108. (	O. lubrica O. treleasei
Spines none or few. Flowers red			 109. (	O. basilaris
Joints bright green. Glochids long Glochids short Joints grayish green			110. 6 111. 6 112. 6	O. microdasys O. macrocalyx O. rufida
Spines very numerous.  Areoles close together  Areoles distant			113. <i>(</i>	O. pycnantha O. comonduensis

# 107. Opuntia lubrica Griffiths, Rep. Mo. Bot. Gard. 21: 169. 1910.

"A low ascending, spreading species very similar in habit to O. microdays, frequently 4½ dm. high and when well developed 10 dm. or more in diameter; joints sub-circular to obovate, about 15 by 20 cm., or in case of last joints of previous year about 12 by 15 cm., bright, glossy, leaf-green, very evidently papillate but scarcely pubescent under a lens; leaves subulate, cuspidate-pointed, 6 to 9 mm. in length; areceles 15 to 22 mm. apart, 4 to 6 mm. in diameter, sub-circular, prominent; spicules prominent, 4 to 5 mm. in length, erect, bushy, in crescentic tufts in upper portion of areoles, becoming much more numerous in age, and at 2 to 4 years completely filling the areole, and, like O. mphda and some other species, becoming very abundant and conspicuous by proliferation of areolar tissue into short randor of columnar structures; spines exceedingly variable, sometimes nearly absent, again quite abundant and irregularly distributed, none to many, mostly 1 to 3. becoming more numerous with age and in scattering areoles to as high as 16, mostly about 12 mm. long, but sometimes 2½ cm., yellowish, translucent, bonelike, sometimes darker at base; fruits decidedly acid, light red without with yellowish green rind and red pulp; seed small, thin shelled, about 3 mm. in diameter."

Type locality: Near Alonzo, Mexico.

Distribution: Known only from the type locality.

Our examination of a painting of this plant in the collection made by Dr. Griffiths showed it to have great similarity to *Opuntia rufida*.

Illustration: Rep. Mo. Bot. Gard. 21: pl. 23.

Figure 147 is copied from the illustration above cited.

108. Opuntia treleasei Coulter, Contr. U. S. Nat. Herb. 3: 434, 1896.

Opuntia basilaris treleasei Toumey, Cycl. Amer, Hort. Bailey 3: 1147. 1901.

Opuntia treleasei kernii Griffiths and Hare, N. Mex. Agr. Exp. Sta. Bull. 60: 81, 1906.

Low, sometimes 3 dm. high, spreading at base, some of the branches of 2 to 4 erect joints; joints obovate, 15 cm. long or more, fleshy, pale bluish green, glabrous, terete at base; areoles numerous, filled with dirty yellow glochids, usually without spines, sometimes quite spiny; flowers rose-colored; fruit dry, subglobose, with large areoles filled with glochids and sometimes bearing spines; seeds large, turgid, 7 cm. in diameter.

Type locality: Caliente, in the Tehachapi Mountains, California.

Distribution: Southern California.

Figure 148 is from a photograph of the plant growing on the mesa southeast of Bakersfield, California, taken by Dr. MacDougal in 1913.

 Opuntia basilaris Englemann and Bigelow, Proc. Amer. Acad. 3: 298. 1856.

Opuntia hasilaris ramosa Parish, Bull. Torr. Club 19: 92. 1892. Opuntia intricata Griffiths, Proc. Biol. Soc. Washington 29: 10. 1916.



Fig. 147.—Opuntia lubrica.

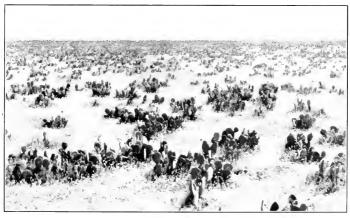


Fig. 148.—Opuntia treleasei, Southern California.

Stems low, growing in clumps, either prostrate or erect, sometimes 12 dm. high; joints broadly obovate, 8 to 20 cm. long, slightly pubescent or glabrous, usually highly colored; leaves 2 to 5 mm. long, subulate; areoles numerous, filled with white to brown wool and brownish glochids; spines none or rarely a few at upper areoles; flowers large, 6 to 8 cm. long, deep purple or sometimes white; filaments purple; fruit dry, globular to obovoid; seeds large, thick, 6 to 10 mm. broad.

Type locality: From Cacrus Pass down the valley of the Bill Williams River.

Distribution: Northern Sonora, western Arizona, southern California, Nevada, and southern Utah.

This is a variable species as to habit, size, pubescence, and color of flowers. The variety ramosa described by Mr. Parish is more erect than the ordinary form and glabrous. It has large, handsome flowers, and is a splendid plant for outdoor cultivation where the climate is suitable, but does not live long in greenhouses. It is called beaver-tail in Arizona.

Opuntia dorfii is advertised by Haage and Schmidt (Monatsschr. Kakteenk. 29: September). We have had a cutting which we would refer to one of the forms of O. basilaris.

Opuntia humistrata Griffiths (Bull. Torr. Club 43: 83. 1916) we refer here from the description; it is said to differ from O. basilaris "by its much smaller as well as different shaped joints"; it was found in the San Bernardino

Mountains, northern California, within the range of O. basilaris.

The following varieties are listed, but have not been described: albiflora, coerulea, nana, and pfersdorffii.

Opuntia basilaris cordata is a garden plant briefly described by F. Forbes (Monatsschr. Kakteenk. 16: 46. 1906), of which we have seen no specimens.

Illustrations: Cact. Journ. 1: 167; Dict. Gard. Nicholson 2: f. 750; Förster, Handb. Cacr. ed. 2. f. 129; Pac. R. Rep. 4: pl. 13, f. 1 to 5; pl. 23, f. 14; Rümpler, Sukkulenten f. 123; W. Watson, Cact. Cult. f. 76; Cact. Journ. 1: pl. October, as Opuntia basilaris var. cristata and var. nevadensis; Alverson, Cact. Cat. front-

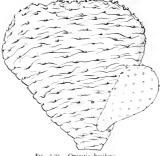


Fig. 149.—Opuntia basilaris.

ispiece, as Opuntia basilaris albiflora; Cact. Journ. 2: 163, as Opuntia basilaris albiflora; Cact. Journ. 1: pl. for October; Möllers Deutsche Gärt. Zeit. 25: 476. f. 9, No. 13, as O. basilaris cordata; Möllers Deursche Gärt. Zeit. 25: f. 9, No. 9, as O. basilaris minima; Watson, Cact. Cult. ed. 3. f. 53, Deutsche Gärt. Zeit. 7: 312; Remark, Kakteenfreund 23; Monatsschr. Kakteenk. 7: 125; Stand. Cycl. Hort. Bailey 4: f. 2597; Gartenflora 31: 280; Schelle, Handb. Kakteenk. 47. f. 10.

Figure 149 is copied from Pac. R. Rep. 4: pl. 13, f. 1, an illustration cited above.

Opuntia brachyclada Griffiths (Proc. Biol. Soc. Washington 27: 25. 1914) is an anomalous plant with some of the joints terete and others somewhat flattened. It has been suggested that it is a hybrid between a cylindric and a flat-jointed species; but, so far as we know, natural hybrids do nor occur between species of these subgenera. It is more likely to be an anomalous form of Opuntia basilaris, a form of which is known in the same mountains where it was found

# 110. Opuntia microdasys (Lehmann) Pfeiffer, Enum. Cact. 154. 1837.

Cactus microdavys Lehmann, Ind. Sem. Hamburg. 16. 1827 Opuntia pulvinata De Candolle, Mém. Mus. Hist. Nat. Paris 17: 119. 1828. Opuntia microdasys minor Salm-Dyck, Hort. Dyck. 186. 1834.

Opuntia microdasys laevior Salm-Dyck, Cact. Hort. Dyck. 1849. 241. 1850.

Often low and creeping but sometimes nearly erect and 4 to 6 dm. high; joints oblong to orbicular, 10 to 15 cm. long, soft-velvety, usually pale green, spineless; areoles conspicuous, closely set, filled with numerous yellow or brown glochids; flowers usually produced in abundance, 4 to 5 cm. long. pure yellow or tinged with red; sepals acuminate; petals broad, retuse; filaments and style white; stigmalobes 6 to 8, green; fruit dark red, juicy, nearly globular; seeds small, 2 to 3 mm. broad.

Type locality: In Mexico, but originally stated by Lehmann as coming from Brazil.

Distribution: Northern Mexico.

In spite of its troublesome glochids, which easily become detached, this species has long been a greenhouse favorite. No cactus collection, however small, lacks one or more pots of this species, which rarely grows large in cultivation.

Opuntia microdasys is usually credited to Lehmann, but he apparently published it as Cactus microdasys, and this is the way it is cired in the Index Kewensis. Lehmann soon republished this species (Nov. Act. Nat. Cur. 16: 317) where it appears as Cactus (Opuntia) microdasys. The first use of the name of Opuntia microdasys was by Salm-Dyck (Hort. Dyck. 186) in 1834, but was without description or synonymy. Pfeiffer in 1837, however, republishes

Lehmann's description under *Opunita* and is therefore cited as the author of the binomial. Here it is first credited to Mexico, although Lehmann stated definitely that it comes from Brazil; this he does also with regard to *Opunita unicata* and *Cactus bradypus*, both Mexican species, while *Cactus linkii and C. ottonis*, both

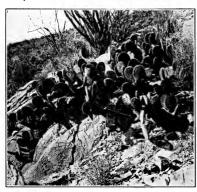


Fig. 150.—Opuntia microdasys.

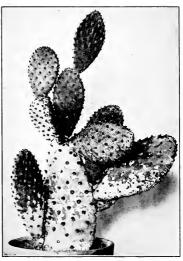


Fig. 151,-Opuntia, probable hybrid.

credited to Mexico, are known only from South America. If this *Opuntia* really came originally from Brazil, it might very well be the same as *Opuntia inanuoena*.

As shown above (p. 116), Opunia puberula is referred to O. decumbens. The O. puberula of our gardens, however, is quite a different plant, and in all probability is of hybrid origin. It is almost identical with a hybrid between O. microdasys and O. cantabrigiensis which Dr. Rose collected in Hidalgo, Mexico, in 1905, and which is now grown in the collection in Washington and in the New York Botanical Garden.

Illustrations: Agr. Gaz. N. S. W. 25: pl. opp. p. 138; p. 138; Gard. Chron. III. 30: f. 76; Rep. Mo. Bot. Gard. 19: pl. 28, in part; 20: pl. 12, in part; Safford, Ann. Rep. Smiths. Inst. 1908: pl. 10, f. 4; U. S. Dept. Agr. Bur. Pl. Ind. Bull. 262: pl. 5, f. 2; Möllers Deutsche Gärt. Zeit. 25: 488. f. 2, No. 4, as Opuntia microdasys monstrosa; Garden 13: 107. as O. pubescems; Schelle, Handb. Kakteenk. 47. f. 9; Möllers Deutsche Gärt. Zeit. 25: 476. f. 9, No. 16;

<sup>\*</sup>This illustration is very poor and the identification is based largely upon the description.

Karsten and Schenck, Vegetationsbilder 2: pl. 22, B.

Plate XXII, figure 1, represents joints of the plant grown in a garden at Riverside, California, received by Dr. Rose in 1905. Figure 150 is from a photograph taken by Professor F. E. Lloyd in Zacatecas, Mexico, in 1908.

Plate XX, figure 3, shows a flowering joint of a plant sent to the New York Botanical Garden by M. Simon, of St. Ouen, Paris, France, in 1901, as *Opuntia puberula*. Figure 151 is from a photograph of the plant sent from La Mortola, Italy, to the same institution in 1912, as *Opuntia puberula*.

# 111. Opuntia macrocalyx Griffiths, Rep. Mo. Bot. Gard. 19: 268. 1908.

"A profusely, divaricately branched, ascending or erect, spreading plant, 9 to 10 dm. high and about the same in diameter; joints long-obovate, variable but commonly 9 by 22 cm. for last year's growth, gray green, pubescent, velvey to the touch; areoles subcircular, usually 2 to 3 mm. in diameter, very close to 1 cm. apart, slightly sunken; wool tawny, prominent, as long as spicules and occupying lower half of areole; spicules reddish brown, about 1 mm. long, occupying upper half of areole, easily separable and causing fully as much annoyance in handling as those of 0. microdazy, in age often appearing dirty yellow in sim but distinctly reddish brown when removed; strictly spincless; flowers yellow, green outwardly, the leaves on ovary very long subulate and changing gradually into the spals which are very long subulate, delicately pointed, loosely arranged or often half recurved at apex, giving to the bud a tather ragged appearance; fruir red but both pulp and rind greenish, long obovate to cylindrical, about 2 by 7 cm., with but few rather small seeds, about 3 mm. in diameter."

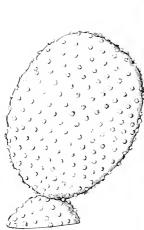




Fig. 152.—Opuntia macrocalyx. x 0.75.

Fig. 153.-Opuntia rufida.

Type locality: In cultivation at Riverside, California.

Distribution: Known only from cultivated plants; perhaps also from Coahuila, Mexico. Illustration: Rep. Mo. Bot. Gard. 19; pl. 28, in part.

Figure 152 is drawn from a joint of the plant collected by Edward Palmer at Saltillo, Mexico, in 1904.

112. Opuntia rufida Engelmann, Proc. Amer. Acad. 3: 298. 1856.

Opuntia microdasys rufida Schumann, Gesamtb. Kakteen 706. 1898.

More or less erect, 2 to 15 dm. high, with a somewhat definite trunk; joints nearly orbicular, 6 to 25 cm. in diameter, thickish, velvety-tomentose, dull grayish green; leaves subulate, caducous, 4 to 6 cm. long, green with reddish tips; areoles large, filled with numerous brown glochids; flowers yellow to orange; 4 to 5 cm. long including the ovary; petals obovate, 2 to 2.5 cm. long; filaments greenish white, short, 1 cm. long; style 1.5 cm. long, thick, bulbous just above the base; stigma-lobes 5, deep green; ovary globular, 1.5 cm. in diameter, umbilicate, with large areoles; fruit, according to field observation of Dr. Griffiths, bright red.

Type locality: About Presidio del Norte, on the Rio Grande.

Distribution: Texas and northern Mexico.

This species seems much less common than *O. microdasys*, with which it is often confused. The joints are gray or bluish green, and the glochids are brown. It does fairly well under greenhouse conditions.

Illustration: Rep. Mo. Bot. Gard. 20: pl. 3; Carnegie Inst. Wash. 269: pl. 11, f. 94.

Figure 153 is from a photograph of a plant brought from Mexico to the New York Botanical Garden in 1896 by Mrs. N. L. Britton.

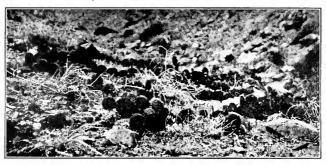


Fig. 154.—Opuntia pycnantha. Along the coastal plain of Lower California.

113. Opuntia pycnantha Engelmann in Coulter, Contr. U. S. Nat. Herb. 3: 423. 1896.

Opuntia pyenantha marganitana Coulter, Contr. U. S. Nat. Herb. 3: 424. 1896.

Often low and creeping, but sometimes forming a clump 2 dm. high; joints oblong to orbicular, often 20 cm. long, puberulent or papillose, usually nearly hidden by the thick mass of spines; areoles large and closely set, the upper part filled with yellow or brown glochids, and the lower part with 8 to 12 yellow or brown reflexed spines 2 to 3 cm. long; leaves and flowers unknown; fruit 4 cm. long, very spiny; seeds 2 cm. broad, very thick.

Type locality: Magdalena Bay, Lower California.

Distribution: Southern Lower California.

Coulter's variety margaritana is known only from Margarita Island, while the species proper is known only from an adjacent island, Magdalena. They differ only in the color of their spines and glochids. Both have been in cultivation in New York City and Washington, but are not well suited for indoor plants.

This species grows in one of the driest parts of Lower California on islands where there is no surface water and where there is no rain sometimes for five or six years.

Figure 154 is from a photograph taken by Dr. Rose near Santa Maria Bay, Magdalena Island, Lower California, in 1911.

Opuntia pycnacantha (Just's Jahresb. 242: 380. 18) seems to have been a misspelling for O. pycnantha.

114. Opuntia comonduensis (Coulter) Britton and Rose, Smiths. Misc. Coll. 50: 519. 1908.

Opuntia angustata comonduensis Coulter, Contr. U. S. Nat. Herb. 3: 425. 1896.

Low, spreading plants, sometimes 2 dm. high and forming broad clumps; joints obovate to orbicular, 12 to 15 cm. long, softly pubescent; areoles large, filled with brown wool and yellow glochids; lower areoles spineless, the upper ones bearing 1 or 2, rarely 3, or on old stems as many as 10, slender spines. 3 to 5 cm. long or longer, yellow; flowers, including ovary, 6 cm. long, yellow; fruit purple, 4 cm. long, spineless; seeds 4 to 4.5 mm. broad, thick.

Type locality: Comondu, Lower California.

Distribution: Southern Lower California.

As was pointed out by Mrs. K. Brandegee, this plant is not closely related to Opuntia angustata.



Fig. 155.—Opuntia comonduensis,

This species has long been known only from herbarium specimens collected by Mr. Brandegee in 1889. In 1911 Dr. Rose collected considerable material both near the town of San José and on Carmen Island which has since been in cultivation in the New York Botanical Garden and in Washington. The above description is based largely on this collection.

This species sometimes grows with *O. tapona*, in fact being confused in the original material; except for its pubescent joints, they are not readily distinguished.

Figure 155 is from a photograph by Mr. T. W. Smillie of a plant collected by Mr. E. W. Nelson and Mr. E. A. Goldman in Lower California in 1906.

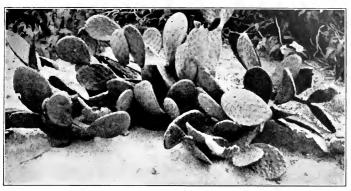


Fig. 156.—Opuntia inamoena, A single plant. Photograph by P. H. Dorsett.

### Series 6. INAMOENAE.

A single, prostrate or depressed, usually spineless, light-green Brazilian species.

Opuntia inamoena Schumann in Martius, Fl. Bras. 42: 306. 1890.
 Opuntia quipa Weber, Dict. Hort. Bois 894. 1898.

Usually low, often prostrate, forming clumps 2 to 10 dm. broad, or sometimes in sheltered situations 6 cm. high and forming dense, extensive thickets; roots fibrous; joints bluish green, when young bright green, orbicular to oblong, 8 to 16 cm. long, usually quite thick, sometimes 3 cm. thick, usually quite spincless; leaves minute, 2 mm. long; areoles small, when young filled with numerous yellowish-brown glochids; glochids unequal, spreading, easily becoming detached; flowers small, brick-red; petals spreading; flaments orange; style yellow; stigma-lobes pale green; fruit globular, yellowish, 2:5 to 3 cm. in diameter.

Type Locality: Schumann cites Rio de Janeiro in original description.

Distribution: Pernambuco, Bahia, and Minas Geraes, Brazil. This plant is known as quipa in Bahia, Brazil.

Fig. 157.—Opuntia inamoena.

This species is very common in all the dry part of Bahia and, although abundant and mostly spineless, is avoided by all kinds of grazing animals, even when the country is devoid of other suitable forage. It has been suggested that the plant may be bitter, or that the glochids are troublesome; the glochids, however, are usually wanting on old joints.

The plant rarely develops acicular spines up to 3 cm. long on some joints, as shown by specimens collected by Dr. Rose and Mr. Russell near Machado Portello, Brazil.

Figure 156 is from a photograph taken by Mr. P. H. Dorsett near Joazeiro, Brazil, in 1914; figure 157 is from a plant collected by Dr. Rose near Machado Portello, Bahia, Brazil, in 1915.

#### Series 7. TORTISPINAE.

Prostrate or spreading plants rarely erect, with mostly rather small, persistent, scarcely tuberculate, orbicular or oval joints, and large flowers; natives of the eastern, central, and southern United States.

Plate 21 represents a group of hardy cacti, chiefly species of this series, at the New York Botanical Garden.

## KEY TO SPECIES

Spines none or only 1 or 2 at an areole.	
Joints bluish green; at least when young; roots tuber-like.	
Fruit clavate; joints thin.	
Fruit about 4.5 cm. long	6. O. allairei
Fruit 5 to 7 cm. long	a. O. lata
Fruir obovoid; joints turgid	<ol> <li>O. polladii</li> </ol>
Joints green; roots not tuberous.	
Flowers 8 cm, broad or less.	
Joints orbicular or little longer than wide 11	8. O. opuntia
Joints oblong, much longer than wide 11	9. O. macrarthra
Flowers 10 to 12 cm. broad	<ol><li>O. grandiflora</li></ol>
Spines mostly 2 or more ar an areole.	
Ovary obconic, 2 ro 4 cm. long.	
Roots tuberous.	
Joints repand; plant subcrect	1. O. austrina
Joints scarcely repand; plants nearly prostrate	<ol><li>O. macrorhiza</li></ol>
Roots not tuberous.	
Flowers and fruit small 12	<ol> <li>O. plumbes</li> </ol>
Flowers and fruit large.	
Spines white to light brown, slender.	
Seeds acute-margined	4. O. tortispina
Seeds obtuse-margined.	
Fruit large, 4 to 5 cm. long; spines light colored. 12	<ol><li>O. stenochila</li></ol>
Fruit small, 2 to 3 cm. long; spines brown 12	6. O. delicata
Spines dark brown, stout	7. O. fuscoatra
Ovary narrowly subcylindric, 5 to 6 cm. long	a O. macateei



Fig. 158.—Opuntia allairei. x 0.66.

### 116. Opuntia allairei Griffiths, Rep. Mo. Bot. Gard. 20: 83. 1909.

A low, spreading, tuberous-rooted, prostrate plant, with some of the joints ascending; joints bluish green, obovate, usually 10 to 15 cm. long, originally described as even longer, with or without spines; spines, if present, 1 to 3, yellowish brown, 2.5 cm. long or less, slender but a little flattened; glochids numerous, especially abundant at very old areoles, yellow; leaves 6 to 8 mm. long; flowers 6 to 7 cm. broad, yellow with a red center; fruit 4 to 5 cm. long, dark red.

Type locality: Mouth of Trinity River, Texas.

Distribution: Southern Texas and western Louisiana.

This species is perhaps nearest *O. macror-biza*, but differs in the usual absence of spines and in differently colored joints.

Illustrations: Rep. Mo. Bot. Gard. 20: pl. 2, f. 2; pl. 5; pl. 12, in part

Figure 158 is copied from the second illustration above cited.

116a. Opuntia Iata Small, Journ. N. Y. Bot. Gard. 20: 26. 1919. (See Appendix, p. 220.)

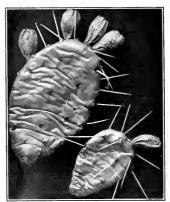


Fig. 159.—Opuntia pollardii. x 0.4.

# 117. Opuntia pollardii Britton and Rose, Smiths. Misc. Coll. 50: 523. 1908.

Prostrate, tuberiferous, related to *Opuntia opuntia*; young joints bluish green, glaucous, 5 to 16 cm. long, 1 to 2 cm. thick; areoles 1.5 to 3 cm. apart, bearing numerous yellow glochids 2 to 3 cm.

BRITTON AND ROSE



Group of hardy prickly pears, mostly Opinitia tortripina, in the herbaceous grounds of the New York Botanical Garden

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long, those toward the top of the joint each with a single stout, stiff, pungent spine 2.5 to + cm. long; fruit short-obovoid, 2.5 cm. long, 1.5 cm. thick, with a few areoles bearing tuffs of brownish wool but no spines and but few glochids; flowers yellow, 6 to 8 cm. broad; sepals deltoid to rhombic; fruit 2.5 to + cm. long; seeds 4 to 6 mm. wide, much thicker than those of *Opunita*.

Type locality: Biloxi, Harrison County, Mississippi.

Distribution: Coastal plain, Church Island, North Carolina, to northern Florida, Alabama, and Mississippi.

Figure 159 is from a photograph of fruiting joints collected by A. H. Howell on Petit Bois Island, Alabama.

118. Opuntia opuntia (Linnaeus) Karsten, Deutsch. Fl. 888. 1882.

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Cattus opputita Linnaeus, Sp. Pl. 468, 1795.
Cattus opputita unan De Candolle, Pl. Succ. Hist, 2: pl. 138. [A], 1799.
Cattus opputita unan De Candolle, Pl. Succ. Hist, 2: pl. 138. [A], 1799.
Cattus opputita unan De Candolle, Pl. Succ. Hist, 2: pl. 138. [A], 1799.
Cattus indipitason Rafinesque, Ann. Nat. 15, 1820.
Opputita unagaris media* Salm-Dyck, Observ. Bot. 3: 9, 1822.
Opputita unagaris media* Salm-Dyck, Observ. Bot. 3: 9, 1822.
Opputita bamitjata Rafinesque, Mell. Bot. Seringe 216. 1830.
Opputita catepitota Rafinesque, Bull. Bot. Seringe 216. 1830.
Opputita catepitota Rafinesque, Bull. Bot. Seringe 216. 1830.
Opputita anan Visiani, Fl. Dalmatica 3: 143. 1852.
Opputita unan Visiani, Fl. Dalmatica 3: 143. 1852.
Opputita rafinesque* impresenta Engelmann. Proc. Amer. Acad. 3: 295. 1856.
Opputita visioneque* impresenta and bigelow, Fac. R. Rep. 4: 55, 1856.
Opputita visioneque* impresenta Catter and bigelow, Fac. R. Rep. 4: 55, 1856.
Opputita visioneque* intervisione impresentatione in Fischer, Handb. Cac. ed. 2: 922, 1885.
Opputita mesaculiba parts Coulter, Contr. U. S. Nat. Herb. 5: 429, 1896.
Opputita mesaculiba parts Coulter, Contr. U. S. Nat. Herb. 5: 429, 1896.
Opputita mesaculiba parts Coulter, Contr. U. S. Nat. Herb. 5: 429, 1896.
Opputita bimiljus miscosperma Coulter, Contr. U. S. Nat. Herb. 5: 429, 1896.
Opputita bimiljus miscosperma Heller, Cat. N. Amer. Pl. ed. 2. 8, 1900.
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Low, spreading plants, sometimes ascending, with fibrous roots; joints orbicular to oblong, 3 to 13 cm. long, rarely longer, thick, dark green; areoles usually far apart; leaves subulate, appressed or spreading, 4 to 8 mm. long, early decidouos; spines often wanting, when present usually one from an areole, rarely two, 5 cm. long or less, brownish or sometimes nearly white, but on seedlings 5 to 12; glochids numerous, yellow to dark brown; flowers usually bright yellow, sometimes with reddish centers, 5 to 8.5 cm. broad; petals 8 to 10, widely spreading; filaments yellow; stigma-lobes white; fruit obovoid to oblong, red, juicy, 2.5 to 5 cm. long, edible; seeds 4 to 5 mm. broad.

Type locality: In Virginia.

Distribution: Sandy and rocky places from Massachusetts to Virginia, the mountains of Georgia and central Alabama extending north into southern Ontario, Canada (Point Pelee), west in isolated colonies to northern Illinois, eastern Missouri and Tennessee, and long established in the mountains of northern Italy and Switzerland.

Linnaeus undoubtedly had two species in his Cactus opuntia, one being the low Virginia plant commonly known as O. vulgaris, and the other a tall, branching plant figured by Bauhin (p. 154). Upon Bauhin's illustration Miller based his Opuntia vulgaris, a name which was afterwards transferred to the low, procumbent plant of the eastern United States. For this reason Burkill (Rec. Bot. Surv. India 4: 288. 1911) would displace the name O. vulgaris and take up the name O. nama. We are quite in agreement with him as to the O. vulgaris Miller, but we retain for the low plant the specific name opuntia Linnaeus. The tall species is O. monacamba, which we now call O. vulgaris, as suggested by Burkill.

It is to be noted that the southern Atlantic coast specimens of *Opuntia opuntia* have yellow or greenish-yellow glochids, while those in its northern and western range have brown glochids. Its southwestern limit is uncertain. It probably does not extend to Texas, although two varieties have been reported from there; these we are disposed to treat as species under the names *Opuntia macrorbiza* and *O. grandiflora*. It is reported from eastern Kansas, but the plants found there are not like those found in Illinois and Indiana, having more spines

<sup>\*</sup> Opuntia vulgaris minor (Labouret, Monogr. Cact. 476. 1853) was doubtless intended for this name † Sometimes spelled rafinesquiana.

and a glaucous bloom, and are tuberous-rooted, and these are referred by us to *O. macro-rhiza*. The published western varieties of *O. humifusa* are specifically distinct; we have referred them to *O. tortispina*.

Some of the joints  $^{\prime}$  this plant elongate under shade conditions, reaching at least 2.5 dm. in length and not more than 5 cm. in width.

Opuntia arkansana (Hirscht, Monatsschr. Kakteenk. 8: 115. 1898) has not been formally described. The name should doubtless be referred here.

Opuntia prostrata Monville and Lemaire (Förster, Handb. Cact. 478. 1846) was given only as a synonym of O. intermedia, while O. intermedia prostrata Salm- Dyck (Cact. Hort. Dyck 1849. 69, 1850) was based on O. prostrata.

O. rafinesquei parra Haage and Schmidt (Verzeichnis Blumenzwiebeln 1915: 29. 1915) is a new name for O. mesacantha parra Coulter.

Under Opuntia vulgaris Michaele Gandoger in his Flora Europea (9: 145. 1886) has proposed the following new binomials: O. recedens, O. morisii, O. cycloidea, O. inaequalis, O. ligustica, and O. mediterranea. The following varieties cited under O. humifusa are in the trade: cymochila, greenei, macrorhiza, oplocarpa and stenochila (Stand. Cycl. Hort. Bailey 4: 2363. 1916.)

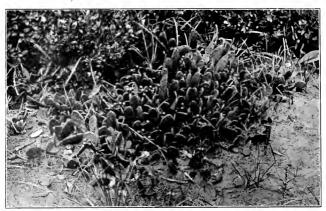
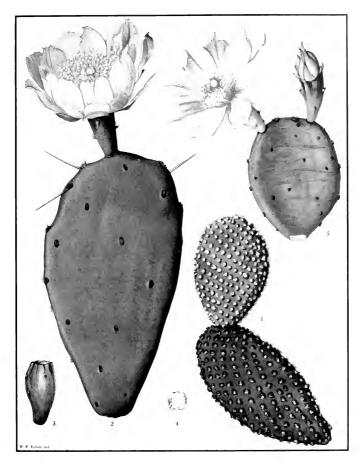


Fig. 160.—Opuntia opuntia in its natural surroundings on Staten Island, New York.

Illustrations: Illustr. Fl. 2: f. 2527; ed. 2. 2: f. 2986; Curtis's Bot. Mag. 50: pl. 2393; Loudon, Encycl. Pl. ed. 3. f. 6884, the last two as Cactus opuntia; De Candolle, Pl. Succ. Hist. 2: pl. 138 [A]; DeTussac, Fl. Antill. 2: pl. 30, the last two as Cactus opuntia mana. Dept. Agr. N. S. W. Misc. Publ. 253: pl. [1], f. 2; Engler and Prantl, Pflanzenfam. 36s: f. 57, G. Förster, Handb. Cact. ed. 2. f. 12; Pac. R. Rep. 4: pl. 10, f. 1, 2, 4: pl. 23, f. 13; Schumann, Gesamtb. Kakteen Nachtr. f. 1, all as Opuntia rulgaris. Standard Cycl. Hort. Bailey 4: f. 2602, in part as Opuntia humifusa. Amer. Entom. Bot. 2: f. 160; Amer. Garden 11: 462; Curtis's Bot. Mag. 115: pl. 7041; Dict. Gard. Nicholson 2: f. 756; Fl. Serr. 22: pl. 2328; Förster, Handb. Cact. ed. 2. f. 2; Gard. Mag. 4: 280; Gartenflora 24: 218; Lemaire, Cact. f. 9; Mechan's Monthly 2: pl. 6; 10: 121; Pac. R. Rep. 4: pl. 10, f. 4, 5; pl. 23, f. 7, 8; Rümpler, Sukkulenten f. 125; W. Watson, Cact. Cult. f. 84, all as Opuntia rafinesquei; Pac. R. Rep. 4: pl. 11, f. 1, as Opuntia rafinesquei minor; Förster, Handb. Cact. ed. 2. f.

PLATE XXII BRITTON AND ROSE



- Joints of Opuntia microdasys.
   Flowering joint of Opuntia macrarthra.
   Fruit of Opuntia macrarthra.
   Keed of same.
   Flowering joint of Opuntia opuntia.
   (All three-fourths size except 4.)

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126, as Opuntia rafinesquei arkansana: Monatsschr. Kakteenk. 14: 124, as Opuntia vulgaris nana; Miller, Fig. Pl. Gard. Dict. 2: pl. 191, as Opuntia folio minori, etc., Dict. Hort. Bois f. 638; Rev. Hort. 40: f. 10, 11; 66: f. 59, all as Opuntia rafinesquiana. Wiener Illustr. Gartenz. 10: f. 112, as Opuntia rafinesquiana arkansana.

Plate XXII, figure 5, represents a flowering joint of the plant which grows naturally on schistose rocks in the New York Botanical Guden. Figure 160 is from a photograph of the plant growing on sand dunes at Crooke's Point, Staten Island, New York, taken by Howard H. Cleaves in 1914.

#### 119. Opuntia macrarthra Gibbes, Proc. Elliott Soc. Nat. Hist. 1: 273. 1859.

Stems prostrate or ascending; joints narrowly oblong to obovate, 12 to 35 cm. long, thick, pale green, somewhat shining; leaves subulate, 10 mm. long, green, sometimes with purplish tips; areoles large, 2 to 3 cm. apart, filled with brown wool; spines wanting, or sometimes 1, up to 2.5 cm. long; glochids when present yellow; flowers not known; truit narrowly obovoid, red, fleshy, 4 to 6 cm. long.

Type locality: Near Charleston, South Carolina.

Distribution: Coast of South Carolina.

This species, long overlooked, has recently been collected by Dr. J. K. Small in the vicinity of the type locality.

This is doubtless one of the species to which Elliott called attention and which he said he expected to publish, but never did.\* The original description long remained unnoticed in the Proceedings of the Elliott Society of Natural History; it is as follows:

"The second, which we will call Opuntia macrarthra, falls under the same section with the preceding, and seems to be near Opuntia angustata, of Engelmann, from the west of the Rio Grande: a prostrate species, joints from ten to fifteen inches long and three inches wide, one-third of an inch thick; no spines, fruit two and a half inches long, stender, clavate."

Plate XV, figure 3, represents a fruiting joint collected by Dr. Small on James Island, South Carolina, in 1916; plate XXII, figure 3, represents a flowering joint of the plant collected by Dr. Small on the Isle of Palms, near Charleston, South Carolina, in 1916; figure 3 shows a fruit of the same plant and figure 4 a seed, enlarged.

120 Opuntia grandiflora Engelmann, Proc. Amer. Acad. 3: 295 1856.



Fi6s. 161, 162.—Opuntia grandiflora.

Opuntia safinesques grandiflora Engelmann, Pac. R. Rep. 4: 55. 1856.

Opuntia mesacantha grandiflora Coulter, Contr. U. S. Nat. Herb. 3: 429. 1896.

Low, with somewhat ascending branches; joints 12.5 to 15 cm. long; areoles 2.5 cm. apart; spines usually wanting; flowers very large. 11 to 12.5 cm. broad, yellow with a red center; petals broad; fruit elongated, 6 cm. long.

Type locality: On the Brazos, Texas.

Distribution: Eastern Texas.

Although Dr. Engelmann formally described this as a species, he introduced it as "probably only a southern variety of O. rafinesquei." A little later he actually used the name as a variety. The position of the plant is still uncertain; if specimens collected by Mr. Wm. R. Maxon at Victoria, Texas, and by Mr. C. V. Piper at Dallas, Texas, belong here, as they appear to, we believe it to be a distinct species.

Illustrations: Pac. R. Rep. 4: pl. 11, f. 2, 3, as Opuntia rafinesquei grandiflora.

Figures 161 and 162 are copied from the illustrations above cited.

<sup>\*</sup> Cactus opuntia. "It is probable that there are now three distinct species on the sea coast of the Southern States covered under this name." Filiott, A Sketch of the Berany of South Carolina and Georgia. 1: 537.

#### 121. Opuntia austrina Small, Fl. Southeast, U. S. 816. 1903.

Opuntia youngii C. Z. Nelson, Chicago Examiner. June 13, 1915.

Roots fusiform or tuberous, resembling sweet potatoes, often 4 to 6 cm. in diameter, 5 to 15 cm. long; stems erect or ascending; joints narrowly obovate to oblong-obovate, thick, tuberculate, repand. bright green, 5 to 12 cm. long; leaves soon deciduous, less than 10 mm. long; glochids yellowish; spines usually on the upper half and margin of the joint, often 2, sometimes 1 to 6, from an areole, whitish or pinkish, darker at base and apex, twisted, sometimes wanting: flowers bright yellow, 6 to 7 cm. broadpetals cuneate, truncate or retuse at apex, mucronate; fruit 2.5 to 3 cm. long.

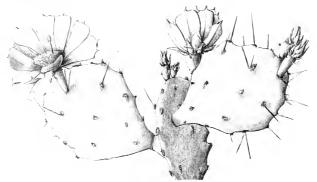


Fig. 163.—Opuntia austrina.

Type locality: Miami, Florida. Distribution: Southern Florida.

Opuntia youngii C. Z. Nelson, published in a Chicago newspaper, we have referred here, after studying a specimen sent by the author.

Opuntia spinalba Rafinesque (Atl. Journ. 1: 147. 1832) was described as from the keys of Florida, and answers in some respects to O. austrina; but it is very unlikely that any plants of the region inhabited by austrina were known to botanists as early at 1832.

Figure 163 represents a plant collected by Dr. Small at the type locality in 1901.

#### 121a. Opuntia eburnispina Small, sp. nov. (Appendix following page 226).

#### 122. Opuntia macrorhiza Engelmann, Bost. Journ, Nat. Hist. 6: 206. 1850.

Opuntra fusiformis Engelmann and Bigelow, Proc. Amer. Acad. 3: 297. 1856.

Opantas jurinami Engelmani ado Bigerowi T.O. Albett, Awar 37-27.

Opantas silvareçun juriquemis Engelmani, Pac. R. Rep. 4: 43, 1856.

Opantas messaniha masteolokas Goulter, Contr. U. S. Nat. Herb. 3: 340. 1896.

Opantas xinatioglochis Griffiths, Rep. Mo. Bot. Gard. 21: 166. 1910.

Opantas vincima Markinen, Bull. Club 38: 142. 1911.

Plant low, usually nearly prostrate, forming a clump 1 meter in diameter, from a cluster of tuberlike roots, these sometimes 5 to 7.5 cm. in diameter; joints orbicular to obovate, dull green, 5 to 16 cm. long, about 1 cm. thick; leaves subulate, 4 to 10 mm. long; areoles rather large, the lower ones and sometimes all of them spineless; glochids numerous, yellow or brown; spines, when present, 1 to 4, unequal, vellow to brown, the longest 2.5 cm. long; flower yellow, with a reddish or purplish center, 7 to 8 cm. broad; fruit narrowly obovoid, 3.5 to 5 cm. long, purple or red, with a depressed umbilicus, not edible; seeds 5 mm. in diameter, with broad margins.

Type locality: Rocky places on the upper Guadalupe, Texas.

Distribution: Missouri and Kansas to Texas.

Opuntia seguina C. Z. Nelson (Galesburg Register, July 20, 1915), published in a newspaper, and said to have come from San Antonio, Texas, seems to be one of the Tortispinae, OPLINTIA

and is probably referable to O. macrorbiza. Through the kindness of Mr. Nelson, we have seen a joint of this species.

Opuntia bulbosa Engelmann (Proc. Amer. Acad. 3: 297. 1856) was used by Engelmann for O. fusiformis, but never described.

Opuntia macrorbiza, originally described by Dr. Engelmann as a species, was afterwards (Proc. Amer. Acad. 3: 296. 1856) proposed as a subspecies but not formally indicated, so that the reference O. rafinesquei macrorbiza Coulter (Contr. U. S. Nat. Herb. 3: 430. 1896) is the proper designation if it is used as a variety.

Illustrations: Cact. Mex. Bound, pl. 69; Förster, Handb. Cact. ed. 2. f. 11, 127; Pac. R. Rep. 4: pl. 12, f. 7, 8; pl. 23, f. 6; Suppl. Dict. Gard. Nicholson f. 606; W. Watson, Cact. Cult. f. 82, 83; Rep. Mo. Bot. Gard. 21: pl. 20, in part, this last as Opuntia xanthoglochia: Addisonia 1: pl. 19; Watson, Cact.; Cult. ed. 3. f. 59; Dict. Gard. Nicholson 4: 580. f. 50, 51.

Plate xiv, figure 5, represents a flowering joint of the plant collected at Irving, Dallas County, Texas, by Albert Ruth in 1912.

### 123. Opuntia plumbea Rose, Smith.: Misc. Coll. 50: 524. 1908.

Plant low, creeping, 10 cm. high, 20 to 30 cm. broad, few jointed; joints small. nearly orbicular, 3 to 5 cm. in diameter, of a dull lead-color, the surface somewhat wrinkled in dead specimens; areoles rather large for the size of the joints; spines pale brownish, slender, usually porrect, often 3 cm. long, mostly 2 in number, rarely as many as 4, sometimes one or even wanting; flowers very small, red; ovary naked; fruit 1.5 to ? cm. long with a few small areoles and these simply woolly; seeds small, rather turgid. smooth, and with a shallow obtuse margin.

Type locality: San Carlos Indian Reservation, Arizona.



Fig. 164.-Opuntia plumbea.

Distribution: Arizona.

This is a peculiar little opuntia with very small joints and fruits. It is known only from the original collections made by Mr. F. V. Coville in 1904.

Figure 164 is from a photograph of the type specimen.

# 124. Opuntia tortispina Engelmann, Proc. Amer. Acad. 3: 293. 1856.

Opuntia tortisperma Engelmann, Pac. R. Rep. 4: pl. 23, f. 1 to 5, 1856

Opuntia cymochila Engelmann, Proc. Amer. Acad. 3: 295. 1856.

Opuntia cymochila montana Englemann, Proc. Amer. Acad. 3: 296, 1856. Opuntia rafinesquei cymochila Engelmann, Pro: Amer. Acad 3: 295. 1856.

Opuntia rafinesquei cycmochila montana Engelmann and Bigelow, Pac. R. Rep. 4: 12 1856.

Opuntu neguesquei eyemoethia monlimi Engelimini and Digerow, Pac. A. Rep. -Opuntu mestaemtha cymoethia Coulter, Contr. U. S. Nat. Herb. 5: 430. 1896. Opuntu mestaemtha greenei Coulter, Contr. U. S. Nat. Herb. 3: 431. 1896. Opuntu mestaemtha oplicacipa Coulter, Contr. U. S. Nat. Herb. 5: 431. 1896.

Opuntia greenei Engelmann in Britton and Rose, Smiths, Misc. Coll. 50: 523. 1908.

(?) Opuntia sanguinocula Griffiths, Proc. Biol. Soc. Washington 27: 26. 1914.

Prostrate and creeping; joints ascending, orbicular to obovate, 15 to 20 cm. long; areoles 1.5 to 3 cm. apart; spines several, often 6 to 8, the upper and longer ones 3 to 6 cm. long, either white, yellowish, or brown; on the upper areoles one spine erect, the others spreading or with the lowermost ones deflexed; flowers sulphur-yellow, 6 to 7.5 cm. broad; fruit rather large, 4 to 5 cm. long, 2 to 3 cm. broad; seeds 4 to 6 mm. broad, thick, regular, with a slight indentation at the bilum.

Type locality: On the Camanchica Plains near the Canadian River.

Distribution: Wisconsin to South Dakota, Texas, Kansas, Colorado, and New Mexico; southeastern Colorado. Established and slowly spreading east of Cincinnati, Ohio (E. T. Wherry).

This has long remained one of our least-understood species. We believe now that it has a wide range, and that it has been referred heretofore to several species. Opuntia cymochila does not seem to differ from it, and the two published varieties of Opuntia mesacantha. geographically out of harmony with that species, doubtless belong here.

Opuntia oplocarpa Engelmann (Coulter, Contr. U. S. Nat. Herb. 3: 431. 1896) was published only as a synonym. Opuntia rafinesquei greenei (Cat. Darrah Succ. Manchester 58.

