A REVISION OF THE CENTRAL AMERICAN GENUS *ROMANSCHULZIA* (BRASSICACEAE)

IHSAN A. AL-SHEHBAZ[1]

Abstract. A revision of the 14 species of *Romanschulzia* is presented. Full synonymy, descriptions, ecological data, when available, and a key are given. Based on the examination of type collections of all species, the limits of *Romanschulzia* is expaned to include two species, *R. alpina* and *R. mexicana,* previously placed in the genera *Lexarzanthe, Sisymbrium,* and *Thelypodiopsis*. The present account deviates from the most recent account of the genus, especially for the most widespread species.

Keywords: Brassicaceae, Cruciferae, *Romanschulzia,* Central America

Schulz (1933) proposed the genus *Romanschulzia* O.E. Schulz (Brassicaceae or Cruciferae) to accommodate four Central American species previously assigned to *Arabis* L., *Nasturtium* W.T. Aiton, *Sisymbrium* L., and *Thelypodium* Endl.

Rollins (1942) revised the genus to include eight species, and several subsequent studies (e.g., Rollins, 1956, 1984, 1993; Al-Shehbaz & Iltis, 1993; Busmante and Fonseca, 2009) expanded it to include a total of 14 species (Al-Shehbaz, 2012).

Schulz (1936) placed the genus in the unigeneric and illegitimately published tribe Romanschulzieae, a group delimited primarily on the basis of having early caducous sepals and spreading, subequal stamens surrounded at base by well-developed nectaries. However, Rollins (1942) suggested that *Romanschulzia* should be assigned to the same tribe including *Thelypodium,* and most recent molecular studies (Warwick et al., 2009, 2010) supported the placement of both genera in the tribe Thelypodieae.

Most species of *Romanschulzia* have caducous sepals that often fall off at anthesis. In general, the sepals are larger and more colorful than the petals that are lacking in species such as *R. apetala* Rollins, *R. correllii* Rollins, *R. guerrerensis* Bustam. & R.M. Fonseca, *R. rzedowskii* Rollins, and *R. subclavata* Rollins. By contrast, the filaments are usually well spreading, and considerably dilated at a base surrounded by well-developed and confluent nectaries. Indeed, the nectar glands are far more developed in *Romanschulzia* than in any other genus of the Brassicaceae. Therefore, in several species the stamens become the most attractive part of the flower. Furthermore, several species (e.g., *R. apetala* Rollins, *R. elata* Rollins, *R. guatemalensis* (Standl.) Rollins, *R. arabifomis* (DC.) Rollins, *R. orizabae* (Schltdl. & Cham.) O.E. Schulz, *R. subclavata* Rollins) have long, several-branched inflorescences the main branches of which may carry as many as 200–500 flowers, as in *Medina 2984* (MEXU) of *R. arabiformis*.

The massive production of flowers undoubtedly attracts a variety of pollinators. Unfortunately, however, we know nothing about the breeding systems, chromosome numbers, or pollinators of a single species of *Romanschulzia*.

The goal of this research is to provide an updated revision of the genus *Romanschulzia* for Flora of the World Online and BrassiBase, an on-line project compiling and synthesizing all available data on the systematics and phylogeny of the family Brassicaceae (Koch et al., 2012). Updated generic and species descriptions, complete synonymy, and a key to species are provided.

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[1] Missouri Botanical Garden, 2345 Tower Grove Avenue, St. Louis, Missouri 63110, U.S.A.; ihsan.al-shehbaz@mobot.org

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Romanschulzia O.E. Schulz, Bot. Jahrb. Syst. 66: 99. 1933.

TYPE: *R. orizabae* (Schltdl. & Cham.) O. E. Schulz (Lectotype, designated by Rollins 1993: 725).

Synonym: *Lexarzanthe* N. Diego & Calderón, Acta Bot. Mexicana 68: 74. 2004.

TYPE: *L. mexicana* (Iltis & Al-Shehbaz) N. Diego & Calderón (=*Romanschulzia mexicana* Iltis & Al-Shehbaz).

Herbs, annual or perennial, with a caudex, rarely shrubs. *Trichomes* absent or simple. Multicellular glands absent. *Stems* erect simple at base, branched above middle, leafy, unarmed. *Basal leaves* soon withered, petiolate, often not rosulate, simple, pinnately divided, dentate, or entire; *cauline leaves* sessile or rarely lowermost petiolate, auriculate to amplexicaul at base, entire, dentate, or denticulate. *Racemes* numerous flowered, lax, ebracteate, elongated considerably in fruit; rachis straight; fruiting pedicels slender or thickened, erect to divaricate or reflexed. *Sepals* ovate to oblong, free, caducous at or rarely after anthesis, spreading or rarely erect, equal, base of inner pair not saccate; petals present or absent, white, creamy white, to purplish, spreading or rarely erect, slightly shorter to longer than sepals; blade oblong or oblanceolate to nearly linear, apex obtuse, entire, obscurely differentiated from claw, unappendaged, glabrous; stamens 6, spreading or rarely erect, equal or subequal in length; filaments wingless, unappendaged, glabrous, free, strongly dilated at base; anthers oblong to linear, not apiculate at apex; nectar glands well developed, confluent, subtending or surrounding bases of all stamens; median nectaries present; ovules 10–60 per ovary; placentation parietal. *Fruit* dehiscent capsular siliques, linear or rarely oblong-linear, terete or latiseptate, not inflated, subsessile or short to long stipitate, unsegmented; valves with an obscure or prominent midvein, glabrous, not keeled, smooth or torulose, wingless, unappendaged; gynophore obsolete or distinct, rarely to 3.2 cm long; replum rounded, visible; septum complete, membranous, not veined; style absent, obsolete or to 6 mm long, cylindric, persistent, glabrous; stigma capitate, entire, unappendaged. *Seeds* uniseriate or biseriate, wingless, oblong to ovoid, plump; seed coat minutely reticulate, not mucilaginous when wetted; cotyledons incumbent or accumbent.

Fourteen species in central and southern Mexico south into Panama.

