

A REVISION OF NEOBESSEYA IN THE UNITED STATES AND CUBA

by

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INTRODUCTION

The genus Neobesseyia Britton & Rose encompasses 13 species of mammiform cacti occurring in North and Central America and on the island of Cuba. In this study only the representatives of Neobesseyia from the United States and Cuba are considered. The purpose of this study was to determine the infrageneric taxa, their distribution, and to align the nomenclature.

Linnaeus included all of the cacti in the genus Cactus: however, it was early apparent that this included numerous more or less distinctive complexes, which were each in turn recognized as genera. The primarily columnar cacti were separated as Cereus by Philip Miller in 1754, the flat, jointed ("beavertail") group as Opuntia by Miller in 1754, and the mammiform ("pin cushion") group as Mammillaria by Haworth in 1812. It is interesting to note that as various assemblages were recognized under separate generic names, the genus name Cactus was lost; creating a situation contrary to the rules of nomenclature and not rectified until the formulation of the *Nomina Generica Conservanda* (cf. International Code of Botanical Nomenclature, 1961).

Mammillaria itself included several rather distinctive species-groups which have been variously recognized as sections or separate genera. Among those generic names bearing upon the assemblage here regarded as constituting the genus Neobesseyia are Mammillaria, Coryphantha, Neomammillaria, and Neobesseyia. The boundaries between these complexes are still subject to investigation. Britton (1901) and Rydberg (1906) recognized the genus Cactus (on the basis of the American code of nomenclature, under which these men worked). In 1932 Rydberg placed the group in the genus Neomammillaria. In the eighth edition of Gray's Manual (1950), Fernald treated the group as Mammillaria. The major published work to-date on the Cactaceae is the four

volume monograph of the family by N. L. Britton and J. N. Rose. Their generic delimitations of Neobesseya have been adopted in this revision (cf. appendix).

The members of the genus Neobesseya occur infrequently on the Great Plains. Because of their small size and green color, they are effectively camouflaged and are only occasionally seen and rarely collected. Neobesseya is normally to be found in open areas with sparse vegetation, on worn, rocky, limestone outcrops. It is only rarely found in thick vegetation, but it may sometimes occur along fence rows in thick vegetation. It is often found in association with Opuntia.

Many of the specimens used for this study were not collected recently and much of the material was in very poor condition. The cacti are difficult to handle and preparing satisfactory specimens for herbarium use is a problem. The specimens seen by this author had been sliced and pressed, or dried whole. The specimens dried whole and placed in small boxes seemed to be in the best condition. Miss Bonnie Templeton (1932) suggests that cacti be preserved in formalin-alcohol, but the author has not seen this method used.

Another mammiform cactus of the Great Plains, Coryphantha vivipara (Nutt.) Britton & Rose, is often confused with the Neobesseya group. It is distinguished from the members of the genus Neobesseya by having brown spines, pink flowers, green clavate fruits which are 2 - 3 cm long, and brown seeds. It was noticed by the author that of the cacti collected in the field and kept in the greenhouse over the winter, the specimens of Neobesseya bloomed three weeks earlier than the other mammiform cacti collected. Interestingly, the specimens of Neobesseya in the greenhouse bloomed a full two months before the blooming dates observed in the field the previous year.

MORPHOLOGICAL CHARACTERS OF TAXONOMIC IMPORTANCE

Vegetative morphology has provided the characters used for the most part to separate the species of Neobesseya. The flowers are often difficult to obtain as the plant remains in flower only one week and individual flowers stay open only 2 - 3 days. However, floral parts provide important taxonomic characters. The length of the perianth differs from species to species; very wide perianth segments are characteristic of Neobesseya wissmannii.

The placement and number of spines on the tubercles are the most permanent and useful characters. Neobesseya similis has a characteristic spine number of 12 - 15 or occasionally as few as 11 or as many as 16, whereas the spine number for Neobesseya missouriensis is mostly 12 - 18 but 25 spines per tubercle are not uncommon. Neobesseya similis has at least one distinct central spine and all of the spines of this species are stiff and easily broken when bent, but other species have spines which are more flexible.

SOURCE OF MATERIALS

Field observations and collections were made by the author in Kansas and Oklahoma. Living materials were brought to Kansas State University and placed in the greenhouses. Specimens also were borrowed from the following institutions; the symbols are in accord with Lanjouw and Stafleu, Index Herbariorum, Part I (1959).

Academy of Natural Sciences, Philadelphia	PH
University of California, Berkeley	UC
Chicago Natural History Museum	F
Gray Herbarium, Harvard University	GH
Kansas State University	KSC

Missouri Botanical Garden	MO
University of Nebraska	NEB
New York Botanical Garden	NY
University of Oklahoma	OKL
Pomona College	POM
University of Texas	TEX
United States National Herbarium	US

ACKNOWLEDGMENTS

I am grateful to Dr. T. M. Barkley, curator of the Herbarium, Kansas State University, under whose patient guidance this revision was prepared. Dr. Lyman Benson, of Pomona College, suggested this study. My father, Orval J. Abel, accompanied me on extended field collections. Mr. Harry Smith, Game Farm Supt., State Pheasant Farm, Meade, Kansas, kindly showed me living plants in the field. Dr. Earl D. Hansing, of Kansas State University generously allowed living specimens to be placed in his greenhouse. Dr. C. L. Kramer, Kansas State University, photographed many of the living specimens as they came into flower. I am indebted to the curators of the various herbaria from which specimens were borrowed for this study.