1908) is a catalogue name.

The plant is hardy at New York, flowering profusely, and also at Buck Hill Falls, eastern Pennsylvania.

Illustrations: Pac. R. Rep. 4: pl. 12, f. 1 to 3; pl. 23, f. 10 to 12; Rev. Hort. Belg. 40: after 186, all as Opuntia cymochila; Illustr. Fl. 2; f. 2528; ed. 2. 2; f. 2987; Pac. R. Rep. 4; pl. 10, f. 3; Stand. Cycl. Hort. Bailey 4: f. 2602, in part,

these as Opuntia humifusa, Pac. R. Rep. 4: pl. 8, f. 2, 3; pl. 23, f. 1 to 5, as O. tortisperma. Illustr. Fl. 2: f. 2529; ed. 2. 2; f. 2988; Watson, Cact. Cult. ed 3. pl. opp. 102; Meehans' Monthly 11: 57, as Opuntia mesacantha; Meekans' Monthly 5: 172, as Opuntia oplocarpa.

Plate xv, figure 4, represents a flowering and fruiting joint of a plant from Colorado, grown at the New York Botanical Garden.

### 125. Opuntia stenochila Engelmann, Proc. Amer. Acad. 3: 296, 1856,\*

Opuntia mesacantha stenochila Coulter, Contr. U. S. Nat Herb. 3: 430. 1896.

Prostrate; joints obovate, 10 cm. long by 7.5 cm. broad; leaves small, 4 to 6 mm. long; spines usually 2, sometimes 3, spreading, 1 long (2.5 to 3 cm. long), and 1 or 2 short and reflexed, usually light-colored, sometimes nearly white; glochids brown; flowers yellow, 6 cm. long; fruit very juicy, 4 to 5 cm. long or more, attenuate at base; seeds thick, quite regular, with very narrow obtuse edges.

Type locality: Canyon of Zuni, New Mexico.

Distribution: Western New Mexico and Arizona.

This species has not been well understood. It has usually passed as a variety of the common species of the eastern Mississippi Valley States, but it grows in a very different region. It is the common low, spreading Opun Figs. 165, 166.—Fruits. Fig. 167.—Joint. tia of northwestern New Mexico and Arizona.

165 Opuntia stenochila,

Illustrations: Pac. R. Rep. 4: pl. 12, f. 4 to 6; pl. 23, f. 9.

Figures 165, 166, and 167 are copied from the first illustration above cited.

#### 126. Opuntia delicata Rose, Contr. U. S. Nat. Herb. 13: 310. 1911.

A small, procumbent plant with rather thin, ovate, bluish, slightly glaucous joints, often only 4 to 9 cm. in diameter; areoles prominent, bearing conspicuous brown glochids; lower areoles spineless, the upper ones bearing 1 or 2 very slender brownish spines, the longer one 3 to 4 cm. long; flowers yellow, 5 cm. long, 5 to 6 cm. broad; fruit oblong, spineless, 2 to 3 cm. long; seeds small, about 4 mm. in diameter, nearly smooth.

Type locality: Calabasas, Arizona.

Distribution: Southeastern Arizona.

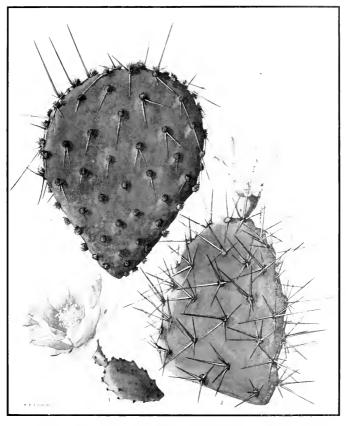
Figure 168 is from a photograph of the type plant.

# 127. Opuntia fuscoatra Engelmann, Proc. Amer. Acad. 3: 297. 1856.

Diffuse prostrate plants; joints orbicular to obovate, somewhat tuberculate, 5 to 8 cm. long, areoles

\*Although formally published as a species, Engelmann states that it is a form or subspecies, and hence Coulter (Contr. U. S. Nat. Herb. 3: 430, 1896) uses the synonym O. refinesquer stenochila Engelmann,

BRITTON AND ROSE PLATE XXIII



Flowering joint of Opuntia fuscoatra.
 Upper part of joint of Opuntia sulphurea.
 Joints of Opuntia tennispina. (All three-fourths size.)



OPUNTIA 133

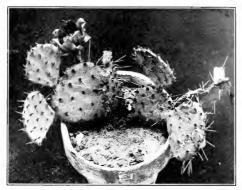


Fig. 168 —Opuntia delicata,

12 to 20 mm. apart, very large for the group; spines single or in twos or threes, one rather stout, sometimes a little flattened, 2.5 to 3 cm. long, yellow to dark brown or even nearly black; usually from the lower arcoles; glochids numerous, brown; flowers 7.5 cm. broad, yellow; petals very broad; stigmalobes 5; ovary 2.5 cm. long, slender; fruit 4 to 5 cm. long, red; seeds 4 mm. broad.

Type locality: Sterile places of prairies west of Houston, Texas.

Distribution: Eastern Texas.

Illustrations: Pac. R. Rep. 4: pl. 11, f. 4.

Plate xxiii, figure 1, represents a flowering joint of the plant collected by W. L. McAtee at Rockport, Texas, in 1911.

#### 127a. Opuntia macateei sp. nov. (See Appendix, p. 221.)

OPUNTIA RUBIFLORA Griffiths, Bull. Torr Club 43: 529. 1916.

Described as a spreading plant 3 to 4.5 dm. high and a meter broad, with obovate, green joints 12 to 18 cm. long, few white spines up to 5 cm. long with brown or straw-colored bases, and pink flowers. The species is based on cuttings received from European collections, and its origin is unknown.

We have received a similar if not identical plant from Haage and Schmidt of Erfurt, Germany, and we suspect it to be a hybrid, having one of the *Tortispinae* as one of its patents.

The specific name *rubiflora* was used by Davidson a few months earlier than by Griffiths for another plant.

#### Series 8. SULPHUREAE.

Low or prostrate species, with rather thick, flat, tuberculate joints; fruit small, nearly globular. Three species, natives of central and southern South America.

#### KEY TO SPECIES.

Flowers yellow.	
Spines stout, subulate	128. O. sulphurea
Spines slender, acicular	129. O. soebrensii
Flowers red	.130. O. microdisca

#### 128. Opuntia sulphurea G. Don in Loudon, Hort. Brit. 196. 1830.

Opuntia maculacantha Förster, Handb. Gartenz. 17: 166. 1861. Opuntia pampeana Spegazzini, Contr. Fl. Ventana 30. 1896. Opuntia vulpina Weber, Dict. Hort. Bois 895. 1898.

Plants low and spreading, forming broad clumps 1 to 2 meters in diameter, 3 dm. high or less; joints flattened, oblong to obovate, 12 to 25 cm. long, thick, strongly tuberculate, usually green but sometimes purplish; terminal joints easily detached; leaves conic, about 2 mm. long; spines 2 to 8, generally straight but sometimes curved and twisted, spreading, 3 to 10 cm. long, brownish to red, but sometimes quite pale at first; flowers about 4 cm. long, yellow; fruit with a deep umbilicus, short, about 1 cm. long.

Type locality: Cited as Chile, but doubtless wrong.

Distribution: Dry parts of western Argentina; recorded also from Chile, and perhaps occurring in Bolivia.

This species was not seen in Chile by Dr. Rose, and we are doubtful in considering the Bolivian material to be *O. sulphurea*; the joints, as shown by Dr. Rose's specimens, collected at La Paz (No. 18860), while thick, are not conspicuously tuberculate; the spines are rather short and stiff, white at first, but somewhat yellowish or horn-colored in age.

The name Cactus sulphureus Gillies was published by G. Don at the place cited above as a synonym of this species.

Ópuntia maculacantha was first described from specimens from Buenos Aires, which had doubtless been sent down from the desert regions to the west or northwest. Schumann in his Monograph referred this species to Mexico, but in his Nachtrag corrects this statement. Dr. Weber, with whom we are in agreement, refers the species to O. sulphurea. It is the only species we know with such large tubercles on the joints.

Several varieties of this species, some of which have been described, are given, such as laexior, major, minor, and pallidior.

Mr. W. B. Alexander writes as follows concerning this species

This is by far the commonest species of Opinita in the Argentine, where it is commonly known as 'penia', i. e. the spiny plant, sometimes being distinguished from other larger species by the name 'peniguilla' or 'penia chica'. The writer met with it in the provinces of Buerins Artes, Cordoba, San Liua, Mendoza, San Jiaan, La Moja, Catamarca and Santiaga del Estero."

Here probably belong Opuntia sericea G. Don (Salm-Dyck, Hort. Dyck. 363. 1834), also reported from Chile, but doubtless from Argentina. Cactus sericeus Gillies (Loudon, Hort. Brit. 196. 1830) is the same. There are several varieties of O. sericea which we would put with it: longstpina Salm-Dyck (Hort. Dyck. 363. 1834); coerulea Forbes (Hort. Tour Germ. 159. 1837) which is probably O. coerulea Gillies (Pfeiffer, Enum. Cact. 155. 1837); maclenii Salm-Dyck (Cact. Hort. Dyck. 1844. 46. 1845) which is O. maelenii (Salm-Dyck, Cact. Hort. Dyck. 1844. 46. 1845). Opuntia tweediei (Schumann, Gesamtb. Kakteen 745. 1898) is given as a synonym of this species by Schumann. Opuntia albisetosa Hildmann, a name only, belongs here according to Hirscht (Monatsschr. Kakteenk. 10: 48. 1900).

Illustrations: Blühende Kakteen 3: pl. 136; Monatsschr. Kakteenk. 8: 121; Schumann, Gesamtb. Kakteen f. 106, Wiener Ill. Gärt. Zeit. 28: f. 17; all as *Opuntia maculacantha*. Deutsche Gärt. Zeit. 25: 476. f. 9, No. 18.

Plate xxiii, figure 2, represents a flowering joint of the plant collected by Dr. Rose near Córdoba, Argentina, in 1915.

### Opuntia soehrensii sp. nov.

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Cactus ayrampo Azara, Voy. 2: 526. 1809.
Opuntia baenquiana Herrera, Rev. Univ. Cuzco 8: 60. 1919.
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Prostrate, in masses usually 1 meter in diameter or less; joints at first erect or ascending, finally prostrate and rooting and forming new colonies, flattened, rather thin, somewhat tuberculate, very spiny, orbicular, + to 6 cm. in diameter, often purplish; spines slender, rather variable in color, usually yellow or brown, several from each areole, sometimes as many as eight, the longest ones 5 cm. long, erect; flowers light yellow, 3 cm. long; sepals brown; filaments yellow; style white; stigma-lobes green; fruit naked, 3 cm. long; seeds 3 to 3.5 mm. broad, ovate, thickish, with narrow margin and roughened sides.

Highlands of southern Peru, Bolivia, and northern Argentina. Type collected by Dr. and Mrs. J. N. Rose below Pampa de Arrieros, Peru, August 23, 1914 (No. 18967).

This species is very common in its region, but as it is cultivated somewhat for its seeds as well as used as a protection for gardens and yards, its natural distribution is difficult to

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determine. On the barren hills below La Paz, Bolivia, the species is well established and grows as if native; on some of these hills it is the dominant and sometimes exclusive plant. In the same general region, however, one finds the plant about the houses, especially on walls, where it has undoubtedly been planted. At Oruro, Bolivia, it was seen only in the wild state, while at several stations along the railroad between Juliaca and Cuzco, Peru, especially at Combatata and Tinta, Peru, it has been planted on top of many of the mud walls about the yards. On the hills below Pampa de Arrieros, Peru, the species is extremely common and undoubtedly native.

The plant is known everywhere by the natives as ayrampo. The seeds are collected in great quantity and dried, and may be bought in the market places, especially in Arequipa. Indeed, there must have been a time when they were shipped by freight, for the name Ayrampo has always appeared on the printed freight classification of the Southern Railroad of Peru. The assistant superintendent of the road, Mr. Brown, states that, so far as he knows, there are few or no shipments made now. One of the places in Peru where Dr. Rose found the plant very abundant is named Ayrampal.

The dry seeds, when placed in water, yield a red substance which is used for coloring jellies and gelatine and, according to some, for coloring wines. In former days the Indians also used this substance in some of their carnival ceremonies. The coloring matter does not come from the seeds themselves, but from the red juice of the fruit which has dried on the surfaces

Azara's original description is interesting and a translation of it is given:

A species of tunilla (taatus) which is found in the temperate gorges near the Cordillera produces the seed in question. The plant is found in arid and sterile soil where ordinarily this family of plants societies in the plant is found in arid and sterile soil where ordinarily this family of plants societies. It is good to the ground in such a way as to stife all the others. From the secretary is used in the condinated within the round and spiny fruit is derived a color of clear voidet, brilliant and extremely agreeable to the eye but very super neal under will plifty, although it acquires a little stability and distributily by the means of altum and some other chemicals.

Figure 169 represents a joint of this species collected by Dr. Rose at Aruro, Bolivia, in

129a. Opuntia macbridei sp. nov. (Appendix following page 226).

130. Opuntia microdisca Weber, Dict. Hort. Bois 896. 1898.

Forming small clumps, very much branched, prostrate; joints mostly obovate to oblong, 4 to 8 cm. long, usually much flattened, but sometimes nearly cylindric, grayish green; leaves minute, purple, soon dropping off; areoles numerous, 5 to 6 mm. apart, rather large, when young densely white-felled; spines 10 to 15, white to reddish, unequal, some of the centrals 1.5 to 2.5 cm. long; glochids numerous, yellow; flower-buds red; flowers 2.5 cm. long, bright red; filaments purple; style white; stigmalobes 6 to 8, short; ovary turbinate, 16 mm. long, bearing numerous areoles subtended by narrow red leaves; areoles on ovary densely felted and bristly; fruit red.

Type locality: In Catamarca, Argentina.

Distribution: Northern Argentina.

Schumann refers this species to *Platyopuntia*, while Weber referred it to Tephrocactus. It evidently belongs to our Sulphureae. being nearest our O. soebrensii.

Our description is drawn chiefly from specimens obtained by J. A. Shafer between Andalgala and Concepción, Argentina, in 1916, supplemented by a living specimen obtained by Dr. Spegazzini in 1915. In Argentina this species also is known as ayrampo.

Figure 170 represents a joint of the plant collected by J. A. Shafer between Andalgala and Concepción, Argentina, December 28, 1916 (No. 24).

To this relationship may belong the following species:

OPUNTIA PENICILLIGERA Spegazzini, Anal. Mus. Nac. Buenos Aires II. Fig. -Joint of Opuntia micro-disca. x 0.". 4: 291. 1902.

Low, nearly prostrate; joints flattened, orbicular to broadly obovate, 10 to 12 cm. long, 7 to 10 cm. broad, dull green; spines slender, twisted, one elongated and 1 to 5 cm. long, the others much shorter, all white; glochids brownish; flowers from the lateral and marginal areoles, citron-yellow;

ovary 3 to 3.5 cm. long, with very many areoles bearing numerous glochids; style thick; stigma-lobes 8 to 10, greenish white; fruit reddish, clavate, 4.5 cm. long, with a depressed umbilicus; seeds small, 3 to 3.5 mm, bread.

Type locality: Argentina, between Río Negro and Río Colorado.

Distribution: Southern Argentina.

According to Dr. Spegazzini, this species is not near to any of the known South American species, but resembles somewhat the North American species O. microdasys and O. basilaris. We know it only from the description.

Mr. W. B. Alexander sends us the following account of this plant.

If N. D. ACCOUNTS CONTINUE AND A CON

OPUNTIA CATALANTHA Griffiths, Bull, Torr. Club 43: 524. 1916.

A low, creeping, prostrate plant 15 cm, long, one meter in diameter; joints obovate, narrowed above and below, inequiliteral, 11 cm, long, 4 cm, broad, tuberculate-wrinkled, mostly deep green; ateoles 1 to 1.5 mm, long, obovate, at first tawny, turning gray, leaves small, subulate, cuspidate, red. 1 mm, long; glochids yellow; spines 5 to 10, up to 5 mm, long; flowers carmine; fruit globular, 1.5 cm, in diameter.

Recorded as probably of South American origin and usually distributed as *Opuntia microdisca*, but from which it is said to differ very much. The plants known to us only from the description of cultivated specimens.

#### Series 9. STRIGILES.

The series consists of a single species, native of Texas. It is a low, bushy plant with large joints bearing many areoles, these close together, each with several acicular, reddish brown spines; the fruit is small.

# 131. Opuntia strigil Engelmann, Proc. Amer. Acad.

**3:** 290. 1856.

Suberect, 6 dm. high; joints orbicular to obovate, 10 to 12.5 cm. long; appressed to together, prominent; spines 5 to 8, spreading, many of them appressed to the joint and deflected, red to reddish brown with lighter tips, the longer ones 2.5 cm. long; glochids numerous; flowers unknown; fruits small, nearly globular, 12 mm. in diameter, truncate, red; arcoles on fruit very small; seeds 3 mm. broad.

Type locality: In crevices of limestone rock, between the Pecos River and El Paso, Texas.

Distribution: Texas.

A rare plant, first collected by Charles Wright in 1851. Engelmann says in the Mexican Boundary Report that it was also collected by Wright and Bigelow, but there is no mention of it in his report



on Bigelow's plants, nor do we find specimens in the Engelmann herbarium, so that it would appear that this reference to Bigelow was a mistake. Bigelow, it is true, crossed the River Pecos, on which the type was found, but it was well up in New Mexico and not in Texas, where it was crossed by Charles Wright. It was more recently collected by Nealley somewhere in Texas. The place of collection by Wright and the later one by Nealley are very indefinitely indicated on the labels accompanying the specimens.

Illustration: Cact. Mex. Bound, pl. 67.

Figure 171 is copied from the illustration above cited.

# Series. 10. SETISPINAE.

Bushy or depressed species, with tuberous or thickened roots, broad, flat, thin joints, and elongated, acicular, brown spines which fade whitish; their fruits are large and juicy. We recognize six species, natives of the south central and southwestern United States and northern Mexico. They approach the Tortispinae on the one hand and the Phaeacanthae on the other.

# OPUNTIA Key to Species.

omts elongated .	1.42	O. meranhiza
oints obovate to orbicular.		
Fruit small, 2 cm. long or less	135	O. Lallu
Fruit large, 2.5 to 6 cm. long.		
Flowers red to purple .	151	O. pottsii
Flowers yellow.		
Areoles large, more or less elevated on old joints; joints glaucous, purplish abo		
areoles	135.	O. wir pina
Areoles small; mature joints green throughout.		
	156.	O. mackensenn
Tourts oboyate: seeds 4 mm, broad or less	137	O to not bear

# 132. Opuntia megarhiza, Rose, Contr. U. S. Nat. Herb. 10: 126. 1906.

Roots long and thickened, sometimes 3 to 6 dm long, 5 to 6 cm, in diameter; stems low, 2 to 3 dm high, much branched; lower joints elongated, 2 to 3 dm, long, cuneate below, thin, 3 cm, broad, lateral joints appearing along the margins of the older joints and often, if not always, in the same plane; spines 2 to 4, acicular, 1 to 2.5 cm, long, brown; leaves minute; flowers lemon-yellow, often tinged with rose, 5 cm, broad; petals about 13, obovate, mucronately tipped; stigma-lobes 7, greenish; ovary clavate, 3 cm, long; fruit and seeds unknown.

Type locality: Alvarez, Mexico.

Distribution: San Luis Potosí, Mexico.

This species is not very closely related to the other species of this series, but it is referred here on account of its very slender spines.

# 133. Opuntia ballii Rose, Contr. U. S. Nat. Herb. 13: 309. 1911.

Plants low, spreading; joints obovate, 6 to 10 cm. long, thickish, pale green, glaucous; spines 2 to 4, brownish, a little flattened, usually ascending or erect, the larger ones 4 to 7 cm. long; glochids conspicuous; fruit small, about 2 cm. long, clavate, glaucous, spineless; seeds thick, 3.5 mm, broad.

Type locality: Pecos, Reeves County, Texas. Distribution: Western Texas.



Fig. 172.-O. ballii Part of type. x 0.5.

Wooton and Standley in their Flora of New Mexico refer this species to *Opuntia fili-pendula*, but *O. ballii* grows in a different habitat, has smaller fruit, stouter and erect spines, and different areoles; it grows on the dry mesa beyond Pecos. Texas.

Illustrations: Contr. U. S. Nat. Herb. 13: pl. 64.

Figure 172 is copied from the illustration above cited.

# 134. Opuntia pottsii Salm-Dyck, Cact. Hort. Dyck. 1849. 236. 1850.

Opuntia filipendula Engelmann, Proc. Amer. Acad. 3: 294. 1856.

Low, spreading plant, 3 dm. high or less, from thickened tuberous roots 2 to 3 cm. in diameter, these sometimes moniliform; joints broadly obovate, 3.5 to 12 cm. long, pale green to bluish; arcoles few either small or large; spines confined to the upper and marginal arcoles. 1 or 2, slender, 2 to 4 cm. long, usually white but sometimes purplish; glochids yellow, usually few but sometimes abundant; flowers large, 6 to 7 cm. broad, deep purple; ovary slender, 3 to 3.5 cm. long, with only a few scattered arcoles: fruit spineless.

Type locality: Near Chihuahua City, Mexico.

Distribution: Central Chihuahua, Mexico, to Texas and New Mexico.

This species was described by Prince Salm-Dyck in 1850 from material collected by John Potts, who was manager of the mint at Chihuahua and who sent many cacti to F. Scheer at Kew between 1842 and 1850. No types of his species seem to have been retained.

In 1885 C. G. Pringle again collected this species near Chihuahua City and it was distributed as 0. filipendula, and there Coulter leaves Pringle's specimen (Cont. Nat. Herb. 3: 428). Dr. E. Palmer collected an abundance of material in 1908 which enabled us to reestablish 0. pottsii, which Coulter omits and Schumann lists under unknown species.

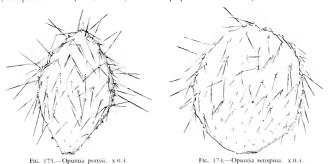
If these Chihuahua specimens are the same as the Texas plants, as Coulter believed and as we regard them, then *Opuntia filipendula* must give place to the older name of Salm-Dyck.

Illustrations: Cact. Mex. Bound. pl. 68; Förster Handb. Cact. ed. 2. f. 10, 131; Suppl. Dict. Gard. Nicholson 2; f. 605; W. Watson, Cact. Cult. f. 81; Watson, Cact. Cult. ed. 3. f. 58; Dict. Gard. Nicholson 4; 580 f. 49; all as Opuntia filipendula.

Figure 173 shows a joint of a plant collected by Dr. Rose in the valley of the Rio Grande below El Paso, Texas, in 1913.

# 135. Opuntia setispina Engelmann in Salm-Dyck, Cact. Hort. Dyck. 1849. 239. 1850.

Stem branching and spreading, sometimes 9 to 12 dm. broad, with some of the branches composed of 3 or 4 joints, erect and 6 dm. high; joints deep bluish green, somewhat glaucous, often purplish at the arcoles, sometimes more or less tinged with purple throughout, obsvate to orbicular, 5 to 15 cm. in diameter; leaves minute, subulate; spines 1 to 6 from an arcole, white, 2 to 3 cm. long; glochids yellow, very conspicuous on old joints; flowers yellow; fruit purplish, about 4 cm. long.



Type locality: Pine woods in the mountains west of Chihuahua, Mexico (fide Engelmann, Proc. Amer. Acad. 3: 294. 1856).

Distribution: Western Chihuahua, Mexico.

This species has long been known only from the type specimens; but in 1908 Dr. Rose visited western Chihuahua, where this species is quite common; our description is based largely upon the specimens he then collected.

Figure 174 represents a joint of the plant collected by Dr. Rose near Miñaca, Chihuahua, in 1908.

# 136. Opuntia mackensenii Rose, Contr. U. S. Nat. Herb. 13: 310. 1911.

Plants low, with rhick, tuberous roots, spreading, usually resting on the edges of the joints, but some of the branches often erect; joints orbicular to obovate, 10 to 20 cm. long, rarely broader than long, pale and glaucous when young, deep green when older; areoles small, the lower ones without spines, the upper ones with 1 to 4 spines; spines white or brown, or brown at base and white above, somewhat flattened and twisted, slender, 5 cm. long or less; glochids brown; flowers of medium size, 7 to 8 cm. broad, yellow with a reddish brown center; stigma-lobes 7 to 9, white; fruit spineless, 4 to 6 cm. long, truncate or nearly so at apex, rose-purple; seeds suborbicular. 5 to 6 mm. broad, acute on the margin.

OPUNTIA 139

Type locality: Near Kerrville, Texas. Distribution: Kerr County, Texas.

Illustrations: Contr. U. S. Nat. Herb. 13: pl. 67; Plant World 19: 142. f. 1; 143. f. 2, the last as O. macrorbiza.

Figure 175 is from a photograph of the type plant from near Kerrville, Texas.

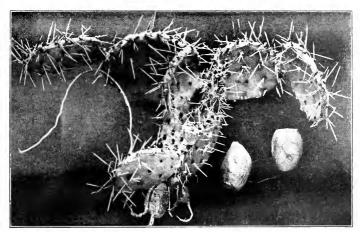


Fig. 175.—Opuntia mackensenti.

# 137. Opuntia tenuispina Engelmann, Proc. Amer. Acad. 3: 294. 1856.

Opuntia minor C. Mueller in Walpers, Ann. Bot. 5: 50. 1858.

Low and spreading, but becoming 3 dm. high; joints obovate, attenuate at base, 7 to 15 cm. long, light green; leaves very slender, 4 mm. long or less; spines 1 to 3 from an arcole, slender, usually white but sometimes brownish, 3 to 5 cm. long, the upper spines erect or spreading; glochids brown; flowers yellow, 6 to 7.5 cm. broad; ovary with numerous arcoles filled with brown wool and brown glochids; fruit oblong, 2.5 to 4 cm. long, with a deep umbilitues; seeds 4 mm. broad or less, very irregular.

Type locality: Sand hills near El Paso, Texas.

Distribution: Southwestern Texas and adjacent parts of Mexico and New Mexico, apparently extending to Arizona.

Engelmann says that this plant grows with *O. phaeacantha*, but is readily distinguished from the latter by its spines and fruit. Cultivated plants and herbarium specimens closely resemble *O. phaeacantha*.

Illustrations: Cact. Mex. Bound. pl. 75, f. 14; N. Mex. Agr. Exp. Sta. Bull. 78: pl. [15.] Plate XXIII, figure 3, represents a joint of the plant collected by Dr. Rose near El Paso, Texas, in 1913.

#### Series 11. PHAEACANTHAE.

Bushy or depressed species, with relatively large, flat, persistent joints, the subulate, usually stout spines brown at least at the base, or in some species nearly white. The series is composed of about fifteen species, natives of the south central and southwestern United States, northern and central Mexico.

#### KEY TO SPECIES.

TELL TO GLECTED	
More or less bushy plants.	
Joints thin; spines, when present, very long and confined to the upper and middle at	reoles.
Spines dark brown, stout, rigid.	
Plant pale green to purplish; spines up to 12 cm. long	138. O. macrocentra
Plant dull dark green; spines 6 cm. long or less	
Spines pale brown, flexible or subulate.	
Usually abundantly spiny	- 140. O. gosselmiana
Usually spineless or some areoles with 1 setaceous deflexed spine	. 141. O. santa-rita
Joints thick; spines not confined to the upper and middle areoles.	
Joints relatively small, seldom over 15 cm. broad; plants relatively low.	
Joints narrowly obovate, about twice as long as wide	1-12. O. angustata
Joints broadly oboyate to orbicular.	
Flowers yellow.	
Spines subulate, brown at least in part.	
Plant light green	1+3. O. atris bina
Plant bluish green or grayish green.	
Plant erect, 2 meters high or less	.144. O. azmea
Plant bushy, rarely over 1 meter high.	145. O. phaeacantha
Plant prostrate	146. O. motarenti
Spines acicular, nearly white	147. O. covillei
Flowers magenta	1-18. Q. r.isevi
Joints relatively large, mostly over 15 cm. broad; plants relatively tall.	
Spines clear brown nearly throughout	149. O. occidentalis
Spines nearly white above or throughout.	
Spines with dark brown bases	150 O engelmmnii
Spines whitish throughout	15) O discuta
Small creeping plants	152 O rathers
Small creeping plants	

# 138. Opuntia macrocentra Engelmann, Proc. Amer. Acad. 3: 292. 1856.

Somewhat bushy, with ascending branches, 6 to 9 dm. high; joints orbicular to oblong, or sometimes broader than long, 10 to 20 cm. long, often bluish or purplish, sometimes spineless but usually bearing spines at the uppermost areoles: spines 1 or 2, rarely 3 together, usually brownish or black but sometimes white above, slender, erect or porrect, 4 to 7 cm. long; flowers yellow, often drying red, 7.5 cm. broad; sepals ovate, acuminate. ovary with few areoles, these bearing brown glochids; filaments very short; fruit 3 to 6 cm. long, purple; seeds 4 to 4.5 mm. broad.

Type locality: Sand hills on the Rio Grande near El Paso, Texas.

Distribution: Western Texas to Eastern Arizona and Chihuahua, Mexico.

This species, especially the forms that have bluish and purplish joints, are very showy. Seedlings sometimes produce long, silky hairs from the areodes, in this respect resembling the *Criniferae*.

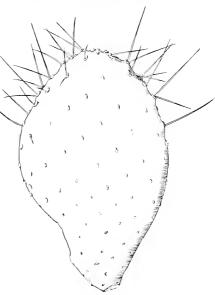


Fig. 176.—Opuntia macrocentra. x 0.5.

OPUNTIA 141

Illustrations: Cact. Mex. Bound. pl. 75, f. 8; N. Mex. Agr. Exp. Sta. Bull. 78; pl. [8]. Figure 176 represents a joint of the plant collected by Dr. Rose near the Rio Grande in New Mexico, northwest of El Paso, Texas, in 1913.

# 139. Opuntia tardospina Griffiths, Rep. Mo. Bot. Gard. 22: 34. 1912.

Roots fibrous; low, spreading plant, the joints usually resting on the ground; joints orbicular to obovate, 16 to 24 cm. long; areoles large, usually distant, often 4 cm. apart; spines usually wanting except from the upper areoles and along the upper margin, usually single, sometimes 2 from an areole, 1 to 5 cm. long, brown, but lighter towards the apex; glochids numerous, brown, persistent; fruit red, 6 cm. long; seeds 5 mm. broad, acute on the margin.

Type locality: Near Lampasas, Texas.

Distribution: Eastern Texas.

Illustrations: Rep. Mo. Bot. Gard. 22: pl. 11, in part; pl. 15.

Figure 177 represents a joint of the plant collected by Albert Ruth in 1912, north of Dallas, Texas.

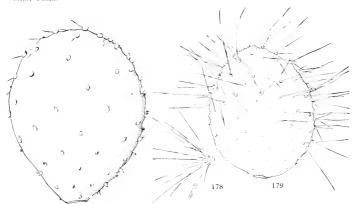


Fig. 177.—O. tardospina. x 0.5. Figs. 178, 179.—Cluster of spines and joint of O. gosseliniana. x 0.1.

#### 140. Opuntia gosseliniana Weber, Bull. Soc. Acclim. France 49: 83. 1902.

One meter or more high, branching from the base, the old trunk often bearing numerous, long, acicular spines; joints usually red or purplish, usually very thin, as broad as or broader than long, sometimes 2 dm, broad; lower and sometimes all the areoles without spines; spines porrect or nearly so, generally 1, sometimes 2, rarely 3 from an areole, 4 to 5 or even 10 cm. long, brown, usually weak; glochids brown, numerous, forming on old joints very large clusters; fruit 4 cm. long, without spines but bearing numerous brown glochids at the areoles, with a depressed umbilities.

Type locality: Coast of Sonora on the Gulf of California.

Distribution: Sonora and Lower California, Mexico.

This species was placed tentatively in the *Pubescentes* by Schumann, although always glabrous; but it belongs better in the *Phaeacanthae*. In some of its phases it resembles *O. macrocentra*. It is a very showy species and worthy of a place in any collection.

Illustrations: Monatsschr. Kakteenk. 17: 69.

Figure 179 represents a joint of the plant collected at Hermosillo in Sonora, by Rose. Standley, and Russell in 1910; figure 178 shows a cluster of spines from a trunk areole.

# 141. Opuntia santa-rita (Griffiths and Hare) Rose, Smiths. Misc. Coll. 52: 195. 1908.

Opuntia chlorotica santa-rita Griffiths and Hare, N. Mex. Agi. Exp. Sta. Bull. 60: 64. 1906.

Opuntia shereana C. Z. Nelson, Galesburg Register, July 20, 1915

Compact plant, 6 to 14 dm. high, with a very short trunk; joints orbicular or a little broader than long, bluish green but deep purple about the areoles and margins; areoles 1.5 cm. apart, beating numer ous chestnut brown glochids and occasionally a brown spine; flowers very handsome, deep yellow, 6 to 7 cm. broad: ovary purple, oblong.

Type locality: Selero Mountains, Arizona.

Distribution: Southeastern Arizona.

This species is one of the most ornamental of the opuntias, and although it does not grow well in greenhouse cultivation, it would doubtless flourish in the Southwest, where it could be given conditions similar to its wild surroundings.

Illustrations: Smiths. Misc. Coll. 52: pl. 15; Plant World 11111; f. 6, this last as Opuntia chlorotica: Journ. Inter. Gard. Club 3: facing page 5, as O. chlorotica santa-rita.

Plate XXIV, figure 1, is from a photograph taken by Dr. MacDougal of a plant near Surritas, Arizona, in 1906.

# 142, Opuntia angustata Engelmann, Proc. Amer. Acad. 3: 292. 1856.

Ascending to erect; joints narrow, 15 to 25 cm. long, rounded above, gradually narrowing downward; areoles distant, often 2.5 cm. apart, large, oblong; spines sharply angled, straw-colored or whitish but with brown bases, 2.5 to 3.5 cm. long; glochids brown; fruit obovoid, 2.5 to 3 cm. long.

Type locality: Bottoms, Bill Williams Fork, Arizona.

Distribution: Recorded as extending from New Mexico to California, but known definitely to us only from central Arizona, perhaps extending north to Utah.

Engelmann's Opuntia angustata was based on three specimens, one from New Mexico, one from Arizona, and one from California. He stated that the first and last were prostrate, while the second was erect. A study of his specimens and descriptions indicates that he had three species before him. The first is from Zuni, New Mexico, and is probably Opuntia phaeacantha. The California specimen is the Opuntia magenta Griffiths, which is probably the same as O. raseyi, while the suberect plant from the bottoms of the Bill Williams River we have allowed to stand for O. angustata. Wooten and Standley (Contr. U. S. Nat. Herb. 19: 447. 1915) suggest that the two fruits illustrated by Engelmann in connection with this species may belong to two species of Cylindropuntia.



Fig. 180.- Opuntia angustata.

This plant was first collected by J. M. Bigelow, February 4, 1854.

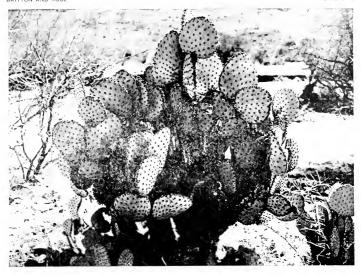
Illustrations: Pac. R. Rep. 4: pl. 7, f. 3, 4.

Figure 180 is copied from figure 3 of the illustrations above cited.

# 143. Opuntia atrispina Griffiths, Rep. Mo. Bot. Gard. 21: 172. 1910.

Usually low and spreading, sometimes 2 meters in diameter, but sometimes the central branches nearly erect and 6 dm. high; joints rather small, nearly orbicular, 10 to 15 cm. in diameter, light green. sometimes a little glaucous; lower ateoles spineless; spines from the upper areoles 2 to 4, the principal ones spreading, flattened, dark brown, almost black at base, much lighter above; glochids at first yellow or yellowish, but soon changing to brown; flowers described as yellow, changing to orange; fruit reddish purple.

BRITTON AND ROSE FLATE XXIV





Plant of Opuntia santa-vita.

Plant of Opuntia discata.



OPUNTIA. 143

Type locality: Near Devil's River, Texas. Distribution: Type locality and vicinity.

This plant is abundant between Del Rio, Texas, and Devil's River, being one of the two commonest species in that region.

Illustrations: Rep. Mo. Bot. Gard. 21: pl. 26, in part.

Plate XXV, figure I, represents a flowering joint of the plant collected near Devil's River, Texas, by Dr. Rose in 1913.

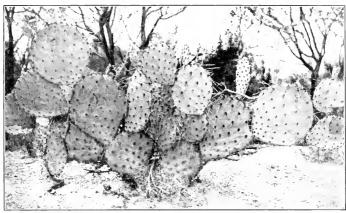


Fig. 181.-Opuntia azurea, Zacatecas, Mexico.

# 144. Opuntia azurea Rose, Contr.. U. S. Nat. Herb. 12: 291. 1909.

Compact, upright, with a single trunk, or branching from the base and more or less spreading; joints orbicular to obovate, 10 to 15 cm. in diameter, pale bluish green, glaucous; areoles about 2 cm. apart, the lower ones spineless, the upper ones with 1 to 3 rather stout spines; spines, at least when old, almost black, unequal, the longer ones 2 to 3 cm. long, more or less reflexed; glochids numerous, brown; petals 3 cm. long, deep yellow, with crimson claw, but in age pink throughout; filaments greenish or almost white; stigma-lobes pale green; fruit dull crimson, subglobose to ovoid, spineless, truncate, juicy, edible.

Type locality: Northeastern Zacatecas, Mexico. Distribution: Zacatecas and probably Durango. Illustrations: Contr. U. S. Nat. Herb. 12: pl. 24; also f. 33.

Figure 181 is from a photograph by F. E. Lloyd of the type plant; figure 182 represents joints of the plant collected by Albert de Lautreppe near Zacatecas, Mexico, in 1904.



145. Opuntia phaeacantha Engelmann in Gray, Mem. Amer. Acad. 4: 52. 1849.

Opuntia phaeacantha brunnea Engelmann, Proc. Amer. Acad. 3: 293. 1856. Opuntia phaeacantha major Engelmann, Proc. Amer. Acad. 3: 293. 1856. Opuntia phaeacantha nigricans Engelmann, Proc. Amer. Acad. 3: 293. 1856. Opuntia camanchica Engelmann and Bigelow, Proc. Amer. Acad. 3: 293. 1856. Opuntia chihuahuensis Rose, Contr. U. S. Nat. Herb. 12: 291. 1909. Opantia (pinadaretri) Rose, Contr. U. S. Nat. Herb. 12: 291, 1909, Opantia (pinec) Rose, Contr. U. S. Nat. Herb. 12: 402, 1909, Opantia blakeana Rose, Contr. U. S. Nat. Herb. 12: 402, 1909, Opantia zamicevis Griffiths, Bull. Torr. Club 43: 86, 1916. (From the description.)

Low, usually prostrate, with some branches ascending; joints usually longer than broad, 10 to 15 cm. long; areoles rather remote, the lower ones often spineless; spines 1 to 4, those on the sides of the joints more or less reflexed, somewhat flattened, usually rather stout, brown, sometimes darker at base, or often nearly white throughout, the longer ones 5 to 6 cm. long; glochids numerous, yellow to brown; flowers 5 cm. broad, yellow; ovary short; fruit 30 to 35 mm. long, much contracted at base.

Type locality: About Santa Fé and on the Rio Grande, New Mexico.

Distribution: Texas to Arizona and Chihuahua.

We have referred to Opuntia phaeacantha the common low, bushy Opuntia with small joints, brown spines, and yellow flowers of the Southwest; we formerly regarded it as composed of several species, and others have followed our lead; but we are unable to draw any distinct lines after a study of much additional herbarium and greenhouse material. Dr. Rose has collected a large series of specimens from the Southwest, especially from the type localities, but his specimens seem to bridge over differences which before seemed tangible; cited differences appear to be racial rather than specific.

Opuntia blakeana, which is found west of the Rocky Mountains, one would expect to be different. It is characterized by small obovate joints, rather short spines, small yellow flowers purple at center.

Opuntia chihuahuensis, which was first described from Mexican specimens, if it belongs here, is in the southern range of O. phaeacantha. It, too, has yellow flowers with red centers, rather large joints, and long, slender spines. Mr. Wooton is of the opinion that to O. chihuabuensis is to be referred the common, low, brown species from El Paso, which includes the specimens of G. R. Vasey, which Coulter called Opuntia mesacantha oplocarpa. This longspined form extends north throughout eastern New Mexico to southeastern Colorado. With the latter form Mr. Wooton believes Opuntia camanchica belongs. If we take this broad view of the limits of this species we are forced to include Opuntia Toumcyi, although it is much larger than O. blakeana, and was considered by Dr. Rose to be different.

Opuntia mesacantha sphaerocarpa Wooton and Standley (Contr. U. S. Nat. Herb. 19: 446. 1915) is a mistake, O. mesacantha oplocarpa being intended.

Opuntia rubrifolia Engelmann in Coulter (Contr. U. S. Nat. Herb. 3: 424, 1896), from St. George, Utah, belongs in this series if E. W. Nelson's No. 156, from the same place has been properly determined as such. The type specimen of O. rubrifolia has, apparently, been lost

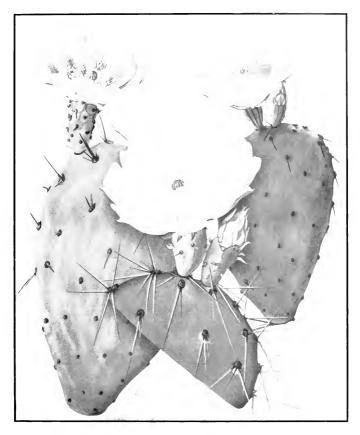
The following varieties of Opuntia camanchica have been offered by Haage and Schmidt in their catalogues: alhispina (Trade Seed Cat. 104. 1911-1912); orbicularis, rubra, and salmonea (all in Haupt-Verzeichnis 1908: 228. 1908). Under O. camanchica has been mentioned also variety luteo-stammea (Cat. Darrah Succ. Manchester 53. 1908).

Opuntia eocarpa Griffiths (Proc. Biol. Soc. Washington 29: 11. 1916), also O. recurvospina Griffiths (Proc. Biol. Soc. Washington 29: 12. 1916) and possibly O. superbospina Griffiths (Proc. Biol. Soc. Washington 29: 13. 1916) and O. caesia Griffiths (Proc. Biol. Soc. Washington 29: 13. 1916) are of this relationship.

Opuntia microcarpa\* Engelmann (Emory, Mil. Reconn. 158. f. 7. 1848) and O. violacea Engelmann (Emory, Mil. Reconn. 158. f. 8. 1848) were described from drawings brought back from the Southwest by W. H. Emory. They can never be critically identified, but are

<sup>\*</sup> Since the above was written Dr. Griffiths (Bull, Torr. Club 43: 527) has published a detailed account of this species, which he regards as distinct; it inhabits southern Arizona.

BRITTON AND ROSE PLATE XXV



Flowering joints of Opuntra atrispina.
 Flowering joint of Opuntra phaeaeantha.
 Upper part of joint of Opuntra engelmannii. (All three-quarters size.)



145 OPUNTIA.

probably of this relationship.

Illustrations: Engler and Prantl, Pflanzenfam. 3ºa: f. 57, C. Förster, Handb. Cact. ed. 2. f. 141; Illustr. Fl. 2: f. 2530; ed. 2. 2: f. 2989; Pac. R. Rep. 4: pl. 9, f. 1 to 5; pl. 22, f. 12 to 15; Wiener Illustr. Gartenz. 10: f. 115, all as Opuntia camanchica; N. Mex. Agr. Exp.

Sta. Bull. 78: pl. [7], as Opuntia chihuahuensis; Contr. U. S. Nat. Herb. 12: pl. 55, as Opuntia blakeana; Cact. Mex. Bound. pl. 75, f. 9 to 13; Deutsche Gärt. Zeit. 7: 447, as Opuntia camanchica; Meehan's Monthly 11: 57, as O. phaeacantha major; Shreve, Veg. Des. Mt. Range pl. 5, A, as O. toumeyi; De Laet, Cat. Gén. f. 58.