KEY TO THE SPECIES OF *ROMANSCHULZIA*

1a. Fruiting pedicels 4–8 cm; gynophore 2–3.2 cm, both filiform . . . . . *R. mexicana*
1b. Fruiting pedicels 0.2–1.5(–2.5) cm; gynophore obsolete or to 0.6 cm, both stout 2
2a. Shrubs or subshrubs; sepals 5–8 mm; fruits latiseptate, 2.5–4 mm wide; style 2–4 mm; gynophore 3–6 mm; seeds ca. 3 × 2 mm, compressed . . . . . *R. apetala*
2b. Annual or perennial herbs; sepals 2–4.5 mm; fruit terete, 1–2(–2.5) mm wide; style 0.5–1.5(–2) mm; gynophore obsolete or 0.1–2 mm; seeds 1–2 × 0.6–1.3 mm, plump 3
3a. Fruits and fruiting pedicels sharply reflexed, subappressed to rachis . . . . . *R. rzedowskii*
3b. Fruits and fruiting pedicels horizontal, divaricate, or ascending, rarely descending, not appressed to rachis 4
4a. Fruits 6–10 cm, submoniliform; ovules and seeds 80–110 per fruit . . . . . *R. meyeri*
4b. Fruits 1.4–4.5(–5.5) cm, smooth or torulose; ovules and seeds 22–68(–80) per fruit 5
5a. Petals absent; fruits strongly torulose 6
5b. Petals present; fruits smooth or only slightly torulose 8
6a. Fruits 1.4–2(–2.5) cm × 1.4–2 mm; ovules 22–28 per ovary; gynophore 1–2 mm . . . . . *R. subclavata*
6b. Fruits 3–4.5 cm × 1.2–1.5 mm; ovules and seeds 36–70 per ovary; gynophore obsolete 7
7a. Fruiting pedicels 2.5–4(–5) mm, ascending; ovules and seeds 56–70 per fruit; filaments 1.5–2 mm; Chihuahua . . . . . *R. correllii*
7b. Fruiting pedicels 5–10 mm, horizontal to divaricate; ovules and seeds 36–54 per fruit; filaments 3–3.5 mm; Guerrero . . . . . *R. guerrerensis*
8a. Petals usually purple; Guatemala 9
8b. Petals white, creamy white, or greenish, very rarely pale lavender; Mexico, Costa Rica, and Panama 10
9a. Petals and stamens ascending; fruits (3.5–)4–5.5 cm; sepals ascending, remaining during anthesis; annuals; stems 1.5–7 dm . . . . . *R. alpina*
9b. Petals and stamens spreading; fruits 1.8–3 cm; sepals spreading, caducous at anthesis; perennials; stems 10–15 dm . . . . . *R. guatemalensis*

KEY TO THE SPECIES OF *ROMANSCHULZIA* CONT.

10a. Fruits erect, ascending, or divaricate, ± forming a right or wider angle with pedicel (except some forms of *R. orizabae*); ovules and seeds (48–)60–80 per fruit, seeds biseriate or subbiseriate 11

10b. Fruits horizontal to descending, ± forming a straight or slightly curved line with pedicel; ovules and seeds 30–50(–60) per fruit, seeds uniseriate 12

11a. Fruits (2–)2.5–3.7(–4.5) cm; seeds 1–1.5 mm; young fruits and sepals glabrous; mature flower bud obtuse at apex, not angled . . . . . *R. orizabae*

11b. Fruits 0.8–1.4(–1.8) cm; seeds 0.7–0.9 mm; young fruits and/or sepals usually sparsely pilose; mature flower buds 4-angled/subcucullate at apex . . . . . *R. arabiformis*

12a. Petals 1–2 mm, oblong; filaments 1.5–2 mm; Costa Rica, Panama . . . . . *R. costaricensis*

12b. Petals 3–5 mm, linear; filaments 3.5–4 mm; México 13

13a. Fruiting pedicels (10–)15–25 mm, not expanded at apex; racemes 120–200-flowered; San Luis Potosí . . . . . *R. elata*

13b. Fruiting pedicels 5–10 mm, distinctly expanded at apex; racemes 20–110-flowered; Hidalgo, Queretaro . . . . . *R. schistacea*

1. Romanschulzia alpina Standl. & Steyerm., Fieldiana, Bot. 24(4): 377. 1946. TYPE: GUATEMALA. Dept. Huehuetenango: between Tojquiá and Caxin bluff, summit of Sierra de los Cuchumatanes, 3700 m, 6 Aug. 1942, *J. A. Steyermark 50144* (Holotype: F-1141005).

Homotypic synonyms: *Thelypodiopsis alpina* (Standl. & Steyerm.) Rollins, Contr. Gray Herb. 206: 12. 1976

Sisymbrium standleyi Rollins, Rhodora 58: 156. 1956, non *Sisymbrium alpinum* E. Fournier, Recherch. Crucif. 131. 1865.

Annual *herbs*, glabrous throughout except lowermost leaves. *Stems* (15–)30–70 cm, erect, branched above. Lowermost *cauline leaves* petiolate, narrowly lanceolate, petioles sparsely ciliate; middle and upper *cauline leaves* 3–7 × 0.5–1.2 cm, sessile, glaucous, auriculate or sagittate, margin remotely denticulate or entire, apex acute to acuminate; auricles acute. *Racemes* somewhat lax, main branch ca. 20-flowered, expanded in fruit; fruiting pedicels 5–12 mm, ascending to divaricate, slender, hardly expanded at apex. *Sepals* 3–3.5 mm, oblong, ascending, lilac, remaining during anthesis; petals purple, 5–6 × ca. 0.5 mm, lingulate, ascending, apex obtuse; filaments 3–3.5 mm, ascending; anthers ca. 1 mm, oblong; nectar glands confluent, surrounding bases of lateral stamens, subtending those of median stamens; ovary glabrous; ovules 30–40 per ovary. *Fruits* (3.5–)4–5.5 cm × ca. 1.5 mm, linear, terete, torulose; gynophore to 0.2 mm; valves with a distinct midvein; style ca. 1 mm; stigma slightly wider than style. *Seeds* 1–1.3 mm, ovoid, plump, uniseriate.

Ecology: found in grassy alpine slopes, rocky areas at 3,300–3,700 m.

Additional specimens examined: GUATEMALA. Huehuetenango: near Tunima, Sierra de los Chuchumatanes, *Steyermark 48923* (F). Quezaltenangto: Volcán Santa Maria, *Skutch 864* (GH).

Because of its ascending instead of spreading floral parts, caducous sepals post- instead of pre-anthesis, and poorly instead of well-developed glandular tissue, this species was excluded from *Romanschulzia* and renamed in *Sisymbrium* L. (Rollins, 1956), transferred to *Thelypodiopsis* Rydb. (Rollins, 1976), and subsequently maintained in the last genus (Rollins, 1982, 1993). However, its assignment to *Sisymbrium* and *Thelypodiopsis* cannot be accepted because they have primarily yellow (vs. white or pink) flowers, tetradynamous (vs. subequal) stamens, and strongly 2-lobed (vs. entire) stigmas, all of which features (in parentheses) are characteristic of *R. alpina*. It is retained herein in *Romanschulzia* also because of having dilated filaments, entire stigmas, auriculate-acuminate cauline leaves, and similar fruit morphology. However, further collections and molecular and cytological studies are needed to elucidate the proper generic placement of the species.

2. Romanschulzia apetala Rollins, Contr. Dudley Herb. 3: 224. 1942. TYPE: Costa Rica. Cerro de la Muerte [as Muerto], 10,000 ft [3,048 m], 27 June 1932, *H. E. Stork 3044* (Holotype: F-672906; Isotype: UC).

