

## A MONOGRAPH OF THE GENUS RATIBIDA<sup>1</sup>

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The genus *Ratibida*, comprised of six perennial species, one variety, and one color form, is native to southern Canada, the United States, and northern Mexico. The plants inhabit prairies, edge of woodlands, coastal plains, foothills, pine forests and meadows. The meaning of the name *Ratibida*, as far as can be determined, is unknown. *Ratibida columnifera*, *R. pinnata* and *R. tagetes* are sold by nurseries under the name of coneflowers; the other species are of little economical importance. Although Indians of northern Mexico use *R. mexicana* as a wash and potion for bites, rheumatism and other ailments, the plants are of little forage value and are frequently classified as weeds because of their ruderal nature.

This study is the first monographic treatment of *Ratibida* and is based on 3703 specimens from 15 herbaria. Extensive field studies of all taxa from Minnesota to northern Mexico and Colorado to Ohio have afforded the author an opportunity to make population studies and to make more than 300 collections throughout the range of the genus. The completion of this work will add to the knowledge of the genus and provide a basis for future biosystematic study.

Chromosome numbers for the species of *Ratibida* are listed in Table 1. Recorded chromosome counts for the genus are  $n = 14$  in *R. columnifera* and *R. peduncularis* var. *picta* (Jackson, 1959),  $n = 16$  in *R. tagetes* (Jackson, 1959),  $2n = 26, 27$  in *R. columnifera* (Perdue, 1959) and  $2n = 28$  in *R. pinnata* (Perdue, 1959). These chromosome numbers were verified during this study from root tip material; counts of other taxa of *Ratibida* not previously recorded are shown in Table 1.

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Table 1. Chromosome Numbers in *Ratibida*

Species	<i>n</i>	Seed Source <sup>1</sup>
<i>R. columnifera</i> <i>f. columnifera</i>	14	Ford Co., Kans. 3763
<i>R. columnifera</i> <i>f. pulcherrima</i>	14	Sheridan Co., Kans. 1069
<i>R. latipalearis</i>	14	Colonia Garcia, Chihuahua, Mex. <i>D. Spilsbury</i>
<i>R. mexicana</i>	14	50 km sw. of Guerrero, Chihuahua, Mex. <i>Hector and Raul Sea</i>
<i>R. peduncularis</i> var. <i>peduncularis</i>	14	Willacy Co., Tex. 3743
<i>R. peduncularis</i> var. <i>picta</i>	14	Gonzales Co., Tex. 3728
<i>R. pinnata</i>	14	Anderson Co., Kans. 3767
<i>R. tagetes</i>	16	Mora Co., N. Mex. 3773

<sup>1</sup>Unless otherwise indicated, the numbers quoted are those of the author's collections.

Pollen of all taxa was examined and the only significant difference in stainability was noted in *R. peduncularis* var. *picta* which was 85 percent as compared to 91-97 for the other species. Pollen size for the genus is 17-26 micra as indicated in Table 2. Cotton blue in lactophenol was used and pollen grains taking a full, dark stain were considered viable. Percent of stainability is based on 500 grains for each taxon and measurements of the outside diameter, exclusive of spines, were taken from 50 grains at 430 magnification.

Rafinesque (1817) founded *Ratibida* with a brief description based on *Rudbeckia columnaris* Pursh (1814). In his description, Rafinesque said, "The species with naked seeds such as *Rudbeckia pinnata* Vent. (1800) must form my genus *Obelisteca* and those with a simple perianthe, such



Table 2. Size and Stainability of Pollen in *Ratibida*

Species	Percent Stainable	Size Range in Micra	Average Size in Micra	Sources of Material
<i>R. columnifera</i> <i>f. columnifera</i>	97.2	17.1-21.5	19.01	<i>Richards 3722</i>
<i>R. columnifera</i> <i>f. pulcherrima</i>	94.5	19.8-26.64	24.37	<i>Richards 3725</i>
<i>R. latipalearis</i>	93.9	18.2-23.3	20.20	<i>Richards 3770</i>
<i>R. mexicana</i>	97.4	18.9-26.64	22.11	<i>Richards 3768</i>
<i>R. peduncularis</i> var. <i>peduncularis</i>	91.5	19.8-26.9	22.77	<i>Richards 3739</i>
<i>R. peduncularis</i> var. <i>picta</i>	85.0	18.4-23.1	21.14	<i>Richards 562</i>
<i>R. pinnata</i>	95.2	18.9-25.8	22.87	<i>Richards 3766</i>
<i>R. tagetes</i>	96.2	18.7-23.3	21.68	<i>Richards 3764</i>

as *Rudbeckia columnaris*, must form my genus *Ratibida*." Rafinesque (1819) published a complete description of *Ratibida* and the same year described the genus *Lepachys* based on *Rudbeckia pinnata* Vent. *Lepachys*, a later name than *Ratibida*, is not acceptable under the International Rules of Botanical Nomenclature.

Cassini (1825) described *Obeliscaria* based on *Rudbeckia pinnata* Vent. and deCandolle (1836) treated *Ratibida* and *Lepachys* as synonyms of *Obeliscaria*. *Obeliscaria*, described later than *Ratibida*, is also congeneric with *Ratibida* Raf. Don (1838) recognized *Ratibida* as being the first validly published name for the genus, even though *Lepachys* and *Obeliscaria* were still being used by other authors.

Torrey and Gray (1842) used *Lepachys* for three species and one variety, *L. columnaris*, *L. pinnata*, *L. peduncularis* and *L. columnaris* var. *pulcherrima*. Gray (1852) named *L. peduncularis* var. *picta* and later transferred *Rudbeckia tagetes* James to *Lepachys*. Watson (1888) described *Lepachys mexicana*, and Barnhart (1897) recognized *Ratibida* and rejected *Lepachys* on a priority basis.



The only recent study of the genus was by Sharp (1935) who did a comparative study on all epappose genera of the Heliantheae.

#### TAXONOMIC CHARACTERS

ROOTS. Fibrous and taproots occur within the genus.

STEMS. The stems are 1.6 to 12.3 dm tall, herbaceous, and branched or unbranched. The leafy branches terminate upward into a naked peduncle. The stems are sulcate with those of *R. mexicana* and *R. latipalearis* averaging 10 ridges, *R. tagetes* 5-6, and all other species 8 ridges.

LEAVES. The leaves of all species are alternate with larger ones at the base and smaller leaves higher up. Petioles on lower leaves are long, becoming short to absent on the uppermost ones. The leaf blades are entire to pinnate, lyrate-pinnate or pinnatifid, linear to lanceolate or obovate.

VESTITURE. The leaves of all species are punctate and hirsute to strigose-hirsute. The trichomes on the lower parts of the stem are up to 1 mm long or longer in *R. mexicana*, *R. peduncularis*, *R. pinnata*, and also *R. columnifera* f. *pulcherrima* occurring at high elevations. The remaining taxa possess trichomes of 0.5 mm or shorter. With few exceptions the leaf pubescence is more dense on the lower surface and limited to the veins and margins on the upper surface; stems and peduncles are hirsute to strigose-hirsute on the ridges with unicellular globular glands in the grooves.

PEDUNCLES. Length of the peduncle is important taxonomically as it ranges from 6 cm in *R. tagetes* to 62 cm in *R. mexicana*. The heads are solitary at the ends of naked peduncles.

PHYLLARIES. The herbaceous phyllaries are strigose-hirsute on the outer surface and glabrous to strigose-hirsute only at the tip and along the vein of the inner surface. They are biseriate with the inner 0.1-6.0 mm long, ovate, and the outer series 0.1-14 mm long and linear-lanceolate. Occasionally they appear as a single row or poorly defined double series, e.g. *R. mexicana*.



**PALEA.** The palea are conduplicate, enclosing the achenes and falling from the receptacle with mature seed in all species except *R. mexicana*. The adaxial edges are hyaline and may be winged or ciliate. The abaxial edges are velutinous-hirsute to about half way down with unicellular glands from the middle to the base in all species except *R. mexicana* which occasionally lacks glands. The tips are recurved and densely velutinous-hirsute, giving the characteristic hoary appearance to the immature heads. A dark resinous linear or oblanceolate gland is along the adaxial edge.

**RECEPTACLE.** The receptacle is narrow with a tapered apex or oblong with a rounded apex and is usually 2.5 cm or longer in all species other than *R. pinnata* and *R. tagetes*.

**RAY COROLLAS.** The ray corollas are yellow, yellowish-purple or purple in various species and are all neutral. They are ovate-oblanceolate or lanceolate-oblong with two to three teeth at the apex and reflexed in all species except *R. mexicana* and *R. latipalearis*.

**DISC COROLLAS.** The disc corollas are fertile, 0.7-2.0 mm long. Each has a light yellowish-green, tubular corolla with purple in the lobes in all species except *R. peduncularis* var. *peduncularis* which has a dark purplish-green apex and *R. latipalearis* with a dark yellow-green apex. They are glabrous except the outer surface of the lobed apex which is velutinous in immature flowers and has globular glands as maturation proceeds. *Ratibida mexicana* has a vertical row of ciliate hairs on the tube opposite the adaxial edge of the palea. Petal segments are distinguishable by a vertical resinous gland from the base of the lobed apex to the base of the tube.

**STIGMAS.** The stigmas are of taxonomic significance due to variation in the length of the stigmatic surface in various species. At anthesis, the stigmas of *R. mexicana* are greenish-purple, but they are reddish-purple in all other taxa.

**PAPPUS.** The pappus is a crown or small ring in *R. tagetes*, awn-like or lacking in *R. mexicana* and *R. pinnata*,



and of one to two tooth-like projections in the remaining taxa.

ACHENES. The disc achenes are taxonomically important because of the pubescence on the lateral margins. The adaxial and abaxial margins are glabrous, ciliate or pectinate-fimbriate with the rest of the surfaces glabrous. The base is indented and the shapes vary from linear-oblong to oblong-oblique. Ray achenes are triangular and strigose-hirsute at the apex.

#### GENERIC RELATIONSHIPS

*Ratibida* is a member of the epappose group of the tribe Heliantheae, family Compositae, and is similar to *Echinacea* and *Rudbeckia*. It is closely related to *Rudbeckia* on the basis of columnar receptacles, phyllaries, palea and pappus development. The achenes of *Ratibida* are flattened laterally and are triangular while in *Echinacea* and *Rudbeckia* they are four-sided. The phyllaries of *Ratibida* are in two series of unequal lengths while *Echinacea* and *Rudbeckia* have two to three series of about equal length. Palea are absent in the columnar receptacle types of *Rudbeckia*, but the phyllaries and palea development of *Ratibida* is similar to *Rudbeckia* (*Dracopsis*) *amplexicaulis*, which some authors consider a distinct genus.

Based on distribution, morphology, method of seed dispersal, and the ruderal nature of the species, Sharp (1935) believed *Rudbeckia* (*Dracopsis*) *amplexicaulis* and *Ratibida* originated from a common ancestor. Anatomically, *Ratibida* and *Rudbeckia* (*Dracopsis*) *amplexicaulis* are similar in stem structure in that the resin canals are opposite the vascular bundles instead of interfascicular as in *Echinacea*. Reported haploid chromosome numbers for *Ratibida* are  $n = 16$  and  $n = 14$  (Jackson, 1959 and Perdue, 1959); *Rudbeckia* has a reported haploid number of 16, and *Echinacea* has a basic number of  $n = 11$  (Darlington and Wylie, 1955).

#### SYSTEMATIC TREATMENT

*RATIBIDA* Raf., Flor. Ludovic., p. 73. 1817.

*Rudbeckia* Linn., Sp. Pl. 906. 1753, in Part.



*Obelisteca* Raf., Flor. Ludovic., p. 73. 1817.

*Lepachys* Raf., J. Phys. 89:100. 1819.

*Obeliscaria* Cass., Dict. Natur. Sci. 35:272. 1825.

Plants perennial with herbaceous stems. Stems simple or branched, mostly erect, strigose-hirsute with vertical light green ridges and dark green grooves containing unicellular-globular glands. Leaves alternate, entire to pinnate, lyrate-pinnate or pinnatifid, linear to lanceolate or obovate, strigose-hirsute with scattered punctate glands interspersed on both surfaces. Heads globular to columnar, solitary on naked peduncles, receptacle linear or oblong; phyllaries reflexed, strigose-hirsute and in two series, a short ovate inner and a longer linear-lanceolate outer series. Ray flowers neutral, yellow, purplish-yellow or purple, reflexed or upright, ovate-oblong to lanceolate-oblong, outer reflexed surface glabrous, inner strigose to hirsute and punctate, apex 2-3-toothed. Disc corollas tubular, greenish-yellow to purplish-green with slight purple at apex, 5-lobed, lobes ovate, reflexed, 0.3-1.0 mm long, 0.3-0.8 mm wide, inner lobe surface velutinous in immature flower but with punctate glands at anthesis; styles short, flat or filiform, style branches short and stigmatic surface a fourth to half the length of the style branches; stamens with sagittate anthers basifixed to short filaments. Palea conduplicate, apex densely velutinous and incurved, adaxial margins hyaline with some ciliation, a small linear to oblanceolate resin gland present on both surfaces near the adaxial edge, abaxial edge velutinous-hirsute to near the middle and glandular to the base, falling at maturity with the achenes except in *R. mexicana*. Achenes glabrous except the edges may be ciliate or pectinate-fimbriate, linear-oblong or oblong-oblique, laterally flattened, with a grooved base. Pappus a crown, or of 1-2 teeth, or lacking.

Native to North America north of the 20th parallel.

Type species. *Ratibida pinnata* (Vent.) Barnhart, Bull. Torr. Bot. Club. 24:410. 1897.



## KEY TO THE SPECIES

Plants with fibrous roots, achenes lacking a crown or tooth-like projections.

Heads columnar; stems unbranched ..... 1. *R. mexicana*.

Heads globular; stems branched ..... 2. *R. pinnata*.

Plants with a taproot, achenes with a crown or tooth-like projections.

Stigmatic surface half the length of the style branch; achenes pectinate-fimbriate on one or two edges.

Leaves bipinnatifid; achenes pectinate-fimbriate on the edges ....

..... 3a. *R. peduncularis* var. *peduncularis*.

Leaves lyrate-pinnate; achenes pectinate-fimbriate along only one edge .....

..... 3b. *R. peduncularis* var. *picta*.

Stigmatic surface one-fourth the length of the style branch; achenes ciliate or glabrous on one edge.

Heads columnar; pappus of tooth-like projections.

Rays reflexed; palea longer than broad.

Rays yellow ..... 4a. *R. columnifera* f. *columnifera*.

Rays purplish-yellow to purple .....

..... 4b. *R. columnifera* f. *pulcherrima*.

Rays upright; palea broader than long ..... 5. *R. latipalearis*.

Heads globular; pappus a crown ..... 6. *R. tagetes*.

1. *RATIBIDA MEXICANA* (Wats.) Sharp, Ann. Mo. Bot. Gard. 22:76,77. 1935.

*Lepachys mexicana* Watson, Proc. Am. Acad. Sci. & Arts 23:277. 1888.