Plate xxv, figure 2, represents a flowering joint of a plant sent from Tucson, Arizona, in 1916, by Dr MacDougal.

146. Opuntia mojavensis Engelmann, Proc. Amer. Acad. 3: 293. 1856.

Prostrate, with suborbicular joints; pulvini remote, with large yellow bristles; spines 2 to 6, stout and annulate, acutely angular and compressed, more or less curved, reddish brown, paler toward tip, 2.5 to 6 cm. long, 1 to 3 smaller, slenderer, pale ones added below; fruit oblong, 4.5 cm. long.

Type locality: On the Mojave, west of the Colorado, Fig. 183.—Opuntia covillei. x 0.4. California.

Distribution: Known only from the type locality.

The fragmentary type specimen has been examined; we have been unable to refer any other specimens to this species, which is thus very imperfectly understood.

Illustration: Pac. R. Rep. 4: pl. 9, f. 6 to 8.

147. Opuntia covillei Britton and Rose, Smiths, Misc. Coll. 50: 532. 1908.

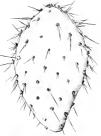
> Opuntia megacarpa Griffiths, Rep. Mo. Bot. Gard. 20: 91. 1909.

> Opuntia sugosa Griffiths, Proc. Biol. Soc. Washington 27: 27. 1914.

Bushy plants, usually growing in dense thickets; joints orbicular to obovate, 10 to 20 cm. long or more, pale green, sometimes purplish, slightly glaucous; areoles 2 to 4 cm. apart; spines several from an areole, slender, unequal, the longest ones 6 cm. long, white when young, brownish when old; flowers large, yellow

Type locality: San Bernardino, California.

Distribution: Interior valleys of southern California.



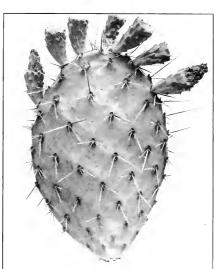


Fig. 184.—Opuntia covillei

Opuntia covillei and O. vaseyi grow in the same valleys, often in adjoining colonies, and while hybrids may occur, the two species could easily be distinguished. When growing in conjunction, O. coviller is considerably taller, has joints of different color, and has yellow flowers. It has doubtless generally passed as Opuntia occidentalis, but that is a much larger, stouter plant, with strong, more or less flattened spines, and is common along the coast.

Figure 183 represents a joint of the plant sent by Dr. MacDougal from Elsinore, California, in 1913; figure 184 is from a photograph of a specimen collected by Mr. S. B. Parish from near the type locality in 1916.

148. Opuntia vaseyi (Coulter) Britton and Rose, Smiths. Misc. Coll. 50: 532. 1908.

Opuntia mesacantha ranesi Coulter, Contr. U. S. Nat. Herb. 3: 431. 1896. Opuntia signic queet i avest Nehumann, Gesamib. Kakeern 717. 1898. Opuntia humphesa taresi Heller, Cat. N. Amer. Pl. ed. 2. 8. 1900. Opuntia magenta Griffiths, Rep. Mo. Bot. Gard, 19: 268. 1908. Opuntia indiplica Davidson, Bull. South. Calif. Acad. 15: 33. 1916.

Plants low, the lower stems spreading at base, but some of the branches erect and 4 to 7 joints high; joints thick, small (usually 10 to 12 cm. long), ovate, pale green, somewhat glaucous; areoles rather large, 2 to 3 cm. apart, bearing 1 to 3 spines; spines porrect, usually short (rarely 2 cm. long), grayish brown or bright brown, whitish or yellowish towards the tips, somewhat flattened; young joints bright green, thickish, bearing short purplish leaves and a single brownish spine from an arcole; flowers deep salmon, almost a red-salmon, from the very first; ovary globular to shortly oblong, areoles few, mostly towards the top of the ovary, spineless but with a few brown glochids; fruit globular to shortly oblong, 4 to 5 cm. long, deep purple, truncate at apex, with few arcoles, the pulp sweetish but hardly edible; umbilicus broadly depressed.

Type locality: Cited as Yuma, Arizona, presumably erroneously.

Distribution: San Bernardino and Orange Counties, southern California.

Even from a moving train this species is distinguishable from its relatives by the color of its flowers. It forms great thickers along the Southern Pacific Railroad north of Los Angeles, either alone or interspersed with one or more other species, and it is also common in the San Bernardino Valley toward the Cajon Pass where it forms great thickers either alone or with Opuntia corillei. Considerable quantities were seen also on hills near Riverside, and it was found cultivated in the cactus garden at Riverside and in the Soldiers' Home Grounds at Santa Monica.

Illustration: Bull. South. Calif. Acad. 15: 32, as Opuntia rubi-

Figure 185 represents a joint of the plant collected by Dr. Rose at San Fernando, California, in 1908.

 Opuntia occidentalis Engelmann and Bigelow, Proc. Amer. Acad. 3: 291. 1856.

Opuntia lindbeimeri occidentalis Coulter, Contr. U. S. Nat. Herb. 3: 421, 1896.

Opuntia engelmannii occidentalii Engelmann in Brewer and Watson, Bot. Calif. 1: 248. 1876.\*

Opunita demissa Griffiths, Rep. Mo. Bot. Gard. 22: 29. 1912.

Erect or spreading, often 1 meter high or more, forming large thickets: joints large, obsvate to oblong, 2 to 3 dm, long; areoles remote; spines 2 to 7, stout, unequal, the longest ones 4 to 5 cm, long, more or less flattened, brown or nearly white, sometimes wanting; shorter spines often white; glochids often prominent, brown; flowers yellow, large, including the ovary often 10 to 11 cm. long; fruit large, purple.

Type locality: Western slopes of the California Mountains, between San Diego and Los Angeles.

Distribution: Southwestern California and northern Lower California and adjacent islands.

In their description of this species, Engelmann and Bigelow state that it was found on the western slope of the California Mountains near San Diego and Los Angeles. In the Engelmann herbarium are the two original sheets. One of these comes from the "Mountains near" one of these comes from the "Mountains near" one of these comes from the "Mountains near" of the second of the sec

\*Coulter refers this name to Pac. R. Rep. 4: errata, 3, 1856, but no formal name is published there.



Fig. 185.—Opuntia vaseyi. x 0.5.

OPUNTIA. 147

tain Valleys of San Pasquel and Santa Isabel," northeast of San Diego. This consists of a single flower and a small piece of a joint containing three bunches of spines; we doubt if this can be identified. The other comes from near Los Angeles and consists of a large pad

and fruit with seeds. The spines are dark brown or nearly black. This specimen appears to be the one figured in the Pacific Railroad Report and may very properly be taken as the type of the species.

There is much uncertainty regarding the range of this species, some referring it to the interior valleys of California. An examination, however, of the type material, and a study of the living plants in southern California by Dr. Rose, convince us that the coastal opuntias can not all be referred to O. littoralis as is sometimes done, but a part belongs to O. occidentalis. The limits of the latter species, and its distribution, are not well defined.

Of this relationship is to be considered *Opunita semispinosa* Griffiths (Bull. Torr. Club 43: 89. 1916), which the author describes as a common, conspicuous species in the coastal region of California.

*Illustrations*: N. Mex. Agr. Exp. Sta. Bull. 60: pl. 3, f. 2; Pac. R. Rep. 4: pl. 7, f. 1, 2; pl. 22, f. 10; Rep. Mo. Bot. Gard. 22: pl. 8, this last as *Opunia demissa*.

Figure 186 is from a plant collected on Santa Catalina Island, California, by Mr. S. B. Parish in 1916.

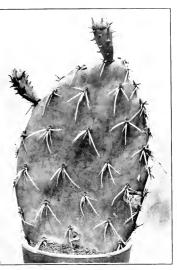


Fig. 186.—Opuntia occidentalis.

# 150. Opuntia engelmannii Salm-Dyck in Engelmann, Bost. Journ. Nat. Hist. 6: 207. 1850.

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Opunita engelmanni; cylede: Engelmann, Proc. Amer. Acad. 3: 291. 1836.
Opunita lindicineni: cyledet Coulter, Contr. U. S. Nat. Herb. 3: 422. 1896.
Opunita dillet Griffiths, Rep. Mo. Bot. Gard. 20: 82. 1909.
Opunita airiona: Griffiths, Rep. Mo. Bot. Gard. 20: 93. 1909.
Opunita evotonii Griffiths, Rep. Mo. Bot. Gard. 20: 93. 1909.
Opunita evotonii Griffiths, Rep. Mo. Bot. Gard. 21: 171. 1910.
Opunita evotonii Griffiths, Rep. Mo. Bot. Gard. 22: 26. 1912.
Opunita evotorii Griffiths, Proc. Biol. Soc. Washington 27: 21. 1914.
Opunita evotorii Griffiths, Proc. Biol. Soc. Washington 27: 28. 1914.
Opunita evotorii British, Proc. Biol. Soc. Washington 29: 9. 1916.
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Opuntia expansa Griffiths, Proc. Biol. Soc. Washington 29: 14. 1916.
Opuntia expansa Griffiths, Proc. Biol. Soc. Washington 29: 14. 1916.
Originally described as erect and up to 2 meters high, but more properly a widely spreading bush, ially without a definite trunk; joints oblong to orbicular, 2 to 3 dm. long, thick, pale green; arcoles

usually without a definite trunk; joints oblong to orbicular, 2 to 3 dm. long, thick, pale green; areoles distant, becoming large and bulging; spines usually more or less white, with dark red or brownish bases and sometimes with black tips, usually 3 or 4, sometimes only 1, or entirely wanting from the lower arcoles, but on old joints 10 or more, usually somewhat porrect or a little spreading, but never teffexed, the larger ones much flattened, the longest one 5 cm. long; leaves subulate, about 15 mm. long; glochids numerous, brown with yellowish tips; flowers large, yellow, fruit 3.5 to 4 cm. long, red: seeds small, 3 to 4 mm. broad.

Type locality: From El Paso to Chihuahua.

Distribution: Chihuahua, Durango, Sonora, Arizona, New Mexico, and Texas.

An examination of the plant collected by Wislizenus (No. 223) north of Chihuahua, now in the herbarium of the Missouri Botanical Garden and labeled by Dr. Engelmann as O. engelmannii Salm-Dyck, shows that this species is of Schumann's series Fulvispinosae (our series Phaeacanthae) rather than series Timae.

Opuntia engelmannii has been more confused than any other species of Opuntia. Salm-Dyck, who first studied the species, doubtless had but a single specimen before him, and this or a duplicate is now in the herbarium of the Missouri Botanical Garden. This type specimen came from near Chihuahua City, from which place Dr. Rose has collected identical material. Dr. Engelmann, who published Salm-Dyck's name, described the plant as crect and 5 to 6 feet high, giving its range from Chihuahua City to Texas. These remarks of his were doubtless based on notes of Dr. Wislizenus, who collected the type, and must have included more than one species; as Engelmann says it is both cultivated and wild, the cultivated plants doubtless referring to some of the many forms grown about towns and ranches. In 1852 Engelmann extends the distribution of the species westward to the Pacific Ocean, referring especially to a San Diego specimen. In 1856 he refers here his previously described species O, lindheimeri, and extends the range eastward to the mouth of the Rio Grande and to lower Mexico. Coulter brought all this material together under O. lindheimeri and four varieties.

An examination of herbarium and greenhouse specimens shows that at least half a dozen species have been passing under the name of *O. eugelmannii*. While certain varieties and specimens are evidently to be excluded from the species, we are still uncertain as to its specific limits. It is quite common about Chihuahua City and extends to Monterey and Saltillo or is represented there by a near ally, while Mr. E. O. Wooton would refer here plants of southern New Mexico, and we are including large, bushy opuntias from Arizona.

Dr. Rose was inclined at one time to separate the Tucson plant, which seems to have some just claims for specific recognition, but there is a mass of herbarium material which seems to connect this with the true O. engelmannii.

Opuntia engelmannii monstrosa (Cat. Darrah Succ. Manchester 54. 1908) is doubtless one of the abnormal forms so common among the flat-jointed opuntias.

Opuntia cyclodes, first found by Bigelow near Anton Chico, New Mexico, is certainly of this relationship. The characters of orbicular joints, of small fruit and of stout, usually solitary spines, originally assigned to ir, are not constant, for it often has obovate to oblong joints bearing as many as four slender spines and large fruit.

In 1913, Dr. Rose explored the upper Pecos, especially about Anton Chico, near the type locality, where he collected specimens similar to the Bigelow plant, but these grade into more spiny forms, some bearing as many as five spines at an areole, usually yellow, especially distally, and more slender than in typical O. engelmannii. From the same type locality, and associated with O. cyclodes, is O. expansa Griffiths, which has more and whiter spines than the typical form, although they are sometimes yellowish with brown bases. O. dillei Griffiths is also related to O. cyclodes, but the spines are fewer; Dr. Griffiths states, however, that more spines develop on cultivated plants.

Illustrations: Pac. R. Rep. 4: pl. 8, f. 1; pl. 22, f. 8, 9, all as Opuntia engelmannii cyclodes; Rep. Mo. Bot. Gard. 20: pl. 4, in part, as Opuntia dillei. Ariz. Agr. Exp. Sta. Bull. 67: pl. 7, f. 1; Rep. Mo. Bot. Gard. 20: pl. 10; Safford, Ann. Rep. Smiths. Inst. 1908: pl. 10, f. 3, 6, all as Opuntia arizonica. Rep. Mo. Bot. Gard. 21: pl. 26, in part, 27, both as Opuntia wootonii. Rep. Mo. Bot. Gard. 22: pl. 3, this last as Opuntia gregoriuma. Standley, Ann. Rep. Smiths. Inst. 1911: pl. 2; Bull. Torr. Club 32: pl. 10, f. 10 to 13; Cact. Journ. 2: 147; Cact. Mex. Bound. pl. 75, f. 1 to 4; Cycl. Amer. Hort. Bailey 3: f. 1547; Gard. Chron III. 30: f. 123; N. Mex. Agr. Exp. Sta. Bull. 78: pl. [5, 6]; Cact. Journ. 1: pl. for February; 2: 162, as Opuntia engelmannii cristata; Gard. Chron. III. 39: 148. f. 58; Plant World 9<sup>12</sup>: f. 49; Shreve, Veg. Des. Mt. Range pl. 5, B; Stand. Cycl. Hort. Bailey 4: f. 2601; Scientific Month. 17: 70, 71, 72.

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Plate xxv, figure 3, represents a flowering joint of a plant sent from Arizona by Dr. Mac-Dougal in 1902.

# 151. Opuntia discata Griffiths, Rep. Mo. Bot. Gard. 19: 266. 1908.

Opuntia gilreviewi Grufiths, Rep. Mo. Bot. Gard. 20: 87. 1909.

Opuntia riparia Grufiths, Proc. Bod. Soc. Washington 27: 26. 1914.

Plants bushy, spreading, sometimes 15 dm. high; joints thick, obicular to broadly obovate, 2.5 dm. in diameter or less, pale bluish green, somewhat glaucous; areoles rather few, distant, in age becoming very large, hemispheric, filled with short brown wool; spines usually 2 to 4, sometimes 7 or more in old areoles, 2 cm. long or more, grayish with dark bases, somewhat flattened; flowers large, 9 to 10 cm. broad, light yellow, darker near the center; style white; stigma-lobes green; fruit magenta, pyriform, 6 to 7 cm. long.

Type locality: Foothills of Santa Rita Mountains, Arizona.

Distribution: Foothills and high mesas of southern Arizona and northern Sonora.

Illustrations: Rep. Mo. Bot. Gard. 20: pl.2, f. 5; pl. 7; pl. 13, f. 6, all as Opuntia gilvescens; Amer. Garden II: 469, this last as Opuntia angustata. Ariz. Agr. Exp. Sta. Bull. 67: pl. 1, f. 2; Bull. U. S. Dept. Agr. 31: pl. 3. f. 2; Rep. Mo. Bot. Gard. 19: pl. 27, in part; Carnegie Inst. Wash. 269; pl. 10, f. 87.

Plate xxiv, figure 2, is from a photograph taken by Dr. MacDougal in the Tortolita Mountains, Arizona, in 1916; Opuntia discata is the plant shown in left foreground.

# 152. Opuntia rastrera Weber, Dict. Hort. Bois 896. 1898.

\*\* \*\*Popuntia lucent Griffiths, Rep. Mo. Bot. Gard. 19: 269. 1908.

Creeping plant; joints circular to obovate, the largest 2 dm. in diameter; spines white, several from an areole, the longest 4 cm. long; glochids yellow; flowers yellow; fruit purple, acid, obovoid.

Type locality: San Luis Potosí, Mexico.

Distribution: The type locality and vicinity.

This species was very briefly described in 1898 by Dr. Weber, who states that it is quite distinct from O. tuna, the Jamaican species. Schumann, who treats it in a note under O. tuna, states that it is a well-differentiated species from Mexico.

From descriptions we are referring here O. lucens Griffiths, also described from San Luis Potosí specimens. Dr. Griffiths states that his O. lucens is related to O. engelmannii, but has a different habit; he says it is called cuija by the Mexicans, but that it is very different from Opuntia cuija.

#### Series 12, ELATIORES.

Tall species, with flat, broad, persistent joints, the areoles bearing acicular, setaceous, or subulate brown spines, or some species spineless. We know about twelve species, most of them South American, with one in Florida (see Appendix p. 222), possibly one (O. fuliginosa) in Mexico.

#### KEY TO SPECIES.

Joints very spiny.	
Spines not banded.	
Areoles surrounded by a purple blotch	153. O. brunnescens
Areoles not surrounded by a purple blotch.	
Spines setaceous: petals yellow	154. O. g.d.ip.igvi.i
Spines, when present, acticular or subulate; petals mostly red or orange.	
Joints strongly undulate; spines short, stout	155. O. delaetiana
Joints not undulate or scarcely undulate.	
Joints bluish green, glaucous	156. O. bergeriana
Joints bright green, not glaucous or slightly glaucous.	
Spines, at least on young joints, acicular, slender.	
Spines, when present, dark brown or blackish; joints dull	157. O. elatror
Spines light brown to straw-colored,	
Spines up to 5 cm. long; joints shining	158. O. banhuryana
Spines 3 cm. long or less; joints dull.	
Flowers 12 to 15 mm. wide; spines 1 to 4 at an areole or	
wanting	159. O. quitensis
Flowers 5 to 6 cm. wide; spines up to 10 at an areole	159a. O. soederstromiana
Spines subulate, stout; joints shining	160. O. schumannii
Spines acicular; petals yellow; joints shining [in this series?]	161. O. fuligmova
Spines distinctly banded; joints dark green, obscurely glaucous	161a. O. zebrina
Joints usually spineless.	
Bushy, I to 2 meters high; flowers rose	162. O. boldinghii
Erect, 3 to 4 meters high; flowers orange-red	163. O. distans

#### 153. Opuntia brunnescens sp. nov.

Usually low and prostrate, sometimes 1 meter high, without a definite trunk, usually forming a bushy clump; joints oblong to orbicular, 15 to 30 cm. long, smooth, dull green, except the purple blotches about the prominent areoles; spines 2 to 5, brownish, porrect or pointing forward, up to 4.5 cm. long, stout, sometimes twisted.

Hills about the city of Córdoba, Argentina, where it was collected by Rose and Russell, September 8, 1915 (No. 21029).

This species is very common on the dry hills about Córdoba, where it is often associated with *Opuntia sul phurea*. It apparently extends northward into Jujuy.

Figure 187 represents a joint of the type specimen above cited; figure 188 shows its fruit collected by Dr. Shafer (No. 78).

# 154. Opuntia galapageia Henslow, Mag. Zool. and Bot. 1: 467. 1837.

Opuntia myriacantha Weber, Dict. Hort. Bois 894, 1898. Opuntia helleri Schumann in Robinson, Proc. Amer. Acad. 38: 180. 1902. Opuntia invaluir Stewart, Proc. Calit. Acad. IV. 1: 113, 1911.

Sometimes low and creeping, but often becoming very large, 5 to 10 meters high, with a large top either open or very compact and rounded; trunk at first very spiny and made up of flat joints set end to end, with the short axis of each joint at right angles to that of the adjacent joint, in time becoming terete, and when old nearly naked, 3 to 13 dm. in diameter; bark of old trunks smooth, brown, peeling off in thin layers; joints oblong to orbicular, usually very large, 1.5 to 3.5 dm. long, very spiny; arcoles large, often prominent on the trunk, there especially forming knobs bearing numererous spines; spines extremely variable, bur nearly all yellowish brown; arcoles on young, vigorous plants very stout and rigid, very unequal, the longest 7 to 8 cm. long; joints of old plants bearing more or less pungent bristles or sometimes very weak soft hairs instead of spines, while the spines from the trunks often are very stout and sometimes 40 in a cluster; flowers yellow, 7.5 cm. broad; ovary more or less tuberculate; fruit greenish, sometimes borne in the ends of joints, more or less spiny; seeds large, 5 to 6 mm. broad, white, covered with soft hairs.

Type locality: Galápagos Islands.

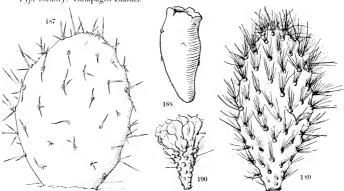


Fig. 187.—O. brunnescens. Xo.4. Fig. 188.—Fruit of O. brun Fig. 190.—Flower of same Right for O. galapageia.

Distribution: Very common, often forming forests, on the Galápagos Islands.

We have here combined the four species reported from the Galápagos Islands, while Alban Stewart, in his admirable paper on the botany of these islands, not only recognizes four species, but describes a fifth without specific name. He also has fourteen full-page

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illustrations showing fine habit views of the Galápagos Opuntia. The early descriptions of this species were very inaccurate and, as pointed out by Mr. Stewart, the characters assigned to its fruit are those of a Cereus-like plant. Mr. Stewart visited the Galápagos Islands in 1905-1906 and brought back a remarkable series of photographs and specimens. Through the kindness of Miss Alice Eastwood, Curator of Botany in the California Academy of Sciences, we have been able to study this material. It consists of about forty sheets of well-preserved joints with a few flowers and fruits. These, in connection with the published illustrations, show a

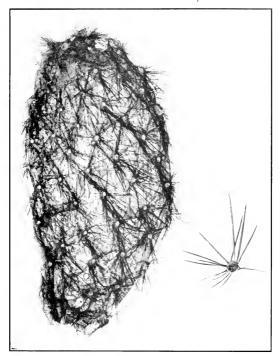


Fig. 191.- Opuntia galapageia, x 0.75.

great range of variation in habit, armament of joints, and character of spines. While these differences are very marked, they are similar to what is sometimes met with in other opuntias, such as O. gosseliniana and O. leucotricha. or in certain Peruvian and Chilean types of Cereus relatives; indeed, in a number of cacti which live under intense desert influences, most diverse forms in the same species are often produced. The habit-character in this species seems to be of little value, according to Mr. Stewart himself, for he calls attention to procumbent and

arborescent forms of O. galapageia, while the greatest range of spine characters is shown between the young plants and old ones and between the trunk and the joints. The specimen which Mr. Stewart has made the type of his Opantia insularis is quite different from all the others, and yet one can easily believe that intergrades could be found; his species is described without flowers or fruit. Mr. Stewart states that this Opantia forms the principal article of food for the Galápagos land tortoise. Its trunk becomes thicker than that of any other known species of the genus.

Illustrations: Gard. Chron. III. 24: f. 75; Mag. Zool. and Bot. 1: pl. 14, f. 2; Proc. Calif. Acad. IV. 1: pl. 7, f. 2; pl. 8; 9, f. 2; pl. 10 to 12. Gard. Chron. Ser. III. 27: f. 56; Proc. Calif. Acad. IV. 1: pl. 7, f. 1; pl. 13, f. 2; pl. 16 to 18, all as Opuntia myriacantha. Proc. Calif. Acad. IV. 1: pl. 13, f. 1; pl. 14, the last two as Opuntia helleri. Proc. Calif. Acad. IV. 1: pl. 15, the last two as Opuntia insularis.

Figure 189 represents a joint of the plant collected by Robert E. Snodgrass and Edmund Heller on Wenman Island, Galápagos, on the Hopkins-Stanford Expedition (type of *Opuntia belleri* Schumann), drawn from the herbarium specimen in the Gray Herbarium; figure 190 is a flower of the same plant; figure 191 is from a photograph of an herbarium specimen collected by Alban Stewart.

#### 155. Opuntia delaetiana Weber in Vaupel, Blühende Kakteen 3: pl. 148. 1913.

Opuntia elata delaetiana Weber in Gosselin, Bull. Mus. Hist. Nat. Paris 10: 392, 1904.

Joints oblong, 25 cm. long, 8 cm. broad, bright green, at first thin and spineless, the margin strongly undulate; arcoles large, bearing 3 to 5 straight, rose-colored or yellowish brown spines up to 4 cm. long; leaves subulate, about 4 mm. long; glochids wanting in young arcoles, later appearing numerous and brown; flower-buds rounded at the apex; outer sepals orbicular, obtuse, red; flower rotate, 5 to 7 cm. broad, orange-colored; stigma-lobes white; fruit oblong or pyriform, red, 5 to 7 cm. long, 3 to 5 cm. in thickness.

Type locality: Paraguay.

Distribution: Paraguay and northeastern Ar-

The plant was collected by Dr. Thomas Morong at Asunción, Paraguay, in 1888, and referred in his list of plants collected in Paraguay (Annal. N. Y. Acad. Sci. 7: 121. 1892) to O. nigricans Haworth; Dr. Shafer found it in 1917 in waste places and in hedge-rows about Concordia and Posados, Argentina. This species may more properly belong in our series Elatae than in Elatiores.

Illustration: Blühende Kakteen 3: pl. 148. Figure 192 is copied from the illustration above cited.

# Opuntia bergeriana Weber in Berger, Gard. Chron. III. 35: 34. 1904.

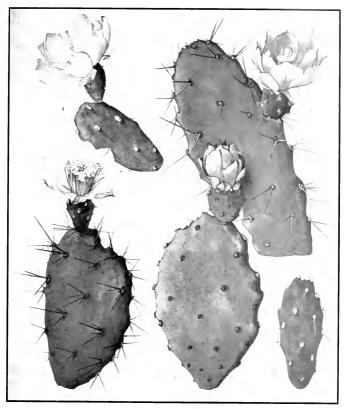
Growing singly or in dense thickers, often 1 to 3.5 meters high and having a trunk 3 to 1 dm. in diameter, with a large, spreading top, or clambering over walls and rocks; joints narrowly oblong, sometimes 2.5 cm. long, when young often quite narrow, bright green, but becoming



Fig. 192.—Opuntia delaetiana,

dull and somewhat glaucous; areôles rather distant, on old joints 2 to 4 cm. apart, filled with short gray wool; spines 2 or 3, rarely 5, unequal, the longest one 3 to 4 cm. long and somewhat flattened, more or less brownish at base, sometimes yellowish, porrect, or somewhat turned downward; leaves 2 to 3 mm. long, fugacious; glochids yellow but sometimes turning brown, rather prominent, forming a half circle in the upper part of the areole; areoles circular, when young filled with light brown wool in the center and white in the outer region; flowers numerous, showy, deep red; some joints

BRITION AND ROSE PLATE XXVI



- 1. Flowering joint of Opuntia bergeriana,
- 3. Flowering joint of Opuntia boldingera.
- 2. Flowering joint of Opuntia elatior.
- 4, 5. Joints of Opuntia elata.

(All three-fourths size)



bearing 20 or more; petals 2.5 cm. long, mucronate; filaments numerous, scarlet-rose; stigma-lobes 6, green; fruit small, 3 to 4 cm. long, red, not edible; seeds few, flattened, 5 mm. broad.

Type locality: Described from cultivated specimens.

Distribution: Not known in the wild state, but now very common on the Riviera, northern Italy, forming large thickets.

Mr. Berger would place this species next to O. nigricans, which we now call O. elatior. This species was named for Alwin Berger, formerly curator of the Hanbury Garden at La Mortola, Italy, who sent material to the late Dr. Weber, from which the species was described. The species is quite common on the Riviera and has run wild in many places, especially about Bordighera, Italy. It produces a great abundance of flowers in May, but blooms more or less throughout the year.

Opuntia ledienii (Berger, Hort. Mortol. 233. 1912), unpublished, is referred here.

Illustrations: Gard. Chron. III. 35: f. 14; Monatsschr. Kakteenk. 16: 156; Gartenwelt

Plate XXVI, figure 1, represents a flowering joint of a plant sent from La Mortola, Italy, to the New York Botanical Garden in 1906.

### 157. Opuntia elatior Miller, Gard. Dict. ed. 8. No. 4. 1768.

Cactus nigricans Haworth, Misc. Nat. 187. 1803.
Opanita nigricans Haworth, Syn. Pl. Succ. 189. 1812.
Cactus elation Wilderoue, Enum. Hort. Berol. Suppl. 34. 1813.
Cactus tuna nigricans Sms. Curtus's Bot. Mag. 38: pl. 1557. 1813.
Cactus tuna elatior Sims, Curtus's Bot. Mag. 38: under pl. 1557. 1813.
Cactus tuna elatior Sims, Curtus's Bot. Mag. 38: under pl. 1557. 1813.

Plants densely bushy-branched, up to 5 meters high; joints obovate to oblong or suborbicular, olive-green, 1 to 2 dm. or even 4 dm. long; leaves 4 mm, long, green with reddish tips; ateoles 2 to 4 cm. apart; spines 2 to 8, acicular, mostly terete, dark brown, 2 to 4 cm. or even 7 cm. long; flowers about 5 cm. broad; petals dark yellow striped with red or sometimes salmon-rose, with mucronate tips; flaments numerous, pink or red; style nearly white; stigma-lobes 5, green; ovary ovoid, deeply umbilicate, its areoles either with or without spines; fruit obovoid, truncate when mature, reddish, the pulp dark red; seeds about 4 mm. broad.

Type locality: Unknown.

Distribution: Common or frequent in Curacao, Venezuela, Colombia, and Panama, escaped from cultivation in Australia. O nigricans has been referred to Mexico, but doubtless wrongly, unless cultivated there. Plants brought by Dr. Howe from Tobogilla Island, Panama, have narrowly obovate joints.

The early history of this species and its various synonyms are rather confusing. Dillenius figured *Opuntia elatior* and this name was taken up by Miller in 1768. There is some doubt as to its native home, but it probably came from northern South America, or possibly Curacao. *Opuntia nigricans*, also referred here, was described by Haworth from cultivated specimens; plate 1557 of Curtis's Botanical Magazine was made from Haworth's specimen and may be considered typical.

Introduced into cultivation in Europe about 1793.

Illustrations: Loudon, Encycl. pl. ed. 3 f. 6877, as Cactus elatior: Curtis's Bot. Mag. 38: pl. 1557, this last as Cactus tuna nigricans: Dillenius, Hort. Elth. pl. 294, this as Tuna elatior, etc.; Agr. Gaz. N. S. W. 23: pl. opp. 208; pl. opp. 210, both these as Opuntia nigricans: Journ. Hort. Home Farm. III. 60: 30, this as Opuntia occidentalis: Loudon, Encycl. pl. ed. 3. 411. f. 6879, as Cactus nigricans.

Plate XXVI, figure 2, shows a flowering joint of a specimen obtained by Dr. Britton and Dr. Shafer in Curacao in 1913.

#### 158. Opuntia hanburyana Weber in Berger, Gard. Chron. III. 35: 34. 1904.

Bushy, 1 to 2 meters high, somewhat straggling; joints narrowly oblong, about 3 dm. long, bright green; leaves subulate, 4 to 5 mm. long; areoles closely set, filled with brown or blackish wool; spines several, spreading, acicular, somewhat flattened and twisted, yellowish brown, the longest 3 cm. long; flowers widely spreading, rather small; fruit small.

Type locality: Described from cultivated plants.

Distribution: Not known in the wild state.

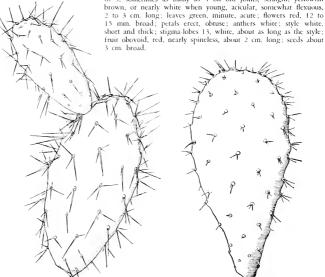
The species commemorates Sir Thomas Hanbury, who, through his extensive garden at La Mortola, Italy, contributed much to botany and horticulture.

Illustration: Gard. Chron. III. 35; f. 15.

Figure 193 represents joints of the plant sent from La Mortola, Italy, in 1913.

159. Opuntia quitensis Weber, Dict. Hort. Bois 894. 1898.

Bushy, sometimes 2 meters high; joints obovate, 1 to 4 dm. long, 8 to 9 cm. broad; areoles small, distant, 2 cm. apart, bearing some white tomentum and short glochids; spines wanting, or 1 to 3, sometimes as many as 4 on old joints, straight, yellowish





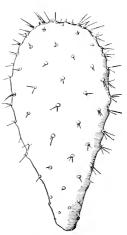


Fig. 194.-O. quitensis.

Type locality: Near Quito, Ecuador.

Distribution: Ecuador.

As observed by Dr. Rose in Ecuador in 1918, this species is very variable in habit, for when grown in the open it is low and bushy with rather small joints, but when growing in thickets it becomes tall and has large joints. About Huigra, where it is very common, it is often spineless, and when the spines are present they are few and weak. In southern Ecuador there is a plant which has small, red flowers like this species, but the joints have stout subulate spines.

Figure 194 represents a joint of a plant obtained in 1901 for the New York Botanical Garden from M. Simon, of St. Ouen, Paris, France.

159a. Opuntia soederstromiana sp. nov. (See Appendix, p. 221.)

## 160. Opuntia schumannii Weber in Berger, Gard. Chron. III. 35: 34. 1904.

Bushy, 1 to 2 meters high; joints obovate to oblong, 1.5 to 2.5 cm. long, dull dark green; areoles distant, medium sized; spines 2 to 10, slightly spreading, very unequal, the longest ones, 4.5 cm. long, more or less twisted, flattened, dark brown; glochids few, soon disappearing; flowers 6 cm. long, yellowish to orange, turning in age to dull red; ovary tuberculate, spineless, deeply umbilicate; fruit dark purple, turgid, juicy, deeply umbilicate, 5 cm. long.

Type locality: Not cited.

Distribution: Northern South America; sometimes assigned to Argentina.

Opuntia schumannii is described by Berger as being intermediate between Opuntia and Nopalea, and according to him, it has long stamens and upright petals; otherwise it has little in common with Nopalea; a plant from Santa Clara, Colombia, which agrees with plants of O. schumannii from La Mortola, Italy, has a normal Opuntia flower.

Illustration: Gard. Chron. III. 35: f. 16.

Plate XXVII, figure 1, represents a fruiting joint of the plant collected by John G. Sinclair at Santa Clara, Colombia, in 1913; figure 2 shows a flower of the same plant.

# 161. Opuntia fuliginosa Griffiths, Rep. Mo. Bot. Gard. 19: 262. 1908.

Tall, tree-like, 4 meters high or more, much branched; joints orbicular to oblong, 3 dm. long or less, shining; leaves subulate, 8 to 12 mm. long; areoles distant; spines few, rarely as many as 6, dull brown or horn-colored, the longest ones 4 cm. long, slightly twisted; glochids yellow to brown; flowers at first yellow but in age red, 5 to 6 cm. long including the ovary; stigma-lobes yellowish green; fruit pyriform to short-oblong, 3 to 4 cm. long, red; seeds 5 mm. broad.

Type locality: Near Guadalajara, Mexico.

Distribution: Central Mexico.

We refer this species to our series Elatiores with hesitation.

Illustration: Rep. Mo. Bot. Gard. 19: pl. 25.

161a. Opuntia zebrina Small, Journ. N. Y. Bot. Gard. 20: 35. 1919. (See Appendix, p. 222.)

## 162. Opuntia boldinghii sp. nov.

Bushy, 2 meters high; joints dull green, somewhat glaucous, obstate, 2 cm. long, spineless or with very short brown spines; leaves conic, red, 2 to 3 mm. long; areoles large, elevated, filled with short brown wool; flowers rose-colored, 5 cm. long; petals obtuse; filaments pink, much shorter than the petals; style nearly white; stigma-lobes yellowish; fruit obovate, 4 cm. long, spineless; seeds 4 mm. in diameter.

Collected by Dr. N. L. Britton and Dr. J. A. Shafer, March 1913, in cultivation on Curacao (No. 2905, type); also collected by H. Pittier around El Palito, Venezuela, July 2, 1913 (No. 6450), and by Dr. Rose in a hedge at Valencia, Venezuela, October 27, 1916 (No. 21842). Chacachacare and Patos Islands, Trinidad.

This species is named in honor of Dr. I. Boldingh, a Dutch botanist, author of a valuable descriptive flora of the Dutch West Indian islands.

Plate XXVI, figure 3, shows a flowering joint of a specimen obtained by Dr. Britton and Dr. Shafer in Curacao in 1913.

#### Opuntia distans sp. nov.

Erect, densely much branched, 3 to 4 meters tall, with a store trunk 1.5 dm. in diameter; joints flat, bluish green when young, grayish green when old, obovate, 2 to 2.5 dm. long, about 1.5 dm. wide and nearly 2 cm. thick, rounded above, narrowed



Ftg. 195.-Joint of O. distans. x 0.4.

at the base, glabrous; areoles few, only about 12 on each side of a joint, distant, large, nearly circular, 8 to 10 mm. broad, slightly elevated, bearing many short glochids, but quite spineless; leaves subulate, about 3 mm. long; ovary obconic, 3 to 4 cm. long, bearing a few small areoles; sepals broadly triangular, acute, 6 to 10 mm. long; petals broad, rounded, 1 to 2 cm. long, orange-red.

Distribution: Sandy places, Andalgala, Catamarca, Argentina, J. A. Shafer, December

A spineless species noteworthy for its few, large, distant arcoles. We append it to the series *Elatiores*, but are uncertain as to its real affinity. The large distant arcoles forbid associating it with the *Ficus-indicae* or the *Streptacanthae*.

Figure 195 represents a joint of the type specimen.

## Series 13. ELATAE.

Erect, tall species, natives of South America, with oblong or oval joints, the brown or white spines, when present, only one or few at each areole, except on the trunk and old joints.

#### KEY TO SPECIES

Joints ovate to broadly oblong or obovate.	
Joints thin, lustrous, light green	164. O. vulgaris
Joints turgid, dull green.	
Leaves purplish, rigid; joints dark green	165. O elata
Leaves green, not rigid; joints pale green.	
Spines slender, terete	166. O cardio perma
Spines stout, angled, elongated	167. O. arechavaletai
Joints narrowly oblong to linear or spatulate.	
Joints oblong to linear: flowers brick-red.	168. O. mieckleyi
Joints spatulate; flowers orange	169, O. bonaerensis

## 164. Opuntia vulgaris Miller, Gard. Dict. ed. 8. No. 1. 1768.

Cactus monacanthos Wildenow, Enum. Pl. Suppl. 33. 1813.
Opantia monacantha Haworth, Suppl. Pl. Succ. 81. 1819.
Cactus indicabeba Vellozo, Fl. Flum. 207. 1825.
Cactus indicas Rosburgh. Fl. Indica 2: 475. 1832.
Cactus indicas Rosburgh. Fl. Indica 2: 476. 1832.
Opantia monacantha gracilior Lemaire. Cact. Gen. Nov. Sp. 68. 1839.
Opantia umbrella Srecudel, Nom. ed. 2. 2: 222. 1841.
Opantia vantaghama Voigt, Hort. Suburth. Calcutt. 62. 1845.
Opantia monacantha deflexa Salm-Dyck, Cact. Hort. Dyck. 1849. 66. 1850.
Opantia monacantha deflexa Salm-Dyck. Cact. Hort. Dyck. 1849. 66. 1850.
Opantia lemaireana Console in Weber, Dict. Hort. Bois 894. 1898.

Plant 2 to 4 or even 6 meters high, often with a definite trunk, usually with a large much branched top: trunk cylindric, 1.5 dm. in diameter, either spiny or smooth; joints ovate to oblong, narrowed at base, 1 to 3 dm. long, bright shining green; leaves subulate, 2 to 3 mm. long; arcoles filled with short wool; glochids brownish; spines 1 or 2, sometimes more (on the trunk often 10 or more) from an arcole, erect, 1 to 4 cm. long, yellowish brown to dark reddish brown; flowers yellow or reddish, 7,5 cm. broad; sepals broad, each with a broad red stripe down the middle; petals golden-yellow, widely spreading; filaments greenish, style white; stigma-lobes 6, white; ovary spineless, 3.5 cm. long; fruit obovoid, 5 to 7.5 cm. long, reddish purple, long-persisting, sometimes proliferous.

Type locality: Type based on an illustration, the origin unknown.

Distribution: Coast and islands of Brazil, Uruguay, and Argentina; in the interior to Paraguay; an escape in Cuba, India, and south Africa and naturalized in Australia; frequently cultivated. According to J. H. Maiden it is found in every state of Australia, but it is not inclined to spread and become a pest.

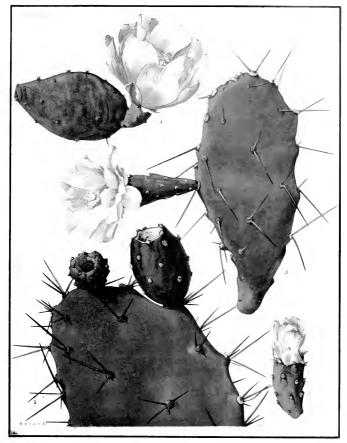
As has been recently pointed out by Burkill, the *Opuntia rulgaris* of Miller is the same as *O. monacantha* Haworth. *O. rulgaris* was based on Bauhin's figure (Hist. Pl. 1: 154. 1650), which was taken from Lobelius (Icones 2: 241. 1591), and is a tall, branching plant. This species is not to be confused with the low, spreading species of the eastern United States, long known as *O. rulgaris*. (See p. 127.)

This species is said by Burkill to be distributed over the earth more widely than any other, but our observation in America is that O. ficus-indica is by far the most widely spread species.

O. rulgaris was one of those most commonly used in the nopalries of India and South Africa in the cochineal industry.

We have referred both of Roxburgh's species here, although Burkill was inclined to

BRITTON AND ROSE PLATE XXVII



- 1. Upper part of fruiting joint of Opuntia schumannii.
- 2. Flower of Opuntia schumannii.

- 3. Flowering joint of Opuntia vulgaris.
- 4. Flowering joint of Opuntia stricta.

(All three-fourths size)



refer Cactus chinensis to O. decumana, which in his sense is O. ficus-indica.

Opuntia monacamba variegata (listed in Cat. Darrah Succ. Manchester 57. 1908) is common in cultivation. Some of the joints are normally green; others are more or less blotched with white or yellow, while others may be entirely white or yellow; the leaves are bright red and though small are conspicuous.

Opuntia urumbella Steudel (Nom. ed 2. 1: 246. 1840), given as a synonym of Cactus urumbella, is doubtless a name for this species.

Opuntia deflexa Lemaire (Cact. Gen. Nov. Sp. 68. 1839) was given as a synonym of O. monacantha gracilior; while the latter was given as a synonym of O. elatior deflexa Salm-Dyck (Cact. Hort. Dyck, 1844. 47. 1845).

Opuntia gracilior (Index Kewensis 3: 357. 1894) is a mistake for O. monacantha gracilior Lemaire

Illustrations: Rev. Hort. 41: f. 37; 66: f. 58; Bauhin, Hist. Pl. 1: 154 [ = Loebelius, Icones 2: 241], this last as Opunita vulgo, etc. Anal. Mus. Nac. Montevideo 5: pl. 32; Curtis's Bot. Mag. 68: pl. 3911; Dept. Agr. N.S. W. Misc. Publ. 253: pl. [3], [4]; Agr. Gaz. N. S. W. 24: facing p. 864; Edwards's Bot. Reg. 20: pl. 1726; Gard. Chron. III. 30: f. 122, in part; 34: f. 35; Journ. Dept. Agr. Vict. 6: pl.25; Martius, Fl. Bras. 4°: pl. 62; Weeds,

Pois. Pl. Nat. Al. Vict. pt. 1. pl. [10], [32], all as Opuntia monacantha; Amer. Garden II: 529; Cact. Journ. 1: 167, these last two as Opuntia monacantha variegata; Vellozo, Fl. Flum. 5: pl. 32, as Cactus urumbeba; De Candolle, Pl. Succ. Hist. 2: pl. 138 [B]; De Tussac, Fl. Antill. 2: pl. 31, these last two as Cactus opuntia tuna; Gard. Chron. III. 47: f. 174, this as Opuntia ficusindica; Rümpler, Sukkulenten f. 122, this as Opuntia tuna; Addisonia 1: pl. 38. Möllers Deutsche Gärt. Zeit. 25: 476. f. 9, No. 20, as Opuntia monacantha variegata; Pl. Utiles Madagascar 124. f. 39; 125. f. 39.