Shrubs or subshrubs, 1–3 m tall, sparsely to densely pilose basally, glabrous above. *Stems* erect, much branched above middle. *Cauline leaves* 7–15 × 1–3 cm, sessile or lowermost petiolate, auriculate, lanceolate to linear-lanceolate, margin denticulate to entire,

apex acute to acuminate, pilose with crisped trichomes but more densely so abaxially, on both surfaces or adaxially glabrescent; auricles oblong, 2–15 × 1–3 mm. *Racemes* lax, main branch 260–410-flowered, elongated considerably in fruit; fruiting pedicels 15–25 mm, divaricate or slightly recurved, slender, glabrous, considerably expanded at apex. *Sepals* 5–8 mm, oblong, glabrous, spreading, purple to lilac; petals absent; filaments 2–4 mm, greatly dilated at base; anthers 2–3 mm, oblong-linear; nectar glands confluent, surrounding bases of all stamens; ovary glabrous; ovules 10–14 per ovary. *Fruit* 2–3 cm × 2.5–4 mm, oblong-linear, flattened parallel to septum, not torulose; gynophore 3–6 mm; valves obscurely veined, cuneate at both ends; style 2–4 mm; stigma only slightly wider than style. *Seeds* ca. 3 × 2 mm, oblong, slightly compressed, uniseriate; cotyledons accumbent.

Ecology: found in *páramo* and cloud forests at 2,500–3,700 m.

Additional specimens examined: COSTA RICA. San José: Cantón de Dota, R.F. Los Santos, Cuenca del Savegre, *Alfaro 2238* (INB, MO), *Gamboa 1619* (CR, INB, MO); Cantón de Pérez Zeledón, *Alfaro 1187* (INB, MO); Cartago: vicinity of Millsville, ca. 3 km above Nivel, *Holm & Iltis 536* (A, MO); Cordillera Talamanca, Lago Ditkebi, Chirripó massif, *Weston 10132* (GH); S to SW of Cerro Chirripó, *Weston 6067* (UC).

3. Romanschulzia arabiformis (DC.) Rollins, Contr. Dudley Herb. 3: 221. 1942.

Basionym: *Nasturtium arabiformis* DC., Syst. Nat. 2: 200, May 1821. TYPE: MEXICO. "inter Sancta Rosa de la Sierra et Puerto de Varientos," 2,700 m, *F. W. H. A. von Humboldt & A. J. A. Bonpland s.n.* (Holotype: P [fragment, G-DC]; Isotype: B).

Homotypic synonyms: *Sisymbrium arabiforme* (DC.) Kunth in HBG, Nov. Gen. Sp. 5(folio 63): 81, Sep. 1821.

Heterotypic synonyms: *Arabis resediflora* Kunth in H.B.K, Nov. Gen. Sp. 5(folio 63): 81, Sept. 1821; *Erysimum resediflora* (Kunth) Kuntze, Revis. Gen. Pl. 1: 25. 1891; *Romanschulzia resediflora* (Kunth) O.E. Schulz, Bot. Jahrb. Syst. 66: 100. 1933. TYPE: same as above.

Thelypodium pallidum Rose, Contr. U.S. Natl. Herb. 8: 294. 1905. TYPE: Mexico. Morelos, near Tres Marias, 21 Sep. 1903, *J. N. Rose & J. H. Painter 7269* [as 7209 in the protologue] (Holotype: US; Isotypes: GH, NY).

Romanschulzia resediflora (Knuth) O.E. Schulz var. *lasiocarpa* O.E. Schulz, Bot. Jahrb. Syst. 66: 101. 1933; *R. arabiformis* var. *lasiocarpa* (O.E. Schulz) Rollins, Contr. Dudley Herb. 3: 222. 1942. TYPE: Mexico. Morelos, mountain fields above Cuernavaca, 8,500 ft [2,591 m], 4 Nov. 1896, *C. G. Pringle 6601* (Holotype: B; Isotypes, CAS, F, GH, GOET, K, LIL, MEXU × 3, MO, NY × 2, PH, RSA, US × 3).

Annual or perennial. Stems 1–2.5 m, glabrous or hirsute throughout, erect, usually branched above middle. *Basal leaves* lyrate-pinnatifid, with 2–5 lateral lobes on each side, these much smaller than terminal lobe; *middle cauline leaves* lanceolate, 5–30 × 1–8.5 cm, sessile, amplexicaul, denticulate, apex acute to acuminate. *Racemes* lax, main branch 200–490-flowered, elongated considerably in fruit; mature flower buds minutely 4-angled at apex, subcucullate; fruiting pedicels 8–15 mm, horizontal to divaricate, glabrous, straight or slightly curved upwards, not expanded at apex. *Sepals* 2–3, oblong, apically sparsely pilose or rarely glabrous, spreading, green, caducous; petals white or rarely pale lavender, narrowly oblanceolate to linear, 3.5–5 × 0.2–0.8 mm; filaments subequal, dilated at base, 2.5–3.5 mm; anthers oblong, 1–1.7 mm; nectar glands confluent, surrounding bases of all stamens; ovules 60–80 per ovary. *Fruit* 0.8–1.4(–1.8) cm × 1.5–2 mm, linear, glabrous or sparsely pubescent when young, not torulose; gynophore 0.4–1.2 mm; valves with a distinct midvein; style 0.5–1 mm; stigma as wide as style. *Seeds* 0.7–0.9 × 0.6–0.8 mm, broadly ovoid to ovoid-globose, plump, biseriate, striate-reticulate; cotyledons incumbent.

Ecology: flowering June–October among pines and fir, near stream banks at 2,000–3,200 m.

Additional specimens examined: MEXICO. Distrito Federal: El Guarda, delegación de Tlalpan, *Rzedowski 33454* (CAS, MEXU, MICH, NY); San Francisco, delegación de Xochimilco, *Ventura 1549* (MEXU, MICH); Delegación Coyoacán, *Espinosa 590* (MEXU); Mason Viejo, Temascaltepec, *Hinton 1315* (GH, MEXU, NY, US). Estado de México:

Ocuilan, *Matuda et al. 31732* (MEXU). Jalisco: pass between Nevado de Colima and Volcán de Colima, (MICH). Michocan: Mpio. Tingambato, Llano de Cananguio, NE de Pichátro, (MEXU, XAL); Cuanajo, (MEXU); Mpio. Sant Clara del Cobre, camino al Cerro La Cantera, (MICH), Mpio. Pátzcuaro, camino de Los Tanques al Cerro Frijol, 7 km E Pátzcuaro, (MEXU); Mpio. Nuevo Parangaricutiro, cima del Cerro La laguna, *Medina 2984* (XAL); Mpio. Nahuatzen, Colonia Emiliano Zapata, *García & Pérez 2875* (MEXU); 1 km SE Zingiro, camino a Erongarícuaro, *Rzedowski 49218* (MEXU, MICH, TEX, XAL). Morelos, Tres Marias, *Orcutt 3739* (F, DS, GH, MO, US); Mpio. Huitzilac, San Lorenzo Km 53.5 de la carretera federal México-Acapulco 95, SW Tres Marías, (MEXU).

Both of the earlier-published *Nasturtium arabiforme* (May 1821) and the later *Arabis resediflora* (September 1821) were based on the same type collection. Therefore, Schulz (1933, 1936) erred in taking the latter instead of the former name for the combined species.