One to several unbranched stems 4.4-9.2 dm tall, pilose-hirsute, spreading above. Leaves ovate-obovate to lanceolate-oblong, basal ones long-petioled, 0.4-2.3 dm long, 1.3-5.6 cm wide, serrate or crenulate, 3-nerved, hirsute below, less so above; upper leaves 2-5 pinnate-parted or cleft, 4.3-16.1 cm long, terminal lobe lanceolate and two-thirds the length of the entire leaf, lateral lobes narrowly oblong or lanceolate, serrate, 0.5-3.3 cm long, 0.1-1.6 cm wide. Peduncles 21.3-61.9 cm long. Heads solitary on naked peduncles, columnar, 1.3-3.2 cm long, 1.0-1.2 cm wide, broader at the base; receptacle linear, tapering at apex. Phyllaries 7-13, 0.4-2.1 cm long, 1.0-2.5 mm wide. Ray flowers 8-15, yellow, oblong or ovate-obovate, 1.5-4.0 cm long, 1.5-11.0 mm wide, outer surface densely hirsute with numerous dark punctate glands, inner surface glabrous, tube 0.8-1.4 mm long, apex 2-3 lobed, 0.1-3.5 mm long, 0.2-2.3 mm wide. Disc corollas 1.8-2.3 mm long, lobes ovate, 0.8-1.0 mm wide, 0.6-1.0 mm long, tube ciliate along one margin; anthers 1.4-2.0 mm long, filaments 0.7-1.0 mm long; styles 1.3-2.0 mm long, the branches 1.0-1.2 mm long, stigmatic surface light yellow, a fourth the length of the style branch. Palea 3.3-5.0 mm long, 1.7-2.1 mm wide, non-deciduous, adaxial edge glabrous or with an occasional unicellular gland, abaxial edge ciliate; resin gland



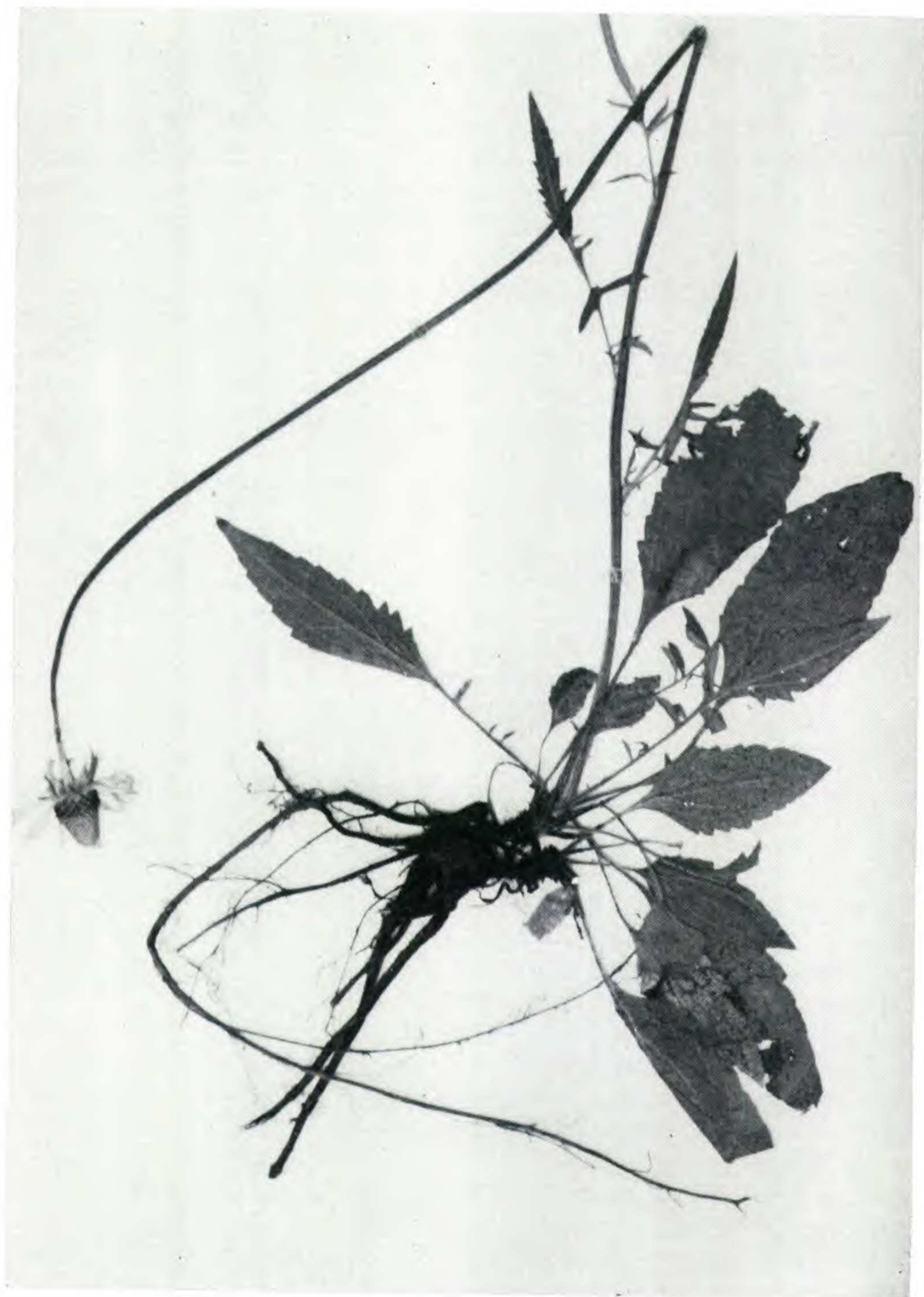


Plate 1387

Fig. 1. *Ratibida mexicana*. ca. 1/3 actual size. Richards 3768 (KANU).



linear, 2.2-3.1 mm long. Achenes oblong, 2.6-4.0 mm long, 1.2-3.0 mm wide, glabrous except for occasional ciliate hairs on adaxial edge and apex, pappus lacking. (Figs. 1, 9, 11d, 12d, & 13d).

Flowering time: July-October.

Holotype. Mexico. Chihuahua: cool slopes of the Sierra Madre Occidental, Sept. 19, 1887, *Pringle 1305* GH; Iso-type NY!, US!).

Habitat and Distribution. Pine forests and meadows of the Sierra Madre Occidental, Chihuahua, Durango, and Sonora, Mexico.

*Ratibida mexicana*, occurring at elevations from 6000-9500 feet, is scattered along the Sierra Madre Occidental of northwestern Mexico and has been infrequently collected. Much of this area is accessible only by foot or horse travel and is sparsely populated. The plants are characterized by the upright ligules, unbranched stems, and undivided basal leaves. The Tarahumar Indians refer to the plant as "Howinowa" and crush the roots to use on legs for rheumatism. Other Indian tribes use the roots for a wash and potion and the leaves in a beverage for headaches and colds.

Representative specimens selected from 37 sheets: MEXICO: CHIHUAHUA: *Gentry 2712* (ARIZ, F, GH, MO, UC, US); *Richards 3768* (KANU); *Richards 3769* (KANU); *Townsend & Barber 101* (F, MO, NY, US). DURANGO: *Nelson 4777* (NY, US). SONORA: *Phillips 683* (GH, LL).

## 2. *RATIBIDA PINNATA* (Vent.) Barnhart, Bull. Torr. Bot. Club. 24:410. 1897.

*Rudbeckia pinnata* Vent., Desc. Nouv. Pl. Jard. Cels. p. 71. 1800.

*Lepachys pinnatifida* Raf., J. Phys. 89:100. 1819.

*Obeliscaria pinnata* (Vent.) Cass., Dict. Sci. Natur. 35:372. 1825.

*Lepachys pinnata* (Vent.) Torr. & Gray, Fl. N. Am. 2:314. 1842.

Stems one or many, branched, 3.4-12.3 dm tall, hirsute pubescence above. Leaves orbicular-oblong to ovate-oblongate or obovate, lower leaves long-petioled, 1.2-3.9 dm long, 1.0-2.5 cm wide, 3-7 pinnate segments, lanceolate-ovate, upper leaves short petiolate or sessile, 0.1-3.1 dm long, segments 3-9, narrowly lanceolate to ovate, 0.1-1.3 dm





Plate 1388

Fig. 2. *Ratibida pinnata*. ca. 1/3 actual size. Richards 1152 (KANU).



long, 0.2-3.2 cm wide, 3-nerved, serrate or lobed. Peduncles 3.0-26.5 cm long. Heads solitary, globular, 1.1-2.5 cm long, 1.1-1.8 cm wide; receptacle oblong, rounded at apex. Phyllaries 10-14, outer series 0.3-1.1 cm long, 1.0-3.0 mm wide, inner 0.3-0.6 cm long, 1.0-3.0 mm wide. Ray flowers 6-13, yellow, linear to oblong-ob lanceolate, 1.6-6.0 cm long, 0.4-1.5 cm wide, outer surface puberulous-hirsute and with punctate glands, inner surface puberulous, apex 2-3 lobed, lobes 0.2-9.0 mm long, 0.2-6.0 mm wide. Disc corollas 1.3-3.0 mm long, lobes 0.6-0.9 mm wide, 0.5-1.0 mm long; anthers 1.7-2.3 mm long, filaments 0.6-1.2 mm long; styles 1.0-2.1 mm long, the branches 1.0-2.0 mm long, stigmatic surface half the length of the style branch. Palea 1.2-5.0 mm long, 1.0-1.8 mm wide, adaxial edge hyaline, entire to ciliate, abaxial edge strigose on upper half and unicellular glands on lower half, resin gland linear, 2.2-3.3 mm long. Achenes linear-ob lanceolate, glabrous except for occasional ciliate adaxial edge and apex, 2.4-3.0 mm long, 1.3-2.0 mm wide; pappus lacking. (Figs. 2, 10, 11a, 12a, 13a).

Flowering time: May-October.

Holotype. Illinois: discovered in the country of Illinois by Michaux, grown in Jardin de Cels from seed collected by Michaux (G? Photograph !).

Habitat and Distribution. Edge of woodlands, limestone outcroppings, and prairies. Central and eastern United States and southeastern Canada.

*Ratibida pinnata* is distributed in Canada and the United States east of the 98th meridian and is less frequent east of the 85th meridian. Colonies can be found along fence rows, edge of woods, banks and ditches. Characteristics of the species are the numerous globular heads, long, yellow ligules, pinnate leaves with coarsely serrate to lobed segments and many branched stems. Because of the similarity in ligules and heads, *R. pinnata* has been confused with *Rudbeckia*.

Representative specimens selected from 789 sheets: UNITED STATES: ALABAMA: Choctaw Co.: *Schuchert*, in 1896 (NY, US). Madison Co.: *Harper 3683* (F, GH, MO, NY, US). Marengo Co.: *McVaugh 8560* (F, GH, TEX). Montgomery Co.: *Howard 12918* (ARIZ, F, GH, KANU, MO, NY, OKL, TEX, UC, US). ARKANSAS: Baxter Co.: *Palmer 6003* (MO, US). Benton Co.: *Richards 1149* (KANU). Carroll Co.: *Richards 1151* (KANU). Clark Co.: *Demaree 17799* (F, MO, OKL). Fulton Co.: *Demaree 26864* (OKL, TEX). Hempstead Co.: *Palmer 8037* (MO). Lawrence Co.: *Demaree 30999* (KANU, OKL). Marion Co.:



*Moore 450809* (TEX). Sharp Co.: *Demaree 26894* (KANU, OKL). Washington Co.: *Moore*, in 1927 (TEX). FLORIDA: Jackson Co.: *Wiegand & Manning 3371* (GH). GEORGIA: Bartow Co.: *Duncan 8422* (GH, MO, NY, UC). Catoosa Co.: *Cronquist 5406* (GH, MO, NY, UC, US). Sumter Co.: *Harper 1051* (GH, MO, NY, US). ILLINOIS: Adams Co.: *Evers, Jones & Jones 567* (GH, MO, TEX, UC). Carroll Co.: *Lodewyks 391* (MO). Champaign Co.: *Jones 15307* (MO, TEX, UC). Cook Co.: *Smith 6035* (F, GH, MO, UC). Cumberland Co.: *Richards 1696* (KANU). Du Page Co.: *Umbach 5657* (NY). Fulton Co.: *Chase 10567* (F). Hancock Co.: *Mead*, Augusta (NY). Henderson Co.: *Patterson*, Oquawka (F, MO, NY). Jackson Co.: *Gleason 2802* (GH). Kankakee Co., *De Selm 543* (F). Lake Co.: *Gates 2891* (F). Macon Co.: *Clokey 2406* (F, GH, MO, NY, UC, US). Mason Co.: *Gleason 9222* (NY). McHenry Co.: *Bennett 7971* (F). McLean Co.: *Robinson*, in 1886 (GH). Peoria Co.: *Chase 13497* (F, LL, UC). Pope Co.: *Palmer 17003* (MO). Richland Co.: *Ridgway 742* (GH). St. Clair Co.: *Tesch* (NEB). Sangamon Co.: *Fuller 1367* (F). Stark Co.: *Chase 709* (F, MO). Whiteside Co.: *Reecher 219* (F). Will Co.: *Swink 2453* (F). Winnebago Co.: *Bebb 3508* (MO). INDIANA: DeKalb Co.: *Shoop*, in 1933 (F). Delaware Co.: *Brady*, in 1888 (UC). Elkhart Co.: *Ek*, in 1942 (F, MO). Greene Co.: *Springer 825* (KANU, NEB, TEX). Jasper Co.: *Welch 1821* (GH, MO). Lagrange Co.: *Perdue 2062* (LL). La Porte Co.: *Coulter*, in 1878 (F, GH). Lawrence Co.: *Kriebel 2314* (GH). Marion Co.: *Floyd*, in 1887 (F). Marshall Co.: *Stovell & Walton 823* (US). Newton Co.: *Friesner 14707* (NY, UC). Noble Co.: *Brooks 2595* (KANU). Porter Co.: *Swink 1772* (F). St. Joseph Co.: Coll. unknown (*E.B.U.*), in 1891 (F). Union Co.: *Rose*, in 1886 (F). Wabash Co.: *Friesner 9006* (F, TEX). Wells Co.: *Deam 1370* (MO, NY, US). IOWA: Adams Co.: *Richards 1264* (KANU). Audubon Co.: *Richards 1296* (KANU). Black Hawk Co.: *Burk 556* (MO). Buena Vista Co.: *Richards 1276* (KANU). Carroll Co.: *Richards 1272* (KANU). Cass Co.: *Richards 1267* (KANU). Cedar Co.: *Pammel 712* (GH). Clay Co.: *Richards 1277* (KANU). Clayton Co.: *Shimek*, in 1923 (NY). Dallas Co.: *Allen*, in 1867 (GH, MO). Decatur Co.: *Anderson*, in 1904 (MO). Dickinson Co.: *Richards 1281* (KANU). Emmet Co.: *Cratty*, in 1897 (MO, US). Fayette Co.: *Fink 545* (US). Harrison Co.: *Fay 3678* (KANU). Iowa Co.: *Easterly 757* (ARIZ). Johnson Co.: *Loufek*, in 1938 (NY). Madison Co.: *Shimek*, in 1917 (MO). Mahaska Co.: *Augustine 377* (OKL). Monona Co.: *Gleason 9324* (NY). Montgomery Co.: *Richards 1265* (KANU). Muscatine Co.: *Shimek*, in 1910 (F, MO). O'Brien Co.: *Shimek*, in 1929 (NY). Osceola Co.: *Richards 1282* (KANU). Pottawattamie Co.: *Bates 437* (NEB). Poweshiek Co.: *Rohrbaugh 100* (OKL, TEX). Ringgold Co.: *Richards 1261* (KANU). Sac Co.: *Richards 1274* (KANU). Story Co.: *Pammel & Ball 56* (CS, F, GH, MO, NY, US). Taylor Co.: *Richards 1263* (KANU). Union Co.: *Richards 1262* (KANU). Washington Co.: *Wagenknecht 568* (F).