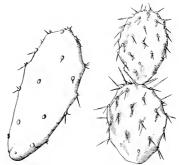


Fig. 196.—O. elata. x 0.4. Fig. 197.—O. cardiosperma. x 0.4.

Plate XXVII, figure 3, represents a flowering joint of a plant presented to the New York Botanical Garden by Mr. Gustav Rix in 1900.

# 165. Opuntia elata Link and Otto in Salm-Dyck, Hort. Dyck. 361. 1834.

An erect plant, I meter high or more; joints thick, dark green, oblong, 5 to 25 cm. long, half as broad as long; leaves minute, caducous; areoles remote, large (7 mm. in diameter), filled with short white wool, usually spineless; spines if present only 1 to 3, except on old stems and there more, horn-colored, stiff, sometimes 3.5 cm. long; glochids very tardy in appearing, long persistent; flowers about 5 cm. broad, orange-yellow; petals obtuse, broad; filaments short; stigma-lobes white; fruit oblong, 6 cm. long, spineless, with a truncate umbilities; seeds 6 mm. broad.

Type locality: In Brazil.

Distribution: Paraguay, but according to Salm-Dyck and Pfeiffer, from Brazil and probably Curacao; our exploration of Curacao failed to prove its existence there. It is grown for ornament in Cuba and has there escaped from cultivation in gardens to roadsides and waste grounds.

Schumann did not know where to place this species, but we believe it is most nearly related to Opuntia vulgaris.

Plate XXVI, figure 4, represents a flowering joint of a plant given to the New York Botanical Garden by Frank Weinberg in 1903; figure 5 represents another joint of the same plant. Figure 196 represents a joint of a plant obtained by Professor Carlos de la Torre at Punta de los Molinos, Cuba, in 1912.

#### 166. Opuntia cardiosperma Schumann, Monatsschr. Kakteenk, 9: 150. 1899.

About 2 meters high, erect, branching; joints narrowly oblong to obovate; rounded at apex, 10 to 15 cm. long or smaller in greenhouse specimens, easily breaking apart, pale green, more or less tuber-culate; leaves minute, subulate; areoles large, 1 to 2 cm. apart, with white wool, when young having conspicuous secreting glands; spines, when present, 1 to 4, acicular, stiff, more commonly 1 or 2 from an arcole, short, 1 to 2 cm. long, brownish at first but nearly white when old, portect or ascending; glochids tardily developing, never conspicuous, brownish; flowers unknown; fruit clongated, pear-shaped, 7.5 cm. long; seeds 6 mm. broad, 2.5 to 3 mm. thick, cordate, gray, with broad yellow margins, woolly on the sides.

Type locality: At Recoleta, near Asunción, Paraguay.

Distribution: Paraguay.

Figure 197 represents joints of the plant sent to the New York Botanical Garden from La Mortola, Italy, in 1913

#### 167. Opuntia arechavaletai Spegazzini, Anal. Mus. Nac. Buenos Aires. III. 4: 520. 1905.

Plants tall, 1 to 3 meters high, much branched; joints flattened, oblong to obovate, 25 to 30 cm. long, green; spines, usually 1, sometimes 3, elongated, porrect, up to 9 cm. long, white, flattened; flowers 4.5 cm. long, yellow; stamens and style white; fruit violet-purple, 7 cm. long.

Type locality: Near Montevideo, Uruguay

Distribution: Argentina and Uruguay.

Illustrations: Anal. Mus. Nac. Montevideo 5: pl. 35; Karsten and Schenck, Vegetations-bilder II: pl. 17.

# 168. Opuntia mieckleyi Schumann, Blühende Kakteen 1: pl. 44. 1903.

Plant erect, much branched; joints narrowly oblong, 15 to 25 cm. long, 4 to 6 cm. broad, glabrous, dark green, darker below the areoles; tubercles rather prominent; leaves small; areoles large, filled with white wool; spines, when present, 1 or 2, very short (5 mm. long), dark-colored; flower-buds obtuse; flowers brick-red, 6 cm. broad; petals irregularly notched; ovary spineless.

Type locality: In Paraguay.

Distribution: Paraguay; Estancia Loma, in San Salvador.

Named for W. Mieckley, gardener in the Berlin Botanical Garden.

Illustration: Blühende Kakteen 1: pl. 44.

#### 169. Opuntia bonaerensis Spegazzini, Contr. Fl. Tandil 18. 1904.

Opuntia chakensis Spegazzini, Anal. Mus. Nac. III. 4: 519. 1905.

Two meters high, very much branched; joints spatulate to elliptic-spatulate, 15 to 25 cm. long, green; spines wanting or one, short; flowers orange, large 4 cm. long; fruit obconic, 6 to 7 cm. long, dull purple; seeds 5 to 6 mm. long, subglobose.

Type locality: Sierra de Curamalal, Argentina.

Distribution: Argentina and perhaps Paraguay.

Opuntia paraguayensis Schumann (Monatsschr. Kakteenk. 9: 149. 1899) according to Spegazzini, and if so this name would supplant O. bonaerensis.

Illustrations: Anal. Mus. Nac. Montevideo 5: pl. 23; Anal. Mus. Nac. Montevideo 5: pl. 33, as Opuntia chakensis.

Mr. W. B. Alexander writes of this species as follows:

This species was seen only on rocky slopes in the Sierra de la Ventana in the south of the province of Buenos Aires. It is known only from the few Sierras which rise from the pampas in the east of the province. There is little doubt that it is nearly related to Opuntia vulgaris Miller (O. monacantha Haworth) which was found by the writer at Rio de Janeiro and is familiar in Australia.

The three following, known to us only from descriptions, may belong to this series. Opuntia stenarthra Schumann, Monatsschr. Kakteenk. 9: 1-i9. 1899.

Shrubby, erect or decumbent, creeping over stones or ascending trees; joints thin, narrow, yellowish

green, oblong to lanceolate, rounded at base, glabrous; spines either wanting or 1 to 3 from an areole, stoutish, subangular; flowers yellow; seeds woolly.

Type locality: Estancia Tagatiya, Paraguay.

Distribution: Paraguay.

OPUNTIA ASSUMPTIONIS Schumann, Monatsschr. Kakteenk. 9: 153. 1899.

Erect, 1 meter high; joints oboxate, narrowed at base, thickish; spines at arcoles on the faces of the joints none, but on the edges 1 or 2, stout, subulate, the upper one stouter, 3 to 4.5 cm. long; flower 3.5 cm. long, lemon-yellow; fruit pear-shaped, with a deep umbilicus; seeds densely villous.

Type locality: Ascunción, Paraguay.

Distribution: Known only from the type locality.

OPUNTIA CANTERAI Arechavaleta, Anal. Mus. Nac. Montevideo 5: 278. 1905.

Stems erect, branching, 5 to 10 dm. high; joints clongated, shining green, attenuate below, 15 to 20 cm. long, 4 to 6 cm. broad; areoles orbicular, when young each surrounded by a violet spot, mostly spincless, about 4 cm. apart; spines, when present, 1 or 2 from an areole, 1.5 to 2 cm. long, whitish, with brownish tips; flowers orange-colored, 4 to 4.5 cm. broad; stigma-lobes 6 or 7, light flesh-colored; fruit somewhat pear-shaped, 5 cm. long; seeds flattened.

Type locality: In Uruguay.

Distribution: Along the coast of Uruguay.

In Uruguay this species flowers in January and February.

#### Series 14. SCHEERIANAE.

A single bushy species, with broad, thin, persistent joints, the areoles close together, each bearing several yellow, acicular spines and long white or yellow hairs. Its home is unknown.

## 170. Opuntia scheeri Weber, Dict. Hort. Bois 895. 1898.

About 1 meter high, branching at base, the lower branches sprawling over the ground; joints oblong to orbicular, 1.5 to 3 dm long, bluish green; arcoles circular, clevated, filled with short brown wool; spines 10 to 12, yellow, acicular, each surrounded by a row of long white or yellow hairs; flowers large, pale, yellow, but in age salmon-colored; stigma-lobes deep green; fruit globular, red, juicy, truncate; seed small, 4 mm. broad, with a broad irregular margin.

Type locality: In Mexico.

Distribution: Mexico, but known to us only from cultivated specimens.

Fig. 198.—Opuntia scheeri. x 0.5,

This is a very beautiful species, covered as it is by yellow spines and long hairs. A fine plant is growing in the open at La Mortola, Italy. The seedlings produce a long mass of soft white hairs almost covering the joints and giving an appearance very different from the adult plant. In this young stage, according to Mr. Alwin Berger, they readily pass for *Opuntia senilis* (O. crinifera).

Opuntia diversispina Griffiths (Bull. Torr. Club 46: 197. pl. 9. 1919) grown from seed of unknown origin at Brownsville, Texas, is described as similar to O. scheeri and in the accompanying illustration the joints resemble those of that species.

Figure 198 represents a joint from a specimen sent from La Mortola, Italy, in 1912.

#### Series 15. DILLENIANAE.

Mostly bushy or tall species, with large, flat, persistent joints, and yellow spines which are sometimes brown at base, some species spineless or nearly so. We recognize thirteen species as composing the series, but many more have been described. The plants inhabit the southern United States, the West Indies, Mexico, and northern South America.

#### KEY TO SPECIES.

Joints spineless, or with only 1 or 2 spines at some of the areoles, or spines very short. Corolla rotate; petals yellow,

Plant tall; spines, when present, 2 cm. long or less Plant depressed, bushy or spreading; spines, when present, up to 7 cm. long Coralla cup-shaped; petals salmon. Joints usually manifestly spiny; spines mostly 2 or more at the areoles, Spines mostly stout, commonly flattened Spines acculate to subulate, terete, or slighby flattened at the base.	173. O. stricta 173a. O. keyensis
Joints elongated-lanceolate or oblong, several times longer than wide	5. O. linguiformis
Joints obovate to suborbicular.	
Spines long.	
Areoles mostly 1.5 to 2 cm. apart.	
Spines subulate, up to 7.5 cm. long 1	16. O. tapona
Spines acicular, 4 cm. long or less.	- 11 11
Spines nearly clear yellow, short	7. O. littoralis
Spines brown at base, long and slender	8. O. aciculata
Areoles mostly 2.5 to 4 cm. apart.	
Bushy species.	- 1. 11 1
Spines yellow or yellowish brown	9. O. lindheimeri
Spines pale yellow or whitish 18	30. O. cantabrigiensis
Depressed or procumbent plant	<ol> <li>O. procumbens</li> </ol>
Spines only 1.5 cm. long or less, or becoming longer on old joints.	
Plant 1 meter high or less; joints thin	32. O. cañada
Plant 3 to 5 meters high; joints very thick.	
Spines reflexed; flowers yellow	33. O. pyriformis
Spines spreading, deciduous; flowers orange-red	3a. O. bonplandii

# 171. Opuntia chlorotica Engelmann and Bigelow, Proc. Amen. Acad. 3: 291.. 1856.

Opuntia tidballii Bigelow, Pac. R. Rep. 4: 11. 1856.

Opuntia curvospina Griffiths, Bull. Torr. Club, 43: 88. 1916.

Erect, bushy, sometimes 2 meters high or more, with a definite trunk; main branches nearly erect; joints ovate to orbicular, sometimes broader than long, 15 to 20 cm. long, more or less glaucous, bluish green; leaves subulate, small, reddish at tip; areoles closely set, prominent; spines yellow, several, most of them usually appressed and reflexed, setaceous, 3 to 4 cm. long; glochids yellow, numerous, elongated, persistent; flowers yellow, 6 to 7.5 cm. broad; filaments white; fruit purple without, green within, 4 cm. long; seeds small.





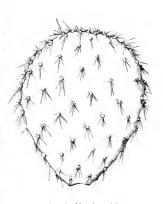


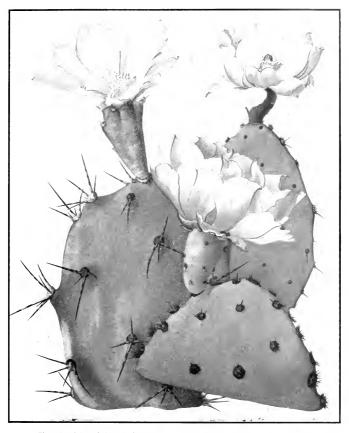
Fig. 200.—Opuntia chlorotica. x 0.4.

Type locality: On both sides of the Colorado from San Francisco Mountains to headwaters of Bill Williams River.

Distribution: Sonora and New Mexico to Nevada, California, and Lower California.

This species is of wide distribution, but is chiefly confined to mountain canyons, being rarely found on the open mesas.

BRITTON AND ROSE PLATE XXVIII



2. Flowering joint of *Opuntia dillenni*, ata. (All three-fourths size.)

Flowering joint of Opuntia laevis.
 Upper part of flowering joint of Opuntia acciulata.



Illustrations: Bull. Torr. Club 43: pl. 3; Pac. R. Rep. 4: pl. 6, f. 1 to 3; Bull. Torr. Club 43: pl. 2, this last as Opuntia curvospina; Bull. N. Mex. Coll. Agr. No. 78, pl. 4; Stand. Cycl. Hort. Bailey 4: f. 2600.

Figure 199 is from a photograph of a plant with narrow joints, in McCleary's Canyon, Santa Rita Mountains, Arizona, taken by Dr. MacDougal; figure 200 represents a joint of a plant from the collection made by Professor J. W. Toumey at Tucson, Arizona, obtained by Dr. MacDougal in 1902.

OPUNTIA PALMERI Engelmann in Coulter, Contr. U. S. Nat. Herb. 3: 423. 1896.

This plant has not been again collected and is still a doubtful species; it came from St. George, southwestern Utah. In 1909 E. W. Nelson made a collection for us in this region, but the only shrubby, juicy-fruited species which he collected has brown spines and brown glochids, which would seem to exclude it from O. palmeri. It is not at all unlikely that O. palmeri should be referred to O. chlorotica, a widely dispersed species, but of which we have not seen any specimens from Utah.

## 172. Opuntia laevis Coulter, Contr. U. S. Nat. Herb. 3: 419. 1896.

Loosely few-branched, 1 to 2 meters high, but in cultivation often forming a low, dense bush; joints oboyate to oblong, 1.5 to 3 dm. long, light green, often spineless but usually with a few (1 to 3) short spines 1 cm. long or less at the areoles of the upper part of the joint; areoles rather distant, small; flower large, 6 to 7 cm. broad; petals lemon-yellow, sometimes tinged with red, broad, and obtuse or retuse; filaments and style short, pale yellow; stigma-lobes green; ovary turbinate, more or less tuberculate, at first leafy, often bristly at top; fruit obovoid, 5 to 7 cm. long; seeds 4 to 5 mm. broad.

Type locality: In Arizona.

Distribution: In the mountains about Tucson, Arizona.

Referred by Professor Schumann to O. inermis (O. stricta), but it is not that species.

Illustrations: Ariz. Agr. Exp. Sta. Bull. 67; pl. 8, f. 1; N. Mex. Agr. Exp. Sta. Bull. 72: pl. 1; Plant World 1110: f. 5; MacDougal, Bot. N. Amer. Des. pl. 56.

Plate XXVIII, figure 1, represents a flowering joint of a plant brought by Dr. Mac-Dougal from Tucson, Arizona, in 1902, to the New York Botanical Garden.

173. Opuntia stricta Haworth, Syn. Pl. Succ. 191. 1812.

Cactus opuntia inermis De Candolle, Pl. Succ. Hist. 2:pl. 138 [C]. 1799.\*

Cactus strictus Haworth, Misc. Nat. 188. 1803.

Opuntia inermis De Candolle, Prodr. 3: 473. 1828.

Opuntia internis De Calidonis, Front. 3. 472, 1926.
Opuntia airampo Philippi, Anal. Univ. Chile 85: 492.
Opuntia parva Berger, Hort. Mortol. 411, 1912.
Opuntia bartionii Griffiths, Rep. Mo. Bot. Gard. 22: 25.
Opuntia bartionii Griffiths, Bull. Torr. Club 43: 525.
1916 (according to description and illustration).

Bushy, low, spreading plants, sometimes forming large clumps, seldom over 8 dm. high; joints obovate to oblong, usually 8 to 15 cm. long, but sometimes much elongated and then 30 cm. long or more, green or bluish green, glabrous, often spineless especially in greenhouse specimens, sometimes but a spine or two on a joint, at other times spines more abundant; leaves stout, subulate, 3 to 4 mm. long; areoles distant, the wool brownish, the glochids short; spines, when present, usually 1 or 2 from an areole, stiff, terete, yellow, 1 to 4 cm. long; flowers 6 to 7 cm. long; petals yellow, broad, obtuse, apiculate; filaments yellow to greenish; style usually white; stigma-lobes usually white but sometimes greenish; fruit purple, usually broadest at top, tapering to a slender base, 4 to 6 cm. long, with a more or less depressed umbilicus.

 $Type\ locality:$  Not given.

Distribution: Western Cuba; Florida to southern Texas.

Opuntia vulgaris balearica Weber (Dict. Hort. Bois 894. 1898) is given by Weber as a synonym of O. inermis; Opuntia balearica Weber (Hirscht, Monatsschr. Kakteenk. 8: 175. 1898) has also been used, but not described, and Hirscht says it belongs here.

This species is often cultivated on the west coast of South America. It was there given the name O. airampo by Dr. Philippi, who supposed it to be the airampo of the Peruvians, a native species, quite different from this one.

Berger (Hort. Mortol, 411, 1912) gives the date 1797.

This species is the pest pear of New South Wales and Queensland. It has now run wild over thousands of acres of the best agricultural and grazing land of the interior of Australia. J. H. Maiden says: "The growth of this *Opuntia* is one of the world, and the spread of few plants in any country can be compared with it."

Illustrations: Dept. Agr. N. S. W. Misc. Pupl. 253: pl. [5]; Gard. Chron. III. 34: f. 32; Gartenflora 31: pl. 1082, f, d, e, f; De Candolle, Pl. Succ. Hist. 2: pl. 138 [C]; De Tussac, Fl. Antill. 2: pl. 34, the last two as Cactus opuntia inermis; Agr. Gaz. N. S. W. 23: pl. opp. 713: pl. opp. 714; pl. opp. 716; Blühende Kakteen 2: pl. 108, all these as Opuntia inermis.

Plate XXVII, figure 4, represents a flowering joint of the plant collected by Dr. Britton and John F. Cowell on limestone rocks near Pinar del Río, Cuba, in 1911.

173a. Opuntia keyensis Britton. (See Appendix, p. 222.)

174. Opuntia dillenii (Ker-Gawler) Haworth, Suppl. Pl. Succ. 79. 1819.

Cactus dillenii Ker-Gawler, Edwards's Bot. Reg. 3; pl. 255. 1818. Opuntia borrida Salm-Dyck in De Candolle, Prodr. 3: 472. 1828. Opuntia maritima Rafinesque, Atl. Journ. 146. 1832. Opuntia tunoidea Gibbes, Proc. Elliott Soc. Nat. Hist. 1: 272. 1859.

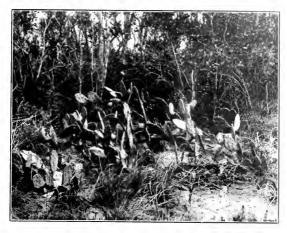


Frg. 201.—Opuntia dillenii, Antigua, West Indies.

Low, spreading bushes growing in broad clumps and often forming dense thickets, or tall and much branched, 2 to 3 meters high, sometimes with definite terete trunks; joints obovate to oblong, 7 to 40 cm. long, the margin more or less undulate, bluish green, somewhat glaucous, but bright green when young, the arcoles somewhat elevated; leaves subulate, curved backward, 5 mm. long; arcoles often large, filled with short brown or white wool when young, usually few and remote, on old joints 10 to 12 mm. in diameter; spines often 10 from an arcole on first-year joints, very variable, usually more or less flattened and curved, sometimes terete and straight, yellow, more or less brown-banded, or mottled, often brownish in age, sometimes 7 cm. long, but usually shorter, sometimes ew or none; glochids numerous, yellow; wool in arcoles short, sometimes brown, sometimes white; flowers in the typical form lemon-yellow, in some forms red from the first, 7 to 8 cm. long; petals broadly obovate, i to 5 cm. long; filaments greenish yellow; style thick, white; stigma-lobes white; fruit pear-shaped to subglobose, narrowed at base, 5 to 7.5 cm. long, purplish, spineless, juicy.

Type locality: Based on Dillenius's illustration.

BRITTON AND ROSE PLATE XXIX





View of Opuntia keyensis, View of Opuntia dillenii.



OPUNTIA, 163

Distribution: Coasts of South Carolina, Florida, Bermuda, the West Indies, east coast of Mexico, and northern South America; extending inland in Cuba.

This species is composed of many races varying greatly in habit, character and number of spines, shape of joints, and color of flowers. Brother León has sent us specimens of several individually quite different plants which inhabit hilltops in Cuba.

Opuntia Incarjana Britton (Bull. N. Y. Bot. Gard. 4: 141. 1906), inhabiting Grand Turk Island, Bahamas, differs in having elongated, often narrowly oblong joints 2 to 4 times as long as wide and many elongated, little-flattened spines. It grows with Opuntia dillenii and O. nashii, and is believed to be a hybrid with these species as parents. A closely similar plant was observed on Buck Island, St. Thomas, Danish West Indies, growing immediately with O. dillenii and O. rubescens, the hybrid nature of which was unmistakable, and similar plants were seen also on Antigua, British West Indies.

Opuntia cubensis Britton and Rose (Torreya 12: 14. 1912), observed in a valley near the southern coast of Cuba at Guantánamo Bay, differs in having narrower joints, rather readily separable and smaller flowers, its stout spines little flattened. It grows near colonies of Opuntia dillenii and O. militaris, and is probably a hybrid between them.

Reference has already been made to the possible hybrid origin of *Opuntia antillana*, with *O. dillenii* as one of its parents. (See p. 115).

Two varieties of *Opuntia dillenii* are given by name only; *minor* Salm-Dyck (Hort. Dyck. 185. 1834); *orbiculata* Salm-Dyck (Cact. Hort. Dyck. 1849. 67, 1850).

Opuntia gilva Berger (Hort. Mortol. 233. 1912) is unpublished. The name was applied to a specimen collected by Carl F. Baker in Cuba in 1907, and has been distributed under this name. It is only a form of this very variable species.

The plant is hardy on the Gulf coast of the United States and in southern California. It is widely distributed through cultivation in the warmer parts of the Old World, being a "pest pear" in southern India and in Australia; it is used for hedges in Teneriffe, and is common along the sea on Grand Canary Island. On Bermuda, when growing in shade, the plant is often spineless, and its joints elongate sometimes to a length of 3 dm., while only 6 or 7 cm. wide. This elongation of the joints also appears in plants from Florida.

Illustrations: Édwards's Bot. Reg. 3: pt. 255, as Éactus tillusii: Rep. Mo. Bot. Gard. 22: pl. 1, 2, both these as Opantia bentonii; Dillenius, Hort. Elth. 2: pl. 296, this as Tuna major, etc.; Amer. Journ. Pharm. 68: pl. 0pp. 169, as Opantia tudigaris: Descourtilz, Fl. Med. Antill. 7: pl. 513, this as Cactus opantia. Abb. Bayer. Akad. Wiss. München 2: pl. 3, f. 7 (?); Amer. Garden 11: 473 (?); Cyl. Amer. Hort. Bailey 3: f. 1545, 1546; Cact. Journ. 1: 154 (?); Lept. Agr. N. S. W. Misc. Publ. 253: pl. [2]; Dict. Gard. Nicholson 2: f. 757; W. Watson, Cact. Cult. f. 86, all these as Opantia tuna; Journ. N. Y. Bot. Gard. 10: f. 26, this as Opantia inermis: Loudon, Encycl. Pl. ed. 3. f. 6878, this as Cactus tuna: Britton Fl. Bermuda 255. Garden 13: 107%, as Opantia crassa; Bull. Tort. Club 46: pl. 10, as O. maritima; Lindley, Veg. King. ed. 3, 746, f. 498, No. 1, 2: Knorr, Thesaurus pl. 0; Watson, Cact. Cult. ed. 3, f. 567

Plate XXVIII, figure 2, represents a flowering joint of a plant collected in 1091 by N. L. Britton and J. F. Cowell on the Island St. Martin, West Indies; plate XXIX, figure 1, is from a photograph of the related Opuntia keyenisi growing on Boot Key, Florida, taken by Marshall A. Howe in 1909; figure 2 is from a photograph of the plant on Bermuda, obtained by Dr. Britton in 1912. Figure 201 is from a photograph of the plant growing on Antigua, British West Indies, taken by Paul G. Russell in 1913.

## 174a. Opuntia ochrocentra Small, sp. nov.

Erect, 1 meter tall or less, much branched or sometimes diffuse, with fibrous roots; joints elliptic to oval, varying to broadest above the middle, 1 to 3 dm. long, thickish, light green, not repand; leaves ovoid, 2 to 4 mm. long, often purplish; areoles tather prominent; glochids yellowish brown; spines 5 to 6 together or sometimes fewer on new joints, yellow, stiff, subulate, reflexed, becoming gray when dry, yellowish green when wet, straight, the longer ones 4.6 to 5 cm. long; flowers rather few; ovary turbinate, even; sepals often purple-tinged, deltoid to rhombic-orbicular or rhombic-reniform, acute; corolla bright lemon-yellow, 7 to 8.5 cm. wide; petals few, cuncate, somewhat crisped; berry obovoid, red,

<sup>\*</sup> This illustration is not very good for this species. It is, however, the same one that Nacholson used (f. 757) and that W. Watson used (f. 86) as Opuntia tuna, which we have referred here.

about 2 cm. long.

On edge of hammock, southeastern end of Big Pine Key, Florida. Type specimens collected in December 1921, by J. K. Small, in the herbarium of the New York Botanical Garden. Related to O. dillenii, differing in shape of the joints, which are not repand, and the strongly reflexed, scarcely flattened spines.

## 175. Opuntia linguiformis Griffiths, Rep. Mo. Bot. Gard. 19: 270. 1908.

A bushy plant, 1 meter high or more; joints elongated, oblong to ovate-oblong or lanceolate, 2 to 4 dm. long or even more, often several times longer than wide, pale green and slightly glaucous; leaves 6 mm. long, terete; spines yellow, very slender, terete or nearly so; areoles filled with brown wood; flowers yellow, 7 to 8 cm. broad; petals broad; filaments white or greenish at base; stigma-lobes 9, green; ovary bearing numerous long glochids at the upper areoles; fruit reddish purple; seeds 3 or 4 mm. broad, acute on the back.

Type locality: Near San Antonio, Texas.

Distribution: Southern Texas, in the vicinity of San Antonio.

This plant is rather common in cultivation in the Southwest and is now found in most cactus collections. According to Dr. Griffiths, it is occasionally found wild near San Antonio. We have seen somewhat similar plants from near Brownsville, Texas, probably referable to one of the races of Opuntia lindbeimeri.

On account of the shape of the joints, this species is commonly called cow's tongue or lengua de vaca.

Illustration: Rep. Mo. Bot. Gard. 19: pl. 27, lower figure.

Plate XXX represents a flowering joint of a plant obtained by Dr. MacDougal from the collection of Professor J. W. Toumey at Tucson, Arizona, for the New York Botanical Garden in 1902.

# 176. Opuntia tapona Engelmann in Coulter, Contr. U. S. Nat. Herb. 3: 423. 1896.

Low, spreading plants rarely over 6 dm. high; joints glabrous, orbicular to obovate, 20 to 25 cm. in diameter, turgid, pale green; spines 2 to 4 yellow, one much longer, 5 to 7 cm. long, slender, porrect or sometimes curved downward; glochids brownish; fruit 4 to 6 cm. long, clavate, dark purple without, red within, spineless.

Type locality: Near Loreto, Lower Califor-

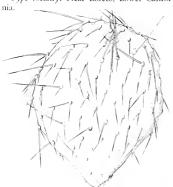


Fig. 202.-Opuntia tapona. x 0.-i.

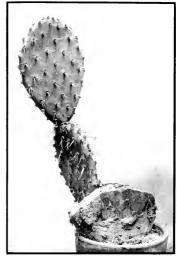
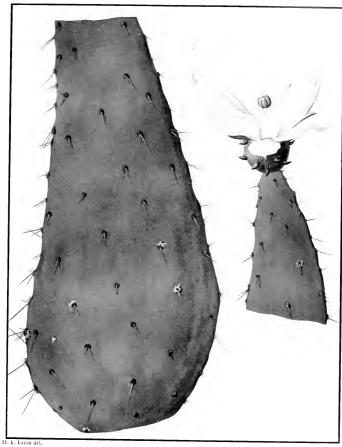


Fig. 203 .- Opuntia littoralis,

BRITTON AND ROSE PLATE XXX



Flowering joint of *Opuntia linguiformis*, (3/4 Natural size.)

OPUNTIA, 165

Distribution: Southern part of Lower California.

Figure 202 represents a joint of the plant collected by Dr. Rose on Pichilinque Island, Lower California, 1911.

Related to O. Lafona, but probably specifically distinct from it, is a plant growing in the mountains of Cedros Island, Lower California; it was recorded from this island by Dr. E. L. Greene as O. engelmannii, and a specimen was brought to Washington by Dr. Rose in 1911. This plant may be described as follows: About 1 meter high; joints oblong, large, 20 cm. long or more, smooth; areoles 3 cm. apart or more, very large, filled with brown wool; spines usually about 7, pale yellow, slender, terete, the longest ones 3 cm. long; glochids yellow. (Rose No. 16170.)

## 177. Opuntia littoralis (Engelmann) Cockerell, Bull. South. Calif. 4: 15. 1905.

Opuntia engelmannii littoralis Engelmann in Brewer and Watson, Bot. Calif. 1: 248. 1876. Opuntia lindheimeri littoralis Coulter, Contr. U. S. Nat. Herb. 3: 422. 1896.

Bushy plants, low and spreading; joints thick, orbicular to oblong, 15 cm. long or more, usually smaller in greenhouse plants, dull green; areoles rather closely set, large, often elevated on old joints; spines numerous, yellow, rather short on young joints (1 to 2 cm. long), but on old joints much longer, in age more or less flattened; wool of the arcoles brown; flowers large, yellow, 8 to 12 cm. broad; sepals broad, apiculate; petals retuse; ovary with many arcoles; fruit red, juicy; seeds 4 to 5 mm, in diameter.

Type locality: Coast from Santa Barbara to San Diego, California,

Distribution: Along and near the coast of southern California.

This species was very briefly described as a variety of Opuntia engelmannii in 1876.

No definite locality was given for it, and the original material preserved is so poor that its

No definite locality was given for it, and the original material preserved is so poor that is identification is doubtful. We have taken as our representative of this species the low, bushy plant with rather thick joints, large and closely set areoles and yellow spines.

Opuntia littoralis often grows in proximity to O. occidentalis in southern California, and hybrids of the two may exist.

Figure 203 represents joints of the plant collected at Elsinore, California, by Dr. MacDougal in 1913.

#### 178. Opuntia aciculata Griffiths, Proc. Biol. Soc. Washington 29: 10. 1916.

Low, bushy plant, 1 meter high or more, often 3 meters broad or more, the lower branches decumbent and sending up erect branches; joints obovate, 12 to 20 cm. long, rounded at apex, dull dark green, somewhat glaucous, bearing large, closely set arcoles, these often spineless; leaves subulate, 7 mm. long; spines several in a cluster, acicular, slender, 3 to 5.5 cm. long often reflexed, brownish at base, with yellow tips, seemingly deciduous; glochids numerous, from all parts of the arcoles, long, persisting for several years; flower golden yellow, sometimes with a greenish center, large, 8 to 10 cm. broad; petals broad, rounded or retuse; filaments yellowish; style dull yellowish green; stigma-lobes 8 to 10, green; fruit pyriform, purple.

Type locality: Near Laredo, Texas.

Distribution: On high gravelly ground at type locality and vicinity.

This species is not very common about Laredo, Texas, but grows in small colonies usually to the exclusion of all other plants. It can easily be distinguished from related species, and is usually restricted to dry hills. Our description is based on specimens obtained by Dr. Rose at Laredo in 1913. Since then it has been grown both in Washington and New York.

Plate XXVIII, figure 3, represents a flowering joint of the plant collected by Dr. Rose near the type locality in 1913.

# 179. Opuntia lindheimeri Engelmann, Bost. Journ. Nat. Hist. 6: 207. 1850.

Opuntia dulei: Engelmann, Proc. Amer. Acad. 3: 291. 1856.
Opuntial Indibeimeri dulei: Coulter, Contr. U. S. Nat. Herb. 3: 421. 1896.
Opuntial Indibeimeri dulei: Schumann, Gesembt. Kakteen 725. 1898.
Opuntial Cacanapa Griffiths Schumann, Gesembt. Cakteen 725. 1898.
Opuntial Cacanapa Griffiths and Hare, N. Mex. Agr. Exp. Sta. Bull. 60: 47. 1906.
Opuntial Cacanapa Griffiths, Rep. Mo. Bot. Gard. 20: 85. 1909.
Opuntia tircolor Griffiths, Rep. Mo. Bot. Gard. 20: 92. 1909.
Opuntia tircolor Griffiths, Rep. Mo. Bot. Gard. 20: 92. 1909.
Opuntia tircolor Griffiths, Rep. Mo. Bot. Gard. 20: 92. 1909.
Opuntia tircolor Griffiths, Rep. Mo. Bot. Gard. 20: 191. 1909.
Opuntia tircolor Griffiths, Rep. Mo. Bot. Gard. 21: 167. 1910.
Opuntia gomei Griffiths, Rep. Mo. Bot. Gard. 22: 30. 1912.
Opuntia content of the Cacanapa Griffiths, Rep. Mo. Bot. Gard. 22: 30. 1912.
Opuntia content Mackensen, Bull. Torr. Club. 39: 290. 1912.

Opontia griffithiam. Mackensen. Bull. Torr. Club 49: 291. 1912. Opontia riftexi Mackensen. Bull. Torr. Club 93: 292. 1912. Opontia deltica Griffiths. Bull. Torr. Club 43: 84. 1916. Opontia lackina Griffiths. Bull. Torr. Club 43: 88. 1916. Opontia Lackina Griffiths. Bull. Torr. Club 43: 87. 1916. Opontia Jexopina. Griffiths. Bull. Torr. Club 43: 87. 1916. Opontia Grandra Griffiths. Bull. Torr. Club 43: 87. 1916.

Usually erect, 2 to 4 meters high, with a more or less definite trunk, but at times much lower and spreading; joints green or bluish green, somewhat glaucous, orbicular to obovate, up to 25 cm. long; leaves subulate, 3 to 4 mm. long, somewhat flattened, pointed; areoles distant, often 6 cm. apart; spines usually 1 to 6, often only 2, one porrect and 4 cm. long or more, the others somewhat shorter and only slightly spreading, pale yellow to nearly white, sometimes brownish or blackish at base, or some plants spineless; glochids yellow or sometimes brownish, usually prominent; petals yellow to dark red; stigmalobes usually green; fruit purple, pyriform to oblong, 3.5 to 5.5 cm. long.

Type locality: About New Braunfels, Texas.

Distribution: Southwestern Louisiana, southeastern Texas, and Tamaulipas, Mexico.

Opuntia lindheimeri is an extremely variable species, composed of many races, differing in armament, color of flowers, size and shape of joints and of fruit. Certain forms have been described which in cultivation we have been able to recognize as possibly distinct; but in the field they seem to integrade with other forms, indicating that they are at most only races of a very variable species. In the delta of the Rio Grande this is especially true, and from this region a number of species has been described. In fact, all the plants described as species which are cited above in the synonymy grow within a relatively small distributional area. Dr. Rose has examined all this region and is of the opinion that only one species of this series exists there, and this we believe is to be referred to Opuntia lindheimeri. It is very common about Brownsville and Corpus Christi, where it forms thickets covering thousands of acres of land. It is very variable in habit, being either low and widely spreading or becoming tall and tree-like, sometimes 3 meters high, with a definite cylindric trunk. Plants from these two extremes, if studied apart from the field, might be considered as different species, but in the field one sees innumerable intergrading forms. The low, prostrate forms gradually pass into others with more or less erect or ascending branches, while the large tree-like forms often bear large lateral branches which lie prostrate on the ground, indicating that they have developed from the prostrate ones. Decided differences in the flower colors have been pointed out in the original descriptions, and we have observed them in greenhouse specimens, but they do not correlate with other characters.

Dr. Small has found this plant established, after cultivation, in pine lands west of Halenville, Florida. Opinitia ellisiana Griffiths (Rep. Mo. Bot. Gard.21: 170. pl. 25. 1910), an unarmed species, is known only from cultivated plants. Dr. Griffiths states that it is quite different from the Ficus-indicae series, which it much resembles, and is quite hardy in southern Texas. It may be a spineless race of the common O. lindbeimeri of this region.

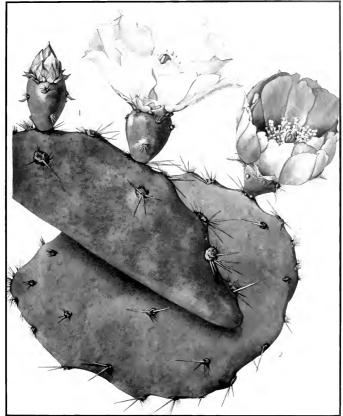
Opuntia pyrocarpa Griffiths (Bull. Torr. Club 43: 90. 1916) we do not know; in its long pyriform fruit it suggests this plant; the type comes from Marble Falls, Texas.

O. winteriana Berger and O. haematocarpa Berger (Bot. Jahrb. Engler 36: 455 and 456, 1905) are of this relationship, but have browner spines than is usual in the species.

Opuntia leptocarpa Mackensen (Bull, Torr. Club 38: 141. 1911), characterized by its low, bushy had elongated, almost abnormal fruits, suggests a natural hybrid between O. Imdbeimeri and O. macrorbiza. Indeed, Mr. Mackensen described the species as intermediate between these two, and all three species are often found growing together. O. leptocarpa originally came from San Antonio, Texas.

Illustrations: Ann. Rep. Smiths. Inst. 1911: pl. 3, 4, B: Cact. Mex. Bound. pl. 75, f, 5 to 7; Karsten, Deutsch. Fl. f. 501. 13, 13a, 13b; N. Mex. Agr. Exp. Sta. Bull. 78: pl. (13, 14), all as Opuntia dulcis. Bull. U. S. Dept. Agr. 31: pl. 3, f. 1, this as Opuntia cacanapa: Rep. Mo. Bot. Gard. 20: pl. 4, in part, this as Opuntia tricolor; Rep. Mo. Bot. Gard. 20: pl. 9; pl. 15, f. 1, these two as Opuntia texana. Bull. U. S. Dept. Agr. 31: pl. 2, f. 1; Rep. Mo. Bot. Gard. 20: pl. 2, f. 1; pl. 11: pl. 11; pl. 13, 4, all these as Opuntia substruata. Rep. Mo. Bot. Gard. 21: pl. 19; pl. 19, pl. 20, in part, these two as Opuntia alta. Rep. Mo. Bot. Gard. 22: pl. 22; in part these two as Opuntia gomei, Rep. Mo. Bot. Gard. 21: pl. 28, this as Opuntia cinclairii. Rep. Mo. Bot. Gard. 22: pl. 9, in part; pl. 10: Journ. Agr. Research 1, pl. f., these three as Opuntia cinclairii. Rep. Mo. Bot. Gard. pl. 22: pl. 9, in part; pl. 16, 17, these three as Opuntia cinclairi. Rep. Mo. Bot. Gard. pl. 22: pl. 9, in part; pl. 16, 17, these three as Opuntia cinclairi. Rep. Mo. Bot. Gard. pl. 22: pl. 9, in part; pl. 10, pl. 9, so Opuntia cinclairi. Rep. Mo. Bot. Gard. 21: pl. 10, pl. 19, so Opuntia cinclairi. Rep. Mo. Bot. Gard. 21: pl. 9, in part; pl. 10, pl. 9, so Opuntia cinclairi.

BRITTON AND ROSE PLATE XXXII



M. E. Eaton del.

Flowering joints of Opuntia lindheimeri.

Orange-flowered race.
 Red-flowered race.
 Natural size.)

OPUNTIA, 167

ellisiana: Journ. Hered. Washington 64; f. 15, 16, as O. cacanapa; Journ. Hered. Washington 64; f. 17, 18, as O. subarmata: Journ. Hered. Washington 5: 233. f. 13; Schulz, 500 Wild Fl. San Antonio pl. 12.

Plate XXXI, figure 1, represents a flowering joint of a plant collected near Brownsville, Texas, by Dr. Rose in 1915; figure 2 represents a flowering joint of a plant obtained by the same collector at the same locality; plate XXXII, figure 1, represents a flowering joint of a plant sent by Mr. M. Mackensen from the type locality of O. leptocarpa in 1910; figure 2 shows the fruit of the same.

180. Opuntia cantabrigiensis Lynch, Gard. Chron. III. 33: 98. 1903.

Opuntia engelmannii cuija Griffiths and Hare, N. Mex. Agr. Exp. Sta. Bull. 60: 44. 1906. Opuntia cuija Britton and Rose, Smiths. Misc. Coll. 50: 529. 1908.

Rounded bushy plant, 1 to 2 meters high; joints orbicular to obovate, 12 to 20 cm. long, rather pale blush green; arcoles remote, large, filled with brown wool; spines usually 3 to 6 but sometimes more, som what spreading, acicular, yellow with brown or reddish bases, 1.5 to 4 cm. long; glochids numerous, large, 1 cm. long or more, yellowish, not forming a brush; flowers 5 to 6 cm. long, yellowish with reddish centers; upper areoles on the ovary bearing long bristles; stigma-lobes green; fruit, globular, about 4 cm. in diameter, purple; seeds numerous, small, 4 mm. in diameter.

Type locality: Described from specimen in Cambridge Botanic Garden, England.

Distribution: Very common in the States of San Luis Potosí, Querétaro, and Hidalgo, Mexico.

Professor Duncan S. Johnson found this species naturalized on sand dunes at Beaufort, North Carolina, in 1899, and Dr. Small studied it there in 1922. At Cambridge, England, it passed through many winters out of doors.

Opuntia chrysacantha (Berger, Hort. Mortol. 231. 1912, name only,) an undescribed species, probably belongs here.

Our determination of the identity of O. cantabrigiensis and O. cnija is based on a living plant of the former received from Mr. Lynch.

Illustrations: N. Mex. Agr. Exp. Sta. Bull. 60: pl. 2, as Opuntia engelmannii cuija: Gard. Chron. III. 30: f. 123, as Opuntia engelmannii; Gartenwelt 10: 560; Gard. Chron. III. 33: 98. f. 42.

Figure 204 represents joints of a plant collected by Dr. Rose near Ixmiquilpan, Hidalgo, Mexico, in 1905.

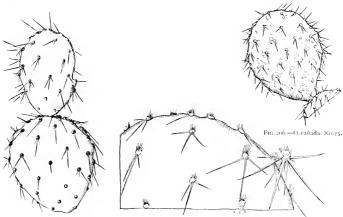


Fig. 204.-O. cantabrigiensis. Xo.4.

Fig. 205.—O. procumbens. Xo.5.

181. Opuntia procumbens Engelmann, Proc. Amer. Acad. 3: 292. 1856.

Stems low and spreading, forming broad masses; joints "always edgewise," orbicular, 2 to 4 or even 5 dm. in diameter, yellowish green, somewhat glaucous; areoles distant (3 to 5 cm. apart), large, bearing long yellow glochids; spines 1 to 5, spreading, 2.5 to 5 cm. long, yellow, lighter above, flattened; flowers said to be yellow; fruit red, juicy.

Type locality: San Francisco Mountains to Cactus Pass, Arizona.

Distribution: Northern Arizona.

This species has long been wanting or poorly represented in our great herbaria. Dr. Rose collected it near Flagstaff, Arizona, and the above description is largely drawn from his notes; but his material was lost. In 1913 it was again collected by Mr. E. A. Goldman.

Illustration: Pac. R. Rep. 4; pl. 6, f. 4, 5.

Figure 205 is copied from the illustration above cited.