Although Rollins (1942) correctly delimited *Romanschulzia arabiformis* from *R. orizabae,* he (1993) confused the limits of both species by placing in the synonymy of the former species elements (such as *Thelypodium australe* and *T. mexicanum*) that clearly belong to *R. orizabae*. He also included *T. pallidum* in the synonymy of *R. orizabae* instead of that of *R. arabiformis*. Furthermore, all three collections of *Sessé & Mociño* (3340, 3342 and 3344 at both F and MA) that Rollins (1960) cited under *R. arabiformis* clearly belong to *R. orizabae*. By contrast, Rollins (1993) separated *R. arabiformis* from *R. orizabae* mainly on the degree of development of nectar glands and whether or not the receptacle is enlarged. These alleged differnces show continuous variation that simply does not hold.

As a result of the confusion between the limits of *Romanschulzia arabiformis* and *R. orizabae,* most of the specimens annotated in the major herbaria as the former species actually belong to the latter. Indeed, it is easy to identify the two species, even based on immature plants with floral buds only (see key).

The ranges of narrowly distributed *Romanschulzia arabiformis* and widespread *R. orizabae* appear to be largely allopatric, though both grow in the Federal District and states of México, Jalisco, Michocan, and Morelos. Of the extensive material examined for both species, only the type collection of *R. resediflora* var. *lasiocarpa* (*Pringle 6601*, one isotype each at GH and US) is a mixed gathering cited herein under both species. The GH and US mixed sheets may have contributed early on to Rollins's (1942) expansion of the limits of *R. arabiformis* to include most plants of *R. orizabae*. Fieldwork is needed to establish whether or not the two species are sympatric and hybridize in the above-mentioned states.

4. Romanschulzia correllii Rollins, Contr. Gray Herb. 214: 24. 1984. TYPE: MEXICO. Chihuahua: edge of woods along stream, near La Rocha on tributary of Rio de Soldado, NE slope of Sierra Mohinora, 7,500 ft [2,286 m], 14–15 Oct. 1959, *D. S. Correll & H. S. Gentry 23139* (Holotype: LL).

Annuals or biennials, hirsute basally, glabrous above. Stems 0.3–2 m, erect, much branched above middle, single at base. *Basal leaves* spatulate, 3–5 cm, entire; middle and upper *cauline leaves* to 15 × 5 cm, sessile, auriculate to amplexicaul, lobed becoming denticulate, uppermost entire. *Racemes* somewhat lax, main branch ca. 50-flowered, elongated considerably in fruit; fruiting pedicels 2.5–4(–5) mm, ascending, straight, glabrous, hardly expanded at apex. *Sepals* broadly oblong, 2–2.5 mm; glabrous; petals absent; filaments subulate, 1.5–2 mm, strongly dilated at base; anthers oblong, ca. 1 mm; nectar glands confluent, surrounding bases of all filament; ovary glabrous; ovules 56–70 per ovary. *Fruit* 3.5–4.5 cm × 1.5–2 mm, linear, terete, slightly torulose, straight, divaricate-ascending; gynophore obsolete; valves with a prominent midvein; style 0.2–0.5 mm; stigma considerably wider than style. *Seeds* ca. 1 mm, ovoid, plump, uniseriate; cotyledons incumbent.

Ecology: Flowering in August, found in moist forests at 2,300–2,800 m.

Additional specimens examined: MEXICO. Chihuahua. 71 miles SW of El Vergel on Hwy 24 to Guadalupe y Calvo, 10.9 miles W of jct. to Atascaderros, ca. 7 miles NE of Guadalupe y Calvo, *Nesom & Lewis 5159* (TEX).

This rare species is known only from the two collections above.

5. Romanschulzia costaricensis (Standl.) Rollins, Contr. Dudley Herb. 3: 219. 1942.

Basionym: *Sisymbrium costaricense* Standl., J. Wash. Acad. Sci. 17: 251. 1927. TYPE: COSTA RICA. San José: near El Copey, ca. 2,000 m, 22 Dec. 1925, *P. C. Standley 42548* (Holotype: US-1,252,847).

Heterotypic synonyms: *Sisymbrium storkii* Standl., Publ. Field Mus. Nat. Hist., Bot. Ser. 8: 13. 1930. TYPE: COSTA RICA. El Roble, 2,850 m, 16 May 1928, *H. E. Stork 2005* (Holotype: F; Isotype: US).

Romanschulzia costaricensis var. *storkii* (Standl.) Rollins, Contr. Dudley Herb. 3: 219. 1942.

Annuals or perennials, sparsely to densely pilose basally, glabrous above or throughout. *Stems* (0.5–)1–2 m tall, erect, much branched above middle. *Cauline leaves* 3–25 × 0.7–9 cm, sessile, auriculate to amplexicaul, lowermost largest, spatulate to oblanceolate, upper ones oblong to lanceolate, margin denticulate to entire, apex acute to acuminate; auricles rounded, to 10 × 10 mm. *Racemes* lax, main branch 70–120-flowered, elongated considerably in fruit; fruiting pedicels 4–9 (–12) mm, horizontal to divaricate or slightly recurved, stout, glabrous, usually forming a straight line with fruit, not expanded at apex. *Sepals* 2–2.7 mm, oblong, glabrous, spreading, green or purple tipped; petals creamy white to greenish, 1–2 × 0.2–0.5 mm, oblong, apex obtuse; filaments 1.5–2 mm, greatly dilated at base; anthers 0.9–1.3 mm, narrowly oblong; nectar glands confluent, surrounding bases of lateral stamens, subtending those of median stamens; ovary glabrous; ovules 40–60 per ovary. *Fruit* 1.8–3.7 cm × 1–1.3 mm, linear, terete, glabrous, slightly torulose; gynophore 0.2–0.5 mm; valves with a prominent midvein; style 1–2 mm; stigma distinctly wider than style. *Seeds* 1–1.3 × 0.6–0.8 mm, ovoid, plump, uniseriate; cotyledons obliquely acccumbent.

Ecology: found in forest clearings, wooded slopes, pastures, moist thickets, fields, open areas along rivers at 800–3,000 m.

Additional specimens examined: COSTA RICA. Cartago: ca. 8 km beyond Puente Dos Amigos, *Almeda et al. 5805* (CAS, MO, TEX); Tapantí, *Zamora et al. 1234* (F, MO), *Lent 2190* (F, MO, NY); Cantón de Paraíso, R.F. Los Santos, entre La Georgina y Villa Mills, km 102–103, *Rodríquez et al. 4197* (INB, NY, MO). Limon: Cantón de Talamanca, Río Lorí, *Fernández 798* (CR, INB, MO). San José. Cantón de Pérez Zeledón, 4 km E Alto loas Jaulares, *Rodríguez 2415* (CR, F, INB, MO); Cantón de Aserri, Cerros de Escazú, *Morales 4669* (MO), El Copey, *Tondus 12190* (US). PANAMA. Chiriqui: Bajo Chorro, *Davidson 447* (F, GH, MO); 10 miles above Boquete on road to Volcan Baru, *Croat 34818* (GH, MO); along Rio Colorado, (GH, MO); Rio Chiriqui, above Cerro Punta, *D'Arcy 6583* (GH, MEXU, MO), (GH, MO); Bajo Chorro, *Woodson & Schery 643* (GH, MO, US); 6 km E Cerro Punta, *Hammel 1524* (GH, MO); Alto Respinga, Viejo above Cerro Punta, *D'Arcy 10700* (MO); above Al Boqete, *Pittier 3058* (GH, US); Distrito de renacimiento, Jurutungo, alrededores de Cerro Pando, Desde Los quetzals hacia El Monumento, *Galdames et al. 3345* (MO, NY, US).