SYSTEMATIC TREATMENT

NEOBESSEYA Britton & Rose, The Cactaceae, Carnegie Inst. Wash. 248(4):51. 1923.

Plants occurring singly or clustered, 2.4 - 6.0 cm in diameter; tubercles 0.3 - 1.4 cm long, grooved on upper side; spines pubescent, 8-25 per tubercle, 0.6 - 1.8 cm long; central spines may or may not be

present; flowers near the top of the plant, generally 2.0 - 5.5 cm long, yellow, yellowish-green to straw colored, or rarely pink; perianth ciliate; stigma branches generally 4 - 7; fruit obovate to narrowly obovate, red; seeds globose, 1 - 2.3 mm at greatest diameter, black, pitted, with a whitish-yellow to tannish-yellow hilum.

Key to Species

- A. Tubercle length 1.0 - 1.5 cm; spines very stiff and breaking easily on dried specimens when bent; central spines 1 - 4; perianth 3.5 - 6.0 cm long.
 - 1. Neobesseyia similis
- AA. Tubercle length 0.6 - 1.4 cm; spines more or less flexible, not stiff; central spines one or none; perianth 1.5 - 5.0 cm long.
 - B. Spines radially arranged in one plane (Fig. 1); no central spine; perianth segments 3 - 5 mm wide, 4.0 - 6.0 mm long, abruptly contracted to a distinctly acuminate to subcuspidate apex; a distinctive species known from central Texas, one locality in Kansas; and is reputedly in Oklahoma.
 - 2. Neobesseyia wisemanni
 - BB. Central spine frequently present, perianth segments 2 - 3 mm wide, narrowly linear, acute to subacuminate.
 - C. Perianth length 1.0 - 1.3 cm; restricted to Cuba.
 - 3. Neobesseyia cubensis
 - CC. Perianth length 1.5 - 5.0 cm; widespread in Central North America.
 - 4. Neobesseyia missouriensis

1. NEOBESSEYA SIMILIS (Engelm.) Britton & Rose, The Cactaceae, Carnegie

Inst. Wash. 248(4):52. 1923. Mammillaria similis Engelmann,
 Bost. Journ. Nat. Hist. 5:246. 1845. Echinocactus similis
 (Engelm.) Poselger, Berliner Allg. Gartenz. 21:107. 1853.
Mammillaria missouriensis var. similis (Engelm.) Schumann,
 Gesamtb. Kakteen. 498. 1898. Cactus similis (Engelm.) Small,
 Fl. Southeast. U. S. 812. 1903. Coryphantha similis (Engelm.)
 Britton & Rose in Rydberg, Fl. Prairies and Plains Cent. N. A.
 561. 1932. Type locality: Lindheimer, "sandstone rocks,
 near Industry" (Texas). (Described from living materials at
 Mo. Bot. Gard. from specimens sent by F. Lindheimer. A specimen
 labelled: "Mammillaria similis Engelm., cult. in hort. Gobel,
 St. Louis, from near Industry, coll. by F. Lindheimer, May, 1846,"
 is in herb. MO, and may represent the type collection. Fig. 2)

Fleshy plants 4.5 - 5.5 cm in diameter; tubercles 1.0 - 1.4 cm long;
 spines 10 - 16 per tubercle, slightly pubescent; spines 0.8 - 1.6 cm long;
 central spines 1 - 4 per tubercle; perianth yellowish and ciliate, 3.5 - 6.0
 cm long; stigma lobes 5; fruit reddish, obovate to narrowly obovate; seeds
 black, pitted, 1.5 - 2.3 mm at greatest diameter.

This species occurs along limestone debris in Texas from Dallas and
 Fort Worth, south to Austin and east to Huntsville. Fig. 10.

Specimens seen:

TEXAS: Austin Co.: Industry, F. Lindheimer s. n. Cult. in Hort. Gobel
 (MO); Industry, E. F. Wiegard s. n. (POM); Industry, collector unknown
 (MO). Bexar Co.: Alamos Creek, J. Jermy s. n. (US - 2 specimens);
 San Antonio, B. Mackensen 1 (US). Blanco Co.: Pierdanales R., F. Lindheimer

s.n. (MO); Blanco, Wright s.n. (MO - 2 specimens); Pierdenales R., collector unknown (MO). Dallas Co.: Dallas, J. R. Alpins s. n. (US). Kaufman Co.: Terrell, F. J. Tyler s. n. (US). Kerr Co.: Kerrville, B. Mackensen s. n. (US - 2 specimens); Kerrville, J. N. Rose and W. R. Fitch s. n. (US). Tarrant Co.: Polytechnic, A. Ruth s. n. (US); Polytechnic, A. Ruth s. n. (NY); Fort Worth, F. E. Upham s. n. (US - 3 specimens); Fort Worth, F. E. Upton s. n. (US); Fort Worth, collector unknown (NY). Travis Co.: Austin, Coville 1800 (US); Austin, B. C. Tharp s. n. (TEX); Austin, B. C. Tharp s. n. (US). Walker Co.: Huntsville, S. R. Walker s. n. (US); Huntsville, collector unknown (US). County unknown: B. C. Tharp s. n. (US); Canon City, W. L. Bray 460 (TEX). State and collector unknown: (MO).