Webster Co.: *Somis 3892* (NEB). Winneshick Co.: *Tolstead*, in 1933 (MO). Woodbury Co.: *Hayden 10783* (UC). KANSAS: Allen Co.: *Richards 1137* (KANU). Anderson Co.: *Richards 1134* (KANU). Atchison Co.: *Horr 4468* (GH, KANU). Bourbon Co.: *Thompson, Hammond* (KANU). Brown Co.: *Horr 4486* (GH). Cherokee Co.: *McGregor 15802* (KANU). Coffey Co.: *Richards 1080* (KANU). Doniphan Co.: *Horr 4261* (KANU). Douglas Co.: *Richards 3766* (KANU). Franklin Co.: *Richards 3752* (KANU). Greenwood Co.: *Englemann 1033* (OKL). Jefferson Co.: *Richards 1255* (KANU). Johnson Co.: *McGregor 4381* (GH, KANU). Labette Co.: *Rydberg & Imler 310* (KANU, NY). Leavenworth Co.: *Richards 1256* (KANU). Linn Co.: *Richards 3754* (KANU). Lyon Co.: *McGregor 14071* (KANU). Montgomery Co.: *Richards 1139* (KANU). Neosho Co.: *Richards 3166* (KANU). Shawnee Co.: *Norton & Clothier 266* (GH, MO, NY, US). Wabaunsee Co.: *McGregor 14073* (KANU). Wilson Co.: *Horr*, in 1930 (KANU). Woodson Co.: *Horr & McGregor*, in 1947 (KANU). Wyandotte Co.: *Richards 3256* (KANU). KENTUCKY: Bullitt Co.: *Bishop 386* (GH). Edmondson Co.: *Lix*, in 1947 (US). Jefferson Co.: *Gunn J-165, 1655* (MO, NY). Logan Co.: *Gleason 8929* (NY). Mercer Co.: *King 125* (F). Scott Co.: *Singer 364* (US). Warren Co.: *Price*, in 1900 (MO). LOUISIANA: La Salle Parish: *Shinners 23990* (GH, TEX). MASSACHUSETTS: Berkshire Co.: *Britton*, in 1909 (NY). MICHIGAN: Calhoun Co.: *Parmelee 2901* (TEX). Ingham Co.: *Parmelee 700* (TEX). Jackson Co.: *Camp & Camp*, in 1897 (F, US). Kalamazoo Co.: *Burgess 378* (F). Kent Co.: *Crozien*, in 1886 (NY). Mackinac Co.: *Ehlers 281* (GH). Washtenaw Co.: *Hermann 9067* (NY). Wayne Co.: *Chandler*, in 1917 (US). MINNESOTA: Cass Co.: *Richards 1406* (F). Cottonwood Co.: *Richards 1285* (KANU). Dodge Co.: *Jeffer*, in 1908 (OKL). Hennepin Co.: *Sandberg*, in 1889 (F, NY, UC). Mower Co.: *Brenckle 47-537* (NY). Murray Co.: *Richards 1288* (KANU). Nicollet Co.: *Ballard*, in 1892 (NY, UC, US). Nobles Co.: *Richards 1284* (KANU). Pipestone Co.: *Richards 1290* (KANU). Ramsey Co.: *Churchill*, in 1912 (MO). Rice Co.: *Hutchinson 47* (NEB). Rock Co.: *Richards 1295* (KANU). Winona Co.: *Holzinger*, in 1905 (NY). MISSISSIPPI: Lowndes Co.: *Diener 934* (NY). Oktibbeha Co.: *Tracy*, in 1892 (US). MISSOURI: Barry Co.: *Richards 1148* (KANU). Benton Co.: *Richards 3340* (KANU). Butler Co.: *Eby*, in 1893 (MO). Camden Co.: *Chandler 4731* (MO). Carter Co.: *Palmer 6204* (MO, US). Cass Co.: *Richards 3312* (KANU). Clay Co.: *Mackenzie 262* (MO, NY). Dallas Co.: *Richards 1162* (KANU). Douglas Co.: *Richards 3401* (KANU). Franklin Co.: *Kellogg 1283* (MO). Greene Co.: *Standley 9622* (US). Henry Co.: *Hitchcock*, Windsor Springs (MO). Hickory Co.: *Richards 1163* (KANU). Jackson Co.: *Bush 164* (MO, NY, OKL, US). Jasper Co.: *Richards 3437* (KANU). Jefferson Co.: *Steyermark 1036* (MO). Johnson Co.: *Richards 1167* (KANU). Laclede Co.: *Richards 1160*



(KANU). Lincoln Co.: *Davis 2732* (MO). Livingston Co.: *Sparling 111* (F). Marion Co.: *Davis 7260* (MO). Mercer Co.: *Palmer & Steyermark 41291* (GH, MO). Nodaway Co.: *Richards 1258* (KANU). Ozark Co.: *Richards 1156* (KANU). Pettis Co.: *Richards 1166* (KANU). Phelps Co.: *Steyermark 72173* (F). Pulaski Co.: *Dixon*, in 1928 (MO). Ralls Co.: *Davis 4645* (MO, TEX). St. Clair Co.: *Bush 12797* (MO). St. Francois Co.: *Bower 17* (F). St. Louis Co.: *Sherff 68* (GH). Saline Co.: *Marsh 1629* (NY). Shannon Co.: *Bush 6147* (MO). Stone Co.: *Richards 3415* (KANU). Taney Co.: *Richards 3387* (KANU). Wright Co.: *Richards 3347* (KANU). NEBRASKA: Cass Co.: *Richards 1308* (KANU). Dakota Co.: *Richards 1306* (KANU). Dodge Co.: *Richards 1307* (KANU). Douglas Co.: *Cleburne*, Omaha (NEB). Nemaha Co.: *Webber 6086* (NEB). Otoe Co.: *Richards 1309* (KANU). Sarpy Co.: *Prind & Saunders 3126* (NEB). Saunders Co.: *Williams*, Ashland (US). NEW YORK: Chautauqua Co.: *Sartwell* (GH). Yates Co.: *Sartwell* (F). OHIO: Adams Co.: *Stephenson*, in 1930 (MO). Delaware Co.: *Crane 2447* (NY). Erie Co.: *Moseley*, in 1895 (GH, US). Franklin Co.: *Condit*, in 1909 (UC). Greene Co.: *Demaree 11477* (MO, US). Ross Co.: *Bartley & Pontius 49* (NY). OKLAHOMA: Adair Co.: *Waterfall 9676* (KANU). Cherokee Co.: *Teachers College*, in 1924 (OKL). Craig Co.: *Stevens 2207* (GH). McCurtain Co.: *Clark 2946* (OKL). Muskogee Co.: *Waterfall 9514* (KANU). Nowata Co.: *Richards 1144* (KANU). Ottawa Co.: *Stevens 2283* (GH, MO, NY, OKLA, US). SOUTH DAKOTA: Clay Co.: *Richards 1305* (KANU). Codington Co.: *Johnson 78* (GH, TEX). Minnehaha Co.: *Richards 1299* (KANU). Roberts Co.: *Johnson* (MO, NY). TENNESSEE: Davidson Co.: *Ward*, in 1877 (US). Franklin Co.: *Eggert*, in 1898 (MO, NY). Lewis Co.: *McDougall 1411* (US). Marshall Co.: *Bain*, in 1892 (US). Maury Co.: *Shimek*, in 1891 (F, MO). Meigs Co.: *Sharp & Underwood 2331* (MO, UC). Rutherford Co.: *Demaree 45751* (KANU). Warren Co.: *Coll. unknown 2639* (US). Wilson Co.: *Svenson 9588* (GH, UC). VERMONT: Chittenden Co.: *Wright 2040* (MO). WISCONSIN: Brown Co.: *Schuetz*, in 1884 (F, GH, NY, US). Buffalo Co.: *Fassett & Wilson 4467* (GH). Dane Co.: *Seymour 1084* (KANU). Door Co.: *Millspauth 3691* (F). La Crosse Co.: *Hartley 997* (US). Milwaukee Co.: *Hasse* (UC). Outagamie Co.: *Melchert*, in 1960 (TEX). Sauk Co.: *Eggert*, in 1903 (MO). Walworth Co.: *Shannon 133a* (MO). Winnebago Co.: *Kellerman* (US). CANADA: ONTARIO: *Macoun 34829* (GH, MO, NY, US).

### 3. *RATIBIDA PEDUNCULARIS* (Torr. & Gray) Barnhart, Bull. Torr. Bot. Club. 24:411. 1897.

Stems one or many, branched, 2.8-11.2 dm tall, thickly hirsute near the base. Leaves oblong-obovate, bipinnatifid to lyrate-pinnate, 1.6-13.7 cm long, 1.0-6.4 cm wide, leaf divisions 3-10, 0.3-6.0 cm long, lobes 0.8-4.3 mm wide. Peduncles 14.8-45.5 cm long. Heads solitary,





Plate 1389

Fig. 3. *Ratibida peduncularis* var. *peduncularis*. ca. 1/3 actual size. Richards 3742 (KANU).



columnar, 1.7-6.9 cm long, 0.8-1.3 cm wide; receptacle linear, tapering at the apex. Phyllaries 7-14, outer series 0.6-1.2 cm long, 0.8-1.3 mm wide, inner 0.1-0.5 cm long, 0.9-1.2 mm wide. Ray flowers 6-13, linear-oblong to oval-orbicular, yellow, purplish-yellow and purple, 4.0-13.5 mm long, 3.0-10.0 mm wide, outer surface hirsute and with unicellular-globular glands, inner glabrous, tube 1.0 mm long, apex 2-3 lobed, lobes 0.2-6.0 mm long, 0.2-3.0 mm wide. Disc corollas 1.5-2.5 mm long, the lobes 0.6-0.8 mm wide, 0.5-0.8 mm long; anthers 1.3-2.0 mm long, filaments 0.5-1.0 mm long; styles 1.0-2.0 mm long, the branches 0.5-2.0 mm long, stigmatic surface half the length of the style branches. Palea 3.0-4.3 mm long, 1.5-3.0 mm wide, adaxial side ciliate, abaxial edge ciliate half way down and with unicellular glands to base, resin gland oval, 1.0-1.8 mm long. Achenes oblique-oblong, 2.3-5.0 mm long, 1.2-3.0 mm wide, margin pectinate-fimbriate, edges winged; pappus of one to two teeth.

3a. *R. PEDUNCULARIS* (Torr. & Gray) Barnh. var. *PEDUNCULARIS*.

*Lepachys peduncularis* Torr. & Gray, Flora N. Am. 2:315. 1842.

*Obeliscaria peduncularis* (Torr. & Gray) Walp., Repert. 2:979. 1843.

Leaves bipinnatifid, ovate-oblong, 2.1-11.2 cm long, 1.1-4.0 cm wide, segments 4-10, linear-lanceolate to ovate-obovate, 0.1-3.2 cm long, 0.1-1.1 cm wide; hairs on upper part of stem with raised base. Achenes pectinate-fimbriate on both edges. Ray flowers yellow to purplish-yellow. (Figs. 3, 10, 11g, 12g, 13g).

Flowering time. March-November.

Lectotype. Texas: S. Felipe de Austin, in 1835, *Drummond 108* (GH!). Since Torrey and Gray did not select a type from the original material, the above lectotype was selected by the author.

Habitat and Distribution. Sandy coastal plains of southeastern Louisiana, Texas, and northeastern Tamaulipas, Mexico.

*Ratibida peduncularis* var. *peduncularis* occurs mainly on the coastal plains of Louisiana, Texas and Mexico. The coastal forms are usually characterized by yellow or purplish-yellow ligules while those more inland have purplish-yellow ligules. Typically the plants have dissected leaves, long peduncles, and achenes with pectinate-fimbriate margins.





Plate 1390

Fig. 4. *Ratibida peduncularis* var. *picta*. ca. 1/3 actual size. Richards 3732 (KANU).



Representative specimens selected from 69 sheets: UNITED STATES: LOUISIANA: Cameron Parish: *Tracy 8548* (F, MO, NEB, NY, TAES). TEXAS: Aransas Co.: *Richards 3739* (KANU). Bexar Co.: *Schulz 422* (TEX, US). Brooks Co.: *Richards 3744* (KANU). Calhoun Co.: *Parks & Cory 11644* (TAES). Cameron Co.: *Runyon 441* (US). Dimmit Co.: *Hamby 950* (LL). Galveston Co.: *Wright* (US). Goliad Co.: *Beamer*, in 1953 (KANU). Hidalgo Co.: *McKelvey 1751* (GH). Jim Hogg Co.: *Lehmann & Davis 38* (F). Kenedy Co.: *Richards 3741* (KANU). Kleberg Co.: *Johnston 54422* (TAES, TEX). Nueces Co.: *Heller 1789* (GH, MO, NY, UC, US). Orange Co.: *Small & Wherry 11802* (NY, US). San Patricio Co.: *Cory 49140* (GH). Willacy Co.: *Richards 3743* (KANU). MEXICO: TAMAULIPAS: *LeSueur 509* (F, TEX).

3b. *R. PEDUNCULARIS* (Torr. & Gray) Barnh. var. *PICTA* (Gray) Sharp, Ann. Mo. Bot. Gard. 22:74. 1935.

*Lepachys peduncularis* Torr. & Gray var. *picta* Gray, Smiths. Contr. Knowl. (Pl. Wright.) 3:107. 1852.

*Lepachys serratus* Buckl., Acad. Natur. Sci. Phila. 13:457. 1861.

*Ratibida picta* (Gray) Small, Flora S. E. United States, ed. 1, 1260 p. 1903.

Leaves lyrate-pinnate, ovate-obovate or oblong, 1.6-13.7 cm long, 1.0-6.4 cm wide, segments 3-7, terminal lanceolate-ovate, toothed to parted, 0.6-7.2 cm long, 0.3-5.0 cm wide, lateral segments linear-oblong to obovate, 0.1-4.5 cm long, 0.1-1.4 cm wide; long pilose and hirsute hairs on lower stem becoming shorter and more numerous on upper stem with the longer hairs strigose, punctate glands mostly few or absent. Achenes pectinate-fimbriate on adaxial edges. Ray flowers purplish-yellow to purple. (Figs. 4, 10, 11e, 12e, 13e).

Flowering time: April-October.

Lectotype. Texas: Gulf Coast near Galveston, in 1849, *Wright* (GH!). Since Gray did not select a type from the original material, the above lectotype was selected by the author.

Habitat and Distribution. Sandy seacoast and wooded areas of the Texas coastal region.

*Ratibida peduncularis* var. *picta* is limited in distribution to the seacoast and inland coastal woods of Texas. This variety is recognized because of the lyrate-pinnate leaves and the pectinate-fimbriate adaxial margin of the achenes.



The achenes are usually more narrow and the unicellular globular glands on the stems and peduncles are less frequent than in *R. peduncularis* var. *peduncularis*. The range overlaps with that of *R. columnifera* and the two species readily hybridize (Jackson, 1963).

*Ratibida peduncularis* var. *picta* probably hybridizes with *R. peduncularis* var. *peduncularis* where their ranges overlap. Collections seem to indicate this as plants intermediate in leaf and achene characteristics and usually more robust than either of the above have been found (*Richards 3745*, KANU).

Representative specimens selected from 52 sheets: UNITED STATES: TEXAS: Aransas Co.: *Richards 3737* (KANU). Bexar Co.: *Richards 3735* (KANU). Calhoun Co.: *Tharp 5639* (TEX, US). Frio Co.: *Higdon* s.n. (TEX). Gonzales Co.: *Richards 3730* (KANU). Guadalupe Co.: *Richards 3731* (KANU). Harris Co.: *Thurrow*, in 1890 (F). Medina Co.: *Richards 3745* (KANU). Victoria Co.: *Tracy 8941* (F, GH, MO, NEB, NY, TAES, TEX). Waller Co.: *Hall 336* (F, MO, NY, US). Wilson Co.: *Richards 3734* (KANU).

#### 4. *RATIBIDA COLUMNIFERA* (Nutt.) Woot. & Standl. Contrib. U. S. Nat. Herb. 19:706. 1915.

Stems one or many, branched, 2.2-10.4 dm high. Leaves ovate-obovate to orbicular-oblongate, 1.8-15.1 cm long, 0.8-6.0 cm wide, bipinnatifid, segments 3-14, narrowly linear-lanceolate to ovate-oblong, 0.1-6.0 cm long, 0.1-1.6 cm wide. Peduncles 1.4-47.3 cm long. Heads solitary, columnar, 1.0-4.7 cm long, 0.7-1.2 cm wide. Phyllaries 5-14, the inner row lanceolate-ovate, 0.8-2.0 mm long, 0.8-1.8 mm wide, outer linear, 0.4-1.4 cm long, 0.5-2.0 mm wide. Ray flowers 4-11, yellow, purplish-yellow to purple, ovate-oblongate to oblong-elliptical, 0.7-3.5 cm long, 0.4-1.7 cm wide, inner surface glabrous to puberulent, outer surfaces hirsute, punctate, apex 2-3 lobed, lobes 0.1-5.3 mm long, 0.2-7.1 mm wide. Disc corollas 1.6-2.8 mm long, lobes 0.5-1.0 mm wide, 0.3-0.8 mm long; anthers 1.2-1.9 mm long, filaments 0.4-1.0 mm long; styles 0.8-1.5 mm long, the branches 0.5-1.4 mm long, stigmatic surface a fourth the length of the branch. Palea 2.3-3.5 mm long, 0.5-3.0 mm wide, adaxial edge hyaline, ciliate, abaxial edge strigose from apex to middle, unicellular glands from middle to base; resin gland oval-oblongate, 0.6-1.5 mm long. Achenes oblong, 1.2-3.0 mm long, 1.2-2.0 mm wide, glabrous except for the ciliate adaxial edge and ciliate or squamellous apex; pappus of 1-2 teeth or absent.





Plate 1391

Fig. 5. *Ratibida columnifera* f. *columnifera*. ca. 1/3 actual size.  
*Richards 1019 (KANU)*.



4a. *RATIBIDA COLUMNIFERA* (Nutt.) Woot. & Standl.  
forma *COLUMNIFERA*.

*Rudbeckia columnifera* Nutt., Fraser's Catal. 1813.

*Rudbeckia columnaris* Pursh, Flora Am. Sept. 2:575.  
1814.

*Ratibida sulcata* Raf. J. Phys. 89:100. 1819.

*Obeliscaria columnaris* DeCandolle Prodr. 5:559. 1836.