6. Romanschulzia elata Rollins, Contr. Dudley Herb. 3: 224. 1942. TYPE: MEXICO. San Luis Potosí: Alvarez, 5–10 Sep. 1902, *Edward Palmer 108* (Holotype: GH; Isotypes: CM, F, MO, NY, US).

Perennials?, basal portions unknown. *Stems* 1–1.5 m tall, erect, branched above middle, glabrous. *Middle cauline leaves* 8–12 × 3–6 cm, sessile, auriculate to amplexicaul, lanceolate to oblong, margin denticulate to subentire, apex acute, upper leaves progressively smaller. *Racemes* lax, main branch 120–210-flowered, elongated considerably in fruit; fruiting pedicels (10–)15–25 mm, divaricate to horizontal, glabrous, straight, usually forming a straight line with fruit, not expanded at base. *Sepals* 3–4 mm, oblong, glabrous, spreading, purplish; petals white, 3–4 × 0.2–0.3 mm, linear, apex obtuse; filaments subequal, 3–3.5 mm, greatly dilated at base; anthers 1.7–2 mm, narrowly oblong, coiled after dehiscence; nectar glands confluent, surrounding bases of all filament; ovules 36–50 per ovary. *Fruit* 2–2.6 cm × 1.2–1.5 mm, linear, terete, not torulose; gynophore 0.5–1 mm; valves with a prominent midvein; style slender, 0.5–1 mm; stigma as wide as style. *Seeds* 1–1.3 × 0.6–0.8 mm, ovoid, plump, uniseriate, obscurely striate, reticulate; cotyledons incumbent.

Ecology: found in ledges of limestone rock at 2,300–2,500 m.

Additional specimens examined: MEXICO. San Luis Potosí: Alvarez, Sierra de Alvarez, *Pennell 17844* (GH, MICH, NY, US).

7. Romanschulzia guatemalensis (Standl.) Rollins, Contr. Dudley Herb. 3: 223. 1942.

Basionym: *Sisymbrium guatemalense* Standl., J. Wash. Acad. Sci. 17: 251. 1927. TYPE: GUATEMALA. Dept. Quiché: San Miguel Uspantán, 2,000 m, Apr. 1892, *Heyde & Lux 3079* (Holotype: US-354938; Isotypes: GH, K, US).

Heterotypic synonym: *Romanschulzia loeseneri* O. E. Schulz, Bot. Jahrb. Syst. 66: 101. 1933. TYPE: Guatemala, Huehuetenango, Todos los Santos, 1896, *Caec. & Ed. Seler 3110* (Lectotype designated as type by Rollins (1942: 223), B; Isolectotype, GH). Name is illegitimate according to Article 52 of ICBN (McNeill et al., 2006) because one of the two syntypes cited by Schulz (1933) is the type of the earlier published *R. guatemalensis* (see above).

Perennial herbs (0.5–)1–1.5 m tall, glabrous throughout. *Stems* erect, branched above. *Cauline leaves* 3–25 × 0.7–9 cm, sessile, amplexicaul, lowermost largest, oblong to broadly lanceolate, margin denticulate entire, apex acute to acuminate; auricles to 10 × 10 mm, rounded. *Racemes* densely corymbose initially, elongating substantially in fruit, main branch 90–330-flowered; fruiting pedicels (8–)10–14(–18) mm, ascending to divaricate, slender, straight, hardly expanded at apex. *Sepals* 3.5–4.5 mm, oblong, spreading, purple at least distally; petals purple or rarely white, 3.5–5 × 0.4–0.6 mm, linear, apex obtuse; filaments 3–4.5 mm; anthers 0.9–1.5 mm, narrowly oblong; nectar glands confluent, surrounding bases of all filaments; ovary glabrous; ovules 38–60 per ovary. *Fruits* 1.8–3.1 cm × 1–1.5 mm, linear, terete, torulose, straight or curved upwards, glabrous; gynophore 0.1–0.5 mm; valves with a prominent midvein; style 0.5–1 mm; stigma only slightly wider or as wide as style. *Seeds* 1–1.5 × 0.8–1 mm, ovoid, plump, uniseriate, reticulate, obscurely striate; cotyledons incumbent or obliquely so.

Ecology: Flowering February–October in open places in forests, wet thickets at 2,500–3,700 m.

Additional specimens examined: GUATEMALA. Chimaltenango, Calderas, *Johnston 1914* (F). Huehuetenango, near Tunimá, Sierra de los Cuchumatanes, *Steyermark 48293* (UC). Quetzaltenango, Volcán Zunil, *Steyermark 34649* (F); Volcán Santa Maria, *Skutch 866* (F, GH).

8. Romanschulzia guerrerensis Bustam. & R.M. Fonseca, Acta Bot. Mex. 87: 24. 2009. TYPE: MEXICO. Guerrero: Munic. General Heliodoro Castillo, ca. 2 km este de Puerto del Gallo, por la carretera rumbo al cerro Teotepec, 2,400 m, 12 Aug. 2044, *R. M. Fonseca & E. Velázquez 3193* (Holotype: FCME [not seen]; Isotype: MO).

Perennials?, hirsute to middle on stems and leaf veins, glabrous distally. *Stems* ca. 0.7 m tall, erect, much branched above middle. *Cauline leaves* 4–10 × 2–4.5 cm, sessile, auriculate to amplexicaul, lowermost largest, oblong-lanceolate to oblanceolate or oblong, margin denticulate to subentire, apex acute to acuminate. *Racemes* lax, elongated considerably in fruit; fruiting pedicels 5–20 mm, horizontal at base, glabrous, curved upwards, not expanded at apex. *Sepals* ca. 2.8 mm, oblong, glabrous, spreading, green or purple; petals absent; filaments subequal, greatly dilated at base, ca. 3.3 mm; anthers 1–1.3 mm, narrowly oblong; nectar glands confluent, surrounding bases of all stamens; ovary glabrous; ovules 36–54 per ovary. *Fruit* 2.8–3.7 cm × 1.2–1.5 mm, linear, terete, erect, strongly torulose, glabrous; gynophore obsolete; valves with a prominent midvein; style ca.1 mm; stigma about as wide as style. *Seeds* 1.3–1.5 × 0.7–0.8 mm, oblong, plump, uniseriate, reticulate, obscurely striate; cotyledons incumbent.

Additional specimens examined: MEXICO. Guerrero: Mpio. Tlacotepec, 4 km NE Puerto del Gallo, camino a Filo de Caballo, 3,000 m, *Martínez & Villaseñor 4268* (MEXU, MO).

The species is known only from the two collections above.

9. Romanschulzia mexicana Iltis & Al-Shehbaz, Novon 3: 96. 1993. TYPE: MEXICO. Guerrero: Mpio. Leonardo Bravo, Pedregal, 28 km WSW of Filo de Caballo, 10 June 1985, *W. Thomas & J. L. Contreras 3788* (Holotype: NY; Isotypes: MEXU, UC, WIS).