2. NEOBESSEYA WISSMANNII (Hildman) Britton & Rose, The Cactaceae,

Carnegie Inst. Wash. 248(h):52. 1923. Mammillaria wissmanii
Hildman in Schuman, Gesamt. Kakteen. 498. 1898. Type
locality: "In Indianer-Territorium und Oklahoma am Falschen
Washita und dem Canadian-River auf Hochebenen bei Fort Arbuckle:
WHIPPLE:". (Not seen.)

Mammillaria similis var. robustior Engelm., Bost. Journ. Nat. Hist.
6:200. 1850. Mammillaria nuttallii var. robustior (Engelm.)
Engelm., Proc. Amer. Acad. 3:265. 1856. Mammillaria
missouriensis var. robustior (Engelm.) S. Watson, Bibl. Index
1:403. 1878. Cactus missouriensis var. robustior (Engelm.)
Coulter, Cont. U. S. Nat. Herb. 3:111. 1894. Cactus robustior
(Engelm.) Small, Fl. Southeast. U. S. 812. 1903. Type locality:
Described in Mo. Bot. Gard. from living materials sent by F.
Lindheimer. A specimen in herb. MO labeled: "Mammillaria similis

var. *robustior*, St. Louis, cultiv. from plants coll. by F. Lindheimer near the Pierdenales, Texas, June 1846" may represent the type collection (Fig. 3).

Individual plants 3.0 - 5.0 cm. in diameter; tubercles 5 - 7 mm long; spines lightly pubescent, 6 - 10 mm long; 8 - 12 spines per tubercle, centrally arranged in one plane, (Fig. 1 and Fig. 6); no central spine; perianth segments ciliate, 4.5 - 6.0 cm long and 3 - 5 mm wide, 4.0 - 6.0 cm long abruptly contracted to a distinctly acuminate to subcuspidate apex; stigma lobes 4 - 5; fruit red-orange, obovate; seeds black, pitted, 1 - 2 mm wide.

This species is known to the author by six specimens from south-central Texas and by one collection from Meade County, Kansas, Fig. 11. The collection Abel 40 (KSC) is the first time to the author's knowledge this species has been collected in Kansas.

Specimens seen:

KANSAS: Meade Co.: Meade Co. State Park, A. E. Abel 40 (KSC),
 TEXAS: Bexar Co.: San Antonio, B. Mackensen s. n. (US - 2 specimens),
 Blanco Co.: Pierdenales, F. Lindheimer s. n. (MO). Colorado Co.:
A. L. Doubt s. n. (US). Travis Co.: Austin, Coville 1800 (US - 2 specimens).

Three specimens from the U. S. Nat. Herb. are labeled: Coville 1800. This seems to be a mixed collection as one specimen is Neobesseyia similis and two are Neobesseyia wissmannii. The specimen labels do not indicate the habitat or whether these three specimens were taken from the same or different populations.

3. NEOBESSEYA CUBENSIS (Britton & Rose) Hester, Desert Plant Life.

xii. (192). 1941. Coryphantha cubensis Britton & Rose, *Torreyia* 12:15. 1912. Mammillaria urbaniana (Britton & Rose) Vaupel, *Monatsschrift fur Kakteenkunde* 22 (5):65. 1912. Not Mammillaria cubensis Zaccarini, Labouret, *Monogr. Cact.* 59. 1853. Type locality: "Among stones in barren savanna, southeast of Holguin, Oriente, Cuba." (J. H. Schafer 2946 (NY, US)). Fig. 4

Plants 2.5 - 3.5 cm in diameter, tubercles 3 - 7 mm long; spines 8 - 12 per tubercle, 4 - 12 mm long, no central spine; perianth yellowish green, ciliate, 1.0 - 1.3 cm long; fruit red; seeds black, 1.0 - 1.4 mm at greatest diameter.

This species is known to the author from only three collections, all made in the area of the type collection. Fig. 12

The placement of this species in Neobesseya may or may not be justified. The characteristics of yellowish flowers, red fruits and black pitted seeds satisfy the present author that this is its proper placement, although the distribution is difficult to explain. The relationship of this species to the other members of the genus might be better understood if experimental and more expansive comparative studies could be made. However, on the basis of the gross morphology it cannot be summarily excluded from Neobesseya.

Specimens seen:

CUBA: Oriente, Holguin, J. H. Schafer 12432 (NY, US - 2 specimens); Oriente, Holguin, M. L. Figueiras 950 (US).

4. NEOBESSEYA MISSOURIENSIS (Sweet) Britton & Rose, The Cactaceae, Carnegie Inst. Wash. 248 (4):53. 1923.

Plants 3.0(3.5)-4.5(5.0) cm in diameter; tubercles 8 - 12 mm long, occasionally 5 - 14; spines lightly pubescent, generally 10 - 16 per tubercle, but may be 6 - 25; spine length 0.6 - 1.4(1.8) cm long; central spine, one or none; perianth yellow to yellow-green, or pink in var. notesteinii; outer perianth parts ciliate along margin and occasionally on dorsal surface; perianth 3.5 - 4.5 cm long in specimens from Kansas and southward, and 1.5 - 3.0 cm long in specimens from Nebraska northward; stigma lobes 4 - 6 or rarely 7; fruit reddish, obovate, 1 - 2 mm at greatest diameter.

This species is occasional to rare in open prairies and along limestone out-crops, from Montana and North Dakota south to Texas. It is often found in association with Coryphantha vivipara. One very distinctive variety is separated by the following key.