*Ratibidia columnaris* (Sims) D. Don, Sweet's Brit. Fl.  
Gard. 4:361. 1838.

*Lepachys columnaris* Torr. & Gray, Flora N. Am. 2:315.  
1842.

*Lepachys columnifera* (Nutt.) MacBride, Contrib. Gray  
Herb. New Ser. 3(65):45. 1922.

*Ratibida columnifera* (Nutt.) Woot. & Standl. var. *bre-*  
*viradiata* Cockerell, Am. Natur. 49(586):620. 1915.

*Ratibida columnifera* (Nutt.) Woot. & Standl. var. *incisa*  
Cockerell, Am. Natur. 49(586):620. 1915.

*Ratibida columnifera* (Nutt.) Woot. & Standl. var. *tubu-*  
*laris* Cockerell, Am. Natur. 49(586):620. 1915.

*Ratibida columnifera* (Nutt.) Woot. & Standl. var. *ap-*  
*pendiculata* Cockerell, J. Hered. 7:428. 1916.

*Ratibida columnaris* (Pursh) Raf. forma *denudata* Boi-  
vin, Natur. Can. 87:49. 1960.

Flowering time. March-November.

Holotype. As far as can be ascertained, there are no  
known types. Evidence indicates that the plants were first  
collected from the "country of the Missouri", 1813. *Nut-*  
*tall*.

Habitat and Distribution. Prairies and foothills. South-  
ern Canada, United States, and northern Mexico.

*Rudbeckia columnifera* Nutt. was first published in  
Fraser's Catalogue in 1813. While there is some dispute  
as to the authorship and legality of the Catalogue, I am  
accepting Nuttall as the author, at least of the plants ac-  
companied with descriptions. This opinion is based on my  
studies of several of Nuttall's works plus additional papers  
favoring him as the author. These are as follows: Dress  
(1961), Cronquist *et al* (1956), Fernald (1938), Britten



(1899) and Greene (1890). Britten (1899) states that the list of names in the Catalogue was written by Nuttall who added his name in ink to the copy from which Professor Greene's reprint was made. Greene (1890) says: "Nuttall wrote his name in ink as the author and even made a few corrections on the copy of the catalogue which was used for the reprint in Pittonia." Nuttall (1818) refers 22 times to his names in "Fraser's Catalogue". Nuttall (1841), writing on *Aplopappus spinulosus*, states: "to which I applied the name of *Sideranthus* in "Fraser's Catalogue." Sims (1814) used plants grown at Fraser's nursery and credits Nuttall as introducing them from the "country of the Missouri". Pursh (1814) cites *Rudbeckia columnifera* Nutt. as a synonym for *Rudbeckia columnaris*. While the description of *Rudbeckia columnifera* in the catalogue is meager, Fernald (1938) sums it up by saying: "certainly this is a far more intelligible diagnosis of a species than was the original characterization of *Ratibida* for a genus." Cronquist *et al* (1956) recognized the names with descriptions in "Fraser's Catalogue" as being validly published. The author accepts *Ratibida columnifera* (Nutt.) Woot. and Standl. as the legitimate name.

Cockerell (1915) described three varieties of *Ratibida columnifera* from Boulder, Colorado, as follows: var. *breviradiata* (US) with short rays, 10 mm long; var. *incisa* (US) with emarginate and cleft rays; var. *tubularis* with rays 25 mm long and 3.5 mm wide, completely quilled, being hollow cylinders. The three varieties named by Cockerell have all been observed over the range of the species by me and are not recognized as varieties, although their occurrence may be uncommon. Aberrant and teratological forms of many kinds have been observed and it is my opinion that they should not be afforded taxonomic rank.

Cockerell (1916) described *Ratibida columnifera* (Nutt.) Woot. & Standl. var. *appendiculata* (GH) with the rays possessing long appendages (usually paired) arising from the throat. Similar aberrant forms have been observed by the author and this variety is not recognized in this study.



Boivin (1960) described *Ratibida columnaris* (Pursh) Raf. forma *denudata* (Boivin & Alex 9886 DAO) where the head was devoid of ray flowers. Even though this condition apparently is not a common occurrence in the above species, it is not recognized in this study.

*Ratibida columnifera* is the most widespread species of the genus and exhibits many morphological forms over its range. Plants of the prairies are characterized by being tall and robust with long, columnar heads while those of drier areas as well as those growing later in the season tend to be shorter and have shorter heads. In sandy areas the plants are more annual, shorter, and less branched. In the southern part of the range, the ligules tend to be somewhat shorter as are those growing later in the season and in dry areas. In ruderal areas, the plants may assume a "bushy" appearance with much branching and short heads. Typically, the species is characterized by the columnar head, yellow ligules, and bipinnatifid leaves.

Representative specimens selected from 1,489 sheets: UNITED STATES: ARIZONA: Apache Co.: Palmer 601 (GH, NY, US). Coconino Co.: MacDougal 416 (GH, KANU, NY, US). Navajo Co.: Mayerhoff 59(F). ARKANSAS: Crittenden Co.: Demaree 11380 (MO). Washington Co.: Palmer 8216 (MO, NY). COLORADO: Adams Co.: Johnston 217A (MO). Arapahoe Co.: Clokey 2819 (MO). Baca Co.: Harrington 3311 (CS). Boulder Co.: Hanson C139 (ARIZ, MO). Chaffee Co.: Sheldon 472 (US). Cheyenne Co.: Christ 983 (CS). Denver Co.: Clokey 2819 (ARIZ, F, GH, UC). Douglas Co.: Christ 1145 (CS). Elbert Co.: Woodward, in 1882 (GH). El Paso Co.: Ehlers 7717 (ARIZ, GH). Fremont Co.: Brandegee 757 (NY). Jefferson Co.: Cleburne, in 1914 (NEB). Kiowa Co.: Harrington 4263 (CS). Kit Carson Co.: Preston, Vona (CS). Larimer Co.: Marshall 2985 (CS, NEB, US). Las Animas Co.: Rogers 4428 (US). Lincoln Co.: Harrington 792 (CS). Phillips Co.: Harrington 2255 (CS). Prowers Co.: Harrington 3480 (CS). Pueblo Co.: Mathias 526 (MO). Washington Co.: Shantz 1133 (US). Weld Co.: Johnston 217 (MO). Yuma Co.: Harrington 4242 (CS). IDAHO: Bannock Co.: Sharpe 17204 (NY). Power Co.: Christ & Ward 15030 (NY). ILLINOIS: Cook Co.: Gates 1221a (F). Du Page Co.: Umbach (F, US). Madison Co.: Eggert, in 1891 (MO). Menard Co.: Hall, in 1861 (F). Peoria Co.: Chase 8923 (KANU, OKL). INDIANA: Clark Co.: Lansing 981 (F). IOWA: Clay Co.: Hayden 10784 (NY). Dickinson Co.: Shimek, Milford (NEB). Fremont Co.: Harms 616 (KANU). Linn Co.: Smith, in 1871



(NY). Lyon Co.: *Gleason 9370* (NY). Muscatine Co.: *Shimek*, in 1915 (MO). Polk Co.: *Hayden 10546* (MO, NEB, NY, TEX). Pottawatomie Co.: *Shimek*, in 1909 (F, NY). Sioux Co.: *Hayden 10547* (GH, MO, NY, UC). Webster Co.: *Somis 3893* (NEB). Woodbury Co.: *Thorne 13366* (US). KANSAS: Anderson Co.: *Richards 1133* (KANU). Barber Co.: *Richards 792* (KANU). Barton Co.: *Richards 876* (KANU). Bourbon Co.: *Thompson* (KANU). Butler Co.: *Richards 1086* (KANU). Chase Co.: *Richards 1082* (KANU). Chautauqua Co.: *Hulbert 3162* (KANU). Cheyenne Co.: *Horr 4692* (GH, KANU). Clark Co.: *Richards 835* (KANU). Clay Co.: *McGregor 5015* (KANU). Cloud Co.: *Kellerman*, in 1888 (MO). Coffey Co.: *Richards 1081* (KANU). Comanche Co.: *Richards 822* (KANU). Cowley Co.: *Richards 1087* (KANU). Decatur Co.: *Richards 2835A* (KANU). Dickinson Co.: *Hulbert 3164* (KANU). Douglas Co.: *Richards 3765* (KANU). Edwards Co.: *McGregor 10556* (KANU). Elk Co.: *Richards 687* (KANU). Ellis Co.: *Richards 1074* (KANU). Ellsworth Co.: *Richards 1076* (KANU). Finney Co.: *Coville 25* (US). Ford Co.: *Richards 3763* (KANU). Franklin Co.: *Richards 3753* (KANU). Geary Co.: *Richards 1077* (KANU). Gove Co.: *Horr & McGregor 3262* (GH, KANU). Graham Co.: *Richards 1071* (KANU). Grant Co.: *Thompson 15* (F, GH, MO, NY, UC, US). Greeley Co.: *Rose & Fitch 17076* (NY, US). Greenwood Co.: *Richards 654* (KANU). Hamilton Co.: *Richards 865* (KANU). Harper Co.: *Richards 772* (KANU). Harvey Co.: *McGregor 12515* (KANU). Hodgeman Co.: *McGregor 10597* (KANU). Jefferson Co.: *Marsh 1615* (KANU, US). Jewell Co.: *Horr 4363* (KANU). Kearney Co.: *Richards 871* (KANU). Kingman Co.: *McGregor 10708* (KANU). Kiowa Co.: *Horr 3989* (KANU). Labette Co.: *Richards 1140* (KANU). Lincoln Co.: *McGregor 7444* (KANU). Linn Co.: *Richards 3755* (KANU). Logan Co.: *McGregor 9405* (KANU). Lyon Co.: *McGregor 1868* (KANU). Marion Co.: *Richards 1084* (KANU). Marshall Co.: *Heller 13975* (MO). McPherson Co.: *Richards 879* (KANU). Meade Co.: *Richards 844* (KANU). Miami Co.: *Oyster 4149* (F, MO, NY). Montgomery Co.: *Rydberg & Imler 366* (KANU, MO). Morris Co.: *Horr*, in 1930 (KANU). Morton Co.: *Richards 2966* (KANU). Neosho Co.: *Richards 3182* (KANU). Norton Co.: *Richards 2793* (KANU). Osborne Co.: *Shear 121* (GH, NEB, US). Pawnee Co.: *Richards 874* (KANU). Phillips Co.: *Richards 2740* (KANU). Rawlins Co.: *McGregor 9470* (KANU). Republic Co.: *Morley 241* (KANU, UC). Rice Co.: *Richards 877* (KANU). Riley Co.: *Gayle 526* (NY). Rooks Co.: *Horr 4987* (KANU). Rush Co.: *Lathrop 3845* (F, KANU, NY). Russell Co.: *Richards 1075* (KANU). Scott Co.: *Gates 16692* (MO). Sedgwick Co.: *Poole 217* (GH). Seward Co.: *Rydberg & Imler 866* (KANU, NY). Sheridan Co.: *Richards 1069* (KANU). Smith Co.: *Richards 2888* (KANU). Stafford Co.: *Richards 875* (KANU). Stanton Co.: *Richards 861* (KANU). Trego Co.: *Richards 1073* (KANU). Wallace



Co.: *Letterman* (MO). Washington Co.: *Horr 4620* (GH, KANU). Wichita Co.: *Agrelius & Agrelius*, in 1912 (KANU). Wilson Co.: *McGregor 14374* (KANU). Woodson Co.: *Richards 603* (KANU). Wyandotte Co.: *Isely 2604* (NY, UC). MASSACHUSETTS: Middlesex Co.: *Jenks*, in 1922 (GH). MICHIGAN: Wayne Co.: *dePaul* (KANU). MINNESOTA: Big Stone Co.: *Gleason 9405* (NY). Chippewa Co.: *Moyer*, in 1897 (ARIZ, UC). Clay Co.: *Dewart* (MO). Goodhue Co.: *Sandberg 566* (F, US). Hennepin Co.: *Aiton*, in 1892 (F, GH, NY, UC). Murray Co.: *Richards 1287* (KANU). Otter Tail Co.: *Chandonnet*, in 1911 (GH). Pipestone Co.: *Anderson*, in 1937 (UC). Polk Co.: *Johnson 520* (GH, NY). Pope Co.: *Taylor*, in 1891 (UC). Rock Co.: *Richards 1296* (KANU). Traverse Co.: *Sheldon*, in 1893 (GH, MO, UC, US). Washington Co.: *Churchill* (NEB). MISSOURI: Greene Co.: *Standley 1533* (US). Jackson Co.: *Bush 163* (MO, OKL, NY, UC, US). Jasper Co.: *Palmer 23389* (GH, NY). Lincoln Co.: *Davis 1390* (MO). Taney Co.: *Steyermark*, in 1938 (F). MONTANA: Broadwater Co.: *Hermann 12323* (US). Cascade Co.: *Cantrell*, in 1947 (OKL). Dawson Co.: *Ward*, in 1883 (US). Gallatin Co.: *Blankinship 283* (F, KANU, MO, US). Jefferson Co.: *Cronquist 6778* (NY). Lewis & Clark Co.: *Kelsey*, in 1888 (F, US). Madison Co.: *Booth*, in 1941 (KANU). Mineral Co.: *Cronquist 6739* (KANU, NY, TAES, TEX). Missoula Co.: *Barkley 1686* (MO, UC). Park Co.: *Scheuber 56* (NY). Rosebud Co.: *Bennett*, in 1957 (F, UC). Sheridan Co.: *Larsen 112* (GH, MO). Stillwater Co.: *Swingle* (CS). Sweetgrass Co.: *Hitchcock & Muhlick 13310* (GH, MO, NY, UC). Wheatland Co.: *Spragg 498* (CS). YELLOWSTONE Co.: *House 4904* (US). NEBRASKA: Adams Co.: *Pammel 232* (MO). Antelope Co.: *Webber 6087* (NEB). Blaine Co.: *Richards 1019* (KANU). Box Butte Co.: *Williamson* (NEB). Brown Co.: *Weinard* (NEB). Buffalo Co.: *Richards 1014* (KANU). Butler Co.: *Cleburne* (NEB). Cass Co.: *Morrison 1187* (MO, NEB). Cedar Co.: *Clements 2a44* (US). Cherry Co.: *Tolstead 450* (GH, NEB). Custer Co.: *Richards 1016* (KANU). Dawes Co.: *Webber 6201* (NEB). Dodge Co.: *Engberg* (NEB). Douglas Co.: *Benke 4314* (F, US). Franklin Co.: *Bates 2955* (NEB). Frontier Co.: *Richards 1028* (KANU). Furnas Co.: *Davidson, Dixit & Romberg 4678* (NEB, OKL). Gage Co.: *Washburn*, in 1899 (US). Hall Co.: *Richards 1012* (KANU). Hamilton Co.: *Richards 1010* (KANU). Jefferson Co.: *Rohbraugh 11* (OKL). Kearney Co.: *Hapeman*, in 1893 (US). Keith Co.: *Werner* (NEB). Keya Paha Co.: *Lawton 35* (F). Kimball Co.: *Moldenke 7228* (NY). Knox Co.: *Wilcox*, in 1888 (NY). Lancaster Co.: *Webber 6090* (MO, NEB). Lincoln Co.: *Richards 1026* (KANU). Logan Co.: *Richards 1022* (KANU). Morrill Co.: *Bates* (NEB). Nance Co.: *Osborn 1136R* (MO). Pierce Co.: *Harms 582* (KANU). Polk Co.: *Turrell* (ARIZ). Red Willow Co.: *Richards 1029* (KANU). Saunders Co.: *Williams 296* (US). Scotts Bluff Co.: *Rydberg 182* (NEB, NY). Sheridan Co.: *Sandoz 172* (NEB). Sioux Co.: *Woods*