182. Opuntia cañada Griffiths, Rep. Mo. Bot. Gard. 20: 90. 1909.

Plant about 1 meter high, with many erect or ascending branches, forming a broad top; joints over to obovate, 16 to 22 cm. long, smooth, and shining; leaves subulate, 1 cm. long; spines various, white to yellow, flattened, sometimes twisted; glochids few on young joints, very abundant on old ones; flowers yellow with red or orange centers; style white to reddish; stigma-lobes green; fruit red.

Type locality: Foothills of the Santa Rita Mountains, Arizona.

Distribution: Southeastern Arizona.

Dr. Griffiths comments on the close relationship of this plant to O. laevis.

*Illustrations:* Rep. Mo. Bot. Gard. **20**: pl. 2, f. 6; pl. 6, in part; pl. 13, f. 2, 12.

Figure 206 is copied from the second illustration above cited.

 Opuntia pyriformis Rose, Contr. U. S. Nat. Herb. 12: 292, 1909.

Plant 3 to 5 meters high, with widely spreading branches, the lower ones almost resting on the ground and 3 to 5 meters long; joints obovate, thick, 18 cm. long or more; arcoles closely set, small; spines 1 or 2, on old joints more, usually reflexed, slender, weak, yellow, 10 to 22 mm. long; flowers yellow; fruit 4 cm. long, somewhat tuberculate, spineless, its large arcoles crowded with brown hairs forming hemispherical cushions.

Type locality: Hacienda de Cedros, Zacatecas, Mexico.

Distribution: Zacatecas, Mexico.

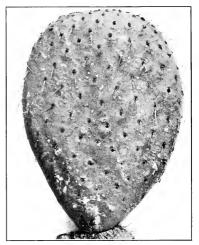


Fig. 207. - Opuntia pyriformis. x 0.5.

The type of this species is in the U. S. National Herbarium. It is known only from the original collection of Professor F. E. Lloyd, made in 1908.

Illustrations: Contr. U. S. Nat. Herb. 12: f. 35; pl. 26.

Figure 207 is copied from the second illustration above cited.

183a. Opuntia bonplandii (HBK.) Weber. (See Appendix, p. 223.)

The three following described species may belong to this series:

OPUNTIA BECKERIANA Schumann, Gesamtb. Kakteen 722. 1898.

The plant on which this species is based was sent to Dr. Schumann from a garden at Bordighera, Italy, and its origin is unknown; Dr. Schumann thought that it might have

come from Mexico. From the description it may belong to our series Dillenianae, but we are unable to associate it with any species known to us; the ovary is described as compressed and tubercled.

OPUNTIA PROSTRATA SPINOSIOR (Schumann, Gesamtb. Kakteen 723, 1898) seems to have been a garden name which Schumann would refer to O. beckeriana.

OPUNTIA ANAHUACENSIS Griffiths, Bull. Torr. Club 43: 92. 1916.

A low, reclining or prostrate plant, up to 5 dm. high, 1.5 meters broad; joints obovate, glossy, yellowish green, 27 cm. long, 13 cm. broad; spines yellow or becoming white, 1 or 2, porrect, flattened, twisted, 2 or 3 cm. long; flowers yellow; style white; stigma-lobes 6, white; fruit dark purplish red, pyriform, 7 cm. long.

Type locality: Anahuac, Texas,

Distribution: Known only from the type locality, at the mouth of Trinity River, eastern Texas.

OPUNTIA MEGALANTHA Griffiths, Bull. Torr. Club 43: 530. 1916.

A tall, erect, open-branching plant, 2 meters high or more; joints obovate, glaucous, grayish green. 21 cm. long, 14 cm. broad; spines yellow, 1 to 3, or even 5 or 6 on old wood, the longest often 4 to 5 cm. long; flowers yellow, 10 to 11 cm. in diameter; petals 5 cm. long, obovate; style white; stigma-lobes 8 or 9, white or tinged with green; fruit dark red.

Known only from cultivated plants received from the Berlin Botanical Garden, where it was grown as Opuntia bergeriana.

#### Series 16. MACDOUGALIANAE.

Erect, mostly tall species, with flat, broad, and thin, persistent joints, the epidermis, at least that of the ovary, pubescent or puberulent. The spines, when present, yellow. There are about half a dozen species, natives of central and southern Mexico.

#### KEY TO SPECIES

Joints merely finely puberulent or glabrous; spines 1.5 cm. long or

less; ovary velvety..... .. 184. O. durangensis Joints distinctly pubescent; spines

2 to 3 cm. long.

Petals red.

Style shorter than the petals 185. O. atropes Style as long as the petals. 186. O. affinis

Petals vellow. Spines acicular, at first yel-

Spines subulate.

Petals retuse; areoles of ovary many, approxi-

mate .... 188. O. velutina

Petals mucronate; areoles

of ovary few, distant 189. O. wilcoxii

184. Opuntia durangensis Britton and Rose,

Smiths. Misc. Coll. 50: 518. 1908. Joints broadly obovate, about 20 cm. long, 16

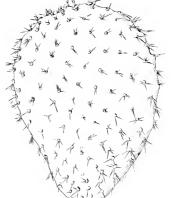


Fig. 208.—Opuntia durangensis. x 0.4.

cm. broad, pale green, glabrous or minutely puberulent, bearing numerous areoles; areoles 1 to 2 cm. apart, elevated; spines 3 to 5 at an areole, short, 1.5 cm. long or less, pungent, spreading, yellow, but in age becoming darker; glochids brown, 2 to 3 mm. long; flowers yellow, 5 cm. long; petals broad, apiculate; ovary 3 to 4 cm. long, finely pubescent, bearing many areoles with numerous glochids and a few spines; fruit white or red; seeds about 3 mm. broad.

Type locality: Near Durango, Mexico.

Distribution: Central Mexico.

This species was collected by the late Dr. E. Palmer in 1912, but he did not record the size and habit of the plant. The joints suggest a large, bushy species.

Figure 208 represents a joint of the type specimen.

### 185. Opuntia atropes Rose, Smiths, Misc. Coll. 50: 518. 1908.

Plant 1 to 3 m:ters high, much branched; joints oblong to obovate, 20 to 30 cm. long, deep green, softly pubescent; young joints somewhat glossy, leaves 4 to 5 mm. long, acuminate, pubescent, standing almost at right angles to the joints, the tips redshish, areoles circular, filled with short tawny wool; young spines white or yellowish; old spines 3 to 6 cm. long, somewhat angled, standing almost at right angles to the joints, dark yellow or brown at the base, much lighter, oftr, white above; glochids numerous, long, yellow; petals reddish; ovary pubescent, covered with large cushion-like areoles bearing long glochids near the top but with few spines or none, truncate at apex.

Type locality: Lava beds near Yautepec, Morelos, Mexico. Distribution: Central Mexico.

## 186. Opuntia affinis Griffiths, Proc. Biol. Soc. Washington 27: 27. 1914.

"A low, arborescent species, from 125 cm. high with us at 4 years of age to 2 m. or more in its natural habitat; joints obovate, 13 by 35 cm., broadly rounded above and gradually narrowed below, densely sifky, villous to the touch, and villous nature plainly visible when viewed in proper light, slightly raised at arcoles, the tubercles being surrounded by a sunken dark-green line; leaves small, subulate, pointed, scarcly 2 mm. in length; arcole small, obovate, 3 mm. long, 25 to 30 mm. apart, white to gray; spicules light straw-colored, at first not conspicuous but rather in a connivent tuft, 3 mm. long; spines absent below and 1 to 5 in upper five-sixths of joint, straw-colored, becoming white the second year, the longest 3 cm. and others much shorter, increasing in age in both length and numbers, at 3 years



Fig. 209.—Opuntia macdougaliana, Tehuacan, Mexico.

often 10 in number and some 6 cm. long, divergent, flattened, angular, twisted; flowers dull dark-red in bud, with stigma protruding the day before the petals spread, small, about 3 cm. in diameter when opened, petals 20 to 25 mm. long, slightly, when at all, recurved, ribs of petals red and wings orange, filaments greenish below and pink above, style bright-glossy red, stigma dull greenish red, 4-parted, equaling the petals in length; ovary small, subglobose, deeply pitted, 15 to 17 mm. in diameter, with small subcircular to slightly transversely elongated, dirty brown areoles, 4 mm. apart; fruit small, subglobose, red."

Type locality: State of Oaxaca, Mexico.

Distribution: Known only from type locality.

Our examination of the type specimen of this species showed that it is closely related to *Opuntia macdougaliana*, differing in the color of its petals, which may not be a specific character.



Fig. 210.-Opuntia macdougaliana.

## 187. Opuntia macdougaliana Rose, Smiths. Misc. Coll. 50: 516. 1908.

Opuntia micrarthra Griffiths, Monatsschr. Kakteenk. 23: 130. 1913.

Plant about 4 meters high, with a distinct cylindric trunk branching from near the base; joints oblong, 30 cm. long by 8 to 10 cm. broad, softly pubescent; arcoles distinct, small; spines generally 4, one much longer (2.5 to 4 cm. long), somewhat flattened, yellowish, becoming whitish in age; glochids short, numerous, yellow; fruit globular to oblong, 5 cm. long, the surface divided into diamond-shaped plates, red, with a broad deep cup at apex, the numerous small rounded arcoles filled with clumps of yellow glochids, very rarely with one or two spines.

Type locality: Near Tehuacán, Mexico.

Distribution: Southern Mexico.

Figure 209 is from a photograph of the type plant taken by Dr. MacDougal at El Riego, Tehuacán, Mexico, in 1906; figure 210 represents a plant grown from a cutting of the type.

188. Opuntia velutina Weber in Gosselin, Bull. Mus. Hist. Nat. Paris 10: 389. 1904. Opuntia nelsonn Rose, Smiths, Misc. Coll. 50: 516. 1908.

Stems I to 4 meters high; joints flattened, oblong to pear-shaped in outline, 15 to 20 cm. long

by 10 to 15 cm. broad near the top, pubescent, pale yellowish green in herbarium specimens; areoles 2 to 3 cm. apart; spines 2 to 6, yellow, becoming white in age, v.ry unequal, the longer ones 3 to 4 cm. long; bristles many, yellow, becoming brownish; flowers rather small; petals yellow, 1 to 3 cm. long; ovary pubescent, bearing many yellowish brown bristles; filaments red; stigma-lobes pale green; fruit "dark red."

Type locality: In Guerrero, Mexico.

Distribution: Southern Mexico.

Plate XXXII, figure 3, represents a flowering joint of a plant collected at Tehuacán, Mexico, by Dr. MacDougal and Dr. Rose in 1906.

### 189. Opuntia wilcoxii sp. nov.

A tall, bushy plant, 1 to 2 meters high, very much branched; joints oblong, thinnish, large, 2 cm. long, dark green, more or less purplish about the large areol's, finely puberulent; glochids numerous, long, yellow; spines 1 to 3, one very long (5 to 6 cm. long), porrect, white or somewhat yellowish; flower, including ovary, 6 cm. long, yellow; petals oblong, mucronate; ovary bearing few large arcoles, these filled with brown wool and yellow glochids; filaments short; style thick, 2 cm. long, with 10 stigma-lobes, fruit pubescent, 4 cm. long.

Very common on the hills in the coastal plain of western Mexico from southern Sonora to southern Sinaloa, Mexico, where it was frequently collected by Rose, Standley, and Russell in 1910; their No. 13546, with flower, from Fuerte, Sinaloa, is selected as the type of the species. It is named for Dr. Glover B. Wilcox, who first sent in living specimens in 1909.

Figure 211 represents a joint of the type specimen.

To this series belong two plants which we have not been able to identify but are here briefly characterized:

The first, a very peculiar species, collected by Rose, Standley, and Russell, March 14, 1910 (No. 12853), on the dry hills near Alamos, Sonora, Mexico, is unlike any of the described species. It is living both in Washington and New York, but it has not done well in cultivation. It may be described as follows:

Bushy; joints oblong, thickish, pale green in color, with very short puberulence, nearly or quite spineless; glochids yellowish or greenish, numerous; young areoles brown in the center, whitewooly in the margin; flowers and fruit not known.



Fig. 211.- Opuntia wilcoxii, x 0.4.

Dr. H. H. Rusby collected the second species on the Balsas River, southern Mexico. It comes from the region of O. velutina, but we do not know its flowers. It may be described as follows:

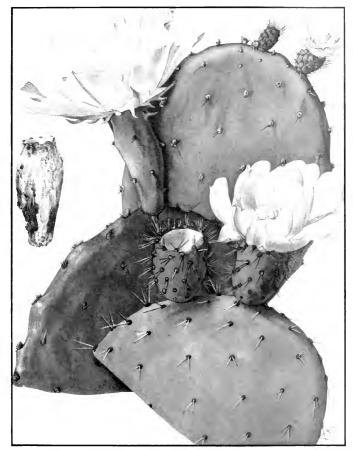
Joints oblong, 18 cm. long, but cultivated specimens smaller, usually obovate, dark green; spines few, short, at first white; young areoles large, bordered with white wool, bearing the spines and glochids from the center.

Living specimens are growing in the New York Botanical Garden under No. 32811.

#### Series 17. TOMENTOSAE.

Tall, erect, pubescent or puberulent species, with flat persistent joints, thespines, when present, white. We know three species, natives of Mexico and Guatemala,

BRITTON AND ROSE



- 1. Upper part of flowering joint of Opintia leptocarpa. 3. Flowering joint of Opintia tetalistics
- 2. Fruit of the same.

  4. Upper part of joint of Opposite and held of (All three-fourths size)

#### KEY TO SPECIES

 Joints narrowly obovate.
 190. O. tomentous

 Joints grayish green, densely velvety...
 191. O. tomentella

 Joints bright green, minutely puberulent.
 191. O. tomentella

 Joints broadly obovate.......
 192. O. guilanchi

190. Opuntia tomentosa Salm-Dyck, Observ. Bot. 3: 8. 1822.

Cactus tomentosus Link, Enum. Hort. Berol. 2: 24. 1822.

Opuntia oblongata Wendland in Pfeiffer, Enum. Cact. 161. 1837.

Opuntia icterica Griffiths, Monatsschr. Kakteenk. 23: 138. 1913.

Becoming 3 to 6 meters high or more, with a broad top and a smooth trunk 10 to 30 cm. in diameter; joints oblong to narrowly obovate, 10 to 20 cm. long, velvety pubescent, somewhat tuberculate when young; glochids yellow; spines usually wanting but sometimes 1 or more appear; flowers orange-colored, 4 to 5 cm. long; filaments white or rose-colored; style dark carmine, longer than the stamens; stigma-lobes 5 or 6, white; fruit ovoid, red, sweetish; seeds 4 mm, broad.



Fig. 212.—Opuntia tomentosa.

Type locality: Not cited; doubtless Mexico.

Distribution: Central Mexico and as an escape in Australia.

This species was first described from cultivated plants and has long been a favorite. When grown out of doors, as it is in Bermuda, it forms a large and conspicuous plant. It is usually nearly or quite spineless, but plants which come from the Valley of Mexico are often spiny.

According to J. H. Maiden, this plant had been sent to him under the unpublished name Opuntia lurida, and as O. pubescens.

Illustrations: Agr. Gaz. N. S. W. 23: pl. opp. 1028; Monatsschr. Kakteenk. 16: 121; De Candolle, Pl. Succ. Hist. 2: pl. 137 [A, B], this last as Cactus cochenillifer (fide Berger); Blanc, Cacti 82. No. 2200, as Opuntia lurida; Reiche, Elem. Bot. f. 165; Gartenwelt II: 75.

Plate XXXIII, figure 1, represents a fruiting joint of a plant raised from seeds received by the United States Department of Agriculture. Fig. 212 is from a photograph of a plant near St. Georges, Bermuda, taken by Stewardson Brown in 1912.

#### 191. Opuntia tomentella Berger, Monatsschr. Kakteenk. 22: 147. 1912.

Bushy: joints oboyate to oblong, 20 to 30 cm. long, 9 to 15 cm. broad, light green, somewhat shining, finely puberulent; areoles about 3 cm. apart, small; spines 1 or 2, acicular, white, short (7 to 10 mm. long), porrect, sometimes wanting; glochids few; flowers numerous, 5 to 6 cm. long; petals obovate, reddish yellow; filaments yellowish green; style rose-colored; stigma-lobes white; ovary tomentose, armed with numerous black glochids; fruit oblong, red, sour.

Type locality: In Guatemala.

Distribution: Guatemala.

This species was distributed by the late F. Eichlam, who sent plants both to Washington and to La Mortola, those sent to La Mortola being used by Mr. Berger for his description. The species is perhaps near the common Mexican species O. tomentosa, but does not grow so tall, and the tomentum is not so dense nor so soft.

Figure 213 represents a joint of a plant collected in Guatemala by F. Eichlam in 1909.

# 192. Opuntia guilanchi Griffiths, Rep. Mo. Bot. Gard. 19:265. 1908.

Becoming 1.5 to 2 meters high, often with a distinct trunk 1.5 to 2.5 cm. in diameter; joints broadly obovate, 14 to 16 cm. wide, 20 to 24 cm. long, minutely pubescent; spines at first white, slightly flattened, the longest 2 cm. long; glochids light yellow; fruit subglobose, 4 cm. in diameter, pubescent, variously colored, aromatic.

Type locality: Near the city of Zacatecas, Mexico. Distribution: Zacatecas, Mexico.

#### Series 18. LEUCOTRICHAE.

This series is restricted to a single species. Schumann grouped as Chaetophorae, O. leucotricha with O. ursina, the latter a species with similar long bristles on the stem but otherwise very different, it being dryfruited. Opuntia leucotricha is characterized by its long, weak, hair-like or bristle-like spines on many of the joints, especially the stem and very Fig. 213.—Opuntia tomentella. old joints. The fruit of this plant is very different from that of related series in that the pulp is fragrant and does not come free from the rind when mature.



#### 193. Opuntia leucotricha De Candolle, Mém. Mus. Hist. Nat. Paris 17: 119. 1828.

Opuntia fulvispina Salm-Dyck in Pfeiffer, Enum. Cact. 164. 1837.

Opuntia leucotricha fulvispina Weber in Schumann, Gesamth. Kakteen Nachtr. 157. 1903.

Often 3 to 5 meters high, with a large top; trunk as well as the older joints covered with long white bristles; joints oblong to orbicular, 1 to 2 cm. long, pubescent; areoles closely set, the upper part filled with yellow glochids, the lower part at first with only 1 to 3 weak white spines; flowers, including ovary, 4 to 5 cm. long; petals yellow, broad; ovary with numerous areoles, the upper ones bearing long, bristly glochids (1 cm. long); style red; stigma-lobes green; fruit variable, 4 to 6 cm. long, white or red, the rind not easily coming off from the pulp, aromatic, edible.

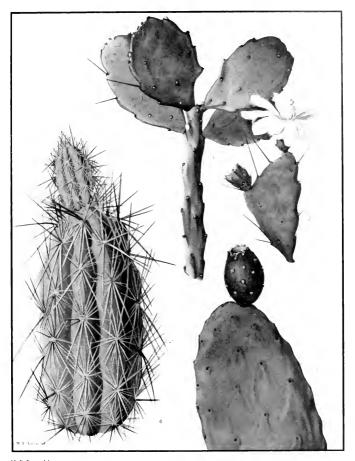
Type locality: In Mexico.

Distribution: Central Mexico.

Opuntia erythrocentron Lemaire (Förster, Handb. Cact. 492, 1846) was given as a synonym of O. fulvispina.

Opuntia leucosticta Wendland (Pfeiffer, Enum. Cact. 167, 1837) probably belongs here. Opuntia leucacantha Link and Otto (Salm-Dyck, Hort. Dyck, 362. 1834), published first in 1834—although the name occurs in literature as early as 1830 (Verh. Ver. Beförd.

ERITTON AND ROSE PLATE XXXII



1. Upper part of joint of Opuntia tomentosa.
2, 3. Flowering joint and branch of Opuntia brastliensis.
4. Joint of Grusonia bradtana. (All ¾ size.)

Gartenb. 6: 434. 1830)—which was later taken up as Consolea leucacantha by Lemaire (Rev. Hort. 1862: 174. 1862), seems to belong here rather than to O. spinosissima. If it came from Mexico, as reported, it could not be O. spinosissima or any of its relatives, for none of them is known from Mexico.

Opumia subferox Schott (Pfeiffer, Enum. Cact. 167. 1837) was given as a synonym of this species, while O. leucacantha laction Salm-Dyck (Cact. Hort. Dyck. 1844. 47. 1845) and O. leucacantha subferox Salm-Dyck (Förster, Handb. Cact. 497. 1846) were supposed to be based on O. subferox.

Opuntia lencantha (De Candolle, Prodr. 3: 474. 1828), unpublished, is doubtless the same as O. lencacantha.

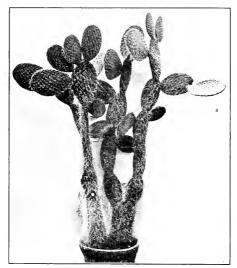


Fig. 214.--Opuntia leucotricha,

Opuntia fulvispina laevior Salm-Dyck (Pfeiffer, Enum. Cact. 164. 1837) and O. fulvispina badia Salm-Dyck (Cact. Hort. Dyck. 1849. 65. 1850) are given as synonyms of O. leucotricha; while O. rufesceus Salm-Dyck (Förster, Handb. Cact. 493. 1846) is given as a synonym of fulvispina laevior; all these seem to belong here.

This is called durasnilla in Mexico. It is grown in Bermuda under the name of Aaron's Beard.

Illustrations: Engler and Prantl, Pflanzenfam. 3<sup>eq</sup>: f. 56, J; N. Mex. Agr. Exp. Sta. Bull. 60: pl. 4, f. 1, 2; Möllers Deutsche Gärt. Zeit. 25: 476. f. 9, No. 4 as *Opunita lenca-cantha*; Cassel's Dict. Gard. 2: 138. Bull. U. S. Dept. Agr. 31: pl. 6, f. 2; pl. 7, f. 2; U. S. Dept. Agr. Bur. Pl. Ind. Bull. 262: pl. 4; pl. 5, f. 1.

Dr. John K. Small has found this plant naturalized in a hammock south of Fort Pierce, Florida, where it is reported as established during the Seminole wars.

Plate XXXIV, figure 1, represents a flowering joint of a plant in the collection of the New

York Botanical Garden. Figure 214 is from a photograph of a plant grown from a cutting received from the collection of M. Simon, St. Ouen, Paris, France, in 1901.

#### Series 19. ORBICULATAE.

We have retained the series Criniferae, although changing its name to Orbiculatae, but we have excluded O. scheeri, which was placed here by Schumann. The species are characterized by long hairs produced from the areoles. The species retained in the series are not closely related; while others, like O. macrocentra, in other series, sometimes produce long hairs from the areoles in the seedling stage, and O. hyptiacantha and some other species have a few hairs at the areoles of mature joints.

## KEY TO SPECIES.

Hairs from the areoles of young plants long and white, long-persistent; plant low 194. O. orbiculata Hairs from the areoles of young joints of old plants early deciduous; plant tall.... 195. O. pilifera

194. Opuntia orbiculata Salm-Dyck in Pfeiffer, Enum. Cact. 156. 1837.

Opuntia crinifera Salm-Dyck in Pfeiffer, Enum. Cact. 15". 1837. Opuntia crinifera Lungera Pfeiffer, Enum. Cact. 157. 1837. Opuntia lanigera Salm-Dyck, Cact. Hort. Dyck. 1849. 65. 1850.

A plant without a very definite trunk, about 1 meter high, often broader than high; joints green or bluish green, orbicular to obovate, sometimes spatulate, about 15 cm. long; leaves subulate, 2 to 3 mm. long; areoles small, in seedlings and young plants producing long white hairs or wool long-persistent; spines acicular, several, yellow; flowers yellow.

Type locality: Cited as Brazil, but undoubtedly by error. Distribution: Northern Mexico.

Opuntia senilis Parmenteer is given by Pfeiffer (Enum. Cact. 157. 1837) as a synonym of O. crinifera, 47. 1845) as a synonym of O. lanigera. They doubtless 47. 1845) as a synonym of O. langiera. They doubtless

both belong here.

Opuntia metternichii Piccioli (Salm-Dyck, Cact. Hort. Dyck. 1844. 46. 1845) and O. orbiculata metternichii Salm-Dyck (Cact. Hort. Dyck. 1849. 68. 1850), names without descriptions, doubtless belong here.

We have studied living plants sent from the Berlin Botanical Gardens as O. crinifera and from the Botanical Garden of Santiago, Chile, as O. orbic-

ulata; the plant is not native in Chile.



Illustrations: Monatsschr. Kakteenk. 11: 155, as Opuntia lanigera: Schelle, Handb. Kakteenk. 48. f. 11, as Opuntia crinifera; Gartenwelt II: 76, as O. lanigera.

Figure 215 represents joints of a plant sent from the Berlin Botanical Garden in 1902.

## 195. Opuntia pilifera Weber, Dict. Hort. Bois 894. 1898.

Becoming 4 to 5 meters high, with a definite, thick, woody, cylindric trunk and a broad, rounded top; joints oblong to orbicular, 1 to 3 dm. long, obtuse at apex, pale green; leaves subulate, about 5 mm. long; areoles 2 to 3 cm. apart, scarcely elevated; spines 2 to 9, white, slightly spreading, acicular; the outer part of the arcole filled with nearly white, more or less deciduous hairs 2 to 3 cm. long; flowers large, red; areoles on the ovary bearing brown glochids and deciduous hairs, the latter especially abundant towards the top of the ovary; fruit red, juicy.

Type locality: In Mexico.

Distribution: Puebla, Mexico.

No definite locality was given for this species when it was first described, and apparently no type material was preserved; living specimens identified by Weber are still grown at La Mortola, Italy. The species is common about Tehuacán, Mexico, being one of the large forms occurring in that region. It is common in all large greenhouse collections.

Figure 216 is from a photograph of a plant in the collection of the New York Botanical Garden grown from a cutting brought by Dr. MacDougal and Dr. Rose from Tehuacán, Mexico, in 1906.

#### Series 20. FICUS-INDICAE.

Large plants, usually with large, nearly spinesergen joints: spines, when present, few, small, white; flowers large, usually orange to yellow. None of the species is definitely known in the wild state, but all doubtless originated from tropical American ancestors, and they may all represent spineless races of plants here included in our series Streptacantbae. Some of them are cultivated for their fruit and others for forage.

#### KEY TO SPECIES.

Joints obovate to elliptic, comparatively broad, more or less glaucous.

Joints dull.

Joints elongated, comparatively narrow.

Flowers yellow; joints somewhat

tuberculate 199, O. lanceolata
Flowers orange-red; joints not tuberculate 200. O. maxima

berculate \_\_\_\_\_\_\_200. O. maxima

196. Opuntia ficus-indica (Linnaeus) Miller,

Gard. Dict, ed. 8. No. 2. 1768.

Cactus ficus-indica Linnaeus, Sp. Pl. 468. 1753
Cactus opuntia Gussone, Fl. Sic. Prodr. 559

1827-8. Not Linnaeus.

Opuntia rulgaris Tenore, Syll. Fl. Neap. 239.
1831. Not Miller.

Opuntia ficu-barbarica Berger, Monatsschr. Kak-

teenk. 22: 181. 1912.

Large and bushy or sometimes erect and tree-like and then with a definite woody trunk up to 5 meters high, usually with a large top; joints ob

like and then with a definite woody trunk up to 5 meters high, usually with a large top; joints ob long to spatulate-oblong, usually 3 to 5 dm. long, sometimes even larger; areoles small, usually spine less; glochids yellow, numerous, soon dropping off;



Fig. 216.—Opuntia pilifera.

leaves subulate, green, 3 mm. long; flowers large, normally bright yellow, 7 to 10 cm. broad; ovary 5 cm. long; fruit normally red, edible, 5 to 9 cm. long, with a low, depressed umbilicus.

Type locality: Tropical America.

Distribution: Native home not known, but now found all over the tropics and sub-tropics either as cultivated plants or as escapes. It is hardy in Bermuda and Florida.

This cactus is widely cultivated in all tropical and subtropical countries, where it is grown for its fruits and for forage. It has run wild in many waste places along the Mediterranean Sea, about the Red Sea, in southern Africa, and in Mexico.

We have not attempted to list the many named garden varieties of this species, which are sometimes Latin and sometimes English in form.

Opuntia amyclaea ficus-indica (Berger, Monatsschr. Kakteenk. 15: 15-i. 1905) has never been described.

The origin of this common, cultivated species doubtless dates back to prehistoric times. We have long been convinced that it is a close relative of the *Streptacanthae*, and have kept it out of that series as only a matter of convenience. Mr. A. Berger believed it to be a spineless form of *O. amyclaea*, which is now a well-established species in certain parts of Italy. Dr. Griffiths has recently figured a reversion which appeared on the common

spineless form which points very definitely to O. megacantha as the origin of this form. (See

Reversion in Prickly Pears, Journ. Hered. 5: 222. 1914.)

Illustrations: Amer. Garden 11: 471; Bull. U. S. Dept. Agr. 31: pl. 1; pl. 2. f. 1; Cycl. Amer. Hort. Bailey 3: f. 1543; Dept. Agr. N. S. W. Misc. Publ. 253: pl. [1], f. 1, 3; Dict. Gard. Nicholson 2: f. 753; Dodon. Pempt. f. 10, 11; Lemaire, Cact. f. 10; Meehan's Monthly 10: 28; Mem. Acad. Neap. 6: pl. 1, 2; Monatsschr. Kakteenk. 15: 151; W. Watson, Cact. Cult. f. 8, in part; f. 80; Engler and Prantl, Pflanzenfam. 36a; f. 57,H; Gard. Chron. III. 34: 89. f. 34; 92. f. 42; Karsten, Deutsche Fl. 887. f. 501. No. 10, 11; ed. 2. 2: 456. f. 605. No. 10. 11; Journ. Dept. Agr. S. Austr. 13: 764; Garten-Zeitung 4: 182. f. 42, No. 1; Stand. Cycl. Hort. Bailey 4: f. 2598; Watson, Cact. Cult. ed 3 f. 57.



Fig. 217.—Opuntia ficus-indica, Córdoba, Argentina.

Figure 217 is from a photograph of the plant growing at Córdoba, Argentina, taken by Paul G. Russell in 1915; figure 218 represents the fruit, obtained in Bermuda by Dr. Britton in 1913.

## 197. Opuntia crassa Haworth, Suppl. Pl. Succ. 81. 1819.

Opuntia parvula Salm-Dyck, Hort. Dyck. 364. 1834. Opuntia crassa major Pfeiffer, Enum. Cact. 153. 1837. Opuntia glauca Forbes, Hort. Tour Germ. 158. 1837.

Plant 1 to 2 meters high, somewhat branched; joints ovate to oblong, 8 to 12.5 cm. long, thick, bluish green, glaucous; areoles bearing brown wool and brown glochids; spines wanting or sometimes 1 or 2, acicular, 2.5 cm. long or less; flowers and fruit unknown.

Type locality: Described from cultivated specimens supposed to

have come from Mexico.

Distribution: Unknown in the wild state; locally found in cultivation in tropical America.

Haworth, who first described this species, thought it to be near O. stricta. Pfeiffer (Enum. Cact. 153. 1837) uses O. glaberrima Hort. Berol. as a synonym of O. crassa major.

Opuntia parvula, when first published, was supposed to be native Fig. 218.—Fruit of Opuntia ficus-indica. x 0.66. of Chile, but this was a mistake. Salm-Dyck compared the species with O. crassa and O. spinulifera, but says it is thrice smaller than either. Schumann refers O. parvula directly to O. crassa, which disposition we follow.

Figure 219 is from a photograph of a plant in the Organ Mountains, Rio de Janeiro,

Brazil, taken by Paul G. Russell in 1915.

198. Opuntia undulata Griffiths, Rep. Mo. Bot. Gard. 22: 32. 1912.

Opuntia undosa Griffiths, Monatsschr. Kakteenk. 23: 139. 1913.

"Plant tall, large, stout, open-branching, with cylindrical trunk, often 30 cm. or more in diameter; joints very large, obovate, broadly rounded above, widest above middle, commonly 35 by 55 cm., frm, hard, quite fibrous, dished, wavy or flat, glossy light yellowish green at first, but changing through a a darker green with a slight touch of glaucous to scurfy brown on old trunks; leaves subcircular in section, subulate, pointed, usually tinged with red at the tip, about 4 mm. long, upon a prominent tubercle and subtending a prominent dark-brown areole; areoles subcircular to ellipsoid or obovate, about 3.5 by 4.5 mm., gray, 5 to 6 cm. apart; spicules yellow in a short, compact tuft in upper part

of arcole, about 1 mm. long, soon becoming dirty and inconspicuous; spines white, few, short, erect, flat-tened, straight or twisted, 10 to 15 mm. long, 1 to 3 or 4, mostly one or none; fruit large, 4 to 5 by 9 to 10 cm., dull red to slightly tinged with orange and pulp streaked with red and orange when rind is removed."

Type locality: Described from cultivated plant obtained at Aguascalientes, Mexico.

Distribution: Mexico.

Illustrations: Rep. Mo. Bot. Gard. 22: pl. 11, in part; pl. 12. We have doubtfully referred to this species plants collected by Dr. Rose on the west coast of Mexico, where they were growing wild; this is some distance from the place where the type was obtained from cultivated plants. These specimens



Fig. 219.—Opuntia crassa.

are like this species in having quite glossy joints with few spines. The plants were not in bloom when seen by Dr. Rose in the spring of 1910.

Dr. Griffiths has changed his first name, O. undulata. on account of the use of that name at an earlier time, which was not accompanied, however, by description.

199. Opuntia lanceolata Haworth, Syn. Pl. Succ. 192. 1812.

Cactus lanceolatus Haworth, Misc. Nat. 188. 1803. Cactus elongatus Willdenow, Enum. Pl. Suppl. 34. 1813. Opuntia elongata Haworth, Suppl. Pl. Succ. 81.1819.

Plants tall, much branched; joints elongated, 3.5 cm. long, dull green, somewhat tuberculate; areoles distant, small; spines if present few, small, white, 1 cm. long or less; glochids yellow; flowers large, yellow.

Type locality: In South America.

Distribution: Known only in cultivation.

We have combined O. lanceolata and O. elongata. although there is a possibility of their being different. O. lanceolata was first described essentially as follows: Joints flattened, sub-erect, subnaked, with leaves 3 lines long; stems at first erect; joints lanceolate, green, when young with many leaves; spines (spicules?) in fascicles, the shortest of all species (except Cactus coccinellifer): leaves longer than in other species.

The species was received by Haworth from W. Anderson; no habitat given. In 1812 Haworth calls it the spear-shaped *Opuntia*. He says it probably came from South America,

and flowers in July. It had been in cultivation before 1796; it flowered in 1808 with Haworth and was described as follows: Flowers shiny yellow; filaments yellow, half as long as petals; style longer than stamens; stigmas 5, thick, obtuse, 2 lines long, sulphur-colored.

De Candolle says the flowers are 4 inches in diameter.

Pfeiffer states the joints are 5 to 6 inches long by 1 to 1.5 inches broad; that the leaves are red and the spicules yellow.

Opuntia elongata laevior Salm-Dyck (Cact. Hort. Dyck. 1849, 242, 1850) may or may not belong here.



Fig. 220.-Opuntia maxima,

## 200. Opuntia maxima Miller, Gard. Dict. ed. 8. No. 5. 1768.

Caetus decumanus Willdenow, Enum. Pl. Suppl. 34, 1813.
Opuntia decumanu Haworth, Rev. Pl. Succ. 71, 1821.
Caetus maximus, Colla, Mem. Accal. 5ci. Torino 35: 140. 1826 (?),
Opuntia gymnocupa, Weber, Ditt. Hort. Bois 893, 1898.
Opuntia labounetina. Console<sup>2</sup> in Schumann, Gesamb, Kakteen 717, 1898.
Opuntia facis-indica decumanu Spegazzini, Anal. Mus. Nac. Buenos Aires III. 4: 512, 1905.
Opuntia facis-indica gymnocupa-ps Spegazzini, Anal. Mus. Nac. Buenos Aires III. 4: 512, 1905.

Forming large, much branched plants; joints elongated, more or less spatulate, 35 cm. long or more, 10 to 12 cm, broad, rounded at apex, somewhat cuneate at base, pale green, not at all tuberculate; areoles small, distant; spines sometimes wanting or sometimes 1 or 2, short, white; glochids yellow (brown in some specimens referred here); flowers conspicuous, 8 cm. broad, orange-red; ovary elongated,

7 to 8 cm. long, bearing numerous large glochids. Illustration: Möllers Deutsche Gärt. Zeit. 25: 488. f. 22, No. 3, as Opuntia labouretiana.

<sup>\*</sup>Berger (Hort, Mortol, 409, 1912) says this is known as O. Labouretiana Console.

BRITTON AND ROSE



- Part of joint of Opuntia lencotricha.
   Part of joint of Opuntia maxima.
- Joint of Opuntia laviacantha.
   Joint of Opuntia robusta.

(All three-fourths size.)

Type locality: In America.

Distribution: Known only in cultivation.

Opuntia maxima Miller was described as the largest of all the opuntias and as the name is older than any of those here cited, it is taken up for this species. Haworth was uncertain whether or not his O. decumana is distinct from Miller's O. maxima, although in the Index Kewensis the two are considered the same; Burkill considered them distinct, but his idea of O. decumana is the O. ficus-indica type. Mr. Berger, on the other hand, states that it is evidently of the O. dillenii group, but this is hardly warranted by the description. Berger is convinced that O. elongata is distinct from O. decumana.

Opuntia labouretiana macrocarpa (Cat. Darrah Succ. Manchester 55. 1908) is only a garden name.

Plate XXXIV, figure 2, represents a flowering joint of a plant presented to the New York Botanical Garden by Frank Weinberg in 1901, which bloomed in May 1916. Figure 220 is from a photograph of the same plant.

Opintia bariramii Rafinesque (Atl. Journ. 1: 146. 1832) is based on Bartram's description (Travels p. 163. 1790), in which he states that the plant is 7 to 8 feet high; joints very large, bright green, glossy; spines none; glochids numerous; flowers large, yellow; fruit pear-shaped, purple. It was found about 6 miles from Lake George, northern Florida, associated with Zamia pumila and Erytbrina. We do not know of any Opuntia answering the description, growing in Florida at the present time. Dr. Small visited the type locality in 1918 but failed to find any plant answering Rafinesque's description.

Opuntia hernandezii De Candolle (Mém. Hist. Nat. Paris 17: 69. pl. 16. 1828) is a complex. The reference to Hernandez applies to Nopalea cochenillifera. Schumann was not able to identify the plant illustrated by De Candolle, but thought it might be referable to Opuntia ficus-indica, in which we agree. Opuntia hernandezii first appeared in De Candolle's Prodromus (3: 474, 1828). Nopal silvestre Thierry (Förster, Handb. Cact. ed. 2, 929, 1885) is cited as a synonym of Opuntia hernandezii. This reference is given also in the Index Kewensis.

Illustration: Förster, Handb. Cact. ed. 2, 930, f. 128,

#### Series 21. STREPTACANTHAE.

Tall, branched, glabrous, green species with white or faintly yellow, acicular or subulate spines, large yellow or red flowers, and fleshy fruits, natives of Mexico and Central and South America. We recognize twelve species. The fruits, known as tunas, are mostly edible and are sold in large quantities in Mexican markets, a practice which probably dates from prehistoric time. The long-continued selection of plants for their fruit has perpetuated many slightly differing races.

#### KEY TO SPECIES.

```
Spines short, 5 mm. to 8 cm. long.
   Joints scarcely if at all tuberculate.
       Joints obovate to elliptic, mostly not more than twice as long as wide.
           Areoles close together, sunken.
                                                                                             ... ......... 201. O. vpinulifera
           Areoles not close together, not sunken.
              Joints dull.
                  Spines acicular...
                                                                                                      202. O. lasiacantha
                  Spines subulate.
                      Areoles with 2 or more short reflexed hairs or bristles at the lower part
                          Spines strongly depressed; areoles with several hairs...
                                                                                          ...... 203. O. by ptiacant ba
                          Spines not strongly depressed; areoles with 1 or 2 hairs.
                             Joints obovate
                                                                                                    . 204. O. streptacantha
                             Joints oblong.
                      Areoles without reflexed hairs or bristles.
                         Spines clear white, terete or nearly so; fruit spineless, 6 to 8 cm. long.
                              yellow, edible.
                                                                                                      206. O. megacantha
                          Spines white to dull yellow, somewhat flattened; fruit 6 cm. long or
                             less bearing a few spines near the top, red, not edible. Plant with a definite trunk; petals reddish; fruit spiny only at top 207. O. deamii
                             Plant bushy; petals chocolate-colored; fruit spiny all over ...... 207.a. O. doblicana
               Joints shining
                                                                                                     208. O. eichlamit
       Joints oblong to oblanceolate, some of them much longer than wide,
```

Joints shining; wool of young areoles white; petals yellow. 209, O. inacquillateralis
Joints dull; wool of young areoles brown; petals deep orange to scarlet. 210, O. pittieri
Joints strongly tuberculate. 211, O. cordobenis
Spines clongated, 10 to 14 cm, long. 212, O. quintilo

### 201. Opuntia spinulifera Salm-Dyck, Hort. Dyck. 364. 1834.

Opuntia candelabriformis Martius in Pfeiffer, Enum. Cact. 159. 1837. Opuntia oligacantha Salm-Dyck, Cact. Hort. Dyck, 1849, 241, 1850.

Tall, much branched plants, joints orbicular to oblong, sometimes obovate, 20 to 30 cm. long glabrous, a little glaucous; leaves small, red, 4 to 6 mm. long; areoles on young joints usually small, sometimes longer than broad, the margin at first bordered with cobwebly hairs, afterwards short white hairs, either spineless or with short white bristle-like spines; areoles on old joints more or less sunken, rather close together; spines on old joints 1 to 3, 1 to 2 cm. long, subulate, bone-colored.

Type locality: In Mexico.

Distribution: Mexico.

We have seen no wild specimens of this species, but Mr. Berger has grown it at La Mortola, Italy, and has distributed specimens now growing in New York and Washington.

So-called Opuntia candelabriformis and Ooligacantha are also in cultivation; but the original descriptions indicate that these two species should be merged into O-spinulifera, and plants so determined in European collections support this view. In so far as we have been able to ascertain, no type specimens of any of the three supposed species are extant. Schumann (Gesamtb. Kakteen 740. 1898) describes the flowers of O. candelabriformis rigidior Salm-Dyck (Cact. Hort. Dyck. 1849. 68. 1850), an unpublished variety, may belong here.

Figure 221 represents a joint of a plant presented to the New York Botanical Garden by Mrs. George Such in 1900.

202. Opuntia lasiacantha Pfeiffer, Enum. Cact. 160. 1837.

Opuntia megacantha lasiacantha Berger, Bot. Jahrb. Engler 36: 453. 1905.

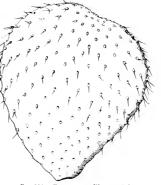


Fig. 221.—Opuntia spinulifera. x 0.4.

A tall plant, with a more or less definite trunk; joints obovate to oblong, 20 to 30 cm. long; leaves short, red; areoles small, 2 to 3 cm. apart; spines usually 1 to 3, acicular, white, 2 to 4 cm. long, slightly spreading; glochids numerous, prominent, dirty yellow to brown; flowers large, yellow or deep orange, 6 to 8 cm. broad; ovary bearing long, brown, deciduous bristles, especially from the upper areoles; style pinkish; stigma-lobes pale green.

Type locality: In Mexico.

Distribution: Central Mexico.

Schumann refers O. lasiacantha to O. robusta, but wrongly, as Berger states, and as living plants show. Pfeiffer said it is near O. candelabriformis, here taken up under O. spinulifera.

This species is very variable and, while it seems distinct from O. megacantha, it is to be noted that Mr. Berger referred it to that species as a variety.

Opuntia chaetocarpa Griffiths (Proc. Biol. Soc. Washington 27: 25. 1914), in its few long white spines, resembles plants collected by Dr. Rose in southern Mexico which we have referred to this species.

Illustration: Addisonia 3: pl. 90.

Plate XXXIV, figure 3, represents a flowering joint of a plant collected by Dr. Rose near the City of Mexico in 1906. Figure 222 represents a joint of a plant collected by Dr. MacDougal and Dr. Rose at Tehuacán, Mexico, in 1906.