Key to varieties of Neobesseya missouriensis

- A. Flowers yellow to yellowish-green, widespread distribution.
 5. Neobesseya missouriensis var. missouriensis
 AA. Flowers pink, known only from Deer Lodge, Montana
 6. Neobesseya missouriensis var. notesteinii
5. NEOBESSEYA MISSOURIENSIS (Sweet) Britton & Rose var. MISSOURIENSIS

The Cactaceae, Carnegie Inst. Wash. 248 (4):53. 1923.

Cactus mammillaris Nuttall, Gen. Pl. 1:295. 1818. Not

Linnaeus, 1753. Mammillaria missouriensis Sweet, Hort. Brit.

171. 1826. Mammillaria simplex Torrey & Gray, Fl. N. Amer.

1:553. 1840. Cactus missouriensis (Sweet) Kuntze. Rev. Gen. Fl. 1:259. 1891. Coryphantha missouriensis (Sweet) Britton & Rose in Britton & Brown, Illust. Fl. 2nd Ed., 2:570. 1913. Neomammillaria missouriensis (Sweet) Britton & Rose in Rydberg, Fl. Prairies and Fl. N. A. 661. 1932. Type locality: Nuttall, "On the high hills of the Missouri, probably to the mountains," (Not seen.)

Mammillaria nuttallii Engelm., Fl. Fendl. 49. 1849. Mammillaria missouriensis var. nuttallii (Engelm.) Schelle, Handb. Kakteenk. 241. 1907. Neobesseya nuttallii (Engelm.) Borg. Cacti. 303. 1937. Type locality: Engelmann: "On high, dry prairies, about Fort. Pierre, on the Upper Missouri; flowering in May." (Not seen.)

Spines 0.6 - 1.8 cm long, and 10 - 16 per tubercle; perianth 1.5 - 4.5 cm long, yellow to yellow green. Figs. 7, 8, and 9.

This variety has wide distribution on the Great Plains and is the best known taxon of the genus. There seem to be two distinct areas in which it is distributed (Fig. 13). The northern range includes Montana, Wyoming, North Dakota, South Dakota and northern Nebraska. The perianth length of this northern group is 1.5 - 3.0 cm long. The southern distribution includes Kansas, Oklahoma and central Texas, and this group has a perianth length of 3.5 - 4.5 cm. The other taxonomic characters holding this group together remain fairly constant. Therefore, the author does not feel that the perianth length is a distinctive enough factor to further separate this variety into additional taxa. Collections of this variety have been scant and additional collections

are needed.

The variability of this variety was demonstrated in the collections made by the author in the Meade County State Park, Kansas. Specimens were collected in two areas about 2 miles apart and have been deposited in herb. KSC; duplicates will be placed in other herbaria. The plants were abundant and found both singly and in clumps. The spine number per tubercle varied from 5 - 10 on some specimens to 8 - 14 on others. The spine length varied from 6 - 9 mm, or 9 - 16 mm. The perianth was pale yellow to yellow-green with a line of light pink extending lengthwise down the inner perianth parts. This pink color varied in shade. The stamens were pale pink to yellow-green and the stigma lobes were light green in all specimens. The number of stigma lobes on any one plant varied from 4 - 7. Fruits were bright red to red-orange. Neither population of plants were consistent in these characters, but plants occurring in one clump demonstrated some consistency in characters. The inconsistency leads this author to believe that the gene pool in this variety is quite large and most unpredictable.

Specimens seen:

COLORADO: Boulder Co.: Lyons, L. and R. L. Benson 16217 (POM).

Jefferson Co.: Golden City, E. L. Greene s. n. (GH).

KANSAS: Barber Co.: Medicine Lodge, A. E. Abel 87 (KSC). Butler Co.:

G. C. Broadhead s. n. (MO). Clark Co.: A. S. Hitchcock s. n. (KSC).

Clay Co.: Clay Center, G. Weber 438 (KSC). Cloud Co.: S. V. Fraser 155

(KSC). Ellis Co.: G. C. Beane s. n. (GH). Kingman Co.: M. A. Carleton

551 (US). Meade Co.: State Park, A. E. Abel 91 (KSC); State Park,

A. E. Abel 92 (KSC); State Park, A. E. Abel 95 (KSC); State Park,

A. E. Abel 96 (KSC); State Park, A. E. Abel 97 (KSC); State Park, A. E. Abel 98 (KSC); State Park, A. E. Abel 99 (KSC); State Park, A. E. Abel 100 (KSC); State Park, A. E. Abel 101 (KSC); State Park, A. E. Abel 102 (KSC); State Park, A. E. Abel 103 (KSC); State Park, A. E. Abel 104 (KSC). Phillips Co.: A. S. Hitchcock s. n. (KSC). Republic Co.: F. A. Smith s. n. (KSC). Riley Co.: Bala, A. E. Abel 22 (KSC); Manhattan, A. E. Abel 105 (KSC); Manhattan, A. E. Abel 106 (KSC); Manhattan, A. E. Abel 107 (KSC); Manhattan, R. H. Pond s. n. (NY, POM); Manhattan, M. A. Carleton s. n. (KSC, US); Manhattan, W. McMurphy s. n. (KSC); Manhattan, G. Schuneman s. n. (KSC); J. B. Norton 183 (KSC, NY, US). Saline Co.: Bavaria, John Hancin A59 (KSC). Stafford Co.: H. T. Porter s. n. (KSC). Trego Co.: A. S. Hitchcock s. n. (KSC - 2 specimens). Wabaunsee Co.: Eskridge, P. Mause 205 (KSC - 2 specimens). Wilson Co.: W. H. Haller 183a (GH, KSC, MO, NY, US). County not identified: A. S. Hitchcock s. n. (KSC - 2 specimens).