Homotypic synonym: *Lexarzanthe mexicana* (Iltis & Al-Shehbaz) N. Diego & Calderón, Acta Bot. Mexicana 68: 76. 2004.

Scandent shrubs, glabrous throughout. *Stems* terete, to 2.5 m. *Lowermost cauline leaves* petiolate, lanceolate to oblong-lanceolate, 2.5–11 × 0.4–3 cm, base cuneate, margin denticulate, apex acute to acuminate; uppermost leaves sessile, auriculate to amplexicaul, margin serrulate, apex acuminate. *Racemes* lax, lateral branches 12–25-flowered, slightly elongated in fruit; fruiting pedicels slender, divaricate, arcuate to straight, 4–8 cm, seriate, considerably expanded at apex. *Sepals* 1–1.2 cm, oblong, deciduous after anthesis; petals creamy white, 1.2–1.4 cm × 2.5–3.5 mm, oblanceolate; filaments erect, 2–2.7 cm; anthers 2–2.3 mm; nectar glands confluent, subtending bases of all filaments; ovary glabrous; ovules 20–36 per fruit. *Fruits* linear, 2.5–5.6 cm × 2–3 mm, terete, glabrous; gynophore 2–3.2 cm, striate; valves with a prominent midvein; septum complete; style 0.5–2 mm; stigma narrower than style. *Seeds* narrolwy oblong, 2.6–3.6 × 1–1.3 mm, uniseriate, plump, obscurely reticulate; cotyledons incumbent.

Ecology: found in mesophyllous areas, forests and pastures on karstic limestone at 1,800–2,630 m.

Additional specimens examined: MEXICO. Guerrero: Mpio. General Heliodoro Castillo, El Jilguero, *Diego et al. 7724* (CAS, IEB), *Diego et al. 7865* (IEB); Mpio. Tlacotepec, 3 km S Cruz Nuevo, *Ramamoorthy et al. 4205* (MEXU).

Romanschulzia mexicana is the most distinctive species in the genus, and it can be readily separated from the other species by a combination of long and rather slender fruiting pedicels and gynophores. Pérez & Rzedowski (2004) transferred the species to a monotypic genus, *Lexarzanthe*, said to differ from *Romanschulzia* by the slender pedicels, erect and larger floral parts, and petals persisting during anthesis. However, these differences are unrealistic because erect to ascending floral parts and petals persisting at anthesis occur together in other species of *Romanschulzia* (e.g., *R. alpina*), and the differences in having longer pedicels and larger flowers simply do not justify the establishment of an independed genus for *R. mexicana*.

10. Romanschulzia meyeri Rollins, Rhodora 58: 149. 1956. TYPE: MEXICO. Nuevo León: E side of Cerro Linadero, Dulces Nombres, E of border into Tamaulipas, 24°N, 99.5–100.5°W, 9 Aug. 1948, along dry steams, 1,900 m, *F. G. Meyer & D. J. Rogers 2892* (Holotype: GH; Isotypes: GH, MO × 4).

Perennial herbs, glabrous throughout except for leaves. *Stems* terete to 2 m, branched above, glabrous. *Basal leaves* with petioles 5–15 cm; blade pinnately lobed to nearly runcinate, 10–20 cm, hirsute, dentate, terminal lobe considerably larger than lateral ones; lateral lobes oblong; *cauline leaves* sessile, amplexicaul, broadly oblong to lanceolate, lowermost 8–20 × 3–8 cm, reduced in size upwards, margin obscurely and remotely denticulate, apex acute. *Racemes* lax in fruit, main branch ca. 200-flowered; fruiting pedicels slender, horizontal to descending, straight, 7–15 mm, glabrous, distinctly expanded at apex. *Flowers* not seen; nectar glands confluent, surrounding bases of all filaments; ovules and seeds 70–100 per fruit. *Fruits* linear, 6–10 cm × 1–1.2 mm, terete, strongly torulose to submoniliform, glabrous; gynophore 0.8–2.5(–5) mm; valves with a prominent midvein; septum complete; style 1–1.5 mm; stigma about as wide as style. *Seeds* oblong, 1.2–1.7 × 0.7–0.8 mm, uniseriate, plump, substriate, reticulate; cotyledons incumbent.

The species is known only from the type collection.

11. Romanschulzia orizabae (Schltdl. & Cham.) O. E. Schulz, Bot. Jahrb. Syst. 66: 102. 1933 .

Basionym: *Nasturtium orizabae* Schltdl. & Cham., Linnaea 5: 212. 1830. TYPE: MEXICO. Mt. Orizaba, *Schiede 433* (Holotype: HAL; Isotype: B).

Homotypic synonyms: *Erysimum orizabae* (Schltdl. & Cham.) Kuntze, Revis. Gen. Pl. 1: 25. 1891.

Sisymbrium orizabae (Schltdl. & Cham.) O. E. Schulz in Engler, Pflanzenreich IV. 105(Heft 86): 73. 1924.

Heterotypic synonyms: *Sisymbrium turritoides* Loes., Bull. Herb. Boiss., ser. 2, 3: 90. 1903. TYPE: MEXICO. Oaxaca: Sierra de San Felipe, 9,500 ft [2,896 m], by brook, 18 Sep. 1894, *C. G. Pringle 4909* (Lectotype partially designated by Rollins (1942: 220) and completed herein, B; Isolectotypes: F, GH, MEXU, MO, UC, US).

Romanschulzia turritoides (Loes.) O.E. Schulz, Bot. Jahrb. Syst. 66: 101. 1933.

Thelypodium australe Brandegee, Zoe 5: 180. 1905. TYPE: MEXICO. State of Mexico: Iztaccihuatl, March–July 1903, *C. A. Purpus 304* (Holotype: UC; Isotypes: CAS, GH, MO).

Romanschulzia australis (Brandegee) Rollins, Contr. Dudley Herb. 3: 225. 1942.

Thelypodium mexicanum Brandegee, Zoe 5: 180. 1905. TYPE: MEXICO. State of Mexico: Iztaccihuatl, March–July 1903, *C. A. Purpus s.n.* (Holotype: UC; Isotype: GH).

Annual or perennial. *Stems* (0.4–)0.8–2.5 m, glabrous or hirsute throughout, erect, usually branched above middle. *Basal leaves* runcinate, 10–40 × 1–7 cm, pilose mostly along veins or glabrous, terminal lobe considerably larger than lateral lobes; *cauline leaves* oblong to lanceolate, middle ones 4.5–20 × 1–7 cm, sessile, amplexicaul, lowermost largest, denticulate, apex acute to acuminate. *Racemes* lax, main branch (70–)100–260-flowered, elongated considerably in fruit; mature flower buds obtuse at apex, terete; fruiting pedicels 7–17(–20) mm, horizontal to divaricate, glabrous, straight or slightly curved upwards, not expanded at apex. *Sepals* 2.5–3(–4 mm), oblong, glabrous, spreading, green, caducous; petals white, oblanceolate to linear, 3.5–5 × 0.2–1 mm; filaments subequal, dilated at base, 2.5–3.5 mm; anthers oblong, 1–1.7 mm; nectar glands confluent, surrounding bases of all stamens; ovules (48–)60–80 per ovary. *Fruit* (2–)2.5–3.7(–4.5) cm × 1.5–2 mm, linear, glabrous, obscurely torulose; gynophore 0.2–2(–5) mm; valves with a prominent midvein; style 0.5–2 mm; stigma as wide as style. *Seeds* 1–1.5 × 0.6–0.8 mm, narrowly ovoid, plump, uniseriate to subbiseriate, striate-reticulate; cotyledons incumbent.