354 (NEB). Thomas Co.: *Richards 1021* (KANU). Webster Co.: *Bates* (NEB). York Co.: *Sperry* (TAES). NEW JERSEY: Hudson Co.: *VanSickle*, in 1895 (US). NEW MEXICO: Catron Co.: *Eggleston 20242* (US). Colfax Co.: *Lucas 194* (TEX, UC). Curry Co.: *Clark 15241* (UNM). Eddy Co.: *Grassl 88* (F). Guadalupe Co.: *Richards 1110* (KANU). Harding Co.: *Sands* (UNM). Lincoln Co.: *Wooton 261* (MO). Mora Co.: *Richards 3774* (KANU). Otero Co.: *Richards 1121* (KANU). Quay Co.: *Richards 1108* (KANU). Sandoval Co.: *Ellis 207* (US). San Miguel Co.: *Richards 1114* (KANU). Santa Fe Co.: *Standley 5279* (MO). Taos Co.: *Marcelline 2864* (F). Union Co.: *Clark 16179* (UNM). NORTH DAKOTA: Barnes Co.: *Barber 154* (GH). Benson Co.: *Rider 452* (F). Cass Co.: *Alexander* (UC). Grand Forks Co.: *Brannon 213* (MO). Grant Co.: *Bell 604* (UC). Kidder Co.: *Rollins & Munoz 2811* (GH, US). McLean Co.: *Rudd* (OKL). Morton Co.: *Sarvis 99* (US). Richland Co.: *Metcalf 176* (GH). Stutsman Co.: *Mearns 167* (US). Ward Co.: *Larsen 187* (MO, NY). Williams Co.: *Bell 112* (UC). OKLAHOMA: Bryan Co.: *Taylor, Silver & Fox 1230* (OKL). Caddo Co.: *Graber 63* (OKL). Canadian Co.: *Taylor 263* (OKL). Carter Co.: *Richards 543* (KANU). Cherokee Co.: *Wallis 1402* (UC). Cimarron Co.: *Rogers 4664* (US). Cleveland Co.: *Es skew 1007* (MO, OKL). Comanche Co.: *Demaree 13136* (MO, NY, OKL). Cotton Co.: *Waterfall 7277* (OKL). Craig Co.: *Richards 1145* (KANU). Creek Co.: *Bush 307* (MO). Custer Co.: *Mericle 460* (OKL). Dewey Co.: *Richards 3751* (KANU). Ellis Co.: *Richards 1096* (KANU). Garfield Co.: *Richards 1091* (KANU). Garvin Co.: *Richards 536* (KANU). Grady Co.: *Warner 30* (OKL). Grant Co.: *Richards 1090* (KANU). Greer Co.: *Bull*, in 1928 (OKL). Harmon Co.: *Stevens 1079* (GH). Harper Co.: *Stratton 399* (MO). Hughes Co.: *McGregor 13897* (KANU). Johnston Co.: *Alder*, in 1950 (OKL). Kay Co.: *Richards 1088* (KANU). Kingfisher Co.: *Blankinship* (GH, MO, US). Latimer Co.: *McGregor 13894* (KANU). Logan Co.: *Keyser 6014* (NY, OKL). Love Co.: *Richards 545* (KANU). Major Co.: *Richards 1094* (KANU). Marshall Co.: *Duff 93* (ARIZ). McClain Co.: *Hopkins 13355* (OKL). McCurtain Co.: *Poole 15* (KANU). McIntosh Co.: *McGregor 14346* (KANU). Murray Co.: *Richards 540* (KANU). Muskogee Co.: *Bebb 4437* (GH, OKL). Noble Co.: *McGregor 13914* (KANU). Nowata Co.: *Richards 1143* (KANU). Oklahoma Co.: *Waterfall 1397* (NY, OKL). Osage Co.: *Stevens 1952* (GH). Payne Co.: *McLean 132* (ARIZ). Pittsburg Co.: *McGregor 13896* (KANU). Pontotoc Co.: *Richards 535* (KANU). Pottawatomie Co.: *Faulkner 131* (OKL). Roger Mills Co.: *Engleman 1630* (OKL). Rogers Co.: *Hubricht, Shoop & Heinze 1485* (MO). Seminole Co.: *Robbins 3082* (OKL, TAES, UC). Texas Co.: *Harms 1971* (KANU). Tillman Co.: *Fleming 120* (OKL). Tulsa Co.: *Richards 3723* (KANU). Washington Co.: *Richards 3722* (KANU). Woods Co.: *Stevens 764* (GH, MO, OKL, US). Woodward



Co.: *Locke 32* (US). SOUTH DAKOTA: Brookings Co.: *Thornber*, in 1893 (ARIZ, MO). Custer Co.: *Rydberg 802* (NEB, US). Day Co.: *Brenckle 39-78* (NY, US). Fall River Co.: *Hayward 517* (F). Harding Co.: *Visher 374* (F). Hutchinson Co.: *Richards 1302* (KANU). Jackson Co.: *Palmer 37623* (GH, MO, NY). Kingsbury Co.: *Thornber*, in 1894 (GH, MO). Lawrence Co.: *Carr 93* (F, NEB, NY, US). McCook Co.: *Richards 1301* (KANU). Meade Co.: *Forwood 218* (US). Minnehaha Co.: *Richards 1298* (KANU). Pennington Co.: *Visher*, in 1908 (F). Roberts Co.: *Powell*, in 1903 (GH). Spink Co.: *Ricksecker 44* (UC). Turner Co.: *Johnson 77* (GH, MO, NY). Washabaugh Co.: *Visher 2033* (F). Yankton Co.: *Richards 1303* (KANU). TEXAS: Aransas Co.: *Uzzell 37* (LL). Armstrong Co.: *Reverchon 3339* (MO). Bell Co.: *Wolff 892* (TAES, US). Bexar Co.: *Groth 95* (F, GH). Brazoria Co.: *Correll & Edwin 16450* (LL). Brewster Co.: *Mueller 8216* (GH, MO, NY, TEX). Cameron Co.: *Runyon 2638* (F, US). Childress Co.: *Blake 7399* (TEX). Collinsworth Co.: *Correll & Johnston 16901* (LL). Crockett Co.: *Warnock 15176* (LL). Culberson Co.: *Moore & Steyermark 3618* (GH, MO, NY, UC, US). Dallam Co.: *Gorder 116* (LL, TEX). Dallas Co.: *Reverchon 493* (F). Eastland Co.: *Ruth 1314* (NY). Erath Co.: *Gould 5615* (ARIZ, TAES). Galveston Co.: *Traverse 1651* (TEX). Gillespie Co.: *Jermy* (MO). Gray Co.: *Richards 1104* (KANU). Hall Co.: *Fairview School 6515* (TEX). Harris Co.: *Reverchon 3987* (MO). Hartley Co.: *Cory & Parks 16466* (TAES). Hemphill Co.: *Richards 1100* (KANU). Hutchinson Co.: *Thornton 52-430* (TEX). Jeff Davis Co.: *Moore & Steyermark 3133* (GH, MO, NY). Karnes Co.: *Richards 561* (KANU). Kaufman Co.: *Reverchon 3337* (MO). Kenedy Co.: *Tharp 49090* (F). Kent Co.: *Tracy & Earle 369* (MO, NEB). Kerr Co.: *Heller 1850* (ARIZ, GH, MO, NY, UC, US). Lipscomb Co.: *Richards 1097* (KANU). Lubbock Co.: *Demaree 7706* (GH, MO). Matagorda Co.: *Cory 20290* (GH). McLennan Co.: *Smith 865* (TEX). Medina Co.: *Richards 3746* (KANU). Menard Co.: *Cory* (TAES). Moore Co.: *Jespersen 2704* (F, MO, NY, UC, US). Nueces Co.: *Heller 1789* (TEX). Ochiltree Co.: *Wallis 7198* (TEX). Oldham Co.: *Richards 1106* (KANU). Parker Co.: *Ruth 1314* (US). Pecos Co.: *Tharp 43-938* (OKL, TEX, UC). Potter Co.: *Palmer 12535* (MO, UC). Presidio Co.: *Hinckley 656* (F). Randall Co.: *Palmer 13878* (MO, US). Reeves Co.: *Gillespie 5253* (UC). Roberts Co.: *Richards 1102* (KANU). Robertson Co.: *Marsh & Calley 74* (TEX). Sherman Co.: *Jackson 5* (KANU). Smith Co.: *Reverchon 2229* (MO). Stephens Co.: *Denton*, in 1931 (TEX.) Sutton Co.: *Gould 5729* (TAES, TEX, UC). Tarrant Co.: *Reverchon 1435* (F, GH, KANU, NEB, NY). Taylor Co.: *Tracy 7891* (F, GH, MO, NEB, NY, TEX, US). Terrell Co.: *Palmer 33538* (NY). Tom Green Co.: *Tweedy 297* (US). Travis Co.: *Barkley 13321* (TEX). Uvalde Co.: *Kincaid & Johnston 54637* (TEX). Val Verde Co.: *Jones 25903* (MO). Victoria Co.: *Richards 3736* (KANU). Williamson



Co.: *York* 46218 (NEB, TAES, TEX). Wise Co.: *Shinners* 7930 (UC). Young Co.: *Gentry* 1254 (TEX). UTAH: Cache Co.: *Holmgren* 3752 (GH, NY, UC, US). WISCONSIN: Milwaukee Co.: *Shinners* 2342 (GH, UC). Sauk Co.: *Steele* 72 (US). Walworth Co.: *Wadmond* L.9 16211 (GH, LL). WYOMING: Albany Co.: *Goodman* 776 (MO, OKL). Campbell Co.: *Porter & Porter* 7568 (UC). Carbon Co.: *Hanna* 1053 (MO). Converse Co.: *Porter* 3151 (GH, MO, UC). Crook Co.: *Hayward* 210 (F). Hot Springs Co.: *Mulford*, in 1892 (GH, MO). Johnson Co.: *Tweedy* 3143 (NY). Laramie Co.: *Pammel*, in 1913 (GH). Niobrara Co.: *Harms* 2131 (KANU). Park Co.: *Witt* 1385 (NY). Platte Co.: *Nelson* 386 (GH, MO, NY, US). Sheridan Co.: *Rollins* 556 (NY). CANADA: ALBERTA: *Moodie* 1181 (F, GH, NY, UC, US). BRITISH COLUMBIA: *Shaw* 1143 (GH, MO, NEB, NY, US). MANITOBA: *Dawson*, in 1873 (GH). ONTARIO: *Dodge*, in 1911 (MO, TEX). SASKATCHEWAN: *Macoun* 5068 (GH, US). MEXICO: COAHUILA: *Palmer* 345 (F, GH, MO, NY, US). HIDALGO: *Chase* 7117 (F, GH, MO, NY). NUEVO LEON: *Taylor* 27 (F, MO, TEX). SAN LUIS POTOSI: *Lundell* 5103 (ARIZ, MO, US). TAMAULIPAS: *Tracy* 8947a (NEB). VERA CRUZ: Det. by Hoffman 213 (GH).

4b. *R. COLUMNIFERA* (Nutt.) Woot. & Standl. forma *PULCHERRIMA* (DC.) Fernald, *Rhodora* 40:353. 1938.

*Obeliscaria pulcherrima* DC., *Prodr.* 5:559. 1836.

*Obeliscaria columnaris* DC. var. *pulcherrima* (DC.) D. Don, *Sweet's Brit. Fl. Gard. Ser. 2*, 4:361. 1838.

*Lepachys columnaris* Torr. & Gray var. *pulcherrima* (DC.) Torr. & Gray, *Flora N. Am.* 2:315. 1842.

*Ratibida columnifera* (Nutt.) Woot. & Standl. var. *pulcherrima* (DC.) Woot. & Standl., *Contrib. U. S. Nat. Herb.* 19:706. 1915.

*Lepachys columnifera* (Nutt.) Rydb. var. *pulcherrima* (DC.) Rydb., *Flora Prairies and Plains of Central North America*, 838 p. 1932.

*Ratibida columnaris* (Sims) D. Don forma *pulcherrima* (DC.) Sharp, *Ann. Mo. Bot. Gard.* 22:70-71. 1935.

Differs from *R. columnifera* only by the purplish-yellow to purple ray flowers. (Figs. 6 and 9).

Flowering time. March-November.

Lectotype. Texas: Mexican province. San Fernando to Bejar, June, 1832, *Berlandier* 1960 (G-DC?, Microfiche!; Isotype GH!). Since deCandolle did not select a type from



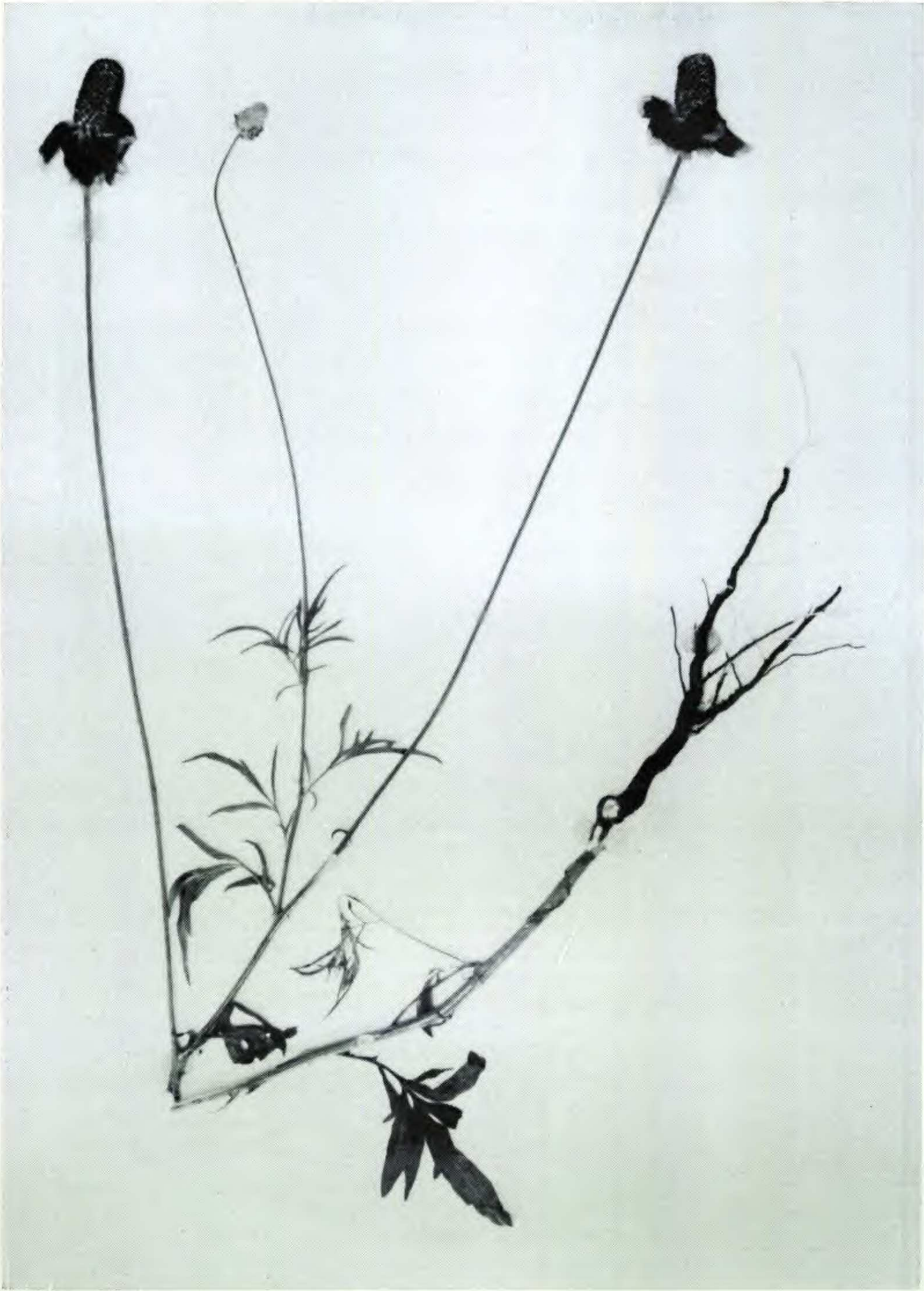


Plate 1392

Fig. 6. *Ratibida columnifera* f. *pulcherrima*. ca. 1/3 actual size.  
*Richards 567 (KANU)*.



the original material, the above lectotype was selected by the author.

Habitat and Distribution. Prairies, foothills, and mountains of Canada, United States, and Mexico.

*Ratibida columnifera* f. *pulcherrima* is characterized by having showy, purplish-yellow to purple ligules. Since deCandolle (1836) first described this as a species, it has attracted attention in nurseries and gardens, and it is invariably collected in the field as being something different. It is recognized as a color form in this work because of its obvious color difference and its distinct distribution pattern. It occurs abundantly in northern Mexico, Texas, and New Mexico and is infrequently found farther north in the prairie and central states as compared to the yellow-liguled plants. Pure populations of the purple forms are common above 7,000 ft. in the Sacramento Mountains of New Mexico with isolated pure purple plants found infrequently over the range of the form.