MONTANA: Clark Co.: V. Bailey s. n. (&S - 2 specimens); Helena, F. D. Kelsey s. n. (POM) (NY); Helena, E. Stars s. n. (MO). Galeatin Co.: F. Tweedy s. n. (PH). Powell Co. Deer Lodge, E. F. Wiegard 205 (POM). Powder River Co.: Powderville, M. A. Hanna s. n. (US - 2 specimens). Prairie Co.: Terry, V. Bailey s. n. (US). Sweet Grass Co.: Grey Cliff, W. W. Eggleston s. n. (US). County not identified: J. W. Blankinship 109 (US); J. S. Holmes s. n. (NY); Transcont. Survey, F. L. Scribner 60b (US).

NEBRASKA: Box Butte Co.: Alliance, C. H. Churchill s. n. (NEB); Cherry Co.: Valentine, J. M. Bates s. n. (NEB - 2 specimens); Valentine,

B. W. Eversman s. n. (F): Custer Co.: Calloway, J. M. Bates s. n. (NEB). Dawes Co.: Fork of White River, F. V. Hayden s. n. (MO). County not identified: Cult by R. Pfifer, apparently collected by T. Meehan s. n. (label data not clear) (PH).

NORTH DAKOTA: Billings Co.: Midora, Peaceful Valley Ranch, C. R. Ball 2151 (US). Burleigh Co.: Bismark, V. Bailey s. n. (US - 2 specimens). Morton Co.: Mandon, H. C. Oberholser s. n. (US - 2 specimens). Stutsman Co.: Jamestown, G. Berner s. n. (US).

OKLAHOMA: Cotton Co.: North of Red River, A. E. Abel 61 (KSC). Payne Co.: Oklahoma Agricultural College, C. O. Chambers s. n. (US, NY). Rogers Co.: Catoosa, B. F. Bush 1162 (MO, NY). Woodward Co.: Camp Supply, F. Moors 329 (US - 2 specimens). County not identified: Natural mound on the Canadian, J. M. Bigelow s. n. (MO); Oklahoma Territory, M. A. Carleton 120 (US).

SOUTH DAKOTA: Haakon Co.: Grindstone, Schouns s. n. (US). Fall River Co.: Hot Springs, P. A. Rydberg 715 (NEB, US). Pennington Co.: Badlands, J. B. Hatcher s. n. (NY, UC); Black Hills, Badlands, H. E. Hayward 658 (F); Badlands, T. A. Williams s. n. (US). (US). Shannon Co.: Pine Ridge Indian Reservation, G. F. Allen s. n. (GH). Stanley Co.: Ft. St. Peirre, F. V. Hayden s. n. (MO); Ft. St. Peirre, collector unknown (MO). County not identified: Deermont, S. Hendrickson s. n. (NY); Grand Forks, J. G. Sinclair s. n. (NY).

TEXAS: Bexar Co.: San Antonio, B. Mackensen s. n. (US). Ford Co.: Crowell, N. H. Boke s. n. (OSU). Lee Co.: Lincoln, F. A. Barkley and C. M. Rowell 7026 (TEX). Tarrant Co.: Fort Worth, A. Ruth s. n. (US). Travis Co.: Austin, F. Lindheimer 5 (GH); Austin, B. C. Tharp

s. n. (NY); Lake Austin, C. M. Rowell and F. A. Barkley 17T238 (TEX); Austin, B. C. Tharp 47168 (TEX). Location unknown. Reverchon 725 (GH, MO) A. Ruth s. n. (NY); collection unknown (GH); Cultivated in garden, collector unknown (US); Red River, Arkansas, Dr. Pitcher s. n. (NY).

WYOMING: Crook Co.: Hulett, M. Ownbey 669 (MO, NY, UC); Beulah, Northern Red Beds, H. E. Hayward 1326 (F). Yellowstone Park, T. Tweedy 423 (US). County unknown: F. A. Barkley, s. n. (F).

STATE UNKNOWN: Dr. Hayden s. n. (MO).

6. NEOBESSEYA MISSOURIENSIS var. NOTESTEINI (Britton & Rose) comb. nov.

Mammillaria notesteinii Britton, Bull. Torr. Club. 18:367. 1891.

Cactus notesteinii Rydberg Mem. N. Y. Bot. Gard. 1:272. 1900.

Type locality: Notestein s. n. "in gravelly soil near a small creek, near Deer Lodge, Montana." (NY, US). Fig. 5

This plant has pale pink flowers, which are 1.8 - 2.2 cm long.

It is known to this author only from its type collection which is near Deer Lodge, Montana. Fig. 14. The vegetative characters of this plant fall within the normal range of variability of Neobesseya missouriensis var. missouriensis, and the only factor separating it from the typical variety is the pink perianth. This variety does not belong in the genus Coryphantha because of the small, red fruits and black pitted seeds.

A re-collection of this variety would be very desirable, and further study may make it necessary to alter the taxonomic position accorded it in this revision.

DOUBTFUL AND EXCLUDED NAMES

Mammillaria caespitos Gray Struct. Bot. 421. f. 838. Mammillaria missouriensis var. caespitosa Watson Bibl. Index 1:403. 1878. No specimens cited by author.