#### OPUNTIA ZACUAPANENSIS Berger, Hort. Mortol. 413. 1912.

"A fine new species with bright-orange flowers. We received this plant a few years ago from M. L. Puteaux, Versailles, as Opintia spec. from Zacuapan.\* Joints 13 to 20 cm. long and 9.5 cm. broad, obovate, smooth, glossy green, areoles 15 to 25 mm. distant, slightly elevated, small, roundish or obsvate. Spicules yellow, short, not numerous. Spines generally two, white, with yellowish points and base, terete, the lower deflexed shorter, the upper one spreading (2-) 3 cm. long. Flowers numerous from the top of the joint, 7.5 cm. long and 6.5 cm. broad, ovary obovate turbinate, 3.5 to 4 cm. long and 22 mm. broad, areoles somewhat elevated, prickly; petals obovate lanceolate, acute and aristate, orange-yellow, with a more reddish-brown hue along the midrib on the back and as well on the shorter obtuse outer petals; stamens yellow, style yellowish, thickened or clavate above the base, stigma (6-) 7. dirty, rose-coloured."

We have studied a plant, sent from La Mortola to the New York Botanical Garden in 1913, which has not flowered; it appears to be related to O. lasiacantha.

Figure 223 represents a joint from the plant received from La Mortola, Italy, in 1913.

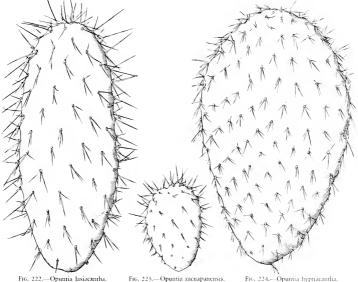


Fig. 224.—Opuntia hyptiacantha.

## 203. Opuntia hyptiacantha Weber, Dict. Hort. Bois 894.

Opuntia nigrita Griffiths, Rep. Mo. Bot. Gard. 21: 169. 1910. 2 Opuntia cretochaeta Griffiths, Proc. Biol. Soc. Washington 29: 11. 1916,

A tall, much branched plant, but in cultivation often only 1 meter high; joints oblong to obovate, 20 to 30 cm. long, pale green, but when young bright green; spines on young joints single, porrect, and accompanied by 2 or 3, sometimes many, white, slightly pungent hairs; spines on old joints 4 to 6 (in the original description 8 to 10), somewhat spreading or appressed, 1 to 2 cm. long; glochids few, brownish; areoles small, 1.5 cm. apart; leaves small, brownish; flowers red; fruit globular, yellowish, its areoles filled with long, weak glochids; umbilious broad, only slightly depressed,

x 0.4.

<sup>\*</sup> Perhaps Zacualpan, in Vera Cruz, Mexico.

Type locality: In Mexico.

Distribution: Oaxaca, Mexico.

This species is very near *Opuntia streptacantha*, and in many cases it is difficult to separate them. It is also near *O. pitifera*, but the arcoles are not so hairy. Weber, who first described it, gives no definite locality for the species; but Dr. Rose has examined, at La Mortola, Italy, a living plant sent by Weber which seems to be the same as one of the large opuntias from Tehuacán, Mexico.

Opuntia chavena Griffiths (Rep. Mo. Bot. Gard. 19: 264. pl. 23, in part. 1908) is a near relative of O. hyptiacantha or not distinct from it.

Illustration: Rep. Mo. Bot. Gard. 21: pl. 24, as Opuntia nigrita.

Figure 224 represents a joint of a plant obtained for the New York Botanical Garden from the collection of M. Simon, St. Ouen, Paris, France, in 1901.

# 204. Opuntia streptacantha Lemaire, Cact. Gen. Nov. Sp. 62. 1839.

Much branched, up to 5 meters high, sometimes with a trunk 45 cm. in diam/ter; joints obovate to orbicular, 25 to 30 cm. long, dark green; areoles small, rather close together for this group; spines numerous, spreading or some of them appressed, white: glochids reddish brown, very short; flowers 7 to 9 cm. broad, yellow to orange, the sepals reddish; filaments greenish or reddish; stigma-lobes 8 to 12, green; fruit globular, 5 cm. in diameter, dull red or sometimes yellow, both within and without.

Type locality: Not cited.

Distribution: Very common on the Mexican table-lands, especially on the deserts of San Luis Potosí.

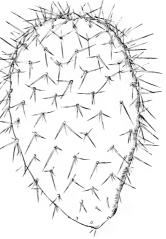


Fig. 225.—Opuntia streptacantha, x 0.5.

This species is known as tuna cardona or nopal cardón, and is one of the most important economic opuntias in Mexico. It has many forms and seems to grade into some of the species which we have here recognized.

Opuntia cardona Weber (Dict. Hort. Bois 895, 1898) and O. coindettii Weber (Dict. Hort. Bois 895, 1898) are two names given as synonyms of the species by Weber, but they were never published. O. diplacantha (Berger, Hort. Mortol. 232, 1912) must be referred here, but of this, so far as we know, there is no published description. Berger has distributed living specimens which we are inclined to refer here.

Opuntia pachona Griffiths (Rep. Mo. Bot. Gard. 21: 168. pl. 22. 1910) is closely related to O. streptacantha, if not a race of that species. Opuntia megacantha tennispina Salm-Dyck (Cact. Hort. Dyck. 1844. 45. 1845) was given as a new name for O. lasiacantha, but was never described.

Hlustrations: N. Mex. Agr. Exp. Sta. Bull. 60: pl. 1; Stafford, Ann. Rep. Smiths. Inst. 1908: pl. 9, f. 6; U. S. Dept. Agr. Bur. Pl. Ind. Bull. 102<sup>1</sup>: pl. 1; 116: pl. 1, this last as tuna cardona; Engler and Prantl, Pflanzenfam. 3<sup>60</sup>: f. 70, this last as Opuntia pseudotuna: Useful Wild Pl. U. S. Canada app. 18, 108, 174, as Opuntia tuna.

Figure 225 represents a joint of a plant received from C. Wercklé in 1902 as O. cardona.

205. Opuntia amyclaea Tenore, Fl. Neap. Prodr. App. 5: 15. 1826.

Opuntia ficus-indica amyelaea Berger, Hort. Mortol. 411. 1912.

Erect; joints oblong to elliptic, 3 to 4 dm. long, about twice as long as broad, thick, dull green, a little glaucous; Laves 4 mm. long, acute, red; arcoles small, with 1 or 2 short bristles from the lower parts of arcoles; spines 1 to 4, stiff, nearly porrect, usually less than 3 cm. long, white or horn-colored, the stoutest angled; glochids brown, soon disappearing; flowers yellow; fruit yellowish red, not very juicy.

Type locality: Described from specimens grown in Italy.

Distribution: Doubtless Mexico, but not known in the wild state.

Our description is based on the original description and a specimen collected by A. Berger near Palermo, where it is grown as a hedge plant. Berger's plant suggests very much O. streptacantba, but is not quite so spiny; it does not suggest very much O. ficus-indica, where Berger has placed it. Our description of the spines is taken from Berger's plant, while the original description states that the spines are 3 to 8, stout, spreading, unequal, white, the longest 35 mm. long.

O. alfagayucca (Salm-Dyck, Cact. Hort. Dyck. 1849. 68. 1850) and O. alfayucca (Rümpler in Förster, Handb. Cact. ed. 2. 938. 1885) were given as synonyms of O. amyclaea.

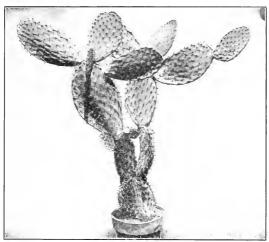


Fig. 226.-Opuntia megacantha.

## 206. Opuntia megacantha Salm-Dyck, Hort. Dyck. 363. 1834.

Opuntia castillae Griffiths, Rep. Mo. Bot. Gard. 19: 261. 1908, ? Opuntia incarnadilla Griffiths, Rep. Mo. Bot. Gard. 22: 27. 1912.

Plant tall, 4 to 5 meters high or more, with a more or less definite woody trunk; joints of large plants obovate to eblong, often oblique, sometimes 40 to 60 cm. long or more, but in greenhouse specimens often much smaller, pale dull green, slightly glaucous; leaves minute, often only 3 mm. long, green or purplish; areoles rather small, on large joints often 4 to 5 cm. apart, when young bearing brown wood; spines white, usually 1 to 5, slightly spreading, sometimes nearly portect, usually only 2 to 3 cm. long, sometimes few and confined to the upper arcoles; glochids few, yellow, caducous, sometimes appearing again on old joints; flowers yellow to orange, about 8 cm. broad; ovary spiny or spine-less, obovoid; fruit 7 to 8 cm. long.



Fig. 227.-Opuntia megacantha on Lanai, Hawaiian Islands.

Type locality: In Mexico.

Distribution: Much cultivated in Mexico; grown also in Jamaica and southern California and escaped from cultivation in Hawaii.

This species was originally described by Salm-Dyck essentially as follows: Erect and of the size of O. decumana; joints 17.5 cm. long by 7.5 cm. broad and 2.5 cm. or more thick;

areoles close together, filled with gray wool; glochids brownish, becoming blackish; spines 7 to 10, white, unequal, acicular, somewhat radiating, the longest one deflexed, 5 cm. long; flowers not known; leaves small, reddish.

Opuntia megacantha trichacantha Salm-Dyck was given as a synonym of this species by Förster (Handb. Cact. 486, 1846), but was never published.

Opuntia tribuloides Griffiths (Monatsschr. Kakteenk. 23: 137. 1913), according to the description, is of this relationship.

This is the chief Mission cactus. It is the one from which the best varieties of edible tunas are obtained and is one of the commonest cultivated opuntias in Mexico, having numerous forms, many of them bearing local names.

Opuntia e'flulgia Griffiths (Bull. Torr. Club 46: 195. 1919) was obtained from San Luis Potosi, Mexico, and grown at Chico, California; O. bispanica Griffiths (Bull. Torr. Club 46: 198. 1919) was described from a plant received from Spain and grown at Chico; O. chata Griffiths (Bull. Torr. Club 46: 199. 1919), from Aguascalientes, Mexico, was grown at Brownsville, Texas, and at Chico; O. oborata Griffiths (Bull. Torr. Club 46: 202. 1919) from Hepasote, Mexico, was also grown at Brownsville and at Chico; O. amarilla Griffiths (Bull. Torr. Club 40: 202. 1919) from dat Chico; O. amarilla Griffiths (Bull. Torr. Club 40: 202. 1919) from the pasote, Mexico, was also grown at Brownsville and at Chico; O. amarilla Griffiths (Bull. Torr. Club

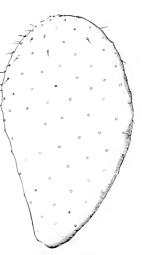


Fig. 228.-Opuntia megacantha, x 0.4,

46: 205. 1919) was obtained in cultivation at Cardenas, Mexico, and grown at Chico. These are known to us only from the descriptions and appear to be races of O. megacantha or of some of the related tall, white-spined species.

Illustrations: Ariz. Agr. Exp. Sta. Bull. 67: pl. 8, f. 2; Rep. Mo. Bot. Gard. 19: pl. 24, both as Opuntia castillae. Rep. Mo. Bot. Gard. 22: pl. 4, 5, these two as Opuntia meannadilla: Amer. Journ. Bot.

4: 572. f. 6; Ann. Rep. Smiths. Inst. 1917: pl. 16, f. 2.

Plate XXXII, figure 4, represents a flowering joint of a plant in the same collection received from Eairmount Park, Philadelphia, in 1905. Figure 226 is from a photograph of a plant in the collection of the New York Botanical Garden; figure 227 is from a photograph taken by A. S. Hitchcock on Lanai in 1916; figure 228 represents a joint of a plant obtained by Dr. MacDougal near Mount Wilson, California, in 1906, a nearly spincless form.

## 207. Opuntia deamii Rose, Contr. U. S. Nat. Herb. 13: 309. 1911.

One meter or so high, with a definite cylindric trunk, branching a short distance above the base; branches few, ascending; joints erect or spreading, very large, obovate to oblanceolate, 25 to 30 cm. long, at first bright leaf-green, in age dark green, glabrous; areoles remote, often 4 cm. apart, rather small; spines 2 to 6, usually 4, white or dull yellow, stout, somewhat flattened, spreading or porrect, 3 to 5.5 cm. long; flowers 7 cm. long, reddish; fruit oblong, 6 cm. long, naked, except for

a few spines near the top, wine-red both within and without, not edible; seeds small, 3 mm. broad.

Type locality: Fiscal, Guatemala.

Distribution: Fiscal to San José de Golfo and Sanarata. Guatemala.

Illustration: Contr. U. S. Nat. Herb. 13: pl.

65.

Figure 229 represents a joint of the type specimen.

A tall, white-spined Opuntia. closely resembling the Mexican O. macracantha. was obtained by Dr. Rose in 1918 (No. 22390) along roadsides at Ambato, Ecuador, presumably escaped from cultivation; its fruit is edible.

# 207*a*. Opuntia dobbieana sp. nov. (See Appendix, p. 225.)

# 208. Opuntia eichlamii Rose, Contr. U. S. Nat. Herb. 13: 310.

Tree-like, 5 to 6 m.ters high, the main branches nearly erect; joints obovate to orbicular, 15 to 20 cm. long, more or less glaucous, especially in dried specinens; leaves minute, caldroous; areoles small, 3 to 3.5 cm. apart; spines 4 to 6, very unequal, 2 cm. long or less, rose-colored at first, soon becoming white, spreading, the larger ones flattened; glochids brown; flower 3.5 cm. long; petals carmine; style red; stigma-lobes 8 to 11, bright green; fruit 4 cm. long, strongly tuberculate, not edible.

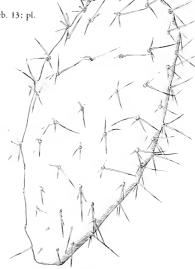


Fig. 229. Opuntia deamii

Type locality: Near Guatemala City. Distribution: Suburbs of Guatemala City, Guatemala. Illustration: Contr. U. S. Nat. Herb. 13: pl. 66. Figure 230 represents a joint of the type specimen.

## 209. Opuntia inaequilateralis Berger, Bot. Jahrb. Engler 36: 453. 1905.

About 12 dm. high, with spreading branches; joints oblique, narrowly ovate to subrhomboid, 40 to 70 cm. long, 2 to 4 times as long as wide, narrowed at base, obtuse at apex, with somewhat sinuate margins, green, shining; young joints bright green, not at all glaucous, oblanceolate to narrowly oblong, rounded at apex; leaves reddish, subulate, 2 to 3 mm. long; areoles small, circular, filled with white wool when young, and having white, somewhat cobwebby hairs on the outer edge; glochids brown, in a dense cluster; spines 3 to 7, accular on young joints, but finally 10 to 15, stout, 3 to 4 cm. long, at first yellowish, becoming white, somewhat spreading but not appressed to the joint; flowers large, borne at the apex of the joints; petals yellow, broadly obovate, retuse with crenulate margins; stigma-lobes green; fruit oblong, truncate, reddish, juicy, sweet.

Type locality: Described from cultivated specimens grown at La Mortola, Italy. Distribution: Known only from cultivated specimens, their origin unknown.

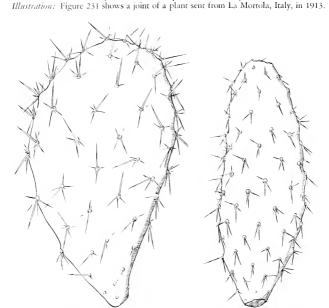


Fig. 230. Opuntia eichlamit. x0.5.

Fig. 231.—Opuntia inaequilateralis, x .5.

## 210. Opuntia pittieri sp. nov.

Plant up to 5 meters high, with a rather definite cylindric spiny trunk; joints large. 25 to 50 cm. long, 2 to 4 times as long as wide, narrowly oblong, green; leaves subulate, with purple tips; wool in young arcoles dark brown to purple; arcoles elevated, rather large, 2 to 3 cm. apart; spines 3 to 6, slightly spreading, acicular, white, the longest 2 to 2.5 cm. long; glochids tardily developing, few, often wanting; flowers deep orange, turning to scarlet; ovary nearly globular, more or less spiny, nearly truncate at apex.

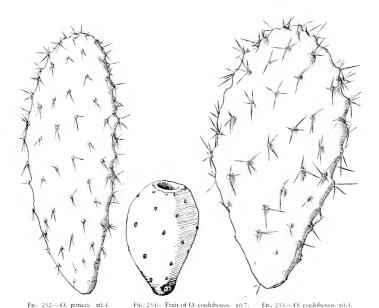
Collected at Venticas del Dagua, Dagua Valley, western cordillera of Colombia, February 1906, by H. Pittier, and since grown in Washington and New York.

Opuntia pittieri differs from O. inaequilateralis in having the young joints thinner, somewhat tuberculate, and with longer leaves; the areoles, too, are filled with brown or purple wool, while the glochids develop more slowly or never appear.

Figure 232 represents a joint of the type plant.

## 211. Opuntia cordobensis Spegazzini, Anal. Mus. Nac. Buenos Aires Ill. 4: 513. 1905.

Much branched, the trunk 1 to 2 meters long, 20 cm. in diameter, very spiny; joints large, 3 dm. long or more, broadly oblong to obovate; arcoles prominent, numerous; spines 1 to 6, white, somewhat spreading, a little flattened and twisted; flowers usually on the margins of the joints; petals about 12, yellow; fruit pyriform, yellowish both within and without, 8 cm. long; seeds about 3 mm. long.



Type locality: Near Córdoba, Argentina. Distribution: Northern Argentina.

The only white-spined species observed by Dr. Rose in 1915 about Córdoba were O. ficus-indica, in cultivation, and what we have taken to be O. cordobensis. The latter is very abundant, growing on the hills about the city, and sometimes planted as hedges. Dr. Spegazzini states that it has the habit of O. labouretiana.

Figure 233 represents a joint of the plant collected by Dr. Rose near Córdoba, Argentina, in 1915; figure 234 represents the fruit as collected by J. A. Shafer at Calilegua, Argentina, in 1917 (No. 197).

## 212. Opuntia quimilo Schumann, Gesamtb. Kakteen 7-16. 1898 .

Much branched, about 4 meters high; joints large, elliptic or obovate, 5 dm. long by 2.5 dm. broad, 2 to 3 cm. thick, grayish green; spines very long, usually 1, sometimes 2 or 3 from an arcole, twisted, 7 to 1+5 cm long; flowers red, 7 cm. broad; fruit pear-shaped to globular, 5 to 7 cm. long, greenish yellow; seeds 8 mm. broad, 1.5 to 2 mm, thick, with broad, thick, white margins.

Type locality: La Banda, Santiago del Estero, Argentina.

Distribution: Northern Argentina.

This plant is known to the natives as quimilo.

Dr. Rose obtained a good photograph of it from Dr. J. A. Dominguez, and seed and a photograph from Dr. Spegazzini. While the volume was going through the press a fine specimen in fruit with the long spines so characteristic of this species was obtained by

H. M. Curran at Quilino, Córdoba Argentina. Dr. Shafer's specimens collected at Río Piedras, show that the trunk-arcoles sometimes bear as many as eight spines.

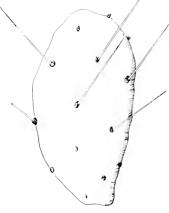




Fig. 235.—Joint of Opuntia quimilo. x0.3.

Fig. 236. Fruit of Opuntia quimilo, x0.3.

Figure 235 represents a joint obtained by Dr. Shafer at Río Piedras, Salta, Argentina. January 4, 1917 (No. 34); figure 236 represents the fruit from the same plant; figure 237 is from a photograph of a flowering joint of the plant, contributed by Dr. Spegazzini.

The following may belong to this series:

OPUNTIA ITHYPETALA Griffiths, Bull. Torr. Club 43: 529. 1916.

Tall, erect plant, 2 meters or more high; joints large, obovate, 26 to 45 cm. long, 1+ to 19 cm. broad, much contracted below, bright dark green, somewhat tuberculate at the areoles; subulate, 5 to 6 mm. long-arcoles large, often 1 cm. in diameter, 4 to 5 cm. apart; spines white at least on second year's growth, 3 to 5; central spine largest, porrect, 3 to 4 cm. long; flowers yellow, fading to rose-purplish; petals erect, 3 cm. in diameter; style white; stigma-lobes 6, light green.

Known only from cultivated plants received from the Berlin Botanical Garden

#### Series 22. ROBUSTAE.

Tall or large plants with blue or bluish green joints, the spines, when present, white or yellowish. Two of the species are widely distributed in warm regions through cultivation for their edible fruits; the other is known in cultivation only in central Mexico. All are presumably Mexican in origin,

#### KEY TO SPECIES

Joints orbicular to broadly oboyate or

Fruit deep red, 7 to 9 cm. in diameter, 213. O. 10busta Fruit greenish white, 4 to 5 cm, in

diameter . . . 

## 213. Opuntia robusta Wendland in Pfeiffer, Enum. Cact. 165. 1837.

Opuntia flavicans Lemaire, Cact. Gen. Nov. Sp. Opuntia Lureyi Weber in Coulter, Contr. U. S.

Nat. Herb. 3: 423. 1896. Opuntia gorda Griffiths, Monatsschr, Kakteenk.

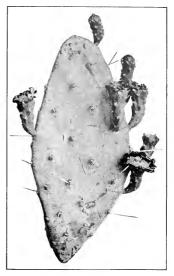
23: 134. 1913. Often erect, sem-times 5 meters high, usually

much branched; joints orbicular to oblong, 20 to 25 cm. long by 10 to 12.5 cm. broad, very thick, bluish green, glaucous; leaves 4 mm. long, reddish, acute; spines 8 to 12, stcut, very diverse, brown or yellowish at base, white above, up to 5 cm. long, but often wanting on greenhouse specimens; flowers 5 cm. broad, yellow; stigma-lobes green; fruit globular to ellipsoid, at first more or less tuberculate, deep red, 7 to 9 cm. long.

Type locality: In Mexico.

Distribution: Central Mexico; cultivated in Argentina.

This is one of the few species of Opuntia of which we have not been able to verify the original publication. It was redescribed by Pfeiffer in 1837.



Ftg. 237.—Opuntia quimilo.

Opuntia camuessa Weber (Dict. Hort. Bois 895. 1898) was given as a synonym of O. robusta, but was never described; and the same is true of O. piccolominiana Parlatore (Schumann, Gesamtb. Kakteen 741. 1898).

The variety Opuntia robusta viridior Salm-Dyck (Förster, Handb. Cact. 487. 1846) was never described.

Opuntia albicans Salm-Dyck (Hort. Dyck. 361. 1834) we do not know, but A. Berger, who has grown a plant under that name at La Mortola, says it is closely related to O. robusta. while in the New York Botanical Garden are specimens labeled O. albicans which are difficult to distinguish from O. ficus-indica. Here belong the following: O. prate Sabine (Pfeiffer, Enum. Cact. 155. 1837), given as a synonym of O. albicans; O. albicans laevior Salm-Dyck (Cact. Hort. Dyck. 1849. 67. 1850), name only; and O. pruinosa Salm-Dyck (Cact. Hort. Dyck. 1849. 67. 1850) given as a synonym of O. albicans laevior.

Opuntia cyanea Griffiths (Bull. Torr. Club 46: 196. 1919) judging from the original description may be related to O. robusta.

Opuntia larreyi, a manuscript name of Weber, which was published by Coulter in 1896, is based on the plant known to the Mexicans as camuessa. Weber gave it the name of O. camuessa, as shown above, but did not publish it; it is usually considered to be only a race of O. robusta, but Dr. Griffiths considers it a distinct species, even referring it to a different series, the Ficus-indicae (N. Mex. Agr. Exp. Sta. Bull. 64: 56. 1907).

Berger remarks that this species is very variable, but that it can not well be divided even into varieties.

Opuntia megalarthra Rose (Smiths. Misc. Coll. 50: 529. 1908), in its very spiny joints, yellow spines, and small fruits, seems very different from the common cultivated O. robusta; yet when grown in the greenhouse for several years it takes on much the appearance of O. robusta. It this view is correct, O. megalarthra represents the wild form of the species.

Opuntia cochinera Griffiths (Rep. Mo. Bot. Gard. 19: 263. pl. 26. 1908) from Zacatecas, Mexico, is, perhaps, a hybrid between Opuntia robusta and one of the Streptacanthae.

Illustrations: N. Mex. Agr. Exp. Sta. Bull. 60: pl. 5, f. 1; Monatsschr. Kakteenk. 23: 135; Journ. Inter. Gard. Club 3: 14. the last two as Opuntia gorda; U. S. Dept. Agr. Bur. Pl. Ind. Bull. 74: pl. 5, as Tapuna pear. ?N. Mex. Agr. Exp. Sta. Bull. 64: pl. 1; Engler and Prantl, Pflenzenfam. 36': f. 56, G. as Opuntia albicans.

Plate XXXIV. figure 4, represents a joint of the plant collected by Dr. Rose in Hidalgo, Mexico, in 1905, and described by him as *Opuntia megalarthra*. Figure 238 is from a photograph taken in Zacatecas, Mexico, by Professor F. E. Lloyd in 1908.



Fig. 238,-Opuntia robusta,

#### 214. Opuntia guerrana Griffiths, Rep. Mo. Bot. Gard. 19: 266. 1908.

Plant 9 to 12 dm. high, with an open, branching top; joints oblong to orbicular, 15 to 25 cm. long, thick, glaucous; arcoles 5 mm. in diameter, filled with tawny wool; spines white to yellow, 1 to 6, flattened, twisted; petals yellow; filaments greenish white; stigma-lobes green; fruit globose greenish white, 4 to 5 cm. in diameter.

Type locality: Near Dublán, Hidalgo, Mexico.

Distribution: Known only from type locality.

Except in size and color of fruit this species is very much like the common Opuntia robusta of this part of Mexico.

## 215. Opuntia fusicaulis Griffiths, Rep. Mo. Bot. Gard. 19: 271. 1908.

Plant 5 meters high or less, the branches erect or spr ading; joints oblong, elongated, 4 dm. long or learning, much longer than wide, glaucous, bluish green, spineless, narrowed at both ends; glochids often wanting; are

Type locality: Described from cultivated plants.

Distribution: Known only from cultivated specimens. Illustration: Rep. Mo. Bot. Gard. 19: pl. 23, in part.

The following may be referable to this series:

#### OPUNTIA CRYSTALENIA Griffiths, Bull. Torr. Club 43: 528. 1916.

Erect, 2 to 2.5 meters high; joints broadly obovate, 25 cm. long, 18 cm. wide, glaucous, blursh green, becoming yellowish in age; leaves 4 mm. long, subulate; spines white, porrect, only on the upper parts of the joints, 1 to 4, usually only 2, the longest 1 to 1.5 cm. long; glochids yellow; flowers yellow; stigma-lobes 10, dark green; fruit subglobose, 4 to 4.5 cm. in diameter.

Type locality: Cardenas, Mexico.

Distribution: Highlands of Mexico, where it is also cultivated.

#### Series 23. POLYACANTHAE.

This series is confined chiefly to plains of the western United States. The species are all low, creeping plants, very spiny, with dry fruits. On account of the dry fruit this series forms a natural group, although some species in the series Basilares also have dry fruits. One species of series Polyacanthae has fragile branches, in this respect resembling the Curassaricae. The species hybridize with those of the Tortispinae.

## KEY TO SPECIES

Joints readily detached, turgid, some of them subterete or subglobose Joints not readily detached, usually flat and thin, or in O. arena ia sometimes turgid and nearly	216.	O. fragilis
Joints not readily detached, usually flat and thin, or in O. arenara sometimes turgid and nearly		
terete.		
Joints turgid, usually small	217.	O. arenaria
Joints thinner than the last, mostly flat, larger.		
Spines, or some of them, very long, flexible and bristle-like.		
Flowers 4 to 5 cm, long	218.	O. trichothora
Flowers 4 to 5 cm. long	219.	O. etimacea
Spines stiff, acicular or subulate; areoles distant,		
Spines subulate.		
Fruit naked	220.	O. juniperina
Fruit spiny.		
Flowers vellow	221.	O. bystricina
Flowers yellow	222.	O. rhodantha
Spines acicular, slender; areoles close together.		
Ovary and fruit without spines	223.	O. shhaerocarba
Ovary and fruit with spines	224.	O. polyacantha

## 216. Opuntia fragilis (Nuttall) Haworth, Suppl. Pl. Succ. 82. 1819.

Cactus fragilis Nuttall, Gen. Pl. 1: 296. 1818.
Opuntia brachardra Engelman and Bigelow, Proc. Amer. Acad. 3: 302. 1856.
Opuntia fragilis brachardra Coulter, Court. U. S. Nat. Herb. 5: 440. 1896.
Opuntia fragilis caeriptosa and taberformis Horrus, Stand. Cycl. Hort. Bailey 4: 2363. 1916.
(3) Opuntia columbiana Griffiths, Bull. Tort. Club 43: 252. 1916.

Usually low and spreading, small and inconspicuous, but sometimes forming mounds 2 dm. high in the center and 4 dm. in diameter, with hundreds of joints; joints fragile (the terminal ones especially breaking off at the slightest touch), often nearly globular but sometimes decidedly flattened, usually dark green, 1 to 4 cm. long; areoles closely set, small, filled with white wool; spines 5 to 7, brown or only with brown tips and lighter below, 1 to 3 cm. long; glochids yellowish; flowers pale yellow, about 5 cm. broad; fruit dry, spiny, 1.5 to 2 cm. long, with a truncate or slightly depressed umbilicus; seeds large, 5 to 7 mm. broad.

Type locality: "From the Mandans to the mountains, in sterile but moist situations."

Distribution: Wisconsin to central Kansas and northwestern Texas, westward to Arizona, Oregon, Washington, and British Columbia.

Dr. Engelmann says "it is rarely found in flower and still more rarely seen in fruit." The only fruit we have seen was collected by Dr. Rose near Liberal, Kansas, in 1912.

Opuntia brachyarthra, sometimes regarded as a variety of O. fragilis, we regard as not specifically separable from that species. An examination of the type material now preserved in the Missouri Botanical Garden does not warrant a separation of any kind.

This species is of wide distribution and is especially common on the plains. It usually grows low, often being hidden by the grass. In the grazing country it is a most troublesome weed, for the joints easily break off and become attached by their spines to passing objects, thus greatly annoying and pestering all animals on the range, even frightening horses. The wide distribution of the species is doubtless largely due to the fact that the joints are so easily

scattered. A hybrid with O. tortispina has been found in Kansas (Rose, No. 17132).

The plant is of especial interest as the most northern in distribution of the opuntias.

It is stated that *Opinitia certicornis* Späth (Car. 156. 1906-7) is "probably a hybrid of which *O. fragilis* is a parent" (Kew Bull. Misc. Inf. 1907: App. 74. 1907). *O. sabinii* (Pfeiffer, Enum. Cact. 147. 1837) was given as a synonym of *O. fragilis*.

Illustrations: Cact. Journ. 1: 100; Dict. Gard. Nicholson 2: f. 752; Förster, Handb. Cact. ed. 2. f. 132; Gartenflora 30: 413; Pac. R. Rep. 4: pl. 12, f. 9; Rümpler, Sukkulenten f. 126; W. Watson, Cact. Cult. f. 78; Wiener Illustr. Gartenz. 10: f. 113, all as Opuntia brachyartbra. Illustr. Fl. 2: f. 2532; ed. 2. 2: f. 2991; Pac. R. Rep. 4: pl. 24, f. 5; Watson, Cact. Cult. ed. 3. f. 55; Deutsche Gärr. Zeit. 7: 313, Remark, Kakteenfreund 22, as Opuntia brachyartbra; Schelle, Handb. Kakteenk. 56, f. 15, as O. fragilis brachyartbra; Meehans' Monthly II: 57.

Plate xxxv, figure 1, shows old and young joints of the plant collected by C. Birdseye at Florence, Montana, in 1910. Figure 239 is from a photograph of the plant taken by E. R. Warren at San Acacio. Colorado, in 1912.

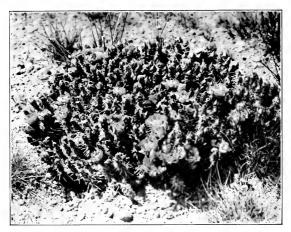


Fig. 239 .- Opuntia fragilis.

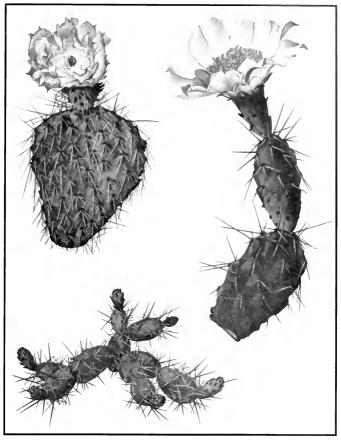
## 217. Opuntia arenaria Engelmann, Proc. Amer. Acad. 3: 301. 1856.

Roots in clusters of 10 to 15, spindle-form, somewhat fleshy; stem prostrate, 2 to 3 dm. long, much branched; joints during growing season quite turgid, afterwards much thinner, 4 to 8 cm. long, half as broad as long; areoles large, numerous, filled with brown wool, glochids, and spines; spines 5 to 8 from an areole, 2 or 3 much longer than the others, sometimes 4 cm. long; flowers red, 7 cm. broad; fruit dry, spiny, 3 cm. long; seeds large, 7 cm. broad.

Type locality: Sandy bottoms of the Rio Grande near El Paso.

Distribution: Texas and southern New Mexico.

This species is very rare and has been reported only a few times. Dr. Rose, who has repeatedly collected at El Paso, was never able to find it until October 1913, and then but a single plant about 8 miles above El Paso on the New Mexican side of the Rio Grande. It grows in nearly pure sand not far above the level of the river. BRITTON AND ROSE PLATE XXXV



M. E. Earon del.

1. Plant of Opuntia fragilis.
2. Flowering branch of Opuntia rhodsantha.
3. Flowering joint of Opuntia polyacantha. (All natural size.)



Illustration: Cact. Mex. Bound, pl. 75, f, 15.

Figure 240 is from a drawing of the plant collected by Dr. Rose near El Paso, Texas, in 1913.

#### 218. Opuntia trichophora (Engelmann) Britton and Rose, Smiths, Misc. Coll. 50: 535, 1908.

Opuntia missourientis trichophora Engelmann, Proc. Amer. Acad. 3: 300. 1856. Opuntia polyacantha trichophora Coulter, Contr. U. S. Nat. Herb. 3: 427. 1896.

A low, spreading plant, often forming small clumps 6 to 10 dm. in diameter; joints orbicular to obovate, 6 to 10 cm. in diameter; areoles closely set; spines numerous, very unequal, the longer one 4 cm. long or so, acicular, pale, often white, but on old joints developing into long, weak hair-like bristles; flowers yellow, the sepals tinged with red; ovary with numerous areoles, these bearing weak, pale bristles; fruit unknown.

Type locality: Mountains near Albuquerque, New Mexico.

Distribution: New Mexico, Texas, and Oklahoma.
This plant, while closely related to Opuntia polyacantha. seems worthy of specific rank, its long weak spines being apparently characteristic. Its northern extension into Oklahoma has recently been determined from plants collected by G. W. Stevens.

Illustrations: Pac. R. Rep. 4: pl. 15, f. 1 to 4; pl. 23, f. 19, all as Opuntia missouriensis trichophora.

Figure 241 is copied from the first illustration above cited.

F16. 240.—Opuntia arenaria. x0.75.

Fig. 241.—Opuntia trichophora. x0.75.

## 219. Opuntia erinacea Engelmann, Proc. Amer. Acad. 3: 301. 1856.

Opuntia ursina Weber, Dict. Hort. Bois 896. 1898. Opuntia ursus borribilis Walton, Cact. Journ. 2: 152. 1899.

Growing in small, low clumps, the branches ascending or erect; joints ovate to oblong, flattened or thick, sometimes nearly terete, 8 to 12 cm. long; arcoles somewhat tuberculate, large, numerous, closely set, 4 to 10 mm. apart; spines numerous, usually white or sometimes brownish or with brown tips, slender, often 5 cm., sometimes 12 cm. long or even more, stiff, often developing on the old joints as long hairs or bristles; glochids numerous; flowers rather large, 6 to 7 cm. long, either red or yellow; ovary and fruit very spiny; seeds large, rather regular.

Type locality: On Mojave Creek, California.

Distribution: Northwestern Arizona, southern Urah, southern Nevada, and eastern California.

This species has long been passing under the name of *Opuntia rutila* Nuttall (Torrey and Gray, Fl. N. Amer. 1: 555. 1840). Dr. Engelmann referred it there in the Report of Simpson's Expedition (page 442), and again in the Botany of California, with the remark that "this plant seems to be Nuttall's long lost *O. rutila.*" And while it is true that the identification of Nuttall's plant is still doubtful, it seems improbable that this reference is correct.

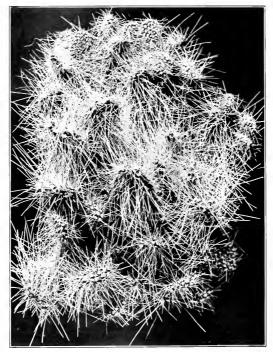


Fig. 242.-Opuntia erinacea.

for the description does not agree with that of the above, and the original station of *O. rutila* in Wyoming is far removed from the other; keen collectors like A. Nelson and V. Bailey, who have searched for the plant for us, have failed to find it in Wyoming. We suspect that *O. rutila* will prove to be *O. polyacantha*.

Opunlia ursina, which comes from the Mojave Desert, seems to be only a slender form with long weak spines. This is known in the trade as the California grizzly bear cactus. Alverson has described it as follows: "This curious plant is covered with tawny white hairs or flexuous spines, some of which are from 3 to 6 inches long, and I have some extra fine

specimens with the spines or hairs 9 and 12 inches long."

Illustrations: Alverson, Cact. Cat. 9 as Opuntia ursina: Pac. R. Rep. 4: pl. 13, f. 8 to 11; pl. 24, f. 4; Cact. Journ. 1: 93, as Opuntia: Möllers Deutsche Gärt. Zeit. 25: 476. f. 9, No. tc; Cycl. Amer. Hort. Bailey 3: 1149. f. 1548; Stand. Cycl. Hort. Bailey 4: 2363. f. 2603, as O. ursina; Mechans' Monthly 4: 9; Monatssschr. Kakteenk. 14: 105; N. Amer. Fauna 7: pl. II, as O. ratila.

Figure 212 is from a photograph of the plant taken by F. B. Headley at a point about 29 miles east of Fallon, Nevada, in 1910.

## 220. Opuntia juniperina sp. nov.

Somewhat of the habit of Opmilia polyacantha, but not so procumbent, stouter, and with fewer and stouter spines; joints obovate, 10 to 12 cm. long, broad, rounded at top; areoles small, all below the middle of the joint naked, the upper ones each bearing one stout spine and 1 to several very short accessory ones; the longer spine very stout, 3 to 4 cm. long, brown; flowers not known; fruit dry, oblong, 3 cm. long, spineless, with a shallow, flat umbilicus; seeds large, irregular, 6 to 8 mm. broad.

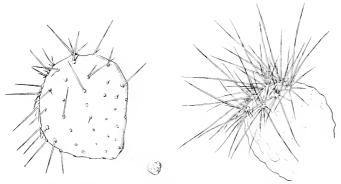


Fig. 243.—Joint of Opuntia juniperina. x0.5.

Fig. 244.—Seed of same. x0.5.

Ftg. 245.—Opuntia hystricina, v0.5

On dry hills among junipers in vicinity of Cedar Hill, San Juan County, New Mexico, altitude about 1,900 meters, August 17, 1911, Paul C. Standley (No. 8051).

This species is nearest *Opuntia rhodantha*, but has stouter joints and much larger seeds. Figure 243 represents a joint of the type specimen; figure 244 represents a seed.

#### 221. Opuntia hystricina Engelmann and Bigelow, Proc. Amer. Acad. 3: 299. 1856.

More or less diffuse; joints obovate to orbicular, 8 to 20 cm. long; areoles numerous, 10 to 15 mm. apart, rather large; spines numerous, pale brown to white, the longer ones 5 to 10 cm. long, stout, flat-tish, often reflexed; glochids yellow; flowers 6 cm. long; petals broad, yellow; ovary nearly globular; fruit oblong to obovoid, 2.5 to 3 cm. long, spiny above, dry, with a compressed umbilicus; seeds 7 mm. broad.

Type locality: Colorado Chiquito and on San Francisco Mountains.

Distribution: New Mexico to Arizona and Nevada.

Although this species has a wide range, it is not very well understood; it approaches O. rbodantba in some of its forms. We have referred here a very remarkable form collected by E. W. Nelson at Lee's Ferry, Arizona, in 1909. This plant has thick, obovate joints 17 to 22 cm. long, strongly tuberculate, with some of the spines very strong, flatrened, and re

flexed; the fruit is very spiny; the seeds are 8 mm. broad, angled, with margine thin and acute. This may be the plant listed in Weinberg's catalogue, also from the Grand Canyon, under the name of *Opuntia bothderfferi*.

Opuntia xerocarpa Griffiths (Proc. Biol. Soc. Washington 29: 15. 1916), from Kingman, Arizona, is of this relationship, described as "readily distinguished from other species of its dry-fruited allies by its spines, shape of joints and color of plant body."

Illustrations: Pac. R. Rep. 4: pl. 15, f. 5 to 7; pl. 23, f. 15.

Figure 245 is copied from the first illustration above cited.

## 222. Opuntia rhodantha Schumann, La Semaine Hort. 1897.

Opuntia xanthostemma Schumann, Gesamtb. Kakteen 735. 1898, Opuntia utahensis J. A. Purpus, Monatsschr. Kakteenk. 19: 133. 1909.

Joints obovate to oblong, 5 to 12 cm. long; areoles distant, 10 mm. apart or more; spines rather stord, 3 or 4, 2 to 3 cm. long, brownish, with 2 or 3 short accessory ones; lower areoles usually naked; glochids brown; flowers, including ovaries, 5 to 6 cm. long, 8 cm. broad; petals red or pink to salmon-colored, obovate, apiculate; stamens red or yellow; fruit spiny; seeds small, 5 mm. in diameter.

Type locality: Colorado, at 2,000 to 2,300 meters altitude.

Distribution: Western Nebraska, Colorado, and Utah.

After a careful examination of living plants of both O. rhodantha and O. xanthostemma, we feel convinced that the latter is only a form of the other. The color of the stamens in the opuntias does not furnish a constant character. It is hardy in cultivation at New York and highly ornamental when in bloom.

Haage and Schmidt, in their 1915 catalogue, list several varieties of this species: brevispina, flavispina, pisciformis, and schumanniana: and under Opunia xambostemma in the same place they list the following varieties: elegans, fulgens, gracilis, orbicularis, and rosea.

Illustrations: Meehan's Monthly 7: 133; Gartenwelt 1: 83, this last as Opuntia xanthostemma; Monatsschr. Kakteenk. 19: 135, this last as Opuntia utahensis; Monatsschr. Kakteenk. 30: 155, as Opuntia xanthostemma.

Plate XXXV, figure 2, represents a flowering plant received by the New York Botanical Garden from Haage and Schmidt, of Erfurt, Germany, in 1913.

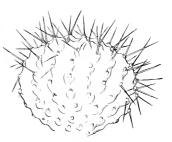


Fig. 246.—Opuntia sphaerocarpa. x0.66.

## 223. Opuntia sphaerocarpa Engelmann and Bigelow, Proc. Amer. Acad. 3: 300. 1856.

Small, spreading plants; joints orbicular, 6 to 7 cm. broad, thickish, strongly tuberculate, wrinkled in drying, light green or becoming more or less purple; areoles 8 to 10 mm. apart, mostly spineless or the upper and marginal ones bearing short accular spines, the longest ones about 2 cm. long; glochids yellow; flowers not known; fruit naked, 18 mm. in diameter, with a truncate umbilicus; seeds 5 mm. broad, very irregular.

Type locality: Mountains near Albuquerque, New Mexico.

Distribution: Known only from type locality.

We have not, with certainty, identified any recently collected plants with this species, although some New Mexican specimens appear to be referable to it.

Illustrations: Pac. R. Rep. 4: pl. 13, f. 6, 7; pl. 24, f. 3.

Figure 246 is copied from the first illustration above cited.

## 224. Opuntia polyacantha Haworth, Suppl. Pl. Succ. 82. 1819.

Cactus ferox Nuttall, Gen. Pl. 1: 296. 1818. Not Willdenow. 1813.