Representative specimens selected from 842 sheets: UNITED STATES: ARIZONA: Apache Co.: *Griffiths 5382* (US). Gila Co.: *Johnson 1697* (KANU). Navajo Co.: *Thornber 4576* (ARIZ). ARKANSAS: Hempstead Co.: *Palmer 8024* (MO, NY). Lawrence Co.: *Demaree 30991* (KANU, MO). Miller Co.: *Eggert*, in 1898 (MO, NY). COLORADO: Archuleta Co.: *Baker 698* (F, MO, NY, US). Baca Co.: *Harrington & Smith 296* (ARIZ). Denver Co.: *Clokey 2819* (TEX). El Paso Co.: *Durshel 4191* (MO). Jefferson Co.: *Letterman*, in 1913 (MO). Larimer Co.: *Crandall 2980* (ARIZ). Las Animas Co.: *Richards 1130* (KANU). Weld Co.: *Osterhout 2310* (NY). KANSAS: Barber Co.: *Richards 773* (KANU). Cheyenne Co.: *Horr 4685* (GH, KANU). Coffey Co.: *Horr 3467* (KANU). Edwards Co.: *Carleton 308* (US). Ellis Co.: *Crockett 182* (OKL). Decatur Co.: *Richards 2835* (KANU). Grant Co.: *Thompson 15* (GH, MO). Gove Co.: *Kellerman*, in 1893 (KANU). Meade Co.: *McGregor & Horr 4954* (KANU). Morton Co.: *Richards 2967* (KANU). Sheridan Co.: *Richards 1059* (KANU). Sherman Co.: *McGregor 5212* (KANU). MISSOURI: Jackson Co.: *Bush 4019* (NY). MONTANA: Cascade Co.: *Safford 591* (US). Dawson Co.: *Ward*, in 1883 (US). Meagher Co.: *Anderson 232* (MO). Rosebud Co.: *Bennett*, in 1957 (US). NEBRASKA: Banner Co.: *Rydberg* (NEB). Box Butte Co.: *Williamson* (NEB). Buffalo Co.: *Richards 1013* (KANU). Cedar Co.: *Clements 2644* (NEB). Custer Co.: *Richards 1018* (KANU). Dawes Co.: *Webber 6200* (MO, NEB). Dawson Co.: *Bates* (NEB). Franklin Co.: *Laybourn 79* (MO).



Hooker Co.: *Rydberg 1445* (NEB, US). Kearney Co.: *Hapeman*, in 1893 (ARIZ, US). Lancaster Co.: *Hedgcock*, in 1899 (MO). Lincoln Co.: *Richards 1024* (KANU). Morrill Co.: *Bates* (NEB). Rock Co.: *Bates*, in 1896 (GH). Scotts Bluff Co.: *Rydberg 183* (NEB, NY). Sheridan Co.: *Hatcher*, in 1886 (NY). Sioux Co.: *Woods 353* (NEB). Thomas Co.: *Richards 1020* (KANU). Webster Co.: *Bates* (NEB). NEW MEXICO: Bernalillo Co.: *Jackson 2085* (UNM). Catron Co.: *Eggleston 20388* (NY). Chaves Co.: *Earle & Earle*, in 1900 (NY). Colfax Co.: *Richards 1128* (KANU). Curry Co.: *Reynolds 243* (UNM). Eddy Co.: *Grassl 88* (GH). Grant Co.: *Jones* (UNM). Guadalupe Co.: *Richards 1109* (KANU). Harding Co.: *Sands* (UNM). Lea Co.: *Castetter 9003* (UNM). Lincoln Co.: *Wooton 247* (GH, MO, NY, UC, US). Otero Co.: *Richards 1122* (KANU). Quay Co.: *Fisher 56* (MO, US). Rio Arriba Co.: *Standley 6762* (US). Sandoval Co.: *Hershey* (UNM). San Miguel Co.: *Richards 1125* (KANU). Sante Fe Co.: *Arsene 15909* (UC). Socorro Co.: *Metcalf 415* (ARIZ, GH, MO, NY, UC, US). Taos Co.: *Dixon A-370* (UNM). Torrance Co.: *Jackson 2166* (UNM). Valencia Co.: *Jones 122* (UNM). NORTH CAROLINA: Moore Co.: *Pinehurst Nurseries*, in 1902 (MO). NORTH DAKOTA: Benson Co.: *Lunell*, in 1917 (MO, US). Grand Forks Co.: *Churchill* (NEB). McKenzie Co.: *Stevens 727* (MO, UC). Stark Co.: *Mearns 168* (US). Steele Co.: *Stevens*, in 1949 (US). Ward Co.: *Larsen 194* (MO, NY, US). Wells Co.: *Bolley*, in 1891 (NY). OKLAHOMA: Beckham Co.: *Mericle 378* (OKL). Cimarron Co.: *Waterfall 7441* (OKL). Cleveland Co.: *Myers 49* (OKL). Comanche Co.: *McCurry 1190* (OKL). Mayes Co.: *Wallis 7676* (KANU, OKL, TEX). McCurtain Co.: *Wehling 24* (OKL). Payne Co.: *Waugh 260* (US). Tillman Co.: *Duncan 28* (MO). SOUTH DAKOTA: Brookings Co.: *Thornber* (ARIZ). Custer Co.: *Murdoch* (F). Hutchinson Co.: *Harms 554* (KANU). Kingsbury Co.: *Thornber*, in 1892 (MO, UC). Meade Co.: *Forwood 218a* (US). Moody Co.: *Ball & Ball 882* (US). Spink Co.: *Ricksecker 45* (UC). Washabaugh Co.: *Visher 2033* (NY). TENNESSEE: Davidson Co.: *Gattinger*, in 1886 (F, MO, NY). TEXAS: Anderson Co.: *Eggert*, in 1899 (MO). Andrews Co.: *Scudday* (LL). Aransas Co.: *Richards 3738* (KANU). Armstrong Co.: *Reverchon 494* (MO). Bailey Co.: *Correll 13102* (LL). Bastrop Co.: *Richards 3725* (KANU). Bee Co.: *Richards 559* (KANU). Bell Co.: *York & York B44* (TEX). Bexar Co.: *Richards 568* (KANU). Brazoria Co.: *Correll & Edwin 16451* (LL). Brazos Co.: *Palmer 7792* (MO, NY). Brewster Co.: *Tharp 8833* (TEX). Caldwell Co.: *Richards 550* (KANU). Cameron Co.: *Traverse 1015* (F, LL, MO, TEX, US). Childress Co.: *Childress Biological Class*, in 1930 (MO). Comal Co.: *Lindheimer 642* (MO). Crane Co.: *Warnock 14697* (LL, TEX). Crockett Co.: *Degener 5093* (NY). Culberson Co.: *Shreve 8121* (ARIZ). Dewitt Co.: *Richards 554* (KANU). Dickens Co.: *Graham 8* (TEX). Eastland Co.: *Hodge Oak Park School 50* (TEX). Edwards Co.: *Gould 6810* (TAES). Erath



Co.: *Hoisington* 88 (OKL, TEX, UC). Galveston Co.: *Reverchon* 3987 (NY). Garza Co.: *Ruth* 1313 (US). Gillespie Co.: *Richards* 3747 (KANU). Goliad Co.: *Richards* 558 (KANU). Gonzales Co.: *Richards* 551 (KANU). Gray Co.: *Stemen* 122 (OKL). Grayson Co.: *Richards* 3724 (KANU). Gregg Co.: *Eggert*, in 1899 (MO). Guadalupe Co.: *Richards* 567 (KANU). Hall Co.: *Reverchon*, in 1904 (MO). Harris Co.: *Traverse* 1492 (F, LL). Hays Co.: *Walker* 44 (TEX). Hemphill Co.: *Eggert*, in 1900 (MO). Hidalgo Co.: *Tracy* 8923 (F, GH, MO, NEB, NY, TAES, TEX, US). Howard Co.: *Correll* 16340 (LL). Jackson Co.: *Drushel* 9564 (US). Jeff Davis Co.: *Waterfall* 4730 (GH, MO, NY). Karnes Co.: *Richards* 560 (KANU). Kenedy Co.: *Johnston* 53.280.85 (TAES, TEX). Kent Co.: *Tracy & Earle* 369 (TEX). Kerr Co.: *Perdue* 1597 (LL, UC). Kinney Co.: *Mearns* 1467 (US). Kleberg Co.: *Cory* 51294 (GH, NY, TAES, US). Lamar Co.: *Shinners* 7864 (GH). La Salle Co.: *Mauermann* 22 (TEX). Llano Co.: *Parks & Cory* 6310 (TAES). Lubbock Co.: *Demaree* 7675 (GH, LL, MO, US). Martin Co.: *Eggert*, in 1900 (MO). Mason Co.: *Taylor* (TAES). Matagorda Co.: *Beamer*, in 1953 (KANU). Maverick Co.: *Bray* (TEX). McMullen Co.: *Thompson & Graham* 67 (TEX). Medina Co.: *Shinners* 7302 (GH). Midland Co.: *Tracy* 7881 (F, GH, MO, NEB, NY, TEX). Nueces Co.: *Pennell* 10341 (NY). Oldham Co.: *Hubricht* A1435 (MO). Parmer Co.: *Shinners* 8332 (GH). Pecos Co.: *Warnock* 11845 (LL). Potter Co.: *Richards* 1105 (KANU). Presidio Co.: *York* 48101 (KANU, TAES, TEX). Randall Co.: *Eggert*, in 1901 (MO). San Patricio Co.: *Richards* 3740 (KANU). Scurry Co.: *Harris*, in 1927 (TEX). Smith Co.: *Moore* 828 (GH). Starr Co.: *Tharp & Johnston* 541899A (TEX). Sutton Co.: *Aldwell Bros.* 17499 (TAES). Tarrant Co.: *Ruth* 1054 (GH). Taylor Co.: *Tolstead* 7274 (GH, MO, NEB, NY, TEX). Terrell Co.: *Webster* 255 (TEX). Tom Green Co.: *Smith* 16 (GH, OKL). Travis Co.: *Richards* 549 (KANU). Val Verde Co.: *Jones* 25904 (MO, UC). Victoria Co.: *Richards* 556 (KANU). Washington Co.: *Brackett* 285 (GH, TEX). Webb Co.: *Orcutt* 5768 (MO). Wharton Co.: *Drushel* 10723 (NY). Willacy Co.: *Johnston* 53.280.87 (TEX). Williamson Co.: *York* 46218 (OKL). Wilson Co.: *Richards* 563 (KANU). Zapata Co.: *Clover* 699 (US). UTAH: Grand Co.: *Holmgren & Hansen* 3496 (GH, NY, US). WYOMING: Converse Co.: *Nelson* 8416 (ARIZ). Laramie Co.: *Shantz* (NEB). Natrona Co.: *Nelson* 570 (MO, NY, UC, US). CANADA: ALBERTA: *Moodie* 1188 (NY, US). MANITOBA: *Macoun* 12243 (NY). MEXICO: CHIHUAHUA: *Shreve* 7979 (ARIZ). COAHUILA: *Nelson* 6152 (F, US). NUEVO LEON: *Frye & Frye* 2358 (ARIZ, GH, MO, NY, UC). TAMAULIPAS: *Tracy* 8947a (F, GH, MO, NY, TAES, TEX).

5. *RATIBIDA LATIPALEARIS* Richards, *Rhodora* 66 (767):267, 268. 1964.





Plate 1393

Fig. 7. *Ratibida latipalearis*. ca. 1/3 actual size. Richards 3770 (KANU).



Stems one or more, branched, sulcate, 5.5-11.7 dm high, strigose-hirsute, unicellular globular glands interspersed in the grooves, average number of ridges 10 just below inflorescence. Leaves strigose-hirsute, punctate on both surfaces, basal leaves long petioled, 3.2-26.5 cm long, ovate-obovate, crenate to 3-7 pinnately cleft, 3-nerved, lateral segments entire to serrate-crenate, oblong-oblongate, 0.2-4.0 cm long, 0.2-2.4 cm wide, terminal lobe ovate, serrate-crenate to cleft-parted, 2.0-7.0 cm long, 0.2-3.6 cm wide, upper leaves ovate-obovate or oblong, 2.7-14.3 cm long, 1.9-8.5 cm wide, 3-9 pinnate or pinnately cleft, terminal segment lanceolate, parted or cleft, 2.0-7.0 cm long, 0.6-4.5 cm wide, lateral segments oblanceolate, entire or cleft, 0.2-4.7 cm long, 0.1-1.5 cm wide. Peduncles 11.8-33.5 cm long. Heads solitary, columnar, 1.7-3.5 cm long, 0.9-1.3 cm wide, on naked peduncles; receptacles linear, 1.7-3.3 cm long, 1.2-4.0 mm wide, narrowing to apex. Phyllaries reflexed, 10-12, linear-lanceolate, black punctate glands present, inner surface glabrous except for strigose-hirsute marginal tips, biseriate, outer row 0.6-1.1 cm long, 1.0-1.2 mm wide, inner row 0.3-0.8 cm long, 0.8-1.2 mm wide. Ray flowers 8-17, yellow, lanceolate-oblongate, or oval-oblong, 0.8-3.1 cm long, 0.4-1.2 cm wide, outer surface hirsute, black resinous and punctate glands interspersed on outer surface, inner surface glabrous, tube short, 1.0-2.0 mm long, apex 2-3 lobed, lobes 0.2-8.2 mm long, 0.2-3.5 mm wide. Disc corollas dark greenish-yellow, 1.6-2.0 mm long, lobe segments 0.6-1.0 mm wide, apex lobes reflexed, ovate, 0.5-1.0 mm long, black resinous glands present on outer lobe surface; anthers sagittate, 1.2-2.0 mm long, tips with black resinous glands on outer surface, filaments 0.5-1.2 mm long, attached to base of anther; styles 1.0-1.8 mm long, filiform, the branches 2, 0.8-1.2 mm long, stigmatic surface restricted to tip, a fourth the length of the style branch. Palea 2.8-3.0 mm long, 4.0-5.0 mm wide, adaxial side hyaline, winged, ciliate, abaxial side hirsute half way down to base, few unicellular, black glands near base; vertical oblanceolate resin gland present in center of palea 1.0-1.2 mm long. Achenes oblong-oblongate, 2.0-3.0 mm long, 1.1-1.4 mm wide, adaxial margin glabrous, occasionally ciliate or with black, stalked glands; pappus 1-2 minute teeth or absent. (Figs. 7, 9, 11f, 12f, 13f).

Flowering time: August-October.

Holotype. Mexico. Chihuahua: Colonia Garcia, 37 miles southwest of Colonia Juarez, pine forest meadow, August 29, 1962, *Richards 3770* (KANU!; Isotypes F!, GH!, KANU!, MO!, NY!, UC!, US!).

Habitat and Distribution. Pine forest meadows, valleys and rocky pine slopes of Sierra Madre Occidental, Chihuahua, Mexico.



*Ratibida latipalearis*, as presently known, is limited in distribution to Chihuahua, Mexico. It was recognized as a new species because of the non-dissected, triple-nerved, first basal leaves, the greenish-yellow heads with 8-17 upright ligules, black glands on the ligules, phyllaries, petal lobes of the disc corollas and the apex of the anthers, palea mostly broader than long with unicellular black glands from the middle to the base of the adaxial margin, and the branching habit of the stem.

Representative specimens selected from 19 sheets: MEXICO: CHIHUAHUA: *Dobie 2* (TEX); *LeSueur 988* (F, MO, TEX, UC); *Muller 3547* (LL, UC); *Richards 3770* (KANU); *Townsend & Barber 230* (F, MO, NY, UC, US); *Tucker 2573* (ARIZ).

6. *RATIBIDA TAGETES* (James) Barnh., Bull. Torr. Bot. Club 24:410. 1897.

*Rudbeckia tagetes* James, Long's Exped. 2:68. 1823.

*Rudbeckia globosa* Nutt., J. Acad. Natur. Sci. Phila. 7:79. 1834.

*Obeliscaria tagetes* DC., Prodr. 5:559. 1836.

*Lepachys columnaris* Torr. & Gray var. *tagetes* Gray, Smiths. Contrib. Knowl. (Pl. Wright.) 3:106. 1852.

*Lepachys tagetes* (James) Gray, Pac. Railw. Report. 4:103. 1856.

*Ratibida tagetes* (James) Barnh. var. *cinera* Standley, Muhlenb. 5:30. 1909.