Mammillaria nuttallii var. borealis Engelmann Proc. Amer. Acad. 3:264. 1856. Specimens not seen. Perhaps Mammillaria nuttalli (= Neobesseyia missouriensis?).

Mammillaria nuttallii var. caespitosa Engelmann Proc. Amer. Acad. 3:265. 1856. Specimens not seen. (= Neobesseyia similis?)

Mammillaria similis var. caespitosa Engelmann Bost. Journ. Nat. Hist. 6:200. 1850. No specimens cited by author.

Neobesseyia wissmannii Lahman ex G. Turner, Cact. Journ. Brit. vi. 2(1937)

Nomen nudum.

INDEX TO SYNONYMY

The number in parentheses corresponds to the number of the taxon in the text.

Cactus

mammillaris	(5)
missouriensis	(5)
var. robustior	(2)
var. similis	(1)
notesteinii	(6)
robustior	(2)
similis	(1)

Coryphantha

cubensis	(3)
missouriensis	(5)
similis	(1)

Echinocactus

similis	(1)
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Mammillaria

missouriensis	(5)
var. nuttallii	(5)
var. robustior	(2)
var. similis	(1)
notesteinii	(6)
nuttallii	(5)
var. robustior	(2)

<i>similis</i>	(1)
<i>var. robustior</i>	(2)
<i>simplex</i>	(5)
<i>urbaniana</i>	(3)
<i>wissmannii</i>	(2)
Neobeseya	
<i>nuttallii</i>	(5)
Neomammillaria	
<i>missouriensis</i>	(5)

INDEX TO EXSICCATAE

The number in parentheses corresponds to the number of the taxon in the text to which the collection is referred. Collections without number or definite date have been omitted.

- Abel, A. E. 22 (5)
Abel, A. E. 40 (2)
Abel, A. E. 61 (5)
Abel, A. E. 87 (5)
Abel, A. E. 91 (5)
Abel, A. E. 92 (5)
Abel, A. E. 95 (5)
Abel, A. E. 96 (5)
Abel, A. E. 97 (5)
Abel, A. E. 98 (5)
Abel, A. E. 99 (5)
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Allen, G. F. s. n. May 1900 (5)
Alpins, J. R. s. n. Dec. 24, 1921 (1)

- Bailey, V. s. n. Aug. 18, 1909 (5)
Bailey, V. s. n. Aug. 8, 1909 (5)
Bailey, V. s. n. July 20, 1909 (5)
Ball, C. R. 2151 (5)
Barkley, F. A., & C. M. Rowell 7026 (5)
Bates, J. M. s. n. May 27, 1890 (5)
Bates, J. M. s. n. May 10, 1893 (5)
Bates, J. M. s. n. May 21, 1901 (5)
Benson, R. L. & L. Benson 16217 (5)
Bigelow, J. M. s. n. Aug. 29, 1853 (5)
Bigelow, J. M. s. n. Aug. 23, 1853 (5)
Blankinship, J. W. 109 (5)
Boke, N. H. s. n. April 28, 1951 (5)
Bray, W. L. 460 (1)
Bush, B. F. 1162 (5)
Carleton, M. A. 120 (5)
Carleton, M. A. 551 (5)
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Churchill, C. H. s. n. May 24, 1887 (5)
Coville, F. V. 1800 (mixed collection) (1, 2)
Deane, G. C. s. n. June 1882 (5)
Doubt, A. L. s. n. Sept. 1910 (2)
Eversman, B. W. s. n. July 1893 (5)
Figueiras, M. L. 950 (3)
Fraser, S. V. 155 (5)
Greene, E. L. s. n. May 23, 1870 (5)

- Haller, W. H. 183a (5)
Hancin, John A59 (5)
Hanna, M. A. s. n. June 13, 1916 (5)
Hatcher, J. B. s. n. June 1886 (5)
Hayden, F. V. s. n. May 14, 1885 (5)
Hayward, H. E. 668 (5)
Hayward, H. E. 1326 (5)
Hendrickson, S. s. n. July 1917 (5)
Hitchcock, A. S. s. n. Aug. 1896 (5)
Hitchcock, A. S. s. n. July 29, 1897 (5)
Hitchcock, A. S. s. n. July 1895 (5)
Jermy, J. s. n. Feb. 1905 (1)
Jermy, J. s. n. April 1905 (1)
Kelsey, F. D. s. n. April 1891 (5)
Lindheimer, F. 5 (5)
Lindheimer, F. s. n. May 1846 (1)
Lindheimer, F. s. n. May 1846 (1)
Lindheimer, F. s. n. June 1846 (2)
Mackensen, B. 1 (1)
Mackensen, B. s. n. Sept. 1909 (5)
Mackensen, B. s. n. Aug. 7, 1909 (1)
Mause, P. 205 (5)
McMurphy, W. s. n. Aug. 11, 1962 (5)
Moors, F. 329 (5)
Norton, J. B. 183 (5)
Notestein, F. N. s. n. June 1, 1891 (6)