Opuntia media Haworth, Suppl. Pl. Succ. 82. 1819. Opuntia missouriensis De Candolle, Prodr. 3: 472.

Opuntia splendens Pfeiffer, Enum. Cact. 159. 1837.

Opuntia missouriensis albispina Engelmann and Bigelow, Proc. Amer. Acad. 3: 300. 1856.

Opuntia missouriensis micros perma Engelmann and Bibelow, Proc. Amer. Acad. 3: 300. 1856. Not O. rafinesquei micros perma Engelmann, Proc. Amer. Acad. 3: 295. 1856

Opuntia missouriensis platycarpa Engelmann, Proc. Amer. Acad. 3: 300. 1856.

Opuntia missouriensis rufispina Engelmann and Bigelow, Proc. Amer. Acad. 3: 300. 1856.

Opunita missourienis subbinerusi. Engendam and Digetow, ribe. Inter. Assat. 37.
Opunita missourienis subbinerusi. Engendam, Proc. Amer. Acad. 3: 300. 1856.
Opunita polyacamita desirabili foulter, Contr. U. S. Nat, Herb. 3: 437. 1896.
Opunita polyacamita berealir Goulter, Contr. U. S. Nat, Herb. 3: 436. 1896.

Opuntia polyacantha platycarpa Coulter, Contr. U. S. Nat. Herb. 3: 436. 1896. Opuntia polyacantha watsonii Coulter, Contr. U. S. Nat. Herb. 3: 437. 1896.

Opuntia missouriensis watsonii Schumann, Gesamtb. Kakteen 735. 1898.

Opuntia schweriniana Schumann, Monatsschr. Kakteenk. 9: 148. 1899.

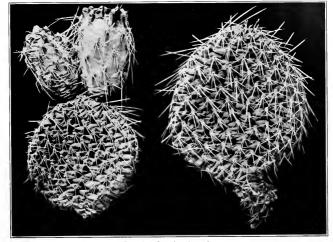


Fig. 247.—Opuntia polyacantha.

Low, spreading plants, with fibrous roots, usually forming small clumps; joints not very thick, orbicular, usually less than 10 cm. in diameter, generally light green; areoles small, closely set, usually less than 1 cm. apart, all spiny; spines numerous, often 9, those from the sides mostly short, appressed, and white, but often 1 or 2 of these elongated and like those from the upper and marginal areoles, dark brown, with lighter tips and about 3 cm. long; glochids yellow; flowers small, 4 to 5 cm. long, including the ovary; sepals tinged with red; petals lemon-yellow; stigma-lobes green; fruit dry, oblong, 2 cm. long, bearing small clusters of white, acicular spines at the areoles; seeds white, 6 mm. long, acute on the margin.

Type locality: Arid situations on the plains of the Missouri.

Distribution: North Dakota to Nebraska, northwestern Oklahoma, Texas, and Arizona to Utah, Washington, and Alberta.

Opuntia sphaerocarpa utahensis Engelmann (Trans. St. Louis Acad. 2: 199. 1863) can not be referred to O. sphaerocarpa, where Dr. Engelmann only provisionally placed it when he first described it. On account of its yellow flowers we have referred it here. Opuntia polyacantha microsperma and O, polyacantha rufispina, mentioned in Bailey's Standard Cyclopedia of Horticulture (3: 2363. 1916), belong here.

Opuntia polyacantha was one of the first of our western opuntias to be collected and described. It was first collected by Thomas Nuttall on his memorable trip to the Upper Missouri. He described it in 1818 as Cactus ferox. a name which had been previously used by Willdenow, which led A. H. Haworth in 1819 to rename Nuttall's plant, calling it Opuntia polyacantha. At the same place Haworth published a second name, Opuntia media, undoubtedly based on a less spiny form of O. polyacantha. In 1828 Nuttall's plant was again renamed, this time by A. De Candolle, who called it Opuntia missouriensis, under which name it was known for many years. In 1896 Dr. John M. Coulter very properly restored Haworth's name O. polyacantha.

This species has a wide distribution laterally and altitudinally. It is properly a plains' species, but is found in mountain valleys and on dry hills, usually in the open, but sometimes in sparse pine woods. In a species of such wide distribution and growing under such diverse circumstances, a wide range of forms is to be expected and a number of varieties have been proposed for the various races, some of which may perhaps have red flowers. The plant is hardy at New York, flowering freely in June.

Illustrations: Curtis's Bot. Mag. 115: pl. 70-16; Illustr. Fl. 2: f. 2531; ed. 2. 2: f. 2990; N. Mex. Agr. Exp. Sta. Bull. 78: pl. [3]; Cact. Journ. 1: 167; Gard. Chron. 50: 3-10, the last two as Opantia missonriensis; Pac. R. Rep. 4: pl. 14, f. 8 to 10; pl. 23, f. 18, the last two as Opantia missonriensis albispina; Pac. R. Rep. 4: pl. 14, f. 5 to 7; pl. 24, f. 1, 2, the last two as Opantia missonriensis microsperma: Pac. R. Rep. 4: pl. 14, f. 1 to 3; pl. 23, f. 17, these last two as Opantia missonriensis platycarpa; Pac. R. Rep. 4: pl. 14, f. 1 to 3; pl. 23, f. 16, these last two as Opantia missonriensis rufispina: Monatsschr. Kakteenk. 9: 148, this last as Opantia schweriniana; Rep. Mo. Bot. Gard. 13: pl. opp. 13; Schelle, Handb. Kakteenk. 54. f. 14, as Opantia missonriensis; Möllers Deutsche Gärt. Zeit. 25: 476. f. 9, No. 6, as O. schweriniana; Scientific American 124: 492; Meehans' Monthly II: 57; Stand. Cycl. Hort. Bailey 4: f. 2604.

Plate xxxv, figure 3, represents a flowering joint of the plant collected by Dr. Rose in western Kansas in 1912. Figure 247 represents joints of the plant from Colorado, photographed by T. W. Smillie.

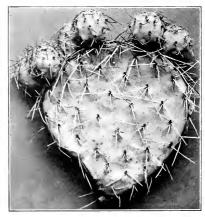
## Series 24. STENOPETALAE.

This is an anomalous group in Opinita, since the flowers are diecious and the petals are linear and more or less erect. It contains three species which are very different in habit and color of spines, but which were all united into a single species by Professor Schumann. Dr. Engelmann was so much impressed by the peculiar structure of the flowers of this group that he proposed for it a new subgenus, Stenophintia.

#### KEY TO SPECIES

acicular ..... 226. O. glaucescens Joints broader; spines

stouter...... 227. O. grandis



225. Opuntia stenopetala Engelmann, Proc. Amer. Acad. 3: 289. 1856.

Low bushy plant, often forming thickets, the main branches procumbent and resting on the edges of the joints; joints obovate to orbicular, 1 to 2 dm. long, grayish green, but often more or less

purplish, very spiny; arcoles often remote, 1 to 3 cm. apart, the lower ones often without spines, bearing white wool when young; leaves only on young joints, spreading, dark red, about 2 mm. long; spines usually redisish brown to black, but sometimes becoming pale, usually 2 to 4, the longest ones 5 cm. long, the larger ones somewhat flattened; glochids very abundant on young joints, brown; flowers diocious, small, including the ovary only 3 cm. long; petals orange-red, very natrow. 10 to 12 mm. long, with long acuminate tips; filaments short; style very thick in the middle, the male flowers with an abortive, pointed style, but female flowers with 8 or 9 yellow stigma-lobes on style; ovary leafy, the upper leaves similar to the sepals; fruit globular, 3 cm. in diameter, acid, naked or spiny; seeds small, smooth, 3 mm. in diameter, with broad, rounded margins.

Type locality: On battlefield of Buena Vista, south of Saltillo, Mexico.

Distribution: In States of Coahuila to Querétaro and Hidalgo, central Mexico.

Referred by Schumann to O. glancescens, but surely a distinct species, as indicated by Berger (Monatsschr. Kakteenk. 14: 71. 1904).

Although in its habit this *Opuntia* is much like many others, its flowers are unique, the petals being very narrow and erect; it is a very beautiful plant, and at flowering time is covered with numerous, small, beautiful flowers. Dr. Griffiths states that it is one of the most valuable ornamental opuntias, and that it is hardy in southern California.

Illustrations; Cact. Mex. Bound. pl. 66; Monatsschr. Kakteenk. 14: 172. f. 1; The Garden 62: 425; Möllers Deutsche Gärt. 25: 476. f. 9, No. 17.

Figure 248 is from a photograph of a fruiting joint of a specimen collected by Dr. Edward Palmer near Saltillo, Mexico, in 1905; figure 249 is copied from the illustration first above cited.

## 226. Opuntia glaucescens Salm - Dyck, Hort. Dyck, 362, 1834.

Probably erect; joints erect, oblong-obovate, 12 to 15 cm. long, 5 cm. broad, sometimes narrowed at both ends, pale green, glaucous, usually purplish around the areoles; leaves small, reddish when young; areoles filled with gray wool; spines 1 to 4, elongated, acicular, white, 2.5 cm. long; glochids brownish to rose-colored.

Type locality: In Mexico. Distribution: Mexico, but range un-



Fig. 249.—Opuntia stenopetala.

The flowers were not known when the species was first described and we do not know that they have since been observed. It has long been in cultivation, but specimens grown under glass at New York have not flowered.

#### 227. Opuntia grandis Pfeiffer, Enum. Cact. 155. 1837.

More or less erect, 6 dm. high or more; joints oblong, 12 to 18 cm. long, erect, when young reddish, glaucous; leaves rose-colored; spines few, white; flowers small, a little open, 2 cm. broad; petals few, narrowly lanceolate, 12 mm. long; filaments reddish; style shorter than the stamens, rose-colored; stigma-lobes 2 or 3, acute.

Type locality: In Mexico.

Distribution: Mexico, but range unknown.

Referred by Schumann to O. glaucescens, but doubtless distinct, as indicated by Berger. Illustration: Monatsschr. Kakteenk. 14: 172. f. 2.

#### Series 25. PALMADORAE.

An erect plant with narrow flat joints, small, brick-red flowers, and apparently erect stamens; the epidermis densely papillose-tuberculate when dry. The flowers suggest those of the *Spinosistimae*, but otherwise the plant is quite different. The series consists of a single species, from the catinga region of eastern Brazil.

## 228. Opuntia palmadora sp. nov.

Plant often 3 meters high, sometimes even 5, but often low; trunk sometimes 9 cm. in diameter, sometimes with brown, smooth bark, but usually very spiny; branches numerous, usually erect, at times forming a compact, almost globular top, at other times quite open; joints unusually thin and narrow, I to 1.5 dm. long, generally erect, very spiny; leaves subulate, minute, 3 to 4 mm. long, green with reddish tips, found only on very young joints; areoles filled with white wool; spines usually I to 4, sometimes 6, from an areole, all yellow at first, in age white, the largest one porrect, 3 cm. long; petals erect or only slightly spreading, brick-red in color; stamens short, erect; filaments orangecolored; style cream-colored; stigma-lobes white; ovary broadly turbinate, 2 cm. long, tuberculate; fruit small.

Collected by Rose and Russell at Barrinha, Bahia, Brazil, June 7, 8, 1915 (No. 19787).

This plant is common in the semiarid parts of Bahia, where it is known as palmadora or palmatoria. Johnston and Tryon describe it briefly without giving it a name in their Report of the Prickly-Pear Travelling Commission, 104. 1914.

Figure 250 represents joints of the type plant; figure 251 is from a photograph of the wild plant from which the above was taken.

#### Series 26. SPINOSISSIMAE.

Erect species, mostly tall, with terete, continuous, unjointed, usually densely spiny trunks, the ultimate branches spreading or divaricate, flat, usually elongated, spiny or sometimes unarmed; flowers small, yellow, orange or red, or changing from yellow to red; fruit fleshy. We recognize seven species, all natives of the West Indies. The series represents the genus Consolea of Lemaire.



Fig. 250.—O, palmadora.



Fig. 251.—Opuntia palmadora. A thicket in Bahia,

Fig. 252.-Opuntia nashii.

## KEY TO SPECIES.

Areoles of the joints distant, 2 to 4 cm. apart. Spines few, 3 cm. long or less, or none.

Arcoles scarcely elevated, spineless or with 1 to 4 weak yellow spines 1 to 2 cm. long. 250. O. halbimana nes, when present, many, the older up to 12 cm. long.

Areoles of the joints closer together, 1 to 1.5 cm. apart.

Spines of the trunk-areoles, or most of them, deflexed.

Young spines straw-colored or whitish; plant up to 5 m. tall. 232. O. spinosissima
Young spines purple; plant 6 dm. high or less. 233. O. millspaughii

Spines of the trunk-arcoles, when present, spreading,

Joints distinctly reticulate-areolate, light green; ovary prominently tuberculate. . 234. O. moniliformis

Joints indistinctly reticulate-areolate, mostly dark green or reddish; ovary low-tuberculate 235. O. rubescens

## 229. Opuntia nashii Britton, Bull. N. Y. Bot. Gard. 3: 446. 1905.

Tree-like, or sometimes bushy, dull green; main axis round, 1 to 4 meters high, 5 to 12 cm. in diameter, spiny; branches flat or becoming round below, the principal ones continuous, 1 meter long or more, 6 cm. wide or less, crenate, blunt; lateral branches opposite or alternate, oblong to linear-oblong, often 3 dm. long, and 8 cm. wide, only about 6 mm. thick, blunt, crenate; areoles 1 to 3 cm. apart, slightly elevated; spines mostly 5 at each areole (2 to 5), divergent, slender, straight, light gray, pungent, the longer 3 to 6 cm. long; glochids very small, brownish; ovary 3 cm. long, 1.5 cm. thick, somewhat clavate, tubercled, the tubercles bearing areoles and spines similar to those of the joints, but the spines somewhat shorter; flowers 1.5 cm. broad when expanded, red; petals broadly oval to obovate, blunt, about 8 mm. long, much longer than the stamens.

Type locality: Inagua, Bahamas.

Distribution: Andros, Crooked Island, Fortune Island, Atwood Cay, Caicos Islands, Turks Islands, Ship Channel Cay, and Inagua, Bahamas.

Figure 252 is from a photograph of a plant at Matthew Town, Inagua, Bahamas, taken by George V. Nash, in 1904; figure 253 is from a photograph of a plant from the same place in the collection of the New York Botanical Garden.

Illustration: Journ. N. Y. Bot. Gard. 6: f. 3.

## 230. Opuntia bahamana sp. nov.

Branched from near the base, bushy, about 1.5 m. high; joints oblong to lanceolate, flat, and thin, 1 to 5 dm. long, 4 to 10 cm. wide, dull green, obtuse, scarcely undulate; leaves red, subulate, 3 cm. long; areoles 1.5 to 3 cm. apart, scarcely elevated, about 2 mm. in diameter, spineless, or bearing 1 to 4 acicular yellow spines 2 cm. long or less when young; glochids few and short; flower about 6 cm. broad; petals obovate, rose-tinted below, yellowish rose above; sepals dark rose, whitish margined.

Distribution: Rocky slopes, The Bright, Cat Island, Bahamas, collected by N. L. Britton and C. F. Millspaugh, March 1907, No. 5794.

This plant was tentatively referred by us (Smiths, Misc. Coll. 50: 525. 1908) to Opuntia lanceolata Haworth. It has

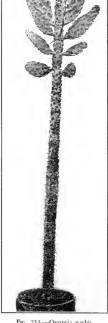


Fig. 253.-Opuntia nashii.

been grown under glass at New York ever since, but does not respond well to greenhouse conditions.

It is here included in the series Spinosissimae, but with hesitation, its bushy habit and larger flowers being anomalous in this group.

Figure 254 represents a joint of the type specimen above cited; figure 255 is copied from a sketch of a flower made by Dr. Millspaugh on Cat Island, when the plant was discovered.

## 231. Opuntia macracantha Grisebach, Cat. Pl. Cub. 116. 1866.

Erect, the trunk up to 15 cm. in diameter, its areoles 1 to 2 cm. broad, bearing many brownish glochids and several divergent spines 15 cm. long or less; upper portion of the trunk, and the ultimate, oblong, or oblong-ovate, spreading branches flat, green, faintly shining, the areoles 2 to 3 cm. apart, scarcely elevated, the numerous glochids brown; spines 1 to 4, up to 15 cm. long, nearly white, stout, subulate, or wanting; flowers often numerous; ovary 2.5 to 3 cm. long, densely beset with glochid-bearing areoles; petals orange-yellow, 1 to 1.3 cm. long.

Type locality: Cuba, in maritime depressions,

Distribution: Southern coast of eastern Cuba and adjacent plains.

Specimens of the plant were erroneously referred by Grisebach to O. triacantha. It is a picturesque feature of the flora of its native habitat.

Figure 256 is from a photograph of the plant on the United States Naval Station, Guantánamo Bay, Cuba, taken by Marshall A. Howe in 1909; figure 257 is from a photograph of a plant from the same place, grown at the New York Botanical Garden.



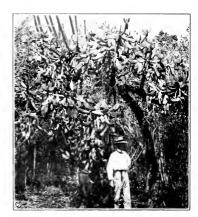


Fig. 254.—Joint of Opuntia

Fig. 255.—Flower of the same.

Ftg. 256.—Opuntia macracantha.

## 232. Opuntia spinosissima Miller, Gard. Dict. ed. 8. No. 8. 1768.

Cactus spinosissimus Martyn, Cat. Hort. Cant. 88. 1771. Consolea spinosissima Lemaire, Rev. Hort. 1862: 174. 1862.

Erect, up to 5 m. high, the trunk sometimes 8 cm. in diameter, densely clothed with arcoles bearing many long brownish glochids and acicular, deflexed or spreading spines up to 8 cm. long; ultimate branches flat, dull green, narrowly oblong, 2 to 4 times as long as wide, their arcoles 1 to 1.5 cm. apart, slightly or not at all elevated, bearing brown glochids and 1 to 3 acicular, straw-colored or whitish spines 8 cm. long or less, or spineless; ovary 3 to 8 cm. long, often flattened, its arcoles bearing short glochids; petals about 1 cm. long, oblong-obovate, rounded at the apex, at first yellow, turning dull red.

Type locality: Jamaica.

Distribution: Southern coast of Jamaica.

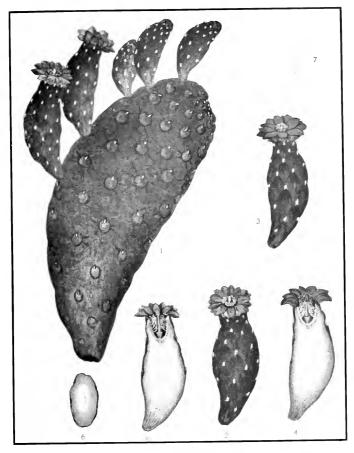
Plate XXXVI, from a painting by Miss H. A. Wood at Hope Gardens, Jamaica, sent by William Harris in 1907. Figure 258 is from a photograph of a plant obtained by Professor John F. Cowell in Jamaica and sent from the Buffalo Botanical Garden to the New York Botanical Garden in 1904.

A species of this series, *Spinosissimae*, occurs on Navassa Island off the southeastern point of Haiti; specimens were sent us by Mr. F. P. Dillan, Superintendent of Light Houses, San Juan, Porto Rico, but they are not complete enough to be specifically referred.

## 233. Opuntia millspaughii Britton, Smiths. Misc. Coll. 50: 513. 1908.

Trunk terete, 7 cm. thick at base, 5 cm. thick at top, 6 dm. high or less, branching at the summit, the branches divaricate ascending, narrowly oblong, much compressed, 40 cm. long or less, 5 to 10 cm.

PLATE XXXVI BRITTON AND ROSE



Opuntia spinosissima.

- Flowering joint.
   3. Single flowers.
   4. 5. Longitudinal section of flower.
- 6. Cross-section of ovary.
- 7. Style.

wide, 1 to 1.5 cm. thick, light green; branchlets obliquely lanceolate, obtuse, as wide as the branches, but shorter, 1 cm. thick or less, floriferous at and near the apex; arcoles of the older branches pitted, about 1 cm. apart, those of very young shoots slightly elevated, the glochids very short, yellowish brown; spines of the trunk 15 cm. long or less, very numerous and densely clothing the trunk, very slender, gray, mostly strongly reflexed, pungent, those of the branches and branchlets restricted to the arcoles on their edges, shorter than those of the trunk but similar, purple when young, those of the fruit yellowish

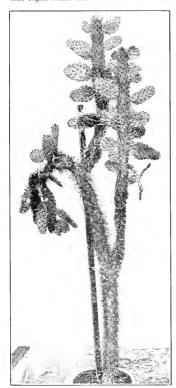






Fig. 258.—Opuntia spinosissima.

gray, 2 cm. long or less; flowers cupulate, crimson-lake, 1 cm. wide; sepals fleshy, ovate, acute, 4 mm. long and wide; petals erect-ascending, obovate mucronulate, about 4 mm. wide; stamens half as long as the corolla; style about as long as the corolla; stigma-lobes oblong, yellowish crimson; fruit compressed-obovoid, 2 cm. long, 1.5 cm. thick, bearing one or two spines at most of the arcoles.

Type locality: Rock Island, Eleuthera Island, Bahamas. Distribution: Eleuthera and Great Ragged Island, Bahamas; Cayo Paredón Grande, Cuba.

Figure 259 is from a photograph of the type plant taken at the type locality by Dr. C. F. Millspaugh, February 22, 1907.

## 23-f. Opuntia moniliformis (Linnaeus) Haworth in Steudel, Nom. ed. 2. 2: 221. 1841.

Cactiv monthformis Linnaeus, Sp. Pl. 468, 1755.
Cactiv Jerox Willdenow, Enum. Pl. Suppl. 35, 1813.
Opanita Jerox Haworth, Suppl. Pl. Succ. 82, 1819.
Civew monthformis De Candolle, Prodr. 3; 470, 1828.
Contolac Javox Lemaire, Rev. Hort. 1862; 174, 1862.
Opanita microcarpa, Schumann, Gesamtb. Kakteen "14, 1898. Not Engelmann, 1848.

Cactus reticulatus Îndex Kewensis 1: 369, 1893.\*

Opunția reticulata Karsten, Deutsche Fl. ed. 2, 2: 457,

Nopalea monilaformis Schumann, Gesamtb. Kakteen 750, 1898.

Opuntia testudinio-cru) Weber in Gosselin, Bull. Mus. Hist. Nat. Paris 10: 389, 1904. Opuntia haitienvi Britton, Smiths, Misc. Coll. 50: 513.

1908. Opunita picardae Urban, Repert. Sp. Nov. Fedde 16: 35.

Trunk somewhat flattened above, 3 to 4 m. high, branchings at the top, densely armed with acicular, yellowish or gray spines 12 cm. long or less, their bases (obthed with yellowish-white wool 1 to 2 cm. long; joints obliquely linear-oblong to obovate, 1 to 3 dm. long, 13 cm. wide or less, about 1 cm. thick, obtuse, distinctly areolate-reticulate, the arcoles somewhat elevated, 1 to 1.5 cm. apart, those of young joints bearing near the edges 3 to 6 acicular spines 1 to 2.5 cm. long, those on the sides of the young joints often spineless or with 1 to 3



Fig. 259.--Opuntia millspaughii

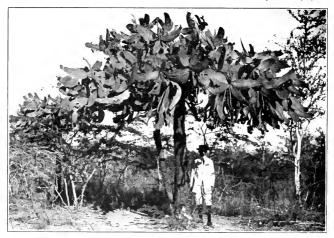


Fig. 260.—Opuntia moniliformis on the plain at Azua, Santo Domingo.

The Index Kewensis refers Cactus reticulatus to Descourtilz (Fl. Med. Antill 1: pl. 68), but the formal name was not used by him.

yellowish spines, and with small tufts of grayish wool; older joints bearing at all areoles 5 to 8 yellowish spines similar to those of the trunk, and brown glochids 6 or 8 mm. long; flowers about 2.5 cm. broad; sepals as broad as long, or broader, apiculate; petals yellow to orange, ovate, apiculate, spreading; stamens much shorter than the petals; ovary cylindric to obovoid-cylindric, terete or nearly so, 4 to 5 cm. long, its distinctly elevated areoles close together, only 5 or 6 mm. apart, bearing brown glochids 2 mm. long, but no spines; fruit oblong-obovoid, about 6 cm. long.

Type locality: Hispaniola.

Distribution: Hispaniola; Desecheo Island, Porto Rico.

The ovaries, fruits and small joints of this species are readily detached and on falling to the ground strike root and proliferate, forming masses of subglobose or turgid joints entirely different in aspect from the fully developed, tree-like plant. It was on this stage of the organism that the *Cactus moniliformis* of Linnaeus, founded on Plumier's conventionalized plate above cited, was based; this illustration is, however, apparently erroneous in showing the style as long-exserted.

The names *Opuntia dolabriformis* and *Opuntia cruciata* were published by Pfeiffer (Enum. Cact. 167. 1837) as synonyms of *O. ferox*. Some of the joints and, perhaps, some whole plants of this species are nearly or quite spineless.

Illustrations: Descourtilz, Fl. Med. Antill. ed. 2. 7: pl. 514, as Cactier moniliforme; Plumier, Pl. Amer. ed. Burmann. pl. 198, as Cactus, etc.

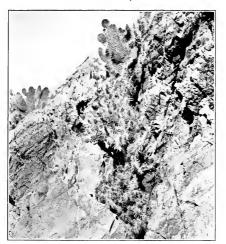






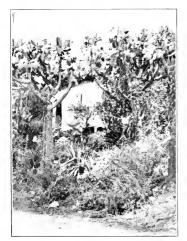
Fig. 262.—Opuntia moniliformis, x0,66.

Figure 260 is from a photograph of a plant at Azua, Santo Domingo, taken by Paul G. Russell in 1913; figure 261 is from a photograph taken by Frank E. Lutz on Desecheo Island, Mona Passage, Porto Rico, in 1914, showing a mass of proliferating sterile ovaries or small joints below and the mature stage of the plant above; figure 262 represents several of the small joints of the Desecheo plant.

## 235. Opuntia rubescens Salm-Dyck in De Candolle, Prodr. 3: 47-i. 1828.

Opuntia estaminta Link and Otto in Pfeiffer, Enum. Cart. 166. 1837. Comodes subsector. Lemaire, Rev. Hort. 1862: 174. 1862. Comodes estaminta Lemaire, Rev. Hort. 1862: 174. 1862. Opuntia gamicina. Schumann in Gürke, Mona secht. Kakteenk. 18: 180. 1908.

Trunk erect, nearly cylindric below, flattened above, 3 to 6 meters high, sometimes 1.5 dm. in diameter, branching above, its arcoles bearing several of many acticular spines up to 8 cm. long or more, or spineless: ultimate joints thin and flat, mostly dark green or reddish green, not reticulate-areolate except when young, oblong to oblong-obovate, 2.5 dm. long or less, mostly 2 to 4 times as long as wide, the terminal ones often much smaller; areoles 1 to 1.5 cm. apart, bearing several acicular nearly white spines 1 to 6 cm. long, or spineless; flowers yellow, orange or red, about 2 cm. broad; ovary long-tuberculate, 4-to 5 cm. long, about 1.5 cm. in diameter; petals obovate, apiculate; stamens about half as long as the petals; fruit reddish, obovoid or subglobose, 5 to 8 cm. in diameter, spiny or spineless; seeds suborbicular, 6 to 8 mm. in diameter.





Figs. 263, 264.—Opuntia rubescens.

Type locality: Cited as Brazil, but erroneously.

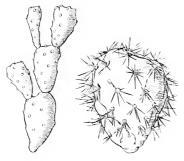
Distribution: Mona and Porto Rico to Tortola, St. Croix, and Guadeloupe.

Culebra, St. Thomas, St. Jan, and Montserrat plants agree with the description of *Opuntia rubescens*, which clearly belongs with the *Spinosissimae (Cruciformes)*, as pointed out by Berger, rather than with the South American series *Inarmatae*, where it was placed by Schumann; it is a spineless state of *O. catacantha*, as was conclusively proven by us through field observations in the Virgin Islands, and greenhouse plants of *O. rubescens* develop spines.

Both the spiny and spineless races exhibit remarkable proliferation of the ovaries, these often forming chains of several joints while attached to the plant; these, falling to the ground, strike root and form many small, flattened joints 2 to 4 cm. long, as in *Opuntia moniliformis*, to which this species is otherwise closely related.

Illustration: Journ. N. Y. Bot. Gard. 7: f. 6, as Opuntia: Carnegie Inst. Wash. 269: pl. 10, f. 90. 91, as Opuntia catacantha.

Figure 263 is from a photograph of the plant taken by Professor John F. Cowell at Guanica, Porto Rico, in 1915; figure 264 is from a photograph taken by Professor Cowell at the same time and place, showing in the foreground a mass of young plants arisen from proliferating joints, and a mature plant behind; figure 265 represents proliferating joints of a plant grown at Nisky, St. Thomas, collected by Dr. Britton and Dr. Rose in 1913; figure 266 represents a fruit, collected by Dr. Britton and Dr. Shafer on Buck Island, St. Thomas, in 1913.





Figs. 265, 266.—Opuntia rubescens. x0.66.

Fig. 267.—Opuntia brasiliensis. x0.75,

#### Series 27. BRASILIENSES.

This series represents one of the five subgenera described by Dr. Schumann, which he called Brasiliopantia. It perhaps should be recognized as a distinct genus. We recognize three species in the series, which may be races of a single one, characterized by an erect cylindric trunk with cylindric, horizontal branches terminating in a series of flattened, thin, leaf-like branches. The leaves are small and caducous. The spines are few on the young growth, but large clusters are developed on the old stem and trunk. The flowers are small, the fruit is juicy, and the seeds are large and covered with a dense mass of wool. Unlike most species of Opuntia, these grow in the moist tropical forests, forming tall, slender, tree-like plants.

#### KEY TO SPECIES.

Fruit globular, yellow	236.	O. bravilrensis
Fruit clavate to oblong, red.		
Fruit oblong, 3 to 4 cm. lung.		
Fruit clavate, 5 cm. long	238.	O. argentina

#### 236. Opuntia brasiliensis (Willdenow) Haworth, Suppl. Pl. Succ. 79. 1819.

Cactus brasiliensis Willdenow, Enum. Pl. Suppl. 33. 1813. Cactus paradoxus Hornemann, Hort. Hafn. 2: 443. 1815.

Cactus passaoxus Hollozo, Fl. Flum. 207. 1825. Cactus arboreus Vellozo, Fl. Flum. 207. 1825. Opuntia arborea Steudel, Nom. ed. 2. 2: 220. 1841. Cereus paradoxus Steudel, Nom. ed. 2. 1: 335. 1841.

Becoming 4 meters high, with a cylindric woody trunk and a small rounded top; old trunk either naked or spiny; branches dimorphic, the lateral ones horizontal, terete; the terminal joints flat and leaf-like, many of these in time dropping off; flowers 5 to 5.5 cm. long; petals yellow, oblong, obtuse; filaments very short; fruit yellow, globular, 3 to 4 cm. in diameter, with a low or nearly truncate umbilicus, bearing large areoles; seed usually one, very woolly, 10 mm. broad.

Type locality: Near Rio de Janeiro, Brazil.

Distribution: Southern Brazil, Paraguay, Peru, Argentina, and central Bolivia. Naturalized in southern Florida.

Dr. Small has found this plant established after planting on shell mounds and waste places in southern Florida.

A number of varieties of this species appear in literature, of which we may mention the following: minor Pfeiffer (Enum. Cact. 169, 1837); schomburgkii Salm-Dyck (Cact. Hort. Dyck. 1849, 74, 1850); spinosior Salm-Dyck (Hort. Dyck. 184, 1834); tennifolia Forbes (Hort. Tour Germ. 159, 1837); and tennior Salm-Dyck (Hort. Dyck. 376, 1834).

Opuntia brasiliensis gracilior Salm-Dyck was given by Förster (Handb. Cact. 500. 1846)

as a synonym of O. brasiliensis minor.

Dr. John H. Barnhart recently called our attention to a number of cactus names published by St. Hilaire which have been overlooked by later writers. One of these, *Cactus beterochadus* St. Hilaire (Voy. Rio de Janeiro and Minas Geraes 2: 103. 1830) seems to belong here, as the following free translation would indicate:



Fig. 268.—Opuntia brasiliensis.

"Another cactus, which I have already seen near Rio de Janeiro, raised its branches in the midst of tortuous lianas; its trunk, which grows more slender from the base to the summit, is covered with fascicles of spines arranged in a quincunx, and it shows various stages of verticillate, horizontal, rounded branches, to the number of seven in each whorl; these branches, like those of the spruce tree, grow shorter toward the summit of the plant, and they bear secondary branches, flattened and oval-oblong, which may in a certain sense be taken as leaves."

Illustrations: Curtis's Bot. Mag. 61: pl. 3293; Dept. Agr. N. S. W. Misc. Publ. 253: pl. [6]; Martius, Fl. Bras. 4: pl. 61; Pfeiffer and Otto, Abbild. Beschr. Cact. 1: pl. 29; Schumann, Gesamtb. Kakteen f. 100; Vellozo, Fl. Flum. 5: pl. 28, this last as Cactus arboreus: Goebel, Pflanz. Schild. 1: f. 37, 38.

Plate xxx, figure 2, represents a flowering joint taken from a specimen in the New York Botanical Garden; fig-



Figs. 269, 270.-Opuntia bahiensis. x0.5.

ure 3 is from the same plant, showing terete and flat joints. Figure 267 represents a fruit collected by Dr. Rose near Iguaba Grande, Brazil, in 1915; figure 268 is from a photograph taken by Paul G. Russell in a public park in Bahia, Brazil.

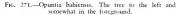
#### 237. Opuntia bahiensis sp. nov.

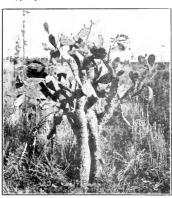
Trunk 3 to 15 meters high, cylindric, 20 to 25 cm. in diameter, tapering gradually upward; the center of trunk pithy, hollow in age, surrounded by an open woody cylinder; lateral joints terete, the terminal ones flat and thin, ovate to oblong; leaves small, 2 to 3 mm. long, turgid; spines on terminal joints, if present, 1 or 2, slender, red at first, then brown; spines on old trunk forming large clusters at all the arcoles; flowers not seen; fruit deep red both within and without, oblong, 3 to 4 cm. long; its small arcoles with brown glochids; seeds 1 to 5, mostly 1 or 2 in each fruit, very hairy, thick, 8 mm. broad.

Collected in the vicinity of Toca da Onca, Bahia, Brazil, by Rose and Russell, June 27 to 29, 1915 (No. 20068).

Figure 269 represents joints of the type plant above cited; figure 270 represents a joint with fruit; figure 271 is from a photograph of the type specimen.







Ftg. 272.-Opuntia ammophila.

## 238. Opuntia argentina Grisebach, Abh. Ges. Wiss. Göttingen 24: 140. 1879.

Opantia bicronymi Grisebath, Abh. Ges. Wiss. Göttingen 24: 140. 1879.

Erect, 5 to 15 meters high, branching at the top, the lateral branches subverticillate, teretes terminal branches flat, 5 to 12 cm. long, 3 to 8 cm. broad; ovary 2 to 2.5 cm. long; petals elliptic to spatulate, 1.8 cm. long, 8 mm. broad, greenish yellow: filaments white; style white; stigma-lobe; yellowish green; ovary flattened, tuberculate, deeply umbilicate; fruit clavate, 5 cm. long, dull purplish violet, with wine-colored pulp; seeds lens-shaped, 5 to 6 mm. long, 2.5 to 3 mm. broad.

Type locality: Near San Andrés, Oran, Argentina.

Distribution: Northern Argentina.

This species was considered identical with O. brasiliensis by Schumann, but they separate on very good fruit characters.

Figure 274 is from a photograph of a flowering branch furnished by Dr. C. Spegazzini.

#### Series 28. AMMOPHILAE.

Erect species, sometimes with a definite continuous trunk, often much branched, the joints broad and flat, spiny or unarmed, the spines (when present) subulate or subulatae-acicular, whitish, gray or reddish, the large flowers yellow. The series now appears to be most nearly related to the Series Toritipinae (vol. 1: 126) and may be placed to follow it as series "3a. Opinita austrina. Small, of southern Florida, may be transferred from the Toritipinae to the Ammophilae.

One peculiar species, native of Florida, constitutes this series, characterized by a continuous erect subterete trunk, flat, spiny branches, and large, yellow flowers.

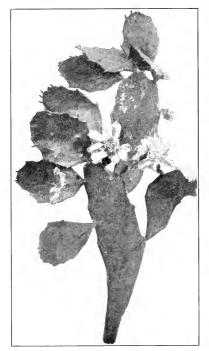
#### Opuntia ammophila Small, Journ. N. Y. Bot. Gard. 20: 29. 1919.

Plant erect, more or less branched throughout or ultimately with a stem 1 to 2 meters tall or more, becoming 2 to 2.5 dm, in



Fig. 273.—Opuntia ammophila.

diameter, bearing several spreading branches near the top, thus tree-like, tuberous at the base; joints various, those of the main stem clongate, ultimately fused on the ends and subvylindric, those of the branches typically obovate or cuneate, varying to elliptic or oval, thickish, 5 to 17 cm. long, becoming grayish green; leaves stout-subulate, 6 to 10 mm. long, green; arcoles relatively numerous, conspicuous on account of the densely crowded long bristles, especially on the older joints, the marginal ones, at least, armed; spines very slender, solitary or 2 together, reddish or red, at maturity gray, mostly 2 to 6 cm. long, nearly terete, scarcely spirally twisted; flowers several on a joint; sepals lancolate, acute or slightly acuminate; buds sharply pointed; corolla bright yellow, 5 to 8 cm. wide; petals obovate, cuneate, notched, and prominently apiculate, 3 cm. long, scarcely erose; stigma-lobes cream-color; berries obovoid, 2 to 3 cm. long, more or less flushed with reddish purple, many-seeded; seeds about 4 mm. in diameter.





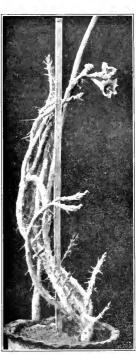


Fig. 275.—Opuntia chaffeyi. Photograph by Señor Don Teodoro Chairez.

Type locality: Fort Pierce, Florida.

Distribution: Inland sand-dunes (scrub), peninsular Florida.

The plant was first collected by Dr. Small near Fort Pierce, Florida, in 1917, and again studied by him in its more northern range west of St. George in 1918. He describes it as

OPUNTIA. 212a

the most conspicuous native prickly pear of Florida, always viciously armed and with a characteristically unjointed trunk. In spite of its many slender spines, cattle browse upon it.

More recent collections of this plant by Dr. Small, show that its range extends south to Cape Romano, Florida, and that the definite trunk, at first taken as characteristic of it, is not always developed; his living plants from different stations show slight individual differences which do not appear to be specific. This species has been erroneously referred by Dr. Griffiths (Bull. Torr. Club 46: 201) to Opinitia bartiamii Rafinesque.

Illustration: Journ. N. Y. Bot. Gard. 20: pl. 224.

Figure 272 is from a photograph of the plant taken by Dr. Small near Fort Pierce, Florida; figure 273 shows a fruiting joint of the type specimen.

#### 239a. Opuntia turgida Small, sp. nov.

Plant erect, more or less diffusely branched, 0.5 meter tall or less, with fibrous roots; joints elliptic to elliptic-obovate, 5 to 12 cm. long, thickish, deep green, sometimes slightly glaucous when young; leaves subulate, 6 to 10 mm. long, spreading and more or less recurved, green, sometimes accompanied by fine bristles, but without spines; arcoles scattered, often prominent and densely bristly on the older joints; spines (as far as known) wanting; flowers often several on a joint; ovary obovoid or obconic-obovoid, 2 to 2.5 cm. long, acute, the inner rhombic-ovate, fully 1.5 cm. long, stout-pointed; corolla bright yellow, 5.5 to 6.5 cm. wide; petals 10 to 12, about 3 cm. long, broadly cuneate, abruptly narrowed, rounded or subtruncate at the apex, mucronate; anthers, 2 mm. long; berry obovoid, 2 to 2.5 cm. long, greenish purple, even, broadly rounded at the base, the umbilitious flat or a little depressed at the middle; seeds rather numerous, about 4 mm. in diameter, somewhat turgid.

Hammocks near Yulee and on the mainland along the Halifax River south of Daytona, Florida. Type collected about five miles south of Daytona, in December 1919, by J. K. Small, preserved in the herbarium of the New York Botanical Garden.

This spineless, small-jointed species is tentatively referred to the Series *Ammophilae* on account of its fruit characters and erect habit. A plant sent from Kew to the New York Botanical Garden in 1902, under an unpublished name, very closely resembles this species.

Opuntia napolea, offered for sale by Grässner (Monatsschr. Kakteenk. February 1920) we have not seen.

The name *Opuntia spirocentra* Engelmann and Bigelow (Haage, Verz. Cact. 30), found in the Index Kewensis, we have not been able to verify. As the name is credited to Engelmann and Bigelow and the habitat of the plant is said to be New Mexico it is doubtless an error and probably was intended for *O. macrocentra*.

Opuntia todari (Haage and Schmidt, Haupt-Verz. 230. 1912) is known only in the trade.

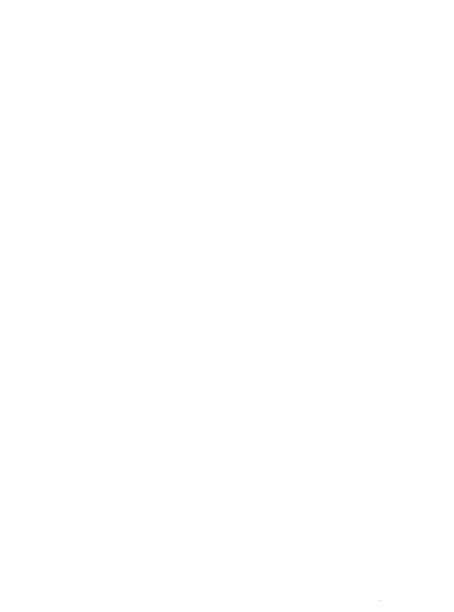
Cactus italicus referred by the Index Kewensis to Tenore (Steudel, Nom. ed. 2. 2: 2:46. 1840) occurs first in 1831 (Tenore, Syll. Pl. Neop. 2:11) where also occurs the name Opuntia italica. Both are unpublished but doubtless refer to some species of Opuntia. CACTUS PARVIFOLIUS Ehrenberg in F. G. Dietrich, Vollst. Lex. Gaertin. 2: 416. 1802.

An upright, cylindrical, almost articulate stem; the upper part bedecked with small, cylindrical, fleshy, pointed leaves; on lower part of the stem, at the place where the leaves are attached, stiff bristles are formed which are surrounded at the base by a whitish-gray, woolly substance; in old age the stem requires a support on account of its slender growth; if the stem is cut through in the middle and the wound well dried, young sprouts make their appearance at this place which serve to propagate the plant. South America is its home.

The above paragraph is a free translation of the description.

We have not been able to identify this plant, but it is probably some species of *Opuntia* or possibly *Tacinga funalis*.

Cereus vulnerator Cortes (Fl. Colombia 69. 1897) and C. guasabara Cortes (Fl. Colombia 208. 1897) are different names for the same plant. From the brief descriptions it is difficult to identify this plant but it certainly is not a Cereus. It suggests some sheathed-spined Opuntia such as O. tunicata which has been introduced into South America and is common in northern Ecuador. It is known as curuntilla or guasabara in Colombia.



#### Series 29. CHAFFEYANAE.

The series contains a single Mexican species, differing from all the other opuntias in having an annual stem which arises from a large, fleshy root or rootstock. The joints, which are clongated and nearly terete, resemble somewhat those of O. leptocaulis, but are more fleshy, while the flowers and fruit are like those of the platyopuntias.