Ecology: flowering June–August in moist woods with tussok grasses and moss-covered rocks, bushes on forest edge, steamsides in woods, hummock grasses in volcanic soil, field margins, rocky ledges, and pine-fir forests at 2100–4000 m.

Additional specimens examined: MEXICO. Distrito Federal: Mpio. Tlalpan, 1 , N de limite enter Distrito Federal y Morelos, *Bye et al. 19095* (MEXU); Popocatepetl, *Rose & Hay 6062* (US); below Paraje Provincial, Mt. Popocatepetl, *Ball 5175* (US); Serano de Agusco, *Pringle 7317* (GH); Cañada de Contreras, *Lyonnet 2975* (US); Desierto de los Leones, *Lyonnet 2587* (CAS, MEXU, MO, US); Cerro de Esqueihuil, delegación de Xochimilco, *Ventura 1702* (MEXU, MICH, MO, NY), *Ventura 2919* (MEXU, MICH, NY); Desierto de los Leones, delegación de Cuajimalpa, *Ventura 3457* (MEXU, XAL), (MEXU). Estado de Mexico: Iztaccihuatl, Trancas, ca. 8 km E San Rafael, *Beaman 2861* (GH, MSC, TEX, UC, US); 5 km WNW of Río Frio at Llano Grande, *Iltis et al. 1102* (GH); 8 km S Río Frio, *Aviña 314* (MEXU); Llano Grande, *Rzedowski 29294* (CAS, MICH, US); N del Llano de Aculco, *Koch 75405* (CAS, F, NY); 1 km N de Llano Grande, *Rzedowski 18426* (GH); Cerro Papayo, 6 km S del Llano Grande, *Rzedowski 36748* (MEXU); 6 km SW Río Frio on hwy 190 at km 56, *Roe et al. 1437* (GH, LL, WIS); camino de Toluca al Nevado de Toluca, *Rzedowski 15817* (GH); San Rafael, *Matuda et al. 27601* (GH, MEXU); Nevada de Toluca, *Rose & Painter 7936* (NY, US), *Correll et al. 31318* (LL); Río San Luis Aculco, *Hinton et al. A 226* (TEX); Peña Descaní Jilotepec, *Matuda et al. 30939* (MEXU); 8 km E de Amecameca, *Rzedowski 31892* (F, MEXU); near Cima, *Rose & Painter 7162* (US). Guanajuato: El Puerto Blanco, 12 km N de Mesas de Jesús, *Ventura & López 7437* (XAL). Guerrero: Mpio. Mina, Teotepec, *Hinton et al. 14459* (F, GH, MO, NY, US). Hidalgo: above Pueblo Nuevo on road from Real del Monte to El Chico, *Moore & Wood 4080* (GH); Cerro de las Ventanas, 6 km N de Pachuca, *Rzedowski 26800* (DS, MICH, MSC, US). Jalisco: NE slopes of Nevado de Colima, below Canoa de Leoncito, *McVaugh 12833* (GH, MICH), *McVaugh 13413A* (GH, MICH); Mpio. Venustiano Carranza, 14 km S Carr. Cd. Guzmán-Autlán, *Villa & Chávez 837* (MICH). Morelos: above Cuernavaca, *Pringle 6601* (GH, US). Nuevo León. Zaragoza, Cerro El Viejo, *Hinton 23245* (TEX). Oaxaca: Sierra de San Felipe, *Smith 807* (US), *Nelson 1082* (US). Puebla-Veracruz border: Ciltaltepetl, *Purpus 2807* (F, GH, NY, UC, US); Mt. Orizaba, *Rose & Hay 5689* (US); Pico Orizaba, *Linden 1007* (K), *Galeotti 4678* (K). Veracruz: Mpio. Perote, 27.4 km on road to Cofre de Perote

from Hwy 140 and Perote, *Cowan et al. 3912* (CAS, GH, TEX); 5 km NW de Cofre de Perote, *Narave et al. 727* (MEXU, XAL); N slopes of Cofre de Perote, vicinity of village Conejos, 14 km SE of Perote, *Hansen & Nee 7700* (F, MO, NY, RSA, XAL).

Although the holotype of *Nasturtium orizabae* has immature fruits, the isotype at B has reasonably developed fruits that clearly support the placement of *Sisymbrium turritoides* in its synonymy. Schulz (1933) recognized both of them as distinct species of *Romanschulzia* and separated the former by having petals shorter (vs. longer) than sepals and by fewer ovules (24–32 vs. 40–56). By contrast, Rollins (1942) distinguished them by having in *R. orizabae* longer (vs. shorter) styles and gynophores. These alleged differences, as well as those of the pedicel length and inflorescence size given by Rollins (1993), simply do not hold. In my opinion, it is far more practical to accept one, widespread, and somewhat variable species than formally recognize some of the minor variants in this complex as species and ignore the remaining variants. The type collection of *R. turritoides* does not differ significantly from most collections of *R. orizabae*. It includes somewhat robust, to 240-flowered plants with fruits 3.3–4.5 cm long, but fruits to 4 cm long occur sporadically in the species range, as evidenced from *Purpus 2807* (NY) from Veracruz-Puebla, *Matauda 30939* (MEXU) and *Beaman 2861* (TEX) from Estado de México, *Leyonnet 2587* (MEXU) from Distrito Federal. The flower number along the main branch of the inflorescence can be quite variable in this complex and does not seem to be useful taxonomically. Therefore, the reduction of *R. turritoides* to synonymy of *R. orizabae* is quite clear based on the extensive material examined, which was not available to Rollins and Schulz.

Loesener (1903) cited two syntypes (*Pringle 4909* and *Seler*) under his *Sisymbrium turritoides*. Although Schulz (1933) removed *Seler 3110* as the type of *Romanschulzia loeseneri* and retained *Pringle 4909* under *R. turritoides,* his action does not constitute automatic lectotypification of *R. turritoides* because it is not in agreement with Article 7.10 of the ICBN (McNeill et al., 2012). Rollins (1942: 220) took Pringle's gathering as the type collection of the species but he did not designate where the lectotype should be. His partial lectotypification is completed herein by taking the specimen at B as the lectotype.

Based on critical examination of types and other specimens of all accepted and synonymized taxa currently assigned to *Romanschulzia*, *R. orizabae* rather than *R. arabiformis* becomes the most widespread and variable species in the genus. The opposite view was held by Rollins (1942, 1993) who did not have access to such extensive material as in the present study.