- Oberholser, H. C. s. n. June 1918 (5)
Ownbey, M. 669 (5)
Pond, R. H. s. n. May 29, 1897 (5)
Porter, H. T. s. n. July 13, 1896 (5)
Reverchon, 725 (5)
Rose, J. N. & W. R. Fitch s. n. Oct. 1913 (1)
Rowell, C. M. & F. A. Barkley 17T238 (5)
Rydberg, P. A. 715 (5)
Schafer, J. H. 2916 (3)
Schafer, J. H. 12132 (3)
Schuneman, G. July 1892 (5)
Scribner, F. L. 60b (5)
Sinclair, J. G. s. n. Sept. 1925 (5)
Smith, F. A. s. n. July 1896 (5)
Starz, E. s. n. June 1893 (5)
Tharp, B. C. 47168 (5)
Tharp, B. C. s. n. April 29, 1933 (1)
Tweedy, F. 423 (5)
Tweedy, F. s. n. May 20, 1888 (5)
Tyler, F. J. s. n. May 13, 1904 (1)
Upton, F. E. s. n. May 1908 (1)
Weber, C. 438 (5)
Wiegard, E. F. 205 (5)
Williams, T. A. s. n. Aug. 1891 (5)
Wright, s. n. May 1950 (1)

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APPENDIX

Key to the Subtribe Coryphanthanae, Tribe Cereeae, of the Cactaceae

(Modified from Britton & Rose, 1923)

- A. Ovary more or less scaly.
- B. Some of the spines hooked; occurring in Texas and northern Mexico. Ancistrocactus
- BB. None of spines hooked.
- C. Tubercles not deeply grooved; fruit scaly and dry; native of Mexico. Thelocactus
- CC. Tubercles deeply grooved; fruit nearly naked, thin-walled and papery; central and northern Mexico and Texas. Neolloydia
- AA. Ovary naked
- D. Flowers central, borne in axils of young tubercles; tubercles grooved above; fruit dull green or red; seeds black or brown.
- E. Seeds mostly light brown; fruit green or yellowish even when mature, ripening slowly; common in Mexico and southern United States. Coryphantha
- EE. Seeds black or dark brown; fruit red, maturing rapidly.
- F. Tubercles not numerous and not persisting as woody knobs; flowers yellow to yellow green; hilum of seed large; occasional on the Great Plains. Neobesseya

FF. Tubercles numerous, persisting after spines fall off as woody knobs; flowers pink to purple; hilum of seed small; northern Mexico and southern Texas. Escobaria

DD. Flowers lateral, borne in axils of old and mature tubercles; tubercles never grooved above; extending from Central America to southern United States. Neomammillaria



Fig. 1. *NEOBESSEYA WISSMANNII* (Hildman) Britton & Rose
Travis Co., Austin, Texas. Coville 1800 (US). X2

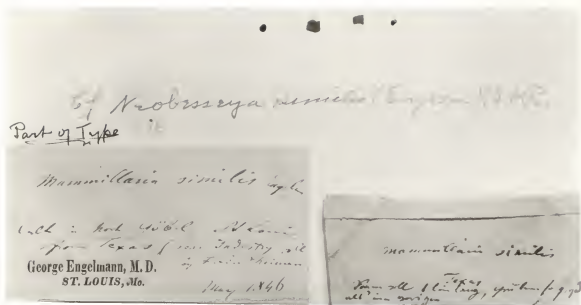


Fig. 2. *NEOBESSEYA SIMILIS* (Engelm.) Britton & Rose Austin Co.,
 Industry, Texas. F. Lindheimer s. n. (MO). The specimen
 consists only of one seed and fragments of the fruit.

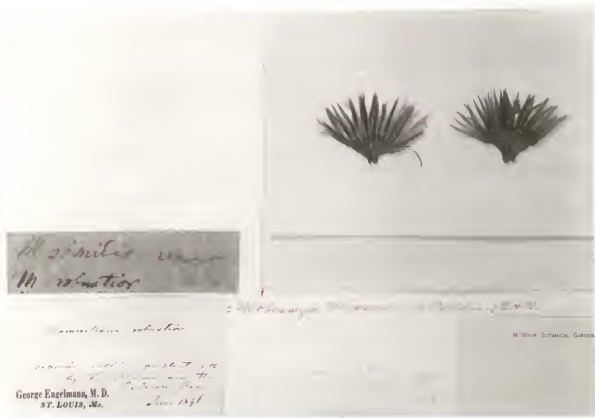


Fig. 3. *NEOBESSEYA WISSMANNII* (Hildman) Britton & Rose
 Blanco Co., Pterdenales, Texas. F. Lindheimer s. n. (MO).

31734. Flowered March 13, 1910.
Coryphantha cubensis
 Cuba, Schafer # 2946. 1909.
 Flowers pale green 16 mm. high.



Fig. 4. *NEOBESSEYA CUBENSIS* (Britton & Rose) Hester Holguin,
 Oriente, Cuba. J. H. Schafer 2946 (NY) (TYPE).



Fig. 5. *NEOBESSEYA MISSOURIENSIS* var. *NOTESTEINII* (Britton & Rose)
comb. nov. Deer Lodge, Montana. Notestein s. n. (US) (TYPE).