Stems one or many, branched, 1.6-5.4 dm tall. Leaves ovate-obovate or linear-oblong, 0.6-8.6 cm long, 0.2-6.6 cm wide, pinnately or bipinnately cleft into 2-7 lobes, narrowly lanceolate, 0.3-4.3 cm long, 0.8-4.0 mm wide, lower leaves are lanceolate and may be entire, a few upper leaves cauline and entire. Peduncles 0.3-6.4 cm long. Heads solitary, globular, 0.6-1.4 cm long, 0.6-1.2 cm wide. Phyllaries 10-12, the inner series ovate, 1.2-3.8 mm long, 0.4-1.5 mm wide, the outer lanceolate, 1.2-6.0 mm long, 0.6-2.4 mm wide. Ray flowers 5-10, yellow, purplish-yellow to purple, oval-oblong, 2.8-8.5 mm long, 2.0-6.0 mm wide, hirsute on outer surface, punctate glands numerous on outer surface, inner surface glabrous, 2-3 lobed apex, lobes 0.1-2.1 mm long, 0.3-3.0 mm wide. Disc corollas 1.2-1.9 mm long, lobes 0.5-0.8 mm wide, apex punctate, 0.5-1.0 mm long; anthers 1.0-1.5 mm long, punctate glands abundant on outer apex, filaments 0.4-1.0 mm long; styles 1.0-1.9 mm long, the branches 0.8-1.2 mm long, stigmatic portion a fourth the length of the style branch. Palea 2.1-4.0 mm long, 1.5-2.5 mm



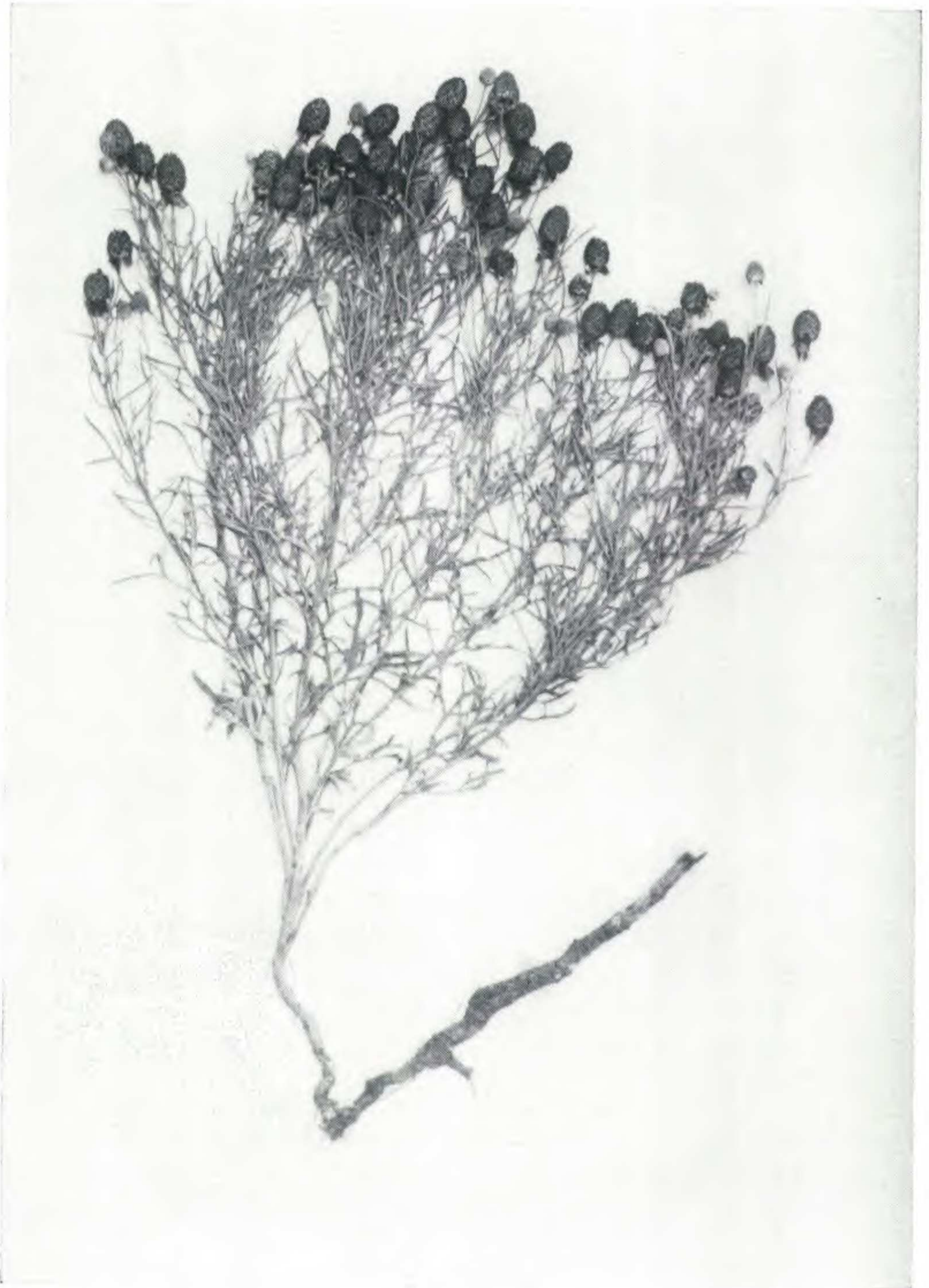


Plate 1394

Fig. 8. *Ratibida tagetes*. ca. 1/3 actual size. Richards 1111 (KANU).



wide, punctate glands at apex, adaxial edge hyaline, ciliate, abaxial edge strigose to below the center, unicellular glands from below center to the base, resin gland linear-oblongate, 1.1-2.1 mm long. Achenes oblong-oblique, 1.9-2.8 mm long, 1.2-2.0 mm wide, glabrous except some ciliation at apex, winged adaxial edge; pappus a thick-crowned corona. (Figs. 8, 10, 11c, 12c, 13c).

Flowering time: May-October.

Holotype. Colorado: Otero County, south of La Junta, in prairie near stagnant pool, July 24, 1820, *James* (NY!).

Habitat and Distribution. Prairies, high plains, and rocky hillsides. Colorado, Kansas, Oklahoma, southwestern United States, and Chihuahua, Mexico.

Standley (1909) described *Ratibida tagetes* var. *cinera* (Holotype *Standley 5156* NY!; Isotype MO!, US!) based on the stem and peduncles being cinerous and densely tomentose-hirsute with gray leaves also very densely strigose-hirsute. This is the only known occurrence of Standley's variety but with transplants from Seward County, Kansas (*Richards 3777* KANU), a pubescence similar to the above named variety was observed on greenhouse plants. Further observation led to the discovery of a minute gall or bud mite (Eriophyidae) feeding in the tomentose-hirsute areas. Use of insecticides stopped further outbreak of this phenomenon and the plants recovered, with the exception of small dead portions, to appear normal and flower. Careful study of Standley's type *5156* revealed the remains of similar mite exoskeletons. One other collection of *Ratibida tagetes*, Colfax County, New Mexico, *Lucas 193* (OKL), exhibited this cinerous type of pubescence and again similar mite remains were seen in the areas showing the pubescence of Standley's variety.

In addition to the bud mite, hyphal filaments of a Deuteromycete were seen on a slide made by scraping the leaf surface in the noticeable areas of pubescence from Standley's specimens and staining with lacto-phenol cotton blue. Standley (1909) mentions the possibility that his variety might be the typical form of *R. tagetes* affected by some fungus. On another specimen, *Lucas 193* (OKL), conidia and hyphal filaments of *Alternaria* were seen on a mounted



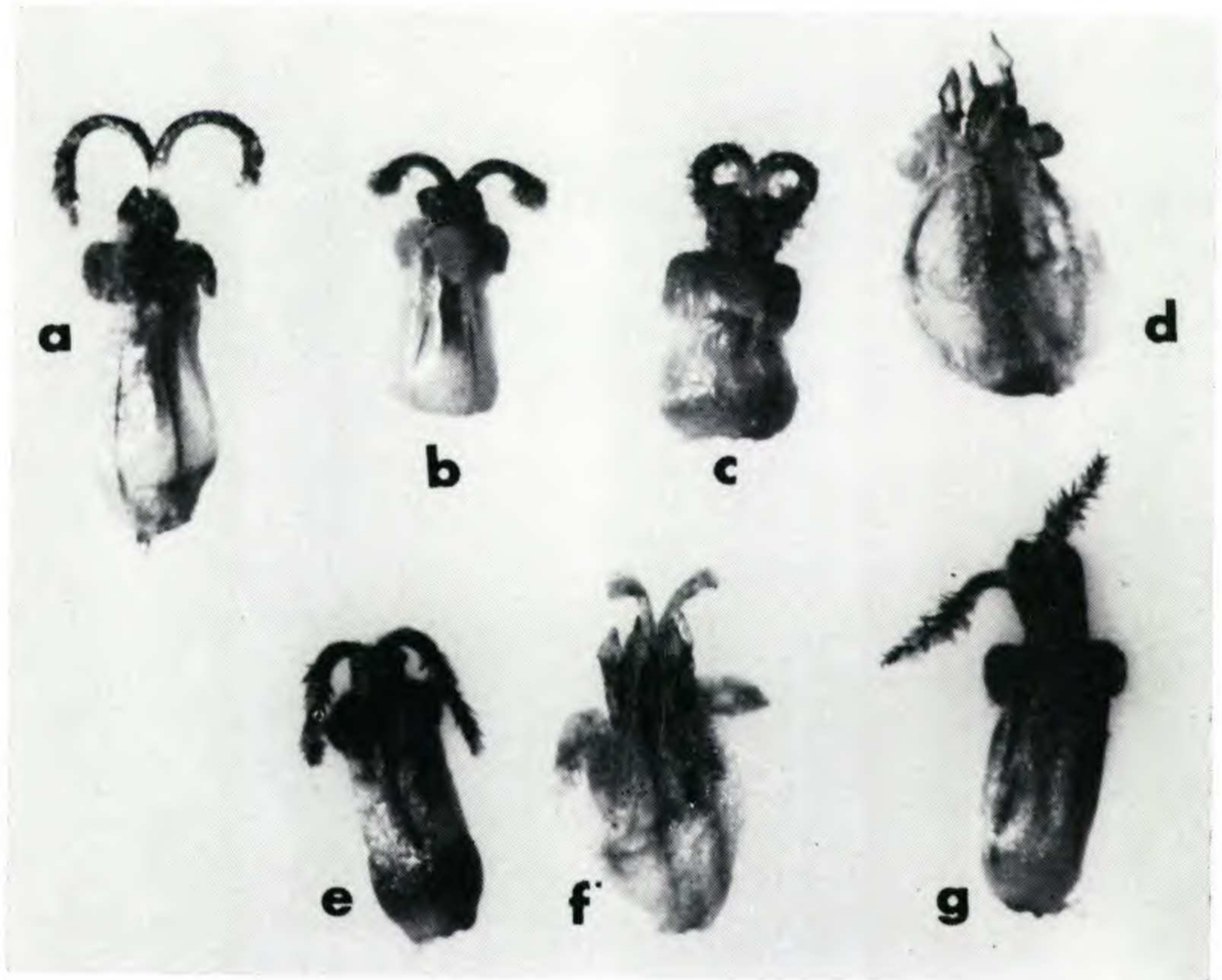


Plate 1395

Fig. 11. Disc Corollas of *Ratibida*; ca.  $\times 9$ . a. *R. pinnata*; b. *R. columnifera*; c. *R. tagetes*; d. *R. mexicana*; e. *R. peduncularis* var. *picta*; f. *R. latipalearis*; g. *R. peduncularis* var. *peduncularis*.

slide. Conidia and hyphal filaments were also taken from *Richards 3777* (KANU).

The above leads the author to believe that either mites or a fungus or both are the cause of the cinerous pubescence of Standley's variety and it is, therefore, not recognized in this study.

*Ratibida tagetes* is a short species characterized by small globular heads, narrowly linear or dissected leaves, yellow to purple ligules, and a well-formed tap root which produces adventitious buds from horizontal branches, leading to clonal development. The purple and purplish-yellow ligules have never been recognized as a color form probably because they usually occur together, infrequently being found in pure colonies. The rays are small and inconspicuous com-



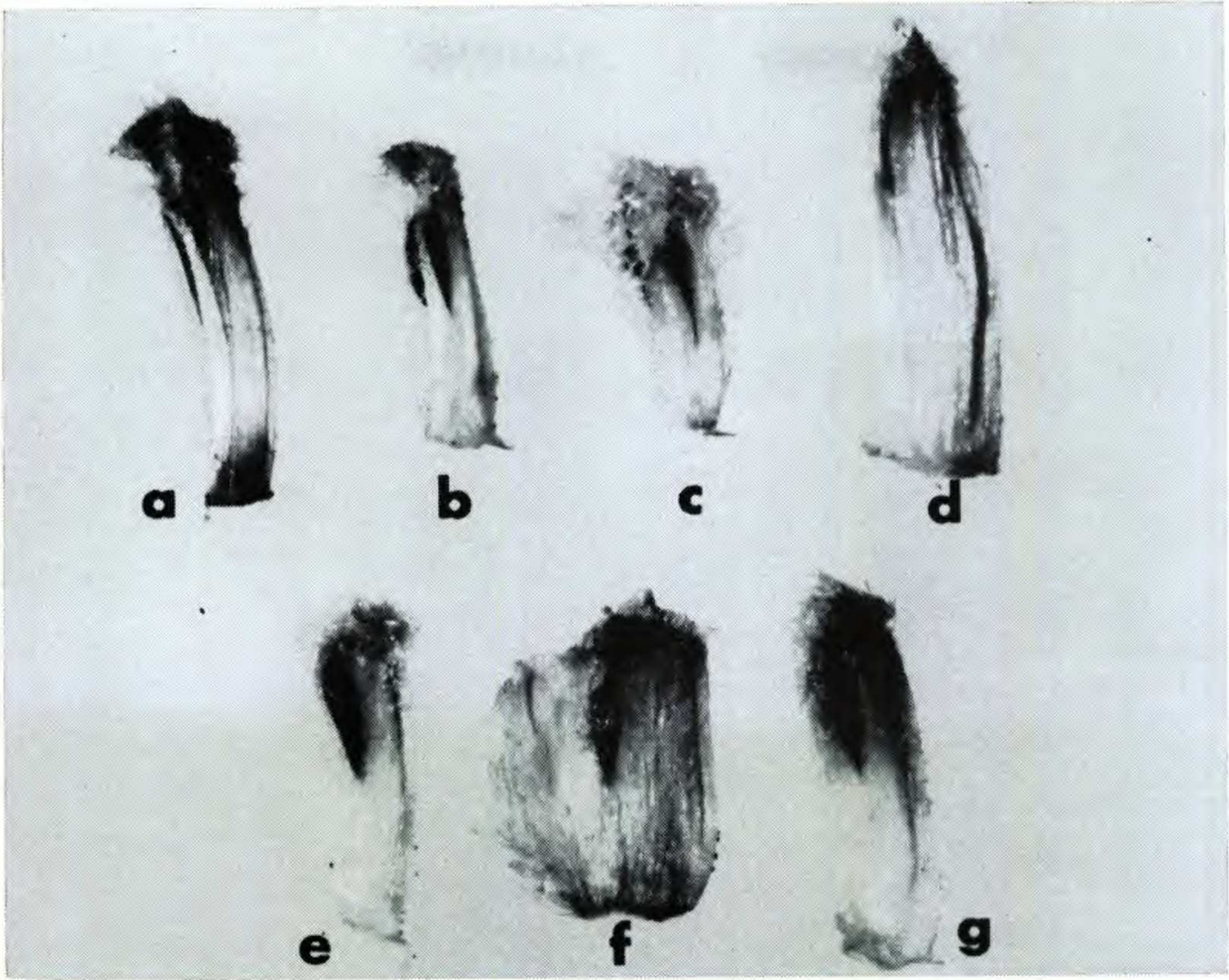


Plate 1396

Fig. 12. Paleae of *Ratibida*; ca.  $\times 9$ . a. *R. pinnata*; b. *R. columnifera*; c. *R. tagetes*; d. *R. mexicana*; e. *R. peduncularis* var. *picta*; f. *R. latipalearis*; g. *R. peduncularis* var. *peduncularis*.

pared to the larger showy ones of the color form of *R. columnifera*. Wootton and Standley (1915) mention the small rays of *R. tagetes* and the various forms as reasons for not naming a new variety.