Although *Thelypodium australe* and *T. mexicanum* were correctly united by Rollins (1942) in *Romanschulzia*, as *R. australis*, their placement in synonymy of *R. arabiformis* (Rollins, 1993) was incorrect because they have distinctly longer fruits, glabrous sepals, and obtuse buds, all of which characters are typical of *R. orizabae*. The type collection of *R. australis* differs from typical *R. orizabae* plants by having erect (vs. divaricate to ascending) fruiting pedicel that forms a straight line (vs. distinct angle) with the fruit. However, this feature shows a continuous variation that occurs throughout most of the species range.

12. Romanschulzia rzedowskii Rollins, Contr. Gray Herb. 214: 25. 1984. TYPE: MEXICO. Jalisco: Veriente N del Cerro Viejo, Arroyo de Aguas, Municipio de Tlajomulco, 14 Aug. 1970, 2,100 m, *J. Rzedowski 27493* (Holotype: GH; Isotypes: CAS, ENCB [not seen], MEXU, MICH, MO).

Annuals or biennials. *Stems* erect, 4–10.8 dm, branched above middle, retrorsely to spreading pilose, glabrate distally. *Basal leaves* lyrate-pinnatifid, 4–10 cm, minutely denticulate by callosities terminating veins, pilose mainly along veins; cauline leaves 4–12 × 1.5–5 cm, sessile, auriculate to amplexicaul, lowermost largest, broadly obovate to broadly oblong, entire and remotely denticulate, reduced in size upwards, apex obtuse to acute, usually sparsely puberulent on veins and margin. *Racemes* lax, main branch 30–50-flowered, elongated considerably in fruit; fruiting pedicels 3.5–6 mm, sharply recurved, stout, glabrous, subappressed to rachis, not expanded at apex. *Sepals* 1.8–2 mm, oblong, glabrous, spreading, readily caducous; petals absent; filaments 1–1.5 mm,

greatly dilated at base, purplish; anthers 0.5–0.7 mm; nectar glands confluent, surrounding bases of all filaments; ovary glabrous; ovules 40–50 per ovary. *Fruit* 2.5–3 cm × 1–1.3 mm, linear, terete, straight, glabrous, pendent; gynophore obsolete or to 0.3 mm; valves with a prominent midvein; style 0.5–1 mm; stigma considerably wider than style. *Seeds* ca. 1.2 × 0.7 mm, ovoid, plump, reticulate, uniseriate; cotyledons incumbent.

Known only from the type collection.

13. Romanschulzia schistacea Rollins, Rhodora 58: 152. 1956. TYPE: MEXICO. Hidalgo: Distr. Zimapán, Barranca de las Verduras, N side of El Monte on trail from Zimapán to mines of El Monte, 7,500–8,400 ft [2,286–2,560 m], 11 Aug. 1948, moist mixed woods, *H. E. Moore, Jr. & C. E. Wood, Jr. 4495* [as 1945 in print] (Holotype: GH; Isotypes: BH, MEXU).

Biennials or possibly *perennial*, glabrous throughout except for leaves. *Stems* 0.5–1.2 m tall, erect, simple or few branched above middle, glabrous. *Basal leaves* lyrate, 3–5 cm, denticulate, sparsely pilose; cauline leaves 4–10 × 1.5–3.5 cm, sessile, amplexicaul, oblong to lanceolate, sparsely pubescent, margin denticulate as callosities terminating veins, apex acute to acuminate, uppermost leaves smaller, denticulate, acute, glabrous or lowermost sparsely pilose. *Racemes* lax, main branch 20–110-flowered, elongated in fruit; fruiting pedicels 5–10 mm, divaricate to horizontal, forming a straight line with fruit, glabrous, straight, distinctly expanded at apex. *Sepals* 3–4 mm, oblong, glabrous, spreading, caducous; petals white, linear, spreading, 4–5 × ca. 0.5 mm, undifferentiated into blade and claw; filaments subequal, spreading, 3.5–4 mm, dilated at base; anthers oblong, 1.5–2 mm, narrowly oblong; nectar glands confluent, surrounding bases of all filaments; ovary glabrous; ovules 30–50 per ovary. *Fruit* 2.5–3.5 cm × ca. 1 mm, linear, terete, obscurely torulose, curved upwards; gynophore obsolete to 0.5 mm; valves with a prominent midvein; style 1–1.5 mm; stigma about as wide as style. *Immature seeds* ovoid, plump, uniseriate.

Ecology: Flowers July–August at 1800–2600 m.

Additional specimens examined: MEXICO. Hidalgo: Zinc mine 12 miles W up mine road from Mex. rte 85, 2 miles No of Posada del Re, Zimapán, *Mears 300* (TEX). Queretaro: Mpio. Pinal de Amoles**,** 1–2 km WSW Puerto de Alejandría, *Carranza 2004* (TEX).

14. Romanschulzia subclavata Rollins, Rhodora 58: 152. 1956. TYPE: Mexico, Michoacán, Mt. Tancitaro, Munic. Tancitaro, just above cloud forest on exposed ridge, 9,500 ft [2,896 m], 25 July 1941, *W. C. Leavenworth & H. Hoogstraal 1207* (Holotype: GH; Isotypes: F, MO).

Biennials or also possibly *perennial*. *Stems* 0.6–2 m tall, erect, much branched above middle, hirsute throughout, glabrous distally or rarely throughout. Lowermost *cauline leaves* runcinate, middle ones 7–15 × 1.5–4 cm, lanceolate, sessile, amplexicaul, hirsute along veins or rarely glabrous, margin denticulate, apex acute to acuminate, uppermost leaves smaller, denticulate, acuminate. *Racemes* lax, main branch 170–280-flowered, elongated considerably in fruit; fruiting pedicels 4–15 mm, horizontal to divaricate, glabrous, straight or curved upwards; not expanded at apex. *Sepals* 3–4 mm, oblong, glabrous, spreading, green or purple, caducous; petals absent; filaments subequal, 3.5–5 mm, greatly dilated at base; anthers oblong, 1.5–2 mm, narrowly oblong; nectar glands confluent, surrounding bases of all filaments; ovary glabrous; ovules 22–28 per ovary. *Fruit* 1.4–2(–2.5) cm × 1.4–2 mm, linear, terete, strongly torulose; gynophore 1–3 mm; valves with a prominent midvein; style 0.5–1 mm; stigma about as wide as style. *Seeds* 1.5–2 × 1–1.2 mm, ovoid, plump, uniseriate, substriate, coarsely reticulate; cotyledons incumbent.

Ecology: Flowers July–August in cloud forests, damp cliffs, forest margins at 2,800–3,660 m.

Additional specimens examined: MEXICO. Distrito Federal: Casa Manero, Area Natural Protegida, desierto de los Leones, *César & Rivera 271* (MEXU). Hidaldgo: El Chico-Hidalgo, *Lyonnet 456* (US). Michoacán: Mt. Tancitaro, *Leavenworth & Hoogstraal 4034* (F, GH, MO); Sierra Chincua, Mpio. Angangueo, *Tenorio & Manríquez 229* (XAL). Jalisco: Mpio. Tuxpan, road to microondas on Volcán Colima, *Beck et al. 1186* (DUKE, MEXU, MO, UC).

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