## 240. Opuntia chaffeyi Britton and Rose, Contr. U. S. Nat. Herb. 16: 241. 1913.

Perennial by a large, fleshy, deep-scated root or rootstock often 35 cm. long by 4 cm. in diameter; sensormally annual, 5 to 15 cm. long sometimes in cultivated specimens 25 cm. long, much branched, often weak and prostrate; joints clongated, 3 to 5 cm. long, 6 to 7 mm. broad, slightly flattened, gla-

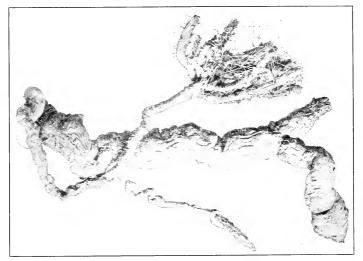


Fig. 276.—Opuntia chaffeyi.

brous, pale bluish green or sometimes purplish; leaves minute, caducous; areoles small, circular, with white wool in the lower parts and brown wool in the upper parts; spines 1, rarely 2 or 3, acciular, 2 to 3 cm. long, whitish or pale yellow; glochids numerous, pale yellow; flower-buds, including ovary, 8 cm. long; flower opening at 10 a. m., closing at 2 p. m., 6 cm. broad; sepals few, small, ovate to oblong, greenish; petals few, 7 to 9, pale lemon-yellow, but slightly pinkish on the outside; filaments numerous, about 1 cm. long; style slender, extending beyond the stamens, about 22 mm. long, somewhat swollen at base; ovary deeply umbilicate, somewhat club-shaped, 4 to 5 cm. long, bearing flattened tubercles and large areoles filled with white wool; upper areoles on ovary bearing also white bristly spines; ovules numerous, borne in the upper third of the ovary; fruit and seeds still unknown.

Type locality: Hacienda de Cedros, near Mazapil, Zacatecas, Mexico.

Distribution: State of Zacatecas, Mexico.

Illustration: Contr. U. S. Nat. Herb. 16: pl. 72.

Figure 275 is from a photograph of part of the original collection as grown by Dr. E. Chaffey, taken and contributed by Señor Don Teodoro Chairez, of Ciudad Lerdo, Mexico; figure 276 is from a photograph of the type showing the large root and the young shoot.

As stated in the original description, this is a remarkable *Opuntia*, being the only one known which has an annual stem. In cultivation, where the plant is grown under abnormal conditions, the stem persists for more than a year; but Dr. Chaffey assures us that in the desert, where the species grows naturally, the stem dies down to the ground in the dry season. We have had it in cultivation since 1910, but it does not do well, and is gradually dying out. It has not been found in flower in a wild state, but it flowered with Dr. Chaffey at Ciudad Lerdo, Durango, Mexico, in 1915. Dr. Chaffey, who has been studying this species for several years, has made a number of interesting observations; he states that the large base, which usually is found 15 to 20 cm. beneath the surface of the ground, when allowed to grow above the ground develops clusters of spines like those on the normal stems, and finds that the plant is easily started from cuttings which soon develop the normal, large, underground part. He further states that the desert turtle eats this plant. It is well known that the Galápagos turtles feed upon the native opuntias of those islands.

The native name of this plant is sacacil.

The following described Opuntias we have been unable to refer to any of the species otherwise mentioned in this work:

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Opuntis bicolor Philippi, Linnaca 35: 83, 1864, glaccophylla Wendland, Cat. Hott. Herrenh. 1835. Levior Salm-Drek, Cact. Hott. Dyck. 1844, 46, 1845, longiglochia C. Z. Nelson, Galesburg Register. July 20, 1915. Incids Hortus, Wiener Illustr. Gartenz, 14: 146, 1889, prostrata chinosia Schumann, Gesamb, Kaktene 723, 1898, spinatrea Karwinsky in Salm-Drek, Cact. Hort. Dyck. 1844, 46, 1845. As synonym for O. prendoman clongata Salm-Dyck.

tubercalata Haworth, Suppl. Pl. Succ. 80, 1819, first described as Cactar Inherenhatus (Enum. Hort. Berol, Suppl. 34, 1813).
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The following names of *Opuntia* are chiefly found in catalogues or in lists, or have been so briefly described that we have not been able to identify them, and it does not seem worth while even to cite the places where they first occur in literature:

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Opuntia alpicolo Schumann
                                                           Opuntia missouriensis elongata Salm-Dyck
       americana Forbes
                                                                       crythrostemma Haage and Schmidt
       attulica Forbes
                                                                       salmonea Haage and Schmidt
       barbata K. Brandegee
                                                                  montana Sencke
       barbata gracillima K. Brandegee
                                                                  morenoi Schumann
       bernbardinii Hildmann
                                                                  myriacintha Link and Otto. Not Weber
                                                                  ottonis Salm-Dyck
       betancourt Murillo
                                                                  bachsarthra flata Haage and Schmidt
       calacantha rubra
                                                                  pachyelada rosea Haage and Schmidt
       carolina Forbes
                                                                       spaethiana Haage and Schmidt
       ciliosa Forbes
                                                                  parote Forbes
       convoleana Todaro
                                                                  piccolomini Hort.
       convolei Haage and Schmidt
                                                                  platyclada Haworth
       demorenia Forbes
                                                                  praecox Forbes
       demoriana Förster
                                                                  protracta Lemaire
       deppei Wendland
                                                                       elongata Salm-Dyck
       dichotoma Forbes
                                                                  pseudococcinellifer Bertoloni
       chorina Förster
                                                                  pseudotuna Salm-Dyck
       erecta Schumann
                                                                      cloneata Salm-Dyck
       festita Sencke
                                                                       spinosior Salm-Dyck
       ficus-indica albispina Haage and Schmidt
                                                                  puli outa Förster
       flarispina Förster
                                                                  ichtan Karwinsky
       Fereinickir Hildmann
                                                                  salmir Forbes
       Intehenii Forbes
                                                                  schomburgkii Salm-Dyck
       italica Tenore
                                                                  speciosa Steudel
       inconnette Haage and Schmidt
                                                                  spinuliflora Salm-Dyck
       intrienii Haage
                                                                  spinulosa Salm-Dyck
       leucostata Forbes
                                                                  straminea Sencke
       macrophylla Haage and Schmidt
                                                                  stricta spinulescens Salm-Dyck
                                                                  subinermis Link
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Opuntia clavata Philippi (Anal. Univ. Chile 41: 722. 1872), O. ottonis G. Don (Hist. Dichl. Pl. 3: 172, 1834), O. phyllanthus Miller (Gard. Dict. ed. 8, No. 9: 1768), O. salicornioides Sprengel (Pfeiffer, Enum. Cact. 141. 1857), and O. spiniflora Philippi (Linnaea 30: 211. 1859) are of the tribe Cerceae.

#### 7. GRUSONIA F. Reichenbach in Schumann, Monatsschr. Kakteenk. 6: 177. 1896.

A low, much branched cactus, the branches terete, jointed, and ribbed; areoles borne on the tops of the ribs, very spiny, but all except the flowering ones without glochids, subtended by small deciduous leaves; corolla rotate, yellow; fruit baccate.

This was first described as a Cereus from specimens collected by Mrs. Anna B. Nickels in 1895, then as a new genus Grusonia, and lastly as an Opuntia. It clearly is not Cereus, but when growing might easily be mistaken by its habit for Echinocereus. The leaves, glochids, flowers, and fruit are those of Opuntia, but its ribbed stem is unlike that of any known species of that genus.

#### 1. Grusonia bradtiana (Coulter).

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Cereus braditanus Coulter, Contr. U. S. Nat. Herb. 3: 406. 1896 (April).
Grutonis cereiformis F. Reichenbach in Schumann, Monatsschr. Kakteenk. 6: 177. 1896 (December).
Opuntis buditans K. Brandegee, Erythes 5: 121. 1897.
Opuntis acereiformis Weber, Dict. Hort. Bois. 897. 1898.
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Forming dense, often impenetrable thickets 2 meters high or less, very spiny; stems light green, 4 to 7 cm. thick, with 8 to 10 low, longitudinal, somewhat tuberculate ribs; areoles 1 to 1.5 cm. apart, 3 to 5 mm. in diameter; leaves linear, fleshy, green, 8 mm. long, early deciduous; spines 15 to 25, yellowish brown when young, soon becoming white; acicular, terete or slightly compressed, 1 to 3 cm. long, not sheathed, some of the longer ones reflexed; wool white, turning brown, early disappearing; corolla rotate, opening in bright sunlight, 3 to 4 cm. broad; sepals ovate, acute, fleshy, petals bright yellow, spatulate, fringed; filaments brownish yellow; stigma-lobes 8, yellow; arcoles of the ovary with long, yellow, weak spines, white wool, and yellow glochids; berry (according to Schumann) ellipsoid, deeply umbilicate; seeds not seen.

Type locality: Plains of Coahuila, Mexico.

Distribution: Coahuila, Mexico.

This species first appeared in print in the catalogue of Johannes Nicolai under the name of Grusonia cereiformis, but we are informed that there was no description and therefore it was not technically published. The same name next appears in the Monatsschrift für Kakteenkunde for 1894. Here Dr. Schumann wrote a long article about the name, especially condemning the loose manner in vogue of publishing new names without descriptions, but giving no characters of the plant, and as a matter of fact he did not then know it. Two months later this name again appears in this same publication, but without description. Two years later Dr. Schumann records seeing this plant and describes it briefly, although he does not approve of the name Grusonia. If the name is to be considered published, it should not date earlier than this (December 1896), although Dalla Torre and Harms accept the date of 1894. In 1898 Weber transferred the name to Opuntia, publishing it as Opuntia cereiformis: in the meantime Coulter (in 1896) published the name Cereus bradtianus for the plant and Mrs. Brandegee (in 1897) transferred it to Opuntia, calling it Opuntia bradtianus.

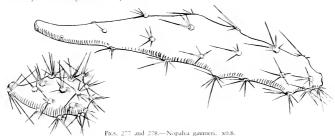
Illustrations: Monatsschr. Kakteenk. 21: 121, as Opuntia bradtiana; Schumann, Gesamtb. Kakteen f. 101, as Opuntia cereiformis.

Plate XXXIII, figure 4, represents a joint of the plant collected by C. A. Purpus at Cerro de Cypriano, near Morano, Mexico, in 1910.

## APPENDIX

## 3a. Nopalea gaumeri sp. nov. (See page 37, ante.)

About 3 meters high, much branched; joints small, linear-oblong or oblong-oblanceolate, 6 to 12 cm, long, 2 to 3 cm, broad, rather thin; areoles smill, 1 to 2 cm, apart; spines very unequal, 5 to 20 mm, long, acicular, 4 to 12, yellowish when young; flower small, including ovary and stamens about 4 cm, long; sepals ovate, acute; petals oblong, 12 mm, long; stamens long-exserted; style longer than the stamens; stigma-lobes 6, greenish; fruit red, darker within, obovoid, 3 cm, long, its numerous areoles bearing spines and yellow glochids; umbilicias prominert, 1 cm, deep; seeds about 4 mm, broad, with a very narrow margin and a very thin testa.



Collected by George F. Gaumer and sons near Sisal, Yucatan, March 1916 (No. 23250, type); also by Dr. Gaumer from Port Silam, 1895 (No. 647).

Dr. Gaumer's field note is as follows: "A coastal cactus, 10 feet high, much branched, small-jointed and of slight build, not of robust build like the interior species. It blooms from February to June. The birds are very fond of the fruit and consume it as fast as it ripens." Figures 277 and 278 show joints of the type-specimen.

## 77a. Opuntia depauperata sp. nov. (See page 101,

Plant 1 to 2 dm, high, with a flattened, much branched top; joints dark green, readily detached, terete or slightly flattened, 3 to 12 cm. long, 2 to 3 cm. thick, puberulent; spines on young joints 2 or 3, on old joints sometimes 6 at each arcole, reddish to pale brown, acicular, 1 to 2.5 cm. long, nearly porrect; glothids tardily developing, conspicuous on old joints, yellow; ovary with a deep umbilicus.

ante.)

Collected by Dr. and Mrs. J. N. Rose north of the station of Zig Zag, along the railroad above Carácas, Venezuela, October 17, 1916 (No. 21751).

This little cactus is very inconspicuous and only a few specimens were observed. The station is near the top of the mountains which separate the valley, in which Carácas lies, from the sea. The region here is not so dry as it is farther down on the seaward side of the mountains, but there are several other species of cacti associated with it.

Figure 279 is from a photograph of type plant taken by Mrs. Rose; figure 280 shows a joint.



Fig. 279.—Opuntia depauperata.

APPENDIX. 217

A plant, apparently of this relationship, was collected by Dr. H. H. Rusby in 1917 on granite rocks, narrows of Magdalena River, Colombia. The joints, however, are glabrous, only 2 to 3 cm. long, the young joints have numerous brown spines and the young areoles produce long white wool.

82a. Opuntia pestifer nom. nov. (See page 103, ante.)

Cactus nanus Humboldt, Bonpland, and Kunth, Nov. Gen. et Sp. 6: 68. 1823. Cereus nanus De Candolle, Prodr. 3: 470. 1828.

Low and nearly prostrate but sometimes 2 dm. high, much branched; the joints very fragile, glabrous; young joints 2 to 5 cm. long, or when old up to 8 cm. long, nearly terete, 1 to 3 cm. in diameter, or when young flattened and 2 to 3 cm. broad, very spiny; spines 2 to 5 at each arcole, acicular, brownish, 1 to 5 cm. long; glochids numerous, yellow; flowers and fruit unknown.

Type locality: Near Sondorello and Guancabamba. In Humboldt's time these places were in southern Ecuador, but they are now in northern Peru. Distribution: Northern Peru to central Ecuador.

Dr. Rose observed the plant in various places in Ecuador, usually at an altitude ranging from 1,000 to 1,500 meters. The following collections were made: at Huigra (No. 22306); at Sibambe (No. 22433); and west of San Pedro, Province of Loja (No. 23352).

This plant, although widely distributed and very common, has never been seen by botanists in flower or fruit. The joints, which come loose easily, are freely distributed by animals. It is so small that, growing half-hidden in the grass, it is easily overlooked but very annoying when one comes upon it unawares. Humboldt speaks of its being troublesome to men and dogs.

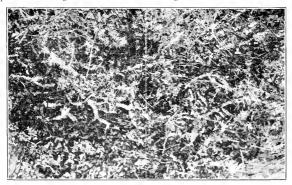


Fig. 281.-Opuntia pestifer, x0.5.

Kunth who describes it as Cactus nanus referred it with hesistancy to the Section Cereus. De Candolle transferred it from Cactus to Cereus placing it in a new subgenus Opuntiacei along with C. moniliformis (which we know now is an Opuntia) and C. serpens. He thought these might represent a genus between Opuntia and Cereus.

Schumann (Gesamth. Kakteen 166) considered it an *Opuntia* but did not formally refer it to that genus.

This name should not be confused with *Opuntia nana* (Fl. Damatica 3: 1-43. 1852) which is *Opuntia opuntia*.

Figure 281 is from a photograph taken by George Rose at Sibambe, Ecuador, in 1918; figure 283 shows the joints of the same plant (Rose, No. 22433).

96a. Opuntia discolor sp. nov. (See page 109, ante.)

A low plant, forming small dense clumps; joints slender, 4 to 12 cm. long, 1.5 to 2.5 cm. in diameter, turgid, glabrous, dark green with dark purple blotches extending downward from the under margin of the arcoles; spines 1 to 6, acicular, nearly porrect, somewhat variegated but mostly brown, 3 cm. long or less; glochids tardily developing but conspicuous on old branches, dark brown; flowers light yellow to orange-yellow, only 3 cm. long including the ovary; filaments white; style and stigmalobes nearly white; fruit evidently very small, bright red.



Fig. 282.—Opuntia discolor

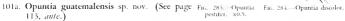
This species is represented by two collections made by Dr. J. A. Shafer in 1917 which slightly differ from each other. They are No. 111, from sandy thickets, Santiago del

Estaro, Argentina, February 23 (type), and No. 95, from gravelly hills near Tapia, Tucuman, February 9.

Apparently common in dry sandy thickets, growing best under bushes where it is least disturbed. The joints easily become detached, sticking readily to any disturbing object.

The species differs from *Opuntia retrorsa* in its more nearly terete joints and spreading spines.

Figure 282 is from a photograph of the type plant; figure 284 represents a joint of the plant from near Tapia, Tucuman.



Low, spreading plant, resembling O. decombens, but joints glabrous and shining; joints deep green, sometimes with dark blotches below the arcoles; areoles small, filled with brown wool, subtended by small leaves; spines 1 to 3 at the arcoles, terete, acicular, shining white with blackish tips when young, soon gray, mostly deflexed, somewhat spreading; flower-buds reddish; flowers much smaller than those of O. decombens; petals lemon-yellow, 2.5 cm. long; stigma-lobes cream-colored.

Collected by Dr. Glover B. Wilcox in 1909 while acting as surgeon on a ship plying between Guatemala and San Francisco. Living specimens were sent directly to Washington and flowered there in April 1915.

Figure 285 represents a joint of the type specimen.

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#### 102a. Opuntia pennellii sp. nov. (See page 115, ante.)

Plant low; joints 1 to 1.5 cm. long, obovate, turgid, bright green; spines 1 or 2 at each arcole, nearly porrect, subulate, 3.5 cm. long or less, white with dark tips; glochids not very conspicuous, yellowish.

Collected near Magangue, coastal plain of Colombia, Department of Bolivar, at about 100 meters altitude, by Francis W. Pennell in 1918. Figure 286 shows joint of type plant.

Here may belong herbarium specimens which we have seen from northern Colombia but with the material at hand it is impossible to determine them definitely. One of these was collected by William R. Maxon, April 10, 1906 (No. 3819) at Puerto Colombia. This plant is described as consisting of 3 to 6 joints, branching at the third or fourth joint, the joints all being in one place. The flowers are yellow and small, only about 4 cm. long, including the ovary. Another was collected by H. H. Smith near Bonda in 1898-1899 (No. 2728); this has joints very similar to those of Dr. Pennell's plant. It is said to be from 2 to 4 feet high.

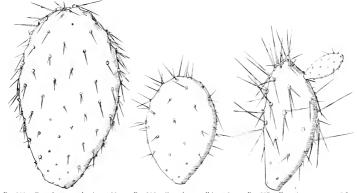


Fig. 285.—Opuntia guatemalensis, x0.33. Fig. 286.—Opuntia pennellii, x0.5. Fig. 287.—Opuntia caracasana, x0.5.

103a Opuntia caracasana Sulm. Dvck Cact. Hort. Dvck 1849, 238, 1850. (See page 116.)

103a. Opuntia caracasana Salm-Dyck, Cact. Hort. Dyck. 1849. 238. 1850. (See page 116, ante.)

Stems low, bushy, 4 to 12 dm. high; joints oblong, 10 to 12.5 cm. long, turgid, pale green, "leaves squamiform, minute"; spines 2 to 4, unequal, 2.5 to 4, cm. long or less, pale yellow; flowers and fruit unknown.

Type locality: Near Carácas, Venezuela.

Distribution: Mountains about Carácas, Venezuela.

The type specimens were collected near Carácas by E. Otto, prior to 1849. Dr. Rose found the plant abundant above Carácas in 1916. It usually grows on exposed hillsides near the top of the divide which separates Carácas from the coast, and it was especially common along the railroad just below the little station of Zig Zag. Several other cacti are to be found in this neighborhood, among which are O. clatior and O. depauperata.

Figure 287 shows a joint of the plant collected by Dr. Rose above Carácas in 1916.

#### 104a. Opuntia aequatorialis sp. nov. (See page 116, ante.)

Bushy, much branched; 1 to 1.5 meters high; the branches spreading or recurved; joints narrowly oblong to obovate, 1.5 to 2 dm. long, 3 to 8 cm. broad, easily becoming detached; spines pale yellow, at first only 2 to 4 but more in age, subulate, 2.5 to 6 cm. long; flower-buds ovoid, acute, red; petals few, 8 to 10, orange-red, spatulate; filaments and style red; stigma-lobes cream-colored.

Collected in thickets on dry hills near Sibambe, Province of Chimborazo, Ecuador, by J. N. Rose and George Rose, August 29, 1918 (No. 22-32).

The locality at which this species is found is semiarid and a number of other cacti are associated with it, among which is the little *O. pestifer*, described on a preceding page. *O. aequatorialis* was not so common as some of the other species and was usually found growing up through open-branched bushes and was in this way more or less protected.

Figure 288 is from a photograph of the type plant taken by George Rose; figure 289 shows one of its joints.

116a. **Opuntia lata** Small, Journ. N. Y. Bot. Gard. **20:** 26. 1919. (See page 126, *ante.*)

Plant prostrate, often radially branched, sometimes forming mats nearly a meter in width, the tip of the branches sometimes assurgent, with elongate cord-like roots; joints elliptic to narrowly obovate, often narrowly so, thick, 4 to 15 cm. long, deep green, sometimes glaucous, especially when young; leaves subulate, 6 to 11 mm. long, green or purple-tinged; arcoles scattered, often conspicuous, sometimes very prominent and densely bristly, the marginal ones, at least, armed; spines slender, solitary or 2 together, pink, turning red or red-banded, at maturity gray or nearly white, nearly sterete.



Fig. 288 -Opuntia aequatorialis.



Fig. 289. O. aequatorialis. x0.4.



Figs. 290 and 291.- O. Jata, x0.4.



Figs. 292 and 293.— Opuntia macateei. x0.4.

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slightly spirally twisted; flowers usually several on a joint, conspicuous; sepals subulate to lanceolate, acute; corolla yellow, 7 to 9 cm, wide; petals numerous, the inner ones broadly oboxate to flabellate, erose at the broad minutely mucronate apex; berries clavate, 5 to 6.5 cm, long, red or reddish purple, many-seeded; seeds about 5 mm, in diameter.

Type locality: Twelve miles west of Gainesville, Florida.

Distribution: Pinelands, northern peninsular Florida.

It was first observed by Dr. Small near Gainesville, Florida, in 1917, and plants were taken to Mr. Charles Deering's cactus garden at Buena Vista, Miami, where it has grown luxuriantly, flowering and fruiting freely alongside of *O. pollardii* which it resembles in habit, but differs from in its long clavate berries and more numerous petals.

Figure 290 shows joints of the plant; figure 291 shows its fruit.

## 127a. Opuntia macateei sp. nov. (See page 133, ante.)

Small prostrate plant; joints 2.5 to 6 cm. long, orbicular to obovate, glabrous, dull green, in age somewhat tuberculate; leaves linear, 10 mm. long or less, green; spines 1 to 3, brownish, the longer ones up to 2.5 cm. long; flowers, including the ovary, 8 to 10 cm. long, 7 to 8 cm. broad, yellow with a red certer; ovary subcylindric, 5 to 6 cm. long, bearing conspicuous leaves, sometimes 12 mm. long.

Differs from related species by its small joints and slender, elongated, leafy ovaries. Collected by W. L. MacAtee at Rockport, Texas, December 28, 1910 (No. 1992).

Figures 292 and 293 represent the joints and flower of the plant.

# 159a. Opuntia soederstromiana sp. nov. (See page 154, ante.)

Sometimes spreading and bushy, but usually erect, 6 to 10 dm. high, very spiny; joints obovate, 2 to 4 dm. long, bright green when young, or sometimes slightly glaucous, grayish green in age; leaves subulate, small, reddish at top; spines at first 2 to 5, but in age 10 or more, when young reddish or pinkish at base and paler above, soon gray throughout, unequal, subulate, 4 cm. long or less; flowers at first yellow but soon orange to brick-red, rather large, 5 to 6 cm. long; petals few, about 10, oblong, retuse; filaments and style reddish; stigma-lobes pale green; fruit obovate to oblong, 4 to 5 cm. long, usually spiny, red, juicy, with a depressed umbilicus.

Collected at San Antonio, Province of Quito, Ecuador, by J. N. Rose and George Rose, October 29, 1918 (No. 23559).

This plant was first collected for us by Ludovic Söderstrom of Quito, at the request of the President of the Central and South American Cable Company. Although



Fig. 294.—Opuntia soederstromiana.

great care was taken in shipping the plants they all died in transit. In 1918 Dr. Rose visited Mr. Söderstrom's locality and collected herbarium, living, and formalin material which has enabled us to describe the plant fully. The illustration here used was made at the same time.

Figure 294 is from a photograph of the type plant taken by George Rose.

161a. Opuntia zebrina Small, Journ. N. Y. Bot. Gard. 20: 35. 1919. (See page 155, ante.)

Plant erect, more or less branched throughout, fully 1 meter tall or less, the roots fibrous, joints oval or obovate, thickish, mostly 1 to 2 dm. long, deep green, sometimes obscurely glaucous; leaves ovoid, 2 to 3 mm. long, bright green; areoles scattered, some of them, usually the lower ones, unarmed, the upper ones irregularly armed; spines slender, solitary or 2, 3, or 4, together, red-brown, nnely banded, nearly terete, closely spirally twisted; flowers few on a joint, or solitary; sepals deltoid to deltoid-reniform or nearly reniform; corolla yellow, rotate, 6 to 7 cm. wide; petals rather numerous, the inner ones broadly ovobate, undulate, minutely mucronate or notched at the apex; berries obovoid, not constricted at the base, 3.5 to 4.5 cm. long, red-purple; seeds many, 6 to 7 mm. in diameter.



Fig. 295.—Opuntia zebrina.

Type locality: Middle Cape Sable, Florida.

Distribution: Coastal sand-dunes, Cape Sable, Florida, and the lower Florida Kevs.

The plant was first discovered by Dr. Britton on Boot Key, Florida, in 1909, and this is the most northern locality yet known for it. The species is interesting not only from its strikingly banded spines but also as being the only known member of the series Elatiores growing wild within the United States. In habit it resembles O. dillenii, and on Key West the two species F16. 296.—Fruit of were observed growing close together.



O. zebrina. x0.5.

Illustration: Journ. N. Y. Bot. Gard. 20: pl. 226.

Figure 295 is from a photograph of the plant on Cape Sable, Florida, in cultivation at Buena Vista, Miami, Florida; figure 296 shows a fruit collected by Dr. Rose on Key West, Florida, in 1918.

173a. Opuntia keyensis Britton in Small, Journ. N. Y. Bot. Gard. 20: 31. 1919. (See page 162, ante.)

Plant erect, much branched, sometimes forming clumps 3 meters tall, with long fibrous roots; joints elliptic, oval, obovate, or spatulate, thick, 1 to 3 dm. long, bright green; leaves ovoid, 2 to 3 mm. long, green; areoles rather conspicuous, often relatively large and prominent, apparently unarmed; spines stout, 4 to 13 together, very short, mostly hidden in the bristles; at first pink, at maturity salmon-colored, slightly flattened; flowers solitary or 2 or 3 on a joint; sepals deltoid to subreniform, acute or acutish; corolla salmon-colored, cup-like, or short-campanulate, 3 to 3.5 cm. wide; petals rather few, thinner ones broadly obovate or orbicular-obovate, undulate, scarcely, if at all, mucronate; berries obovoid, 4 to 6 cm. long, purple; seeds numerous.

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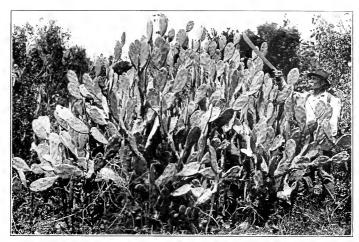


Fig. 297.—Opuntia keyensis.

Type locality: Boot Key, Florida.

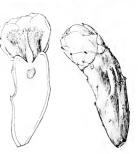
Distribution: Hammocks, Florida Keys and Cape Sable.

Opuntia keyensis was first collected by Dr. Britton in 1909 on Boot Key, Florida. Plants brought subsequently by Dr. Small from the Keys to Buena Vista, Miami, and there observed by him under cultivation show the species to be distinct from either O. dillenii or O. stricta, with both of which it has been associated.

Illustration: Journ. N. Y. Bot. Gard. 20: pl. 225.

Figure 297 is from a photograph of the plant in cultivation at Buena Vista, Miami, Florida; figures 298 and 299 show its flowers, collected by Dr. Small on Key Largo, Florida, in 1909. See also plate xxx, figure 1.

183a. Opuntia bonplandii (HBK.) Weber, Dict. Hort. Bois 894. 1898. (See page 168, ante.)



Figs. 298 and 299.—Flower of Opuntia keyensis. x0.5.

Cactus bonplandii Humboldt, Bonpland, and Kunth, Nov. Gen. et Sp. 6: 69. 1823.

Plants tall, 2 to 4 meters high, open-branching; joints ovate to obovate, 2 to 3 dm. long, dull green; spines at first 2 to 7, pale yellow, acicular, 1 to 1.5 cm. long but soon falling off; flowers orange-colored, about 6 cm. long and nearly as broad when fully expanded; petals obtuse; stainens short.

Type locality: Cuenca, Ecuador.

Distribution: Ecuador.

This species was collected by Humboldt and Bonpland at Cuenca, Ecuador, and was first described as Cactus (Opuntia) bonplandii. Apparently the type was not preserved as Dr.

Rose did not find it either at Berlin or Paris in 1912. Schumann mentions it only in a note under O. quitensis following Weber who associates the two. Dr. Rose, while in Ecuador in 1918, spent about a week at Cuenca collecting plants in all directions from the town. The only Opuntia in this whole region is the one above described which grows in hedges and along the roadsides. It may be an introduced species which has escaped from gardens but we know nothing in cultivation just like it. It resembles somewhat the Nopal de Castilla, so common

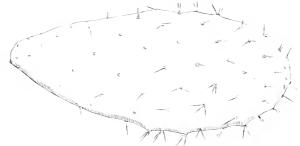


Fig. 300 -- Opuntia bonplandii x0.5.

in Mexico and the southwestern states Humboldt compared it with the tuna de Espana which may be the same. Bonpland seems to have called his plant *Cactus coccinellifer* which it very much resembles in the shape of the joints and in being spineless in age. If we are right in our interpretation of this species it has no close alliance with *O. quitensis* which Dr. Rose collected also; it has very small flowers with erect petals which are not readily affected by the sun as are those of *O. bonplandii* and most of the other species.

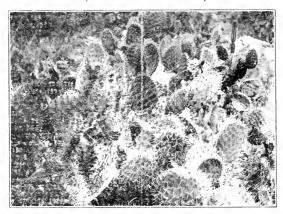


Fig. 301.—Opuntia dobbieana.

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Figure 300 shows a joint collected by Dr. Rose at Cuenca, Ecuador, in 1918.

#### 207a. Opuntia dobbieana sp. nov. (See page 187, ante.)

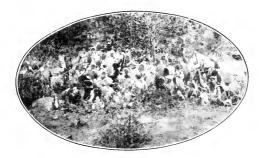
Usually low and bushy, forming dense thickets, but sometimes tall and then 3 to 4 meters high; joints orbicular to short-oblong or obovate, 1 to 2.5 dm. long, pale green in color, very spiny; leaves minute, 1 to 2 mm. long, green, spreading; areoles small, closely set; spines white, 5 to 12, usually acicular but on old joints subulate, 1 to 3 dm. long, accompanied by 2 to 4 reflexed hairs from the lower side of the areole; flower, including ovary, 5 to 6 cm. long; petals chocolate-colored, oblong, 2 cm. long; filaments and style pinkish; stigma-lobes dull green; ovary strongly tubercled, leafy, very spiny, especially towards the top; fruit juicy, red, at first spiny, 3 to 5 cm. long.

Common in dry places from Huigra to Sibambe, Province of Chimborazo, Ecuador. Collected by J. N. Rose and George Rose, August to November 1918, at Huigra (No. 22201, type); at Sibambe, August 29 (No. 22434).

This species, on account of its white spines, is referred to the *Streptacanthae*, although it usually is more bushy than these species generally are. So far as we could learn, the fruit is not used by the Ecuadoreans; the plant was never seen cultivated, and there is every reason to believe it is native to Ecuador.

The species is named for John Dobbie, general manager of the Guayaquil and Quito Railway, whose courtesies and assistance added greatly to the success of Dr. Rose's visit to Ecuador in 1918.

Figures 301 and 302 (the latter at the bottom of this page) are from the photographs of the type plant, taken by George Rose.





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From Appendix Vol. IV, page 252. Insert on page 30.

### 11. Pereskiopsis scandens sp. nov.

Slender, climbing or clambering over walls, up to 10 meters long; branches terete, grayish, smooth; areoles circular, white-woolly when young gray in age, with a short spine (5 mm. long) and a bunch of brown glochids in the upper edge; leaves ovate, 1.5 to 2 cm. long, glabrous, acute; flowers yellow, from the areoles on old branches, appearing in June; fruit maturing slowly (perhaps requiring 2 to 3 years to ripen), very narrow, 5 to 7 cm. long, somewhat tubercled, with a deep umbilicus; seeds few.

Living specimens of *P. scandens* were sent by Dr. George F. Gaumer from Izamal, Yucatan, Mexico, in July 1921 (type). It was also collected by A. Schott at Mérida in 1865 (No. 409).

From Appendix Vol. IV, page 252.

Withdraw the name Pereskia zehntneri from page 14, vol. I, and substitute the following at the end of Pereskiopsis on page 30:

#### 1a. QUIABENTIA gen. nov.

A low, leafy, much branched shrub with numerous horizontal branches, usually in whorls; leaves fleshy but flattened, stiff, borne at right angles to the branches; areoles large, white-fleted, often with numerous spines; these acicular and white, the upper part of areole bearing glochids; flowers terminal, very large, bright red; ovary leafy, very narrow; stamens numerous, a little shorter than the style, much shorter than the petals; style short and stiff; stigma-lobes very short, obtuse; seeds white, a little flattened, covered with a hard bony aril as in Opantia.

A monotypic genus, native of the semiarid region of Bahia, Brazil. The generic name is from quiabento, the native name of the plant.

### 1. Quiabentia zehntneri Britton and Rose.

Pereskia zehntneri Britton and Rose, Cactaceae 1: 14. 1919.

Flowers at ends of branches, large, 7 to 8 cm. broad, 3 to 4 cm. long, bright red, appearing in November; petals broad, retuse; ovary borne in the upper end of the branch, very narrow, 3 to 4 cm. long, bearing the usual leaves, areoles, and spines of the branches; fruit oblong to clavate, 6 to 7 cm. long, 1.5 cm. in diameter at the top, slightly angled by the low elongated tubercles running downward from the small scattered areoles, and finally without leaves, spines, or bristles, sterile below, with thick flattened sides rounded on the back, 5 mm. in diameter.

In its large, red, rotate flowers this plant at once suggests a *Pereskia*. Its red flowers are so similar to those of *P. babiensis* of the same region that at first we considered the two species congeneric. Now that we have studied the fruit and seed it is evident that *P. zehntneri* belongs to a very different genus. Then, too, the old areoles develop deciduous spines or bristles which are doubtless glochids; these occur on the upper part of the areoles but do not form the definite brush of the *Opuntiae*. These glochids would exclude it from the *Pereskieae*. It must therefore be referred to the *Opuntiaee* and next to *Pereskiopsis*. In its broad, thick leaves it resembles that genus, but its flowers are terminal, very large, and rotate; its fruit is much elongated and the seeds are glabrous.

We are indebted to Dr. Leo Zehntner, a very keen observer, for many fine specimens and much information regarding it. He has found it only on a small calcareous mountain near the city of Bom Jesus da Lapa, Brazil, but it has been transplanted to the Horto Florestal of Joazeiro where it is well established and where it flowered three years after being replanted. In 1915 Dr. Rose brought living specimens to the New York Botanical Garden from this stock (No. 19722).

# From Appendix Vol. IV, page 255. Insert on page 94.



Fig 234.—Opuntia wetmorei, fruit, stem, and seeds.

#### 64a. Opuntia wetmorei sp. nov.

Forming low mounds of considerable extent with hundreds of branches; joints 4 to 10 cm. long, terete, turgid, 2 cm. in diameter or less, slightly tapering towards each end, dull green, but dull purple around and especially below the areoles; leaves subtending the minute areoles, 1 to 2 mm. long, caducous; areoles circular, bearing tawny or white wool when young; glochids short, yellowish; spines numerous, very unequal, scarcely pungent, white to straw-colored or brownish, 3 or 4 of lower ones almost hair-like, reflexed or appressed to joints, 3 or 4 of uppermost erect or ascending, flattened, 2 to 3.5 cm. long; flowers not known; immature fruit glabrous at first, dull green, becoming reddish purple especially about the areoles, 3 cm. long, bearing long white bristly spines, especially from upper areoles, deeply umbilicate.

Collected by W. B. Alexander in the barranca of the Tunuyán River near Tunuyán, Mendoza, Argentina, March 22 and 23, 1921.

This species is perhaps nearest *Opuntia darwinii*. We are under great obligation to W. B. Alexander for sending us very fine living plants by Alexander Wetmore, who brought them to us directly from Argentina. Mr. Wetmore was with Mr. Alexander when the plant was collected and he has given us a word picture of the plant; we take pleasure in naming the species for him, not only in recognition of this service but also for obtaining other valuable specimens of cacti.

Figure 234 is from a photograph of the type plant, one-half natural size.

From Appendix Vol. IV, page 256. Insert on page 99.

76a. Opuntia alexanderi sp. nov.

Low, depressed, forming a small clump: joints readily detached, grayish green, strongly tubercled, globose, 2 to 3 cm. in diameter, nearly hidden by the numerous spines; areoles small, close together, circular; spines 4 to 12, up to 4 cm. long, flexible, white below, dark above or with black tips, scurfy-pubescent even in age; flowers not known; fruit red, dry, obovoid, 2 cm. long, lower areoles not spiny, but upper ones bearing 2 to 8 long, white, erect, weak spines overtopping the fruit; umbilicus of fruit depressed; seeds white, 5 to 6 mm. broad.

Collected by W. B. Alexander, between Chilecito and Fanatina, province of La Rioja, Argentina, February 19, 1921. Mr. Alexander studied this species in the field but could not identify it and sent it to us for study. It belongs to the subgenus *Tephrocactus*, but is not near any of the known species. We take great pleasure in naming it for Mr. Alexander, who has extensively studied the cacti in Argentina.

From Appendix Vol. IV, page 257. Insert on page 102.

80a. Opuntia abjecta Small, sp. nov.

Prostrate, often growing in large irregular patches on almost bare limestone or where some sand and humus has accumulated, irregularly branched; joints suborbicular, sometimes nearly subglobose, oval, or broadly obovate, mostly 4 to 8 cm. long, very thick, frequently turgid, light green, loosely attached to each other; leaves ovoid to conic-ovoid, 2 to 3 mm. long, ascending and slightly curved upward, green or purplish; glochids yellowsh; spines setateous-acciular, mostly solitary, brown, or redship hurple, motted light and dark, becoming chalky gray when dry; the larger ones 2 to 6 cm. long; flowers usually solitary on a joint; berry urceolate, 1 to 1.5 cm. long, somewhat tuberculate, red or purple-red, rounded at base; umblicus relatively broad, concave; seeds few, flattish, about 4 mm, wide.

On edge of hammock, southern end of Big Pine Key, Florida. Type collected in May 1921 by J. K. Small, preserved in the herbarium of the New York Botanical Garden.

Similar to Opuntia drummondii but with shorter joints, longer and more slender spines, and different fruit.

From Appendix Vol. IV, page 257. Insert on page 105.

86a. Opuntia impedata Small, sp. nov.

Prostrate, ultimately copiously branched, the joints often piled several layers deep and forming viciously armed mats, elliptic or oblong, mostly 1 to 15 cm. long, rather thick, pale green; leaves



HG. 235.—Opuntia impedata.

stout-subulate, 4 to 6 mm. long, erect or ascending, slightly curved upward, dark green; glochids brownish; spines subulate, usually unmerous, solitary or 2 together, light gray, except the brown tip, salmon-colored when dry, and faintly banded when wer; flowers often several on a joint; ovary obconic, nearly rerete; sepals green, outer lanceolate to ovate, 4 to 8 mm. long, acuminate, the inner much larger, with shoulders of very broad body narrowed into stoutish tip; corolla bright yellow, 4.5 to 5.5 cm. wide; petals about 12, 2.5 to 3 cm. long, broadly obovate to cuneate-obovate, broadly rounded at apex, mu-cronate; anthers nearly 2 mm. long; berry clavate, about 3 cm. long, narrowed at base; umbilicus rather small, somewhat concave; seeds rather few, 4 to 4.5 mm. in diameter.

Sand dunes, northeastern Florida. Type in the herbarium of the New York Botanical Garden; collected on dunes at Atlantic Beach, Florida, in April 1921, by J. K. Small.

Dr. Small notes that the stiff spines may penetrate leather shoes and that the plant is very prolific, both vegetatively and through its fruit.

Figure 235 is from a photograph taken by Dr. Small of the type plant.

# From Appendix Vol. IV, page 258. Insert on page 110.

#### Series 3a. PISCIFORMES.

Plants in dense colonies with turgid, very spiny, natrow, deep green joints, the spines conspicuously long and slender, salmon-colored in the first year, gray in the second; flowers numerous, bright yellow; berry turbinate-obovoid, 4 cm. long or less. The only species inhabits Florida.

### 96a. Opuntia pisciformis Small sp. nov.

Prostrate, copiously branched, forming dense mats often 1 to 3 meters in diameter, with joints piled several layers deep, roots fizrous; joints narrowly elliptic, linear-elliptic, or spatulate, mostly 1 to 3 dm.



Fig. 236.—Opuntia pisciformis,

long, very thick, deep green, readily detached; leaves stout-subulate, 2 to 4 mm. long, incurved; areoles rather prominent, mostly armed; spines solitary or 2 or 3 together, cream-colored, becoming salmon-colored and gray with a dark tip when dry, salmon when wet, the longer ones 5 to 6 cm. long; flowers numerous; ovary turbinate, angular and tuberculate; sepals green, the outer lanceolate to triangular-lanceolate, 9 to 12 mm. long, acuminate, the inner much larger, the broad ovate or suborbicular base broadly tapering into the very stout tip; corolla bright yellow, 6 to 7.5 cm. wide; petals about 12, 3 to 4 cm. long, broadly cuneate, mostly truncate or emarginate at apex, mucronate; anthers nearly 2 mm. long; betry broadly turbinate-obovoid, 3.5 to 4 cm. long, purple, narrowed at base, the umbilicus deeply concave; seeds rather numerous, 5 to 5.5 mm. in diameter.

Sand dunes, estuary of the Saint Johns River, Florida. Type in the herbarium of the New York Botanical Garden; collected on dunes at Atlantic Beach, Florida, in April 1921, by J. K. Small.

Figure 236 is from a photograph by Dr. Small of the type plant.

From Appendix Vol. IV, page 260. Insert on page 130.

121a. Opuntia eburnispina Small, sp. nov.

Prostrate, widely branched and forming mats on dune sands, with tuberous roots; joints oval or suborbicular, varying to broadest above middle, thickish, 6 to 13 cm. long, pale green, somewhat shining, especially when young; leaves ovoid-subulate, 4 to 5 mm. long, pale green, recurved-spreading; spines relatively stout, 2 to 4 at an arcole or sometimes solitary, 1 to 2 cm. long, ivory-white with yellowish tips when young, becoming dark gray, not spirally twisted, greenish when wet; flowers few; ovary obconic; sepals triangular, green, 5 to 7 mm. long; corolla clear yellow, 4 to 5 cm. wide; petals few, narrowly cuneate, often minutely pointed; berries obovoid, 2 cm. long or less.

Coastal sands, Cape Romano, Florida. Type specimens in the herbarium of the New York Botanical Garden; collected in May 1922, by J. K. Small.

Figure 237 is from a photograph by Dr. Small of the type plant.



Fig. 237.—Opuntia eburnispina.

From Appendix Vol. IV, page 261. Insert on page 135.

129a. Opuntia macbridei sp. nov.

A low bush, 6 dm. high, forming broad impenetrable thickets on gravelly river flats; joints obovate, 6 to 8 cm. broad, 8 to 15 cm. long, glabrous, at first light green, in age dark green; leaves minute, 1 to 2 mm. long, caducous; areoles on young joints hemispheric, brown-felted and with brown glochids, on old joints 2 to 3 cm. apart; spines 2 to 4, in age gray to horn-colored, with yellowish tips, very unequal, the longest up to 5 cm. long, stout-subulate; flowers very small, orange to orange-red; petals only 4 to 5 mm. long; ovary tuberculate, bearing many brown-felted tubercles but without spines, deeply umbilicate; fruit deeply umbilicate, red to purple.

Collected by Macbride and Featherstone at Huanuco, Peru, altitude 2,300 meters, August 28 to September 3, 1922 (No. 2365, type), and April 8, 1923 (No. 3250).

Mr. Macbride states that the seeds are brown. All the fruits we have seen were sterile; these sterile fruits on falling to the ground take root and form new plants.



Fig. 238.—Opuntia macbridei.

This interesting plant, which proves to be undescribed, we have named for Mr. J. Francis Macbride, who led the Botanical Expedition of 1922 to South America, sent out by the Field Museum of Natural History, under the Captain Marshall Field fund.

Figure 238 is from a photograph showing the habit of this plant.



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