Representative specimens selected from 398 sheets: UNITED STATES: ARIZONA: Apache Co.: *Griffiths 5092* (US). Coconino Co.: *Deaver* (ARIZ). COLORADO: Archuleta Co.: *Bethel & Payson*, in 1917 (NY). Baca Co.: *Richards 1132* (KANU). Bent Co.: Coll. unknown 572 (CS). Cheyenne Co.: *Robertson 1474* (CS). Denver Co.: *Engelmann*, in 1874 (MO). Fremont Co.: *Shear 3769* (NY, UC, US). Gunnison Co.: *Baker 667* (GH, MO, NY, UC, US). Huerfano Co.: *Parry 110* (MO). Kit Carson Co.: *Preston* (CS). Las Animas Co.: *Richards 1131* (KANU). Lincoln Co.: *Ownbey 1348* (GH, MO, NY, UC). Otero Co.: *Richards 3776* (KANU). Prowers Co.: *Christ 583* (CS). Pueblo Co.: *Woodward 156* (GH). KANSAS: Barber Co.: *McGregor 14790* (KANU). Edwards Co.: *Richards 3764* (KANU). Finney Co.: *Wilson*



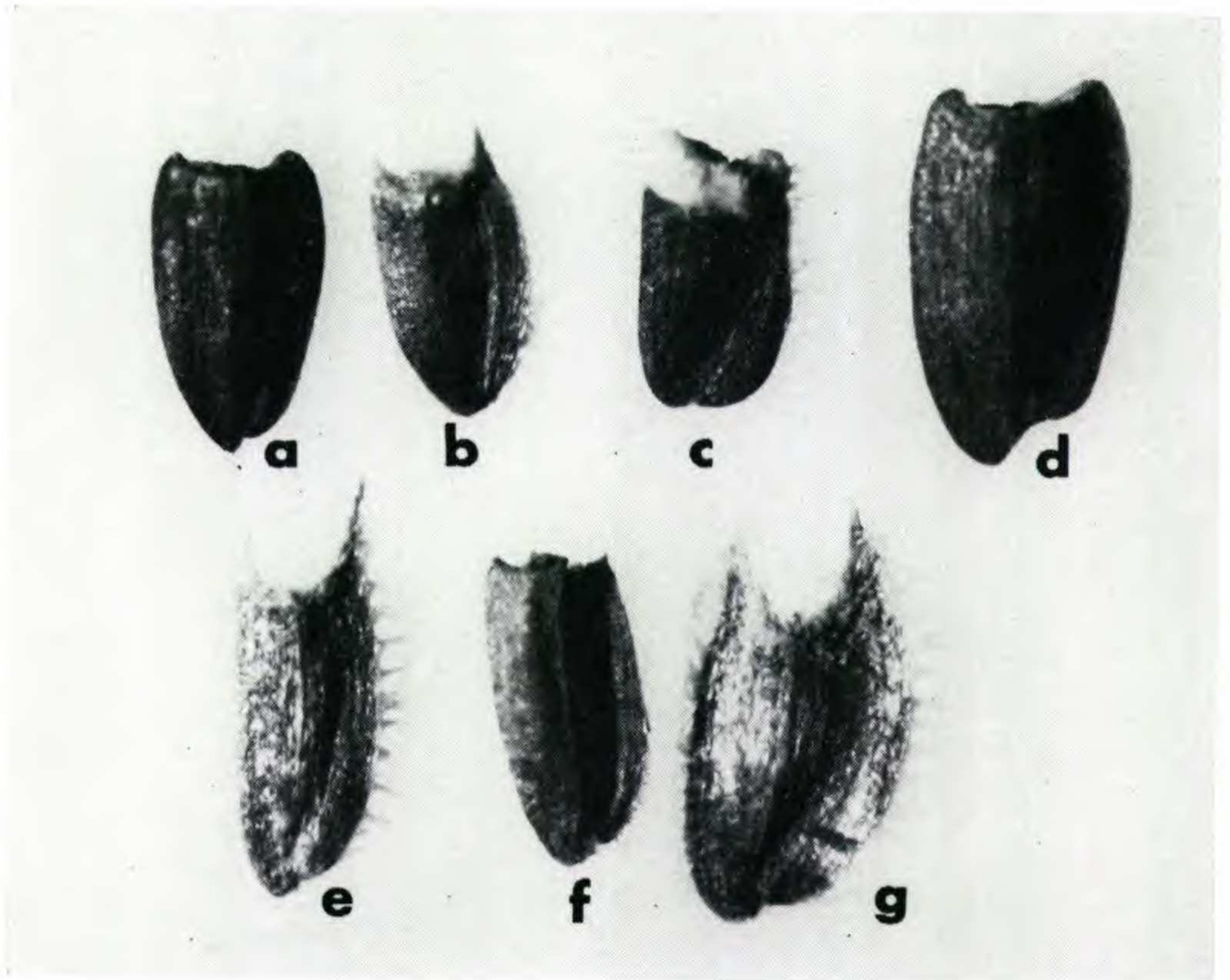


Plate 1397

Fig. 13. Achenes of *Ratibida*; ca.  $\times 10$ . a. *R. pinnata*; b. *R. columnifera*; c. *R. tagetes*; d. *R. mexicana*; e. *R. peduncularis* var. *picta*; f. *R. latipalearis*; g. *R. peduncularis* var. *peduncularis*.

& Miller, in 1912 (KANU). Ford Co.: Richards 3762 (KANU). Grant Co.: McGregor 13993 (KANU). Gray Co.: McGregor 15773 (KANU). Greeley Co.: Reed, in 1892 (MO, UC, US). Hamilton Co.: Rydberg & Imler 1017 (KANU, NY). Kearney Co.: Rydberg & Imler 938 (KANU, NEB, NY). Logan Co.: McGregor 17245 (KANU). Meade Co.: Richards 3759 (KANU). Morton Co.: Richards 3570 (KANU). Russell Co.: Hitchcock 268 (GH, KANU, MO, NY, US). Scott Co.: Agrelius, Wilson & Agrelius, in 1912 (KANU). Seward Co.: Richards 3761 (KANU). Sherman Co.: Harshbarger 3801 (US). Stanton Co.: Thompson 68 (F, MO, NY, UC, US). Stevens Co.: Harms 752 (KANU). Trego Co.: Bodin 20 (F). Wallace Co.: Letterman, in 1884 (MO, NY). NEW MEXICO: Bernalillo Co.: Jones 4118 (F, US). Colfax Co.: Richards 1129 (KANU). Dona Ana Co.: Wootton 5 (GH, MO, NY, US). Eddy Co.: Standley 40347 (US). Grant Co.: Bigelow 5571 (NY). Guadalupe Co.: Richards 1111 (KANU). Hidalgo Co.: Wolf 2591 (GH). Lea Co.: Harms 1786 (KANU). Lincoln Co.: Skehan 32 (F, GH, MO, NY, UC, US). McKinley Co.: Dittmer 9020 (UNM). Mora Co.:



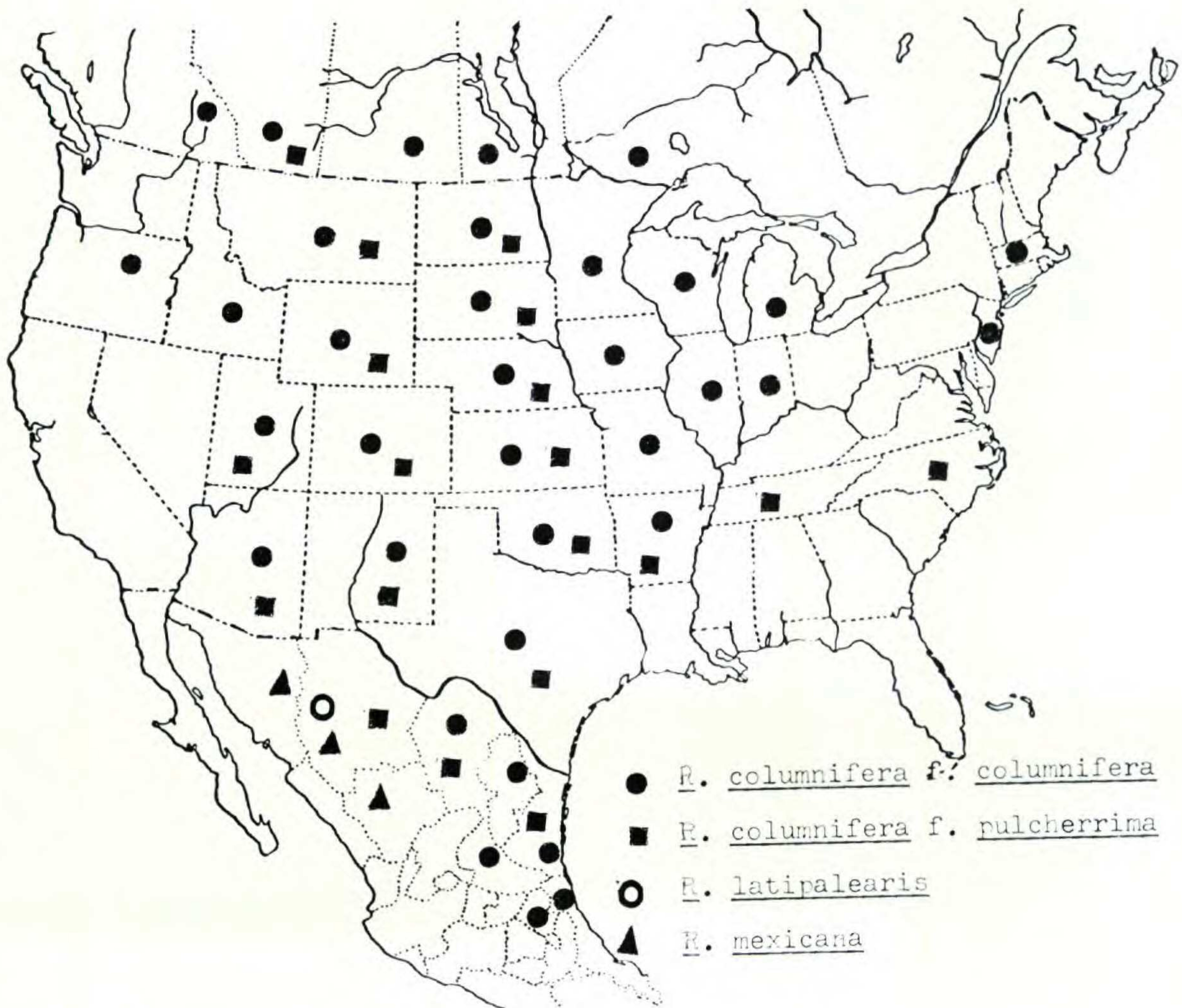


Fig. 9. Distribution of *Ratibida*.

*Richards 3773* (KANU). Quay Co.: *Fisher 157* (US). Rio Arriba Co.: *Jackson 2511* (UNM). Roosevelt Co.: *Dittmer 9018* (UNM). Sandoval Co.: *Ellis 208* (US). San Miguel Co.: *Richards 3772* (KANU). Santa Fe Co.: *Heller & Heller 3829* (ARIZ, GH, KANU, MO, NEB, NY, US). Sierra Co.: *Jackson 2814* (KANU). Socorro Co.: *Dunn 5281* (UNM). Torrance Co.: *Clark 10328* (UNM). Union Co.: *Harms 1958* (KANU). Valencia Co.: *Dittmer 9019* (UNM). OKLAHOMA: Cimarron Co.: *Demaree 13301* (GH, NY, OKL). Harmon Co.: *Stevens 1080* (GH, MO, NY, OKL). Texas Co.: *Williams 95* (UC). TEXAS: Brewster Co.: *Warnock W919* (GH, TEX). Crane Co.: *Tharp, in 1941* (TEX). Crockett Co.: *Parks & Cory 29672* (TAES). Culberson Co.: *Tharp & Janszen 49-1002* (TEX). Dallam Co.: *Griffiths 5641* (MO, US). Deaf Smith Co.: *Shinners 8334* (TEX). El Paso Co.: *Waterfall 3956* (ARIZ, GH, MO). Hartley Co.: *Palmer 14142* (MO, US). Hudspeth Co.: *Mulford 260* (MO, NY). Lamb Co.: *Shinners 8354* (GH, UC). Lub-



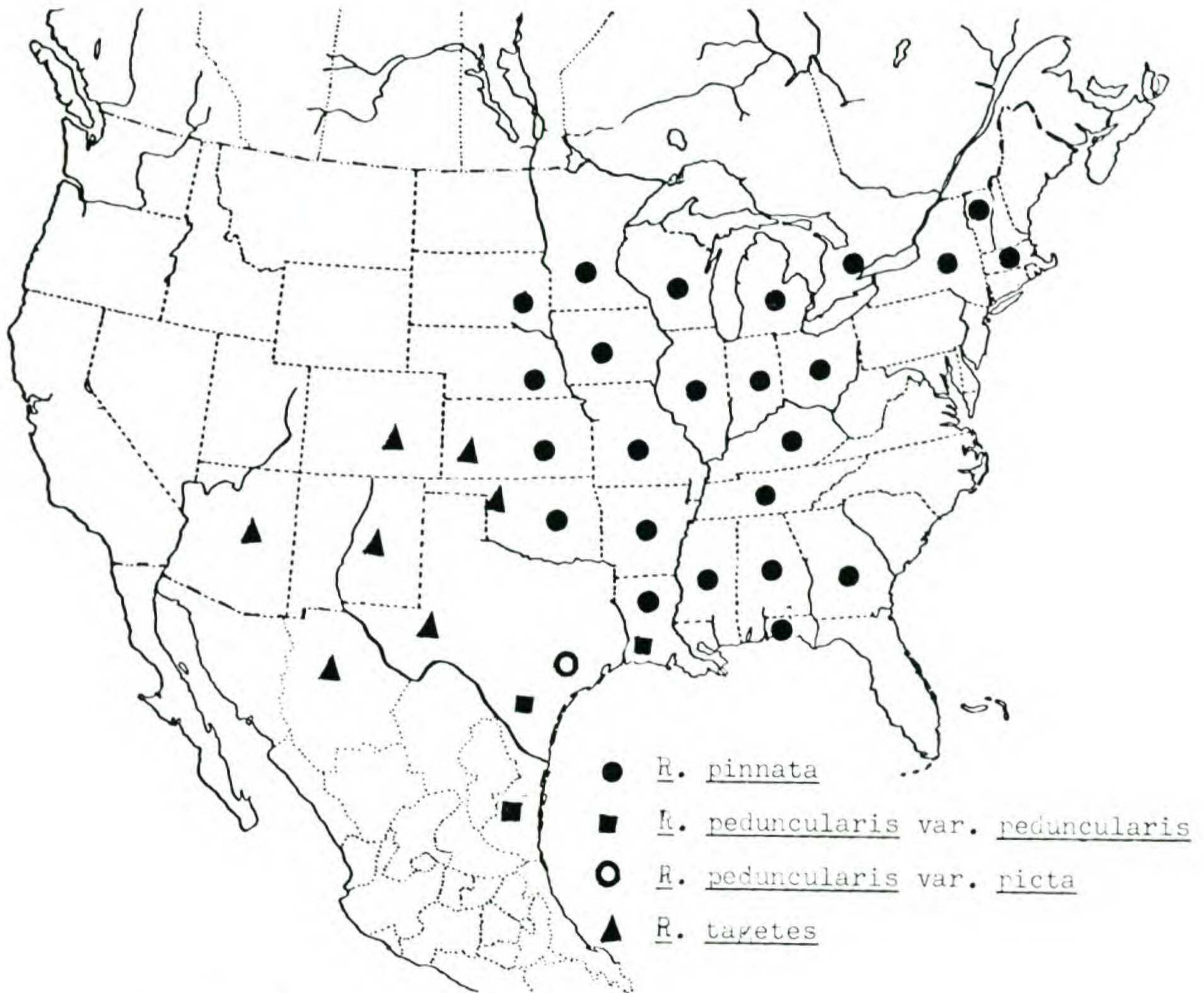


Fig. 10. Distribution of *Ratibida*.

bock Co.: *Demaree* 7728 (GH, MO, US). Nolan Co.: *Tharp* 47466 (TAES). Ochiltree Co.: *Cory* 32228 (TEX). Oldham Co.: *Reverchon* 3340 (MO). Pecos Co.: *Tharp* 43939 (F, MO, NY, TEX, UC). Potter Co.: *Palmer* 12534 (MO, UC). Randall Co.: *Cory* 16505 (GH). Reagan Co.: *Merrill* (TAES). Reeves Co.: *Warnock* 6229 (TEX). Sherman Co.: *Weaver* 17800 (TAES). Sutton Co.: *Cory* 15414 (LL). MEXICO: CHIHUAHUA: *Pringle* 1061 (F, MO, NY).

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