Fig. 6. *NEOBESSEYA WISSMANNII* (Hildman) Britton & Rose



Fig. 7. *NEOBESSEYA MISSOURIENSIS* (Sweet) Britton & Rose
var. *MISSOURIENSIS*



Fig. 8. *NEOBESSEYA MISSOURIENSIS* (Sweet) Britton & Rose
var. *MISSOURIENSIS*



Fig. 9. *NEOBESSEYA MISSOURIENSIS* (Sweet) Britton & Rose
var. *MISSOURIENSIS*

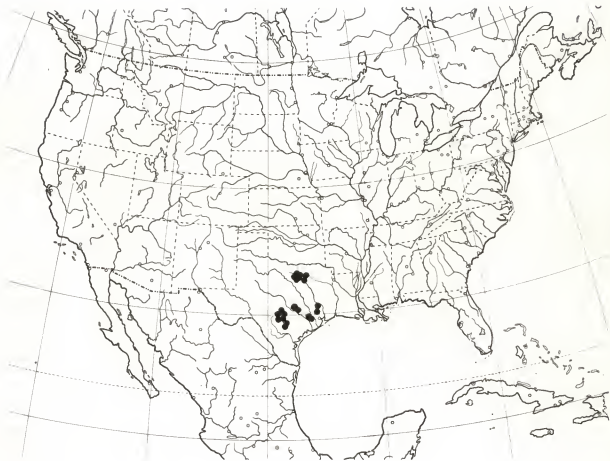


Fig. 10. Distribution of *NEOBESSEYA SIMILIS*

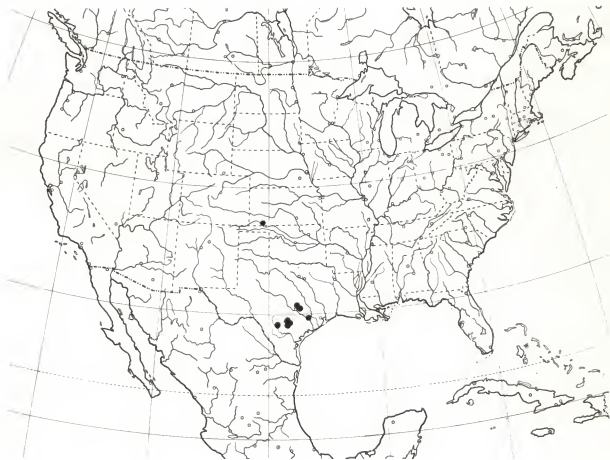


Fig. 11. Distribution of *NEOBESSEYA WISSMANNII*

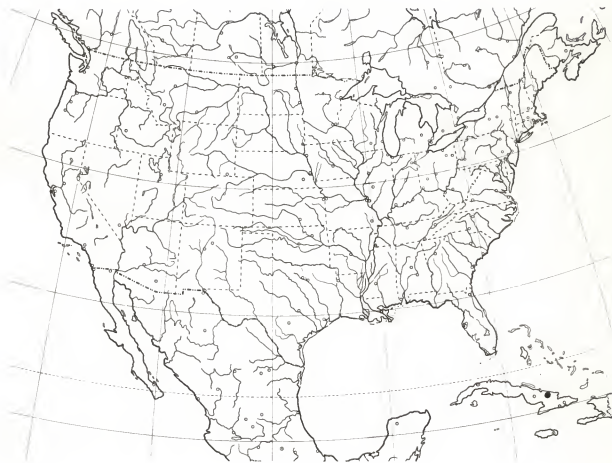


Fig. 12. Distribution of *NEOBESSEYA CUBENSIS*

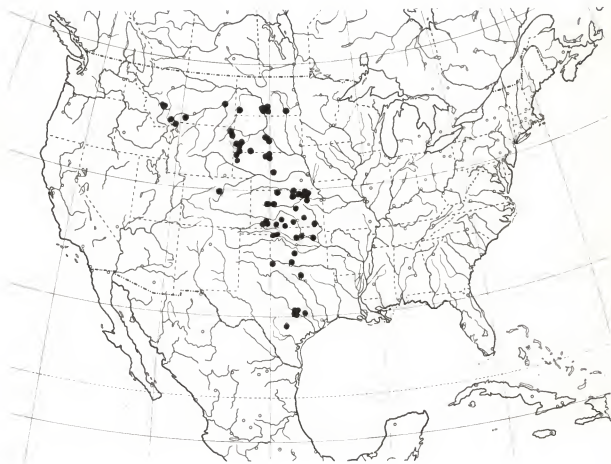


Fig. 13. Distribution of *NEOBESSEYA MISSOURIENSIS* var. *MISSOURIENSIS*



Fig. 14. Distribution of *NEOBESSEYA MISSOURIENSIS* var. *NOTESTEINII*

A REVISION OF NEOBESSEYA IN THE UNITED STATES AND CUBA

by

ARLENE EDITH ABEL

B. A., University of Kansas, 1958

AN ABSTRACT OF A MASTER'S THESIS

submitted in partial fulfillment of the

requirements for the degree

MASTER OF SCIENCE

Department of Botany

KANSAS STATE UNIVERSITY
Manhattan, Kansas

1963

The genus NEOBESSEYA is a genus of mammiform cacti occurring from Central America north to Montana. This study includes those species occurring in the United States and in Cuba. The purpose of this study was to determine the infrageneric taxa, their distribution and to align the nomenclature.

NEOBESSEYA is only of occasional occurrence, and it is for the most part restricted to the Great Plains. The plants occur singly or in clusters, and are characterized by having perianth parts which are yellow, yellowish-green to straw colored, or rarely pink; red fruits which are obovate to narrowly obovate; and black pitted seeds which are 1 - 2.3 mm at greatest diameter.

Four species, one with two varieties, are recognized. A dichotomous key has been constructed to separate the entities. One new nomenclatural combination is proposed: NEOBESSEYA MISSOURIENSIS var. NOTESTEINII (Britton & Rose) comb. nov. The range of NEOBESSEYA WISSMANNII, formerly thought to be restricted to central Texas, was extended into Kansas. A distribution map is provided for each taxon, and an index to exsiccatae has been prepared.